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INTERSTATE 64 / HIGH RISE BRIDGE CORRIDOR STUDY



CITY OF CHESAPEAKE, VA | STATE PROJECT #: 0064-131-783 | UPC: 104366

INDIRECT & CUMULATIVE EFFECTS
TECHNICAL REPORT

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Acronym List

American Community Survey	ACS
Candidate Build Alternative	CBA
City of Chesapeake	Chesapeake
Citizen Information Meeting	CIM
Commonwealth of Virginia	Virginia
Constrained Long Range Plan	CLRP
Council on Environmental Quality	CEQ
Department of Transportation	DOT
Dominion Chesapeake Energy Center	CEC
Environmental Assessment	EA
Erosion & Sediment Control	ESC
Executive Order	EO
Federal Emergency Management Agency	FEMA
Federal Highway Administration	FHWA
Flood Insurance Rate Map	FIRM
G.A. Treakle Memorial Bridge	High Rise Bridge
Geographic Information Systems	GIS
Great Bridge Boulevard	Route 190
Hampton Roads Transportation Planning Organization	HRTPO
Interstate 264	I-264
Interstate 464	I-464
Interstate 64	I-64
Interstate 664	I-664
Mean High Water	MHW
National Cooperative Highway Research Program	NCHRP
National Environmental Policy Act	NEPA
National Oceanic and Atmospheric Administration	NOAA
National Marine Fisheries Service	NMFS
Polychlorinated biphenyls	PCB
Quarterly Census of Employment and Wages	QCEW
Route 13 / Military Highway	Route 13
Route 17 / George Washington Highway	Route 17
Stormwater Management	SWM

Total Max Daily Load	TMDL
Transportation Research Board	TRB
U.S. Army Corps of Engineers	USACE
U.S. Census Bureau	Census
U.S. Coast Guard	USCG
U.S. Department of Health and Human Services	HHS
U.S. Department of Agriculture, Natural Resources Conservation Service	NRCS
U.S. Environmental Protection Agency	USEPA
U.S. Fish and Wildlife Service	USFWS
Virginia Department of Agricultural and Consumer Services	DACS
Virginia Department of Conservation and Recreation	DCR
Virginia Department of Environmental Quality	DEQ
Virginia Department of Forestry	DOF
Virginia Department of Health	VDH
Virginia Department of Historic Resources	DHR
Virginia Department of Transportation	VDOT
Virginia Employment Commission	VEC
Virginia Marine Resource Commission	VMRC
Virginia Maritime Association	VMA

1.0 INTRODUCTION

The Virginia Department of Transportation (VDOT), in cooperation with the Federal Highway Administration (FHWA) as the lead federal agency, and the United States Coast Guard as a cooperating agency, has initiated the Interstate 64/High Rise Bridge Corridor Study to evaluate options to improve transportation conditions along the Interstate 64 (I-64) corridor between the Interstate 464 (I-464) interchange and the Interstate 664 (I-664) and Interstate 264 (I-264) interchanges at Bowers Hill in the City of Chesapeake, Virginia (Chesapeake). Pursuant to the National Environmental Policy Act of 1969, as amended, (NEPA) and in accordance with FHWA regulations, an Environmental Assessment (EA) has been prepared to analyze the potential social, economic, and environmental effects associated with the proposed project¹.

In accordance with applicable FHWA guidance documentation, the following report describes Indirect and Cumulative Effects of the Interstate 64/High Rise Bridge Corridor Study, as well as considers the impacts each alternative may have on these resources. The methods used in this report for the identification of resources are described in detail in the EA and associated technical reports.

1.1 Description of the Study Area

The study area for the Interstate 64/High Rise Bridge Corridor Study is located in the southwestern quadrant of the Hampton Roads Beltway, which is formed by a loop of I-64 and I-664 (**Figure 1**). The study area encompasses approximately eight-miles of I-64, consisting of two travel lanes in each direction, between the I-464 interchange and the I-664 and I-264 interchanges at Bowers Hill. It includes interchanges along I-64 at Military Highway (Route 13), George Washington Highway (Route 17), and Great Bridge Boulevard (VA Route 190). The G.A. Treacle Memorial Bridge (High Rise Bridge), a mile-long double-leaf drawbridge that spans the Southern Branch of the Elizabeth River, also is included in the study area.

Within the study area, I-64 connects to numerous businesses, homes, schools, and recreational opportunities throughout Chesapeake. Due to the loop that I-64 follows through the Hampton Roads region of the Commonwealth of Virginia (Virginia), I-64 West travels in an easterly direction and I-64 East travels westerly through the study area. For the purpose of this EA, I-64 will be described in terms of the road name and not the direction of the road.

The study area extends beyond the interchanges described above to ensure the impacts of any of the proposed transportation improvements are adequately documented. The study area consists of (**Figure 1**):

- Four interchanges (estimated at 3,000 feet in diameter/1,051 acres combined) ;
- Mainline along I-64 (100 feet on each side from existing edge of pavement – estimated at 327 acres); and,
- High Rise Bridge (600 feet from the center line for a total of 1,200 feet – estimated at 308 acres).

¹ NEPA and FHWA's regulations for Environmental Impact and Related Procedures can be found at 42 USC § 4332(c), as amended, and 23 CFR § 771, respectively.

- I 64/High Rise Bridge Corridor Study Area*
- Water Bodies
- Great Dismal Swamp

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 Federal Project Number: NH-IM-064-3(481)

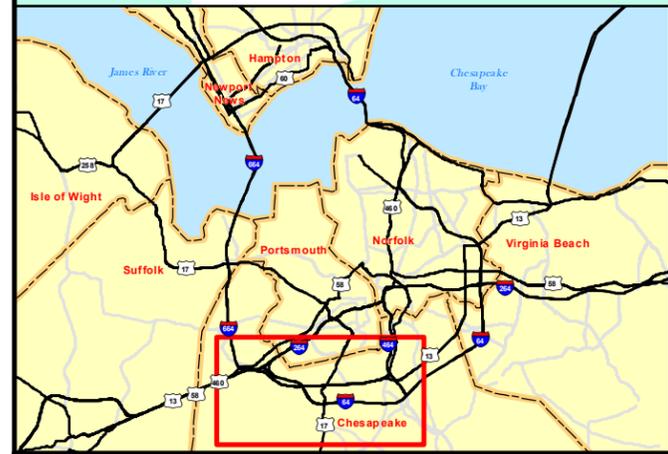
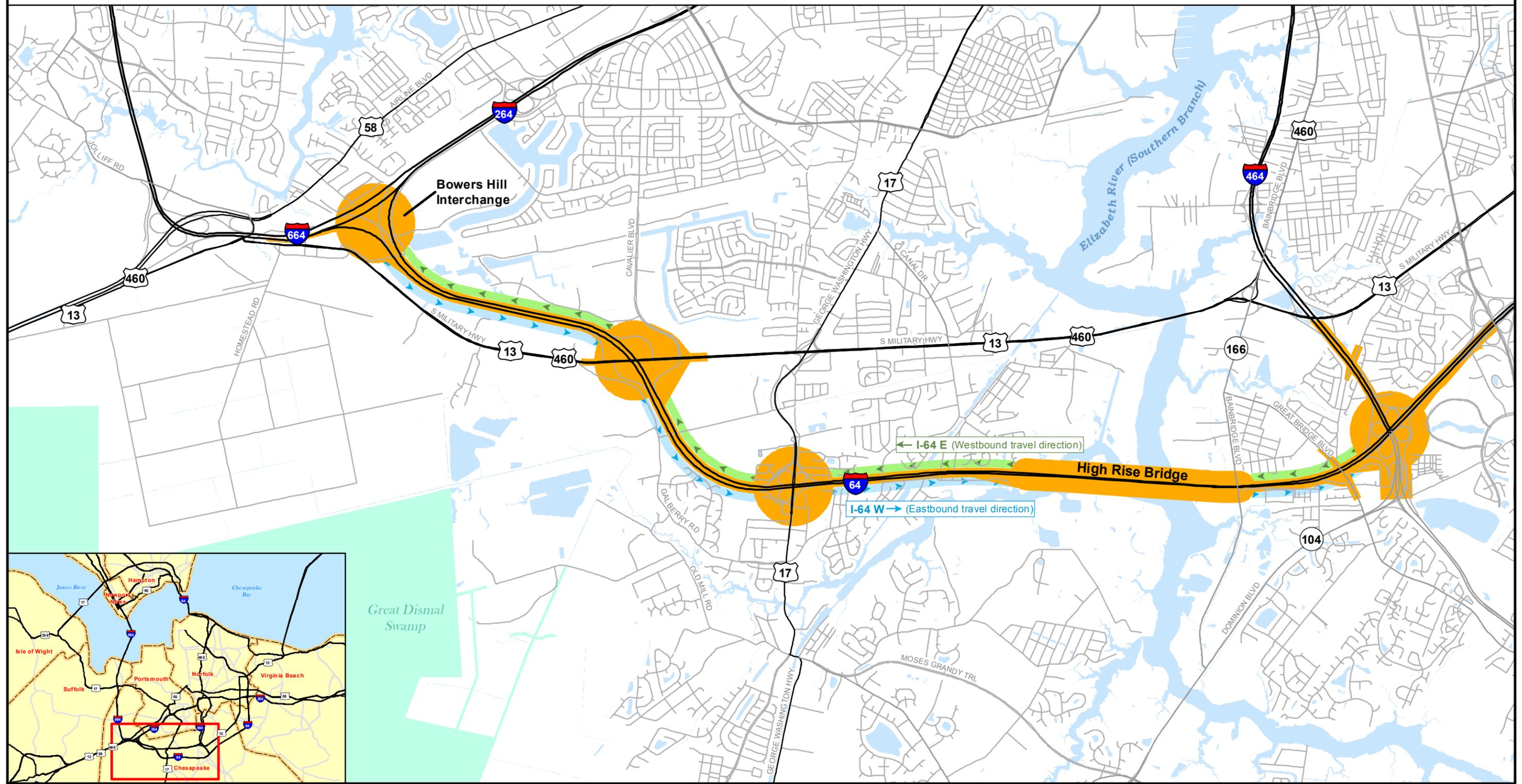
Figure 1 Study Area

Interstate 64/High Rise Bridge Corridor Study Indirect and Cumulative Effects Technical Report City of Chesapeake



*The study area is a buffer around the road corridor that includes all natural, cultural and physical resources that must be analyzed in the NEPA document. It does not imply right-of-way take or construction impact.

Mapping Source: VDOT and City of Chesapeake



Additionally, as discussed in the *Alternatives Development Technical Report* (VDOT, 2014a), potential or estimated environmental impacts of the alternatives retained for detailed study were estimated based on the alternative's area of impact (or footprint) within the substantially larger study area. The area of impact has been estimated for alternative comparison purposes and decision-making during the NEPA process, but would be further refined if and when an alternative advanced to design.

1.2 Alternatives Considered for Evaluation

To address the identified purpose and need of the I-64/High Rise Bridge Corridor Study (See **EA Chapter 1.0**), alternatives were developed, as described in the *Alternatives Development Technical Report* (VDOT, 2014a). Initial analysis included Eight and Ten lane Build Alternatives. Prior to the completion of this technical report, FHWA and VDOT agreed to move forward with retaining the Eight lane Build Alternatives, as they would generally provide Level of Service "C" for the majority of the study area in the design year and be consistent with FHWA's Performance Based Practical Design policy (FHWA, 2014). Details on the analyses conducted to support this decision are included in the *Alternatives Development Technical Report* (VDOT, 2014a) and the *Traffic and Transportation Technical Report* (VDOT, 2014c). Given the level of analysis that had occurred to inform this decision, data on the Eight and Ten lane alternatives are included in this technical report. Accordingly, the analyses of these alternatives are described in the following sections.

Due to the number of possible managed lane scenarios, there have been no specific operational scenarios identified at this stage of the study. Accordingly, the following three operational scenarios were developed to establish a sample range of travel demand conditions for the Eight or Ten lane Build – Managed Alternative: High Occupancy Vehicle (HOV), High Occupancy Toll (HOT), and All Tolled. For the purpose of this report, potential impacts associated with the Eight or Ten lane Build – Managed Alternative assume the same footprint as the respective general purpose (GP) Build Alternative. However it should be noted, of the three scenarios developed for this study, the HOV and All Tolled lane scenarios would fit within the area of impact. Furthermore, if a specific managed lane scenario is identified as the Preferred Alternative, impact estimates could be updated in the Revised EA and associated technical reports.

1.2.1 No Build Alternative

In accordance with the regulations implementing NEPA (40 CFR § 1502.14(d)), the No Build Alternative has been included for evaluation in the EA to serve as a benchmark for the comparison of future conditions and impacts. The No Build Alternative would retain the existing I-64 interstate, associated interchanges and the High Rise Bridge in their present configurations, and allow for routine maintenance and safety upgrades. This alternative also assumes that the projects currently programmed and funded in VDOT's Fiscal Year 2015-2020 Six-Year Improvement Program and the Hampton Roads Transportation Planning Organization's (HRTPO) Constrained Long Range Plan (CLRP) would be implemented as discussed in the *Alternatives Development Technical Report* (VDOT, 2014a) and *Traffic and Transportation Technical Report* (VDOT, 2014c).

1.2.2 Eight Lane Build Alternative

This alternative would include construction of four additional lanes of capacity (two lanes in each direction) on I-64 within the study area. The eight lanes under this alternative are GP Lanes and are available for use without any restrictions or tolls. Wherever possible, the additional lanes would be

constructed towards the existing median of I-64. The widening of I-64 to eight lanes also would require the reconstruction of I-264 ramp bridge over I-64 to the I-664 ramp; widening of I-64 bridge over Rotunda Avenue; improvements to Route 13 interchange: widening of I-64 bridges over Yadkin Road; improvements to Route 17 interchange; widening of I-64 bridge over Shell Road; extensions of the culvert along Gilmerton Deep Creek Canal; reconstruction of the High Rise Bridge (see bridge options discussed in **Section 1.3**); reconstruction of the Route 190 bridge over I-64; and improvements at the I-464 interchange.

1.2.3 Eight Lane Build – Managed Alternative

The Eight Lane Build – Managed Alternative would be similar to the Eight Lane Build Alternative, providing four additional lanes of capacity (two lanes in each direction) on I-64. However, some or all of the travel lanes would be managed using tolls and/or vehicle occupancy restrictions. Additionally, expanded local/express bus service or bus rapid transit could be accommodated with this alternative in the GP or the managed lanes. Numerous managed lane scenarios are possible depending on the type of strategy selected including, but not limited to, HOV lanes, HOT lanes, occupancy restrictions (at least 2 or 3 occupants), or time of day/day of week restrictions. The following three operational scenarios were evaluated to identify a sample range of potential conditions for this Build Alternative.

- HOV
- All lanes tolled
- Two HOT Lanes + Two General Purpose Lanes (2 HOT / HOV-2 “free” + 2 GP)

This study does not identify what type of managed lane would be constructed. Moreover, if this alternative is identified as the Preferred Alternative, subsequent studies would be required to refine the specifics of the managed lanes throughout the study area. These specifics could include the identification of additional costs and impacts not quantified as part of this study, including those associated with providing access between the GP and managed lanes at interchanges and/or between interchanges.

1.2.4 Ten Lane Build Alternative

This alternative would include construction of six additional lanes of capacity (three lanes in each direction) within the study area. The ten lanes under this alternative are GP Lanes and are available for use without any restrictions or tolls. Wherever possible, the additional lanes would be constructed towards the existing median of I-64. The widening of I-64 to ten lanes also would require the reconstruction of I-264 ramp bridge over I-64 to the I-664 ramp; widening of I-64 bridge over Rotunda Avenue; improvements to Route 13 interchange: widening of I-64 bridges over Yadkin Road; improvements to Route 17 interchange; widening of I-64 bridge over Shell Road; extensions of the culvert along Gilmerton Deep Creek Canal; reconstruction of the High Rise Bridge (see bridge options discussed in **Section 1.3**); reconstruction of the Route 190 bridge over I-64 and improvements at the I-464 interchange.

1.2.5 Ten Lane Build – Managed Alternative

The Ten Lane Build – Managed Alternative would be similar to the Ten Lane Build Alternative, providing five continuous mainline lanes in each direction of I-64. However, some or all of the travel lanes would be managed using tolls and/or vehicle occupancy. Additionally, expanded local/express bus service or bus rapid transit could be accommodated with this alternative in the GP or the managed lanes. Numerous managed lane scenarios are possible depending on the type of strategy selected including, but not limited

to, HOV lanes, HOT lanes, occupancy restrictions at least 2 or 3 occupants, or time of day/day of week restrictions. The following three operational scenarios were evaluated to identify a sample range of potential conditions for this Build Alternative.

- HOV
- All lanes tolled
- Two HOT Lanes + Two General Purpose Lanes (2 HOT / HOV-2 “free” + 2 GP)

This study does not identify what type of managed lane would be constructed. Moreover, if this alternative is identified as the Preferred Alternative, subsequent studies would be required to refine the specifics of the managed lanes throughout the study area. These specifics could result in the identification of additional costs and impacts not quantified as part of this study, including those associated with providing access between the GP and managed lanes at interchanges and/or between interchanges.

1.3 Bridge Alternatives

1.3.1 Fixed-Span Bridge – 95 Foot – Vertical Clearance

This alternative would consist of high-level, fixed-span bridges measuring 95-feet during mean high water (MHW). This alternative would include the construction of a new bridge carrying eastbound traffic south of the existing bridge. The proposed eastbound roadway approach would be shifted south, by approximately 100 feet, to tie in with the proposed location of the new bridge. The existing I-64 drawbridge would remain in service during the construction of the new bridge but could then be demolished to build a new fixed span bridge to current design standards. Additionally, this alternative includes consideration of widening the horizontal clearance from 125-feet to 135-feet. The typical section would vary to match the mainline alternative; however, the bridge would include 14-foot wide shoulders on the inside and outside due to the high truck volume that utilizes I-64, VDOT Bridge Design Manual (VDOT, 2014b).

1.3.2 Fixed-Span Bridge – 135 Foot – Vertical Clearance

This alternative would consist of high-level, fixed-span bridges measuring 135-feet during MHW. This alternative would include the construction of a new bridge carrying eastbound traffic south of the existing bridge. The proposed eastbound roadway approach would be shifted south, by approximately 100 feet, to tie in with the proposed location of the new bridge. The existing I-64 drawbridge would remain in service during the construction of the new bridge but could then be demolished to build a new fixed span bridge to current design standards. Additionally, this alternative includes consideration of widening the horizontal clearance from 125-feet to 135-feet. The typical section would vary to match the mainline alternative; however, the bridge would include 14-foot wide shoulders on the inside and outside due to the high truck volume that utilizes I-64, VDOT Bridge Design Manual (VDOT, 2014b).

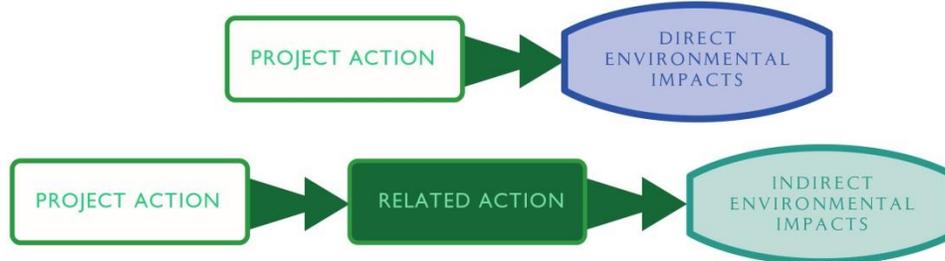
2.0 METHODOLOGY

The NEPA legislation does not mention indirect or cumulative impacts. The Council on Environmental Quality (CEQ) regulations for implementing NEPA, however, address federal agency responsibilities applicable to indirect and cumulative impacts considerations, analysis, and documentation (40 CFR §

1508.25) and in the content requirements for the environmental consequences section of an EIS (40 CFR § 1502.16) (FHWA 2014).

CEQ defines indirect effects as “...effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. 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(a)). These induced actions are those that would or could not occur without the implementation of the proposed project, as illustrated in **Figure 2**.

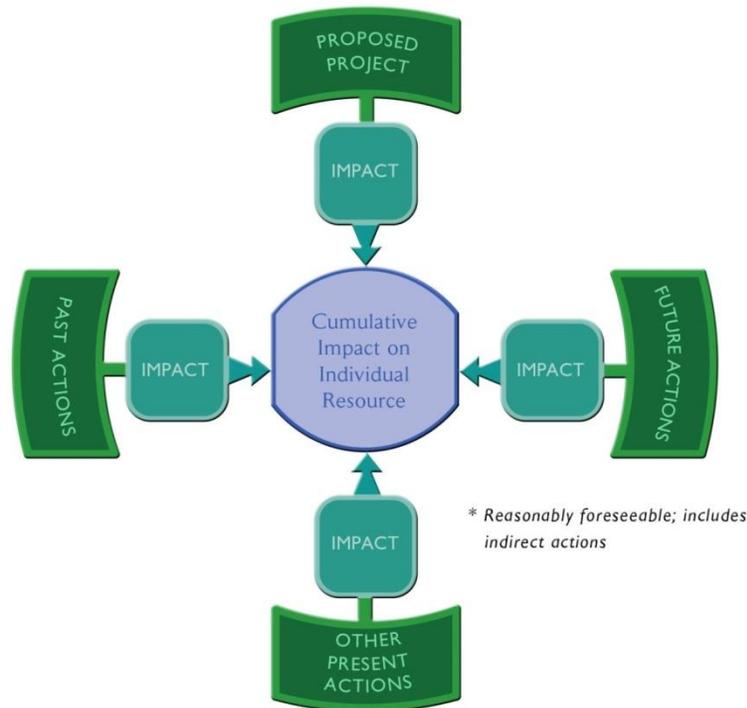
Figure 2: Direct vs. Indirect Environmental Impact



Source: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process, FHWA, 2014.

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

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

Figure 3: Cumulative Impacts

Source: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process, FHWA, 2014.

Therefore, while reasonably foreseeable events may be uncertain, they must still be probable. As such, those events that are considered possible, but not probable, may be excluded from NEPA analysis. There is an expectation in the CEQ guidance that judgments concerning the probability of future impacts will be informed, rather than based on speculation (FHWA, 2014). This direction on identifying reasonably foreseeable actions is taken into account in both the analyses described in the following sections. Specific methodologies on how these analyses were conducted are presented for indirect and cumulative effects, respectively.

The means by which these regulations are applied to this Technical Report are explained in the sections below.

2.1 Indirect Effects

This section presents an analysis of the potential indirect impacts related to the proposed alternatives described in **Section 1.0**. For the purposes of this Technical Report and the associated EA, the methodology followed for analyzing indirect effects are prescribed in the Transportation Research Board's (TRB) National Cooperative Highway Research Program (NCHRP) Report 466, *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects* (TRB, 2002).

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

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

For the purposes of this analysis, the term “indirect effects” refers to encroachment-alteration impacts, as no induced growth is anticipated (see **Section 3.0**). The stepwise process TRB recommends in NCHRP Report 466 for assessing indirect effects has been used as the structure for the analysis, and considers the following steps:

- | | |
|--------|---|
| Step 1 | Scoping |
| Step 2 | Identify Study Area Direction and Goals |
| Step 3 | Inventory Notable Features in the Study Area |
| Step 4 | Identify Impact-Causing Activities of the Proposed Alternatives |
| Step 5 | Identify Indirect Effects for Analysis |
| Step 6 | Analyze Indirect Effects and Evaluate Analysis Results |
| Step 7 | Assess Consequences and Develop Mitigation |

To complete these steps, the required analyses rely on planning judgment. The NCHRP 25-25 program, Task 22, *Forecasting Indirect Land Use Effects on Transportation Projects*, documents means of applying planning judgment to indirect and cumulative effects analyses (TRB, 2007). The direction provided in the TRB document is the basis for the indirect effects analyses presented in this technical report.

2.2 Cumulative Effects

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

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

Each of these parts of the Cumulative Effects evaluation process is discussed in **Section 4.0** of this Technical Report.

3.0 INDIRECT EFFECT ANALYSIS

3.1 Step One: Scoping

The first step in the indirect effects analysis includes scoping activities and the identification of the study area in order to set the stage for the remaining steps. As part of this scoping effort, a number of planning documents prepared by the City were reviewed, including the City's Comprehensive Plan, *Moving Forward-Chesapeake 2035*, the 2035 Land Use Plan, and the 2050 Master Transportation Plan (Chesapeake, 2014c). These documents illustrate that the proposed improvements have been considered in the local and regional planning processes for some time.

Scoping also included agency coordination. On August 26, 2013, VDOT mailed scoping letters to the following federal, state, and local agencies and organizations to obtain pertinent information and to identify key issues regarding the potential environmental impacts for this study.

- Chesapeake Bay Local Assistance
- City of Chesapeake
- Commonwealth Transportation Board
- Dominion Resources Services, Inc.
- Federal Emergency Management Agency
- Hampton Roads Transportation Planning Organization
- National Marine Fisheries Service
- The Elizabeth River Project
- United States Army Corps of Engineers
- United States Coast Guard
- United States Department of Agriculture, Natural Resources Conservation Service
- United States Department of the Interior
 - Fish and Wildlife Service
 - Great Dismal Swamp National Wildlife Refuge
 - National Park Service, Northeast Region
 - Office of Environmental Policy and Compliance
- United States Environmental Protection Agency
- Virginia Department of Agricultural and Consumer Services (DACCS)
- Virginia Department of Conservation and Recreation (DCR)
- Virginia Department of Emergency Management
- Virginia Department of Environmental Quality
 - Division of Land Protection and Revitalization
 - Environmental Impact Review
 - Office of Air Data Analysis
 - Office of Wetlands and Stream Protection
 - Tidewater Regional Office
 - Water Division
- Virginia Department of Forestry
- Virginia Department of Game and Inland Fisheries
- Virginia Department of Historic Resources
- Virginia Department of Health
- Virginia Department of Mines, Minerals and Energy
- Virginia Department of Rail and Public Transportation
- Virginia Marine Resources Commission (VMRC)
- Virginia Maritime Association
- Virginia Outdoors Foundation
- Virginia Pilot Association
- Virginia State Police Department

On September 18, 2013, VDOT also held a Citizen Information Meeting (CIM) to solicit input from the

public. The open house format for the CIM included display boards depicting general information on the study, including the study schedule and purpose of the study. Comment sheets and informational handouts were provided at the meeting and also were made available on the study website. VDOT representatives were available to discuss the study and answer questions. A total of 82 citizens attended the CIM and 22 public comments were received as a result of the 30-day comment period following the CIM.

As a result of its coordination with USCG (see *Navigational Evaluation Technical Memorandum* [VDOT, 2014e]), VDOT was made aware of differences in the indirect and/or cumulative effects between a 95- and 135-foot bridge. These differences are documented in this Technical Report. Input from this process was used to inform the identification of the study area (**Figure 1**), resource-specific study areas, and notable features. The study area was identified to support the development of alternatives and direct impact analysis, while resource specific study areas were developed for each resource/feature in order to analyze a full range of potential indirect and cumulative effects and are discussed further in **Section 3.2.1**.

Although there was no other input from this coordination effort to the indirect and cumulative effect analysis, the information obtained through these efforts was used to further inform discussions on the direction and goals of the region, as well as the resources included in the study area. Additional details on the scoping process can be found in the associated EA, **Section 4.0 Coordination and Comments**.

3.2 Step Two: Identify Study Area Direction and Goals

The second step in the indirect effects analysis focuses on assembling information regarding general trends and goals within the various resource study areas. Before these trends and goals could be identified, specific resource studies areas were developed based on the information obtained during the first step of the process.

3.2.1 Study Areas

The study area for this EA (**Figure 1**), along with input from the scoping process outlined above, was used to inform the identification of resource-specific study areas for this indirect effects analysis. Specific indirect effect study areas were developed for each of the following resource topics:

- **Socioeconomic and Land Use:** This study area was established to analyze indirect effects to socioeconomics and land use, community facilities, environmental justice. The study area includes the study area for the EA as well as an area along the Southern Branch of the Elizabeth River that extends the distance to the Dominion Boulevard Bridge (south) and to the Gilmerton Bridge (north). This extended area was selected for analysis based on input received during development of the *Navigational Evaluation Technical Memorandum* (VDOT, 2014e). The Socioeconomic and Land Use study area is shown in **Figure 4**.
- **Natural Resources:** This study area was established to analyze indirect effects to wildlife, threatened and endangered species, floodplains, state wild and scenic rivers, and Waters of the US. The study area for natural resources is the same as the Socioeconomic and Land Use study area described above. This area was selected for analysis based on input received during the development *Navigational Evaluation Technical Memorandum* (VDOT, 2014e) and to provide further analysis of the indirect impacts to the Southern Branch of the Elizabeth River and its tributaries. A watershed level analysis was not incorporated into this study. The region surrounding the study area is highly developed and

contains countless sources of pollution and habitat fragmentation that result in indirect and cumulative effects to natural resources. Without extensive levels of data, the role the proposed alternatives may play in indirect and cumulative effects cannot be accurately depicted. In the absence of this level of data, this study relies on planning judgment to define indirect effects (see **Section 2.1**). Due to the lack of data, and because planning judgment cannot differentiate between all of the different impact sources within the region, a natural resource study area was selected in which impacts associated with the proposed alternatives could be identified and analyzed. The Natural Resources indirect and cumulative effects study area is shown in **Figure 4**.

- **Recreational Resources:** This study area was established to analyze indirect effects to recreational resources. This study area includes the direct impact study area for the project. The Recreational Resources indirect and cumulative study area is the same as the direct effects study area. The Recreational Resources indirect and cumulative effects study area is the same as the study area for direct impact analysis in the EA (**Figure 1**).
- **Historic Properties:** This study area was established to analyze indirect effects to historic properties. This study area includes the Area of Potential Effect² as defined for the undertaking. The Historic Properties indirect and cumulative effects study area is shown in **Figure 5**.

3.2.2 Demographics

Chesapeake is the third largest city in Virginia. The once rural landscape has been transformed to neighborhoods, shopping centers, and business parks by years of rapid development. From the mid-1980's to mid-1990's, the City's average annual growth rate was 4.5%. Although growth has slowed in recent years, the City is expected to continue to grow through the study forecast year of 2040 (Chesapeake Planning Department, 2013).

Chesapeake's population has grown from 151, 976 in 1990 to 222,209 in 2010. It is forecasted to continue to increase to 313,600 in 2034 and 336,448 in 2040 (Chesapeake Planning Department, 2013). The projected 2040 population would represent a 120% increase from the City's 1990 population. The study area population was 31,819 in 1990, 44,399 in 2000 and 52,285 in 2010. It is forecast to grow to 72,201 in 2034, and 77, 180 in 2040. The projected 2040 population in the study area would represent a 143% increase from 1990. The potential for higher levels of growth within the study area can be attributed to the existing utilities and transportation infrastructure, as well as the well-established schools and residential communities which could attract higher levels of population growth than portions of the City that are not as developed (*Socioeconomic, Land Use and Community Facilities Technical Report* [VDOT, 2014g]).

² The geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking. [36 CFR Part 800.16(d)].

Figure 4 Natural Resources/Socioeconomic Indirect and Cumulative Effects Study Area

Interstate 64/High Rise Bridge Corridor Study Environmental Assessment

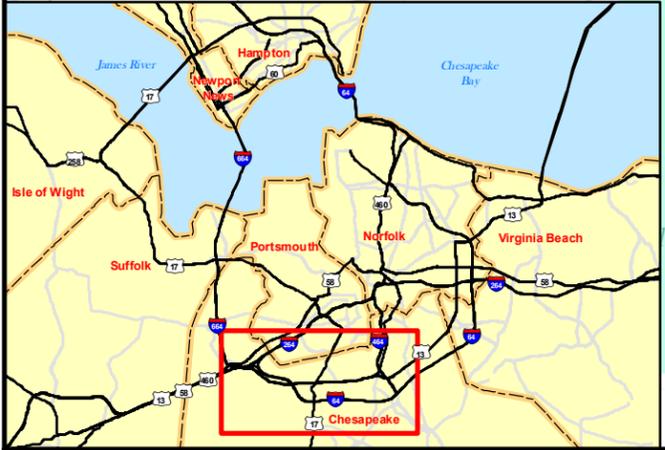
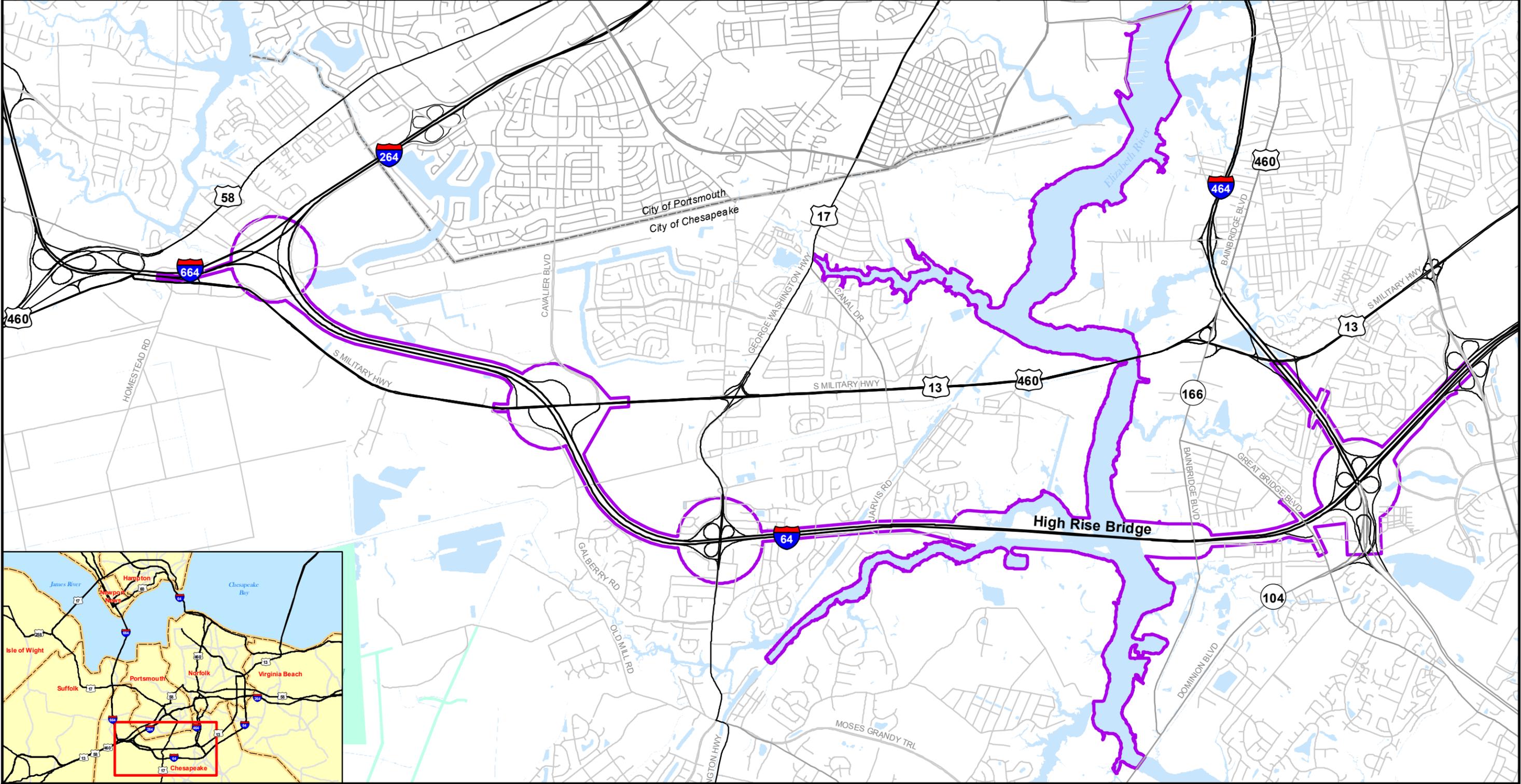
City of Chesapeake

State Project Number: 0064-131-783, P101; UPC: 104366
Federal Project Number: NH-IM-064-3(481)

- ICE Study Area
- Water Bodies
- Great Dismal Swamp
- City Boundary



Mapping Source: VDOT and City of Chesapeake



- Area of Potential Effects
- Water Bodies
- Great Dismal Swamp
- City Boundary

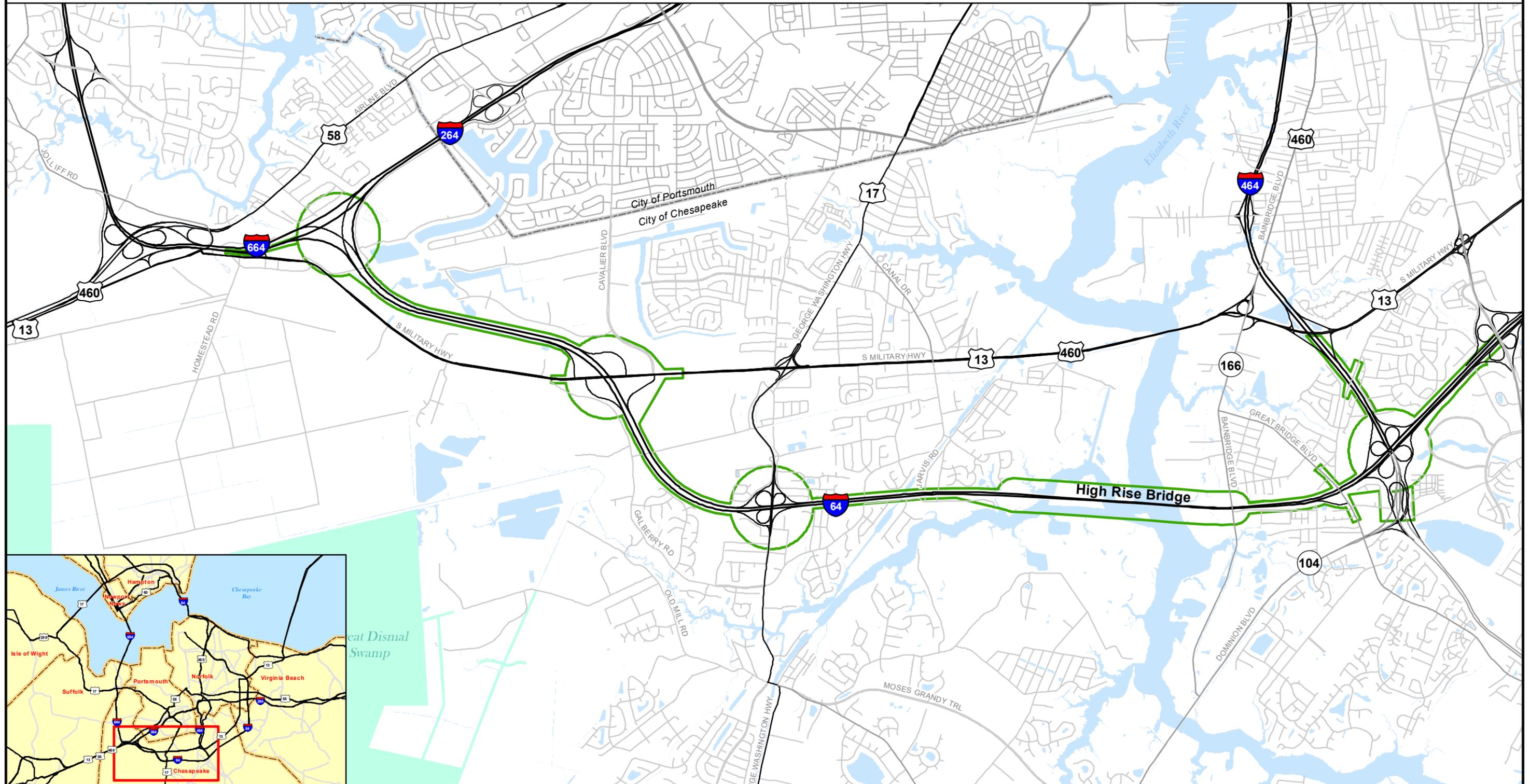
Figure 5 Architectural and Archaeological Area of Potential Effects

Interstate 64/High Rise Bridge Corridor Study
Indirect and Cumulative Effects Technical Report
City of Chesapeake

State Project Number: 0064-131-783, P101; UPC: 104366
Federal Project Number: NH-IM-064-3(481)



Mapping Source: VDOT and City of Chesapeake



Employment within the region is expected to grow substantially by 2020 (Chesapeake Planning Department, 2013). Improved access and mobility provided by the improvements would accommodate continued economic growth and planned development within and beyond the study area. Improvements to I-64 are included within Chesapeake's *Moving Forward-Chesapeake 2035 (2035 Comprehensive Plan Update)* as means to achieve Chesapeake's economic growth and development goals. According to the Quarterly Census of Employment and Wages (QCEW) third quarter data, generated July, August, and September of 2013, and presented within the 2013 VEC Community Profile for Chesapeake, there are just over 95,500 reported individuals employed throughout Chesapeake (VEC, 2013). The most prevalent industries in Chesapeake currently, as reported by the QCEW, include:

1. Federal, State, and Local Government (16.0%);
2. Retail Trade (15.4%);
3. Accommodation and Food Services (9.9%);
4. Administrative and Support and Waste Management (8.6%); and,
5. Professional, Scientific, and Technical Services (8.5%).

These industries alone account for approximately 58% of total Chesapeake employment. As the leading industry within Chesapeake, Federal, State, and Local Government Services comprise 16% employment, followed closely by Retail Trade at approximately 15%. This equates to just less than 30,000 people employed in Chesapeake solely within the Government and Retail Trade industries (VEC, 2013).

Persons under the age of 18 comprise the largest percentage of the study area population. With over 13,500 residents, they represent approximately 26% of the study area population. People between the ages of 35-44 are the second most represented group, at 15%. Age distribution within the study area is similar to the overall distribution for the City and state. The study area contains a higher minority population at 47% than both the overall minority populations of Chesapeake (37%) and Virginia (31%). Census Tracts 209.03 and 214.04 contain the highest rates of minority populations, each at 79%. **Table 3** in the *Socioeconomics, Community Facilities and Land Use Technical Report* (VDOT, 2014g) provides a demographic profile of the area. More detailed information on age, race, population and employment as well as a description of the methods used can be found in the *Socioeconomics, Community Facilities and Land Use Technical Report* (VDOT, 2014f).

3.2.3 Land Use Patterns and Plans

In 1963, Norfolk County and South Norfolk merged to become Chesapeake. At that time, 78,000 residents lived in Chesapeake (Cross and Cross, 1985; Ward, 1990; U.S. Census Bureau, 2000). At the same time the City was established, I-64 was being constructed through Hampton Roads. The interstate crossed the Southern Branch of the Elizabeth River in 1969, with the construction of the High Rise Bridge. The bridge is located upstream (south) of the South Norfolk Jordan and Gilmerton bridges and downstream (north) of the Dominion Boulevard Bridge. The construction of the interstate and these bridge crossings played a major role in land use and development patterns. Descriptions of these crossings, including their history and height restrictions, are described below:

- **South Norfolk Jordan Bridge (Fixed Span):** Located approximately 3.5 miles north of the High Rise Bridge, the recently reconstructed Jordan Bridge carries Route 337 over the Elizabeth River. Historically a fixed-span bridge known as the Norfolk-Portsmouth Bridge, it opened for public use in 1928. In late 2008, the Chesapeake City Council voted to close the bridge due to the high

cost of necessary repairs and restoration required for the bridge's structural deficiencies. In January 2009, the City Council approved a proposal to entirely reconstruct the Jordan Bridge using private funds. Several studies were conducted to determine the vertical and horizontal clearances required to make the reconstructed Jordan Bridge a fixed structure. The Jordan Bridge reopened in October 2012 with a 145-foot vertical clearance. This represented the highest bridge in Hampton Roads, as well as the region's first fully-electronic toll roadway facility (South Norfolk Jordan Bridge, 2013).

- **Gilmerton Bridge (Lift Span):** Located approximately 1.2 miles north of the High Rise Bridge, the Gilmerton Bridge recently reopened to traffic in November 2013, after undergoing replacement construction. Originally constructed in 1938 as a double-leaf bascule bridge with a seven (7) foot vertical clearance in the closed position, the Gilmerton was replaced with a lift span bridge with a 35-foot vertical clearance in the closed position and up to 135-feet in the open position.
- **Dominion Boulevard Bridge (Fixed Span):** Located approximately 1.5 miles south of the High Rise Bridge, reconstruction on the Dominion Boulevard (formerly "Route 104") Bridge began in January 2013. The Dominion Boulevard Bridge was a double-leaf bascule bridge that was constructed in 1962. A "Route 104 Feasibility Study" was initiated by VDOT in 1997, which sought to identify a practicable means for addressing the aging bridge. The study concluded that a 95-foot fixed span bridge was the appropriate replacement option. Construction on the Dominion Boulevard Bridge has an estimated completion date of early 2017.

The growth that these transportation facilities facilitated has changed a once rural landscape to one of neighborhoods, shopping centers, and business parks largely dependent on the automobile (Chesapeake Planning Department, 2013). Historically, growth within Chesapeake has occurred primarily in the city's northern suburban areas, of which the study area is a part. Beginning in the 1960s, residential development, typically residential subdivisions, sprang up in Chesapeake. Throughout the late twentieth century, Chesapeake continued to experience high levels of residential and industrial development. Development was concentrated to the northwest of I-264, at the western end of the study area. Although the area encompassing the study area has experienced growth since the 1960's, much recent residential development was constructed in the 1990's and 2000's. These higher density uses are depicted on the 2035 Land Use Plan (Chesapeake Planning Department, 2013). Generally, older communities are located near interchanges, as the access provided by them led to early development. As land was developed, newer communities stretched further from the interchanges and into undeveloped areas. Commercial and industrial centers developed in areas with easy access to interstate and primary facilities. Early waterfront development was not dependent on the interstate, but once the interstate system and bridges were in place, waterfront development accelerated due to more direct land access (Google Earth [software], 2010).

As depicted on the 2035 Land Use Plan within the 2035 Comprehensive Plan Update, the study area traverses land planned for a variety of land uses including Industrial/Logistics in the northwest portion of the study area and Low Density Residential land uses to the south. The study area lies predominantly within the Urban Overlay district, with portions south of I-64 crossing into the Suburban Overlay district. The intent of the Urban Overlay district is to provide opportunities for infill development in areas of established infrastructure in order to reduce less efficient, sprawling development patterns. The Suburban Overlay district aims to provide a transition area between the urban areas of Chesapeake and the outer lying rural area. Thus, the Urban Overlay district has been identified as the principal location for increased future residential, commercial, and industrial development. The 2050 Development Pattern

Map also identifies much of the study area corridor as within an Auto-Oriented Major Activity Center, an area of development designed with an emphasis on automobile use access, rather than pedestrian access (Chesapeake Planning Department, 2013).

Most industrial development within the study area has been concentrated north of I-64, between the I-264 and Route 13 interchanges. Some industrial development is evident along Route 13 (Military Highway) south of I-64. Industrial and commercial development is concentrated around the Southern Branch of the Elizabeth River as well. Although some rural land still remains in the western end of the study area, this section of the study area exhibits more recent industrial growth; the landscape features large, metal-clad warehouses and late-twentieth-century office parks. Also in this section of the study area are two rail lines, both owned by the Norfolk and Western. The northern line is defunct; however, the southern line along Yadkin Road is still in use. The central portion of the study area features dense residential development. While many of these residences are located in mid- to late twentieth-century subdivisions, some are of a slightly earlier period and predate the interstate. Dense industrial and commercial properties are concentrated near the Southern Branch of the Elizabeth River. Recent years have seen a reduction in the rate of development as the area has built out. Current and future development is anticipated to be infill and conversion of existing land uses to higher density uses.

Recent aerial photography illustrates the level of development that exists in an area that was considered relatively rural 60 years ago. The comparison between aerial photography from 1990 to 2011 also reveals that growth in the region has slowed over the last 20 years, with infill development replacing sprawl and more intensive land development. While much of the existing industrial development within the study area was in place prior to 1990, small areas of industrial development have continued. For example, in the western end of the study corridor, Flowserve constructed a facility in the early 1990s, and Chesbay Distributing constructed a warehouse in 2003. Wilson Trucking Company constructed a terminal between I-64 and Military Highway between 1994 and 2003. A number of new subdivisions also have been constructed since 1990, including those near the southwest quadrant of the I-64/I-464 interchange; west of Great Bridge Road and south of I-64; north and south of I-64 between the existing bridge and the Gilmerton Deep Creek Canal; and in the northeast and northwest quadrant of the I-64/Route 17 interchange (Google Earth Imagery, 2014). A new marina was constructed south of the existing bridge structure between 1990 and 2004. Therefore, while the historic growth in Chesapeake has stabilized in recent years, the region still experiences routine development and expansion of residential, commercial, and industrial land uses.

3.3 Step Three: Inventory Notable Features in the Study Area

The environmental analyses conducted as part of the Interstate 64 / High Rise Bridge Corridor Study were used to identify notable features. Notable features are those social, ecological, or historical resources which are considered valuable and/or unique and which may be less able to bear impacts from a transportation improvement (NCDOT, 2001). The study areas, as identified in **Section 1.1** of this Technical Report, contain notable features that were inventoried and are described in more detail in the EA and associated technical documents. The objective of this step of the process is to identify notable features against which the proposed alternatives may be assessed. The following sections discuss the notable features that were identified as part of this study.

3.3.1 Socioeconomic and Land Use

Population and Employment

From the mid-1980's to mid-1990's, the City's average annual growth rate was 4.5%. Although growth has slowed in recent years, the City is expected to continue to grow through the study forecast year of 2040. Chesapeake's population has grown from 151, 976 in 1990 to 222,209 in 2010. It is forecast to continue to increase to 313,600 in 2034 and 336, 448 in 2040 (VDOT, 2014c). The study area population was 31,819 in 1990, 44,399 in 200 and 52,285 in 2010. It is forecast to grow to 72,201 in 2034, and 77, 180 in 2040. Employment within the region is expected to grow substantially by 2020. According to the QCEW third quarter data, generated July, August, and September of 2013, and presented within the 2013 VEC Community Profile for Chesapeake, there are just over 95,500 reported individuals employed throughout Chesapeake (VEC, 2013).

Neighborhoods and Community Facilities

Table 1 lists the community facilities that have been identified within the study area. The majority of community facilities identified are located within or immediately adjacent to the circular study areas surrounding the Route 17 (George Washington Highway North)/I-64 interchange and the I-64/I-464 interchange. No hospitals, public libraries, police or fire stations were identified within the study area.

Table 1: Community Facilities within the Indirect and Cumulative Effects Study Area

Community Facility	Facility Address	Facility Description
Bible World Church	600 Happy Acres Road, Chesapeake, VA	Religious Institution
Crestwood Intermediate School	1204 Great Bridge Boulevard, Chesapeake, VA	Educational Institution
Deep Creek Elementary School	2809 Forehand Drive, Chesapeake, VA	Educational Institution
Deep Creek Middle School	1955 Deal Drive, Chesapeake, VA	Educational Institution
Deep Creek High School	2900 Margaret Booker Drive, Chesapeake, VA	Educational Institution
Grace Baptist Temple	1101 Burns Street, Chesapeake, VA	Religious Institution
Indian River Masonic Lodge No. 252	1040 Burns Street, Chesapeake, VA	Freemason Meeting Center
Indiana United Methodist Church	4505 Indiana Avenue, Chesapeake, VA	Religious Institution
Lake Drummond Masonic Lodge No. 178	509 George Washington Highway North, Chesapeake, VA	Freemason Meeting Center
Roosevelt Memorial Park	1101 Campostella Rd, Chesapeake, VA	Cemetery
St. Benedict's Church	521 McCosh Drive, Chesapeake, VA	Religious Institution

3.3.2 Environmental Justice

Title VI of the Civil Rights Act of 1964, as amended, requires that no person in the United States shall on the ground of race, color, or national origin, be excluded from participation in, be denied benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. In addition, Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, and Department of Transportation (DOT) Order 5610.2(a) direct federal agencies to identify and address disproportionately high and adverse human health or environmental effects that their programs, policies and activities may have on minority and low-income populations to the greatest extent practicable. As described in detail in the *Socioeconomics, Community Facilities and Land Use Technical Report* (VDOT, 2014g), seven of the census tracts within the socioeconomic study area are considered to have minority populations for the purposes of this study.

None of the census block groups within or adjoining the study area, however, have a median household income below the HHS poverty threshold, at \$23,850 for a family of four in 2012. Thus, no low-income populations have been identified within the project study area, *Socioeconomics, Community Facilities and Land Use Technical Report* (VDOT, 2014g).

3.3.3 Natural Resources

Waters of the United States

The Elizabeth River has a long history of impairment. Efforts are underway to improve the quality of the Elizabeth River. Efforts taken by the group to improve the river include the Money Point Revitalization, Paradise Creek Restoration, and the Lafayette River Project. Restoration of Money Point has been a joint public-private effort that included the removal and replacement of highly contaminated sediments as well as restoration of marsh plants. Paradise Creek restoration has resulted in creation of the Paradise Creek Nature Park, a 40 acre park created in cooperation with the City of Portsmouth, Virginia Port Authority and other partners. The Elizabeth River Project has also developed a plan to guide restoration of the Lafayette River (Elizabeth River Project, 2011). Additionally, since 1995, the Elizabeth River Project has restored 22 wetland sites along the river (Elizabeth River Project, 2008).

A number of impaired surface waters are identified in the study area. Goose Creek, Deep Creek, Hodges Creek, Mains Creek, and the Southern Branch of the Elizabeth River have been identified as Not Supporting (impaired) for Aquatic Life Use because of failure to meet the dissolved oxygen criteria (DEQ, 2014A). These water bodies also were listed as Not Supporting (impaired) for Fish Consumption Use because of the Virginia Department of Health (VDH) fish consumption advisory for polychlorinated biphenyls (PCBs) issued January 23, 2009. This area also is listed as a Shellfish Condemnation Zone by VDH (DEQ, 2014B). Additional information is included in **Section 3 (Environmental Consequences)** of the EA and the *Natural Resource Technical Report* (VDOT, 2014f).

Although it is not the most accurate data, a review of the National Wetland Inventory (NWI) database files identified over 1,200 acres of wetlands within the natural resources study area. These wetland resources have been impacted by the construction of the bridges and transportation facilities discussed in **Section 4.2.1**, as well as the development that has occurred in the past. In response to these impacts, wetland mitigation banks were established. Within the study area, the Chesapeake Land Development Tidal Bank is located in the vicinity of Libertyville Road.

Floodplains

Based on the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps, there are over 1,300 acres of 100-year floodplains within the natural resource study area. This includes an estimated 290 acres of 100-year floodplains within the overall study area. There are over 20 acres of 500-year floodplains within the natural resources study area and approximately 20 acres of 500-year floodplains are located within the project study area. The floodplain associated with the Southern Branch of the Elizabeth River constitutes the majority of the floodplain in the study area. This area includes the existing High Rise Bridge and related ramps and mainline approaches. This floodplain has been subjected to continuous and intensive development for years. The section north of the existing bridge is the location of some of the East Coast's largest port facilities, dredge disposal areas, military ship yards, and marine related industry, such as metal recycling and concrete production. The banks of the Elizabeth

River south of the bridge include industrial development such as heavy construction yards, granaries, and marinas.

Wildlife and Threatened and Endangered Species

Wildlife

The natural resources study area encompasses a suburban/urban mix of residential, commercial, and industrial land uses along I-64. Wildlife habitat within the study area is limited by the range of developed land uses along and adjacent to the existing roadways and the maintenance of the interstate right-of-way. Industrial development is located along the east bank of the Southern Branch of the Elizabeth River and in the northwestern portion of the study area. Residential development is located to the northeast of the study area and in the central and eastern portions of the study area. Other than the aquatic environments connected to the river, the primary wildlife habitat within the study area are the forested areas located in the medians and interchanges. Given their location within the interstate facility, these areas provide limited habitat value. The value of the aquatic habitat has been greatly impacted by historic pollution and development that has impaired many of the waterways in the natural resource study area. This has resulted in limited wildlife populations within the study area, as described in greater detail in the ***Natural Resources Technical Report*** (VDOT, 2014f). Given these impacts, the Southern Branch of the Elizabeth River and its tributaries are particularly sensitive to new development. The implementation of modern stormwater management facilities throughout the region, and the actions taken by groups like the Elizabeth River Project, are protecting and enhancing these sensitive resources.

As noted in the ***Natural Resource Technical Report*** (VDOT, 2014f), since 2007, the bald eagle (*Haliaeetus leucocephalus*) is no longer protected under the Endangered Species Act after removal from the federal threatened and endangered species list. Bald eagles are protected under the Bald and Golden Eagle Protection Act which prohibits taking or disturbing bald eagles and their nests. A September 2013 search of the VaFWIS online database indicated that the study area is not within two-miles of a known bald eagle concentration area or roost. However, three bald eagle nesting areas were denoted approximately one mile north of the Bowers Hill interchange. The nest that was most recently active was listed as active on April 25, 2011. Two bald eagle nests were identified approximately one mile to the north of the Bowers Hill interchange. The closest bald eagle concentration areas were located approximately 15 miles to the northwest of the Bowers Hill interchange (VDOT, 2014b).

Threatened and Endangered Species

The canebrake rattlesnake (state endangered), Dismal Swamp southeastern shrew (state threatened), and peregrine falcon (state threatened) were the only threatened or endangered species identified within two miles of the study area. Although the northern long-eared bat has been proposed for federal listing as endangered, there are no confirmed records of the northern long-eared bat within two miles of the study area (USFWS, 2014c).

3.3.4 Recreational Resources

The primary recreational resources within the recreational resource study area are the athletic fields located at Deep Creek High School, Deep Creek Middle School, Deep Creek Elementary School, and Crestwood Intermediate School. These resources are maintained by the City and well-used by the surrounding community. The proximity of these resources to the interstate results in frequent noise intrusions during recreational activities.

3.3.5 Historic Properties

As noted in both the *Archaeological and Architectural Survey Reports* (Archaeological, Architectural, 2014c,d), a historic property (or historic resource) is defined in the National Historic Preservation Act of 1966 (NHPA) [16 U.S.C. § 470w(5)] as any “prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on, the National Register of Historic Places, including artifacts, records, and material remains related to such a property or resource”. For the purpose of this analysis historic properties are archeological sites and architectural resources eligible for listing or listed in the National Register of Historic Places (NRHP).

A preliminary search of the Virginia Department of Historic Resources (VDHR) records indicated that 14 previously recorded historic architectural resources were located within the Area of Potential Effect (APE). All but one (total of 13) of the previously recorded architectural resources are recommended not eligible for the NRHP, nor are they contributing resources to a historic district. The remaining resource, Sunray Historic District, is listed on the NRHP. No archeological sites on or eligible for listing on the NRHP were identified within the study area.

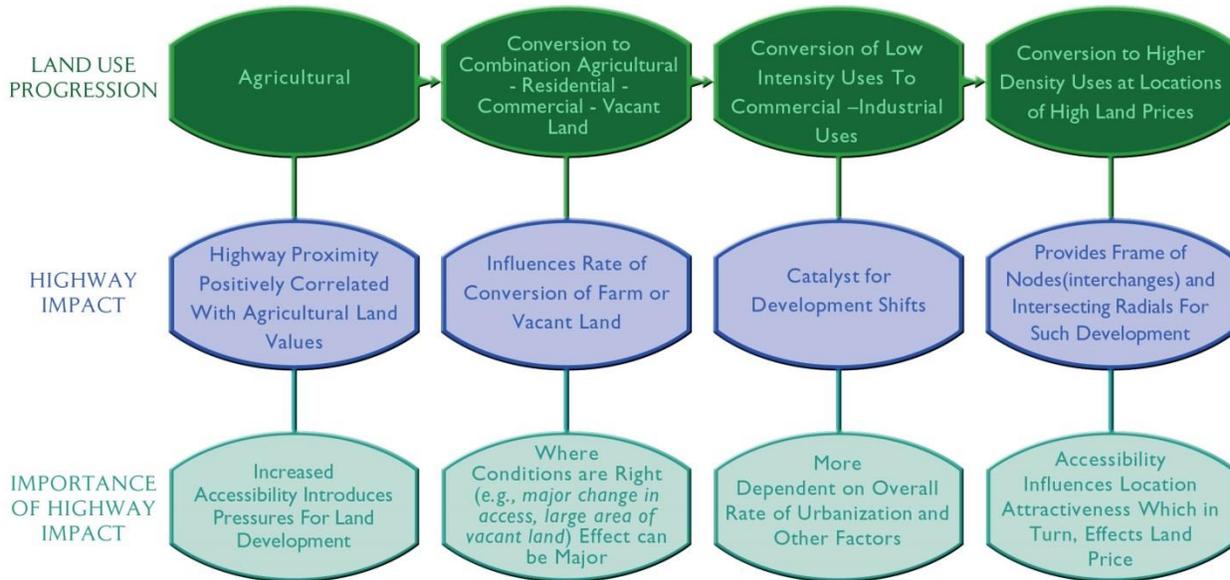
The Virginia State Historic Preservation Officer (SHPO) concurred with the above findings, identifying the Sunray Agricultural Historic District as the only historic property within the project APE.

3.4 Step Four: Identify Impact Causing Activities of the Proposed Alternatives

The objective of this step is to identify direct impacts which could have indirect effects that could conflict with the goals and trends identified in Step 2 and/or impact the notable features identified in Step 3. The NCHRP Report 466 includes groups of actions associated with transportation projects that are known to trigger indirect effects. Some examples of these impact-causing activities include: alteration of drainage, channelization, noise and vibration, cut and fill, barriers, excavation, erosion and sediment control, landscaping, and alteration of travel time/cost. These activities are assumed to result in the estimated impacts documented in **Table 2**.

It should be noted that induced growth is not anticipated for any of the Alternatives because the improvements associated with each alternative occur on an existing interstate facility and do not result in any new interchanges. Important characteristics for induced growth are described in North Carolina Department of Transportation’s (NCDOT) *Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina, Vol. II: Practitioners Handbook* (NCDOT, 2001). These characteristics include existing land use conditions in the project area, increased accessibility that may result from new transportation improvements, local political and economic conditions, and the availability of other infrastructure and the rate of urbanization in the region. The NCDOT guidance illustrates the different stages of development and how a highway improvement project may influence development (see **Figure 6**). Because the study area is in an advanced land use progression, it is more likely that the proposed transportation improvements could result in infill development than urban/suburban sprawl. As a result, the improvements are not expected to be a catalyst for induced growth, but rather accelerate existing or planned growth. Any growth that does occur is expected to occur along the existing corridor in existing or previously developed areas where the environment already has been impacted.

Figure 6: Highway Investment on Typical Progress of Urbanization



It is assumed that the direct impacts presented in **Table 2** could result in indirect effects. Comparing these actions to the directions and goals and notable features of the region, allows for the identification of resources that could be affected by indirect effects. The findings of this identification process are presented as part of Step 5.

Table 2: Anticipated Design Corridor Impacts

Category	No Build	CBA 1		CBA 2	
		95 ft.*	135 ft.**	95 ft.*	135 ft.**
Total Area of Alternative (acres)	0	599.64	600.12	599.64	600.12
Vacant Land tax parcels (no.)	0	52	48	52	48
Residential tax parcels (no.)	0	132	132	132	132
Business tax parcels (no.)	0	49	47	49	47
Noise Receptors (no.)	390	783	815	783	815
Tidal Streams (acres)	0	2.14	1.88	2.14	1.88
Non Tidal Streams (linear feet)	0	5,098.00	5,098.00	5,098.00	5,098.00
Wetlands (acres)	0	22.37	20.80	22.37	20.80
100-Year Floodplain (acres)	0	30.10	25.98	30.10	25.98
500-Year Floodplain (acres)	0	3.79	3.75	3.79	3.75
Forest and Vegetation (acres)	0	272.52	268.75	272.52	268.75
Section 4(f) Properties (acres)	0	0.12	0.12	0.12	0.12

*This alternative would consist of high-level, fixed-span bridges with 95-foot vertical clearances during MHW

**This alternative would consist of high-level, fixed-span bridges with 135-foot vertical clearances during MHW

3.5 Step Five: Identify Indirect Effects for Analysis

The objective of this step is to assess whether notable features and/or goals identified above would be indirectly impacted by the proposed alternatives. Although multiple alternatives are under consideration, they all occupy an existing interstate corridor and river crossing, with no new interchanges or access points. Therefore, the potential indirect effects are similar in nature for each alternative. The following describes which notable features may experience indirect effects and identifies those that are carried forward for analysis.

3.5.1 Socioeconomics and Land Use

The summary of impacts in **Section 3.0 (Environmental Consequences)** of the EA indicates that each alternative would result in relocations, proximity impacts, noise impacts, and visual intrusions. Given these potential impacts and the proximity of similar land uses within the indirect and cumulative effects study area, socioeconomics and land use is considered in Step 6.

3.5.2 Neighborhoods and Community Facilities

As noted above, the proposed alternatives would result in indirect effects to local populations and land uses. The indirect effects that may occur to local populations and land use could have some impact on the environment surrounding these community facilities; however, none of the community facilities identified in **Table 1** would be relocated or directly impacted by the alternatives. Furthermore, it is not anticipated that any of these facilities would be converted from their current use. Improved access to the interstate could reduce traffic that currently uses neighborhood streets to access the interstate. There are a substantial number of primary roads in the study area, and as a result it is not anticipated that "cut-through" traffic is a substantial problem. Because substantial indirect effects are not anticipated, neighborhoods and community facilities are not addressed in Step 6.

3.5.3 Environmental Justice

As noted above, the proposed alternatives would occupy an existing interstate corridor that passes through residential, commercial, and industrial portions of Chesapeake. The summary of impacts in **Table 3.1** of the associated EA indicates that each alternative would result in relocations, proximity impacts, noise impacts, and visual intrusions. While some of these impacts would occur in areas of environmental justice populations, these impacts would not be disproportionately borne by these populations. The community effects of the project, including improved roadway capacity; enhanced corridor safety by addressing conditions that contribute to vehicular crash incidences; improved ability of the corridor to function as a key emergency evacuation route; and improvements to the High Rise Bridge, would be borne by all residents within Chesapeake, including minority and low-income persons. Displacements within environmental justice communities would occur in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (as amended, 1987). Therefore, impacts to environmental justice populations are not addressed in Step 6 but are assumed to be included in the analysis of socioeconomics and land use. If a specific tolling alternative is selected, additional analysis on the indirect effects to low-income populations may be required, *Socioeconomics, Community Facilities and Land Use Technical Report* (VDOT, 2014g).

3.5.4 Waters of the United States

A number of impaired surface waters are identified in the study area. Other notable features present in the study area include tidal and non-tidal wetlands. Given the proximity of these resources to potential

impact causing activities, these resources would likely be impacted directly and indirectly by any of the proposed alternatives. Because indirect effects on Waters of the US are anticipated, this subject is carried forward to Step 6.

3.5.5 Floodplains

Given the location of the study area, each of the proposed alternatives involve some impact to the Elizabeth River floodplain. Given these potential impacts, along with the input obtained through coordination with USCG, indirect effects from the proposed alternatives on floodplains are anticipated and this subject is addressed in Step 6.

3.5.6 Wildlife and Threatened and Endangered Species

Direct impacts to wildlife and threatened and endangered species are documented in **Section 3 (Environmental Consequences)** of the EA and the *Natural Resource Technical Report* (VDOT, 2014f). Project-related impacts to wildlife and threatened and endangered species are not expected to extend a substantial distance away from the area of direct impacts. However, because indirect effects from the proposed alternatives on wildlife, threatened and endangered species could be anticipated, this subject is addressed in Step 6.

3.5.7 Recreational Resources

The indirect effects that may occur to local populations and land use could have some impact on the environment surrounding these recreational resources; however, Chesapeake Public Schools is in agreement with VDOT and FHWA that the potential impacts would be minimal and would not adversely impact the resource's role as recreational areas. Because indirect effects on recreational resources are anticipated to be minimal, this subject is not addressed in Step 6.

3.5.8 Historic Properties

One historic property is located within the historic properties study area. In determining the effects of the undertaking on historic properties, both direct and indirect effects are considered. Based on coordination with the SHPO, it is not anticipated that any of the alternatives would result in effects to historic properties. Any unanticipated indirect effects that occur to historic properties as a result of future federal undertakings would be subject to review under Section 106 of the NHPA by the Virginia Department of Historic Resources. Because indirect effects on historic properties are not anticipated, this subject is not addressed in Step 6.

3.5.9 Summary

The comparison of notable features to impact causing activities determined that the following resources may experience indirect effects that have been analyzed in this Technical Report:

- Socioeconomics and Land Use
- Waters of the United States
- Floodplains
- Wildlife and Threatened and Endangered Species

This analysis is included in the following section.

3.6 Step Six: Analyze Indirect Effects and Evaluate Analysis Results

3.6.1 Socioeconomics and Land Use

As stated in **Section 0**, the proposed alternatives are anticipated to result in displacements and relocations along the study area. Because the study area encompasses an existing interstate facility, it can be assumed that local residents and businesses are accustomed to the intrusions related to highway activity. Under the proposed alternatives, it is anticipated that some of these intrusions would be reduced through the introduction of noise barriers. These barriers and the expanded interstate facility would be in closer proximity to the residences and businesses than the current facility. This change may lead some residents to decide to leave the area. Others may find the communities adjacent to the interstate more favorable, based on the protection provided by noise barriers, improved access to the interstate, and reduced travel times to regional destinations. Given the high level of development that already has occurred around the existing interstate facility, it can be assumed that the effects would have minimal consequence on the surrounding populations and land uses. While it is not anticipated that induced growth would occur, the existing land uses for the region may become more desirable properties resulting in changes to higher density uses and infill development.

Under the No Build Alternative, these population changes could still occur. Individuals and business owners within the socioeconomic study area may find the increasing congestion and noise levels coming from the interstate to be a growing impact to their way of life or business and opt to leave the region. Under the No Build Alternative; however, it would be less likely that other individuals or businesses would move to the region at a level that would result in higher density use and/or infill development.

In addition to population changes, there is the potential for indirect effects to waterfront development. Information regarding these potential impacts was identified during the *Navigational Evaluation Technical Memorandum* (VDOT, 2014e). Although the waterfront has been intensely developed in the past, there is potential for infill development and reuse. Construction of a 135-foot bridge would result in the potential for similar indirect effects as the no-build condition, as both would allow for the movement of all conceivable vessels along the river. Under these conditions, marine development south of the High Rise Bridge could expand to match that of areas north of the study area. Construction of a 95 foot bridge would have indirect effects on future development. Although there are no current plans for development south of the bridge that require more than 95 feet of clearance, future development would be limited to that which relies on no more than 95 feet of clearance. As noted in the *Navigational Evaluation Technical Memorandum* (VDOT, 2014e), given the lack of any vessels or documented plans that would require a clearance of 135 feet, the 95-foot clearance would not result in indirect effects to existing vessel owners.

3.6.2 Waters of the United States

Implementation of the proposed Build Alternatives would improve a 45 year old interstate facility that does not have stormwater management facilities. Modern temporary and permanent stormwater management measures, including stormwater management ponds, sediment basins, vegetative controls, and other measures, would be implemented to minimize potential degradation of water quality. These measures would reduce or detain discharge volumes and remove many pollutants. All VDOT projects on state-owned lands must comply with the Virginia Erosion & Sediment Control (ESC) Law and Regulations, the Virginia Stormwater Management (SWM) Law and Regulations, the most current

version of the VDOT Annual ESC and SWM Specifications and Standards, and the project-specific ESC and SWM plans. The proposed project would not inhibit the attainment of Total Maximum Daily Load (TMDL) goals for the Elizabeth River and streams in the study area. In addition, the improved water quality resulting from any Build Alternative supports the Elizabeth Rivers Project Watershed Management Plan's goal to restore thriving marine life by increasing dissolved oxygen and reducing excess nutrients as well as toxics in the water.

A review of the NWI database identified over 1,200 acres of wetlands within the natural resources study area. This figure includes tidal and non-tidal wetlands that have been impacted and fragmented by the construction of I-64, the High Rise Bridge, the Gilmerton Bridge, Dominion Boulevard, and the other transportation facilities in the region. The proposed Build Alternatives would expand existing areas of fill and culverts that have created these fragmented conditions within the natural resources study area. This could have some impact on wetland systems in the study area; however, given the impaired condition of the water resources in the study area and the time that these resources have had to adapt to the fragmented conditions, it is unlikely that the widening of the existing interstate facility would have measurable indirect effects on Waters of the U.S.

Under the No Build Alternative, there would be no further fragmentation of wetland systems within the natural resources study area. Although the existing interstate facility would not be expanded, it would continue to lack appropriate stormwater management facilities. This would result in uncontrolled volumes and pollutant loads exiting the interstate into the surrounding water resources. This would continue to contribute to the impaired condition of these resources.

3.6.3 Wildlife and Threatened and Endangered Species

Implementation of the proposed Build Alternatives would result in indirect effects to terrestrial and aquatic species. The terrestrial wildlife habitat is already highly fragmented by the existing interstate facility, surrounding road system, and high level of development in the region. The species that do exist in the study area have already been impacted by fragmentation. Further fragmentation could impact these species but would not expect to fragment a previously undisturbed habitat, as the study area encompasses an existing interstate facility.

Aquatic environments also would experience further fragmentation by extending culverts along streams and the Gilmerton Cut. The construction of a new bridge alignment also would create some new fragmentation, given the level of impact and impairment that has occurred in the waterways within the study area, it is unlikely that the widening of the existing interstate facility would represent a measurable level of fragmentation. In addition, the construction of modern stormwater management facilities would result in beneficial indirect effects in the waterways surrounding the direct impact area.

Under the No Build Alternative, there would be no further fragmentation of wildlife habitat along the existing interstate facility. Species that have adapted to living in close proximity to the interstate could continue to do so. The lack of appropriate stormwater management could continue to adversely impact the species and habitat that surround the interstate.

3.6.4 Floodplains

Impacts to floodplains in the natural resources study area is related to marine development along the waterfront of the Elizabeth River and its tributaries. Although the waterfront has been intensely

developed in the past, there is potential for infill development and reuse. Indirect effects to floodplains vary by alternative and are influenced by the height of the proposed bridge. Construction of a 135-foot bridge would result in the potential for similar indirect effects as the no-build condition, as both would allow for the movement of all conceivable vessels along the river. Under these conditions, marine development south of the High Rise Bridge could expand to match that of areas north of the study area. This increase in development could result in greater impacts to floodplains and other natural resources. Construction of a 95 foot bridge would have indirect effects on future development. Although there are no current plans for development south of the bridge that require more than 95 feet of clearance, future development would be limited to that which relies on no more than 95 feet of clearance. This would result in future growth south of the High Rise Bridge comparable to what currently exists. While this development already has impacted the floodplain and other natural resources, future impacts would not be expected at a scale greater than what currently exists within the natural resources study area.

3.7 Step Seven: Assess Consequences and Develop Mitigation

The analysis included in Step 6 identified a variety of indirect effects. Planning judgment allows for an identification of potential indirect effects; however, the consequences of these impacts cannot be fully assessed at the NEPA planning level. For example, while it is known that the changes to socioeconomic resources could result in some individuals and businesses voluntarily leaving the I-64 corridor and attract others to the region; it is unclear which landowners or businesses would fall into these two different categories. Without this information, it is difficult to fully assess the consequences of the indirect effects.

Similarly, while this document contains data on direct and indirect effects to natural resources, there is not enough information at the NEPA planning phase to determine how far downstream such impacts may actually occur. Such information would come through the design, permitting, and construction of a Build Alternative.

Despite the lack of detail, the consequences of the indirect effects are expected to be minimal. The study area consists of a portion I-64 and highly developed residential, commercial, and industrial areas. The Southern Branch of the Elizabeth River is a river with a long history of adverse impacts. While this has made it a sensitive resource, indirect effects to water quality would be beneficial through the construction of modern stormwater management facilities.

4.0 CUMULATIVE EFFECT ANALYSIS

As noted in **Section 2.2**, the cumulative effects analysis is based on the process outlined in *Fritiofson v. Alexander*, 772 F.2d 1225 (5th Cir. 1985), as described in FHWA's *Guidance: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process* (FHWA, 2014). The following sections follow this direction.

4.1 Geographic Area

The geographic limits for the cumulative effects analysis included both the indirect and cumulative effects study areas as described in **Section 3.2.1** of this report.

4.1.1 Resources Study Areas

Resource study areas are described in **Section 3.2.1** of this report.

4.1.2 Timeframe for Analysis

The analysis of cumulative effects must consider past, present, and reasonably foreseeable future actions. The temporal boundary used to establish the timeframe for this cumulative effects assessment spans from the 1960s, when construction of I-64 within the study corridor began, to 2040 which is the modeled design year for the EA.

4.2 Affected Resources

During the indirect effects analysis, an inventory of notable features was performed. These resources were reviewed for potential cumulative effects. Existing conditions information for these resources is contained in **Section 3.3** of this report. For the purposes of this analysis, the environmental baseline includes the current condition of these resources. The natural, physical, and cultural resources within the study area have been manipulated and impacted by urban/suburban development, and all of the other past and present actions listed in **Table 3** and **Table 4**. Furthermore, it is assumed that this baseline would be further impacted by all of the reasonably foreseeable future actions listed in **Table 4**. All of these past, present, and reasonably foreseeable actions play a role in establishing the environmental baseline.

4.2.1 Past Actions

Many of the past actions that have contributed to the baseline for this analysis occurred as part of the residential, commercial, and industrial development described in **Section 0**. This development transformed a rural landscape into an urban/suburban environment. This change resulted in a loss of wildlife habitat and species, impacts to wetlands and streams, and increased levels of air and water pollution. The development also formed the basis for the tremendous level of population growth Chesapeake experienced. With this growth has come an increase in employment and investment in the study area.

More recent developments include the observations made from aerial photography discussed in **Section 0**. These recent developments include the construction of the Gilmerton Bridge and South Norfolk Jordan Bridge.

4.2.2 Present and Reasonably Foreseeable Future Activities and Actions

Table 3 lists the past, present, and reasonably foreseeable transportation projects within Chesapeake through the EA design year 2040 planning horizon. These projects are included in the HRTPO's CLRP and have identified future funding. Projects in these planning documents are treated as reasonably foreseeable actions because future construction funds have been set aside for them in the planning process. The status of each project is noted in **Table 3** and they are part of the regional traffic model.

Table 3: Present and Reasonably Foreseeable Future HRTPO Projects within Chesapeake

Project Name	Project Description	Status
Dominion Boulevard	Widen from 2-lane undivided arterial to a 4-lane limited access highway, add urban interchanges and replace the steel drawbridge with 95foot fixed span bridge.	Under Construction
Portsmouth Boulevard	Widen from 2 lane undivided arterial to 4 lane arterial	Committed project in HRTPO 2034 Long-Range Transportation Plan

Source: Hampton Roads 2034 Long Range Transportation Plan; Project Information Guide

In addition to projects outlined above in **Table 3**, Chesapeake has transportation, stormwater, and facilities projects underway. These projects are shown below in **Table 4**.

Table 4: Reasonably Foreseeable Future Projects Sponsored by the City of Chesapeake

Project Name	Project Type	Project Description
22nd Street Bridge	Transportation	Replace the existing bridge with new 2-lane bridge and sidewalks
Bruce and Taylor Road Right Turn Lane	Transportation	Right turn lane extension
Centreville Turnpike Bridge Repairs	Transportation	Repair existing structure
Deep Creek Bridge	Transportation	Replacement of existing Deep Creek bridge with 2-lane split leaf bascule bridge and roadway approaches
Elbow Road Curve Realignment	Transportation	Improve curve radii and shoulders
Elbow Road Flashing Beacons	Transportation	Install curve warning flashing beacons
Gum Road Multi Use Path	Transportation	Construct 10' wide asphalt multi-use path along east side of Gum Road
Greenbrier Streetscape Project	Transportation	Landscaping, decorative streetlights, sidewalks, left turn lanes and crosswalks
Hudgin Bridge	Transportation	Replace existing steel and timber bridge on Fentress Airfield Road
Military Highway Improvements	Transportation	Left turn lanes and traffic signal improvements
Portsmouth Boulevard Widening Phase IV	Transportation	Widen from 2 lanes to 4 lanes
Sunray Bridge Rehab	Transportation	Superstructure replacement and roadway approaches
Triple Decker Bridge Rehab	Transportation	Rehabilitation of existing bridge structure
Volvo/Independence Roundabout	Transportation	Construct roundabout at Volvo Parkway/Independence Parkway
Woodlake Drive Extension	Transportation	Extend Woodlake Drive to Battlefield Boulevard
Compressed Natural Gas Fueling Station #2	Facilities	Design and construct second natural gas fueling station
Conference Center Renovation	Facilities	Renovation of existing conference facility
Dismal Swamp Trail	Facilities	Extend paved trail from Deep Creek to Ballahack Road
Great Bridge Visitors Center	Facilities	Provide 8,500 square foot building at Great Bridge Battlefield and Waterways Park

Project Name	Project Type	Project Description
Juvenile Services PLC Systems Replacement	Facilities	Replace electronic and computer systems
EECBG Energy Retrofits	Facilities	Lighting and Heating, Ventilation and Air Conditioning upgrades
Elizabeth River Park Improvements	Facilities	Parking, entrance, roadway and sidewalk improvements
Mosquito Control Facility Relocation	Facilities	Purchase property for future construction of facility
Municipal Parking Lots and Sidewalks	Facilities	Replace pavement at existing fire stations
Fire Station #10	Facilities	Acquire property and construct new fire station
Public Safety Emergency Dispatch Center	Facilities	Construct 51,000 square foot building on South Military Highway to house City services
Fire Station #13 Expansion	Facilities	Expand fire station to include restroom, dormitory and fitness space improvement
Public Works Solid Waste Operation Relocation	Facilities	Relocate solid waste operation to a site south of the SPSA transfer station
Renewal and Replacement Work	Facilities	Roof replacements, HVAC improvements, installation of security systems, remodeling, restrooms and other spaces
South Norfolk Community Center Upgrades	Facilities	Remodeling and upgrade projects

Source: City of Chesapeake website; Active Public Works Projects

In addition to the construction of new facilities, the Dominion Chesapeake Energy Center (CEC), located south of the Gilmerton Bridge and north of the High Rise Bridge, is scheduled to shut down by 2015 (Dominion Energy, 2013).

Also, the Elizabeth River Project's goal of cleaning up the Elizabeth River is being implemented through a series of projects that include the Money Point Revitalization, Paradise Creek Restoration, and the Lafayette River Project (Elizabeth River Project, 2008). Efforts taken by the group to improve the river include the Money Point Revitalization, Paradise Creek Restoration, and the Lafayette River Project. Restoration of Money Point has been a joint public-private effort that included the removal and replacement of highly contaminated sediments as well as restoration of marsh plants. Paradise Creek restoration has resulted in creation of the Paradise Creek Nature Park, a 40 acre park created in cooperation with the City of Portsmouth, Virginia Port Authority and other partners. The Elizabeth River Project has also developed a plan to guide restoration of the Lafayette River (Elizabeth River Project, 2011). Additionally, since 1995, the Elizabeth River Project has restored 22 wetland sites along the river (Elizabeth River Project, 2008).

4.3 Impacts

Cumulative impacts consist of the impacts of the alternatives under consideration in the EA and the impacts of the past, present, and reasonably foreseeable future actions. **Table 5** illustrates the resources that could potentially be impacted by the actions described in **Table 3** and **Table 4**. These potential impacts are taken into consideration in the following discussions of cumulative impacts to different resources. Although multiple Build Alternatives are under consideration, the close proximity of these alternatives to each other along the existing corridor makes their potential for cumulative impacts similar.

Table 5: Activities with Potential Cumulative Effects on Identified Resources

Project Name	Project Type	Anticipated Environmental Issues that could be Cumulative
Dominion Boulevard	Transportation	Socioeconomics and land use, natural resources, recreational resources
Gilmerton Bridge	Transportation	Socioeconomics and land use, natural resources, recreational resources
South Norfolk Jordan Bridge	Transportation	Socioeconomics and land use, natural resources, recreational resources
Portsmouth Boulevard	Transportation	Socioeconomics and land use, natural resources, recreational resources
I-64 High Rise Bridge	Transportation	Socioeconomics and land use, natural resources, recreational resources
22nd Street Bridge	Transportation	Socioeconomics and land use, natural resources
Bruce and Taylor Road Right Turn Lane	Transportation	Socioeconomics and land use, natural resources
Centreville Turnpike Bridge Repairs	Transportation	Socioeconomics and land use, natural resources
Deep Creek Bridge	Transportation	Socioeconomics and land use, natural resources
Elbow Road Curve Realignment	Transportation	Socioeconomics and land use, natural resources
Elbow Road Flashing Beacons	Transportation	Socioeconomics and land use, natural resources
Gum Road Multi Use Path	Transportation	Socioeconomics and land use, natural resources, recreational resources
Greenbrier Streetscape Project	Transportation	Socioeconomics and land use, natural resources, recreational resources
Hudgin Bridge	Transportation	Socioeconomics and land use, natural resources
Military Highway Improvements	Transportation	Socioeconomics and land use, natural resources
Portsmouth Boulevard Widening Phase IV	Transportation	Socioeconomics and land use, natural resources
Sunray Bridge Rehab	Transportation	Socioeconomics and land use, natural resources
Triple Decker Bridge Rehab	Transportation	Socioeconomics and land use, natural resources
Volvo/Independence Roundabout	Transportation	Socioeconomics and land use, natural resources
Woodlake Drive Extension	Transportation	Socioeconomics and land use, natural resources
Compressed Natural Gas Fueling Station #2	Facilities	Socioeconomics and land use, natural resources
Conference Center Renovation	Facilities	Socioeconomics and land use, natural resources
Dismal Swamp Trail	Facilities	Socioeconomics and land use, natural resources, recreational resources
Great Bridge Visitors Center	Facilities	Socioeconomics and land use, natural resources, recreational resources
Juvenile Services PLC Systems Replacement	Facilities	Socioeconomics and land use, natural resources
EECBG Energy Retrofits	Facilities	Socioeconomics and land use, natural resources
Elizabeth River Park Improvements	Facilities	Socioeconomics and land use, natural resources, recreational resources
Mosquito Control Facility Relocation	Facilities	Socioeconomics and land use, natural resources
Municipal Parking Lots and Sidewalks	Facilities	Socioeconomics and land use, natural resources

Project Name	Project Type	Anticipated Environmental Issues that could be Cumulative
Fire Station #10	Facilities	Socioeconomics and land use, natural resources
Public Safety Emergency Dispatch Center	Facilities	Socioeconomics and land use, natural resources
Fire Station #13 Expansion	Facilities	Socioeconomics and land use, natural resources
Public Works Solid Waste Operation Relocation	Facilities	Socioeconomics and land use, natural resources
Renewal and Replacement Work	Facilities	Socioeconomics and land use, natural resources
South Norfolk Community Center Upgrades	Facilities	Socioeconomics and land use, natural resources
Residential and commercial development	Facilities	Socioeconomics and land use, natural resources, recreational resources
Industrial development	Facilities	Socioeconomics and land use, natural resources, recreational resources
The Elizabeth River Project	Environmental Restoration	Socioeconomics and land use, natural resources, recreational resources

4.3.1 Socioeconomic and Land Use

Past, present, and reasonably foreseeable future actions have and would continue to impact socioeconomic and land use resources in the socioeconomic study area. Since the 1960s, these actions have led to rapid residential and commercial development, along with continued industrial growth. Although industrial growth has occurred outside the study area, it has stimulated the residential and commercial growth within the study area. This growth and development has led to the land uses, population dynamics, and income levels that exist within the socioeconomic study area today. The actions listed in **Table 3** and **Table 4** have facilitated this growth and/or improved the quality of life within the socioeconomic study area.

Under the No Build Alternative, there would be no change to the existing interstate system. Future growth in the region would add to the congestion on the interstate (as illustrated in the *Traffic and Transportation Technical Report* [VDOT, 2014h]). Increased congestion could reduce the attractiveness of the areas along the corridor, reducing the residential, commercial, or industrial development that is planned or could be considered in the future. As such, the No Build Alternative would contribute minor adverse increments to the beneficial cumulative effects to socioeconomics and land use.

The Build Alternatives would improve capacity along the interstate. These capacity improvements would enhance access within and through the study area. As such, the developed area along the interstate would be more attractive to residential, commercial, and industrial users. While it is not anticipated that the improvement would result in induced growth, it is expected to provide positive impacts to population growth and planned development. The Build Alternatives also would result in some property takes that could impact tax revenues and individual properties.

Candidate Build Alternative (CBA) 1 would provide a non-tolled route through a region that has had a number of tolled facilities constructed in recent years. Under this alternative, the benefits described in the

paragraph above would be achieved. These benefits also would be achieved under the tolled options included in CBA 2; however, the tolling of another crossing along the Elizabeth River could result in some adverse impacts to socioeconomic resources. If a tolled option is advanced, the impacts associated with tolling will be evaluated in future NEPA documentation. As such, the Build Alternatives would contribute minor beneficial increments to beneficial cumulative effects to socioeconomics and land use.

4.3.2 Neighborhoods and Community Facilities

The conditions described in **Section 3.2.2** that led to the development of the residential, commercial, and industrial land uses within the study area also led to the growth of neighborhoods and community facilities within the socioeconomic study area. Under the No Build Alternative, there would be no improvement to the existing interstate. The predicted increase in congestion described in the *Transportation and Traffic Technical Report* (VDOT, 2014h) could cause some drivers to divert from the interstate and take local roads to travel through the study area. This could increase traffic through neighborhoods or along routes to community facilities. Such diversions most likely already exist and the increase in the future could be proportional with the increase of traffic on the interstate. Therefore, the No Build Alternative would contribute minor adverse increments to beneficial cumulative effects to neighborhoods and community facilities.

CBA 1 would provide the appropriate capacity improvements along the interstate. This improvement would reduce some traffic on local roads and along routes to community facilities. In doing so, CBA 1 would contribute minor beneficial increments to beneficial cumulative effects to neighborhoods and community facilities.

CBA 2 also could result in drivers diverting from the interstate to the local neighborhoods to avoid tolls. The improved capacity on the interstate would offset this diversion somewhat, as some drivers would opt to pay the toll or drive in the limited number of general purpose lanes instead of driving through local streets. This could result in the managed lane alternatives contributing minor adverse increments to beneficial cumulative effects to neighborhoods and community facilities.

4.3.3 Natural Resources

Waters of the United States

Past actions have led to the impaired waters and impacted wetland systems that exist within the natural resource study area. These actions occurred without the benefit of modern stormwater management facilities and/or water quality regulations. Present and reasonably foreseeable future actions not only include these protections, but also consider environmental restoration efforts taken by the Elizabeth River Project and other groups.

Under the No Build Alternative, there would be no improvement made to the existing interstate facility. This would include no stormwater management facilities. Therefore, runoff from the interstate would continue to enter the Southern Branch of the Elizabeth River, its tributaries, and surrounding wetlands. As such, the No Build Alternative would contribute beneficial cumulative effects to water resources.

All of the Build Alternatives would include modern erosion and sediment control and stormwater management facilities that would comply with current federal and state regulations. This would result in the quantity and quality of stormwater being generated from the interstate facility being captured and

treated before entering the surrounding water resources. As such, the Build Alternatives would contribute beneficial cumulative effects to water resources.

Floodplains

Past actions have resulted in varying levels of floodplain development within the natural resources study area. Present and reasonably foreseeable future actions have had limited to no impact on floodplains, due to protective regulations and relatively limited marine-based development. The No Build Alternative would not directly result in any new development within the floodplain. As such, the No Build Alternative would contribute minor beneficial increments to adverse cumulative impacts related to floodplains.

As noted in the indirect effects analysis, the No Build and 135-foot bridge options would allow for increased development in the floodplain in the future, while the 95-foot bridge options would limit the level of development that occur south of the High Rise Bridge. All of the Build Alternatives would result in limited levels of development within the floodplain, associated with the new bridge structures. These new structures would not greatly increase the developed footprint within the floodplain nor would they measurably alter floodplain functions within the natural resource study area. As such, any of the Build Alternatives would contribute minor adverse increments to adverse cumulative impacts related to floodplains.

4.3.4 Wildlife and Threatened and Endangered Species

Past actions resulted in the loss and fragmentation of much of the terrestrial wildlife habitat that existed within the natural resources study area. This resulted in limited habitat that is suitable for only the most common residential species. Within the Southern Branch of the Elizabeth River and its tributaries, much of the impairment to wildlife habitat occurred prior to the construction of I-64. However, impacts continued to occur for some time, before environmental regulations and restoration efforts began to reverse this trend. The limited number of threatened and endangered species that exist within the natural resources study area illustrate these impacts.

Under the No Build Alternative, there would be no additional fragmentation of terrestrial habitat. The continued operation of the interstate would limit the movement of wildlife throughout the natural resources study area. In the absence of stormwater management facilities, runoff from the interstate would continue to adversely impact water resources throughout the study area. This would impact terrestrial and aquatic species. As such, the No Build Alternative would contribute moderate adverse increments to adverse cumulative impacts related to wildlife and threatened and endangered species.

The Build Alternatives would further fragment the natural resource study area along the interstate. The interstate already serves as a nearly impassible boundary for wildlife. Therefore, the increased width would not contribute measurably to fragmentation. The implementation of modern stormwater management facilities; however, would address one of the largest impervious surfaces in the natural resource study area. The improvements to water quality would benefit terrestrial and aquatic species. As such, the Build Alternatives would contribute minor beneficial increments to adverse cumulative impacts related to wildlife and threatened and endangered species.

4.3.5 Recreational Resources

The historic residential development that occurred within the socioeconomic study area led to the development of a number of recreational resources. The most notable of these resources are the athletic fields located at Deep Creek Elementary, Middle, and High Schools and Crestwood Intermediate School. Past, present, and reasonably foreseeable future actions also have led to increased development, noise, and vehicular congestion around these resources that have impacted their use but also made them more valuable to the surrounding community.

Under the No Build Alternative, there would be no direct impact to these resources. Increased congestion and development could impact their use but continue to enhance the value of these recreational resources. As such, the No Build Alternative would contribute minor beneficial increments to beneficial cumulative effects related to recreational resources.

The Build Alternatives could result in limited impacts to recreational resources at Crestwood Intermediate School and Deep Creek Middle School. These impacts would not alter the use of the properties but would expand the transportation facility closer to these resources. Although the interstate would intrude on these facilities, the potential for sound walls at these locations and along the corridor would reduce the impact surrounding development may have on these resources. As such, the Build Alternatives would contribute minor beneficial increments to beneficial cumulative effects related to recreational resources.

4.4 Overall Impacts

Table 5 summarizes the discussions from the previous section. Overall the No Build Alternative would not measurably alter the cumulative impacts related to socioeconomic, natural, or recreational resources. The general purpose alternative could enhance beneficial impacts to socioeconomic, natural, and recreational resources. The managed lane alternative would have similar impacts; however, its contribution to socioeconomic resources may not be as great.

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