CHESAPEAKE
BAY CROSSING STUDY
TIER 1 NEPA

DRAFT ENVIRONMENTAL IMPACT STATEMENT

FEBRUARY 2021

MDTA Maryland Transportation Authority

U.S. Department of Transportation Federal Highway Administration

CHESAPEAKE BAY CROSSING STUDY: TIER 1 NEPA

Maryland

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to:
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By:
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
and
MARYLAND TRANSPORTATION AUTHORITY

In Cooperation with:
US Army Corps of Engineers, US Environmental Protection Agency,
US Coast Guard, National Marine Fisheries Service,
Maryland Department of the Environment, Maryland Department of Natural Resources,
and the Maryland Department of Transportation State Highway Administration

2/2/2021
Date of Approval

James F. Ports, Jr.
James F. Ports, Jr., Executive Director
Maryland Transportation Authority

2/3/2021
Date of Approval

Gregory Murrill, Division Administrator
Federal Highway Administration

The following persons may be contacted for additional information concerning this document:

Heather Lowe
Maryland Transportation Authority
Point Breeze
2310 Broening Highway
Baltimore MD 21224
410-537-5665

Jeanette Mar
Federal Highway Administration
George H. Fallon Building
31 Hopkins Plaza, Suite 1520
Baltimore, Maryland 21201
410-779-7152

The purpose of the Chesapeake Bay Crossing Study: Tier 1 NEPA is to consider corridors for providing additional capacity and access across the Chesapeake Bay in order to improve mobility, travel reliability and safety at the existing Bay Bridge. The Study is evaluating potential new corridor alternatives that will include 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. This Tier 1 Draft Environmental Impact Statement (DEIS) presents the Study purpose and need, alternatives considered, the existing environmental conditions, and an analysis of the anticipated beneficial and adverse environmental effects of the alternatives. The DEIS provides a comparative analysis between the No-Build Alternative and three corridor alternatives; and identifies the Maryland Transportation Authority-Recommended Preferred Corridor Alternative as Corridor 7. Comments on the DEIS are due by May 10, 2021 and should be sent to Heather Lowe at the above address or submitted using the online comment form at https://baycrossingstudy.com/public-involvement/submit-comments. The Federal Highway Administration intends to issue a combined FEIS / Record of Decision.

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MDTA
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ABBREVIATIONS & ACRONYMS

ACHP	Advisory Council on Historic Preservation
ACRES	Assessment, Cleanup and Redevelopment Exchange System
ACS	American Community Survey
ADT	Average Daily Traffic
AET	All Electronic Tolling
APE	Area of Potential Effects
BMC	Baltimore Metropolitan Council
BCS	Bay Crossing Study
BRT	Bus Rapid Transit
BRTB	Baltimore Regional Transportation Board
CAA	Clean Air Act
CAC	Critical Area Commission
CARA	Corridor Alternatives Retained for Analysis
CBF	Chesapeake Bay Foundation
CEDRI	Compliance and Emissions Data Reporting Interface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CHART	Coordinated Highways Action Response Teams
CHS	Controlled Hazardous Substance
CL	Corporate Land
CO	Carbon Monoxide
COMAR	Code of Maryland Regulations
CWA	Clean Water Act
DEIS	Draft Environmental Impact Statement
DelDOT	Delaware Department of Transportation
DOE	Determination of Eligibility
DOI	Department of the Interior

ABBREVIATIONS & ACRONYMS

EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ES	Estuarine
ETC	Electronic Toll Collection
FCA	Forest Conservation Act
FED	Federal Land
FEMA	Federal Emergency Management Administration
FFDOCKET	Federal Facility Hazardous Waste Compliance Docket
FIDS	Forest Interior Dwelling Species
FRS	Facility Registry System
FTA	Federal Transit Administration
FHWA	Federal Highway Administration
GHG	Greenhouse Gas
GI	Green Infrastructure
GIS	Geographic Information System
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
HRT	Heavy Rail Transit
ICE	Indirect and Cumulative Effects
ICM	Interagency Coordination Meeting
IDA	Intensely Developed Areas
L	Lacustrine
LDA	Limited Development Area
LEP	Limited English Proficiency
Leq	Equivalent Continuous Sound Level
LRP	Long-Range Plan
LOS	Level of Service
LRP	Land Restoration Program
LRT	Light Rail Transit
LUST-ARRA	Leaking Underground Storage Tank- American Recovery and Reinvestment Act
LWCF	Land and Water Conservation Fund Act
MAA	Maryland Aviation Administration
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MDOT	Maryland Department of Transportation
MDOT MTA	Maryland Department of Transportation Maryland Transit Administration
MDOT MVA	Maryland Department of Transportation Motor Vehicle Administration

ABBREVIATIONS & ACRONYMS

MDP	Maryland Department of Planning
MD-RCRA	Maryland- Resource Conservation and Recovery Act Information System
MDTA	Maryland Transportation Authority
MD-TEMPO	Maryland- Tools for Environmental Management and Protection Organizations
MHT	Maryland Historical Trust
MIHP	Maryland Inventory of Historic Properties
MOA	Model and Operational Alternatives
MPO	Metropolitan Planning Organization
MSAT	Mobile Source Air Toxics
MSTM	Maryland Statewide Transportation Model
MVMT	Million Vehicle Miles Traveled
MWCOG	Metropolitan Washington Council of Governments
NAAQS	National Ambient Air Quality Standard
NAC	Noise Abatement Criteria
NCDB	National Compliance Data Base
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NHL	National Historic Landmark
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NSA	Noise-Sensitive Area
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
O_3	Ozone
O-D	Origins and destinations
OMB	Office of Management and Budget
OPA	Oil Pollution Act
OWJ	Official with Jurisdiction
P&N	Purpose and Need
PEM	Palustrine Emergent
PFA	Priority Funding Area
PFO	Palustrine Forested
$PM_{2.5}$	Fine Particulate Matter
PM_{10}	Course Particulate Matter

ABBREVIATIONS & ACRONYMS

PSS	Palustrine Scrub/Shrub
PTI	Planning Time Index
PUB	Palustrine Unconsolidated Bottom
PUS	Palustrine Unconsolidated Shore
RCA	Resource Conservation Areas
RCRA	Resource Conservation and Recovery Act
RMP	Risk Management Plan
ROD	Record of Decision
SAV	Submerged Aquatic Vegetation
SEMS	Superfund Enterprise Management System
SDAT	State Department of Assessments and Taxation
SIP	State Implementation Plan
SSPRA	Sensitive Species Project Review Areas
TIP	Transportation Improvement Program
TRIS	Toxics Release Inventory System
TSCA	Toxic Substances Control Act
TSM/TDM	Transportation System Management/Travel Demand Management
USACE	United States Army Corps of Engineers
USC	United States Code
USCG	United States Coast Guard
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank
VDOT	Virginia Department of Transportation
VCP	Voluntary Cleanup Program
VPD	Vehicles per Day
VPH	Vehicles per Hour
WILMAPCO	Wilmington Area Planning Council
WOTUS	Waters of the United States
WSSC	Wetlands of Special State Concern

EXECUTIVE **SUMMARY**

The Chesapeake Bay is one of Maryland's most iconic and significant environmental resources. Comprising a 64,000 square mile watershed that spans six states and the District of Columbia, the Bay holds more than 18 trillion gallons of water and is the largest estuary in the United States. The Bay maintains a functioning ecosystem that filters water and provides suitable habitat for diverse and abundant life. It also provides flood protection, serves as a transportation route for cargo and cruise ships, and plays a major role in Maryland's economy through commercial fishing activities and recreational, educational, and tourism opportunities.

The Bay also presents a clear transportation barrier between Maryland's Western and Eastern Shores. The first highway connection across the Chesapeake Bay was constructed in 1952, and the second parallel Bay Bridge was constructed in 1973. As Maryland's only crossing of the Chesapeake Bay, the William Preston Lane Jr. Memorial Bridge (Bay Bridge) plays a major role in the State's regional transportation system and is vital in supporting the diverse regional economy.

However, increased use of the Bay Bridge over the years has meant that daily commuters, regional travelers, truck freight operators, and vacationers have experienced increased congestion, often struggling to reach their destinations with low confidence in travel times. Aging infrastructure, capacity limitations at the existing bridge, and an increasing demand for trips across the Bay will continue to exacerbate the congestion and delays that travelers currently experience. There would likely be negative consequences with wide-ranging effects if this primary link between the Eastern Shore and the Baltimore and Washington Metropolitan Areas were to become seriously degraded or unavailable due to safety or performance issues.

MDTA understands that the current pandemic situation is impacting all Marylanders today in how we work, in how we spend our free time, and in how we travel. We also recognize the impact that the current pandemic situation has had on transportation patterns throughout the region, including the Bay Bridge. MDTA's number one priority during these challenging times is the health and safety of all Marylanders. Notwithstanding the current crisis, we continue our efforts to ensure transportation improvements are being developed to meet our State's needs not only for today but for the next 20-plus years. At this time, there is no definitive traffic model that would predict how the pandemic will affect long-term traffic projections; however, we will continue to track trends in travel behavior and traffic volumes as our communities, businesses, places of worship, and schools begin to reopen, and consider new information as it becomes available.

What is the Chesapeake Bay Crossing Study: Tier 1 NEPA?

The Chesapeake Bay Crossing Study: Tier 1 NEPA (Bay Crossing Study) is the critical first step to addressing existing and future congestion at the Bay Bridge and its approaches along US 50 and US 301. Led by the Maryland Transportation Authority (MDTA) and the Federal Highway Administration (FHWA), the study encompasses a broad geographic area, spanning nearly 100 miles of the Chesapeake Bay from the northern-most portion in Harford and Cecil counties to the southern border with Virginia between St. Mary's and Somerset counties. Through data collection, analysis, and modeling, as well as with extensive agency and public input, the Bay Crossing Study will result in the identification of a selected corridor alternative to address congestion at the Bay Bridge.

This document is a Tier 1 Draft Environmental Impact Statement (DEIS). The DEIS is being circulated to agencies and the public for comment before the development of a Final Environmental Impact Statement (FEIS) and issuance of a Record of Decision (ROD) identifying the Tier 1 selected alternative.

What is the purpose of the Bay Crossing Study and why is it needed?

The purpose of the Bay Crossing Study is to consider corridors for providing additional capacity and access across the Chesapeake Bay in order to improve mobility, travel reliability, and safety at the existing Bay Bridge.

The project needs are adequate capacity, dependable and reliable travel times, and the flexibility to support maintenance and incident management. As part of the study, MDTA will also consider financial viability of the proposed alternatives and environmental resources.

What is the National Environmental Policy Act (NEPA)?

The National Environmental Policy Act (NEPA) is federal legislation that applies to projects receiving federal funding or approval. NEPA requires Federal agencies to prepare an environmental impact statement that assesses the impact of a major action on the human and natural environment. NEPA requires consideration of a reasonable range of alternatives and ensures that agencies and the public are informed and involved in considering the potential effects of such action on the environment.

TIERED NEPA PROCESS

What is a tiered NEPA approach?

A tiered approach to NEPA is a staged process that allows a federal agency to examine a potential action on a broad scale in an initial EIS (the first stage, or Tier 1) and subsequently analyze a more site-specific action in another NEPA study at a later date (the second stage, or Tier 2).

NEPA regulations issued by the Council on Environmental Quality (CEQ) 40 CFR Parts 1500-1508) and the Federal Highway Administration 923 CFR § 771.111(g)) recognize tiering as an appropriate option for complying with NEPA, particularly for projects like the Bay Crossing Study that must examine information at a very broad scale (i.e., determining a potential corridor) before shifting the focus to a project at a site-specific scale (i.e., determining an alignment within a specific corridor)

Why did the Bay Crossing Study pursue a tiered analysis?

Most infrastructure-related NEPA efforts focus on design alternatives at a specific location. However, the Bay Crossing Study is different by virtue of its scale – the study area for the effort spans nearly 100 miles of the Chesapeake Bay. Within those 100 miles, there are myriad of crossing possibilities. By using a tiered NEPA approach, MDTA will narrow the area under consideration by evaluating two-mile wide potential corridors in Tier 1.

Completion of the Tier 1 study does not presume that a Tier 2 study will occur, and a Tier 2 study is not funded at this time. However, if a Corridor Alternative is selected in Tier 1, a potential Tier 2 study would include development and evaluation of specific design alternative alignments within the selected Corridor Alternative. A smaller geographic area would be studied in a potential Tier 2 study, allowing for a more detailed evaluation. This tiered approach allows for a more efficient environmental review and permitting process.

What is included in a Tier 1 and a Tier 2 analysis?

A Tier 1 NEPA Study includes a high-level review of cost, engineering, and environmental data. The Tier 1 study for this effort may conclude with the selection of a Corridor Alternative for a potential Bay Crossing.

A Tier 2 NEPA Study would further evaluate possible alignments within the Corridor Alternative selected in Tier 1. More detailed analysis of cost, engineering, and environmental data would be conducted in a potential Tier 2 study.

TIER 1 NEPA (CURRENT STUDY)

- Establish the project Purpose and Need
- Evaluate a range of alternatives across the Bay using broadscale engineering information
- Include public involvement and comment
- Identify a Selected Corridor Alternative

TIER 2 NEPA (FUTURE STUDY)

- Refine Purpose and Need
- Identify alignments within the Selected Corridor Alternative identified in Tier 1
- Include more detailed engineering of alternatives and specific assessment of potential environmental impacts
- Identify potential mitigation measures
- Include public involvement comment
- Identify a Selected Alternative within the Tier 1 Selected Corridor

RANGE OF ALTERNATIVES

What alternatives has the Bay Crossing Study considered?

Three categories of alternatives were evaluated for the Bay Crossing Study: the No-Build Alternative, modal and operational alternatives (MOAs), and corridor alternatives.

The **No-Build Alternative** included the existing infrastructure, planned future improvements, and regular maintenance of the Bay Bridge.

The **Modal and Operational Alternatives** are presented in the graphic below.

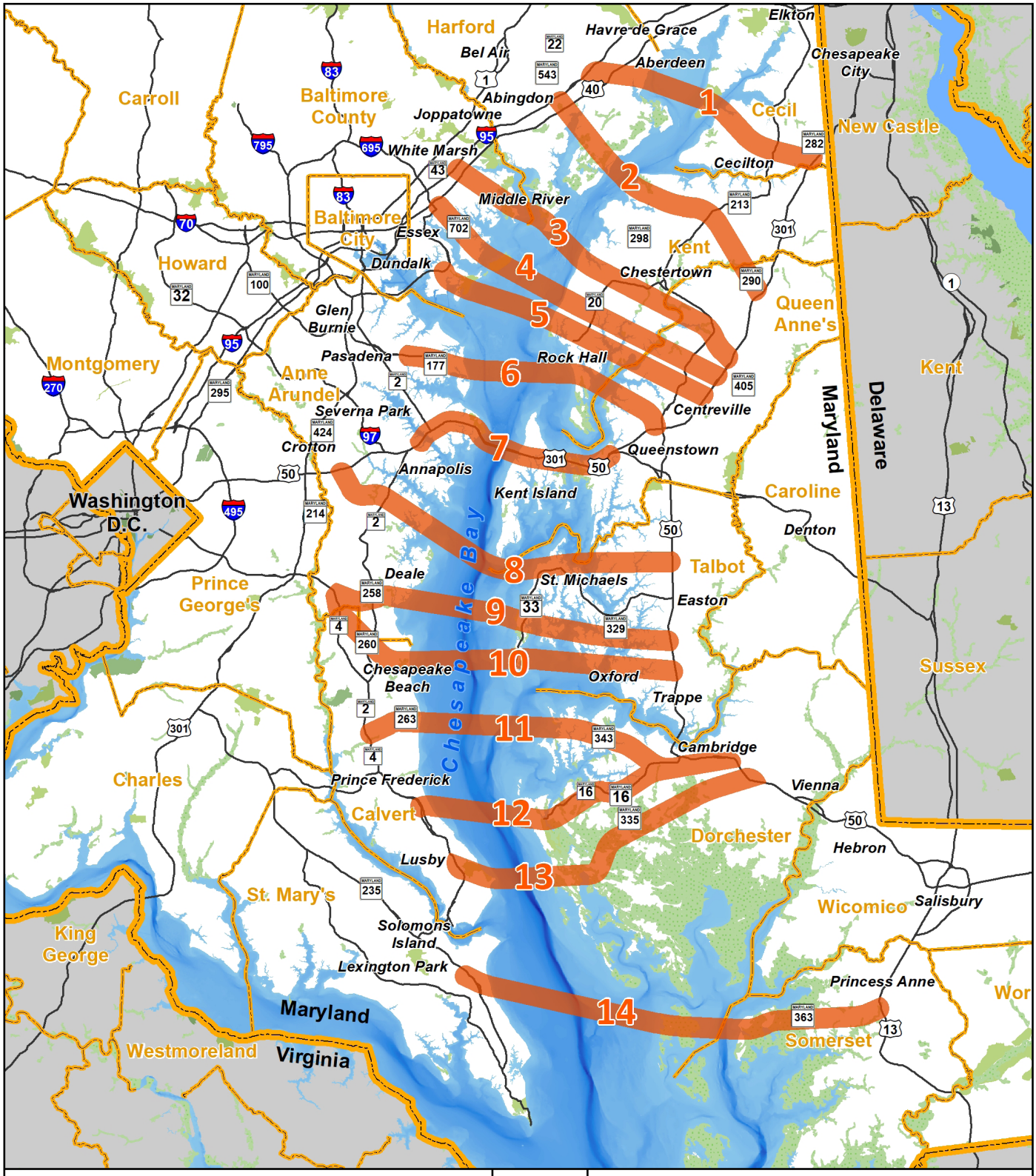
Transportation System Management (TSM) / Travel Demand Management (TDM)- infrastructure and operational changes to improve the function of the existing roadway network without adding major new capacity. Improvements evaluated included all-electronic tolling or variable tolling. (All-electronic tolling at the Bay Bridge has since been implemented as of Spring 2020)

Ferry service- one or more sets of ferry terminals to connect the Eastern Shore and the Western shore. May include roadway improvements to connect terminals to existing roadways

Bus Rapid Transit- high-quality bus-based transit system that would use the existing Bay Bridge or a new crossing

Rail Transit- rail service providing passenger service that would use a new Bay crossing

Fourteen Corridor Alternatives were developed to include potential Chesapeake Bay crossing locations and the approach roadways that would tie into the existing roadway network, as shown on the map on page 5.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Havre-de-Grace
Elkton
Bel Air
Aberdeen
Chesapeake City
Carroll
Baltimore County
Abingdon
Joppatowne
Cecil
New Castle
White Marsh
Cecilton
Middle River
Baltimore City
Essex
Kent
Howard
Dundalk
Chestertown
Queen Anne's
Glen Burnie
Montgomery
Pasadena
Rock Hall
Kent
Anne Arundel
Severna Park
Centreville
Maryland
Delaware
Crofton
Queenstown
Annapolis
Kent Island
Caroline
Washington D.C.
Denton
Talbot
Deale
St. Michaels
Prince George's
Easton
Chesapeake Bay
Sussex
Chesapeake Beach
Oxford
Trappe
Cambridge
Charles
Prince Frederick
Vienna
Calvert
Dorchester
Hebron
Lusby
St. Mary's
Wicomico
Salisbury
King George
Solomons Island
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Federal Highway Administration
MDTA Maryland Transportation Authority
CHESAPEAKE BAY CROSSING STUDY
TIER 1 NEPA

How were the MOAs considered?

MOAs were analyzed separately from the corridor alternatives because they were strategies not tied to a specific geographic location. An examination of the MOAs revealed that they would not meet the study purpose and need as stand-alone alternatives because they would not provide adequate capacity to relieve congestion at the existing bridge, provide dependable and reliable travel times, or provide flexibility to support maintenance and incident management at the existing bridge. Therefore, all MOAs were recommended to be eliminated from further consideration as stand-alone alternatives.

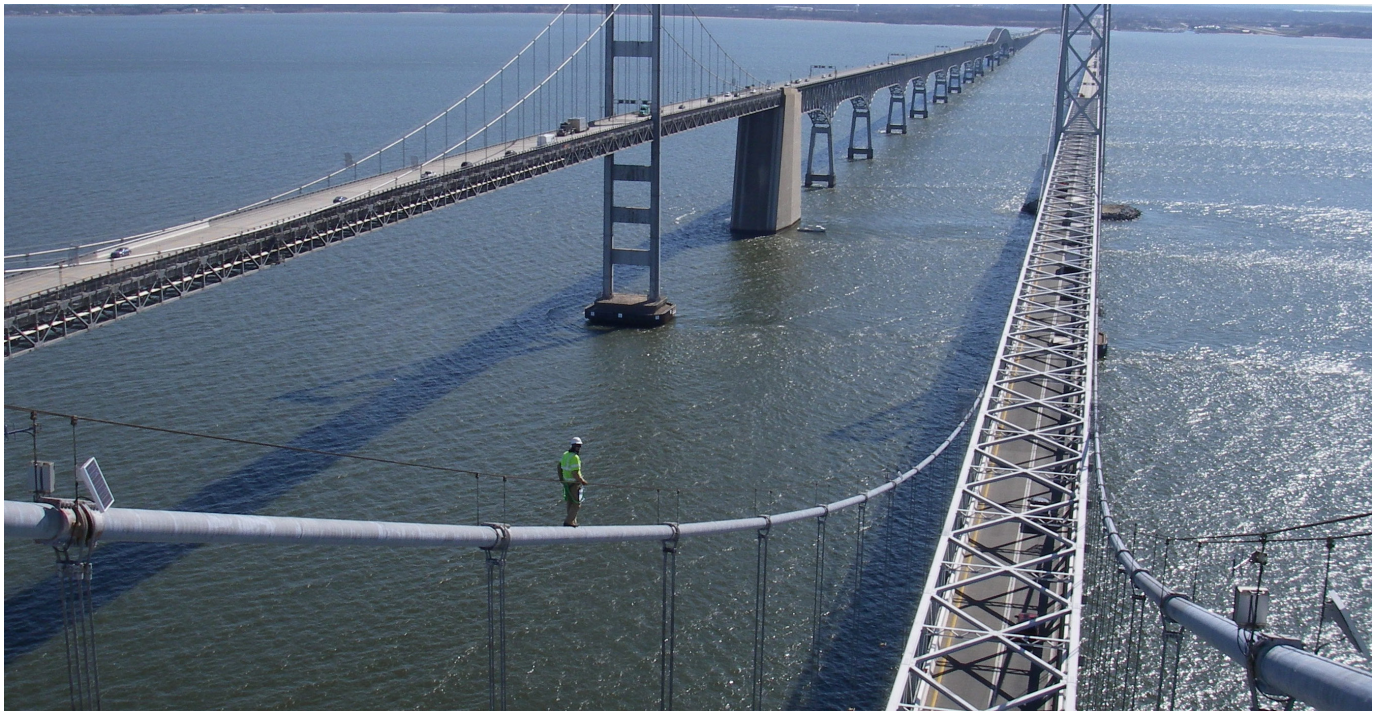
However, three of the MOAs – TSM / TDM, BRT, and Ferry Service – are recommended to be considered in combination with other alternatives should the Bay Crossing Study advance to a Tier 2 NEPA study. MDTA would consider the TSM / TDM, Ferry Service, and BRT MOAs in combination with other alternatives in a Tier 2 evaluation. Rail would not be evaluated further due to the anticipated high cost and low ridership.

How were the corridor alternatives screened?

The initial 14 corridor alternatives were screened using the elements of the study purpose and need. Each alternative was assessed for its ability to provide adequate capacity, dependable and reliable travel times, and flexibility to support maintenance and incident management at the existing Bay Bridge. Environmental resources, financial viability, and public comment/agency input were also considered.

The 14 corridor alternatives were screened in two phases. In the first phase, corridors were analyzed for adequate capacity, focusing specifically on anticipated 2040 summer weekend and non-summer weekend average daily traffic (ADT) at the existing crossing. Corridors were eliminated that could not reduce the 2040 ADT at the existing crossing to below existing (2017) levels on either summer weekends or non-summer weekdays. They were also screened for unavoidable impacts to major resources like the Aberdeen Proving Ground or Blackwater National Wildlife Refuge.

In the second phase, the corridors that met the metrics from the first phase were evaluated for their ability to provide dependable and reliable travel times; offer flexibility to support maintenance and incident management at the existing bridge. The screening also considered results of the screening-level environmental inventory and potential financial viability.



The environmental inventory portion of the screening process identified natural, socioeconomic, and cultural resources present in the two-mile wide corridor alternatives. Since developing specific alignments within a given corridor was not a goal of the Tier 1 NEPA study, impacts were generally assessed on a qualitative basis. The screening-level environmental inventory was used as an indicator of the types of resources that would be anticipated to be present, their overall prevalence, and the magnitude of potential impacts in comparison to other corridor alternatives.

Financial viability was assessed considering the complexity of the crossing and the magnitude of the approach infrastructure. The evaluation of the complexity included what would be required to build a new crossing, with the assumption that longer corridor alternatives and wider deep-water or channel crossings would require greater expense to construct. The approach infrastructure referred to the overall length and complexity of infrastructure required to connect to logical termini on both sides of the Chesapeake Bay.

CORRIDOR ALTERNATIVES RETAINED FOR ANALYSIS

Which corridor alternatives were evaluated in more detail?

Three corridor alternatives were identified as Corridor Alternatives Retained for Analysis (CARA) as a result of the screening process applied to the 14 initial corridors:

CORRIDOR 6

Connects Pasadena and Centreville. Follows MD 177 and ties in with MD 100 on Western Shore; does not follow existing road network on Eastern Shore to tie into US 301.

CORRIDOR 7

Follows existing road network along US 50/301 from west of the Severn River on the Western Shore to US 50/301 split on the Eastern Shore; includes location of existing Bay Bridge.

CORRIDOR 8

Follows MD 214/424 and ties into existing US 50 interchange on Western Shore; does not follow existing road network on Eastern Shore to connect to US 50.

These three corridors were the only corridors to meet all elements of the purpose and need, and were carried forward for further analysis in the DEIS. They were anticipated to provide adequate capacity, dependable and reliable travel times, and flexibility to support maintenance and incident management at the existing bridge. Furthermore, the CARA achieved the goal of reducing congestion better than all other corridors – a goal that was emphasized by public input collected at the Fall 2019 Open Houses.

What are the potential impacts of the CARA?

The Tier 1 NEPA study evaluated potential environmental impacts by using a screening-level inventory as an indicator of the types of resources that would be anticipated to be present, their overall prevalence, and the magnitude of potential impacts in comparison to other corridor alternatives. Corridor alternatives with greater acreage or numbers of a resource would be expected to be more likely to impact those resources. See adjacent tables. The environmental inventory consisted of identifying the total amount of each resource present within each two-mile wide corridor. In addition to the environmental inventory, a qualitative assessment was conducted to evaluate the distribution of resources throughout the corridors and the potential to avoid impacts. This qualitative assessment is detailed in Chapter 4 of the DEIS. The DEIS also includes analysis of indirect and cumulative effects, such as potential increased land use change and development near a new crossing.

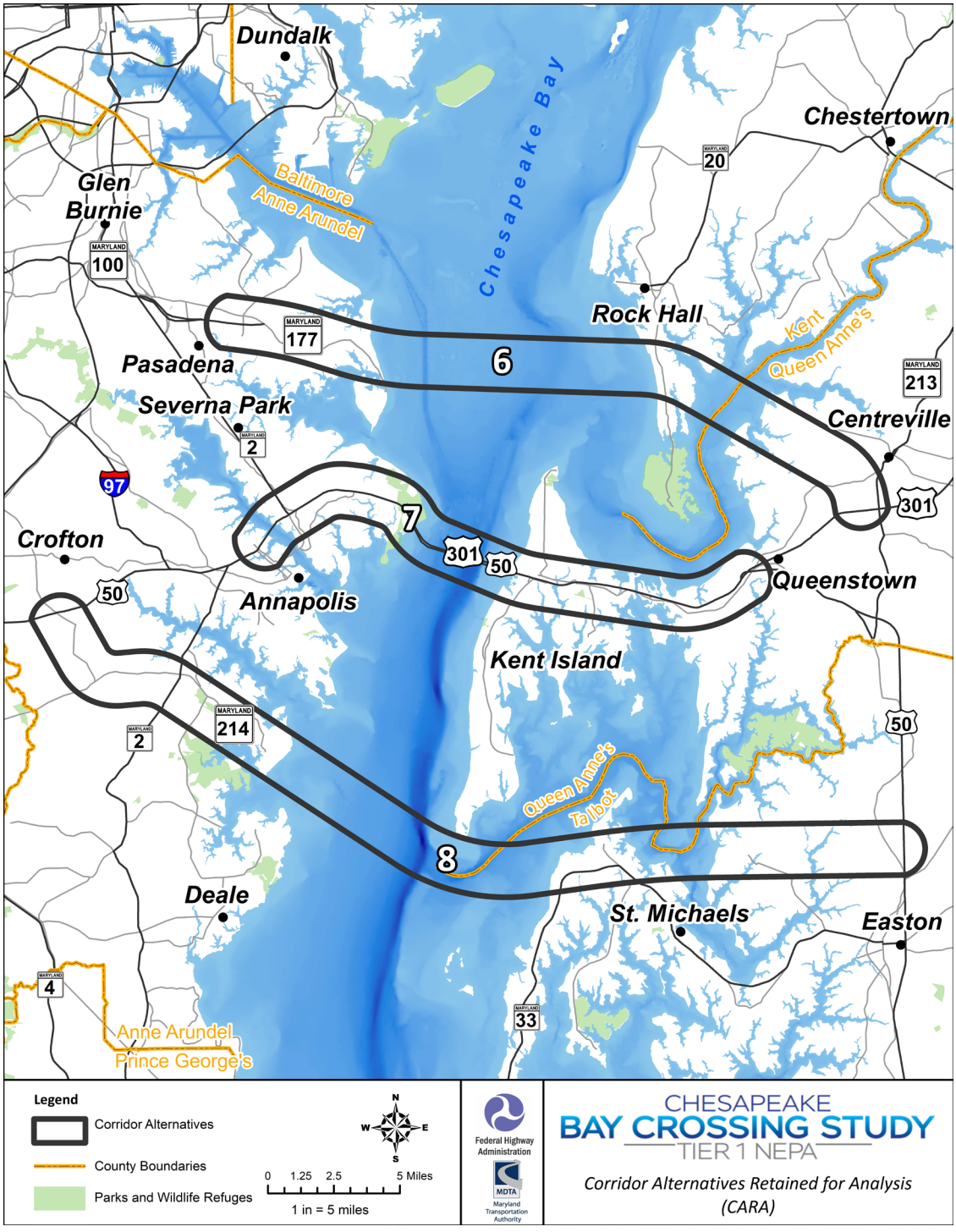
What were the findings of the environmental analysis?

The evaluation of resource distribution and potential for avoidance yielded differing results for the numerous different resources. Many resources were identified that could not be avoided, such as 100-year floodplains and Chesapeake Bay Critical Areas. Aquatic resources such as submerged aquatic vegetation and oyster resources often cover the full width of the open water portions of the corridors. Other resources such as community facilities could potentially be avoided in some cases, though further analysis would be required.

Corridor 7 would potentially have lower overall environmental impacts due to the shorter crossing length and ability to utilize existing on-land infrastructure along US 50/301. Corridors 6 and 8 would require longer crossings and more roadway along new alignment, likely resulting in greater impacts to sensitive environmental resources in and around the Chesapeake Bay, especially tidal wetlands and aquatic resources. Corridor 7 could have greater impacts to noise sensitive areas and socioeconomic resources such as community

facilities and commercial areas due to the more developed nature of the corridor compared to Corridors 6 and 8.

The analysis of indirect and cumulative effects determined that Corridors 6 and 8 could result in substantial land use changes on the Eastern Shore. Providing access to undeveloped land on the Eastern Shore in proximity to major employment centers such as Baltimore and Washington, DC could lead to increased demand for unplanned residential development in the rural areas of Corridor 6 and 8. Corridor 7, in contrast, would be more compatible with existing and planned future land uses. Public and agency input emphasized the potential for induced growth effects of a new crossing as a topic of particular importance for this Tier 1 study.



ENVIRONMENTAL INVENTORY RESULTS WITHIN THE CARA

Resource	Unit	Corridor 6	Corridor 7	Corridor 8
Total Area	Acres	35,010	27,990	46,810
Land	Acres	16,840 (48%)	18,330 (65%)	26,230 (56%)
Open Water	Acres	18,140 (52%)	9,660 (35%)	20,590 (44%)
Community Facilities Total	Count	27	70	37
Forest Land	Acres	4,500	4,500	8,520
Residential Land Use	Acres	5,660	6,560	6,830
Commercial Land Use	Acres	270	930	320
Environmental Justice (EJ) Census Tracts	Count (Census Tracts)	1 Low-income 0 Minority Race/Ethnicity	1 Low-income 1 Minority Race/Ethnicity	0 Low-income 0 Minority Race/Ethnicity
Total Section 4(f) Resources	Count	10	25	24
MDNR Non-Tidal Wetlands	Acres	1,200	1,500	2,080
MDNR Tidal Wetlands	Acres	18,460	10,870	29,940
Surface Waters	Linear Feet	344,380	394,020	471,890
100-Year Floodplain	Acres	3,050	6,640	3,950
Chesapeake Bay Critical Area	Acres	4,910	9,810	8,120
FIDS Habitat	Acres	7,020	6,900	11,410
Sensitive Species Project Review Areas (SSPRAs)	Acres	2,720	2,180	8,630
Green Infrastructure – Total	Acres	4,880	4,480	11,450
Essential Fish Habitat (EFH)	Acres	64,320	36,650	87,680
Submerged Aquatic Vegetation (SAV)	Acres	40	270	460
Oyster Resources	Acres	11,130	3,460	7,960
MDNR Oyster Sanctuaries	Acres	6,470	1,580	2,090
Noise-Sensitive Areas	Acres	5,390	7,400	5,700

How much will the CARA cost?

Two cost estimates were developed for each corridor. First, cost estimates were developed that assumed the new lanes for the approach roadways would be completely on new alignment (representing a high estimate) or a portion of the new lanes would follow an existing roadway and the existing infrastructure would be widened where possible (representing a low estimate). Second, since it has not been determined whether a new Chesapeake Bay crossing would be a bridge or a bridge-tunnel, cost estimates were developed for both structure types. A tunnel-only option was not evaluated due to the anticipated high cost.

Crossing Type	Cost Range (in Billions)	Corridor 6	Corridor 7	Corridor 8
Bridge only	Low End of Range	$6.6	$5.4	$11.7
	High End of Range	$7.2	$8.9	$15.7
Bridge-Tunnel	Low End of Range	$12.7	$8.0	$13.2
	High End of Range	$13.3	$13.1	$18.0

MDTA-RECOMMENDED PREFERRED CORRIDOR ALTERNATIVE

What is the MDTA Recommended Preferred Corridor Alternative (MDTA-RPCA)?

The corridor screening results and further evaluation in the DEIS showed that Corridor 7 had substantial advantages over the other CARA, Corridors 6 and 8. The advantages of Corridor 7 included:

- Better congestion relief at the existing Bay Bridge
- More effective reduction of duration of unacceptable level of services
- More effective backup reduction at the Bay Bridge
- Better compatibility with existing land-use patterns likely resulting in fewer indirect effects
- The best diversion route and overall incident management
- Potential for lower environmental impacts particularly to Chesapeake Bay aquatic resources

As a result, Corridor 7 was identified as the MDTA-RPCA. The selection of an alternative will not be finalized until comments on this DEIS and input from the public hearings are considered. The selected alternative will be included in the Final EIS and Record of Decision (ROD).

How was the MDTA-RPCA identified?

To identify the MDTA-RPCA, three categories of information were analyzed for each of the CARA consistent with the established Tier 1 Study Purpose and Need: traffic, engineering and cost, and environmental considerations.

The traffic analysis focused on congestion relief, which examined Average Daily Traffic (ADT) volumes at the Bay Bridge for both non-summer weekdays and summer weekends in 2040 and considered whether queue lengths and durations at the existing Bay Bridge would worsen by 2040 compared to existing (2017) conditions with the addition of a new crossing. While none of the CARA would result in greater queue lengths or durations at the Bay Bridge than currently exist on summer weekends, only Corridor 7 would not result in a longer queue length on non-summer weekdays. Additionally, Corridor 7 would have no hours of Level of Service (LOS) E or F operation at the Bay Bridge on summer weekends or non-summer weekdays; however, Corridor 6 and 8 would not reduce the hours of LOS E or F to zero at the Bay Bridge on either non-summer weekdays or summer weekends.

Cost estimates and analysis of environmental considerations were developed for Corridors 6, 7, and 8 and are shown in the tables above. Since Corridor 7 requires the shortest crossing of the Chesapeake Bay due to the narrower width of the Bay at this location, and since it has the shortest overall length of improvements necessary due to the presence of existing infrastructure in the corridor, it could potentially result in the lowest overall environmental impacts as compared to Corridors 6 and 8, particularly for aquatic resources in the Chesapeake Bay.

When will the MDTA-RPCA be constructed?

Following issuance of a ROD at the conclusion of the Tier 1 NEPA Study currently anticipated in Winter 2021/2022, a Tier 2, project-level NEPA Study could proceed. Final project design and construction would follow final agency decisions based on completion of Tier 2 NEPA Study documents. Currently, there is no timetable for construction of a new crossing.

COORDINATION AND PUBLIC INVOLVEMENT

What agencies are involved with the Bay Crossing Study?

The MDTA and the FHWA are undertaking the Bay Crossing Study in coordination with federal, state, and local agencies and stakeholders.

The FHWA is the lead federal agency for the Bay Crossing Study. A lead federal agency is the agency that carries out the federal action and is responsible for complying with the requirements of NEPA, and supervises the preparation of the environmental document. Beyond the lead federal agency, there are two additional designations for parties involved with the NEPA process: cooperating agencies and participating agencies.

Cooperating agencies are those that have special expertise regarding certain aspects relevant to the project and are committed to participating in the scoping process, providing information or analyses in their area of expertise, and making their staff available to support the NEPA process. A cooperating agency may adopt the FHWA NEPA document after an independent review. The following seven cooperating agencies for the Bay Crossing Study were asked to provide their concurrence at study milestones: the US Army Corps of Engineers, the US Coast Guard, the Environmental Protection Agency, the National Marine Fisheries Service, the Maryland Department of Transportation State Highway Administration, the Maryland Department of Environment, and the Maryland Department of Natural Resources.

Participating agencies are those agencies with an interest in the project. There are 35 participating agencies in the Bay Crossing Study. A list of participating agencies is found in Section 6.2.

In addition, MDTA has provided notifications at major milestones to other agencies that could be affected by the action including: six federal, eight state, four county, 68 municipal, three metropolitan planning organizations, 31 stakeholder organizations, 17 federally-recognized tribes, and ten state-recognized tribes.

Lead, cooperating, participating, and notified agencies and stakeholders are listed in Chapter 6 of the DEIS.

Interagency Coordination Meetings (ICMs), designed to foster communication between cooperating and participating agencies and the MDTA, were held thirteen times since study initiation in October 2017. Participants were asked to provide feedback on the study process, methodologies, and results of major findings at study milestones.

What is the Section 106 consultation process?

Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations set forth in 36 Code of Federal Regulations (CFR) Part 800, requires Federal agencies to take into account the effects of their undertakings on historic properties. It affords the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on such undertakings. The Bay Crossing Study is engaging in Section 106 consultation with the ACHP and the Maryland Historical Trust, the designated State Historic Preservation Officer, because a new crossing would have the potential to impact historic properties.

The Section 106 process seeks to accommodate historic preservation concerns with the needs of Federal undertakings through consultation among the agency official and other parties with an interest in the effects of the undertaking on historic properties. According to 36 CFR Part 800.16 (l), the term "historic property," refers to any prehistoric or historic district, site, building, structure, or object listed in or eligible for inclusion in, the National Register of Historic Places (NRHP).

How has the public been engaged in the study

The Bay Crossing Study launched a website in October 2017 to share project information and gather feedback from the public. Additionally, three rounds of public meetings have been held to date.

MDTA has received over 1,800 public comments on the study including letters, emails, website comments, public meeting comment cards, and MDTA customer survey cards. The comprehensive public outreach program conducted in support of the Bay Crossing Study has yielded important information and informed key decisions throughout the process. The comments collected reflected a wide range of concerns that were considered in the development of the screening process and methodologies for the environmental technical studies supporting this DEIS.

On-Line Scoping Meeting:
Virtual presentation with 6 in-person viewing locations
(November 15, 2017)

Open House Meetings:
6 Locations
(May 8-22, 2018)

Open House Meetings:
7 Locations
(Sep 24-Oct 28, 2019)

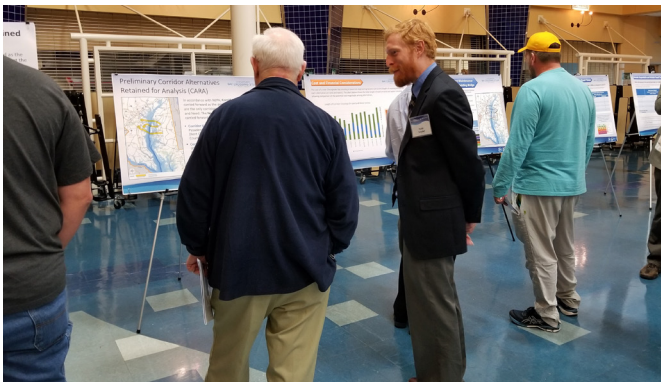
DEIS Public Hearings

How can the public comment on the DEIS?

The public can comment on the DEIS in multiple ways: via the project website, email, comment cards, and letters. The public will also have the opportunity to provide formal written or spoken testimony at the DEIS Public Hearing and during the DEIS comment period.

Comments on DEIS can provided in several ways:

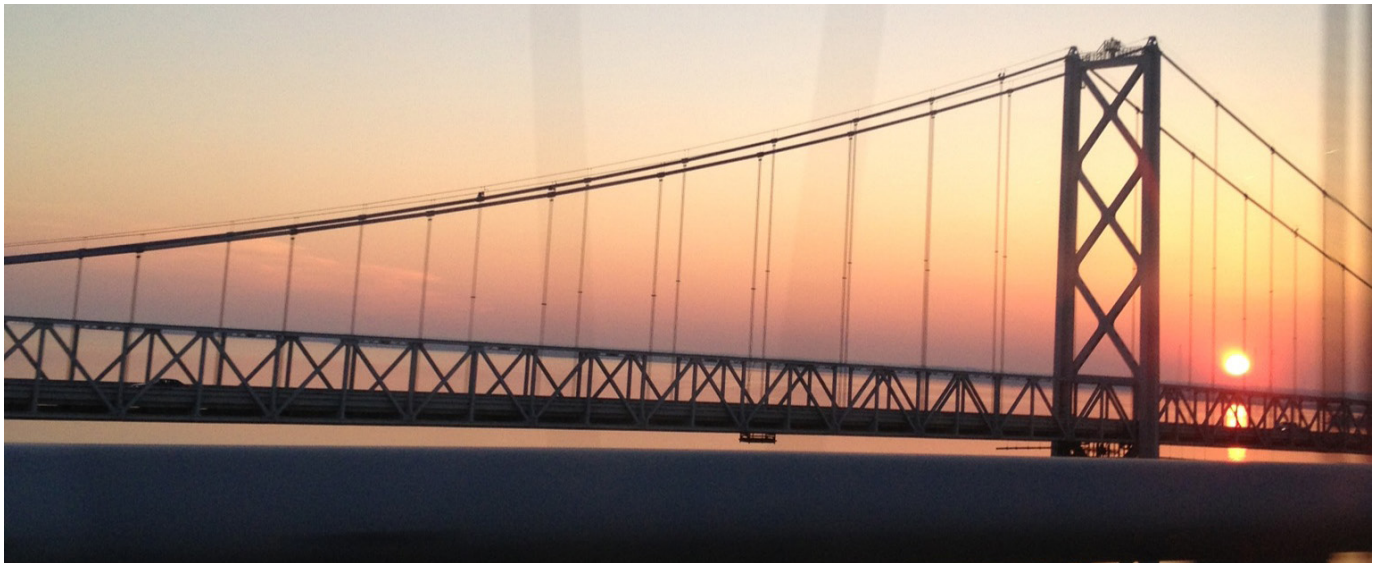
- Fill out a comment card and/or provide testimony at a public hearing
- Visit the website at: www.baycrossingstudy.com
- Email your comments to: info@baycrossingstudy.com



What are the next steps in the NEPA process?

Following issuance of a ROD at the conclusion of the Tier 1 NEPA Study, a Tier 2, project-level NEPA Study may be advanced. Completion of Tier 1 does not presume that Tier 2 will be initiated, and a potential Tier 2 study has not been funded at this time. The Tier 2 NEPA Study could result in decisions made on a project-level (site-specific) analysis through evaluation of specific alignments within the corridor selected in the Tier 1 NEPA Study.

The Tier 2 analysis would include preliminary engineering design of alternative alignments and the assessment of potential environmental impacts associated with those alignments. As indicated previously, three of the MOAs – TSM / TDM, BRT, and Ferry Service – would be considered in combination with other alternatives should the Bay Crossing Study advance to a Tier 2 NEPA undertaking. Similar to the Tier 1 NEPA Study, agency and public involvement would be an essential part of the Tier 2 effort.



1 INTRODUCTION

The Maryland Transportation Authority (MDTA), in coordination with the Federal Highway Administration (FHWA), has initiated the Chesapeake Bay Crossing Study: Tier 1 National Environmental Policy Act (NEPA), referred to as the "Bay Crossing Study." As announced by Governor Larry Hogan, the Bay Crossing Study is the critical first step to begin addressing existing and future congestion at the William Preston Lane Jr. Memorial Bridge (Bay Bridge) and its approaches along US 50/US 301. The study encompasses a broad geographic area, spanning nearly 100 miles of the Chesapeake Bay (the Bay) from the northern-most portion in Harford and Cecil counties to the southern border with Virginia between St. Mary's and Somerset counties (**Figure 1-1**).

1.1 IMPORTANCE OF A CHESAPEAKE BAY CROSSING

The Chesapeake Bay is one of Maryland's most iconic and significant environmental resources. Comprising a 64,000 square mile watershed spanning six states and the District of Columbia, the Bay holds more than 18 trillion gallons of water and is the largest estuary in the United States. The Bay maintains a functioning ecosystem that filters water and provides suitable habitat for diverse and abundant life. In an effort to support Bay restoration efforts, many State and Federal agencies, including the Maryland Department of Transportation (MDOT), have committed to achieving specific pollution-reduction targets by 2025. As supporters of Bay restoration, the MDTA and FHWA recognize the importance of the Chesapeake Bay and the major role it plays in the lives of those living in its watershed, and beyond.

The Bay not only supports thousands of animal and plant species, but it also provides flood protection, serves as a transportation route for cargo and cruise ships, and plays a major role in Maryland's economy via commercial fishing activities, recreational, educational and tourism opportunities. Each year, 500 million pounds of seafood (namely blue crabs, clams and oysters) are harvested from the Bay, adding nearly $600 million to Maryland's economy. Recreational boating and fishing are also popular activities in Maryland. According to the Chesapeake Bay Foundation (CBF) and the 2009 Economic Impact of Maryland Boating report, roughly $2 billion and 32,000 jobs are generated each year in Maryland due to the recreational boating industry. Additionally, in 2014, CBF estimated that implementation of the Chesapeake Clean Water Blueprint, a plan for improving the value of the Bay's natural services, will increase Maryland's economy by $4.6 billion annually, from $15.8 to $20.4 billion (CBF, 2014).

Accessible through the Bay, Maryland's Port of Baltimore is recognized as an ideal location for international trade, as it is only one of two Eastern U.S. ports where the main shipping channel is dredged to a depth of 50 feet. The Port generates nearly $3 billion in annual wages and salary, and supports 13,650 direct jobs and 127,000 jobs connected to Port work (Maryland State Archives, 2017). In January 2017, the Port handled a record-setting tonnage of cargo and number of loaded containers, moving key exports such as coal, waste paper, and automobiles, and imports including automobiles, farm and construction machinery, and petroleum products (Maryland State Archives, 2017).

Additionally, the Port of Baltimore is home to Cruise Maryland, a passenger cruise terminal that offers year-round trips and welcomes a variety of cruise lines. The Port of Baltimore's cruise industry supports over 500 jobs and brings in over $90 million to Maryland's economy (Maryland State Archives, 2017).

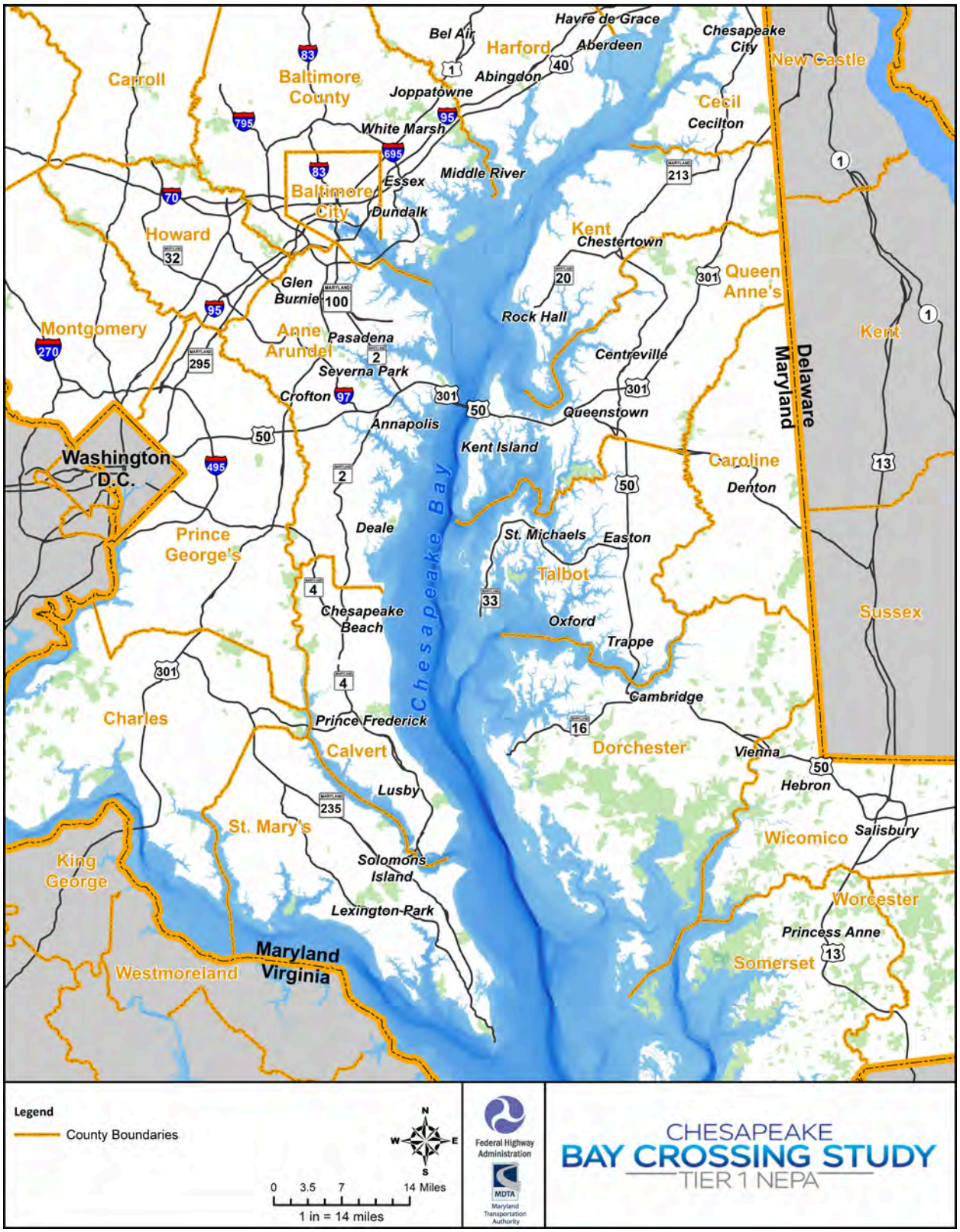
The Bay provides a variety of activities and opportunities for visitors and Marylanders alike; however, the Bay also presents a clear transportation barrier between Maryland's Western and Eastern Shores. In 1952, the first highway connection between Maryland's Western Shore in Anne Arundel County and Eastern Shore in Queen Anne's County was built as a two-lane bridge along US 50/US 301 across the Chesapeake Bay.

In an effort to keep up with the growing travel demand, a second parallel Bay Bridge carrying three lanes of traffic opened in 1973. Today, the nearest alternative roadway routes are over 45 miles north of the Bay Bridge along US 40 or I-95 across the Susquehanna River. Using these routes, travelers must head north and around the Bay in order to head south towards some of the coastal destinations. The nearest southern alternative roadway route is in Virginia, 140 miles south of the Bay Bridge via the Chesapeake Bay Bridge-Tunnel along US 13.

As Maryland's only crossing of the Chesapeake Bay, the Bay Bridge plays a major role in the State's regional transportation system and is vital in supporting the diverse regional economy. The Western Shore is characterized by its major metropolitan employment centers and surrounding communities in the Baltimore-Washington region, complemented by agricultural, seafood and waterfront industries. By contrast, the Eastern Shore is best known for its farming and agricultural enterprises, seafood and waterfront industries, as well as tourism and recreational activities in coastal areas.

Throughout the years, as travel across the Bay has become more common, employment centers have also become more accessible to residents of both shores. Summer vacations along the coast have also turned into household norms. However, increased use of the Bay Bridge has meant that daily commuters, regional travelers and vacationers have experienced increased congestion, often struggling to reach their destinations with low confidence in travel times. Aging infrastructure, capacity limitations at the existing bridge, and an increasing demand for trips across the Bay will continue to exacerbate congestion and delays currently experienced by the traveling public.

Figure 1-1: Bay Crossing Study Area



As the area's population grows, barriers to crossing the Bay Bridge are expected to intensify, threatening to jeopardize the functionality of the existing connection between the shores. If this primary link between the Eastern Shore and the Baltimore and Washington metropolitan areas becomes seriously degraded or unavailable due to safety or performance issues, negative consequences with wide-ranging effects are foreseeable for Marylanders and visitors alike. For example, populations dependent upon a reliable Bay crossing that live on the Eastern Shore would experience disadvantages in access to employment opportunities located on the Western Shore, resulting in potential job and financial losses. Additionally, travelers that typically head east towards recreational, commercial, and other locations on the Eastern Shore or the Atlantic coast may be compelled to start choosing alternate travel destinations. In summary, an inadequate connection between the shores increases the likelihood for negative impacts to communities and a reduction in the State's local and regional economies.

1.2 Previous Actions and Studies

To address congestion at the Bay Bridge, the MDTA has adopted a number of transportation management operation practices, including implementing contra-flow (reversible lanes) during peak periods, eliminating the westbound toll plaza in the 1980s, implementing electronic toll collection at the toll plaza (including dedicated "electronic toll collection only" lanes), and developing extensive promotional and educational efforts aimed at encouraging travelers to take trips during off-peak periods. As of May 2020, MDTA has implemented all electronic tolling (AET) at the Bay Bridge, which replaced the former toll plaza with an overhead tolling gantry.

In 2016, the Governor announced the MDTA's initiation of this Tier 1 NEPA Study since congestion had continued to worsen at the Bay Bridge. An important distinction between the Tier 1 NEPA Study and previous efforts described below is that this study will result in the identification of a potential Bay crossing corridor location through qualitative, high-level analysis and extensive agency, stakeholder, and public involvement following the NEPA process. Previous studies were focused on gathering data to begin identifying potential needs at the existing Bay crossing and not at identifying specific solutions for implementation.

This Tier 1 NEPA Study will utilize applicable information from the following previous MDTA studies and analyses assessing potential Bay crossings, as appropriate:

- **2004 Transportation Needs Report:** The MDTA initiated a study of transportation and safety needs associated with the existing Bay Bridge in 2001, which resulted in preparation of the 2004 Transportation Needs Report. This study found that the bridge generally meets current geometric design standards, although the lack of roadside shoulders impacts the vehicular capacity of the bridge during incident management activities. The study also showed that the Bay Bridge carries approximately 53 percent more traffic on an average summer weekend day than on an average weekday.
- **2006 Task Force Report:** The MDTA formed a Task Force in 2005 to examine the range of issues to help educate stakeholders about the need for additional capacity across the Bay. The Task Force recommended that more detailed studies be undertaken and subsequent studies were conducted to evaluate the potential for transit or ferry service to provide capacity and alleviate

congestion (e.g., September 2007 Analysis of Transit Only Concepts to Address Traffic Capacity Across the Chesapeake Bay).

- **2015 Life Cycle Cost Analysis Study:** This study was conducted by the MDTA in 2015 to evaluate the travel operations and structural condition of the Bay Bridge, understand the costs and time frame associated with implementing future Bay Bridge improvements, and evaluate complementary improvements that would be needed if/when (a) new structure(s) were built including mainline US 50/301 improvements. Build recommendations were not included in this study, but given the scope of the "build options" and the critical environmental features in proximity to the project, the necessity of a NEPA Study was stated regarding any proposed improvements.
- **2020 Electric Ferry Study:** MDTA conducted this study, separate from the Bay Crossing Study, at the request of the Maryland General Assembly to examine the feasibility of electric ferry service as an alternative to a third crossing for the Chesapeake Bay. The study found that a MDTA-operated ferry service utilizing all-electric ferries is not a feasible alternative to a third crossing of the Chesapeake Bay.

1.3 THE TIERED NEPA PROCESS

This study will follow formal regulatory procedures in accordance with the Council on Environmental Quality (40 CFR Parts 1500-1508) and FHWA NEPA regulations (23 CFR Part 771) and result in the preparation of a Tier 1 Environmental Impact Statement (EIS). The Tier 1 Study is expected to identify a Recommended Preferred Corridor Alternative for a potential Bay Crossing. A Tier 2 Study will follow with consideration of possible alignments within the Recommended Preferred Corridor Alternative if and when appropriate.

"Tiering" is defined in 40 CFR 1508.28 as, "[…]the coverage of general matters in broader environmental impact statements (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as regional or basinwide program statements or ultimately site-specific statements) incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared."

Consistent with this regulatory definition, a tiered environmental review process is being undertaken due to the regional needs to be addressed by the proposed action, influence of the Bay Crossing from both an environmental and socio-economic perspective, and expansive size of the study's geographical area.

Furthermore, 40 CFR 1508.28 notes that "Tiering is appropriate when the sequence of statements or analyses is:

(a) From a program, plan or policy environmental impact statement to a program, plan, or policy statement or analysis of lesser scope or to a site-specific statement or analysis.

(b) **From an environmental impact statement on a specific action at an early stage (such as need and site selection)** to a supplement (which is preferred) or a subsequent statement or analysis at a later stage (such as environmental mitigation). Tiering in such cases is appropriate when it helps

> the lead agency to focus on the issues which are ripe for decision and exclude from consideration issues already decided or not yet ripe." (Emphasis added.)

FHWA regulations in 23 CFR 771.111(g) further describe the circumstances in which a tiered NEPA analysis is most appropriate. Specifically, FHWA notes that a Tier 1 EIS ."…would focus on broad issues such as general location, mode choice, and areawide air quality and land use implications of the major alternatives. The second tier would address site-specific details on project impacts, costs, and mitigation measures."

Thus, this Tier 1 document is intended to identify the general location of a new Bay Crossing so that a site-specific study in Tier 2 can avoid further consideration of the corridor location decision made in Tier 1. This will allow the Tier 2 study to focus on the issues ripe for discussion, such as the detailed study of environmental impacts, cost and mitigation for alternative alignments within a corridor.[1]

1.3.1 Tier 1

The Tier 1 NEPA Study represents the MDTA's first step within a two-tiered NEPA approach and includes a high-level, qualitative review of cost, engineering, and environmental data. The EIS prepared in the Tier 1 NEPA Study will define existing and future transportation conditions and needs at the existing Bay Bridge, identify broad corridor alternatives (including a "No-Build" alternative), document the corridor alternative screening process, identify the most reasonable Corridor Alternatives Retained for Analysis (CARA), evaluate potential environmental impacts of the CARA, and present a recommendation for one preferred corridor alternative to be advanced into a Tier 2 NEPA Study. Decisions resulting from the Tier 1 NEPA Study (e.g., deciding upon a preferred corridor alternative for a potential future proposed action) will address broad planning level issues consistent with a corridor-level analysis for both potential corridor alternatives and environmental impacts. The length and exact limits of the two-mile wide corridor alternatives analyzed in Tier 1 will not be binding for a project-level Tier 2 analysis, depending on the corridor alternative selected, the proposed project engineering design, and the nature of the key resources identified within that corridor. The corridor alternative decision in Tier 1 will assist with the future identification of logical termini for a potential new crossing by establishing potential connections to the existing transportation network. The Tier 2 analysis will focus on alternatives within a selected corridor to the maximum extent practicable. It is possible that changes to the termini of a potential new crossing or alignment shifts to avoid and minimize impacts could require minor adjustments to the definition of a corridors selected following the Tier 1 analysis.

The Tier 1 NEPA Study evaluation involved close coordination with regulatory and resource agencies, stakeholders, and the public to identify critical resources and assist in determining key mobility, environmental, and other impacts associated with potential corridor alternatives. Possible adverse environmental impacts that could occur as a result of moving forward with a preferred corridor will be identified to help inform site-specific, potential avoidance, minimization and mitigation opportunities. As with all NEPA analyses, the Tier 1 Study will take into account comments from cooperating and participating State and Federal agencies as well as the public.

[1] Additionally, guidance from NCHRP Project 25-25, Task 38, *Guidelines on the Use of Tiered Environmental Impact Statements for Transportation Projects* was considered.

Specific activities for the Tier 1 Study include:

- Establishing Purpose and Need
- Evaluating a range of alternatives across the Bay using broad-scale engineering and environmental information
- Including public involvement and comment
- Identifying the Recommended Preferred Corridor Alternative
- Preparing a Tier 1 EIS
- Issuing a Record of Decision

1.3.2 Tier 2

Following issuance of a Record of Decision at the conclusion of the Tier 1 NEPA Study, the MDTA may advance a Tier 2, project-level NEPA Study. In comparison to the more general Tier 1 analyses, a Tier 2 NEPA Study would result in decisions made on a project-level (site-specific) analysis, through evaluation of specific alignments within the preferred corridor alternative selected in the Tier 1 NEPA Study. Tier 2 analysis would include detailed engineering design of alternative alignments and the assessment of potential environmental impacts associated with those alignments. Consistent with NEPA's requirements, agency and public involvement will be an essential part of the Tier 2 NEPA Study.

In the Tier 2 NEPA Study, avoidance and minimization measures will be considered and recommended; the potential for unavoidable adverse direct, indirect and cumulative impacts will be documented; and appropriate permitting and mitigation measures for any unavoidable impacts will be identified. Results of the analyses conducted during Tier 2 will inform decisions regarding engineering for a specific crossing and supporting transportation network, cost considerations, and mitigation. Final project design and construction will follow final agency decisions based on completion of Tier 2 NEPA Study documents. Examples of regulatory activities resulting from the Tier 2 NEPA Study may include Section 4(f) resource avoidance (to the extent such resources are involved), Section 106 consultation and negotiation of a Memorandum of Agreement to address impacts to historic and cultural resources, if necessary, and other specific permitting decisions for applicable water, species, and other natural resources matters.

Specific activities for a Tier 2 Study would include:

- Refinement of Purpose and Need to reflect project-level proposals
- Identification of alignments within the Recommended Preferred Corridor Alternative identified in Tier 1
- More detailed engineering of alternatives, evaluation of crossing types, and specific assessment of potential environmental impacts
- Public and cooperating agency involvement and response to all comments
- Selection of a Preferred Alignment within the Preferred Corridor
- Identification of appropriate mitigation measures
- Preparation of a Tier 2 EIS
- Issuing a Record of Decision

2 PURPOSE AND NEED

2.1 PURPOSE OF THE BAY CROSSING STUDY

The Chesapeake Bay Crossing Study: Tier 1 NEPA considers corridors for providing additional capacity and access across the Chesapeake Bay in order to improve mobility, travel reliability and safety at the existing Bay Bridge. The Tier 1 NEPA Study will evaluate potential new corridor alternatives through the 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.

Public and agency input was considered in the scoping phase of the study to help inform the Purpose and Need. More detailed information on the public and agency involvement activities and comments received throughout the Tier 1 Study is in **Chapter 6**, "Coordination"**.**

This chapter is a summary of the ***Bay Crossing Study Purpose and Need*** document.

2.2 NEEDS

The following three primary needs have been identified for the Tier 1 NEPA Study and are the basis for evaluating corridor alternatives: adequate capacity; dependable and reliable travel times; and flexibility to support maintenance and incident management in a safe manner. Recognizing the importance of the resources involved and the magnitude of possible solutions, other elements considered include the financial viability and environmental responsibility of any solutions proposed to address the study needs.

2.2.1 Adequate Capacity

At present, the MDTA is responsible for the four-mile long, dual-span Bay Bridge and its approach roadways. US 50/US 301 is classified as an urban freeway/expressway with three lanes in each direction at both approaches to the Bay Bridge. For eastbound travelers in Anne Arundel County, there is an eleven-lane wide toll plaza, where all lanes are electronic toll collection (ETC) enabled (three lanes were designated as ETC only in 2018). There are no tolls for westbound travelers.

The Bay Bridge typically carries three lanes of westbound traffic except during periods of heavy eastbound travel when one westbound lane is reversed to provide a third eastbound lane. This reverse travel flow condition is called "contra-flow operation". The eastbound travel lane widths are 12 feet five inches and the westbound travel lanes are 12 feet wide. There are less than two feet of offset on the outside of the travel lanes in each direction.

The existing two spans of the Bay Bridge carry increasing volumes of travelers that frequently approach or exceed its capacity for long durations. These increasing travel volumes, containing a high percentage of trucks during weekdays, correlate with increases in regional population and employment, and result in greater congestion. Queue lengths of up to four miles eastbound during summer weekend evenings have been observed during the study period. While the computed capacity of the Bay Bridge in either the eastbound or westbound direction is up to approximately 4,900 vehicles per hour (vph), queues have been observed to begin forming at demand levels at or less than 3,900 vph. The reported capacity of the eastbound toll plaza is 9,900 vph. Queues begin to develop when traffic volumes approach or exceed capacity; therefore, the bridge itself is the constraining factor to travel flow.

To illustrate the historical increase of travel volumes at the Bay Bridge, **Figure 2-1** and **Table 2-1** present the annual number of vehicle trips across the Bay Bridge. After 57 years of consistent growth between 1953 and 2007, the annual number of vehicles crossing the bridge fluctuated between 2008 and 2014, coinciding with the national economic recession. A minimum of two percent annual growth in the number of vehicles crossing the bridge was reported in 2015 and 2016, with the greatest number of reported crossings occurring in 2016, which is over two and half times the number of crossings in 1980.

Figure 2-1: Annual Chesapeake Bay Bridge Volume

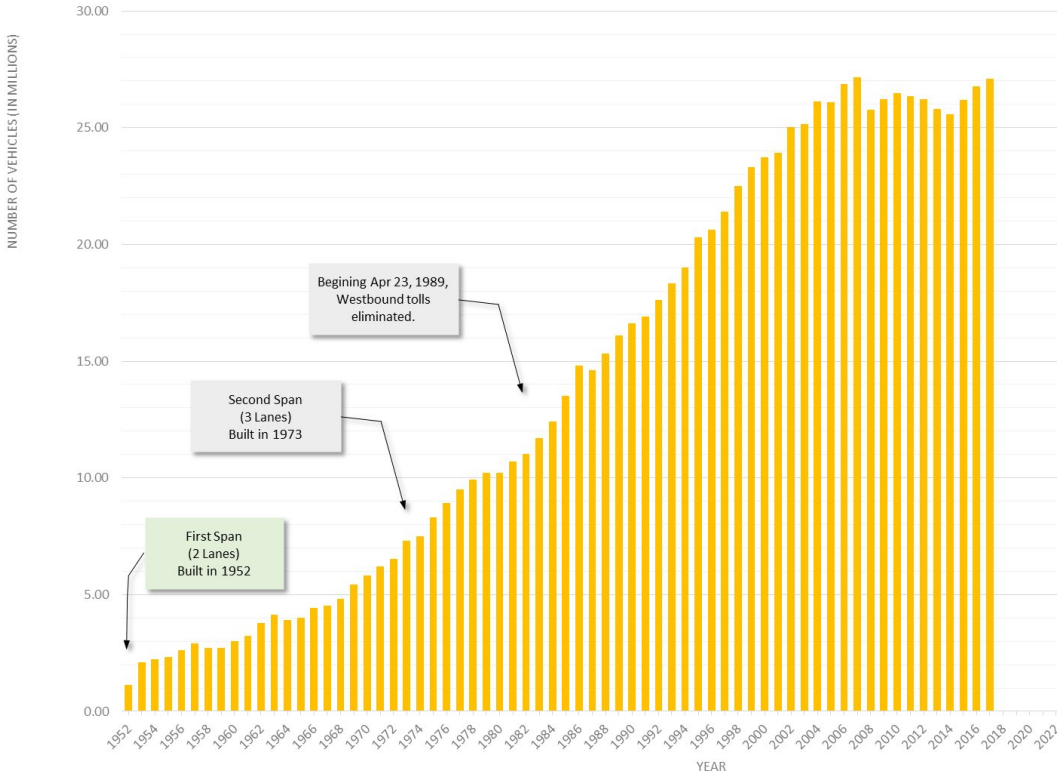


Table 2-1: Annual Number of Vehicle Trips across the Bay Bridge[1]

YEAR	NUMBER OF VEHICLES	ANNUAL GROWTH (%)
1953[2]	2,100,000	-
1974[3]	7,500,000	+6.2
1980[4]	10,323,300	+5.5
1985	13,686,400	+5.8
1990	16,078,600	+3.3
1995	20,410,800	+4.9
2000	23,867,600	+3.2
2005	26,066,100	+1.8
2006	26,855,600	+2.9
2007	27,140,600	+1.1
2008	25,740,950	-5.2
2009	26,184,950	+1.7
2010	26,449,700	+1.0
2011	26,344,950	-0.4
2012	26,193,150	-0.6
2013	25,788,700	-1.5
2014	25,544,900	-0.9
2015	26,173,400	+2.5
2016	26,696,100	+2.0

[1] Number of vehicles obtained by doubling the annual vehicle counts in the EB direction
[2] 1953 is the year after the first Bay Bridge span opened to traffic.
[3] 1974 is the year after the second Bay Bridge span opened to traffic.
[4] Five-year increments are shown between 1980 to 2005 due to steady annual growth during this period of time (see Figure 2-1, below). Annual growth shown reflects the annual growth between each of these entries, not the 5-year growth.

As a comparison to the growth in trips across the Bay Bridge, **Table 2-2** presents the historic population growth in Maryland.

Table 2-2: Population in the State of Maryland

YEAR	POPULATION (IN MILLIONS)	DIFFERENCE
1952 (original span of Bay Bridge opens)	2.5	-
1973 (second span of Bay Bridge opens)	4.1	1.6 times
1980	4.2	1.0 times
2016	6.0	1.4 times

Source: US Census Bureau

The growth in the State population between 1980 and 2016 was less than the growth in the number of crossings during the same period (1.4 times versus 2.5 times). Moreover, the growth in the State population since the second span was opened is approaching the growth that occurred between the opening of the original and second spans (1.4 times versus 1.6 times).

Increasing travel demand at the crossing has resulted in growing congestion and vehicle queues at the Bay Bridge. These congested conditions at the bridge, which can last up to four hours during an average weekday evening and up to 11 hours through a summer weekend afternoon and evening, are expected to worsen by the planning horizon year of 2040 due to anticipated regional growth in population and employment from the Baltimore Metropolitan Council (BMC) land use model Round 8b and Metropolitan Washington Council of Governments (MWCOG) land use model Round 9.0 as shown in **Figure 2-2**.

This anticipated growth will increase demand for trips across the Bay during the average weekday, as well as during summer months and weekends, as tourists and recreationists make their way east to points such as Ocean City and the Delaware beaches.

The ability of the Bay Bridge to support this growing volume of vehicle demand is further impacted by the amount of trucks in the vehicle mix. Trucks occupy a larger amount of space and do not accelerate as quickly as smaller vehicles at toll booths and along climbing grades. The current weekday percentage of trucks crossing the Bay Bridge is shown in **Table 2-3**. Bridge capacity is further negatively impacted because the weekday average percentage of trucks on the Bridge, 13.5 percent, far exceeds the Maryland Statewide average of five percent for other similar type roadways (i.e., urban freeway expressways) and carries a substantial percentage of trucks as compared to other major waterway crossings in the State as shown in **Table 2-4**.

Table 2-3: Percentage of Trucks within Weekday Vehicle Mix on the Bay Bridge

YEAR	PERCENTAGE OF TRUCKS
2013	15.5%
2014	15.5%
2015	13.5%
2016	13.5%

Source: Maryland Department of Transportation State Highway Administration (MDOT SHA) Truck Volume Maps

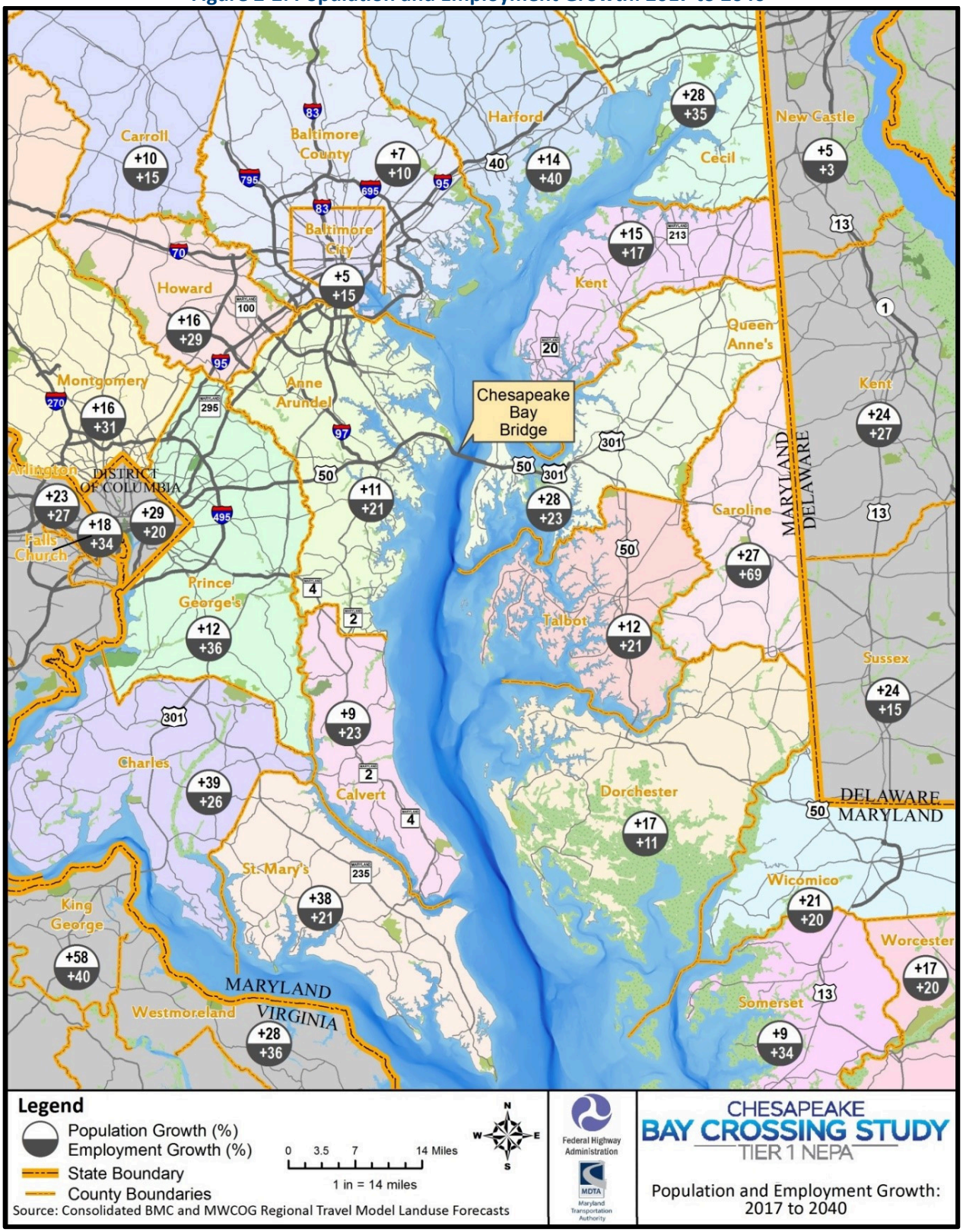
Table 2-4: 2016 Reported Weekday Percentage of Trucks at Maryland Waterway Crossings

FACILITY	ROUTE NO.	ROAD CLASSIFICATION	AADT	TRUCK %	STATEWIDE AVG TRUCK % *
Harbor Tunnel	I-895	Urban Interstate	72,000	5.3 %	5.0%
Hatem Bridge	US 40	Urban Other Principal Arterial	28,000	6.6%	5.0%
Nice Bridge	US 301	Rural Other Principal Arterial	19,000	10.9%	5.0%
Bay Bridge	US 50	Urban Freeway Expressway	73,000	13.5%	5.0%
Ft. McHenry Tunnel	I-95	Urban Interstate	107,000	14.4%	5.0%
Key Bridge	I-695	Urban Interstate	98,000	14.5%	5.0%
Tydings Bridge	I-95	Rural Interstate	85,000	20.1%	5.0%

** For Urban Freeway Expressways*

Source: Maryland Department of Transportation State Highway Administration (MDOT SHA) Truck Volume Maps

Figure 2-2: Population and Employment Growth: 2017 to 2040



2.1.1.1 Travel Demand Origins and Destinations

The capacity provided by the Bay Bridge supports travel demand for both local trips (e.g., work related and discretionary trips) with origins and destinations (O-D) relatively close to the shores, and regional trips (e.g., commerce, recreation, regional travel) with O-Ds throughout and beyond Maryland. Current travel patterns are observed from origin-destination surveys of trips crossing the Bay Bridge conducted between June and August 2016 and 2017, and October and May 2016 and 2017, as reflected in **Figure 2-3** and **Figure 2-4**.

The data provides that a "trip" ends when a vehicle remains stopped for 5 minutes. Accordingly, some actual trips may be longer than shown in this O-D data. For example, if a vehicle is going from Baltimore to Ocean City and makes an intermediate stop for longer than five minutes, then its intermediate-stop becomes its trip-end. When the vehicle starts moving again, it will begin a new trip. However, the data does not create such stops on highways, so extreme delays due to congestion (or toll booths) will not break up trips.

During a non-summer weekday, 60 to 67 percent of the trips crossing the Bay Bridge are between points near either the western or eastern ends of the existing bridge, as shown in **Table 2-5**, which are typical destinations of local or commuter trips. During summer weekends, as reflected by travel on a summer Sunday, there is a higher percentage of trip destinations beyond the western and eastern ends of the bridge (42 to 50 percent) as compared to weekday trips (32 to 39 percent), which are more characteristic of regional or recreational trips. As the region's population and employment levels grow, the demand for all trip types will increase, requiring more travel capacity across the Bay.

Table 2-5: Origins and Destinations (Dest.) of Trips across the Bay Bridge

	NON-SUMMER WEEKDAY (TUESDAY THROUGH THURSDAY)				SUMMER SUNDAY			
	EB TRIP ORIGINS	EB TRIP DEST.	WB TRIP ORIGINS	WB TRIP DEST.	EB TRIP ORIGINS	EB TRIP DEST.	WB TRIP ORIGINS	WB TRIP DEST.
Near western end of the bridge[1]	62.7%			60.6%	57.5%			51.1%
Near eastern end of the bridge[2]		66.3%	67.4%			55.5%	49.9%	
Beyond vicinity of bridge	37.3%	33.7%	32.6%	39.4%	42.5%	44.5%	50.1%	48.9%

Note: EB = eastbound, WB = westbound

[1] Anne Arundel and Prince George's counties, MD; Washington, D.C.; Arlington and Alexandria VA

[2] Caroline, Queen Anne's and Talbot counties, MD

Figure 2-3: Non-Summer Average Weekday Travel across Bay Bridge

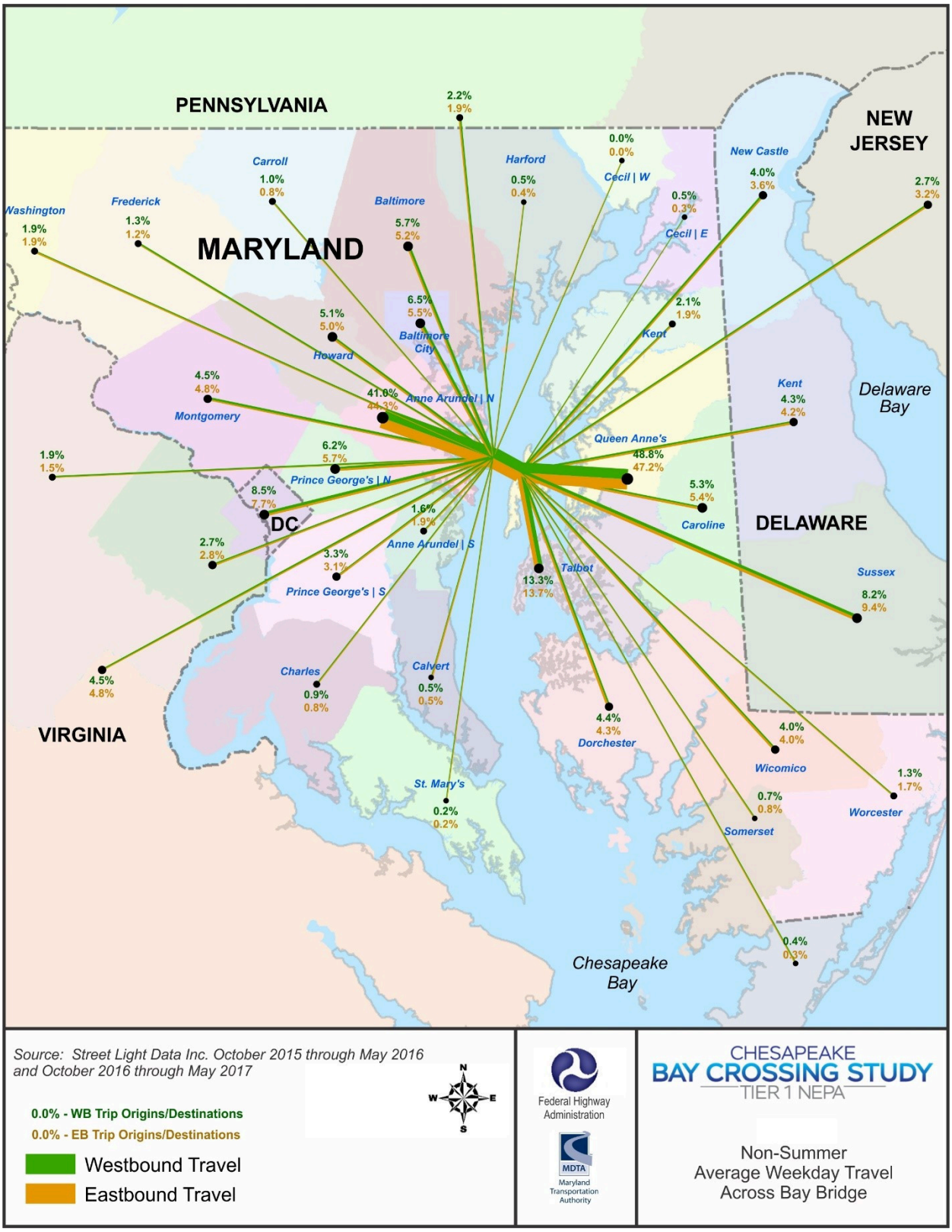
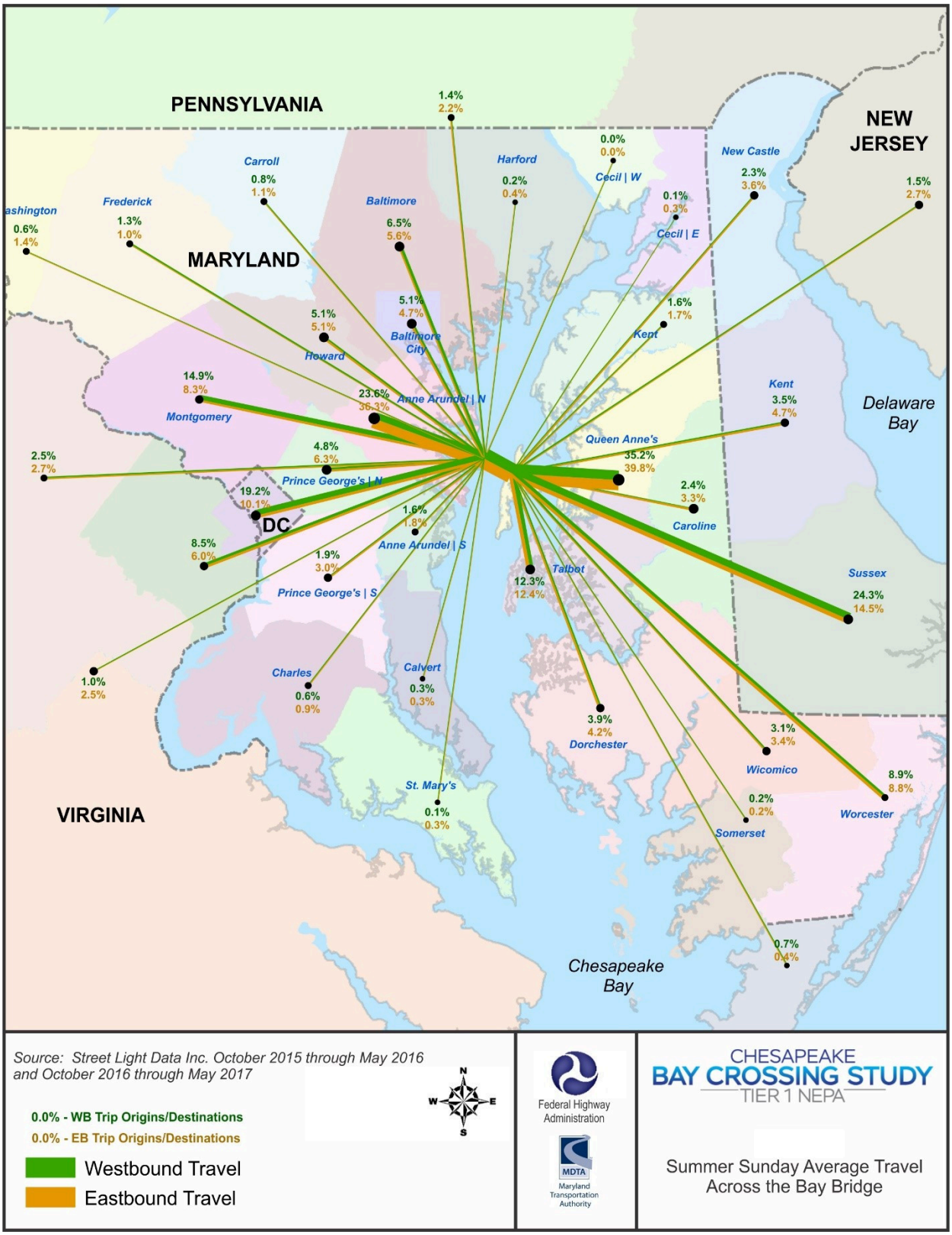


Figure 2-4: Summer Sunday Average Travel across the Bay Bridge



2.1.1.2 Travel Demand Volume

Table 2-6 presents the average daily travel volume at the Bay Bridge in 2017 and projected in the planning horizon year 2040 using the Maryland Statewide Travel Model. As shown in **Table 2-6**, the Bay Bridge is expected to carry nearly 14 to 23 percent more daily travel volume in 2040 as compared to current daily travel demand in 2017.

Table 2-6: Daily Trips across the Bay Bridge (vehicles per day)

	2017	2040 NO-BUILD	PERCENT CHANGE (%)
Average Weekday	68,598	84,276	22.9
Summer Weekend Day	118,579	135,280	14.1

Source: May and August 2017 counts and Maryland Statewide Travel Demand Model

Results from an analysis of the Peak Hour vehicle volumes for average weekdays and summer weekend days are summarized in **Table 2-7**. The Sunday afternoon volumes during the summer are very consistent between 12 PM and 10 PM. The shift in the peak hour reflected for 2017 and 2040 is a result of this steady flow condition. The results in **Table 2-7** show a projected increase of current peak hour traffic volumes ranging from 11.7 to 19.4 percent by 2040 – eastbound weekday and summer weekend peak hour increases are projected to be identical at 19.4 percent. The need for additional capacity is demonstrated by both the daily and peak hour projected travel volumes, which indicate a continuation of the historic trend of increases in travel demand at the Bay Bridge.

Table 2-7: Directional Peak Hour Volumes across the Bay Bridge (vehicles per hour)

	AVERAGE WEEKDAY		SUMMER WEEKEND DAY	
	EASTBOUND (5-6 PM)	WESTBOUND (7-8 AM)	EASTBOUND - FRIDAY (4-5 PM)	WESTBOUND - SUNDAY (12-1 PM IN 2017 4-5 PM IN 2040)
2017	3,395	3,448	4,299	4,170
2040 No-Build	4,055	4,009	5,133	4,658
Percent Change (%)	19.4	16.3	19.4	11.7

Source: May and August 2017 counts and Maryland Statewide Travel Demand Model

2.2.2 Dependable and Reliable Travel Times

Mobility across and around the Bay will continue to be reduced by the anticipated increase in population and employment in communities on both sides of the Chesapeake Bay (**Figure 2-2**), a nearly 20 percent increase in commuter travel, and increased tourism and recreational travel (**Table 2-6** and **Table 2-7**). Marylanders and visitors need dependable Chesapeake Bay crossing options with reliable operating speeds and travel times. Reliable crossing options support access to employment and recreation areas, as well as facilitate emergency services and evacuation events.

One method to describe how dependable travel flow is operating is "level of service" (LOS). The Highway Capacity Manual (HCM) 6th Edition (Transportation Research Board, 2016) defines LOS as, "A quantitative stratification of a performance measure or measures that represent quality of service, measured on an A-F scale, with LOS A representing the best operating conditions from the traveler's perspective and LOS F the worst." Usually a LOS D is regarded as the lowest acceptable operating condition in rural areas and

LOS E is regarded as the lowest acceptable operating condition in urban areas. A summary of the 2017 and projected 2040 no-build directional hourly LOS for both average weekday and summer weekend day conditions across the Bay Bridge using the Highway Capacity Software (HCS) is presented in **Table 2-8**.

During an average weekday in 2017, the hourly travel demand in one direction approaches the capacity of the Bay Bridge for three hours in the afternoon. Similarly, during summer weekends in 2017, the hourly travel demand approached or exceeded the bridge capacity in at least one direction for 10 hours. Under 2040 No-Build conditions, hourly travel demand is predicted to exceed the capacity of the Bay Bridge in at least one direction for five hours on an average weekday (as compared to three hours in 2017) and 12 hours on a summer weekend day (as compared to 10 hours in 2017).

Table 2-8: Hourly Levels of Service across the Bay Bridge

	2017				2040 NO-BUILD			
	AVERAGE WEEKDAY		SUMMER WEEKEND		AVERAGE WEEKDAY		SUMMER WEEKEND	
TIME	EB	WB	EB	WB**	EB	WB	EB	WB**
12-1AM	A	A	A	A	A	A	A	A
1-2AM	A	A	A	A	A	A	A	A
2-3AM	A	A	A	A	A	A	A	A
3-4AM	A	A	A	A	A	A	A	A
4-5AM	A	B	A	A	A	B	A	A
5-6AM	A	C	B	A	B	D	B	A
6-7AM	C	D	C	A	C	E	D	A
7-8AM	C	D	D	A	D	F	D*	A
8-9AM	C	D	C*	B	D	D	D*	B
9-10AM	C	C	D*	C	D	D	E*	C
10-11AM	D	B	E*	D	C*	D	F*	D
11AM-12PM	D	B	E*	D	C*	D	F*	D
12-1PM	D	B	E*	E	C*	D	F*	F
1-2PM	D	B	E*	E	D*	D	F*	E
2-3PM	D*	C	E*	D	E*	D	F*	E
3-4PM	E*	C	E*	E	F*	D	F*	E
4-5PM	E*	C	F*	E	F*	D	F*	F
5-6PM	E*	C	E*	E	F*	D	F*	F
6-7PM	D*	C	E*	E	E*	C	F*	E
7-8PM	C*	B	E*	E	D*	B	F*	F
8-9PM	C	A	D*	E	D	A	E*	F
9-10PM	C	A	C*	E	C	A	D*	F
10-11PM	B	A	D	D	B	A	D	D
11PM-12AM	A	A	B	B	B	A	C	B

Source: Calculations Based on May and August 2017 counts and Maryland Statewide Travel Demand Model
**Assuming contra-flow operation on the westbound bridge*
***Assuming 3 lanes in the Westbound Peak-Flow Direction, this never overlaps the Eastbound Peak-Flow*
Note: Highlighted values exceed LOS D.

The current summer weekend vehicle queues of up to four miles eastbound are projected to increase to nearly 13 miles in 2040. Similarly, in the westbound direction, the current two and a half mile queues are

predicted to grow to over 10 miles during the summer weekend evenings in 2040. During average weekdays, current evening eastbound queues of up to one mile are expected to increase to five miles in 2040, while westbound morning queues over one mile long are expected to form by 2040.

The annual "State Highway Mobility Report" accounts for non-recurring events in trip reliability using the measurement of the Planning Time Index (PTI). Non-recurring events such as vehicle breakdowns, crashes, weather, and maintenance activities reduce usable capacity and affect the reliability of the facility and adds to the variability of trip times. The PTI represents the 95th percentile travel time for a section of the transportation network and is considered the total time travelers should allow for trips to assure on-time arrival at destinations. Statewide PTI are categorized as Reliable (PTI less than 1.5), Moderately Unreliable (PTI between 1.5 and 2.5) and Highly to Extremely Unreliable (PTI above 2.5).

The PTI for a trip along US 50/US 301 between the MD 2 interchange in Anne Arundel County and the US 50/US 301 split in Queen Anne's County for each travel direction was calculated for 2017 during average weekdays and Fridays and Sundays during the summer. **Table 2-9** and **Table 2-10** present the PTI findings. The highest PTI for an eastbound trip in 2017 occurs on a summer Friday between 6 PM and 7 PM with a measurement 5.80. The highest PTI for a 2017 westbound trip occurs on a summer Sunday between 3 PM and 4 PM with a measurement of 3.37.

The dependability and reliability of trip travel times across the Chesapeake Bay support the need for additional capacity given the following conditions at the existing crossing:

- expected growth in vehicle queue length and duration by 2040;
- predicted increase in the number of hours of unsatisfactory Level of Service by 2040; and
- current unreliability of the Bay Bridge as measured by the Planning Time Index.

Table 2-9: Planning Time Index for Eastbound Trips on US 50/US 301 between MD 2 and the US 50/US 301 Split

TIME OF DAY	2017 AVERAGE WEEKDAY (SEP. 2016 TO MAY 2017)	2017 SUMMER FRIDAY (JUN 2017 TO AUG 2017)	2017 SUMMER SUNDAY (JUN 2017 TO AUG 2017)
12-1AM	1.13	1.12	1.10
1-2AM	1.14	1.12	1.11
2-3AM	1.13	1.09	1.14
3-4AM	1.12	1.07	1.11
4-5AM	1.08	1.06	1.09
5-6AM	1.06	1.04	1.12
6-7AM	1.04	1.01	1.16
7-8AM	1.04	1.02	1.07
8-9AM	1.04	1.02	1.04
9-10AM	1.05	1.04	1.09
10-11AM	1.05	1.08	1.46
11AM-12PM	1.07	1.32	2.34
12-1PM	1.06	1.27	3.57
1-2PM	1.05	1.57	3.84
2-3PM	1.21	2.47	3.52
3-4PM	1.42	4.42	3.15
4-5PM	1.74	5.25	3.58

TIME OF DAY	2017 AVERAGE WEEKDAY (SEP. 2016 TO MAY 2017)	2017 SUMMER FRIDAY (JUN 2017 TO AUG 2017)	2017 SUMMER SUNDAY (JUN 2017 TO AUG 2017)
5-6PM	1.96	5.08	2.76
6-7PM	1.66	5.80	1.89
7-8PM	1.17	5.39	1.27
8-9PM	1.14	5.63	1.09
9-10PM	1.14	3.71	1.12
10-11PM	1.13	2.03	1.13
11PM-12AM	1.13	1.24	1.20

Source: RITIS Data (September 01, 2016 to May 31, 2017 for average weekday values and June 01, 2017 to August 31, 2017 for summer values). Note: Highlighted values exceed the threshold for moderately unreliable conditions

Table 2-10: Planning Time Index for Westbound Trips on US 50/US 301 between the US 50/US 301 Split and MD 2

TIME OF DAY	2017 AVERAGE WEEKDAY (SEP. 2016 TO MAY 2017)	2017 SUMMER FRIDAY (JUN 2017 TO AUG 2017)	2017 SUMMER SUNDAY (JUN 2017 TO AUG 2017)
12-1AM	1.08	1.13	1.20
1-2AM	1.07	1.10	1.11
2-3AM	1.07	1.11	1.11
3-4AM	1.06	1.07	1.09
4-5AM	1.03	1.07	1.07
5-6AM	1.00	0.99	1.11
6-7AM	1.00	0.98	1.14
7-8AM	1.08	1.01	1.05
8-9AM	1.14	1.04	1.05
9-10AM	1.05	1.04	1.05
10-11AM	1.04	1.22	1.06
11AM-12PM	1.06	1.41	1.28
12-1PM	1.06	1.74	1.63
1-2PM	1.06	1.56	1.91
2-3PM	1.06	1.51	2.65
3-4PM	1.05	1.60	3.37
4-5PM	1.06	1.32	3.36
5-6PM	1.07	1.26	3.28
6-7PM	1.08	1.28	3.23
7-8PM	1.08	1.13	3.32
8-9PM	1.10	1.10	2.93
9-10PM	1.13	1.09	3.44
10-11PM	1.08	1.08	2.45
11PM-12AM	1.08	1.09	1.57

Source: RITIS Data (September 01, 2016 to May 31, 2017 for average weekday values and June 01, 2017 to August 31, 2017 for summer values) Note: Highlighted values exceed the threshold for moderately unreliable conditions

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

As reported in the 2015 Bay Bridge Life Cycle Cost Analysis conducted by MDTA, the need for maintenance and rehabilitation activities will increase as the Bay Bridge ages. These activities, along with the incident management (i.e., crash response, debris removal) on the Bay Bridge, increase congestion, causing travelers to wait out the resulting delays due to the lack of nearby alternative detour routes. These conditions also put maintenance workers and incident responders at risk when performing their duties next to moving traffic. Additional capacity across the Bay is needed to maintain flexible options for safe travel during maintenance and for management of incidents on the Bay Bridge.

Structural analysis concludes that the existing spans of the Bay Bridge are currently in satisfactory condition and can provide functionality for the next 15-20 years with scheduled rehabilitation and maintenance (i.e., painting, deck rehabilitation, suspension span rehabilitation, traffic control device and electrical repairs). Beyond the Tier 1 Study horizon year of 2040, major superstructure and substructure rehabilitation/replacement work involving short- and long-term lane closures would be required to maintain fair condition of the bridges. Such rehabilitation work will cause a substantial impact to capacity and travel operations across the Bay. During maintenance work, as well as during incident management on the Bay Bridge, flexibility in crossing the Chesapeake Bay is needed to support any required lane closures or width/use restrictions (i.e., narrowed lane widths, vehicle width/weight prohibitions). Those restrictions, in turn, exacerbate congestion and negatively affect safety conditions.

The MDTA attempts to schedule maintenance activities during periods when they will have the least impact on travel operations. Many maintenance activities on the Bay Bridge occur during overnight hours when volumes are lowest. Lane closures (or bridge closures) are signed on the impacted roadways well in advance, in accordance with statewide standards for lane/roadway closures. In addition, the MDTA attempts to notify the public of upcoming maintenance activities through public announcements using various sources (i.e., traditional and social media, postings at toll booths, etc.).

During an incident, the MDTA uses state-of-the-art incident management techniques to detect, verify, respond to, and clear the incident. The primary goal is to save lives and address any injuries, while protecting the public and employees from any further injury. Once those issues have been addressed, clearing the incident to restore full capacity of the crossing is undertaken. The MDTA and the MDTA Police are active members of the Coordinated Highways Action Response Teams (CHART) program, which also includes the Maryland Department of Transportation State Highway Administration and the Maryland State Police. This program provides advanced notification to travelers of the incident and the related progress made in clearing the incident. The CHART Program also coordinates evacuations with Maryland and local government agencies, as well as agencies in other states for the use of the Bay Bridge during major weather events. Increased crossing capacity would provide resiliency in the network to better handle evacuations and major incidents requiring travel.

A total of 224 crashes were reported for US 50 from Oceanic Drive to MD 8 (Romancoke Road) between January 1, 2014 to December 31, 2016, as obtained at the onset of this study. The resulting 49.3 crashes per 100 million vehicle miles traveled (MVMT) is significantly higher than Maryland Statewide rate for urban freeway expressways (39.0 crashes per 100 MVMT). There was one fatal crash reported in 2016, while 62 of the crashes involved injuries. The 161 property damage crashes occurred at a rate of 35.4 crashes per 100 MVMT, which is significantly higher than the Maryland Statewide rate for urban freeway

expressways (25.2 crashes per 100 MVMT). Property damage crashes typically result from lower speed incidents, which correlate to congested conditions. **Table 2-11** lists the most frequent probable causes of crashes as listed on police reports, and **Table 2-12** lists the types of crashes most frequently reported for this segment of US 50.

Rear-end, sideswipe and opposite direction type crashes occurred at a rate significantly higher than the Maryland Statewide rate for urban freeways/expressways. Rear-end type crashes are typically experienced during congested conditions. The rate of truck related crashes was 9.2 crashes per 100 MVMT, which is significantly higher than the Maryland Statewide rate for urban freeway expressways (4.5 crashes per 100 MVMT). This finding correlates to the high percentage of trucks in the weekday vehicle mix across the Bay Bridge.

Table 2-11: Most Frequent Reported Probable Causes of Crashes along US 50 from Oceanic Drive to MD 8 (Romancoke Road) (January 1, 2014 – December 31, 2016)

REPORTED PROBABLE CAUSE OF CRASH	NUMBER OF CRASHES	PERCENT (%) OF CRASHES
Other or Unknown	65	29
Failure to give Full Attention*	47	21
Too Fast for Conditions*	35	16
Followed too Closely*	33	15

Source: MDOT SHA Office of Traffic and Safety
**These causes relate closely with congested conditions.*

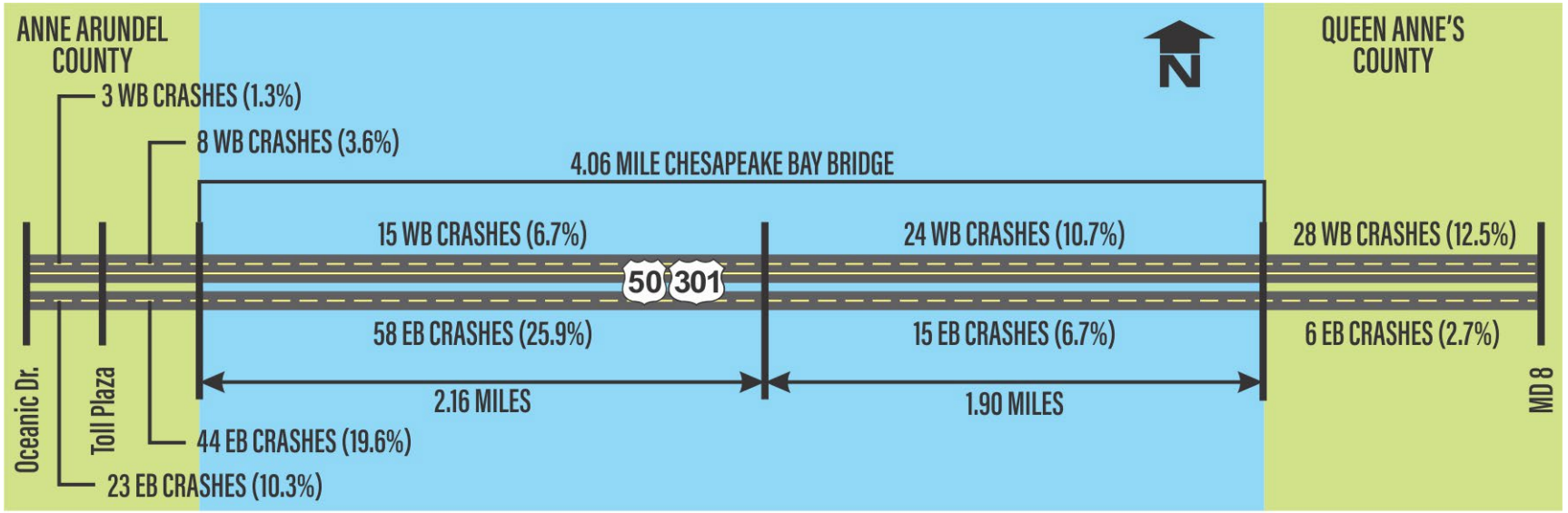
Table 2-12: Most Frequent Type of Reported Crash along US 50 from Oceanic Drive to MD 8 (Romancoke Road) (January 1, 2014 – December 31, 2016)

REPORTED TYPE OF CRASH	NUMBER OF CRASHES	PERCENT (%) OF CRASHES
Rear-End	139	62
Sideswipe	53	24
Other	15	7
Guardrail/Barrier	10	4
Opposite Direction	4	0.9

Source: MDOT SHA Office of Traffic and Safety

Figure 2-5 presents the location and direction of the reported crashes along the segment of US 50/US 301 between Oceanic Drive and MD 8 from 2014 through 2016. Of the 224 reported crashes in this segment, 112 or half occurred on the Bay Bridge itself. Almost two times more crashes were reported in the eastbound direction than in the westbound direction of travel (146 versus 78). The portion of this segment of US 50/US 301 west of the center of the Bay Bridge saw the majority of the total reported crashes (151 out of 224, or 67.4 percent). Most of the crashes occurring west of the center of the Bay Bridge were in the eastbound direction (125 out of 146, or 85.6 percent). This result may be related to the two-lane eastbound span versus the three-lane westbound span and the toll plaza on the eastbound approach to the bridge. It is noted that 162 or 72.3 percent of the reported crashes occurred between 11 AM and 8 PM, with the peak of 27 crashes being reported in the 3 PM timeframe. Approximately 41 percent of the crashes occurred in the months of June, July and August and 55 percent were reported on Friday, Saturday and Sunday. Twenty seven percent of the crashes were reported on a Friday, Saturday or Sunday in June, July and August.

Figure 2-5: Crash Experience in Vicinity of the Bay Bridge (2014 Through 2016)



As shown from recent crash history in the vicinity of the Bay Bridge, and the Life Cycle Analysis of the Bay Bridge structures, additional capacity is needed across the Chesapeake Bay to provide travelers alternate routes to avoid crash-related delays. There is also an expected increase in frequency of maintenance and rehabilitation activities as the Bay Bridge ages, which will require additional short- and long- term lane closures on the Bridge in the future and exacerbate congestion. As documented in previous studies, the lack of roadside shoulders or buffer areas results in the loss of a lane or roadway closures during incident management activities, which impacts the vehicular capacity of the Bridge. This supports the need for additional capacity across the Bay, in order to maintain flexible options for safe travel during maintenance and for management of other incidents on the Bay Bridge.

2.3 FINANCIAL VIABILITY

Providing additional capacity across the Chesapeake Bay, as well as improvements to existing facilities, must be financially viable. In order to assess potential additional crossing corridor alternatives, it is necessary to consider the means to pay for the development, operation and maintenance of the facilities. As an independent State agency, the MDTA does not receive funding from tax dollars, the General Fund or the Maryland Transportation Trust Fund. The MDTA will explore potential funding strategies for any potential Bay Crossing improvements, which must be deemed financially viable (i.e., ability to pay for the development, operation and maintenance of such facilities).

The level of financial viability analysis conducted for this study of corridor alternatives cannot be as detailed as that undertaken during a Tier 2 study. This Tier 1 NEPA Study will not define the specific construction actions to be evaluated in a Tier 2 study, yet some level of cost estimating was conducted for each corridor alternative based on, among other factors:

- future navigational channel planning;
- the potential amount of new or upgraded approach transportation network facilities that may be required;
- the range of structure lengths required to cross the Bay (if appropriate);
- the type of structure crossing the Bay (if appropriate);
- the theoretical capacity of the Bay Crossing;
- an order of magnitude of impacts; and
- the anticipated operating and maintenance costs associated with the crossing improvements (i.e., amount of infrastructure required).

2.4 ENVIRONMENTAL RESPONSIBILITY

The MDTA recognizes that the Chesapeake Bay is a critical environmental resource in Maryland. Any Bay Crossing improvements must consider the sensitivity of the Bay, including existing environmental conditions, and the potential for adverse impacts to the Bay and the important natural, recreational, socioeconomic and cultural resources it supports. As noted previously, this tiered NEPA study has analyzed the full range of engineering and environmental issues at a level of detail appropriate for a Tier 1 Study. Additional detail will be included in Tier 2. Impacts, including those to environmental resources to be discussed include, but are not limited to:

- natural resources (e.g., floodplain, wetlands, water quality, flora, fauna, prime farmland);
- cultural resources (e.g., archeology, historic properties);
- socioeconomics (e.g., land use compatibility, environmental justice, economics);
- air quality;
- noise;
- hazardous materials; and
- indirect and cumulative effects.

Consistent with State priorities, all counties neighboring the Bay have planning documents with goals that address resource protection, growth and development. Preservation of natural resources, including forests, steep slopes, wetlands, floodplains, watersheds, and waterways is a high priority as evident in programs (e.g., Chesapeake Bay Critical Area, Heritage Areas, Open Space, Priority Preservation Areas) that limit and control development. Maryland State legislation and local land use planning processes guide development patterns throughout each county by structuring projects around designated growth areas where planned growth is suitable, while preserving the low-density development and rural areas, and limiting sprawl development.

During Tier 2, the MDTA will take into account the Bay and the communities dependent upon it during the study to identify the effects of any potential corridor alternative on natural environmental, cultural and community resources. MDTA will also take into consideration the potential beneficial and adverse effects to regional economic activities, such as the recreational and tourism industries. Potential corridor alternatives will be evaluated for their ability to support planned economic development. Local land uses, existing and planned development patterns, and economics will be critical elements of the corridor evaluation.

2.5 SUMMARY

Congestion currently experienced at the Bay Bridge during weekdays and summer weekends is due to increasing travel demands and the inadequate capacity of the existing Bridge and its approach roadways. Adding to the congestion problem is a need for increased rehabilitation and maintenance efforts in future years, which will require lane closures and result in further back-ups and delays. The region needs a dependable Bay crossing that provides reliable operating speeds and travel times; facilitates emergency services and evacuation events; allows access to employment and recreation areas; and offers flexible options for safe travel during rehabilitation, maintenance and incident management on the existing Bridge. Therefore, in an effort to improve mobility, travel reliability and safety at the existing Bay Bridge, the purpose of the Bay Crossing Tier 1 NEPA Study is to consider corridors for providing additional capacity and access across the Bay in order to improve mobility, travel reliability and safety at the existing Bay Bridge. After extensive vetting, including public input, the MDTA, the Federal Highway Administration and the Bay Crossing Study cooperating agencies have concurred on the Purpose and Need for the Bay Crossing Study.

The evaluation of potential new corridor alternatives for the Bay Crossing Study includes an assessment of the transportation infrastructure needed, while also taking into account financial viability and environmental responsibility, accounting for potential adverse effects to the Bay and the important natural, recreational, socioeconomic and cultural resources it supports.

3 ALTERNATIVES CONSIDERED

This chapter includes a description of the range of preliminary alternatives considered, a summary of the screening-level environmental inventory, a review of the alternatives screening process and results, and preliminary cost estimates. For more details on the screening process, screening-level environmental inventory and screening results, see the ***BCS Alternatives Report***. Discussion of the MDTA-Recommended Preferred Corridor Alternative (RPCA) is included in **Chapter 5**.

3.1 DEVELOPMENT OF PRELIMINARY RANGE OF ALTERNATIVES

The preliminary range of alternatives for the Bay Crossing Study (BCS) included the No-Build Alternative, four Modal and Operational Alternatives (MOAs), and 14 corridor alternatives.

3.1.1 No-Build Alternative

The No-Build Alternative was included as a baseline for comparison to the corridor alternatives. The No-Build Alternative includes all currently planned and programmed infrastructure projects as of Project Scoping in 2017 and includes regular maintenance at the Bay Bridge. (A current list of projects is provided in **Table 4-46**.) It will be updated as needed during Tier 2 to reflect future projects that were not planned and programmed as of Project Scoping in 2017, such as implementation of all-electronic tolling (AET) or eliminating the physical toll plazas and the option to pay cash at those facilities, which would allow traffic to remain at highway speeds and avoid slowing down to drive through a toll plaza to pay the toll. In addition, transportation system management/travel demand management (TSM/TDM) measures such as improvements to the contraflow operation on the existing bridge may be implemented. As discussed below, AET is in operation at the Bay Bridge as of May 2020. Since the Draft EIS has been in development at the same time that AET has been put in place at the Bay Bridge, it was not feasible to include information regarding its impact on Bridge traffic in the Draft EIS.

3.1.2 Modal and Operational Alternatives (MOAs)

Four MOAs were developed to evaluate if a different mode or operational changes could meet the Purpose and Need for the study as a stand-alone alternative: TSM/TDM, Ferry Service, Bus Rapid Transit, and Rail Transit. The MOAs are referred to as "stand-alone" because the evaluation was intended to

determine if any of them could meet the Purpose and Need independently and without the implementation of any other alternatives.

Combinations of alternatives, such as MOAs in combination or in combination with a recommended corridor alternative, will be evaluated in Tier 2 to determine whether such a combination could satisfy the transportation needs in combination with alternative alignments.

3.1.2.1 Transportation Systems Management/Travel Demand Management (TSM/TDM)

This alternative would consist of infrastructure and operational changes aimed at improving performance of the existing roadway network without adding major new highway capacity. TSM/TDM improvements are typically relatively low-cost projects and/or practices that can be implemented without major impacts compared to building new capacity. Specific examples of TSM/TDM improvements could include:

Implementing All Electronic Tolling (AET)

This improvement includes replacing the existing toll booths with an overhead toll gantry that collect electronic tolls at highway speeds. AET commenced at the Bay Bridge in Spring 2020. Following completion of the Draft Tier 1 EIS, and prior to the preparation of the Final Tier 1 EIS, additional data collection will be performed to evaluate the effects of AET on eastbound operations

Implementing Variable Tolls

This improvement would include adjusting toll rates to encourage a more equal distribution of trips throughout the day. Toll rates would generally be lower during the off-peak period, which could influence some drivers to change their trip times to avoid paying a higher toll.

It is possible that MDTA will implement future TSM/TDM improvements separately from the Bay Crossing Study. The results of this screening analysis do not preclude such improvements from future implementation.

3.1.2.2 Ferry Service

This alternative would consist of implementing a ferry service across the Chesapeake Bay. The alternative would include construction of ferry terminals at one or more locations on each shore. It was assumed that the ferry service would provide one or more alternate crossing routes for vehicles that would otherwise cross the Bay Bridge. This alternative could also necessitate roadway improvements between the existing roadway network and the proposed ferry terminals.

3.1.2.3 Bus Rapid Transit

This alternative would consist of a new Bus Rapid Transit (BRT) service between major destinations on the Western and Eastern Shores. It was assumed that the BRT service would use the existing bridge to cross the Bay.

The potential BRT routes were assumed to service commuters traveling on Non-Summer Weekdays and for leisure travelers on Summer Weekends traveling to/from the Eastern Shore beach areas. For Non-Summer Weekdays, transit travel was assumed to occur from the Eastern Shore, i.e. Kent Island and Queen Anne's County, to the Western Shore, i.e. Annapolis, Baltimore, and Washington, DC, via the Bay

Bridge in the AM Peak Hour. In the PM Peak Hour, reverse travel was assumed to occur from the Western Shore to the Eastern Shore via the Bay Bridge. The potential BRT routes were identified in consideration of existing travel patterns.

3.1.2.4 Rail Transit

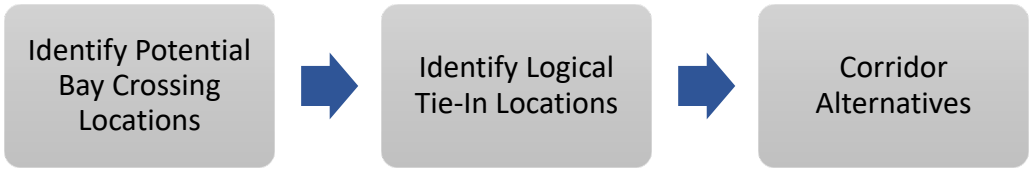
This alternative would consist of construction of a new rail line and implementation of a new rail service between major destinations on the Eastern and Western Shores. It was assumed that a new Chesapeake Bay crossing would need to be constructed to support such a rail line. The Rail transit alternative would include consideration of both Heavy Rail Transit (HRT) and Light Rail Transit (LRT). HRT is a railway transit mode with the capacity for a heavy volume of passengers. It is typically characterized by high speed and rapid acceleration of passenger rail cars operating singly or in multi-car trains on fixed rails, with separate rights-of-way and high platform loading. LRT is a transit mode with a lower volume of passenger capacity compared to HRT, generally characterized by passenger rail cars operating singly or in short trains on fixed rails in shared or exclusive right-of-way, low or high platform loading, and power drawn from an overhead electric line.[1]

As with the BRT Alternative, potential rail transit routes were assumed to service commuters traveling on Non-Summer Weekdays and for leisure travelers on Summer Weekends traveling to/from the Eastern Shore beach areas. For Non-Summer Weekdays, transit travel was assumed to occur from the Eastern Shore, i.e. Kent Island and Queen Anne's County, to the Western Shore, i.e. Annapolis, Baltimore, and Washington, DC, via the Bay Bridge in the AM Peak Hour. In the PM Peak Hour, reverse travel was assumed to occur from the Western Shore to the Eastern Shore via the Bay Bridge.

3.1.3 Corridor Alternatives

The corridor alternatives included potential Chesapeake Bay crossing locations and the approach roadways that would tie into the existing roadway network and followed a logical development methodology illustrated in **Figure 3-1**.

Figure 3-1: Corridor Development Methodology



A structured approach was used to locate the corridor alternatives, including:

- The full extent of the Chesapeake Bay in Maryland was considered for potential crossings.
- A corridor width of two miles was assumed.
- Corridors were developed within the constraints of the Chesapeake Bay geography. Thus, corridors were placed to generally connect peninsulas or long stretches of shoreline while avoiding mouths of rivers or other large bodies of water.

[1] Definitions for HRT and LRT are from the Federal Transit Administration (FTA) National Transit Database Glossary. *https://www.transit.dot.gov/ntd/national-transit-database-ntd-glossary*

- Corridors were generally not placed in towns or in other developed areas.
- The existing roadway network was considered in corridor placement. Tie-ins to the existing roadway network were based on extending the corridor to the first major intersecting roadway.
- To reduce the length of the crossing and related engineering challenges, corridors were placed perpendicular to the Chesapeake Bay where possible.

Fourteen corridor alternatives were developed that were two miles wide, as shown in **Figure 3-2**. The intent of the Tier 1 phase of the study is to identify a corridor location; the specific alignment of a potential new crossing will not be defined in Tier 1. Additionally, the type of crossing, such as a bridge or tunnel, is not evaluated or identified in Tier 1.

3.1.3.1 Tie-In Locations

For each crossing location, the transportation network tie-in locations were identified based on the following considerations:

Western Shore Tie-ins

1. Corridors started at a limited-access highway where possible.

2. Corridors in southern Maryland, where there are no limited-access highways, followed relatively straight alignments and started at the nearest major regional routes (e.g., MD 2/4 or MD 235).

Eastern Shore Tie-ins

1. All corridors ended at US 50, US 301, or US 13.
2. Corridors followed existing state routes where possible.
3. Most corridors followed a relatively straight alignment from the Chesapeake Bay crossing to the tie-in with US 50, US 301, or US 13.

3.1.3.2 Corridor Alternative Locations

A description of each corridor alternative is presented in **Table 3-1**. The table identifies and provides rationale for the range and location of corridors. The table is ordered from north to south through the study area along the Chesapeake Bay. The identified range of corridor alternatives (as shown in **Figure 3-2**) is highlighted blue in **Table 3-1**. Justification is provided for why corridor alternatives were not identified in locations that are in between.

Figure 3-2: Corridor Alternatives

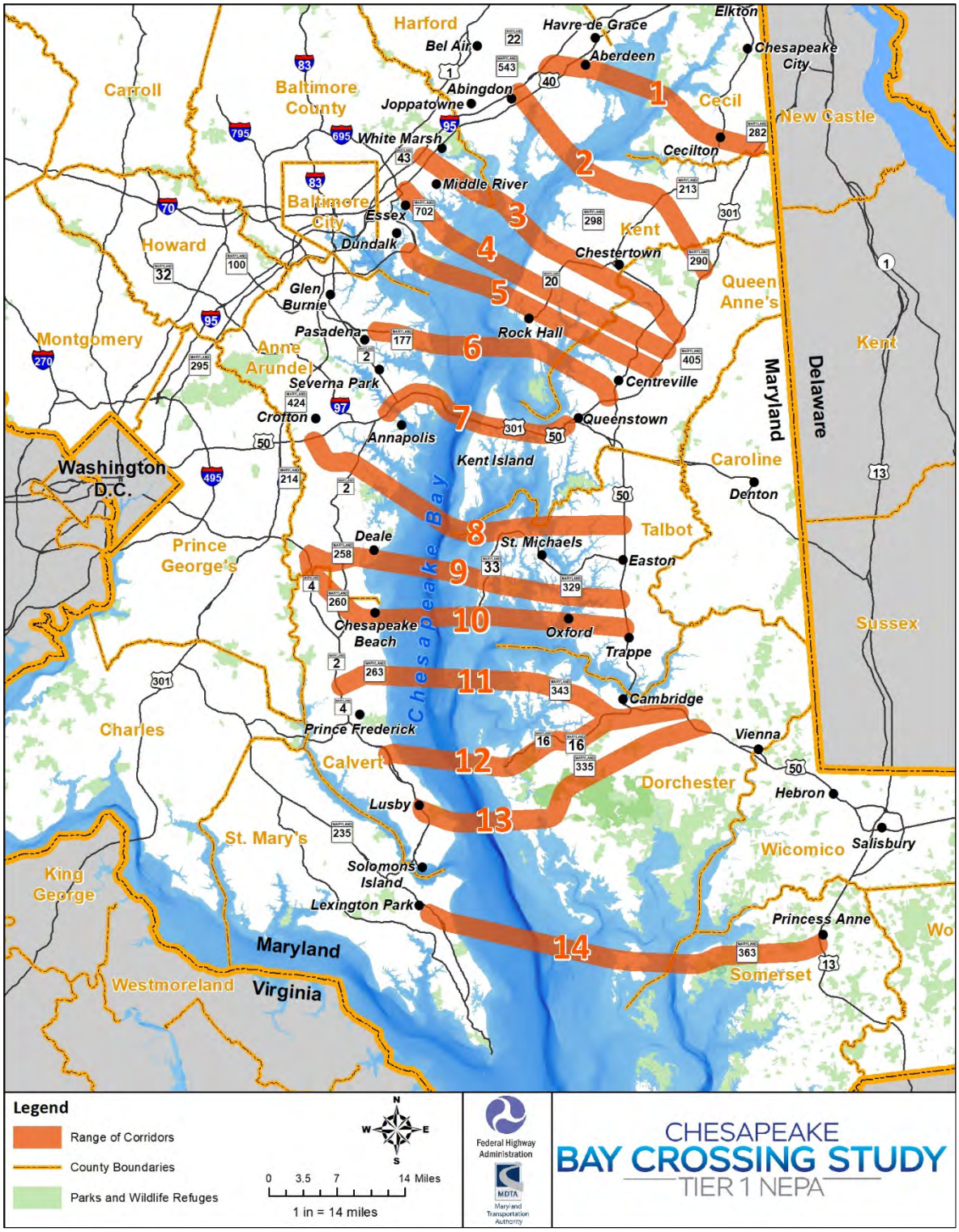


Table 3-1: Corridor Alternative Locations

LOCATION	DESCRIPTION/RATIONALE
North of Corridor 1	• Close to I-95/US 301 route around Bay • Mouth of Susquehanna River • Proximity to Havre de Grace
Corridor 1	• Connects Aberdeen and Cecilton • Follows MD 22 and ties into existing I-95 interchange on Western Shore • Follows MD 282 on Eastern Shore
South of Corridor 1 and North of Corridor 2	• Mouth of Sassafras River • Would pass through developed section of Aberdeen Proving Ground (APG)
Corridor 2	• Connects Abingdon and Chestertown • Undeveloped portion of APG • Follows MD 298/290 on Eastern Shore and ties into existing MD 543/I-95 interchange on Western Shore
South of Corridor 2 and North of Corridor 3	• Would pass through developed section of APG • Mouth of Gunpowder River on Western Shore • Mouth of Bush River on Western Shore
Corridor 3	• Connects White Marsh and Chestertown • Ties into existing MD 43/I-95 interchange on Western Shore; follows portions of MD 20 and MD 405 on the Eastern Shore. Much of the corridor does not follow existing road network on the Eastern Shore, ties into US 301.
South of Corridor 3 and North of Corridor 4	• Proximity to Middle River • Proximity to Martin State Airport on Western Shore
Corridor 4	• Connects Essex and Rock Hall • Follows MD 702 and ties into existing I-695 interchange on Western Shore; does not follow existing road network on the Eastern Shore to tie into US 301.
South of Corridor 4 and North of Corridor 5	• Mouth of Back River on Western Shore
Corridor 5	• Connects Dundalk and Rock Hall • Requires a short connection to I-695 on Western Shore; does not follow existing road network on Eastern Shore to tie into US 301.
South of Corridor 5 and North of Corridor 6	• Mouth of Patapsco River on Western Shore
Corridor 6	• Connects Pasadena and Centreville • Follows MD 177 and ties in with MD 100 on Western Shore; does not follow existing road network on Eastern Shore to tie into US 301.
South of Corridor 6 and North of Corridor 7	• Mouth of Magothy River on Western Shore
Corridor 7	• Follows existing road network along US 50/301 from west of the Severn River on the Western Shore to US 50/301 split on the Eastern Shore. Includes location of existing Bay Bridge
South of Corridor 7 and North of Corridor 8	• Mouth of Severn River on Western Shore • Proximity to Annapolis • South River on Western Shore

LOCATION	DESCRIPTION/RATIONALE
Corridor 8	• Connects Crofton and Easton • Follows MD 214/424 and ties in to existing US 50 interchange on Western Shore. • Does not follow existing road network on Eastern Shore to connect to US 50.
South of Corridor 8 and North of Corridor 9	• Limited infrastructure on both shores • Would pass through St. Michaels
Corridor 9	• Connects Deale and Easton • Follows MD 258 and ties into existing MD 4 interchange on Western Shore; follows portions of MD 329 and MD 33 to tie into US 50 on the Eastern Shore.
South of Corridor 9 and North of Corridor 10	• Proximity to Corridors 9 and 10
Corridor 10	• Connects Chesapeake Beach and Trappe • Follows MD 260 and ties into MD 4 on Western Shore; does not follow existing road network on Eastern Shore to connect to US 50.
South of Corridor 10 and North of Corridor 11	• Mouth of Choptank River on Eastern Shore
Corridor 11	• Connects Prince Frederick and Cambridge • Follows MD 263 on Western Shore • Follows MD 343 on Eastern Shore
South of Corridor 11 and North of Corridor 12	• Mouth of Little Choptank River on Western Shore
Corridor 12	• Connects Prince Frederick and Cambridge • Requires a short connection to MD 2/4 on Western Shore • Follows MD 16 on Eastern Shore
South of Corridor 12 and North of Corridor 13	• Proximity to Corridors 12 and 13
Corridor 13	• Connects Lusby and Cambridge • Requires a short connection to MD 2/4 on Western Shore; follows a portion of MD 335 on the Eastern Shore
South of Corridor 13 and North of Corridor 14	• Mouth of Patuxent River on Western Shore • Proximity to Naval Air Station Patuxent River on Western Shore • Limited infrastructure on Eastern Shore • Proximity to Blackwater National Wildlife Refuge on Eastern Shore
Corridor 14	• Connects Lexington Park and Princess Anne • Requires a short connection to MD 235 on Western Shore • Follows MD 363 on Eastern Shore
South of Corridor 14	• Limited infrastructure on both shores • Southern extent of study area

3.2 ALTERNATIVES SCREENING PROCESS

The BCS Purpose and Need includes three elements: adequate capacity, dependable and reliable travel times, and flexibility to support maintenance and incident management at the existing Bay Bridge. Environmental responsibility and financial viability are additional considerations in the study. All three of these elements and both considerations were used as the basis for evaluating the corridor alternatives and the MOAs.

The MOAs were analyzed differently from the corridor alternatives because they are not location-specific. Potential environmental effects from MOAs were evaluated qualitatively, to compare the relative extent of resources likely to be affected.

Public comment and agency input were critical to the screening of alternatives. Three rounds of public meetings have been conducted so far to correspond with key milestones in the study including scoping, alternatives development, and screening. An extensive program of agency involvement has included 13 Interagency Coordination Meetings held with Cooperating and Interagency Coordination Meeting (ICM) Participating Agencies as detailed in ***Chapter 6***.

Input on a range of topics such as the methodologies of technical studies, key resources to consider, data sources, and specific concerns within corridors have been considered in the alternatives screening process. In particular, much of the public and agency input emphasized the importance of potential indirect effects of a new crossing on land use and development, particularly on the Eastern Shore. Agency input also emphasized the sensitivity of important aquatic resources throughout the Chesapeake Bay, and the most important sources of data to include in the environmental inventory.

3.2.1 MOA Screening

The MOAs were evaluated relative to their ability to meet the BCS Purpose and Need, along with financial feasibility and environmental considerations. Some or all of the MOAs evaluated would be considered in Tier 2 in combination with one or more other proposed build alternatives.

The MOAs were developed as part of the range of alternatives to determine if a different mode, or operational changes, could meet the Purpose and Need as stand-alone alternatives. In other words, this Tier 1 screening is intended to determine if any of these MOAs could meet the Purpose and Need independent of other corridor alternatives or MOAs.

The MOAs were evaluated based on the Purpose and Need elements of adequate capacity, dependable and reliable travel times, and flexibility to support maintenance and incident management at the existing Bridge.

3.2.2 Corridor Alternative Screening

A two-phased screening approach was employed to narrow the corridor alternatives. Corridors that met the adequate capacity metric and avoided major practical challenges in the Phase 1 analysis were advanced to Phase 2. The corridor alternative screening approach is summarized in **Table 3-2** and detailed in the sections below.

Table 3-2: Corridor Alternatives Screening Criteria

PHASE 1 SCREENING	PHASE 2 SCREENING
• Adequate Capacity o 2040 Summer Weekend Average Daily Traffic (ADT) at the Existing Crossing o 2040 Non-Summer Weekday ADT at the Existing Crossing	• Dependable and Reliable Travel Times o 2040 Summer Weekend – Daily hours with queue length of 4 miles or greater o 2040 Non-Summer Weekday – Daily hours with queue length of 1 mile or greater o 2040 Summer Weekend – Hours with LOS E or F o 2040 Non-Summer Weekday – Hours with LOS E or F
• Practical Challenges o Unavoidable impacts to major resources (such as Aberdeen Proving Ground or Blackwater National Wildlife Refuge)	• Flexibility to Support Maintenance and Incident Management at the Existing Bridge o Additional travel time required to divert from the existing bridge to a new crossing • Screening-Level Environmental Inventory, Indirect and Cumulative Effects • Financial Viability

The Purpose and Need emphasizes that a new crossing within any proposed corridor needs to address existing and future traffic conditions at the existing Bay Bridge, taking into account both non-summer weekday and high-volume summer weekend conditions. A traffic analysis was conducted to analyze whether each corridor alternative could meet the Purpose and Need.

From the perspective of traffic relief and congestion management, the calculation of adequate capacity for summer weekend and non-summer weekday Average Daily Traffic (ADT) was an effective means of distinguishing the performance of the identified potential corridors relative to the stated BCS Purpose and Need. Assessment of this measure, in addition to identification of high-level practical challenges associated with existing land uses within the potential corridors helped narrow the range of reasonable corridors. However, with respect to at least five of the potential corridors, additional traffic analysis and further land use considerations were recommended to further screen corridors for detailed analysis in the Tier 1 Draft EIS.

Environmental and financial information was developed for all 14 corridors prior to the two-phase screening. Environmental considerations included information from the screening-level environmental inventory and the potential for indirect effects. Financial considerations were assessed by analyzing engineering factors such as the length and complexity of each crossing. Sensitive lands identified in the screening-level environmental inventory were included in Phase 1 of the screening; other environmental and financial considerations were applied in Phase 2.

The environmental inventory portion of the screening identified natural, socioeconomic, and cultural resources present in the two-mile wide corridor alternatives. It should be emphasized that creation of an environmental *inventory* is distinguished from a detailed analysis of environmental *impacts*; an inventory consists of determining the total amount of each resource present within each two-mile wide corridor. Specific alignments will not be developed during Tier 1; thus, the screening-level environmental inventory

was used as an indicator of the types of resources that would be anticipated to be present, their overall prevalence, and the magnitude of potential impacts in comparison to other corridor alternatives. Specifically, concentrations of existing natural resources have been quantified using the limits of the study area for each of the corridors and overlaying existing GIS-based natural resource data layers. This level of analysis provides a relative comparison of potential impacts associated with each corridor but does not quantify actual impacts associated with a defined limit of disturbance. Moreover, crossing alignments identified during Tier 2 would require a much smaller footprint than a two-mile wide corridor. The smaller Tier 2 footprint would have a greater level of engineering detail including more precise limits of disturbance associated with proposed project elements and construction activities. The more precise limits of disturbance would then be used to specifically delineate and quantify potential impacts to properties and sensitive resources. Once these potential impacts are known, additional engineering refinements would be made to avoid, minimize, and mitigate the effects.

For some resources, it was possible to determine that no avoidance could likely occur within a corridor alternative, such as where a resource covers the full width of the corridor alternative. However, for most resources, there may be opportunities to avoid and minimize impacts based on the location of the resource relative to a specific alignment (identified during Tier 2). The resources considered in the screening-level environmental inventory are listed below and described in more detail in **Chapter 4**.

- Total Area of Corridor
- Sensitive Lands: Military, Parks and Wildlife Refuges
- Community: Residential Land Use, Priority Funding Areas, Low Income and Minority Census Tracts
- Prime Farmland
- Known Cultural Resources
- Aquatic Resources: Area of Open Water, Submerged Aquatic Vegetation, Natural Oyster Bars
- Wetlands, Perennial Streams, and Floodplains
- Terrestrial Habitat: Forested Land, Chesapeake Bay Critical Areas, Sensitive Species Project Review Areas
- Coastal Barrier Resources Act (CBRA) Protected Lands
- Description of Potential Indirect Effects

3.2.2.1 Phase 1 Corridor Alternative Screening

For Phase 1, the quantitative measure of ADT in 2040 was first applied to measure the ability of each corridor alternative to provide adequate capacity to reduce congestion at the existing bridge. In addition to this traffic evaluation, other practical considerations were included in Phase 1 to determine if one or more practical challenges rendered a proposed corridor alternative unreasonable, such as unavoidable impacts to critical resources. Upon completion of the Phase 1 analysis, corridor alternatives that met the capacity metric and did not demonstrate major practical challenges were evaluated in a Phase 2 analysis to further distinguish among the various proposed corridor alternatives.

Adequate Capacity to Relieve Congestion at the Existing Bridge

Corridor alternatives that reduced the 2040 ADT at the Bay Bridge below existing (2017) ADTs on either non-summer weekdays or summer weekends were deemed to meet the Purpose and Need element for adequate capacity. In 2017, the existing bridge experienced ADT volumes of 118,600 vehicles per day (vpd) on summer weekends and 68,600 vpd on non-summer weekdays.

The traffic analyses used the 2017 existing conditions and modeled 2040 No-Build conditions for comparison. The traffic screening was based on travel demand forecasting using the Maryland Department of Transportation State Highway Administration (MDOT SHA) Maryland Statewide Transportation Model (MSTM).

The screening included modeling summer weekend traffic and non-summer weekday traffic because of the differing origin and destination (O&D) patterns corresponding to these time frames. Summer weekend ADT reflected the increased demand resulting from travelers to summer vacation destinations such as Ocean City, MD. Non-summer weekday ADT reflected more typical conditions, with more of the demand from commuters. A more detailed discussion of O&D data can be found in ***Section 2.2.1.1***.

To understand how many vehicles would use each corridor alternative, the traffic projections were based on an unconstrained model that did not limit the capacity of the corridor alternative. Traffic estimates included existing and currently planned land use. The traffic projections were based on currently approved future land use and regional travel demand modeling.

Practical Challenges

An additional consideration for the Phase 1 analysis was whether a corridor alternative could face major practical challenges due to its location. Corridor alternatives that would pass through large areas of sensitive lands, such as Aberdeen Proving Ground or Blackwater National Wildlife Refuge (NWR), were identified in this step. While numerous smaller areas of sensitive or protected land were identified in the screening-level environmental inventory, this step identified only sensitive or protected lands that would extend the entire two-mile width of a corridor and well beyond, thus resulting in no potential for avoidance. Smaller areas of sensitive or protected land would not pose the same degree of practical challenge as those that encompass the full width of a corridor.

3.2.2.2 Phase 2 Corridor Alternative Screening

In Phase 2, the corridor alternatives that met the Phase 1 capacity criteria were evaluated to determine how they would impact performance at the existing crossing based on queue lengths/durations, hours of unacceptable LOS, and diversion travel times. This Phase 2 analysis also considered financial viability and environmental factors present in each corridor alternative, including the potential for indirect environmental effects. Queue lengths/durations and hours of unacceptable LOS were used to measure the Purpose and Need element of dependable and reliable travel times; diversion travel times were used to measure the Purpose and Need element of flexibility to support maintenance and incident management at the existing bridge.

Dependable and Reliable Travel Times

Travel times during congested conditions are highly variable, so queue lengths and durations were used to provide an assessment of the Purpose and Need element of dependable and reliable travel times. The analysis considered the duration of time that queue lengths of more than one mile on non-summer weekdays and more than four miles on summer weekends would be present at the existing bridge in 2040. Currently, the queue lengths at the existing bridge do not extend more than one mile for more than one hour on non-summer weekdays, and not more than four miles for more than one hour on summer weekends. The one-mile for more than one hour and four-mile for more than one-hour queue length criteria were selected to allow direct comparison, as these are the queue lengths/durations that occur in existing conditions. These queue lengths are expected to worsen by 2040 in the No-Build condition, with the existing bridge expected to experience queue lengths extending more than one mile for nine hours on non-summer weekdays and extending four miles or greater for nine hours on summer weekends. Corridor alternatives with one-mile and four-mile queues for lengths/durations that are not greater than one hour above existing conditions were deemed to sufficiently meet this Purpose and Need element.

The number of hours the existing bridge will experience LOS of E or F in 2040 was evaluated to provide a comparison of the ability of the corridor alternatives to meet the need of improving travel times and is shown in **Table 3-3**. Currently, the Bay Bridge experiences three hours with 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 nine hours in the westbound direction). This is expected to worsen by 2040 to seven hours on non-summer weekdays (with five hours in the eastbound direction and two 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).

Table 3-3: Hours with LOS E or F

TIMEFRAME	NON-SUMMER WEEKDAYS – HOURS WITH LOS E OR F			SUMMER WEEKEND – HOURS WITH LOS E OR F		
	EASTBOUND	WESTBOUND	TOTAL	EASTBOUND	WESTBOUND	TOTAL
Existing (2017)	3	0	3	10	9	19
No-Build (2040)	5	2	7	12	10	22

Flexibility to Support Maintenance and Incident Management at the Existing Bridge

Flexibility to support maintenance and incident management at the existing bridge was measured by estimating the additional travel time required for vehicles diverted from the existing bridge to a new crossing in the event of a full or partial bridge closure. Diversion was measured from the US 50/US 301 split near Grasonville on the Eastern Shore to the US 50/US 301/MD 3 interchange near Bowie on the Western Shores. The current travel time between these end points is approximately 36 minutes. This 36-minute travel time was used as a benchmark for evaluation of travel time diversion. Given that the goal of a potential new crossing is to improve flexibility, it would not be reasonable for a corridor alternative to more than double the existing travel time between these end points to divert from the existing bridge to a new crossing. Such a crossing, therefore, will not sufficiently meet the Purpose and Need element of providing an adequate level of flexibility for maintenance and incident management.

Corridor alternatives located the furthest from the existing bridge will provide minimal opportunity for traffic diversion during maintenance and incident management. Corridor alternatives closer to the existing bridge will be better for diverting traffic during maintenance. Potential alignments within the corridors have not been studied in Tier 1. A new Bay crossing in Corridor 7 could conceivably utilize existing US 50/US 301 for much of its approach. If this were to be the case, and if a closure were to occur on the US 50/US 301 approach rather than on the Bay Bridge itself, both crossings (the existing Bay Bridge and a new crossing) could be closed. This possibility would be considered in the development and analysis of alternative alignments during Tier 2.

Environmental Considerations

Environmental responsibility is an additional consideration of the Purpose and Need. Each corridor alternative contains substantial environmental resources, as identified in the screening-level environmental inventory. Additionally, a new crossing within a corridor would likely lead to indirect effects on environmental resources resulting from pressure for land use changes and new development. The extent of the pressure will vary based on factors such as proximity to major employment centers and availability of undeveloped land.

The screening-level inventory of environmental features and evaluation of potential indirect and cumulative effects were completed for all corridors, regardless of whether they were eliminated in Phase 1 of the screening. As described below, all corridors contain substantial environmental resources. Because the composition of the screening-level inventory within each corridor is markedly different, a suitable differentiation between corridors on the basis of environmental considerations could not be made at this stage absent a specific alignment which would be designed to avoid such impacts if possible. More detailed assessment of environmental resources within the Corridor Alternatives Retained for Analysis (CARA) is included in **Chapter 4.**

In certain situations, environmental resources considered in the screening-level inventory such as military land and Blackwater NWR spanning the full width of a corridor were given particular consideration due to the practical difficulties they would pose.

Cost and Financial Considerations

In addition to the needs described in the Purpose and Need, financial viability was identified as an additional important project consideration. Cost and financial considerations were developed for all corridors, regardless of whether they were carried forward past Phase 1 of the screening, to ensure complete information for the full range of corridors. The cost of a new crossing is a key factor in the financial viability of a new crossing. Engineering factors were used to compare the potential magnitude of cost among alternatives. The cost and financial considerations are presented in two categories: complexity of crossing and scope of approach infrastructure. Cost and financial considerations are described below.

Complexity of Crossing

Complexity of crossing was intended to evaluate the overall degree of complexity required to build the crossing of the Chesapeake Bay. It is expected that corridor alternatives that would require crossings of greater length, with longer deep-water crossings, and with more channel crossings would require greater expense to construct. The following elements were considered:

- **Approximate Length of Chesapeake Bay Crossing** - The approximate length of Chesapeake Bay crossing was estimated by measuring the distance across the Chesapeake Bay along the centerline of each corridor alternative.
- **Approximate Length of Deep-Water Crossing** - The approximate length of deep-water crossing was defined as the longest continuous portion of the crossing where the water depth is greater than 50 feet. The deep-water area was estimated using Geographic Information System (GIS) bathymetry contour data. Deep water crossings are anticipated to be generally more complex to construct, requiring deeper piers and longer spans (for bridges) or deeper tunnels relative to shallower areas of the Bay.
- **Number of Channel Crossings** - Navigational channels were identified using digital nautical navigation mapping along the Chesapeake Bay and adjacent waterways within the corridor alternatives. Channel crossings would potentially increase the complexity of the structures required because a potential new crossing would need to achieve adequate clearance to maintain navigability. This could potentially require higher structures and longer spans in these locations.

Scope of Approach Infrastructure

The scope of approach infrastructure criteria was intended to estimate the overall length and complexity of infrastructure required to tie into logical termini on both sides of the Bay. The following elements were considered:

- **Approximate Length of On-Land Improvements** - Estimated length in miles of the on-land improvements was measured along the centerline of the corridor alternative and included all areas that are not major water crossings.
- **Approximate Length of Other Water Crossings** - The approximate length of other water crossings is the total distance required to cross all other major waterways aside from the Chesapeake Bay. The total was estimated based on 2010 MDP Land Use/Land Cover (LULC) data, so only waterways which are large enough to be included as open water in the LULC dataset are counted. Minor crossings such as small streams were not included.

The screening results for alternatives eliminated from consideration are summarized below in **Section 3.3,** with the MOA eliminated from consideration summarized in **Table 3-4** and the corridor alternatives eliminated summarized in **Table 3-9**. The corridor alternatives retained are summarized below in **Section 3.4** and **Table 3-10**.

3.3 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

3.3.1 Modal and Operational Alternatives

Based on the MOA screening analysis results, all MOAs are recommended to be eliminated from further consideration as stand-alone alternatives. TSM/TDM, Ferry Service, BRT, and Rail Transit each fail to meet the Purpose and Need of the study because they would not provide adequate capacity to relieve congestion at the existing bridge, provide dependable and reliable travel times, or provide flexibility to support maintenance and incident management at the existing bridge. (See **Table 3-4**)

However, three of the MOAs – TSM/TDM, BRT and Ferry Service – will be considered in combination with other alternatives during the Tier 2 Bay Crossing Study. Rail will not be further evaluated due to high cost and low ridership expected. MDTA will also consider the TSM/TDM, Ferry Service and BRT MOAs in combination with new roadway capacity in the Preferred Corridor location during Tier 2.

MDTA will continue to implement existing TSM/TDM measures on the existing Bay Bridge. Any corridor alternative advanced from Tier 1 of the Bay Crossing Study will be evaluated with TSM/TDM measures during Tier 2. Furthermore, TSM/TDM could be implemented on either the Bay Bridge or a new corridor alternative should MDTA complete future, separate studies that determine these improvements are warranted.

Table 3-4: Summary of MOA Screening Results

MOA ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
MOA TSM/TDM	Eliminate as Stand-alone Alt.	Given the anticipated increase in ADT at the Bay Bridge by 2040 (15,700 additional vehicles per day during non-summer weekdays and 16,700 additional vehicles on summer weekends), the TSM/TDM alternative does not meet the needs for adequate capacity or improved travel times as a stand-alone alternative. TSM/TDM improvements would be feasible to implement with relatively low-cost and minimal environmental impacts compared to new infrastructure. **The TSM/TDM alternative would not meet the Purpose and Need as a stand-alone alternative.**
MOA Ferry Service	Eliminate as Stand-alone Alt.	The 2019 Ferry Service Report (***Appendix A*** of the ***BCS Alternatives Report***) found that one ferry route (with multiple trips per day) could convey a maximum estimated capacity of 972 vehicles per day. These numbers do not represent actual demand but give an indication of the total number of potential trips a ferry route could provide. By 2040, daily volumes at the Bay Bridge are expected to increase by an additional 15,700 on non-summer weekdays and an additional 16,700 on summer weekends. Thus, a ferry service operating at maximum capacity could accommodate less than five percent of the growth in volume and would not

MOA ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
		reduce existing volumes. Given the anticipated increase in ADT at the Bay Bridge by 2040, it is not expected that a ferry service would effectively relieve congestion and improve travel times at the existing Bay Bridge. Therefore, ferry service, as a stand-alone alternative, does not meet the Purpose and Need of the Tier 1 study. The improvements required to implement a ferry service, including terminals on both sides of the Bay, would be relatively low cost compared to construction of a new crossing. The study estimated that fare revenues generated by most ferry route locations would not be enough to cover operational costs. Environmental impacts of a ferry service would be dependent on location and the number of terminals but would likely be less extensive overall compared to a new crossing. Need for roadway approach infrastructure upgrades could require additional environmental impact. **Ferry service would not meet the Bay Crossing Study Purpose and Need as a stand-alone alternative.**
MOA Bus Rapid Transit	Eliminate as Stand-alone Alt.	In MDTA's 2019 Transit Service Report (***Appendix B*** of the ***BCS Alternatives Report***), the potential BRT ridership was estimated for the existing and future years for both Non-Summer Weekdays and Summer Weekends, and the ridership was converted into a number of daily equivalent vehicle trips due to transit to evaluate traffic relief at the Bay Bridge. BRT would have potential to remove an average of 588 cars from the Bay Bridge on weekdays and 1,548 cars on summer weekends in 2040. Given the anticipated increase in ADT at the Bay Bridge by 2040 (15,700 additional vehicles per day during non-summer weekdays and 16,700 additional vehicles on summer weekends), it is not expected that BRT would effectively relieve congestion and improve travel times at the existing Bay Bridge. BRT service operating in existing facilities would require relatively minimal infrastructure improvements such as maintenance facilities. Most or all cost of the alternative would be related to operation of the bus service. BRT service operating on a dedicated transitway would likely require more substantial capital expense. BRT operating on existing roadways and using the existing Bay Bridge would result in minimal impacts to environmental features. BRT operating on a dedicated transitway would likely require greater environmental impacts. **BRT would not meet the Bay Crossing Study Purpose and Need as a stand-alone alternative.**

MOA ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
MOA Rail Transit	Eliminate as Stand-alone Alt.	Similar to BRT, rail transit (including LRT or HRT) was evaluated in the 2019 Transit Service Report. The ridership estimates were developed to also reflect the potential ridership of a rail transit alternative. Rail transit would have the same limited potential for traffic relief as BRT. LRT or HRT would have potential to remove an average of 588 cars from the Bay Bridge on an average weekday and 1,548 cars on an average summer weekend in 2040. Given the anticipated increase in ADT at the Bay Bridge by 2040 (15,700 additional vehicles per day during non-summer weekdays and 16,700 additional vehicles on summer weekends), it is not expected that LRT or HRT would effectively relieve congestion and improves travel times at the existing Bay Bridge. Rail transit would require substantial infrastructure improvements, including construction of a new crossing and approach infrastructure. Additionally, this alternative may include the cost of acquiring new transit vehicles and operational costs. Construction of new rail transit facilities would likely require substantial environmental impacts due to the need for a new crossing structure and approach infrastructure. **Rail transit would not meet the Purpose and Need for the Bay Crossing Study as a stand-alone alternative.**

3.3.2 Corridor Alternatives

The results of the Phase 1 and Phase 2 alternative screening determined that many of the proposed crossing locations would not adequately meet the study Purpose and Need. The traffic metrics determined the level of demand for each corridor alternative and whether the trips through each corridor alternative would divert traffic away from the Bay Bridge. The results showed that the diversion of traffic away from the Bay Bridge is greatest for corridor alternatives in closest proximity to the existing Bay Bridge, and lowest for those farthest away. More specifically, the traffic related screening results show Corridors 1 through 4 and 10 through 14 do not meet the Purpose and Need because they would not provide adequate capacity to reduce 2040 congestion at the existing crossing below current levels, as measured by the Phase 1 evaluation of ADT. Corridors 2 and 13 will also result in substantial practical challenges due to their locations passing through Aberdeen Proving Ground and Blackwater National Wildlife Refuge, respectively. Therefore, Corridors 1 through 4 and 10 through 14 were eliminated in Phase 1. **Table 3-5** below includes the results of the Phase 1 traffic analysis, measuring each corridor alternative's ability to meet the project need of providing adequate capacity to relieve congestion at the existing Bay Bridge. The existing conditions (2017) and No-Build 2040 scenario are included for comparison.

Table 3-5: Screening Results – 2040 ADT

CORRIDOR ALTERNATIVE	2040 SUMMER ADT				2040 WEEKDAY ADT			
	EXISTING BRIDGE	EXISTING BRIDGE: CHANGE FROM 2017	PROPOSED CROSSING	COMBINED CROSSINGS	EXISTING BRIDGE	EXISTING BRIDGE: CHANGE FROM 2017	PROPOSED CROSSING	COMBINED CROSSINGS
Measure	ADT	Change in ADT	ADT	ADT	ADT	Change in ADT	ADT	ADT
Existing (2017)	118,600	N/A	N/A	118,600	68,600	N/A	N/A	68,600
No-Build (2040)	135,300	+16,700	N/A	135,300	84,300	+15,700	N/A	84,300
Corridor 1	130,300	+11,700	36,400	166,700	82,800	+14,200	16,000	98,800
Corridor 2	128,400	+9,800	32,700	161,100	81,900	+13,300	11,100	93,000
Corridor 3	123,500	+4,900	33,900	157,400	78,500	+9,900	10,700	89,200
Corridor 4	121,300	+2,700	35,200	156,500	76,600	+8,000	12,000	88,600
Corridor 5	116,600	-2,000	40,800	157,400	73,600	+5,000	15,000	88,600
Corridor 6	111,200	-7,400	45,700	156,900	69,600	+1,000	18,200	87,800
Corridor 7	79,700	-38,900	79,700	159,400	44,900	-23,700	44,900	89,800
Corridor 8	104,300	-14,300	55,200	159,500	68,100	-500	20,000	88,100
Corridor 9	118,300	-300	36,800	155,100	76,900	+8,300	9,100	86,000
Corridor 10	121,300	+2,700	32,200	153,500	78,600	+10,000	7,100	85,700
Corridor 11	125,300	+6,700	25,700	151,000	80,500	+11,900	5,000	85,500
Corridor 12	127,200	+8,600	22,300	149,500	81,500	+12,900	4,100	85,600
Corridor 13	129,000	+10,400	18,400	147,400	82,700	+14,100	2,900	85,600
Corridor 14	133,000	+14,400	8,500	141,500	83,800	+15,200	1,200	85,000

Note: all ADTs are presented in vehicles per day (vpd)

Phase 2 considered Corridors 5 through 9 in more detail. More detailed traffic analysis, as documented in the ***BCS Traffic Analysis Technical Report*** and summarized in the ***BCS Alternatives Report***, showed that for Corridors 5 through 9, queue lengths/durations and hours with LOS of E or F increase as the corridor alternatives get further away from the existing Bridge. Additionally, corridor alternatives located closer to the existing Bridge would provide better flexibility to support maintenance and incident management at the existing Bridge because traffic could more easily divert to a new crossing.

More specifically, the Phase 2 evaluations showed that Corridor 5 does not provide an acceptable level of flexibility for incident diversion and would cause potentially major indirect effects on the Eastern Shore. Corridor 9 also requires substantial additional travel time for incident diversion and would result in unreasonably long duration of queues on summer weekends at the existing crossing (six hours with

queues of one mile or greater on non-summer weekdays). Both Corridors 5 and 9 will only provide a minimal level of improvement to hours of LOS E or F at the existing crossing in 2040. **Table 3-6** summarizes the diversion travel times. In addition, Table **3-7** and **Table 3-8** provide a summary of the queue lengths/durations and hours with LOS E or F at the existing bridge

Table 3-6: Diversion Travel Times

CORRIDOR ALTERNATIVE	ADDITIONAL TRAVEL TIME FOR DIVERSION (MIN)
5	43
6	26
7	0
8	26
9	40

Table 3-7: Queue Lengths/Durations

CORRIDOR ALTERNATIVE	NON-SUMMER WEEKDAY – HOURS WITH 1 MILE QUEUE OR GREATER	SUMMER WEEKEND – HOURS WITH 4 MILE QUEUE OR GREATER
5	3	0
6	1	0
7	0	0
8	1	0
9	6	1

Table 3-8: Hours with LOS E or F at the Existing Bridge

CORRIDOR ALTERNATIVE	NON-SUMMER WEEKDAY HOURS* WITH LOS E OR F (CHANGE FROM EXISTING)	SUMMER WEEKEND HOURS* WITH LOS E OR F (CHANGE FROM EXISTING)
5	+2	-1
6	+1	-5
7	-3	-19
8	+1	-9
9	+2	-1

*Total of eastbound and westbound hours combined

The ability of Corridors 5 and 9 to only partially meet the Purpose and Need is especially challenging given the anticipated magnitude of cost for a new corridor alternative, expected to be multiple billions of dollars. Therefore, while Corridors 5 and 9 each partially meet the Purpose and Need, they are not recommended to be retained for analysis in the Draft EIS and have been eliminated.

The cost and financial feasibility considerations, as measured by engineering metrics such as length and complexity, were highly dependent on location. No corridor alternatives were shorter overall compared to Corridor 7, where the existing Bay Bridge is located, due to a relatively short crossing location and availability of existing on-land infrastructure for tie-in locations.

The screening-level environmental inventory showed that every corridor contains substantial environmental resources, and no new crossings could be built without likely causing substantial environmental impacts. The screening-level environmental inventory did not provide a suitable differentiation between the corridors. Corridors that are shorter overall such as Corridor 7 would likely

result in fewer overall direct impacts. Corridor alternatives near the southern end would likely have the most substantial impacts due to the prevalence of sensitive resources such as wetlands and wildlife refuges. All corridors would have indirect effects, but some corridor alternatives such as Corridors 3, 4 and 5 would have potentially greater indirect effects resulting from demand for new development on the Eastern Shore.

Table 3-9: Corridor Alternatives Eliminated from Consideration

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
1	Eliminate (Phase 1)	Corridor 1 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 14,200 vpd and summer weekend crossings would increase by 11,700 vpd over existing conditions. Corridor 1 contains substantial environmental resources, including 3,300 acres of Submerged Aquatic Vegetation (SAV), the highest among all corridors, and 1,600 acres of parks and wildlife refuges. **Corridor 1 would not meet the Bay Crossing Study Purpose and Need.**
2	Eliminate (Phase 1)	Corridor 2 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 13,300 vpd and summer weekend crossings would increase by 9,800 vpd over existing conditions. Corridor 2 passes through the Aberdeen Proving Ground, a United States Army facility located adjacent to Aberdeen, Maryland, with no apparent potential for avoidance resulting in major practical challenges. Corridor 2 contains substantial environmental resources, including 16,100 acres of prime farmland. **Corridor 2 would not meet the Bay Crossing Study Purpose and Need.**

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
3	Eliminate (Phase 1)	Corridor 3 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 9,900 vpd and summer weekend crossings would increase by 4,900 vpd over existing conditions. Corridor 3 would potentially cause major indirect effects on the Eastern Shore resulting from increased demand for urban development. Corridor 3 would create a direct new connection from the Baltimore area employment center to Kent County, and expose large areas of undeveloped farmland to substantial new pressure for development. Corridor 3 contains substantial environmental resources, including 17,800 acres of prime farmland and 60 miles of perennial streams. **Corridor 3 would not meet the Bay Crossing Study Purpose and Need.**
4	Eliminate (Phase 1)	Corridor 4 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 8,000 vpd and summer weekend crossings would increase by 2,700 vpd over existing conditions. Corridor 4 could potentially cause major indirect effects on the Eastern Shore resulting from increased demand for urban development. Corridor 4 would create a direct new connection from the Baltimore area employment center to Kent County, and expose large areas of undeveloped farmland to substantial new pressure for development. Corridor 4 contains substantial environmental resources, including 1,600 acres of parks and wildlife refuges, 19,300 acres of prime farmland, and 12,200 acres of Chesapeake Bay Critical Area. **Corridor 4 would not meet the Bay Crossing Study Purpose and Need.**

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
5	Eliminate (Phase 2)	Corridor 5 would provide some traffic benefit on summer weekends, but weekday non-summer traffic would increase compared to existing conditions on the Bay Bridge. Summer weekend crossings at the existing Bridge would be reduced by 2,000 vpd over existing conditions. Weekday non-summer crossings at the existing Bridge would result in an increase of 5,000 vpd over existing conditions. Because it improves summer weekend ADT below existing conditions, Corridor 5 meets the need for adequate capacity. Corridor 5 would result in a queue of one mile or greater at the existing crossing for three hours on non-summer weekdays. These queues would be longer than currently occur at the existing bridge and are considered unreasonable particularly in comparison to other corridor alternatives such as 6, 7 and 8. Corridor 5 contains substantial environmental resources including 14,900 acres of prime farmland, 6,200 acres of forested land, 15,200 acres of open water, and 1,500 acres of parks and wildlife refuges. Corridor 5 could potentially cause major indirect effects on the Eastern Shore resulting from increased demand for urban development. Corridor 5 creates a direct new connection from the Baltimore area employment center to Kent County, and exposes large areas of undeveloped farmland to substantial new pressure for development. **Corridor 5 would not meet the Bay Crossing Study Purpose and Need.**

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
9	Eliminate (Phase 2)	Corridor 9 would provide some traffic benefit on summer weekends, but weekday non-summer traffic would increase compared to existing conditions on the Bay Bridge. Weekday non-summer crossings at the existing bridge would increase by 8,300 vpd over existing conditions. Summer weekend crossings would be reduced by 300 vpd. Because it improves summer weekend ADT below existing conditions, Corridor 9 meets the need for adequate capacity. Corridor 9 would result in a queue of four miles or greater at the existing crossing for one hour per day during summer weekends, and a queue length of one mile or greater at the existing crossing for six hours on non-summer weekdays. These queues would be much longer than currently occur at the existing bridge and are considered unreasonable particularly in comparison to other corridor alternatives such as 6, 7 and 8. Corridor 9 would also be expected to have LOS E or LOS F conditions for five hours on non-summer weekdays (with three hours in the eastbound direction and two hours in the westbound direction) and 18 hours on summer weekends (with 10 hours in the eastbound direction and eight hours in the westbound direction). This would be a greater number of hours than at the existing bridge today on non-summer weekdays, and a slightly lower number of hours at the existing bridge on summer weekends. This improvement of LOS, combined with the increase in hours with LOS E or F on non-summer weekdays, is considered unreasonable particularly in comparison with other corridor alternatives such as 6, 7 and 8. Overall, Corridor 9 does not sufficiently meet the need for dependable and reliable travel times. Corridor 9 would require an estimated additional travel time of 40 minutes for vehicles diverted from the existing bridge, resulting in a total travel time of 76 minutes. Because this would more than double the existing travel time of 36 minutes, Corridor 9 would not sufficiently meet the need for flexibility to support maintenance and incident management at the existing bridge. Corridor 9 contains substantial environmental resources, including 8,600 acres of natural oyster bars and 11,100 acres of Chesapeake Bay Critical Areas. **Corridor 9 would not meet the Bay Crossing Study Purpose and Need.**

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
10	Eliminate (Phase 1)	Corridor 10 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 10,000 vpd and summer weekend crossings would increase by 2,700 vpd over existing conditions. Corridor 10 contains substantial environmental resources including a large area of open water within the corridor (23,400 acres), due to relatively long crossings required. Corridor 10 also includes 7,600 acres of residential land use and 9,600 acres of natural oyster bars. **Corridor 10 would not meet the Bay Crossing Study Purpose and Need.**
11	Eliminate (Phase 1)	Corridor 11 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at existing bridge would increase by 11,900 vpd and summer weekend crossings would increase 6,700 vpd over existing conditions. Corridor 11 contains substantial environmental resources, including 5,100 acres of residential land use, 1,400 acres of SAV, and 4,000 acres of wetlands. **Corridor 11 would not meet the Bay Crossing Study Purpose and Need.**
12	Eliminate (Phase 1)	Corridor 12 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and therefore does not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 12,900 vpd and summer weekend crossings would increase by 8,600 vpd over existing conditions. Corridor 12 contains substantial environmental resources, including 2,500 acres of parks and wildlife refuges, 6,200 acres of wetlands, 18,100 acres of prime farmland, 8,000 acres of Chesapeake Bay Critical Areas, and 12,200 acres of Sensitive Species Project Review Areas (SSPRAs). **Corridor 12 would not meet the Bay Crossing Study Purpose and Need.**

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
13	Eliminate (Phase 1)	Corridor 13 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 14,100 vpd and summer weekend crossings would increase by 10,400 vpd over existing conditions. Corridor 13 contains substantial environmental resources, including 5,000 acres of parks and wildlife refuges, 7,800 acres of wetlands, 16,600 acres of forested land, 19,200 acres of prime farmland, 13,200 acres of Chesapeake Bay Critical Areas, and 22,800 acres of SSPRAs. Corridor 13 passes through Blackwater National Wildlife Refuge, with no apparent opportunity for avoidance of the resource and resulting in major practical challenges. **Corridor 13 would not meet the Bay Crossing Study Purpose and Need.**
14	Eliminate (Phase 1)	Corridor 14 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 15,200 vpd and summer weekend crossings would increase by 14,400 vpd over existing conditions. Corridor 14 would attract low volumes from the existing bridge, resulting in minimal improvement over the No-Build condition. Corridor 14 requires the longest Chesapeake Bay crossing (17.1 miles) of all the corridor alternatives. Corridor 14 contains substantial environmental resources, including 5,600 acres of parks and wildlife refuges, 28,700 acres of open water, 1,200 acres of SAV, 4,300 acres of natural oyster bars, 4,500 acres of wetlands, 8,700 acres of Chesapeake Bay Critical Areas, and 8,600 acres of SSPRAs. **Corridor 14 would not meet the Bay Crossing Study Purpose and Need.**

3.4 CORRIDOR ALTERNATIVES RETAINED FOR ANALYSIS (CARA)

The results of the alternative screening presented a clear pattern among the corridor alternatives and resulted in the identification of four Corridor Alternatives Retained for Analysis (CARA), including the No-Build. The results show Corridors 6, 7, and 8 have a greater ability to meet the Purpose and Need than all the other corridor alternatives. The No-Build Alternative will be retained throughout the NEPA process to serve as a baseline of comparison. These CARA were then further analyzed and evaluated to identify a single MDTA-RPCA, which is discussed in detail, below in **Chapter 5**.

Public input collected at the Fall 2019 Open Houses reinforced the emphasis on reducing congestion as a key factor in identifying the CARA. Members of the public identified “reducing congestion” most often as

a priority for identifying corridors to carry forward. Corridors 6, 7 and 8 achieve the goal of reducing congestion better than all other corridors. For more detailed information on the public involvement activities and comments received from the public, see **Chapter 6.**

Corridor Alternatives 6, 7 and 8 are the only corridors to sufficiently meet all elements of the Purpose and Need including adequate capacity, dependable and reliable travel times, and provide flexibility to support maintenance and incident management at the existing bridge.

While Corridors 6, 7, and 8 are all recommended to be carried forward for further evaluation, the screening results show that Corridor 7 has advantages over Corridors 6 and 8. The advantages of Corridor 7 include better congestion relief at the existing Bay Bridge, more effective reduction of duration of unacceptable LOS, more effective backup reduction at the Bay Bridge, the best diversion route, and better compatibility with existing land-use patterns likely resulting in fewer indirect effects.

Corridor Alternatives 6, 7, and 8 were recommended to be carried forward as the CARA as described in **Table 3-10** and shown on **Figure 3-3**.

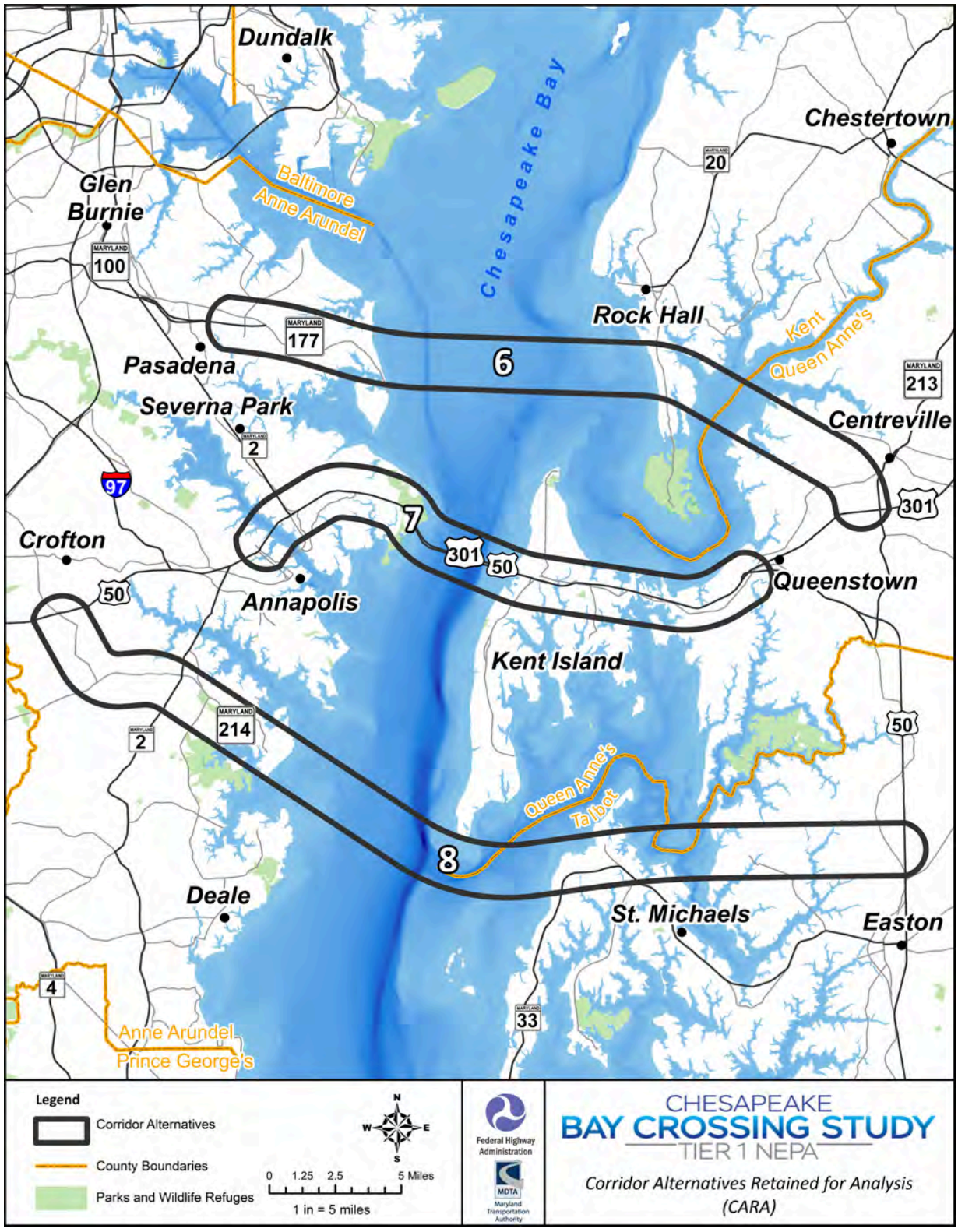
Table 3-10: Corridor Alternatives Retained for Analysis

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
No-Build	**Retain**	The No-Build Alternative will not relieve traffic congestion and improve travel times on the existing Bay Bridge and will not impact environmental resources. The No-Build Alternative will be retained throughout the NEPA process to serve as a baseline of comparison. The No-Build Alternative includes existing TSM/TDM measures such as contraflow lanes on the existing bridge, as well as any planned and funded TSM/TDM measures such as automated contraflow lanes.
6	**Retain**	Corridor 6 would provide traffic benefit on summer weekends, but weekday non-summer traffic would increase compared to existing conditions on the Bay Bridge. Summer weekend crossings would be reduced by 7,400 vpd over existing conditions. Weekday non-summer crossings at the existing bridge would increase by 1,000 vpd. Because it improves summer weekend ADT below existing conditions, Corridor 6 meets the need for adequate capacity. Corridor 6 would not result in greater queue lengths/durations at the existing crossing than currently exists on summer weekends although it would result in a longer queue for one hour on non-summer weekdays. Corridor 6 would result in LOS E or LOS F conditions at the existing bridge for four hours on non-summer weekdays (with three hours in the eastbound direction and one hour in the westbound direction) and 14 hours on summer weekends (with nine hours in the eastbound direction and five hours in the westbound direction). This would be a greater total number of hours than at the existing bridge today on non-summer weekdays, but a lower number of hours than at the existing bridge today

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
		on summer weekends. Corridor 6 would therefore meet the need for dependable and reliable travel times. It is estimated that Corridor 6 would require only 26 minutes of additional travel time for vehicles diverted from the existing bridge. Thus, Corridor 6 meets the need for flexibility to support maintenance and incident management at the existing bridge. Corridor 6 contains substantial environmental resources, including 18,000 acres of open water, 5,400 acres of natural oyster bars, and 900 acres of parks and wildlife refuges. Corridor 6 would have indirect effects, but likely less induced growth compared to Corridors 3, 4, and 5. **Corridor 6 meets the Bay Crossing Study Purpose and Need.**
7	**Retain**	Corridor 7 would meet the need of providing adequate capacity; providing benefit for both non-summer weekdays and summer weekends. Corridor 7 would result in an estimated reduction of 23,700 vpd on non-summer weekdays on the Bay Bridge compared to existing conditions, and a reduction of 38,900 vpd on summer weekends on the Bay Bridge compared to existing conditions. Corridor 7 would not result in greater queue lengths/durations than existing conditions at the existing crossing on summer weekends or on non-summer weekdays. In addition, there would be no hours of LOS E or F operation at the existing bridge on summer weekends or non-summer weekdays. Corridor 7 would therefore meet the need for dependable and reliable travel times. Additionally, it is estimated that Corridor 7 would meet the need for flexibility to support maintenance and incident management at the existing bridge, requiring no additional travel time to divert vehicles from the existing crossing to the new crossing. Among all corridors, Corridor 7 has the lowest total area (28,000 acres), and the lowest area of forested land (4,500 acres). It also compares favorably to other corridors in other categories including prime farmland (5,600 acres), area of open water (9,600 acres), wetlands (1,500 acres), and length of streams (30 miles). Corridor 7 would result in adding new capacity to the existing transportation network in relative proximity to the Bay Bridge, which would be more compatible with existing land use patterns and plans. Corridor 7 would have indirect effects, but likely less induced growth compared to Corridors 3, 4 or 5. **Corridor 7 meets the Bay Crossing Study Purpose and Need.**

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
8	**Retain**	Corridor 8 would meet the need of providing adequate capacity; providing traffic benefit on both non-summer weekday and summer weekends. Weekday non-summer crossings at the existing bridge would be reduced by 500 vpd, and summer weekend crossings would be reduced by 14,300 vpd over existing conditions. Corridor 8 would not result in greater queue lengths/durations than existing conditions at the existing crossing on summer weekends although it would result in a longer queue for one hour on non-summer weekdays. Corridor 8 would be expected to have LOS E or LOS F conditions at the existing bridge for four hours on non-summer weekdays (with three hours in the eastbound direction and one hour in the westbound direction) and 10 hours on summer weekends (with eight hours in the eastbound direction and two hours in the westbound direction). This would be a greater number of hours than at the existing bridge today on both non-summer weekdays, and a lower number of hours at the existing bridge on summer weekends. Overall, Corridor 8 would meet the need for dependable and reliable travel times. Additionally, it is estimated that Corridor 8 would require 26 minutes of additional travel time for vehicles diverted from the existing bridge. Thus, Corridor 8 meets the need of providing flexibility to support maintenance and incident management at the existing bridge. Corridor 8 contains substantial environmental resources, including 20,400 acres of open water, 6,500 acres of natural oyster bars, and 8,600 acres of forested land. Corridor 8 would have indirect effects, but likely less induced growth compared to Corridors 3, 4, or 5. **Corridor 8 meets the Bay Crossing Study Purpose and Need.**

Figure 3-3: Corridor Alternatives Retained for Analysis (CARA)



3.5 PRELIMINARY COST ESTIMATES

Conceptual project cost estimates were developed for Corridors 6, 7, and 8. The cost estimates included construction, preliminary engineering, and right-of-way for a project that would extend for the entire length of each corridor, including the Western Shore and Eastern Shore approach roadways. Since detailed alignments have not yet been developed, the cost estimates are high-level in nature and account for a range of possibilities. The major structure costs were calculated separately from the approach roadways to account for the uniquely large and complex crossings that would exist within each corridor.

A cost estimate range was developed for each corridor to account for several factors that are unknown at this time, including the number of new lanes and whether the new lanes would be along a new alignment or along an existing roadway. Cost estimates were developed for each combination of factors to determine the ranges. In addition, a low and high cost per mile unit price was used for each estimate to account for unknown design considerations that could affect the project costs.

The traffic modeling results were used to estimate a range in the number of new lanes that would be needed within each corridor to reach a certain level of transportation performance. The lower limit of the range was the number of new lanes that would meet Level of Service (LOS) D, and the upper limit of the range was the number of lanes that would meet LOS C on a new crossing. For Corridor 6, it was assumed that four new lanes would be needed. For Corridor 7, it was assumed that as few as four and as many as seven lanes would be needed, depending on if the new lanes are along a new alignment or if the existing US 50/301 alignment is widened. For Corridor 8, it was assumed that four or six new lanes would be needed. No reversible lanes were assumed.

For each corridor, two cost estimates were developed and incorporated into the overall range. First, cost estimates were developed for each corridor that assumed the new lanes would be completely on new alignment. Additionally, cost estimates were developed for each corridor that assumed a portion of the new lanes would follow an existing roadway and widen the existing infrastructure where possible.

Independent cost estimates were developed for each major structure within each corridor. The major structures include the Chesapeake Bay in all three corridors and other large water crossings. The other large water crossings include the Chester River in Corridor 6, the Severn River and the Kent Narrows in Corridor 7, and two crossings of the Miles River in Corridor 8. The major structure estimates are based on a cost per square foot methodology instead of the cost per mile approach.

Since it has not been determined whether a new Chesapeake Bay crossing would be a bridge or a bridge-tunnel, cost estimates were developed for both structure types. A tunnel-only option was not considered due to the anticipated high cost relative to the other crossing types.

Tables 3-11 and **3-12** present the range of cost estimates developed for each corridor based on the factors described above. The costs in **Table 3-11** assume a bridge across the Chesapeake Bay and the costs in **Table 3-12** assume a bridge-tunnel across the Chesapeake Bay.

Table 3-11: Total Project Costs Assuming a Bridge across the Chesapeake Bay (2020 dollars)

CORRIDOR	LOW END OF RANGE - TOTAL COST IN BILLIONS	HIGH END OF RANGE (IN BILLIONS) – TOTAL COST IN BILLIONS	LOW END OF RANGE MAJOR STRUCTURES COST IN BILLIONS	HIGH END OF RANGE - MAJOR STRUCTURES COST IN BILLIONS	LOW END OF RANGE – ON LAND INFRASTRUCTURE COST IN BILLIONS	HIGH END OF RANGE – ON LAND INFRASTRUCTURE COST IN BILLIONS
6	$6.6	$7.2	$3.9	$3.8	$2.7	$3.4
7	$5.4	$8.9	$3.7	$4.6	$1.7	$4.3
8	$11.7	$15.7	$7.4	$9.6	$4.3	$6.1

Table 3-12: Total Project Costs Assuming a Bridge-Tunnel across the Chesapeake Bay (2020 dollars)

CORRIDOR	LOW END OF RANGE – TOTAL COST IN BILLIONS	HIGH END OF RANGE – TOTAL COST IN BILLIONS	LOW END OF RANGE MAJOR STRUCTURES COST IN BILLIONS	HIGH END OF RANGE - MAJOR STRUCTURES COST IN BILLIONS	LOW END OF RANGE – ON LAND INFRASTRUCTURE COST IN BILLIONS	HIGH END OF RANGE – ON LAND INFRASTRUCTURE COST IN BILLIONS
6	$12.7	$13.3	$9.5	$9.5	$3.2	$3.8
7	$8.0	$13.1	$6.1	$8.5	$1.9	$4.6
8	$13.2	$18.0	$8.8	$11.7	$4.4	$6.3

4 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter provides an overview of existing conditions and potential environmental effects for the three CARA (Corridor 6, Corridor 7, and Corridor 8) along with the No-Build Alternative. The CARA discussed in this DEIS are two-mile wide corridors crossing the Chesapeake Bay, including enough on-land area on each shore to connect to major roadway infrastructure as described in **Chapter 3**.

Specific roadway alignments were not identified in the Tier 1 phase of the study. The two-mile wide CARA are the primary focus of the environmental analysis in this chapter. Therefore, the evaluation of existing conditions and environmental effects relies primarily on an inventory of environmental resources within the three CARA and a qualitative discussion of the potential for impacts from a new crossing in each. Potential for impacts or avoidance are discussed based on the presence and distribution of environmental resources throughout the corridors. The evaluation of resources primarily relied upon desktop-level assessment of environmental resource data. The study has also considered county planning documents and other relevant land use and environmental studies pertaining to the study area. Field visits were used to collect information on some resources, but no detailed field assessment (such as wetland delineation) was conducted. This general methodology applied to all resource topics reported in this section.

It is important to note that the resource inventories presented here do not reflect the actual impacts of a new crossing. The resources quantified within the two-mile wide CARA are much more extensive than the area that would be impacted by any alternative alignments. The resource quantities are presented for comparative purposes, with the general assumption that corridors with more resources could result in greater impacts. However, this assumption must also be considered in light of the potential for avoidance of resources based on their distribution throughout the corridor. Furthermore, some resources may have a greater importance than others in terms of ecological function or other factors.

Avoidance and mitigation strategies are not considered in this broad level Tier 1 analysis, as specific impacts will not be known until a potential future Tier 2 study. If a corridor alternative is carried forward for further evaluation in Tier 2, multiple alignments would be considered within the corridor based on a variety of engineering, environmental and land use factors. Avoidance and mitigation strategies would be assessed based on the potential impacts identified in Tier 2.

4.1 SOCIOECONOMICS

This section provides an overview of relevant socioeconomic data, including population characteristics, communities and existing land uses, community facilities (such as park, schools, and emergency services), and economic characteristics (such as employment and household income) for the CARA. In addition, this section offers a qualitative summary of potential impacts to these socioeconomic resources, including consideration of minority and low-income populations pursuant to federal requirements.

4.1.1 Introduction and Methodology

The evaluation of socioeconomic resources within each CARA was primarily based on a desktop-level assessment of 2013-2017 American Community Survey (ACS) US Census data, Maryland iMap Geographic Information Systems (GIS) repository, and other available resources. The analysis focused on the presence and distribution of communities and resources throughout each corridor and the potential for transportation improvements to impact these resources.

For demographic analysis (**Sections 4.1.3** and **4.1.4**), a socioeconomic Study Area for the BCS has been developed based on 2010 US Census Tracts to include the contiguous area extending from the northernmost CARA to the southernmost, including any Census Tracts located between the CARA. (Thus, some of the Census Tracts within the Socioeconomic Study Area do not overlap any of the three CARA).

A more detailed discussion of socioeconomic resources, including a broader overview of the full Chesapeake Bay, is included in the ***BCS Socioeconomic Technical Report***.

4.1.2 Communities and Land Use

This section considers existing conditions within each of the CARA and a qualitative discussion of how local land uses and community facilities could be directly affected by a new Chesapeake Bay crossing. The assessment also considers the presence and distribution of designated Priority Funding Areas (PFAs) where growth and investment are prioritized. Factors that could inhibit community cohesion are identified and described.

The assessment used the Maryland iMap Statewide Land Use and Land Cover data from the Maryland Department of Planning (MDP). Discussion of zoning within the corridors is included in the ***BCS Socioeconomic Technical Report, Section 5.1.***

The No-Build Alternative for this study would require no impacts from construction of transportation improvements. The No-Build Alternative does include currently planned and programmed infrastructure projects as of Project Scoping in 2017 and would be updated during Tier 2 to reflect newly 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. This worsening congestion would have negative effects on communities, businesses, and community facilities. 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 could occur from worsening congestion.

4.1.2.1 Community Facilities

This assessment includes identification of the location and type of community facilities present within the CARA. The community facilities evaluated include: public parks and recreational facilities, schools, fire and rescue services, hospitals, police facilities, libraries, post offices, airports, ports, military facilities, and places of worship. Maps of community facilities identified within the CARA are included within **Appendix A**. Identification and evaluation of local community facilities would continue in Tier 2.

Public Parks and Recreational Facilities

Parks and recreational facilities have been identified within the CARA using Maryland iMap GIS data (Maryland iMap GIS Catalog) supplemented with internet searches, as shown in **Appendix A** and **Table 4-1**. Local, state, and national parks are considered. Wildlife refuges are also included as Section 4(f) protected resources (see **Section 4.3** for more information on Section 4(f) resources).

Each of the three corridors contain multiple parks and recreational facilities that could potentially be impacted by an alignment in the corridor. Corridor 6 has eight facilities, Corridor 7 has 14 facilities, and Corridor 8 has 10 facilities. While alignments could potentially be identified in each corridor to avoid some or all of these parks and recreational facilities, it is likely that one or more of the facilities in any of the CARA would be impacted given their prevalence and spatial distribution throughout the corridors. More information is included in the ***Socioeconomic Technical Report*, Section 5.1.1.1.**

Schools

Schools were identified within the CARA using Maryland iMap GIS data, which includes information on K-12 public schools. Each of the three corridors contain K-12 public schools that could potentially be impacted by an alignment in the corridor – Corridor 6 has five schools, Corridor 7 has nine schools, and Corridor 8 has seven schools. Although all of the schools are located adjacent to roadways that may be impacted, alternate alignments could potentially be developed to avoid impacts to the schools in each of the corridors. Specific schools in the CARA can be found in the ***Socioeconomic Technical Report*, Section 5.1.1.2.**

Fire and Rescue Services

Fire and rescue services were identified within the CARA using Maryland iMap GIS data. Corridor 6 contains two fire stations and Corridor 7 contains four fire stations that could potentially be impacted by an alignment in the corridor – there are none located in Corridor 8. Avoidance and mitigation strategies would be considered if potential impacts to one or more fire stations are identified in Tier 2. Specific fire and rescue services in the CARA can be found in the ***Socioeconomic Technical Report*, Section 5.1.1.3**.

Police

Police facilities were identified within the CARA using Maryland iMap GIS data. There are no police facilities located within Corridor 6 or Corridor 8. There are three police facilities located in Corridor 7 that could potentially be impacted by an alignment in the corridor. Avoidance and mitigation strategies would be considered if potential impacts to one or more police facilities are identified in Tier 2. Specific police facilities in the CARA can be found in the ***Socioeconomic Technical Report*, Section 5.1.1.4**.

Table 4-1: Parks and Recreational Facilities

CORRIDOR	PARKS AND RECREATIONAL FACILITIES	JURISDICTION
Corridor 6	Beachwood Park	Anne Arundel County
	Jacobsville Park	Anne Arundel County
	Lake Shore Athletic Complex and Recreation Area	Anne Arundel County
	Bodkin Park	Anne Arundel County
	Downs Memorial Park	Anne Arundel County
	Recovery Community Park	Queen Anne's County
	Route 18 Park	Queen Anne's County
	4-H Club Park	Queen Anne's County
Corridor 7	Broadneck Park	Anne Arundel County
	Cape St. Claire Park	Anne Arundel County
	Bay Head Park	Anne Arundel County
	Sandy Point State Park	MDNR
	Terrapin Nature Park	Queen Anne's County
	Old Love Point Park	Queen Anne's County
	Cross Island Trail	Queen Anne's County
	Mowbray Park	Queen Anne's County
	Ferry Point Park	Queen Anne's County
	Long Point Park	Queen Anne's County
	Grasonville Park	Queen Anne's County
	Ewing Pond Park	Queen Anne's County
	Kent Island Research Wildlife Management Area	MDNR
	Kent Narrows Landing	Queen Anne's County
Corridor 8	Kings Branch Park	Anne Arundel County
	Riva Area Park	Anne Arundel County
	Central Ave Park	Anne Arundel County
	Smithsonian Environmental Research Center	Smithsonian Institution
	Lock Haven Park	Anne Arundel County
	Mayo Beach Park	Anne Arundel County
	Beverly Triton Nature Park	Anne Arundel County
	Claiborne Landing	Talbot County
	Talbot County Community Sports Complex	Talbot County
	Hog Neck Golf Course	Talbot County

Libraries

Libraries were identified within the CARA using Maryland iMap GIS data. Each of the three corridors contain libraries that could potentially be impacted by an alignment in the corridor – Corridor 6 has one library, Corridor 7 has four libraries, and Corridor 8 has one library. Although the libraries are located adjacent to roadways that may be impacted, alternate alignments could potentially be developed to avoid impacts to the libraries in each of the corridors. Avoidance and mitigation strategies would be considered if potential impacts to one or more libraries are identified in Tier 2. Specific library facilities in the CARA can be found in the ***Socioeconomic Technical Report*, *Section 5.1.1.5***.

Places of Worship

Places of Worship were identified within the CARA using information from the United States Geological Survey's (USGS) Geographic Names Information System supplemented with internet searches (USGS, 2019). Each of the three corridors contains numerous places of worship that could potentially be impacted by an alignment in the corridor – Corridor 6 has nine, Corridor 7 has 29, and Corridor 8 has 15. The places of worship are scattered throughout the corridor and adjacent to existing roadways, so alignments developed in Tier 2 could have potential impacts to one or more, depending on the specific alignment. Specific places of worship in the CARA can be found in the ***Socioeconomic Technical Report*, *Section 5.1.1.6***.

Other Community Facilities

Other community facilities were identified within the CARA including post offices, airports, and community centers. Facilities were identified using Maryland iMap GIS data and web searches. No hospitals are located within any of the CARA. More information is included in the ***Socioeconomic Technical Report*, *Section 5.1.1.7.***

Each of the three corridors contains community facilities that could potentially be impacted by an alignment in the corridor. Potential alignments could impact the private airport or post office in Corridor 6, the post offices, airport, and/or community center in Corridor 7, and the post offices and/or community center in Corridor 8, depending on the specific alignment. During Tier 2, alternate alignments could potentially be developed to avoid impacts to the various other community facilities in each of the corridors.

4.1.2.2 Land Use

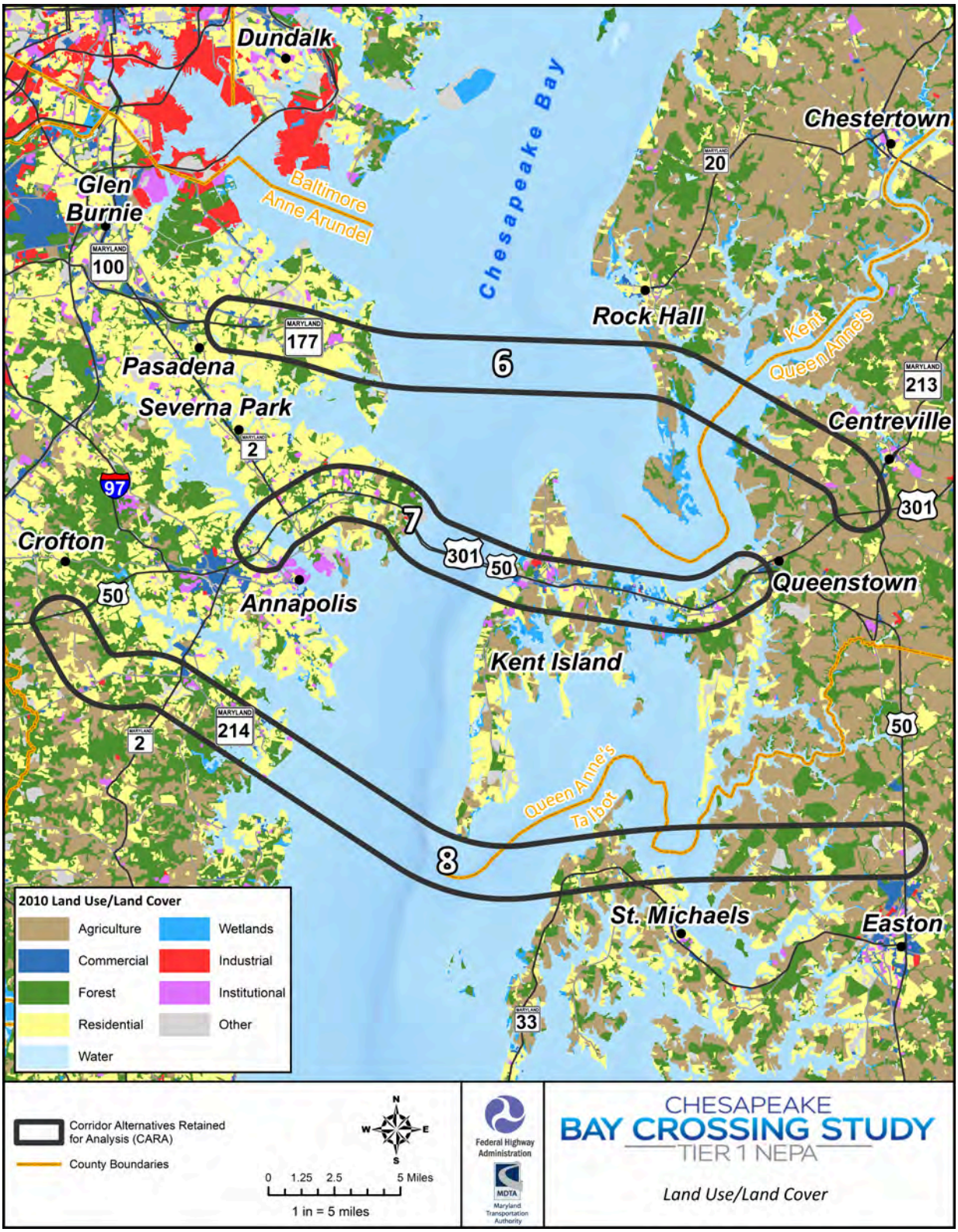
Existing land use within the corridors was identified based on MDP 2010 Land Use/Land Cover data, as shown in **Table 4-2** and **Figure 4-1**. The data was accessed via Maryland iMap (Maryland iMap GIS Catalog, 2018). Additional Land Use/Land Cover maps for the CARA are included within **Appendix A**.

Table 4-2: Land Use/Land Cover

LAND USE/ LAND COVER	CORRIDOR 6		CORRIDOR 7		CORRIDOR 8	
	ACRES	PERCENT	ACRES	PERCENT	ACRES	PERCENT
Agriculture	5,620	16%	3,260	12%	9,250	20%
Commercial	270	1%	930	3%	320	1%
Forest	4,500	13%	4,500	16%	8,520	18%
Residential	5,660	16%	6,560	23%	6,830	15%
Water	18,140	52%	9,660	35%	20,590	44%
Wetlands	280	1%	820	3%	350	1%
Industrial	0	0%	90	<1%	40	<1%
Institutional	280	1%	890	3%	200	<1%
Other	270	1%	1,270	5%	720	2%
Total Area	35,010	100%	27,990	100%	46,810	100%

Note: All values rounded to closest 10 acres or 1%

Figure 4-1: Land Use/Land Cover



Examination of **Table 4-2** generally shows similar percentages of land use/land cover present across all corridors. By percentage, Corridor 6 contains more water than the others, Corridor 7 contains more residential property than the other two, and Corridor 8 contains the most agricultural land.

For each of the three corridors, any Tier 2 alignment would likely impact residential land uses on the Western Shore, which extend through the entire width of the corridors. In Corridor 6, parks and other forested lands that are scattered throughout the corridor would likely be impacted. In Corridor 7, commercial impacts are likely if an alignment is considered along US 50/301. In Corridor 8, impacts would potentially also include farmland and forested areas – additionally, the entirety of the shoreline is occupied by park and residential uses.

On the Eastern Shore, impacts to agricultural land would be prevalent in both Corridor 6 and Corridor 8 for any Tier 2 alignment. In Corridor 7, potential impacts are most likely to commercial, residential, and institutional land uses, as well as some farmland.

4.1.2.3 Priority Funding Areas

PFAs are existing communities and places designated by local governments where investment is intended to support future growth (MDP, 2019). The presence of PFAs within a corridor indicates that new transportation infrastructure may be more compatible with planned land uses. Because PFAs also encompass areas with existing development, the presence of PFAs may also correlate with a greater likelihood of direct impacts to already developed areas. PFAs are shown in **Figure 4-2** and quantified in **Table 4-3.** PFAs are identified based on data from Maryland iMap (Maryland iMap GIS Catalog, 2018).

Table 4-3: Priority Funding Areas (PFAs)

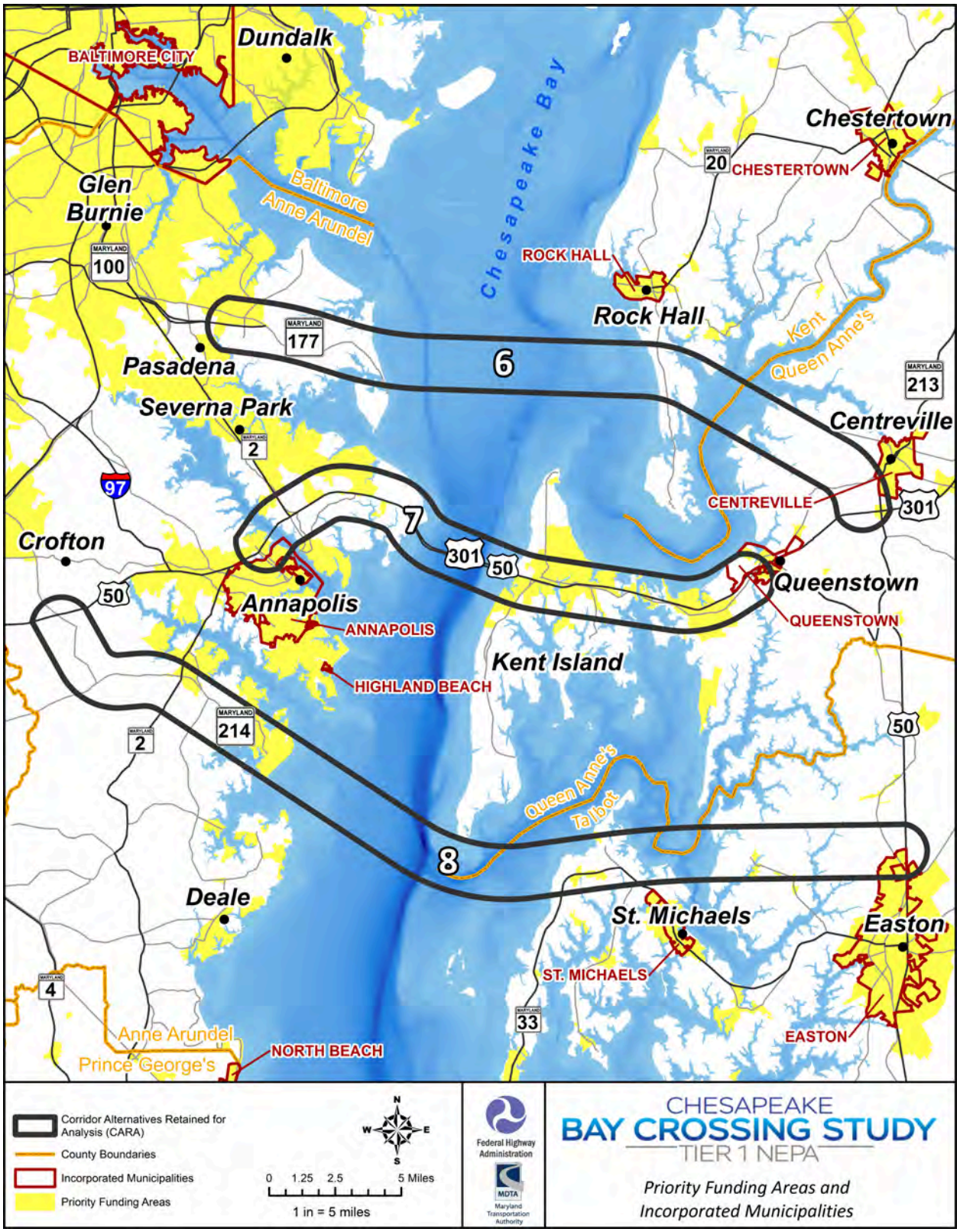
CORRIDOR	ACRES OF PFAS	PFAS PERCENTAGE OF TOTAL AREA
Corridor 6	1,600	5%
Corridor 7	7,900	28%
Corridor 8	3,500	7%

Corridor 7 contains the highest percentage of PFAs by acreage (28 percent), which also correlates with a greater likelihood of direct impacts to developed areas. Corridor 6 (five percent) and Corridor 8 (seven percent) both have a much lower percentage of PFAs by acreage and the majority of these PFAs are located on the Western Shore. Coordination with MDP would continue in a future Tier 2 study.

4.1.2.4 Community Cohesion

This section describes potential impacts to community cohesion that could result from a new crossing within each CARA. Community cohesion was evaluated based on data such as community facilities identified in **Section 4.1.2.1**, MDP 2010 Land Use/Land Cover presented in **Section 4.1.2.2**, and review of aerial imagery (Maryland iMap GIS Catalog, 2018).

Figure 4-2: Priority Funding Areas and Incorporated Municipalities



Potential impacts to community cohesion that could result from a new crossing within each CARA were evaluated as part of this Tier 1 Study, such as a roadway alignment crossing through existing communities, barriers to accessing community facilities, and barriers resulting from limited access roadways. In general, impacts to community cohesion are possible for all three of the CARA, but could potentially be minimized by avoiding, to the extent possible, bisecting residential neighborhoods and locating Tier 2 alignments near the periphery of residential areas where impacts are unavoidable. For all three CARA, it is possible that impacts to community cohesion would result from a new crossing, even with avoidance and minimization measures. Public involvement activities associated with a future Tier 2 Study would further engage project stakeholders, business owners, study area residents and members of potentially impacted communities to provide further input into the presence of and potential impacts on community cohesion.

For both Corridors 6 or 8, the distribution of residential land and the density of residential subdivisions encompassing the full width of the corridor on the Western Shore would make avoidance of residential communities unlikely. A potential Tier 2 alternative within Corridor 6 would cause community impacts on the Western Shore for residential areas located near MD 177. Corridor 8 includes the greatest acreage of residential land. Communities and residential neighborhoods in Corridor 8, particularly in the vicinity of Mayo, Beverly Beach, and St. Michaels, would likely be impacted. A new crossing in Corridors 6 or 8 would thus be more likely to cause substantial community impacts by bisecting residential areas, disrupting local mobility, and causing other potential impacts to community cohesions compared to Corridor 7.

For Corridor 7, impacts to community cohesion could potentially be limited by adding new capacity along the existing US 50/301 roadway. A future Tier 2 alternative that expands capacity along existing roadways in Corridor 7 could also minimize impacts to community cohesion and disruption to residential neighborhoods. Neighborhoods in the vicinity of US 50/301 have generally been developed to the north or south of the highway, often separated by commercial areas or wooded buffers. Thus, new capacity in Corridor 7 could likely avoid bisecting existing residential neighborhoods; impacts would likely be primarily along the periphery of residential areas. Such an alignment would, however, have greater impacts on commercial land uses and community facilities that are more prevalent alongside US 50/301. Access roads to adjacent land uses could also be impacted.

New capacity in any of the corridors could provide greater access for Eastern Shore residents to facilities such as hospitals that are more prevalent on the Western Shore.

4.1.3 Population and Housing

Demographic data on population and housing are identified within each CARA as well as the Socioeconomic Study Area (**Figure 4-3**) and the State of Maryland for comparison. **Table 4-4** presents the US Census Bureau American Community Survey (ACS) 5-Year total population estimates from 2017 (US Census Bureau, 2018). Census Tracts within the Socioeconomic Study Area are shown in **Figure 4-3**. More information on the data sources and methodology used are included in the ***BCS Socioeconomic Technical Report, Section 3.2***.

Under the No-Build Alternative, anticipated increases in travel times and delays related to growing traffic congestion may lead to future negative effects for population and housing. The study area could potentially become less desirable for residents and businesses due to the effects of growing traffic congestion.

Table 4-4: Total Population

AREA	STATE OF MARYLAND	SOCIOECONOMIC STUDY AREA TRACTS	CORRIDOR 6 TRACTS	CORRIDOR 7 TRACTS	CORRIDOR 8 TRACTS
Total Population	5,996,079	286,739	76,360	78,181	59,266

Source: US Census Bureau ACS 2013-2017

The Socioeconomic Study Area includes 56 Census Tracts that are located within the CARA and the contiguous area between the CARA. The Socioeconomic Study Area tracts have an estimated total population of 286,739.

Table 4-5 presents housing data for the State of Maryland, Socioeconomic Study Area, and the tracts within each CARA. The Socioeconomic Study Area contains an estimated 119,469 housing units, which are 89.9 percent occupied.

Table 4-5: Housing Units and Occupancy

AREA	STATE OF MARYLAND	SOCIOECONOMIC STUDY AREA TRACTS	CORRIDOR 6 TRACTS	CORRIDOR 7 TRACTS	CORRIDOR 8 TRACTS
Total Housing Units	2,427,014	119,469	30,719	30,492	25,723
Occupied	2,181,093	106,994	27,196	27,359	22,680
Vacant	245,921	12,475	3,523	3,133	3,043
Occupancy Rate	89.9%	89.6%	88.5%	89.7%	88.2%

Source: US Census Bureau ACS 2013-2017

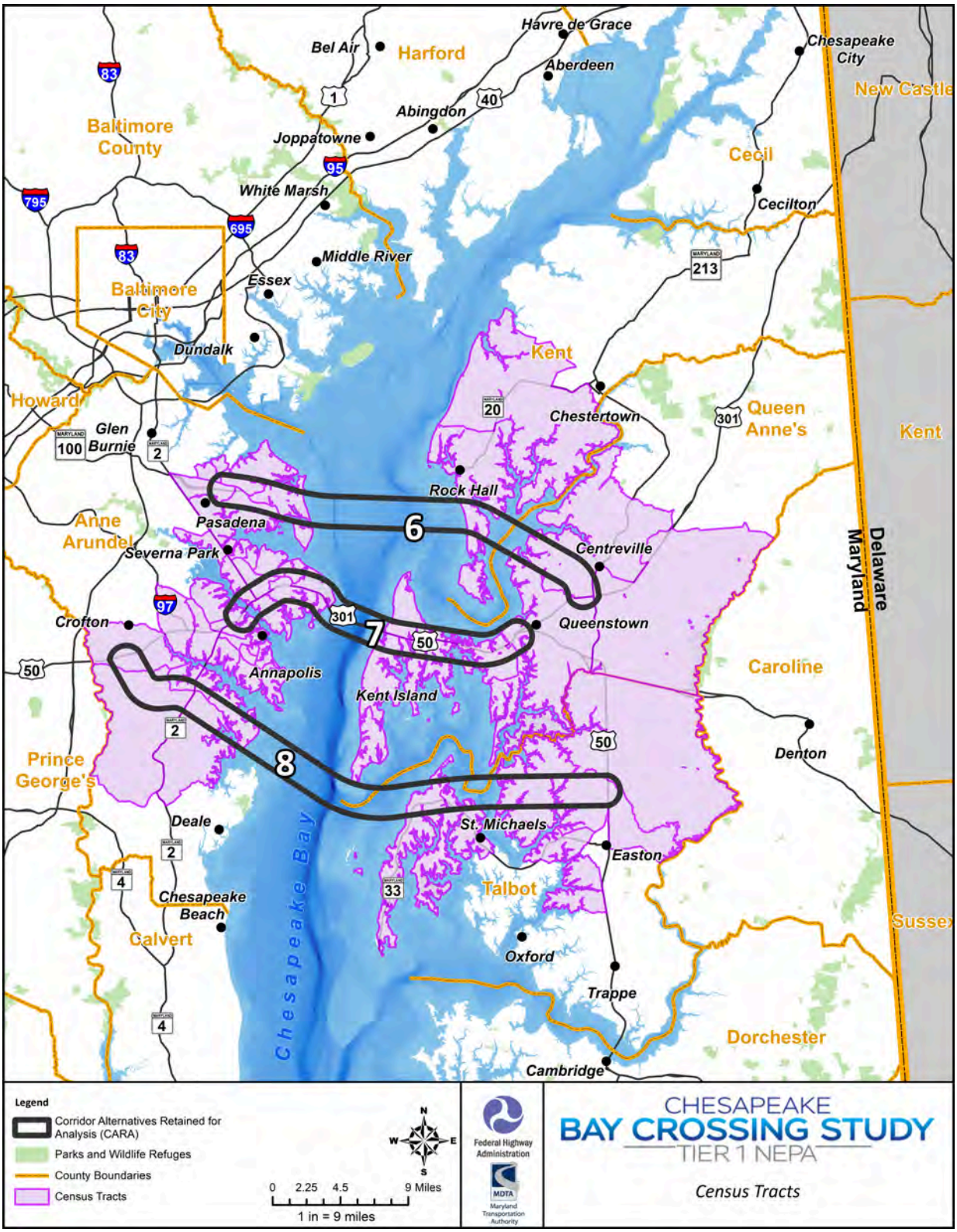
Within the CARA, Corridor 6 and Corridor 7 contain approximately similar estimated total populations (76,360 and 78,181, respectively), while Corridor 8 has a lower population (59,266). In line with the population data, Corridor 6 and Corridor 7 have a comparable number of total housing units (30,719 and 30,492, respectively), while Corridor 8 has fewer (25,723). All three of the CARA have a similar occupancy rate. Residential displacements could potentially be required for Tier 2 alignments in any of the three corridors, especially on the Western Shore. Corridors with greater population could potentially require greater impacts to population and housing; however, future Tier 2 alternatives could be developed to avoid and minimize impacts to populated areas where possible.

4.1.4 Environmental Justice in Minority and Low-Income Populations

The FHWA Title VI Program requires consideration of Executive Order (EO) 12898 – Federal Actions to Address Environmental Justice (EJ) in Minority and Low-Income Populations (1994) to ensure federal programs do not result in disproportionately high and adverse environmental or health impacts to these populations by requiring federal agencies to:

> *"…promote nondiscrimination in federal programs substantially affecting human health and the environment and provide minority and low-income communities' access to public information on, and an opportunity for public participation in, matters relating to human health or the environment."*

Figure 4-3: Socioeconomic Study Area Census Tracts



The strategies developed under EO 12898 and the FHWA policies on EJ take the appropriate steps to identify and address disproportionately high and adverse effects of federal transportation projects on the health or environment of minority and/or low-income populations to the greatest extent practicable and permitted by law, while ensuring EJ communities are provided meaningful opportunities for public participation in project development and decision-making.

According to the United States Office of Management and Budget (OMB) Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity (1997), for the purposes of EO 12898, a population is identified as minority in an area affected by the policy action if "either (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis" (OMB, 1997).

The FHWA and USDOT EJ Orders define a "minority population" as "any 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 will be similarly affected by a proposed FHWA program, policy, or activity (FHWA 2012)." The Tier 1 analysis includes qualitative assessments, consistent with FHWA's *Guidance on Environmental Justice and NEPA* (FHWA 2011), of potential effects to EJ populations such as from potential changes to community cohesion, community facilities, socioeconomics, altered travel patterns and parking, access, visual quality, and noise. Land area (in acres) of EJ Census Tracts falling within each corridor alternative was identified and maps were developed to depict the location of EJ Census Tracts in relation to the corridor alternatives. This information is presented in the following sections.

When potential impacts to EJ populations are identified, the impacts are compared to those experienced in non-EJ population areas within each corridor in the CARA. A disproportionately high and adverse effect on minority and low-income populations is defined by the FHWA EJ Order as an impact that:

- Would be predominately borne by a minority and/or low-income population, or
- Will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population.

4.1.4.1 Low-Income Populations

The FHWA and USDOT EJ Orders define a "low-income" individual as a person whose median household income is at or below the Department of Health and Human Services poverty guidelines (FHWA, 2011). The 2017 HHS poverty guidelines identify the poverty level at $12,060 annual income for a single-person household and $16,240 for a two-person household. The rate increases by $4,180 for each additional person in a household beyond two (HHS, 2017). US Census ACS 5-year data on incomes below poverty level and median household income was collected for each Census Tract within the Socioeconomic Study Area. The percentage of the population below the poverty level will be calculated for the study area as a whole, as well as for the State of Maryland.

For this study, Census Tracts are considered potential locations of low-income populations if the population below the poverty level:

1. Is greater than 50 percent; or,
2. Is 10 percentage points or more over the average percentage of the overall Socioeconomic Study Area (all Census tracts that comprise the study area).

All census tracts meeting one or both of the criteria above were identified as potential low-income EJ population areas.

As shown in **Table 4-6**, Maryland has an estimated 9.7 percent of the population below the poverty level, or 566,966 total. The Socioeconomic Study Area includes an estimated population of 15,077 below the poverty level, or 5.4 percent of the total population within the Study Area for whom the poverty status is determined.

Census Tracts that exceed the Socioeconomic Study Area percentage below the poverty level by 10 percentage points or more, or 15.4 percent, are identified as potential low-income EJ Census Tracts. Three such Census Tracts meet this criterion (Census Tract 9505, Tract 8107, and Tract 7064.02). Census Tract 9505 is located within Corridor 6 and Census Tract 8107 is located within Corridor 7. Census Tract 7064.01 is located within the Socioeconomic Study Area but does not fall within any of the three corridors. Corridor 8 does not contain any potential low-income EJ Census Tracts. Complete census tract data and analysis is found in the ***BCS Socioeconomic Technical Report*, *Section 5.3.1***.

Table 4-6: Poverty Status

GEOGRAPHY	TOTAL POPULATION FOR WHOM POVERTY STATUS IS DETERMINED	POPULATION BELOW POVERTY LEVEL	PERCENT POPULATION BELOW POVERTY LEVEL	NUMBER OF LOW-INCOME TRACTS
State of Maryland	5,856,088	566,966	9.7%	N/A
Socioeconomic Study Area	279,059	15,077	5.4%	3
Corridor 6	75,820	3,479	4.6%	1
Corridor 7	72,248	3,787	5.2%	1
Corridor 8	59,046	3,212	5.4%	0

Source: US Census Bureau ACS 2013-2017

Census Tract 9505 is located within Corridor 6 and impacts to the area within the Census Tract could not be avoided as it extends throughout the full width of the corridor. The specific location of low-income residents is not known at this level of detail, but the overall population in this Census Tract is primarily concentrated north of Corridor 6 in the vicinity of Rock Hall. The portion of the Census Tract within Corridor 6 is primarily agricultural and likely sparsely populated. This would minimize the overall impact to all populations, including low-income populations. Further evaluation during Tier 2 would be required to determine whether disproportionately high and adverse impacts could occur from a new crossing in Corridor 6. However, based on the available data, potential impacts to low-income population would not be expected to be disproportionately high and adverse. Avoidance and minimization would be considered in Tier 2 for any potential impacts to low-income populations.

Census Tract 8107 is located within Corridor 7 and impacts to some portion of the land area within this Census Tract could not be avoided because it encompasses the full width of the corridor. Specific Tier 2 alignments could potentially avoid or minimize impacts to populated areas. Tract 8107 encompasses Grasonville and the surrounding area. The existing US 50/301 corridor bisects the tract currently.

Commercial land uses are generally most prevalent directly adjacent to US 50/301 in the vicinity of Grasonville. Residential areas are primarily located along MD 18 (south of US 50/301) and in several subdivisions to the north of US 50/301. Other portions of the Tract include farmland and forested areas. A Tier 2 alternative could help minimize the potential for disproportionately high and adverse effects to low-income population in Tract 8107 by adding new capacity along US 50/301, which would likely impact primarily commercial businesses and would have lesser impacts to community cohesion compared to a roadway along new alignment. A Tier 2 alternative with new alignment to the north or south of US 50/301 could have greater residential and community cohesion impacts. Further evaluation in Tier 2 would be required to determine whether disproportionately high and adverse impacts could result from potential improvements in Corridor 7.

Minority and low-income census tracts within the CARA are shown on **Figure 4-4**.

4.1.4.2 Minority Populations

The USDOT and FHWA EJ Orders define a minority individual as one 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 were identified at the Census Tract level for the Tier 1 assessment. Minority Race is evaluated separately from Hispanic and Latino ethnicity, because they are considered separately in the US Census.

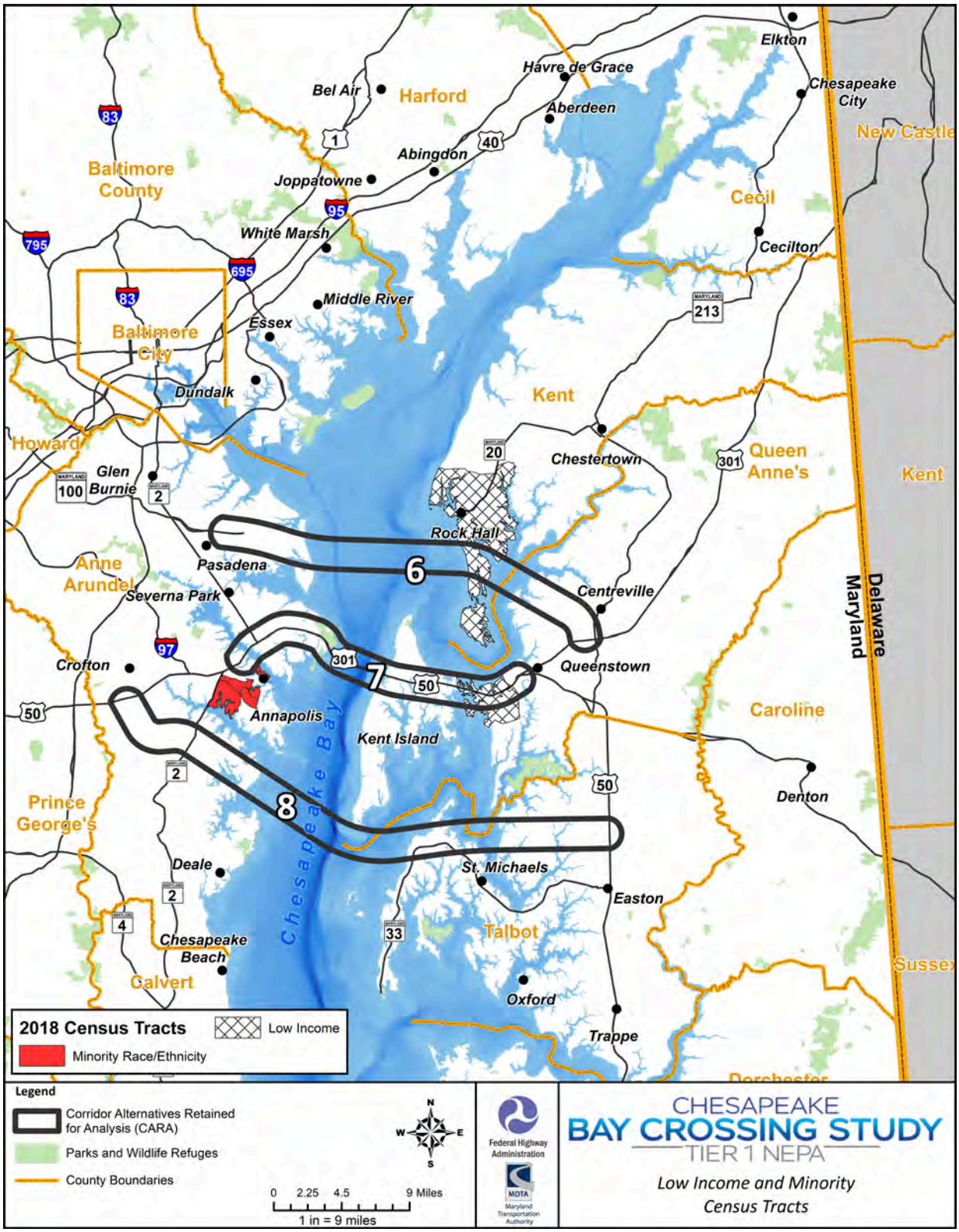
The population of the full Socioeconomic Study Area is approximately 14.5 percent minority race, which is notably lower than the State of Maryland at 43.4 percent. The Socioeconomic Study Area has approximately 6.2 percent population identifying as Hispanic or Latino, which is lower than the State of Maryland at 9.6 percent. **Table 4-7** summarizes the demographic data by corridor alternative.

Table 4-7: Minority Race and Ethnicity

GEOGRAPHY	TOTAL POPULATION	MINORITY RACE POPULATION	MINORITY RACE %	NUMBER OF MINORITY RACE TRACTS	HISPANIC OR LATINO POPULATION	HISPANIC OR LATINO %	NUMBER OF HISPANIC/ LATINO TRACTS
State of Maryland	5,996,079	2,600,867	43.4%	N/A	573,303	9.6%	N/A
Socioeconomic Study Area	286,739	41,549	14.5%	5	17,864	6.2%	3
Corridor 6	76,360	7,952	10.4%	0	3,022	4.0%	0
Corridor 7	78,181	10,321	13.2%	1	4,164	5.3%	0
Corridor 8	59,266	6,352	10.7%	0	2,188	3.7%	0

Source: US Census Bureau ACS 2013-2017

Figure 4-4: Minority and Low-Income Census Tracts



Potential minority race and ethnicity populations were identified in this analysis as any Census Tract with a proportion of minority race or ethnicity population 10 percentage points higher than the full Socioeconomic Study Area. Thus, Census Tracts with a minority race population of 24.5 percent or greater and Census Tracts with Hispanic and Latino population greater than 16.2 percent were identified.

The Socioeconomic Study Area contains five Census Tracts identified as potential minority EJ populations, with minority race population greater than 24.5 percent (Census Tracts 7025, 7064.01, 7064.02, 7065, and 7067). Census Tract 7067, which contains African-American, Asian and other minority populations, is located within Corridor 7 – the other tracts are located in the contiguous areas between the CARA and not within the actual corridors. Complete census tract data and analysis is found in the ***BCS Socioeconomic Technical Report*, *Section 5.3.2***.

Census Tract 7067 is relatively densely developed and accounts for a very small portion of the width of the corridor, as shown in **Figure 4-4** above, leaving space for future Tier 2 alignments that could avoid the Tract. It is expected that a reasonable alignment would avoid impacts to population within the Tract, because other less impactful Tier 2 alignments could likely be developed.

The Socioeconomic Study Area contains three Census Tracts identified as potential minority Hispanic and Latino EJ areas, with a Hispanic and Latino population greater than 16.2 percent (Census Tracts 7064.01, 7064.02, and 7065) – these tracts are located in the contiguous areas between the CARA and not within the actual corridors. No disproportionately high and adverse impacts to potential EJ minority race or Hispanic and Latino populations are expected to occur in Corridors 6, 7, or 8 based on the Census Tract level evaluation. Complete census tract data and analysis is found in the ***BCS Socioeconomic Technical Report*, *Section 5.3.2***. Further evaluation of potential impacts to Hispanic and Latino populations would be conducted in Tier 2.

4.1.5 Limited English Proficiency

The assessment of EJ populations also includes limited English proficiency (LEP) populations. EO 13166 challenges federal agencies to "implement a system by which [limited English-proficient or "LEP"] persons can meaningfully access… services consistent with, and without unduly burdening, the fundamental mission of the agency." LEP is defined as individuals who do not speak English as their primary language and who have a limited ability to read, speak, write, or understand English (US Department of Justice, 2000). LEP populations are evaluated with consideration of the 2005 USDOT *Policy Guidance Concerning Recipients' Responsibilities to Limited English Proficient (LEP) Persons.* US Census ACS data was collected at the Census Tract level to quantify the presence of LEP populations, as shown in **Table 4-8**.

Table 4-8: Limited English-Speaking Households

GEOGRAPHY	TOTAL HOUSEHOLDS	LIMITED ENGLISH-SPEAKING HOUSEHOLDS	PERCENT LIMITED ENGLISH-SPEAKING HOUSEHOLDS
State of Maryland	2,181,093	69,236	3.2%
Socioeconomic Study Area	106,994	1,229	1.1%
Corridor 6	27,196	144	0.5%
Corridor 7	27,359	150	0.5%
Corridor 8	22,680	123	0.5%

Source: US Census Bureau ACS 2013-2017

An estimated 3.2 percent of households in Maryland are identified as limited English-speaking households. The Socioeconomic Study Area includes an estimated 1,229 limited English-speaking households, or 1.1 percent. The Census Tracts within the CARA each have an estimated 0.5 percent limited English-speaking households.

Public engagement measures assuring meaningful language access for identified LEP populations will include written translations of vital documents, and if warranted, the providing of interpreters at public involvement events and other outreach methods, to satisfy the requirements of Executive Order 13166.

4.1.6 Jobs and Industry

This section details employment by industry sector and the overall employment/unemployment totals and rates in Census Tracts that comprise the Socioeconomic Study Area, compared with the State of Maryland as a whole. In addition, employment data was compiled for each of the three corridors.

US Census ACS data was obtained at the Census Tract level to examine employment in the various industry sectors as shown in **Table 4-9**. The top five industry sectors in terms of percentage of total employment within the Socioeconomic Study Area include:

- Educational Services, and Health Care and Social Assistance (22 percent),
- Professional, Scientific, and Management, and Administrative and Waste Management Services (16 percent),
- Public Administration (10 percent),
- Arts, entertainment, and recreation, and accommodation and food services (10 percent); and
- Retail Trade (10 percent).

This data illustrates that the Socioeconomic Study Area is composed of a largely service and knowledge-based economy, which is consistent with the general nationwide trend of declining manufacturing and agriculture. While no specific impacts affecting employment are anticipated from the No-Build Alternative for this study, the No-Build Alternative does include currently planned and programmed infrastructure projects as of Project Scoping in 2017 and would be updated during Tier 2 to reflect newly planned and programmed projects that may affect the study area. Anticipated increases in travel times and delays related to growing traffic congestion forecasted to occur under the No-Build condition could have potential negative effects on economic activity. The potential strain placed upon workforce commuters and supply chain deliveries by delays in motor vehicle travel could ultimately lead to decreases in economic performance as businesses and workers look for alternate locations to operate outside of the study area, distancing themselves from the issues generated by congestion.

With a project of this magnitude, there could also be positive impacts to many of the industry sectors identified in **Table 4-9** within affected communities. Sectors dealing directly with construction, transportation and utilities, real estate, and other growth-oriented development could see economic benefits associated with a new crossing.

As shown in **Table 4-9**, employment percentages by industry sector are generally similar across all three corridors.

US Census ACS data was obtained at the Census Tract level to also determine the total number of employed/unemployed persons over the age of 16 within the various Census Tracts comprising the Socioeconomic Study Area as compared with the State of Maryland. This data was also compiled for the Socioeconomic Study Area as a whole and the various Census Tracts contained partially within the CARA. Complete census tract data and analysis is found in the ***BCS Socioeconomic Technical Report*** ***Section 5.5***.

Table 4-9: Employment by Industry Sector

INDUSTRY SECTOR	STATE OF MARYLAND	SOCIOECONOMIC STUDY AREA TRACTS	CORRIDOR 6 TRACTS	CORRIDOR 7 TRACTS	CORRIDOR 8 TRACTS
Civilian employed population 16 years and older	3,040,792	149,241	41,630	39,191	30,222
Agriculture, forestry, fishing and hunting and mining	15,110 (<1%)	1,208 (1%)	553 (1%)	247 (1%)	448 (1%)
Construction	203,192 (7%)	11,429 (8%)	3,569 (9%)	2,492 (6%)	2,613 (9%)
Manufacturing	136,368 (4%)	7,419 (5%)	2,348 (6%)	2,067 (5%)	1,412 (5%)
Wholesale Trade	57,497 (2%)	3,649 (2%)	1,221 (3%)	1,230 (3%)	650 (2%)
Retail trade	292,326 (10%)	14,264 (10%)	4,487 (11%)	3,827 (10%)	2,844 (9%)
Transportation and warehousing, and utilities	137,153 (5%)	4,854 (3%)	1,883 (5%)	1,259 (3%)	957 (3%)
Information	64,760 (2%)	2,906 (2%)	717 (2%)	916 (2%)	443 (1%)
Finance and insurance, and real estate and rental and leasing	187,636 (6%)	9,513 (6%)	2,683 (6%)	2,258 (6%)	2,080 (7%)
Professional, scientific, and management, and administrative and waste management services	468,379 (15%)	23,978 (16%)	5,796 (14%)	6,399 (16%)	4,628 (15%)
Educational services, and health care and social assistance	724,995 (24%)	32,188 (22%)	8,609 (21%)	8,970 (23%)	6,069 (20%)
Arts, entertainment, and recreation, and accommodation and food services	254,958 (8%)	14,401 (10%)	3,519 (8%)	3,487 (9%)	3,152 (10%)
Other services, except public administration	165,095 (5%)	8,285 (6%)	2,118 (5%)	1,966 (5%)	1,924 (6%)
Public administration	333,323 (11%)	15,147 (10%)	4,127 (10%)	4,073 (10%)	3,002 (10%)

Source: US Census Bureau ACS 2013-2017

Demographic data indicates that the unemployment rate within the Socioeconomic Study Area is 4.4 percent, which is lower than the State as a whole (6.1 percent). Notable unemployment rates in individual Census Tracts include: 7014 (10.4 percent) and 7313.03 (9.5 percent). Census Tract 7014 is partially within Corridor 8 and Census Tract 7313.03 is within Corridor 6. Census Tracts within Corridor 8 have the highest current estimated unemployment rate of 5.1 percent. It is important to note that Census Tracts within Corridor 8 also have the lowest total population 16 years and over and consequently the lowest

employment/population ratio (60.4 percent). In contrast, Census Tracts within Corridor 6 have the lowest overall unemployment rate of 3.6 percent.

4.1.7 Transportation

This section includes a qualitative discussion of existing conditions and potential impacts to existing transportation services and facilities in the CARA, including roadways, public transit, railroads, air travel, and water travel. Any transportation-related impacts related to the No-Build Alternative for this study would result from currently planned and programmed infrastructure projects. The No-Build Alternative would include both short-term and long-term improvements documented in the adopted Regional Constrained Long-Range Plans (LRP) for transportation within the Greater Baltimore and Washington, D.C. areas as of Project Scoping in 2017. The No-Build Alternative includes existing TSM/TDM measures including contraflow lanes on the existing bridge, as well as any planned and funded TSM/TDM measures as of Project Scoping in 2017, such as automated contraflow lanes. The No-Build would be updated during Tier 2 to reflect newly planned and programmed projects. Qualitatively, under the No-Build Alternative increases in travel times and delays related to growing traffic congestion are anticipated and could lead to potential future negative effects for all transportation systems within the study area. Mobility and accessibility for commuters, passengers, essential services, and supply chains related to all modes (air, rail, transit, water) could each be further strained by increased inefficiencies of motor vehicle travel.

The arterial surface roadway networks present on both the Western Shore and Eastern Shore provide east-west connections across the Bay via the existing crossing. Corridor 7 may require fewer upgrades and alterations to existing transportation systems and presents the opportunity for utilizing existing roadway infrastructure, depending on the specific alignment chosen. In particular, an alignment to widen US 50/301 would efficiently use existing infrastructure. However, US 50/301 also has local access roads running parallel to much of it, which could be impacted by such an alternative. By comparison, Corridor 6 or 8 would more likely require the construction of new roadways along new alignments for most or all of the corridor length.

Corridor 6 would require new or existing transit services on both shores to be routed/re-routed along the alignment of the new limited access highway and would provide opportunities for park and ride facilities that could support existing and new bus transit system users with enhanced access to employment, commercial and recreational centers. Corridor 7 would potentially augment existing opportunities to introduce bus service across the Chesapeake Bay to connect system users with employment, commercial, and recreational opportunities and the existing public transportation routes on the Western Shore and Eastern Shore would likely experience minimal impact. Corridor 8 would require new or existing transit services on both shores to be routed/re-routed along the alignment of the new limited access highway and would provide opportunities for park and ride facilities that could support existing and new bus transit system users with enhanced access to employment, commercial and recreational centers.

In Corridor 6, a new crossing would provide residents of the central Eastern Shore additional access to MARC and Amtrak via the Northeast Corridor. Construction in Corridor 7 or Corridor 8 would likely have minimal impact on rail traffic.

No air travel operations are affected in Corridor 6. Corridor 7 would have the potential to affect the operation of the Bay Bridge Airport. A new crossing west of the airport would affect the existing airfield traffic pattern. Corridor 8 would have the potential to affect the operation of Lee Airport in Edgewater on the Western Shore and Easton Airport on the Eastern Shore - construction of any limited access highway associated with a new crossing would have the potential to affect the existing airfield traffic pattern of these airports.

With all corridors, any impacts to travel by water would likely be during construction and temporary in nature. More detailed consideration of crossings over navigable waterways will be included in Tier 2.

4.1.8 Children's Health and Safety

Executive Order (EO) 13045, Protection of Children from Environmental Health Risks and Safety Risks requires federal agencies to identify and assess environmental health and safety risks that may disproportionally affect children. In this case, "environmental health and safety risks" are defined as "risks to health or to safety that are attributable to products or substances that the child is likely to come in contact with or ingest (such as the air we breathe, the food we eat, the water we drink or use for recreation, the soil we live on, and the products we use or are exposed to)".

The most likely locations of potential effects on children would be at schools and parks located within the CARA where there are outdoor activity facilities for children. Potential impacts to communities with children could result from a new crossing within each CARA, such as a roadway alignment crossing through existing communities, creating potential concern for traffic safety in relation to pedestrian and bicycle travel by children. Homes and facilities located closer to a roadway alignment would also be a likely location for potential effects related to air quality and noise, but specific impacts cannot be determined at this level of detail.

Each of the three corridors contain multiple parks and recreational facilities that could potentially be impacted by an alignment in the corridor, as discussed in **Section 4.1.2.1**. Corridor 6 has eight facilities, Corridor 7 has 14 facilities and Corridor 8 has 10 facilities. While Tier 2 alignments could potentially be identified in each corridor to avoid some or all these parks and recreational facilities, it is likely that one or more of the facilities would be impacted given their prevalence and spatial distribution throughout each of the corridors.

Each of the three corridors contain K-12 public schools that could potentially be impacted by an alignment in the corridor, as discussed in **Section 4.1.2.1**. Corridor 6 contains five schools, Corridor 7 contains nine schools and Corridor 8 contains seven. Although all the schools are located adjacent to roadways that may be impacted, alternate alignments could potentially be developed to avoid impacts to the schools in each of the corridors.

The study's air quality and noise impacts have also been evaluated as a potential health and safety risk to children. As noted in **Section 4.6.2,** the project would not cause any violations of national ambient air quality standards established by the USEPA to protect human all health and welfare, including children. **Section 4.7.3** identifies the locations of potentially noise sensitive areas that exist within each of the three CARA.

4.2 CULTURAL RESOURCES

4.2.1 Introduction and Methodology

Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) (Section 106) and its implementing regulations set forth in 36 Code of Federal Regulations (CFR) Part 800, Protection of Historic Properties (Section 106), requires Federal agencies to take into account the effects of their undertakings on historic properties. The Section 106 process seeks to accommodate historic preservation concerns with the needs of Federal undertakings through consultation among the agency official and other parties with an interest in the effects of the undertaking on historic properties, commencing at the early stages of the project. According to 36 CFR Part 800.16 (l), the term "historic property," refers to "any prehistoric or historic district, site, building, structure, or object listed in or eligible for inclusion in, the National Register of Historic Places (NRHP)."

NEPA regulations set forth in 40 CFR §1502.25(a) require that related surveys and studies be coordinated with Section 106 of the NHPA and other environmental regulations. In considering whether a NEPA action may significantly affect the quality of the human environment, agencies must consider the proximity of the action to historic properties (40 CFR §1508.27(b)(3)). The FHWA and MDTA are complying with Section 106 during the BCS tiered NEPA process with the Tier 1 approach including the phased identification of historic properties.

FHWA initiated Section 106 consultation with the Maryland State Historic Preservation Office (SHPO) (Maryland Historical Trust [MHT]) on May 3, 2018 and received MHT's response June 25, 2018. FHWA invited ten Federally Recognized Tribes and other potential consulting parties to participate in the Section 106 consultation process via letter on November 29, 2018. A second letter dated April 9, 2019, was sent to those invited parties that had not responded. FHWA completed an inventory of recorded cultural resources within the 14 preliminary study corridors. This information was presented as part of the environmental inventory at the Fall 2019 Open Houses where the public was able to provide comments. FHWA has prepared a ***BCS Cultural Resources Technical Report*** for review and comment. Consulting parties participating in Section 106 consultation, including ten Federally Recognized Tribes were provided with a draft of the technical report on June 24, 2020.

Section 106 regulations at 36 CFR §800.4(b)(2) allow agencies to complete phased identification of historic properties for projects such as the Bay Crossing Study, in which large corridors or land areas are being considered as alternatives. The Section 106 regulations state that final identification and evaluation of historic properties may be deferred "if it is specifically provided for in… documents used by an agency official to comply with the National Environmental Policy Act pursuant to [36 CFR] §800.8." Phased identification of historic properties in projects with large corridors should establish "the likely presence of historic properties" within the Area of Potential Effects (APE) for each alternative through "background research, consultation and an appropriate level of field investigation, taking into account the alternatives under consideration, the magnitude of the undertaking and its likely effects, and the views of the SHPO /THPO [Tribal Historic Preservation Office] and any other consulting parties" (36 CFR §800.4). Once the alternatives are refined, the agency would proceed with the identification and evaluation process as set forth in 36 CFR §800.4(b)(1) and (c).

In consultation with the Maryland SHPO and the Advisory Council on Historic Preservation (ACHP), FHWA and MDTA have developed a phased approach for complying with Section 106 identification and evaluation requirements during Tier 1 NEPA. Tier 1 Section 106 historic property identification efforts focus on establishing the likely presence of historic properties within the APE (defined as coterminous with the CARA). Since previous historic properties survey and documentation has not been uniform in scale or scope throughout the CARA, the ***BCS Cultural Resources Technical Report*** identifies unrecorded resources (unsurveyed and unevaluated resources that meet the NRHP age threshold established in 36 CFR 60.4) within the CARA in addition to evaluated (National Historic Landmark [NHL], NRHP listed or eligible historic properties) and unevaluated resources (such as Maryland Inventory of Historic Properties [MIHP] resources or easement properties without an NRHP evaluation). Unrecorded architectural resources were identified using a 1980 date of construction (inclusive) as a cut off year to identify resources 40 years or older to account for properties that may ultimately meet the age threshold. The results of Tier 1 identification efforts allowed for direct comparison of the CARA when analyzing each corridor alternative; identified significant resources - such as NHLs - that merit avoidance; and provided data that supports and contributes to the Bay Crossing Study.

In accordance with 36 CFR §800.8, Section 106 consultation for the Bay Crossing Study will run concurrently with the NEPA process. Section 106 decisions made during Tier 1 will be recorded in the Tier 1 Final Environmental Impact Statement/Record of Decision (FEIS/ROD). The Bay Crossing Study will coordinate Section 106 and NEPA rather than invoke 36 CFR §800.8(c) "Use of the NEPA process for section 106 purposes." Recorded commitments will include the deferral of historic properties identification and the continuation of the Section 106 process during Tier 2. The FEIS/ROD will also document Section 106 activities completed in Tier 1 and specify that Section 106 consultation will continue only within the Preferred Corridor.

The Section 106 process would continue with a future Tier 2 NEPA study within the Preferred Corridor. If a Preferred Corridor is approved at the conclusion of Tier 1, the APE would be refined during Tier 2 in consultation with MHT and the consulting parties. The refinement of the APE would be determined by the scale and nature of the undertaking as defined by the project alternatives, including considerations such as visual, audible, atmospheric, or other physical impacts. Once identification and evaluation of historic properties is complete as set forth in 36 CFR §800.4(b)(1) and (c), if there are adverse effects to historic properties or effects cannot be determined, then Section 106 consultation will conclude with an agreement document, following 36 CFR §800.6 or §800.14(b).

The three CARA encompass an environmentally diverse and historically rich section of Maryland's Chesapeake Bay Region. Background research about known cultural resources within the CARA was conducted by examining data from the archaeological and architectural layers available on the Maryland Historical Trust (MHT) Medusa Cultural Resource Information System (Medusa). Desktop sources including cultural resources management reports, MHT archaeological site and Maryland Inventory of Historic Properties (MIHP) files, state and local histories, and environmental, geological, and soil data were also consulted.

The cultural resources study synthesizes previous cultural resources studies completed within the CARA, identifies the location and survey status of previously identified resources, and proposes methodologies for intensive identification of potential unrecorded archaeological and architectural resources in a potential future Tier 2 study.

A detailed discussion of environmental setting and historic cultural context is included in the ***BCS Cultural Resources Technical Report.*** The environmental setting discussion includes topography, geology, hydrology, soils, paleoenvironment and vegetation. The cultural context discussion includes precontact archaeological context and historical cultural context.

4.2.1.1 Archaeological Gap Analysis Methodology

The archaeological gap analysis identified areas within the CARA that have not been subject to archaeological survey or have not been surveyed to meet the current Standards and Guidelines for Archaeological Investigations in Maryland (Schaffer and Cole 1994). For the purposes of this study, surveys conducted prior to 1990 are assumed to not meet current MHT standards and those conducted later as meeting current MHT standards. Both unsurveyed areas and areas surveyed prior to 1990 will be referred to as "unsurveyed areas" throughout the remainder of this document. Areas that were subjected to Phase I archaeological survey in or after 1990 were eliminated from further analysis during this study. However, if Tier 1 concludes with the selection of a Preferred Corridor, the methodology of each previous survey should be verified during a future Tier 2 study to ensure they meet current MHT standards.

The unsurveyed areas within the CARA were assessed to determine if they may require archaeological survey during a future Tier 2 cultural resources study. A desktop analysis using National Resources Conservation Service (NRCS) soil data, topographic relief, and soil drainage was conducted to eliminate areas from consideration based on obvious disturbance or urban/suburban development; no further archaeological survey is recommended for those areas. The remaining areas were assessed for their archaeological potential and recommendations for additional survey were made based on that potential.

Unsurveyed areas were classified as "may require archaeological survey" if they contained:

- No documented disturbance in the NRCS soil data layers;
- Slopes less than or equal to 10 percent on the Eastern Shore;
- Slopes less than or equal to 15 percent on the Western Shore; and
- Moderately well-drained to very well drained soils.

Unsurveyed areas were classified as having "low archaeological potential" if they contained:

- Urban Land or Udorthents;
- Slopes in excess of 10 percent on the Eastern Shore;
- Slopes in excess of 15 percent on the Western Shore; and
- Moderately poorly-drained to very poorly drained soils.

An additional precontact and historic archaeological potential assessment is recommended during the Tier 2 study for the areas identified in this study as "may require archaeological survey". No further archaeological assessment or investigation is recommended for those identified as low potential, pending MHT concurrence.

In an effort to identify additional potential underwater archaeological sites not yet known or recorded by MHT, the National Oceanic and Atmospheric Administration (NOAA) dataset [NOAA Automated Wreck and Obstruction Information System and electronic navigational chart] of shipwrecks was reviewed.

4.2.1.2 Architectural Gap Analysis Methodology

The architectural gap analysis identified recorded and unrecorded architectural resources within the CARA. In Tier 1, the limits of the CARA have been identified as the APE.

Identification of recorded architectural resources began with studying the architecture layers on Medusa, namely NRHP, Determination of Eligibility Short Forms, MIHP, Pending Submittal MIHP, and MHT Easements within the APE. The MIHP layer also includes the Determination of Eligibility (DOE) Forms. Easement records obtained from the MHT Easement Administrator were also studied. Properties with MHT Easements are considered by MHT to be eligible for the NRHP regardless of whether a formal DOE has been prepared. If Tier 1 concludes with the selection of a preferred corridor alternative, resources identified as potentially warranting reevaluation for NRHP eligibility will be studied during Tier 2.

The collected data was organized into four categories to better reflect gap analysis needs: 1) historic properties (resources listed or eligible for inclusion in the NRHP and NHLs); 2) not eligible resources; 3) unevaluated resources; and 4) demolished resources (comprising any resource within the prior three categories that has been demolished). Verification of demolished resources was accomplished via desktop analysis.

Non-contributing elements of listed or eligible historic districts, as well as potentially eligible resources located within not eligible districts, were not identified as part of the gap analysis. If Tier 1 concludes with the identification of a preferred corridor alternative, these resources will be identified and individually evaluated during Tier 2.

Unrecorded architectural resources within the CARA were identified using a 1980 date of construction (inclusive) as a cut off year to identify resources 50 years or older providing a ten-year buffer for project construction. Parcels were identified through GIS desktop analysis conducted of Maryland State Department of Assessments and Taxation (SDAT) build years. Clusters of parcels with build dates of 1980 and earlier that had potential to be an unrecorded historic district received an additional layer of analysis. Using aerial imagery, these clusters were reviewed for their potential as unrecorded districts. Only areas within the CARA were reviewed; these historic districts may extend beyond the CARA. Other than three post-1945 concrete and steel bridges determined eligible by MDOT SHA (QA-542, AA-44, and AA-45), all post-1945 concrete bridges within the APE are exempt due to the ACHP Program Comment Issued for Streamlining Section 106 Review for Actions Affecting Post-1945 Concrete and Steel Bridges (77 FR 68790).

For architectural resources with no recorded build date in SDAT, the analysis extended to the metadata within the SDAT database. Parcels unlikely to have architectural resources, such as those identified as "open space" or "flood plain," were removed, as were properties that appeared to be vacant lots. Properties likely to contain parks or other recreational facilities were retained. Those properties determined likely to contain a resource received a second level of review using aerial imagery and Google Street View to verify the existence of a building or structure on the parcel. Parcels with structures with and without build dates were then assigned one of five property types based on the land use description metadata within SDAT—agricultural, commercial, industrial, miscellaneous, and residential. Miscellaneous property types aggregate land uses such as: government, education, parks and recreation, religious, and institutional.

4.2.2 Archaeological Resources

To document and assess the potential for archaeological historic properties within each CARA, an archaeological gap analysis evaluation of existing data sources was conducted. The archaeological gap analysis first identified areas within each CARA that had been subjected to Phase I archaeological survey meeting MHT's current standards as presented in *Standards and Guidelines for Archeological Investigations in Maryland* (Shaffer and Cole 1994). For the purposes of this study, all surveys conducted in 1990 or later were considered to meet current standards and those conducted prior to 1990 were considered not to meet current standards. Previously recorded archaeological sites within the CARA were also reviewed for their NRHP status.

4.2.2.1 Corridor 6

There are 43 previously recorded terrestrial archaeological sites within Corridor 6. Of these, 21 are on the Eastern Shore and 22 are on the Western Shore. Of the 43 sites, 20 sites are precontact, 14 sites are historic, and nine are multi-component sites. Of the recorded archaeological sites, one has been determined ineligible for listing in the NRHP. This site is the multi-component Denbigh Farm (18QU218). The other 42 sites have not yet been evaluated for listing in the NRHP.

There are four previously recorded underwater archaeological sites in Corridor 6. Of the four sites, one is precontact, and three are historic. None of the four sites have been evaluated for listing in the NRHP. Two additional underwater sites were recorded in the archaeology quad files maintained by MHT and six shipwrecks were recorded by NOAA within Corridor 6.

4.2.2.2 Corridor 7

There are 127 previously recorded terrestrial archaeological sites in Corridor 7. Eighty-two of the sites are located on the Eastern Shore and 45 of the sites are on the Western Shore. Of the 127 sites, 64 are precontact, 35 sites are historic, 26 sites are multi-component, and two sites are of an unrecorded cultural period.

In Corridor 7, two of the recorded sites are listed in the NRHP, two sites are eligible for listing, and 12 sites are ineligible. The remaining 112 archaeological sites have not yet been evaluated for listing in the NRHP. Of the four sites in Corridor 7 that are listed or determined eligible for listing in the NRHP, one is an historic site and the remaining three are multi-component.

- Martin's Pond (18AN141) is a precontact and historic site in Anne Arundel County and listed in the NRHP under Criterion D[1].
- Sandy Point Farmhouse (18AN534) is an historic site in Anne Arundel County and is listed in the NRHP under Criterion D.
- Sharpe-Ridout-Boone Mill (18AN652) is located in Anne Arundel County and consists of a multicomponent precontact and historic site which is eligible under Criterion D.

[1] NRHP criteria are defined in 36 CFR 60.4. For detailed explanation of NRHP evaluation criteria, see the National Register Bulletin – *How to Apply the National Register Criteria for Evaluation* (https://www.nps.gov/subjects/nationalregister/upload/NRB-15_web508.pdf)

- Gibson's Grant 1 (18QU968) is an historic site located on Kent Island in Queen Anne's County. The site is listed under Criterion D.

There are eight previously recorded underwater archaeological sites in Corridor 7. None of the sites have been evaluated for listing in the NRHP. Nine additional underwater sites were recorded in the archaeology quad files maintained by MHT and 14 shipwrecks recorded by NOAA within Corridor 7.

4.2.2.3 Corridor 8

There are 154 previously recorded terrestrial archaeological sites within Corridor 8. Of these, 32 are on the Eastern Shore and 122 are on the Western Shore. Of the 154 sites, 72 sites are precontact, 58 sites are historic, and 24 are multi-component sites.

In Corridor 8, one of the recorded sites is listed in the NRHP, four sites are eligible for listing, and nine sites are ineligible. The remaining 140 sites have not been evaluated for listing in the NRHP.

- Gresham (18AN571) is an historic site located in Anne Arundel County and listed in the NRHP under Criterion D.
- Smithsonian Pier (18AN284) is a precontact and historic site located in Anne Arundel County and is determined eligible for the NRHP under Criterion D.
- Smithsonian Pier West (18AN285) is a precontact site located in Anne Arundel County and is eligible for the NRHP under Criterion D.
- SH 8 (18TA424) is a precontact and historic site in Talbot County and is eligible for the NRHP under Criterion D.
- SH 9 (18TA425) is a precontact and historic site in Talbot County and is eligible for the NRHP under Criterion D.

There are ten previously recorded underwater archaeological sites in Corridor 8. None of these sites have been evaluated for listing in the NRHP. Eighteen shipwrecks were recorded by NOAA within Corridor 8.

4.2.2.4 Assessment of Archaeological Potential

Unsurveyed areas within the CARA were assessed for future archaeological identification survey needs and categorized as either areas that may require archaeological survey or areas with low archaeological potential. Areas that may require archaeological survey are both terrestrial and underwater. **Table 4-10** presents the results of assessment of terrestrial archaeological potential. More detailed discussion of this analysis is included in the ***BCS Cultural Resources Technical Report*, Section 6.2.1.**

All unsurveyed underwater areas within each CARA may require additional underwater archaeological survey. Corridor 6 contains 29,300 acres that may require underwater archaeological survey. Corridor 7 contains 16,160 acres that may require underwater archaeological survey and Corridor 8 contains 31,580 acres that may require underwater archaeological survey.

Table 4-10: Assessment of Terrestrial Archaeological Potential

CORRIDOR	ACRES THAT MAY REQUIRE SURVEY	ACRES WITH LOW POTENTIAL
6	15,740	11,550
7	10,080	19,050
8	17,580	25,910

The areas recommended for additional archaeological survey are mapped in **Appendix A.**

4.2.2.5 Summary of Archaeological Resources

The goal of the Archaeological Gap Analysis was to identify the potential future archaeological survey and evaluation needs of each CARA. To that end, Gap Analysis reviewed soil data, archaeological survey and site data, and maritime data of each CARA that may require additional terrestrial and underwater archaeological survey, the number of archaeological sites listed in or eligible for listing in the NRHP, and the number of archaeological sites or shipwrecks that may require evaluation for eligibility for listing in the NRHP during the Tier 2. A summary of the results are presented in **Table 4-11**.

Table 4-11: Summary of Archaeology Results

CORRIDOR	ACRES THAT MAY REQUIRE ADDITIONAL TERRESTRIAL SURVEY	ACRES THAT MAY REQUIRE ADDITIONAL UNDERWATER SURVEY	NUMBER OF NRHP LISTED OR ELIGIBLE SITES	NUMBER OF UNEVALUATED SITES (INCLUDING QUAD FILES)	NUMBER OF NOAA RECORDED SHIPWRECKS
6	15,740	29,300	0	48	6
7	10,080	16,160	4	124	14
8	17,580	31,580	5	148	18

Note: all acreage numbers rounded to closest 10 acres

4.2.3 Recorded Architectural Resources

4.2.3.1 Corridor 6

A search of existing records identified 61 recorded architectural resources within Corridor 6.

There are two recorded historic properties in Corridor 6, and both are listed on the NRHP (**Table 4-12**). Of the recorded resources in Corridor 6, 20 were determined not eligible for the NRHP.

There are 37 resources in Corridor 6 that have been surveyed for the MIHP, but not individually evaluated for NRHP eligibility. If Corridor 6 is selected as the preferred corridor alternative at the end of Tier 1, resources that fall within the Tier 2 APE would need to be evaluated for NRHP eligibility.

More detailed information on these resources is included in the ***BCS Cultural Resources Technical Report*, *Section 7.1.1***. Maps of historic structures are included in **Appendix A.**

Table 4-12: Historic Properties in Corridor 6

ID	COUNTY	MIHP	NAME	DATE	SIGNIFICANCE CRITERION
1	Queen Anne's	QA-224	Bachelor's Hope (also Phares Morris Farm)	May 3, 1984	C – Architecture
2	Queen Anne's	QA-5	Reed's Creek Farm	July 7, 1975	C – Architecture

A new crossing within Corridor 6 could impact two recorded historic properties, both of which are located on the Eastern Shore in Queen Anne's County. Bachelor's Hope (also known as Phares Morris Farm) (MIHP QA-224) and Reed's Creek Farm (MIHP QA-5) are both eighteenth and nineteenth-century plantations that may contain extensive lands within their boundaries. Because of their size, both the land and the buildings of the properties may be impacted directly or indirectly. Of the three CARA, selecting Corridor 6 as the preferred corridor alternative would require the second most architectural surveying during Tier 2. An alignment located in the northern half of Corridor 6 would have the potential to avoid impacts to the recorded historic properties.

4.2.3.2 Corridor 7

The search of existing records identified 166 recorded architectural resources within Corridor 7.

There are 13 recorded historic properties in Corridor 7 (**Table 4-13**), including one NHL: the U.S. Naval Academy (AA-359). The U.S. Naval Academy was designated an NHL on July 4, 1961. Properties determined eligible for the NRHP include the Stevensville Historic District.

Of the recorded resources in Corridor 7, 44 were determined not eligible for the NRHP. There are 94 resources in Corridor 7 that have been surveyed for the MIHP, but not individually evaluated to NRHP eligibility. Additionally, there are two roadways in Anne Arundel County that are listed in the MIHP, but for which no documentation has been filed. If Corridor 7 is identified as the preferred corridor alternative at the end of Tier 1, and these resources are within the Tier 2 APE, they would need to be evaluated for NRHP eligibility.

More detailed information on these resources is included in the ***BCS Cultural Resources Technical Report*, *Section 7.1.*** Maps of historic structures are included in **Appendix A.**

A new crossing within Corridor 7 could impact 13 recorded historic properties, including one NHL: the U.S. Naval Academy (MIHP AA-359). Particular attention must be paid to the U.S. Naval Academy per Section 110(f) of the NHPA and 36 CFR 800.10 which requires the agency official to undertake such planning and actions as may be necessary, to the maximum extent possible, to minimize harm to any NHL that may be directly and adversely affected by an undertaking. A Tier 2 alignment within Corridor 7 that is adjacent to the existing US 50/301 corridor on its southern side would have the potential to avoid impacts to the U.S. Naval Academy as well as the Stevensville Historic District and White's Heritage. Of the three CARA, selecting Corridor 7 as the preferred corridor alternative would require the most architectural surveying during Tier 2.

Table 4-13: Historic Properties within Corridor 7

ID	COUNTY	MIHP NO.	NAME	STATUS AND DATE	SIGNIFICANCE CRITERION
1	Anne Arundel	AA-359	U.S. Naval Academy	NRHP Listed 10/15/1966; NHL designated 4/4/1961	C-Historic District
1a	Anne Arundel	AA-359-15	Building 187, Steam Generation Building	Eligible 6/23/2014	C-Contributes to U.S. Naval Academy
2	Anne Arundel	AA-136	Howard's Inheritance	Listed 7/23/1998; Preservation Easement recorded 12/29/1986	C- Architecture
3	Anne Arundel	AA-330	Sandy Point Farm House	Listed 2/11/1972	A-Agriculture C-Architecture
4	Queen Anne's	QA-463	Stevensville Historic District	Listed 9/11/1986; reevaluated 3/19/1998	C-Historic District
5	Queen Anne's	QA-259	Cray House	Listed 5/9/1983; Preservation Easement recorded 2/2/2001	C-Architecture
6	Queen Anne's	QA-212	Christ Church	Listed 7/24/1979; Preservation Easement recorded 7/26/2005	A- Settlement, Religion C-Architecture
7	Queen Anne's	QA-264	Stevensville Bank	Listed 1/3/1985	A-Commerce C-Architecture
8	Anne Arundel	AA-47	William Preston Lane, Jr., Memorial Bridge, Eastbound	Eligible 4/2/2001	A-Association with designer and builder C-Engineering
9	Anne Arundel	AA-48	William Preston Lane, Jr., Memorial Bridge, Westbound	Eligible 4/3/2001	A-Association with designer and builder C-Engineering
10	Anne Arundel	AA-765	Bridge 2081, Weems Creek Bridge	Eligible 6/29/1993	A-Transportation C-Engineering
11	Queen Anne's	QA-222	White's Heritage	Eligible 2/11/1980	C-Architecture
11a	Queen Anne's	QA-222-1	Garage, White's Heritage	Eligible 9/21/2006	C-Contributes to White's Heritage HD
11b	Queen Anne's	QA-222-2	Tenant House, White's Heritage	Eligible 9/21/2006	C-Contributes to White's Heritage HD
11c	Queen Anne's	QA-222-3	Tenant Farm Complex, White's Heritage	Eligible 9/21/2006	C-Contributes to White's Heritage HD
12	Queen Anne's	QA-542	SHA Bridge No. 1700600	Eligible 6/3/2011	C-Engineering
13	Queen Anne's	QA-524	Barnstable Hill, Lowery Farm	Eligible 9/11/1980	A-Agriculture C-Architecture

4.2.3.3 Corridor 8

The search of existing records identified 133 recorded architectural resources within Corridor 8.

There are 15 recorded historic properties in Corridor 8, which are listed in **Table 4-14.** Of these, 12 are listed in the NRHP and three have been determined eligible – two by preservation easement. Properties with MHT Easements are considered by MHT to be eligible for the NRHP regardless of whether a formal DOE has been prepared.

Of the recorded resources in Corridor 8, ten were determined not eligible for the NRHP. There are 102 resources in Corridor 8 that have been surveyed for the MIHP, but not individually evaluated for NRHP eligibility. Additionally, there are seven roadways in Anne Arundel County that are listed in the MIHP, but for which no documentation has been filed. If Corridor 8 is identified as the preferred corridor alternative at the end of Tier 1, resources that fall within the Tier 2 APE, would need to be evaluated for NRHP eligibility.

More detailed information on these properties is included in the ***BCS Cultural Resources Technical Report*, *Section 7.1.*** Maps of historic structures are included in **Appendix A.**

Table 4-14: Historic Properties in Corridor 8

ID	COUNTY	MIHP NO.	NAME	LISTED OR ELIGIBLE	DATE OF DOE	SIGNIFICANCE
1	Anne Arundel	AA-1006	Davidsonville Historic District	Listed	3/27/1992	C-Historic District
2	Anne Arundel	AA- 140	South River Club	Listed	5/15/1969	A-Social C-Architecture
3	Anne Arundel	AA-144	Summer Hill	Listed	7/25/1974	C-Architecture
4	Anne Arundel	AA-160	Mount Airy	Listed	4/13/1973	A-Agriculture C-Architecture
5	Anne Arundel	AA-200	Indian Range	Listed	2/13/1986	C-Architecture
6	Anne Arundel	AA-200A*	Indian Range Servant's Quarter	Listed	2/13/1986	C-Architecture
7	Anne Arundel	AA-150	All Hallow's Church	Listed	5/15/1969	A-Religion C-Landscape Arch., Architecture
8	Anne Arundel	AA-232	Gresham	Listed	9/7/1984	B-Assoc. with Comm. Isaac Mayo
9	Queen Anne's	QA-297	Bloody Point Bar Light	Eligible	2/22/2007	Preservation Easement
10	Talbot	T-244	Sherwood Manor	Listed	4/5/1977	C-Architecture
11	Talbot	T-527	Skipjack CLAUD W. SOMERS	Listed	5/16/1985	A-Commerce and Transportation
12	Talbot	T-90	Hope House	Listed	11/1/1979	C-Architecture
13	Talbot	T-89	Wye Town Farm House	Listed	12/16/1982	C-Architecture

ID	COUNTY	MIHP NO.	NAME	LISTED OR ELIGIBLE	DATE OF DOE	SIGNIFICANCE
14	Talbot	T-381	Unionville	Eligible	3/24/1999	A-African-American settlement C-Historic District, Architecture
15	Talbot	T-211	Rich Neck Manor	Eligible	12/19/1988	Preservation Easement

* Indian Range Servant's Quarters (AA-200A) has a separate MIHP number but is connected to Indian Range (AA-200); both resources are included in the Indian Range NRHP nomination form.

A new crossing within Corridor 8 could impact 14 recorded historic properties. Of the three CARA, selecting Corridor 8 as the preferred corridor alternative would require the least architectural surveying during Tier 2. A Tier 2 alignment that extends through the northern half of Corridor 8 in Anne Arundel County but that extends through the southern half of Queen Anne's County would have the potential to avoid impacts to recorded historic properties.

4.2.3.4 Unrecorded Architectural Resources

For this Tier 1 study, MDTA conducted a preliminary assessment of unrecorded architectural resources with a date of construction in or prior to 1980 located within the CARA (**Table 4-15**).

The study eliminated parcels overlapping with previously surveyed historic architectural resource layers on MHT's Medusa, including: MHT Preservation Easements, National Register of Historic Places, Determination of Eligibility Short Forms, Resources listed in the MIHP, and Resources Pending Submittal to the MIHP. Potential NRHP evaluation or re-evaluation of resources in the aforementioned categories are addressed in **Section 4.2.3**. Additional analysis of these resources by property type and build year is included in ***BCS Cultural Resources Technical Report*, *Section 7.2***. A full list of unrecorded architectural resources and unrecorded architectural resources by property type are included as Appendices T and U of that report.

Table 4-15: Preliminary Unrecorded Architectural Resources in the CARA

CORRIDOR	UNRECORDED RESOURCES BUILT PRE-1980	UNRECORDED HISTORIC DISTRICTS	UNRECORDED RESOURCES WITH NO BUILD YEAR LIKELY TO CONTAIN BUILDINGS	TOTAL UNRECORDED ARCHITECTURAL RESOURCES
6	944	37	89	1,070
7	1,931	38	160	2,129
8	1,115	34	105	1,254

4.2.3.5 Summary of Architectural Resources

Tier 1 architectural resources identification has found that historic properties are distributed evenly between Corridors 7 and 8, with the fewest number of recorded historic properties in Corridor 6. Corridor 6 has 37 unevaluated resources. This is markedly lower than the number of unevaluated resources in Corridor 7 (94) and Corridor 8 (102).

Perhaps spurred by development following the construction of the William Preston Lane, Jr. Memorial Bridges, Corridor 7 has 2,129 resources built prior to 1980 (inclusive), compared to 1,070 in Corridor 6 and 1,254 in Corridor 8 as shown in **Table 4-16**.

Table 4-16: Summary of Historic Properties and Architectural Resources within the CARA

CORRIDOR	RECORDED HISTORIC PROPERTIES	UNEVALUATED MIHP RESOURCES	NOT ELIGIBLE RESOURCES	RESOURCES BUILT PRE-1980
6	2	37	20	1,070
7	13 (including 1 NHL)	94	44	2,129
8	15	102	10	1,254

The analysis of the quantities and locations of recorded historic properties has revealed information regarding potential impacts in each of the three CARA. The presence of the resources shows that each CARA contains numerous areas of the built environment that reflect several hundred years of Maryland's rich history, dating from the seventeenth century to the late twentieth century. While specific impacts to cultural resources will not be determined for each corridor alternative at this stage of the study, the Tier 1 survey results can be used to make recommendations for future research to fill in observed data gaps and for selecting future Tier 2 alignments within each corridor that might avoid impacts to the known and potential cultural resources located there. Additional discussion of potential indirect and cumulative effects on historic properties can be found in **Sections 4.8.2** and **4.8.3**.

4.2.4 Tier 2 Recommendations

If a Bay Crossing Study Tier 2 NEPA study is conducted, the Section 106 process (36 CFR 800 Subpart B) will resume and phased identification of historic properties will continue within the refined APE established within the Preferred Corridor identified during Tier 1 NEPA. The following outlines how phased identification would proceed during the Tier 2 NEPA process. The Tier 1 historic property identification would require review and reevaluation at the start of Tier 2, when more information is available about the specific alignment of the Project and any constraints, such as the project schedule, the project delivery method, or other factors that are currently unknown. Given these constraints, the recommendations in this section are intended to provide a general outline of the remainder of the historic property identification process through a Tier 1 study, as well as to identify additional work that may be needed, based on the findings of the ***BCS Cultural Resources Technical Report***.

A future Tier 2 NEPA study would include delineation of an APE based on Tier 2 alignment alternatives (within the Tier 1 Preferred Corridor) and their potential for direct and indirect effects to historic properties. Identification efforts during a Tier 2 study would involve detailed identification of historic properties within the APE of the alignment alternatives and assessment of effects on those historic properties. As part of the identification effort, FHWA and MDTA will continue to work with the consulting parties in identifying knowledgeable individuals and organizations who could provide information that could assist in the identification and evaluation of historic properties within the Tier 2 APE. FHWA and MDTA will continue Section 106 consultation with the ACHP, MHT, Federally Recognized Tribes and consulting parties participating during Tier 1, as well as any consulting parties newly identified during Tier 2, and the general public.

4.2.4.1 Archaeological Resources

It is recommended that a Tier 2 archaeological study include a more detailed assessment of the precontact and historic archaeological potential within the refined APE of the Preferred Corridor.

The detailed archaeological assessment would build on the Tier 1 archaeological assessment by:

- reviewing the methodologies of all the previously conducted archaeological surveys within the APE to determine which surveys conform to MHT's archaeological guidelines and which do not and will require additional survey;
- assessing and verifying the potential for additional ground disturbance within the APE beyond that documented in the soil data through the use of LiDAR and windshield survey;
- developing specific criteria for assessing the areas that may require archaeological survey for their specific precontact and historic terrestrial archaeological potential including a consideration of distance from surface potable water, known archaeological sites, and former shorelines, as well as land use history; and
- conducting a GIS-based predictive terrestrial archaeological potential model.

Tier 2 archaeological studies are recommended to include a Phase I terrestrial archaeological survey of all areas within the APE, identified by the detailed assessment of precontact and historic archaeological potential as having terrestrial archaeological potential. Phase I underwater survey of areas within the refined APE are also recommended where there will be direct impacts. It is also recommended that the locations of all unevaluated sites within the refined APE be reestablished and additional evaluation be conducted based on site integrity and potential significance.

All investigations will be conducted in accordance with the *Standards and Guidelines for Archeological Investigations in Maryland* (Shaffer and Cole 1994), and *Standards and Guidelines for Archeological Investigations in Maryland, Technical Update No. 1* (Morehouse et al. 2018). It is also recommended that Tier 2 investigations for underwater archaeological resources are undertaken in consultation with MHT. Although dependent on the location and nature of the undertaking and consultation with MHT, subsequent investigations may entail geophysical survey operations such as single beam bathymetry, side scan sonar, sub-bottom profiling, and electromagnetic (EM) interrogation of the seabed to identify potential submerged archaeological resources within the Chesapeake Bay.

4.2.4.2 Architectural Resources

Architectural resources would be surveyed, evaluated, and documented following the standards and guidelines published in the MHT document, *Standards and Guidelines for Architectural and Historical Investigations in Maryland* (MHT 2019). Historic properties would be identified according to criteria outlined in National Register Bulletin 15, How to Apply the National Register Criteria for Evaluation (Bulletin 15) (DOI 1990). The NRHP significance criteria will be used to evaluate the historic significance of the resources.

4.2.4.3 Evaluation of Recorded Architectural Resources

Recommended Tier 2 architectural identification efforts would include verifying and updating information gathered during Tier 1 NEPA, to include resource evaluations completed subsequent to this report. Desktop analysis and field survey would be used to document whether resources are extant or any other changes have affected the integrity of the resources. MDTA would complete NRHP evaluations of any unevaluated resources within the refined APE of the Preferred Corridor. Re-evaluations of resources would be completed on a case-by-case basis, particularly if documentation of the eligibility and/or significance of recorded resources does not contain sufficient information to make an effects determination. Resources identified during Tier 1 that may require additional documentation include unevaluated MIHP resources; MHT preservation easement properties without eligibility determinations; historic properties for which new information or historic contexts have become available since its listing or eligibility determination; changes to a resource's integrity; or demolition.

4.2.4.4 Unrecorded Architectural Resources

Identification of unrecorded architectural resources in the Tier 2 APE would begin with desktop GIS analysis to identify all resources constructed 50 years prior to the project's anticipated completion date. Resources will be identified using research tools such as SDAT, current and historic aerial imagery, plat maps, and field survey. MDTA would include consulting parties such as local governments, historic preservation organizations, and other parties with demonstrated interest in the undertaking to assist in the identification of historic properties. MDTA will also continue efforts to consider property types within the Tier 2 APE that may not be adequately represented in the MHT's MIHP, including cultural landscapes and resources associated with historically marginalized populations.

Resources would be grouped and evaluated as districts where appropriate, such as subdivisions; suburban, urban, or rural historic districts; or farm complexes.

Property specific research would be conducted as needed. The evaluations would rely on the existing historic contexts, such as *Suburbanization Historic Context* (KCI 1999) and the *Suburbanization Historic Context Addendum* (Manning et al. 2019) if the Tier 2 APE includes suburban areas. The need for additional historic context development would be assessed for areas or resource types without sufficient existing context to complete NRHP evaluations. The majority of unrecorded resources in all corridors date to after 1950; however, postwar suburban development patterns in Anne Arundel, Kent, Queen Anne, and Talbot Counties differ from those in Montgomery and Prince George's Counties because of their distance from Washington, DC, and lack of limited-access highways. It will likely be necessary to complete a suburbanization historic context addendum for those counties. The goal of an addendum would be to identify patterns of development and character-defining elements for the various types of suburban development within the proposed alternatives. This document would focus heavily on residential development types as they are the majority of resources requiring evaluation. In addition, because of the relatively large number of agricultural resources in Corridor 8, additional agricultural historic contexts may be necessary should that corridor move forward into Tier 2. Few existing contexts are available describing the impact agricultural diversification and mechanization had on twentieth-century farms locally or statewide.

4.2.4.5 Cemeteries

In addition to the archaeological and architectural resources, there are numerous recorded cemeteries and burial grounds within the three CARA. During Tier 2 MDTA will continue phased identification and NRHP evaluation of cemeteries and burial grounds within the Tier 2 APE.

4.3 SECTION 4(F)

4.3.1 Introduction

Section 4(f) of the US Department of Transportation (DOT) Act of 1966 (49 USC 303(c)) is a federal law that protects significant publicly-owned parks, recreation areas, wildlife and waterfowl refuges, or any significant public or privately-owned historic sites. Section 4(f) applies to all transportation projects that require funding or other approvals by the US DOT, such as construction of transportation improvements that could ultimately result from the Bay Crossing Study. FHWA, which is a US DOT agency and the lead federal agency for this Study, will comply with Section 4(f) pursuant to implementing regulations at 23 CFR 774.

The regulations at 23 CFR 774.17 define a Section 4(f) property as "publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance, or land of a historic site of national, state, or local significance." 23 CFR 774.17 further defines "historic site" to include any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). The criteria for defining a site as eligible for inclusion in the National Register is further detailed in **Section 4.2**.

Section 4(f) as amended (49 USC 303(c)) stipulates that the US DOT, including the FHWA, cannot approve a transportation project that uses any Section 4(f) property, unless:

- FHWA determines that there is no feasible and prudent avoidance alternative to the use of land from the property, and the action includes all possible planning to minimize harm to the property resulting from such use (23 CFR 774.3(a)); or
- FHWA determines that the use of the Section 4(f) properties, including any measures to minimize harm (such as avoidance, minimization, mitigation, or enhancements measures) committed to by the applicant, will have a *de minimis* impact on the property (23 CFR 774.3(b)).

4.3.2 Use of Section 4(f) Properties

Pursuant to 23 CFR 774.17, a "use" of Section 4(f) property occurs:

(i) When land is **permanently incorporated** into a transportation facility;

(ii) When there is a **temporary occupancy** of land that is adverse in terms of the statute's preservation purpose as determined by the criteria in 23 CFR 774.13(d); that is, when one of the following criteria for temporary occupancy are not met:

- The duration of the occupancy must be less than the time needed for the construction of the project, and no change of ownership occurs;

- Both the nature and magnitude of the changes to the Section 4(f) land are minimal;
- No permanent adverse physical changes, nor interference with activities or purposes of the resources on a temporary or permanent basis, are anticipated;
- The land must be returned to a condition that is at least as good as existed prior to the project; and
- There is documented agreement with the appropriate Federal, State, or local officials having jurisdiction over the land that the above conditions have been met.

(iii) When there is a **constructive use** of a Section 4(f) property. As defined in 23 CFR 774.15, a constructive use occurs when the transportation project does not incorporate land from a Section 4(f) property, but the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired. The degree of impact and impairment must be determined in consultation with the officials with jurisdiction in accordance with 23 CFR 774.15(d)(3).

(iv) A *de minimis* impact involves the use of Section 4(f) property that is generally minor in nature. A *de minimis* impact is one that, after taking into account avoidance, minimization, mitigation and enhancement measures, results in no adverse effect to the activities, features, or attributes qualifying a park, recreation area, or refuge for protection under Section 4(f). For historic properties, a *de minimis* impact is one that results in a Section 106 determination of "no adverse effect" or "no historic properties affected." A *de minimis* impact determination requires agency coordination with the officials having jurisdiction over the Section 4(f) property and opportunities for public involvement. A *de minimis* impact determination may not be made when there is a constructive use.

4.3.3 Identification of Section 4(f) Properties

FHWA must comply with 23 CFR 774.7(e) when tiered NEPA documents such as the Bay Crossing Study Tier I EIS are prepared. A Section 4(f) approval may involve different levels of detail where the Section 4(f) involvement is addressed in a tiered EIS under 23 CFR 771.111(g). When the first-tier, broad-scale EIS is prepared, the detailed information necessary to complete the Section 4(f) approval may not be available at that stage in the development of the action. In such cases, the documentation should address the potential impacts that a proposed action will have on Section 4(f) property and whether those impacts could have a bearing on the decision to be made.

The affected environment under consideration in Tier 1 consists of Corridors 6, 7, and 8, which collectively comprise the CARA. The Tier 1 NEPA Study has defined existing and future transportation conditions and needs at the Bay Bridge, identified broad corridor alternatives, documented the corridor alternative screening process, identified the most reasonable CARA, evaluated the potential environmental impacts of the CARA, and presented recommendations for one preferred corridor alternative to be advanced into a Tier 2 study. The scope of these activities does not provide information sufficient to complete a preliminary Section 4(f) evaluation. Pursuant to 23 CFR 774.7(e) and guidance from the 2012 Section 4(f) Policy Paper, MDTA has inventoried known Section 4(f) properties within the CARA. In the event BCS proceeds to Tier 2, FHWA would prepare a Section 4(f) evaluation to identify and evaluate any potential use of Section 4(f) property, in accordance with 23 CFR 774. This process is outlined below in **Section 0**.

4.3.4 Parks, Recreation Areas, Wildlife and Waterfowl Refuges

A variety of public parks, recreation areas, and wildlife and waterfowl refuges have been identified within the CARA. **Table 4-17** summarizes the number and area of parks, recreation areas, wildlife, and waterfowl refuges that could potentially be affected if Tier 1 concludes with the identification of a corridor as the Selected Alternative. The size of each Section 4(f) property is sourced from the official with jurisdiction (OWJ) over the property or, if no information was available, from SDAT data. Information is provided in acres, unless otherwise noted. The area shown represents the full size of the property, including any area that may be outside the CARA. If the No-Build is identified as the Selected Alternative, no Section 4(f) properties would be affected.

There are eight Section 4(f) public parks, recreation areas, and wildlife and waterfowl refuges in Corridor 6, 12 in Corridor 7, and 11 in Corridor 8. The parks, recreation areas, and wildlife and waterfowl refuges are scattered throughout each of the corridors, though a number are concentrated along the shoreline of the Chesapeake Bay. Owing to the vastness of the Smithsonian Environmental Research Center, the area of Section 4(f) public lands in Corridor 8 is more than twice as much as Corridor 6 and nearly three times greater than in Corridor 7. If a corridor is identified as the Selected Alternative, Tier 2 activities would include further examination of alignments and evaluation of the relevant parks, recreation areas, and wildlife and waterfowl refuges listed below to avoid or minimize impacts.

Table 4-17: Inventory of Section 4(f) Public Lands in the CARA

ID	SECTION 4(f) PROPERTY	TOTAL SIZE (ACRES)	AREA WITHIN CORRIDOR	COUNTY	OFFICIAL WITH JURISDICTION
Corridor 6					
1	Beachwood Park	60	57	Anne Arundel	Anne Arundel County Recreation and Parks
2	Jacobsville Park	30	25	Anne Arundel	Anne Arundel County Recreation and Parks
3	Lake Shore Athletic Complex	180	155	Anne Arundel	Anne Arundel County Recreation and Parks
4	Magothy Greenway Natural Area	390	157	Anne Arundel	Anne Arundel County Recreation and Parks
5	Bodkin Park	20	20	Anne Arundel	Anne Arundel County Recreation and Parks
6	Compass Pointe Golf Courses	~800	334	Anne Arundel	Anne Arundel County Recreation and Parks
7	Downs Park	240	234	Anne Arundel	Anne Arundel County Recreation and Parks
8	Route 18 Park	50	50	Queen Anne's	Queen Anne's County Parks & Recreation
Total Area of Public Lands in Corridor 6				**1,032 Acres**	

ID	SECTION 4(f) PROPERTY	TOTAL SIZE (ACRES)	AREA WITHIN CORRIDOR	COUNTY	OFFICIAL WITH JURISDICTION
Corridor 7					
1	Broadneck Park	46	46	Anne Arundel	Anne Arundel County Recreation and Parks
2	Bay Head Park	30	24	Anne Arundel	Anne Arundel County Recreation and Parks
3	Cape St. Claire Park	20	15	Anne Arundel	Anne Arundel County Recreation and Parks
4	Sandy Point State Park	790	750	Anne Arundel	Maryland Department of Natural Resources
5	Terrapin Nature Area	280	262	Queen Anne's	Queen Anne's County Parks & Recreation
6	Old Love Point Park	30	30	Queen Anne's	Queen Anne's County Parks & Recreation
7	Cross Island Trail	6 miles[1]	~1.1 miles	Queen Anne's	Queen Anne's County Parks & Recreation
8	Long Point Park	<10	4	Queen Anne's	Queen Anne's County Parks & Recreation
9	Ferry Point Park	40	40	Queen Anne's	Queen Anne's County Parks & Recreation
10	Mowbray Park	20	6	Queen Anne's	Queen Anne's County Parks & Recreation
11	Grasonville Park	40	28	Queen Anne's	Queen Anne's County Parks & Recreation
12	Grasonville School Playground	<10	< 10	Queen Anne's	Queen Anne's County Public Schools
Total Area of Public Lands in Corridor 7				**1,215 Acres**	
Corridor 8					
1	Riva Area Park	100	60	Anne Arundel	Anne Arundel County Recreation and Parks
2	Kings Branch Park	20	13	Anne Arundel	Anne Arundel County Recreation and Parks
3	Central Avenue Park	40	36	Anne Arundel	Anne Arundel County Recreation and Parks

ID	SECTION 4(f) PROPERTY	TOTAL SIZE (ACRES)	AREA WITHIN CORRIDOR	COUNTY	OFFICIAL WITH JURISDICTION
4	Loch Haven Park	30	4	Anne Arundel	Anne Arundel County Recreation and Parks
6	Beverly Triton Nature Park	340	340	Anne Arundel	Anne Arundel County Recreation and Parks
7	Mayo Beach Park	30	20	Anne Arundel	Anne Arundel County Recreation and Parks
8	Smithsonian Environmental Research Center	2,800	300	Anne Arundel	Smithsonian Institute
9	Talbot County Community Sports Complex	50	50	Talbot	Talbot County Parks and Recreation
10	Hog Neck Golf Course	280	247	Talbot	Talbot County Parks and Recreation
Total Area of Public Lands in Corridor 8				**1,143 Acres**	

Note: The length of the cross-island trail is not included in the total area of public lands. The true area of the trail is unknown because the width of the trail varies along its distance. Total area of parks is rounded to closest 10 acres. Area of parks within each corridor is rounded to the nearest acre. Acres within the corridor does not reflect the acreage of potential Section 4(f) use.

4.3.5 Historic Sites

MDTA has inventoried 29 recorded historic sites within the CARA. There are two in Corridor 6, 13 in Corridor 7, and 14 in Corridor 8. In addition to the recorded historic sites, MDTA has identified nine additional archaeological sites that are listed in the NRHP or eligible for listing in the NRHP. There are four in Corridor 8 and 5 in Corridor 9. Archaeological sites are only subject to Section 4(f) if they possess value for preservation in place. No determination on whether these sites possess value for preservation in place will be made during Tier 1. Coordination with the official with jurisdiction, MHT, is required to obtain a lack of objection that archaeological sites possess minimal value for preservation in place. This coordination would take place during Tier 2. **Table 4-18** summarizes the known historic sites that could potentially be affected if Tier 1 concludes with the identification of a corridor as the Selected Alternative. If Tier 1 identifies the No-Build as the Selected Alternative, no Section 4(f) Historic Sites would be affected. The official with jurisdiction over historic sites in Maryland is the MHT. The ACHP is also participating in Section 106 Consultation for the Bay Crossing Study and is also an OWJ over Historic Sites. The greatest number of historic sites is within Corridor 8. MDTA has also identified one NHL – the United States Naval Academy, in Corridor 7. The National Park Service is an additional OWJ over NHLs. Impacts to NHLs warrant more stringent consultation under Section 106 as outlined in 36 CFR 800.10, up to and including involvement of the Secretary of the Interior (36 CFR 800.10(c)). Only a small portion of the U.S. Naval Academy is within Corridor 7 and impacts are likely to be avoided.

Table 4-18: Inventory of Section 4(f) Historic Sites

ID	SECTION 4(f) PROPERTY	SIZE (ACRES)	AREA WITHIN CORRIDOR	COUNTY
Corridor 6				
1	Bachelor's Hope	1	1	Queen Anne's
2	Reed's Creek Farm	158	158	Queen Anne's
Area of Historic Sites in Corridor 6		**159**		
Corridor 7				
1	Howard's Inheritance	<1	< 1	Anne Arundel
2	US Naval Academy (NHL)	~270	< 1	Anne Arundel
3	Sandy Point Farm House	18	15	Anne Arundel
4	William Preston Lane Jr Memorial Bridge (EB)	91	91	Anne Arundel
5	William Preston Lane Jr Memorial Bridge (WB)	96	96	Anne Arundel
6	Weems Creek Bridge (Bridge 2081)	2	2	Anne Arundel
7	Stevensville Historic District	57	57	Queen Anne's
8	Christ Church	1	1	Queen Anne's
9	Cray House	<1	<1	Queen Anne's
10	Stevensville Bank	<1	<1	Queen Anne's
11	White's Heritage	140	139	Queen Anne's
12	Barnstable Hill, Lowery Farm	75	52	Queen Anne's
13	Kent Narrows Bridge (SHA Bridge 170600)	3	3	Queen Anne's
Area of Historic Sites in Corridor 7		**460**		
Corridor 8				
1	Davidsonville Historic District	15	15	Anne Arundel
2	South River Club	1	1	Anne Arundel
3	Summer Hill	5	5	Anne Arundel
4	Mount Airy	25	23	Anne Arundel
5	Indian Range	5	5	Anne Arundel
6	All Hallow's Church	2	2	Anne Arundel
7	Gresham	5	5	Anne Arundel
8	Bloody Point Bar Light	< 1	< 1	Queen Anne's
9	Sherwood Manor	20	20	Talbot
10	Skipjack Claude W. Somers[1]	2	2	Talbot
11	Hope House	76	76	Talbot
12	Wye Town Farm House	8	6	Talbot
13	Unionville[2]	Unknown	Unknown	Talbot
14	Rich Neck Manor	787	~350	Talbot

ID	SECTION 4(f) PROPERTY	SIZE (ACRES)	AREA WITHIN CORRIDOR	COUNTY
Area of Historic Sites in Corridor 8		**511**		

1. The Claude W. Somers was listed in the NRHP in 1985 at this location. The skipjack was removed to the Reedville Fishermen's Museum in 2000 for restoration. When not in use for fishing or heritage tours, the boat has been moored in Virginia since that time. The boat was listed in the NRHP in Virginia in 2005 and is no longer docked in Talbot County. For purposes of this inventory, however, the area of the historic boundary is included in the additive total.
2. The MIHP form and NRHP eligibility determination for Unionville does not identify or justify boundaries of the historic district. The area is not included in the total.
3. There are four recorded archaeological sites in Corridor 7 and five recorded Archaeological sites in Corridor 8 that are listed in the NRHP or have been determined eligible for listing in the NRHP. A determination on whether these archaeological sites have value for preservation in place will be made during Tier 2. To maintain the integrity of archaeological resources, the locations of these archaeological sites are not identified.

All areas rounded to closest 1 acre.

Should one of the CARA be identified as the Selected Alternative at the conclusion of Tier 1, Tier 2 activities would include identifying additional historic sites through Section 106 consultation per 36 CFR 800.4. The Tier 2 study would include the development and consideration of alignment alternatives within the Selected Corridor to determine if avoidance alternatives would be feasible and prudent.

4.3.6 Section 4(f) Property within the Affected Environment

Table 4-19 presents the total area of Section 4(f) Properties within each of the CARA.

Table 4-19: Total Area of Section 4(f) Properties within Affected Environment

CARA	NUMBER OF SECTION 4(f) PUBLIC LANDS	AREA OF SECTION 4(f) PUBLIC LANDS	NUMBER OF SECTION 4(f) HISTORIC SITES	AREA OF SECTION 4(f) HISTORIC SITES	TOTAL NUMBER OF SECTION 4(f) PROPERTIES	TOTAL AREA OF SECTION 4(f) PROPERTIES
Corridor 6	8	1,030	2	160	10	1,190
Corridor 7	12	1,220	13	460	25	1,680
Corridor 8	10	1,140	14	510	24	1,650

Note: Public lands area and total areas rounded to closest 10 acre. Historic sites area rounded to closest 1 acre.

4.3.7 Subsequent Tier 2 Analysis of Section 4(f) Properties

The area of Section 4(f) property presented in **Table 4-19** is preliminary because identification of historic properties is being phased as part of the Section 106 process. No new identification of historic properties has taken place during Tier 1. Evaluation of historic significance of unevaluated properties would take place during Tier 2.

During environmental compliance efforts associated with Tier 2, a project-level Section 4(f) evaluation will be completed, and permanent and temporary uses, as well as *de minimis* impact determinations, will be prepared. Coordination with the official(s) with jurisdiction over historic sites would determine if any of the archaeological sites listed in the NRHP or eligible for listing in the NRHP has value for preservation in place. The Section 4(f) evaluation would include development of avoidance alternatives, identification of

measures to minimize harm and potentially a least overall harm analysis, as required. Consultation with officials with jurisdiction over Section 4(f) properties will continue during Tier 2 activities. According to FHWA guidance, "like Section 4(f), Section 106 of the National Historic Preservation Act (NHPA) of 1966 also mandates consideration of a project's effect on historic sites. The most important connection between the two statutes is that the Section 106 process is generally the method by which historic properties are identified that would be subject to consideration under Section 4(f). The results of the identification step under Section 106 - including the eligibility of the resource for listing on the NRHP, the delineation of NRHP boundaries, and the identification of contributing and non-contributing elements within the boundary of a historic district—are a critical part of determining the applicability of Section 4(f) and the outcome of the Section 4(f) evaluation. Whereas Section 106 is concerned with adverse effects, Section 4(f) is concerned with use. The two terms are not interchangeable and an adverse effect determination under Section 106 does not automatically equate to a Section 4(f) use of the property"(FHWA Environmental Review Toolkit, Section 4(f) Tutorial).

4.3.8 Section 6(f) Properties

This section provides a preliminary assessment of Section 6(f) properties as part of this Tier 1 Draft EIS. If a corridor is identified as the Selected Alternative, FHWA will determine the need for additional Section 6(f) evaluation as part of Tier 2 NEPA.

Section 6(f) is part of the Land and Water Conservation Fund Act (LWCF) of 1965, which provides funds and matching grants to federal, state, and local governments for the acquisition of land and water for recreational purposes. Section 6(f) states those properties acquired or improved with LWCF appropriations shall not be converted to a use other than public outdoor recreation without the approval of the U.S. Secretary of the Interior, acting through the NPS and at the request of the state delegate/state liaison officer. Under the LWCF Act, if a Section 6(f) property or a portion of a property is converted to non-recreational use, replacement of the property is required.

Section 6(f) properties are solely classified based on acquisition or improvements made using LWCF money. This makes properties difficult to identify with certainty at a desktop level. In Tier 1, the public lands inventoried for Section 4(f) (**Table 4-17**) have the potential to be Section 6(f) properties. FHWA and MDTA will coordinate with State and local governments in Tier 2 to determine if LWCF appropriations were used in the acquisition or improvements of any public lands that could be impacted by a future Tier 2 alternative.

If one of the CARA is selected in the Tier 1 ROD, the Tier 2 alignments could result in impacts to Section 6(f) properties. Potential mitigation, minimization and avoidance strategies could include design or construction modifications to avoid the conversion of all or a portion of a Section 6(f) property to a non-recreational use; the incorporation of natural design features such as landscape plantings or earthen berms; and/or identifying replacement parklands.

Analysis conducted as part of Tier 2 NEPA would conclude whether a conversion of any Section 6(f) property would occur and identify mitigation strategies and measures that would avoid or minimize these impacts. Under LWCF, any conversion of Section 6(f) property to a non-recreational use must meet the following requirements:

- A conversion request must be made by the state liaison to the appropriate regional office of the NPS.
- All practical measures to avoid the conversion shall be evaluated.
- The fair market value of the property shall be established
- The property proposed for replacement must be "reasonably equivalent" in terms of usefulness and location of the property being converted.
- The property being converted shall be evaluated to identify which recreational needs are being fulfilled and opportunities available. Likewise, it also requires that property being proposed for replacement shall be evaluated to determine if it would meet the needs of the recreational opportunities lost.
- All other relevant agency coordination has been completed, including Section 4(f).
- The proposed conversion and replacement are in accordance with each state's Statewide Comprehensive Outdoor Recreation Plan.

4.4 NATURAL RESOURCES

4.4.1 Introduction and Methodology

This section of the DEIS provides a broad view of key sensitive natural resources within the limits of the three CARA via an examination, using existing GIS resources, of where those natural resources are most prevalent. Sensitive resources determined to be relevant for this level of analysis include the following:

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

Natural resources within the two-mile wide corridors were identified based on agency input throughout the scoping process, review of existing available scientific literature, GIS databases and mapping, and field reconnaissance of the corridor study areas conducted in June 2019. The agency input included recommendations from federal and state agencies concerning the natural resources relevant to this study and the datasets and information available for the associated natural resource. Field reconnaissance was conducted to document general characteristics and existing conditions but did not involve detailed investigations to determine the limits of jurisdictional resources. The ***BCS Natural Resource Technical Report*, *Appendix A*** includes a series of photos that generally depict existing natural resources within each corridor, concentrating on large undisturbed forested areas, areas within the Critical Area, wetlands and open waters, and public lands.

Table 4-20 below is a summary table of existing mapped natural resources for each corridor. This table summarizes the information on the individual tables provided for each natural resource category in **Section 4.4** below.

Existing natural resources have been quantified using the limits of the study area for each of the three corridors and overlaying existing GIS-based natural resource data layers. This level of analysis provides a relative comparison of existing natural resources associated with each study area corridor but does not quantify actual impacts associated with a defined limit of disturbance.

Table 4-20: Summary of Existing Natural Resources

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

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

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

- Chesapeake Bay Critical Area Commission (CAC)
- Federal Emergency Management Administration (FEMA)
- Federal Highway Administration (FHWA)
- Maryland Dept. of the Environment (MDE)
- Maryland Dept. of Natural Resources (MDNR)
- Maryland Natural Heritage Program (MHT)
- National Oceanic and Atmospheric Administration (NOAA)

- U.S. Army Corps of Engineers (USACE)
- U.S. Dept. of Transportation (USDOT)
- U.S. Environmental Protection Agency (USEPA)
- U.S. Fish and Wildlife Service (USFWS)

4.4.2 Wetlands, Surface Waters, Water Quality and Drinking Water Supply

Wetlands and Surface Waters

At the Federal level, jurisdictional Waters of the U.S. (WOTUS), which includes wetlands and surface waters, are afforded regulatory protection under numerous sections of the Clean Water Act (CWA), including Section 404. Regulations adopted pursuant to CWA Section 404 also identify jurisdictional wetlands as Special Aquatic Sites. Special Aquatic Sites are defined in part in 40 CFR Part 230.3 (q-1) as "areas possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values." The U.S. Environmental Protection Agency (USEPA) and U.S. Army Corps of Engineers (USACE) share responsibility for implementing Section 404, which specifically regulates dredge and fill activities affecting WOTUS.

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

Section 404 regulations at 40 CFR Part 230.3(t) defines a jurisdictional wetland as follows:

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

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

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

The limits of the study areas associated with Corridors 6, 7, and 8 were overlain with the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) and the Maryland Department of Natural Resources (MDNR) wetlands, Wetlands of Special State Concern (WSSC), and mapped surface waters GIS

layers to provide a comparative analysis of existing conditions and potential impacts associated with each two-mile wide corridor.

The total amount of mapped non-tidal wetlands, tidal wetlands, which includes open waters of the Bay, and linear feet of surface water resources associated with tributary rivers and streams located within each of the three study corridors is provided in **Tables 4-21**, **4-22**, and **4-23** below. Also provided in the tables is the percentage of mapped resource area to total corridor study area.

The Watershed Resources Registry (WRR) is a planning level tool that identifies and prioritizes watershed resources, including wetlands, by their potential for restoration and preservation. The State of Maryland, with input from multiple state and federal natural resource and transportation agencies, developed the WRR as a tool to evaluate watershed resource impacts associated with large-scale transportation projects during the project planning stages.

The WRR provides a comparative analysis by assigning a point value between one and five, with five representing the highest value, to potential wetland preservation areas. The limits of the study areas were overlain with the WRR Wetland Preservation GIS layer to determine the total acreage of wetland preservation areas with a point value of four or five. An assigned value of four or five represents the wetland areas with the highest potential to provide ecological benefits to their associated watershed. The results of this comparative analysis are provided in **Table 4-22** below.

Table 4-21: Mapped Non-Tidal Wetlands and WSSC

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

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

Table 4-22: Mapped Tidal Wetlands

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

Note: values rounded to closest 10.

Table 4-23: Mapped Surface Waters

CORRIDOR	RIVER AND STREAM SURFACE WATERS (LF)	SURFACE WATERS OF THE BAY (ACRES)	SURFACE WATER PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	344.380	18,080	52%
7	394,020	9,600	34%
8	471,890	24,480	52%

Note: values rounded to closest 10.

Table 4-24 below provides a breakdown of the MDNR mapped wetlands within each corridor by the associated Cowardin wetland classification code and percentage of the wetland classification area relative to the total amount of mapped resource. Cowardin wetland classification codes used for this analysis are as follows:

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

According to the data, the vast majority of mapped MDNR wetlands identified within the corridors are classified as Estuarine (ES) followed by a relatively large percentage of PFO wetlands. ES wetlands consist of deepwater tidal habitats and adjacent tidal wetlands that are typically semi-enclosed by land. MDE defines tidal wetlands as all State and private tidal wetlands, marshes, submerged aquatic vegetation, lands, and open water within the Chesapeake and its tidal tributaries, the Coastal Bays and their tidal tributaries, and the Atlantic Ocean to a distance of 3 miles offshore of the low water mark. The remaining classifications are all associated with non-tidal wetland or waters. The percentage distribution of wetland types is relatively uniform between the three corridors (**Table 4-24**).

Table 4-24: Mapped MDNR Wetlands by Cowardin Wetland Classification/Percentage of Total

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

Water Quality

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

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

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

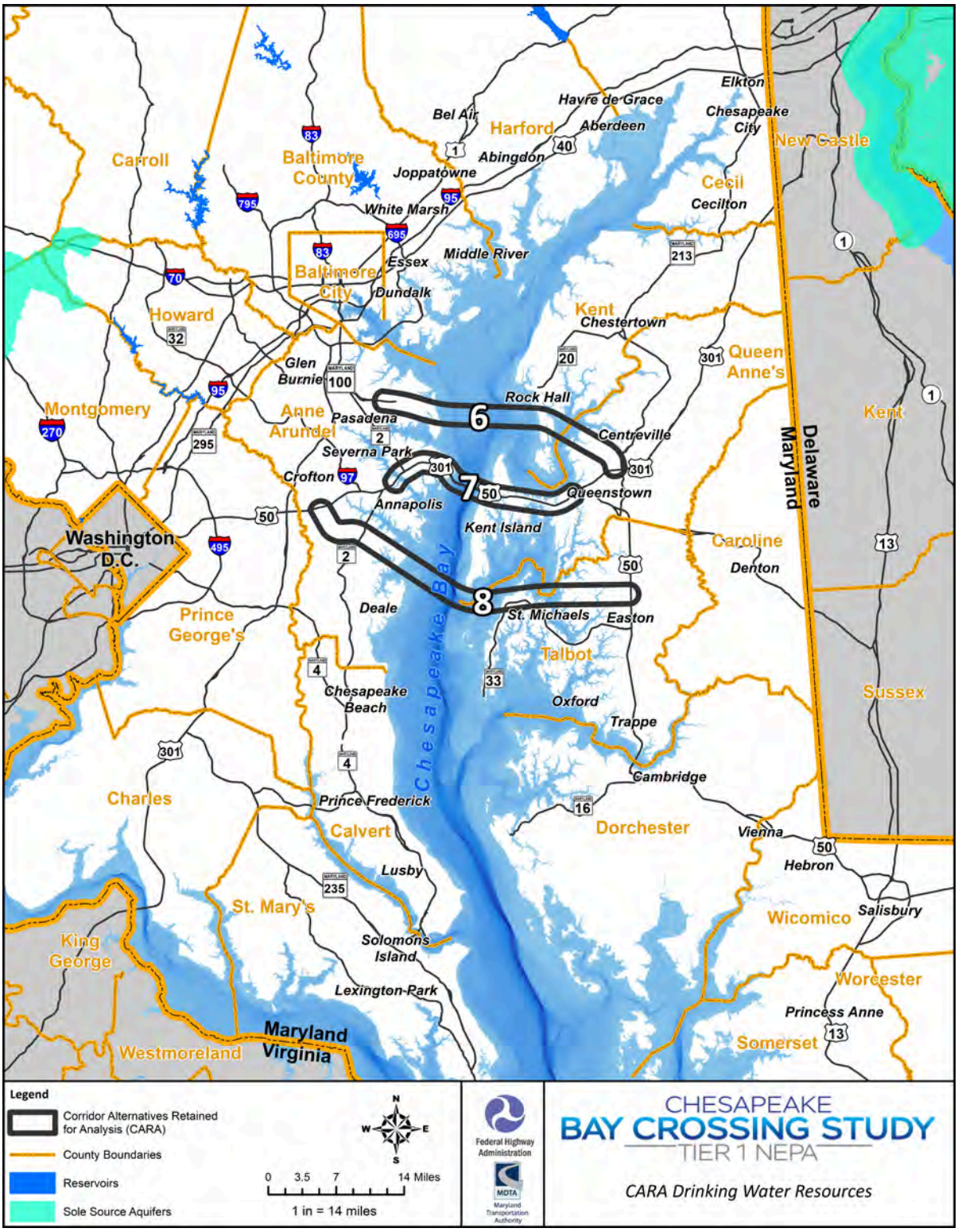
Chesapeake Bay Executive Order (EO) 13508, Chesapeake Bay Protection and Restoration, dated May 12, 2009 required a Federal Leadership Committee to prepare and publish a multi-phased strategy to guide efforts to protect and restore the Chesapeake Bay. One of these strategies is how to improve the overall water quality. EO 13508 was issued because, despite significant efforts by Federal, State, and local governments, existing State water quality standards and the "fishable and swimmable" goals of the CWA have not been attained for the Chesapeake Bay. Part 3 of the EO defines the Water Pollution Control Strategies and how the EO can "make full use of its authorities under the Clean Water Act to protect and restore the Chesapeake Bay and its tributary waters and, as appropriate, shall consider revising any guidance and regulations." Project alternatives carried forward to a Tier 2 analysis must address how it complies with all applicable aspects of EO 13508, including water quality.

Drinking Water

A search of online resources was conducted to determine whether the study area corridors intersected with any Sole Source Aquifers (SSA) or drinking water reservoirs. According to the EPA's National GIS database there were no SSA's within the study area limits of the three study area corridors (**Figure 4-5**). Also, according to MDNR's Maryland Geological Survey, there are no drinking water supply reservoirs within the limits of study area corridors (**Figure 4-5**). GIS layers of Wellhead Protection Areas (WHPA) are not available for Maryland.

WHPAs require a field delineation or a request can be made to MDE's Water Supply Program to assist in defining the area. MDE will review all delineations in accordance with the standard methods developed for different hydrogeologic conditions. Assessment of WHPAs would occur during a Tier 2 NEPA study.

Figure 4-5: CARA Drinking Water Resources



4.4.2.1 Corridor 6

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

The majority of the mapped wetlands, excluding the tidal open waters, associated with Corridor 6 are located east of the Bay, just south of Rock Hall, MD (**Figures 4-6** and **4-7**).The extreme western portion of the corridor, along MD 177, is highly developed and consists largely of retail establishments and residential development along both sides of the roadway with little to no mapped wetlands. The largest concentration of mapped NWI and MDNR wetlands within the western portion of Corridor 6, west of the Bay, are located between North Shore Road and Hickory Point Road and were identified both north and south of MD 177. This area also contains the 80 acres of mapped WSSC. The WSSC are associated with Fresh Pond, the Magothy Greenway Natural Area, and the North Greys Creek Bog Tributary. The eastern side of the Bay is more rural in nature and consists largely of farmland and low-density residential housing. The majority of the mapped wetlands in this area are located east of MD 445 (Eastern Neck Island Road). On the eastern side of the Chester River, near the town of Centreville, the mapped wetlands are concentrated along the river shoreline with sparse concentrations as the corridor continues east. Based on the location of mapped wetland resources within Corridor 6, the largest amount of impacts would likely occur within the eastern section of the corridor just south of Rock Hall with the least amount of potential impacts within the western section of the corridor, between Pasadena, MD and the western shoreline of the Bay.

Corridor 6 contains approximately 344,380 linear feet of mapped surface waters associated with tributary rivers and streams, (**Figure 4-8**). Beginning in the western section, before reaching the Bay, the corridor intersects multiple mapped surface waters including, from west to east, Baily's Branch, Rock Creek, Brookfield Branch, Beachwood Branch, Nanny's Branch, Main Creek, South Greys Creek, North Greys Creek, Cornfield Creek, and Locust Cove Creek. Generally, surface waters on the north side of MD 177 drain north while surface waters on the south side of MD 177 drain south. The surface waters west of the Bay are classified as Use Class I until they reach the limits of tidal influence where they are classified as Use Class II. On the east side of the Bay, between the Bay and the Chester River, Corridor 6 intersects with the lower stem of the Chester River, Church Creek, and Grays Inn Creek. On the east side of the Chester River, near the town of Centreville, the corridor intersects with Corsica River tributaries, Chester River tributaries, Grove Creek, Reed Creek, Earle Creek, Mill Stream and Gravel Run. Mill Stream and Gravel Run are classified as Tier II High Quality Waters. The surface waters located west of the Bay are classified as Use Class I until they reach the limits of tide where they become Use Class II.

Figure 4-6: NWI Resources

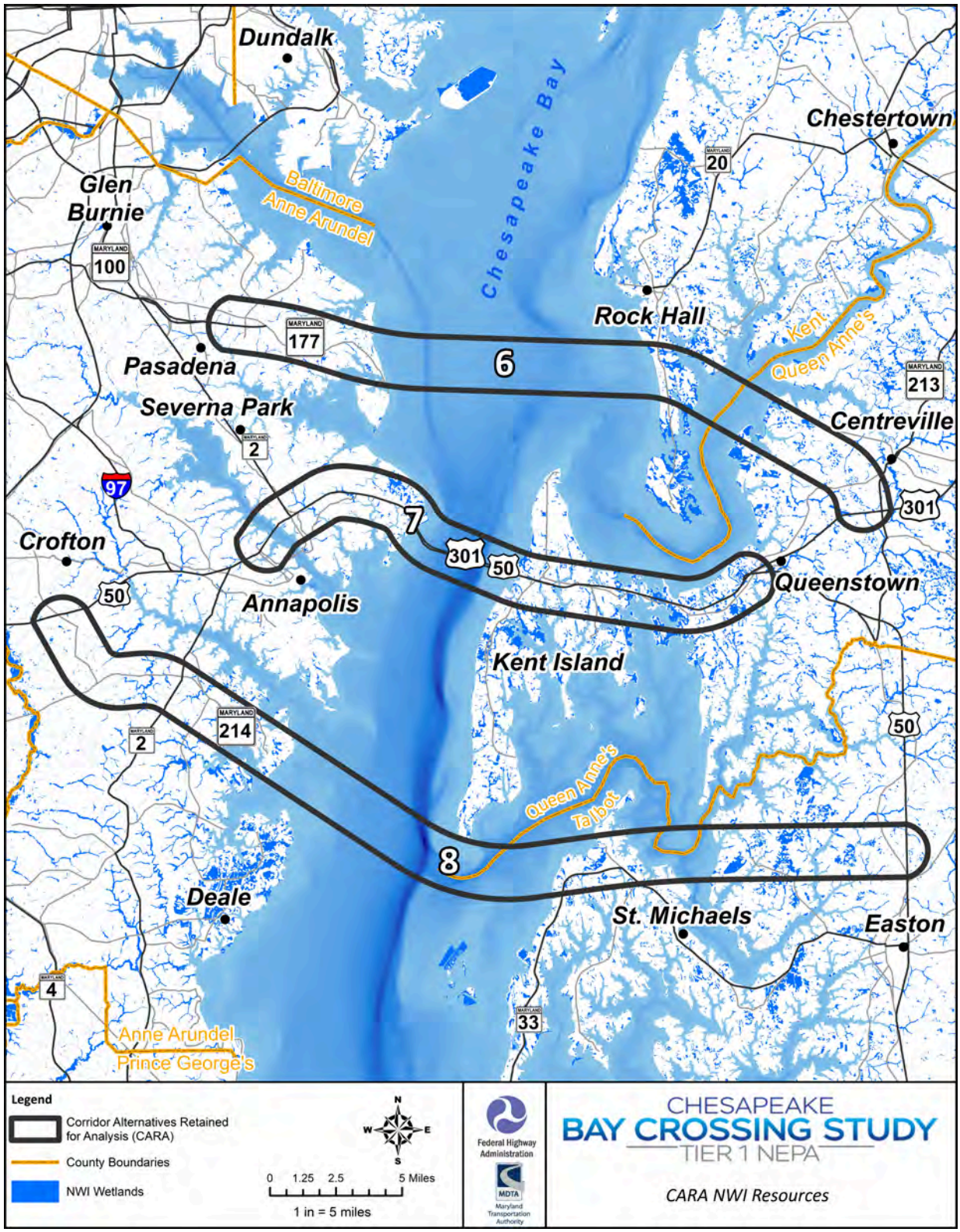


Figure 4-7: DNR Wetlands and Wetlands of Special State Concern

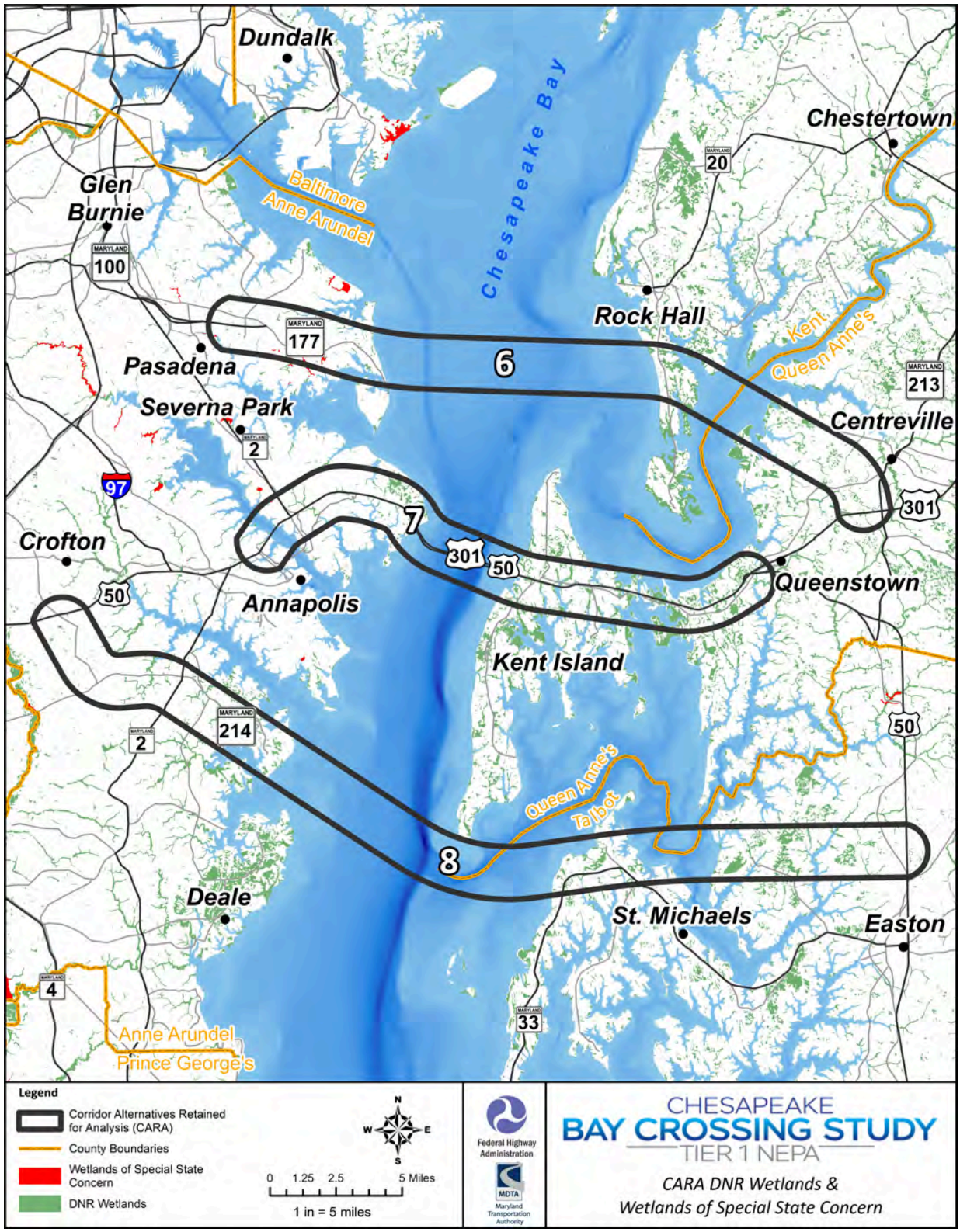
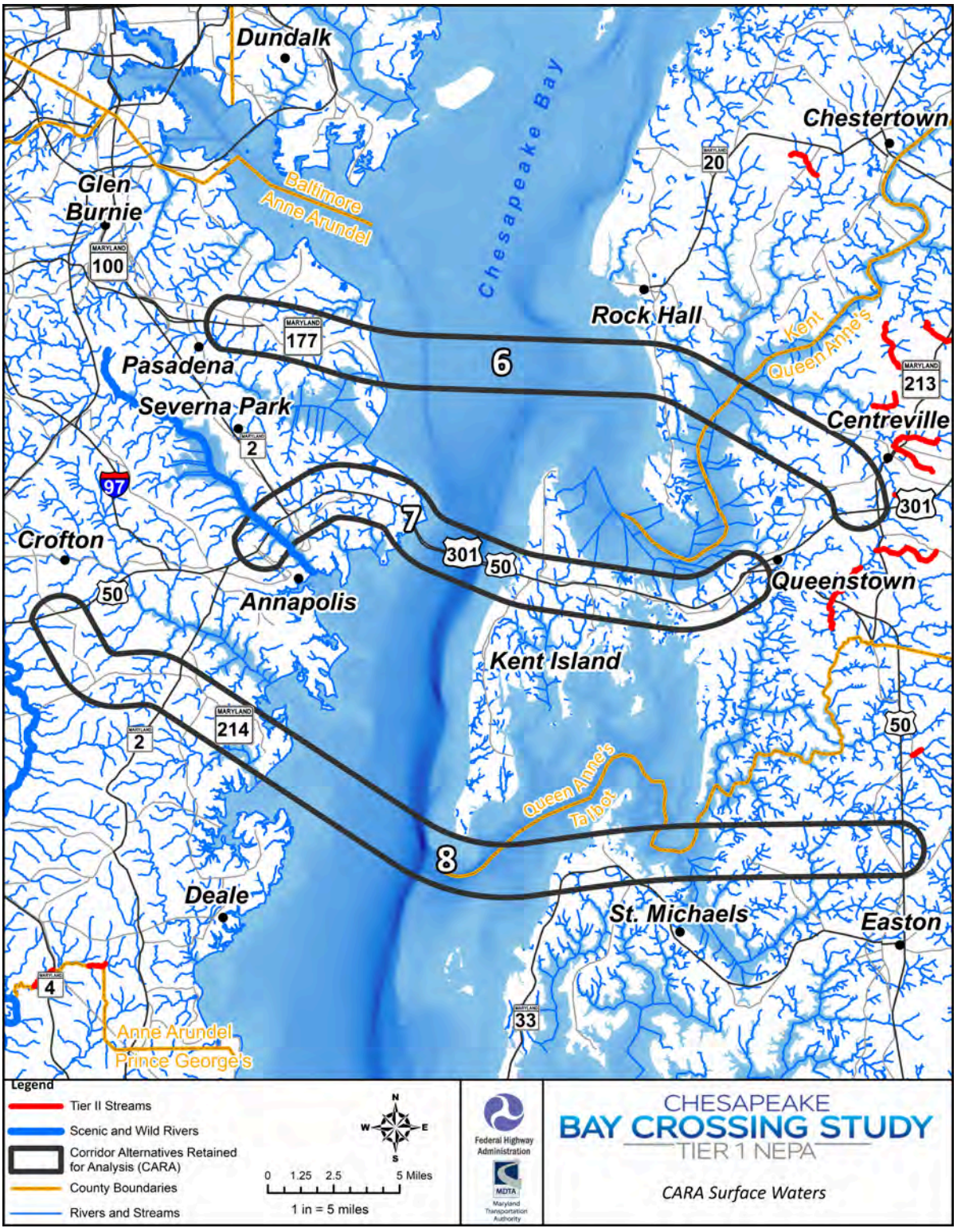


Figure 4-8: Surface Waters



4.4.2.1 Corridor 7

Corridor 7 includes the existing Bay Bridge alignment and contains approximately 1,520 acres of mapped non-tidal NWI wetlands, 1,500 acres of mapped non-tidal MDNR wetlands, and 10 acres of mapped WSSC.

Mapped non-tidal wetlands constitute approximately 5 percent of the total area associated with Corridor 7. Corridor 7 also contains approximately 10,870 acres of mapped tidal wetlands, of which, 9,600 acres consist of open waters of the Bay. The remaining tidal wetlands consist of coastal wetlands influenced by the tidal range of the Chesapeake Bay. Tidal wetlands constitute approximately 34 percent of the total corridor study area.

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

Corridor 7 contains approximately 394,020 linear feet of mapped surface waters associated with tributary rivers and streams, (**Figure 4-8**). The western portion of the corridor intersects with the Severn River and multiple tributaries to the Severn River within the extreme western portion of the study area. The Severn River is classified as a Wild and Scenic River. Because of this classification, potential impacts to the Severn River and its viewshed would need to be coordinated with MDNR at a later phase. Continuing east, Corridor 7 intersects with Mill Creek, Whitehall Creek, and Meredith Creek before spanning the Bay. As it continues east across the Bay, Corridor 7 intersects with Thompson Creek and Cox Creek on Kent Island, and the Wye River and Wye River East within the eastern portion of the corridor. The Wye River is classified as a Tier II High Quality Water. The larger, tidal waters associated with Corridor 7 are classified as Use Class II waters, while the smaller, non-tidal tributaries are classified as Use Class I.

4.4.2.2 Corridor 8

Corridor 8 contains approximately 2,270 acres of mapped non-tidal NWI wetlands, 2,080 acres of mapped non-tidal MDNR wetlands. Mapped non-tidal wetlands constitute approximately 5 percent of the total area associated with Corridor 8. Corridor 8 also contains approximately 24,940 acres of mapped tidal wetlands, of which, 24,480 acres consist of open waters of the Bay. The remaining tidal wetlands consist

of coastal wetlands influenced by the tidal range of the Chesapeake Bay. Tidal wetlands constitute approximately 53 percent of the total corridor study area. This represents the highest total of mapped NWI and MDNR wetlands of the three corridors (**Figures 4-6** and **4-7**). There are no WSSC identified within the limits of Corridor 8.

The western portion of Corridor 8 begins just south of Crofton, at the intersection of US 50/301 and MD 424 and extends southeast to the Bay. This portion of the corridor consists largely of low density residential development and farmland. The majority of the mapped wetlands within the western section of the corridor are located adjacent to the Bay with sparsely mapped wetlands west of MD 2. The highest concentration of mapped wetlands within Corridor 8 are located north of MD 33, near the town of St. Michaels, and between the Bay and US 50, along the Eastern Shore. This section of Corridor 8 consists primarily of low-density residential and farmland. Based on the location of mapped wetland resources within the limits of Corridor 8, the largest amount of potential impacts would occur within the eastern extent of the corridor, along the Eastern Shore. The least amount of potential impact would occur within the western extent of the corridor, west of MD 2.

Corridor 8 contains approximately 471,890 linear feet of mapped surface water. (**Figure 4-8**). Between US 50 and the Bay, Corridor 8 bisects several smaller streams including Tarnans Branch, several unnamed tributaries to the Patuxent River, Flat Creek, Chandlers Branch, Kings Branch, Marriots Branch, Davidsonville Branch, Beards Creek, Glebe Branch, Pocahontas Creek, Bear Neck Creek, Sellman Creek, and, as the corridor approaches the bay, the tidal South River and the Rhode River. The non-tidal tributaries in this area are classified as Use Class I while the tidal systems are classified as Use Class II. As it continues east across the Bay, Corridor 8 intersects with the tidal Harris Creek, Broad Creek, Edge Creek, Tred Avon River, the Choptank River, and several non-tidal tributaries to these systems. The non-tidal tributaries in this area are classified as Use Class I while the tidal systems are classified as Use Class II. There are no mapped Wild and Scenic Rivers within the limits of Corridor 8. The watershed for Kings Creek, a Tier II High Quality Water, is located within eastern portion of Corridor 8.

4.4.2.3 Conclusions

Results of the GIS based mapping data for wetlands and surface waters indicate that the highest total of mapped non-tidal, tidal wetland, and waters resources are associated with Corridor 8. This includes the total surface area of open waters of the Bay. Corridor 8 also contains the highest amount of mapped tributary rivers and streams. The lowest total amount of mapped non-tidal and tidal wetlands is associated with Corridor 7.

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

For unavoidable impacts, mitigation will follow the replacement guidelines associated with the regulatory permit requirements applicable at the time of construction. Typically, mitigation includes replacing the impacted wetland areas with wetlands of similar functions and values, ideally as geographically close to

the area of the impacted wetlands as possible. The ratio of replacement wetland to acres of impacts varies depending on whether the mitigation provides for similar functions and values, occur in the same watershed, and other factors. For impacts to streams, maintaining naturalized stream corridors and aquatic passage at newly constructed road crossings or road widening areas will be a priority.

4.4.3 FEMA 100-Year Floodplain

The 100-year floodplain is the land that is predicted to flood during a 100-year storm, which has a 1-percent chance of occurring in any given year. Based on the expected 100-year flood flow rate, the flood water level can be mapped as an area of inundation. The resulting floodplain map is referred to as the 100-year floodplain. Impacts to the jurisdictional 100-year floodplain associated with non-tidal waters are authorized via the USACE/MDE Joint Permit Application process. The majority of mapped 100-year floodplains throughout all three corridors are tidal with lesser concentrations of non-tidal floodplain associated with smaller, non-tidal creeks and tributaries.

Figure 4-9 provides a graphic depiction of the location and distribution of the 100-year floodplain within each of the three corridor study areas. **Table 4-25** below provides a breakdown of the total area, in acres, of 100-year floodplain within each of the corridors and a percentage of the total study area encompassed by the 100-year FEMA floodplain. **Appendix A** includes maps that depict a more detailed view of the FEMA 100-Year Floodplain within each corridor.

Table 4-25: 100-Year FEMA Floodplain

CORRIDOR	100-YEAR FEMA FLOODPLAINS (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	3,050	9%
7	6,640	24%
8	3,950	8%

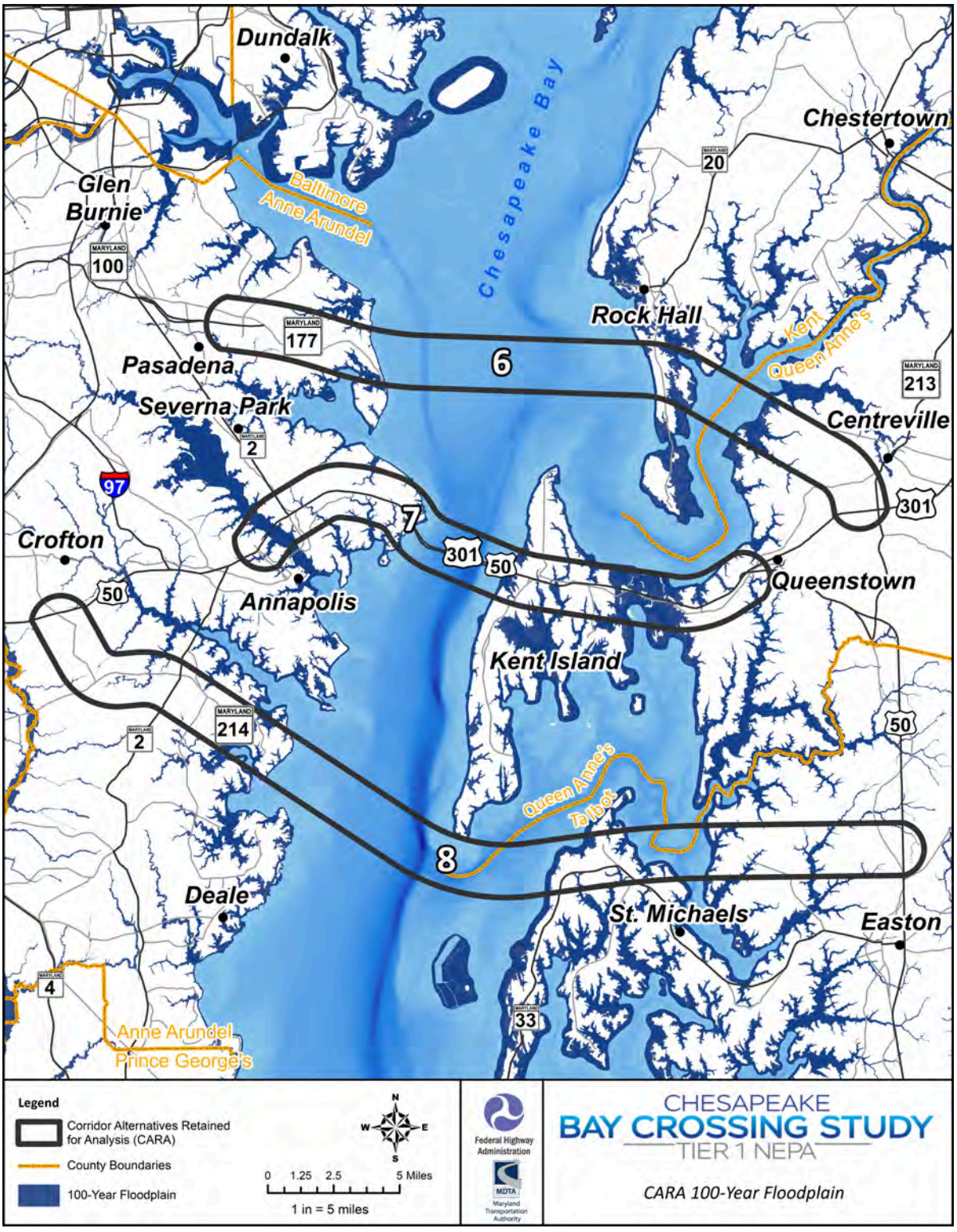
Note: values rounded to closest 10 acres.

4.4.3.1 Corridor 6

Corridor 6 contains approximately 3,050 acres of 100-year FEMA floodplain and intersects the least amount of mapped floodplain of the three corridors (**Figure 4-9**). The western portion of Corridor 6 contains very little mapped floodplain with the exception of the area associated with Sillery Bay, the Magothy River, and the Chesapeake Bay. The eastern side of the corridor, along the Eastern Shore contains large areas of mapped floodplain which are primarily associated with tidal waters of the Chester River and the Chesapeake Bay. Mapped floodplain within the eastern extent generally spans the entire corridor width.

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

Figure 4-9: 100-Year Floodplain



4.4.3.2 Corridor 7

Corridor 7 contains approximately 6,640 acres of mapped 100-year FEMA floodplain and intersects the largest area of floodplain of the three corridors (**Figure 4-9**). Within the western portion of Corridor 7, along US 50, the largest area of floodplain spans the entire width of the study area and is associated with tidal portions of the Severn River and the non-tidal floodplains associated with several Severn River tributaries. Further east, Corridor 7 intersects with the tidal floodplains associated with Mill Creek, Whitehall Creek, Meredith Creek, and the floodplain adjacent to the Bay. Extensive areas of tidal wetlands are located on Kent Island within Corridor 7, primarily between Kent Island and the Eastern Shore. The tidal floodplains identified on Kent Island are those associated with the shoreline on both sides of the Island, Thompson Creek, Cox Creek, Crab Alley Creek, and Kirwan Creek. Mapped FEMA floodplain acreages associated with Corridor 7 are higher than Corridors 6 and 8 in part because much of the mapped areas are associated with open waters of the Severn River and the near shoreline areas around Kent Island. The portion of Corridor 7 that spans the Eastern Shore intersects with tidal floodplains associated with the Chester River and Winchester Creek along the northern side of the alignment, and the Wye River along the southern side.

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

4.4.3.3 Corridor 8

Corridor 8 contains approximately 3,950 acres of mapped 100-year floodplain (**Figure 4-9**). Within the western portion, Corridor 8 intersects with the floodplain associated Flat Creek, King's Branch, and Beards Creek. Further east, Corridor 8 intersects floodplain associated with several tidal waters including Bear Neck Creek, Whitemarsh Creek, Sellman Creek, Muddy Creek, Williamson Branch, Mill Swamp Branch, and the mapped floodplain adjacent to the Bay. After spanning the open waters of the Bay, Corridor 8 intersects the tidal floodplain associated with the shoreline of the Bay, Harris Creek, the Miles River, the Tred Avon River, and the Choptank River. The mapped floodplains within the limits of Corridor 8 generally extend the entire width of the corridor.

Based on the distribution of 100-year FEMA floodplain within the limits of Corridor 7, the area with the highest potential for impacts is located just south of MD 14, within the western section of the corridor.

4.4.3.4 Conclusions

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

Measures to limit potential effects to the mapped floodplains should be incorporated into the planning and design process should a corridor alternative be carried forward for further evaluation during a Tier 2 evaluation. Impacts to the jurisdictional 100-year floodplain associated with non-tidal waters are authorized by MDE via the JPA process. The majority of mapped 100-year floodplains throughout all three corridors are tidal with lesser concentrations of non-tidal floodplain associated with smaller, non-tidal

creeks and tributaries. Because the mapped floodplain spans the entire width of the corridor study areas in several places, impacts to floodplain resources would be unavoidable.

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

4.4.4 Chesapeake Bay Critical Area

The Chesapeake Bay Critical Area encompasses land that is within 1,000 feet of the mean high tide line of the bay and adjacent streams and rivers. Within the Critical Area, three land classifications have been designated: Intensely Developed Areas (IDAs), Limited Development Areas (LDAs), and Resource Conservation Areas (RCAs). Each of these areas has specific regulations that dictate future development while accounting for the current surrounding land use and land cover. The Critical Area also has two additional areas identified as Corporate Land (CL) and Federal Land (FED). These designations are for lands that are corporately owned or owned by the federal government and are not classified as RCA, LDA, or IDA because activities on these lands are not directly regulated through the state's Critical Area Program but are regulated through the Coastal Zone Management Act. The Critical Area Commission (CAC) also regulates a 100-foot buffer which consists of the first 100-feet landward of tidal waters, tidal wetlands, or tributary streams. For further protection, the 100-foot buffer is expanded to include steep slopes, adjacent non-tidal wetlands, and hydric or highly erodible soils.

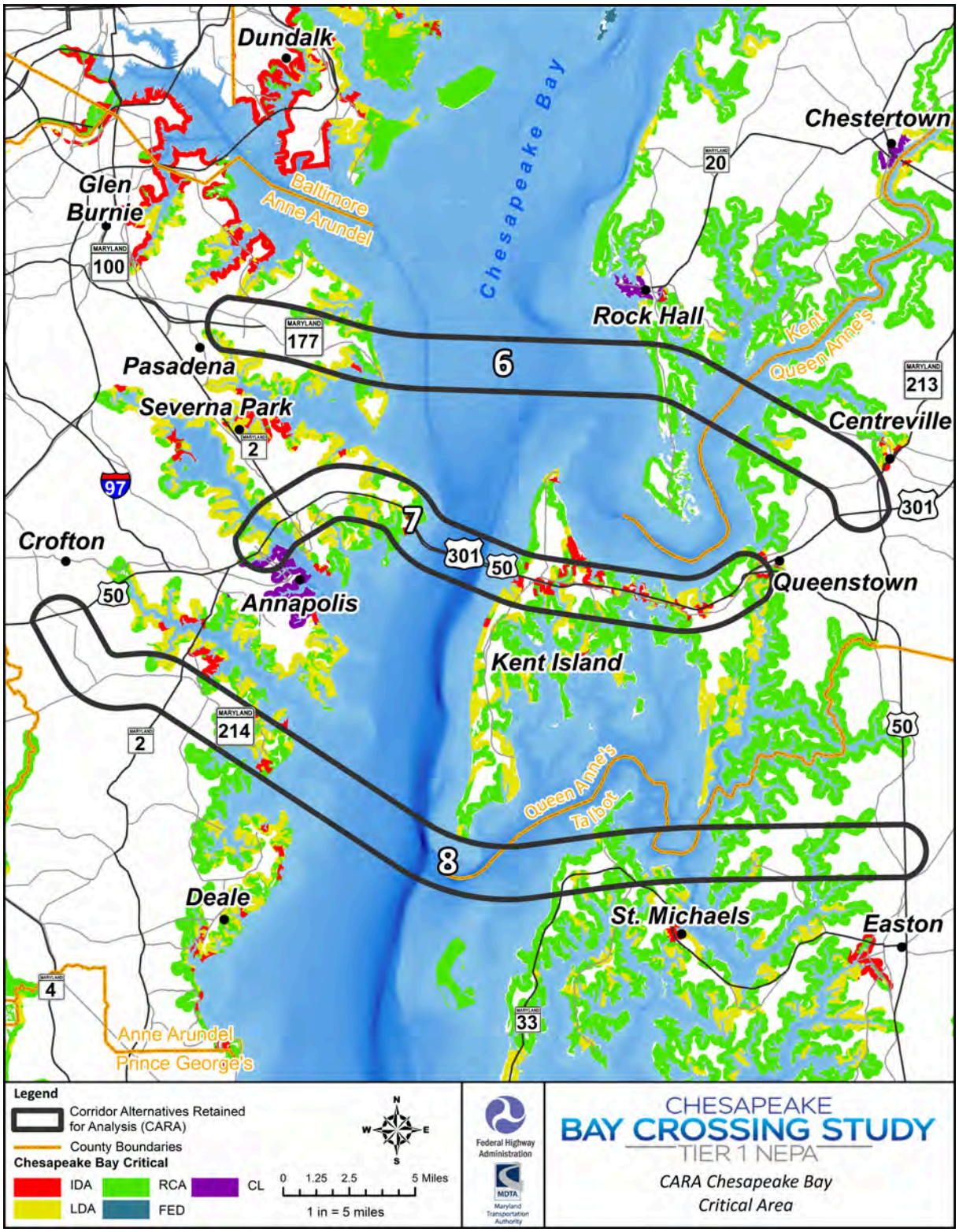
Figure 4-10 provides a graphic depiction of the location and distribution of Critical Area within the limits of the three study area corridors. This data was obtained from the Maryland iMap GIS data portal. **Table 4-26** below provides a breakdown of total area, in acres, of IDA, LDA, and RCA located within the limits of the three study area corridors. **Appendix A** includes detailed maps of the Critical Area within each corridor.

Table 4-26: Chesapeake Bay Critical Area

CORRIDOR	IDA (ACRES)	LDA (ACRES)	RCA (ACRES)	TOTAL WITHIN CORRIDOR (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	50	1,080	3,780	**4,910**	14%
7	1,300	3,370	5,140	**9,810**	35%
8	160	1,420	6,540	**8,120**	17%

Note: values rounded to closest 10 acres.

Figure 4-10: Chesapeake Bay Critical Area



4.4.4.1 Corridor 6

Corridor 6 contains approximately 4,910 acres of land area that falls within the limits of the Critical Area, the overall majority of which is classified as RCA (**Figure 4-10**). Within the western extent, the Critical Area is generally limited to the northern and southern edges of the corridor until it spans the Western Shore area of the Bay. The majority of Critical Area within the western extent of Corridor 6 is classified as RCA with lesser concentrations of LDA. One small roughly 50-acre section of IDA was identified within the western portion of the Corridor 6 and was associated with the Long Point neighborhood along Sillery Bay. The eastern portion of Corridor 6 intersects Critical Area along the entire width at the eastern shoreline of the Bay and along both banks of the Chester River. Mapped Critical Area along the Eastern Shore is primarily RCA with lesser concentrations of LDA.

4.4.4.2 Corridor 7

Corridor 7 contains approximately 9,810 acres of land that falls within the limits of the Critical Area. The majority is classified as RCA but the corridor also contains relatively high levels of both LDA and IDA (**Figure 4-10**). Within the western extent, the Critical Area is primarily associated with the Severn River and the western shoreline of the Bay. A large portion of the western extent of Corridor 7, primarily along the northern corridor border, is located outside the limits of the Critical Area. A large are of CL is mapped within the western portion of Corridor 7, just north of Annapolis, MD. Impacts to CL are administered under the Coastal Zone Management Act, not the Critical Area Program.

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

4.4.4.3 Corridor 8

Corridor 8 contains approximately 8,120 acres of land that falls within the limits of the Critical Area (**Figure 4-10**). The western extent of Corridor 8 contain relatively little Critical Area with the exception of where the corridor spans the western shore of the Bay. A small area of IDA is also located within the western portion of the corridor, just south of MD 214.

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

4.4.4.4 Conclusions

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

Coordination with the CAC Staff and local jurisdictions would be required to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation. During

the planning process, special attention must be paid to areas with steep slopes and highly erodible soils as these areas will be subject to Critical Area buffer expansion.

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

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

4.4.5 Terrestrial Habitat

The corridor study areas encompass various types of terrestrial habitat, including; upland and riparian forested areas, scrub-shrub and herbaceous uplands, agricultural lands, freshwater wetlands, beaches, marshes, tidal flats, and large areas of urban and suburban development. The GIS mapping for terrestrial habitat focuses on upland habitats that are afforded regulatory protection, including Forest Conservation Act (FCA) easements and forest interior dwelling species (FIDS) habitat. Wetlands areas were evaluated in **Section 4.4.2** of this document. FIDS habitat within the Critical Area is subject to specific mitigation requirements as determined by the local jurisdiction with input from MDNR and the Critical Area Commission staff.

The total amount of FIDS habitat and FCA easements within each of the three study corridors is presented in **Table 4-27**. Data were obtained from the MDNR GIS Data Portal and identifies the largest amount of FIDS habitat within Corridor 8 with the highest concentration located within the western portion of the proposed corridor. Corridor 6 contains the largest amount of area within existing FCA easements, all of which are located within the western portion of the corridor.

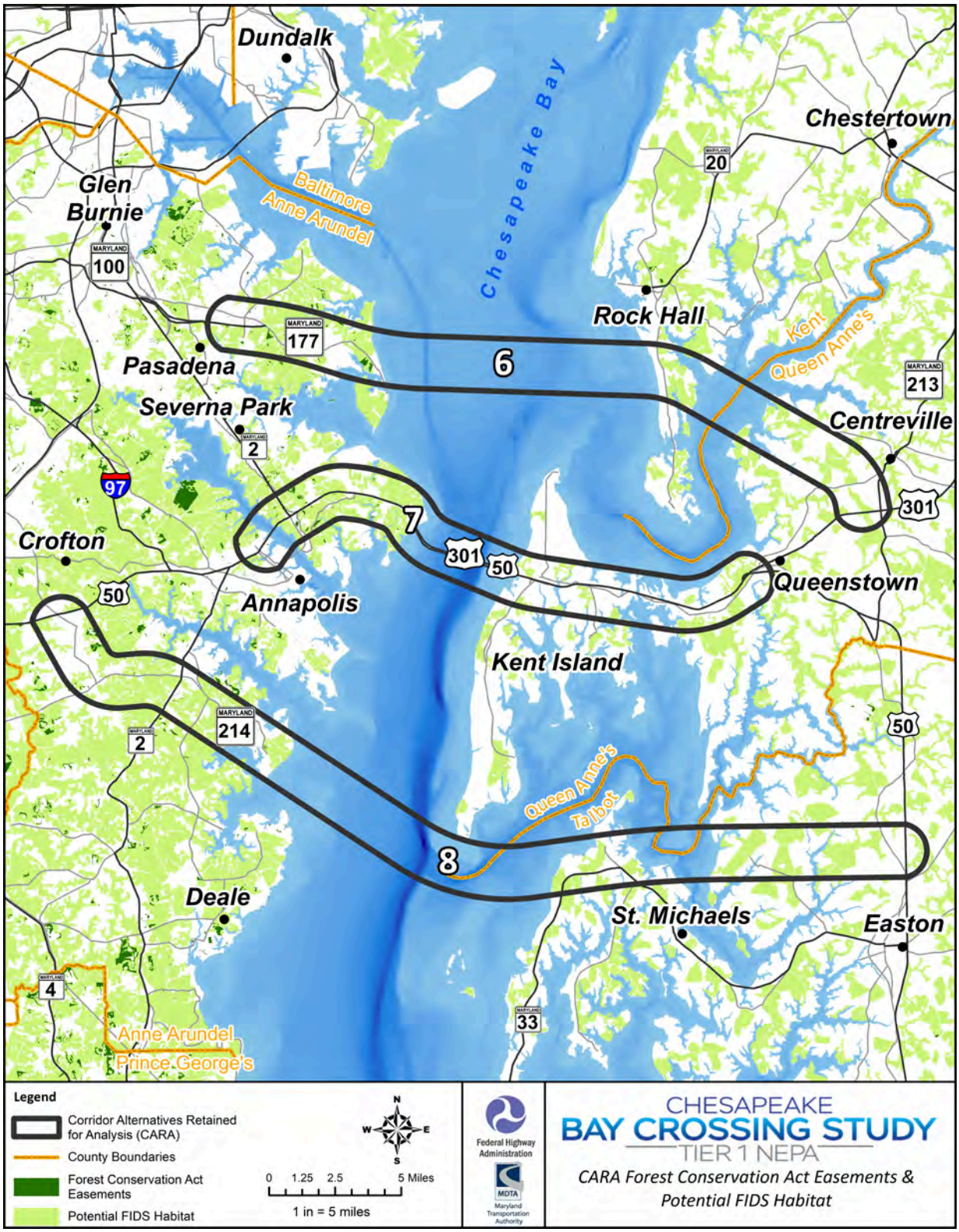
Table 4-27: FIDS & FCA Easements

CORRIDOR	FIDS (ACRES)	FCA EASEMENTS (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	7,020	140	20%
7	6,900	130	25%
8	11,410	110	25%

Note: values rounded to closest 10 acres.

Figure 4-11 provides a visual depiction of the location of the most concentrated forest resources within the corridor limits, identifying FCA easements and areas of potential FIDS habitat. FCA easements protect forest cover on private land by placing restrictive covenants and limiting certain activities. Easements are generally created as part of a forest conservation plan. FIDS habitat identifies areas of large contiguous forest blocks at least 300 feet from a forested edge.

Figure 4-11: Forest Conservation Act Easements and Potential FIDS Habitat



4.4.5.1 Corridor 6

Corridor 6 contains approximately 7,020 acres of potential FIDS habitat with the largest concentrations occurring within the western portion of the corridor, on the Western Shore of the Bay (**Figure 4-11**). This section of the corridor still contains relatively large areas of forest interspersed with residential development. Corridor 6 also intersects with 140 acres of FCA Easements, all of which are located along the MD 177 corridor, within the western extent of the corridor. The eastern portion of Corridor 6 also contains areas of potential FIDS habitat but in lesser concentrations, largely due to the presence of substantial areas of open fields areas associated with agricultural production.

4.4.5.2 Corridor 7

Corridor 7 contains approximately 6,900 acres of potential FIDS habitat with the largest concentrations occurring within the western portion of the corridor. Corridor 7 also intersects with 130 acres of FCA Easements, all of which are located within the western portion of the corridor (**Figure 4-11**). This section of the corridor still contains relatively large areas of forest interspersed with residential development. As a result, this area has the lowest potential for impacts to FIDS resources. The eastern portion of Corridor 7, just west of Queenstown, also contains areas of potential FIDS habitat but in lesser concentrations, largely due to the presence of substantial areas of open fields associated with agricultural production.

4.4.5.3 Corridor 8

Corridor 8 contains approximately 11,410 acres of potential FIDS habitat, the largest amount of the three corridors with the largest concentrations located within the western portion of the corridor. This section of the corridor still contains relatively large tracts of forest areas, particularly along the MD 24 alignment, west of MD 2. Corridor 8 also contains several FCA easements, all of which are located within the extreme western portion of the Corridor study area, west of MD 2 (**Figure 4-11**). The eastern portion of Corridor 8 also contains areas of potential FIDS habitat but in lesser concentrations, largely due to the presence of substantial areas of open fields associated with farming activities.

4.4.5.4 Conclusions

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

According to the GIS mapping sources, Corridor 8 contains the highest total of FIDS resources. FCA easement totals do not vary significantly between the corridor study areas. Because resources generally span the width of the study area corridors, impacts are likely unavoidable. Coordination with MDNR and County planning agencies would be required during a Tier 2 NEPA study to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis. Minimization and avoidance strategies would be implemented once a limit of disturbance associated with a more defined project area is established.

4.4.6 Unique and Sensitive Areas

For the purposes of this Tier 1 analysis, Unique and Sensitive Areas are defined as habitats and biological resources that have special environmental attributes worthy of protection and retention. **Figure 4-12** identifies the location of Sensitive Species Project Review Areas (SSPRAs) and represents the general locations of various types of areas of concern statewide, including; Targeted Ecological Areas (TEA), Natural Heritage Areas (NHA), listed species sites, locally significant habitat areas, colonial waterbird sites, non-tidal wetlands of special state concern, green infrastructure, and geographic areas of particular concern.

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

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

MDNR's GIS Data Portal's SSPRA coverage layer was used to provide a comparative analysis of unique and sensitive areas within each of the three study corridors (**Table 4-28**). Corridor 8 contains the highest concentration of SSPRA, with the majority located within the Eastern Shore portion of the corridor. There is also a relatively large concentration of SSPRA located within the western section of Corridor 6 (**Figure 4-12**).

Table 4-28: Sensitive Species Project Review Areas (SSPRA)

CORRIDOR	SSPRA (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	2,720	6%
7	2,180	8%
8	8,630	11%

Note: values rounded to closest 10 acres.

Figure 4-12: Sensitive Species Project Review Areas

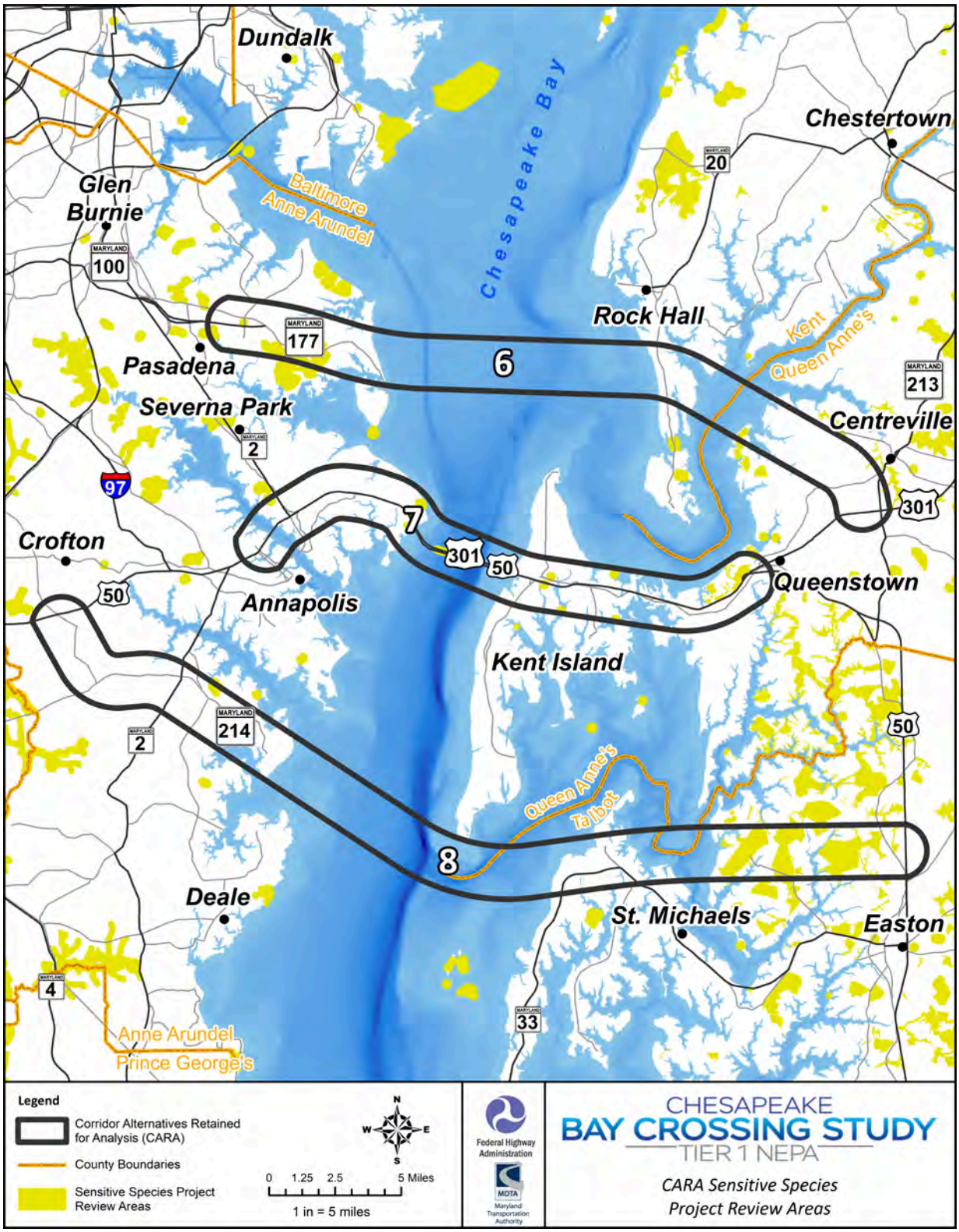


Figure 4-13 identifies the location of Green Infrastructure (GI) hubs and corridors within the limits of the three study corridors. This data was obtained from the MD iMap Data Portal. Areas identified include unfragmented natural areas, called "hubs." Hubs were defined as contiguous forest blocks and wetland complexes of at least 250 acres, rare or sensitive species habitats, biologically important rivers and streams, and existing conservation lands managed for natural values. "Corridors" are linear stretches of land, at least 1,100 feet wide, which follow the best ecological or most natural routes between hubs to help animals, plant seeds, water, and other important resources move between hubs.

Table 4-29 provides a comparative analysis of existing GI areas identified within the limits of the three study corridors. As indicated, Corridor 8 contains the highest amount of GI and contains a significant amount of GI hubs (**Figure 4-13**). Corridor 6 contains the highest amount of GI corridors which generally span the width of the corridor on both the Western and Eastern Shores of the Bay.

Table 4-29: Green Infrastructure

CORRIDOR	GREEN INFRASTRUCTURE CORRIDORS (ACRES)	GREEN INFRASTRUCTURE HUBS (ACRES)	TOTAL WITHIN CORRIDOR (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	3,150	1,730	**4,880**	14%
7	1,260	3,220	**4,480**	16%
8	2,100	9,350	**11,450**	25%

Note: values rounded to closest 10 acres.

FEDERALLY LISTED SPECIES

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

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

- Loggerhead Turtle (*Caretta caretta*)/Threatened/Adults and Juveniles/migrating and foraging
- Green Sea Turtle (*Chelonia mydas*)/Threatened/Adults and Juveniles/migrating and foraging
- Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)/Endangered/Adults and Juveniles/migrating and foraging
- Leatherback Sea Turtle (*Dermochelys coriacea*)/Endangered/Adults and Juveniles/migrating and foraging

- Shortnose Sturgeon (*Acipenser brevirostrum*)/Endangered/Adult/overwintering, migrating and foraging
- Atlantic Sturgeon (*Acipenser oxyriynchus oxyriynchus*)/Endangered/Subadult, Juvenile, Adult/migrating and foraging

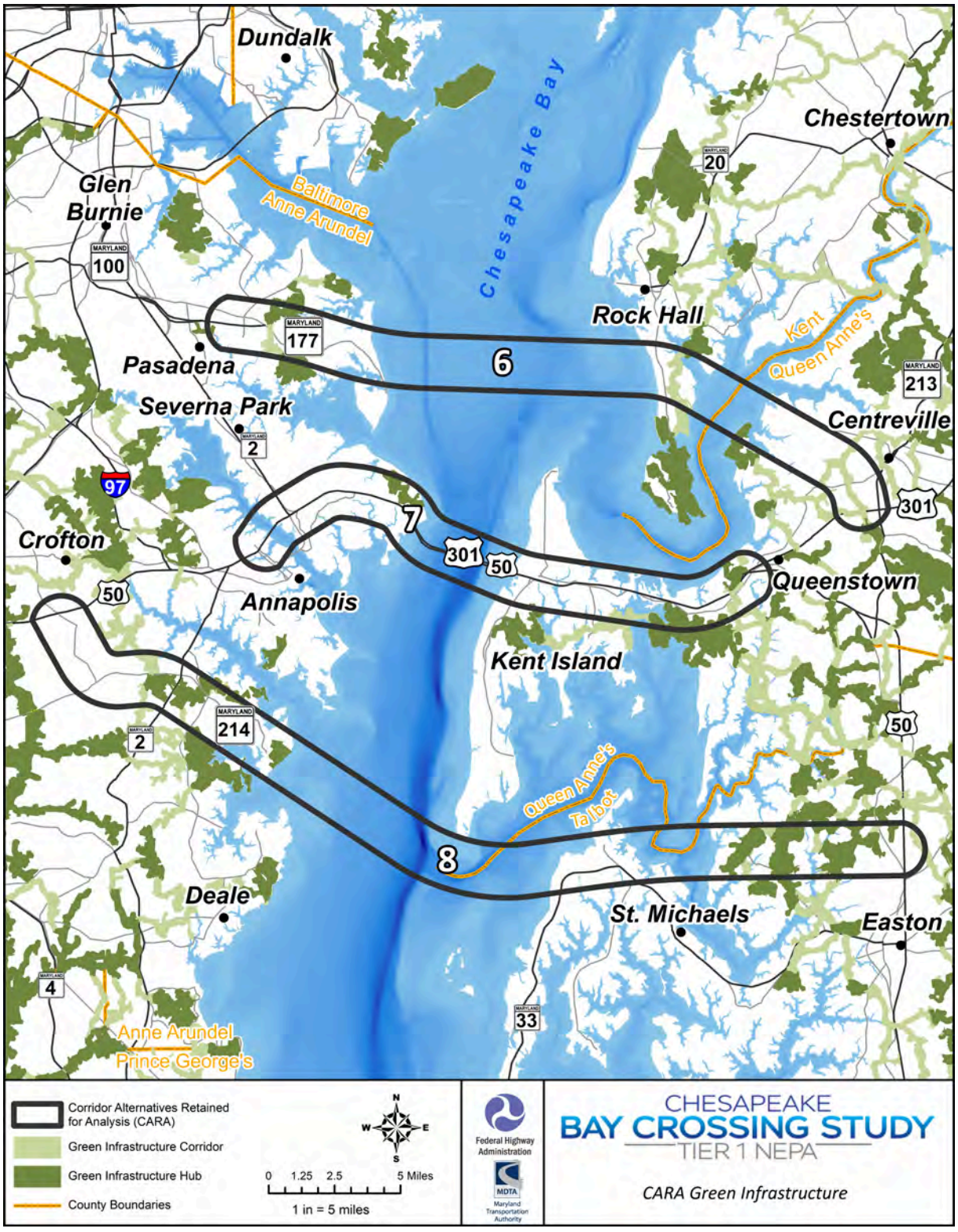
STATE LISTED SPECIES

Correspondence was submitted to MDNR to determine the presence of state-listed rare, threatened or endangered species or habitat within the limits of the study areas for the three potential corridors. The results of this request are summarized in **Table 4-30** and in the Corridor discussions below and detailed in the ***Natural Resources Technical Report; Section 5.6.***

Table 4-30: MDNR Listed Species

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

Figure 4-13: Green Infrastructure



4.4.6.1 Corridor 6

Corridor 6 contains approximately 2,720 acres of area mapped as SSPRA, with a relatively large area within the western section of the corridor, directly adjacent to MD 177. This area is generally associated with the Magothy Greenway Natural Area and the areas directly adjacent. The eastern portion of Corridor 6 contains relatively sparse areas of SSPRA which are located along the western bank of the Chester River (**Figure 4-12**). These SSPRA are labeled as MDNR Targeted Ecological Areas. Targeted Ecological Areas are lands and watersheds of high ecological value that have been identified as conservation priorities by MDNR for natural resource protection. As SSPRA generally extends the width of the western portion of Corridor 6, impacts would be unavoidable in this area. Impacts to SSPRA within the eastern portion of Corridor 6 could potentially be avoided by siting a potential alignment within the central portion of the corridor study area.

Corridor 6 contains approximately 3,150 acres of GI corridors and 1,730 acres of GI hubs. The GI corridors were identified on both sides of the Bay and generally extend the corridor width. The majority of the GI hubs within Corridor 6 were identified on the Western Shore of the Bay with smaller concentrations on the Eastern Shore, adjacent to the Chester River (**Figure 4-13**). Avoiding impacts to the GI hubs would require siting the alignment within the central portion of the corridor. As the GI corridors span the entire width of Corridor 6, impacts would be unavoidable.

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

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

4.4.6.2 Corridor 7

Corridor 7 contains approximately 2,180 acres of SSPRA with the largest concentrations located on Kent Island and further east along the Eastern Shore (**Figure 4-12**). The SSPRA identified on Kent Island is associated with Targeted Ecological Areas located south of US 301 and a small area identified as the Terrapin Nature Area, north of US 301. Further east, SSPRA were identified on the Eastern Shore, west of Queenstown, and were associated with Targeted Ecological Areas south of US 301 along the eastern shoreline of Prospect Bay and the Queenstown Harbor Lakes Course, north of US 301, along the eastern bank of the Chester River. A relatively small amount of mapped SSPRA was also identified within the western portion of Corridor 7 and is associated with Sandy Point State Park, located on the north side of US 301, along the west bank of the Bay. SSPRA impacts associated with the western section of Corridor 7 would be minimal and could be completely avoided by remaining south of Sandy Point State Park.

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

Corridor 7 contains approximately 1,260 acres of GI corridors and 3,220 acres of GI hubs. GI corridors were identified along the southern portion of Corridor 7, on Kent Island, and within the eastern section of the Corridor 7, just west of Queenstown. No GI corridors were identified within the western section of Corridor 7. GI hubs were identified within the western section of Corridor 7 and were associated with Sandy Point State Park. GI hubs were also identified within the eastern section of Corridor 7, just west of Queenstown (**Figure 4-13**). Avoiding impacts to GI hubs within the western portion of Corridor 7 would require siting the alignment on the south side of US 301. Siting the alignment within the central portion of Corridor 7, along Kent Island and the Eastern Shore, would minimize potential impacts to GI hubs within the central and eastern sections of the corridor. GI corridor impacts associated with Corridor 7 would be relatively minimal and associated with one section, west of Queenstown, where the GI corridor spans the entire width of Corridor 7.

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

4.4.6.3 Corridor 8

Corridor 8 contains approximately 8,630 acres of SSPRA which constitutes the largest total amount of SSPRA of the three corridors with the vast majority located within the extreme eastern portion of the corridor study area, along the Eastern Shore (**Figure 4-12**). One small area of SSPRA was identified within the western portion of Corridor 8, along the northern corridor edge just north of MD 214 and is associated with a Targeted Ecological Area adjacent to the eastern bank of Glebe Creek. The eastern portion of Corridor 8 intersects with several Targeted Ecological Areas that generally span the entire width of the corridor and constitutes the vast majority of land area within the section between US 50 and the Eastern Shore of the Bay. The western section of Corridor 8 contains very small areas of mapped SSPRA along the northern extent of the corridor. Impacts could be avoided by siting the alignment within the central or southern portion of the corridor. Avoiding impacts within the eastern section would be difficult as a majority of mapped SSPRA within Corridor 8 is located on the Eastern Shore, and is fairly evenly distributed throughout the width of the corridor.

Corridor 8 contains approximately 2,100 acres of GI corridors and 9,350 acres of GI hubs. The majority of these resources were identified within the eastern section of the corridor, along the Eastern Shore, with lesser but still significant resources identified within the western section of the corridor (**Figure 4-13**). Impacts to GI corridors and GI hubs within Corridor 8 would be unavoidable as these resources generally extend the width of the corridor on both sides of the Bay.

Within the limits of Corridor 8, MDNR identified several areas designated as habitat protection areas, or areas known or suspected to provide habitat for RTE species. These areas include Glebe Creek Woods in Anne Arundel County, Copperville Wet Woods in Talbot County along the Miles River, and Third Haven Woods along Goldsborough Neck Road in Talbot County. Delmarva Fox Squirrel habitat was identified within the limits of Corridor 8 in Talbot County north of Easton. Waterfowl Concentration Areas were identified, as described above under Corridor 6.

4.4.6.4 Conclusions

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

4.4.7 Aquatic Resources

The Chesapeake Bay supports a vast array of aquatic resources, including, 348 species of finfish, 173 species of shellfish, and 2,700 species of plants species. However, to quantify potential impacts associated with each corridor study area, this analysis relies on available mapped GIS resources to provide a comparative analysis. These mapping sources include GIS layers for Essential Fish Habitat (EFH), Submerged Aquatic Vegetation (SAV), Natural Oyster Bars (NOB), and oyster sanctuaries. This data was gathered from the MD iMap database from 2018. A more comprehensive analysis of potential impacts to all aquatic resources, including sea turtles, Atlantic Sturgeon, aquatic mammals, sea birds, etc. should be performed if a corridor alternative is carried forward to a Tier 2 analysis and a more defined study area is defined.

A breakdown of aquatic resources identified within the limits of the three study corridors, including data associated with EFH, SAV, and oyster resources is provided in **Table 4-31**. Oyster resources were identified by whether they were mapped as Natural Oyster Bars (NOB) or Oyster Sanctuaries. Sanctuaries are areas where the wild harvest of oysters is prohibited and are provided more stringent protective measures. NOBs are also called “public” oyster bars. MDNR regulates the harvesting of oysters in NOBs and places timing restrictions and quantity limits for both commercial and recreational harvesting.

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

degradation; 3) whether and to what extent, development activities are stressing the habitat type; and/or 4) rarity of habitat type (50 CFR 600.815(a)(8)).

The EFH data were obtained from the NOAA EFH Data Inventory that categorizes EFH by fish species. The categories include habitat for Atlantic butterfish (*Peprilus tricanthus*), black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), scup (*Stenotomus chrysops*), and summer flounder (*Paralichthys dentatus*). For the purposes of this comparative analysis, these fish species have been combined into a single EFH category. **Appendix A** includes detailed maps of SAV within each corridor.

Table 4-31: Aquatic Resources

CORRIDOR	EFH (ACRES)	EFH PERCENTAGE OF TOTAL CORRIDOR STUDY AREA	SAV (ACRES)	NATURAL OYSTER BARS (ACRES)	NATURAL OYSTER BARS PERCENTAGE OF TOTAL CORRIDOR STUDY AREA	MDNR OYSTER SANCTUARIES (ACRES)
6	64,320	52%	40	11,130	32%	6,470
7	36,650	34%	270	3,460	12%	1,580
8	87,680	44%	460	7,960	17%	2,090

Note: values rounded to closest 10 acres.

4.4.7.1 Corridor 6

Corridor 6 contains approximately 64,320 acres of mapped EFH with a large area associated with the open waters of the Bay and, within the eastern portion of the corridor, where the corridor spans the lower portion of the Chester River (**Figure 4-14**). The portion of Corridor 6 that spans the main channel of the Bay is mapped as EFH for scup (*Stenotomus chrysops*), Atlantic butterfish (*Peprilus triacanthus*), summer flounder (*Paralichthys dentatus*), black sea bass (*Centropristis striata*), and bluefish (*Pomatomus saltatrix*). The eastern portion of the Bay and within the lower Chester River, is mapped as EFH for summer flounder and bluefish.

Corridor 6 also contains approximately 11,130 acres of mapped NOBs, with the largest concentrations located adjacent to the Eastern Shore and within the lower portions of the Chester River. NOBs were also mapped within the open waters of the Bay and the lower portions of the Magothy River and Sillery Bay (**Figure 4-15**). Of the 11,130 acres of mapped oyster resources, 6,470 acres consist of protected oyster sanctuaries. The largest concentration of oyster sanctuaries associated with Corridor 6 are located along the bank of the Eastern Shore (**Figure 4-15**). Relatively small amounts of SAV (40 acres) were identified within the limits of Corridor 6 with one small section located within the eastern portion of the corridor, within the lower stem of the Chester River (**Figure 4-15**).

4.4.7.2 Corridor 7

Corridor 7 contains the least amount of total area spanning open waters and contains the least amount of EFH at approximately 36,650 acres (**Figure 4-14**). The largest concentrations occur within the area spanning the main channel of the Bay and within the coves and inlets in and around Kent Island and the Eastern Shore. The main channel of the Bay is mapped as EFH for scup, Atlantic bluefish, summer flounder, black sea bass, and bluefish. The open water areas adjacent to Kent Island and the Eastern Shore are mapped as EFH for summer flounder, scup, and black sea bass. Relatively small areas of EFH for bluefish, scup, and summer flounder are also mapped within the western portion of the Corridor 7, within the Severn River.

Figure 4-14: Essential Fish Habitat

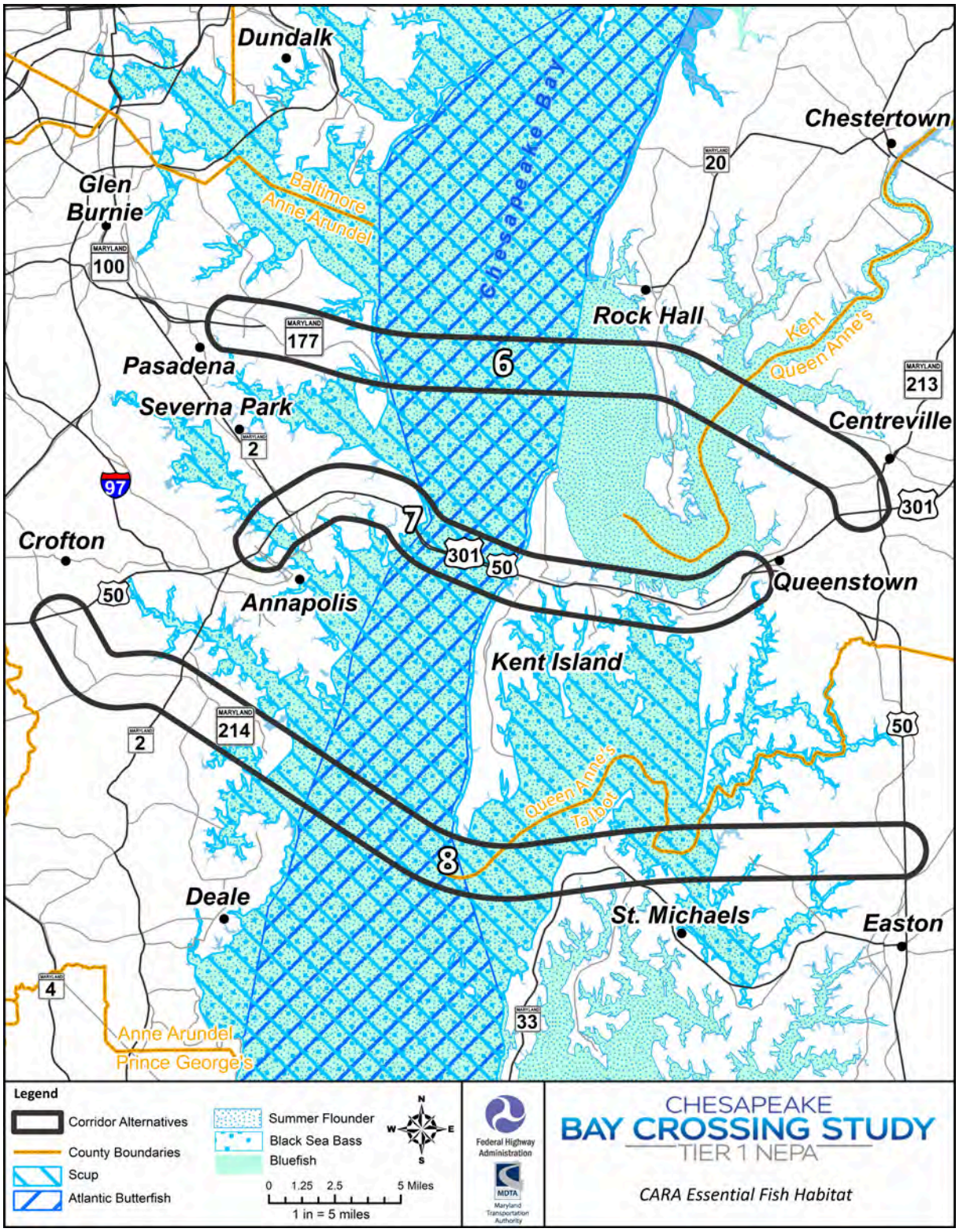
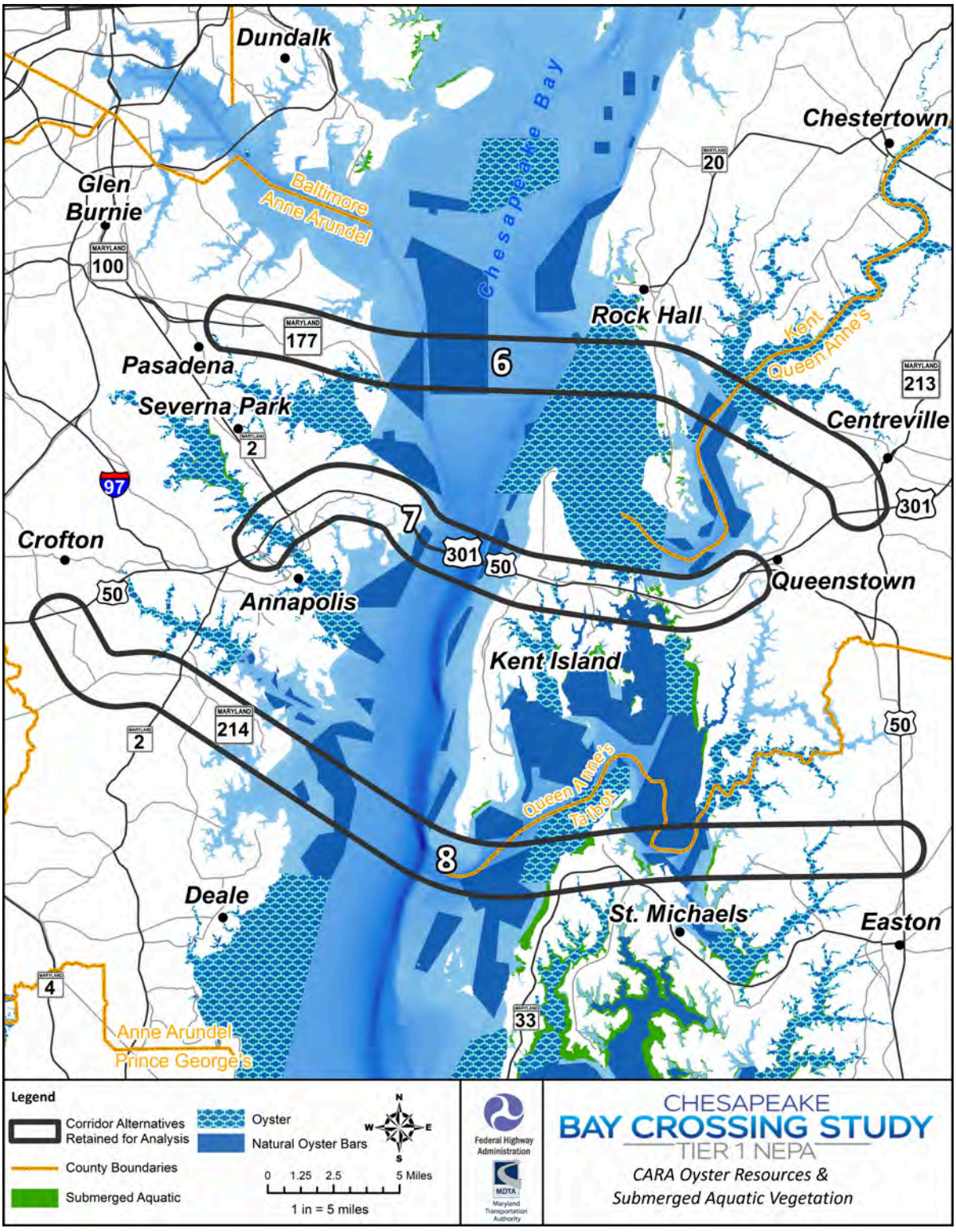


Figure 4-15: Oyster Resources and Submerged Aquatic Vegetation



Corridor 7 also contains the least amount of oyster resources at approximately 3,460 acres with the largest mapped areas associated with the Severn River in the western portion of the corridor and within the coves and inlets of Kent Island and Eastern Shore within the central and eastern portions of the corridor (**Figure 4-15**). Of the 3,460 acres of mapped NOB's, 1,580 acres consist of protected oyster sanctuaries. The largest concentration of oyster sanctuaries associated with Corridor 7 are associated with the Severn River (**Figure 4-15**). A relatively large concentration of SAV (approximately 270 acres) was identified within the eastern portion of Corridor 7, between Kent Island and the Eastern Shore (**Figure 4-15**).

4.4.7.3 Corridor 8

Corridor 8 contains the largest amount of area spanning open water and therefore contains the highest acreage total of EFH at approximately 87,680 acres. The western portion of the corridor, within and adjacent to the Rhode River is mapped as EFH for bluefish, black sea bass, summer flounder, and scup. The main channel of the Bay, within the limits of Corridor 8 is mapped as EFH for scup, Atlantic butterfish, summer flounder, black sea bass, and bluefish. The eastern portion of Corridor is mapped as EFH for scup, summer flounder, black sea bass, and bluefish (**Figure 4-14**).

Corridor 8 also contains 7,960 acres mapped as NOB's with the majority occurring in the near shore areas adjacent to the Eastern Shore (**Figure 4-15**). Of the 7,960 acres of mapped NOB's, 2,090 acres consist of protected oyster sanctuaries. The largest concentration of oyster sanctuaries associated with Corridor 8 are located along the bank of the Eastern Shore (**Figure 4-15**). Corridor 8 contains the largest areas of mapped SAV which are concentrated exclusively along the shoreline areas within Marshy Creek and the Chester River, within the eastern portion of the corridor study area (**Figure 4-15**).

4.4.7.4 Conclusions

Based on the results of the mapping resources for EFH, SAV, NOB, and Oyster Sanctuaries, Corridors 6 and 8 have the highest potential for impacts due to the associated amount of open water areas. Because all three corridors span large expanses of open water associated with the Bay and large tidal tributaries to the Bay, impacts to aquatic resources would be unavoidable. Permanent impacts to aquatic resources could result from the placement of piers and pilings, and the areas filled for approaches and scour protection measures. The placement of piers and pilings often introduce concussive forces which have adverse effects on fish with swim bladders. Other permanent impacts include those associated with an increase in noise and vibration from vehicle traffic associated with a new bay crossing structure. Increased noise and vibration can inhibit fish communication, mating behavior, detection of prey and predators, orientation and migration, and habitat selection.

Temporary impacts could result from cofferdams, causeways or temporary roads, work bridges or barges, dredge material dewatering and disposal, construction staging areas, and removal of benthos which could alter foraging behaviors. During the construction phase, specifically during dredging and filling activities for bridge and pier construction, adjacent areas can be affected based on the tides and currents due to the re-suspension of sediment in the water column. Local and temporary siltation and turbidity may reduce the photic zone in areas of SAVs, may release contaminants in the sediment, and would result in the temporary loss of benthic communities which provide food sources for fish.

Impacts to individual EFH species would vary based on the habitat considered essential for that species. Following is a list of the EFH species identified in **Section 4.4.7** and the associated habitat that may be impacted by any of selected corridor alternatives.

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

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

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

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

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

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

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

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

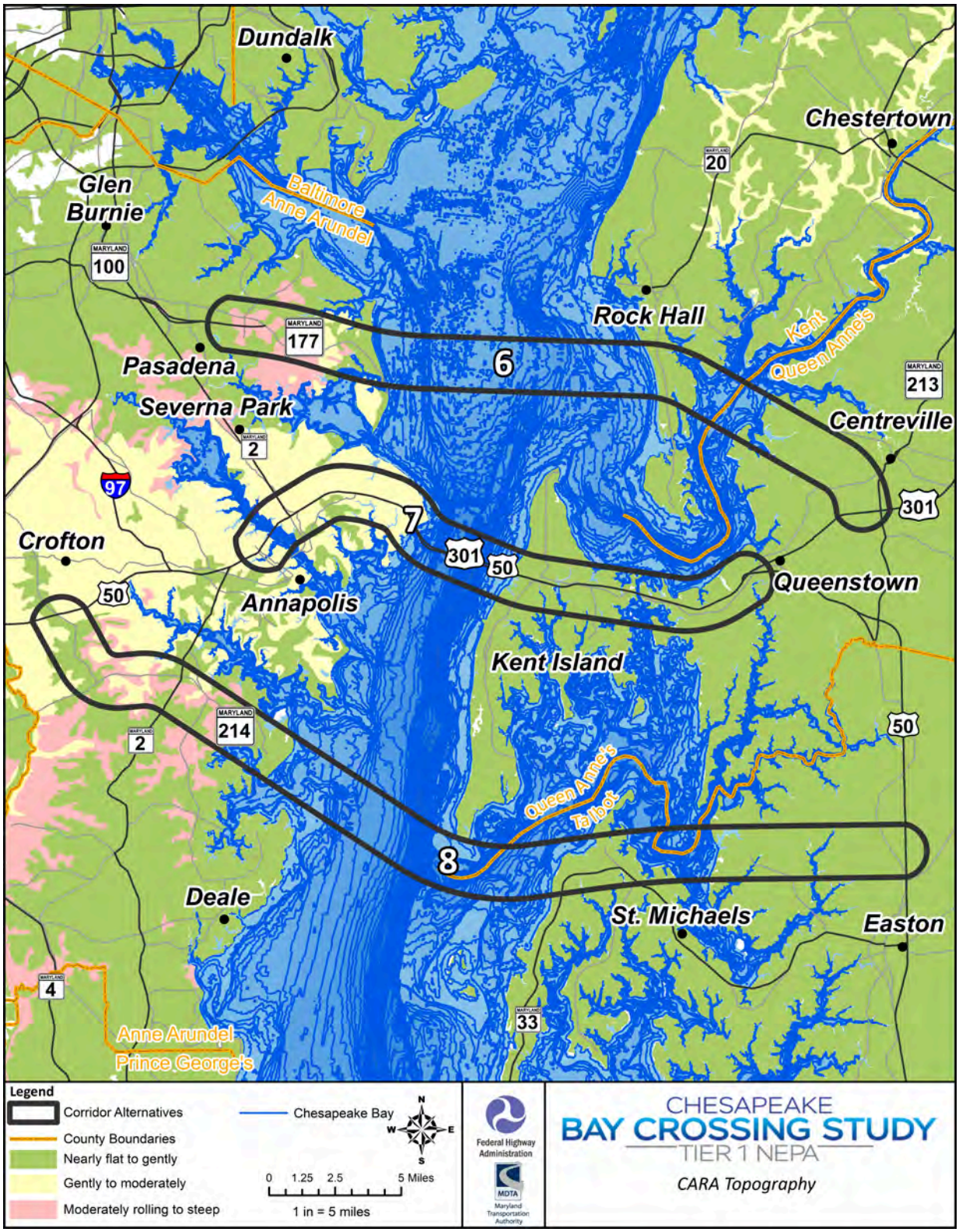
4.4.8 Topography, Soils and Geology

To provide a comparative analysis of potential impacts associated with topography, this study concentrated on areas mapped as steep slopes. The United States Department of Agriculture (USDA) Natural Resource Conservation Service defines steep slopes as those with gradients of 15 percent or greater. However, projects located in the Chesapeake Bay Critical Area may be subject to a more restrictive definition of steep slopes. Slopes provide an environment for movement of soils and pollutants during land disturbance activities. While soils have varying degrees of erodibility, all soils are subject to movement especially on steep slopes. Preservation of steep slopes adjacent to watercourses is especially important because of the potential of adverse effects on water quality and aquatic habitat.

To provide a comparative analysis of potential impacts associated with soils, this study focuses on soils that are classified as hydric, partially hydric, or highly erodible. Hydric and partially hydric soils are typically those associated with jurisdictional wetlands. Highly erodible soils are defined as soils with an erodibility factor K greater than 0.35 and with a slope greater than 5 percent. K factor is the soil erodibility factor which represents both susceptibility of soil to erosion and the rate of runoff.

A comparison of the amount of steep slopes, hydric or partially hydric soils, and highly erodible soils located within each of the three study corridors is presented in **Table 4-32**. Steep slopes are depicted on **Figure 4-16** and defined as slopes of 15 percent or greater. This steep slope and soils information was obtained from the Maryland iMap dataset. The source for the soils data was the *Soil Survey Geographic Database for Maryland*. Topography relative to aquatic habitat is also represented on **Figure 4-16**. Deep water habitats were identified within the limits of Corridors 7 and 8. These deep water areas may serve as refuge areas for fish and shellfish as discussed in **Section 4.4.7**. Deep water habitat was not identified within the limits of Corridor 6.

Figure 4-16: Topography



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

A graphic depiction of the underlying geology associated with the three study corridors is provided in **Figure 4-17**.

Table 4-32: Topography & Soils

CORRIDOR	STEEP SLOPES (ACRES)	STEEP SLOPES PERCENTAGE OF TOTAL CORRIDOR STUDY AREA	HYDRIC & PARTIALLY HYDRIC SOILS (ACRES)	HYDRIC AND PARTIALLY HYDRIC SOILS PERCENTAGE OF TOTAL CORRIDOR STUDY AREA	HIGHLY ERODIBLE SOILS (ACRES)	HIGHLY ERODIBLE SOILS PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	2,090	6%	3,580	10%	5,560	16%
7	0	0%	5,390	20%	9,280	33%
8	3,090	7%	8,250	18%	9,050	19%

Note: values rounded to closest 10 acres.

4.4.8.1 Corridor 6

Corridor 6 intersects with approximately 2,090 acres of land identified as having moderately rolling to steep slopes **(Figure 4-16)**. Relatively large areas of steep slopes were identified within the western portion of Corridor 6, adjacent to MD 177. This constitutes a relatively large percentage of the total land area within this section of the corridor. The section of Corridor 6 that spans the Eastern Shore is mapped entirely with nearly flat to gently rolling soils with no mapped steep slopes.

Corridor 6 contains approximately 3,580 acres of mapped hydric and partially hydric soils and 5,560 acres of mapped highly erodible soils. The vast majority of these areas are located within the eastern portion of the corridor, along the Eastern Shore (**Figure 4-18**).

4.4.8.2 Corridor 7

No steep slope areas were identified within the limits of Corridor 7 (**Figure 4-16**). The slopes within the western portion of the corridor are generally mapped as gently to moderately rolling while the section of Corridor 7 that spans Kent Island and the Eastern Shore are almost entirely mapped as nearly flat to gently rolling slopes.

Corridor 7 does contain large areas of highly erodible soils (approximately 9,280 acres), primarily within the western portion of the corridor, adjacent to the Bay and on Kent Island, with lesser concentrations along the Eastern Shore near Queenstown, MD. Corridor 7 also contains approximately 5,390 acres of mapped hydric and partially hydric soils with large areas identified on Kent Island and the Eastern Shore with lesser concentrations within the western portion of the corridor study area (**Figure 4-18**).

Figure 4-17: Geology

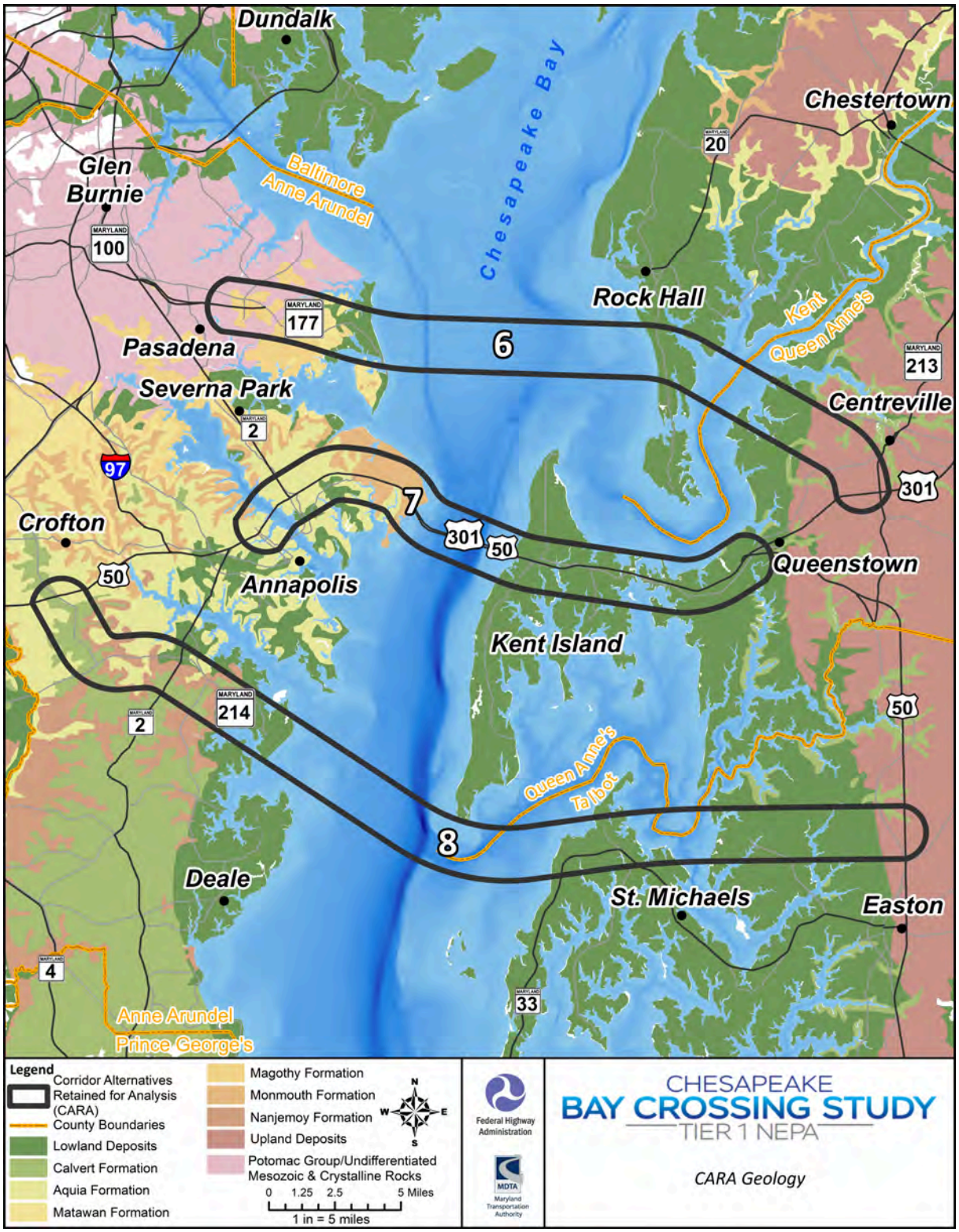
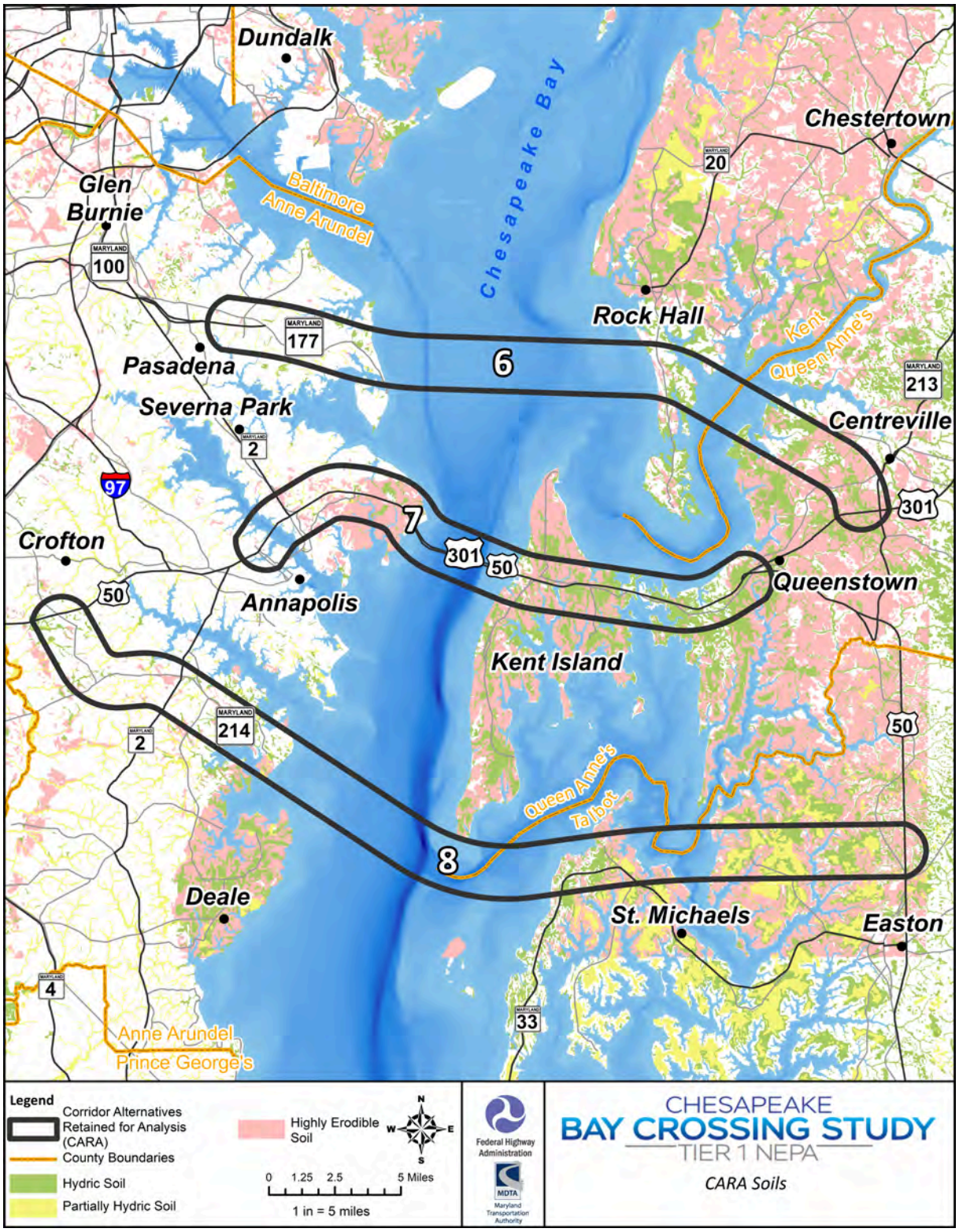


Figure 4-18: Soils



4.4.8.3 Corridor 8

Corridor 8 intersects with approximately 3,090 acres of land mapped as steep slopes and are almost exclusively located within the western portion of the corridor. No steep slopes were mapped within the eastern portion of the corridor (**Figure 4-16**).

Corridor 8 contains approximately 8,250 acres of mapped hydric and partially hydric soils, the majority of which were identified within the eastern portion of the corridor, near the town of St. Michaels and further east within the corridor. Also, the majority of the 9,050 acres of mapped highly erodible soils were identified within the eastern portion of the corridor (**Figure 4-18**).

4.4.8.4 Conclusions

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

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

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

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

4.4.9 Sea Level Rise

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

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

A comparative analysis of the total amount of land area susceptible to sea level rise was performed for the three study area corridors. **Table 4-33** below identifies the total area of land, in acres, susceptible to sea level rise based on projections for 2050 and 2100. This data was obtained from the Maryland iMap GIS portal using the *Maryland Sea Level Rise by County in 2050 & 2100* datasets.

Table 4-33: Sea Level Rise

CORRIDOR	LAND AREA SUSCEPTIBLE TO SEA LEVEL RISE (2050) (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA SUSCEPTIBLE TO SEA LEVEL RISE (2050)	LAND AREA SUSCEPTIBLE TO SEA LEVEL RISE (2100) (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA SUSCEPTIBLE TO SEA LEVEL RISE (2100)
6	350	1%	1,470	4%
7	1,310	5%	3,230	12%
8	680	1%	1,620	3%

Note: values rounded to closest 10 acres.

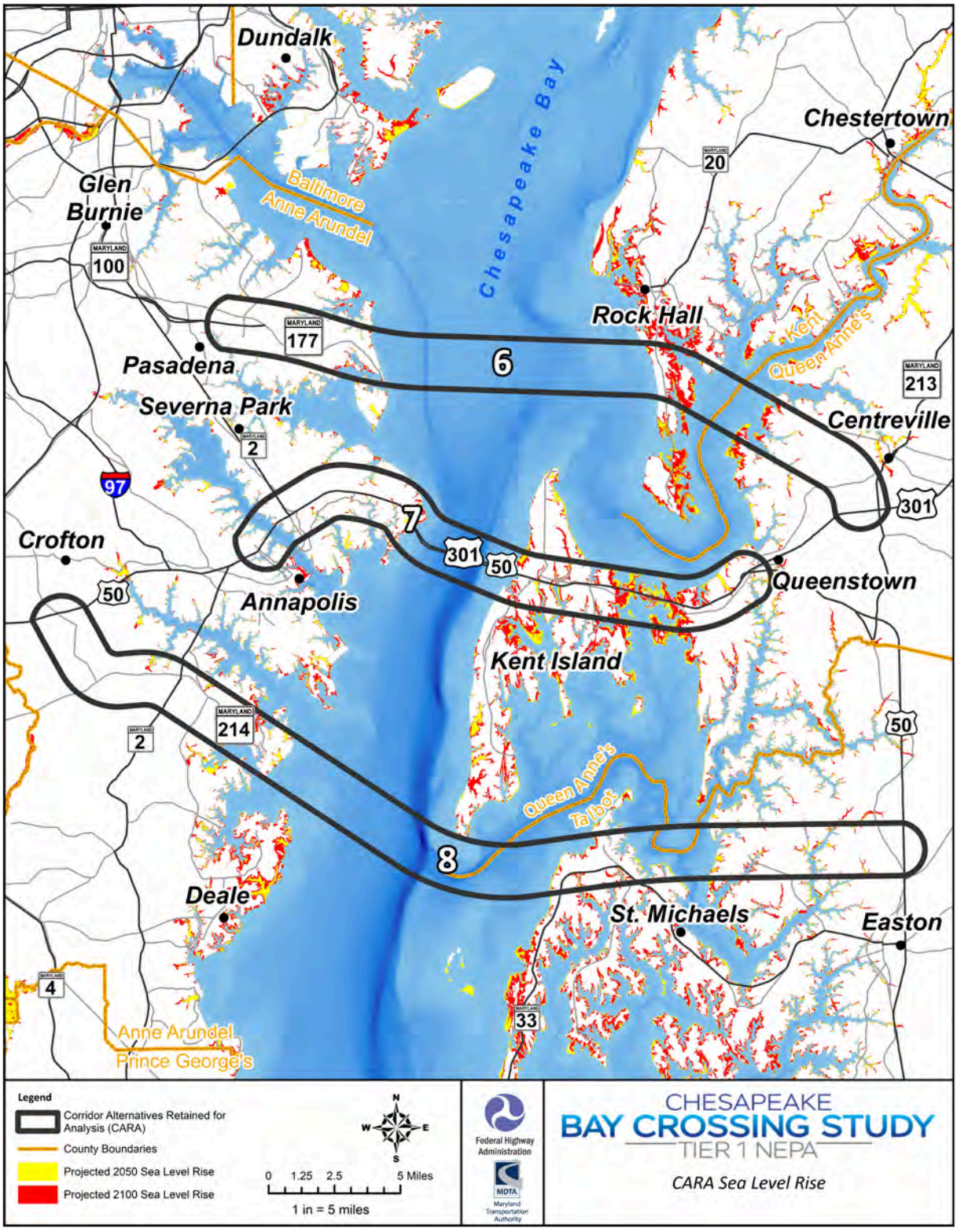
4.4.9.1 Corridor 6

Corridor 6 contains the least amount of total land area susceptible to sea level rise based on the projections for 2050 and 2100. The highest concentrations are located within the eastern section of the corridor and are generally associated with Eastern Neck Island and the shoreline of the Chester River (**Figure 4-19**).

4.4.9.2 Corridor 7

Corridor 7 contains the highest amount of total land area susceptible to sea level rise based on the projections for 2050 and 2100. The highest concentrations are located within the section of the corridor that spans Kent Island and at Kent Narrows and the Chester River in the eastern portion of the corridor (**Figure 4-19**).

Figure 4-19: Sea Level Rise



4.4.9.3 Corridor 8

Relative to the length of the corridor, Corridor 8 contains a comparatively small amount of total land area susceptible to sea level rise based on projections for 2050 and 2100. The highest concentrations are located within the western section of the corridor and are generally associated with the tidal inlets and waterways adjacent to the Bay (**Figure 4-19**).

4.4.9.4 Conclusions

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

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

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

Because of the coastal location of the three corridor study areas, spanning areas susceptible to sea level rise is unavoidable. Over time, sea level rise and the associated tidal and storm surges will have impacts on coastal transportation infrastructure. Therefore, comprehensive analysis and adaptation to these potential impacts will be an important component of medium and long-range planning and project development. It will also become increasingly important to continually incorporate adaptive management processes into planning as more updated data becomes available.

4.5 HAZARDOUS MATERIALS

4.5.1 Introduction and Methodology

Under NEPA, evaluation of hazardous materials, solid waste, and pollution prevention includes the evaluation of:

- Waste streams that would be generated by a project, potential for the wastes to impact environmental resources, and the impacts on waste handling and disposal facilities that would likely receive the wastes;

- Potential hazardous materials that could be used during construction and operation of a project, and applicable pollution prevention procedures;
- Potential to encounter existing hazardous materials at contaminated sites during construction, operation, and decommissioning of a project; and
- Potential to interfere with any ongoing remediation of existing contaminated sites at the proposed project site or in the immediate vicinity of a project site.

Several federal laws ensure remediation of contaminated sites. Two of the most prominent laws include the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or "Superfund") and the Resource Conservation Recovery Act (RCRA), which includes the Underground Storage Tank (UST) program and the Oil Pollution Act (OPA). In general, CERCLA applies to contaminated sites, while RCRA's focus is on controlling the ongoing generation and management of particular waste streams. RCRA, like CERCLA, has provisions to require cleanup of contaminated sites that occurred in the past. At the State level, analogous Maryland programs include the Maryland Department of the Environment (MDE) Land Restoration Program (LRP), MDE Voluntary Cleanup Program (VCP), and MDE Controlled Hazardous Substance (CHS) Enforcement Division. More detailed discussion of the regulatory context is included in the ***BCS Hazardous Materials Technical Report*, Section 3.0.**

Both federal (USEPA) and State (MDE) environmental databases were reviewed for current and/or historical contamination or hazardous materials concerns within the CARA. The investigation included a desktop evaluation of readily accessible records involving properties with environmental concerns and a cross-check of location data to ensure parcel and address information was accurate. The database review was performed in accordance with the requirements of the Council on Environmental Quality (CEQ) regulation section 1508.9, Environmental Assessment, as required by NEPA. Sites only needed to be identified in one governmental database to be included, although several sites were identified in multiple databases. Additionally, although some of the reviewed databases may contain similar or duplicative information on sites of concern, all of the data, as well as descriptions for each database retained for review, is included in the ***BCS Hazardous Materials Technical Report*** for relative comparison among the CARA.

Due the large volume of facilities/sites identified during the database review, it was important to designate a specific priority ranking to each facility/site based on the likelihood that they could potentially impact construction activities. While facilities/sites may have characteristics applicable to more than one rank, for the purposes of this Study, each site was assigned the highest applicable priority ranking as a default.

Each identified facility/site was assigned a Low, Moderate or High priority ranking based on the characteristics outlined below. Additionally, the characteristic criteria are ranked based on potential to impact construction activities (1- least impact, 11- most impact).

- Low Priority
  - No history of contamination or spills
  - Site is a USEPA Regulated Facility
  - Site with an MDE case that is closed with details outlining final determination
  - Site is in the Maryland Hazardous Waste Program

- Moderate Priority
    - Substantial property size (> 10 acres)
    - Insufficient information available
    - Federal Military Installation
    - Site with an MDE case that is closed with insufficient explanation outlining final determination
    - Site has a history of contamination, dumping and/or spills
- High Priority
    - MDE case and the site is open;
    - Superfund NPL listing

4.5.2 Hazardous Materials Database Review

Data within the following databases was accessed on January 27, 2020:

- Federal Military Installations;
- Facility Registry System (FRS)
    - Assessment, Cleanup and Redevelopment Exchange System (ACRES)
    - Compliance and Emissions Data Reporting Interface (CEDRI)
    - Federal Facility Hazardous Waste Compliance Docket (FFDOCKET)
    - Leaking Underground Storage Tank- American Recovery and Reinvestment Act (LUST-ARRA)
    - Maryland- Resource Conservation and Recovery Act Information System (MD-RCRA)
    - Maryland- Tools for Environmental Management and Protection Organizations (MD-TEMPO)
    - National Compliance Data Base (NCDB)
    - RCRAInfo
    - Risk Management Plan (RMP)
    - Superfund Enterprise Management System (SEMS) Search
    - Toxics Release Inventory System (TRIS)
    - Toxic Substances Control Act (TCSA)
- Maryland Department of the Environment (MDE) Land Restoration Program (LRP)
    - Voluntary Cleanup Program (VCP)/ Brownfields Division
    - Controlled Hazardous Substance (CHS) Enforcement/Fund Lead Site Assessment Division

As a result of the CARA analysis, 176 facilities/sites were identified which could potentially impact construction activities; 41 facilities/sites in Corridor 6, 99 facilities/sites in Corridor 7, and 34 facilities/sites in Corridor 8. Facility/site information including site names, addresses, GPS coordinates, database and environmental interest, reason for priority ranking, priority ranking, reference URLs (if applicable), and current status (active, inactive, unknown) are included in the ***BCS Hazardous Materials Technical Report***. Figures illustrating the physical location in relation to Corridors 6, 7, and 8 are included in **Appendix A**.

4.5.3 Summary

To summarize, an evaluation within Corridor 6, Corridor 7, and Corridor 8 was completed to identify facilities/sites with current and/or historical contamination or hazardous materials concerns. Identified facilities/sites were then further evaluated to determine their potential to affect corridor planning and impact construction activities. A low, moderate, or high priority ranking was applied to each facility/site based on their probability of presenting concerns from a corridor or alignment planning perspective. The results are summarized below in **Table 4-34**. Maps of the identified facilities/sites are included in **Appendix A.**

Table 4-34: Results Summary

	LOW PRIORITY	MODERATE PRIORITY	HIGH PRIORITY	TOTAL
Corridor 6	24	17	0	**41**
Corridor 7	63	33	3	**99**
Corridor 8	28	7	1	**36**

At this time, it is unknown how many potential hazardous materials sites would be impacted or be able to be avoided by a specific alignment. Based on the desktop database evaluation, all identified sites can potentially be avoided during the alignment planning phase. Accordingly, as the project progresses through subsequent phases of detailed CARA analysis and beyond to a Tier 2 Study, MDTA will investigate reasonable and feasible hazmat avoidance, minimization, and mitigation options. In the event that known hazmat sites cannot be avoided during alignment planning, studies will be conducted to identify containment and remediation/mitigation options to minimize the release of potential hazmat elements.

4.6 AIR QUALITY

4.6.1 Regulatory Context and Methodology

Various federal and state regulations and guidance require potential impacts on air quality be considered during the NEPA review of transportation projects. Major regulations and guidance related to the potential air quality impacts of transportation projects include:

- The Clean Air Act (CAA) and Amendments, 42 U.S.C. 7401 *et seq*.
- The Transportation Conformity Rule, 40 CFR part 93 subpart A
- Environmental Protection Agency (USEPA) Transportation Conformity Guidance for the *South Coast II* Court Decision (November 2018)
- FHWA Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents (October 18, 2016)
- The Greenhouse Gas Reduction Act of 2009, Md. ENVIRONMENT Code Ann. § 2-1201 - § 2-1211
- General Emissions Standards, Prohibitions, and Restrictions - Particulate Matter, COMAR 26.11.06.03

The goal for the BCS Tier 1 Study air quality assessment was to provide comparison among the CARA regarding the potential air quality impacts from alternative alignments to be developed in a future Tier 2 study. The methodology used to analyze potential differences includes consideration of CAA transportation conformity requirements, mobile source air toxics, traffic characteristics, greenhouse gases, and construction emissions. This Tier 1 air quality assessment involved reviewing existing EPA National Ambient Air Quality Standard (NAAQS) designations within the CARA to determine what transportation conformity requirements would apply in a potential future Tier 2 NEPA analysis. Likely Mobile Source Air Toxics analysis needs for a potential future Tier 2 NEPA analysis were considered by examining predicted traffic volumes. The traffic characteristics of speeds and truck volumes were compared as they correlate to potential vehicle emissions. Greenhouse gas and construction requirements were qualitatively considered.

4.6.2 Clean Air Act

4.6.2.1 Requirements

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 USEPA as having exceeded NAAQS for transportation related pollutants. For projects in these areas a transportation conformity determination must be completed prior to approval of the final NEPA document, in this case during a potential future Tier 2 analysis, 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. 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.

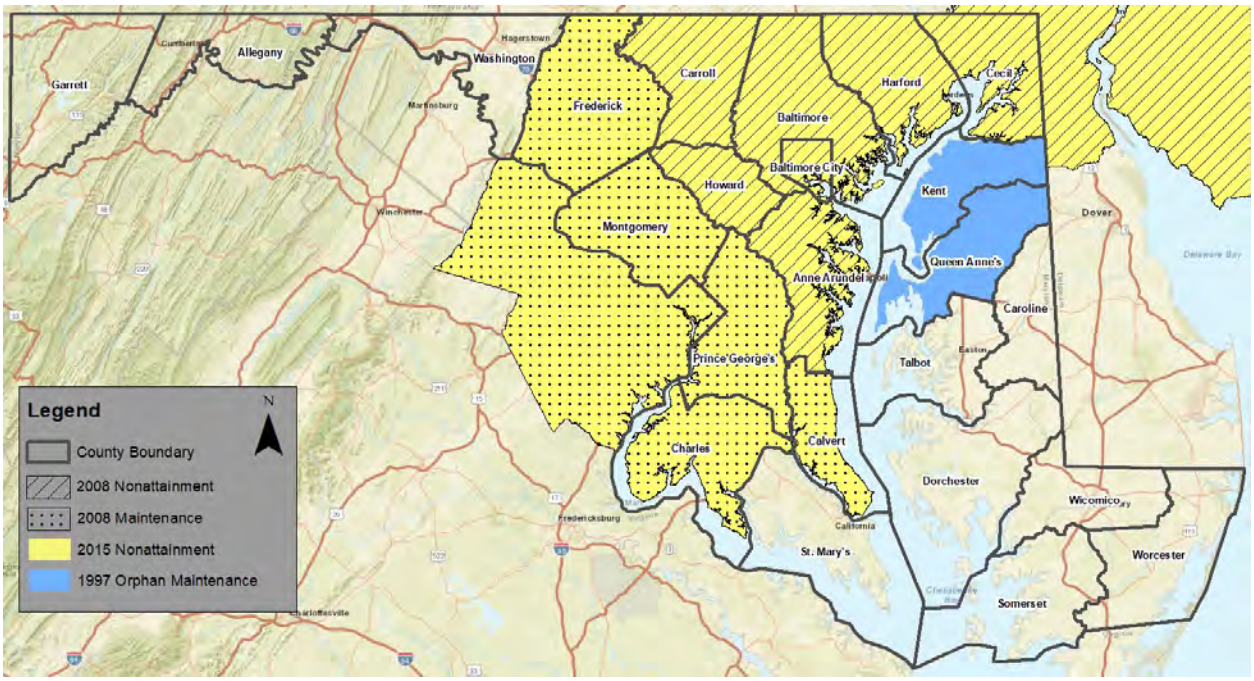
4.6.2.2 Existing Conditions

As currently designated by USEPA, Maryland is in attainment of the PM_{10}, $PM_{2.5}$, NO_2 and CO NAAQS. Baltimore City and 11 Maryland counties (Anne Arundel County, Baltimore County, Calvert County, Carroll County, Cecil County, Charles County, Frederick County, Harford County, Howard County, Montgomery County, and Prince George's County) are in 2015 O_3 8-hour NAAQS nonattainment areas (**Figure 4-20**). Baltimore City and 6 Maryland counties (Carroll County, Baltimore County, Harford County, Cecil County, Howard County, and Anne Arundel County) are also in 2008 O_3 8-hour NAAQS nonattainment areas, while 5 Maryland counties (Frederick County, Montgomery County, Prince George's County, Charles County, and Calvert County) 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*).

4.6.2.3 Assessment

West of the Bay, Corridors 6, 7, and 8 are located in Anne Arundel County, which is in both 2008 and 2015 O_3 NAAQS nonattainment areas. East of the Bay, Corridors 6, 7, and 8 are located partially in Queen Anne's County, which is in a 1997 O_3 NAAQS orphan maintenance area. A conformity determination would be completed for the preferred alternative identified during a potential future Tier 2 NEPA analysis regardless of the Corridor since Corridors 6, 7, and 8 each would be located within O_3 2008 and 2015 NAAQS nonattainment areas as well as 1997 orphan maintenance. 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 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. Additional detail is included in the ***BCS Air Quality Technical Report*.**

Figure 4-20: Maryland O_3 8-Hour NAAQS Nonattainment and Maintenance Areas



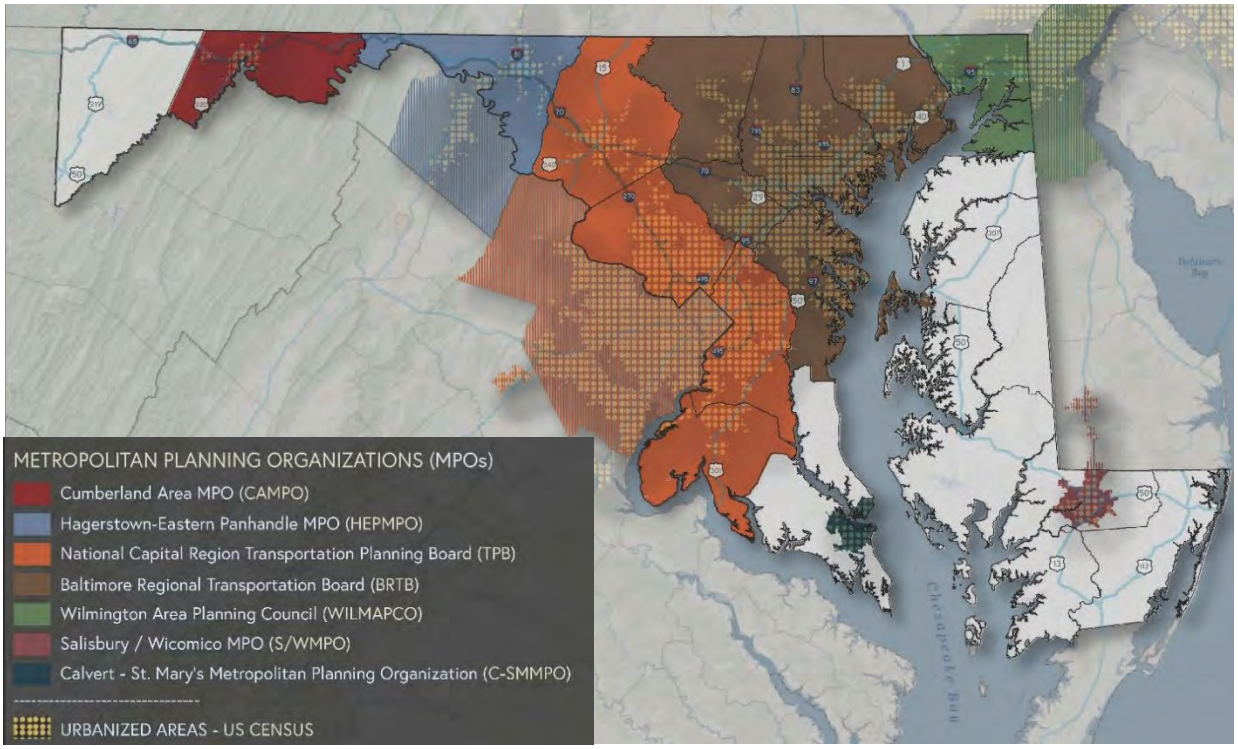
LRTP and TIP documents are developed by the governing Metropolitan Planning Organization (MPO), which is also responsible for ensuring the LRP and TIP conform to the SIP. An MPO is a federally mandated and federally-funded transportation policy-making organization made up of representatives from local governments and governmental transportation authorities. For O¬3 8-hour nonattainment/maintenance areas, the project must be included in the conforming TIP and LRTP for the region as part of the determination that the project also conforms to the SIP. There are seven MPO authorities in Maryland (**Figure 4-21**). Corridors 6, 7, and 8 are located partially within the area under the jurisdiction of the Baltimore Regional Transportation Board (BRTB) MPO and any preferred alternative identified during a potential future Tier 2 NEPA analysis would need to be properly included in the BRTB financially constrained TIP and LRTP descriptions to satisfy conformity determination requirements. This may require an amendment to the TIP and LRTP. A new bay crossing is not listed in either the current BRTB 2020-2023 TIP or Maximize 2045 LRP. The preferred alternative will need to meet the conformity requirements of the Clean Air Act Section 176(c) as appropriate.

4.6.3 Mobile Source Air Toxics

4.6.3.1 Requirements

In conjunction with the CAA Amendments of 1990, Congress mandated USEPA regulate 188 hazardous air pollutants. Of these pollutants, USEPA identified the following nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors: 1,3-butadien; acetaldehyde; acrolein; benzene; diesel PM; ethylbenzene; formaldehyde; naphthalene; and polycyclic organic matter. While FHWA currently considers these the priority Mobile Source Air Toxics (MSAT), the list is subject to change and may be adjusted in consideration of future USEPA rules.

Figure 4-21: Maryland MPO Authorities



Depending on project scope and anticipated changes in traffic volumes due to the project, either a qualitative discussion, qualitative analysis, or quantitative analysis must be included in NEPA documentation (FHWA 2016 *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*). Qualitative MSAT discussion is recommended for projects with no meaningful impacts on traffic volumes, which are considered by FHWA to have no potential MSAT effects. Qualitative MSAT analysis is recommended for projects that improve highway operations which impact traffic volumes without adding substantial new capacity and have design year annual average daily traffic estimates below 140,000 vehicles per day (VPD). Such projects are considered by FHWA to have low potential MSAT effects. Quantitative MSAT analysis is recommended for projects located in proximity to populated areas which either create new capacity or create significant additional capacity that is above 140,000 VPD in the design year. Such projects are considered by FHWA to have higher potential MSAT effects. Both quantitative and qualitative analyses would involve comparing a preferred alternative alignment to the No-Build Alternative during a potential future Tier 2 NEPA analysis.

4.6.3.2 Assessment

Tables 4-35 and **4-36** display projected design year 2040 ADT volumes for the CARA on non-summer weekdays and summer weekends. Shaded cells represent the values utilized for MSAT considerations. The No-Build Alternative was not used in determining likely MSAT analysis needs. The No-Build Alternative would be considered in the potential future Tier 2 NEPA analysis, regardless of the Corridor. These values are indicative of the likely level of MSAT analysis needed for any preferred alternative alignment identified during a potential future Tier 2 NEPA analysis.

Table 4-35: 2040 Non-Summer Weekday Projected Average Daily Traffic Volumes (VPD)

CROSSING	NO-BUILD	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Existing Bay Bridge	84,300	69,600	44,900	68,100
New Crossing	N/A	18,200	44,900	20,000
Total – Existing Bridge and New Crossing	84,300	87,800	89,800	88,100

Note: Shaded cells represent the values considered in determining the likely MSAT analysis needs

Table 4-36: 2040 Summer Weekend Projected Average Daily Traffic Volumes (VPD)

CROSSING	NO-BUILD	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Existing Bay Bridge	135,300	111,200	79,700	104,300
New Crossing	N/A	45,700	79,700	55,200
Total – Existing Bridge and New Crossing	135,300	156,900	159,400	159,500

Note: Shaded cells represent the values considered in determining the likely MSAT analysis needs

On both non-summer weekdays and summer weekends, a new crossing within Corridor 6 is projected to have an ADT below 140,000 VPD, yet since a new crossing within Corridor 6 would add capacity, the alternative alignment in a Tier 2 NEPA analysis would have low potential MSAT effects and a qualitative MSAT analysis would be considered.

Corridor 7 encompasses the Bay Bridge. Therefore, the combined total projected ADT at both the new crossing and the Bay Bridge would be considered in determining the type of MSAT analysis that would likely be most appropriate for Corridor 7. On non-summer weekdays Corridor 7 does not exceed 140,000 VPD but does exceed 140,000 VPD on summer weekends in 2040. Additionally, Corridor 7 is located in proximity to populated areas in both Annapolis and Kent Island. Therefore, any alternative alignment in a Tier 2 NEPA analysis would have a higher potential MSAT effect and a quantitative MSAT analysis be considered.

Similar to Corridor 6, a new crossing within Corridor 8 has projected traffic volumes less than 140,000 VPD on both non-summer weekdays and summer weekends, and a new crossing within Corridor 8 would add capacity. Therefore any alternative alignment in a Tier 2 NEPA analysis in this corridor would have a low potential MSAT effect and a qualitative MSAT analysis would be considered.

4.6.4 Traffic Characteristics

4.6.4.1 Assessment

Projected traffic characteristics from alternatives under consideration may also be indicators of relative levels of vehicle emissions. Two of these characteristics include travel speed and truck percentage.

Tables 4-37 and **4-38** reflect the average daily 2040 design year non-summer weekday and summer weekend vehicle speeds in each direction for the CARA and No-Build alternatives at the respective crossing of the Bay.

Table 4-37: 2040 Non-Summer Weekday Average Daily Vehicle Speeds (MPH)

CROSSING		NO-BUILD	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Existing Bay Bridge	Eastbound	42	45	45	45
	Westbound	43	45	45	45
New Crossing	Eastbound	N/A	55	55	55
	Westbound	N/A	55	55	55

Note: Speeds rounded to closest 1 MPH

Table 4-38: 2040 Summer Weekend Average Daily Vehicle Speeds (MPH)

CROSSING		NO-BUILD	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Existing Bay Bridge	Eastbound	35	41	45	44
	Westbound	37	45	45	45
New Crossing	Eastbound	N/A	55	55	55
	Westbound	N/A	55	55	55

Note: Speeds rounded to closest 1 MPH

These tables indicate average vehicle speeds would be greater at the Bay Bridge with any of the CARA; Corridor 7 has the highest projected vehicle speeds on summer weekends in 2040. Higher speeds with a reduction in congestion are typically related to lower vehicle emissions for certain pollutants.

Tables 4-39 and **4-40** compare the average daily number of trucks crossing the Chesapeake Bay in the 2040 design year non-summer weekday and summer weekends for the CARA and No-build conditions. Shaded cells in the tables represent the values compared for potential emissions considerations.

Table 4-39: 2040 Non-Summer Weekday Projected Average Daily Truck Volumes (VPD)

CROSSING	NO-BUILD	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Existing Bay Bridge	12,730	10,510	5,810	10,290
New Crossing	N/A	2,750	7,750	3,010
Total - Existing Bridge and New Crossing	12,730	13,260	13,560	13,300

Note: Shaded cells represent the values compared for potential emissions considerations

Table 4-40: 2040 Summer Weekend Projected Average Daily Truck Volumes (VPD)

CROSSING	NO-BUILD	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Existing Bay Bridge	11,230	9,230	5,670	8,660
New Crossing	N/A	3,790	7,560	4,580
Total – Existing Bridge and New Crossing	11,230	13,020	13,230	13,240

Note: Shaded cells represent the values compared for potential emissions considerations

Corridors 6 and 8 do not encompass the Bay Bridge and therefore only truck volumes at the new crossing are compared to the No-Build. Since Corridor 7 encompasses the Bay Bridge, the total truck volume of the Bay Bridge and New Crossing are considered. These tables indicate Corridors 6 and 8 would result in lower truck volumes than the No-Build Alternative, whereas Corridor 7 would increase the number of projected daily truck crossings. Higher truck volumes are typically related to greater vehicle emissions.

4.6.5 Greenhouse Gases

4.6.5.1 Requirements

Currently, there are no federal mandated project planning requirements regarding the consideration of greenhouse gas (GHG) impacts for transportation projects. Maryland also does not require GHG analysis at the project level. However, MDOT is exploring strategies and programs aimed at reducing GHG emissions in conjunction with Maryland's Greenhouse Gas Emissions Reduction Act, which requires a 40 percent reduction of emissions from 2006 levels by 2030.

4.6.5.2 Assessment

Projected GHG emissions may be qualitatively discussed for a preferred alternative during a potential future Tier 2 NEPA analysis if warranted and practicable.

4.6.6 Construction Emissions

4.6.6.1 Requirements

The construction phase of any project has the potential to impact the local ambient air quality by generating fugitive dust through activities such as demolition and materials handling. MDOT has addressed this possibility by establishing procedures to be followed by contractors involved in transportation project site work through publishing the *Standard Specifications for Construction and Materials*. Through consultation with the MDE Maryland Air and Radiation Management Administration, MDOT determined the adequacy of the specifications in terms of satisfying the requirements of the *Regulations Governing the Control of Air Pollution in the State of Maryland*.

4.6.6.2 Assessment

As indicated by COMAR 26.11.06.03 D, all appropriate measures to minimize construction impacts on the air quality of the area would be incorporated during the construction of any resulting improvements. Mobile source emissions can also be minimized during construction by prohibiting idling delivery trucks or other equipment during periods of unloading or other non-active use. The existing number of traffic lanes would be maintained during construction to avoid traffic congestion and idling to the maximum extent possible, and construction schedules would be planned in a manner to avoid traffic disruption and an increase in air pollutants. Application of these measures could help to minimize the construction emission impact of any transportation improvement project. Regardless of the CARA selected, the same measures to minimize construction emissions would be required during project construction.

4.7 NOISE

4.7.1 Regulatory Context

FHWA regulations at 23 CFR 772.7 require highway agencies to develop noise policies for the study and possible abatement of traffic noise impacts from highway projects requiring FHWA approval, regardless of funding source. FHWA provides agencies additional guidance for the application of 23 CFR 772 within FHWA's "Highway Traffic Noise: Analysis and Abatement Guidance". MDTA currently utilizes the existing The Maryland Department of Transportation State Highway Administration (MDOT SHA) "Highway Noise Abatement Planning and Engineering Guideline" for the evaluation of potential noise impacts resulting from highway projects, which received FHWA approval April 17, 2020. The analysis of noise impacts and evaluation of abatement measures during a future Tier 2 NEPA analysis are anticipated to be completed under the MDOT SHA Highway Noise Abatement Planning and Engineering Guidelines.

A project involving construction of a new highway, capacity additions to the existing highways, major operational improvements, or the construction or modification of specific highway related facilities is considered a Type I project. For Type I projects, the Highway Noise Guidelines state a traffic noise impact is identified when design year traffic noise levels are projected to equal or exceed the appropriate Noise Abatement Criteria (NAC) for each activity category. The NAC for each "Activity Criteria" is shown in the following **Table 4-42** from the Highway Noise Guidelines. The BCS Tier 1 study is being treated as a Type I project for purposes of the assessment of potential noise sensitive areas. If a Tier 2 study is initiated it will be a Type I project, and as such the entire project area will be treated as a Type I Project.

The MDOT SHA Highway Noise Abatement Planning and Engineering Guidelines define traffic noise impact criteria based upon the identified activity category (see **Table 4-41**) in areas where frequent human use occurs within various land use types. Activity Categories A through E are considered noise sensitive land use types, and Activity Categories F and G are considered non-noise sensitive land use types. A noise impact is defined as noise levels that approach or exceed the applicable NAC, and/or experiences a substantial noise level increase of 10-15 dB(A) depending upon the existing noise level. FHWA regulations and the MDOT SHA *Highway Noise Guidance* require that noise abatement be investigated at all Noise Sensitive Areas (NSAs) where impacts have been identified. Where noise abatement is warranted for consideration, additional criteria is examined to determine if the abatement is feasible and reasonable. The assessment of noise abatement feasibility, in general, focuses on whether it is physically possible to build an abatement measure (i.e. noise barrier) that achieves a minimally acceptable level of noise reduction. Barrier feasibility considers three primary factors: acoustics, safety & access, and site constraints. The assessment of noise abatement reasonableness, in general, focuses on whether it is practical to build an abatement measure. Barrier reasonableness considers three primary factors: viewpoints, design goal, and cost effectiveness. Traffic noise impacts and noise abatement measures have not been determined in the Tier 1 study, but would be investigated if a Tier 2 study is initiated.

Table 4-41: Noise Abatement Criteria (NAC) [Hourly A-Weighted Sound Level in Decibels db(A)]

ACTIVITY CATEGORY	ACTIVITY CRITERIA[1] LEQ(H)[2]	MARYLAND SHA APPROACH CRITERIA	EVALUATION LOCATION	DESCRIPTION OF ACTIVITY CATEGORY
A	57	56	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67	66	Exterior	Residential
C	67	66	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	51	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[3]	72	71	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	--	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	--	--	--	Undeveloped lands that are not permitted

1. The Leq(h) Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.
2. The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq.
3. Table is adapted from Table 1 in 23 CFR 772. 23 CFR 772 specifies that Highway agencies establish an approach level to be used when determining a traffic noise impact. The approach level shall be at least 1 dB(A) less than the NAC for activity categories A to E.
4. Includes undeveloped lands permitted for this activity category.

Generally, the loudness of traffic noise is increased by heavier traffic volumes, higher speeds, and greater numbers of trucks. FHWA has established the following vehicle categories to use in traffic noise analyses:

- Automobiles - vehicles with two axles and four tires;
- Medium trucks - all cargo vehicles with two axles and six tires;
- Heavy trucks - all cargo vehicles with three or more axles;
- Buses - all vehicles designed to carry more than nine passengers; and
- Motorcycles - all vehicles with two or three tires and an open-air driver/passenger compartment

Noise levels are affected by distance from the noise source, terrain between the noise source and receptor, vegetation and other natural or manmade obstacles between the noise source and receptor.

4.7.2 Methodology

Since the Tier 1 study area consists of approximately two-mile wide corridors and does not identify a specific alignment within these corridors the Tier 1 traffic noise assessment for the BCS identified land use types in the CARA based on local planning agency land use or zoning designations. Noise sensitive areas within the retained corridors were identified based on the NAC categories shown in **Table 4-41**. A detailed analysis of traffic noise impacts and abatement would be completed during a subsequent Tier 2 evaluation as the scale and scope of this project is narrowed using the analysis methodology of Type I projects as defined by the Highway Noise Guidelines. A subsequent Tier 2 evaluation would also consider potential impacts from the construction of the project together with measures to minimize or eliminate adverse construction impacts to the community. The Bay Crossing Study Tier 1 assessment included:

- Identifying land uses based on local planning agency land use cover mapping and categorization of the land into Activity Categories within each CARA; and
- Quantifying the number and percentage of noise sensitive areas (NSAs) within each CARA.

Additionally, a description of noise implications for potential alignments considered in a Tier 2 study within these NSAs is provided. NSAs will be further refined and delineated for the Tier 2 study. Identification of areas of potential noise receptor locations for traffic noise monitoring and initiation and completion of field noise measurements will be conducted in Tier 2.

4.7.3 Land Use Designations and Noise Implications

The land within each CARA has been classified into Activity Categories as defined in **Table 4-41** based on the Maryland Department of Planning 2010 Land Use/Land Cover Update. The 2010 Land Use data is the most recent available data as of the writing of the ***BCS Highway Noise Qualitative Assessment***. New developments may have occurred since this data was generated; however, it would only affect a relatively small amount of acres compared to the overall size of each corridor. Each corridor is two miles wide and encompasses an area of approximately 35,000 acres for Corridor 6, 28,000 acres for Corridor 7, and 47,000 acres for Corridor 8. A large portion of this area is open water which does not fall into any of the Activity Categories and will not require any consideration for the noise analysis. Because the nature of the land uses varies between the Western Shore and Eastern Shore, the percentage breakdowns of land use activity have been divided into separate tables for each shore. Only Categories B, C, and E (considered noise sensitive areas) and F and G (considered non-noise sensitive areas) have been identified based upon the land use data. Category A and D activities are not yet identified because they require a field inspection

of the activities present within each parcel, which would occur during a future Tier 2 NEPA analysis. Land use data has not been verified in the field for the Tier 1 assessment, but would be verified and updated during a future Tier 2 NEPA analysis.

4.7.3.1 Land Uses within Corridor 6

Corridor 6 would connect MD 100 on the Western Shore to US 301 on the Eastern Shore. On the Western Shore, the study area is located in the vicinity of Pasadena, Jacobsville, and Lake Shore in Anne Arundel County. A majority of the land use on the Western Shore is residential, with the commercial land uses primarily located along Mountain Road (MD 177). There are several schools and churches located within the corridor, as well as Compass Pointe Golf Course and the Lake Shore Athletic Complex. On the Eastern Shore, Corridor 6 first passes through Eastern Neck Road (MD 445), just south of Rock Hall in Kent County. This area includes approximately 20 single family residences and the Bayshore Campgrounds, while the rest of the corridor is agricultural or undeveloped in nature. The corridor then crosses the Chester River and connects to US 301 in the vicinity of Centreville in Queen Anne's County. There are two recreational areas, the Queen Anne's County 4-H Park and Route 18 Park located within the corridor; the rest of the area is primarily agricultural in nature. See **Table 4-42** and the **Appendix A** mapping for a summary of the land uses.

Table 4-42: Land Use Activity Category Areas and Summary: Corridor 6

WESTERN SHORE				EASTERN SHORE			
NOISE SENSITIVE AREAS	ACTIVITY CATEGORY	ACRES	PERCENTAGE	NOISE SENSITIVE AREAS	ACTIVITY CATEGORY AREAS	ACRES	PERCENTAGE
Yes (60.9%)	B	4178	55.0%	Yes (8.2%)	B	682	7.4%
	C	427	5.6%		C	78	0.8%
	E	26	0.3%		E	1	0.0%
No (39.1%)	F	511	6.7%	No (91.8%)	F	5576	60.3%
	G	2456	32.3%		G	2910	31.5%

4.7.3.2 Land Uses within Corridor 7

Corridor 7 generally follows the existing US 50/301 corridor between Parole and Annapolis in Anne Arundel County and Queenstown in Queen Anne's County alongside the existing Bay Bridge. On the Western Shore, the land is primarily split between residential and agricultural/commercial uses. There are several schools and churches located within the corridor, including a portion of the US Naval Academy, as well as Sandy Pointe State Park and Broadneck Park. On the Eastern Shore, the land is primarily agricultural/commercial in nature. There are also several schools and churches located within the corridor, as well as Queenstown Harbor Golf Course and Old Love Point Park. This corridor passes through the towns of Stevensville, Chester, Kent Narrows, Grasonville, and Queenstown. See **Table 4-43** and the **Appendix A** mapping for a summary of the land uses.

Table 4-43: Land Use Activity Category Areas and Summary: Corridor 7

WESTERN SHORE				EASTERN SHORE			
NOISE SENSITIVE AREAS	ACTIVITY CATEGORY	ACRES	PERCENTAGE	NOISE SENSITIVE AREAS	ACTIVITY CATEGORY AREAS	ACRES	PERCENTAGE
Yes (50.0%)	B	3560	41.8%	Yes (31.9%)	B	2111	21.4%
	C	645	7.6%		C	907	9.2%
	E	52	0.6%		E	129	1.3%
No (50.0%)	F	3263	38.3%	No (68.1%)	F	4752	48.1%
	G	1001	11.8%		G	1976	20.0%

4.7.3.3 Land Uses within Corridor 8

Corridor 8 would connect US 50/301 near Crofton in Anne Arundel County on the Western Shore to US 50 just north of Easton in Talbot County on the Eastern Shore. On the Western Shore the corridor roughly follows MD 424 to Davidsonville, then follows MD 214 to Mayo and the shoreline. A majority of the land is non-noise sensitive agricultural, undeveloped forest land, and industrial uses. There are several schools and churches located within the corridor, as well as recreation centers including: Riva Area Park, The Golf Club at South River, The YMCA Camp Letts, Camp Wabanna, and Mayo Beach Park. On the Eastern Shore, the corridor first passes through Claiborne and McDaniel before crossing the Eastern Bay towards Easton. This area is almost entirely non-noise sensitive agricultural land and undeveloped forest land, with some small pockets of residential areas. The Harbourtowne Country Club is the only recreational facility identified in this area. After the corridor crosses the Eastern Bay and ties into the mainland at US 50, the land is also almost entirely non-noise sensitive agricultural land and undeveloped forest land, with some small pockets of residential areas. Along US 50 there are three Category C land uses, including the Discovery Christian Church, the Talbot County Community Center, and Hog Neck Golf Course. See **Table 4-44** and the **Appendix A** mapping for a summary of the land uses.

Table 4-44: Land Use Activity Category Areas and Summary: Corridor 8

WESTERN SHORE				EASTERN SHORE			
NOISE SENSITIVE AREAS	ACTIVITY CATEGORY	ACRES	PERCENTAGE	NOISE SENSITIVE AREAS	ACTIVITY CATEGORY AREAS	ACRES	PERCENTAGE
Yes (33.7%)	B	3831	28.9%	Yes (9.6%)	B	897	7.0%
	C	604	4.6%		C	320	2.5%
	E	28	0.2%		E	15	0.1%
No (66.3%)	F	3795	28.7%	No (90.4%)	F	7106	55.2%
	G	4981	37.6%		G	4527	35.2%

4.7.3.4 Noise Implications

In general, lands that fall within approximately 500 feet of a proposed alignment would need to be considered as a part of the noise impact study area, but study limits can be extended if potential impacts are found to extend further from the alignment. At a distance of 500 feet traffic noise from the studied alignment will rarely result in an impact, and background noise sources such as local traffic, wind, animal, bird, insect noises, as well as traffic noise from other adjacent highways and arterials will begin to be the predominate noise sources. Whether a proposed roadway improvement involves widening of an existing

roadway or a roadway on a new alignment will also affect the types of noise impacts that may be identified. Since existing roadways contribute to the noise environment, widening projects typically do not result in substantial increases in noise levels, so impacts are primarily based upon the NAC. However, when a roadway is constructed on a new alignment, there is a greater potential to identify substantial increases adjacent to the new alignment due to the absence of an existing noise source.

Concentrations of potentially noise sensitive areas exist within each of the three CARA. Noise impact analysis must be conducted for all Category B residential land uses that fall within the study limits. Category C and E land uses will require verification of active outdoor land use areas in order to be considered noise sensitive. This primarily includes activities such as outdoor dining and recreational areas. However, locations where the activities may generate noise themselves, or where the uses may be transient in nature may not be considered noise sensitive. Per MDOT SHA Highway Noise Guidelines, Category C land uses that include large recreational areas are assigned an equivalent residence value based upon the amount of linear frontage they have adjacent to the proposed roadway. A determination is made that the typical uses would be of sufficient frequency and duration, and the equivalent residence value can be weighted based upon this "intensity of use" determination. If upon further investigation a Category C area contains no outdoor land uses, however indoor noise sensitive uses are present, these areas will be reclassified as Category D. The interior noise levels are analyzed for Category D areas by applying a building noise reduction factor based on the type of construction materials used for the structure to estimate the interior noise levels from the exterior noise levels just outside the building.

Lands that have been identified as non-noise sensitive using the land use cover data may also need further identification of potential noise sensitive areas. For Category F agricultural areas there are typically dwelling structures located within the lots, and the areas directly adjacent to these dwelling structures would need to be considered as a Category B noise sensitive area. Locations within the forest land identified as Category G may also contain recreational areas which may fall into a Category C.

The mapping in **Appendix A** identifies the Land Use Activity within each of the CARA. Every parcel within each CARA has been classified based on the Maryland Department of Planning 2010 Land Use/Land Cover Update and shaded accordingly. Land Use/Land Cover data will be updated and field verified as needed in a future Tier 2 NEPA analysis. Open water is not considered noise sensitive, but does not fall into any of the Activity Categories and has not been included with the shading and these areas have also been excluded in the results. Land-locked freshwater lakes have been included in the results. The shaded areas correspond to the acreage and percentages shown in **Tables 4-42** through **4-44**.

4.8 Indirect and Cumulative Effects

This section presents the assessment of Indirect and Cumulative Effects (ICE) of the alternatives evaluated in the Tier 1 EIS for the three CARA and the No-Build Alternative. **Section 4.8.1** provides the introduction and the methodology for the ICE analysis, including the scoping process and ICE analysis boundary. **Section 4.8.2** provides information on resource identification and data collection used for the ICE analysis. **Section 4.8.3** covers the indirect effects analysis, and Section **4.8.4** discusses the cumulative effects analysis. More detailed information is available in the ***BCS Indirect and Cumulative Effects Technical Report***.

4.8.1 Introduction and Methodology

The ICE analysis was implemented consistent with the Council on Environmental Quality's (CEQ) *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ, 1997) 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 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 1508.8(b)). 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 1508.8(b)).

For the purposes of this EIS, indirect effects can occur in three broad categories. For this analysis, the term "indirect effects" refers to all three of these 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).

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). 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 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?

Indirect and cumulative effects were 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 the public and appropriate regulatory agencies during the scoping process.

4.8.1.1 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 were not 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 the following sub-boundaries: potential induced growth areas, watershed boundaries, and US Census Tracts.

Induced Growth Study Areas were developed to reflect areas that could potentially experience induced growth from a new crossing (as described in **Section 4.8.1.2**)**.** Areas on the Eastern Shore within 30 to 45 minutes, or 45 to 60 minutes of travel time via the Bay Bridge or a new crossing location are considered in the induced growth analysis.

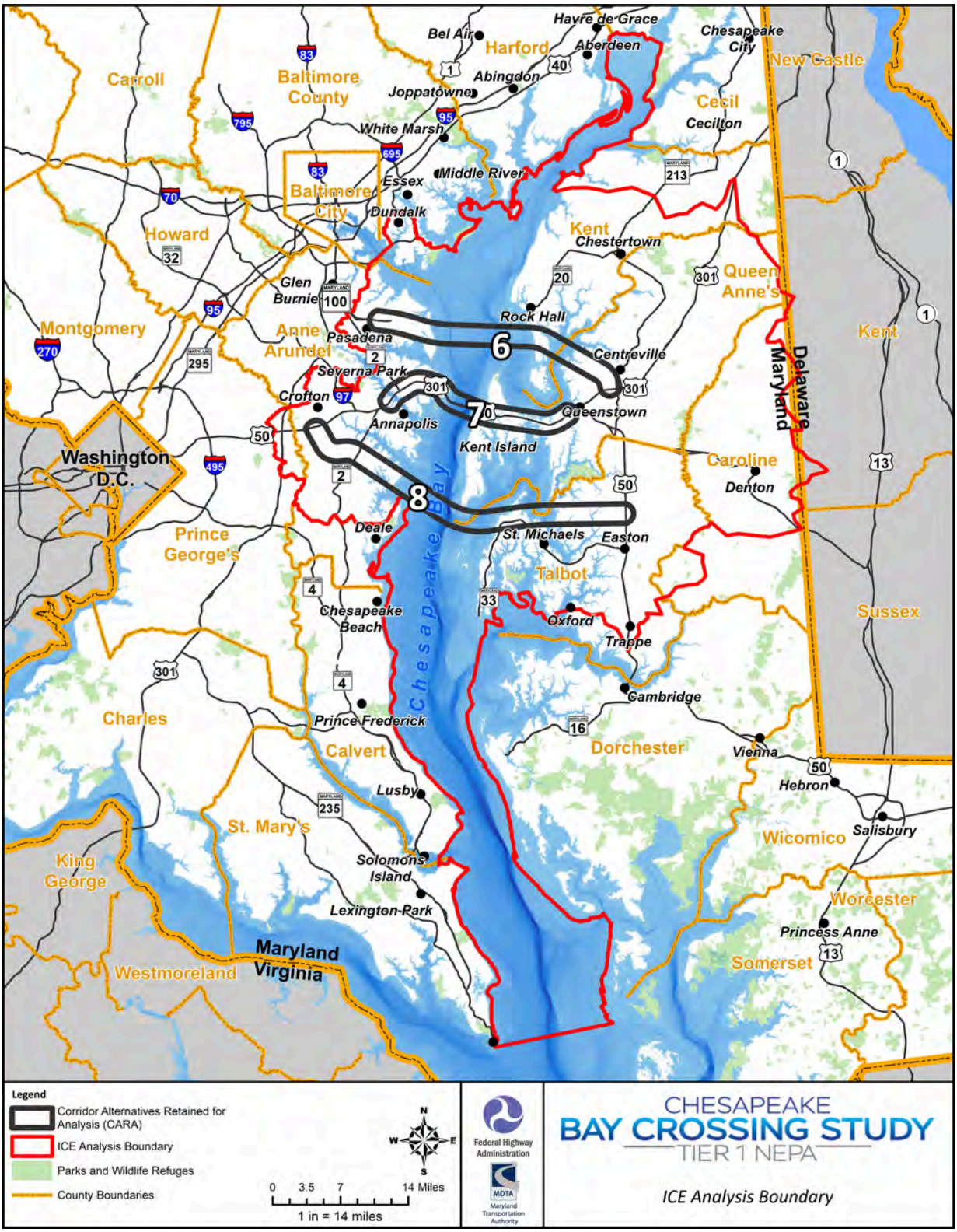
The boundaries of those Census tracts overlapping the corridor alternatives, including the geographically contiguous area between the corridors, were considered in development of the ICE Analysis Boundary to ensure inclusion of relevant socioeconomic resources such as communities, community facilities, businesses and employers, and housing. The outermost edges of the overlaid sub-boundaries (US Census Tracts, Induced Growth Study Areas, and watershed boundaries) comprise the overall ICE Analysis Boundary as shown on **Figure 4-22**.

The watersheds used to develop the ICE Analysis Boundary include those 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**.** The 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.

4.1.1.1 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. 1970 was selected as the early timeframe because the second span of the 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.

Figure 4-22: ICE Analysis Boundary



4.1.1.2 Indirect Effects Induced Growth Analysis

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 greater access to Western Shore employment centers due to the connection of a new crossing would potentially be the most likely to experience development pressure. For more detailed description of the induced growth analysis, refer to the ***BCS ICE Technical Report*, *Section 5.3.***

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 considered 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. 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 Induced Growth Study Areas, would be made accessible within a 0-30, 30-45, or 45-60 minute drive of the employment centers based on distance and speed limits for the existing and proposed segments of roadway network. Areas that are currently within these specified drive times under existing conditions (based on distance and speed limits) were excluded from the Induced Growth Study Areas.

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 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, included in the ***BCS ICE Technical Report***. No 30-minute or less travel bands extend to the Eastern Shore for either corridor.

The induced growth analysis associated with a new crossing in Corridor 7 differs from the other two CARA evaluated. Induced growth resulting from a new crossing in Corridor 7 is considered qualitatively because the Bay Bridge within the corridor already provides access to Western Shore employment centers. The Induced Growth Study Areas methodology, which considers access to employment centers based on distance and speed limits, would not identify any areas of greater access on the Eastern Shore resulting from Corridor 7 beyond those already provided by the Bay Bridge. However, induced growth could still occur as a result of reduced traffic congestion in Corridor 7, which was considered qualitatively. Similarly, areas on the Western Shore were also considered qualitatively for their potential to experience Induced Growth.

4.8.2 Resource Inventory and Data Collection

Data were collected to cover the established ICE Analysis Boundary and the temporal boundaries. This study considered 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 historic resources.

The resource inventory and data collection effort also included 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 EIS, much of the data presented in this section is aggregated at the county level. Evaluation at a finer level of detail would occur during Tier 2 study.

4.8.2.1 Socioeconomic Resources

Existing socioeconomic information, as documented for the CARA in **Section 4.1**, was used to inform the analysis of ICE and 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;
- Section 4(f) and Section 6(f) Resources, such as parks, refuges and historic sites.

More detailed discussion of socioeconomic resources within the ICE Analysis Boundary is included in the ***BCS ICE Technical Report*.**

4.8.2.2 Natural Resources

The Natural Resources section of this document, **Section 4.4**, provides a detailed description of the existing conditions and regulatory basis and methodology used for the analysis of direct effects of potential improvements within the corridor alternatives on natural resources.

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.

Prior 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. More detailed discussion of natural resources within the ICE Analysis Boundary is included in the ***BCS ICE Technical Report***.

4.8.2.3 Cultural Resources

The Cultural Resources section of this document, **Section 4.2**, provides a detailed description of the existing conditions and regulatory basis and methodology used for the analysis of direct effects of the potential improvements within the corridor alternatives on cultural resources.

The NHPA defines a historic property as any "prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP, including artifacts, records, and material remains related to such a property or resource." For the evaluation of ICE historic architectural and archaeological resources listed in the NRHP were identified within the ICE Analysis Boundary. According to NRHP data, a total of 236 historic properties listed in the NRHP are in the ICE Analysis Boundary.

The ICE Analysis also considered the recorded historic properties identified within the CARA, as described in **Section 4.2.** The FHWA and MDTA have initiated the Section 106 consultation process and will implement the phased identification of historic properties. This Tier 1 EIS involves the identification of recorded historic properties within the CARA, as defined in **Section 4.2.1**. There are two recorded 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 an NHL, 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.

4.8.2.4 Air Quality

The Air Quality section of this document, **Section 4.6**, provides a detailed description of the existing conditions and regulatory basis and methodology used for the analysis of direct effects of the potential improvements within the corridor alternatives on air quality. The ICE Analysis relies on the same information presented in **Section 4.6.**

4.8.3 Indirect Effects Analysis

This Tier 1 analysis includes consideration of the resources within the CARA and the ICE Analysis Boundary, and qualitative discussion of the most likely type of indirect effects that could occur from implementing a crossing within the corridors. The No Build Alternative was also considered. 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. For more details on the indirect effects analysis results, see the ***BCS Indirect and Cumulative Effects Technical Report, Section 5.0***.

4.8.3.1 Types of Indirect Effects Considered

The indirect effects analysis focused 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 4.8.1**): 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 presented below.

Transportation improvements can also 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 flow of goods, 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 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.

4.8.3.2 Summary of Potential Indirect Effects

No-Build Alternative Summary

The No-Build Alternative would result in increasingly poor traffic conditions at the 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 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 nine hours in the westbound direction). This is expected to worsen by 2040 to seven hours on non-summer weekdays (with five hours in the eastbound direction and two 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.

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.

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.

CARA Summary

A crossing in a new location over the Chesapeake Bay could 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. 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.

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 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 likely have substantial 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. More detailed discussion of the induced growth analysis, including maps of the Induced Growth Study Areas, is included in the ***BCS ICE Technical Report*, *Sections 5.6.2, 5.7.2, and 5.8.2.***

Induced growth effects could also occur on the Western Shore as a result of a new crossing. The magnitude of such an effect would likely be lower than on the Eastern Shore, because the Western Shore is already connected to employment centers such as Baltimore and Washington by the existing roadway network without the barrier of the Chesapeake Bay. This new infrastructure could attract new or more intensive commercial development along the new roadway, and along existing roads with access points to the new roadway. Additionally, commute times to employment centers could be marginally reduced for some Western Shore areas connecting to the new roadway, due to the presence of new capacity. Existing residential communities and undeveloped lands along major roadways connecting to the new roadway could see pressure for greater development. This effect would be particularly expected for Corridor 8, which would require the longest portion of new roadway on the Western Shore among the CARA.

Potential induced growth effects could have both adverse and beneficial socioeconomic impacts. For example, induced residential growth could lead to commercial and institutional types of growth to service new residents in the long term. This could be beneficial to local employment and the local economy. New growth could also put pressure on services provided by local governments such as schools, water and sewer service. 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 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 could substantially alter the rural setting, impacting community cohesion.

The areas likely impacted by induced growth on the Eastern Shore include substantial important natural resources such as wetlands, floodplains, streams, and Chesapeake Bay Critical Areas. 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. 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.

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.

In addition to the induced growth potential described within the ICE Analysis Area, indirect effects resulting from greater tourism to beach destinations such as Ocean City could occur as a result of a new crossing. 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.

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. 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.

New waterway crossings and new impervious surfaces could have potential for indirect effects on natural resources such as downstream impacts to water quality and aquatic resources, and effects from habitat fragmentation. An increase in the extent of impervious surface from a new crossing could indirectly increase the amount and velocity of stormwater runoff into streams located in, and downstream of, the direct impacts area, impacting water quality and human and wildlife uses. If dredging is required for construction, dredging and disposal activities could affect water quality by increasing turbidity 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. Impacts to aquatic habitat could affect commercial and recreational fishing or crabbing locations. Minimization would be included in the later stages of planning and design if a corridor is carried forward for Tier 2 evaluation, such as a comprehensive stormwater management plan in compliance with applicable regulations.

Land use conversion could indirectly affect wildlife through water quality impacts and habitat fragmentation. Habitat fragmentation can have wide-ranging indirect effects to sensitive wildlife. A new crossing could restrict wildlife movement through the riparian corridors crossed by the infrastructure, and potentially alter up and downstream hydrologic flow. Corridor 7 could potentially have lower indirect impacts to natural resources due to the shorter crossing and overall corridor length and the presence of the existing Bay Bridge crossing. Potential indirect effects to natural resources are discussed in more detail in the ***BCS ICE Technical Report*****.**

4.8.4 Cumulative Effects Analysis

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, while other present and reasonably foreseeable actions are included in **Table 4-45** and **Table 4-46**, below. 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. For more details on the cumulative effects analysis results, see the ***BCS ICE Technical Report*, *Section 6.4***.

Table 4-45: 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
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

PROJECT	LOCATION	DESCRIPTION	STATUS
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 4-46: 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
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

PROJECT	SOURCE	LOCATION	DESCRIPTION	STATUS
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
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

4.8.4.1 Socioeconomic Resources

Numerous past actions have contributed to development and population growth within the ICE Analysis Boundary and are discussed in **Section 4.8.2**. 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 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). Future transportation and other actions are expected to be beneficial for some, but not for others. For example, transportation improvements could increase efficiency that in turn could increase employment opportunities but require relocations to accommodate. Current federal regulations 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.

Summary of Potential Cumulative Socioeconomic Resource Effects

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 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 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 nine hours in the westbound direction). This is expected to worsen by 2040 to seven hours on non-summer weekdays (with five hours in the eastbound direction and two 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 cumulative induced growth within the ICE Analysis Boundary.

CARA

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 could likely 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. Further analysis would be required in a Tier 2 NEPA Study.

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.

4.8.4.2 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. 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. However, federal, state, and local regulations enacted over the last 50 years have done much to slow this loss of wildlife and wildlife habitat, improve wildlife habitat and water quality, and recover protected species.

NEPA regulations require avoidance, minimization, and compensation for adverse effects to water quality, WOTUS, wildlife and protected species, and wildlife habitat. Past and present private conservation efforts have also positively contributed to natural resources in the region. Future growth and development in the ICE Analysis Boundary is more limited on the Western Shore due to the lack of developable land. The effects of growth and development would also be limited because its effects would be primarily within

previously disturbed areas. However, future growth and development on the Eastern Shore has a higher potential 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 (Tiner 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 (c)); losses in SAV (Orth et al., 1984); poor waterway health (MDE, 2019, DNREC, 2018); and threatened existence of vulnerable aquatic species (USFWS, 1993). Losses in forestland have displaced, or extirpated, species dependent on forested interiors (MDNR, 2000) and caused habitat fragmentation.

Many major waterways, including the Chesapeake Bay within the ICE Analysis Boundary, are designated as impaired for one or more uses (MDE, 2019). 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, nutrients such as sulfate, 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 4-45** and **Table 4-46**)**.** These include projects to construct and widen roadways, commercial center construction, or expansion, and planned commercial, institutional, and residential development. 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.

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. Federal, state, and local regulations would continue for the foreseeable future and could continue to require minimization, avoidance, and compensation for terrestrial and aquatic habitat direct and indirect effects.

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.

Summary of Potential Cumulative Natural Resource Effects

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 4-45** and **Table 4-46**), 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.

CARA

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.

Overall, Corridors 6 and 8 have 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.

4.8.4.3 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 Boundary. 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 USDOT Act of 1966 affords some protection to historic properties by requiring USDOT agencies to avoid the use of architectural and certain archaeological historic properties unless there is no prudent and feasible alternative.

Summary of Potential Cumulative Cultural Resource Effects

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.

CARA

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.

4.8.4.4 Air Quality

No cumulative air quality effects have been identified or determined at this phase of Tier 1 analysis. It is assumed that 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 appropriate 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.

4.9 SUMMARY

At the conclusion of Tier 1, MDTA and FHWA will identify a Selected Corridor Alternative. More detailed analysis of the affected environment and environmental consequences for alternatives within the Selected Corridor Alternative would be conducted in a potential future Tier 2 NEPA study. Likely impacts of alternatives within the Selected Corridor Alternative would be determined based on roadway alignments and limits-of-disturbance developed during Tier 2 and would be documented in a Tier 2 EIS.

Overall, the information presented in **Chapter 4** shows that substantial environmental resources are present within each of the three CARA. The types of resources most prevalent in each of the CARA can be related to factors such as the location and land uses, overall length, and the relative amount of land or water within each corridor. Corridor and crossing lengths are provided for reference in **Table 4-47**.

Table 4-47: Corridor and Crossing lengths

CORRIDOR ALTERNATIVE	APPROXIMATE LENGTH OF CHESAPEAKE BAY CROSSING	APPROXIMATE LENGTH OF DEEP WATER CROSSING	APPROXIMATE LENGTH OF ON-LAND IMPROVEMENTS	APPROXIMATE LENGTH OF OTHER WATER CROSSINGS	TOTAL CORRIDOR LENGTH
Measure	**Miles**	**Miles**	**Miles**	**Miles**	**Miles**
Existing	4	2	N/A	N/A	N/A
Corridor 6	11	0	14	3	28
Corridor 7	4	2	17	1	22
Corridor 8	12	2	21	4	37

4.9.1 No-Build Alternative

The No-Build Alternative would include no transportation improvements beyond those already planned, so direct impacts to resources such as agriculture, residential properties, businesses, community facilities, wetlands, streams, forest and wildlife habitat would not occur from new crossing construction. However, the traffic analysis estimates showed that traffic conditions at the existing Bay Bridge are expected to continue to deteriorate by 2040. Greater volumes of travelers and potentially increased need for maintenance at the bridge will cause greater unpredictability, longer backups, and slower travel times across the Bridge resulting in reduced mobility. Community and economic impacts from worsening congestion could potentially include reduced economic efficiency, reduced community desirability and impacts to tourism on the Eastern Shore. The No-Build Alternative would not be expected to result in impacts to the resources quantified in **Table 4-48**, therefore no column is included for the No-Build.

4.9.2 CARA

Table 4-48 provides a summary of the environmental resource inventory presented in **Section 4.1** through **4.8**. Note that these values reflect existing conditions within the two-mile wide CARA and are not reflective of actual impacts. The inventory of environmental features is, however, a useful indicator at the Tier 1 level of detail for comparing among broad corridor alternatives. Generally speaking, corridors with greater acreage or numbers of a resource are expected to be more likely to result in impacts to those resources.

In some instances, the geographic distribution of resources throughout a corridor also informs the qualitative discussion of potential impacts. For example, resources clustered along the edge of a corridor could allow a greater possibility of avoidance compared to resources that span the full width of a corridor. This kind of qualitative analysis will be detailed throughout the DEIS and technical reports and is summarized below for the purposes of this report. In general, the discussion focuses on resources that showed some distinction among the corridors.

Table 4-48: Environmental Resources Inventory Summary

RESOURCE	UNIT	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Total Area	Acres	35,010	27,990	46,810
Land	Acres	16,840 (*48%*)	18,330 (*65%*)	26,230 (*56%*)
Open Water	Acres	18,140 (*52%*)	9,660 (*35%*)	20,590 (*44%*)
Socioeconomic Resources				
Community Facilities Total	Count	27	70	37
Parks and Recreation	Count	8	14	10
Schools (K-12 Public)	Count	5	9	7
Fire Stations	Count	2	4	0
Police Facilities	Count	0	3	0
Libraries	Count	1	4	1
Places of Worship	Count	9	29	15
Other	Count	2	7	3
Land Use/Land Cover Total	Acres	35,010	27,990	46,810
Agriculture	Acres	5,620 (*16%*)	3,260 (*12%*)	9,250 (*20%*)
Commercial	Acres	270 (*1%*)	930 (*3%*)	320 (*1%*)
Forest	Acres	4,500 (*13%*)	4,500 (*16%*)	8,520 (*18%*)
Residential	Acres	5,660 (*16%*)	6,560 (*23%*)	6,830 (*15%*)
Water	Acres	18,140 (*52%*)	9,660 (*35%*)	20,590 (*44%*)
Wetlands	Acres	280 (1%)	820 (*3%*)	350 (*1%*)
Industrial	Acres	0 (*0%*)	90 (*<1%*)	40 (*<1%*)
Institutional	Acres	280 (*1%*)	890 (*3%*)	200 (*<1%*)
Other	Acres	270 (*1%*)	1,270 (*5%*)	720 (*2%*)
Priority Funding Areas (PFAs)	Acres	1,600	7,900	3,500
Environmental Justice (EJ) Census Tracts	Count (Census Tracts)	1 Low-income 0 Minority Race/Ethnicity	1 Low-income 1 Minority Race/Ethnicity	0 Low-income 0 Minority Race/Ethnicity
Section 4(f) Resources				
Parks and Wildlife Refuges	Count	8	12	10

RESOURCE	UNIT	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Area of Parks and Wildlife Refuges	Acres	1,030	1,220	1,140
Historic Sites	Count	2	13	14
Area of Historic Sites	Acres	160	460	510
Total Section 4(f) Resources	Count	10	25	25
Total Area of Section 4(f) Resources	Acres	1,190	1,680	1,650
Cultural Resources				
Recorded NRHP Eligible or Listed Properties	Count	2	13	14
Resources Listed in MIHP and Not Previously Evaluated for NRHP	Count	37	94	102
Land Areas Potentially Requiring Archaeological Survey	Acres	15,740	10,080	17,580
Natural Resources				
MDNR Non-Tidal Wetlands	Acres	1,200	1,500	2,080
MDNR Tidal Wetlands	Acres	18,460	10,870	24,940
NWI Non-Tidal Wetlands	Acres	1,340	1,520	2,270
Wetlands of Special State Concern (WSSC)	Acres	80	10	0
Surface Waters	Linear Feet	344,380	394,020	471,890
100-Year Floodplain	Acres	3,050	6,640	3,950
Chesapeake Bay Critical Area	Acres	4,910	9,810	8,120
FIDS Habitat	Acres	7,020	6,900	11,410
Forest Conservation Act (FCA) Easements	Acres	140	130	110
Sensitive Species Project Review Areas (SSPRAs)	Acres	2,720	2,180	8,630
Green Infrastructure - Total	Acres	4,880	4,480	11,450
Green Infrastructure Corridors	Acres	3,150	1,260	2,100
Green Infrastructure Hubs	Acres	1,730	3,220	9,350
Essential Fish Habitat (EFH)	Acres	18,080	9,600	20,480
Submerged Aquatic Vegetation (SAV)	Acres	40	270	460
Oyster Resources	Acres	11,130	3,460	7,960
MDNR Oyster Sanctuaries	Acres	6,470	1,580	2,090
Steep Slopes	Acres	2,090	0	3,090
Hydric Soils	Acres	3,580	5,390	8,250
Highly Erodible Soils	Acres	5,560	9,280	9,050
Land Susceptible to Sea Level Rise – 2050	Acres	350	1,310	680
Land Susceptible to Sea Level Rise – 2100	Acres	1,470	3,230	1,620
Noise				
Noise-Sensitive Areas	Acres	5,390	7,400	5,700

RESOURCE	UNIT	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Hazardous Materials				
Hazardous Materials Sites of Concern - Total	Count	41	99	36
Low Priority	Count	24	63	28
Moderate Priority	Count	17	33	7
High Priority	Count	0	3	1

Sources: Data Sources: Maryland iMap GIS, MDP LULC 2010, NWI, USGS Web Soil Survey, USEPA Facility Registry Service, US Census Bureau, MIHP. Acreage values rounded to closest 10.

4.9.2.1 Corridor 6

The on-land area within Corridor 6 primarily encompasses a mix of communities, community facilities and other developed land uses on the Western Shore, along with many natural resources, agricultural areas and low-density residential uses on the Eastern Shore. Corridor 6 contains more agricultural land than Corridor 7, but less than Corridor 8.

Corridor 6 has the lowest total amount of residential land among the CARA. However, the distribution of residential land and the density of residential subdivisions encompassing the full width of the corridor on the Western Shore would make avoidance of these communities unlikely. A potential Tier 2 alternative within Corridor 6 would cause community impacts on the Western Shore for residential areas located along MD 177 by bisecting residential areas, disrupting local mobility, and causing other potential impacts to community cohesion. The amount of on-land natural resources within Corridors 6 and 7, such as forested land, surface waters, MDNR wetlands, FIDS habitat, SSPRAs, and green infrastructure, are relatively similar and both lower than Corridor 8.

Corridors 6 and 8 would require a Bay crossing of roughly 11 and 12 miles respectively, compared to an approximate length of four miles for Corridor 7. As a result, the amount of open water in Corridors 6 and 8 (18,140 acres and 20,590 acres respectively) is substantially greater than Corridor 7 (9,660 acres). Subsequently, aquatic resources associated with open water such as EFH and oyster resources are more prevalent in Corridors 6 and 8 compared to Corridor 7. EFH and oyster resources encompass the full width of the corridors in some locations, and thus could not be avoided.

The Cultural Resources evaluation found that recorded NRHP listed or eligible properties (as described in **Section 4.2**) are distributed relatively evenly between Corridors 7 and 8, with the fewest number of recorded historic properties in Corridor 6. Evaluation of additional properties would need to occur within any of the three corridors, and potential avoidance of historic properties would be possible. This Tier 1 analysis identified data gaps where further evaluation of historic properties would need to be conducted, as described in the ***BCS Cultural Resources Technical Report*, *Sections 6.0* and *7.0***.

Corridor 6 would potentially have substantial indirect effects. Corridor 6 would provide new access to areas within a roughly 30-45 minute distance of Baltimore, potentially resulting in increased demand for residential development on the Eastern Shore. The ICE analysis indicated that areas likely to experience new development pressure include important natural and agricultural resources, areas vulnerable to residential development (according to MDP data), and areas largely outside of PFAs.

4.9.2.2 Corridor 7

Because Corridor 7 follows the existing US 50/301 Bay Bridge crossing, the on-land portions of the corridor encompass a greater number of community facilities and a greater acreage of commercial and institutional land uses compared to Corridors 6 and 8. Corridor 7 also has substantially greater area of PFAs compared to the other CARA. Many of the commercial and institutional land uses and community facilities are located in close proximity to US 50/301. Improvements identified under a Tier 2 alternative would result in impacts to community facilities, commercial areas and institutional land uses. Corridor 7 has the highest acreage of noise-sensitive land uses due to the greater prevalence of developed land uses in the corridor.

Residential land uses are relatively similar among all three corridors, with Corridor 7 falling in between the acreages of Corridors 6 and 8. The existing US 50/301 infrastructure within Corridor 7 could potentially facilitate a future Tier 2 alternative with lower overall community impacts. A future Tier 2 alternative to expand capacity along existing roadways in Corridor 7 could minimize impacts to community cohesion and local mobility, and disruption from bisecting residential neighborhoods relative to Corridors 6 or 8. Neighborhoods in the vicinity of US 50/301 have generally been developed to the north or south of the highway, often separated by a commercial area or wooded buffers. Thus, new capacity in Corridor 7 could likely avoid bisecting existing residential neighborhoods; impacts would likely be primarily along the periphery of residential areas. Such an alignment would, however, have greater impacts on commercial land uses and community facilities that are more prevalent alongside US 50/301. Access roads to adjacent land uses could also be impacted. Building a new limited access roadway where one does not currently exist, as would be required in Corridors 6 and 8, would generally be expected to cause greater impacts to existing residential communities. However, a future Tier 2 alternative in Corridor 7 located away from US 50/301 would likely cause substantial impacts to developed land uses and communities comparable to a potential new alignment within Corridors 6 or 8.

As noted above, Corridor 7 would require a much shorter crossing of the Chesapeake Bay compared to Corridors 6 and 8, which could result in lower potential impacts to open water of the Bay and other major waterways. Aquatic resources associated with open water such as Essential Fish Habitat (EFH), tidal wetlands and oyster resources are more prevalent in Corridors 6 and 8 compared to Corridor 7. EFH and oyster resources encompass the full width of the corridor in some locations, and thus impacts could not be avoided. Overall, the longer crossing is likely to result in greater impact on the Chesapeake Bay and associated aquatic resources compared to Corridor 7. Consideration of all the environmental factors suggests that Corridor 7 would potentially result in fewer environmental impacts to sensitive aquatic resources of the Chesapeake Bay such as open water, fish habitat, and oysters.

Corridor 7 includes more coastline relative to the other corridors, due to the geography of Kent Island within the Corridor. Thus resources associated with coastal areas are generally more prevalent in Corridor 7 such as Chesapeake Bay Critical Area and 100-Year Floodplain. Furthermore, the prevalence of coastline within Corridor 7 results in a greater on-land area vulnerable to sea level rise.

Additionally, the presence of the existing US 50/301 corridor could allow for less impactful new infrastructure in Corridor 7. Corridors 6 and 8 would both require a major, new limited-access roadway largely on a new alignment through areas that are currently not impacted by major transportation infrastructure. However, a future Tier 2 alternative could be developed in Corridor 7 that expands the

existing US 50/301 infrastructure. Much of the land adjacent to the existing US 50/301 roadway is developed, so utilizing this infrastructure potentially minimizes overall impacts to on-land natural resources.

Corridor 7 contains a somewhat higher number of potential hazardous materials sites (99) compared to Corridors 6 or 8 (41 and 36, respectively), reflecting its more developed land uses. However, much of the difference between the corridors is due to the high number of low priority sites (63) within Corridor 7. At this time, it is unknown how many potential hazardous materials sites would be impacted or be able to be avoided by a specific alignment. Based on the desktop database evaluation, any identified sites could potentially be avoided during the Tier 2 planning phase.

Corridor 7 would likely result in additional new capacity to the existing transportation network in relative proximity to the Bay Bridge, which would be more compatible with existing land use patterns and plans compared to Corridor 6 or Corridor 8. Corridor 7 would potentially have indirect effects, but would likely have lower induced growth effects compared to Corridors 6 or 8. When it was constructed, the existing Bay Bridge resulted in growth in areas such as Kent Island and Queenstown due to accessibility to these areas. The pattern of growth that began from the Existing Bay Bridge would continue with a new crossing in Corridor 7. New capacity in the vicinity of the existing crossing would potentially increase the demand for development, but would be expected to result in more incremental change within the existing pattern of land use and demand for development, rather than substantially depart from existing patterns. More area in proximity to Corridor 7 is designated as PFA relative to Corridors 6 or 8, indicating that growth in these locations would be more compatible with planned future land uses compared to Corridors 6 or 8.

4.9.2.3 Corridor 8

Corridor 8 has the greatest overall length of the three CARA, and also includes the longest crossing. As a result, Corridor 8 generally includes the highest amount of many natural resources relative to Corridors 6 and 7. Corridor 8 has the highest amount of agricultural land, forested land, open water, tidal and non-tidal wetlands, surface waters, FIDS habitat, SSPRAs, green infrastructure, EFH, SAV, hydric soils, and highly erodible soils. Thus, it is likely that a new crossing within Corridor 8 would be the most environmentally impactful compared to alternatives within Corridors 6 and 7, particularly to natural resources.

Corridor 8 also includes the greatest acreage of residential land. Communities and residential neighborhoods particularly in the vicinity of Mayo, Beverly Beach and St. Michaels would likely be impacted, as their density and distribution would make avoidance difficult. Thus, a Tier 2 alternative in Corridor 8 would likely result in community disruption, bisect residential neighborhoods, impact local mobility, and cause other community cohesion impacts in this vicinity.

Corridor 8 would also result in potential substantial indirect effects. Corridor 8 would provide new access to areas within a roughly 45-60 minute distance of Washington DC, potentially resulting in increased demand for residential development on the Eastern Shore. The ICE analysis showed that areas within Corridor 8 that could potentially to experience new development pressure include important natural and agricultural resources, areas vulnerable to residential development (according to MDP data), and areas largely outside of PFAs.

4.10 NEXT STEPS

Based on the evaluation of engineering, traffic, cost, and environmental considerations along with public and agency input, MDTA has identified an MDTA-Recommended Preferred Corridor Alternative, discussed in Section 5 below.

After holding a public hearing and providing opportunity for public comments on this DEIS, a Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) will be prepared. The FEIS and ROD will respond to public comments on this DEIS. MDTA has conducted regular coordination with Cooperating and Participating agencies as outlined in **Chapter 6.** Coordination with agencies will continue through the remainder of the Tier 1 process, providing opportunity for agency input on the FEIS and ROD.

The FEIS and ROD will also include a discussion of how the Tier 2 process would be conducted including the development and evaluation of alternatives, environmental analysis, and the evaluation of avoidance, minimization, and mitigation to be conducted in Tier 2. Agency and public involvement would continue through the Tier 2 process. A Tier 2 study would include coordination with natural resource agencies regarding the permitting and review processes applicable to resources that could be impacted by a Tier 2 alternative. Examples include, but are not limited to:

- Impacts to jurisdictional WOTUS will require coordination with the USACE and MDE and are authorized under the JPA process or Individual Permit process, depending on the level of jurisdictional impact.
- Impacts to the jurisdictional, non-tidal 100-year FEMA floodplain are authorized by MDE via the JPA process.
- Impacts to lands within 1,000 feet of the mean high water line of tidal waters of the Chesapeake Bay and its tributaries require authorization from the Critical Area Commission.
- Use of publicly-owned parks, recreation areas, wildlife and waterfowl refuges, or any significant public or privately-owned historic sites will require adherence to Section (4)f of the USDOT Act of 1966, Section 6(f) of the LWCF Program, and/or MDNR's Program Open Space.
- Coordination with MDNR and county planning agencies would be required during a Tier 2 NEPA study to evaluate potential impacts to forested areas and FIDS habitat.
- SAV and oyster resources and regulated by MDNR but are also classified as Special Aquatic Sites and regulated by MDE and USACE under Section 404 of the CWA.
- Coordination with the MHT and consulting parties would occur as appropriate regarding potential effects to historic resources in accordance with Section 106.
- Coordination with the USFWS would be required for any potential effects on listed endangered or threatened species in accordance with Section 7 of the Endangered Species Act (ESA).
- Coordination with the Chesapeake Bay Oyster Alliance, MDNR, the Virginia Marine Resources Commission, USACE, USFWS, and NOAA, among others, may be required during a Tier 2 NEPA study to evaluate potential aquatic resource impacts.

5 MDTA RECOMMENDED PREFERRED CORRIDOR

Based on the analysis of a wide range of engineering and environmental factors described in this DEIS and supporting documents, as well as input received through public comments and coordination with State and federal cooperating agencies, **Corridor 7 has been identified as the MDTA-Recommended Preferred Corridor Alternative (MDTA-RPCA)**. The analysis used to identify the MDTA-RPCA is summarized below to highlight the differences between the three CARA and the advantages of Corridor 7. The identification of the MDTA-RPCA included an analysis of the following categories for each of the CARA: traffic analysis, cost and engineering, and environmental considerations. While all three of these factors were important in the identification of the MDTA-RPCA, the traffic analysis proved to be the key distinguishing factor. The assessment of cost, engineering, and environmental factors provided further support for Corridor 7 as the MDTA-RPCA. The selection of an alternative will not be finalized until comments on this DEIS and input from the public hearings are considered. The selected alternative will be included in the Final EIS and Record of Decision (ROD).

5.1 TRAFFIC ANALYSIS

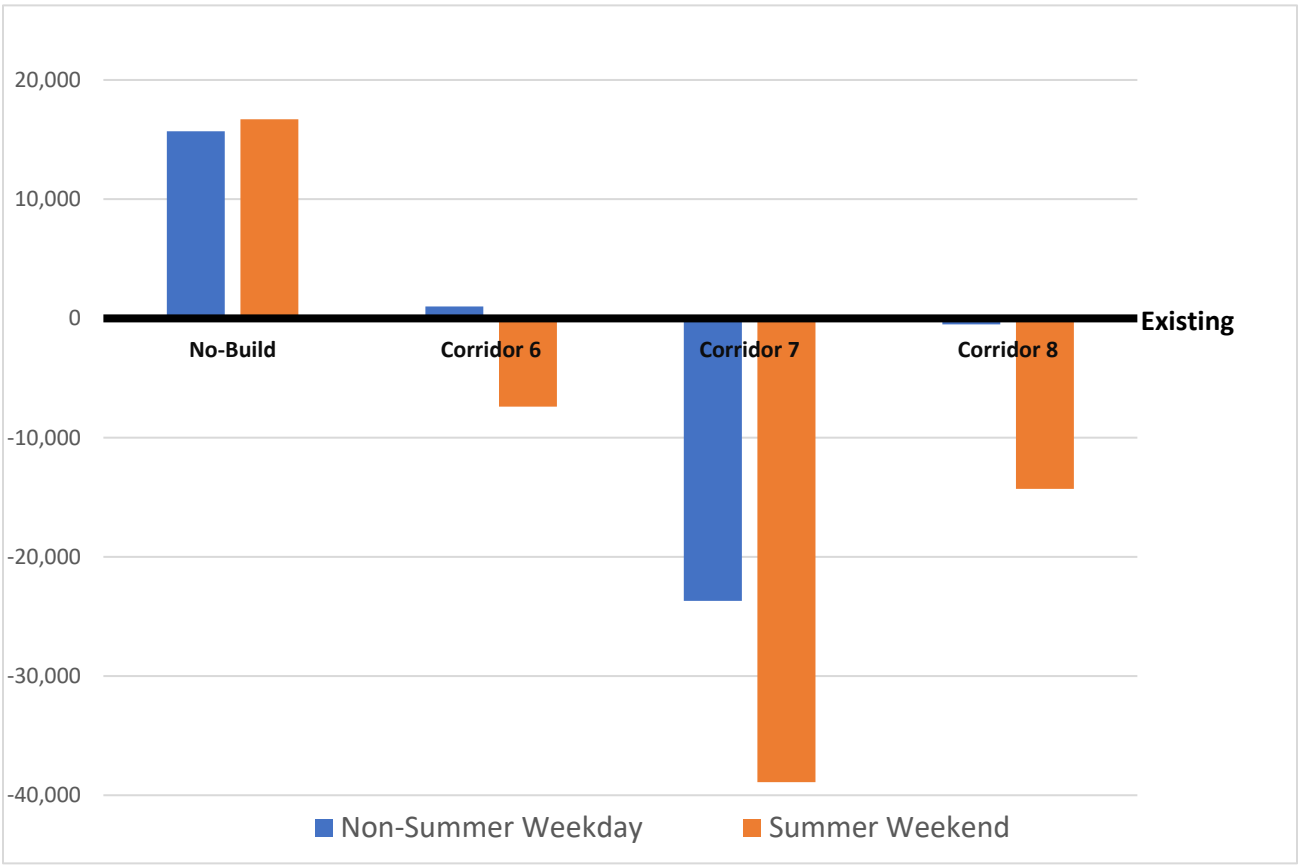
The primary focus of the Bay Crossing Study is to relieve traffic congestion at the Bay Bridge, which would be accomplished by attracting vehicles away from the Bay Bridge and onto a new crossing. The Screening Traffic Analysis (described in **Section 3.2.2**) determined that Corridor 7 would provide the greatest congestion relief, based on comparison of the Average Daily Traffic (ADT) volumes at the Bay Bridge, for both non-summer weekdays and summer weekends in 2040 for the three CARA.

As shown in **Table 5-1** and **Figure 5-1**, Corridor 7 would result in an estimated reduction of approximately 23,700 vehicles per day (vpd) on non-summer weekdays on the Bay Bridge compared to existing conditions, and a reduction of approximately 38,900 vpd on summer weekends on the Bay Bridge compared to existing conditions. These reductions in traffic on the Bay Bridge would be substantially greater than could be achieved by a new crossing in Corridor 6 or Corridor 8, as shown in the column labeled 'Change in ADT.'

Table 5-1: 2040 Average Daily Traffic Volumes

CORRIDOR ALTERNATIVE	2040 SUMMER WEEKEND ADT				2040 NON-SUMMER WEEKDAY ADT			
	EXISTING BRIDGE	EXISTING BRIDGE: CHANGE FROM 2017	PROPOSED CROSSING	COMBINED CROSSINGS	EXISTING BRIDGE	EXISTING BRIDGE: CHANGE FROM 2017	PROPOSED CROSSING	COMBINED CROSSINGS
Measure	**ADT**	**Change in ADT**	**ADT**	**ADT**	**ADT**	**Change in ADT**	**ADT**	**ADT**
Existing (2017)	118,600	N/A	N/A	118,600	68,600	N/A	N/A	68,600
No-Build (2040)	135,300	+16,700	N/A	135,300	84,300	+15,700	N/A	84,300
Corridor 6	111,200	**-7,400**	45,700	156,900	69,600	**+1,000**	18,200	87,800
Corridor 7	79,700	**-38,900**	79,700	159,400	44,900	**-23,700**	44,900	89,800
Corridor 8	104,300	**-14,300**	55,200	159,500	68,100	**-500**	20,000	88,100

Figure 5-1: 2040 Average Daily Traffic Volumes – Change from Existing Conditions (2017)



Corridor 6 would provide some traffic benefit on summer weekends, but weekday non-summer traffic would increase compared to existing conditions on the Bay Bridge. Corridor 8 would provide some traffic benefit on both non-summer weekday and summer weekends, but still substantially less compared to Corridor 7.

The Screening Traffic Analysis also considered whether queue lengths/durations at the existing Bridge would worsen by 2040 compared to existing conditions for each of the CARA. The analysis determined that Corridor 7 would not result in greater queue lengths/durations than existing conditions at the Bay Bridge on summer weekends or on non-summer weekdays. Corridors 6 or 8 would each result in no greater queue lengths/durations at the Bay Bridge than currently exists on summer weekends, but either would result in a longer queue for one hour on non-summer weekdays.

In addition, the Screening Traffic Analysis estimated that Corridor 7 would have no hours of LOS E or F operation at the Bay Bridge on summer weekends or non-summer weekdays. Neither Corridor 6 nor

Corridor 8 would reduce the hours of LOS E or F to zero at the Bay Bridge, either on non-summer weekdays or summer weekends. On non-summer weekdays in particular, the hours of LOS E or F would be worse than current conditions in 2040. Both Corridor 6 or 8 would reduce the number of hours with LOS E or F at the Bay Bridge on summer weekends, but would not eliminate LOS E or F conditions.

Corridor 7 would require no additional travel time to divert vehicles from the Bay Bridge to a new crossing. Corridors 6 and 8, in contrast, would each require approximately 26 minutes of additional travel time for vehicles diverted from the Bay Bridge. Thus, Corridors 6 or 8 would not provide the same level of flexibility to support maintenance and incident management at the Bay Bridge as Corridor 7.

Following selection of the CARA, an additional traffic analysis of Corridors 6, 7 and 8 was conducted. The CARA Traffic Analysis included evaluation of the 2040 peak hour traffic volumes and LOS for a new crossing in each corridor and the Bay Bridge for both summer weekends and non-summer weekdays. The results of the CARA Traffic Analysis provided greater detail in distinguishing between the CARA to help identify the MDTA-RPCA.

The results of the CARA Traffic Analysis further defined the differences between the CARA and reinforced the notable advantages of Corridor 7 in meeting the goals of the Bay Crossing Study. The LOS analysis was conducted to further evaluate the ability of the CARA to meet the study purpose and need. The LOS metric at the existing Bay Bridge demonstrates how well each CARA could relieve the traffic congestion at the existing crossing. The LOS at a new crossing was developed for comparison with the existing crossing.

The CARA Traffic Analysis revealed that substantial new capacity in Corridor 6 or 8 would still result in unacceptable peak hour LOS at the Bay Bridge in 2040. **Table 5-2** and **Table 5-3** present the 2040 peak hour LOS at a new crossing and at the Bay Bridge with the assumed addition of eight new lanes for each new crossing in the CARA. Note that the assumption of eight new lanes was used to evaluate the draw of traffic to a new crossing location without limiting the available capacity. The eight-lane scenario presented here is included for comparative purposes only; the actual number of lanes in any Corridor Alternative would be identified in a Tier 2 study.

Table 5-2: 2040 Summer Weekend Peak Hour LOS

CORRIDOR ALTERNATIVE	CORRIDOR 6		CORRIDOR 7		CORRIDOR 8		NO-BUILD	
DIRECTION	EB	WB	EB	WB	EB	WB	EB	WB
Existing Bay Bridge – Peak Hour LOS	F	E	D	C	F	E	F	F
New Crossing – Peak Hour LOS[1]	B	A	D	C	B	B	N/A	N/A

[1] Although Corridors 6 and 8 provide a LOS A or B, the Bay Bridge would still operate at LOS E or F, thus demonstrating that those corridors would not draw enough traffic away from the Bay Bridge to effectively relieve congestion.

Table 5-3: 2040 Non-Summer Weekday Peak Hour LOS

CORRIDOR ALTERNATIVE	CORRIDOR 6		CORRIDOR 7		CORRIDOR 8		NO-BUILD	
DIRECTION	EB	WB	EB	WB	EB	WB	EB	WB
Existing Bay Bridge – Peak Hour LOS	E	E	C	C	E	E	F	F
New Crossing – Peak Hour LOS[1]	A	A	C	C	A	A	N/A	N/A

[1] Although Corridors 6 and 8 provide a LOS A or B, the Bay Bridge would still operate at LOS E or F, thus demonstrating that those corridors would not draw enough traffic away from the Bay Bridge to effectively relieve congestion.

With new capacity in Corridors 6 or 8, the Bay Bridge would still experience peak hour LOS F (eastbound) or LOS E (westbound) on non-summer weekends in 2040. An equivalent amount of new capacity added in Corridor 7 would result in peak hour LOS D eastbound and LOS C westbound in 2040 on summer weekends at the existing bridge.

On non-summer weekdays, new capacity in Corridors 6 or 8 would still result in peak hour LOS E on the Bay Bridge in both directions. The equivalent new capacity at Corridor 7 could achieve LOS C in both directions at the existing bridge.

This analysis demonstrates that even a substantial addition of new capacity in Corridor 6 or Corridor 8 would not sufficiently relieve the traffic congestion problem at the Bay Bridge. LOS E and F are considered unacceptable LOS, causing unpredictable travel times and major delays. A new eight-lane crossing in Corridor 7 could much more effectively improve the traffic conditions at the Bay Bridge by achieving LOS C westbound and LOS D eastbound on summer weekends, and LOS C in both directions on non-summer weekdays.

It is important to note that the LOS A and B for the new crossing in Corridors 6 and 8 are due to the inability of a new crossing in either corridor to draw enough traffic away from the Bay Bridge. These high LOS would result from a lower number of vehicles using the new crossing in Corridor 6 or 8, while larger numbers of vehicles would continue to use the Bay Bridge resulting in LOS E or F. For Corridor 7, in contrast, the traffic volumes would balance out between the Bay Bridge and the new crossing. This would provide greater congestion relief and improved peak hour LOS at the Bay Bridge under Corridor 7.

5.2 ENGINEERING AND COST

Conceptual project cost estimates were developed for Corridors 6, 7, and 8, as described in **Section 3.5**.

For cost estimation purposes, Corridor 7 was estimated to need five to seven new crossing lanes. The number of new approach lanes would vary between four and seven to match the total number of crossing lanes, and also depends on whether the new approach lanes would be located on a new alignment or adjacent to the existing US 50/301 alignment. The costs included a new Chesapeake Bay crossing, all on-land infrastructure, and crossings of the Severn River and Kent Narrows. The preliminary estimated cost of a new bridge across the Chesapeake Bay and associated infrastructure in Corridor 7 would be between $5.4 and $8.9 billion in 2020 dollars. A new bridge-tunnel and associated infrastructure would cost an estimated $8.0 to $13.1 billion. The lower end of the cost estimate for Corridor 7, which assumed primarily utilizing existing infrastructure, would be the lowest of all three corridors. This indicated that cost savings could be achieved from utilizing the existing US 50/301 approach roadways in Corridor 7. The higher end of the cost estimate for Corridor 7 assumes that the new lanes would be completely on a new alignment. The cost estimates are shown in **Table 3-11** and **Table 3-12** in **Section 3.5** above**.**

For cost estimation purposes, Corridor 6 was estimated to need four new lanes, which would achieve LOS C/D. The range of costs included the potential for new lanes completely on a new alignment, or up to 33 percent following existing roadways. The estimates accounted for a Chesapeake Bay crossing, all on-land infrastructure, and a crossing of the Chester River. The cost estimate for Corridor 6 ranged between $6.6 and $7.2 billion for a bridge across the Chesapeake Bay and associated infrastructure. The cost of a bridge-tunnel and associated infrastructure was estimated between $12.7 and $13.3 billion. These estimates showed that the high end of the bridge cost estimate would be lower than the high end of the Corridor 7 bridge estimate, but the lower end of the range for a bridge in Corridor 6 would be higher than the low end of the range for Corridor 7. This showed that an entirely new alignment in Corridor 6 could be less expensive than an entirely new alignment in Corridor 7; but that cost savings could be achieved by utilizing existing infrastructure in Corridor 7.

For cost estimation purposes, Corridor 8 was estimated to need four to six new lanes to meet LOS D and C, respectively. The range of costs included potential for new lanes completely on new alignment, or up to 20 percent following existing roadways. The estimates accounted for a Chesapeake Bay crossing, all on-land infrastructure, and two crossings of the Miles River. The cost estimate for Corridor 8 ranged between $11.7 and $15.7 billion for a bridge across the Chesapeake Bay and associated infrastructure. The cost of a bridge-tunnel and associated infrastructure was estimated between $13.2 and $18.0 billion. Due in large part to the 12 mile length of crossing required in Corridor 8, the lower end of the cost estimates for a bridge in Corridor 8 would still be higher than the high end of the range in Corridors 6 or 7. The low end of the range for a bridge crossing in Corridor 8 ($11.7 billion) would be more than twice as high as the low end of the range for a bridge in Corridor 7 ($5.4 billion). Thus, even accounting for the range of potential costs, a new crossing in Corridor 8 would be substantially more expensive than Corridor 7.

5.3 ENVIRONMENTAL CONSIDERATIONS

The evaluation of environmental considerations showed that all three CARA contain substantial environmental resources. The environmental inventory within the two-mile wide corridors, however, does not provide the level of specificity needed to determine actual environmental impacts. Specific impacts would be largely determined by the alignment of a new crossing, which would be developed during a future Tier 2 study. The inventory of environmental features is, however, a useful indicator at the Tier 1 level of detail for comparing among broad corridor alternatives. Generally speaking, corridors with greater acreage or numbers of a resource are expected to be more likely to result in impacts to those resources.

In some instances, the geographic distribution of resources throughout a corridor also informs the qualitative discussion of potential impacts. For example, resources clustered along the edge of a corridor could allow a greater possibility of avoidance compared to resources that span the full width of a corridor. This kind of qualitative analysis is detailed in **Chapter 4** and the supporting technical reports, and is summarized below. In general, the discussion focuses on resources that showed some distinction among the corridors.

Corridor 7 would require the shortest crossing of the Chesapeake Bay due to the narrower width of the Bay at this location. Corridor 7 also has the shortest overall length of improvements necessary due to the presence of existing infrastructure in the corridor (see **Table 5-4**). These factors lead to Corridor 7 potentially resulting in the lowest overall environmental impacts compared to Corridors 6 or 8.

Table 5-4: Corridor and Crossing Lengths in Miles

CORRIDOR ALTERNATIVE	APPROXIMATE LENGTH OF CHESAPEAKE BAY CROSSING	APPROXIMATE LENGTH OF ON-LAND IMPROVEMENTS	APPROXIMATE LENGTH OF OTHER WATER CROSSINGS	TOTAL CORRIDOR LENGTH
Corridor 6	11	14	3	28
Corridor 7	4	17	1	22
Corridor 8	12	21	4	37

Table 5-5 displays a selection of key resources included in the environmental inventory. More detail and discussion of additional resources is included in **Chapter 4**. The environmental inventory reflects the breadth and complexity of existing environmental conditions in the two-mile wide corridors, and indicates some advantages and some disadvantages for every corridor. However, consideration of all the environmental factors suggests that Corridor 7 would potentially result in fewer environmental impacts to sensitive aquatic resources of the Chesapeake Bay such as open water, fish habitat, and oysters.

Additionally, the presence of the existing US 50/301 corridor could allow for less impactful new infrastructure in Corridor 7. Corridors 6 and 8 would both require a major, new limited-access roadway largely on a new alignment through areas that are currently not impacted by major transportation infrastructure. However, a future Tier 2 alternative could be developed in Corridor 7 that expands the existing US 50/301 infrastructure. Much of the land adjacent to the existing US 50/301 roadway is developed, so utilizing this infrastructure potentially minimizes overall impacts to on-land natural resources.

A future Tier 2 alternative that expands capacity along existing roadways in Corridor 7 could also minimize impacts to community cohesion and disruption to residential neighborhoods. Neighborhoods in the vicinity of US 50/301 have generally been developed to the north or south of the highway, often separated by a commercial area or wooded buffers. Thus, new capacity in Corridor 7 could avoid bisecting existing residential neighborhoods; impacts would likely be primarily along the periphery of residential areas. Such an alignment would, however, have greater impacts on commercial land uses and community facilities that are more prevalent alongside US 50/301. Access roads to adjacent land uses could also be impacted. Corridor 7 is more developed and contains greater amounts of commercial land uses, community facilities, and noise-sensitive areas.

Table 5-5: Summary of Environmental Inventory

RESOURCE	UNIT	CORRIDOR 6	CORRIDOR 7*	CORRIDOR 8
Total Area	Acres	35,010	27,990	46,810
Land	Acres	16,840 (48%)	18,330 (65%)	26,230 (56%)
Open Water	Acres	18,140 (52%)	9,660 (35%)	20,590 (44%)
Community Facilities Total	Count	27	70	37
Forest Land	Acres	4,500	4,500	8,520
Residential Land Use	Acres	5,660	6,560	6,830
Commercial Land Use	Acres	270	930	320
Environmental Justice (EJ) Census Tracts	Count (Census Tracts)	1 Low-income 0 Minority Race/Ethnicity	1 Low-income 1 Minority Race/Ethnicity	0 Low-income 0 Minority Race/Ethnicity
Total Section 4(f) Resources	Count	10	25	24
Area of Section 4(f) Resources	Acres	1,190	1,680	1,650
MDNR Non-Tidal Wetlands	Acres	1,200	1,500	2,080
MDNR Tidal Wetlands	Acres	18,460	10,870	24,940
Surface Waters	Linear Feet	344,380	394,020	471,890
100-Year Floodplain	Acres	3,050	6,640	3,950
Chesapeake Bay Critical Area	Acres	4,910	9,810	8,120
FIDS Habitat	Acres	7,020	6,900	11,410
Sensitive Species Project Review Areas (SSPRAs)	Acres	2,720	2,180	8,630
Green Infrastructure – Total	Acres	4,880	4,480	11,450
Essential Fish Habitat (EFH)	Acres	64,320	36,650	87,680
Submerged Aquatic Vegetation (SAV)	Acres	40	270	460
Oyster Resources	Acres	11,130	3,460	7,960
MDNR Oyster Sanctuaries	Acres	6,465	1,580	2,087
Noise-Sensitive Areas	Acres	5,390	7,400	5,700

* Shading indicates the MDTA-RPCA

For both Corridors 6 or 8, the distribution of residential land and the density of residential subdivisions encompassing the full width of the corridor on the Western Shore would make avoidance of residential communities unlikely. A potential Tier 2 alternative within Corridor 6 would cause community impacts on the Western Shore for residential areas located near MD 177. Corridor 8 includes the greatest acreage of residential land. Communities and residential neighborhoods in Corridor 8, particularly in the vicinity of

Mayo, Beverly Beach, and St. Michaels, would likely be impacted. A new crossing in Corridors 6 or 8 would thus be more likely to cause substantial community impacts by bisecting residential areas, disrupting local mobility, and causing other potential impacts to community cohesion compared to Corridor 7. More detailed discussion of potential community impacts is included in ***Section 4.1.2***. Due to the more developed land uses in Corridor 7, it includes the highest acreage of noise-sensitive areas, as discussed in ***Section 4.7.3***. Corridor 7 also contains two Census Tracts identified as potential Environmental Justice populations, as presented in ***Section 4.1.4***.

Corridors 7 and 8 contain roughly the same number and acreage of Section 4(f) protected lands, and Corridor 6 contains a somewhat smaller amount (see ***Section 4.3***). Potential impacts to Section 4(f) lands will require consideration of avoidance and minimization in a Tier 2 EIS. As noted in **Table 5-4**, Corridor 7 would require a much shorter crossing of the Chesapeake Bay compared to Corridors 6 and 8, which could result in potentially lower impacts to the open water of the Bay and other major waterways. Corridor 6 would require a Chesapeake Bay crossing of roughly 11 miles and a Corridor 8 crossing would be 12 miles, compared to an approximate length of four miles for Corridor 7. In addition to the main crossing of the Chesapeake Bay, Corridor 7 would require shorter crossings of other major waterways adjacent to the Bay. Corridor 7 would require approximately one mile of additional water crossings, whereas Corridors 6 or 8 would require three or four miles of additional water crossings, respectively. As a result, the amount of open water in Corridor 6 (18,140 acres) or Corridor 8 (20,590 acres) are each substantially higher than Corridor 7 (9,660 acres). A longer crossing would require greater impervious surfaces, more substantial construction, and a greater overall footprint of area impacted in the Chesapeake Bay and other major water bodies.

Aquatic resources associated with open water such as Essential Fish Habitat (EFH) and oyster resources are more prevalent in Corridors 6 and 8 compared to Corridor 7. EFH and oyster resources encompass the full width of the corridor in some locations, and thus impacts could not be avoided. Further discussion of aquatic resources is included in ***Section 4.4.7.*** Tidal wetlands, which include open water of the Chesapeake Bay, are also substantially lower for Corridor 7 compared to Corridors 6 or 8 (see ***Section 4.4.2***). Overall, the longer crossing is likely to result in greater impact on the Chesapeake Bay and associated aquatic resources compared to Corridor 7.

For many on-land natural resources such as forest, non-tidal wetlands, surface waters, FIDS Habitat, SSPRAs and green infrastructure, the inventory numbers are roughly similar between Corridors 6 and 7, and notably higher for Corridor 8 (See ***Section 4.4.5*** and ***Section 4.4.6***). Thus, impacts to terrestrial resources would likely be greatest under Corridor 8, largely due to the length of on-land improvements and the less developed nature of the corridor. Improvements in Corridor 7 could potentially reduce impacts to such resources by expanding the existing US 50/301 corridor, whereas Corridor 6 would require greater improvements on a new alignment likely translating to greater impacts. Some resources associated with coastline such as Chesapeake Bay Critical Areas and 100-year flood plains are somewhat more prevalent in Corridor 7 compared to Corridors 6 or 8 due to the geography of the corridor (as discussed in ***Section 4.4.3*** and ***Section 4.4.4***). During a Tier 2 EIS and later final design, more detailed study would be completed to avoid and minimize adverse impacts to floodplains.

Corridor 7 would likely result in additional new capacity to the existing transportation network in relative proximity to the Bay Bridge, which would be more compatible with existing land use patterns and plans compared to Corridor 6 or Corridor 8. Corridor 7 would have indirect effects, but likely less potential for

induced growth compared to Corridors 6 and 8 due to existing development patterns and density in the corridors.

When it was constructed, the Bay Bridge resulted in growth in areas such as Kent Island and Queenstown due to new accessibility to these areas. The pattern and pace of growth that began since the construction of the Bay Bridge would continue with a new crossing in Corridor 7. New capacity in the vicinity of the existing crossing would potentially increase the demand for development. However, this demand would be expected to result in a more incremental change within the existing pattern of land use development, rather than a substantial departure from existing patterns that would be expected under Corridors 6 or 8. A greater area in proximity to Corridor 7 is designated as Priority Funding Areas (PFAs) relative to Corridors 6 or 8, indicating that growth in these locations would be more compatible with planned future land uses compared to Corridors 6 or 8.

In contrast to Corridor 7, Corridor 6 would provide new access to areas within a roughly 30 to 45-minute distance of Baltimore City, and Corridor 8 would provide new access to areas within a roughly 45 to 60-minute distance of Washington DC, potentially resulting in increased demand for residential development on the Eastern Shore. The Indirect and Cumulative Effects (ICE) analysis showed that these corridors would likely result in new development pressure on important natural and agricultural resources, areas vulnerable to residential development, and areas largely outside of designated PFAs. Thus, a new crossing in Corridors 6 or 8 would have the potential to substantially alter land use patterns and result in greater pressure for unplanned growth than Corridor 7, likely with corresponding impacts to natural resources, community cohesion, and agricultural resources, especially on the Eastern Shore. This potential for indirect effects from new land use development on the Eastern Shore has been a primary concern reflected in public and agency input throughout the study process, particularly from communities on the Eastern Shore. Further discussion of indirect and cumulative effects is included in ***Section 4.8***.

5.4 SUMMARY

The analysis shows that Corridor 7 would have substantial advantages in terms of traffic, engineering and cost, and environmental considerations. The identification of Corridor 7 as the MDTA-RPCA can be summarized by the following key points:

- Corridor 7 would provide the greatest traffic relief at the Bay Bridge, and thus has a greater ability to meet the Purpose and Need of this Tier 1 Study. Corridor 7 would divert substantially more traffic away from the Bay Bridge in terms of total vehicles per day on both summer weekends and non-summer weekdays.
- A new crossing in Corridor 7 would result in greater peak hour congestion relief at the Bay Bridge compared to an equivalent number of lanes in Corridors 6 or 8.
- Corridor 7 would likely be the least costly of the three CARA because of the ability to utilize existing infrastructure on US 50/301 and the shorter length of crossing over the Chesapeake Bay.

- Corridor 7 would potentially have lower overall environmental impacts due to the shorter Chesapeake Bay crossing length and ability to utilize existing on-land infrastructure along US 50/301. Corridors 6 and 8 would require longer crossings and more roadway along new alignment, likely resulting in greater impacts to sensitive environmental resources in and around the Chesapeake Bay, especially tidal wetlands and aquatic resources like SAV and oyster resources.
- Corridor 7 could have greater impacts to noise sensitive areas and socioeconomic resources such as community facilities and commercial areas due to the more developed nature of the corridor compared to Corridors 6 and 8.
- Corridors 6 and 8 would likely cause substantial indirect effects from new connectivity between rural lands on the Eastern Shore and employment centers such as Baltimore and Washington, DC. Corridors 6 or 8 could lead to substantial pressure for new residential development, especially on the Eastern Shore, with corresponding impacts to farmland and natural resources. Corridor 7 would have some indirect effects, but they would be more consistent with existing land use patterns and plans.

6 COORDINATION

A comprehensive public involvement and agency coordination program has been conducted throughout the duration of the Bay Crossing Study. This chapter summarizes that program, including regulatory agency consultation, conducted during the NEPA process from the initial scoping in November 2017 through ongoing activities leading to the publication of this Draft Environmental Impact Statement (DEIS) document. Public and agency engagement will continue during the remainder of the Study and will include the solicitation of comments on this document.

6.1 PUBLIC INVOLVEMENT

6.1.1 Public Involvement Activities

The Bay Crossing Study's public involvement efforts began shortly after the Notice of intent (NOI) was published in the Federal Register on October 11, 2017. The Bay Crossing Study website (www.baycrossingstudy.com) was developed and launched in October 2017 to share project information and gather feedback from the public. Public involvement efforts were organized by subsequent key coordination points: Scoping Activities, Purpose and Need and Screening Criteria, Range of Alternatives and CARA, plus ongoing activities planned for the remainder of the Study, leading to the publication of a Record of Decision (ROD). Three rounds of public meetings have been held thus far. Specifically, one Online Scoping Meeting was held in November 2017, six Open House Meetings were held between May 8 and May 22, 2018, and seven Open House Meetings were held between September 24 and October 28, 2019.

The November 2017 Online Scoping Meeting was held to seek input on the project scope and Purpose and Need. That meeting included a virtual presentation and in-person viewing locations.

The Spring 2018 Open House Meetings were held at six locations to present and solicit comments on the Purpose and Need, the environmental review process, corridor development, and screening process. Information was also provided on scoping activities and public comments. A total of 452 people attended the Spring 2018 Open House Meetings. The meetings were held at the following dates and locations:

- May 8th at Calvert High School
- May 9th at Broadneck High School
- May 10th at Kent County Middle School

- May 16th at Middle River Middle School
- May 17th at Cambridge-South Dorchester High School
- May 22nd at Chesapeake College

Seven Open House Meetings were held in Fall 2019 to present the range of alternatives considered, the screening analysis and results, and the preliminary CARA. The seven Open House Meetings were attended by a total of 1,025 people, with a low of 15 attendees at the Calvert High School Open House to a high of 266 attendees at the Kent County High School Open House.

These meetings were held at the following dates and locations:

- September 24th at Kent County High School
- September 26th at Calvert High School
- October 1st at Middle River Middle School
- October 2nd at Anne Arundel Community College
- October 3rd at Talbot County Community Center
- October 9th at Kent Island High School
- October 28th at Annapolis High School

Advertising methods for the Fall 2019 Open House Meetings included website announcements; a press release; emails to the project mailing list, stakeholders, and elected officials; digital advertising in 11 online publications; print ads in 21 publications; and social media outreach on Facebook and Twitter.

6.1.2 Public Comments

Public comments are presented in two sections below. First, in **Section 6.1.2.1**, is a summary of the comments received between November 15, 2017 and August 26, 2019. These include all comments received from the initiation of the project until the Fall 2019 Open House meetings. Comments received during and after the Fall 2019 Open Houses are presented in **Section 6.1.2.2**. These are discussed separately because new information on the Corridor Alternatives, MOA, and preliminary CARA was made available to the public in conjunction with the Fall 2019 Open House Meetings. All public comments received are posted on a monthly basis to view on the Bay Crossing Study website at https://baycrossingstudy.com/public-involvement/view-public-comments.

6.1.2.1 Comments Received from Fall 2017 to August 2019

MDTA received over 1,100 comments between November 15, 2017 and August 26, 2019. Comments were submitted via the project website, email, comment cards (at meetings) and letters. All public comments are available for review on the project website at baycrossingstudy.com, and have been divided into nine general topic areas: recommendations for a specific crossing location (35 percent), environmental or land use considerations (18 percent), miscellaneous comments (12 percent), modal and operational (10 percent), general opposition to the study or improvements (10 percent), traffic and infrastructure comments (10 percent), general support for the study or improvements (three percent), requests for information (two percent), and bicycle and pedestrian recommendations (less than 1 percent). **Table 6-1** includes the list of comments by topic. Percentages were rounded to the closest one percent.

Table 6-1: Comments by Topic – November 2017 to August 2019

TOPIC	PERCENT OF COMMENTS
Recommendations for a specific crossing location	35%
Environmental or land use considerations	18%
Miscellaneous comments	12%
Modal and operational alternatives	10%
General opposition to the study or improvements	10%
Traffic and infrastructure comments	10%
General support for the study or improvements	3%
Requests for information	2%
Bicycle and Pedestrian recommendations	<1%

6.1.2.2 Comments Received During and After Fall 2019 Open House Meetings

A total of 736 comments were received from the beginning of the Fall 2019 Open House Meetings to January 31, 2021, including letters, emails, website comments, public meeting comment cards, and MDTA customer survey cards. Information on each of the 14 corridor alternatives was presented to the public at the Fall 2019 Open Houses.

Written comments received have been summarized based on the listed categories: Specific Crossing Location (54 percent), Traffic and Infrastructure (20 percent), Environmental and Land Use (11 percent), Other/Miscellaneous (four percent), Other Alternatives (six percent), General Support (four percent), General Opposition (four percent), Requests for Information (one percent), and Bicycle/Pedestrian (0.2 percent). Many comments are included in multiple categories.

Table 6-2: Comments Received During and After Fall 2019 Open House Meetings

TOPIC	PERCENT OF COMMENTS
Specific Crossing Location	54%
Traffic and Infrastructure	20%
Environmental and Land use	11%
Other/Miscellaneous	4%
Other Alternatives	6%
General Support for Study and/or Improvements	4%
General Opposition to Study and/or Improvements	4%
Requests for Information	1%
Bicycle and Pedestrian	0.2%

Specific Crossing Location

Information on each of the 14 corridor alternatives was presented to the public at the Fall 2019 Open Houses. Corridors 6, 7, and 8 were highlighted in the materials to collect public input on the recommendation to carry forward as the CARA. Comment cards provided at the public meeting and on the website included a section for comments specifically on the preliminary CARA, Corridors 6, 7, and 8. Written comments were also included in this category where commenters indicated support or opposition to any of the corridors, not solely the preliminary CARA. **Table 6-3** below summarizes the number of comments indicating a preference for or against each of the preliminary CARA. A total of 110 comments were specific to corridors other than the preliminary CARA. Some commenters indicated more than one preference. A total of 76 comments expressed general opposition to the study or a new crossing, including support for the No Build Alternative.

Table 6-3: Comments For or Against the Preliminary CARA

Preliminary CARA	In Favor	Opposed
Corridor 6	61	223
Corridor 7	215	171
Corridor 8	90	249

Other Alternatives

A total of 134 comments mentioned other alternatives/modes or non-corridor options including the MOA evaluated in the screening. Many commenters in this category advocated for options aside from a new crossing to relieve congestion such as ferry service, bus service, electronic toll lanes, toll rate flexibility during peak times, and rail.

General Support

A total of 77 commenters expressed general support for the study or a new crossing. Commenters in this category often emphasized the importance of existing problems at the Bay Bridge and the need to address them.

General Opposition

There were 77 comments expressing general opposition to the study or a new crossing. These included comments expressing support for the No Build Alternative. Commenters expressed concerns over impacts to communities and the environment, among other issues.

Environmental, Cultural and Socioeconomic Issues

There were 232 comments that touched on environmental issues such as natural resources, communities, cultural resources, and agriculture. Comments in this category expressed concerns with potential impacts to resources such as the Chesapeake Bay, wildlife, and wetlands. Commenters also noted the potential impact of sea level rise on Chesapeake Bay environment and infrastructure. Concerns with potential impacts to cultural resources and agricultural lands were also common themes.

Bicycle and Pedestrian

Five comments included the topic of bicycle and pedestrian access. These comments included suggestions for bicycle and/or pedestrian access on a new crossing, as well as general questions as to whether bicycle and pedestrian access has been considered.

Engineering, Traffic and Transportation

A total of 421 comments were included in the category of engineering, traffic and transportation. A broad range of issues were mentioned in these comments such as roadway capacity concerns, discussion of specific roadways and intersections, concerns about safety, roadway maintenance issues, comments on the study traffic analysis, and comments on the type of crossing. Common themes included concerns over the impact of a new crossing on local roadways, discussion of how the existing crossing affects local traffic, and concerns that a new crossing would lead to increased traffic on local roadways.

Requests for Study Information

There were 23 comments requesting specific information about the study. For example, questions about how to view project materials online or questions about meeting locations were included in this category.

Other

A total of 92 comments did not fit into any of the other categories and were classified as "other". Examples of these include comments regarding cost or funding, the Bay Crossing study process, the Open House meeting format, and questions unrelated to other topic areas.

Checkboxes: Important Factors in Selecting the Preferred Corridor Alternative

In addition to the information above, the comment forms included the prompt, "Which three factors are most important to you in selecting the preferred Corridor Alternative?" Commenters were given seven options to choose from. The checkbox options and number of commenters checking each box are provided in **Table 6-4**.

Table 6-4: Checkbox Prompt Responses

Checkbox Factors	Number of Commenters Selecting
Community / Development Impacts	402
Reducing congestion	375
Environmental impacts	355
Safety	200
Cost	124
Engineering /Construction	87
Other	85

6.1.2.3 Conclusions

The comprehensive public outreach program conducted in support of the Bay Crossing Study has yielded important information and informed key decisions throughout the process. The comments collected reflected a wide range of concerns that were considered in the development of the screening process and methodologies for the environmental technical studies supporting this DEIS. One notable theme emerging from the public comments is an emphasis on the potential for land use changes from a new crossing, particularly on the Eastern Shore. This input underscored the importance of analyzing potential induced growth throughout the alternatives screening and DEIS development.

Public input on the screening analysis also helped to reinforce the identification of the CARA and the MDTA RPCA. Public input collected at the Fall 2019 Open Houses reinforced the emphasis on reducing congestion as a key factor to distinguish between the corridors, in support of the Purpose and Need. Members of the public identified "reducing congestion" as a high priority for identifying corridors to carry forward. Additionally, as shown in **Table 6-3** above, more favorable public comments were received for Corridor 7 compared to the other CARA.

6.2 AGENCY COORDINATION

The FHWA and MDTA actively engaged the federal, state, regional, and local agencies, as well as the adjacent counties, Metropolitan Planning Organizations (MPO), and other stakeholders throughout the Study process. A Coordination Plan was developed and made available on the Project website at the initiation of the study to facilitate the structured coordination with agencies and ensure adequate participation in the Study. Key coordination points included the development of the Purpose and Need, the range of alternatives and the identification of the CARA. Agencies were also consulted throughout the development of environmental technical studies and this DEIS, including discussions of methodology and data sets used.

During the Scoping Activities outreach stage, potential Cooperating, Participating, and Notified Agencies at the federal, state, local and regional levels were initially identified by FHWA and MDTA, in accordance with 40 CFR 1501.6 and 23 U.S.C. § 139. Seven agencies (four federal and three state) are Cooperating Agencies and 35 agencies (six federal, eight state, 14 counties, and five MPOs) are Participating Agencies for the study. The notified agencies and stakeholders include six federal, eight state, four counties, 68 municipalities, and three MPOs. Additionally, 31 stakeholders were designated as notified agencies, along with 17 federally recognized tribes and ten state recognized tribes. These cooperating, participating, and notified agencies are listed in **Table 6-5**, the local agencies and regional stakeholders in **Table 6-6**. Lists of federal and state recognized tribes and the municipalities area also included below.

Table 6-5: Lead, Cooperation, Participating, and Notified State and Federal Agencies

ROLE	FEDERAL AGENCIES	MARYLAND / STATE AGENCIES
Lead Agencies	• Federal Highway Administration (FHWA) – Maryland Division	• Maryland Transportation Authority (MDTA)
Cooperating Agencies	• US Army Corps of Engineers (USACE) • US Coast Guard (USCG) • Environmental Protection Agency (EPA) • National Marine Fisheries Service (NMFS)	• MDOT State Highway Administration (MDOT SHA) • MD Department of Environment (MDE) • Maryland Department of Natural Resources (MDNR)
Participating Agencies	• National Park Service (NPS) • Natural Resource Conservation Service (NRCS) • Federal Transit Administration (FTA) • US Fish and Wildlife Service (USFWS) • Advisory Council on Historic Preservation (ACHP) • US Navy	• MDOT Maryland Port Administration (MDOT MPA) • MDOT Maryland Transit Administration (MDOT MTA) • Maryland Department of Planning (MDP) • Critical Areas Commission for the Chesapeake and Atlantic Coastal Bays (CAC) • Maryland Emergency Management Agency • Maryland Board of Public Works • Virginia Department of Transportation (VDOT) • Maryland Historical Trust (MHT)
Notified Agencies	• Federal Aviation Administration • US Geological Survey • FHWA – Virginia Division • FHWA – Delaware Division • Federal Emergency Management Agency (FEMA) • US Army	• Maryland State Police • Maryland Department of Agriculture • MDOT Motor Vehicle Administration (MDOT MVA) • Delaware Department of Transportation (DelDOT) • Maryland Aviation Administration (MAA) • Maryland Commission on Indian Affairs • Maryland Natural Resources Police • Maryland Department of Commerce

Table 6-6: Local Agencies and Regional Stakeholders

ROLE	Counties	Municipalities	MPOs	Other
Participating	• Cecil County • Kent County • Queen Anne's County • Talbot County • Caroline County • Dorchester County • Somerset County • Wicomico County • Worcester County • Harford County • Baltimore County • Anne Arundel County • Calvert County • St. Mary's County		• Baltimore Metropolitan Council (BMC) • Calvert-St. Mary's MPO • Tri-County Council – Lower Eastern Shore • Tri-County Council – Southern Maryland • Salisbury/Wicomico MPO	
Notified	• Sussex County, DE • Kent County, DE • New Castle County, DE • Baltimore City	• Municipalities within the fourteen participating counties (see list below)	• Dover/Kent County MPO • Metropolitan Washington Council of Governments (MWCOG) • Wilmington Area Planning Council (WILMAPCO)	• Chesapeake Bay Program Members • Chesapeake Bay Foundation • Alliance for the Chesapeake Bay • Waterkeepers Chesapeake • Chesapeake Bay Commission • Chesapeake Bay Trust • Chesapeake Conservancy • Oyster Recovery Partnership • The Nature Conservancy • Preservation Maryland • Federally Recognized Tribes (see list below) • State Recognized Tribes (see list below) • Stories of the Chesapeake Heritage Area • Heart of Chesapeake Country Heritage Areas • Annapolis, London Town, & South County (Four Rivers) Heritage Area

ROLE	Counties	Municipalities	MPOs	Other
				• Southern Maryland Heritage Area • Cecil Land Trust • Harford Land Trust • Gunpowder Valley Conservancy • North County Land Trust • Scenic Rivers Land Trust • American Chestnut Land Trust • Patuxent Tidewater Land Trust • Chesapeake Wildlife Heritage • Eastern Shore Land Conservancy • Lower Shore Land Trust • Ducks Unlimited-Wetlands America Trust • Kent Conservation & Preservation Alliance • Kent County Bay Bridge Monitoring Committee • Queen Anne's Conservation Association • Rural Maryland Council

List of Federally Recognized Tribes:

- Delaware Nation
- Delaware Tribe of Indians
- Oneida Indian Nation
- Onondaga Nation
- Saint Regis Mohawk Tribe
- Tuscarora Nation
- Seneca-Cayuga Nation
- Absentee-Shawnee Tribe of Oklahoma
- Eastern Shawnee Tribe
- Shawnee Tribe

List of State Recognized Tribes:

- Piscatawa Indian Nation
- Piscataway Conoy Tribe of Maryland
- Piscataway Conoy Confederacy and Subtribes of Maryland
- Cedarville Band of Piscataway
- Nause-Waiwash Band of Indians
- Accohannock Indian Tribe
- Pocomoke Indian Nation

List of Notified Municipalities in the Counties Adjacent to the Bay

Anne Arundel County
- Annapolis
- Highland Beach

Baltimore County
- (none)

Calvert County
- Chesapeake Beach
- North Beach

Caroline County
- Denton
- Federalsburg
- Goldsboro
- Greensboro
- Henderson
- Hillsboro
- Marydel
- Preston
- Ridgely
- Templeville

Cecil County
- Cecilton
- Charlestown
- Chesapeake City
- Elkton
- North East
- Perryville
- Port Deposit
- Rising Sun

Dorchester County
- Brookview
- Cambridge
- Church Creek
- East New Market
- Eldorado
- Galestown
- Hurlock
- Secretary
- Vienna

Harford County
- Aberdeen
- Bel Air
- Havre de Grace

Kent County
- Betterton
- Chestertown
- Galena
- Millington
- Rock Hall

Queen Anne's County
- Barclay
- Centreville
- Church Hill
- Millington
- Queen Anne
- Queenstown
- Sudlersville
- Templeville

St. Mary's County
- Leonardtown

Somerset County
- Crisfield
- Princess Anne

Talbot County
- Easton
- Oxford
- Queen Anne
- St. Michaels
- Trappe

Wicomico County
- Delmar
- Fruitland
- Hebron
- Mardela Springs
- Pittsville
- Salisbury
- Sharptown
- Willards

Worcester County
- Berlin
- Ocean City
- Pocomoke City
- Snow Hill

The Interagency Coordination Meetings (ICMs) were held at key coordination points by MDTA and FHWA and attended by the Cooperating and ICM Participating Agencies. ICM Meetings focused on sharing and discussing information and seeking feedback from attendees on the study process, methodologies, and results of major study findings at study milestones. All Cooperating and ICM Participating Agencies were encouraged to provide both data and comments throughout the study thus far.

Cooperating Agencies are requested to provide concurrence at milestones, as outlined in the Agency Coordination Plan. Concurrence was received on the study schedule (as outlined in the BCS Coordination Plan) and guiding principles for the agency coordination process in February 2018. In July 2018, the Cooperating Agencies concurred on the Purpose and Need statement. In February 2020, the Cooperating Agencies concurred on the identification of the CARA. Concurrence will be requested on the MDTA RPCA at a future date.

A total of 13 ICMs have been held since the Study initiation in October 2017. A summary of the ICM meetings held to date for the Study is provided in **Table 6-7.** Coordination with County Participating Agencies has occurred at Maryland Association of Counties (MACo) meetings.

Table 6-7: Summary of Interagency Coordination Meetings (ICM)

DATE	KEY TOPICS
October 2017	Agencies comment on study scoping, draft coordination plan, and preliminary Purpose and Need (P&N) concepts.
December 2017	Agencies introduced to draft P&N summary, draft coordination plan, draft Guiding Principles memorandum, and draft study methodologies with opportunity for comment.
January 2018	Review and discussion of draft P&N summary, draft coordination plan, draft Guiding Principles memorandum, and draft study methodologies
February 2018	MDTA requests **concurrence from Cooperating Agencies on Guiding Principles memorandum. MDTA requests concurrence from Cooperating and Participating Agencies and on the schedule included in the coordination plan.** Agencies introduced to draft screening criteria and draft P&N Statement. Agencies provide comment.
March 2018	Review and discussion of draft screening criteria and draft P&N Statement. Agencies provide comment.
April 2018	Review and discussion of draft screening criteria and draft P&N Statement. Overview of the materials to be presented at the May 2018 Public Meeting. Agencies provide comment.
June 2018	Review of updates to draft P&N Statement. Summary of May Public Meetings.
July 2018	MDTA requests **concurrence on draft Purpose and Need Statement from Cooperating Agencies.** Agencies provide comment.
September 2018	Review and discussion of draft screening criteria. Agencies provide comment.
November 2018	Present the preliminary range of alternatives. Agencies provide comment.
September 2019	Discuss preliminary range of alternatives. Present the preliminary MDTA recommended CARA. Agencies provide comment.
January 2020	MDTA requests agency comment on the Draft Alternatives Concurrence Package.
February 2020	MDTA requests **concurrence on draft CARA from Cooperating Agencies** for inclusion in DEIS. Agencies provide comment.

Appendix B includes relevant BCS agency correspondence.

7 LIST OF PREPARERS

MDTA

Name	Role
Heather Lowe	Project Manager
Russell Walto	Manager – Planning and Community Relations
Melissa Williams	Director – Planning and Program Development
Melissa Bogdan	Community Relations Project Manager

FHWA

Name	Role
Jeanette Mar	Environmental Program Manager – FHWA Maryland Division
Blair Jones	Area Engineer – FHWA Maryland Division

RK&K

Name	Role
Karen Kahl	Project Manager
Eric Almquist	Environmental Manager, DEIS Development
Ryan Snyder	DEIS Lead Author and Technical Editor
Jeff Roberta	Engineer
Dave Roberts	Engineer
Jon Schmidt	DEIS Contributing Author, Section 106, Section 4(f)
Susan Miller	DEIS Contributing Author, ICE
Travis Comer	DEIS Contributing Author, ICE
Ryan Sless	GIS
Liz O'Keefe	DEIS Contributing Author, Socioeconomics, GIS
Michelle Moir	Technical Writer, Reviewer
Tyler Lane	Hazardous Materials
Christeen Taniguchi	Architectural Historian
Jason Shellenhamer	Archaeology
Karen Hutchins-Keim	Archaeology

AECOM

Name	Role
Tim Ryan	Project Manager, Traffic Analysis
Josh Crunkleton	DEIS Contributing Author, Technical Reviewer
Brian Lange	DEIS Contributing Author, Technical Reviewer
Mark Cheskey	DEIS Contributing Author, Technical Reviewer
Daniel Hulbert	Hazardous Materials
Krishna Patnam	Traffic Analysis

Jacobs

Name	Role
Harriet Levine	Public Outreach
Shannon Rousey	Public Outreach

Argo

Name	Role
Bob Soller	Hazardous Materials

Coastal Resources, Inc

Name	Role
Sarah Williamson	Task Lead - Agency Coordination
Emma Beck	Agency Coordination

CEM

Name	Role
Daniel Smith	GIS
Tim Palmer	Task Lead, GIS, Natural Resources
Peter Scherr	DEIS Contributing Author, Natural Resources
Barb Willig	GIS
Nathan Conway	GIS

Maryland Environmental Services

Name	Role
Sarah Groesbeck	Cultural Resources, Section 106
Kristofer Beadenkopf	Cultural Resources, Section 106

Navarro & Wright

Name	Role
Robert Eiswert	Cultural Resources
Timothy Carn	Cultural Resources
Matthew Bray	Cultural Resources

Wallace Montgomery

Name	Role
Ray Moravec	Engineer
Cassandra Greenhawk	Planner; Technical Reviewer

Wilson T Ballard

Name	Role
Jen Rohrer	Project Manager, Air Quality, Noise
Shawn Burnett	Project Manager, Air Quality, Noise
Matt Monto	DEIS Contributing Author, Noise Analysis
Nicole Hebert	DEIS Contributing Author, Air Quality

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9 DISTRIBUTION LIST

LEAD AGENCIES:

- Federal Highway Administration Maryland Division
- Maryland Transportation Authority

COOPERATING AGENCIES

- Maryland Department of Environment
- Maryland Department of Natural Resources
- Maryland Department of Transportation State Highway Administration
- National Marine Fisheries Service
- US Army Corps of Engineers
- US Coast Guard
- US Environmental Protection Agency

PARTICIPATING STATE AND FEDERAL AGENCIES

- Advisory Council on Historic Preservation
- Critical Areas Commission for the Chesapeake and Atlantic Coastal Bays
- Federal Transit Administration
- Maryland Board of Public Works
- Maryland Department of Planning
- Maryland Department of Transportation Maryland Port Administration
- Maryland Department of Transportation Maryland Transit Administration
- Maryland Emergency Management Agency
- Maryland Historical Trust
- National Park Service
- Natural Resource Conservation Service
- US Fish and Wildlife Service
- US Navy
- Virginia Department of Transportation

NOTIFIED STATE AND FEDERAL AGENCIES

- Delaware Department of Transportation
- Federal Aviation Administration
- Federal Emergency Management Agency
- Federal Highway Administration – Delaware Division
- Federal Highway Administration – Virginia Division
- Maryland Aviation Administration
- Maryland Commission on Indian Affairs
- Maryland Department of Agriculture
- Maryland Department of Commerce
- Maryland Department of Transportation Motor Vehicle Administration
- Maryland State Police
- US Army
- US Geological Survey

PARTICIPATING LOCAL AGENCIES AND REGIONAL STAKEHOLDERS

- Anne Arundel County
- Baltimore County
- Baltimore Metropolitan Council
- Caroline County
- Calvert County
- Calvert-St. Mary's Metropolitan Planning Organization
- Cecil County
- Dorchester County
- Harford County
- Kent County
- Queen Anne's County
- Salisbury/Wicomico Metropolitan Planning Organization
- Somerset County
- St. Mary's County
- Talbot County
- Tri-County Council – Lower Eastern Shore
- Tri-County Council – Southern Maryland
- Wicomico County
- Worcester County

NOTIFIED LOCAL AGENCIES AND REGIONAL STAKEHOLDERS

- Alliance for the Chesapeake Bay
- American Chestnut Land Trust
- Annapolis, London Town & South County (Four Rivers) Heritage Area
- Baltimore City
- Cecil Land Trust
- Chesapeake Bay Commission
- Chesapeake Bay Foundation
- Chesapeake Bay Program Members
- Chesapeake Bay Trust

- Chesapeake Conservancy
- Chesapeake Wildlife Heritage
- Dover/Kent County Metropolitan Planning Organization
- Ducks Unlimited-Wetlands America Trust
- Eastern Shore Land Conservancy
- Gunpowder Valley Conservancy
- Harford Land Trust
- Heart of Chesapeake Country Heritage Areas
- Kent County Bay Bridge Monitoring Committee
- Kent County, Delaware
- Kent Conservation & Preservation Alliance
- Lower Shore Land Trust
- Metropolitan Washington Council of Governments
- New Castle County, Delaware
- North County Land Trust
- Oyster Recovery Partnership
- Patuxent Tidewater Land Trust
- Preservation Maryland
- Queen Anne's Conservation Association
- Rural Maryland Council
- Scenic Rivers Land Trust
- Southern Maryland Heritage Area
- Stories of the Chesapeake Heritage Area
- Sussex County, Delaware
- The Nature Conservancy
- Waterkeepers Chesapeake
- Wilmington Area Planning Council

FEDERALLY RECOGNIZED TRIBES

- Absentee-Shawnee Tribe of Oklahoma
- Delaware Nation
- Delaware Tribe of Indians
- Eastern Shawnee Tribe
- Onandaga Nation
- Oneida Indian Nation
- Saint Regis Mohawk Tribe
- Seneca-Cayuga Nation
- Shawnee Tribe
- Tuscarora Nation

STATE RECOGNIZED TRIBES

- Accohannock Indian Tribe
- Cedarville Band of Piscataway
- Nause-Waiwash Band of Indians
- Piscatawa Indian Nation
- Piscataway Conoy Tribe of Maryland

- Piscataway Conoy Confederacy and Subtribes of Maryland
- Pocomoke Indian Nation

MUNICIPALITIES

Anne Arundel County
- Annapolis
- Highland Beach

Calvert County
- Chesapeake Beach
- North Beach

Caroline County
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- Federalsburg
- Goldsboro
- Greensboro
- Henderson
- Hillsboro
- Marydel
- Preston
- Ridgely
- Templeville

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- Charlestown
- Chesapeake City
- Elkton
- North East
- Perryville
- Port Deposit
- Rising Sun

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- Eldorado
- Galestown
- Hurlock
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- Rock Hall

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- Centreville
- Church Hill
- Millington
- Queen Anne
- Queenstown
- Sudlersville
- Templeville

St. Mary's County
- Leonardtown

Somerset County
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- Ocean City
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- Snow Hill