CHESAPEAKE
BAY CROSSING STUDY
TIER 1 NEPA

INDIRECT AND CUMULATIVE EFFECTS TECHNICAL REPORT

MDTA
Maryland Transportation Authority

JANUARY 2021

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LIST OF ABBREVIATIONS & ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ACS	American Community Survey
ADT	Average Daily Traffic
BIBI	Benthic Macroinvertebrates
BMP	Best Management Practices
CARA	Corridor Alternatives Retained for Analysis
CBP	Chesapeake Bay Program
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COMAR	Code of Maryland Regulations
CSA	Combined Statistical Area
CWA	Clean Water Act
DC	District of Columbia
DE	Delaware
DNREC	Department of Natural Resources and Environmental Control
EDDMapS	Early Detection & Distribution Mapping System
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
ESC	Erosion and Sediment Control
FCA	Forest Conservation Act
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
GHG	Greenhouse Gas
IBI	Index of Biotic Integrity
IDA	Intensely Developed Areas
FIDS	Forest Interior Dwelling Species
FMP	Fishery Management Plans
GIS	Geographic information system
HAPC	Habitat Areas of Particular Concern
HUC	Hydrologic Unit Code
ICE	Indirect and Cumulative Effects
IDA	Intensely Developed Areas

IPaC	Information for Planning and Consultation
LDA	Limited Development Areas
LRP	Long-range Plan
LULC	Land Use and Land Cover
MBSS	Maryland Biological Stream Survey
MD	Maryland
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MDOT	Maryland Department of Transportation
MDOT SHA	Maryland State Highway Administration
MDP	Maryland Department of Planning
MDTA	Maryland Transportation Authority
M-NCPPC	Maryland-National Capital Park and Planning Commission
MOVES	Motor Vehicle Emission Simulator
MRL	Maryland Reforestation Law
MWCOG	Metropolitan Washington Council of Governments
NAAQS	National Ambient Air Quality Standards
NCDOT	North Carolina Department of Transportation
NCHRP	National Cooperative Highway Research Program
NCSG	National Center of Smart Growth
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NLEB	Northern Long-eared Bat
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NR	Not-rated
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OSPC	Office of State Planning Coordination
PFA	Priority Funding Area
RCA	Resource Conservation Areas
SAV	Submerged Aquatic Vegetation
SIP	State Implementation Plan
SSPRA	Sensitive Species Project Review Areas
SWM	Stormwater Management
TAZ	Transportation Analysis Zones
TEA	Targeted Ecological Areas
TDM	Travel Demand Management
TIP	Transportation Improvement Program
TMDL	Total Maximum Daily Load

TRB	Transportation Research Board
TSM	Transportation Systems Management
US	United States
USACE	United States Army Corps of Engineers
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WOTUS	Waters of the US
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**). This analysis of ICE considers the three Corridor Alternatives Retained for Analysis (CARA) as described in **Section 2.0,** which were identified from a screening of 14 corridors**.**

This technical report presents the assessment of Indirect and Cumulative Effects (ICE) of the alternatives evaluated in the Tier 1 EIS. Section 1 introduces the project, the purpose and need for the proposed action, the alternatives considered, and the methodology for the ICE analysis. Section 2 describes the scoping process and results relevant for ICE, the analysis of geographic and temporal boundaries, and sensitive resources inventory in the ICE Analysis Boundary. Section 3 provides information on resource identification and data collection. Section 5 covers the indirect effects analysis, and Section 6 discusses the cumulative effects analysis.

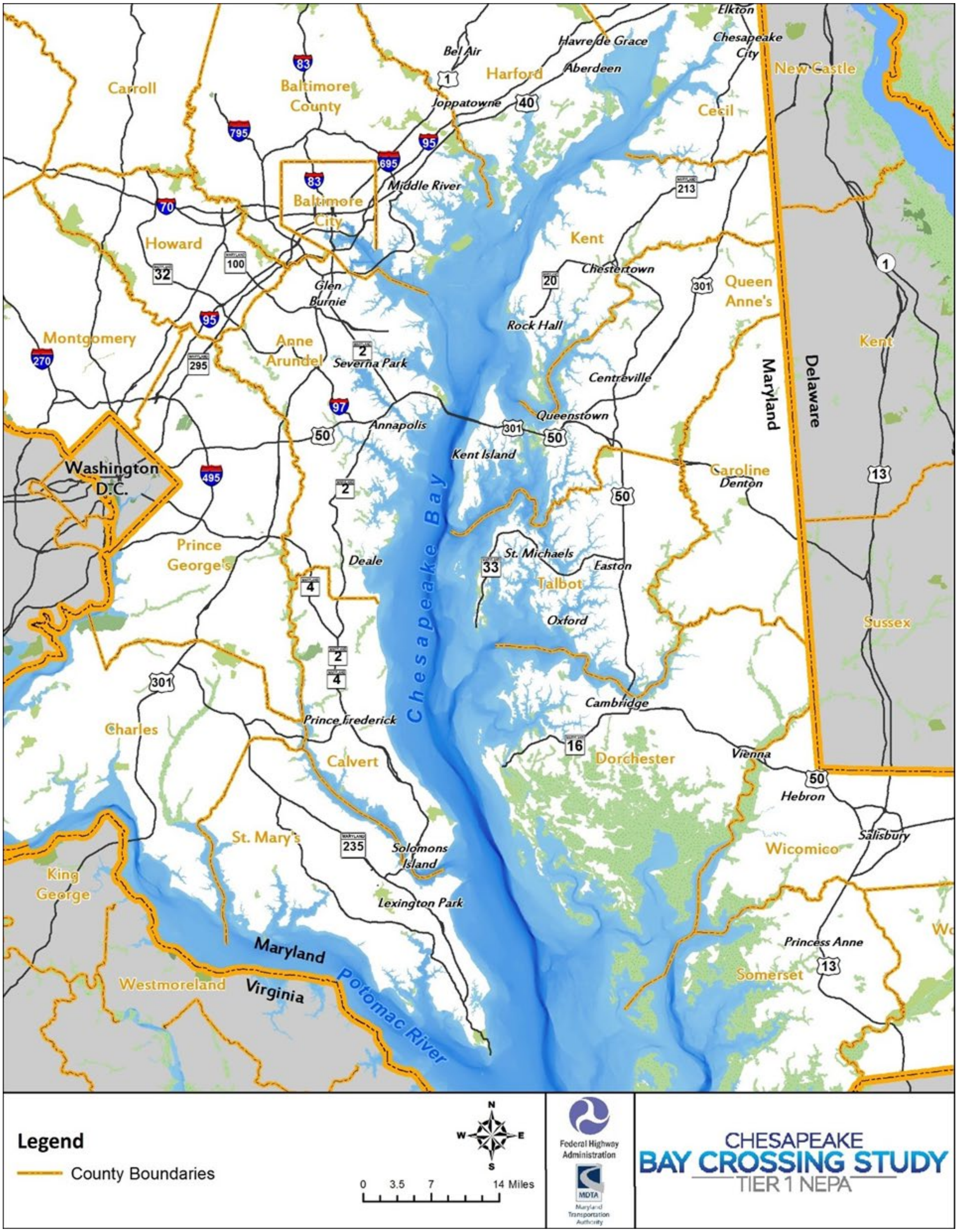
1.2 Purpose and Need

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.

Figure 1-1: General Study Area



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, socioeconomic and cultural resources it supports.

2.0 ALTERNATIVES CONSIDERED

The alternatives considered in this technical study include three Corridor Alternatives Retained for Analysis (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 screening resulted in the identification of three CARA; none of the MOA were carried forward for further Tier 1 analysis as standalone alternatives.

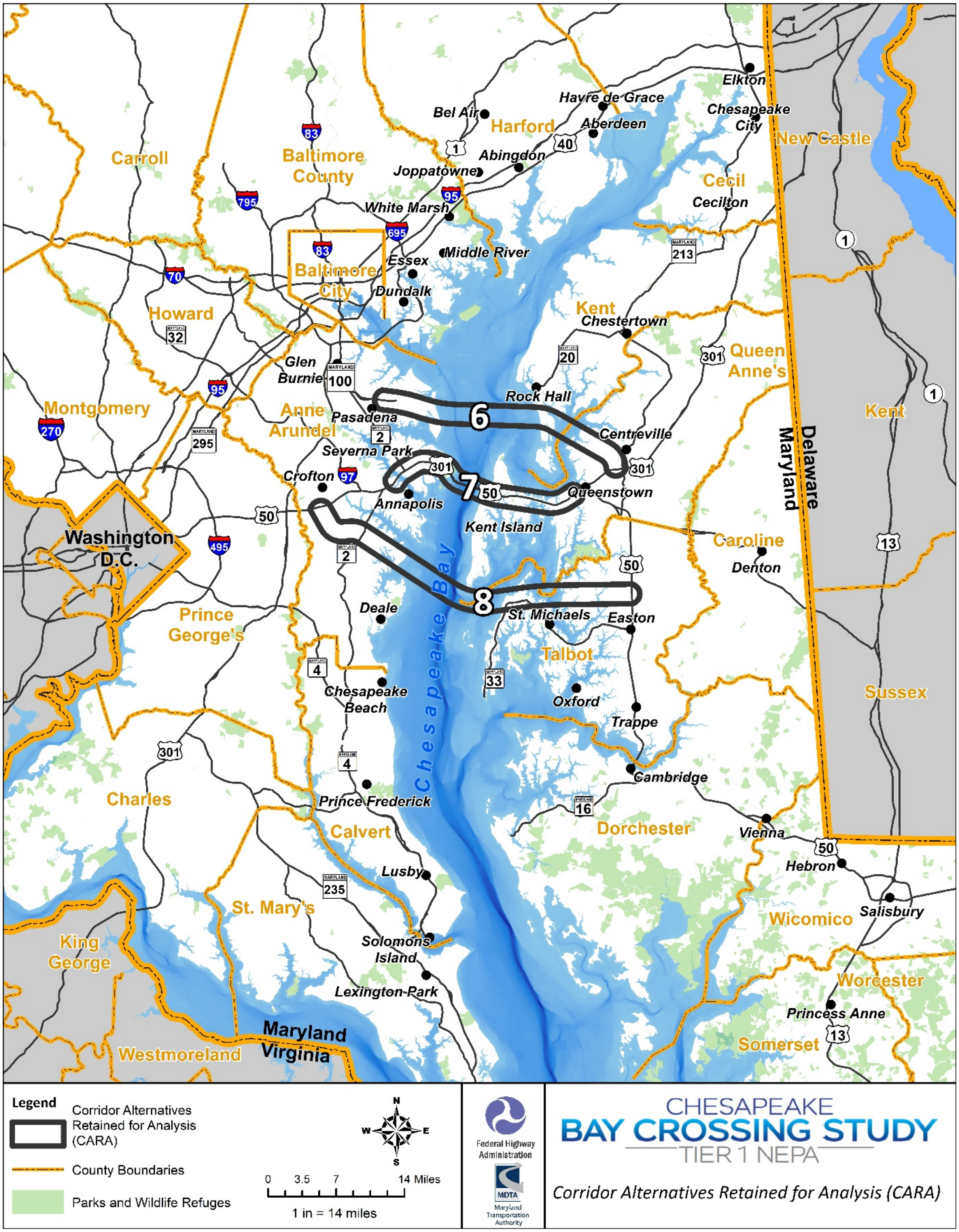
2.1 No-Build Alternative

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. The No-Build Alternative also includes existing transportation systems management/travel demand management (TSM/TDM) measures such as contraflow lanes on the existing bridge and planned and funded TSM/TDM measures as of Project Scoping in 2017, such as automated contraflow lanes.

2.2 Corridor Alternatives Retained for Analysis (CARA)

The initial screening process began with an evaluation of 14 corridors and 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 four 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.

Figure 2-1: Corridor Alternatives Retained for Analysis



2.2.1.1 Corridor 6

From west to east, the 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 the existing roadway network until the tie-in with US 301 south of Centreville.

2.2.1.2 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.

2.2.1.3 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.

3.0 METHODOLOGY AND SCOPING

The level of detail and analysis presented in this document is consistent with a tiered NEPA process. Relative to a typical project-level EIS, this Tier 1 level analysis is more general, relying primarily on desktop analysis of available data. Additionally, no alignments within the CARA have been developed and assessment of the broad two-mile wide corridors is primarily in the form of an environmental inventory of resources and qualitative discussion of potential effects.

3.1 Methodology

3.1.1 Regulatory Context

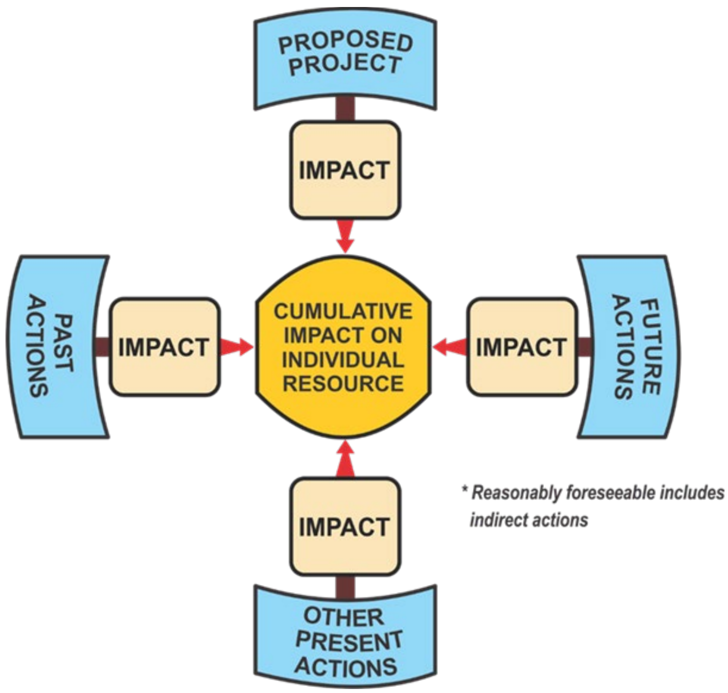
The ICE analysis was implemented consistent with the Council on Environmental Quality's (CEQ) *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ, 1997a) and Maryland State Highway Administration's (MDOT SHA) *Indirect and Cumulative Effects Analysis Guidelines for Environmental Impact Statements and Environmental Assessments and Categorical Exclusions* (MDOT SHA, 2007).

CEQ regulations for implementing NEPA address federal agency responsibilities applicable to indirect and cumulative considerations, analysis, and documentation (40 Code of Federal Regulations (CFR) 1508.25) for the environmental consequences section of an EIS (40 CFR 1502.16) (FHWA, 2014). CEQ defines indirect effects as "…effects which are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable" (40 CFR 1508(a)). Indirect effects may include "growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 CFR 1508(a)). These induced actions are those that may occur with the implementation of the proposed project**.**

CEQ defines cumulative effects (or impacts) as, "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). Cumulative effects are evaluated in light of the total of all impacts, direct and indirect, experienced by a particular resource that have occurred, are occurring, and/or would likely occur as a result of any action or influence, including effects of a federal activity (USEPA, 1999), as illustrated in **Figure 3-1**.

Because indirect and cumulative effects may be influenced by actions including those taken by others outside of the immediate study area, assumptions must be made to estimate the result of these actions. The CEQ regulation cited above states that the analysis must include all the indirect effects that are known, and make a good faith effort to explain the impacts that are not known but which are "reasonably foreseeable". While NEPA does not define what constitutes "reasonably foreseeable actions," court decisions on this topic indicate that indirect effects analysis should consider effects that are sufficiently "likely" to occur and not those that only may be conceived or imagined (FHWA, 2014). Building upon judicial interpretations, CEQ guidance suggests that actions that are probable should be considered while actions that are merely possible, conceptual, or speculative in nature are not reasonably foreseeable and need not be considered (CEQ, 1981; FHWA, 2014).

Figure 3-1: Cumulative Effects



Source: FHWA (2015)

3.1.2 Indirect Effects

Transportation improvements often reduce time and cost of travel, as well as provide new access to properties, enhancing the attractiveness of surrounding land to developers and consumers. Development of vacant land, or conversion of the built environment to more intensive uses, is often a consequence of highway projects.

For the purposes of this technical report and the associated EIS, the methodology prescribed in the Transportation Research Board's (TRB) National Cooperative Highway Research Program (NCHRP) Report 466, *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects* (TRB, 2002) is followed for analyzing indirect effects.

In NCHRP Report 466, TRB states that indirect effects can occur in three broad categories:

1) Encroachment-Alteration Impacts – Alteration of the behavior and functioning of the affected environment caused by study encroachment (physical, biological, socioeconomics) on the environment;
2) Induced Growth Impacts – Project-influenced development effects (land use); and
3) Impacts Related to Induced Growth – Effects related to project-influenced development effects (impacts of the change of land use on the human and natural environment).

For the purposes of this analysis, the term "indirect effects" refers to all three of these categories.

3.1.3 Cumulative Impacts

Cumulative impacts are the incremental impacts to the environment that are brought about by an action in the context of other past, present, and reasonably foreseeable future actions. In simplest terms, analyzing cumulative impacts means considering and accounting for the impacts of a proposed action to important natural and socio-economic resources in the study area in the context of other public or private actions that could affect those same resources.

To document cumulative effects for this study, the analysis followed the five-part evaluation process outlined in Fritiofson v. Alexander, 772 F.2d 1225 (5th Cir., 1985), as described in FHWA's Guidance: *Questions and Answers Regarding the Consideration of Indirect and Cumulative Effects in the NEPA Process* (FHWA, 2014):

1) What is the geographic area affected by the study?
2) What are the resources affected by the study?
3) What are the other past, present, and reasonably foreseeable actions that have impacted these resources?
4) What were those impacts?
5) What is the overall impact on these various resources from the accumulation of the actions?

Each of these parts of the cumulative effects evaluation process is discussed in **Section 6.0** of this technical report.

Indirect and Cumulative effects will be analyzed using the following steps:

Step 1. Scoping (described in this section);

Step 2. Resource Inventory Identification and Data Collection (described in **Section 4.0**); and

Step 3. Analysis of Indirect and Cumulative Effects Analysis (described in **Section 5.0 and 6.0**).

Because no specific indirect and cumulative impacts will be identified in this ICE analysis, discussion of avoidance, minimization and mitigation measures will be considered in the Tier 2 EIS.

To complete Steps 1-3, the required analyses rely on planning judgment. Planning judgment is a structured process for analyzing and forecasting land use change (American Association of State Highway and Transportation Officials (AASHTO), 2007) and relies on an understanding of the basics of transportation and land use interactions and available data sources while using conclusions from research and experience to make informed judgments. Planning judgment is based on experience and expertise of the study team combined with previously published reports and data rather than extensive modeling or field data collection and analysis; thus, indirect effects will be analyzed both qualitatively and quantitatively. The indirect effects analysis is also based on an understanding of the proposed infrastructure, the resources, trends and existing conditions in the study area, professional experience, past scientific studies of the effects of similar projects, and input from appropriate resource and regulatory agencies during the scoping process.

3.2 Scoping

As part of the EIS process, MDTA published the Notice of Intent in the Federal Register on October 11, 2017 announcing the EIS and providing information on scoping meetings and how to provide comment. A total of 390,899 email notifications were sent between October 30 and November 7, 2017. A total of 444 public comments were received, many of which concerned the potential for new development resulting from a new crossing, and the associated indirect effects (both positive and adverse), to communities, socioeconomics and natural resources. Other concerns about indirect effects included the potential for traffic impacts on local infrastructure capacity.

MDTA coordinated with numerous agencies to collect their input during the scoping process. The overall agency coordination process includes Cooperating, Participating, and Notified organizations. These include federal and state agencies as well as local agencies, counties, municipal planning organizations, and other stakeholders. Seven agencies are Cooperating Agencies (four federal and three state) and 35 agencies are Participating Agencies. Notified agencies and stakeholders include four federal and eight state agencies, fourteen counties and 68 municipalities. MDTA mailed scoping letters from November to December 2017 to these agencies and stakeholders to obtain pertinent GIS data layers and jurisdictional resource information as well as to identify key issues regarding the potential environmental impacts for this study. Input from the agency scoping period, such as GIS data layers and input on the technical studies methodology, is included in this ICE Technical Report.

Data collected during the scoping phase was used to develop the ICE Analysis Boundary and Temporal Study Boundary, as described in **Section 3.3** and **Section 3.4** below. Information collected during and after the scoping phase is included in **Section 4.0**, below.

3.3 ICE Analysis Boundary

The CARA evaluated in the EIS are two miles wide and extend far enough to connect to existing roadway infrastructure on both sides of the Bay. Specific alignments within these corridors will not be identified during Tier 1. Corridors 6, 7, and 8 were used to develop the ICE Analysis Boundary. A single ICE Analysis Boundary was established for assessing indirect and cumulative effects to capture the area of influence for the corridors. This ICE Analysis Boundary was developed to allow for flexibility in comparing the corridors, encompassing potential induced growth areas, watershed boundaries, and US Census Tracts.

The ICE Analysis Boundary was developed as described below. The outermost edges of the overlaid sub-boundaries comprise the overall ICE Analysis Boundary as shown on **Figure 3-2**. The sub-boundaries used to form portions of the ICE Analysis Area included watersheds, Census Tracts, and the Induced Growth Study Areas as described below.

3.3.1 Induced Growth Study Areas

A series of Induced Growth Study Areas were developed to reflect areas that could be potentially affected by induced growth from a new crossing. The combined Induced Growth Study Areas are shown in **Figure 3-3.** Areas on the Eastern Shore within 30 to 45 minutes, or 45 to 60 minutes of travel time via the existing Bay Bridge or a new crossing location are considered in the induced growth analysis. The outermost areas within these induced growth study areas were used to delineate the overall ICE Analysis Area boundary shown in **Figure 3-2**. Statistics on regional commuting used to inform the induced growth study areas is included in **Section 4.1.1.4.** Detailed discussion and mapping of the induced growth analysis can be found in **Section 5.3.** The induced growth study areas were the outermost boundaries on the Eastern Shore used for the ICE Analysis Area. The induced growth study areas are relevant to the evaluation of socioeconomic, natural, and cultural resources.

3.3.2 Census Tracts

The boundaries of those Census Tracts overlapping the corridor alternatives, including the geographically contiguous area between the corridors, are shown in **Figure 3-4**. Census tracts were considered in development of the ICE Analysis Area to ensure inclusion of relevant socioeconomic resources such as communities, community facilities, businesses and employers, and housing. Use of Census Tracts also ensures potential indirect and cumulative effects to cultural resources are included.

3.3.3 Watershed Boundaries

Hydrologic unit boundaries were used for assessing indirect effects to forestland, water resources, floodplains, wildlife, wildlife habitat, and threatened or endangered species using the watershed boundary dataset at the 12-digit level from the US Geological Survey (USGS) Watershed Boundaries Dataset. The USGS 12-digit watersheds used to develop the ICE Analysis Boundary include those watersheds that contain the corridor alternatives and the full open water area of the Chesapeake Bay. The ICE Analysis Boundary is sized to capture potential direct effects of those transportation improvements evaluated in the EIS, and the indirect, downstream effects which may occur (**Figure 3-6).** The Hydrologic Unit Code (HUC)-12 watersheds covering the full open water area of the Chesapeake Bay were included to ensure the important aquatic Chesapeake Bay resources are captured in the analysis.

Figure 3-2: ICE Analysis Boundary

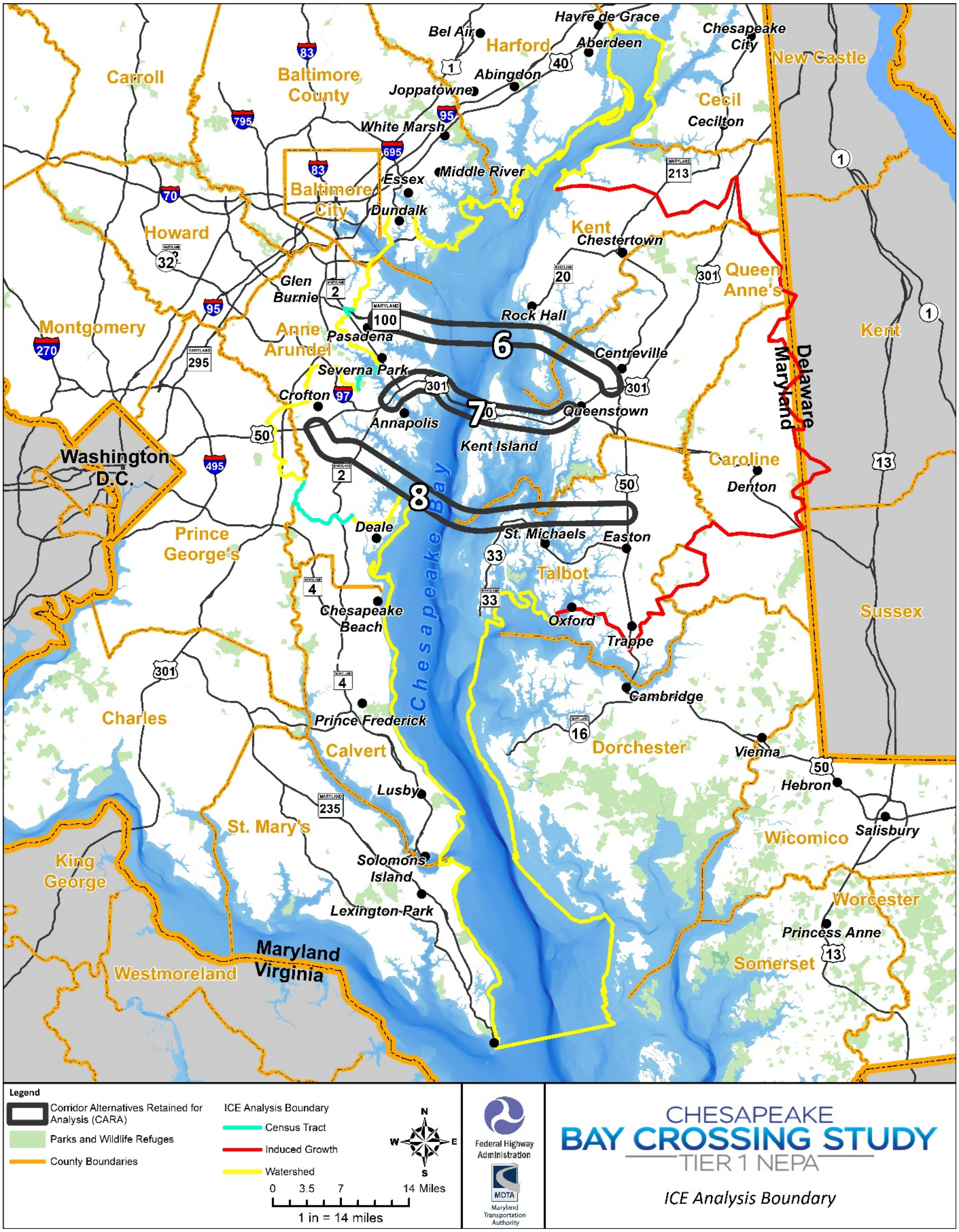


Figure 3-3: Combined Induced Growth Study Areas

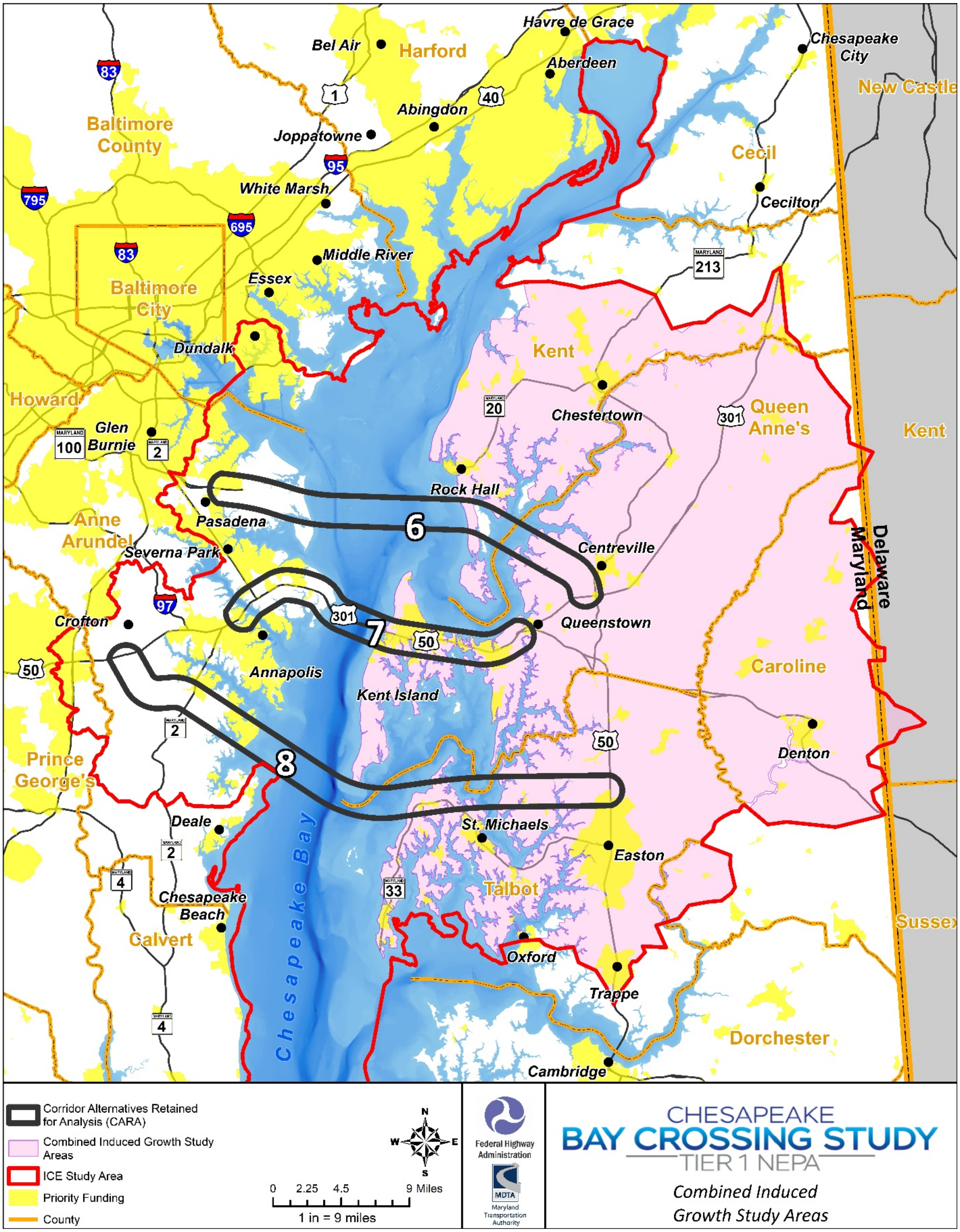


Figure 3-4: Census Tracts

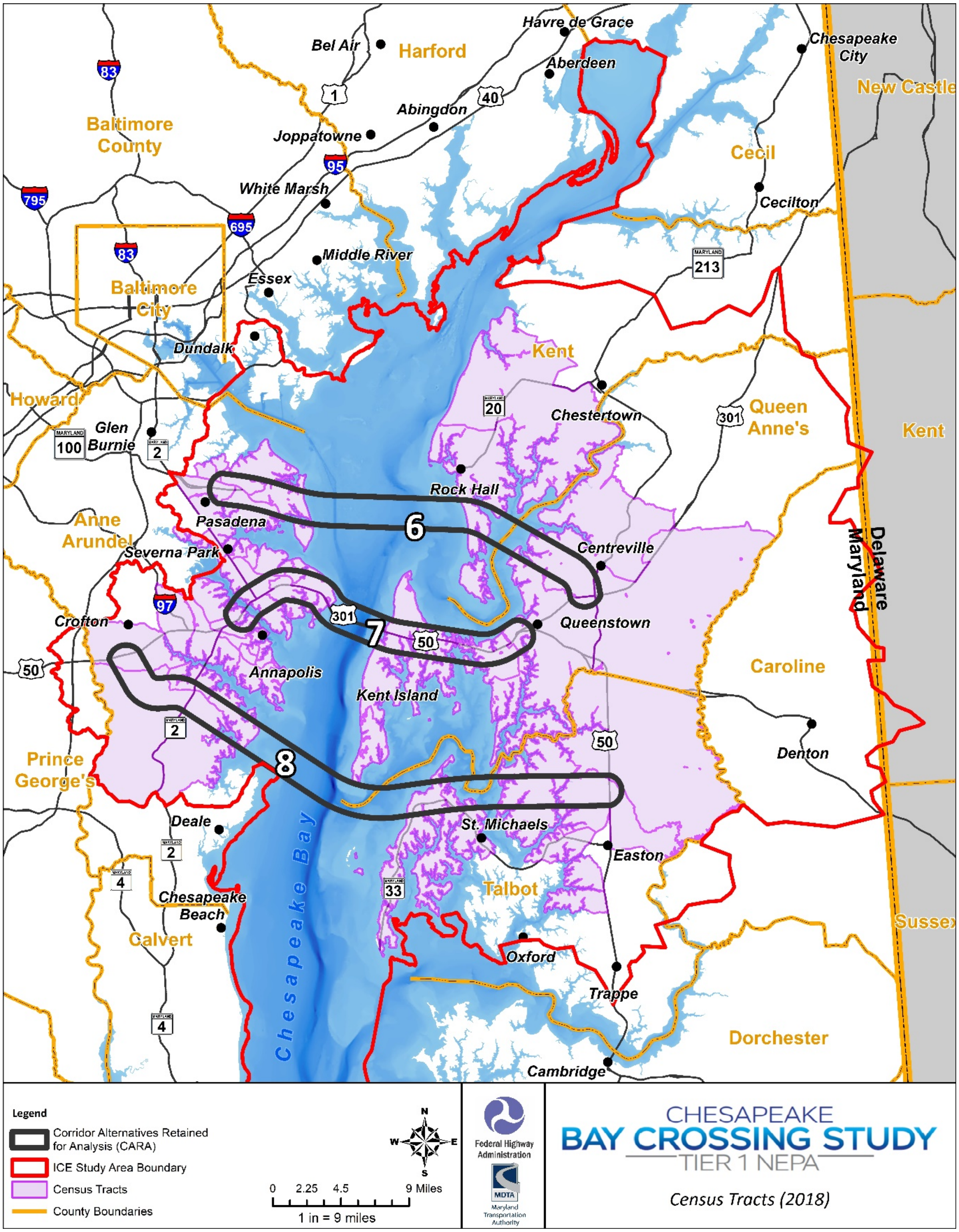
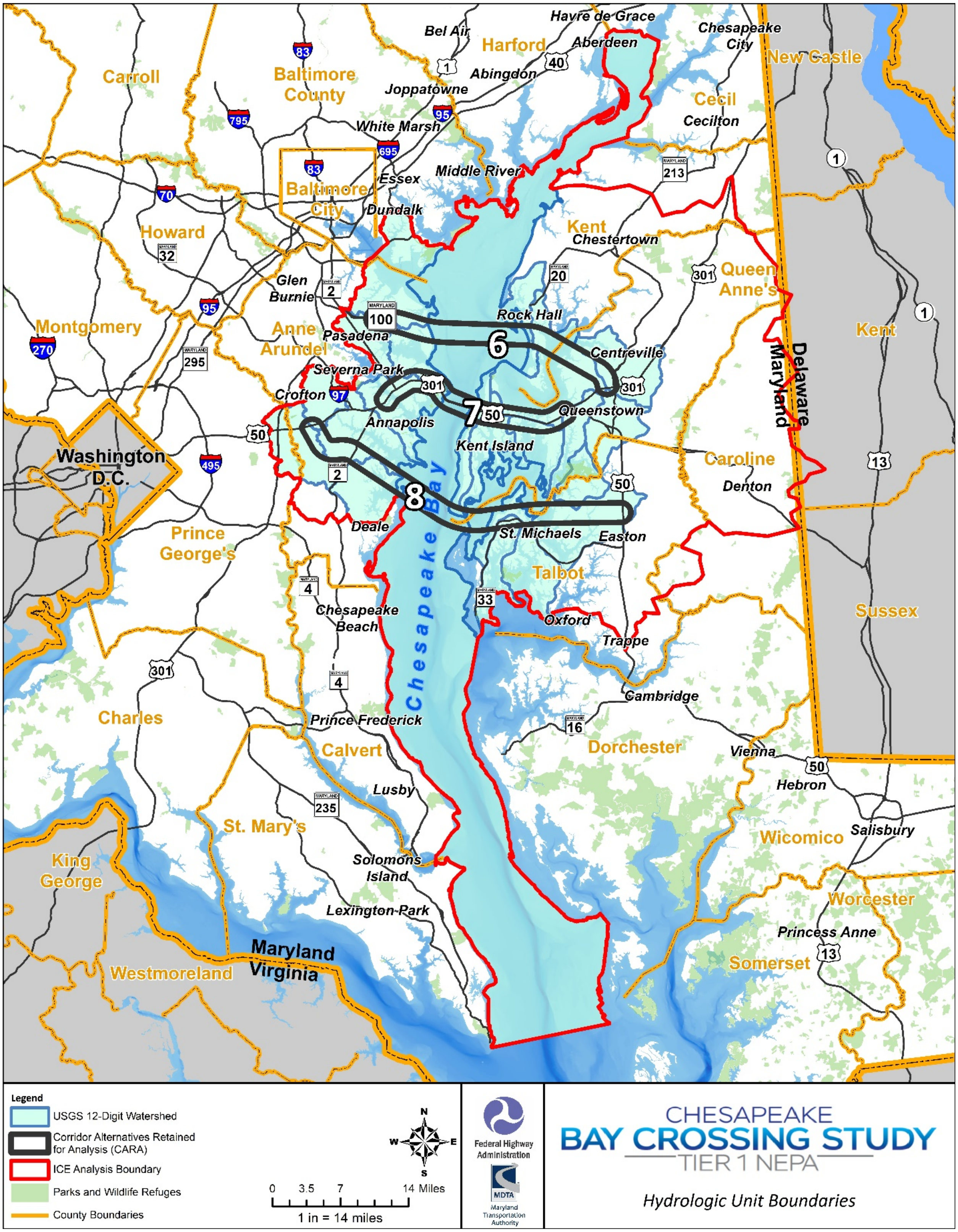


Figure 3-5: Hydrologic Unit Boundaries in the ICE Analysis Boundary



3.4 Temporal Study Boundary

The temporal boundaries, or time frame, of the analysis is based on factors including data availability, relevant historical events, and the anticipated year of implementation for improvements being evaluated in the Tier 1 EIS. The temporal limits for the cumulative effects analysis are from 1970 to 2040. Historical population data included in **Section 4.1.2** was considered. 1970 was selected as the early timeframe because the second span of the existing Bay Bridge was built in 1973, and based on the availability of past land use data from 1973 and decennial census data from 1970. 2040 was selected as the latter time frame based on the anticipated year of implementation for the potential improvements.

4.0 RESOURCE INVENTORY AND DATA COLLECTION

Data collection and identification of key resources was conducted to facilitate the analysis of potential ICE. Data was collected to cover the ICE Analysis Boundary and the temporal boundaries identified. This study considers key resources including socioeconomic resources (including land use, community cohesion, community facilities, recreational facilities, low-income and minority [EJ] populations, businesses, farmlands); natural resources (including streams, wetlands, water quality, floodplains, wildlife and wildlife habitat, and threatened or endangered species), and cultural resources (including archaeological and historic architectural resources).

This section also includes information on resource planning, patterns, policies and trends to inform the analysis of indirect and cumulative effects. This information is used to establish a context for past, present and future conditions within the ICE Study Area, identify trends in land use planning, cultural and natural resources, and provide other important information needed to identify indirect and cumulative effects.

Because of the geographic extent of the ICE Analysis Boundary and the broad level of analysis in this Tier 1 study, much of the data presented in this section is aggregated at the county level. It should be noted that some counties included in this data account for comparatively small portions of the ICE Analysis Boundary such as Baltimore City, Baltimore County, Prince George's County, and Kent County, Delaware. Therefore, county-level data throughout this should be considered with this in mind. Evaluation at a finer level of detail would occur during Tier 2.

4.1 Socioeconomic Resources

Socioeconomic information used to inform the analysis of ICE includes data such as:

- Population and employment trends based on census and geographic data;
- Growth trends based on reports, historic maps, and aerial imagery;
- Planning and forecasting documents concerning past, present, and future economic development; employment; land use; zoning; transportation; resource protection; and recreation.

Topics covered under socioeconomic resources include historic land use, existing land use/land cover, county plans, priority funding areas, commuting patterns, communities, community facilities, demographics and housing (including EJ), regional transportation plans, businesses and employers, and agriculture.

4.1.1 Communities and Land Use

4.1.1.1 Land Use

The Chesapeake Bay region was inhabited by Native American farmers settled in large villages at the time of first contact with Europeans in the early 1600s. At that time, the region had extensive estuaries, marshlands, and rivers and was heavily wooded. In 1634, English settlers arrived permanently in Maryland, establishing their first capital in St. Mary's City (National Center of Smart Growth (NCSG), 2006a). The Chesapeake Bay region and shorelines were in relatively "pristine" condition, with many more wetlands and wildlife than are present today (Jefferson Patterson Park and Museum et al., No Date). European settlement in the region was established relatively quickly with fur trade in Kent Island (1631), the first upper Chesapeake settlement (Ruffner, 2017). During the late 1800s to early 1900s, 80 percent of the land in Maryland was cleared of trees (Jefferson Patterson Park and Museum et al., No Date).

In 1804 the Chesapeake and Delaware Canal opened, connecting the Chesapeake Bay to Philadelphia and other areas north. Steamboats began operating on the Bay in 1813 (NPS 2020). The development of the Port of Baltimore allowed for this area to become the new economic center of the State. By 1820, Baltimore was the nation's third largest city. Northern Anne Arundel County developed an economy based in iron ore, and the creation of the Annapolis and Elkridge Railroad in 1840 linked Anne Arundel to the Baltimore and Ohio (B&O) Railroad, enabling ore and other products to be shipped farther than previously (Anne Arundel County 2019).

Historically, the Western Shore in the area of central Maryland (consisting of Anne Arundel, Prince George's, and Baltimore Counties), has been the home of much of Maryland's industry, military, and government. Increased industrialization during World War II and the national movement towards suburban living that followed caused changes in the area. Major employers moved to the region and the dedication of Friendship International Airport (Baltimore-Washington International Airport) occurred during this time (NCSG, 2006b).

The Eastern Shore of Maryland is part of the Delmarva Peninsula, bounded by the Chesapeake Bay to the west and the Atlantic Ocean to the east. The Eastern Shore is a historically rural and agricultural area, despite its close geographic proximity to the major economic centers of Baltimore and Washington, DC. This is due in part to its relative geographic isolation, with the Chesapeake Bay separating it from urban areas to the west. (NCSG, 2006c).

Originally, the Chesapeake and Delaware Bays, and some larger rivers, provided the transportation routes for settling the Eastern Shore and the transport of Eastern Shore goods (seafood, ducks, timber, and grains) to markets. Use of steam vessels in the early nineteenth century contributed to growth, and the arrival of the railroad in the mid-nineteenth century enabled further expansion into the interior of the Eastern Shore. The completion of the Chesapeake Bay Bridge in 1952 and second span in 1973 allowed for further growth on the Eastern Shore by providing a faster connection to major metropolitan areas on the Western Shore (NCSG, 2006c).

According to the Maryland Department of Planning (MDP), the total developed acreage increased 145 percent statewide, from 654,000 to 1.7 million between 1973 and 2010. The population increased by 39 percent during this same period. Statewide, over one million acres of forest and agricultural lands have been developed during that timeframe (MDP, 2010).

Figure 4-1 displays the distribution of various land use/land cover classes occurring in the Maryland portion of the ICE Analysis Boundary in 1973. **Figure 4-2** displays the distribution in 2010. **Table 4-1** shows change in land use in the ICE Analysis Area in Maryland from 1973 to 2010. Historical land use/land cover is not available for the Delaware portion of the ICE Analysis Area.

The land use data shows a substantial loss of agricultural and forested lands occurred within the ICE Analysis area from 1973 to 2010. Over 50,000 acres of agricultural land and a roughly equivalent amount of forest were converted to other uses. During this same time frame, residential land uses increased by over 90,000 acres (an increase of nearly 200%), likely accounting for the vast majority of converted farmland and forest uses.

Table 4-1: Maryland Land Use/Land Cover Change from 1973 to 2010 in the ICE Analysis Boundary

LAND USE/LAND COVER	1973 ACRES	2010 ACRES	CHANGE 1973-2010 (%)
Agriculture	441,200 (30%)	388,200 (27%)	-53,000 (-12%)
Commercial	6,400 (<15)	9,800 (1%)	+3,400 (53%)
Forest	259,400 (18%)	205,900 (14%)	-53,500 (-21%)
Industrial	3,700 (<1%)	5,100 (<1%)	+1,400 (38%)
Institutional	3,400 (<1%)	7,900 (1%)	+4,500 (132%)
Other	6,000 (<1%)	12,400 (15)	+6,400 (107%)
Residential	48,100 (3%)	139,300 (10%)	+91,200 (190%)
Water	675,400 (46%)	674,900 (46%)	-500 (<1%)
Wetlands	14,100 (1%)	14,100 (1%)	<100 (<1%)

Source: MDP (2010 via Maryland iMap GIS. All numbers rounded to closest 100 acres or 1%.

Developed land in the ICE Analysis Boundary typically occurs near major transportation corridors and facilities connecting major metropolitan areas. Within the ICE Analysis Area, the highest concentration of developed lands (residential, commercial, industrial, and institutional) occurs on the Western Shore in Anne Arundel County. An additional concentration of developed land on the Western Shore occurs in Baltimore County including Dundalk and Sparrows Point. Development on the Eastern Shore is concentrated near the towns of Chestertown, Centreville, Denton, Easton, Rock Hall, and St. Michaels. Additional developed lands are prevalent on Kent Island. The greatest acreage of natural lands in the ICE Analysis Boundary occurs on the Eastern Shore. Natural lands on the Eastern Shore are distributed amongst the more prevalent agricultural lands that dominate the land use/cover of the Eastern Shore (**Figure 4-2** and **Table 4-1**). The current land use for the Delaware portion of the ICE Analysis Boundary is shown in **Table 4-2**.

Figure 4-1: Land Use/Land Cover 1973

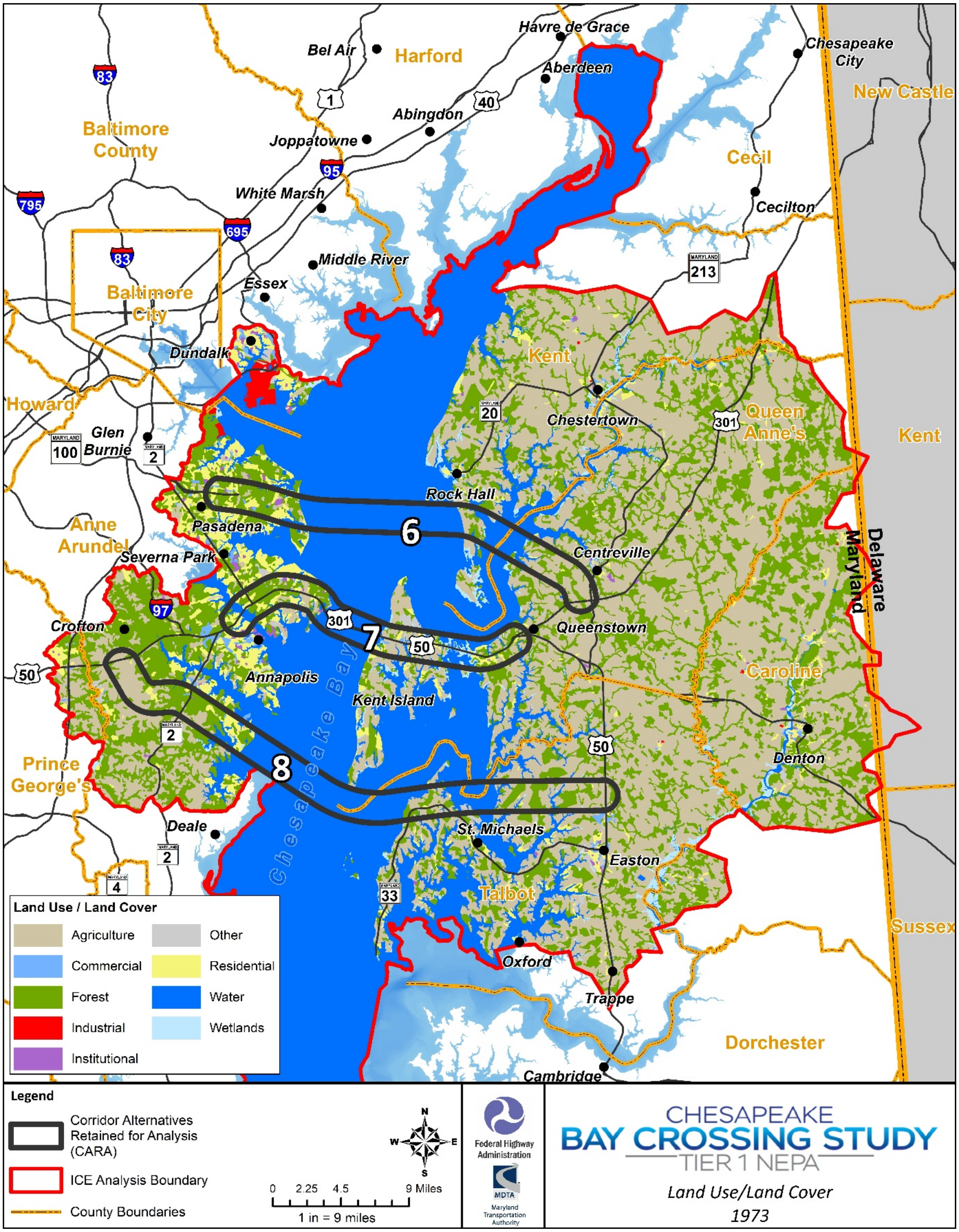


Figure 4-2: Land Use/Land Cover 2010

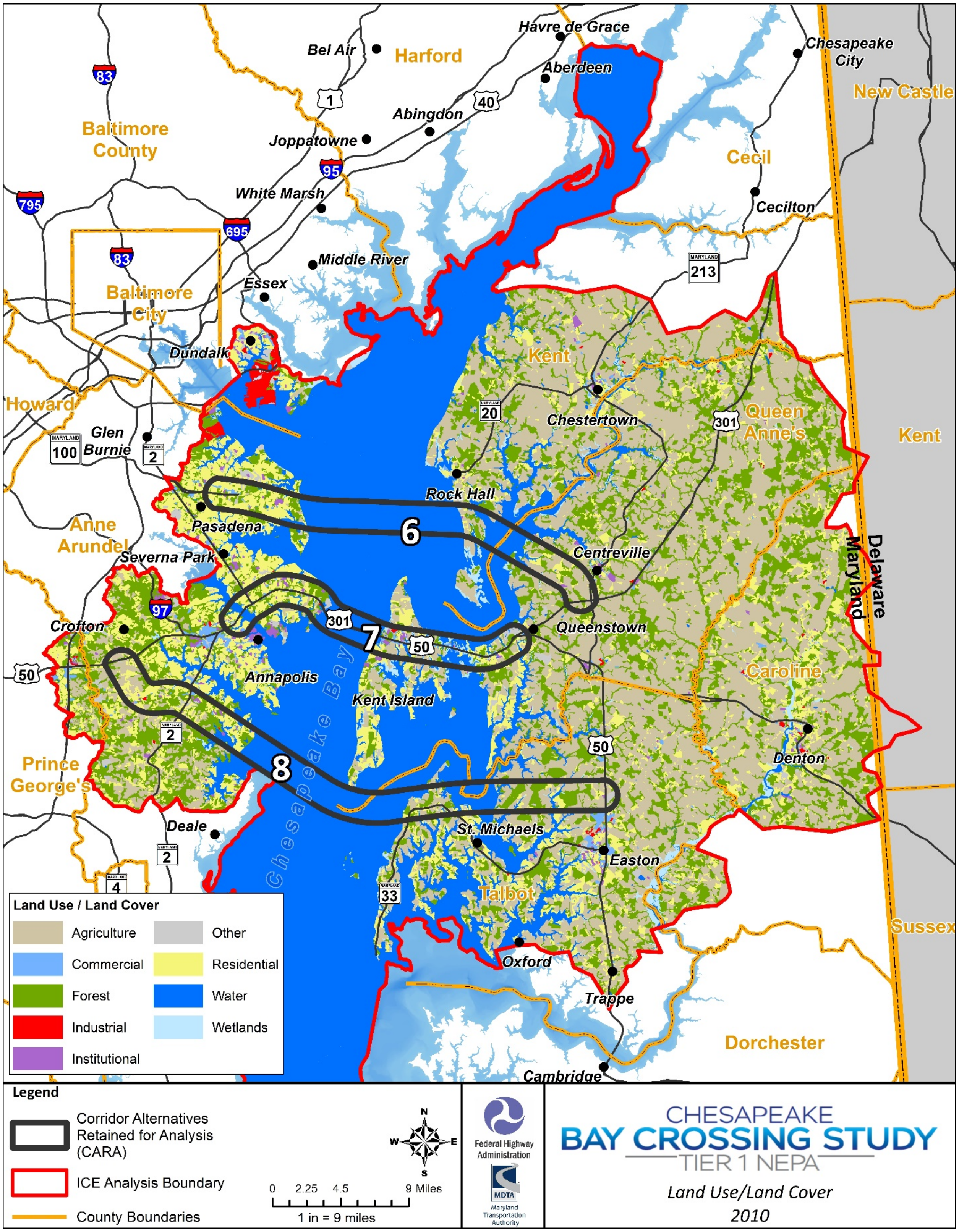


Table 4-2: 2007 Land Use/Land Cover in the Delaware Portion of the ICE Analysis Boundary

LAND USE CATEGORY	ACREAGE	PERCENTAGE
Agriculture	2,800	58%
Commercial	<100	<1%
Forest	400	8%
Industrial	<100	<1%
Institutional	<100	<1%
Other	200	4%
Residential	200	5%
Water	<100	1%
Wetlands	1,200	24%

Source: Delaware OSPC, 2012. via Firstmap GIS

4.1.1.2 County Plans

A review of the land use, transportation, environmental planning, and conservation elements of the general plans of the cities and counties that encompass the ICE Analysis Area was conducted to identify future land use goals and policies in the study area counties.

The following section describes the local plans that guide the land use patterns and other developments in the ICE Analysis Boundary. Additional information is available in the *Socioeconomic Technical Report*. The following plans provide a general, overarching guide for community development that focuses on issues specific to that planning area.

Anne Arundel County

Then 2009 *Anne Arundel County General Development Plan* identifies "Priority Highway Improvement Corridors", which are identified "[…]to apply the entire tool box of demand management, access management, transit, pedestrian safety, and geometric improvement strategies to accommodate the anticipated travel demand." US 50/301 is identified as one such Priority Highway Improvement Corridor. The plan also cites the supporting document, *General Development Plan 2008 - Background report on Transportation* (Anne Arundel County, 2008) which recommends expanded capacity on US 50/301[1]. The General Development Plan calls for growth areas around the existing bridge location designated for industrial and government uses (Anne Arundel County, 2009).

According to the Plan, in the long term (beyond the 20-year planning horizon), land use planning priorities in the County are likely to gradually shift from a focus on new development to redevelopment and revitalization as the County matures and as vacant land becomes scarcer.

Baltimore County

The 2010 *Baltimore County Maryland Master Plan 2020* reports that the "majority of future growth will be in the form of redevelopment because most of the land within the urbanized portion of the County is

[1] Table 6 of the *General Development Plan 2008 – Background Report on Transportation* includes proposed expansion of US 50 between MD 179 and the Bay Bridge from 6 lanes to 8 in 2035. Table 7 includes expansion of US 50 from I-97 to the Bay Bridge from 6 to 8 lanes.

already developed. The areas most suitable for growth are typically located along major roads in commercial corridors, in or adjacent to existing town centers, or on older industrial and warehouse properties. The most ideal sites to accommodate future growth will have adequate public infrastructure already in place" (Baltimore County, 2010).

The *Baltimore County Strategic Operations Plan* published in 2012 by the County's Department of Economic Development (Baltimore County, 2012) emphasizes the need for creating compact, mixed-use, walkable live/work settings consistent with existing community character and near available or planned transit options. Notable plans for portions of the County in the ICE Analysis Area include:

- Promoting the revitalization of underutilized industrial land;
- Making the Sparrows Point-Dundalk area a state-of-the-art industrial and logistics center; and
- Developing a long-range plan for Sparrows Point-Dundalk as a distribution and marine terminal center.

Baltimore City

The 2009 *City of Baltimore Comprehensive Master Plan* states that the City's development "shall be concentrated in suitable areas with policies and strategies that encourage development, infill and redevelopment that is transit oriented, brings back vacant areas into productive use, located in Growth Promotion Areas and the Central Business District yet preserves and respects our City's historic character" (City of Baltimore, 2009). Two of the plan's objectives are to: improve access to jobs and transportation linkages between businesses and enhance transportation options to provide workers with commuting options and mitigate traffic congestion.

Caroline County

The primary land use goal stated in the 2010 *Caroline County Comprehensive Plan* is to preserve agriculture, natural resources, and the rural character of the County by directing future growth to existing population centers. The Plan indicates access to metropolitan areas on the Western Shore will be enhanced when MD Route 404 is dualized. The Plan concludes the County's economic development trends indicate that the Eastern Shore is becoming a service and tourism-based economy including heritage tourism as well as eco-tourism (Caroline County, 2010).

Kent County, Delaware

The 2018 Kent County, Delaware Comprehensive Plan includes the commercial development goal in this area to create a sense of place and destination for existing and new neighborhoods while complementing the existing commercial development in the adjacent towns (Kent County, DE, 2018).

Kent County, Maryland

The 2018 *Kent County Comprehensive Plan* states key principles including a desire for future limited growth. The Plan calls for preserving the County's unique quality of life; growth is planned to occur slowly and deliberately at specific locations at a manageable rate which would not exceed the County's historic growth rate. The Plan states that a new Chesapeake Bay crossing would not be consistent with the Plan's growth areas, summarized by the following excerpt.

> *"Kent County and the Eastern Shore face unprecedented change. Historic modest growth rates and patterns are threatened and undermined by modern suburb style development and potential changes in commuter patterns. Although development pressure has lessened recently, improvements to US 301 and the renewed discussions of an additional Bay crossing place the County in a perilous position that is detrimental to this Vision. Kent County adamantly and in the strongest terms possible opposes any proposal for constructing another bridge crossing of the Chesapeake Bay north of the existing Bay Bridge spans with a terminus in Kent County. A northern bridge crossing will have a detrimental impact on the County's rural landscape and natural resource-based economy. It will undermine the County's efforts to preserve our agricultural industry and develop a tourism industry based on our cultural, historical, natural, and scenic assets. Limiting access to Kent County will discourage development resulting from urban expansion of the Baltimore region and, therefore, help maintain the County's rural character. This is particularly important as Kent County does not now or plan to have infrastructure to support such an expansion"* (Kent County, MD, 2018).

Prince George's County

The 2002 *Prince George's County Approved General Plan* designates six area classifications that represent the County's growth policy (Maryland-National Capital Park and Planning Commission (M-NCPPC), 2014). The Growth Policy Map identifies Regional Transit Districts, Employment Areas, Local Centers, Established Communities, Future Water and Sewer Service Areas, and Rural and Agricultural Areas. Each of these is associated with specific goals and policies to achieve outcomes in the Plan based on existing conditions and planned future growth.

Land use policies and goals in the Plan would direct most projected new residential and employment growth to the Regional Transit Districts while supporting new employment growth in Employment Areas. The Plan limits future mixed use and commercial growth to areas outside of residential areas in Established Communities and preserving Rural and Agricultural Areas.

The 2009 *Prince George's Countywide Master Plan of Transportation* acknowledges the need for increased roadway capacity and focuses on improving transportation to improve user experience and ease access to major metropolitan areas and US 50. The Transportation Plan indicates it is important to assess the capacity of transportation system segments to accommodate the desired development in the General Plan.

Queen Anne's County

The 2010 *Queen Anne's County Comprehensive Plan* includes smart growth principles to encourage infrastructure to protect waterways, conserve natural resources, and support sustainable and responsible agriculture. The Plan states the policies adopted are intended to direct growth to designated growth areas such as Priority Funding Areas (PFAs). These strategies also include infill and redevelopment in targeted locations, including future town annexation areas and County Planning Areas (Chester/Stevensville, Kent Narrows and Grasonville).

The eastern terminus of the existing Bay Bridge is in Queen Anne's County. The transportation element of the Plan recommends a Bay Bridge study to resolve problems caused by through traffic that impedes the movement of local traffic. According to the Plan, the County wishes to work with MDOT SHA to develop a US 50/301 corridor plan aimed at providing commuting citizens a reliable transportation route in the County to other metropolitan areas while assuring access for deliveries to the Eastern Shore (Queen Anne's County, 2010). The Plan calls for a study of the corridor to link land use and transportation planning to more effectively manage land use and improve economic outcomes associated with the existing Bridge Crossing corridor. The study would "review land use and create strategies and solutions for use management and good design practices specific to the corridor, increase economic development opportunities, and prepare architectural and site design guidelines to enhance the corridor" (Queen Anne's County, 2010).

Talbot County

The 2016 Talbot County Comprehensive Plan proposes to set aside land along the Bay side of the County for sensitive environmental or conservation areas, except for the small town of Oxford (Talbot County, 2016). Countywide land use policies seek to restrict economic development except for industries that are supportive of the County's rural and natural resource-based economy. The Plan directs that the County should "preserve its unique rural landscape through conservation of farmland, forestlands, and environmentally sensitive lands by application of land use regulations and easement programs that conserve open space in rural areas, continue a restrictive approach toward the use of land over which it has zoning authority, and new development should be of a controlled nature and channeled into the most appropriate areas and discouraged in others". Economic development targets of the Plan are retention of rural and natural assets that anchor the County's tourism industry, expansion of clean energy manufacturing, expanding broadband to support remote work, and attraction of retirees and professional/financial services.

Summary of the County Plans

The county comprehensive plans reviewed for this assessment reflect the diverse geography surrounding the Bay, with different goals and policies put forth to address varying needs and conditions. Counties with more matured land use patterns and less developable land, such as Baltimore County, focus on promoting appropriate infill, densification and redevelopment in targeted areas, supporting economic growth, and maintaining existing residential land uses. In contrast, counties such as Kent and Talbot on the Eastern shore emphasize protecting farmland, forests, natural resources and tourism based economies, and limiting growth to prevent rapid suburbanization.

Kent County's plan takes a strong position regarding a new Bay Crossing, and in very direct terms states the fundamental incompatibility of a new crossing in the County with the desired vision of future land use. All of the plans describe their County's vision for its future growth and economic development and are useful guides to policy priorities regarding transportation, land use, economic development and conservation.

4.1.1.3 Priority Funding Areas

Maryland's 1997 Priority Funding Areas Act allows localities to identify areas to prioritize for state spending to support future growth. The 1997 planning law recognizes the important role of local governments in managing growth and determining the locations most suitable for state-funded projects (MDP, 2019). State spending is therefore directed towards infrastructure needs of existing urbanized areas and districts designated for growth. Future growth can be guided to these areas, rather than to rural areas where sprawling development might occur (MDP, 2007).

PFAs in the ICE Analysis Boundary account for 296,906 acres (**Figure 4-3**). The Western Shore portion of the ICE Analysis Area has approximately 244,709 acres of PFAs, while the Eastern Shore has 52,192 acres. The Eastern Shore has fewer designated acres as this area is mainly rural and any future growth is targeted around already developed towns and cities to preserve rural character, forest and farmland.

In Delaware, the *Strategies for State Policies and Spending* provides a framework for infrastructure and service investments by state agencies (Delaware Office of State Planning Coordination, 2015). The *Strategies* recommendations were adopted by Executive Order (EO) 59 in April 2016. Five Investment Levels were defined to distinguish different funding priorities across the state. Within the ICE Analysis Boundary 2,947 acres in Delaware are designated Investment Level 4 and 1,531 acres are designated as Investment Level 5 (**Figure 4-3**). Delaware's intent is to discourage additional urban and suburban development in Investment Level 4 Areas unrelated to agriculture and to the areas' needs as identified by local governments. Investment Level 5 areas are publicly-owned lands, private conservation lands and those permanently conserved as open space.

4.1.1.4 Commuting Patterns

A new crossing would provide new or improved access to areas on the Eastern Shore, resulting in greater connectivity to regional employment centers in the Washington, D.C. and Baltimore metropolitan areas. Areas that are within a typical commute distance of major employment centers may be particularly susceptible to increased demand for land development. Information presented here on existing commuting patterns in the region was used to inform the induced growth analysis **(Section 5.3)**.

Data shows that most study area localities have more workers commuting in and out of their jurisdictions than who live and work in the same locality. Washington, D.C. and Baltimore metropolitan areas are the largest major population and employment centers within the region and these areas draw workers from surrounding localities, including from the Eastern Shore. According to 2015 commuter and worker profile data obtained from the US Census Bureau, except for Kent County, Delaware, both the number of in-commuters and out-commuters for each locality in the ICE Analysis Boundary exceeded the counts for those who lived and worked in the individual localities (**Table 4-3**).

Queen Anne's County is the Eastern Shore county that is closest to the existing bridge crossing. Second to Caroline County, it has the highest percentage of workers employed outside the jurisdiction (US Census Bureau, 2015). According to data retrieved from the US Census Bureau's OnTheMap application, for all workers and primary jobs in 2015, at least 9.3 percent of Caroline County residents commuted to the Western Shore for employment either in Baltimore City, Parole, Annapolis, or Washington, D.C. For the same year, at least 16.8 percent of Queen Anne's County residents commuted to the Western Shore for employment in Parole, Baltimore City, Annapolis, or Washington, D.C.

Figure 4-3: Priority Funding Areas in the ICE Analysis Boundary

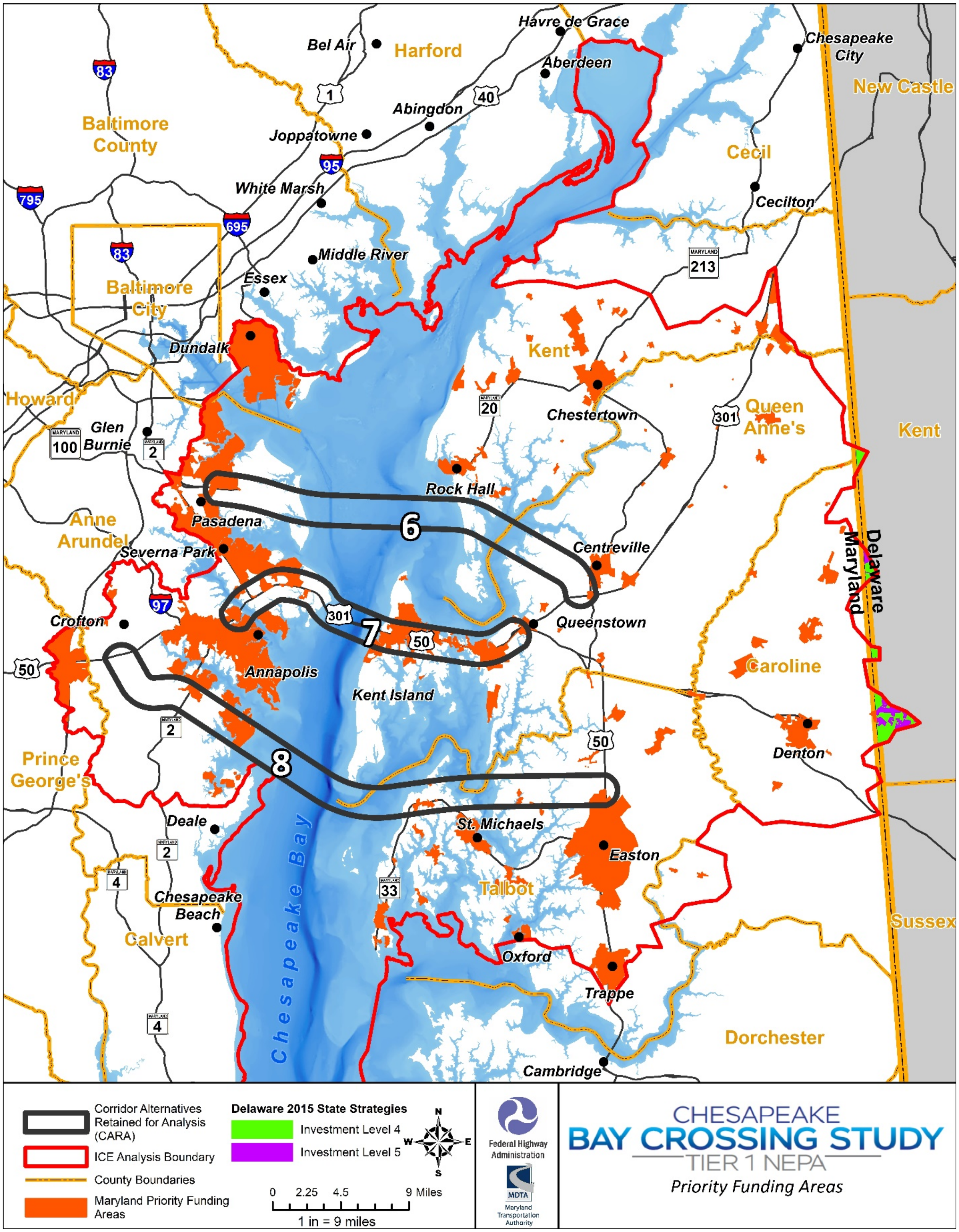


Table 4-3: Regional Commuting Statistics (2015)

LOCATION	EMPLOYED IN LOCALITY/ LIVING OUTSIDE	EMPLOYED IN LOCALITY/ LIVING INSIDE	LIVING IN THE LOCALITY, EMPLOYED OUTSIDE	LOCALITY JOBS FILLED FROM OUTSIDE (%)	EMPLOYED RESIDENTS WORKING OUTSIDE LOCALITY (%)
Total Study Area Counties	772,268	522,984	829,193	60%	62%
Eastern Shore					
Caroline County	4,484	3,455	11,480	57%	77%
Queen Anne's County	7,100	5,461	16,041	57%	75%
Talbot County	10,069	7,012	8,751	59%	56%
Kent County	3,914	3,715	4,015	51%	52%
Kent County, Delaware	22,579	36,787	28,048	38%	43%
Western Shore					
Anne Arundel County	137,712	100,169	139,275	58%	58%
Baltimore City	217,230	108,482	123,194	67%	53%
Baltimore County	195,450	150,373	221,550	57%	60%
Prince George's County	173,730	107,530	276,839	62%	72%

Table 4-4 presents commute travel time data from the US Census Bureau's American Community Survey (ACS) (2013-2017 dataset) for the Washington-Baltimore-Arlington DC-MD-VA-WV-PA Combined Statistical Area (CSA). The table shows approximately 72 percent of commuters in the CSA travel 44 minutes or less to work. Similarly, 84 percent of commuters in the CSA travel 59 minutes or less to work.

Table 4-4: Commute Travel Time in the Washington-Baltimore Combined Statistical Area

COMMUTE TRAVEL TIME	% OF COMMUTERS
0 – 29 Minutes	47%
30 – 44 Minutes	25%
45 – 59 Minutes	13%
60+ Minutes	16%

Source: US Census Bureau ACS (2017)

Based on this data, areas on the Eastern Shore within 45 and 60 minutes of travel time via improvements in Corridors 6, 7, and 8 to employment centers located on the Western Shore, are considered in this technical report for their potential to experience induced growth.

4.1.1.5 Communities

There are nine county-level jurisdictions in the ICE Analysis Boundary, including four on the Western Shore and five on the Eastern Shore. The Western shore jurisdictions are Anne Arundel County, Baltimore County, Prince Georges County, and Baltimore City. The Eastern Shore jurisdictions are Caroline, Kent (MD), Queen Anne's, Talbot, and Kent (DE). Listed below are municipalities in the ICE Analysis Area. The county-level jurisdictions and municipalities in the ICE Analysis Area are shown on **Figure 4-4**.

- Annapolis
- Baltimore City
- Barclay
- Bowie
- Centreville
- Chestertown
- Church Hill
- Denton
- Easton
- Goldsboro
- Greensboro
- Havre De Grace
- Henderson
- Highland Beach
- Hillsboro
- Millington
- Oxford
- Queen Anne
- Queenstown
- Ridgley
- Rock Hall
- St. Michaels
- Sudlersville
- Templeville
- Trappe

Much of the Western Shore is characterized by populated areas in and around Baltimore, Washington, D.C., and Annapolis. Urban and suburban development radiates outward from the cores of Baltimore City and Washington DC, particularly along major roadways such as I-95, US 40, and I-97. The smaller urban center of Annapolis is located south of Baltimore City directly adjacent to the Bay.

4.1.1.6 Community Facilities

Community facilities include parks and recreational facilities, schools, libraries, hospitals, post offices, fire stations, police stations, places of worship, community centers, emergency shelters, health departments, water and sewer facilities, roadway facilities, and others.

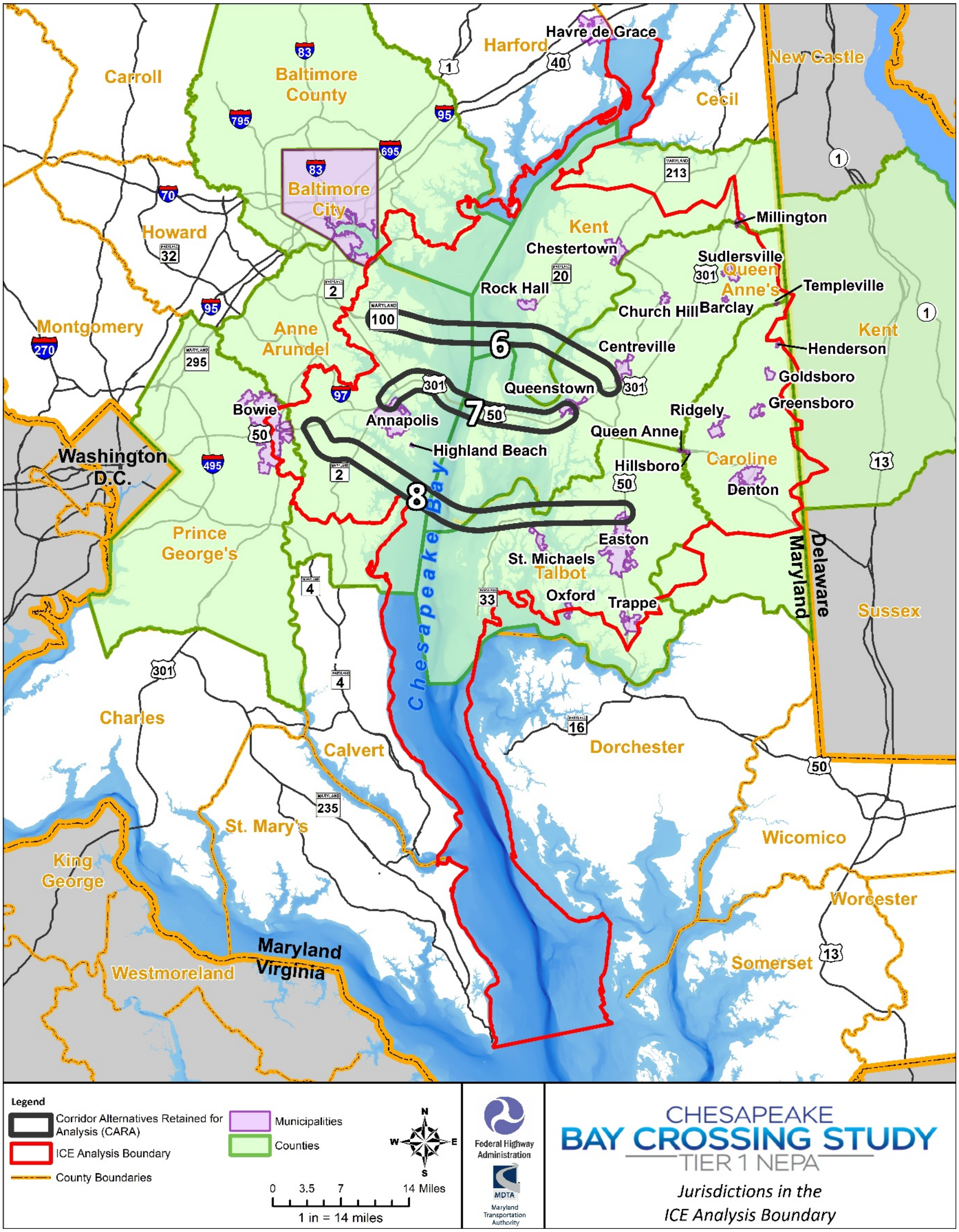
A total of 1,123 facilities were identified in the ICE Analysis Area in Maryland using Maryland iMap Geographic Information System (GIS) data (not including water, sewer, or roadways). These facilities are concentrated along the main roadways in the ICE Analysis Area and in the population centers of Annapolis and Dundalk on the Western Shore, and Chestertown, Centreville, Denton, Easton, Rock Hall, and St. Michaels on the Eastern Shore.

Parks are defined as lands that have been officially designated as such by a federal, state, or local agency. For this Tier 1 EIS, federal, state, and local parks were identified within the ICE Analysis Area. Data from several sources were used to inventory parks within the ICE Analysis Area. These sources included federal, state, and county websites, and associated GIS data, and aerial photography mapping programs such as Google Maps and ArcGIS. A GIS database of parklands and recreation areas was compiled with input from state agencies, local jurisdictions, and Metropolitan Planning Organizations. The ICE Analysis Area includes 132 public parks.

US 50/301 across the existing Bay Bridge serves as the primary connection between the Eastern and Western Shores in Maryland. The Bay Bridge is a key piece of regional transportation infrastructure that provides social and economic connection as the only crossing of the Chesapeake Bay in Maryland.

Major north-south corridors routed along the northern portion of the Western Shore include US 40 and I 95. Interstate highway facilities located in and around Baltimore City and Baltimore County include I-695, I-83, I-70, I-895 and I-195. The I-97 corridor serves as the primary north-south connection between Baltimore and Annapolis. Other major roadways include MD 100, MD 235, MD 214, and MD 260. MD 2 and MD 4 serve as main north-south routes through the southern portions of the Western Shore.

Figure 4-4: Counties and Incorporated Municipalities in the ICE Analysis Boundary



4.1.2 Demographics and Housing

4.1.2.1 Population

According to data obtained from the US Census Bureau, each county-level jurisdiction encompassed by the ICE Analysis Boundary, except Baltimore City, has experienced an increase in population since the 1970s (US Census Bureau, 2010; 2017). Baltimore City has seen a continuing decline in population since the 1970s (**Table 4-5**). In 2017, three other study jurisdictions on the Eastern Shore (Caroline County, Talbot County, and Kent County, Maryland) experienced small declines in population between 2010 to 2017.

The largest increase in population since 1970 in study localities occurred on the Western Shore. Population size since 1970 in Western Shore localities increased by 432,237 residents (an approximately 17 percent increase). The largest increase in population occurred in Anne Arundel County. Eastern Shore localities in the ICE Analysis Boundary added 152,205 residents between 1970 and 2017, an approximate 95 percent increase. Therefore, although the Western Shore localities experienced the greatest increase in residents, the Eastern Shore localities experienced a higher percent increase in population since the second span of the Bay Bridge was constructed.

The MDP and Delaware Office of State Planning Coordination (OSPC) forecast population for the counties in the ICE Analysis Area to the year 2040 (MDP, 2018; Delaware OSPC, 2018). As with the past trends, the forecasts (2015 to 2040) predict the greatest increase in population would occur in study localities on the Western Shore (**Table 4-6**), where the population is expected to increase by 215,350 residents by 2040, an approximately seven percent increase. The largest population increase is predicted to occur in Prince George's County.

According to the US Census Bureau ACS 2013-2017 5-year data, the population of the Census tracts in the ICE Analysis Area is approximately 598,154, with approximately 579,886 residing in the Maryland portion of the ICE Analysis Area and 18,268 residing within the Delaware portions. The population in the Maryland portion of the ICE Analysis Area accounts for approximately 10 percent of the total population of Maryland (US Census Bureau, 2017). Housing in the ICE Analysis Area Census Tracts ranges from single-family homes and townhouses to apartments and condominiums. An estimated 247,729 housing units were in the study Census tracts. Of those, 222,332 (approximately 90 percent) were occupied.

Table 4-5: Historic Population (1970-2017)

LOCATION	1970	1980	1990	2000	2010	2017	CHANGE 1970 TO 2017
Delaware	548,104	594,338	666,168	783,600	897,934	943,732	72%
Change %	n/a	8%	12%	18%	15%	5%	
Maryland	3,923,897	4,216,933	4,781,468	5,296,486	5,773,552	5,996,079	53%
Change %	n/a	7%	13%	11%	9%	4%	
Eastern Shore							
Caroline County, Maryland	19,781	23,143	27,035	29,772	33,066	32,785	66%
Change %	n/a	17%	17%	10%	11%	-1%	
Queen Anne's County, Maryland	18,422	25,508	33,953	40,563	47,798	49,071	166%
Change %	n/a	39%	33%	19%	18%	3%	
Talbot County, Maryland	23,682	25,604	30,549	33,812	37,782	37,461	58%
Change %	n/a	8%	19%	11%	12%	-1%	
Kent County, Maryland	16,146	16,695	17,842	19,197	20,197	19,666	22%
Change %	n/a	3%	7%	8%	5%	-3%	
Kent County, Delaware	81,892	98,219	110,993	126,697	162,310	173,145	111%
Change %	n/a	20%	13%	14%	28%	7%	
Total	159,923	189,169	220,372	250,041	301,153	312,128	95%
Percent Change	n/a	15%	14%	12%	17%	4%	
Western Shore							
Anne Arundel County, Maryland	298,042	370,775	427,239	489,656	537,656	564,600	89%
Change %	n/a	24%	15%	15%	10%	5%	
Baltimore County, Maryland	620,409	655,615	692,134	754,292	805,029	828,637	34%
Change %	n/a	6%	6%	9%	7%	3%	
Baltimore City, Maryland	905,787	786,471	736,014	651,154	620,961	619,796	-32%
Change %	n/a	-13%	-6%	-12%	-5%	-0.2%	

LOCATION	1970	1980	1990	2000	2010	2017	CHANGE 1970 TO 2017
Prince George's County, Maryland	661,719	665,071	729,268	801,515	863,420	905,161	37%
Change %	n/a	1%	10%	10%	8%	5%	
Total	2,485,957	2,477,932	2,584,655	2,696,617	2,827,066	2,918,194	17%
Percent Change	n/a	0%	4%	4%	5%	3%	

Notes: Census of Population and Housing Population and Housing Unit Counts United States
Percentages were rounded to the nearest whole number

Table 4-6: Population Forecasts (2015 to 2040)

LOCATION	ESTIMATED 2015 POPULATION	FORECASTED 2040 POPULATION	FORECASTED INCREASE (2015-2040)	% INCREASE (2015 TO 2040)
Caroline County	32,900	42,950	10,050	31%
Queen Anne's County	48,650	61,050	12,400	25%
Talbot County	37,600	42,000	4,400	12%
Kent County	19,600	23,000	3,400	17%
Kent County Delaware	176,501	206,639	30,138	17%
Eastern Shore Geography Total	315,251	375,639	60,388	19%
Anne Arundel County	562,850	622,250	59,400	11%
Baltimore City	615,800	643,400	27,600	4%
Baltimore County	828,950	880,750	51,800	6%
Prince George's County	905,850	982,400	76,550	8%
Western Shore Geography Total	*2,913,450*	*3,128,800*	*215,350*	*7%*
Total Study Geography	3,228,701	3,504,439	275,738	9%

Source: MDP (2017), Delaware OSPC (2018)

4.1.2.2 Households

Table 4-7 presents the forecasted number of households in the ICE Analysis Area county-level jurisdictions from 2015 to 2040. Based on MDP and Delaware OSPC projections, the number of households is forecast to increase by approximately 12 percent by 2040.

Table 4-7: Forecasted Households (2015 to 2040)

LOCATION	ESTIMATED 2015 HOUSEHOLDS	FORECAST 2040 HOUSEHOLDS	FORECAST INCREASE (2015-2040	% INCREASE (2015 TO 2040)
Caroline County	12,117	15,909	3,792	31%
Queen Anne's County	18,456	24,074	5,618	30%
Talbot County	16,438	18,710	2,272	14%
Kent County	7,836	9,523	1,687	22%
Kent County, Delaware	62,613	81,388	18,775	30%
Eastern Shore Geography Total	*117,460*	*149,604*	*32,144*	*27%*
Anne Arundel County	211,878	242,753	30,875	15%
Baltimore City	250,780	273,224	22,444	9%
Baltimore County	325,261	354,929	29,668	9%
Prince George's County	314,276	351,158	36,882	12%
Western Shore Geography Total	*1,102,195*	*1,222,064*	*119,869*	*11%*
Total Study Geography	1,219,655	1,371,668	152,013	12%

Source: MDP (2015), Delaware OSPC (2018)

4.1.2.3 Employment

Table 4-8 shows employment trends from 2000 to 2017 in the ICE Analysis Boundary counties. Employment in these counties increased by 208,517 or 15 percent between 2000 to 2017. Of the Eastern Shore localities in Maryland, employment increased the most (20 percent) in Queen Anne’s County over the same period, but in Kent County, employment declined by 163 (two percent). On the Western Shore, employment in Prince George’s County grew the most by 77,534 (19 percent) from 2000 to 2017, and the remaining three localities’ employment levels increased over the study period.

Table 4-9 presents the MDP and Delaware OSPC-forecast total employment from 2015 to 2040 for the county-level jurisdictions in the ICE Analysis Area. Employment in the study geography is expected to increase 14 percent, with a 20 percent increase on the Eastern Shore and 13 percent increase on the Western Shore. Caroline and Queen Anne’s Counties on the Eastern Shore have the highest predicted percentages of employment growth (27 percent), although the forecast total number of employed persons is much greater on the Western Shore.

Table 4-8: Employment Trends 2000 to 2017

LOCATION	EMPLOYED 2000	EMPLOYED 2010	% CHANGE	EMPLOYED 2017	% CHANGE 2010-2017	EMPLOYED 2000-2017 CHANGE	% CHANGE 2000-2017
Total Study Geography	1,404,230	1,546,270	10%	1,612,747	4%	208,517	15%
Eastern Shore							
Caroline County	14,297	16,159	13%	15,674	-3%	1,377	10%
Queen Anne's County	21,186	24,211	14%	25,556	6%	4,370	20%
Talbot County	16,208	18,287	13%	17,863	-2%	1,655	10%
Kent County	9,294	10,045	8%	9,131	-9%	-163	-2%
Kent County, Delaware	57,895	69,720	20%	78,078	12%	20,183	35%
Western Shore							
Anne Arundel County	250,254	269,717	8%	290,628	8%	40,374	16%
Baltimore City	256,036	274,033	7%	277,954	1%	21,918	9%
Baltimore County	379,705	411,816	8%	420,974	2%	41,269	11%
Prince George's County	399,355	452,182	13%	476,889	5%	77,534	19%

Source: US Census Bureau 2010

Table 4-9: Forecasted Employment (2015 to 2040)

LOCATION	ESTIMATED 2015 EMPLOYMENT	FORECASTED 2040 EMPLOYMENT	FORECASTED EMPLOYMENT INCREASE (2015-2040)	% INCREASE (2015 TO 2040)
Total Study Geography	1,909,511	2,172,907	263,396	14%
Eastern Shore				
Eastern Shore Geography Total	144,411	173,607	*29,196*	20%
Caroline County	14,800	18,800	4,000	27%
Queen Anne's County	23,100	29,400	6,300	27%
Talbot County	28,600	33,100	4,500	16%
Kent County	12,900	15,000	2,100	16%
Kent County, Delaware	65,011	77,307	12,296	19%
Western Shore				
Western Shore Geography Total	1,765,100	1,999,300	*234,200*	13%
Anne Arundel County	404,700	476,200	71,500	18%

LOCATION	ESTIMATED 2015 EMPLOYMENT	FORECASTED 2040 EMPLOYMENT	FORECASTED EMPLOYMENT INCREASE (2015-2040)	% INCREASE (2015 TO 2040)
Baltimore City	400,600	435,700	35,100	9%
Baltimore County	519,900	579,900	60,000	12%
Prince George's County	439,900	507,500	67,600	15%

Source: MDP (2015), Delaware OSPC (2018)
Source: US Census Bureau OnTheMap

4.1.2.4 Minority and Low-Income Populations (Environmental Justice)

Executive Order 12898 – Federal Actions to Address Environmental Justice (EJ) in Minority Populations and Low-Income Populations issued in 1994 directs each federal agency to identify and address disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations. The *Bay Crossing Study Socioeconomic Technical Report* provides a detailed description of the regulatory basis and methodology used for the EJ analysis of direct, indirect and cumulative effects of the improvements in Corridors 6, 7, and 8 on sensitive populations such as minority and low-income populations. These populations are considered sensitive, as they have historically been subjected to disproportionately high or adverse human health or environmental effects from infrastructure projects (US Department of Transportation (USDOT), 2016).

Population and demographic data, income, and poverty data are reported by the US Census Bureau. The area assessed for this EJ analysis includes all Census tracts that intersect the ICE Analysis Boundary. Demographic data from the historic Census and the 2017 ACS 5-Year Estimates were gathered at the state, county, and Census tract level and included race, ethnicity, median household income, and poverty. GIS mapping was used to identify where EJ populations are located.

The USDOT and FHWA EJ Orders define a minority individual as belonging to one of the following groups: (1) Black: a person having origins in any of the black racial groups of Africa; (2) Hispanic or Latino: a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race; (3) Asian American: a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent; (4) American Indian and Alaskan Native: a person having origins in any of the original people of North America, South America (including Central America), and who maintains cultural identification through Tribal affiliation or community recognition; or (5) Native Hawaiian and Other Pacific Islander: a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands (FHWA, 2011).

Minority Populations are readily identifiable groups of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who would be similarly affected by a proposed US DOT/FHWA program, policy, or activity (US DOT and FHWA EJ Orders). For the purposes of this analysis, a minority population is present when: (a) the minority population of the affected area exceeds 50 percent of total population or (b) the minority population percentage in the affected area is “meaningfully greater” than the minority population percentage in the general population or other appropriate unit of geographical analysis (CEQ, 1997b). For the purposes of this study Census tracts are considered to contain minority populations if the minority population is greater than 50 percent or is 10 percent greater or more than the percentage of the overall study Census tracts in the ICE Analysis Boundary.

Low-Income Populations are any readily identifiable group of low-income persons who live in geographic proximity, and, if circumstances warrant, geographically dispersed/transient persons who would be similarly affected by a proposed US DOT/FHWA program, policy, or activity (US DOT/FHWA EJ Orders). In the ICE Analysis Boundary, Census tracts were considered potential locations of low-income populations if the population below the poverty level:

1. Is greater than 50 percent; or,
2. Is 10 percent or more over the average percentage of the overall study Census tracts in the ICE Analysis Boundary.

Tables 4-10 and 4-11 summarize the minority and low-income EJ population data for the ICE analysis while **Figure 4-5** shows the Census tracts qualifying as EJ populations. More detailed information by Census tract is provided in **Appendix A**.

Table 4-10: Minority Population Summary

GEOGRAPHY	TOTAL POPULATION	TOTAL MINORITY POPULATION	PERCENT MINORITY RACE POPULATION	PERCENT HISPANIC/ LATINO POPULATION	NUMBER CENSUS TRACTS IN ICE ANALYSIS AREA	NUMBER CENSUS TRACTS WITH EJ POPULATIONS IN ICE ANALYSIS AREA
Delaware	943,732	264,028	28%	9%	4	0
Maryland	5,996,079	2,313,501	39%	10%	127	26
ICE Analysis Boundary Census Tracts	598,154	104,549	17%	6%	131	26

Source: US Census Bureau ACS 2017

Minority Census tract populations were determined by using the sum of persons identifying as Black or African American alone, Asian American alone, American Indian and Alaskan Native alone, Native Hawaiian or other Pacific Islander alone, some other race alone, and two or more races. Hispanic and Latino individuals were counted separately. The percentage of each race/ethnicity within the respective Census tracts is found in a detailed table in **Appendix A**. The "meaningfully greater" threshold for racial minority populations was set at 27 percent based on the total percent of individuals identifying as minority race in the 131 Census Tracts (17 percent plus an additional 10 percent).

A total of 22 Census Tracts were identified as potential minority population tracts in the ICE Analysis Boundary. Of these, eight are in Anne Arundel County, two in Baltimore County, 10 in Prince George's County, one in Talbot County, and one in Baltimore City. Among the study Census tracts, eight had populations 50 percent or more identifying as minority race.

Table 4-11: Low-Income Population Summary

LOW-INCOME POPULATION CENSUS TRACTS	POPULATION FOR WHOM POVERTY STATUS IS DETERMINED	POPULATION BELOW POVERTY LEVEL	PERCENT POPULATION BELOW POVERTY LEVEL
Census Tract 7064.02	3,027	536	18%
Census Tract 4203.01	2,515	453	18%
Census Tract 4209	3,580	904	25%
Census Tract 4211.01	3,033	692	23%
Census Tract 4213	2,949	613	21%
Census Tract 9550	3,390	792	23%
Census Tract 9552.01	3,687	757	21%
Census Tract 9553.02	2,975	496	17%
Census Tract 9503	4,139	912	22%
Census Tract 9505	2,459	410	17%
Census Tract 2505	5,171	1,621	31%

Source: US Census Bureau ACS 2017. All tracts shown are meaningfully greater than the study area average of 7%, exceeding it by 10 percentage points or more.

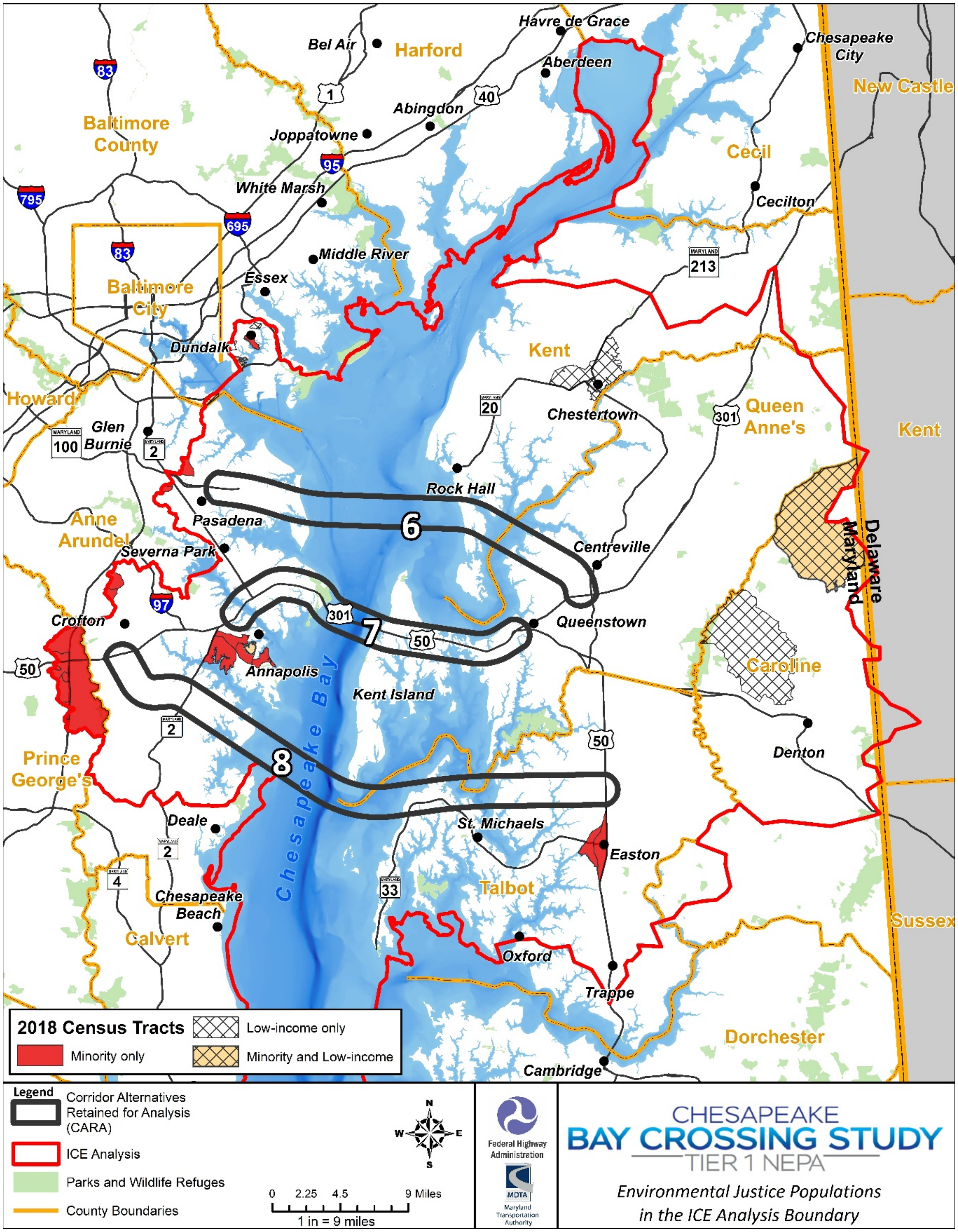
Similar methodology was applied to individuals identifying as Hispanic or Latino. The "meaningfully greater" threshold for populations identifying as Hispanic/Latino ethnicity was set at 16 percent (6 percent plus an additional 10 percent[2]). Based on this threshold, six of the 131 study Census tracts meet the definition of Hispanic/Latino populations. Of the six Census tracts, four are in Anne Arundel County, one is in Caroline County, and one in Talbot County. Two of the six Census tracts that are identified as potential EJ populations based on the Hispanic/ Latino ethnicity also contained minority race threshold populations. These two Census tracts are 7025 and 7064.02, both in Anne Arundel County.

As shown in **Table 4-10**, approximately 17 percent (104,549 individuals) of the total study Census tracts population self-identified as belonging to a minority race. Within the study Census tracts, white alone is the most prevalent race (77 percent), followed by Black or African American alone (12 percent) and two or more races alone (three percent). Hispanic or Latino ethnic residents made up six percent (35,115) of the overall study area population.

Of the 131 Census tracts in the ICE Analysis Boundary, the percent of residents below the poverty level averaged seven percent. Adding 10 percent over this amount, the low-income population threshold is 17 percent. Therefore, 11 Census tracts in the ICE Analysis Boundary met the definition of low-income populations of which four were in Baltimore County, three were in Caroline County, two in Kent County, Maryland, one in Baltimore City, and one in Anne Arundel County. No study Census tract had a population over the 50 percent poverty level threshold.

[2] This analysis defined "meaningfully greater" as a census block group in which the percentage of minority or low-income residents was at least 10 percentage points or more than the corresponding percentage in the surrounding jurisdictions within the study area.

Figure 4-5: Environmental Justice Populations in the ICE Analysis Boundary



4.1.3 Regional Transportation Plans

Regional transportation planning bodies applicable to the jurisdiction include the Baltimore Metropolitan Council (BMC) Regional Transportation Board and the Metropolitan Washington Council of Governments (MWCOG) Transportation Planning Board.

4.1.3.1 Baltimore Metropolitan Council: Baltimore Regional Transportation Board

Maximize 2045: A Performance-Based Transportation Plan (Maximize 2045) is the 2019 long-range transportation plan for the Baltimore region including the cities of Annapolis and Baltimore, and Anne Arundel, Baltimore, and Queen Anne's Counties in the ICE Analysis Boundary. Published in 2019, the plan establishes the region's broad transportation goals and strategies which will guide transportation investments over the life of the plan (2024-2045) (Baltimore Metropolitan Council, 2018).

Maximize 2045 contains a list of the major surface transportation projects the region expects to implement in the period from 2024 to 2045. The transportation plan identifies the Bay Crossing Study and notes that MDTA is conducting a Tier I NEPA study that would result in the identification of a preferred corridor alternative to address congestion at the Bay Bridge and evaluation of its financial feasibility. The Bay Crossing improvements are included in the plan as an illustrative project which could be amended into Maximize 2045 should future funds become available. Eight other major capital projects included in the plan occur in the ICE Analysis Boundary. These projects are listed in **Table 4-12**.

4.1.3.2 Metropolitan Washington Council of Governments: Transportation Planning Board

Visualize 2045: A Long-Range Transportation Plan for the National Capital Region (Visualize 2045) is the federally mandated, long-range transportation plan for the National Capital Region, including Prince George's County in the ICE Analysis Boundary. In addition to projects that the region's transportation agencies expect to be able to afford between now and 2045, the plan includes aspirational initiatives that go beyond financial constraints. The plan also highlights how the region is incorporating new federal Performance-Based Planning and Programming requirements into the regional transportation planning process (Metropolitan Washington Council of Governments, 2018).

Though the focus of the financially constrained element is on regionally significant road and transit projects, Visualize 2045 also highlights bicycle and pedestrian projects, freight planning, and other transportation programs aimed at reducing congestion and improving air quality. In addition, the plan presents and analyzes key land-use issues facing the region, considering the link between land-use, economic vitality, and transportation. The plan recommends that the region manage transportation demand as well as provide new capacity and indicates changes in land-use patterns can have a profound impact on travel demand. The Transportaion Planning Board concluded that they cannot simply build projects which would overcome the challenges the region faces (housing and job location, roadway congestion, transit crowding, and inadequate bus service) and that a more nuanced approach was needed that combines projects, programs, and policies. The Plan aims to better manage peak period travel demand, reduce single occupant travel, make transit more viable and affordable, and enhance existing infrastructure. To accomplish this, more than 100 major and regionally signifcant projects were included in the financially constrained element. One project, widening of MD 3 in Prince George's County, occurs in the ICE Analysis Boundary (**Table 4-12**). The plan does not include mention of the Bay Crossing Study, or potential added capacity across the Chesapeake Bay.

Table 4-12: Major Capital Projects

OPERATING AGENCY/JURISDICTION	NAME	LIMITS/LENGTH	DESCRIPTION
MDOT SHA/Queen Anne's County	MD 8 / U.S. 50/301 Interchange and Service Roads	Skip Jack Parkway south to Davidson Drive; east to Thompson Creek service road/7.94 miles	Widen from 2 to 4 lanes, convert MD 8 overpass to divergent diamond, interchange with US 50/301, and add Thompson Creek and Cox Creek service roads to improve traffic flow, add capacity and allow for alternative routes to services and residential areas. Provide for bike and pedestrian improvements along existing and new routes.
MDOT SHA/Queen Anne's County	MD 18	Kent Narrows to Bay Bridge – MD 18 and MD 835 on east side of Kent Narrows to MD 18/4.96 miles	Widen from 2 to 4 lanes, including ROW acquisition, utility relocation, new pedestrian improvements, and reconstruction of intersections to improve capacity, safety, and mobility on the only alternative route to US 50/301 on the island.
TBD/Anne Arundel County	US 50 Bus Rapid Transit	Bus Rapid Transit between New Carrollton MARC/Metro station and Parole along US 50/21.0 miles	New Carrollton to Parole Bus Rapid Transit Route.
MDOT SHA/Anne Arundel County	I-97	MD 32 to US 50/301/6.5 miles	Add managed lanes (high-occupancy vehicle lanes) to address capacity needs. Investigate need for additional interchange access in Crownsville
MDOT SHA/Anne Arundel County	MD 2	US 50 to I-695/17.0 miles	Widen 4-lane sections to 6 lanes throughout. Roadway improvements, new premium transit service, new sidewalks, and permitting land use densities that support transit in select locations where redevelopment might occur.
MDOT SHA/Anne Arundel County	MD 177	MD 177 from MD 2 to Lake Shore Drive/7.8 miles	Widen from 2 to 4 lanes.
MDOT SHA/Anne Arundel County	MD 214	MD 424 to Shoreham Beach Road/7.5 miles	Widen from 2 to 4 lanes for most of this corridor (from MD 424 to Selby Boulevard). Bicycle improvements throughout most of the corridor and pedestrian improvements in segments. Traffic signal warrant assessments recommended at MD 214 / Riva Road and MD 214 /Stepneys Lane intersections.
Anne Arundel County	US 50	I-97 to MD/25.5 miles	Widen from 6 to 8 lanes.
Prince George's County	MD 3 (Robert Crane Highway)	Virginia State line to Prince George's County line near Annapolis Road	Widen to 6 lanes.

Source: BRTB (2018); MWCOG (2018)

4.1.4 Businesses and Employers

Existing economic characteristics considered in this analysis include the number and type of establishments in the ICE Analysis Area county-level jurisdictions, based on data obtained from the Maryland Department of Commerce and US Census bureau. Also presented are the major industries in the ICE Analysis Boundary counties and major employers.

The data indicates most employers by total count and percentage of employees were private establishments. The Western Shore localities, however, contained many more establishments for each establishment type. Baltimore County featured the greatest number of establishments. Prince George's and Anne Arundel Counties contained the most federal establishments. Queen Anne's and Talbot Counties on the Eastern Shore had the most employers in 2017. This is in agreement with the population data provided in **Table 4-13** which indicates that those two counties had the largest populations in the Maryland portion of the ICE Analysis Boundary on the Eastern Shore in 2017.

Where available, the major employers for 2018 for each of the study localities is provided in **Table 4-14**. Nearly all of the major employers listed for the Eastern Shore localities in Maryland are located in the ICE Analysis Area. However, the major employers for Kent County, Delaware are located outside the study boundary and near Dover, Delaware to the east. Most Western Shore top employers are located outside of the boundary. Northrop Grumman, however, has an office in Annapolis near US 50/US 301.

Table 4-13: Number of Establishments by Place of Work (2017)

LOCATION	FEDERAL GOVERNMENT (ESTABLISHMENTS/%)	STATE GOVERNMENT (ESTABLISHMENTS/%)	LOCAL GOVERNMENT (ESTABLISHMENTS/%)	PRIVATE (ESTABLISHMENTS/%)
Eastern Shore				
Caroline County	14/0.7%	6/2.0%	27/16.0%	630/81.2%
Queen Anne's County	15/0.7%	8/1.5%	32/15.6%	1,407/82.2%
Talbot County	18/1.0%	8/1.1%	18/7.3%	1,515/90.6%
Kent County	12/0.8%	7/3.1%	18/9.4%	691/86.8%
Kent County, Delaware[1]	3,422			
Western Shore				
Anne Arundel County	102/4.9%	76/4.5%	161/8.0%	14,932/82.6%
Baltimore City	78/3.2%	123/10.0%	221/6.9%	13,297/79.9%
Baltimore County	71/3.9%	25/2.9%	236/7.9%	21,031/85.2%
Prince George's County	114/8.5%	15/6.6%	299/12.8%	15,626/72.0%

Sources: Maryland Department of Commerce (2019); US Census (2018)
Note: Maryland data includes civilian employment only.
[1]*Total employer establishments in 2016*

Table 4-14: Top 3 Employers in the ICE Analysis Area County-Level Jurisdictions

LOCATION	1st	2nd	3rd
Eastern Shore			
Caroline County	Dart Container	Benedictine School for Exceptional Children	Preston Automotive Group
Queen Anne's County	Chesapeake College	REEB Millwork	Paul Reed Smith Guitars
Talbot County	University of Maryland Shore Medical Center	Qlarant	Shore Bancshares
Kent County	Washington College	Dixon Valve & Coupling	UM Shore Medical Center at Chestertown
Kent County, Delaware	Dover Air Force Base	Bayhealth Medical Center	Dover Downs
Western Shore			
Anne Arundel County	Ft. George G. Meade	Northrup Grumman	Southwest Airlines
Baltimore City	Johns Hopkins Hospital & Health System	Johns Hopkins University	University of Maryland Medical System
Baltimore County	U.S. Social Security Administration	University System of Maryland	Centers for Medicare & Medicaid Services
Prince George's County	University System of Maryland	Joint Base Andrews Naval Air Facility Washington	U.S. Internal Revenue Service

Source: Maryland Department of Commerce (2019)
Note: Excludes post offices, state and local governments, national retail, and national foodservice.
Most Western Shore top employers are located outside of the boundary.

4.1.5 Agriculture

As illustrated in the land use/land cover data depicted in **Figure 4-2** and **Table 4-1**, agricultural lands cover a substantial portion of the land within the ICE Analysis Area. These lands, and the farm businesses that operate on them, are important to the local economies (particularly on the Eastern Shore), and Maryland's and Delaware's statewide agricultural economy.

As listed in **Table 4-15**, hundreds of farms are located in the ICE Analysis Area Counties, primarily on the Eastern Shore. The number of farms has varied since 2012, decreasing in each of the Eastern Shore localities and increasing on the Western Shore. The amount of farmed land has also varied by locality since 2012. Along with decreases in the number of farms in Talbot and Caroline Counties, large changes occurred in the amount of farmed lands between 2012 and 2017. During this period there was an approximate 22 percent and 15 percent decrease in the farmed acreage in Talbot and Caroline Counties, respectively. Although the number of farms decreased in Queen Anne's, Kent County, Maryland, and Kent County, Delaware, the amount of farmed lands increased. On the Western Shore, Baltimore County, and Prince George's County both experienced a growth in farmland acreage between 2012 and 2017.

Agriculture is a major economic driver in many of ICE Analysis Area counties. The market value of crops produced in study localities nearly reached $470 million dollars in 2017, with approximately 82 percent being grown on the Eastern Shore (US Department of Agriculture (USDA), 2019a, b). Queen Anne's County, Caroline County, and Kent County all ranked in the top five in the state with Queen Anne's County topping the list.

Table 4-15: Total and Per Farm Overview (2017)

LOCALITY	NUMBER OF FARMS	CHANGE SINCE 2012 (%)	LAND IN FARMS (ACRES)	CHANGE SINCE 2012 (%)
Eastern Shore				
Caroline County	588	-11	128,052	-15
Queen Anne's County	483	-9	163,001	+4
Talbot County	317	-3	93,622	-22
Kent County	346	-6	134,262	+1
Kent County, Delaware	822	-5	182,396	+6
Western Shore				
Anne Arundel County	390	+2	27,003	-4
Baltimore City	Included with Baltimore County			
Baltimore County	708	+11	76,123	+8
Prince George's County	367	+6	34,399	+5

Source: USDA (2019a; b)

On the Eastern Shore, the value of livestock, poultry, and products produced in 2017 nearly doubled the value of crops produced for that year with Caroline County and Kent County, Delaware producing the highest values (USDA, 2019a,b). Combined, the value of the crops, livestock, poultry, and products produced in study localities exceeded $1.1 billion dollars in 2017 (USDA, 2019a; b).

4.2 Natural Resources

The *Natural Resources Technical Report* provides a detailed description of the regulatory basis and methodology used for the analysis of direct effects of potential improvements within the corridor alternatives on natural resources. The resources evaluated herein include terrestrial resources including forestland, water resources, floodplains, wildlife, wildlife habitat, and threatened or endangered species. The information contained in this report supports discussions presented in the EIS. Comparative data, where available, was used to evaluate these resources in both the Maryland and Delaware portions of the ICE Analysis Area.

The ICE Analysis Boundary encompasses numerous classes of natural communities including mesic forests, maritime forests, alluvial wetlands, non-alluvial wetlands, tidal wetlands, and riverine aquatic beds (Maryland Wildlife and Heritage Service, 2016). Key wildlife habitat in the ICE Analysis Boundary includes: mixed hardwood forests, coastal plain oak-pine forests, coastal bluffs, coastal beaches, coastal plain floodplains, flatwoods, depression swamps, and seepage swamps, Delmarva bays, vernal pools, tidal forests, marshes, and shrublands, intertidal mudflats and sandflats, coastal plain, and blackwater streams and rivers, shellfish beds, submerged aquatic vegetation (SAV) areas, and pelagic-open water habitat.

Historical development in the ICE Analysis Boundary has resulted in significant loss of natural areas, wildlife and wildlife habitat, and caused negative impacts to water quality. Today, the comprehensive plans from study area localities define objectives, goals, or strategies to minimize loss and degradation of environmental resources such as forest lands, wetlands, streams and rivers, water quality, floodplains, and wildlife habitats.

4.2.1 Terrestrial Resources

Chesapeake Bay region forests protect water quality, offer habitat for fish and wildlife, improve air quality, encourage recreation, and enhance the economy (Sprague et al., 2006). In Maryland, forest lands such as these cover approximately 2.5 million acres, representing an approximate 16% loss since 1964 (United States Forest Service, 2008). As shown in **Table 4-1** above, forest loss in the ICE Analysis Boundary has exceeded this percentage; experiencing a loss of just over 53,000 acres of forest between 1973 and 2010, or a decline of roughly 21 percent.

According to the United States Forest Service, forest change dynamics in Maryland are due to a complex interaction of patterns of population growth, land development, reversion of agricultural land to forest, conservation policies, and the availability of land open to development (United States Forest Service, 2008).

The Maryland Forest Conservation Act (FCA) enacted in 1991 is intended to minimize the loss of forest resources during land development by making the identification and protection of forests and other sensitive areas an integral part of the site planning process. During the first fifteen years of implementation (1993-2007) the FCA was responsible for the review of 199,925 acres of forest on projects scheduled for development. Of those, 120,638 acres were retained, 71,885 acres were cleared, and 21,461 acres were planted with new forest (MDNR, 2007).

Forests are defined by Code of Maryland Regulations (COMAR) 08.19.03.01 as "a biological community dominated by trees and other woody plants covering a land area of 10,000 square feet or larger" (Maryland Division of State Documents, 2019). They include areas that have at least 100 trees per acre with at least 50 percent of those having a two-inch or greater diameter at breast height and forest areas that have been cut but not cleared.

Forest impacts from activities requiring an erosion and sediment control permit on areas 40,000 square feet or greater are regulated under the FCA. Enacted in 1991, the FCA was created to preserve existing forested lands and protect Maryland forests from being cleared. The Act requires local governments to establish and implement local forest conservation programs and provides for the MDNR administration of forest conservation requirements. According to Maryland iMap GIS data, the ICE Analysis Area contains approximately 2,643 acres of FCA easements. Most of the easements are on the western side of the Chesapeake Bay in Anne Arundel County (**Figure 4-6**). Forests of Recognized Importance are defined by the Maryland Forest Service as areas combining forests with other important resources. In these areas, 100-foot buffers around stronghold watersheds, trout bearing streams, streams feeding municipal drinking water reservoirs, and Maryland Department of the Environment (MDE) Tier 2 High Quality Waters are established for special consideration and protection and be buffered according to the Maryland Forest Service's Operations Order. Maryland's Forest Service data indicates approximately 25 square miles of Forests of Recognized Importance are in the ICE Analysis Boundary (Maryland Forest Service, 2015). The forested areas occur along streams and rivers located on the eastern side of the Chesapeake Bay in Kent, Queen Anne's, Caroline, and Talbot Counties (**Figure 4-6**). Taber State Forest lies in southwestern Kent County, Delaware and is the smallest of Delaware's State Forests at 1,273 acres. It is managed primarily for timber production and wildlife habitat. Approximately 178 acres of Taber State Forest is within the ICE Analysis Boundary.

Over 130 parks or conservation areas are in the ICE Analysis Boundary (**Figure 4-7**). These include local parks, state parks, natural resource management areas, wildlife management and two federal national wildlife refuges, Eastern Neck National Wildlife Refuge and the Susquehanna National Wildlife Refuge. The Smithsonian Environmental Research Center is also located within the ICE Analysis Boundary, and specifically within Corridor 8. The Eastern Neck National Wildlife Refuge encompasses approximately 2,232 acres and the Susquehanna National Wildlife Refuge has approximately two acres within the analysis area. The ICE Analysis Boundary also contains other types of protected lands such as conservation easements and preservation areas, listed in **Table 4-16**. These conservation lands and parks contain undeveloped land potentially used by wildlife and contribute to wildlife corridors, linking isolated areas of natural habitat and allowing for wildlife migration.

Table 4-16: Protected Resources in the ICE Study Area

RESOURCE	ACRES IN ICE ANALYSIS BOUNDARY
MDNR-Owned Properties and Conservation Easements	19,592
Maryland Historical Trust Preservation Easements	626
Delaware Agricultural Lands Preservation Easements	1,425
Maryland Forest Conservation Act Easements	2,643
Maryland Rural Legacy Properties	2,002
Maryland Forests of Recognized Importance	15,904
Maryland Permanent Preserve Agricultural Areas	87,428
Maryland Local Protected Lands	32,338
Maryland Environmental Trust Easements	32,156
Maryland Private Conservation Lands	8,524
Delaware State Protected Lands	178
Protected Federal Conservation Lands	4,183

Source: (Maryland iMap GIS Data)

4.2.2 Aquatic Resources

Two six-digit USGS HUC watersheds are in the ICE Analysis Boundary: 020600 (Upper Chesapeake) and 020801 (Lower Chesapeake) (USGS, 2019). The Upper Chesapeake watershed is approximately 2,272 square miles in size with flows generally east or west towards the Chesapeake Bay, which bisects the ICE Analysis Area north to south. Major tidal tributaries within this watershed include the Patapsco River, Chester River, Magothy River, Severn River, Miles River, Broad Creek, Tred Avon River, West/Rhode River, and South River. Approximately 99 percent of the ICE Analysis Area is located within the Upper Chesapeake Bay watershed. The remaining portion of the analysis area occurs within the Lower Chesapeake watershed (approximately 12 square miles). Streams in this watershed generally flow to the southeast and eventually join either Marshyhope Creek or the Nanticoke River draining to the Chesapeake Bay. Named waterways within this watershed include Saulsbury Creek, Short and Hall Ditch, Smithville Ditch, Tommy Wright Branch, Hickman Ditch, and Wolfpit Branch.

Figure 4-6: Protected Forested Habitat

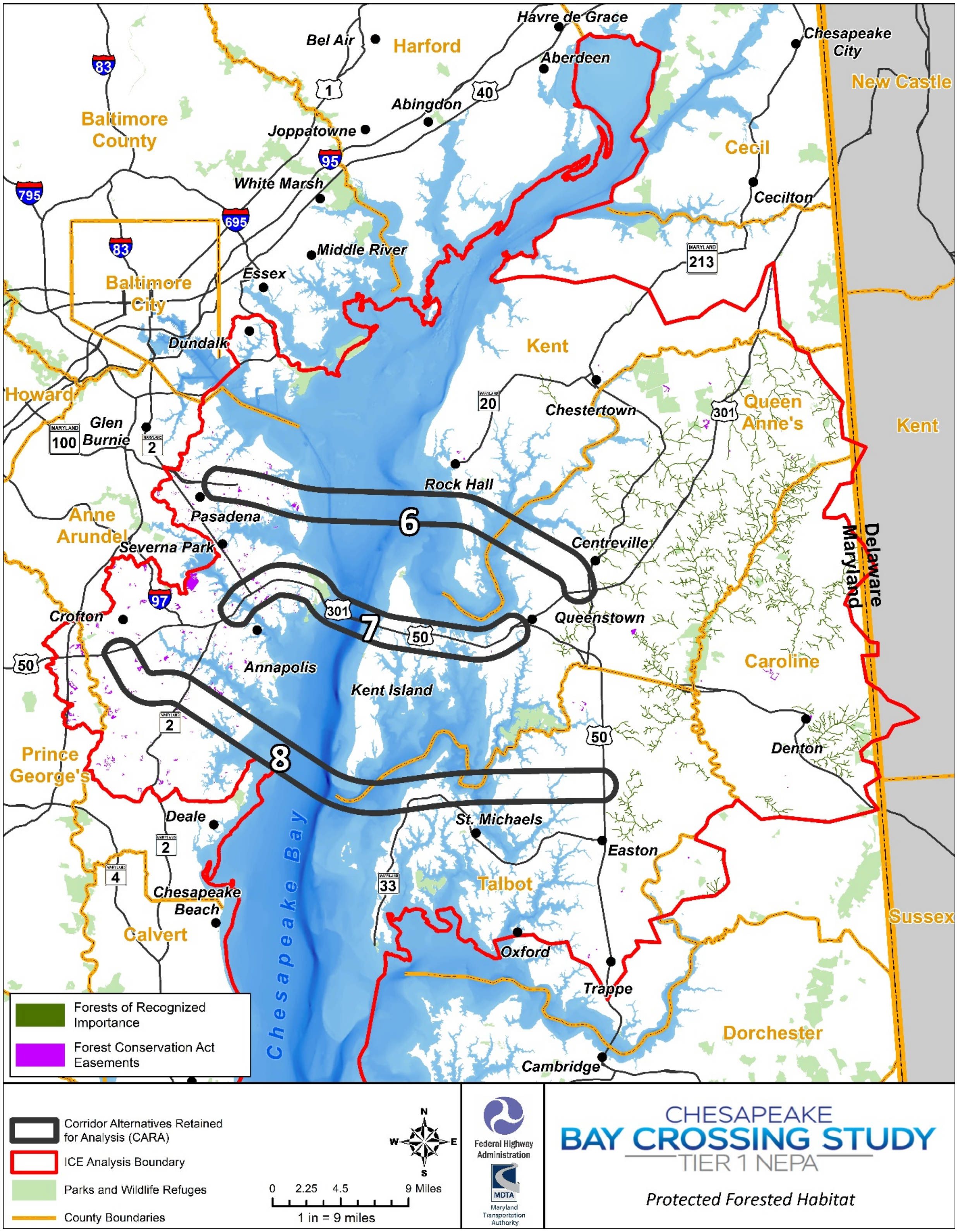
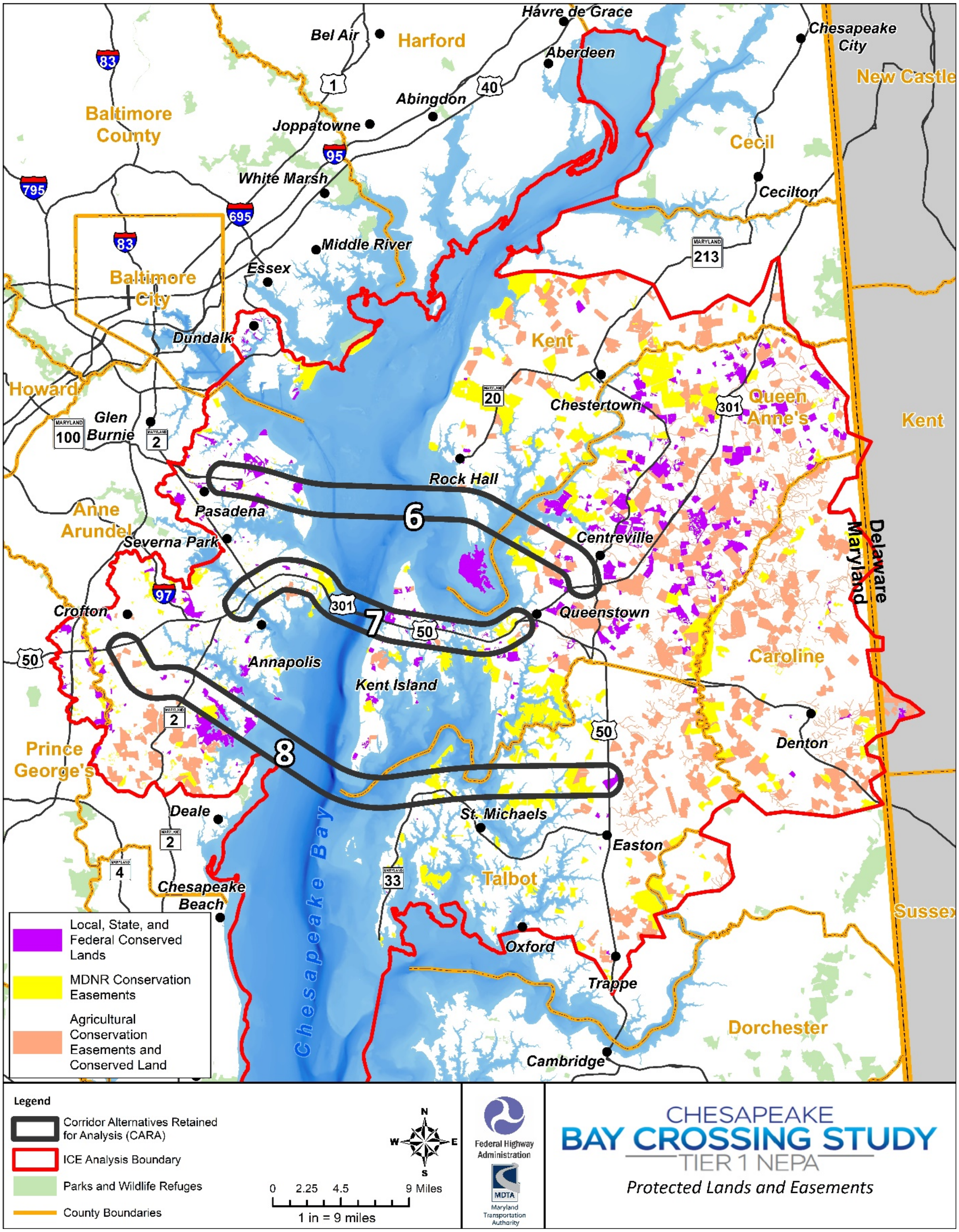


Figure 4-7: Conserved Lands, Parks, Preservation Areas, and Easements



4.2.2.1 Wetlands

Maryland's coastal bays have experienced approximately 54,778 acres of wetland loss since European settlement, and Maryland has lost approximately 600,000 acres of pre-contact settlement acreage (Tiner and Burke, 1995). It has been estimated that Maryland has lost between 45 percent and 65 percent of its original wetlands (Tiner and Burke, 1995). The main causes of wetland loss have been attributed to agriculture, forestry, industrial and urban development, and recreation and these uses have resulted in the draining, dredging, ditching, filling, diking, and damming of wetlands. Along with these causes, climate change and sea level rise exacerbate other stressors such as erosion, and can alter salinity, produce sediment deficits, and convert vegetated wetlands to open water areas due to inundation (USEPA, 2015).

What remains in Maryland, approximately 757,000 acres, consists nearly entirely of estuarine or palustrine wetlands, with palustrine wetlands being the most abundant. Prior to the enactment of the Tidal Wetlands Act by the Maryland General Assembly in 1970, over 1,000 acres of wetlands were being destroyed throughout tidewater Maryland each year (MDE, 2018). Today, the net loss of tidal wetlands averages less than one acre per year (MDE, 2015). The Tidal Wetlands Act mandated the mapping of tidal wetlands and the creation of a regulatory program to protect the State's tidal wetland resources. In 1989, the Maryland General Assembly enacted the Nontidal Wetlands Protection Act to protect these lands by regulating and restricting all activities that could impact nontidal wetlands or waters of the state. At the Federal level, jurisdictional Waters of the U.S. (WOTUS), which includes wetlands and surface waters, are afforded regulatory protection under Section 404 of the Clean Water Act (CWA). Section 404 also identifies jurisdictional wetlands as Special Aquatic Sites. Special Aquatic Sites are defined as areas "possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values" (40 CFR Part 230.3 (q-1)). 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 WOTUS.

The MDE tracks wetland permit applications and associated permanent impacts. Between January 1, 1991 and December 31, 2012, there were approximately 900 acres of permanent nontidal wetland impacts. Permittees were required to mitigate for 1,005 acres nontidal wetlands. Combined with other authorized nontidal wetland gains, the resulting aquatic resource gain during the period was 732 acres of nontidal wetlands. Additionally, voluntary tidal and nontidal wetland restoration, creation, and enhancement completed throughout Maryland was reported to the state. During the years 1998 through 2012, this included 10,816 acres of nontidal wetland restoration/creation, 6,898 acres nontidal wetland enhancement, 463 acres of tidal wetland restoration/creation, and 160,081 acres of tidal wetland enhancement (MDE, 2015).

Within the ICE Analysis Area, wetland acreages remained relatively unchanged between 1973 and 2010 according to MDP LULC data. This indicates that any wetland loss has been likely offset by restoration efforts.

The Maryland Wetland Program Plan, prepared by the MDE in coordination with MDNR, Maryland Department of Agriculture, and Critical Area Commission for Chesapeake and Atlantic Coastal Bays, identifies Maryland's goals, objectives, and key tasks to be accomplished over the next several years in the implementation of a balanced and effective wetland program in the State. At the goal level, Maryland plans to protect wetlands through regulatory efforts by increasing the efficiency and effectiveness of wetlands regulation and management. Regarding monitoring and assessment, Maryland has a goal to develop, update, or recognize tools and methods which will provide critical baseline information on wetland extent, condition, and function to improve wetland management decisions. For restoration and protection, Maryland has a goal to ensure restoration and preservation efforts provide the greatest water quality, native habitat and associated ecosystem service benefits possible for the financial resources expended, today and in the future, through science-guided practices and priorities, ongoing stewardship and effective partnerships. Finally, Maryland has a goal to determine whether adoption of wetland water quality standards would enhance wetland protection and management (MDE, 2018).

The Mid-Atlantic region contains a wide variety of coastal wetlands due to variations in climate hydrology, soils, vegetation, and other factors (USEPA, 2015). The transition from fresh to salt water systems support forested and shrub wetland habitats described above in headwater systems, brackish marshes, and tidal freshwater wetlands in the transition zones, and salt marshes, mudflats, and beaches near the shore. These wetlands serve multiple functions including, but not limited to, groundwater recharge/discharge, flood flow alteration, wildlife habitat, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, primary production export, and sediment/shoreline stabilization. Values provided by wetlands include, but are not limited to, recreation, educational/scientific value, aesthetics, and heritage.

The ICE Analysis Area encompasses large areas of wetlands 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. The following identifies concentrations of previously-mapped wetland and surface water resources within the ICE Analysis Boundary.

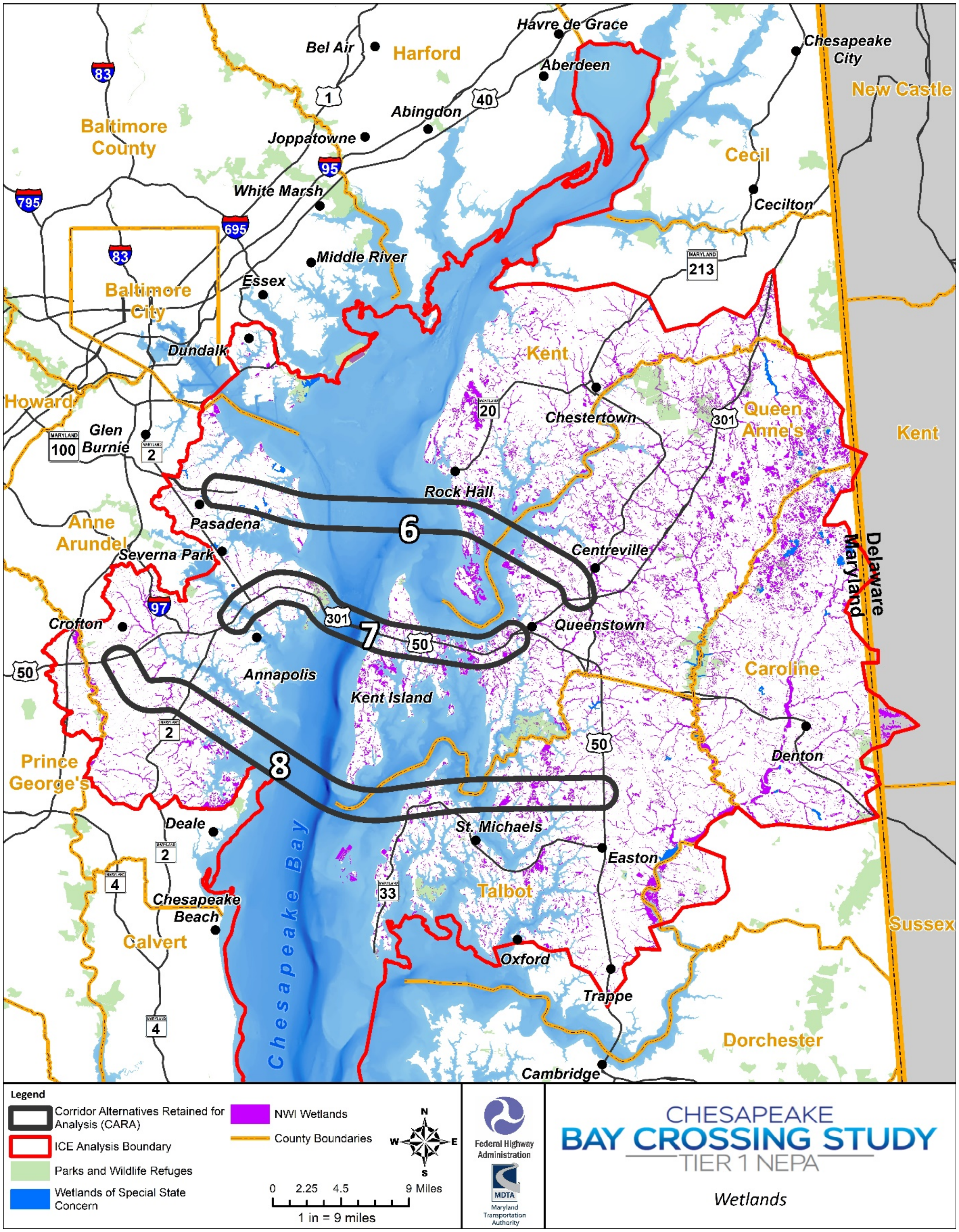
Figure 4-8 identifies the location of mapped USFWS identified National Wetlands Inventory (NWI) wetlands and surface waters within the ICE Analysis Area. According to the mapping, the highest concentrations of NWI resources are on the Eastern Shore. The NWI data approximates that there are 66,541 acres of freshwater vegetated wetlands in the ICE Ana lysis Area (USFWS, 2019a). Of these, approximately 77 percent are forested/shrub wetlands and approximately 6 percent are emergent wetlands. Approximately 13,648 acres of estuarine wetlands occur in the ICE Analysis Area (**Table 4-17**).

Table 4-17: NWI Wetland Classification

WETLAND TYPE	ACRES IN ANALYSIS AREA	PERCENT WETLANDS IN ANALYSIS AREA
Estuarine Wetland	13,648	17%
Freshwater Emergent Wetland	4,548	6%
Freshwater Forested/Shrub Wetland	61,993	77%
Total	**80,189**	**100%**

Source: (USFWS, 2019a)

Figure 4-8: Wetlands



Maryland non-tidal Wetlands of Special State Concern (WSSC) are designated for special protection under the state's non-tidal wetlands regulations (COMAR Title 26, Subtitle 23, Chapter 06, Sections 01 & 02), which afford WSSC certain protections including a 100-foot buffer. These are wetlands with exceptional ecological and educational value and, in many cases, contain the last remaining populations of native plants and animals that are threatened with extinction in the state. According to data from Maryland iMap, approximately 2,687 acres of WSSC occur in the ICE Analysis Area (**Figure 4-8**) (MDNR, 2017). The state of Maryland also regulates permanent and temporary impacts to the 25-foot nontidal wetland buffer and the 100-foot nontidal wetland buffer.

Potential impacts to wetlands are regulated on a federal, state, and local level. Mitigation may be required for permanent impacts to tidal wetlands. Mitigation can be in the form of (1) permittee-responsible mitigation; (2) use of a tidal wetland mitigation bank; or (3) pay into the Tidal Fund. The Maryland Board of Public Works accepts monetary compensation only if the MDE Wetlands and Waterways Program (WWP) determines that creation, restoration, or enhancement of tidal wetlands are not feasible alternatives. In addition, the WWP may approve mitigation bank sites in consultation with the appropriate local, State, and federal agencies. Lastly, mitigation for the loss of tidal wetlands is considered in the following order of preference:

1. Restoration;
2. In-kind creation;
3. Out-of-kind creation;
4. Enhancement of existing tidal wetlands;
5. Monetary compensation to the Wetlands Compensation Fund.

When nontidal wetland or waterway impacts are considered to be more than minimal, they must be mitigated through restoration or other environmentally beneficial projects. Wetland and waterway compensatory mitigation efforts are also required to meet the requirements of the 2008 EPA-Corps Mitigation Rule (40 CFR Part 230). In-lieu fee (ILF) programs administered by states (such as Maryland's Wetlands Compensation Fund) are not currently recognized as acceptable mitigation by the USACE; but approved mitigation banks or permittee-responsible mitigation may be used where appropriate. Coordination with both the USACE and the MDE Nontidal Wetlands Division, Mitigation and Technical Assistance Section will be conducted throughout the process to discuss mitigation requirements once detailed impacts are quantified for a selected alternative.

4.2.2.2 Surface Waters

Streams and rivers in the ICE Analysis Boundary have been impacted by the area's growth and development. Streams and waterways have been: filled in, dammed, realigned and channelized, dredged, lined with concrete associated with bridge and culvert construction, and stream banks hardened with riprap and other materials. To those waterbodies affected, these impacts have eliminated or reduced waterbody functions and values including: natural flood control, nutrient recycling, groundwater recharge, and sustaining the biological productivity of downstream rivers and estuaries. These functions and values are important for waterbodies to provide habitat for plants, animals, and microorganisms in the form of shelter, food, protection from predators, fish passage, and spawning locations and nursery areas.

Potential impacts to streams are regulated on a federal, state, and local level. Mitigation may be necessary for permanent impacts to tidal waters. Mitigation may be in the form of (1) permittee-responsible mitigation; (2) use of a tidal wetland mitigation bank; or (3) pay into the Tidal Fund. As noted above, payment into ILF programs, such as MDE's Tidal Wetlands Compensation Fund (Tidal Fund), are not recognized by the USACE to be acceptable compensatory mitigation. Most mitigation in Maryland is in the form of permittee-responsible mitigation and it often occurs on-site (MDE, 2015). When nontidal wetland waterway impacts are considered to be more than minimal, they must be mitigated through restoration or other environmentally beneficial projects.

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.

Water quality in the ICE Analysis Boundary has diminished due to past population growth and development. Increases of impervious surfaces in the study area especially on the Western Shore has resulted in an increase in the velocity and volume of surface runoff entering the surrounding waterbodies. This can lead to increased erosion, sedimentation, and introduction of more pollutants being deposited into nearby waters. Ground disturbance from development and agriculture have exposed soils to water erosion and reduced filtering vegetation, increasing sediment deposition into nearby waterbodies. Fertilizers and pesticides from agriculture, along with livestock byproducts, end up in stormwater runoff which can cause algal blooms that deplete the water of oxygen, affecting the survival of aquatic life. Agriculture is found on both sides of the Bay, though it is much more prevalent on the Eastern Shore.

In April 2003, the USEPA issued the guidance document entitled Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll a for the Chesapeake Bay and Its Tidal Tributaries, as required by the Clean Water Act (CWA) and in accordance with water quality standards regulations (40 CFR §131). The document was issued to provide the states guidance when developing their water quality standards to ensure they comply with the CWA. Of importance in the ICE Analysis Boundary is the document's guidance on dissolved oxygen in surface waters. Nutrient enrichment is often the cause of this impairment in shallow waters. The USEPA guidance document establishes dissolved oxygen criteria to protect migratory fish spawning and nursery habitat, shallow-water bay grasses, and open-water fish and shellfish uses (USEPA, 2003).

Further, water quality is regulated by Sections 303(d), 305(b), and 314 of the federal CWA and the Safe Drinking Water Act. These laws have led to implementation of state programs to monitor water quality, identify sources of impairments, and establish Total Maximum Daily Load (TMDL) levels of pollutants for impaired waters, all which benefit water quality in the ICE Study Area. Laws and regulations have led to an improvement in some areas, contrary to the historically negative trend in water quality within the region.

Chesapeake Bay resources are afforded federal protection under EO 13508 (Chesapeake Bay Protection and Restoration). The EO, which was issued May 12, 2009, was intended to bring a new level of interagency coordination and cooperation while recovering habitat by restoring a network of land and water habitats to support priority species and other public benefits; sustaining fish and wildlife; and conserving land and increasing public access. EO 13508 also establishes additional responsibilities for federal agencies to ensure that their actions are not opposed to the goals of addressing water quality issues in the Chesapeake Bay watershed. A keystone commitment of the federal strategy to meet the requirements of the EO is adherence to Chesapeake Bay TMDL requirements, which necessitate quantitative nutrient reductions by each contributing jurisdiction.

Maryland's ability to meet the Chesapeake Bay TMDL and reduce bacterial impairment relies on the implementation of stormwater criteria to achieve no net increase of nutrients from new development. Managing soil erosion and runoff from construction sites is administered by the state in accordance with the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment which requires construction activities that would disturb certain acreage thresholds to acquire permits and implement Best Management Practices (BMPs) to control erosion and runoff (MDE, 2012). These include measures such as: using silt fencing, erosion control blankets, temporary vegetative covers, and placing check dams and drainage inlet protection. Federal, state, and local laws also regulate agriculture through land conservation measures to minimize water erosion, restrict the amount and timing of fertilizer and pesticide applications, and regulate concentrated feed operations.

Commercial and industrial development in the ICE Study Area have also introduced pollutants to surface water at specific outfall points. Point discharges, damming, and loss of tree canopy vegetation have altered water temperature and light levels in water that affect aquatic life. Loss of vegetation, wetlands, and/or riparian areas have reduced vegetation that filters pollutants from runoff before it reaches major waterbodies. These past and present activities have impaired the ability of some water bodies to support both human and wildlife uses in the ICE Analysis Boundary. Accidental fuel spills, vehicle emissions, and chemicals used for road maintenance also impact stormwater runoff.

The federal Coastal Zone Management Act and the Maryland Coastal Zone Management Program require federally licensed, permitted, or assisted activities that have reasonably foreseeable coastal impacts to be consistent with the enforceable policies of the Maryland Coastal Zone Management Programs. The Maryland Coastal Zone Enforceable Regulatory Programs enhance water quality in the ICE Analysis Boundary by regulating land and wetlands management, nonpoint source pollution control, point source pollution control, shoreline sanitation, air pollution control, and coastal lands management. In addition to applying for a nontidal Wetlands and Waterways Permit and Tidal Wetlands License, any future crossing project will require Water Quality Certification as well as Coastal Zone Consistency Determination.

The ICE Analysis Area contains many tidal, perennial, and intermittent streams/rivers, ponds, lakes, and man-altered waterways including canals, ditches, and connectors (**Figure 4-9**). According to the NWI dataset, most of these surface waters consist of the estuarine deepwater portions of the Chesapeake Bay and its tidal tributaries (**Table 4-18**). The National Hydrography Dataset (NHD) estimates that approximately 3,142 miles of streams, rivers, ditches, canals, or connectors are in the ICE Analysis Area

(**Figure 4-9**). Several permanent, perennial waterbodies are also present, accounting for approximately one percent of the area total (USGS, 2019).

Table 4-18: NWI Aquatic Areas Classification

WATER TYPE	ACRES IN ANALYSIS AREA	PERCENT OF WATERS IN ANALYSIS AREA
Estuarine and Marine Deepwater	675,734	98%
Freshwater Pond	4,456	1%
Lake	820	<1%
Riverine	4,861	1%
Total	**685,871**	**100%**

Source: (USFWS, 2019a)

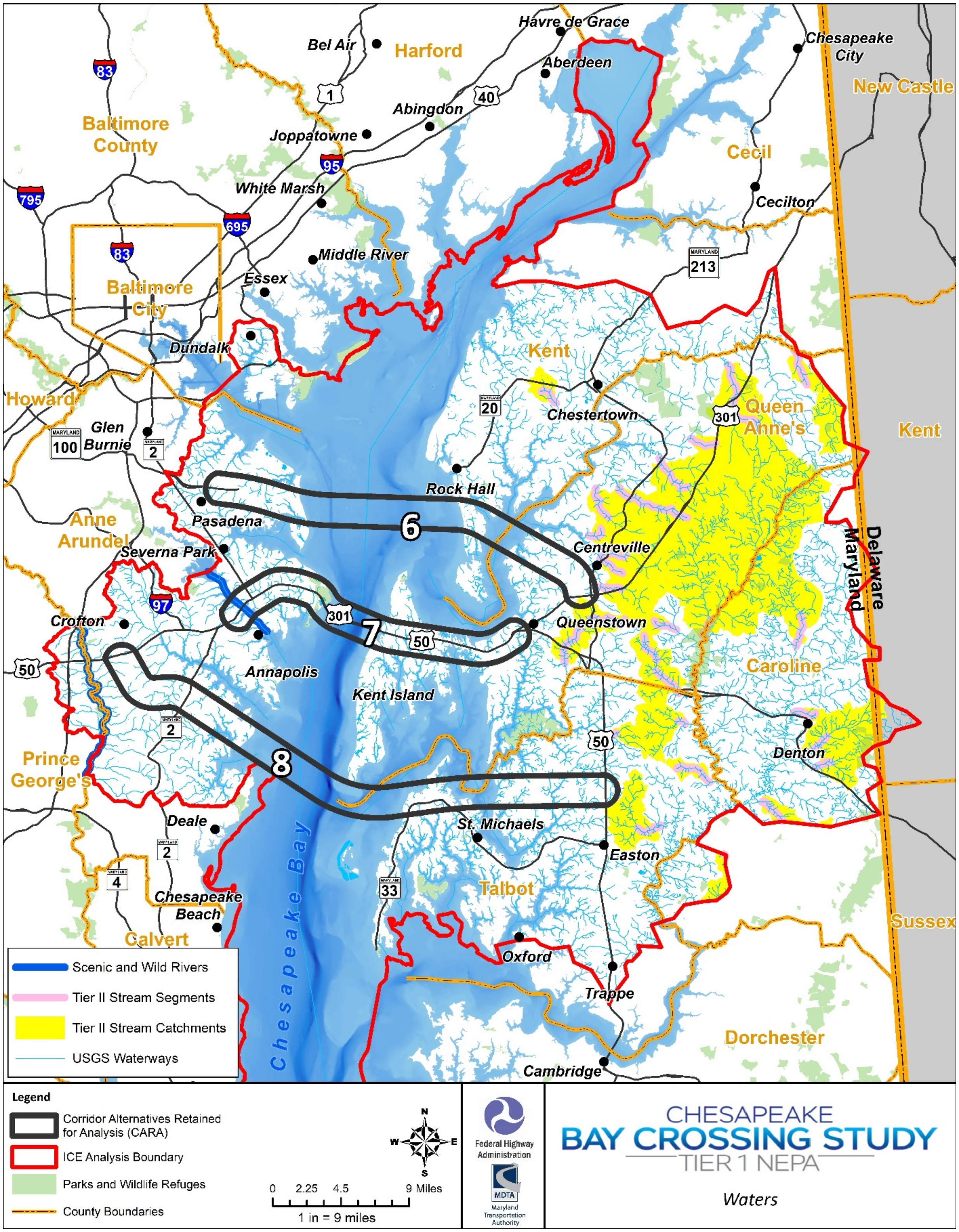
In Maryland, the ICE Analysis Area also contains approximately 61 linear miles of Tier 2 stream segments, which are high quality waters with significantly better than the minimum requirements, as specified in water quality standards (MDNR, 2016a). Associated with the stream segments, the ICE Analysis Area contains approximately 251 square miles of Tier 2 Catchments (MDNR, 2016b).

The Maryland Scenic and Wild Rivers System Act of 1968 recognizes rivers and their related land areas that possess outstanding scenic, geologic, ecologic, historic, recreational, agricultural, fish, wildlife, cultural, and other similar resources values (**Figure 4-9)**. The Act mandates the preservation and protection of natural values associated with rivers designated as Scenic and/or Wild. According to mapping maintained by the MDNR, the ICE Analysis Area contains approximately 19 linear miles of State-designated Scenic and Wild Rivers. This includes portions of the Patuxent River and Severn River (MDNR, No Date(a)). No federally-designated Wild and Scenic Rivers occur within the ICE Analysis Area.

Every year, the Maryland Port Administration and the United States Army Corps of Engineers (USACE) dredge roughly 4.5 million cubic yards of sediment from the Bay to maintain freight cargo shipping channels (Sea Grant, 2018). Some of the sediment has, over generations, accumulated high levels of pollutants, including heavy metals and pesticides that can be harmful to human health. Dredging in Waters of the US (WOTUS) is regulated by Section 404 of the CWA and Maryland Tidal Wetlands Act 1970. Dredging materials may be used for construction fill or be disposed of in other waters or on land.

Dredging in the ICE Analysis Boundary is routinely implemented to maintain navigation channels and could be carried out for special purposes, such as deepening navigation channels, laying utilities, or to remediate contaminated water bottom sediments. Dredging results in: resuspension of sediments and increased turbidity which decreases the amount of light available. Without enough light, photosynthesis will stop, and the SAV will no longer produce dissolved oxygen. The turbidity associated with dredging lasts only as long as the dredging, however, the resuspension of adsorbed contaminants and release of contaminants into the water column lasts after the completion of dredging.

Figure 4-9: Waters



Dredging and placement of crossing infrastructure can alter hydrodynamics of flowing water that can adversely affect aquatic wildlife and erode streambanks and shorelines. Changes in water quality as discussed above have impacted aquatic wildlife and vegetation. These activities together have altered the proportion of aquatic habitat by: reduced SAV important for food, cover, and spawning habitat for certain species; disturbed migration and reproduction of certain species; increased turbidity that impacts light levels in water affecting wildlife and SAV; and reduced aquatic wildlife populations (Marine Notes, No Date).

The water quality of some rivers/streams and waterbodies contained in the ICE Analysis Area were evaluated in the recent 303(d) and 305(b) integrated reports released by Maryland and Delaware. *Maryland's Final 2018 Integrated Report of Surface Water Quality* was released by Maryland's Department of the Environment (MDE) and approved by USEPA in April 2019 (MDE, 2019a). Data from this report is available as a GIS geodatabase (MDE, 2019b). The *Draft State of Delaware 2018 Combined Watershed Assessment Report (305(b)) and Determination for the Clean Water Act Section 303(d) List of Waters Needing TMDLs* was issued by the Delaware Department of Natural Resources and Environmental Control (DNREC) in August 2018 (DNREC, 2018). Category 4 waters are described as those where one or more water quality standards are impaired or threatened but a TMDL is not required or has already been established. Category 5 waters are impaired, do not attain the water quality standard, and a TMDL or other acceptable pollution abatement initiative is still required. Each of these water quality categories are specific to certain pollutants, nutrients, or other sources of impairment, so any given waterbody within the study corridor may fall into separate categories depending on the constituent of concern. Causes of impairment of these sensitive rivers, streams, open water areas, or waterbodies are due to: the presence of *Escherichia coli* in the waters, the amount of total suspended solids, chloride, sulfate, nutrients such as total phosphorous, and/or, total nitrogen, alterations such as channelization or lack of riparian buffers, contaminants in fish tissue, and/or causes unknown. The major suspected sources of the impairments are livestock (grazing or feeding operations), agriculture, urban runoff/storm sewers, municipal point source discharges, nonpoint source discharges, atmospheric deposition, urban development, and/or causes unknown. Some of the listed rivers, streams, open water areas, or waterbodies are impaired by point-source pollutants with TMDLs that have been established and approved by the USEPA.

4.2.2.3 Floodplains

Along with impacts to wetlands, streams and rivers, and water quality, past development has encroached on and modified floodplains such that severity of flooding and erosion may be increased. Increased impervious surfaces from development can increase surface runoff quantity and velocity that exacerbate flooding. Floodplains are important because they temporarily store flood waters, maintain water quality by filtering sediments and pollutants, help preserve and recharge groundwater supply, provide fish and wildlife habitat, and offer recreation opportunities (National Wildlife Federation, 2016). Executive Order 11988: Floodplain Management, issued in 1977, requires federal agencies to avoid, to the extent possible, long- and short-term impacts to floodplains and avoid direct and indirect support of floodplain development wherever there is a practicable alternative. Floodplain impacts are also regulated at the state level by MDE and at the local level by local flood insurance programs administered in each locality in the ICE Analysis Boundary under the National Flood Insurance Program (NFIP).

The Maryland Model Floodplain Management Ordinance (FPMO), developed through a coordinated effort with local communities, integrates NFIP and state permit requirements. It is the purpose of the regulations to promote the public health, safety, and general welfare to encourage the utilization of appropriate construction practices by discouraging unwise design and construction of development in areas subject to flooding. The FPMO requires that a proposed development in a 100-year floodplain may not increase flooding or create a dangerous situation during flooding, and requires documentation and inspection to ensure structures are in compliance.

Digital floodplain data from the National Flood Hazard Layer was obtained from the Federal Emergency Management Agency (FEMA) GeoPlatform and plotted in the ICE Analysis Area to determine the location and extent of floodplain areas shown in **Figure 4-10**. Based on this data, the ICE Analysis Area includes an estimated 203 square miles of 100-year floodplains (FEMA, 2019). The highest concentrations of floodplains are located along the Eastern Shore, primarily within Talbot, Queen Anne's, and Kent counties. The broad, expansive floodplain within this area is a result of the low-lying, flat topography of the Eastern Shore. This area is especially susceptible to flooding associated with tide and storm surge. Distribution of the floodplain along the Western Shore is relatively uniform along tributaries to the Chesapeake Bay, between Dundalk and Deale. Development within floodplains can increase upstream flooding by narrowing the width of the channel and increasing the channel's resistance to flow.

4.2.3 Wildlife and Habitat

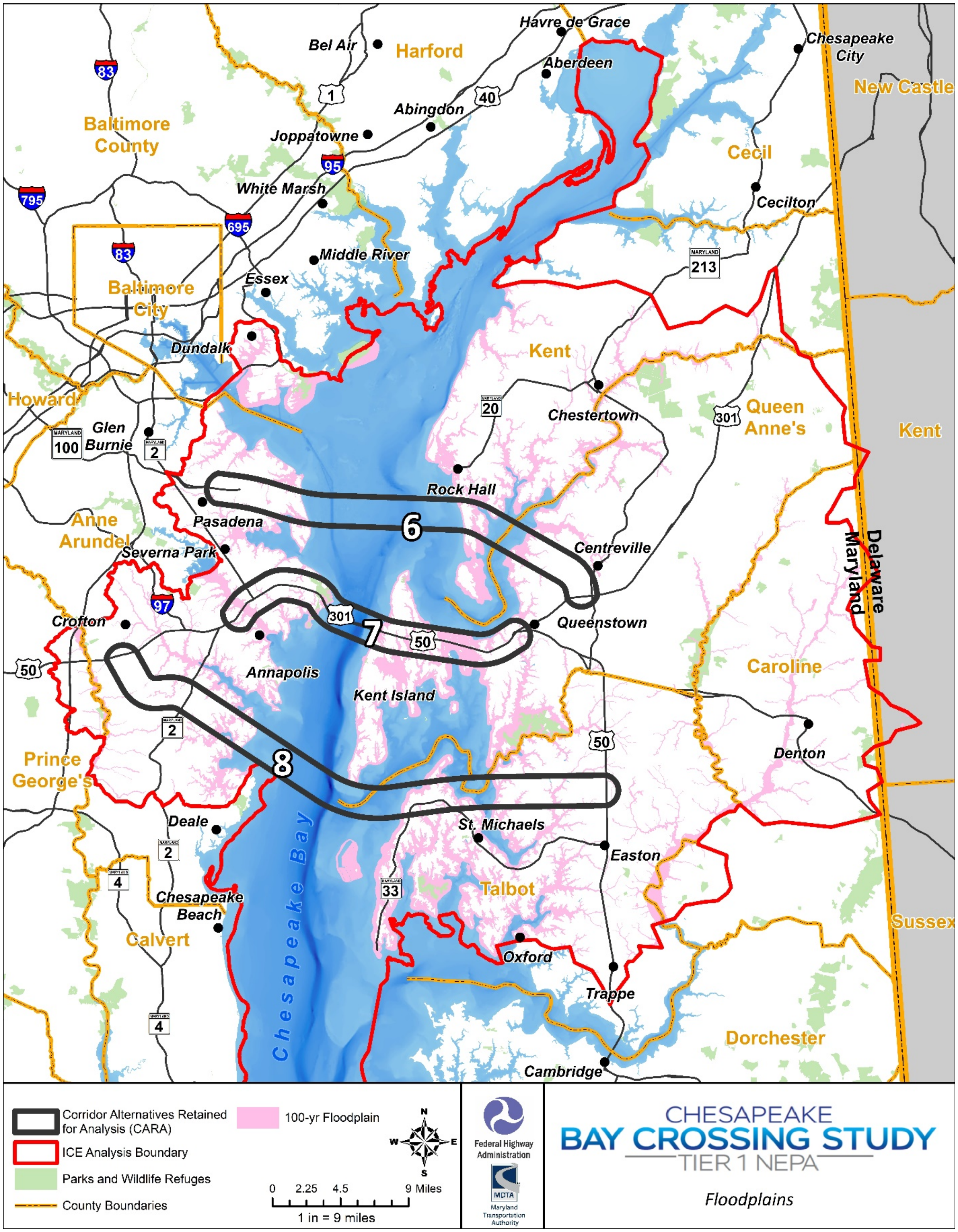
Due to the broad use of available habitat by terrestrial and aquatic wildlife, numerous federal and state agencies may be involved in the regulation of proposed habitat impacts. The United States Fish and Wildlife Service (USFWS) and MDNR act as consulting agencies under the United States Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 USC 661 et seq.), and provide environmental analysis of projects or permit applications coordinated through the federal Energy Regulatory Commission, the USACE, and other state or federal agencies. The Threatened and Endangered Species section of this report contains regulatory specifics pertaining to threatened and endangered species.

4.2.3.1 Terrestrial Habitat

Impacts to forested habitat are regulated under the Maryland Reforestation Law (MRL) and the FCA. The MRL was created to preserve existing forested lands and protect Maryland forests from being cleared without replacement. The FCA requires that any new subdivision development with a land disturbance over 40,000 square feet reduce forest loss and the submittal of a Forest Stand Delineation and a Forest Conservation Plan to MDNR or the local reviewing agency for review and approval. An analysis published by the National Center for Smart Growth Research and Education indicates that following implementation of the FCA, forest cover within subdivisions was approximately 22 percent greater in accordance with the FCA than development in the same subdivisions if the FCA was never implemented (Ferris and Newburn, No date).

Based on the Chesapeake Conservancy Land Cover Dataset, updated March 2017, the ICE Analysis Boundary contains forested land, areas with low vegetation, shrubland, water, wetlands, barren land, and developed lands (Chesapeake Conservancy, 2017).

Figure 4-10: Floodplains



The composition of land cover directly affects natural communities, wildlife, and biodiversity in a given environment; therefore, lands with natural cover such as forested land, shrubland, and wetlands are considered sensitive resources that provide greater ecological values to the landscape than developed lands.

Terrestrial lands with natural cover including forests, wetlands, and shrubland areas account for approximately 22 percent of the ICE Analysis Boundary and are distributed throughout (**Figure 4-11**). The largest unbroken sections of forested land occur on the west side of the Chesapeake Bay in Anne Arundel County. These large areas of unbroken forested land, and smaller areas containing natural cover, support a diverse array of species and ecosystem functions. Low vegetation areas predominately consist of agricultural lands and dominate the land cover on the east side of the Chesapeake Bay in Kent, Queen Anne's, Caroline, and Talbot Counties.

The Maryland Critical Area Act of 1984 was passed to protect and manage development of all lands in the state 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 was established to develop and implement land use programs designed to minimize adverse effects on water quality and habitats, while also accommodating growth and its indirect effects on the environment. **Figure 4-12** shows Critical Areas in the ICE Analysis Area.

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 LULC. For example, priorities within IDAs include improving water quality, since so much of the land is already developed, whereas RCAs focus on limiting growth density to maintain natural land cover types and require specific development standards to ensure any development that does occur accounts for ecological needs. 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. **Figure 4-12** identifies the location of IDAs, RCAs, and LDAs in the ICE Analysis Area. According to data obtained from MDNR, approximately 14 square miles, 207 square miles, and 60 square miles of IDAs, RCAs, and LDAs occur in the ICE Analysis Area, respectively (MDNR, 2018).

Forest Interior Dwelling Bird Species (FIDS) are regulated as a protected resource within the Critical Area (COMAR 27.01.09.04). This group of birds includes migrating songbirds and long-distant migrants such as tanagers, warblers, and vireos; resident species; and short distance migrants including woodpeckers, hawks, and owls. Potential FIDS habitat, depicted in **Figure 4-15**, 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 (MDNR, 2000). FIDS require large forest areas to breed successfully and maintain viable populations. Approximately 413 square miles of potential FIDS habitat occurs in the ICE Analysis Area (MDNR, 2013a) but conservation is only mandated in the portion (approximately 84 square miles) occurring in the Critical Area (IDAs, LDAs, or RCAs) (**Figure 4-12**).

Figure 4-11: Land Cover

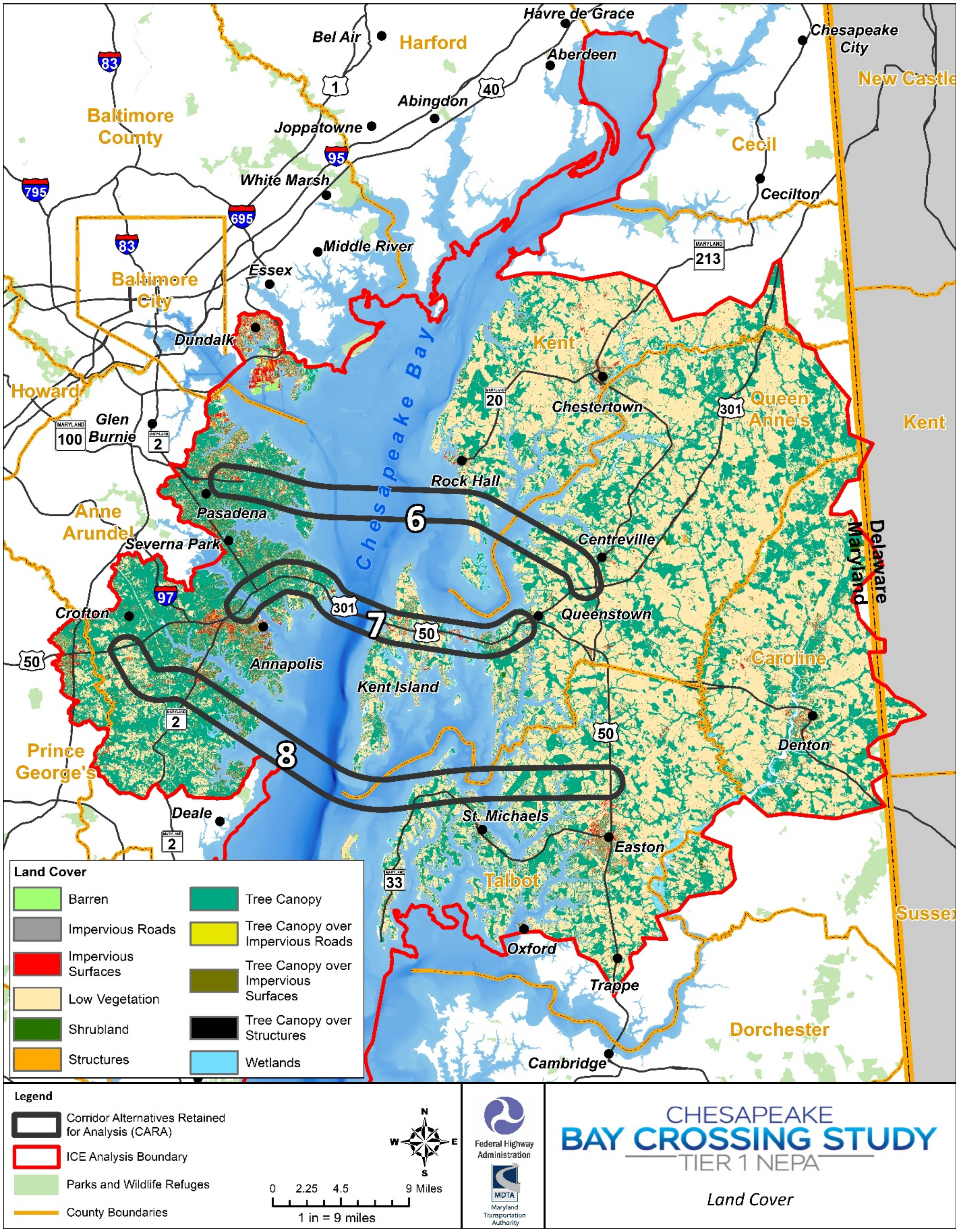


Figure 4-12: Chesapeake Bay Critical Area

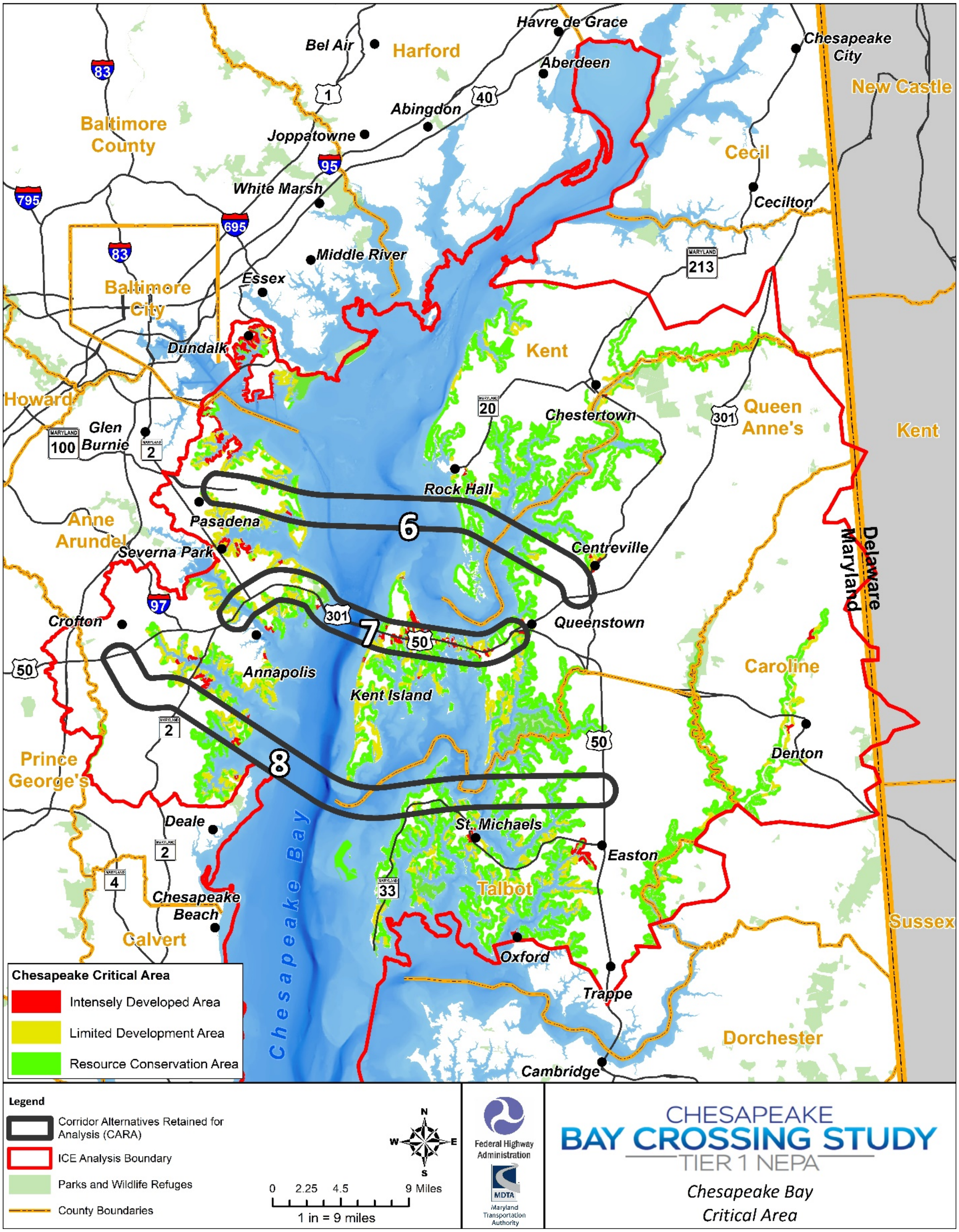


Figure 4-13: Targeted Ecological Areas

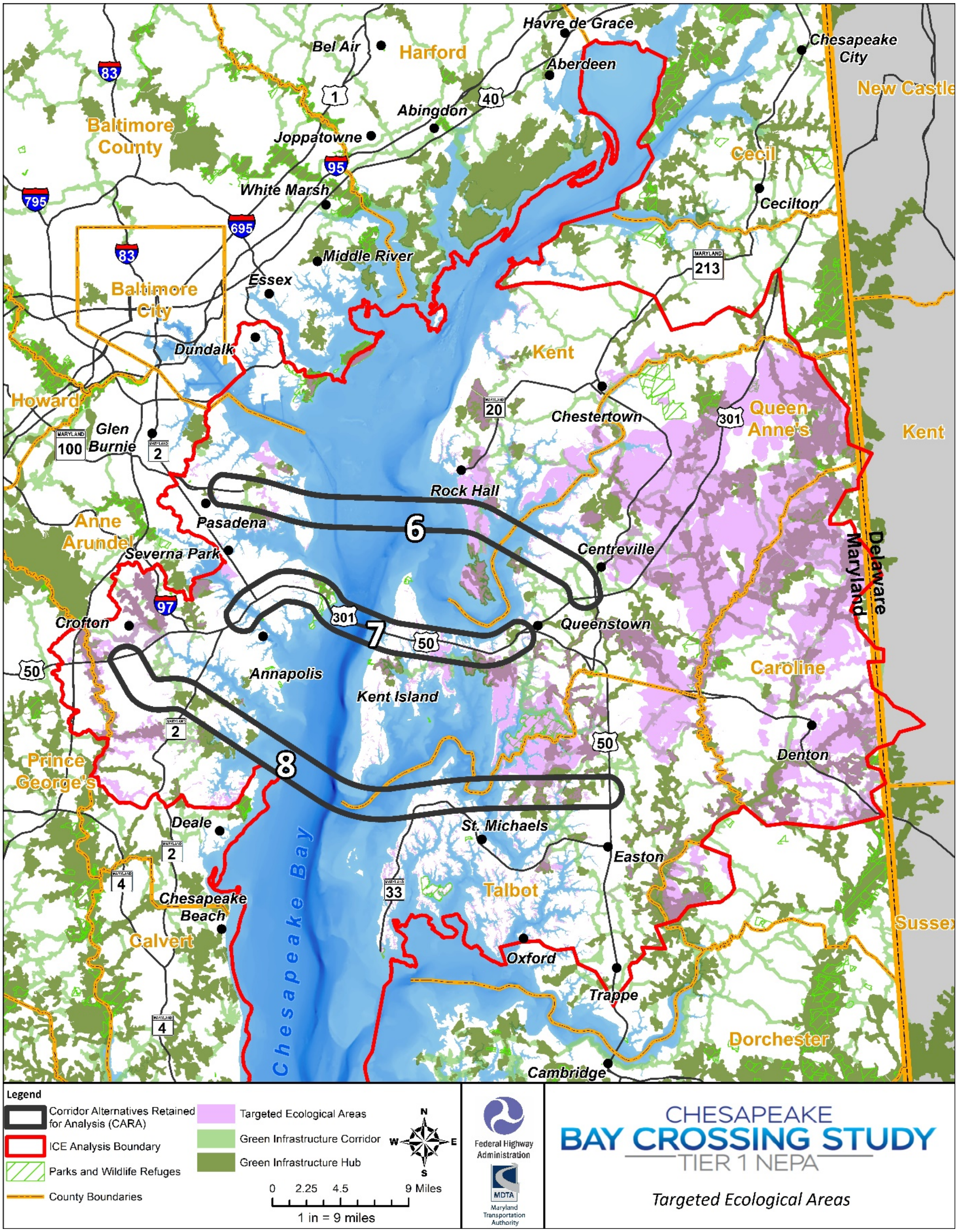


Figure 4-14: Biodiversity Conservation Network

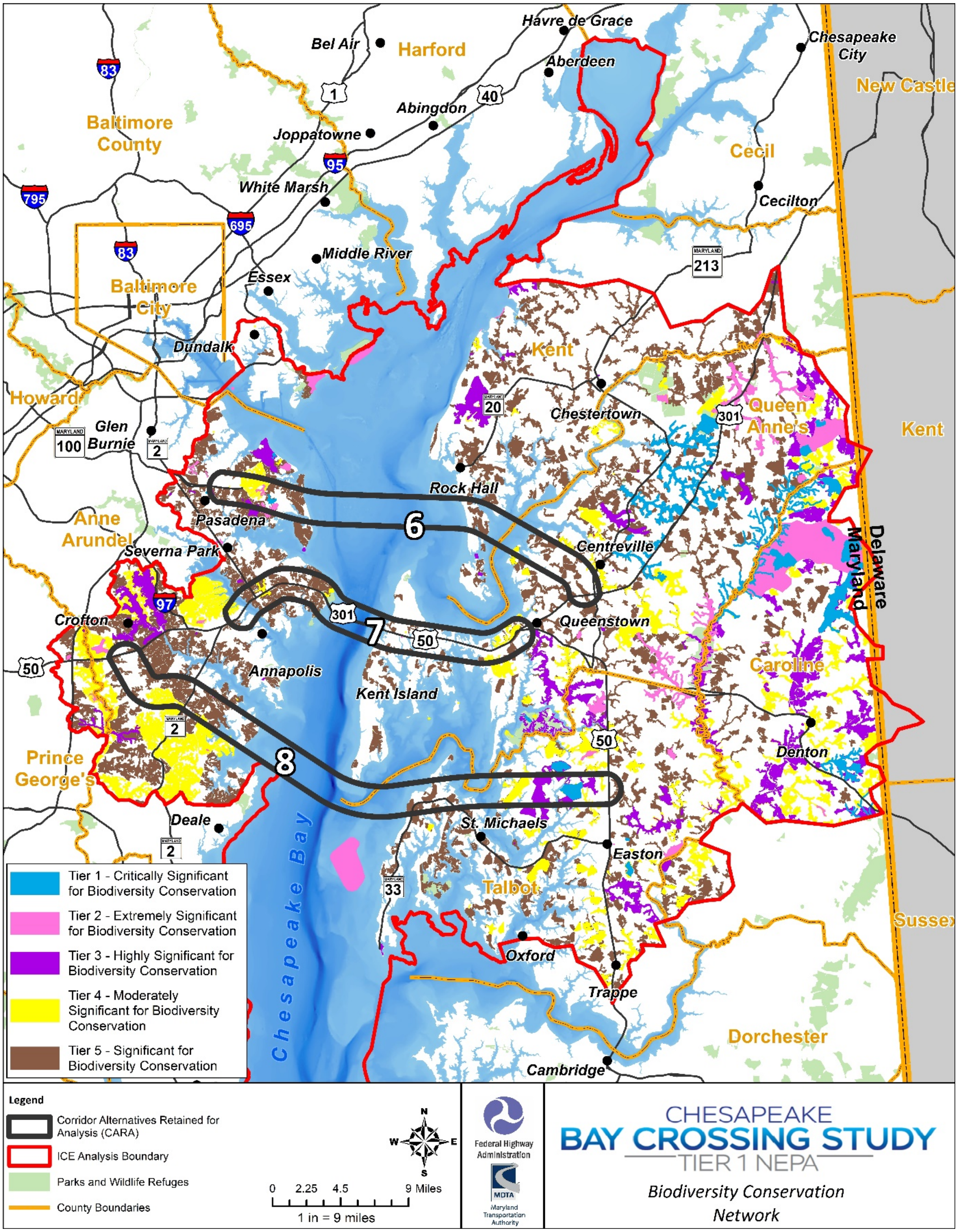
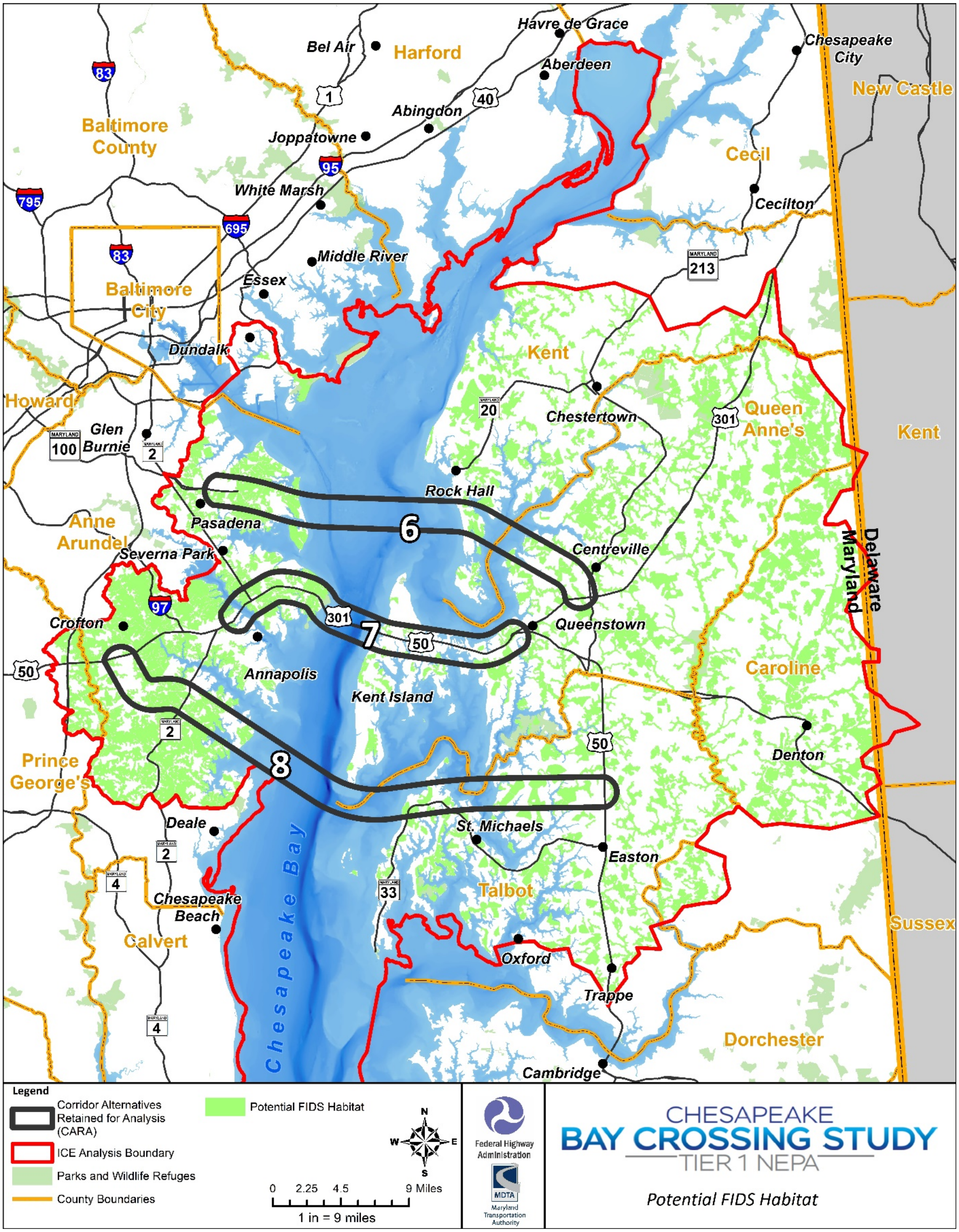


Figure 4-15: Potential FIDS Habitat



Although it does not provide the same level of protections to federally-listed threatened and endangered species as the Endangered Species Act, the Migratory Bird Treaty Act (16 USC 703-711) applies to many species of songbirds, waterbirds, and colonial waterbirds known to occur in the ICE Analysis Area. The law applies to the removal of nests (such as swallow nests on bridges) occupied by migratory birds during the breeding season.

Targeted Ecological Areas (TEAs) in Maryland 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 Green Infrastructure hubs and corridors when appropriate, represent the most ecologically valuable areas in the state. Approximately 392 square miles of TEAs occur in the ICE Analysis Area (MDNR, 2011) (**Figure 4-13**). According to MDE, "Maryland's green infrastructure is a network of undeveloped lands that provide the bulk of the state's natural support system. Ecosystem services, such as cleaning the air, filtering water, storing and cycling nutrients, conserving soils, regulating climate, and maintaining hydrologic function, are all provided by the existing expanses of forests, wetlands, and other natural lands. These ecologically valuable lands also provide marketable goods and services, like forest products, fish and wildlife, and recreation. The Green Infrastructure serves as vital habitat for wild species and contributes in many ways to the health and quality of life for Maryland residents."

In addition, MDE defines two types of important resource lands - "hubs" and "corridors." Hubs typically large contiguous areas, separated by major roads and/or human land uses, that contain one or more of the following: large blocks of contiguous interior forest (containing at least 250 acres, plus a transition zone of 300 feet); large wetland complexes (with at least 250 acres of unmodified wetlands); important animal and plant habitats of at least 100 acres, including rare, threatened, and endangered species locations, unique ecological communities, and migratory bird habitats; relatively pristine stream and river segments (which, when considered with adjacent forests and wetlands, are at least 100 acres) that support trout, mussels, and other sensitive aquatic organisms; and existing protected natural resource lands which contain one or more of the above (for example, state parks and forests, National Wildlife Refuges, locally owned reservoir properties, major stream valley parks, and Nature Conservancy preserves).

Corridors are linear features connecting hubs together to help animals and plant propagules to move between hubs. Corridors were identified using many sets of data, including land cover, roads, streams, slope, flood plains, aquatic resource data, and fish blockages. Generally speaking, corridors connect hubs of similar type (hubs containing forests are connected to one another; while those consisting primarily of wetlands are connected to others containing wetlands). Corridors generally follow the best ecological or "most natural" routes between hubs. Typically, these are streams with wide riparian buffers and healthy fish communities. Other good wildlife corridors include ridge lines or forested valleys."

The State of Maryland has also systematically identified and prioritized ecologically important lands to conserve its biodiversity (i.e., plants, animals, habitats, and landscapes) with use of its Biodiversity Conservation Network dataset. This dataset, available via Maryland iMap, identifies numerous areas significant for biodiversity conservation that occur in the ICE Analysis Area. Areas designated as critically and extremely significant occur predominately on the Eastern Shore, and in Caroline, Queen Anne's, and Talbot Counties (**Figure 4-14**).

4.2.3.2 Aquatic Habitat

Aquatic wildlife and habitat in the ICE Analysis Boundary have also been historically impacted, as discussed above for wetlands, streams and rivers, floodplains, and forested areas. Changes in water quality have impacted aquatic wildlife by disturbing migration and reproduction of certain species; increasing turbidity that impacts light levels in water affecting wildlife; and reducing aquatic wildlife populations. Impacts to aquatic habitat such as these are regulated in the ICE Analysis Boundary at the federal, state, and local level. These regulations aim to minimize and mitigate adverse impacts through design modifications, BMPs, restoration and enhancements.

The MDNR conducts the Maryland Biological Stream Survey (MBSS) to determine the biological conditions in streams throughout the state. The MBSS evaluates fish, benthic (i.e., bottom of waterbody) macroinvertebrates, and aquatic habitat using a physical habitat index as well as Indices of Biotic Integrity (IBI) for both fish (FIBI) and benthic macroinvertebrates (BIBI) as well as providing a physical habitat index (PHI). In their 2011 report detailing the third round of monitoring (2007-2009), the MDNR rates the FIBI, BIBI, and PHI for streams within the five major tributary basins within the ICE Analysis Boundary: Upper Eastern Shore, Choptank, Patapsco-Back, Lower Western Shore, and Patuxent (MDNR, 2011). **Table 4-19** contains the habitat assessment results from the third round of monitoring. Streams were "Not Rated" (NR) when they could not be sampled due to lack of flow.

Table 4-19: MBSS Third Round Habitat Rating Results

TRIBUTARY	FISH IBI	BENTHIC IBI	PHI
Upper Eastern Shore	11% NR 12% Poor 18% Fair 59% Good	28% Very Poor or Poor 45% Fair 27% Good	11% NR 30% Severely Degraded or Degraded 47% Partially Degraded 12% Minimally Degraded
Choptank	54% NR 6% Very Poor 50% Good	59% Very Poor or Poor 25% Fair 16% Good	28% NR 28% Degraded 39% Partially Degraded 5% Minimally Degraded
Patapsco-Back	3% NR 23% Very Poor or Poor 20% Fair 54% Good	46% Very Poor or Poor 37% Fair 17% Good	82% Severely Degraded or Degraded 18% Partially Degraded
Lower Western Shore	66% Very Poor or Poor 44% Fair	57% Very Poor or Poor 43% Fair	57% Degraded 33% Partially Degraded 10% Minimally Degraded
Patuxent	49% Very Poor or Poor 32% Poor 19% Good	38% Very Poor or Poor 33% Fair 29% Good	46% Severely Degraded or Degraded 28% Partially Degraded 26% Minimally Degraded

The results indicate that stream habitat conditions within the ICE Analysis Boundary were less degraded on the Upper Eastern Shore, and the most degraded on the western side of the Bay. Statewide, the total percentage of streams with very poor or poor BIBI scores decreased from 53.1 percent in 1995 to 43.2

percent in 2009 (MDNR, 2011). The report identifies the top five stressors responsible for degrading Maryland's streams as: urban land use greater than 5 percent, no riparian buffer, channelization, nitrate-nitrogen greater than 5 milligrams per liter (mg/l), and dissolved oxygen less than 3mg/l. The most common species collected in the third round of monitoring in the coastal plain included the American eel (*Anguilla rostrate*), eastern mudminnow (*Umbra pygmaea*), pumpkinseed (*Lepomis gibbosus*), blacknose dace (*Rhinichthys atratulus*), and tessellated darter (*Etheostoma olmstedi*).

The federal Magnuson-Stevens Fisheries Conservation and Management Act of 1976 provides conservation and management of the nation's fishery resources through the preparation and implementation of fishery management plans (FMPs). The Magnuson-Stevens Act calls for National Oceanic and Atmospheric Administration (NOAA) Fisheries to work with regional Fishery Management Councils to develop FMPs for each fishery under their jurisdiction. Federal agencies are required to consult with the National Marine Fisheries Service (NMFS) on proposed actions that may impact essential fish habitat (EFH); that is, waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The Magnuson-Steven Fishery Conservation and Management Reauthorization Act of 2006 authorized the Community-based Restoration Program administered by NOAA to implement and support the restoration of fishery and coastal habitats by providing federal financial and technical assistance for local restoration and to promote stewardship and conservation values. **Figure 4-16** includes the location of EFH, recreational fishing grounds, and active commercial pound net sites in the ICE Analysis Area.

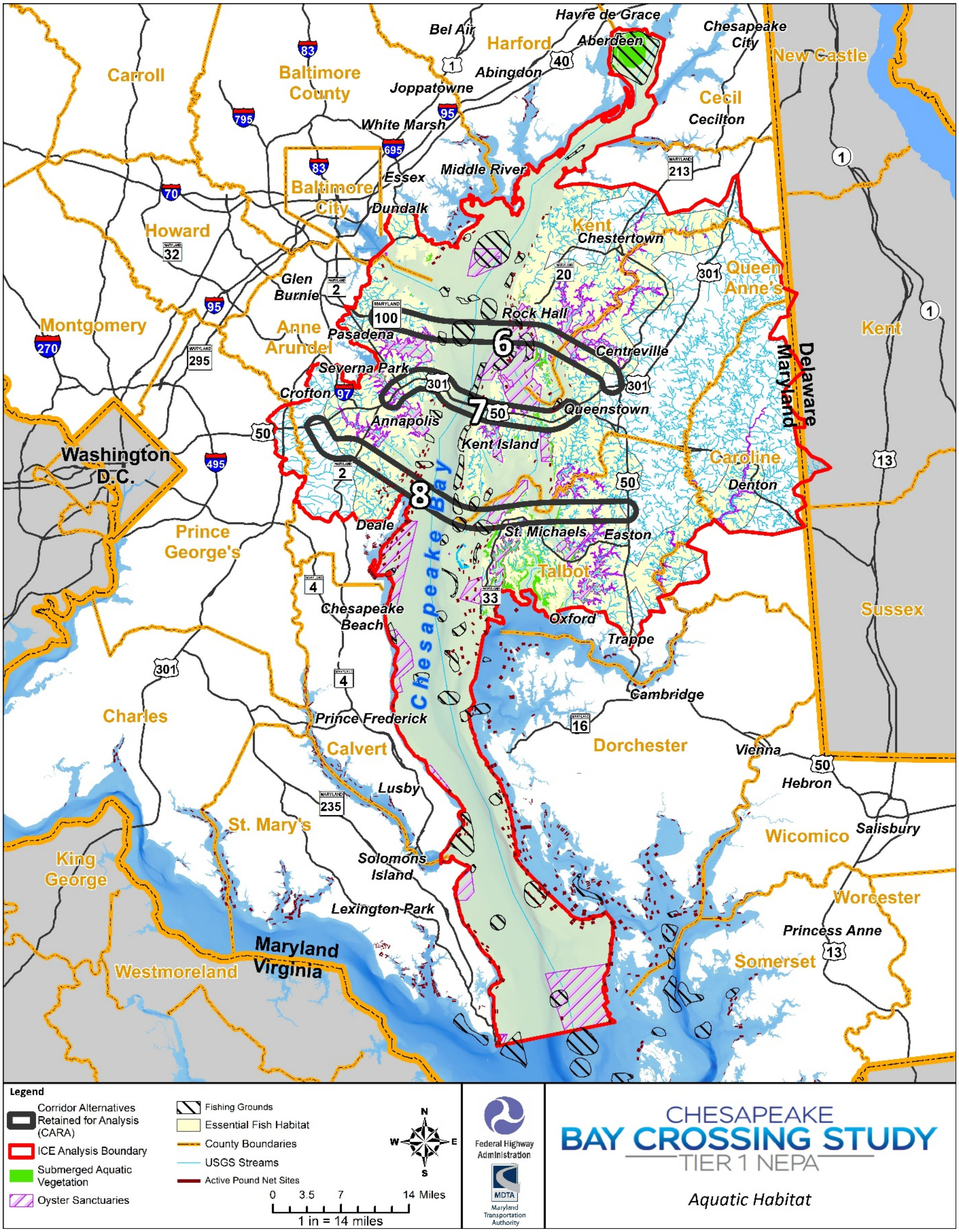
The Fish and Wildlife Coordination Act, as amended in 1964, requires that all federal agencies consult with NOAA Fisheries, USFWS, and state wildlife agencies when proposed actions might result in modification of a natural stream or body of water. Federal agencies must consider effects that these projects would have on fish and wildlife.

Anadromous fish are born in freshwater, migrate to the ocean, and return to freshwater streams and rivers to spawn. Archaeological evidence and historical records indicate anadromous fish species have long migrated into the upper reaches of the Bay. Heavy fishing pressure, dams, canals, and other obstructions have substantially reduced anadromous fish populations. The importance of migratory fish species was recognized in the Chesapeake Bay Agreement of 1987 and again in the Chesapeake 2000 agreement. Several protected species are also anadromous and are regulated under the federal and Maryland Endangered Species Acts. Any project with the potential to prevent passage of anadromous fish must take into account measures to ensure fish passage is not diminished.

Federal agencies are required to consult with the NMFS on proposed actions that may affect EFH. The Fish and Wildlife Coordination Act, as amended in 1964, requires that all federal agencies consult with NOAA, NMFS, USFWS, and state wildlife agencies when proposed actions might result in modification of a natural stream or body of water that supports EFH. Federal agencies must consider the impacts that these projects would have on fish and wildlife development in these areas.

According to EO 13112, invasive species are non-native plant, animal, or microbial species that cause, or have the potential to cause, economic or ecological harm or harm to human health.

Figure 4-16: Aquatic Habitat



Federal, state and local governments regulate invasive plant and animal species in the ICE Analysis Boundary to prevent the spread of harmful wildlife species and noxious weeds and plants deemed to be detrimental to the human and natural environment.

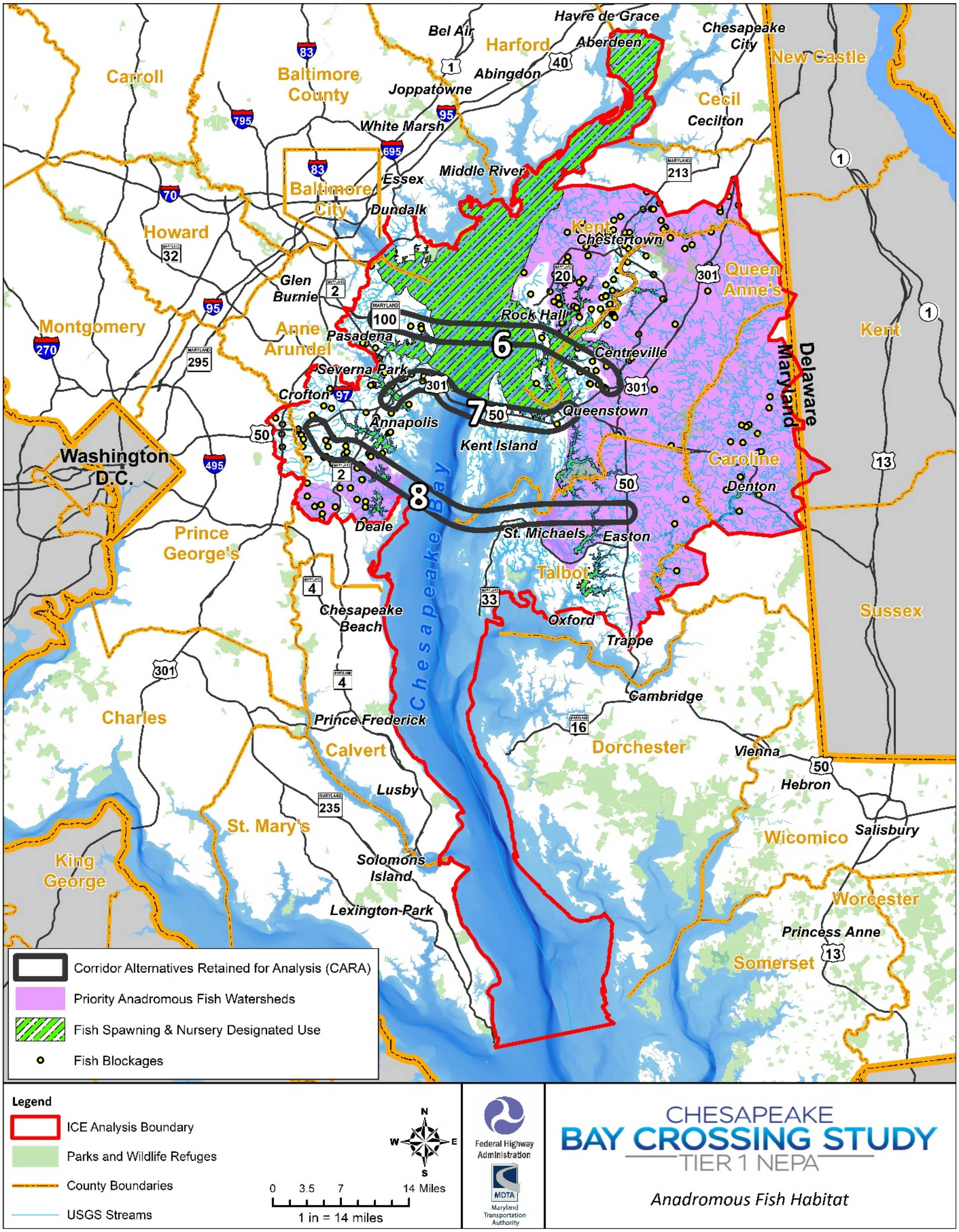
Habitat Areas of Particular Concern (HAPCs) are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation. The HAPC designation does not provide additional protection or restrictions upon an area but can help prioritize conservation efforts. HAPCs are described in the implementing regulations of the EFH provisions at 50 CFR 600.815. Regional Fishery Management Councils are encouraged to identify habitat types or areas within EFH as HAPCs, based on one or more of the following considerations: the importance of the ecological function provided by the habitat; the extent to which the habitat is sensitive to human-induced environmental degradation; whether, and to what extent, development activities are, or will be, stressing the habitat type; and the rarity of the habitat type.

A review of data obtained from the NMFS for Mid-Atlantic and New England Fishery Management Council species indicates that EFH exists in the ICE Analysis Area (**Figure 4-16**) for all life stages of Atlantic butterfish (*Peprilus triacanthus*), black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), scup (*Stenotomus chrysops*), Atlantic herring (*Clupea harengus*), little skate (*Leucoraja erinacea*), red hake (*Urophycis chuss*), windowpane flounder (*Scophthalmus aquosus*), winter skate (*Leucoraja ocellata*), clearnose skate (*Raja eglanteria*) and summer flounder (*Paralichthys dentatus*) (NOAA, 2018a; 2018b). SAV is designated by the Mid-Atlantic Fisheries Management Council as a HAPC for summer flounder. SAV is the only HAPC in the ICE Analysis Area.

Common anadromous fish visiting the Chesapeake Bay include American shad, hickory shad, alewife herring, and blueback herring (MDNR, No Date b). Heavy fishing pressure, dams, canals, and other obstructions as well as drainage has substantially reduced anadromous fish populations so that by 1980, the shad harvest was only approximately 0.2 percent of the total harvest documented at the beginning of the twentieth century (MDNR, No Date b). Several protected species are also anadromous and are regulated under the federal and Maryland Endangered Species Acts. MDNR has identified priority anadromous fish watersheds (MDNR, 2013b) in the ICE Analysis Area. The federal Chesapeake Bay Program administered by the USEPA has also identified and designated anadromous fish use areas of the Chesapeake Bay and its tributaries, which contain spawning areas and juvenile nurseries for anadromous fish and semi-anadromous fish species protected from February 1 through May 31. **Figure 4-17** presents the state designated anadromous fish use areas in the ICE Analysis Area.

There are over 2,500 manmade blockages in the Chesapeake Bay watershed that inhibit migratory and resident fish from reaching their spawning habitat, such as those illustrated in **Figure 4-17** as part of the priority watersheds and spawning and nursery areas (MDNR, 2010a). According to MDNR fish blockage data, 215 of these blockages occur within the ICE Analysis Area (MDNR, 2010a). These blockages include dams, pipeline crossings, weirs, culverts, and tide gates. The highest densities of the blockages in the Study Area occur in Anne Arundel and Kent Counties (**Figure 4-17**). Any project with the potential to prevent passage of anadromous fish in the ICE Analysis Area must take into account measures to ensure fish passage is not diminished.

Figure 4-17: Anadromous Fish Habitat



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. Areas containing SAV are regulated as special aquatic sites under Section 404 of the CWA. SAV is designated by the Mid-Atlantic Fisheries Management Council as a HAPC for summer flounder. SAV areas located in the ICE Analysis Area were identified through use of data obtained from the MDNR. Due to the transient nature of some SAV beds, five survey years of data (2012-2016) were aggregated to determine the amount and location of SAV beds in the analysis boundary. According to the data obtained from the MDNR for the five survey years, the ICE Analysis Area contains approximately 16,378 acres of SAV beds (MDNR, 2012; 2013; 2014; 2015; 2016) (**Figure 4-16**). The highest density of SAV beds occur within Talbot County's Harris Creek, Broad Creek, and the Ted Avon River.

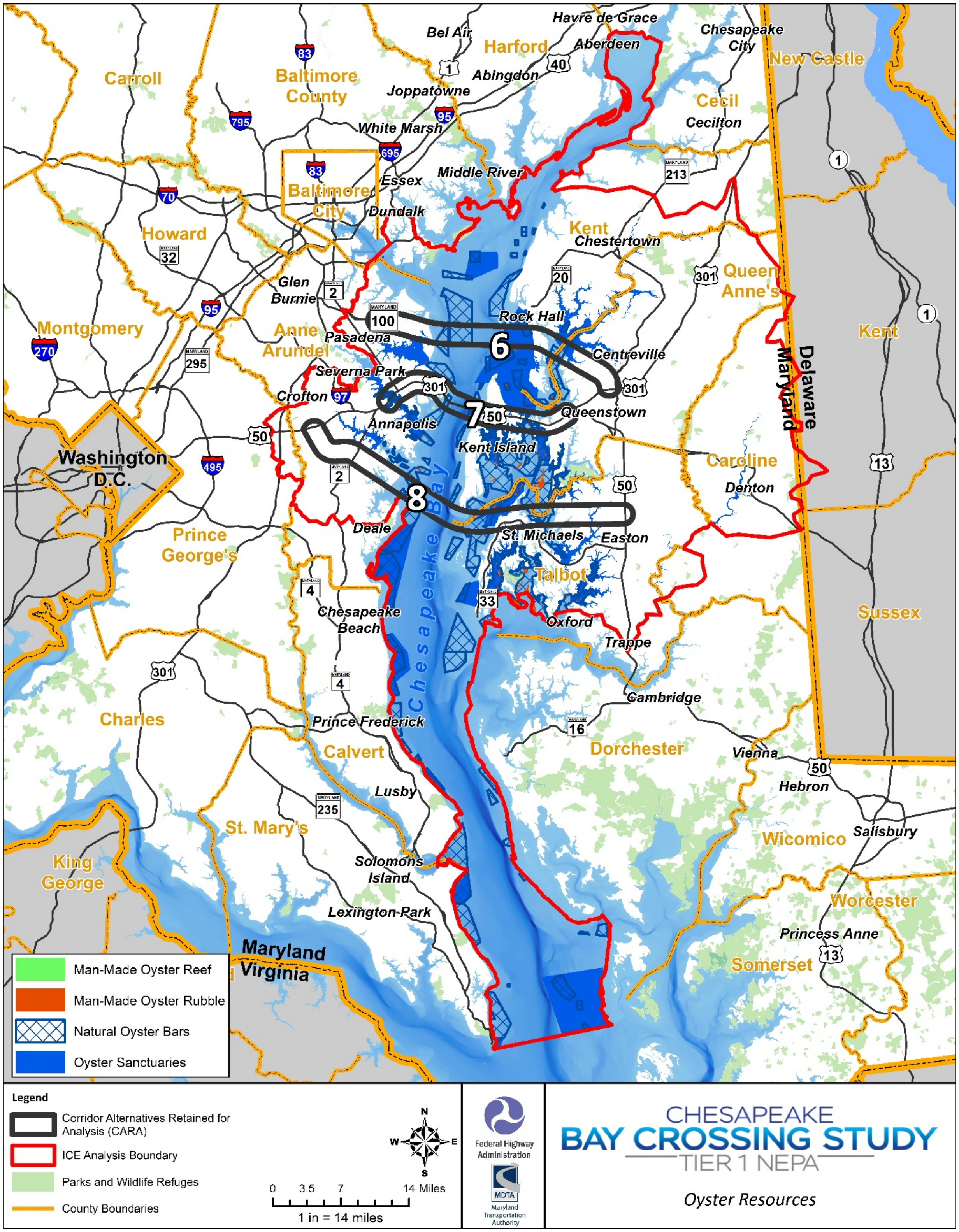
The location and extent of natural and man-made oyster reef habitat in the Chesapeake Bay was obtained from the NOAA Chesapeake Bay Office to identify their presence in the ICE Analysis Area. The benthic data used were aggregated from multiple sources to create a bay-wide record of seabed material in the Chesapeake Bay. The source data were collected during the interval of 1842-2014 (MDNR, 2015a). According to the data, natural and man-made oyster reef habitat is located along the eastern side of the Chesapeake Bay within Eastern Bay, the Chester River, and tributaries to the Choptank River (**Figure 4-18**).

Fishery managers began comprehensive and coordinated management of oysters throughout the Chesapeake Bay with the adoption of the *Chesapeake Bay Oyster Management Plan* (Chesapeake Bay Program, 1989), subsequent revisions in 1994 (Chesapeake Bay Program, 1994), and 2004 (Chesapeake Bay Program, 2004), and with an amendment to the COMAR in 2010 (Maryland Register, 2010). In addition, commitments made in the Chesapeake 2000 Agreement (Chesapeake Bay Program, 2000), 2009 *Programmatic Environmental Impact Statement* (USACE, 2009), 2010 *Maryland's 10-Point Oyster Restoration Plan* (MDNR, 2010b), 2014 Chesapeake Bay Watershed Agreement (Chesapeake Bay Program, 2014), and 2019 *Draft Maryland Oyster Management Plan* (MDNR, 2019g) (published in the Maryland Register on June 21, 2019) include efforts to rebuild the Chesapeake Bay's native oyster resources. A key element of this rebuilding effort has been the establishment and monitoring of oyster sanctuaries in the Chesapeake Bay. Sanctuaries, many of which contain natural oyster bars, are currently distributed throughout the ICE Analysis Area in embayments of the Chesapeake Bay including near the Chester River, Eastern Bay, and Tracy's Creek, and within rivers and creeks located in the boundary including the Magothy River, Severn River, South River, Waterhouse Creek, Corsica River, Chester River, and Langford Creek, and tributaries including Tred Avon River and Harris Creek (**Figure 4-18**).

4.2.3.3 Invasive Species

According to EO 13112, invasive species are non-native plant, animal, or microbial species that cause, or have the potential to cause, economic or ecological harm, or harm to human health (United States, 1999). EO 13112 requires federal agencies to not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States, with certain exceptions. EO 13751 amends EO 13112 and directs actions to continue coordinated federal prevention and control efforts related to invasive species (United States, 2016).

Figure 4-18: Oyster Resources



State and local governments also regulate invasive plant and animal species in the ICE Analysis Area to prevent the spread of harmful wildlife species and noxious weeds and plants deemed to be detrimental to the human and natural environment. According to MDNR, invasive or exotic species observed within Maryland surrounding, or in the Chesapeake Bay, include the: purple loosestrife (*Lythrum salicaria*), common reed (*Phragmites australis)*, water chestnut (*Trapa natans*), emerald ash borer (*Agrilus planipennis*), blue catfish (*Ictalurus furcatus*), flathead catfish (*Pylodictis olivaris*), northern snakehead (*Channa argus*), grass carp (*Ctenopharyngodon idella*), Chinese mitten crab (*Eriocheir sinensis*), red swamp crawfish (*Procambarus clarkii*), southern white river crawfish (*Procambarus zonangulus*), virile crayfish (*Orconectes virilism*), Asiatic clam (*Corbicula fluminea*), mute swan (*Cygnus olor*), and nutria (*Myocastor coypus*) (MDNR, 2019h). Other species reported within the Early Detection & Distribution Mapping System (EDDMapS) for the areas of Maryland and Delaware containing the ICE Analysis Area include the Japanese honeysuckle (*Lonicera japonica*), Japanese knotweed (*Reynoutria japonica*), tree-of-heaven (*Ailanthus altissima*), and red fox (*Vulpes vulpes*) (EDDMapS, 2019).

4.2.4 Threatened and Endangered Species

Past and present development and agriculture impacts to plant and wildlife habitat, overexploitation of plants and wildlife, and introduction of exotic invasive species have been the principal factors contributing to reducing certain species to extinction or levels of concern for their continued existence (Evans, 2013). The Federal Endangered Species Act (ESA) of 1973 and subsequent amendments and regulations define basic protections for federally-listed wildlife and plants that are considered threatened, endangered, or Species of Greatest Conservation Need. The law also covers the protection to prescriptive habitat critical for protected species' survival, and applies to all federal, state, and privately-authorized projects or actions in the ICE Analysis Area that potentially affect threatened and endangered species. The USFWS and the NMFS are responsible for listing, protecting, and managing federally-listed threatened and endangered species.

State- and federally-listed threatened or endangered species reported to occur in the ICE Analysis Area are considered sensitive resources. These species were identified by reviewing the USFWS' Information Planning and Consultation (IPaC) database (USFWS, 2019b) and NOAA's Section 7 Mapper (NOAA, 2019a). **Table 4-20** lists the protected species listed for occurrence within the ICE Analysis Area. No critical habitats were identified in the ICE Analysis Area using the IPaC service or NOAA's Section 7 Mapper.

The NOAA Section 7 Mapper provides the locations of Section 7 Consultation Areas where listed species are potentially affected within a river/estuary/marine zone. The Consultation Areas specify which life stages and behaviors may be affected. The location and extent of these Consultation Areas, within the ICE Analysis Area are provided in **Figure 4-19**. Atlantic and shortnose sturgeon Consultation Areas occur throughout the study area, and sea turtle Consultation Areas occur throughout the Bay, and its tidal tributaries, south of Rock Hall in Kent County.

The MDNR Wildlife and Heritage Service manages the Environmental Review system which is the state's primary method used to ensure that actions authorized, funded, or carried out by other state agencies do not jeopardize the continued existence of listed species.

Table 4-20: Listed Species Database Search Results for the ICE Analysis Boundary

SPECIES	STATUS	SOURCE
Northern Long-eared Bat *(Myotis septentrionalis)*	Threatened	IPaC
Dwarf Wedgemussel *(Alasmidonta heterodon)*	Endangered	IPaC
Northeastern Beach Tiger Beetle *(Cicindela dorsalis dorsalis)*	Threatened	IPaC
Puritan Tiger Beetle *(Cicindela puritana)*	Threatened	IPaC
Canby's Dropwort *(Oxypolis canbyi)*	Endangered	IPaC
Small-Whorled Pogonia *(Isotria medeoloides)*	Threatened	IPaC
Swamp Pink *(Helonias bullata)*	Threatened	IPaC
Shortnose sturgeon *(Acipenser brevirostrum)*	Endangered	NOAA Section 7 Consultation Area
Atlantic sturgeon *(Acipenser oxyrhynchus oxyrhynchus)*	Endangered	NOAA Section 7 Consultation Area
Kemp's Ridley sea turtle *(Lepidochelys kempii)*	Endangered	NOAA Section 7 Consultation Area
Leatherback sea turtle *(Dermochelys coriacea)*	Endangered	NOAA Section 7 Consultation Area
Green sea turtle *(Chelonia mydas)*	Threatened	NOAA Section 7 Consultation Area
Loggerhead sea turtle *(Caretta caretta)*	Threatened	NOAA Section 7 Consultation Area

Sources: (USFWS, 2019b; NOAA, 2019a)

Sensitive Species Project Review Areas, or SSPRAs, represent the general locations of documented rare, threatened, and endangered species in Maryland. 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 Wetlands of Special State Concern, and Geographic Areas of Particular Concern. Approximately 228 square miles of these areas occur in the study area as shown in **Figure 4-20**, with the majority in Caroline, Talbot, and Queen Anne's Counties (MDNR, 2010c).

The northern long-eared bat (NLEB) was listed as a federally-threatened species by the USFWS on April 2, 2015 (USFWS, 2019c). A review of mapping from the USFWS indicates the current range for the species encompasses the entire Western Shore portion of the ICE Analysis Area, but no areas of known habitat on the Eastern Shore.

The dwarf wedgemussel was federally-listed as an endangered species in 1990. The dwarf wedgemussel occurs on muddy sand, sand, and gravel bottoms in creeks and rivers of various sizes in the ICE Analysis Area. In parts of the range, dwarf wedgemussels also occur in clay banks and small riffle areas. Threats to the dwarf wedgemussel include habitat destruction from damming and channelizing of rivers, and degradation of habitat due to pollution, sedimentation, invasion by exotic species, and fluctuations in water level or temperature. Industrial, agricultural, and domestic pollution are largely responsible for the disappearance of the dwarf wedgemussel from much of the species' historic range (USFWS, 2019d).

Figure 4-19: NOAA Section 7 Consultation Areas

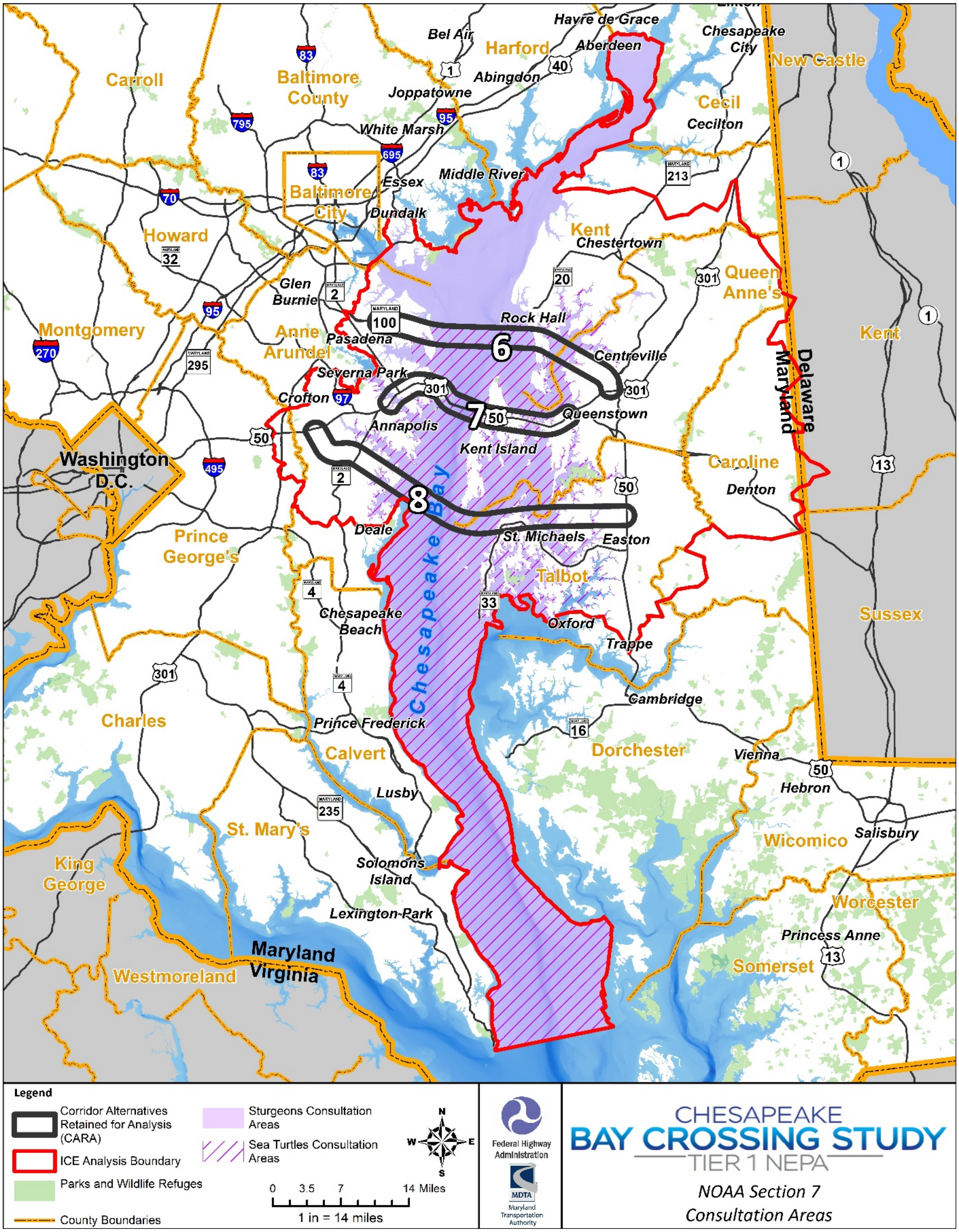
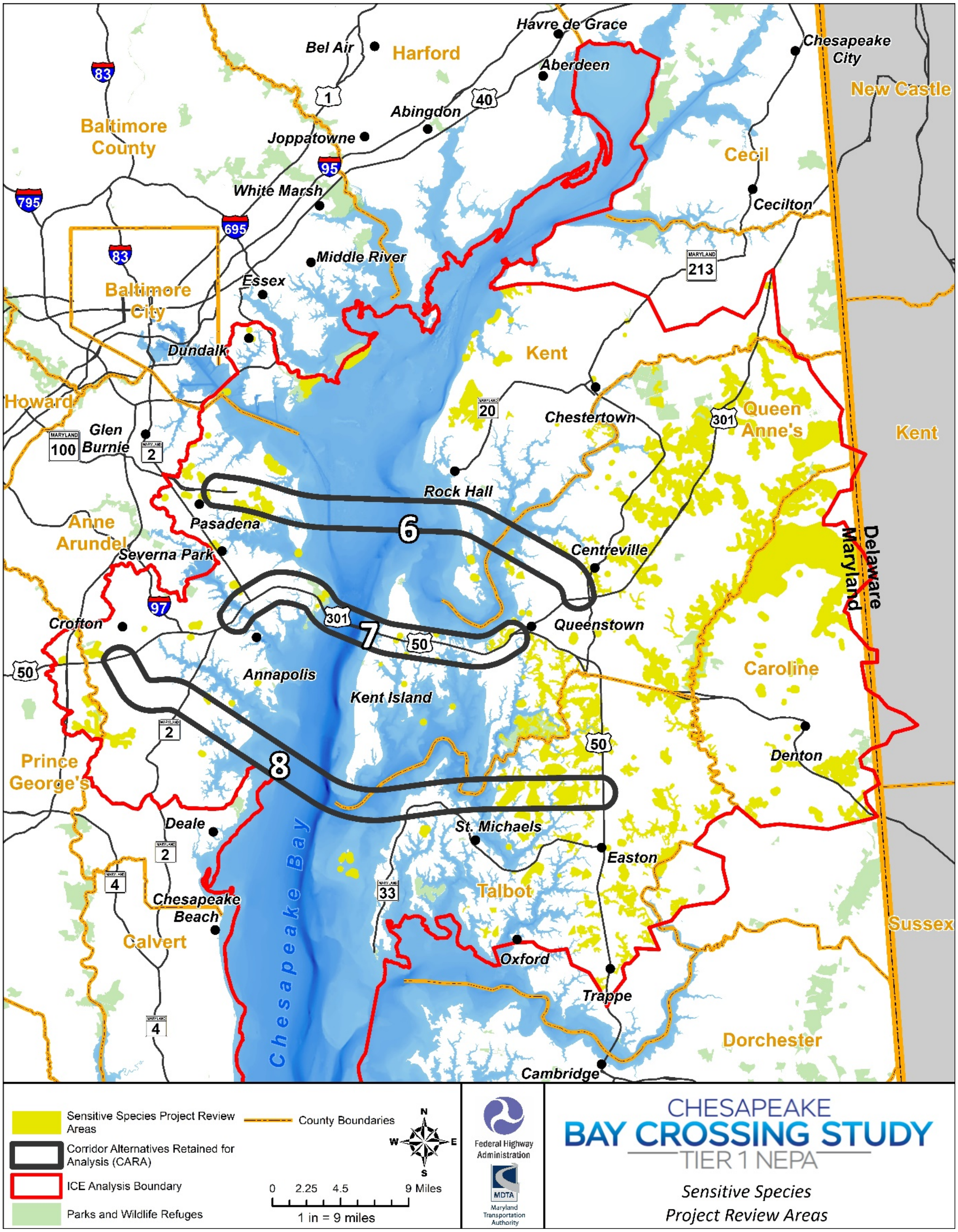


Figure 4-20: Sensitive Species Project Review Areas



The northeastern beach tiger beetle was federally-listed as a threatened species on August 7, 1990. There are many populations in the Chesapeake Bay area, most are threatened by activity associated with humans. Development, beach alteration, beach stabilization structures, and recreational activities have greatly altered the beetle's habitat (USFWS 2019e).

The Puritan tiger beetle was federally-listed as a threatened species on August 7, 1990. The species occurs along narrow sandy beaches of the Chesapeake Bay backed by tall cliffs. A major threat to this species is increased vegetation growth (natural or shoreline erosion control structures) on the cliffs which results in a reduction of the bare areas needed for adult oviposition and larval development (USFWS, 2019f).

The Canby's dropwort was federally-listed as an endangered species on February 25, 1986 and is known to occur near the Delaware State line in the ICE Analysis Area (USFWS, 2019g). Canby's dropwort has been found in a variety of coastal plain habitats and wetlands. Threats to the species include loss or degradation of the wetland habitats and localized environmental catastrophes, because of its small population sizes.

Small-whorled pogonia was federally-listed as a threatened species on September 9, 1982 (USFWS, 2019h). The small-whorled pogonia occurs on upland sites in mixed-deciduous or mixed deciduous/coniferous forests that are generally in second- or third-growth successional stages. Habitat loss and degradation, recreational activities, and trampling are considered to be the main threats to this species.

Swamp pink was federally-listed as a threatened species on September 9, 1982 (USFWS, 2019i). This species occurs within shady forested wetland areas. A major threat to the species is loss and degradation of its wetland habitat due to encroaching development, sedimentation, pollution, succession, and wetland drainage.

According to the University of Maryland Center for Environmental Science, the bottlenose dolphin is frequently spotted in the Bay during the summer months. However, very little is known about how often dolphins actually come into the Bay, how long they spend in the Bay, and what areas of the Bay they are using. The Marine Mammals Protection Act (MMPA) prohibits the "taking" of marine mammals and imposes a moratorium on the import, export, and sale of any marine mammal, along with any marine mammal part or product within the United States. Under the Act, the term "take" means "to harass, hurt, capture or kill, or attempt to harass, hurt, capture or kill any marine mammal." The MMPA defines harassment, in part, 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 (16 USC § 1361 et seq.).

Shortnose sturgeon was federally-listed on October 15, 1966. Shortnose sturgeon live in rivers and coastal waters around Maryland. The most significant threats to the species are dams, habitat degradation, poor water quality, dredging, water withdrawals from rivers, and unintended catch in some commercial fisheries (NOAA, 2019b).

The Atlantic sturgeon was federally-listed as endangered in 2012 under the Chesapeake Bay distinct population segments. Atlantic sturgeon are found in rivers and coastal waters of the Chesapeake Bay. The most significant threats to Atlantic sturgeon are unintended catch, dams, habitat degradation, poor water quality, dredging, water withdrawals from rivers, and vessel strikes (NOAA, 2019c).

Kemp's Ridley sea turtle was federally-listed as endangered in 1970. Adult turtles primarily occupy nearshore coastal habitats which typically contain muddy or sandy bottoms. The greatest threats to this turtle are from bycatch, ocean pollution, and marine debris (NOAA 2019d).

The leatherback sea turtle was federally-listed as endangered in 1970. Leatherbacks are primarily found in the open ocean, and feed in areas just offshore. The threats faced by leatherbacks are bycatch, harvesting of eggs and intentional kills in certain countries, vessel strikes, pollution, and nesting beach habitat loss and alteration (NOAA, 2019e).

The green sea turtle was federally-listed in 1978. The primary threats green turtles face are bycatch, direct killing of turtles and harvest of eggs, vessel strikes, loss and alteration of nesting habitat, degradation and loss of foraging habitat, and entanglement in or ingestion of marine debris (NOAA, 2019f).

The loggerhead sea turtle was federally-listed in 1978. Their preferred habitat is in coastal bays and estuaries. The threats to the loggerhead turtles are the same as listed above under the green sea turtle (NOAA, 2019g).

4.3 Cultural Resources

The National Historic Preservation Act (NHPA) defines a historic property as any "prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP), including artifacts, records, and material remains related to such a property or resource." FHWA and MDTA are taking a phased approach to the identification and evaluation of historic properties for the Bay Crossing Study. For the Tier 1 EIS, previously recorded and otherwise known historic properties were identified. For this analysis, historic properties are historic architectural and archaeological resources listed on the NRHP. According to NRHP data, a total of 236 historic properties listed on the NRHP are in the ICE Analysis Boundary (**Figure 4-21**).

The FHWA and MDTA have initiated the Section 106 consultation process and will implement the phased identification of historic properties. Tier 1 NEPA involves the identification of known historic properties within the CARA using the Maryland Inventory of Historic Properties (MIHP), as presented in **Table 4-21, Table 4-22, and Table 4-23**. More detailed information on cultural resources such as cultural context, architectural and archaeological gap analyses, and Tier 2 recommendations are included in the *Cultural Resources Technical Report*.

There are two known historic properties in Corridor 6. There are 17 historic properties in Corridor 7, including three historic districts: Stevensville Historic District, White's Heritage, and U.S. Naval Academy. The U.S. Naval Academy is also a National Historic Landmark, the only such resource identified in the CARA. There are 20 historic properties in Corridor 8, including two historic districts: Davidsonville Historic District and Unionville. One of the historic properties in Corridor 8 is the skipjack Claud W. Somers, a ship that has not been docked within its historic boundary since relocating to Virginia in 2000 for restoration. Nonetheless, it is included in the initial inventory of historic properties.

If a build alternative is pursued at the end of Tier I NEPA, Section 106 identification of historic properties would continue during Tier 2. More detailed discussion of the known cultural resources within the CARA is presented in the *Cultural Resources Technical Report.*

Table 4-21: Historic Properties in Corridor 6

County	MIHP No.	Name	Status and Date	Significance Criterion
Queen Anne's	QA-224	Bachelor's Hope (also Phares Morris Farm)	Listed; May 3, 1984	C – Architecture
Queen Anne's	QA-5	Reed's Creek Farm	Listed; July 7, 1975	C – Architecture

Table 4-22: Historic Properties within Corridor 7

County	MIHP No.	Name	Status and Date	Significance Criterion
Anne Arundel	AA-359	U.S. Naval Academy	NRHP Listed 10/15/1966; NHL designated 4/4/1961	C-Historic District
Anne Arundel	AA-359-15	Building 187, Steam Generation Building	Eligible 6/23/2014	C-Contributes to U.S. Naval Academy
Anne Arundel	AA-136	Howard's Inheritance	Listed 7/23/1998; Preservation Easement recorded 12/29/1986	C- Architecture
Anne Arundel	AA-330	Sandy Point Farm House	Listed 2/11/1972	A-Agriculture C-Architecture
Queen Anne's	QA-463	Stevensville Historic District	Listed 9/11/1986; reevaluated 3/19/1998	C-Historic District
Queen Anne's	QA-259	Cray House	Listed 5/9/1983; Preservation Easement recorded 2/2/2001	C-Architecture
Queen Anne's	QA-212	Christ Church	Listed 7/24/1979; Preservation Easement recorded 7/26/2005	A- Settlement, Religion C-Architecture
Queen Anne's	QA-264	Stevensville Bank	Listed 1/3/1985	A-Commerce C-Architecture
Anne Arundel	AA-47	William Preston Lane, Jr., Memorial Bridge, Eastbound	Eligible 4/2/2001	A-Association with designer and builder C-Engineering
Anne Arundel	AA-48	William Preston Lane, Jr., Memorial Bridge, Westbound	Eligible 4/3/2001	A-Association with designer and builder C-Engineering
Anne Arundel	AA-765	Bridge 2081, Weems Creek Bridge	Eligible 6/29/1993	A-Transportation C-Engineering

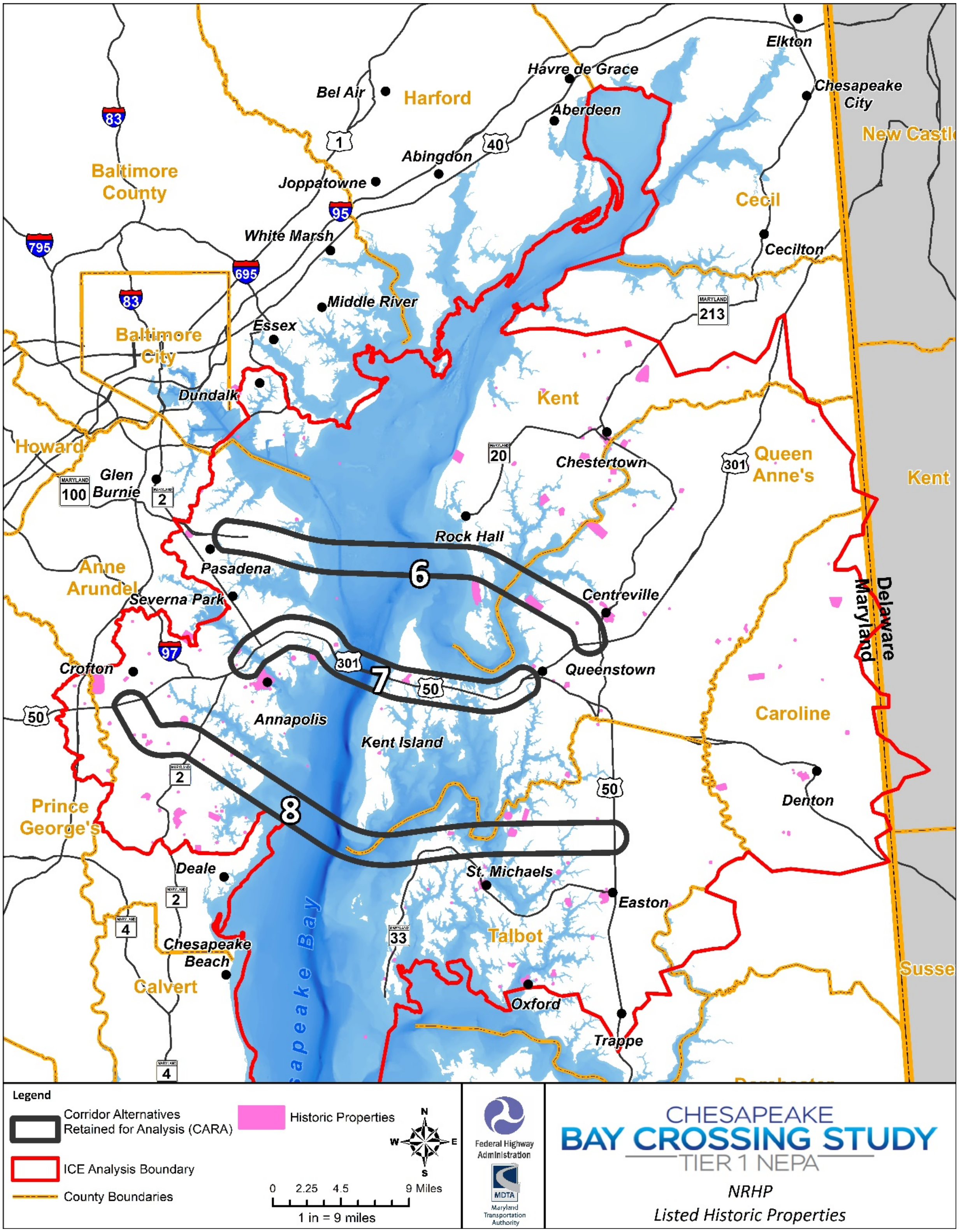
County	MIHP No.	Name	Status and Date	Significance Criterion
Anne Arundel	18AN141	Martin's Pond	Listed 6/5/1975	D-Information Potential
Anne Arundel	18AN534	Sandy Point Farmhouse	Listed 2/22/1972	D-Information Potential
Anne Arundel	18AN652	Sharpe-Rideout-Boone Mill	Eligible 12/22/1989	D-Information Potential
Queen Anne's	QA-222	White's Heritage	Eligible 2/11/1980	C-Architecture
Queen Anne's	QA-222-1	Garage, White's Heritage	Eligible 9/21/2006	C-Contributes to White's Heritage HD
Queen Anne's	QA-222-2	Tenant House, White's Heritage	Eligible 9/21/2006	C-Contributes to White's Heritage HD
Queen Anne's	QA-222-3	Tenant Farm Complex, White's Heritage	Eligible 9/21/2006	C-Contributes to White's Heritage HD
Queen Anne's	QA-542	SHA Bridge No. 1700600	Eligible 6/3/2011	C-Engineering
Queen Anne's	QA-524	Barnstable Hill, Lowery Farm	Eligible 9/11/1980	A-Agriculture C-Architecture
Queen Anne's	18QU968	Gibson's Grant	Eligible 10/31/2006	D-Information Potential

Table 4-23: Historic Properties within Corridor 8

County	MIHP No.	Name	Status and Date of DOE	Significance
Anne Arundel	AA-1006	Davidsonville Historic District	Listed; 3/27/1992	C-Historic District
Anne Arundel	AA- 140	South River Club	Listed; 5/15/1969	A-Social C-Architecture
Anne Arundel	AA-144	Summer Hill	Listed 7/25/1974	C-Architecture
Anne Arundel	AA-160	Mount Airy	Listed 4/13/1973	A-Agriculture C-Architecture
Anne Arundel	AA-200	Indian Range	Listed 2/13/1986	C-Architecture
Anne Arundel	AA-200A	Indian Range Servant's Quarters	Listed	Anne Arundel

County	MIHP No.	Name	Status and Date of DOE	Significance
Anne Arundel	AA-150	All Hallow's Church	Listed 5/15/1969	A-Religion C-Landscape Arch., Architecture
Anne Arundel	AA-232	Gresham	Listed 9/7/1984	B-Assoc. with Comm. Isaac Mayo
Anne Arundel	18AN284	Smithsonian Pier	Eligible 3/28/1995	D-Information Potential
Anne Arundel	18AN285	Smithsonian Pier West	Eligible 3/28/1995	D-Information Potential
Anne Arundel	18AN571	Gresham	Listed 9/7/1984	D-Information Potential
Queen Anne's	QA-297	Bloody Point Bar Light	Eligible 2/22/2007	Preservation Easement
Talbot	T-244	Sherwood Manor	Listed; 4/5/1977	C-Architecture
Talbot	T-527	Skipjack CLAUD W. SOMERS	Listed; 5/16/1985	A-Commerce and Transportation
Talbot	T-90	Hope House	Listed; 11/1/1979	C-Architecture
Talbot	T-89	Wye Town Farm House	Listed; 12/16/1982	C-Architecture
Talbot	T-381	Unionville	Eligible; 3/24/1999	A-African-American settlement C-Historic District, Architecture
Talbot	T-211	Rich Neck Manor	Eligible; 12/19/1988	Preservation Easement
Talbot	18TA424	SH 8	Eligible 9/13/2012	D-Information Potential
Talbot	18TA425	SH 9	Eligible 9/13/2012	D-Information Potential

Figure 4-21: Historic Resources in the ICE Analysis Boundary



4.4 Air Quality

The Clean Air Act outlines transportation conformity requirements for highway projects involving FHWA approval to ensure air quality goals will be met with project implementation. Transportation conformity applies in geographic areas identified by the USEPA as having exceeded National Ambient Air Quality Standards (NAAQS) for transportation related pollutants. NAAQS dictate pollutant levels which protect public and environmental health. Attainment areas are designated where pollutant levels do not exceed the NAAQS. Nonattainment areas are designated where pollutant levels exceed NAAQS. Maintenance areas are designated where pollutant levels have improved from NAAQS nonattainment to attainment and require monitoring to ensure air quality programs maintain pollutant levels which do not exceed the NAAQS. NAAQS have been established for five pollutants emitted from transportation activities:

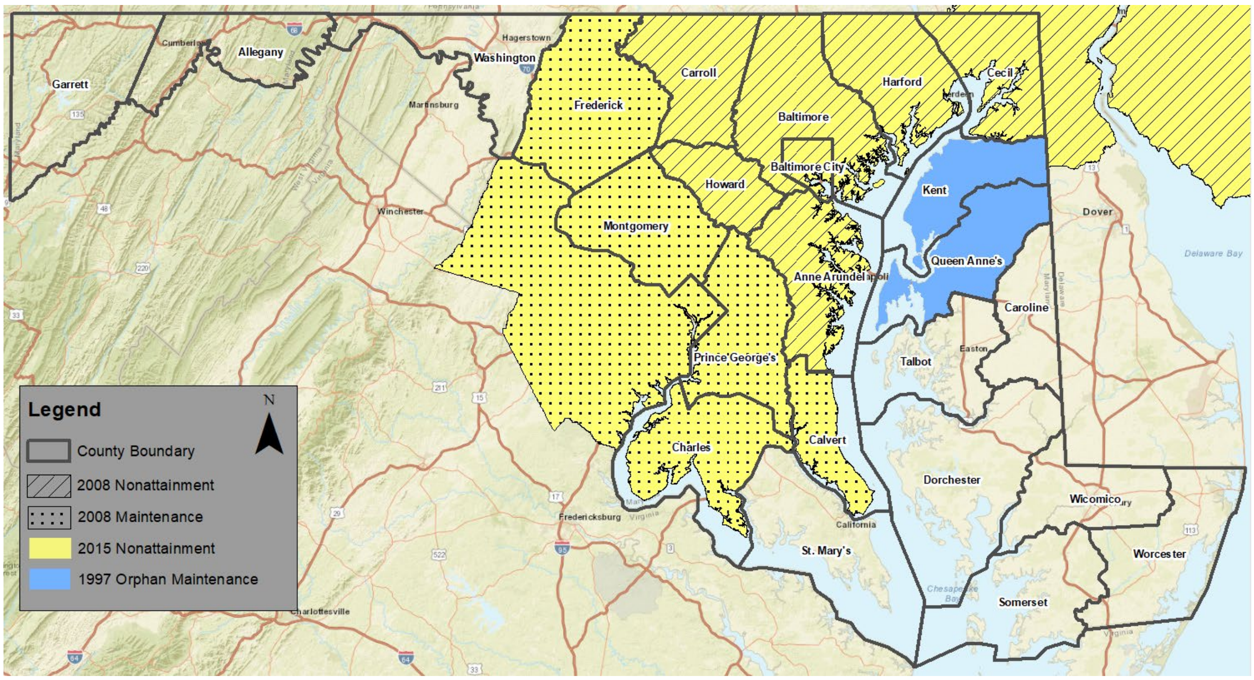
- Ozone (O_3);
- Coarse particulate matter (PM_{10});
- Fine particulate matter ($PM_{2.5}$);
- Nitrogen dioxide (NO_2); and
- Carbon monoxide (CO).

USEPA periodically establishes new NAAQS and rescinds existing NAAQS based on rigorous scientific review, resulting in multiple NAAQS for some pollutants. When discussed, NAAQS are generally distinguished by year of USEPA establishment and time over which pollutant measurements are averaged. Baltimore City and 11 Maryland counties are in 2015 O_3 8-hour NAAQS nonattainment areas (**Figure 4-22**). Baltimore City and six Maryland counties are also in 2008 O_3 8-hour NAAQS nonattainment areas, while five Maryland counties are within a 2008 O_3 8-hour NAAQS maintenance area. Kent County and Queen Anne's County are located in an orphan 1997 O_3 8-hour NAAQS maintenance area. The term "orphan" notes that although the 1997 O_3 8-hour NAAQS was revoked in 2015, this area is still subject to transportation conformity requirements (USEPA 2018 *Transportation Conformity Guidance for the* South Coast II *Court Decision*). West of the Bay, Corridors 6, 7, and 8 intersect Anne Arundel County, which is in the 2008 and 2015 O_3 NAAQS nonattainment areas. East of the Bay, Corridor 6 also intersects both Kent County and Queen Anne's County and Corridor 7 intersects Queen Anne's County. Therefore Corridors 6, 7 and 8 are subject to transportation conformity requirements.

When transportation conformity requirements apply to a project, a transportation conformity determination must be completed to demonstrate these requirements are met and show the project will not cause new NAAQS violations, worsen existing NAAQS violations, or delay timely attainment of relevant NAAQS or interim milestones (42 U.S.C. 7506(c)). The purpose of these requirements is to ensure the project conforms to, or is consistent with, the state implementation plan (SIP). A SIP is a collection of regulations and documents used by a state, territory, or local air district to reduce air pollution in nonattainment/maintenance areas and ensure NAAQS implementation, maintenance, and enforcement.

Conformity determination requirements for projects within an O_3 8-hour nonattainment/maintenance area, as well as O_3 8-hour orphan maintenance areas, are fulfilled when the project is included in both the applicable conforming long-range plan (LRP) and transportation improvement program (TIP) with descriptions consistent with the current design concept and scope (40 CFR 93.109). An LRP is a federally mandated planning document for urbanized areas which describes long-term plans to operate, maintain, and expand transportation infrastructure over a minimum planning horizon of 20 years. A TIP, complementary to the LRP, is a federally mandated planning document for urbanized areas which describes short-term transportation infrastructure plans over a planning horizon of at least four years.

Figure 4-22: Maryland O_3 8-Hour NAAQS Nonattainment and Maintenance Areas



A single Preferred Corridor Alternative will potentially be identified at the conclusion of the Tier 1 EIS process. Alternative alignments within the Preferred Corridor Alternative would be evaluated and compared to the No-Build Alternative in a Tier 2 NEPA analysis; such improvements would be subject to CAA transportation conformity, Mobile Source Air Toxic (MSAT), GHG, and construction emissions requirements. Under the CAA, any Tier 2 preferred alternative alignment within a Preferred Corridor Alternative would require a conformity determination in either Corridor 6, 7, or 8 during Tier 2.

Conformity determination requirements for projects within an O3 8-hour nonattainment/maintenance area, as well as O3 8-hour orphan maintenance areas, are fulfilled when a project is included in both the applicable conforming long-range transportation plan (LRTP) and transportation improvement program (TIP) with descriptions consistent with the current design concept and scope (40 CFR 93.109). An LRTP is a federally mandated planning document for urbanized areas which describes long-term plans to operate, maintain, and expand transportation infrastructure over a minimum planning horizon of 20 years. A TIP, complementary to the LRTP, is a federally mandated planning document for urbanized areas which describes short-term transportation infrastructure plans over a planning horizon of at least four years.

A required conformity determination in Tier 2 would account for indirect and cumulative effects of a new crossing within Corridor 6, Corridor 7, or Corridor 8. A conformity determination covers a broad enough area to account for indirect effects and ensure that air quality is maintained on a regional scale. CAA conformity also accounts for cumulative effects by ensuring the incremental contribution of actions such as a new Bay Crossing, considered in the context of existing levels of criteria pollutants and other actions, would not cause a violation of NAAQS. None of the three CARA are currently included in a TIP. More information is included in the *Air Quality Technical Report.*

5.0 INDIRECT EFFECTS ANALYSIS

This Tier 1 analysis includes consideration of the resources within Corridors 6, 7, and 8, and qualitative discussion of the most likely type of indirect effects that could occur from implementing a crossing within the corridors. Because an alignment for each alternative would not be determined until a potential Tier 2 study, it was not feasible to specify resources that could be affected by a given alignment in Corridors 6, 7 or 8.

5.1 Impact Causing Activities of Build Alternatives

The direct encroachment upon or alteration of the human and natural environment may result in changes in the behavior and functioning of the affected environment that occurs later in time or some distance away from the initial direct physical impacts. Indirect effects by definition are an outcome of direct effects of a build alternative. Construction of a build alternative could entail the following direct impact-causing activities:

- Alteration of travel times by providing travel speed and level-of-service improvements in the alternative's area of influence;
- Land clearing and grading to construct crossing and roadway improvements;
- Alteration of drainage patterns and volumes by drainage structures at stream crossings and displacing and/or relocating sections of stream channels where needed;
- Construction and maintenance of temporary and permanent erosion control and stormwater management (SWM) facilities;
- Avoidance, minimization, mitigation and remediation measures to offset adverse impacts; and
- Right-of-way acquisition.

5.2 Types of Indirect Effects Considered

The indirect effects analysis focuses on the potential for effects that could occur outside of the area of direct impact caused by the construction and operation of a new crossing in Corridor 6, Corridor 7, or Corridor 8. Three broad categories of indirect effects are considered as described in **Section 3.1.2**: encroachment effects, induced growth, and effects related to induced growth.

In general, transportation improvements often reduce time and cost of travel, as well as provide new or improved access to properties, enhancing the attractiveness of surrounding land to developers and consumers, potentially resulting in demand for new growth. Possible indirect and induced growth effects resulting from potential improvements in Corridor 6, Corridor 7, and Corridor 8 are analyzed below.

Transportation improvements can have various effects on community economics including direct effects such as business relocations, and indirect effects such as induced growth from improved or new accessibility, or temporary delays during construction which may affect shipments, and employee and patron access to businesses. Some effects can be positive such as a new or expanded highway facility can increase a community's access to other areas that increases the labor pool and reduces costs for input and output of materials and services expanding markets. Improved accessibility may increase workers' access to education and employment opportunities.

Community cohesion is a sensitive resource and is a loosely defined concept of community identity potentially based on shared ethnicity; coherent design features in a community's layout and aesthetics; and spatial cohesion gained by accessibility to neighbors, community facilities, goods and services. The level of cohesion in communities may vary depending on how long residents have stayed or plan to stay in the area and the accessibility to services and community facilities. Transportation impacts to community cohesion "may be beneficial or adverse, and may include splitting neighborhoods, isolating a portion of a neighborhood or an ethnic group or separating residents from community facilities" (FHWA, 1987). Construction and expansion of existing transportation corridors can disrupt community cohesion by changing connectivity between residential neighborhoods (i.e., physically dividing communities); displacing residents; disrupting access to community facilities, either on a temporary or permanent basis; and introducing noise and visual elements incompatible with existing surrounding conditions (FHWA, 1998). Transportation projects also may enhance access within communities by improving connectivity, contributing to a community's layout and aesthetics through design features and amenities such as pocket parks, and improving accessibility to new goods and services.

The induced growth analysis concentrates on identifying where future development would be most likely to occur associated with new crossings and connecting road network improvements in Corridor 6, Corridor 7, and Corridor 8, compared to the No-Build Alternative.

5.3 Induced Growth Analysis Overview

Construction of a new crossing would result in new connectivity across the Bay. Some areas on the Eastern Shore, such as Kent County, are relatively geographically isolated from areas on the Western Shore due to a lack of direct connections across the Bay. Those areas on the Eastern Shore which would experience new access due to the connection of a new crossing would potentially be the most likely to experience development pressure. This analysis considered the following employment centers relevant to Corridors 6, 7, and 8:

- Baltimore;
- Annapolis;
- Washington, DC; and
- I-95 between Baltimore and Washington, DC (capturing employment areas along I-95 such as Columbia).

The analysis considers the potential for induced growth through the use of 0 to 30, 30 to 45, and 45 to 60-minute travel bands extending from major employment centers. **Section 3.3.1** provides additional background on the Induced Growth Study Areas and their use in the overall ICE Analysis Methodology. (Maps of the Induced Growth Study Areas are included in **Sections 5.4** through **5.8**). Each travel band reflects the area that would be within a range of driving time to an employment center, as defined by the existing roadway network and any proposed improvements for each corridor. These travel bands, or the areas that would be made accessible within a 0-30, 30-45, or 45-60-minute drive of the employment centers were developed for each corridor alternative based on distance and speed limits for the existing and proposed segments of roadway network. Drive times were estimated beginning at the origin points of the I-695 and I-495 beltways for Baltimore and Washington, DC, respectively; central downtown Annapolis, and the closest connection from I-95 to each of the CARA. The travel bands were developed to identify areas on the Eastern Shore that would be made accessible within a typical commute distance of major employment centers on the Western Shore. Areas that are already within the specified drive distance of an employment center under existing conditions are not included, except under existing conditions **(Section 5.4).**

Traffic conditions are not considered quantitatively in this broad-scale Tier 1 level analysis of induced growth. The Induced Growth Study Area boundaries were generalized to include contiguous land areas within the roadway network, and within roughly 300 feet of the roadways. This results in a conservatively large estimate of the area potentially affected. An Induced Growth Study Area boundary was also developed based on existing conditions for comparison. These Induced Growth Study Areas were incorporated into the overall ICE Analysis Boundary.

Development pressure on the Western Shore could occur, especially along the roadways feeding into new crossings at Corridor 6, 7, and 8. Reasonably foreseeable changes in land use on the Western Shore, however, would likely be of a lesser magnitude than those changes on the Eastern Shore, because access to the major employment centers identified above would likely only change marginally from existing conditions. No Induced Growth Study Areas were developed for the Western Shore because Western Shore communities would not experience a major change in access to employment centers like Baltimore or Washington, D.C., and thus development pressure would be expected to be of a much lower magnitude compared to areas on the Eastern Shore. However, qualitative discussion of the potential for induced growth on the Western Shore is included. The analysis includes high-level discussion about the kinds of land use changes that could indirectly occur from the new on-land infrastructure on the Western Shore connecting to a new crossing. Numerous uncertainties are involved with potential future land use changes, such as access points to a new facility, zoning and comprehensive planning, and economic conditions.

The induced growth analysis associated with a new crossing in Corridor 7 will differ from the other two potential corridors. The BCS conducted a qualitative analysis because access to Western Shore employment centers is already provided by the existing Bay Crossing within this corridor. The Eastern Shore is in a unique geographic location, separated from major cities by the barrier of the Chesapeake Bay, so a new crossing would have much greater potential to cause induced growth there. Additionally, while new access to employment centers on the Eastern Shore would potentially be provided by a new crossing, this would not be expected to drive substantial induced growth on the Western Shore due to the relatively small size of the employment centers on the Eastern Shore.

This analysis examines areas on the Eastern Shore that could be potentially susceptible to development pressure. In particular, areas for which travel times to the Western Shore would be reduced to roughly 60 minutes or less via a proposed new crossing within Corridor 6 or Corridor 8 are considered most likely to experience indirect effects. Areas for which travel times to major employment centers would be reduced to 45 minutes or less would likely be more susceptible. These assumptions are based on the analysis of regional commuting data presented in **Section 4.1.1.4**. No 30-minute or less travel bands extend to the Eastern Shore for either corridor.

Specific details about a potential new crossing, such as access locations, would not be determined until Tier 2. However, it was necessary to make assumptions about access locations on the Eastern Shore to conduct the induced growth analysis. For Corridor 7, it is assumed that access points to on-land infrastructure would remain unchanged from existing conditions. A new crossing in Corridor 7 would be assumed for the purpose of this analysis to provide access to the same roadways as the existing US 50/301 approach roadways. For Corridors 6 and 8, it is assumed that connections to Maryland state routes would be provided along the new on-land portions of the roadway. Thus, it is assumed that Corridor 6 would have access provided at MD 445 or MD 20 in the vicinity of Rock Hall, along with the eastern terminus at US 301. Corridor 8 is assumed to have access at MD 33 near St. Michaels, and the eastern terminus at US 50. Access points are not part of the Corridor Alternatives and will not be determined during the Tier 1 analysis; these assumptions are used only to facilitate the evaluation of induced growth.

The analysis is intended to capture areas which are currently outside of a typical commute distance for the major employment centers on the Western Shore that would be connected within a typical commute distance by a new crossing. These are areas where large numbers of residents are currently not likely to be commuting to the Western Shore due to the travel time separating them, but that may experience a growth in such commuters if a crossing were constructed.

Induced growth associated with a new crossing in Corridor 7 may also occur. However, because access to the Western Shore employment centers is already provided by the existing Bay Crossing in this general vicinity, qualitative analysis of potential induced growth was conducted. Much of the growth associated with new access may have already occurred in the past within Corridor 7. The analysis methodology is primarily aimed at identifying areas that are not currently within a reasonable commute distance of the Western Shore employment centers, but that would be within such a commute distance due to the provision of a new crossing. Because the existing Bay Bridge provides a connection to the Western Shore employment centers already, no additional areas beyond existing conditions would be within a typical commute distance based on the methodology used in this analysis. Increased capacity within Corridor 7 would likely have different kinds of implications for land use and induced growth. For example, the continuation or intensification of existing land use and development patterns would be expected in Corridor 7, rather than substantially altered development patterns resulting from a crossing in an entirely new location. Induced growth for Corridor 7 is therefore evaluated qualitatively in **Section 5.7.2.**

The analysis includes an examination of the proportion of developed versus undeveloped land, and the extent of designated growth areas. The analysis assumes the greatest potential for changes in land use from induced growth related to a new crossing within the CARA would occur in agricultural or natural areas. Also, lands designated for future growth by government planning organizations could be more likely to experience new development, infill or redevelopment associated with induced growth from greater or new access.

A 2013 study by MDP classified rural resource lands in the state as having limited, moderate, or high vulnerability to residential development which was used to inform this analysis. Rural resource lands include natural lands, resource conservation lands, agricultural land and lands designated for agricultural preservation. MDP used current zoning and land use management tools governing subdivision and development of land parcels to estimate development capacities for all parcels in a grid across the state.

Maryland's Priority Funding Areas are used for designated growth areas identification in the State. In Delaware, designated growth areas are based on Levels of Investment as described in *Delaware's 2015 Strategies for State Policies and Spending*.

Note that not all identified resources within a travel band would be impacted by induced growth; these areas are intended to identify the most likely locations of induced growth impacts. The actual level of induced growth and resulting impacts to resources would depend upon a variety of factors involving considerable uncertainty, including local zoning and planning policies, permitting and regulatory requirements, economic factors influencing the demand for development, and others.

The analysis also assumes that potential induced growth effects would be greater for the travel bands corresponding with larger employment areas. The travel bands for a smaller employment center such as Annapolis would therefore be expected to have a smaller induced growth effect relative to a larger employment center such as Baltimore.

5.4 Induced Growth Analysis - Existing Conditions Baseline

To provide an overview of existing conditions, this analysis includes an evaluation of the existing areas on the Eastern Shore within 0 to 30, 30 to 45, and 45 to 60-minute travel bands of major employment centers including Annapolis, Washington, DC, Baltimore and the I-95 Corridor, as shown in **Figure 5-1** through **Figure 5-4**. The information in this section is intended to provide a baseline of existing conditions information to inform the analysis of induced growth in the CARA.

The existing conditions travel time band geography does not include any area with new access to the Western Shore employment centers and reflects an approximation of existing conditions. Therefore, the information presented in this section is meant to inform the understanding of existing conditions but is not directly comparable to the induced growth study areas developed for Corridor 6 or Corridor 8.

Table 5-1 and **Figure 5-5** present the existing acreage of developed and undeveloped lands, by employment center and travel time band. The data show there are substantial areas within 30 to 45 minutes of Annapolis (over 180,000 acres), and relatively smaller areas within a 30 to 45-minute drive of Baltimore, DC and I-95 (less than 15,000 acres each).

As shown in **Figure 5-1** through **5-4** the 30 to 45-minute travel bands for Baltimore, DC, and I-95 primarily only extend as far as Kent Island on the Eastern Shore. Kent Island has experienced more development than many other areas on the Eastern Shore, which is likely related to its proximity to the Western Shore employment centers, as illustrated by the travel-time bands. The 30 to 45-minute travel band for Annapolis, along with the 45 to 60-minute travel bands for Baltimore and Washington, DC, extend past Kent Island further onto the Eastern Shore through Queenstown and Centreville. These areas have also seen some increase in land use development since the existing Bay Bridge was constructed.

Figure 5-1: Induced Growth Study Areas – Existing Conditions - Annapolis

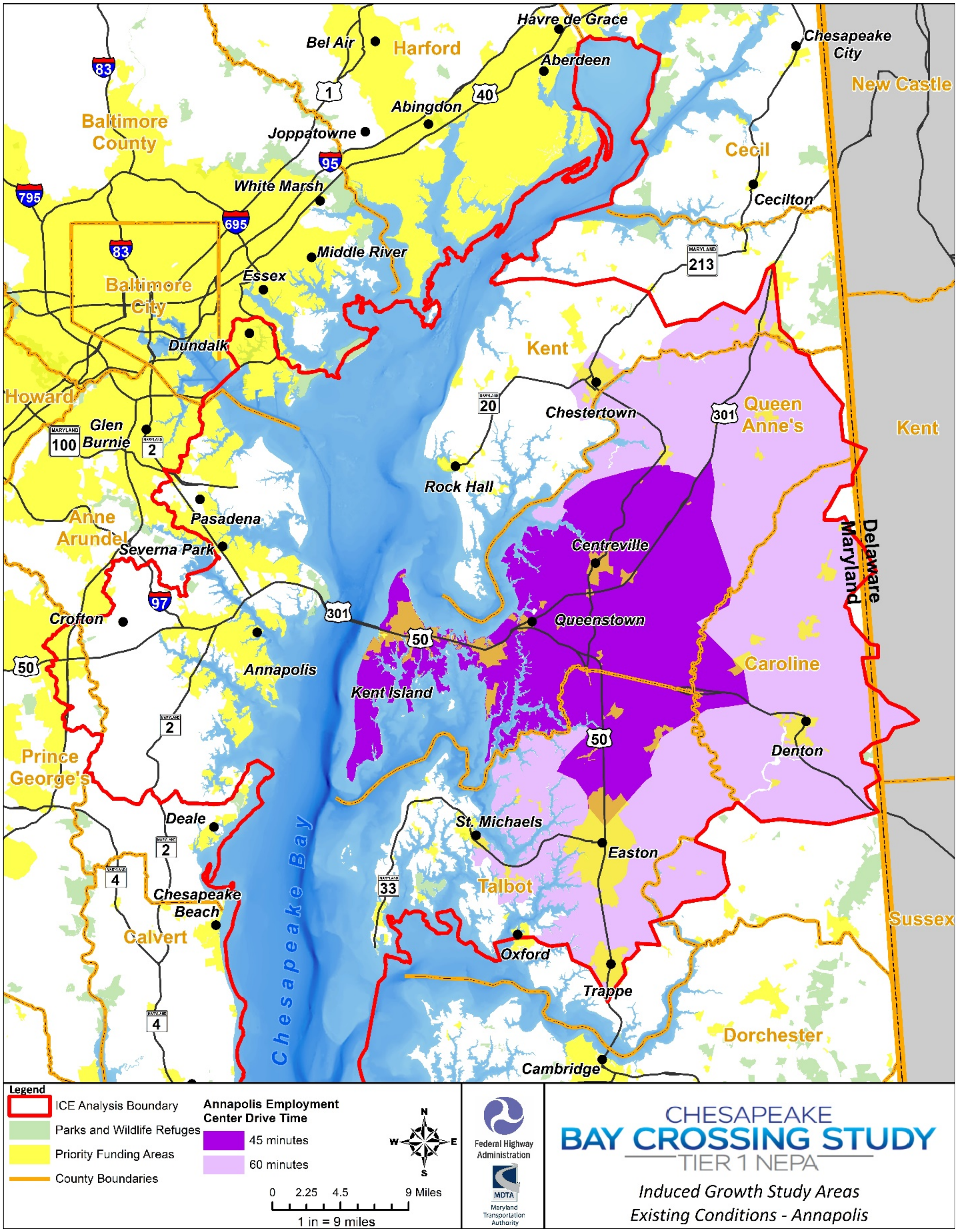


Figure 5-2: Induced Growth Study Areas – Existing Conditions - Baltimore

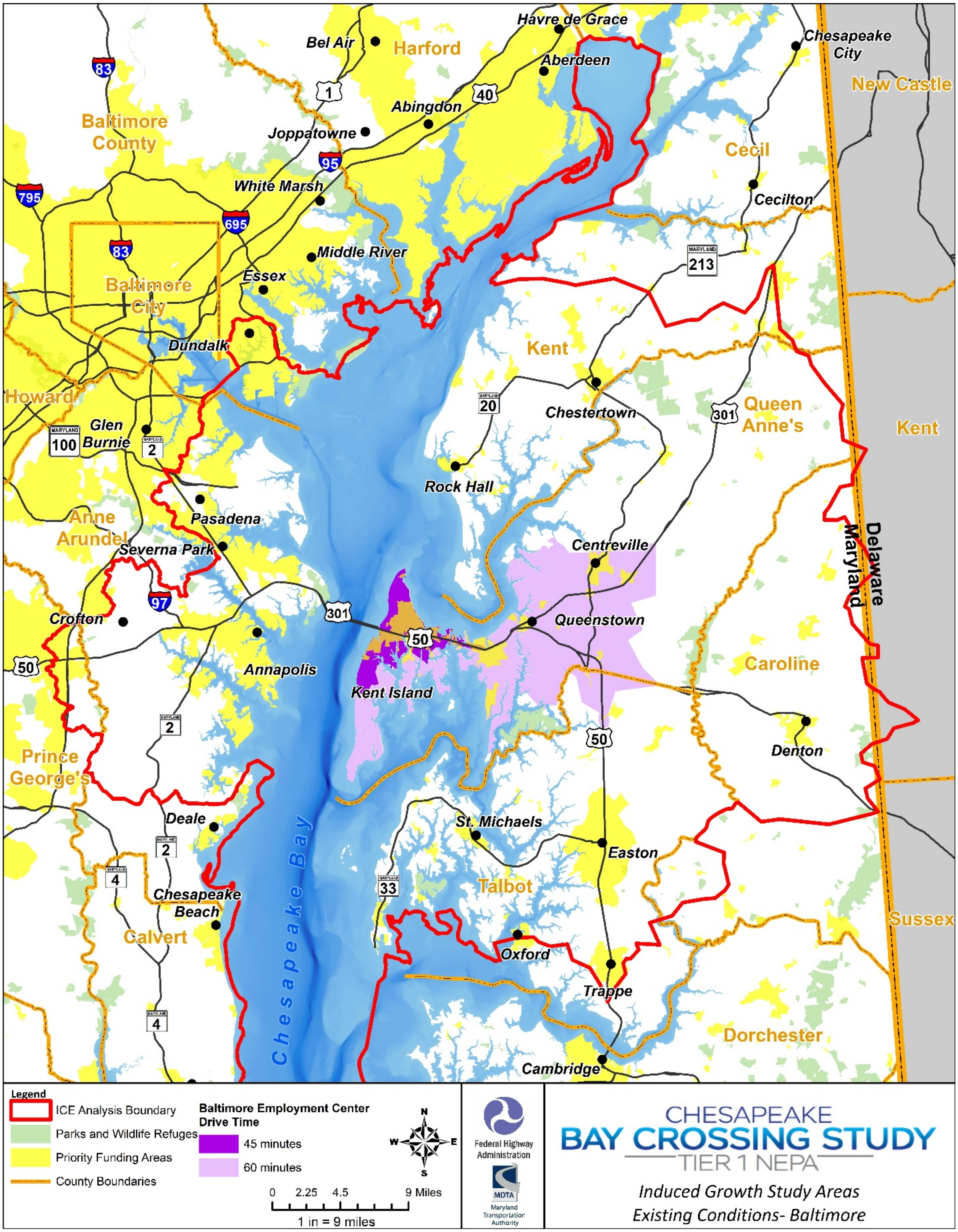


Figure 5-3: Induced Growth Study Areas – Existing Conditions – Washington, DC

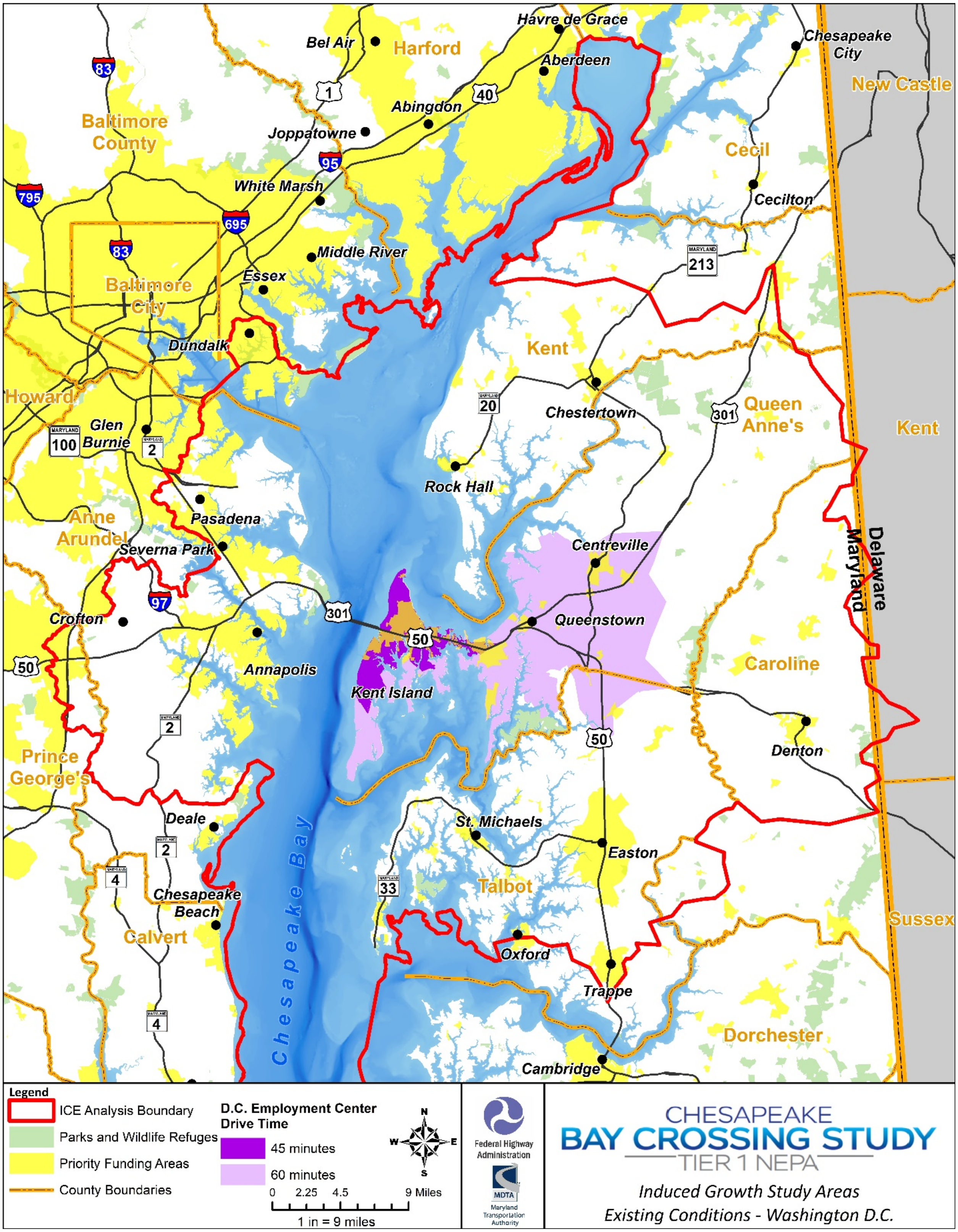


Figure 5-4: Induced Growth Study Areas – Existing Conditions – I-95

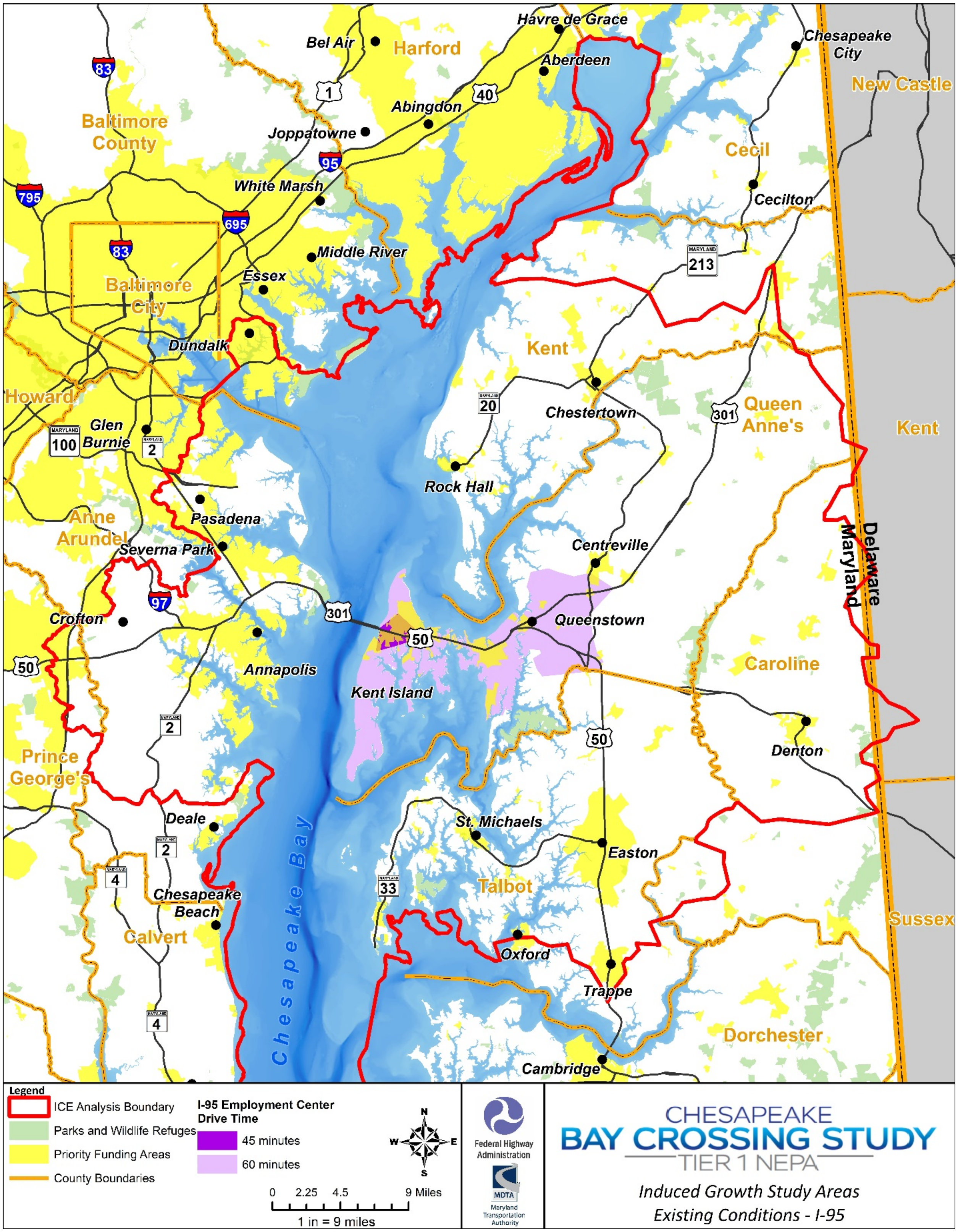
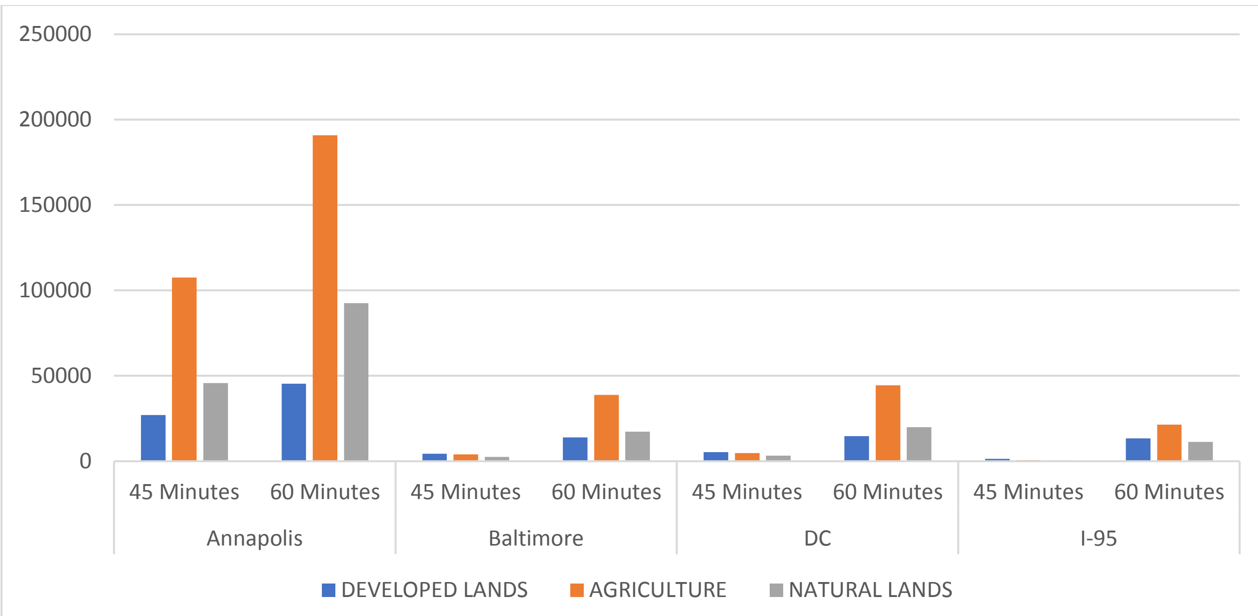


Table 5-1: Land Use/Land Cover in the Existing Conditions Induced Growth Study Area

GEOGRAPHY	TRAVEL MINUTES BAND	TRAVEL BAND SIZE (ACRES)	DEVELOPED LANDS (ACRES)	AGRICULTURE (ACRES)	NATURAL LANDS (ACRES)
Annapolis	30 - 45 Minutes	183,381	27,099	107,625	45,748
	45 - 60 Minutes	334,173	45,447	190,900	92,635
Baltimore	30 - 45 Minutes	11,507	4,328	4,086	2,592
	45 - 60 Minutes	72,056	14,016	38,840	17,370
DC	30 - 45 Minutes	13,792	5,346	4,749	3,246
	45 - 60 Minutes	80,680	14,605	44,527	19,872
I-95	30 - 45 Minutes	2,724	1,482	665	429
	45 - 60 Minutes	47,946	13,343	21,442	11,387

Source: MDP (2010); Delaware OCSP (2012)

Figure 5-5: Developed and Undeveloped Land by Employment Center and Travel Time Band – Existing Conditions



Source: MDP (2010); Delaware OSPC (2012)
Developed lands = residential, commercial, industrial, institutional, other developed lands, and transportation
Agriculture = cropland, pasture, orchards/vineyards/horticulture, feeding operations, barns/storage/breeding facilities, farmed fish facilities/ponds, row and garden crops
Natural Lands = forest lands, mixed forest, and brush

Table 5-2 presents the acreage of Maryland's PFAs by employment center and travel time band under existing conditions.

Table 5-2: Maryland Priority Funding Areas per Employment Center and Travel Time Band – Existing Conditions

GEOGRAPHY	PRIORITY FUNDING AREA ACREAGE	
	30 - 45 MINUTES	45 - 60 MINUTES
Annapolis	24,522	31,266
Baltimore	6,925	9,512
DC	7,024	9,402
I-95	4,654	10,277

Source: MD iMAP (2015)

Based on MDP data, **Table 5-3** and **Figure 5-6** present the acreages of rural resource land vulnerable to residential development by employment center and travel time band in the existing conditions Induced Growth Study Area. As seen in **Figure 5-4**, the greatest proportion of rural resource lands vulnerable to residential development in the existing conditions Induced Growth Study Area occur within the 30 to 45 minute and 45 to 60-minute travel time bands for the Annapolis employment center. Of the acreage of land in the 45-minute travel time band for the Annapolis employment center, approximately 25 percent currently have limited vulnerability, 21 percent are moderately vulnerable, and 54 percent are highly vulnerable to residential development.

Table 5-3: Maryland Development Vulnerability in the Existing Conditions Induced Growth Study Area

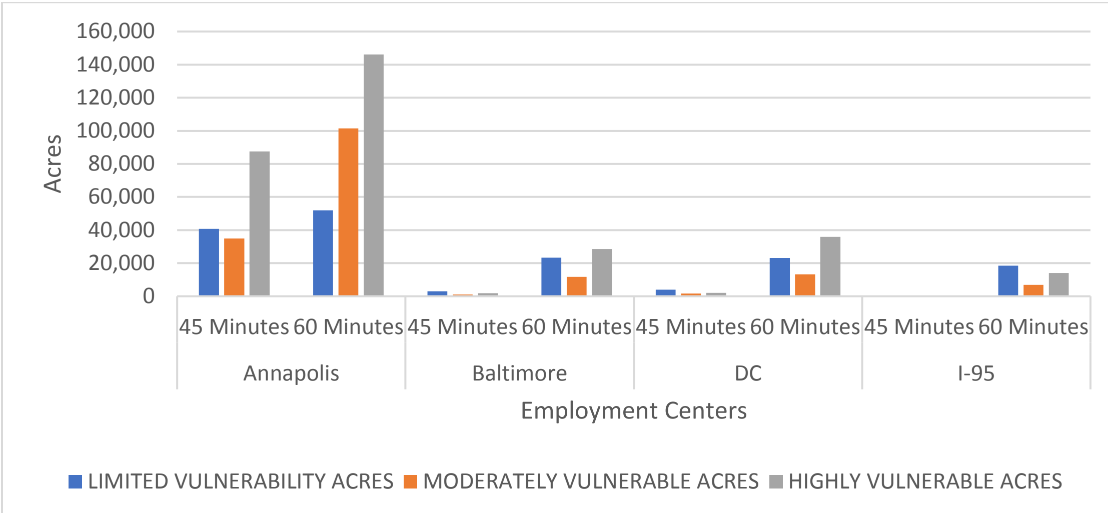
GEOGRAPHY	TRAVEL MINUTES BAND	TRAVEL BAND SIZE (ACRES)	LIMITED VULNERABILITY ACRES	MODERATELY VULNERABLE ACRES	HIGHLY VULNERABLE ACRES	TOTAL VULNERABLE ACRES
Annapolis	45 Minutes	183,381	40,779	34,824	87,587	163,190
	60 Minutes	334,173	51,977	101,527	146,222	299,726
Baltimore	45 Minutes	11,507	3,033	1,085	1,787	5,905
	60 Minutes	72,056	23,238	11,798	28,531	63,567
DC	45 Minutes	13,792	4,012	1,563	2,122	7,697
	60 Minutes	80,680	23,196	13,269	35,832	72,297
I-95	45 Minutes	2,724	85	0	368	453
	60 Minutes	47,946	18,425	6,951	14,068	39,444

Source: MDP (2013)

Overall, the PFAs and development vulnerability measures show that substantial areas of PFAs and land vulnerable to development are present within the 30 to 45 and 45 to 60-minute travel bands of Annapolis. The travel bands for Baltimore, Washington, DC, and I-95 are much smaller overall and thus contain less of these areas.

Tables 5-4 to **Table 5-7** present an estimate of wetland acres, floodplain acres, linear feet of streams and Critical Area acres for the No-Build travel time bands by employment center.

Figure 5-6: Development Vulnerability per Employment Center and Travel Time Band under Existing Conditions



Source: MDP (2013)

Table 5-4: Existing Conditions - National Wetlands Inventory Acres per Employment Center and Travel Time Band

GEOGRAPHY	NATIONAL WETLANDS INVENTORY ACRES	
	30-45 MINUTES	45-60 MINUTES
Annapolis	25,621	46,174
Baltimore	2,483	10,718
DC	3,091	11,499
I-95	453	8,681

Source: USFWS (2016)

Table 5-5: Existing Conditions - FEMA 100-Year Floodplain Acres per Employment Center and Travel Time Band

GEOGRAPHY	FEMA 100-YEAR FLOODPLAIN ACRES	
	30-45 MINUTES	45-60 MINUTES
Annapolis	12,817	20,486
Baltimore	2,520	5,795
DC	3,163	5,662
I-95	434	6,771

Source: FEMA (2019)

Table 5-6: Existing Conditions - Linear Feet of Streams per Employment Center and Travel Time Band

GEOGRAPHY	LINEAR FEET OF STREAMS	
	30-45 MINUTES	45-60 MINUTES
Annapolis	2,922,375	5,760,476
Baltimore	108,020	999,765
DC	135,589	1,138,571
I-95	20,126	613,012

Source: USGS (2016)

Table 5-7: Existing Conditions – Acres of Chesapeake Bay Critical Area Per Employment Center and Travel Time Band

GEOGRAPHY	ACRES OF CHESAPEAKE BAY CRITICAL AREA	
	30-45 MINUTES	45-60 MINUTES
Annapolis	35,991	48,551
Baltimore	6,358	19,334
DC	8,047	19,311
I-95	1,156	19,561

Table 5-8 presents the USGS 12-digit HUC Watersheds located within one or more of the existing conditions travel bands. The table includes the acres and percentage of the total watershed area located within one or more of the existing conditions travel bands.

Table 5-8: HUC 12 Watersheds within One or More Existing Conditions Induced Growth Study Areas

12-Digit HUC	USGS 12-Digit Watershed Name	Acres within One or More Travel Bands	Percentage within One or More Travel Bands
020600020402	Andover Branch	7,180	24%
020600050502	Bolingbroke Creek-Choptank River	680	4%
020600050505	Broad Creek-Frontal Choptank River	1,910	9%
020600050205	Chapel Branch-Choptank River	21,430	83%
020600020409	Corsica River	24,010	95%
020600050201	Cow Marsh Creek	30	<1%
020600020607	Cox Creek-Frontal Eastern Bay	11,770	59%
020600020504	Craney Creek-Frontal Chesapeake Bay	5,590	48%
020600020401	Cypress Branch	1,080	4%
020600050204	Forge Branch-Choptank River	16,480	100%
020600050206	Fowling Creek-Choptank River	29,700	79%
020600050203	Gravelly Branch-Choptank River	15,070	58%
020600050105	Jadwins Creek-Tuckahoe Creek	27,210	100%
020600050103	Jarmans Branch	13,950	100%
020600050301	Kings Creek	14,520	100%

12-Digit HUC	USGS 12-Digit Watershed Name	Acres within One or More Travel Bands	Percentage within One or More Travel Bands
020600050503	La Trappe Creek-Choptank River	1,640	6%
020600020410	Langford Creek	340	1%
020600020411	Lower Chester River	15,020	31%
020600050102	Lower Mason Branch	11,760	100%
020600020603	Lower Wye East River	9,290	76%
020600050304	Marsh Creek-Choptank River	16,220	57%
020600020408	Middle Chester River	13,940	51%
020600020605	Miles River	25,890	76%
020600020405	Morgan Creek	610	3%
020600050104	Norwich Creek-Tuckahoe Creek	23,990	100%
020600020606	Prospect Bay-Eastern Bay	7,600	51%
020600020404	Red Lion Branch	15,340	100%
020801090302	Saulsbury Creek-Marshyhope Creek	2,610	9%
020600020601	Skipton Creek	12,200	98%
020600020407	Southeast Creek	34,730	98%
020801090304	Sullivan Branch-Marshyhope Creek	320	2%
020600050202	Tappahanna Ditch-Choptank River	6,320	17%
020801090303	Tommy Wright Branch-Marshyhope Creek	4,990	19%
020600050504	Tred Avon River-Frontal Choptank River	24,700	64%
020600020403	Unicorn Branch	12,920	100%
020600020406	Upper Chester River	24,870	72%
020600050101	Upper Mason Branch	21,660	100%
020600020301	Upper Sassafras River	40	<1%
020600020602	Upper Wye East River	18,990	98%
020600050302	Williams Creek-Choptank River	11,510	60%
020600020604	Wye River	10,480	81%

Acreages rounded to closest 10 acres.

5.5 No-Build Alternative

The No-Build Alternative would result in increasingly poor traffic conditions at the existing Bay Bridge and approach roadways by 2040. Traffic analysis conducted for the Bay Crossing Study determined that under the No-Build Alternative, average daily traffic (ADT) volumes are expected to increase by 16,700 vehicles per day by 2040 on summer weekends, and 15,700 vehicles per day on non-summer weekdays. Currently, the Bay Bridge experiences three hours with Level of Service (LOS) E or F on non-summer weekdays (all in the eastbound direction) and 19 hours on summer weekends (with 10 hours in the eastbound direction and 9 hours in the westbound direction). This is expected to worsen by 2040 to 7 hours on non-summer weekdays (with 5 hours in the eastbound direction and 2 hours in the westbound direction) and 22 hours on summer weekends (with 12 hours in the eastbound direction and 10 hours in the westbound direction).

The indirect effects of worsening traffic congestion could include loss of economic productivity, changes in community cohesion resulting from reduced access and delays, effects on the desirability of communities, and potential changes to individual decisions about where to live and work. While no resources are anticipated to be directly impacted by a No-Build Alternative for this study, the No-Build Alternative does include currently planned and programmed infrastructure projects and would be updated during Tier 2 to reflect planned and programmed projects that may affect the study area. Moreover, under the No-Build Alternative, motor vehicle volumes are forecasted to increase over time and with them are anticipated increases in travel times and delays related to growing traffic congestion. These qualitative increases would be expected to have potential negative effects on motor vehicle-reliant activities, such as; emergency response services, supply chain/commercial trucking and deliveries, school bus schedules, and workforce commuters.

5.5.1 Encroachment Effects

The No-Build Alternative would not result in project-related construction or any associated property acquisitions; therefore, no encroachment effects on land use, communities, community facilities, population, housing, EJ populations, or economics would occur from property acquisition.

Under the No-Build Alternative, no project-related roadway improvements would occur in the ICE Analysis Boundary; therefore, no indirect effects to natural resources would occur.

The No-Build Alternative would have no direct physical impact on archaeological or architectural resources as no construction would occur; therefore, no indirect effects would occur to historic properties.

5.5.2 Induced Growth

As no improvements are proposed with the No-Build Alternative, no project-related induced growth impacts would be expected under the No-Build Alternative. Worsening traffic congestion could lead to reduced demand for new growth in areas affected by frequent congestion and limited access to employment areas. Because no induced growth would occur under the No-Build Alternative, no related indirect effects would occur to natural resources or historic properties.

5.6 <u>Corridor 6</u>

5.6.1 Encroachment Effects

5.6.1.1 Socioeconomic Resources

Impacts from a new crossing within Corridor 6 could include reduced community cohesion by creating barriers within a neighborhood and/or displacing community facilities, which could change the composition of a neighborhood near the new crossing. This could have the indirect effect of a community becoming more or less attractive, depending on perceived benefits or detriments of living in proximity to a new crossing. Greater connectivity over the Chesapeake Bay could provide new access to community facilities such as hospitals which are more prevalent on the Western Shore.

Changes to local roadway networks may be required to accommodate traffic volumes on the approaches to the new crossing while maintaining local circulation. New interchanges, overpasses, or other changes to local roadways adjacent and connecting to a new crossing could have indirect effects on local communities such as altered traffic patterns, changes in local access and noise. Additional analysis of these potential effects would occur during a potential Tier 2 study.

During construction, temporary detours may be needed, and temporary loss of parking could occur. This could result in marginally increased travel times for residents, indirectly impacting community cohesion, and increased travel time for customers, potentially indirectly impacting the patronage of businesses and affecting employee access and shipments. These potential indirect effects could be limited by providing advance notice of temporary detours, clear signing, and working with individuals, businesses, and the community to potentially adjust schedules and identify alternative access. Temporary detours could also lead to increased traffic on detour routes and the increased congestion could divert traffic to other local streets, indirectly impacting community cohesion and access to businesses and services. These effects would be short-term, ending once construction was completed, and potentially better connectivity could result on the improved transportation routes and adjacent roadways. Additional indirect effects during construction could include temporary increased employment, and increased revenue for local businesses due to expenditures by the construction crew/contractors for housing, food, and supplies, which would benefit the local economy.

A new crossing could provide indirect economic benefits to residents through improved mobility and access to employment and services. Long-term socioeconomic benefits in the travel area served by Corridor 6 could be realized as a new Bay Crossing could offer travel time savings for commuters, as well as provide connections to major employers in the region, expanding employment opportunities. Connecting urban areas and communities by improving access and mobility could expand markets for businesses on both shores of the Bay, benefiting the local economies. A new crossing in Corridor 6 could divert traffic from the existing Bay Bridge (located within Corridor 7), resulting in fewer potential customers for services and businesses along US 50/301 near the existing crossing. Traffic studies conducted for alternatives screening show that by 2040, on summer weekends, improvements in Corridor 6 could divert an average of 7,400 vehicles daily from the existing bridge. However, by 2040, non-summer weekday ADT would still increase by 1,000 vehicles per day. However, not all the traffic diverted from the existing bridge would be expected to patronize the businesses or other service providers in that corridor.

No known minority populations or low-income populations reside in the Corridor 6 study area based on the Census tract evaluation conducted for this ICE analysis. Therefore, excepting potential induced growth discussed below, no adverse indirect effects to EJ populations would likely occur from a new crossing in Corridor 6.

5.6.1.2 Natural Resources

Improvements associated with the Corridor 6 crossing would provide a transportation facility on a new location and would indirectly change natural systems in the corridor. Corridor 6 improvements would cause direct habitat loss. Habitat fragmentation is indirectly associated with habitat loss. When Green Infrastructure is directly impacted (as defined in **Section 4.2.3.1**), hubs and corridors are potentially diminished in quantity and quality, this contributes to and/or intensifies fragmentation. Habitat fragmentation can have wide-ranging indirect effects to sensitive wildlife including:

- Species shifts associated with less interior habitat (smaller patch size), lower diversity due to smaller habitat patches, decreased flow of genetic material through the landscape, and separation of populations which may result from vegetation removal in the Study Area;
- Restricting wildlife movements that disrupt foraging, breeding/nesting, and migration;
- Increased risk of invasive species establishment;
- Generally, reduced biological diversity; and
- Altered habitat utilization, strained communication, and heightened metabolic rates on wildlife (especially avian communities) due to roadway noise, indirectly causing wildlife abandonment of the area.

The most prevalent land cover types within the landward portions of Corridor 6 are tree canopy and low vegetation (**Table 5-9**). Tree canopy is more prevalent on the Western Shore and low vegetation on the Eastern Shore. The areas classified as low vegetation almost entirely represent agricultural lands in the corridor. These lands have replaced natural land cover and are more abundant than in Corridor 7. In the areas which remain undeveloped and not under agricultural use, intact habitat occurs within Corridor 6 in the form of wetlands, streams, benthic habitat, SAV habitat, riparian areas, and forested areas. A new crossing could restrict wildlife movement through the riparian corridors crossed by the infrastructure, and potentially alter up and downstream hydrologic flow. Habitat loss could directly impact the SSPRA within the corridor (**Table 5-10**) and indirectly impact the protected state and federally-listed species located in the corridor through the fragmentation of suitable forage and summer roost habitat (NLEB), fragmentation of foraging habitat along the shoreline (northeastern beach tiger beetle and Puritan tiger beetle), reduction in marsh and mudflat foraging habitat (shortnose sturgeon), removal of adjacent canopy cover, providing too much direct sunlight (swamp pink), and shadowing of bridged wetlands (Canby's dropwort). Artificial lighting along a new crossing near the shoreline area could also fragment sea turtle nesting habitat, causing light pollution which could make them more vulnerable to predation.

Table 5-9: Land Cover

CORRIDOR	BARREN LAND (ACRES)	LOW VEGETATION (ACRES)	SHRUBLAND (ACRES)	DEVELOPED LANDS (ACRES)[1]	TREE CANOPY (ACRES)[2]	WATER (ACRES)	WETLANDS (ACRES)
6	22	6,649	30	1,092	8,547	18,311	300
7	43	5,553	51	2,034	8,848	9,966	974
8	9	10,636	50	1,329	13,593	20,843	226

Source: Chesapeake Conservancy (2017)
[1]*Includes impervious roads, impervious surfaces, and structures*
[2]*Includes tree canopy over impervious roads, impervious surfaces, and structures*

Table 5-10: Sensitive Species Project Review Areas and NOAA Consultation Areas

CORRIDOR	SSPRA (ACRES)	STURGEONS CONSULTATION AREA (ACRES)	SEA TURTLES CONSULTATION AREA (ACRES)
6	2,723	18,014	17,797
7	2,175	9,456	9,352
8	8,627	20,477	20,465

Sources: MDNR (2019); NOAA (2019a)

As the design, location, and construction methods of a new crossing within Corridor 6 will not be determined in the Tier 1 phase, the extent of direct impacts to terrestrial resources is unknown. However, if improvements were constructed in Corridor 6, forest clearing within the corridor would directly remove canopy cover and possibly indirectly cause fragmentation of FIDS habitat and lands within Maryland-designated FCA Easements and TEAs. As provided below in **Table 5-11**, FIDS habitat in Corridor 6 is more extensive than in Corridor 7. Corridor 6 contains more acreage of FCA easements, and TEAs than the other two corridors.

Table 5-11: FIDS Habitat and FCA Easements

CORRIDOR	FIDS HABITAT (ACRES)	FCA EASEMENTS (ACRES)	TARGETED ECOLOGICAL AREAS (ACRES)
6	7,017	142	2,388
7	6,904	125	1,877
8	11,409	111	2,034

Sources: MDNR (2011; 2013a; 2019a)

The FIDS habitat provides nesting and foraging areas for bird species and the TEAs allow for animal migration and potentially support listed species and rare plant and animal communities. The FCA Easements consist of conserved forested and planted areas which may be suitable plant and animal habitat. No forests of recognized importance occur within Corridor 6. Potential measures to minimize direct and associated indirect impacts of Corridor 6 improvements to conserved habitat, protected species, and their habitat would be developed in consultation with federal and state regulators with the Tier 2 EIS, if advanced to further study, and during the permitting phase, if applicable.

Actions such as habitat restoration or time-of-year restrictions for construction activities could be incorporated to reduce or offset direct impacts, which would also help reduce indirect effects outside of the area of direct impact. It is likely that direct and indirect impacts to habitat would potentially still result, even after application of avoidance and minimization actions.

The hydrodynamic indirect effects related to the new crossing and need for dredging has not been determined during this Tier 1 phase, because a crossing type and alignment has not been identified. However, a crossing in Corridor 6 would need to traverse approximately 13 miles of open water consisting mainly of the Chesapeake Bay and Chester River. This would be over twice the distance of open water crossed by Corridor 7, and less than the distance of open water crossed by Corridor 8. Different crossing designs could indirectly affect aquatic species (benthic species, pelagic species, anadromous fish, and protected species including sturgeon and sea turtles) differently by varying amounts of habitat loss. Different designs could vary in the degree of water quality degradation from sedimentation, resuspension of sediment in the water column (turbidity), and the potential release of toxicants (if present) from sediment disturbance. If dredging is required for construction, dredging and disposal activities could affect water quality by increasing suspended solids in the water, indirectly affecting benthic and pelagic species, including anadromous fish, and the EFH, SAV habitat, fish spawning and nursery habitat, and oyster resources in the corridor (**Table 5-12**). Impacts to aquatic habitat could affect commercial and recreational fishing or crabbing locations. As shown above in **Figure 4-17,** commercial and recreational fishing resources are located throughout the Chesapeake Bay. If a preferred corridor is carried forward for Tier 2 analysis, further evaluation of construction methods and project design would be conducted to consider measures to reduce indirect effects of sedimentation, turbidity, and altered hydrodynamics on oyster sanctuaries, fish nurseries, and turtle spawning areas.

The potential for other effects from disposal operations would be site-specific, depending on the characteristics of the dredged material, whether disposal is on land or in water, and the hydrodynamic conditions at the disposal site. These include indirect impacts from increased or decreased light penetration and potential release of toxicants that may alter feeding, breeding, and nursery habitat as well as affect the life and health of nearby wildlife.

Table 5-12: Aquatic Resources and Habitat

CORRIDOR	EFH (ACRES)	SAV (ACRES)	OYSTER RESOURCES (ACRES)	PRIORITY ANADROMOUS FISH WATERSHEDS (ACRES)	FISH SPAWNING & NURSERY DESIGNATED USE (ACRES)
6	64,317	41	11,126	2,968	18,032
7	36,649	274	3,445	956	2,888
8	87,678	460	7,962	16,252	953

Sources: MDNR (2010a; 2012; 2013; 2013b; 2014; 2015; 2015b; 2016); NOAA (2018a; 2018b)

An increase in the extent of impervious surface within Corridor 6 could indirectly increase the amount and velocity of runoff in streams located in, and downstream of, the direct impacts area, indirectly impacting water quality and human and wildlife uses. Runoff from roadways could contain heavy metals, salt, trash and associated materials, organic compounds, and nutrients. When runoff enters waters that are already impaired the impacts are cumulative and can result in accelerated changes in the macrobenthic community structure and composition, which in turn can affect the fish and amphibian populations that rely on them as a food source, as well as the birds and aquatic mammals that prey on the fish and amphibians. The effects can result in changes in community structure at a local level but may also extend further to include changes in ecosystem structure and function, particularly in the absence of proper mitigation.

Runoff could also pick up more sediment from disturbed soils during construction that could be deposited downstream, temporarily reducing water quality. The water quality and habitat indirect effects resulting from construction of impervious surfaces have the potential to negatively affect the EFH, oyster sanctuaries, and SAV beds (**Figure 4-17**), oyster reefs and resources (**Figure 4-19**), anadromous fish habitat and designated fish nursery and spawning habitat (**Figure 4-18**), sturgeon habitat (**Figure 4-20**), and potential habitat for the protected dwarf wedgemussel within Corridor 6. These habitats could be indirectly impacted through increased runoff volume that increases sedimentation and reduced water quality resulting from pollutants in the runoff, impacting aquatic life movement, breeding and nursery success, and hindering finding prey. Improvements would adhere to measures described for water quality such as compliance with the Maryland SWM Act, Erosion Control Law, compliance with local requirements, and adherence to guidelines identified in the *Maryland Stormwater Management and*

Erosion & Sediment Control Guidelines for State and Federal Projects (MDE, 2015). The potential adverse indirect impacts on water quality, aquatic habitat, and wildlife from stormwater runoff could be reduced or mitigated, though some indirect impacts would potentially occur even with appropriate minimization practices. Minimization would be included in the later stages of planning and design if a corridor is carried forward for Tier 2 evaluation, including a comprehensive stormwater management plan in compliance with applicable regulations.

Depending on the location of potential improvements within the corridor, direct effects to those wetlands and WSSC located in Corridor 6 (**Table 5-13**) could result from excavation and filling activities, and forested or scrub/shrub wetland clearing where the wetlands remain, but the vegetation is maintained as an emergent system. Direct impacts from cut/fill would result in loss of all wetland functions within the immediate footprint of the impact and indirectly contribute to habitat fragmentation effects described above. Indirectly, these activities could result in hydrologic isolation, or permanent cover changes in remaining wetlands. Some of the potential indirect effects that may occur because of changes to natural processes in wetlands in the corridor include changes to floodwater storage capacity and retention times, vegetative community composition and structure (from shading caused by constructed bridges or adjacent canopy cover changes), nutrient cycling, and aquatic life movement. These indirect effects could alter wetland functions such as groundwater recharge, flood flow alteration, shoreline stabilization, and nutrient export.

Table 5-13: Mapped Wetlands

CORRIDOR	NWI WETLANDS (ACRES)	WETLANDS OF SPECIAL STATE CONCERN (ACRES)
6	19,847	76
7	12,453	7
8	23,412	0

Sources: MDNR (2017); USFWS (2019a)

Filling floodplains to construct Corridor 6 improvements could result in loss of floodplain functions within the impacted floodplains in the corridor (**Table 5-14**). Floodplain encroachment could alter the hydrology of the floodplain that could indirectly result in more severe flooding in terms of flood height, duration, and erosion. The magnitude of the effects to wetland functions could also indirectly alter hydrologic flow through the floodplains in the corridor. A new crossing could be designed to adequately pass design floods and accommodate passage of aquatic organisms. The design could aim to minimize the indirect effects to water quality from drainage of the new crossing. Design modifications to eliminate or minimize floodplain encroachments to the extent practicable are required by EO 11988: Floodplain Management (42 FR 26951-26957: May 25, 1977). Corridor 6 contains the fewest 100-year FEMA floodplains compared to the other two corridors. Impacts to floodplains could occur under any of the corridors, even with required minimization actions and adherence to regulatory requirements.

Table 5-14: 100-Year FEMA Floodplains

CORRIDOR	100-YEAR FEMA FLOODPLAINS (ACRES)
6	3,047
7	6,643
8	3,949

Source: FEMA (2019)

Improvements proposed in Corridor 6 would require new roadway crossings over waterways, or the lengthening of existing culverts located along roadways in the corridor. However, the location of these crossings is not known at this time. Where they would occur, direct impacts to wetlands, streams, and floodplains could indirectly change hydrologic flow dynamics through adjacent natural communities located up or downstream of these crossings and could sometimes alter these dynamics at the ecosystem level. Preserving the hydrodynamic flow through these systems in the ICE Analysis Area is important because reduced flow reduces the ability to move sediment and material downstream, potentially clogging streams located in the corridor and reducing habitat functionality. This potential could be minimized by wetland and stream habitat restoration and compliance with EO 11988, Floodplain Management, as well as proper design of crossings in accordance with local, state, and federal standards. This could indirectly impact aquatic life movement, breeding and nursery habitat, and feeding/prey success. **Table 5-15** lists the linear feet of surface waters (streams) in Corridor 6.

Table 5-15: Surface Water Resources

CORRIDOR	SURFACE WATERS (LINEAR FEET)	TIER 2 STREAM[1] SEGMENTS (LINEAR FEET)	TIER 2 STREAM CATCHMENTS (ACRES)	SCENIC AND WILD RIVERS (LINEAR FEET)
6	344,378	0	0	0
7	394,021	0	259	10,588
8	471,887	0	0	0

Sources: MDNR (2016a; 2016b; No Date (a)); USGS (2019)
[1]Streams with high water quality

Reduction in riparian and canopy cover in Chesapeake Bay Critical Areas (**Figure 4-13; Table 5-16**) from construction within Corridor 6 could indirectly affect water chemistry by increasing sun exposure, leading to increases in dissolved oxygen, temperature, and photosynthesis, all of which impact nutrient cycling and aquatic life in the waters in, and adjacent to, the corridor. In addition, as discussed previously for wetlands, the opposite could occur as constructing a new bridge, and widened bridges and culverts at waterway crossings, could shadow wetlands, altering soil temperature and reducing photosynthesis that could indirectly alter the plant community and wildlife habitat in these areas, potentially indirectly impacting sensitive species and habitat.

Table 5-16: Chesapeake Bay Critical Area

CORRIDOR	IDA[1] (ACRES)	LDA[2] (ACRES)	RCA[3] (ACRES)	TOTAL WITHIN CORRIDOR (ACRES)
6	52	1,083	3,778	**4,913**
7	1,295	3,373	5,138	**9,806**
8	161	1,422	6,536	**8,119**

Source: MDNR (2018)

[1] Intensely developed areas; [2]Limited development areas; [3]Resource Conservation Areas

The removal of existing vegetation and canopy overhanging water habitat, and within riparian and forested habitat, could also enable the introduction or spread of existing invasive species over native plants, which could indirectly impact sensitive wildlife species habitat such as in the designated SSPRAs (**Figure 4-17**) located in Corridor 6. Construction can also indirectly increase the presence of invasive plant species as enabled by earth disturbance and spreading from vehicles. These changes to community composition, and competition with the spread of invasive species could reduce the amount of habitat preferred by native plant species, and indirectly impact sensitive wildlife habitat. While areas with active land disturbance could be vulnerable to the colonization of invasive plant species from adjacent properties, implementation of state and local provisions could reduce the potential for the establishment and proliferation of invasive species.

5.6.1.3 Historic Resources

Indirect effects include potential impacts to a historic property's setting, feeling and association that diminish the characteristics that qualify the historic property for NRHP eligibility.

Corridor 6 contains two known historic properties listed on the NRHP, but as the entire corridor has not been surveyed, additional historic properties may be present. Section 106 identification of historic properties would be completed during Tier 2 if Corridor 6 were selected in the Tier 1 Record of Decision. Potential impacts would be identified at that time. Assessment and resolution of adverse effects to historic properties, including mitigation, would be developed through the Section 106 process at that time.

5.6.1.4 Air Quality

Because no specific alignment or design features will be developed under the Tier 1 EIS, detailed air quality analysis is not feasible at this time for crossing improvements in Corridor 6. Potential improvements in Corridor 6 would increase traffic volume across the Bay, contributing emissions to the air shed managed in the SIP. The Tier 2 EIS would evaluate alignments within the Corridor selected in Tier 1 for a conformity analysis and other applicable air quality concerns as needed.

5.6.2 Induced Growth

5.6.2.1 Socioeconomic Resources

A crossing within Corridor 6 would provide new access from areas on the Eastern Shore to employment centers and markets on the Western Shore. The potential induced growth areas for Corridor 6 are shown below for Annapolis (**Figure 5-7**), Baltimore (**Figure 5-8**), Washington, DC (**Figure 5-9**), and I-95 (**Figure 5-10**). Induced growth areas include the areas on the Eastern Shore that, as a result of a crossing built in

Corridor 6, would be within a roughly 60-minute drive time of major employment centers on the Western Shore. Areas that are already within the specified travel time distances under existing conditions (as presented in **Section 5.4**) are not included within the induced growth study areas.

One of the factors affecting the extent of induced growth that could occur from new access is the availability of undeveloped land. Induced growth could lead to the conversion of undeveloped lands to development, or enable intensified land use of already developed land, depending on other favorable conditions for growth.

Table 5-17 and **Figure 5-11** present the acres of developed and undeveloped lands by employment center and travel time band for Corridor 6. Land use/land cover data provided by the MDP 2010 dataset and Delaware Office of State Planning Coordination's 2007 dataset (rev. 2012) were reclassified into developed and undeveloped land categories and overlain by travel time bands to calculate the acreage of undeveloped land per employment center. Open water is not included in the developed/undeveloped land cover categories.

As shown in **Table 5-17**, a new crossing within Corridor 6 would result in new access to undeveloped lands, potentially resulting in induced growth effects. Most notably, nearly 30,000 acres of agricultural land and over 13,000 acres of natural lands would now be within roughly 30 to 45-minute drive of Baltimore (see **Figure 5-11**). This area would primarily be located in the vicinity of Rock Hall, along MD 445 and MD 20, as well as near Queenstown and Centreville. An even larger area of undeveloped lands (over 200,000 acres of agriculture and natural lands) would now be within a roughly 45 to 60-minute drive of Baltimore. This new access to Baltimore, one of the largest regional concentrations of employment, could have potentially substantial effects on land use. Additional acreage, as detailed in **Table 5-17,** would also be within approximate commute distance of Annapolis, DC, and I-95 employment centers, further increasing the likelihood of potential induced growth effects.

If induced growth were to occur due to a new crossing in Corridor 6, the undeveloped lands could be converted to developed land uses such as residential and commercial use, and the developed areas may experience infill and/or redevelopment. Growth could also occur beyond the 60-minute travel bands associated with a new crossing in Corridor 6.

Figure 5-7: Induced Growth Study Areas - Corridor 6 – Annapolis

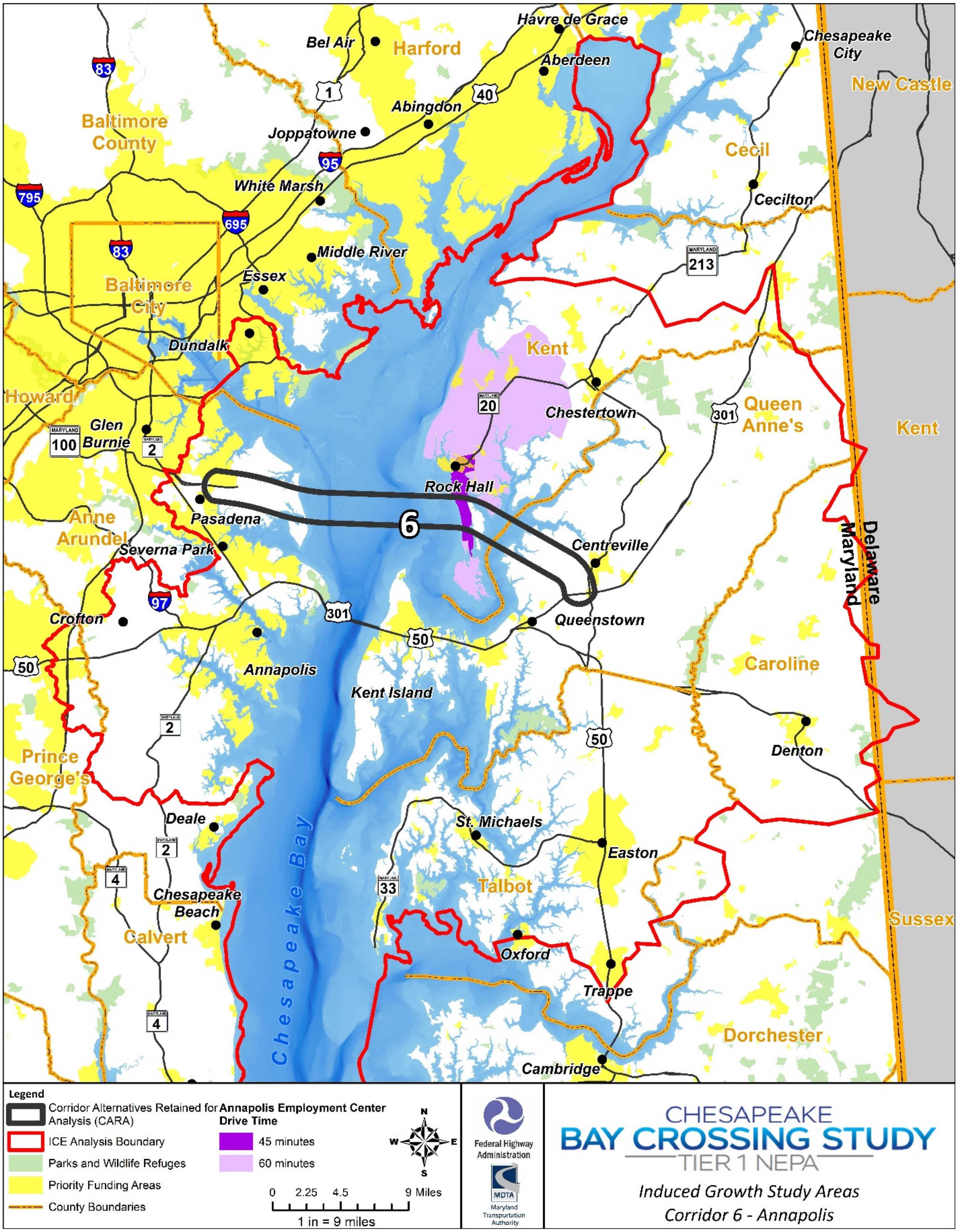


Figure 5-8: Induced Growth Study Areas – Corridor 6 – Baltimore

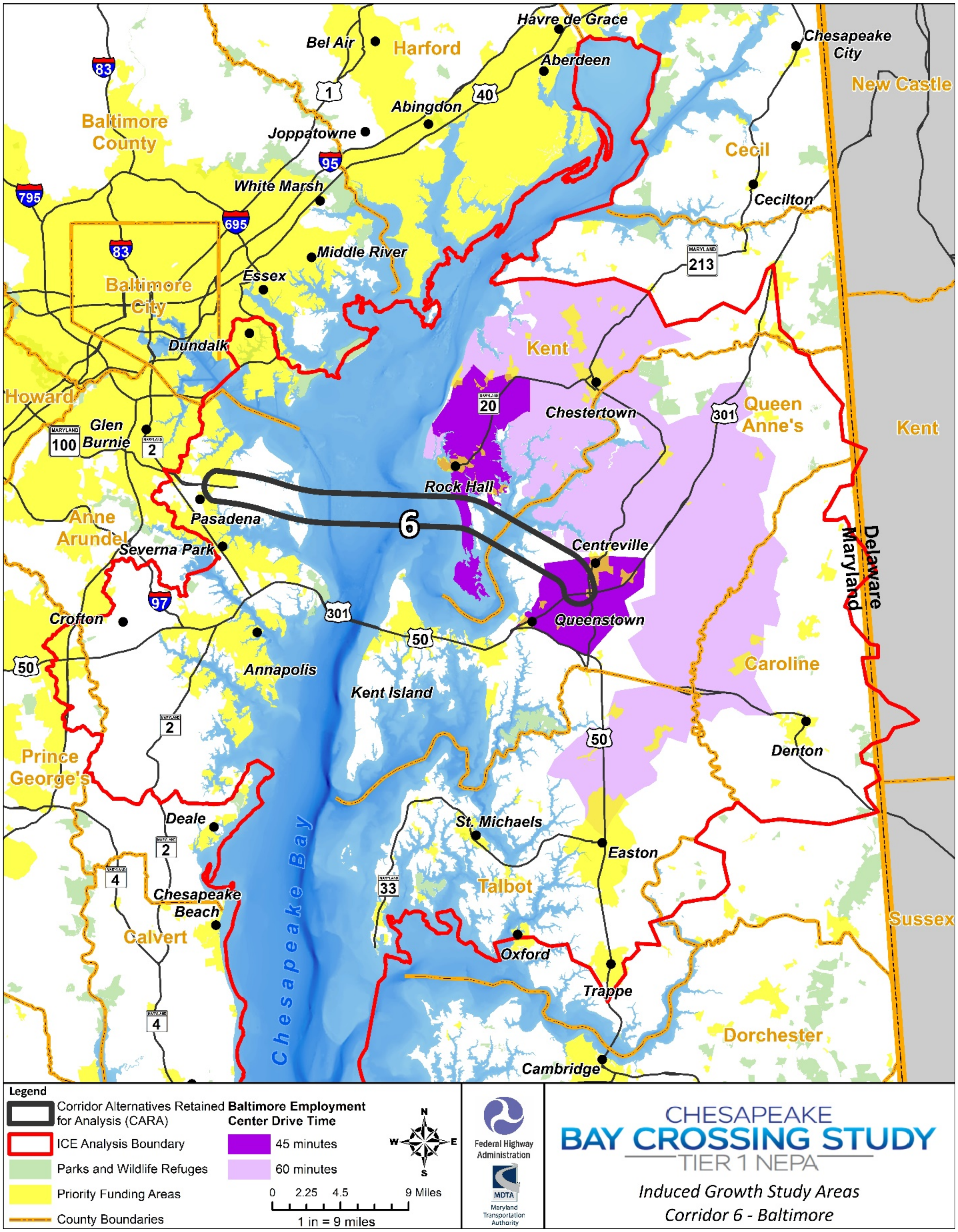


Figure 5-9: Induced Growth Study Areas – Corridor 6 – Washington, DC

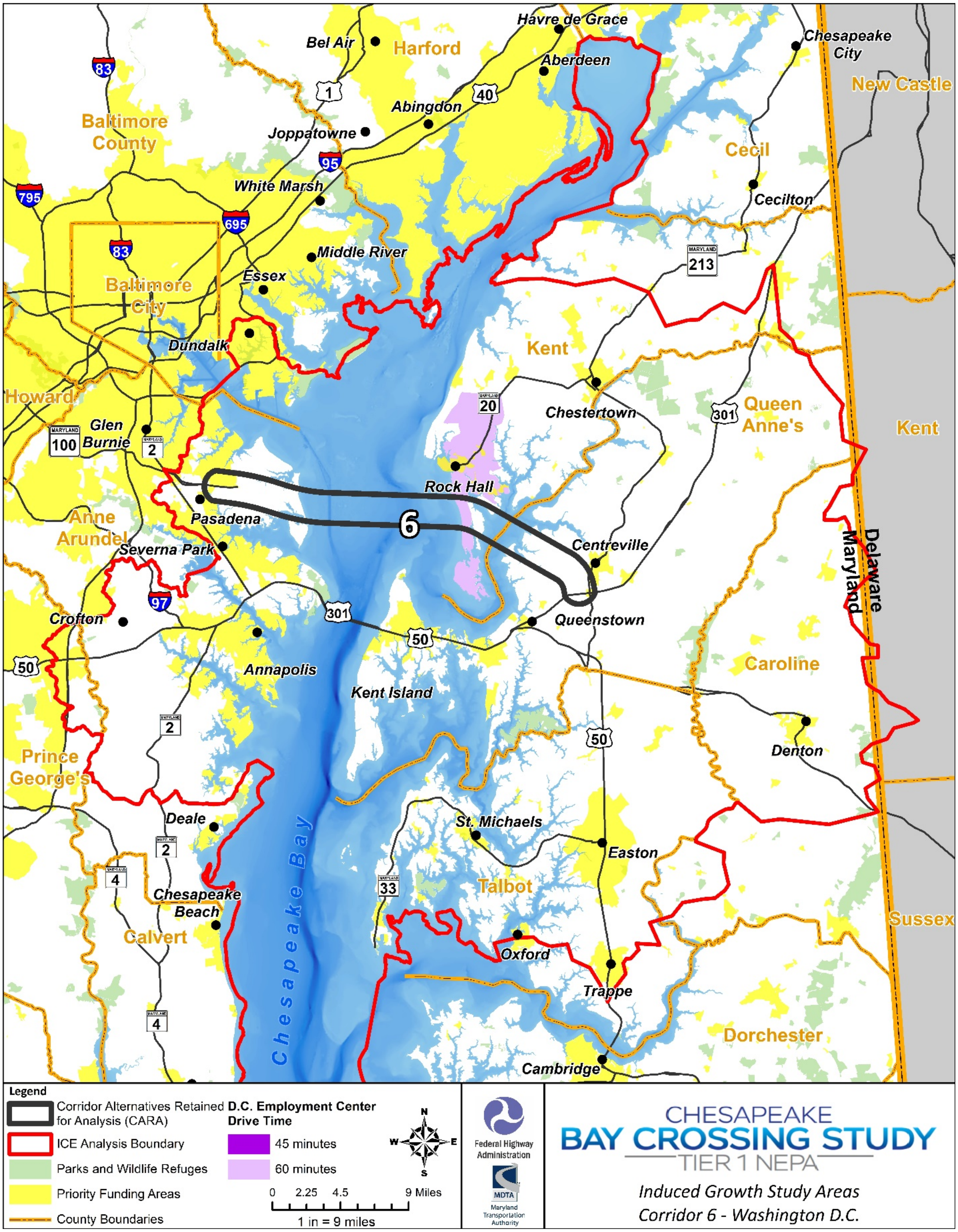


Figure 5-10: Induced Growth Study Areas – Corridor 6 – I-95

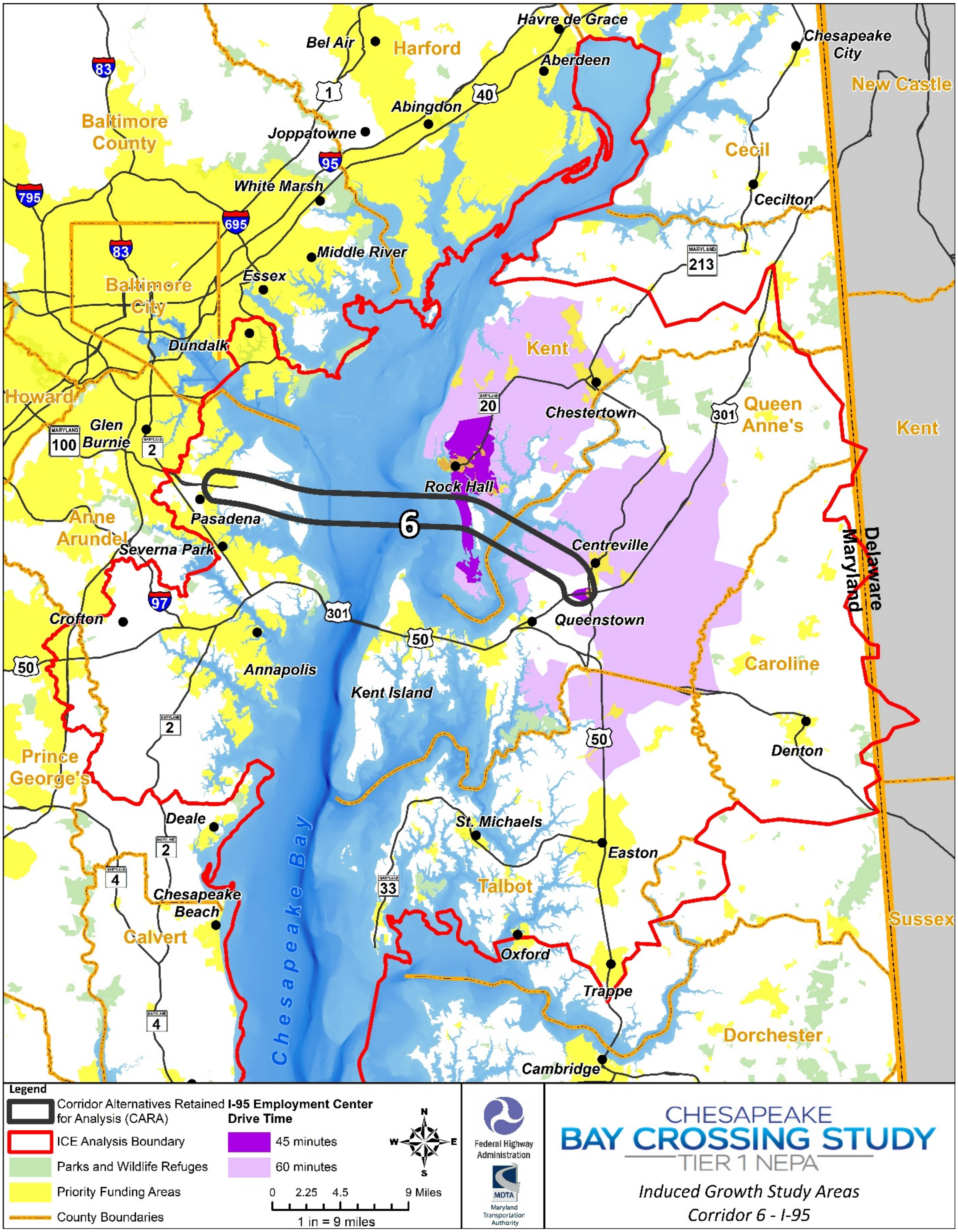
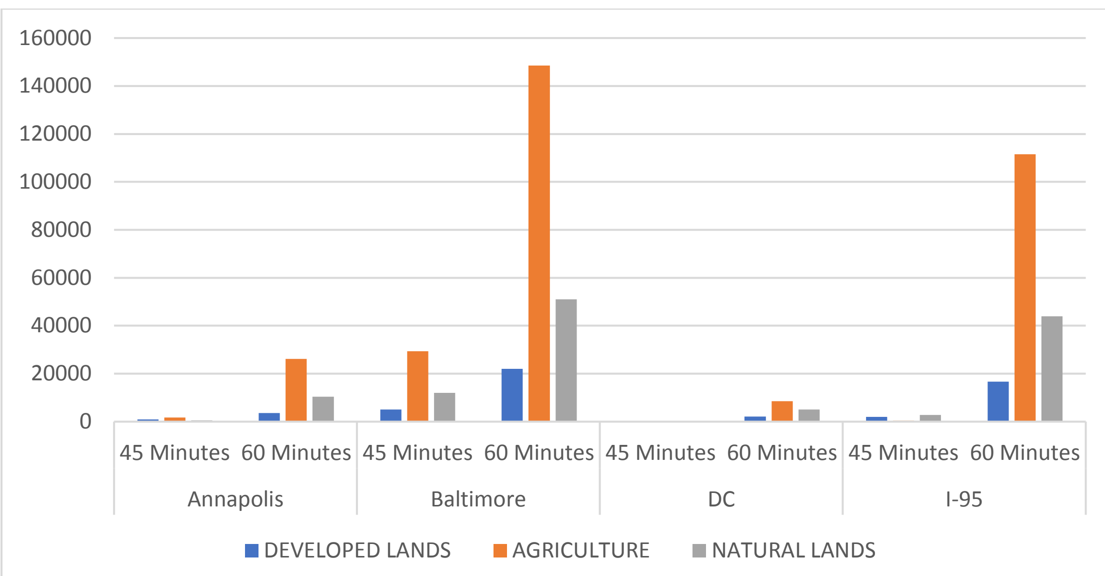


Table 5-17: Land Use/Land Cover in the Corridor 6 Induced Growth Study Area

EMPLOYMENT CENTER	TRAVEL MINUTES BAND	TRAVEL BAND SIZE (ACRES)	DEVELOPED LANDS (ACRES)	AGRICULTURE (ACRES)	NATURAL LANDS (ACRES)
Annapolis	30 - 45 Minutes	3,605	968	1,718	760
	45 - 60 Minutes	42,923	3,655	26,209	11,985
Baltimore	30 - 45 Minutes	48,450	5,021	29,337	13,282
	45 - 60 Minutes	226,346	22,063	148,494	52,987
DC	30 - 45 Minutes	N/A[1]	N/A	N/A	N/A
	45 - 60 Minutes	17,697	2,167	8,562	6,293
I-95	30 - 45 Minutes	12,424	1,977	343	3,702
	45 - 60 Minutes	175,785	16,692	111,475	45,642

Source: MDP (2010)
[1] N/A = Travel time band does not extend to Eastern Shore
Developed lands = residential, commercial, industrial, institutional, other developed lands, and transportation
Agriculture = cropland, pasture, orchards/vineyards/horticulture, feeding operations, barns/storage/breeding facilities, farmed fish facilities/ponds, row and garden crops
Natural Lands = wetlands, forest lands, mixed forest, and brush

Figure 5-11: Corridor 6 Developed and Undeveloped Land by Employment Center and Travel Time Band



Source: MDP (2010); Delaware OSPC (2012)
No Data = travel time band does not extend onto Eastern Shore
Developed lands = residential, commercial, industrial, institutional, other developed lands, and transportation
Agriculture = cropland, pasture, orchards/vineyards/horticulture, feeding operations, barns/storage/breeding facilities, farmed fish facilities/ponds, row and garden crops
Natural Lands = wetlands, forest lands, mixed forest, and brush

The location and extent of those areas designated by localities for growth influences the potential for induced growth associated with a potential Bay Crossing in Corridor 6. **Table 5-18** presents the acres of Maryland's PFAs by employment center and travel time band. These are areas where growth would potentially be encouraged, and where it would be potentially be most compatible with existing and planned land uses.

Table 5-18: Maryland Priority Funding Areas per Corridor 6 Employment Center and Travel Time Band

GEOGRAPHY	PRIORITY FUNDING AREA ACRES	
	45-MINUTES	60-MINUTES
Annapolis	1,118	2,986
Baltimore	5,629	21,715
DC	N/A[1]	1,689
I-95	1,839	10,210

Source: MD iMAP (2015)
[1] N/A = Travel time band does not extend to Eastern Shore

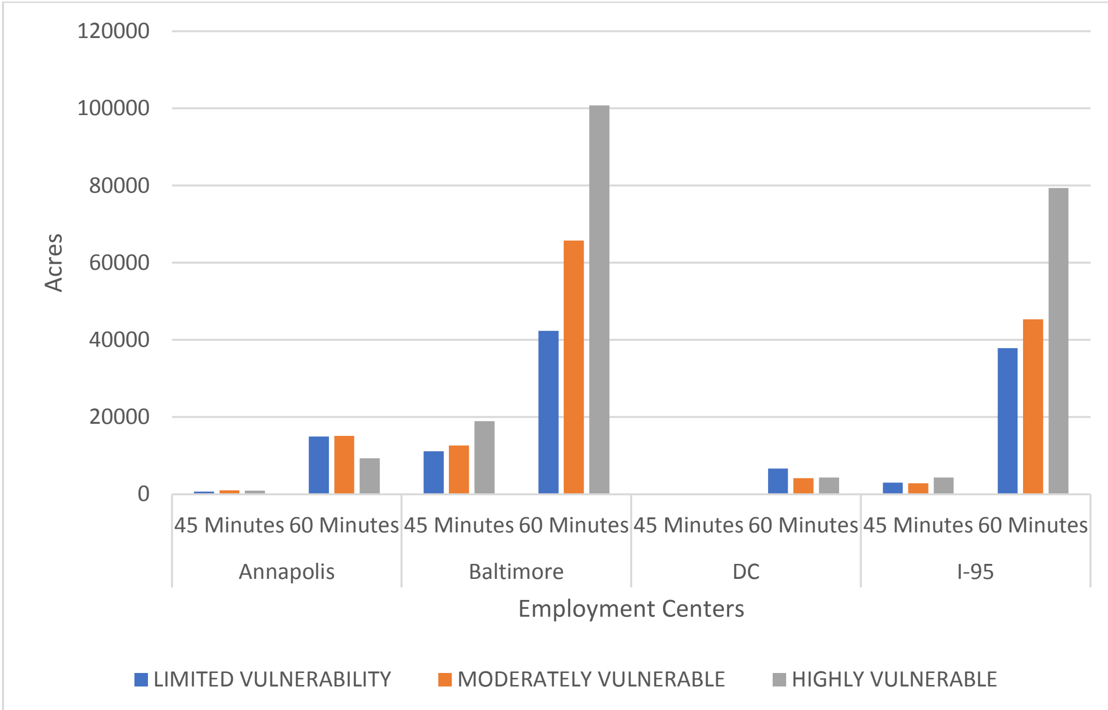
Based on MDP data, **Table 5-19** and **Figure 5-12** present the acreage vulnerable to residential development by employment center and travel time band. MDP used current zoning and land use management tools governing subdivision and development of land parcels to estimate development capacities for all rural resource land parcels in a grid across the state. By definition, all vulnerable lands were identified by MDP outside of PFAs.

Table 5-19: Maryland Development Vulnerability in the Corridor 6 Induced Growth Study Area

EMPLOYMENT CENTER	TRAVEL MINUTES BAND	TRAVEL BAND SIZE (ACRES)	LIMITED VULNERABILITY ACRES	MODERATELY VULNERABLE ACRES	HIGHLY VULNERABLE ACRES
Annapolis	45 Minutes	3,605	676	1,055	947
	60 Minutes	42,923	14,943	15,117	9,357
Baltimore	45 Minutes	48,450	11,133	12,627	18,933
	60 Minutes	226,346	42,325	65,723	100,740
DC	45 Minutes	0	0	0	0
	60 Minutes	17,697	6,655	4,191	4,369
I-95	45 Minutes	12,424	2,985	2,868	4,368
	60 Minutes	175,785	37,907	45,381	79,394

Source: MDP (2013)

Figure 5-12: Corridor 6 Development Vulnerability per Employment Center and Travel Time Band



Source: MDP (2013)
No data = travel time band does not extend onto Eastern Shore

As shown in **Table 5-19 and Figure 5-12**, much of the land within the Induced Growth Study Areas for Corridor 6 is considered moderately or highly vulnerable to residential development. Most notably, over 12,000 acres of moderately vulnerable land and nearly 19,000 acres of highly vulnerable land would be within a roughly 30 45-minute drive of Baltimore as a result of a new crossing in Corridor 6. Additionally, over 65,000 acres of moderately vulnerable land and over 100,000 acres of highly vulnerable land would be within a roughly 45 to 60-minute drive of Baltimore as a result of a new crossing in Corridor 6, beyond those areas already within such a distance. Additionally, substantial portions of land would be provided access within approximate commute distance of Annapolis, Washington DC, and the I-95 corridor where such access to the employment centers does not currently exist, as shown in **Table 5-19**. This would potentially further increase the likelihood of induced growth effects.

Potential induced growth effects associated with Corridor 6 could have both adverse and beneficial impacts. For example, induced residential growth could lead to commercial and institutional types of growth to service new residents. This could be beneficial to local employment and the local economy. It could also indirectly impact community cohesion, changing the character and use of neighborhoods and rural areas. The existing communities in the Induced Growth Study Areas for Corridor 6 are largely rural in character, with expanses of open space afforded by agricultural and natural resource lands interspersed with farmsteads and small communities. Development pressures from the new access created by a crossing in Corridor 6 could substantially alter the rural setting, impacting community cohesion.

Impacts to community facilities could also be beneficial or negative, such as displacing or burdening community facilities in the short-term from population growth, but in the long term potentially leading to more community facilities to serve a larger population. Population growth could lead to increased demand for school facilities, a need for greater water and sewer capacity to support planned growth or strain on other services provided by local governments.

EJ populations are identified in all travel time band geographies for Corridor 6 except those based on the Washington, DC employment center. Induced growth associated with a new crossing in Corridor 6 could have beneficial and adverse effects to EJ populations as described above for all community residents in the Corridor 6 Induced Growth Study Area. These induced effects could have greater impacts on EJ populations due to compounding circumstances. For example, low-income populations may be more reliant on community facilities that could be strained by potential population growth. Low income populations could also be negatively affected by rising housing costs associated with increased demand. Further evaluation in a Tier 2 analysis would be required to determine whether disproportionate adverse indirect effects to EJ communities would occur.

Induced growth effects could occur on the Western Shore due to a new crossing within Corridor 6. The magnitude of such an effect would likely be less than on the Eastern Shore, because the Western Shore is already connected to employment centers such as Baltimore by the existing roadway network without the barrier of the Chesapeake Bay. Corridor 6 would require approximately 6.6 miles of new on-land roadway capacity located between MD 100 and the shore of the Chesapeake Bay. This new infrastructure could potentially attract new or more intensive commercial development along the new roadway, and existing roads with access points to the new roadway. Specific access points to the improvements in Corridor 6 would not be determined until Tier 2; however, it is likely that state highways in the Corridor would be connected.

Additionally, commute times to employment centers could be marginally reduced for some areas connecting to the new roadway. Existing residential communities and undeveloped lands in this area could see pressure for greater development. The new roadway on the Western Shore would be located on a peninsula between the Magothy River and the Patapsco River; any induced growth effects would likely be localized in this area.

Indirect effects resulting from greater travel to beach destinations such as Ocean City could occur as a result of a crossing in Corridor 6. The Bay Bridge is a main route for travelers from Maryland, Washington, DC and Virginia traveling to destinations on the Atlantic coast in Maryland and Delaware. Greater access could increase demand for tourism, spurring new economic growth and land use development in coastal areas. The extent and location of such potential induced growth in tourist areas cannot be determined with certainty; such growth could have both positive and adverse effects. This potential indirect effect from increased tourism would be expected under any of the CARA.

5.6.2.2 Natural Resources

Development associated with induced growth can adversely affect water quality by increasing impervious surfaces leading to more stormwater and subsequent pollutant loading of nearby streams, increasing the need for water treatment, and exposing soil to erosion and the sedimentation of nearby waters, affecting human use and ecosystem functions. Federal, state and local regulations addressing sewer and stormwater runoff and protecting water quality could reduce potential adverse impacts.

Development associated with induced growth in the Induced Growth Study Area of Corridor 6 could affect wetlands, streams, and floodplain areas. **Table 5-20, Table 5-21**, **Table 5-22,** and **Table 5-23** present an estimate of wetland acres, floodplain acres, linear feet of streams and Chesapeake Bay Critical Area respectively, in the Corridor 6 Induced Growth Study Area by employment center and travel time band as a frame of reference for the extent of the resources potentially affected.

The induced growth areas for Corridor 6 contain notable amounts of wetlands, floodplains, streams, and Critical Area, particularly for the Baltimore and I-95 employment centers. Should future induced growth and development occur related to a new Bay Crossing in Corridor 6, some portion of these waters, wetlands, streams, floodplains or Critical Areas could potentially be impacted by encroachment. New development could be subject to review, approval, and/or permits from local, state, or federal agencies (including the USACE) but impacts would still potentially occur.

Table 5-20: NWI Wetlands Acres per Corridor 6 Employment Center and Travel Time Band

GEOGRAPHY	NATIONAL WETLANDS INVENTORY ACRES	
	30-45 MINUTES	45-60 MINUTES
Annapolis	707	6,572
Baltimore	7,253	27,328
DC	N/A[1]	4,142
I-95	2,438	22,827

Source: USFWS (2016)

[1] N/A = Travel time band does not extend to Eastern Shore

Table 5-21: FEMA 100-Year Floodplain Acres per Corridor 6 Employment Center and Travel Time Band

GEOGRAPHY	FEMA 100-YEAR FLOODPLAIN ACRES	
	30-45 MINUTES	45-60 MINUTES
Annapolis	923	4,634
Baltimore	3,950	11,414
DC	N/A[1]	3,529
I-95	2,669	9,442

Source: FEMA (2019)

[1] N/A = Travel time band does not extend to Eastern Shore

Table 5-22: Linear feet of Streams per Corridor 6 Employment Center and Travel Time Band

GEOGRAPHY	LINEAR FEET OF STREAMS	
	30-45 MINUTES	45-60 MINUTES
Annapolis	34,163	393,617
Baltimore	529,641	3,781,613
DC	N/A[1]	119,819
I-95	96,687	2,723,363

Source: USGS (2016)

[1] N/A = Travel time band does not extend to Eastern Shore

Table 5-23: Acres of Chesapeake Bay Critical Area per Corridor 6 Employment Center and Travel Time Band

GEOGRAPHY	ACRES OF CHESAPEAKE BAY CRITICAL AREA	
	30-45 MINUTES	45-60 MINUTES
Annapolis	2,084	11,653
Baltimore	8,368	24,982
DC	N/A	6,056
I-95	4,754	24,751

Table 5-24 presents the USGS 12-digit HUC Watersheds located within one or more of the Corridor 6 Induced Growth Study Areas. The table includes the acres and percentage of the total watershed area located within one or more of Induced Growth Study Areas for Corridor 6.

Table 5-24: HUC 12 Watersheds within One or More Corridor 6 Induced Growth Study Areas

12-Digit HUC	USGS 12-Digit Watershed Name	Acres within One or More Travel Bands	Percentage within One or More Travel Bands
020600050205	Chapel Branch-Choptank River	1,990	8%
020600020409	Corsica River	24,020	95%
020600020502	Fairlee Creek-Frontal Chesapeake Bay	22,640	80%
020600050204	Forge Branch-Choptank River	2,860	17%
020600050105	Jadwins Creek-Tuckahoe Creek	12,150	44%
020600050103	Jarmans Branch	13,980	100%
020600050301	Kings Creek	3,220	22%
020600020410	Langford Creek	23,550	88%
020600020411	Lower Chester River	15,630	32%
020600050102	Lower Mason Branch	11,760	100%
020600020603	Lower Wye East River	2,610	21%
020600020408	Middle Chester River	21,620	80%
020600020605	Miles River	10,270	30%
020600020405	Morgan Creek	14,690	65%
020600050104	Norwich Creek-Tuckahoe Creek	23,990	100%
020600020404	Red Lion Branch	9,190	60%
020600020601	Skipton Creek	11,610	93%
020600020407	Southeast Creek	33,730	96%
020600020501	Still Pond Creek-Frontal Chesapeake Bay	3,510	24%
020600020503	Swan Creek-Frontal Chesapeake Bay	8,200	62%
020600050504	Tred Avon River-Frontal Choptank River	100	<1%
020600020406	Upper Chester River	3,610	10%
020600050101	Upper Mason Branch	10,350	48%
020600020602	Upper Wye East River	14,980	77%
020600020604	Wye River	4,580	35%

The impacts of induced growth could include wildlife loss; habitat loss, fragmentation, and degradation; disruption of resting, feeding, movement, breeding, and nursery sites; changes in wildlife population density and species richness; alterations of hydrology and species interaction; and the imperilment of protected species. Potential impacts to federally protected species on private property are also regulated**.** Proposed modifications to wetlands could be federally and state regulated as well, reducing potential adverse impacts of induced growth to wildlife and wildlife habitat as described in **Section 4.2**. Impacts would potentially occur, even with adherence to applicable regulations.

5.6.2.3 Historic Resources

New construction or rehabilitation associated with induced growth has the potential to adversely affect archaeological and architectural historic properties. This could occur by:

- Demolition, excavation, or vibration effects;
- Changing the design, materials, or workmanship; and
- Altering any characteristic of an historic property that contribute to the integrity of a historic property.

Development of new land uses or more intensive land uses could lead to destruction or degradation of cultural resources, as older structures are cleared to make way for new construction, or agricultural and rural areas are converted to more intensive urban and suburban uses with resulting changes in land use context surrounding cultural resources. Archaeological sites could also be impacted by new construction accompanying land development. Given the rural nature of the induced growth study areas on the Eastern Shore, the alteration of the context surrounding rural and agricultural-related cultural resources may be particularly impacted if substantial land use change occurs.

Potential impacts to historic resources are regulated as previously described in **Section 4.3**. Development projects funded, permitted, or on lands controlled by federal and state agencies must take into account effects on historic properties by complying with Section 106 of the NHPA, the Maryland Historical Trust Act of 1985, and Delaware Code Title 7 Ch 53 Archaeological Resources in the State, and Title 7 Ch 54 Unmarked Human Burials and Human Skeletal Remains.

Many localities have historic preservation commissions that maintain and update local lists of historic sites and review architectural projects in historic and cultural preservation overlay districts. These review processes could reduce the potential adverse effects to historic properties from induced growth associated with constructing a new crossing and other proposed roadway improvements in Corridor 6.

5.7 <u>Corridor 7</u>

5.7.1 Encroachment Effects

5.7.1.1 Socioeconomic Resources

Construction of a new crossing in Corridor 7 would involve similar potential for indirect impacts to socioeconomic resources described for Corridor 6; though the potential to utilize existing infrastructure in the corridor could minimize some types of indirect effects. Increased traffic capacity in Corridor 7 would increase travel speed and reliability while decreasing travel time across the Bay, benefiting all persons traveling across the existing Bay Bridge with greater access. This could indirectly benefit employment, businesses, and the local economy as described for Corridor 6 and Corridor 8.

A new crossing in Corridor 7 would divert traffic from the existing Bay Bridge, indirectly affecting services and businesses along US 50/301 near the existing crossing if the new crossing is not directly adjacent to the existing crossing. However, not all of the traffic diverted from the existing bridge would be expected to patronize the businesses or other service providers along the existing alignment, and the diverted traffic would be within roughly one mile of the existing alignment in Corridor 7, minimizing impacts to the local economy.

As discussed for Corridor 6, a new crossing in Corridor 7 could affect community cohesion. A new crossing in Corridor 7 would convert other land uses to transportation use through right-of-way acquisition that may indirectly affect land use planning. Conflicts with a locality's land use plan would be less likely if the on-land infrastructure connecting to a new crossing adjacent to the existing crossing was widened, as opposed to new alignment through more residential or rural areas. Similar to the discussion for Corridor 6, potential relocations could indirectly impact community cohesion if many relocations would be required and affected property owners or tenants cannot find replacement property in the same communities. Impacts to local roadways could have indirect effects such as altered traffic patterns and changes in local access. Greater access over the Chesapeake Bay could provide better access to community facilities such as hospitals which are more prevalent on the Western Shore.

Short-term detours and reduced parking during construction could require new travel patterns indirectly impacting community cohesion, and indirectly affecting businesses and the local economy similar to Corridor 6. Traffic could be temporarily increased on detour routes and local streets, temporarily changing the community setting. Commute times could be temporarily increased and access to businesses affected by increased travel distance and travel time and temporary loss of some parking that reduces patronage in the short-term. The same measures discussed for Corridor 6 to limit the potential indirect effects of temporary detours and lost parking to residents and businesses could apply to Corridor 7.

Similar to Corridor 6, no EJ populations were identified within the two-mile wide Corridor 7 limits; thus, other than induced growth discussed below, a new crossing in Corridor 7 would not be expected to have disproportionate adverse effects to low-income or minority populations.

5.7.1.2 Natural Resources

Potential improvements within Corridor 7 would provide additional capacity near the existing Bay Crossing in a more urbanized area, with more intensely developed land cover (**Table 5-9**), when compared to Corridors 6 and 8. Considering the degree of development, amount of existing road infrastructure in the area, and corridor length, a new crossing within Corridor 7 has the potential for fewer direct impacts to natural resources, and consequently, fewer indirect impacts when compared to potential improvements in Corridors 6 or 8, dependent on the location of improvements within each corridor.

If the direct effects to a resource are extensive, the indirect effects could potentially be more extensive as well. If less infrastructure was needed to connect a new Bay Crossing to the existing roadway network on the Eastern and Western Shores, direct and indirect impacts to jurisdictional resources, habitat, and important ecological areas could be lessened.

Improvements in Corridor 7 have the potential for less impacts to sturgeon and sea turtle Section 7 Consultation Areas (**Table 5-10**), anadromous fish watersheds, EFH, and oyster resources (**Table 5-12**), FIDS habitat and TEAs (**Table 5-11**), and mapped NWI wetlands (**Table 5-13**) than potential improvements in Corridors 6 or 8. Improvements in the corridor have the potential for less direct, and therefore indirect impacts, to designated fish spawning habitat and nursery areas (**Table 5-12**) and protected forested habitat (**Table 5-17**) than potentially for improvements in Corridor 6. It also could have potentially less impacts to SSPRA (**Table 5-16**), SAV habitat (**Table 5-18**), and surface water resources (**Table 5-15**) than improvements in Corridor 8. However, depending on their location, Bay Crossing improvements in Corridor 7 could potentially have higher impacts to floodplains (**Table 5-14**), the Chesapeake Bay Critical Area (**Table 5-16**), Tier 2 stream catchments, and Scenic and Wild Rivers (**Table 5-15**) than improvements in Corridors 6 or 8. Because of the difference in corridor lengths (Corridor 7 being the shortest potential corridor), and the location of impaired waters, improvements in Corridor 7 may result in less direct and indirect impacts to impaired waters than potential improvements in Corridor 8.

Corridor 7 potential improvements would cause some habitat loss that could indirectly reduce overall wildlife populations, and shift species' range, causing overpopulation in increasingly smaller areas of remaining habitat, or abandonment of the area altogether. Habitat loss can also affect species richness. Potential indirect habitat fragmentation effects would be similar to those discussed for improvements in Corridor 6.

The types of indirect effects to forestland, wetlands, waters, water quality, floodplains, species, and benthic, aquatic, and terrestrial habitat would be similar to those discussed for Corridor 6 (see **Section 5.6.1.2**). However, the degree and extent of these potential impacts could be different, based on the difference in corridor lengths, the presence of an existing crossing, and the amount of urbanization in the corridor. Potential resource impact mitigation and avoidance options would be available for improvements within Corridor 7, similar to those discussed for Corridor 6.

5.7.1.3 Historic Resources

A new crossing in Corridor 7 could indirectly impact the setting, feeling, and association of historic properties in the viewshed. Presently, Corridor 7 includes nine known historic properties listed on the NRHP. As Corridor 7 has not been completely surveyed, additional historic properties may be present. If improvements in Corridor 7 proceed for further evaluation, Section 106 identification of historic properties would take place for the Tier 2 EIS. If improvements in Corridor 7 were to proceed to construction, and potential impacts are identified, mitigation for adverse effects to historic properties would be developed through the Section 106 process at that time.

5.7.1.4 Air Quality

As discussed for Corridor 6, detailed air quality analysis is not feasible at this time as no detailed alignment for a new crossing and associated on-land infrastructure in Corridor 7 is identified in the Tier 1 EIS. Potential improvements in Corridor 7 could impact emissions to the air shed managed in the SIP. The Tier 2 EIS would evaluate alignments within the Corridor selected in Tier 1 and specific proposed improvements for a conformity analysis and other applicable air quality concerns as needed. If Corridor 7 is selected as the Recommended Preferred Corridor, a planning level design for improvements in the corridor would be completed. At that time, it will be determined if the planning level design is in conformity with the SIP.

5.7.2 Induced Growth

5.7.2.1 Socioeconomic Resources

Because improvements in Corridor 7 would be in relatively close proximity to the existing Bay Bridge and approach infrastructure, no access to developable areas on the Eastern Shore would be created beyond what already exists. The Bay Bridge already provides access to the Eastern Shore within Corridor 7 under existing conditions. Therefore, a new crossing would have the effect of increasing capacity for those areas that are currently within a commute distance of Western Shore employment centers (as described in **Section 5.4**).

New growth associated with a new crossing in Corridor 7 could occur beyond what would be expected under the No-Build Alternative, but the extent of such growth cannot be determined with certainty. Factors such as economic conditions and potential future changes to local plans and land use policies create a degree of uncertainty in predicting future indirect land use effects. As discussed in **Section 4.1.1**, the current comprehensive plans and zoning in Corridor 7 are focused on directing development to designated areas while preserving agricultural and natural lands. The areas designated for growth (such as PFAs or existing developed areas) would likely be prioritized for new development.

The new capacity from a new crossing in Corridor 7 would largely accommodate existing traffic from past growth (as evidenced by the poor traffic conditions seen today on the existing Bay Bridge and described in the Purpose and Need chapter of the EIS), along with reasonably foreseeable traffic growth that is expected to occur regardless of a new crossing.

It is also reasonably foreseeable that some level of increased development would likely occur with a new crossing in Corridor 7 beyond that which would occur under the No-Build Alternative. In contrast to Corridors 6 and 8, however, induced growth in Corridor 7 would more likely be a modest intensification of existing land use patterns, rather than a substantial change in land use resulting from new access to employment areas where none exists currently. Such growth could occur on both the Eastern and Western Shores, though the effect would likely be of a lesser magnitude on the Western Shore.

Induced growth from constructing a new crossing in Corridor 7 would have similar types of beneficial and adverse impacts to socioeconomic resources as described for Corridor 6, although potentially to a lesser extent. This is because existing growth and development trends would likely continue in the existing conditions Induced Growth Study Area (**Section 5.4**) that has had long-term access to the Western Shore.

Induced growth associated with a new crossing in Corridor 7 could have beneficial and adverse effects to EJ populations. Indirect effects from induced growth are anticipated to be generally less for Corridor 7 compared to Corridors 6 or 8; any adverse indirect effects to communities would not be expected to be disproportionate to EJ populations. However, if Corridor 7 is advanced into Tier 2, additional analysis would be required to determine whether disproportionate adverse effects to EJ populations would occur.

Indirect effects resulting from greater travel to beach destinations such as Ocean City could occur as a result of Corridor 6. The Bay Bridge is a main route for travelers from Maryland, Washington, DC and

Virginia traveling to destinations on the Atlantic coast in Maryland and Delaware. Greater access to these beach resort areas could increase demand for tourism, spurring new economic growth and land use development. The extent and location of such potential induced growth in tourist areas cannot be determined with certainty; such growth could have both positive and adverse effects. This potential indirect effect from increased tourism would be expected under any of the CARA.

5.7.2.2 Natural Resources

As noted in the prior section, potential induced growth within Corridor 7 would be most likely to occur as an intensification of existing land use patterns. Development has already occurred in the vicinity of the existing crossing, and major changes to land use patterns would not be expected to result. However, greater demand for growth could occur compared to the No-Build Alternative. As discussed under the Corridor 6 alternative, development associated with induced growth can adversely affect natural resources. The extent of induced growth and subsequent indirect impacts to natural resources would be expected to be lower under Corridor 7 compared to Corridors 6 or 8 where new access to undeveloped lands would be created. Federal, state and local regulations could reduce potential adverse impacts associated with induced growth in the Corridor 7 travel time band geography, as discussed for Corridor 6. However, impacts would likely occur even with adherence to applicable regulations.

5.7.2.3 Historic Resources

Impacts of induced growth on historic resources can include indirect effects, as described for Corridor 6. Potential impacts to historic resources are regulated as previously described in **Section 4.3**. As noted above, potential induced growth within Corridor 7 would be most likely to occur as an intensification of existing land use patterns. Development has already occurred in the vicinity of the existing crossing, and major changes to land use patterns would not be expected to result. New construction or redevelopment associated with induced growth has the potential to adversely affect archaeological and architectural historic properties as discussed for Corridor 6. Development projects funded, permitted, or on lands controlled by federal and state agencies must take into account effects on historic properties by complying with Section 106 of the NHPA, the Maryland Historical Trust Act of 1985, and Delaware Code Title 7 Ch 53 Archaeological Resources in the State, and title 7 Ch 54 Unmarked Human Burials and Human Skeletal Remains. In addition, many localities have historic preservation commissions that maintain and update lists of historic sites and review architectural projects in historic and cultural preservation overlay districts. These processes could reduce the potential adverse effects to historic properties from induced growth associated with a new crossing in Corridor 7.

5.8 Corridor 8

5.8.1 Encroachment Effects

5.8.1.1 Socioeconomic Resources

A new crossing in Corridor 8 would have similar types of indirect socioeconomic resources effects as described for Corridor 6, such as economic effects and community cohesion impacts, impacts on and impacts on local roadways and traffic. A new crossing in Corridor 8 would divert traffic from the existing Bay Bridge (located within Corridor 7), potentially affecting services and businesses along US 50/301 near the existing crossing. Traffic studies conducted for alternatives screening shows that by 2040 on summer weekends, a new crossing located within Corridor 8 would divert 14,300 vehicles per day from the existing bridge relative to 2017 ADT; on weekdays it would divert 500 vehicles per day. However, not all traffic over the existing bridge would be patrons of businesses or other services provided in the ICE Analysis Boundary.

Similar to Corridors 6 and 7, no EJ populations were identified in the Corridor 8 study area. Therefore, a new crossing and associated roadway improvements in Corridor 8 would not be expected to have disproportionate adverse effects to EJ populations.

5.8.1.2 Natural Resources

As with potential Corridor 6 improvements, Corridor 8 improvements could provide a new Bay Crossing on a new location. The types of natural resources and conservation areas within Corridor 8 are generally similar to those discussed for Corridors 6 and 7. Corridor 8 has a longer length than the other corridors, and therefore, it has the potential for greater natural resource direct and indirect effects, dependent on where improvements are located within each corridor. If the direct effects to a resource are extensive, the indirect effects could potentially be more extensive as well. Based on the Corridor 8 location, and the location of resources within the corridor, Corridor 8 improvements have the potential for greater direct and indirect effects to forested areas (**Table 5-9**), SSPRA, sturgeon and sea turtle Section 7 Consultation Areas (**Table 5-10**), FIDS habitat (**Table 5-11**), EFH, SAV habitat, and priority anadromous fish watersheds (**Table 5-12**), mapped NWI wetlands (**Table 5-13**), and surface waters (**Table 5-15**) when compared to Corridors 6 and 7.

Corridor 8 improvements could potentially have less direct effects, and therefore, potentially less indirect effects to TEAs (**Table 5-11**), oyster resources (**Table 5-12**), and floodplains (**Table 5-14**) than Corridor 6 improvements, and less potential effects to FCA easements (**Table 5-11**), designated fish spawning and nursery areas (**Table 5-12**), and WSSC (**Table 5-13**) than potential improvements in Corridors 6 or 7, as indicated by the presence of these resources within the corridors. Improvements in Corridor 8 could potentially have less direct and indirect effects to floodplains (**Table 5-14**) and the Chesapeake Bay Critical Area (**Table 5-16**) than potential improvements in Corridor 7.

Corridor 8 improvements could have similar types of indirect effects to natural resources as described for Corridor 6 (See **Section 5.6.1.2**). These include indirect effects to forestland, wetlands, waters, water quality, floodplains, Critical Areas, species, and benthic, aquatic, and terrestrial habitat. The location and extent of these indirect effects would be dependent on the location of potential improvements within the corridor. The same avoidance, minimization, and mitigation measures as described for Corridor 6 could reduce adverse indirect effects from Corridor 8 improvements to natural resources.

5.8.1.3 Historic Resources

Indirect effects to historic properties include potential impacts to a historic property's setting, feeling and association that diminish the historic characteristics that qualify the historic property for NRHP eligibility.

The Corridor 8 study area has 11 known historic properties listed on the NRHP. The entire study corridor has not been surveyed, thus it is possible that more historic properties are present. Section 106 identification of historic properties would be complete during a Tier 2 EIS. Assessment and resolution of adverse effects to historic properties, including any mitigation, would be developed through the Section 106 process at that time.

5.8.1.4 Air Quality

Because no specific alignment or design features would be developed under the Tier 1 EIS, detailed air quality analysis is not feasible at this time for crossing improvements in Corridor 8. Potential improvements in Corridor 8 could impact emissions to the air shed managed in the SIP. The Tier 2 EIS would evaluate alignments within the Corridor selected in Tier 1 for a conformity analysis and other applicable air quality concerns as needed. If Corridor 8 is selected as the Recommended Preferred Corridor, advances toward construction, and is found in conformity with the SIP, the indirect effects of the potential improvements in Corridor 8 would be relatively minor.

5.8.2 Induced Growth

5.8.2.1 Socioeconomic Resources

Induced growth could occur under Corridor 8 as a crossing on new location would provide access from areas on the Eastern Shore to employment centers and markets on the Western Shore where no such access currently exists within a typical commute distance. One of the factors affecting the extent of induced growth that could occur from new access is the availability of undeveloped land. Induced growth could lead to the conversion of undeveloped lands to development, or enable intensified land use of already developed land, depending on other favorable conditions for growth. The potential induced growth areas for Corridor 8 are shown below for Annapolis (**Figure 5-13**), Baltimore (**Figure 5-14**), Washington, DC (**Figure 5-15**), and I-95 (**Figure 5-16**).

Table 5-25 and **Figure 5-16** present the acres of developed and undeveloped lands by employment center and travel time band. A new crossing within Corridor 8 would result in new access to undeveloped lands, potentially resulting in induced growth effects. Just over 6,000 acres of agricultural land and over 4,000 acres of natural land would be within a roughly 30 to 45-minute drive of Annapolis. Relatively small areas of agricultural land (275 acres) and natural land (138 acres) would be within a roughly 30 to 45-minute drive of Baltimore. No areas would be within a 30 to 45-minute drive of Washington, DC or the I-95 Corridor, though a relatively large area (nearly 75,000 acres) of undeveloped farmland and natural land would be within approximately 45 to 60 minutes of Washington, DC.

Figure 5-13: Induced Growth Study Areas – Corridor 8 - Annapolis

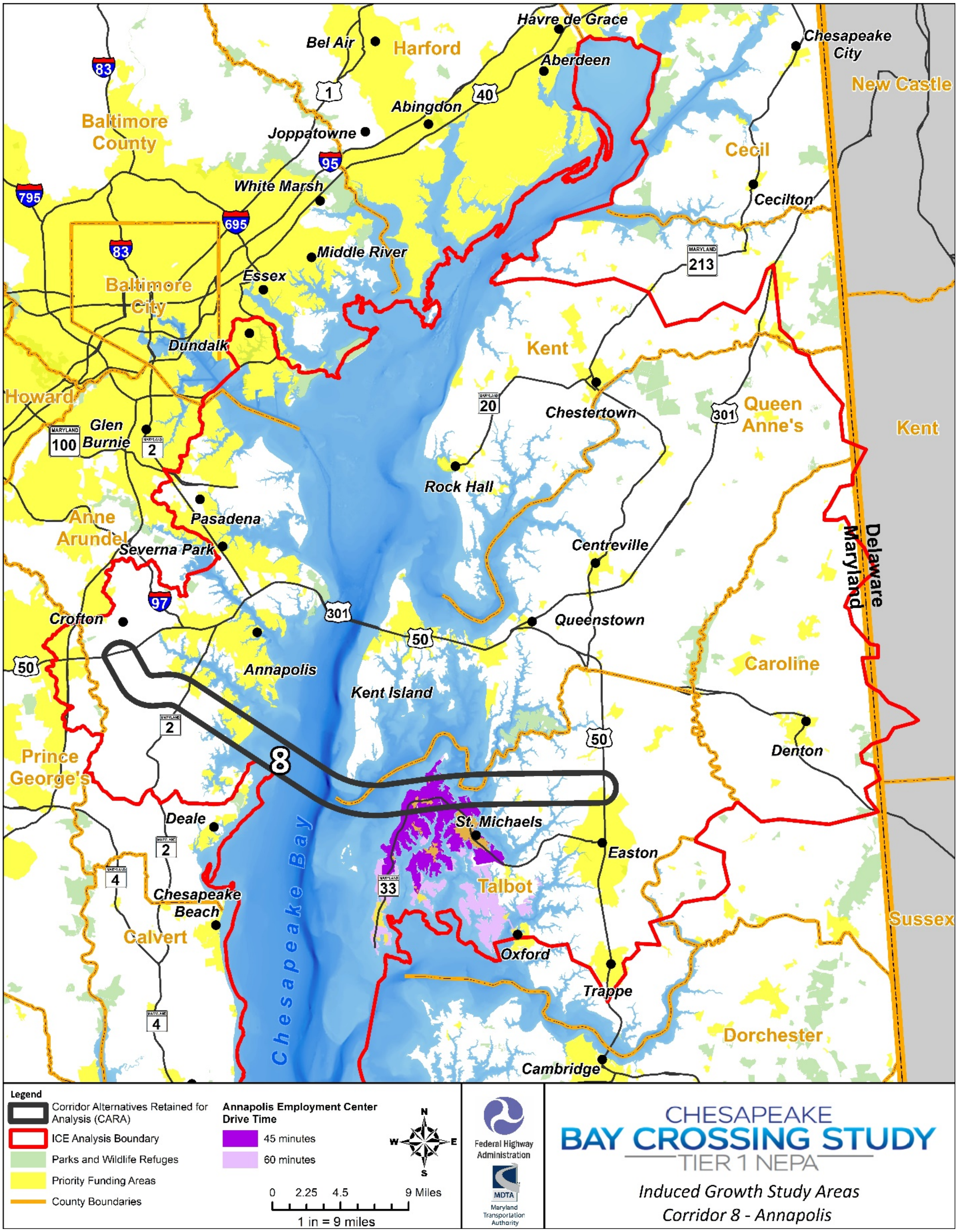


Figure 5-14: Induced Growth Study Areas – Corridor 8 - Baltimore

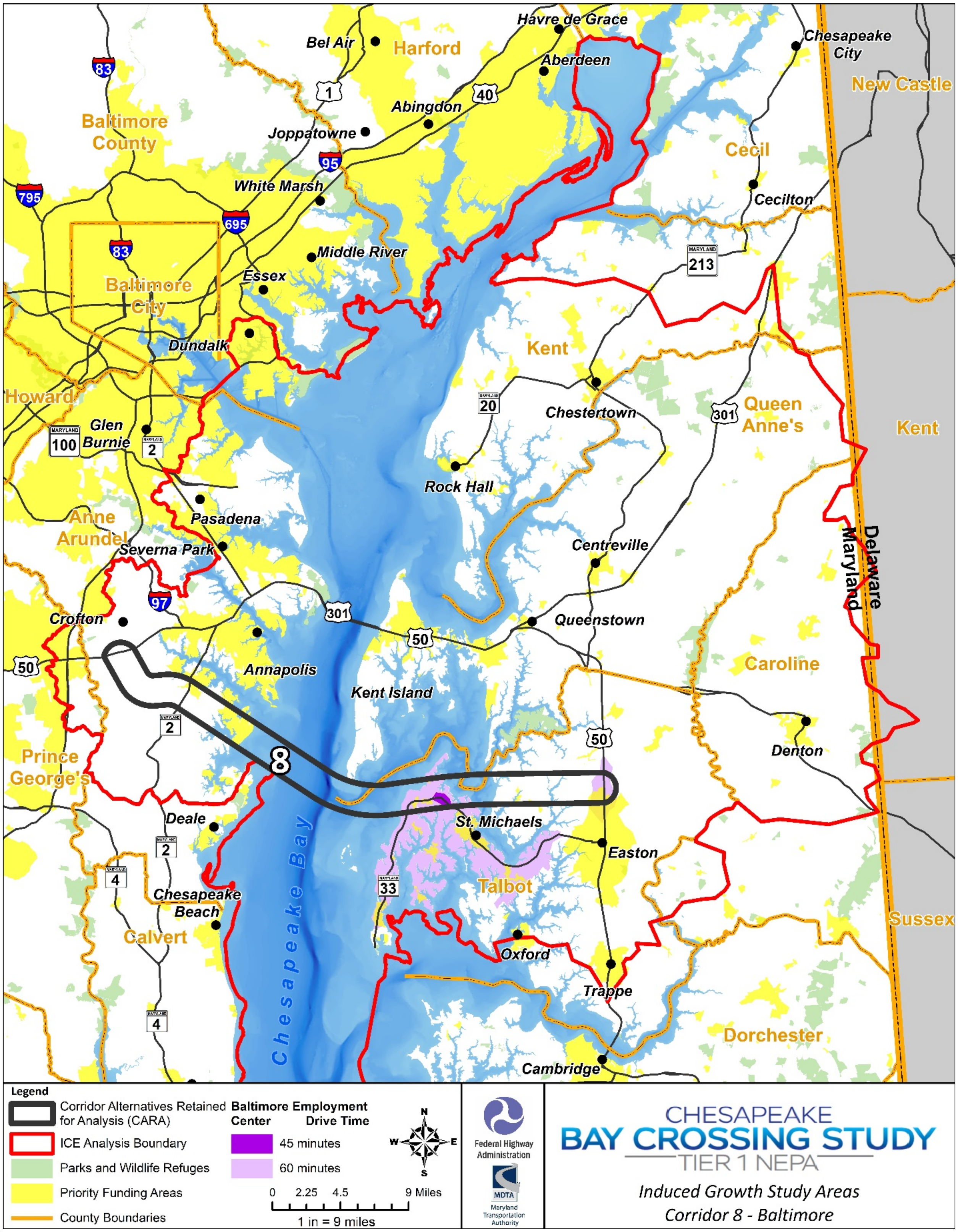


Figure 5-15: Induced Growth Study Areas – Corridor 8 – Washington, DC

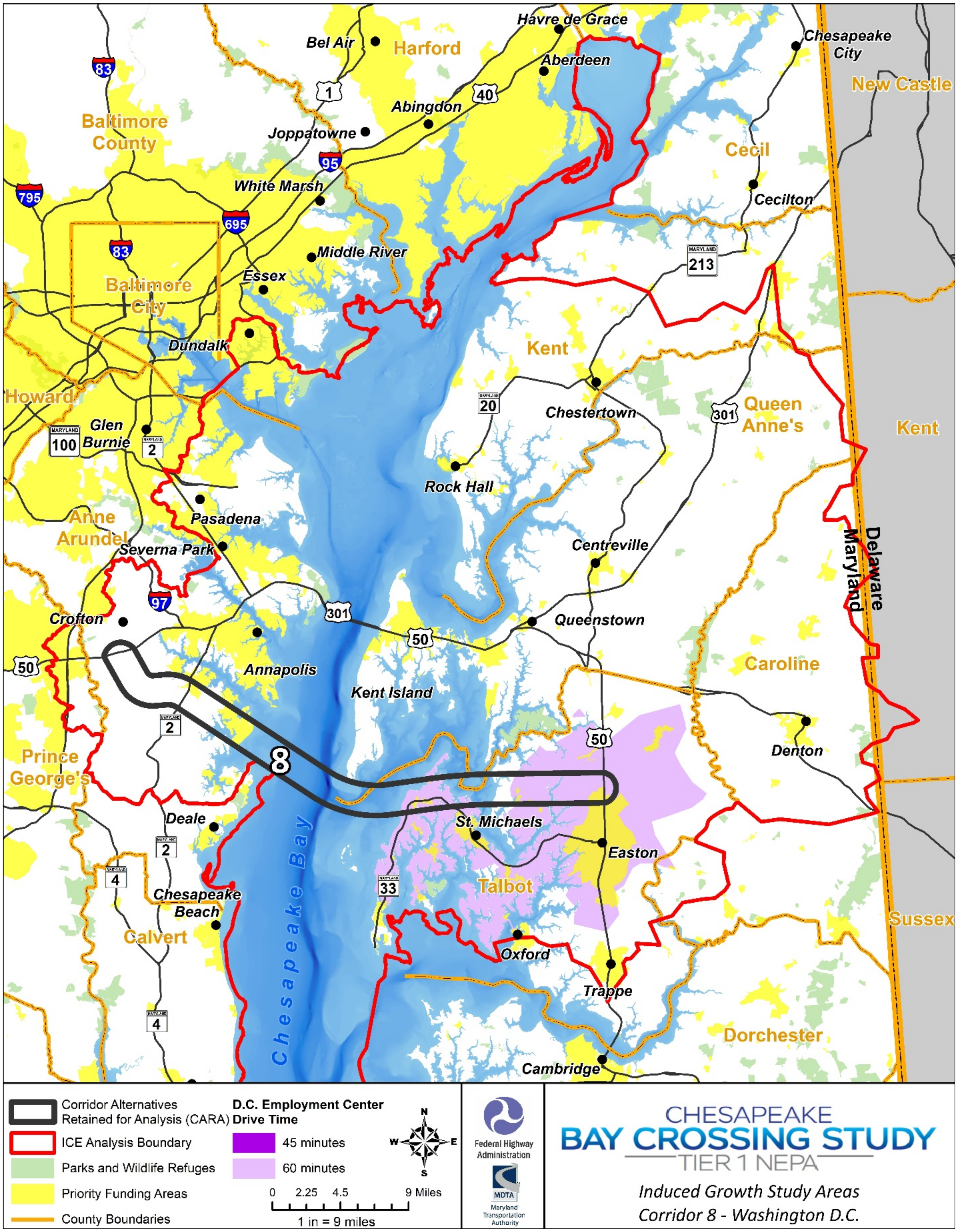


Figure 5-16: Induced Growth Study Areas – Corridor 8 – I-95

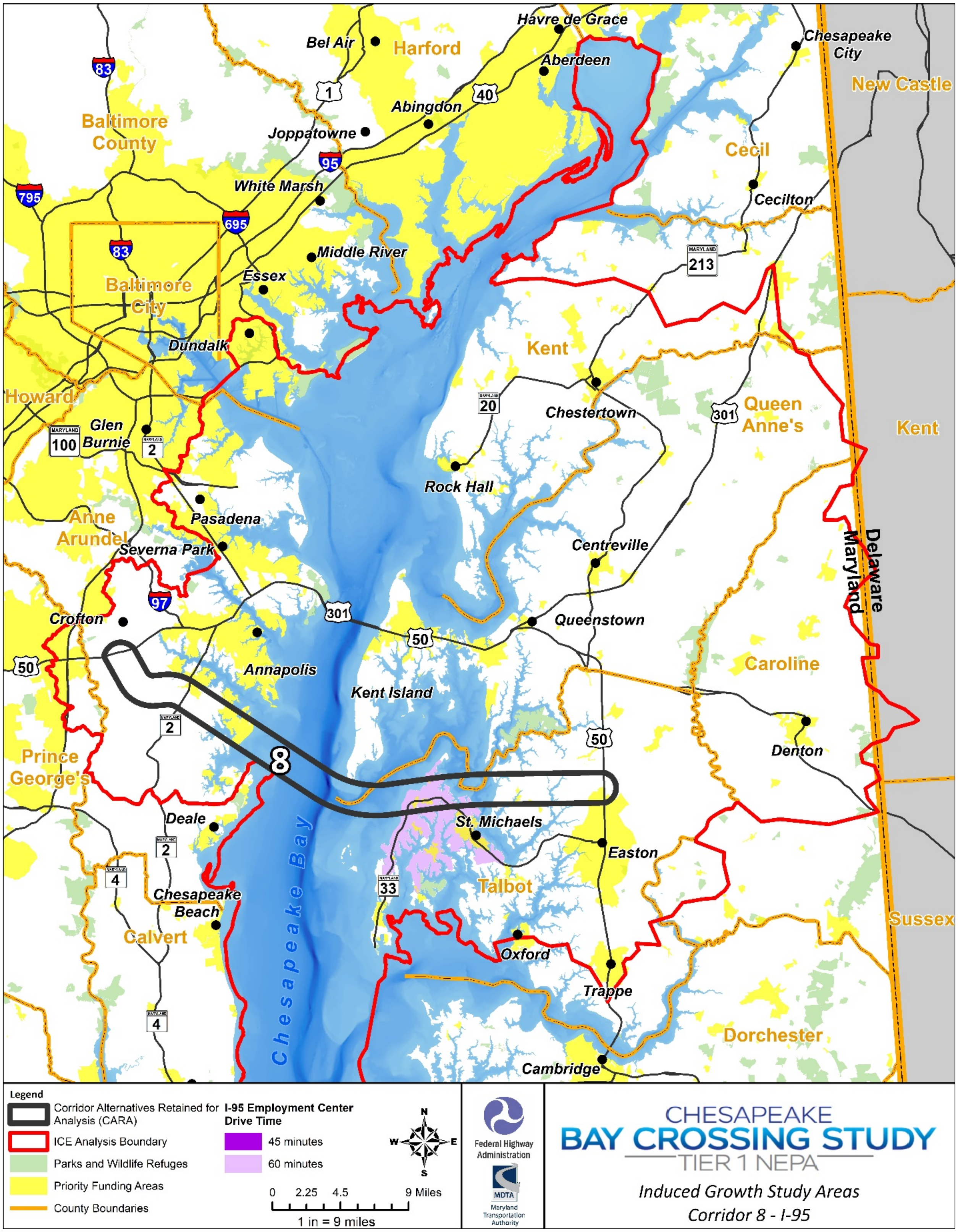


Table 5-25: Land Use/Land Cover in the Corridor 8 Induced Growth Study Area

GEOGRAPHY	TRAVEL MINUTES BAND	TRAVEL BAND SIZE (ACRES)	DEVELOPED LANDS (ACRES)	AGRICULTURE (ACRES)	NATURAL LANDS (ACRES)
Annapolis	30 - 45 Minutes	16,406	3,232	6,293	4,157
	45 - 60 Minutes	10,637	2,636	4,760	2,199
Baltimore	30 - 45 Minutes	523	93	275	138
	45 - 60 Minutes	29,516	9,645	11,169	7,096
DC	30 - 45 Minutes	N/A[1]	N/A	N/A	N/A
	45 - 60 Minutes	97,138	21,250	49,199	24,028
I-95	30 - 45 Minutes	N/A	N/A	N/A	N/A
	45 - 60 Minutes	16,406	5,001	6,293	4,157

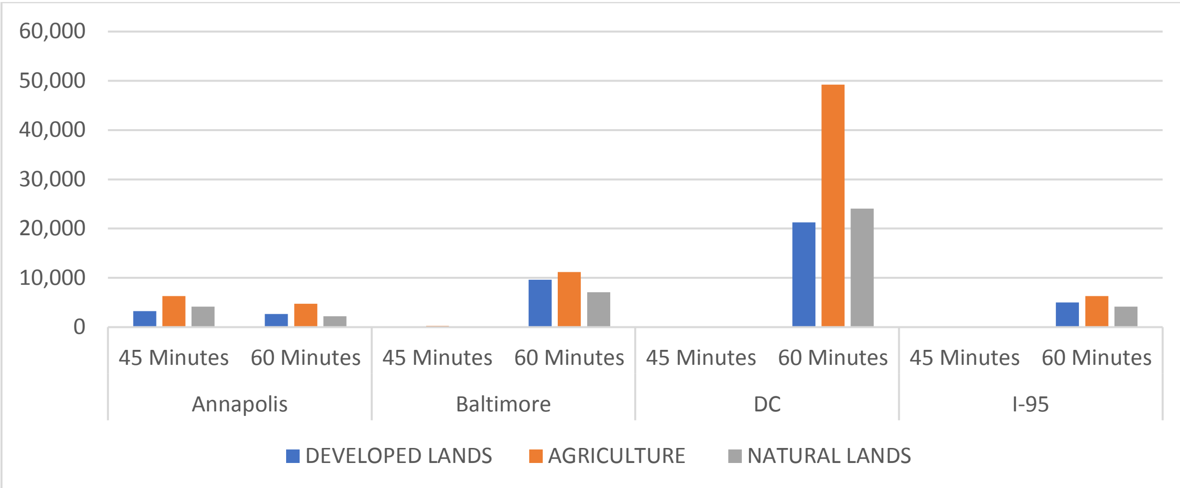
Source: MDP (2010)
[1] N/A = Travel time band does not extend to Eastern Shore
Developed lands = residential, commercial, industrial, institutional, other developed lands, and transportation
Agriculture = cropland, pasture, orchards/vineyards/horticulture, feeding operations, barns/storage/breeding facilities, farmed fish facilities/ponds, row and garden crops
Natural Lands = wetlands, forest lands, mixed forest, and brush

If induced growth were to occur due to a new crossing in Corridor 8, the undeveloped lands could be converted to developed land uses such as residential and commercial use, and the developed areas may experience infill and/or redevelopment. Growth could also occur beyond the 60-minute travel bands associated with a new crossing in Corridor 8.

The results suggest a somewhat lower potential for induced growth effects compared to Corridor 6, but still with induced growth likely to occur. The 30 to 45-minute travel areas, where induced growth would likely be most prevalent, is the largest for the Annapolis employment center, and small or nonexistent for the other employment centers considered. Annapolis is a smaller employment center relative to others like Baltimore and DC, so the anticipated extent of induced growth would be somewhat more moderate. The 45 to 60-minute travel area for Washington, DC would still be substantial in size, but the effect on areas now within a roughly 45 to 60-minute driving distance would likely be less compared to areas within 30 to 45 minutes.

The location and extent of those areas designated by localities for growth influences the potential for induced growth associated with a potential Bay Crossing in Corridor 8. **Table 5-26** presents the acres of Maryland's PFA by employment center and travel time band for Corridor 8. These are areas where growth would potentially be encouraged, and where it would be potentially be most compatible with existing and planned land uses.

Figure 5-16: Corridor 8: Developed and Undeveloped Land by Employment Center and Travel Time Band



Source: MDP (2010)
No Data = travel time band does not extend onto Eastern Shore
Developed lands = residential, commercial, industrial, institutional, other developed lands, and transportation
Agriculture = cropland, pasture, orchards/vineyards/horticulture, feeding operations, barns/storage/breeding facilities, farmed fish facilities/ponds, row and garden crops
Natural Lands = wetlands, forest lands, mixed forest, and brush

Table 5-26: Maryland Priority Funding Areas per Corridor 8 Employment Center and Travel Time Band

GEOGRAPHY	PRIORITY FUNDING AREA ACRES	
	30 - 45 MINUTES	45 - 60 MINUTES
Annapolis	3,432	1,307
Baltimore	6	14,645
DC	N/A[1]	18,361
I-95	N/A	3,432

Source: MD iMAP (2015)
[1] *N/A = Travel time band does not extend to Eastern Shore*

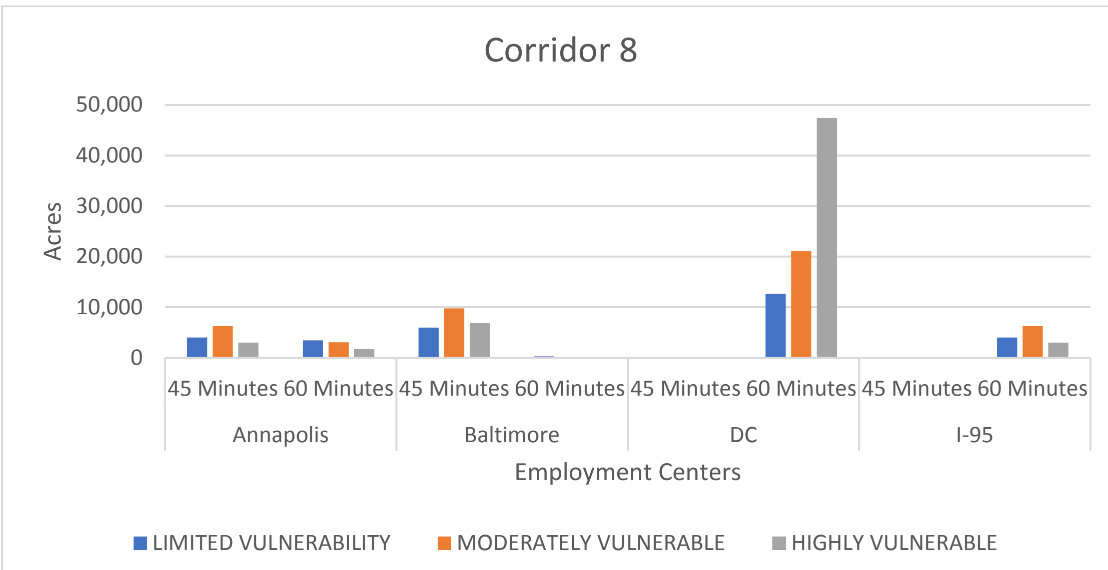
Based on MDP data, **Table 5-27** and **Figure 5-17** present the acreage of rural resource lands vulnerable to residential development by employment center and travel time band for Corridor 8. As seen in **Figure 5-17,** the greatest proportion of lands vulnerable to residential development in the Induced Growth Study Area associated with Corridor 8 are in the 60-minute travel time band of the DC employment center. Most notably, roughly 9,000 acres of land now within 30 to 45 minutes of Annapolis would be moderately or highly vulnerable to residential development. A smaller area of less than 200 acres of moderately to highly vulnerable land would be within 30 to 45 minutes of Baltimore. A relatively large area would be within approximately 45 to 60 minutes of Washington, DC, including over 68,000 acres of land moderately to highly vulnerable to residential development.

Table 5-27: Maryland Development Vulnerability in the Corridor 8 Induced Growth Study Area

GEOGRAPHY	TRAVEL MINUTES BAND	TRAVEL BAND SIZE (ACRES)	LIMITED VULNERABILITY ACRES	MODERATELY VULNERABLE ACRES	HIGHLY VULNERABLE ACRES
Annapolis	45 Minutes	16,406	3,999	6,306	3,019
	60 Minutes	10,637	3,434	3,064	1,763
Baltimore	45 Minutes	523	263	43	163
	60 Minutes	29,516	6,269	9,823	7,020
DC	45 Minutes	N/A[1]	N/A	N/A	N/A
	60 Minutes	97,138	12,660	21,126	47,440
I-95	45 Minutes	N/A	N/A	N/A	N/A
	60 Minutes	16,406	3,999	6,306	3,019

Source: MDP (2013)
[1]N/A = travel time band does not extend onto Eastern Shore

Figure 5-17: Corridor 8 Development Vulnerability per Employment Center and Travel Time Band



Source: MDP (2013)
No Data = travel time band does not extend onto Eastern Shore

If induced growth associated with providing a new Bay Crossing and other roadway improvements in Corridor 8 would occur, socioeconomic resources could be affected both adversely and positively, as described under the Corridor 6 discussion. Induced growth could lead to greater strain on existing community facilities such as schools and water and sewer systems, creating challenges in providing enough capacity for new growth. Induced growth could increase employment and provide community facilities but could also impact community cohesion by changing the character of the existing rural neighborhoods and communities. New access could be provided for community facilities such as hospitals that are more prevalent on the Western Shore.

For Corridor 8, only the Baltimore and DC 60-minute travel time band geographies include EJ populations. Both positive and adverse indirect effects could occur to EJ populations in the study geography from induced growth associated with a new crossing in Corridor 8. All communities in the applicable travel time band geographies would experience the same indirect effects, but such effects could have a potential for greater impact on EJ communities due to compounding circumstances. Further evaluation would be required in Tier to determine whether the impact would be disproportionate to EJ populations.

Induced growth effects could occur on the Western Shore due to a new crossing within Corridor 8. The magnitude of such an effect would likely be less than those on the Eastern Shore, because the Western Shore is already connected to employment centers such as Washington, DC by the existing roadway network without the Chesapeake Bay serving as a barrier to transportation. Corridor 8 would require approximately 11.4 miles of new on-land roadway capacity located between US 50 and the shore of the Chesapeake Bay near Mayo and Beverly Beach. This new infrastructure could attract new commercial development along the new roadway, and along existing roads connected to the new roadway. Specific access points to the improvements in Corridor 8 would not be determined until Tier 2; however, it is likely that state highways within the Corridor would be connected. The corridor is roughly aligned with existing routes including MD 424 and MD 214. Therefore, any potential induced growth would be primarily due to increased capacity along or parallel to portions of the existing roadway network, resulting in a more marginal change rather than new access created from an entirely new alignment.

In particular, the connection to US 50 could provide some commuters with streamlined access to employment in Washington, DC. Existing residential communities or undeveloped areas along connecting major roadways could therefore see pressure for new or intensified development. Areas closest to the new on-land infrastructure, such as Edgewater, Mayo and Beverly Beach, could experience the greatest effect. Undeveloped or existing residential areas along north-south roadways such as MD 424, MD 2 or MD 468 could also experience induced growth. The potential for induced growth on the Western Shore from Corridor 8 would likely be somewhat higher in general than for Corridors 6 or 7 on the Western Shore, due to the greater length of on-land improvements required.

Considering areas further south outside of the ICE Analysis Area, it becomes more likely that an alternative route to Washington, DC would be faster for commuters, even with the provision of new infrastructure in Corridor 8. It is possible that induced growth effects could extend further south to areas such as Deale or Chesapeake Beach; however, the magnitude of such an effect is not reasonably foreseeable based on readily available data.

Indirect effects resulting from greater travel to beach destinations such as Ocean City could occur as a result of Corridor 8. The Bay Bridge is a main route for travelers from Maryland, Washington, DC and Virginia traveling to destinations on the Atlantic coast in Maryland and Delaware. Greater access to these beach resort areas could increase demand for tourism, spurring new economic growth and land use development. The extent and location of such potential induced growth in tourist areas cannot be determined with certainty; such growth could have both positive and adverse effects. This potential indirect effect from increased tourism would be expected under any of the CARA.

5.8.2.2 Natural Resources

As previously discussed, development associated with induced growth can adversely affect water quality by increasing impervious surfaces leading to more stormwater and subsequent pollutant loading of nearby streams, increasing the need for water treatment, and exposing soil to erosion and sedimentation of nearby waters. Federal, state and local regulations addressing sewer and stormwater runoff and protecting water quality could reduce potential adverse impacts associated with induced growth.

Development associated with induced growth in the Induced Growth Study Area of Corridor 8 could affect wetlands, streams, floodplain areas and Chesapeake Bay Critical Areas. **Table 5-28** to **Table 5-31** present an estimate of wetland acres, floodplain acres, linear feet of streams and acres of Critical Area, respectively, in the Corridor 8 Induced Growth Study Area by employment center and travel time band.

The induced growth areas for Corridor 8 include substantial amounts of water resources, though the areas generally encompass fewer resources compared to Corridor 6. Notably, the area that would be within a roughly 45 to 60-minute drive of Washington, DC due to Corridor 6 (beyond those areas already within such a distance) includes over 11,000 acres of NWI wetlands and over 1 million linear feet of streams. Should future induced growth and development occur related to improving the existing Bay Crossing in Corridor 8, some portion of these waters, wetlands, streams or floodplains could potentially be impacted. Development would be subject to review, approval, and/or permits from local, state, or federal agencies (including the USACE) but impacts would potentially occur even with adherence to applicable permitting requirements.

The impacts of induced growth, if it were to occur associated with Corridor 8 improvements, could include wildlife loss; habitat loss, fragmentation, and degradation; disruption of resting, feeding, movement, breeding, and nursery sites; changes in wildlife population density and species richness; alterations of hydrology and species interaction; and the imperilment of protected species. Potential impacts to federally protected species on private property are also regulated. Proposed modifications to wetlands could be federally and state regulated as well, though potential adverse impacts of induced growth to wildlife and wildlife habitat as described in **Section 4.2** could still occur.

Table 5-28: NWI Wetlands Acres per Corridor 8 Employment Center and Travel Time Band

GEOGRAPHY	NATIONAL WETLANDS INVENTORY ACRES	
	30-45 MINUTES	45-60 MINUTES
Annapolis	2,436	2,081
Baltimore	73	4,546
DC	N/A[1]	11,216
I-95	N/A	2,436

Source: USFWS (2016)

[1] N/A = Travel time band does not extend to Eastern Shore

Table 5-29: FEMA 100-Year Floodplain Acres per Corridor 8 Employment Center and Travel Time Band

GEOGRAPHY	FEMA 100-YEAR FLOODPLAIN ACRES	
	30-45 MINUTES	45-60 MINUTES
Annapolis	2,439	3,234
Baltimore	54	4,673
DC	N/A	8,603
I-95	N/A	2,439

Source: FEMA (2019)

N/A = Travel time band does not extend to Eastern Shore

Table 5-30: Linear Feet of Streams per Corridor 8 Employment Center and Travel Time Band

GEOGRAPHY	LINEAR FEET OF STREAMS	
	30-45 MINUTES	45-60 MINUTES
Annapolis	115,874	26,485
Baltimore	3,263	255,936
DC	N/A	1,315,673
I-95	N/A	115,874

Source: USGS (2016)

N/A = Travel time band does not extend to Eastern Shore

Table 5-31: Acres of Chesapeake Bay Critical Area per Corridor 8 Employment Center and Travel Time Band

GEOGRAPHY	ACRES OF CHESAPEAKE BAY CRITICAL AREA	
	30-45 MINUTES	45-60 MINUTES
Annapolis	11,392	8,358
Baltimore	320	18,455
DC	N/A	34,035
I-95	N/A	11,392

Table 5-32 presents the USGS 12-digit HUC Watersheds located within one or more of the Corridor 8 Induced Growth Study Areas. The table includes the acres and percentage of the total watershed area located within one or more of Induced Growth Study Areas for Corridor 6.

Table 5-32: HUC 12 Watersheds within One or More Corridor 8 Induced Growth Study Areas

12-Digit HUC	USGS 12-Digit Watershed Name	Acres within One or More Travel Bands	Percentage within One or More Travel Bands
020600050505	Broad Creek-Frontal Choptank River	12,080	56%
020600050506	Harris Creek-Frontal Choptank River	7,762	50%
020600050105	Jadwins Creek-Tuckahoe Creek	6,296	23%
020600050301	Kings Creek	12,732	88%
020600020603	Lower Wye East River	3,490	29%
020600050304	Marsh Creek-Choptank River	733	3%
020600020605	Miles River	24,625	72%

12-Digit HUC	USGS 12-Digit Watershed Name	Acres within One or More Travel Bands	Percentage within One or More Travel Bands
020600050104	Norwich Creek-Tuckahoe Creek	35	<1%
020600050509	Poplar Island-Frontal Chesapeake Bay	1,451	14%
020600020601	Skipton Creek	3,856	31%
020600020608	Tilghman Creek-Frontal Eastern Bay	3,578	44%
020600050504	Tred Avon River-Frontal Choptank River	20,013	52%
020600020602	Upper Wye East River	70	<1%
020600050302	Williams Creek-Choptank River	3,619	19%

5.8.2.3 Historic Resources

Impacts of induced growth on historic resources can include direct and indirect effects. Potential impacts to historic resources are regulated as previously described in **Section 4.3**. New construction or redevelopment associated with induced growth has the potential to adversely affect archaeological and architectural historic properties.

Development of new land uses or more intensive land uses could lead to destruction or degradation of cultural resources, as older structures are cleared to make way for new construction, or agricultural and rural areas are converted to more intensive urban and suburban uses with resulting changes in land use context surrounding cultural resource areas. Archeological sites could also be impacted by new construction accompanying land development. Given the rural nature of the induced growth study areas on the Eastern Shore, the alteration of context surrounding certain rural and agricultural-related cultural resources may be particularly likely impacts if substantial land use change occurs.

Projects funded, permitted, or on lands controlled by federal and state agencies must take into account effects on historic properties by complying with Section 106 of the NHPA, the Maryland Historical Trust Act of 1985, and Delaware Code Title 7 Ch 53 Archaeological Resources in the State, and Title 7 Ch 54 Unmarked Human Burials and Human Skeletal Remains.

Many localities have historic preservation commissions that maintain and update a list of historic sites and review architectural projects in historic and cultural preservation overlay districts. These processes could reduce the potential adverse effects to historic properties from induced growth associated with providing a new crossing and other proposed roadway improvements in Corridor 8.

5.9 <u>Summary of Indirect Effects</u>

A crossing in a new location over the Chesapeake Bay would allow new access to rural, undeveloped areas on the Eastern Shore. This new access, considered in light of the major employment centers on the Western Shore, would likely lead to induced growth of residential and commercial development on the Eastern Shore. Corridor 6 would likely have the greatest potential for induced growth, given its close proximity to the Baltimore metropolitan area. Over 40,000 acres of undeveloped land would be within a roughly 30 to 45 minute-drive of Baltimore area as a result of a new crossing in Corridor 6, much of which is identified by MDP as vulnerable to residential development. Corridor 8 would also have likely induced growth effects, given its proximity to Annapolis and somewhat more distant proximity to Washington, DC.

Over 70,000 acres of undeveloped land on the Eastern Shore would be within a roughly 45 to 60-minute drive of Washington, DC as a result of a new crossing in Corridor 8. Corridor 7 would likely have the least extent of indirect effects due to the presence of the existing crossing and associated infrastructure in Corridor 7. Growth and development have already occurred along Corridor 7, so a new crossing within the corridor would likely continue, and perhaps accelerate, existing land use development patterns as they presently occur.

For any of the corridors, the extent of induced growth would be dependent on various other factors such as economic conditions and local land use regulation. Induced growth could result in impacts to natural resources, community cohesion, and cultural resources as existing land uses are converted or redeveloped. Induced growth could also potentially have beneficial economic impacts for local economies.

Encroachment effects from a new crossing within each of the corridors could also result in indirect effects to socioeconomic, natural, and cultural resources. In particular, a new crossing could have indirect impacts by altering traffic flows and potentially altering the character and cohesion of communities. While direct impacts from, new waterway crossings, and new impervious surfaces are not fully revealed during the Tier 1 phase, there is the potential for indirect effects on natural resources such as downstream impacts to water quality. Land use conversion could indirectly affect wildlife through water quality impacts and habitat fragmentation. The extent of direct impacts, and thus the likely potential for indirect effects from encroachment, are not fully explored in detail during Tier 1. However, Corridor 7 could potentially have lower indirect impacts to natural resources due to the shorter crossing and overall corridor length.

6.0 CUMULATIVE EFFECTS ANALYSIS

The cumulative effects analysis considers the incremental contribution of the direct and indirect effects of the corridor alternatives in the context of past, present and reasonably foreseeable actions. The analysis follows the methodology found in **Section 3.1.3.**

6.1 Geographic Area Affected

Cumulative effects are assessed within the ICE Analysis Area as described in **Section 3.1.1**.

6.2 Resources Affected

The resources affected by the alternatives in the ICE Analysis Area include socioeconomic resources, natural resources, and cultural resources, as identified in **Section 4.0**.

6.3 Past, Present, and Reasonably Foreseeable Actions that have Impacted or may Impact These Resources

6.3.1 Past Actions

Section 4.0 describes many of the past actions that have broadly contributed to the baseline conditions of the ICE Analysis Area that were used for this analysis. This development transformed a largely natural pre-European settlement landscape over time into an agrarian landscape, and in modern times into an urban/suburban environment in many parts of the ICE Analysis Area. Many of the natural ecological systems in the ICE Analysis Area have been heavily affected by past actions, including extensive development in the metropolitan areas, population growth and development (especially on the Western

Shore where there are several metropolitan areas), and conversion of natural lands to agricultural uses. Land use intensification in the region has corresponded with growth in economy, housing and infrastructure, but also has negatively affected some socioeconomic, natural, and cultural resources.

The specific past actions since 1970 that have contributed to existing conditions within the ICE Analysis Area are too numerous to list individually for this study. Past actions include the construction of a second span at the existing Bay Bridge crossing, MD 665 construction, MD 404 dualization, shoreline development, dredging, and numerous others.

6.3.2 Present and Reasonably Foreseeable Future Actions

Many development actions are occurring and/or are planned to occur in the ICE Analysis Area that could impact resources also affected by the CARA. MDTA, MDOT SHA and local actions planned within the ICE Analysis Area are too numerous to list individually. Therefore, for this analysis, projects estimated to cost over $10 million on the Western Shore and $5 million on the Eastern Shore are identified as the larger efforts that would likely have more substantial effects to the human and natural environment. These thresholds were selected as a reasonable approximation of major projects that would likely have the greatest effects, and the Western Shore value was set higher due to the greater prevalence of large infrastructure projects. Modifications to the roadway network programmed and approved for implementation by 2040 in the most recent Long-Range Transportation Plan or funded in capital improvement plans that cover the ICE Analysis Area could potentially affect the Chesapeake Bay Crossing Study. These actions were identified through the review of the following documents, plans, or lists:

- Annapolis Comprehensive Plan (2009);
- Anne Arundel County General Development Plan (2009);
- Caroline County Comprehensive Plan (2010);
- City of Baltimore Comprehensive Master Plan (2009));
- Baltimore County Master Plan 2020 (2010));
- 2007 Kent County Comprehensive Plan (2008);
- Comprehensive Plan Kent County Maryland (2006);
- Plan 2035 Prince George's Approved General Plan (2014);
- Queen Anne's County Comprehensive Plan (2010);
- Talbot County, Maryland Comprehensive Plan (2005);
- Visualize 2045: A Long-Range Transportation Plan for the National Capital Region (2018);
- Move Anne Arundel! County Transportation Master Plan (2019);
- Baltimore Region Transportation Improvement Program 2018-2021;
- Maryland's Statewide Transportation Improvement Program (STIP) 2019-2024,
- Maryland's Consolidated Transportation program 2019-2024
- 2040 Maryland Transportation Plan (2019)
- Delaware Capital Transportation Program FY-19-FY2024
- Dover/Kent County Metropolitan Planning Organization Council Delaware Department of Transportation Fiscal Years 2020-2023 list

When conducting cumulative effects analyses, MDTA and FHWA consider "Reasonably Foreseeable Future Actions" to be those actions that are fiscally constrained in the region's transportation plans. Projects included in the documents, plans, or lists provided above are treated as reasonably foreseeable actions because future construction funds have been set aside for them in the planning process. Long-Range Transportation Plans identify the significant capital improvement projects for the region's highway, transit, and active transportation systems that transportation agencies expect to be able to fund over the next 20-plus years. Due to scarce financial resources, projects that do not have identified funding may not be constructed and are therefore not reasonably foreseeable. **Table 6-1** and **Table 6-2** list the present and reasonably foreseeable future projects within the ICE Analysis Boundary and notes the status of each project. These projects could all contribute to cumulative effects related to human and natural environments.

Table 6-1: Major Present and Reasonably Foreseeable Future Non-Transportation Projects within the ICE Analysis Boundary

PROJECT	LOCATION	DESCRIPTION	STATUS
Western Shore			
Hancock's Resolution	Pasadena, Anne Arundel County	This work will include the construction of a new visitor center, SWM, landscaping parking, and associated amenities.	Construction scheduled to be completed in 2020.
South Shore Trail	Anne Arundel County	Multi-phase construction will consist of: Phase I (Waterbury to MD 3), Phase II (MD 3 to Odenton), Phase III (Bestgate to Eisenhower Golf Course), Phase IV (Eisenhower Golf Course to Waterbury Road) and Phase V (Bestgate Road to City of Annapolis). These phases will create a new paved multi-use Trail in Anne Arundel County.	Phase I complete. Phase II and IV Feasibility Study complete. Phase II design underway. Phase V complete.
Broadneck Peninsula Trail	Anne Arundel County (partially within Corridor 7)	Multi- phased project to create multi use paved trail in Anne Arundel County.	Phase III final design, Phase II under construction, Phase IB in design, Phase IA open.
Annapolis Regional Library	1410 West Street, Annapolis, Anne Arundel County	New library construction.	Planned to open in 2020
New Galesville Fire Station	6920 Owensville Road, Galesville, Anne Arundel County	New fire station construction.	Under construction
Eastport Shopping Center	Annapolis, Anne Arundel County	Shopping centers and apartments.	Under construction

PROJECT	LOCATION	DESCRIPTION	STATUS
Westfield Annapolis mall	Annapolis, Anne Arundel County	Mall additions and reconfigurations.	under construction
Shipley's Choice Dam	Anne Arundel County	Rehabilitation.	Under construction
Eastern Shore			
Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island	Talbot County	Restoration of Poplar Island using dredged material.	Under construction
K Hovnanian's Four Seasons at Kent Island	Kent Island, Queen Anne's County	Residential development	Phase one of construction complete.
South Kent Island Wastewater Sub-district	Kent Island, Queen Anne's County	Sewer service expansion	Estimated completion in 2025.
Kent Island Library	Kent Island, Queen Anne's County	Library expansion	Partially funded
Village at Slippery Hill	Grasonville, Queen Anne's County	Commercial development	Under construction

Table 6-2: Major Present and Reasonably Foreseeable Future Transportation Projects within the ICE Analysis Boundary

PROJECT	SOURCE	LOCATION	DESCRIPTION	STATUS
Chesapeake Bay and Existing Bay Bridge				
US 50/301 Bay Bridge Deck Rehabilitation and Miscellaneous Modifications	CTP	Bay Bridge	Rehabilitation and Miscellaneous Modifications.	Added to construction program
US 50/301 Bay Bridge - Crossover Automated Lane Closure System	CTP	Bay Bridge	Installation of Automated Lane Closure System.	Added to construction program
US 50/301 Bay Bridge Cable Replacement	CTP	Bay Bridge	Replace 5KV Feeder Cable on Eastbound Span.	Added to construction program
Dredge Material Placement and Monitoring	CTP	Chesapeake Bay	Involves the placement and monitoring of material dredged from the Port of Baltimore channels.	Continuous over next 6 years

PROJECT	SOURCE	LOCATION	DESCRIPTION	STATUS
Western Shore				
US 301 Corridor (Bowie)	Visualize 2045	Prince George's County	Upgrade and widen US 301 from north of Mount Oak Road to US 50.	Expected to have funding by 2045
US 301 Southern Corridor	Visualize 2045	Prince George's County	Multi-modal corridor study to consider highway/transit improvements from the Potomac River to Mount Oak Road (US 50/US 301 interchange).	Expected to have funding by 2045
MD 450 Corridor	Visualize 2045	Prince George's County	Widen MD 450 from Whitfield Chapel Road to west of MD 3.	Expected to have funding by 2045
US 50; MD 70 TO MD 2	Baltimore Metropolitan Council (BMC)	Anne Arundel County	US 50, from MD 70 to MD 2 (north), including the Severn River/Pearl Harbor Memorial Bridge.	Partially funded
Port of Baltimore Enhancements	BMC	Baltimore	Improvements to the Port of Baltimore.	funded
MD 151/MD 151B, Sparrows Point Boulevard	CTP	Baltimore	Replace bridge 0309900 on MD 151 and bridge 0335000 on MD 151B. Replace bridge deck on bridge 0335100 on MD 151B.	Under Construction
Hart-Miller Island Related Projects	CTP	Hart- Miller	Design wildlife habitat at the North Cell of the island; dewatering and site improvements.	Continuous over next 6 years
Cox Creek Dredged Material Containment Facility Expansion and Related Projects	CTP	Bay	Expansion and raising dikes at the existing 144-acre Dredged Material Containment Facility.	Continuous over next 6 years
MD 3, Robert Crain Highway	CTP	Anne Arundel County	US 301, North of Mount Oak Road to US 50 and MD 450, Stonybrook Drive to west of MD 3.	Planning on hold.
Mountain Road Corridor Revitalization - Phase I	CTP	Anne Arundel County	MD 177 (Mountain Road) corridor between Solley Road and Edwin Raynor Boulevard. Phase 1, Catherine Avenue to Edwin Raynor.	Funding for Phase I, 2022 completion date
US 50, from MD 70 to MD 2 (north)	CTP	Anne Arundel County	Capacity improvements including the Severn River/Pearl Harbor Memorial Bridge MD 175, Annapolis Road.	Planning

PROJECT	SOURCE	LOCATION	DESCRIPTION	STATUS
Eastern Shore				
MD 291, Cypress Street	MDOT SHA	Kent County	Roadway Rehabilitation along MD 291 from West of School Street to East of Crane Street.	Under construction 2019.
MD 213, Centerville Road	MDOT SHA	Queen Anne's	Rehabilitate Bridge 1702000 over Gravel Run and Replace Bridge over Old Mill Stream.	Under construction
US 50, Ocean Gateway	MDOT SHA	Queen Anne's	6-lane divided reconstruct.	8 phases not funded
US 301, construct interchange at MD 304	CTP	Queen Anne's	Construct interchange.	Project on hold.

6.4 Cumulative Effects

Cumulative effects consist of the direct and indirect effects of the potential improvements in the corridor alternatives in the context of the impacts of past, present, and reasonably foreseeable actions. Past, present, and reasonably foreseeable actions have already affected or have the potential to impact land use and socioeconomic, natural, or historic resources. Past trends and forecasts impacting the human and natural environmental resources evaluated in the ICE are discussed in detail in **Section 4.0**, while other present and reasonably foreseeable actions are listed above. If no direct or indirect impacts from a proposed action would occur, then no incremental cumulative effect would occur. These potential effects are considered in the following discussions of cumulative effects of the alternatives to different resources. The following briefly discusses the cumulative effects to socioeconomic, natural and historic resources.

6.4.1 Socioeconomic Resources

Numerous past actions have contributed to the development discussed in **Section 4.1**. These actions have been both beneficial and adverse to socioeconomic resources and land use, and it is expected that reasonably foreseeable future actions could be as well. Past and present growth and development has led to greater connectivity and access to employment and recreation. Such growth and development has benefited local economies by improving access to markets and customers. However, some past and present developments have resulted in large-scale residential, community facility, and business relocations that adversely affected community cohesion, such as construction of the interstate system and other major freeways.

Roadway infrastructure associated with the existing conditions and US 50/301 on either side of the Bay has likely had socioeconomic impacts by providing new accessibility and economic opportunity, but also by negatively impacting community cohesion in the vicinity of the infrastructure. Transportation facilities can reduce access in areas directly adjacent to the highways.

Infrastructure development can also have detrimental impacts on community character, as rural landscapes are transformed into developed land uses, especially the suburban housing development and commercial uses that often accompany major new roadway infrastructure. Conversion of farmland to other uses can also impact local agricultural economies. Construction of the existing Bay Bridge has likely spurred growth in areas on the Eastern Shore such as Kent Island, with both positive and negative socioeconomic impacts.

Minority and low-income populations have historically been adversely affected by past roadway construction (Karas, 2015). Current federal regulations require that adverse effects of federal actions consider and incorporate mitigation into decisions that adversely affect communities. These federal regulations will continue to direct future federally-funded and federally-authorized projects to avoid disproportionate high and adverse effects to minority and low-income populations wherever possible. Future federal and non-federal projects may continue to have both adverse and beneficial impacts on minority and low-income populations. For example, transportation improvements could increase efficiency that in turn could increase employment opportunities, but such improvements could also require direct community impacts from relocations.

6.4.1.1 No-Build Alternative

Under the No-Build Alternative, a new Bay Crossing between the Western and Eastern Shores of the Chesapeake Bay in Maryland would not be built. The No-Build Alternative would result in increasingly poor traffic conditions at the existing Bay Bridge and approach roadways by 2040. Traffic analysis conducted for the Bay Crossing Study determined that under the No-Build Alternative, ADT volumes are expected to increase by 16,700 vehicles per day by 2040 on summer weekends, and 15,700 vehicles per day on non-summer weekdays. Currently, the Bay Bridge experiences three hours with Level of Service (LOS) E or F on non-summer weekdays (all in the eastbound direction) and 19 hours on summer weekends (with 10 hours in the eastbound direction and 9 hours in the westbound direction). This is expected to worsen by 2040 to 7 hours on non-summer weekdays (with 5 hours in the eastbound direction and 2 hours in the westbound direction) and 22 hours on summer weekends (with 12 hours in the eastbound direction and 10 hours in the westbound direction).

Other present or reasonably foreseeable future projects are occurring, or may occur, some of which may result in induced growth within the ICE Analysis Area.

6.4.1.2 Corridor 6

Construction of a new crossing and connecting on-land infrastructure within Corridor 6 could impact community cohesion if barriers to community interaction result or areas become isolated by the roadway. New right-of-way could directly lead to residential, farm, commercial, community facility and recreational resource relocations that also impacts community cohesion. Future transportation and redevelopment projects could potentially result in business or residential relocations within the Corridor 6 study area, though specific impacts are not currently known. Reasonably foreseeable future actions such as the Mountain Road Corridor Revitalization project along MD 177 could have similar types of encroachment impacts resulting from infrastructure improvements in close proximity to Corridor 6. The incremental contribution of potential improvements in Corridor 6 to community cohesion are uncertain as the exact alignment and associated direct and indirect impacts to specific resources are not known at the Tier 1 EIS evaluation stage. Relocations and other community impacts could be of a larger magnitude than other reasonably foreseeable future actions in Corridor 6, potentially resulting in a substantial incremental contribution.

Because right-of-way would be acquired for the approaches to the new bridge and new connecting roads, other lands could be converted to transportation use, also potentially indirectly impacting planned land use. However, because the potential improvements would be within a relatively narrow transportation corridor, with the exception of induced growth discussed below, incremental cumulative impacts to planned land use would be limited along the construction corridor.

Improvements in Corridor 6 could result in greater connectivity to community facilities near the new crossing on both the Western and Eastern Shore. However, community facilities could also be relocated for right-of-way needed to construct the new crossing. Past, present and future actions would continue to have both positive and adverse cumulative effects to community facilities and recreation.

A new crossing in Corridor 6 would potentially benefit the local economy from more direct connections to services and commercial areas, and increased employment indirectly related to more direct access to employment centers on the Western Shore. This could also have an incremental cumulative effect considered in the context of other past and present development and infrastructure projects with beneficial economic impacts.

Minority and low-income populations have historically been adversely affected by large infrastructure projects such as interstate construction. Since 1994, federal regulations require federal actions to avoid disproportionate high and adverse effects to minority and low-income populations. Future federal and non-federal development may continue to have both adverse and beneficial effects on minority and low-income populations. Federal regulations would continue to require that federally funded or federally authorized actions avoid disproportionate high and adverse effects of their authorized actions to minority and low-income populations whenever possible. No minority populations or low-income Census Tracts were identified in Corridor 6. Therefore, with the exception of induced growth effects discussed below, no direct or indirect effects to EJ populations would likely occur from potential improvements in Corridor 6, therefore; there are no cumulative impacts anticipated.

Past actions that have impacted socioeconomic resources in the areas potentially affected by constructing a new Bay Crossing in Corridor 6 include the numerous infrastructure and land development activities that occurred from 1970 up to today, such as construction of the second existing Bay Bridge span, as well as major roadway network construction. As described in **Section 4.1.2**, jurisdictions in the ICE Analysis Area have experienced substantial growth in population, housing, and employment since 1970. This growth and development in the ICE Analysis Area has entailed continuous expansion and intensification of urban and suburban land uses into previously rural landscapes. But the remoteness of the Eastern Shore has likely contributed to the area retaining more of its rural character today than could otherwise have occurred if the area had easy access to the major employment centers on the Western Shore.

A new crossing in Corridor 6 would provide new access to areas on the Eastern Shore that currently have less connectivity to the Western Shore and its major employment centers. This could induce infill and redevelopment in areas already developed and the conversion of undeveloped lands to intensified uses in the portion of the ICE Analysis Area within a typical commute distance of employment centers on the Western Shore accessed via Corridor 6. Induced growth associated with new access provided by a new crossing in Corridor 6 would be most likely when combined with other present and future actions favorable to growth in the ICE Analysis Area. These other actions influencing the pace and extent of growth range from economic conditions to local zoning changes permitting conversion of agricultural and natural lands to development to the availability of existing infrastructure. The locality comprehensive plans generally aim to direct growth to areas already developed and capable of using existing infrastructure, while preserving agricultural and natural lands (see **Section 4.1.1.2**).

6.4.1.3 Corridor 7

Improvements within Corridor 7 would result in greater transportation accessibility and reduced congestion, providing greater capacity for more efficient movement of more goods and people, benefitting local economies.

Construction of new infrastructure in Corridor 7 could impact community cohesion if barriers to community interaction result or areas become isolated by new or expanded facilities. Existing communities in close proximity to the Bay Bridge are likely to currently experience community cohesion effects from the presence of the major limited-access US 50/301 facility, such as barriers to local movement, noise, and visual impacts. Expansion or creation of a new facility within Corridor 7 would likely contribute further to community cohesion impacts to the same areas currently impacted, resulting in an incremental cumulative effect to communities in the vicinity of Annapolis, Kent Island, Grasonville and Queenstown.

Right-of-way acquisition from a new crossing could directly lead to residential, farm, commercial, community facility and recreational resource relocations. Other development and roadway projects in the vicinity of Corridor 7 could have similar types of encroachment impacts as a new crossing in Corridor 7. Reasonably foreseeable future projects such as improvements to the US 301 Corridor in Prince George's County, improvements to the MD 450 Corridor, or others identified in **Table 6-2** could have similar types of impacts resulting in a cumulative effect. A new crossing in Corridor 7 could potentially have more substantial impacts compared to other reasonably foreseeable projects.

A new crossing in Corridor 7 would potentially benefit the local economy from more direct connections to services and commercial areas, and increased employment indirectly related to more direct access to employment centers on the Western Shore. This could also have an incremental cumulative effect considered in the context of other past and present development and infrastructure projects with beneficial economic impacts.

The existing bridge and US 50/301 were originally constructed prior to 1994 when EO 12898: EJ (59 FR 7629-763: February 16, 1994) became effective. As no minority or low-income Census Tracts were identified within Corridor 7, this alternative would not be expected to have cumulative effects to EJ populations.

Induced growth effects from Corridor 7 would not be anticipated to cause major changes in existing land use patterns, as detailed in **Section 5.6.2.** However, increased capacity within Corridor 7 could contribute incrementally to induced growth effects from the existing Bay Bridge. Substantial land use change has occurred since the construction of the two spans of the Bay Bridge, particularly on Kent Island. This is likely due in part to induced growth effects, as the existing bridge has allowed new connectivity to employment centers on the Western Shore leading to increased demand for residential and commercial development. By relieving traffic congestion currently experienced by commuters on the Eastern Shore and allowing easier accessibility to employment centers on the Western Shore, new capacity within Corridor 7 could potentially intensify the demand for growth on the Eastern Shore. The extent of such an effect cannot be predicted with certainty, and numerous other factors such as economic conditions and local zoning regulations would also play a major role in the extent of cumulative impact.

6.4.1.4 Corridor 8

A new proposed crossing on new alignment in Corridor 8 would have similar types of incremental cumulative effects to socioeconomic resources as discussed for Corridor 6. Because this Tier I EIS does not identify the exact direct effects to specific resources, the extent of direct and indirect effects of a new crossing and associated roadway improvements in Corridor 8 to socioeconomic resources are not known but would likely be both beneficial and adverse. Other past, present and future actions in the ICE Analysis Boundary may also have beneficial and adverse effects to socioeconomic resources.

Construction of a new crossing and connecting on-land infrastructure within Corridor 8 could impact community cohesion if barriers to community interaction result or areas become isolated by the roadway.

New right-of-way could directly lead to residential, farm, commercial, community facility and recreational resource relocations. Future transportation and redevelopment projects could potentially result in residential and business relocations within Corridor 8, though specific impacts are not currently known. Reasonably foreseeable projects in the vicinity of Corridor 8 such as improvements to US 301 near Bowie (see **Table 6-2**) could have similar kinds of impacts such as relocations and community cohesion effects.

Similar to Corridor 6 and 7, no low-income or minority Census Tracts were identified within Corridor 8. Therefore, with the exception of induced growth discussed above, a new crossing and associated roadway improvements in Corridor 8 would not have incremental cumulative impacts to EJ populations.

A new crossing in Corridor 8 would potentially benefit the local economy from more direct connections to services and commercial areas, and increased employment indirectly related to more direct access to employment centers on the Western Shore. This could also have an incremental cumulative effect considered in the context of other past and present development and infrastructure projects with beneficial economic impacts.

A new proposed crossing and new alignment in Corridor 8 would have similar types of incremental cumulative effects from induced growth as discussed for Corridor 6, corresponding with the induced growth effects described in **Section 5.6.2**. A new crossing in Corridor 8 would provide areas on the Eastern Shore with new access to employment centers on the Western Shore. Past actions that have impacted socioeconomic resources in the areas potentially affected by constructing a new Bay Crossing in Corridor 8 include the numerous infrastructure and land development activities that occurred from 1970 up to today, such as construction of the second existing Bay Bridge span, as well as major roadway network construction. As described in **Section 4.1.2**, jurisdictions in the ICE Analysis Area have experienced substantial growth of population, housing, and employment since 1970. This growth and development in the ICE Analysis Area has entailed continuous expansion and intensification of urban and suburban land uses into previously rural landscapes.

6.4.1.5 Summary

Any of the three CARA would potentially result in incremental contributions to cumulative socioeconomic effects when considered in the context of past, present and future actions. A new crossing in any location would be a substantial project with a magnitude of direct and indirect effects greater than most other individual infrastructure and development projects.

Corridors 6 and 8 are located in areas with fewer existing major limited-access roadways. Therefore, a new crossing and the subsequent impacts to community cohesion would be a substantial incremental increase relative to the somewhat smaller-scale past roadway infrastructure projects more typical of Corridors 6 and 8. In contrast, a new crossing in Corridor 7 that utilizes the existing US 50/301 corridor could result in a relatively lower incremental increase in community cohesion effects, but the effects would be felt largely by the same communities that are already impacted by US 50/301. A new crossing along a new parallel alignment in Corridor 7 would result in substantial community effects, which would further contribute to the cumulative effects in the context of the existing US 50/301 roadway.

Relocations and other community impacts could be of a larger magnitude than other actions in all three CARA, potentially resulting in a substantial incremental contribution.

The cumulative effect of induced growth from a new crossing, particularly in Corridors 6 and 8, could be substantial when considered in the context of past, present and future development occurring on the Eastern Shore. Corridor 7 would be expected to have lower indirect effects from induced growth, but the effects would incrementally contribute to the substantial past effect of induced growth resulting from the existing Bay Bridge.

None of the CARA would be expected to have disproportionate incremental effects to low-income or minority populations.

All three of the CARA would be expected to have beneficial local economic effects from more direct connections to services and commercial areas, and increased employment indirectly related to more direct access to employment centers on the Western Shore. This could have an incremental cumulative effect considered in the context of other past, present, and reasonably foreseeable development and infrastructure projects with beneficial economic impacts for all three CARA.

6.4.2 Natural Resources

Past, present, and reasonably foreseeable future growth and development actions in the ICE Analysis Boundary have been, and primarily would be, adverse to natural resources. Intensification of land use particularly on the Western Shore has resulted in reduced water quality with many waters impaired for human and wildlife use; loss of wetlands, streams, and floodplains; substantial wildlife population loss from overexploitation and loss of habitat; fragmented habitat; and degraded habitat quality. This has led to some species becoming threatened and endangered with extinction. On the Eastern Shore, agricultural production has resulted in degraded terrestrial and aquatic habitat due to forest clearing, filling, and draining of wetlands, piping and rerouting of streams, and reduction in water quality due to sediment, microbe, and nutrient laden runoff. This habitat alteration has had a negative effect on wildlife in the area. Federal, state, and local regulations enacted over the last 50 years have slowed this loss of wildlife and wildlife habitat, improved wildlife habitat and water quality in some locations, and recovered some protected species.

Past and present private conservation efforts have also positively contributed to natural resources in the region. The effects of growth and development would continue to occur on both the Eastern and Western Shores. Growth on the Western Shore may be more likely to occur within previously developed areas. Future growth and development on the Eastern Shore may have a higher potential for effects to natural resources due to the greater presence of undeveloped, or less intensively developed land. Further, communities have land use plans in place that aim to concentrate growth while preserving important natural resources.

Past growth, development, and agricultural practices have diminished natural resources within the ICE Analysis Boundary. Urban and suburban development and infill has occurred, predominately on the Western Shore, with suburban and rural development occurring on the Eastern Shore. Past development in the ICE Analysis Boundary has included shoreline commercial and residential development and roadway construction and widening projects on both sides of the Chesapeake Bay. This development and practices have impacted aquatic and terrestrial habitat and impaired water quality. The prevailing trend has been habitat loss in regard to wetlands and streams (Tyner and Burke, 1995; MDE, 2006), and forestland (Ferris and Newburn, No date), with more intense development occurring on the Western Shore and agricultural use on the Eastern Shore. Developed lands eliminate habitat and natural cover, increase impervious surface area, prevent natural infiltration, and increase stormwater runoff. Results from USGS research and monitoring projects in agricultural landscapes indicate that there are environmental issues associated with agricultural production including changes in the hydrologic cycle; introduction of toxic chemicals, nutrients, and pathogens; reduction and alteration of wildlife habitats; and invasive species (USGS, 2007).

Aquatic impacts occurring in the ICE Analysis Boundary have included dredging (including the April 2019 completion of the dredging of approximately 2.6 million cubic yards of sediment from multiple channels that lead into Baltimore Harbor), stream piping, relocation, channelization, and flow alteration. Further aquatic impacts causing impediments to fish passage have included the damming of many waterways. Consequences of aquatic habit loss have included approximately 100 percent decreases in historic anadromous fish catches in Maryland (MDNR, No Date (b)); losses in SAV (Orth et al., 1984); poor waterway health (MDE, 2019a, DNREC, 2018); and threatened existence of vulnerable aquatic species (USFWS, 1993).

Many major waterways, including the Chesapeake Bay within the ICE Analysis Boundary, are designated as impaired for one or more uses (MDE, 2019a). Causes of impairment of these sensitive rivers, streams, open water areas, or waterbodies are due to the presence of *Escherichia coli* in the waters, the amount of total suspended solids, chloride, sulfate, nutrients such as total phosphorous, and/or, total nitrogen, alterations such as channelization or lack of riparian buffers, contaminants in fish tissue, and/or causes unknown. The major suspected sources of the impairments are livestock (grazing or feeding operations), agriculture, urban runoff/storm sewers, municipal point source discharges, nonpoint source discharges, atmospheric deposition, urban development, and/or causes unknown.

Past development and harvesting of wildlife have led to the very existence of some wildlife species to be threatened and endangered. However, passage of the Maryland Nongame and Endangered Species

Conservation Act and the federal ESA requires state and federal agencies to avoid and minimize potential impacts to designated threatened and endangered species and their critical habitat.

The terrestrial habitat along the waterways in the ICE Analysis Boundary has been fragmented, primarily by agriculture on the Eastern Shore and developed land uses on the Western Shore. Habitat fragmentation can have wide-ranging indirect effects to wildlife, possibly resulting in: species shifts associated with greater edge habitat and less interior habitat (smaller patch size); lower diversity due to smaller habitat patches; potential isolation of populations; increased vulnerability of species to external competition and predation; potential decreased flow of genetic material through the landscape; restricting wildlife movements that disrupt foraging, breeding/nesting and migration; increased risk of invasive species establishment; and generally, reduced biological diversity. Roadway noise can result in altered habitat utilization, strained communication, and heightened metabolic rates on wildlife, especially avian communities, indirectly causing wildlife abandonment of the area, increased predation, reduced foraging success, decreased breeding success, and decreased wildlife health. Bridge lighting along the shore could negatively affect nesting sea turtles and their hatchlings. New bridges and culvert improvements could indirectly restrict wildlife movement through the riparian corridors crossed by these structures and alter upstream and downstream hydrologic flow.

Current and reasonably foreseeable future development in the ICE Analysis Boundary could encroach on WOTUS and contribute to their loss (**Table 6-1** and **Table 6-2**). These include projects to construct and widen roadways, commercial center construction, or expansion, and planned commercial, institutional, and residential development. Future projects such as the wildlife habitat site improvements on Hart-Miller Island could have effects on aquatic habitat and fisheries during construction resulting in disturbance or displacement. Cumulative negative effects on WOTUS could occur; however, local, state, and/or federal permits require avoidance and minimization of impacts, and compensation for permanent losses. Cumulative impacts could occur even with adherence to permitting requirements. Further analysis of potential impacts to natural resources would be conducted in Tier 2.

Current and future growth and development, and the expansion of agricultural uses, could possibly further reduce and degrade terrestrial and aquatic habitat for the long term. Future growth and development would be subject to Federal, state, and local regulations requiring minimization, avoidance, and compensation for terrestrial and aquatic habitat direct and indirect effects. Impacts from future growth and development will likely continue to occur even with adherence to applicable regulations.

One current and future project in the ICE Analysis Boundary would restore remote island habitat lost in the Chesapeake Bay due to erosion. Construction of the Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island began in the 1990s and continues today in the Chesapeake Bay portion of Talbot County, Maryland. Dredge material is being used to restore lost habitat and the final project will be designed to contain about 68 million cubic yards of material, resulting in a total of 1,715 acres of remote island habitat. The final project will consist of approximately 776 acres of tidal wetlands, including low marsh and high marsh habitat, bird nesting islands, and open water ponds, and an upland portion of approximately 829 acres. The final expansion plan includes a new habitat feature for the site, a 110-acre open water embayment with a depth of up to 12 feet. The Bay bottom in this area will remain primarily undisturbed, limiting impacts to the benthic habitat. This semi-protected fisheries habitat will provide a vital trophic link between open water and restored wetlands, where wetlands will provide a food source and nursery habitat for larger fish species. Three breakwater structures will protect the embayment and provide additional habitat for fish as well as bird nesting habitat on the breakwaters' sandy crests. Large rock reefs within the open water embayment will add further complexity (Maryland Environmental Service, 2017). One of the considerations of the Poplar Island project construction and expansion was the displacement of commercial fishing and crabbing grounds. Construction of a new crossing may result in a cumulative loss of these resources in the short or long term.

6.4.2.1 No-Build Alternative

Under the No-Build Alternative, a new Bay Crossing connecting the Western and Eastern Shores of the Chesapeake Bay in Maryland would not be built. Other present or reasonably foreseeable future projects are occurring, or may occur (**Table 6-1** and **Table 6-2**), and some of these may result in effects to natural resources within the ICE Analysis Boundary. However, no incremental cumulative effects to the natural environment would occur as a result of the No-Build Alternative.

6.4.2.2 Corridor 6

Direct impacts to wetlands, streams, and floodplains may indirectly change hydrologic flow dynamics through adjacent natural communities up or downstream, which sometimes alters these dynamics at the ecosystem level such that the ability of the system to maintain itself is altered. Preserving the hydrodynamic flow is important so sediment and larger material can be transported downstream and to preserve the riffle/pool habitat in streams.

The introduction of exotic invasive species is one of the principal factors contributing to reducing certain species to extinction or levels of concern for their continued existence (Evans, 2013). Construction during development can increase the presence of invasive plant species enabled by earth disturbance and spreading from contaminated vehicles, clothing, and shoes. For non-transportation development projects in the ICE Analysis Boundary, the introduction of exotic invasive species can be minimized by adherence to requirements specified in the most recent versions of the *Maryland Standards and Specifications for Soil Erosion and Sediment Control* and *Delaware Erosion & Sediment Control Handbook*. Some potential impacts could still occur even with adherence to these requirements.

Runoff during bridge and roadway development could contain heavy metals, salt, and associated materials, organic compounds, and nutrients. When runoff enters waters that are already impaired, the impacts are cumulative and can result in accelerated changes in the macrobenthic community structure and composition. In turn, this can affect the fish and amphibian populations that rely on them as a food source, as well as the birds and aquatic mammals that prey on the fish and amphibians. The impacts can result in changes in community structure at a local level but may also extend further to include changes in ecosystem structure and function in the absence of proper mitigation.

Potential improvements within Corridor 6 could include a new Bay Crossing, and associated roadways to connect the crossing to the existing roadway infrastructure on the Eastern and Western Shores. Potential Corridor 6 improvements including a new Bay Crossing would directly impact habitat, and based simply on corridor length, it would be in greater amount than in Corridor 7, and in a lesser amount than Corridor 8. These potential direct impacts, and associated indirect impacts, could result in habitat loss and contribute to the cumulative negative effects to natural resources in Corridor 6, and in the ICE Analysis Boundary.

Bay Crossing improvements in Corridor 6 could include short-term reduced water quality (during construction), as well as changes to floodwater storage capacity and retention times (floodplain impacts), vegetative community composition and structure (forestland and wetland impacts), and long-term impacts to waterways and water quality due to increases in impervious surface areas. The construction and post-construction discharges of stormwater could possibly contribute to increases in the pollutants and nutrients causing impairments in local waterways. Drainage design for waterway crossing structures would be in conformance with current stormwater regulations in order to minimize downstream impacts to natural resources and water quality. The cumulative effects of Corridor 6 improvements on natural resources and water quality would further be minimized by implementation of local and state-mandated BMPs. Cumulative effects to water quality could still occur even with application of required BMPs and adherence to applicable stormwater regulations.

A new Bay Crossing in Corridor 6 would cause loss of natural terrestrial habitat (forestlands and riparian areas), aquatic habitat, and wetlands, and cause increases in wildlife barriers depending on the crossing location. The crossing could contribute to the ongoing loss of native habitat and the potential for direct mortalities to birds, mammals, and reptiles due to vehicle strikes. Adherence to MDOT SHA specifications could reduce the potential contribution by Corridor 6 improvements to cumulative effects (either direct or indirect) on habitat and protected species from the introduction of invasive species, though incremental contributions to cumulative impacts on habitat from invasive species may still occur.

Potential Bay Crossing improvements within Corridor 6 could have long-term operation and short-term construction effects to EFH, anadromous fish use areas, oyster sanctuaries, designated nursery areas, and SAV habitat. The potential impact to these resources would likely be greater than in Corridor 7, and less than in Corridor 8, based on corridor length. Impacts to aquatic habitat could affect commercial and recreational fishing or crabbing locations. Minimization steps could be used to avoid construction activities during sensitive periods and include measures to reduce indirect effects of sedimentation, turbidity, and altered hydrodynamics. Avoidance and minimization could reduce the incremental cumulative effects of Corridor 6 improvements to these aquatic resources, but cumulative impacts could still occur.

A new Bay Crossing in Corridor 6 could modify floodplains which could interfere with natural flows, increasing the potential risk of flooding which could damage the infrastructure within the floodplain. Features constructed in floodplains could contribute to higher floodwater beyond the floodplain, increasing the potential of flooding in nearby land and property. While proper design could minimize adverse effects on natural flows and reduce the potential effects, a new proposed Bay Crossing would not likely be able to avoid incrementally contributing to cumulative effects on floodplains.

6.4.2.3 Corridor 7

Potential Corridor 7 Bay Crossing improvements would have similar types of cumulative effects on natural resources as improvements in Corridor 6. Direct impacts from Corridor 7 improvements to water resources could result in similar indirect changes to water quality, floodwater storage capacity and retention times, habitat continuity, and vegetative community composition and structure as improvements in Corridor 6; but generally at a lesser extent based on corridor length. The existing Bay Crossing is located in Corridor 7, and Corridor 7 includes a higher proportion of developed land uses than the other corridors as indicated by the prevalence of IDAs within the Chesapeake Bay Critical Area (**Table 5-16**), and the amount of developed land cover in the corridor (**Table 5-9**). The amount of IDAs within Corridor 7 is approximately 25 times the amount in Corridor 6, and approximately eight times as much as in Corridor 8, even though it is the shortest of the three potential corridors. According to the MDNR, IDAs are areas of concentrated development where little natural habitat occurs. As such, the past development which replaced natural habitat in Corridor 7 with built facilities, including the existing Bay Crossing, could have resulted in greater effects to natural resources when compared to the other corridors. Although areas in Corridors 6 and 8 have been converted in greater amounts from natural habitat to agricultural use, these areas provide a measure of habitat suitable for adaptable species, have greater rainwater infiltration capacity than built areas, less air pollution sources, and have a broader potential for environmental restoration than developed lands. Therefore, cumulatively, past actions in Corridor 7 could have had a greater and more permanent negative impact on the environment than which has occurred in Corridor 6 or 8. Construction of a new Bay Crossing in Corridor 7 could result in the smallest incremental increase in natural resource impacts based on its shorter corridor length and prevalence of existing developed uses. With impact avoidance, impact minimization, and proper crossing design, the incremental contribution of Corridor 7 improvements to adverse cumulative effects on natural resources could be further reduced.

Improvements in Corridor 7 could result in degraded water quality from sedimentation, resuspension of sediment in the water column (turbidity), and potential release of toxicants from water bottom disturbance for bridge and culvert construction. A new crossing in Corridor 7 would cross the least amount of open water of the three CARA, and potential direct and indirect effects to aquatic habitat and wildlife could be reduced through impact avoidance and minimization. Present and future actions by others will likely continue to impact aquatic habitat.

The types of cumulative effects of improvements in Corridor 7 to terrestrial wildlife and habitat would be similar to those described for improvements in Corridor 6. Habitat loss resulting in habitat fragmentation may have wide-ranging effects to wildlife and biological diversity. However, the existing habitat is already fragmented due to development, including the Bay Crossing, and agricultural uses, reducing the potential for substantial adverse effects. As with the other corridors, the cumulative effects of Corridor 7 improvements on protected species and their habitat could be avoided or minimized through coordination with the resource agencies during the permitting/design process. The mitigation measures used would be the same as those useful for the other corridors and would reduce negative incremental impacts to protected species in the corridor. Future development from other projects, and by others, could lead to terrestrial habitat loss and negative effects to protected species; these actions should also require permits and minimization/mitigation of any potential direct or indirect effects per consultation with regulatory agencies. Incremental cumulative impacts would likely occur even with all required minimization and adherence to permitting requirements.

Vegetation removal and soil disturbance in Corridor 7 would have potential effects from the spread of invasive species as described for improvements in Corridor 6. Adherence to MDOT SHA specifications would help reduce the incremental contribution to cumulative impacts on habitat from invasive species.

Other present and future development actions in the ICE Analysis Boundary could spread invasive species, and accidental releases of invasive species could occur. Existing federal and state regulations such as Maryland's Weed Control Law, EO 13112, and local regulations implementing invasive species control would help minimize potential effects from invasive species to natural resources, though some impacts could still occur even with minimization measures.

6.4.2.4 Corridor 8

A new crossing in Corridor 8 would have similar types of negative direct and indirect effects on aquatic and terrestrial wildlife and habitat as improvements in Corridor 6 or 7, however, to a potentially greater extent than in Corridors 6 or 7 due to its longer corridor length, and increased distance over surface waters including the Chesapeake Bay, Eastern Bay, and Miles River. As such, Bay Crossing improvements in Corridor 8 could have a greater incremental increase in the cumulative effects to natural resources in the corridor, and in the ICE Analysis Boundary, when combined with the other past, present, and reasonably foreseeable future actions.

The incremental contribution of Corridor 8 improvements on protected species and regulated habitat could be avoided or minimized through coordination with the resource agencies during the permitting/design process. The mitigation measures used could be the same as those useful for the other corridors. Similar to the other corridors, adherence to MDOT SHA standard specifications and special provisions for Corridor 8 improvements could reduce the incremental contributions to cumulative impacts on habitat from invasive species. However, it is still possible that incremental cumulative effects could occur even with all required minimization measures and adherence to MDOT SHA standards.

6.4.2.5 Summary

A new crossing within any of the CARA would contribute incrementally to the negative effects of past, present and future actions on natural resources.

While the distribution of different types of natural resources varies within each of the CARA, Corridor 7 would require the shortest crossing and shortest overall length of improvements compared to Corridors 6 and 8, and thus would likely have lower overall potential for direct impacts from construction of crossing improvements. Corridor 7 could also potentially make use of more existing infrastructure compared to Corridors 6 and 8 by following the existing US 50/301 roadway. Corridor 7 is somewhat more developed compared to Corridors 6 and 8, so impacts in Corridor 7 could incrementally contribute in the context of greater past impacts to natural resources.

Corridor 8 would require the longest crossing, and longest overall length of improvements. This would likely influence the overall amount of impacts to natural resources such as habitat, wetlands, streams, and forests that could occur, and thus the extent of contribution to cumulative negative effects on natural resources from other actions.

While specific impacts would need to be further examine during a Tier 2 analysis, Corridors 6 and 8 have an overall higher potential for direct and indirect impacts to natural resources compared to Corridor 7. Thus, despite the potentially greater past impacts to natural resources within Corridor 7 from other actions, the overall cumulative effect of natural resources impacts would likely be lower for Corridor 7 compared to Corridors 6 and 8.

6.4.3 Historic Resources

With human occupation of the Maryland Chesapeake Bay region extending thousands of years into the past and ongoing today, archaeological and architectural historic properties have been continuously altered by succeeding developments over time in ICE Analysis Area. Transportation improvements and other actions potentially adversely affect archaeological and architectural historic properties by destruction or altering the integrity of their historically significant characteristics. Federal and state laws requiring agencies to take into account effects to historic properties have slowed their loss. Section 4(f) of the DOT Act of 1966 affords some protection to historic properties by requiring DOT agencies to avoid adversely affecting architectural and certain archaeological historic properties, and only authorizing adverse effects if there is no prudent and feasible alternative.

6.4.3.1 No-Build Alternative

Under the No-Build Alternative, a new Bay crossing between the Western and Eastern Shores of the Chesapeake Bay in Maryland would not be built in either Corridor 6, Corridor 7 or Corridor 8, and the existing Bay Bridge would not be improved. No direct or indirect effects to historic properties would occur under the No-Build Alternative; therefore, no incremental cumulative impacts to cultural resources would occur.

6.4.3.2 Corridor 6

Past actions that have impacted cultural resources include the numerous infrastructure and land development activities that occurred in the ICE Analysis Area. The ICE Analysis Area has experienced substantial growth of population, housing, and employment since 1970. This has resulted in destruction or degradation of many resources, including demolition for new construction or changes in land use context surrounding cultural resources. Present and future actions, including transportation projects and land development activity, would likely continue to impact cultural resources in similar ways. For transportation projects, existing protective regulations and consultation requirements associated with Section 106 and Section 4(f) resources would minimize and mitigate for such effects. Potential present and future impacts to cultural resources from non-transportation projects would also be subject to applicable federal, state, and local planning ordinances that protect many of these resources.

As no specific alignment within Corridor 6 is evaluated in this Tier 1 EIS, the extent of direct effects to cultural resources is not currently known. It is possible that construction of a new crossing within Corridor 6 would have adverse effects to cultural resources such as the demolition of historic structures. Improvements within Corridor 6 could have impacts that occur in areas where growth and urbanization have already had adverse effects on cultural resources, resulting in an incremental contribution to the overall cumulative impact. The magnitude of such an incremental effect cannot be determined during the Tier 1 phase of the study.

Indirect effects of induced growth from a new crossing in Corridor 6 could similarly contribute incrementally to the cumulative impact of past, present, and future activities on cultural resources in the ICE Analysis Area. Corridor 6 could potentially have substantial induced growth effects on the Eastern Shore, some of which could result in adverse effects to cultural resources by altered land use context and demolition of historic structures to accommodate new development. Much of the induced growth study areas for Corridor 6 are highly rural and agricultural in nature, so past land use changes and infrastructure projects have likely had somewhat modest effects on cultural resources compared to more developed areas. The incremental effect from induced growth from Corridor 6 would thus be potentially substantial compared to other past, present and reasonably foreseeable future actions.

6.4.3.3 Corridor 7

As discussed for Corridor 6, past development and infrastructure projects have likely had detrimental impacts on cultural resources in the ICE Analysis Area. Past, present and future impacts to cultural resources within Corridor 7 have potentially been more substantial than Corridors 6 or 8 due to the presence of the existing Bay Bridge and the associated development along the US 50/301 corridor, particularly on Kent Island.

As no specific alignment within Corridor 7 is evaluated in this Tier 1 EIS, the extent of direct effects to cultural resources is not currently known. It is possible that construction of a new crossing within Corridor 7 would have adverse effects to cultural resources such as the demolition of historic structures. Improvements within Corridor 7 could have impacts that occur in areas where growth and urbanization have already had adverse effects on cultural resources, resulting in an incremental contribution to the overall cumulative impact. The magnitude of such an incremental effect cannot be determined during the Tier 1 phase of the study.

Indirect effects from Corridor 7, including the potential intensification of demand for growth where development already exists, would likely have a relatively minor incremental contribution to cumulative cultural resources impacts from other past, present and reasonably foreseeable future actions. The presence of existing development and infrastructure along the US 50/301 corridor has likely impacted many cultural resources, and any induced growth from Corridor 7 would not likely result in major land use changes. Thus, the incremental contribution would likely be relatively small compared to the cumulative effect of past, present and future actions.

6.4.3.4 Corridor 8

Cumulative impacts to cultural resources resulting from improvements in Corridor 8 would likely be similar to those under Corridor 6. As with Corridor 6, Past actions that have impacted cultural resources include the numerous infrastructure and land development activities that occurred in the ICE Analysis Area.

As no specific alignment within Corridor 8 is evaluated in this Tier 1 EIS, the extent of direct effects to cultural resources is not currently known. It is possible that construction of a new crossing within Corridor 8 could have adverse effects to cultural resources such as the demolition of historic structures. Improvements within Corridor 8 could have impacts that occur in areas where growth and urbanization have already had adverse effects on cultural resources, resulting in an incremental contribution to the overall cumulative impact. The magnitude of such an incremental effect cannot be determined during the Tier 1 phase of the study.

Indirect effects of induced growth from Corridor 8 would likely have cumulative impacts similar in nature to those described for Corridor 6, and corresponding with the induced growth effects described in **Section 5.6.2.**

6.4.3.5 Summary

Each of the three CARA would likely have detrimental impacts on cultural resources, and would potentially incrementally contribute to cumulative impacts on cultural resources from other past, present, and future actions. The relative magnitude of the direct impacts to cultural resources cannot be determined during this Tier 1 Study.

Past impacts to cultural resources within Corridor 7 have likely been more substantial than Corridors 6 or 8 due to the presence of the existing Bay Bridge and the associated development along the US 50/301 corridor, particularly on Kent Island.

Corridors 6 and 8 would likely have greater induced growth effects on the Eastern Shore compared to Corridor 7, and this induced growth would likely occur in more rural areas where past land use changes and infrastructure projects have had lower impacts on cultural resources. The presence of existing development and infrastructure within Corridor 7 along the US 50/301 corridor has likely impacted many cultural resources, and any induced growth from Corridor 7 would not likely result in major land use changes. Thus, the incremental contribution from induced growth for Corridor 7 would likely be relatively small compared to the cumulative effect of past, present and future actions. Corridors 6 and 8, in contrast, would have greater direct impacts, contributing incrementally in the context of lower past effects from other actions.

6.4.4 Air Quality

The CAA outlines transportation conformity requirements for highway projects involving FHWA approval to ensure air quality goals will be met with project implementation. Transportation conformity applies in geographic areas identified by the US Environmental Protection Agency (USEPA) as having exceeded NAAQS for transportation related pollutants. As noted previously, Corridors 6, 7 and 8 are subject to transportation conformity requirements. When transportation conformity requirements apply to a project, a transportation conformity determination must be completed to demonstrate these requirements are met and show the project will not cause new NAAQS violations, worsen existing NAAQS violations, or delay timely attainment of relevant NAAQS or interim milestones (42 U.S.C. 7506(c)). The purpose of these requirements is to ensure the project conforms to, or is consistent with, the SIP. A SIP is a collection of regulations and documents used by a state, territory, or local air district to reduce air pollution in nonattainment/maintenance areas and ensure NAAQS implementation, maintenance, and enforcement.

Conformity determination requirements for projects within an O_3 8-hour nonattainment/maintenance area, as well as O_3 8-hour orphan maintenance areas, are fulfilled when the project is included in both the applicable conforming LRP and TIP with descriptions consistent with the current design concept and scope (40 CFR 93.109). An LRP is a federally mandated planning document for urbanized areas which describes long-term plans to operate, maintain, and expand transportation infrastructure over a minimum planning horizon of 20 years. A TIP, complementary to the LRP, is a federally mandated planning document for urbanized areas which describes short-term transportation infrastructure plans over a planning horizon of at least four years.

A single Preferred Corridor Alternative will potentially be identified at the conclusion of the Tier 1 EIS process. Alternative alignments within the Preferred Corridor Alternative would be evaluated and compared to the No-Build Alternative in a Tier 2 NEPA analysis; such improvements would be subject to CAA transportation conformity, MSAT, GHG, and construction emissions requirements. Under the CAA, any Tier 2 preferred alternative alignment within a Preferred Corridor Alternative would require a conformity determination in either Corridor 6, 7, or 8 during Tier 2. Because the transportation conformity requirements would take into account the potential for air quality impacts in consideration of other existing and planned sources of air emissions (such as future transportation projects), it would serve as an assessment of the incremental cumulative contribution of a future Tier 2 alternative.

Any Tier 2 alternative alignments within Corridors 6 and 8 would likely be considered to have low potential MSAT effects and involve a qualitative MSAT analysis in Tier 2. Any Tier 2 alternative alignments within Corridor 7 would likely be considered to have higher potential MSAT effects and involve a quantitative MSAT analysis in Tier 2 due to the location of the existing Bay Bridge in Corridor 7. Based on projected travel speeds, Corridor 7 may result in lower emissions for some pollutants than Corridors 6 and 8. However, based on projected truck volumes, Corridor 7 could also result in higher emissions for some pollutants than Corridors 6 and 8. GHG and construction emissions may be qualitatively considered in Tier 2 regardless of the Corridor selected as the Preferred Corridor Alternative. The preferred alternative will meet the conformity requirements of the Clean Air Act Section 176(c) as appropriate.

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APPENDIX A: LOW-INCOME AND MINORITY POPULATION BY CENSUS TRACT

Table: Census Tracts Poverty Level

Geography	Total Population	Below Poverty Level	Percent Below Poverty Level	Potential EJ Population
Study Census Tracts Total	586577	43,426	7%	N/A
Delaware	943,732	918,100	12%	N/A
Maryland	5,996,079	5,856,088	10%	N/A
Census Tract 419	5,466	695	13%	No
Census Tract 420	3,039	417	14%	No
Census Tract 428	6,870	878	13%	No
Census Tract 431	2,867	450	16%	No
Census Tract 7011.01	4,059	174	4%	No
Census Tract 7011.02	8,203	546	7%	No
Census Tract 7012	8,656	119	1%	No
Census Tract 7013	7,724	485	6%	No
Census Tract 7014	3,494	320	9%	No
Census Tract 7021	7,134	530	7%	No
Census Tract 7022.04	4,217	55	1%	No
Census Tract 7022.06	6,499	52	1%	No
Census Tract 7022.08	7,139	136	2%	No
Census Tract 7022.09	4,460	83	2%	No
Census Tract 7023	5,626	100	2%	No
Census Tract 7024.02	6,192	237	4%	No
Census Tract 7025	5,919	784	13%	No
Census Tract 7026.01	5,437	253	5%	No
Census Tract 7026.02	5,780	154	3%	No
Census Tract 7027.01	4,187	87	2%	No
Census Tract 7027.02	3,715	90	2%	No
Census Tract 7061.01	3,374	348	10%	No
Census Tract 7063.01	4,233	207	5%	No
Census Tract 7063.02	3,145	199	6%	No
Census Tract 7064.01	7,741	776	10%	No
Census Tract 7064.02	3,027	536	18%	Yes
Census Tract 7065	5,295	276	5%	No
Census Tract 7066	5,398	474	9%	No
Census Tract 7067	477	10	2%	No
Census Tract 7070.01	6,242	281	5%	No
Census Tract 7070.02	4,879	365	7%	No
Census Tract 7080.01	3,787	263	7%	No

Geography	Total Population	Below Poverty Level	Percent Below Poverty Level	Potential EJ Population
Census Tract 7080.04	5,996	926	15%	No
Census Tract 7301	10,815	115	1%	No
Census Tract 7302.04	5,998	575	10%	No
Census Tract 7305.02	5,878	577	10%	No
Census Tract 7305.04	7,430	384	5%	No
Census Tract 7306.01	6,993	75	1%	No
Census Tract 7306.03	3,033	113	4%	No
Census Tract 7306.04	7,233	210	3%	No
Census Tract 7307	7,457	372	5%	No
Census Tract 7308	2,477	72	3%	No
Census Tract 7309.01	2,530	20	1%	No
Census Tract 7309.02	4,156	119	3%	No
Census Tract 7310.02	3,571	158	4%	No
Census Tract 7310.03	4,140	68	2%	No
Census Tract 7310.04	4,408	195	4%	No
Census Tract 7311.02	7,658	269	4%	No
Census Tract 7311.03	5,300	531	10%	No
Census Tract 7311.04	4,326	67	2%	No
Census Tract 7311.05	3,568	157	4%	No
Census Tract 7312.01	6,377	249	4%	No
Census Tract 7312.02	7,920	152	2%	No
Census Tract 7312.03	7,102	165	2%	No
Census Tract 7312.04	6,269	616	10%	No
Census Tract 7313.03	6,838	202	3%	No
Census Tract 7313.06	5,891	179	3%	No
Census Tract 7313.07	6,475	389	6%	No
Census Tract 7313.08	3,898	176	5%	No
Census Tract 7313.09	5,873	850	14%	No
Census Tract 7313.10	5,587	306	5%	No
Census Tract 7313.11	8,084	162	2%	No
Census Tract 7408	4,528	259	6%	No
Census Tract 7516	5,047	280	6%	No
Census Tract 7517	2,785	52	2%	No
Census Tract 4201	3,689	275	7%	No
Census Tract 4202	2,595	186	7%	No
Census Tract 4203.01	2,515	453	18%	Yes
Census Tract 4203.02	2,574	295	11%	No
Census Tract 4203.03	1,352	47	3%	No

Geography	Total Population	Below Poverty Level	Percent Below Poverty Level	Potential EJ Population
Census Tract 4204.01	6,176	907	15%	No
Census Tract 4204.02	1,972	186	9%	No
Census Tract 4207.01	3,209	294	9%	No
Census Tract 4208	3,210	398	12%	No
Census Tract 4209	3,580	904	25%	Yes
Census Tract 4211.01	3,033	692	23%	Yes
Census Tract 4211.02	2,367	369	16%	No
Census Tract 4212	1,635	199	12%	No
Census Tract 4213	2,949	613	21%	Yes
Census Tract 4510	1,690	141	8%	No
Census Tract 4518.02	3,910	345	9%	No
Census Tract 4519	2,604	90	3%	No
Census Tract 4520	2,638	144	5%	No
Census Tract 4521	3,380	351	10%	No
Census Tract 4524	3,405	338	10%	No
Census Tract 4525	3,662	474	13%	No
Census Tract 9550	3,390	792	23%	Yes
Census Tract 9551	5,406	690	13%	No
Census Tract 9552.01	3,687	757	21%	Yes
Census Tract 9552.02	2,037	222	11%	No
Census Tract 9553.01	4,097	629	15%	No
Census Tract 9553.02	2,975	496	17%	Yes
Census Tract 9554	2,006	166	8%	No
Census Tract 9555	4,373	430	10%	No
Census Tract 9501	3,775	361	10%	No
Census Tract 9502	4,670	495	11%	No
Census Tract 9503	4,139	912	22%	Yes
Census Tract 9504	3,028	181	6%	No
Census Tract 9505	2,459	410	17%	Yes
Census Tract 8004.01	2,382	91	4%	No
Census Tract 8005.04	4,836	189	4%	No
Census Tract 8005.05	2,448	58	2%	No
Census Tract 8005.07	3,231	23	1%	No
Census Tract 8005.11	5,142	228	4%	No
Census Tract 8005.13	5,530	54	1%	No
Census Tract 8005.15	4,205	225	5%	No
Census Tract 8005.16	4,012	206	5%	No
Census Tract 8005.19	4,005	170	4%	No

Geography	Total Population	Below Poverty Level	Percent Below Poverty Level	Potential EJ Population
Census Tract 8005.20	1,913	88	5%	No
Census Tract 8101	3,055	319	10%	No
Census Tract 8102	2,762	187	7%	No
Census Tract 8103	4,371	403	9%	No
Census Tract 8104	5,825	195	3%	No
Census Tract 8105	5,369	226	4%	No
Census Tract 8106	4,973	296	6%	No
Census Tract 8107	4,073	643	16%	No
Census Tract 8108	5,651	236	4%	No
Census Tract 8109.01	5,022	178	4%	No
Census Tract 8109.02	2,931	95	3%	No
Census Tract 8110	4,512	341	8%	No
Census Tract 9601	4,259	236	6%	No
Census Tract 9602.01	3,940	221	6%	No
Census Tract 9603	3,765	566	15%	No
Census Tract 9604	5,077	781	15%	No
Census Tract 9605.01	4,871	456	9%	No
Census Tract 9605.02	3,958	450	11%	No
Census Tract 9606	1,644	68	4%	No
Census Tract 9607	3,344	194	6%	No
Census Tract 9608	1,939	266	14%	No
Census Tract 9609	4,252	454	11%	No
Census Tract 2505	5,171	1621	31%	Yes

Minority Race and Ethnicity Population by Census Tract

Geography	Total Population	White Alone		Black or African American Alone		American Indian and Alaska Native Alone		Asian Alone		Native Hawaiian and Other Pacific Islander Alone		Some other Race		Two or More Races		Total Minority Race Population		Total Hispanic or Latino Ethnicity Population	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Study Census Tracts Total	598,154	458,490	77%	72,945	12%	1,064	0%*	13,924	2%	228	0%*	1,098	0%*	15,290	3%	104,549	17%	35,115	6%
Delaware	94,3732	594,911	63%	201,411	21%	2,887	0%	36,094	4%	201	0%	1,831	0%	21,604	2%	264,028	28%	84,793	9%
Maryland	5,996,079	3,109,275	52%	1,754,143	29%	11,634	0%	370,660	6%	2,441	0%	17,279	0%	157,344	3%	2,313,501	39%	573,303	10%
419	5,485	4,489	82%	379	7%	38	1%	8	0%	0	0%	15	0%	257	5%	697	13%	299	5%
420	3,039	2,720	90%	75	2%	69	2%	38	1%	0	0%	0	0%	44	1%	226	7%	93	3%
428	6,877	5,536	81%	848	12%	17	0%	24	0%	0	0%	0	0%	94	1%	983	14%	358	5%
431	2,867	2,710	95%	35	1%	0	0%	18	1%	0	0%	0	0%	5	0%	58	0.%	99	3%
7011.01	4,059	3,786	93%	73	2%	0	0%	21	1%	0	0%	0	0%	0	0%	94	2%	179	4%
7011.02	8,296	6,579	79%	455	5%	0	0%	195	2%	0	0%	0	0%	236	3%	886	11%	831	10%
7012	8,656	8,237	95%	121	1%	0	0%	0	0%	0	0%	0	0%	83	1%	204	2%	215	2%
7013	7,790	6,388	82%	873	11%	0	0%	69	1%	0	0%	0	0%	236	3%	1,178	15%	224	3%
7014	3,515	3,074	87%	367	10%	0	0%	0	0%	0	0%	0	0%	57	2%	424	12%	17	0%
7021	7,148	6,029	84%	453	6%	0	0%	59	1%	0	0%	0	0%	218	3%	730	10%	389	5%
7022.04	4,236	3,430	81%	157	4%	9	0%	227	5%	0	0%	9	0%	76	2%	478	11%	328	8%
7022.06	6,694	4,449	66%	1,093	16%	0	0%	348	5%	0	0%	0	0%	386	6%	1,827	27%	418	6%
7022.08	7,139	4,344	61%	1,293	18%	0	0%	609	9%	0	0%	16	0%	437	6%	2,355	33%	440	6%
7022.09	4,467	3,550	79%	322	7%	10	0%	123	3%	0	0%	0	0%	142	3%	597	13%	320	7%
7023	5,626	4,890	87%	124	2%	0	0%	229	4%	0	0%	48	1%	98	2%	499	9%	237	4%
7024.02	6,341	5,698	90%	174	3%	11	0%	144	2%	0	0%	0	0%	122	2%	451	7%	192	3%
7025	5,949	2,760	46%	1,942	33%	0	0%	92	2%	0	0%	0	0%	202	3%	2,236	38%	953	16%
7026.01	5,470	4,275	78%	729	13%	0	0%	116	2%	0	0%	0	0%	159	3%	1,004	18%	191	3%
7026.02	5,784	4,479	77%	558	10%	0	0%	138	2%	0	0%	18	0%	156	3%	870	15%	435	8%
7027.01	4,617	3,422	74%	640	14%	0	0%	286	6%	0	0%	0	0%	78	2%	1,004	22%	191	4%
7027.02	3715	3,231	87%	321	9%	0	0%	23	1%	0	0%	0	0%	11	0%	355	10%	129	3%
7061.01	3,686	2,665	72%	825	22%	9	0%	35	1%	0	0%	0	0%	0	0%	869	24%	152	4%
7063.01	4,233	2,675	63%	1,204	28%	0	0%	25	1%	0	0%	21	0%	81	2%	1,331	31%	227	5%
7063.02	3,145	2,598	83%	132	4%	0	0%	58	2%	0	0%	0	0%	44	1%	234	7%	313	10%
7064.01	7,855	2,476	32%	1,060	13%	0	0%	77	1%	0	0%	0	0%	55	1%	1,192	15%	4187	53%
7064.02	3,099	1,483	48%	981	32%	0	0%	23	1%	0	0%	0	0%	44	1%	1,048	34%	568	18%
7065	5,295	3,068	58%	1,013	19%	0	0%	257	5%	0	0%	0	0%	18	0%	1,288	24%	939	18%
7066	5,398	3,864	72%	725	13%	0	0%	96	2%	0	0%	0	0%	27	1%	848	16%	686	13%
7067	5,873	3,906	67%	512	9%	15	0%	379	6%	29	0%	43	1%	524	9%	1,502	26%	465	8%
7070.01	6,242	5,281	85%	604	10%	0	0%	39	1%	0	0%	0	0%	118	2%	761	12%	200	3%
7070.02	4,900	4,296	88%	247	5%	23	0%	113	2%	0	0%	37	1%	53	1%	473	10%	131	3%

Geography	Total Population	White Alone		Black or African American Alone		American Indian and Alaska Native Alone		Asian Alone		Native Hawaiian and Other Pacific Islander Alone		Some other Race		Two or More Races		Total Minority Race Population		Total Hispanic or Latino Ethnicity Population	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
7080.01	3,787	3,500	*92%*	73	*2%*	0	*0%*	37	*1%*	0	*0%*	32	*1%*	71	*2%*	*213*	*6%*	74	*2%*
7080.04	5,996	4,427	*74%*	957	*16%*	38	*1%*	0	*0%*	0	*0%*	0	*0%*	152	*3%*	*1,147*	*19%*	422	*7%*
7301	10,861	8112	*75%*	1,450	*13%*	0	*0%*	399	*4%*	0	*0%*	60	*1%*	457	*4%*	*2,366*	*22%*	383	*4%*
7302.04	6,162	3,476	*56%*	1,635	*27%*	61	*1%*	334	*5%*	74	*1%*	0	*0%*	136	*2%*	*2,240*	*36%*	446	*7%*
7305.02	5,953	3,585	*60%*	1,487	*25%*	0	*0%*	316	*5%*	0	*0%*	0	*0%*	291	*5%*	*2,094*	*35%*	274	*5%*
7305.04	7,430	4,269	*57%*	2,305	*31%*	0	*0%*	190	*3%*	0	*0%*	0	*0%*	402	*5%*	*2,897*	*39%*	264	*4%*
7306.01	6,993	6275	*90%*	0	*0%*	11	*0%*	398	*6%*	0	*0%*	20	*0%*	83	*1%*	*512*	*7%*	206	*3%*
7306.03	3,054	2,522	*83%*	113	*4%*	18	*1%*	297	*10%*	0	*0%*	35	*1%*	69	*2%*	*532*	*17%*	0	*0%*
7306.04	7,372	6,515	*88%*	396	*5%*	0	*0%*	261	*4%*	0	*0%*	0	*0%*	186	*3%*	*843*	*11%*	14	*0%*
7307	7,487	6,530	*87%*	344	*5%*	36	*0%*	63	*1%*	0	*0%*	14	*0%*	213	*3%*	*670*	*9%*	287	*4%*
7308	2,477	2,298	*93%*	13	*1%*	0	*0%*	33	*1%*	0	*0%*	4	*0%*	32	*1%*	*82*	*3%*	97	*4%*
7309.01	2,604	2,093	*80%*	304	*12%*	0	*0%*	34	*1%*	0	*0%*	0	*0%*	93	*4%*	*431*	*17%*	80	*3%*
7309.02	4,156	3,491	*84%*	178	*4%*	11	*0%*	65	*2%*	0	*0%*	0	*0%*	88	*2%*	*342*	*8%*	323	*8%*
7310.02	3,571	2,702	*76%*	303	*8%*	0	*0%*	82	*2%*	0	*0%*	0	*0%*	138	*4%*	*523*	*15%*	346	*10%*
7310.03	4,166	3682	*88%*	38	*1%*	0	*0%*	65	*2%*	6	*0%*	0	*0%*	142	*3%*	*251*	*6%*	233	*6%*
7310.04	4408	3,996	*91%*	61	*1%*	0	*0%*	135	*3%*	0	*0%*	0	*0%*	9	*0%*	*205*	*5%*	207	*5%*
7311.02	7,658	7,189	*94%*	157	*2%*	0	*0%*	99	*1%*	0	*0%*	46	*1%*	68	*1%*	*370*	*5%*	99	*1%*
7311.03	5,300	4,241	*80%*	411	*8%*	21	*0%*	315	*6%*	0	*0%*	0	*0%*	69	*1%*	*816*	*15%*	243	*5%*
7311.04	4,336	3,486	*80%*	256	*6%*	0	*0%*	158	*4%*	0	*0%*	0	*0%*	221	*5%*	*635*	*15%*	215	*5%*
7311.05	3,574	3,147	*88%*	123	*3%*	0	*0%*	162	*5%*	0	*0%*	0	*0%*	39	*1%*	*324*	*9%*	103	*3%*
7312.01	6,454	5,956	*92%*	2	*0%*	0	*0%*	62	*1%*	0	*0%*	33	*1%*	80	*1%*	*177*	*3%*	321	*5%*
7312.02	7,920	7,378	*93%*	201	*3%*	28	*0%*	147	*2%*	0	*0%*	0	*0%*	27	*0%*	*403*	*5%*	139	*2%*
7312.03	7,132	6,485	*91%*	205	*3%*	0	*0%*	66	*1%*	0	*0%*	0	*0%*	161	*2%*	*432*	*6%*	215	*3%*
7312.04	6,284	5,283	*84%*	325	*5%*	0	*0%*	255	*4%*	0	*0%*	0	*0%*	106	*2%*	*686*	*11%*	315	*5%*
7313.03	6,838	6,473	*95%*	39	*1%*	0	*0%*	109	*2%*	0	*0%*	26	*0%*	166	*2%*	*340*	*5%*	25	*0%*
7313.06	5,904	5,403	*92%*	90	*2%*	40	*1%*	60	*1%*	0	*0%*	0	*0%*	149	*3%*	*339*	*6%*	162	*3%*
7313.07	6,530	5,824	*89%*	336	*5%*	0	*0%*	51	*1%*	0	*0%*	0	*0%*	186	*3%*	*573*	*9%*	133	*2%*
7313.08	3,898	3,548	*91%*	69	*2%*	0	*0%*	87	*2%*	0	*0%*	0	*0%*	119	*3%*	*275*	*7%*	75	*2%*
7313.09	5,912	5,096	*86%*	473	*8%*	2	*0%*	23	*0%*	0	*0%*	14	*0%*	73	*1%*	*585*	*10%*	231	*4%*
7313.10	5,612	4,834	*86%*	460	*8%*	5	*0%*	119	*2%*	0	*0%*	0	*0%*	35	*1%*	*619*	*11%*	159	*3%*
7313.11	8,123	6,180	*76%*	529	*7%*	0	*0%*	92	*1%*	0	*0%*	0	*0%*	441	*5%*	*1,062*	*13%*	881	*11%*
7408	4,610	3,705	*80%*	333	*7%*	0	*0%*	92	*2%*	9	*0%*	16	*0%*	187	*4%*	*637*	*14%*	268	*6%*
7516	5,197	4,848	*93%*	168	*3%*	16	*0%*	134	*3%*	0	*0%*	0	*0%*	30	*1%*	*348*	*7%*	1	*0%*
7517	2,866	2,305	*80%*	251	*9%*	0	*0%*	138	*5%*	0	*0%*	0	*0%*	32	*1%*	*421*	*15%*	140	*5%*
4201	3,689	3,256	*88%*	38	*1%*	48	*1%*	323	*9%*	0	*0%*	0	*0%*	11	*0%*	*420*	*11%*	13	*0%*

Geography	Total Population	White Alone		Black or African American Alone		American Indian and Alaska Native Alone		Asian Alone		Native Hawaiian and Other Pacific Islander Alone		Some other Race		Two or More Races		Total Minority Race Population		Total Hispanic or Latino Ethnicity Population	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
4202	2,604	2128	82%	118	5%	65	2%	0	0%	0	0%	0	0%	39	1%	222	9%	254	10%
4203.01	2,515	1,962	78%	122	5%	0	0%	32	1%	0	0%	0	0%	198	8%	352	14%	201	8%
4203.02	2574	1,818	71%	229	9%	52	2%	29	1%	0	0%	12	0%	67	3%	389	15%	367	14%
4203.03	1,352	1,288	95%	5	0%	6	0%	5	0%	0	0%	0	0%	31	2%	47	3%	17	1%
4204.01	6,230	4,066	65%	1,230	20%	80	1%	392	6%	0	0%	0	0%	344	6%	2,046	33%	118	2%
4204.02	1,972	1,628	83%	120	6%	9	0%	78	4%	9	0%	0	0%	74	4%	290	15%	54	3%
4207.01	3,209	2,181	68%	137	4%	45	1%	135	4%	15	0%	0	0%	331	10%	663	21%	365	11%
4208	3220	2,748	85%	108	3%	0	0%	62	2%	0	0%	0	0%	91	3%	261	8%	211	7%
4209	3,580	2,753	77%	468	13%	22	1%	0	0%	0	0%	0	0%	92	3%	582	16%	245	7%
4211.01	3,033	2,249	74%	439	14%	85	3%	0	0%	0	0%	0	0%	142	5%	666	22%	118	4%
4211.02	2,392	2,072	87%	202	8%	0	0%	28	1%	0	0%	0	0%	25	1%	255	11%	65	3%
4212	1,635	1,530	94%	26	2%	0	0%	27	2%	0	0%	0	0%	24	1%	77	5%	28	2%
4213	2,949	662	22%	1,930	65%	9	0%	250	8%	0	0%	0	0%	88	3%	2,277	77%	10	0%
4510	1,723	1,589	92%	63	4%	6	0%	10	1%	0	0%	0	0%	23	1%	102	6%	32	2%
4518.02	3,910	3,565	91%	59	2%	0	0%	146	4%	48	1%	0	0%	54	1%	307	8%	38	1%
4519	2,604	2,409	93%	139	5%	0	0%	6	0%	0	0%	0	0%	50	2%	195	7%	0	0%
4520	2,638	2,358	89%	180	7%	0	0%	38	1%	0	0%	0	0%	12	0%	230	9%	50	2%
4521	3,380	2,759	82%	263	8%	0	0%	0	0%	0	0%	0	0%	114	3%	377	11%	244	7%
4524	3,405	2,903	85%	250	7%	0	0%	97	3%	0	0%	9	0%	125	4%	481	14%	21	1%
4525	3,684	3,094	84%	145	4%	32	1%	49	1%	0	0%	0	0%	191	5%	417	11%	173	5%
9550	3,452	2,346	68%	181	5%	0	0%	15	0%	0	0%	1	0%	28	1%	225	7%	881	26%
9551	5,422	4,664	86%	301	6%	41	1%	13	0%	0	0%	4	0%	166	3%	525	10%	233	4%
9552.01	3,752	2,731	73%	650	17%	0	0%	33	1%	0	0%	0	0%	163	4%	846	23%	175	5%
9552.02	2,037	1,586	78%	325	16%	0	0%	28	1%	7	0%	0	0%	61	3%	421	21%	30	1%
9553.01	4,224	3,561	84%	414	10%	0	0%	22	1%	0	0%	0	0%	128	3%	564	13%	99	2%
9553.02	3,179	2,178	69%	630	20%	0	0%	0	0%	0	0%	0	0%	50	2%	680	21%	321	10%
9554	2,012	1,889	94%	40	2%	0	0%	2	0%	0	0%	0	0%	47	2%	89	4%	34	2%
9555	4,379	3,446	79%	561	13%	0	0%	66	2%	0	0%	26	1%	60	1%	713	16%	220	5%
9501	3,779	2,759	73%	450	12%	37	1%	21	1%	0	0%	0	0%	90	2%	598	16%	422	11%
9502	4,727	3,962	84%	518	11%	0	0%	10	0%	0	0%	0	0%	68	1%	596	13%	169	4%
9503	5,549	4,196	76%	1,004	18%	0	0%	172	3%	0	0%	0	0%	38	1%	1,214	22%	139	3%
9504	3,094	2,315	75%	631	20%	0	0%	6	0%	0	0%	0	0%	47	2%	684	22%	95	3%
9505	2,517	2,134	85%	309	12%	2	0%	9	0%	0	0%	0	0%	37	1%	357	14%	26	1%
8004.01	2,422	1,278	53%	596	25%	0	0%	192	8%	0	0%	0	0%	88	4%	876	36%	268	11%

Geography	Total Population	White Alone		Black or African American Alone		American Indian and Alaska Native Alone		Asian Alone		Native Hawaiian and Other Pacific Islander Alone		Some other Race		Two or More Races		Total Minority Race Population		Total Hispanic or Latino Ethnicity Population	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
8005.04	4,836	2,663	*55%*	1,187	*25%*	0	*0%*	330	*7%*	0	*0%*	8	*0%*	94	*2%*	*1,619*	*33%*	554	*11%*
8005.05	2,454	1,451	*59%*	509	*21%*	0	*0%*	110	*4%*	0	*0%*	4	*0%*	63	*3%*	*686*	*28%*	317	*13%*
8005.07	3,231	600	*19%*	2,105	*65%*	0	*0%*	281	*9%*	0	*0%*	9	*0%*	119	*4%*	*2,514*	*78%*	117	*4%*
8005.11	5,176	1,474	*28%*	3,035	*59%*	0	*0%*	138	*3%*	0	*0%*	85	*2%*	243	*5%*	*3,501*	*68%*	201	*4%*
8005.13	5,530	2,078	*38%*	2,266	*41%*	0	*0%*	377	*7%*	0	*0%*	20	*0%*	363	*7%*	*3,026*	*55%*	426	*8%*
8005.15	4,325	1,263	*29%*	2,433	*56%*	0	*0%*	201	*5%*	0	*0%*	0	*0%*	78	*2%*	*2,712*	*63%*	350	*8%*
8005.16	4,017	815	*20%*	2,682	*67%*	0	*0%*	170	*4%*	0	*0%*	0	*0%*	90	*2%*	*2,942*	*73%*	260	*6%*
8005.19	4,005	763	*19%*	2,320	*58%*	0	*0%*	369	*9%*	0	*0%*	56	*1%*	153	*4%*	*2,898*	*72%*	344	*9%*
8005.20	1,913	59	*3%*	1,653	*86%*	0	*0%*	67	*4%*	0	*0%*	0	*0%*	51	*3%*	*1,771*	*93%*	83	*4%*
8101	3,086	2,583	*84%*	470	*15%*	0	*0%*	0	*0%*	0	*0%*	0	*0%*	0	*0%*	*470*	*15%*	33	*1%*
8102	2,762	2,122	*77%*	333	*12%*	3	*0%*	0	*0%*	0	*0%*	0	*0%*	18	*1%*	*354*	*13%*	286	*10%*
8103	4,603	4,074	*89%*	369	*8%*	9	*0%*	0	*0%*	0	*0%*	0	*0%*	21	*0%*	*399*	*9%*	130	*3%*
8104	6,028	5,415	*90%*	462	*8%*	1	*0%*	0	*0%*	0	*0%*	0	*0%*	17	*0%*	*480*	*8%*	133	*2%*
8105	5,405	4,786	*89%*	374	*7%*	0	*0%*	7	*0%*	0	*0%*	0	*0%*	93	*2%*	*474*	*9%*	145	*3%*
8106	4,973	4,198	*84%*	147	*3%*	0	*0%*	20	*0%*	0	*0%*	3	*0%*	11	*0%*	*181*	*4%*	594	*12%*
8107	4,073	3385	*83%*	468	*11%*	0	*0%*	38	*1%*	0	*0%*	67	*2%*	10	*0%*	*583*	*14%*	105	*3%*
8108	5,651	5,035	*89%*	398	*7%*	0	*0%*	0	*0%*	0	*0%*	19	*0%*	142	*3%*	*559*	*10%*	57	*1%*
8109.01	5,029	4,516	*90%*	144	*3%*	0	*0%*	91	*2%*	0	*0%*	37	*1%*	100	*2%*	*372*	*7%*	141	*3%*
8109.02	2949	2,733	*93%*	54	*2%*	0	*0%*	71	*2%*	0	*0%*	7	*0%*	71	*2%*	*203*	*7%*	13	*0%*
8110	4,512	3,642	*81%*	208	*5%*	0	*0%*	41	*1%*	0	*0%*	0	*0%*	453	*10%*	*702*	*16%*	168	*4%*
9601	4,268	3,691	*86%*	374	*9%*	3	*0%*	14	*0%*	0	*0%*	186	*4%*	0	*0%*	*577*	*14%*	0	*0%*
9602.01	3940	3,465	*88%*	287	*7%*	0	*0%*	85	*2%*	0	*0%*	0	*0%*	75	*2%*	*447*	*11%*	28	*1%*
9603	3,840	1,908	*50%*	1,166	*30%*	0	*0%*	71	*2%*	0	*0%*	0	*0%*	119	*3%*	*1356*	*35%*	576	*15%*
9604	5,380	3,755	*70%*	547	*10%*	0	*0%*	55	*1%*	0	*0%*	0	*0%*	130	*2%*	*732*	*14%*	893	*17%*
9605.01	4,884	3933	*81%*	240	*5%*	3	*0%*	181	*4%*	0	*0%*	0	*0%*	226	*5%*	*650*	*13%*	301	*6%*
9605.02	3,958	2,927	*74%*	505	*13%*	16	*0%*	68	*2%*	0	*0%*	0	*0%*	85	*2%*	*674*	*17%*	357	*9%*
9606	1,644	1,503	*91%*	117	*7%*	2	*0%*	0	*0%*	0	*0%*	0	*0%*	3	*0%*	*122*	*7%*	19	*1%*
9607	3,344	2,802	*84%*	329	*10%*	0	*0%*	17	*1%*	0	*0%*	20	*1%*	121	*4%*	*487*	*15%*	55	*2%*
9608	1,939	1704	*88%*	83	*4%*	0	*0%*	15	*1%*	0	*0%*	0	*0%*	49	*3%*	*147*	*8%*	88	*5%*
9609	4264	3,388	*79%*	628	*15%*	0	*0%*	28	*1%*	31	*1%*	0	*0%*	79	*2%*	*766*	*18%*	110	*3%*
2505	5,171	2,454	*47%*	1,751	*34%*	0	*0%*	36	*1%*	0	*0%*	18	*0%*	204	*4%*	*2,009*	*39%*	708	*14%*

Note – Race is evaluated separately from Hispanic/Latino ethnicity by the US Census.0%= less than one*
yellow highlighting = minority race population above EJ population threshold
green highlighting= minority Hispanic/ Latino ethnicity above EJ population threshold