FINAL
11/23/2023

2023

HRTPO Regional Connectors Study, Phase III, Technical Guide

Documentation of Phase III Segment Tiering

Table of Contents

Acronyms

The following are common acronyms used throughout the Technical Guide.

ADT: Average Daily Traffic
CAV: Connected and Automated Vehicle
CGP: Construction General Permit
CIDMMA: Craney Island Dredge Material Management Area
CIMT: Craney Island Marine Terminal
COSS: Corridors of Statewide Significance
CTB: Commonwealth Transportation Board
CWA: Clean Water Act, Waters of the U.S.
DCR: Department of Conservation and Recreation (Virginia)
DEQ: Department of Environmental Quality (Virginia)
DON: Department of the Navy
DOT: Department of Transportation
FEIS: Final Environmental Impact Statement
FEMA: Federal Emergency Management Agency
FHWA: Federal Highway Administration
GIS: Geographic Information Systems
GP: General Purpose
GRP: Gross Regional Product
HOT: High Occupancy Toll
HRBT: Hampton Roads Bridge Tunnel
HRCS: Hampton Roads Crossing Study
HREDA: Hampton Roads Economic Development Alliance
HRPDC: Hampton Roads Planning District Commission
HRSD: Hampton Roads Sanitation District
HRTAC: Hampton Roads Transportation Accountability Commission
HRTF: Hampton Roads Transportation Fund
HRTPO: Hampton Roads Transportation Planning Organization
IIJA: Infrastructure Investment and Jobs Act
LOD: Limit of Disturbance
LOS: Level of Service
LRTP: Long Range Transportation Plan
LWCF: Land and Water Conservation Fund
MaaS: Mobility as a Service
MMMBT: Monitor–Merrimac Memorial Bridge–Tunnel
MOE: Measures of Effectiveness
MPO: Metropolitan Planning Organization
NEPA: National Environmental Policy Act
NIT: Norfolk International Terminals
PCES: VDOT Project Cost Estimating System
PE: Preliminary Engineering
PMT: Portsmouth Marine Terminal
REMI: Regional Economic Models, Inc.
RCS: Hampton Roads Regional Connectors Study
SEIS: Supplemental Environmental Impact Statement

SPUI: Single Point Urban Interchange
TaaS: Transportation as a Service
TAZ: Transportation Analysis Zones
TDM: Travel Demand Model
TEU: Twenty-Foot Equivalent Unit
TOSAM: Traffic Operational and Safety Analysis Manual
TREDIS: Transportation Economic Development Impact System
UPAS: Urban Principal Arterial System
USACE: United States Army Corps of Engineers
USACE RIBITS: USACE Regulatory In lieu fee and Bank Information Tracking System
USCG: United States Coast Guard
USDA: United States Department of Agriculture
USFWS: United States Fish and Wildlife Service
USGS: United States Geological Survey
VDHR: Virginia Department of Historic Resources
VDOF: Virginia Department of Forestry
VDOT: Virginia Department of Transportation
VIG: Virginia Inland Gateway container terminal
VIMS: Virginia Institute of Marine Science
VMRC: Virginia Marine Resources Commission
VMT: Vehicle Miles of Travel
VPA: Virginia Port Authority
VWPP: Virginia Waters Protection Permit
ZPV: Zero-Passenger Vehicle

Phase III Technical Guide

Overview

The Technical Guide for the Phase III segment tiering under the Hampton Roads Transportation Planning Organization's (HRTPO) Regional Connectors Study (RCS) is intended to document Phase III activities, explaining the overall segment cost effectiveness analysis and the data and modeling prepared to support the recommendations for the tiering of the RCS project segments. (See Chapter 1 for background information on Phases I, II, and III.) The Phase III Technical Guide is also intended to serve as a resource for further planning, environmental analysis, and preliminary engineering, allowing users to understand how the segments were developed and the underlying assumptions in the RCS tiering analysis.

Throughout the Phase III process, the consultant team generated several technical memos on various elements of the tiering process. Content from those documents has been incorporated into the Phase III Technical Guide. Part I of the Phase III Technical Guide is intended to accomplish two broad objectives:

1) Document the development of segment tiering using permitting issues, readiness, and construction complexity as well as regional congestion and economic benefits in comparison to costs; and
2) Document a "stress test" evaluation of the higher-tier segments in traffic operations, congestion, and economic analysis under alternative assumptions about future growth and transportation system demand.

Part I of the Phase III Technical Guide consolidates content from the memos and assembles them into a more comprehensive narrative of the whole process, thus creating a logical and user-friendly narrative of the Phase III tiering and bundling process. Part II of the Phase III Technical Guide is a series of appendices that provide detailed documentation of the Phase III analyses — some of which was not included in previous documents —to give a more detailed understanding of the tiering assumptions. Generally, this Technical Guide also follows the four sequential steps of the Phase III scope of work for the RCS as described in the following paragraphs.

Step 1. Qualitative Analysis of Segments

The first step of the Phase III Technical Guide documents the qualitative analysis of the existing and proposed highway segments to be discussed in the remainder of the report. Every segment is a limited access highway. Segments are either existing highways proposed for lane addition and widening, or new segments proposed as new corridor construction. The qualitative reports for each segment addressed permitting issues, readiness, and construction complexity. As a planning study, these are general assessments based on analysis of stakeholder input, data from prior studies and available data sources such as planning documents, geographic information system (GIS) data, and the planning-level segment concepts. More refined and detailed analysis of individual project need, benefits, and impacts would occur in the future if any segments were advanced further in project development, such as an environmental impact analysis under the National Environmental Policy Act (NEPA), which would be accompanied by more detailed engineering design.

Step 2. Quantitative Analysis of Segments

Step 2 of the Phase III Technical Guide documents the methodology for estimating the construction costs, economic benefits, and construction benefits of each of the segments. To determine economic benefits and congestion relief, it is necessary to assemble the segments defined in Step 1 into “bundles.” Each bundle is a set of segments forming a network of improvements. Step 2 documents the quantitative benefits for each bundle and compares them with projected costs to generate an assessment of cost effectiveness for each bundle. This cost effectiveness analyses, as well as the projected economic benefits and congestion relief, inform the segment and bundle tiering process in the Phase III Technical Guide.

The benefits analyzed in this step are improvements in regional congestion, aggregate travel time, reliability, and the associated economic impacts. Congestion relief is measured in terms of hours of delay, which refers to the additional time travelers spend due to congested conditions. Regional congestion relief is a means of prioritizing potential harbor crossing investments. While some data regarding the traffic volumes, congestion, and speeds on various locations within the region are provided on a segment basis within the analysis, the performance of individual segments is not the focus. Importantly, a given facility may draw traffic from other slower-speed roads when its capacity and/or reliability improves, which makes the regional performance measures more pertinent to the Regional Connectors Study. If any segments advance to further project development, the individual project’s purpose and need will be defined and detailed solutions will be examined relative to that purpose and need. For example, an individual project may address safety needs in the corridor, which is not a type of need addressed in this study; therefore the resulting solution may differ from the segment concept presented in this study.

Step 3. Scenario Testing & Operations Analysis

Step 3 of the Phase III Technical Guide documents the economic and congestion performance of the segment bundles when the scenarios developed in Phase II are considered for the region. Step 3 also documents the proposed traffic operations of each bundle if built as proposed in Step 2.

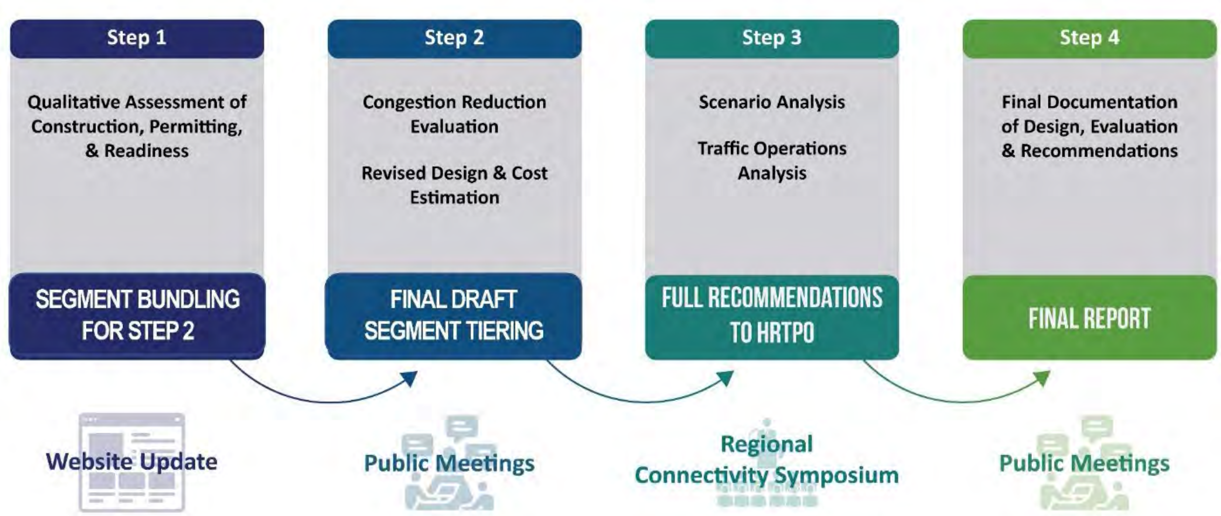


Figure 1: Phase III Four-Step Process

RCS Segments and Bundles

The Regional Connectors Study began with five mandatory study segments:

- Segment 1: I-664 from Bowers Hill Interchange to I-64 in Hampton (widening)
- Segment 2: VA 164 from west of Cedar Lane to I-664 (widening)
- Segment 3: VA 164 Connector (new facility)
- Segment 4: I-564 Connector (new facility)
- Segment 5: I-664 Connector (new facility)

During Phase III, Segment 1 was divided into two parts:

- Segment 1a: I-664 from College Drive to I-64 in Hampton
- Segment 1b: I-664 from Bowers Hill Interchange to College Drive

The mandatory segments are shown in Figure 2.

During Phase III, based on the initial readiness evaluation,[1] Segment 1b, I-664 widening south of College Drive to Bowers Hill was changed from a mandatory segment for consideration to a baseline segment, as it has been approved for NEPA analysis and preliminary engineering. The segments that were evaluated in the remainder of Phase III are shown in Figure 3 and defined below. Detailed descriptions of the segment updates, assumptions, and special considerations are provided in Chapter 3.

Segment 1a (I-664 Widening north of College Drive):
Add four new southbound travel lanes through a new tunnel west of the existing tunnel and change the existing tunnel to four northbound lanes. For approximately five miles of roadway, widen two lanes in each direction for express lanes (high-occupancy/toll lanes). Includes a new alignment of the peninsula end of the bridge-tunnel to accommodate the new Hampton Roads Sanitation District (HRSD) facilities and pipeline and assumes a bored rather than immersed tunnel.

Segment 2 (VA 164 Widening):
Widen VA 164 to six lanes, three lanes in each direction. Use existing right-of-way to the extent possible for widening VA 164 *without* widening to the inside towards the rail corridor.

Segment 3 (VA 164 Connector):
Construct a new four-lane highway, two lanes in each direction, from a new interchange at VA 164 west of Cedar Lane across Portsmouth Landfill and Craney Island. The new highway will connect to a new interchange with I-564 Connector and/or I-664 Connector over the water. Includes a realignment west of the Navy Fuel Depot that crosses the Portsmouth Landfill, to address U.S. Navy security concerns.

[1] April 26, 2022, joint Steering (Policy) Committee and Working Group meeting, See Part II Appendix G

Segment 4 (I-564 Connector):
Construct a new four-lane highway, two lanes in each direction, from I-564 using a tunnel and bridge to a new mid-harbor island connection at the VA 164 Connector and/or I-664 Connector. Assumes a bored, rather than immersed, tunnel, which moves the mid-harbor island connecting Segments 3, 4 and 5 to the west. Includes adjustments to the project profile and Hampton Boulevard interchange near Gate 6 of Naval Station Norfolk to address U.S. Navy Security concerns.

Segment 5 (I-664 Connector):
Construct a new four-lane highway, two lanes in each direction, from I-664 to a new mid-harbor island connection to I-564 Connector and/or VA 164 Connector.

Note that congestion modeling for Segments 3, 4 and 5 assumed the presence of tolls[2], but the implementation of tolls would be subject to future study and based in part on the applicability of the Elizabeth River Crossings / Commonwealth of Virginia agreement which requires tolling of any new Elizabeth River crossing within a specified time period. With respect to Segment 2 VA 164 widening, HRTAC's and HRTPO's understanding is that this agreement would not apply to this segment alone or in tandem with the I-664 widening. (Segment 1a). The Regional Connectors Study acknowledges that the Elizabeth River Crossing agreement has had a detrimental impact on Portsmouth and the goal is not to repeat this. At this time there are no plans to implement tools on VA 164 widening. The HRTPO will work with regional, state, and other stakeholders to ensure that funding is in place to avoid tolls.

To evaluate the RCS segments in the regional models for congestion and economic impacts, the segments were combined into "bundles" for analysis. The study team created four segment bundles for use in Phase III analysis, as shown in Figure 4.

- Bundle A: Segment 1a only
- Bundle B: Segments 1a and 2
- Bundle C: Segments 1a, 4 and 5
- Bundle D: Segments 1a, 2, 3, and 4

[2] Tolls were assumed to be $1.00 for cars and $3.00 for trucks for each segment (Segments 3, 4 and 5). These are based on the SEIS toll assumptions and were presented to the RCS Working Group at their April 8, 2021 meeting.

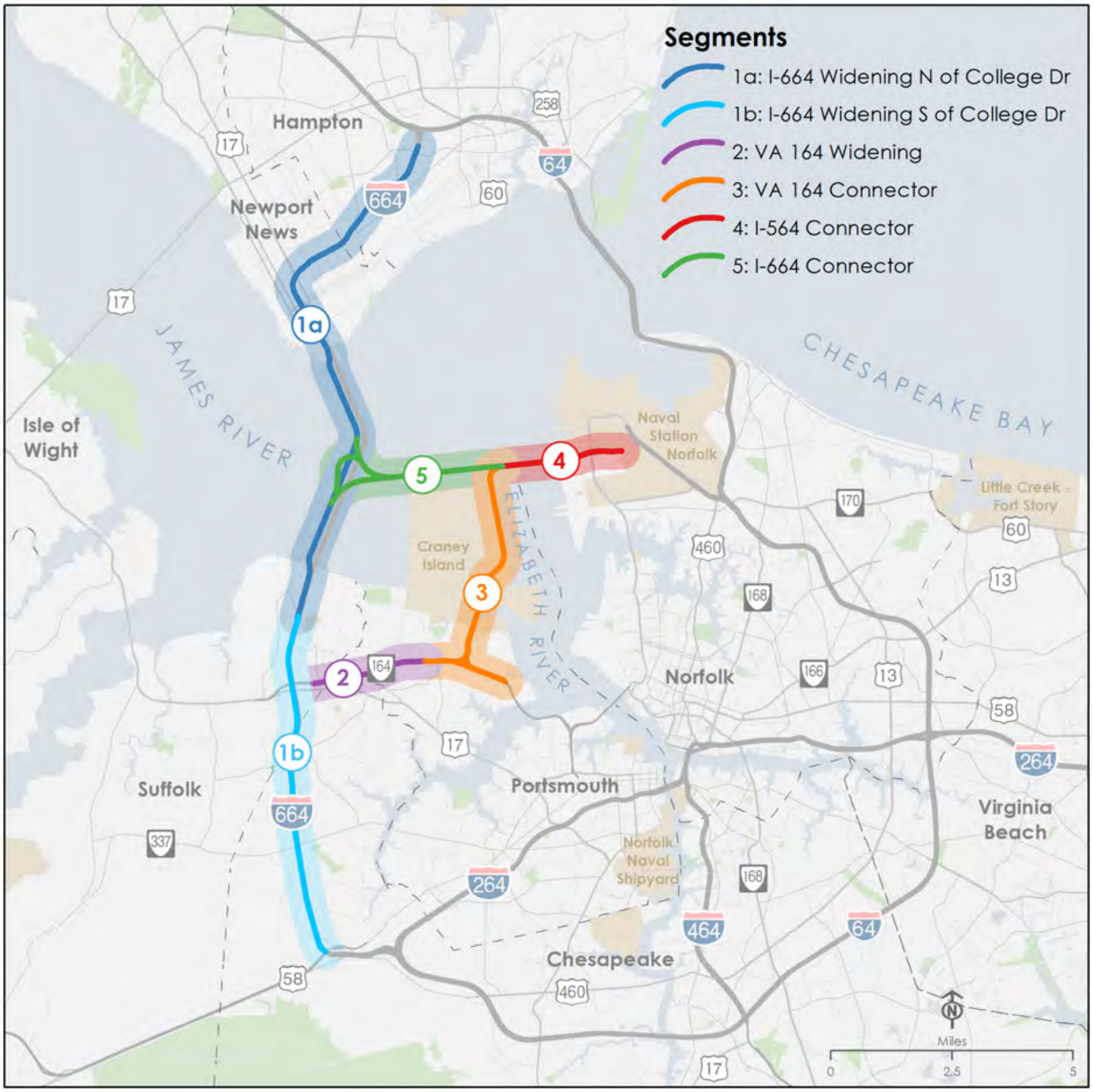


Figure 2: Hampton Roads Regional Connectors Study Mandated Segments

Figure 3: Hampton Roads Regional Connectors Study Phase III Segments Analyzed

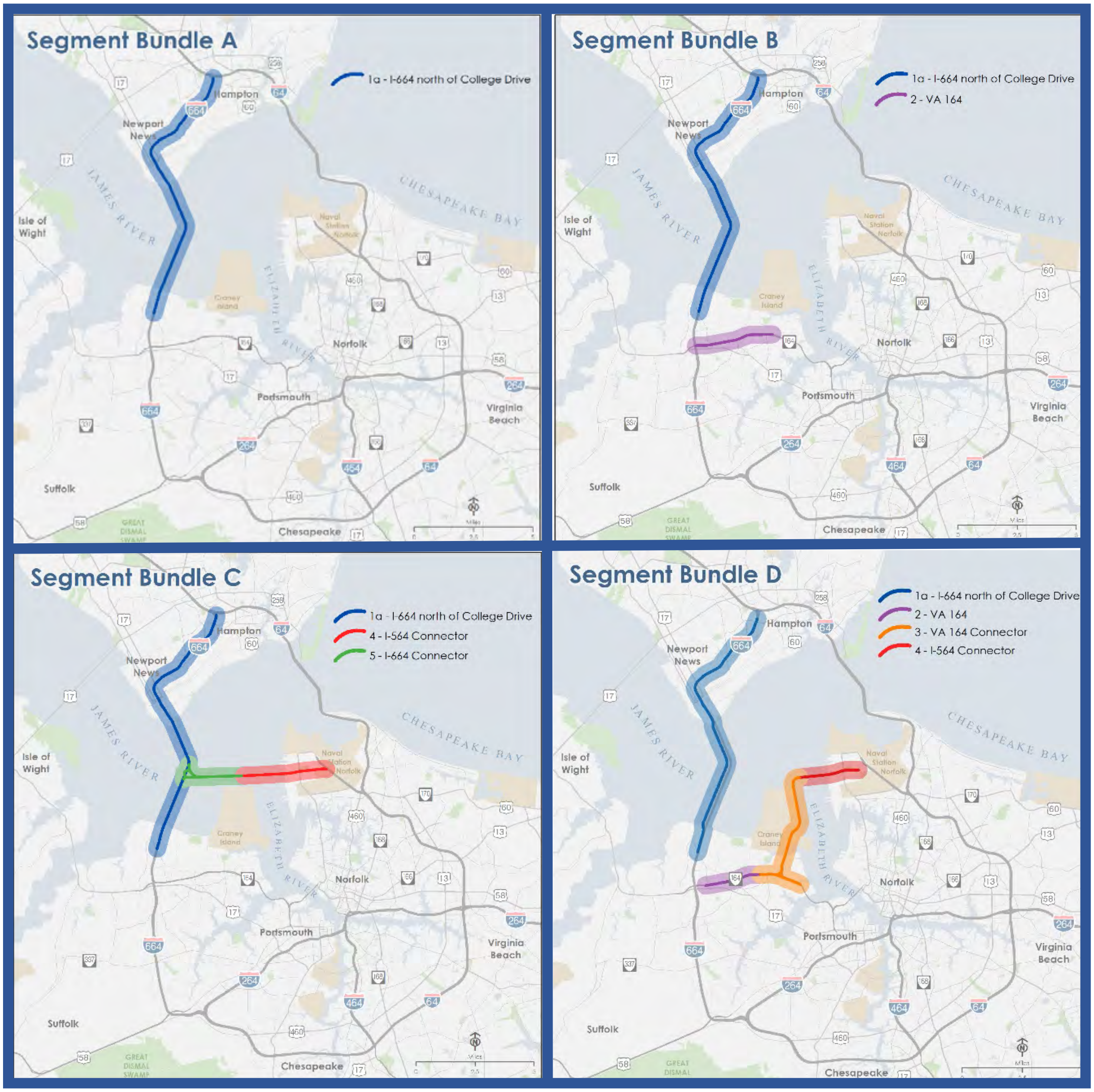


Figure 4: Hampton Roads Regional Connectors Study Segment Bundles

Part I

Chapter 1: Background

In 2015, the Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA), initiated the preparation of a Supplemental Environmental Impact Statement (SEIS) for the March 2001 Hampton Roads Crossing Study (HRCS) Final Environmental Impact Statement (FEIS).

On July 25, 2016, the FHWA and Commonwealth Transportation Board (CTB) approved the Hampton Roads Crossing Study Draft Supplemental Impact Statement (HRCS SEIS). At its September 2016 meeting, the Hampton Roads Transportation Planning Organization (HRTPO) unanimously approved the HRCS SEIS Alternative A, “modified” to include the Bowers Hill Interchange, as the region’s Preferred Alternative[3]. On October 20, 2016, the Hampton Roads Transportation Accountability Commission (HRTAC) also unanimously supported the HRTPO’s selection of Alternative A-modified, and allocated up to $7 million of Hampton Roads Transportation Fund (HRTF) for further study of the HRCS SEIS components not included in the selected Alternative A.

On December 7, 2016, the CTB approved Alternative A and instructed VDOT to continue to work with HRTPO, HRTAC, USACE, Navy, the Port of Virginia, and others to advance separate studies to identify appropriate access options around Craney Island to include I-564/I-664 Connectors, I-664/MMMBT and VA 164/VA 164 Connector. The resolution also directed VDOT to continue to work with HRTPO, HRTAC, USACE, and other parties to advance a separate study of the Bowers Hill Interchange in Chesapeake.

In January 2017, the HRTPO Board directed staff to work with VDOT, HRTAC, and other partners to develop a Memorandum of Understanding (MOU) for supporting studies on how to move forward with the remaining segments of the SEIS and the Bowers Hill Interchange. The May 1, 2017, MOU was signed among the HRTPO, VDOT, and HRTAC to advance two components:

- $4 million for study of the Bowers Hill Interchange following the NEPA process, to be managed by VDOT.
- $3 million for Additional Feasibility Studies of the remaining components of the HRCS SEIS not included in the approved Alternative A, to be managed by the HRTPO. In March 2017, HRTAC approved a contingency of $4 million to be available if additional funding is required to complete the HRTPO feasibility studies.

Regional Connectors Study

HRTPO kicked off the Regional Connectors Study in June 2018 with funding from HRTAC. The study focuses on Hampton Roads connectivity through the lenses of congestion relief, economic vitality, resiliency, accessibility, and quality of life.

---

[3] Alternative A is the expansion of the I-64 Hampton Roads Bridge Tunnel, under construction at the time of this report’s publication, to add four additional lanes including two new 2-lane tunnels as shown on the project website.

The HRTPO Regional Connectors Study reexamines projects previously studied in the HRCS SEIS, seen in Figure 1, including:

- VA 164
- I-564 Connector
- VA 164 Connector
- I-664 Connector
- I-664 widening (from I-64 in Hampton to US 460/58/13 in Chesapeake)

The I-664 widening between US 460/58/13 in Chesapeake and the Bowers Hill area (shown as Segment 1b in Figure 5) is already undergoing review for future planning, design, and construction, and is not considered in this report.

Phase I

The Regional Connectors Study was conducted through a multi-phased approach (see Figure 6). Phase I resulted in the establishment of goals and objectives for the remainder of the study and included the development of a draft scope for Phase II. Phase I entailed the following five tasks:

- Task 1: Develop and initiate an engagement program
- Task 2: Evaluate the regional travel demand model
- Task 3: Define the scenario planning effort
- Task 4: Update existing conditions information
- Task 5: Present findings at Working Group meetings

The Phase I activities were documented in several reports including the *Regional Survey Report*, *Corridor Conditions Report*, and *Travel Demand Model Technical Memorandum*.

Phase II

Phase II developed three alternative scenarios to analyze for economic and congestion effects. Phase II laid the groundwork for the tiering of segments in Phase III. Phase II entailed the following five tasks:

- Task 1: Define base geography and place types
- Task 2: Develop “No Build” Analysis
- Task 3: Develop alternative “Greater Growth” scenarios: Water, Urban, and Suburban
- Task 4: Calculate Scenario Performance Measures versus “No Build”
- Task 5: Present findings to the RCS advisory committees

In Phase II, the consultant team developed three models for scenario planning: land use, travel demand, and economic effects. The scenarios, models and input files were delivered to HRTPO for use in the development of the 2045 Long Range Transportation Plan (LRTP). For the RCS, the scenario results were documented and shared with the public via online engagement, culminating in the Phase II Technical Guide.

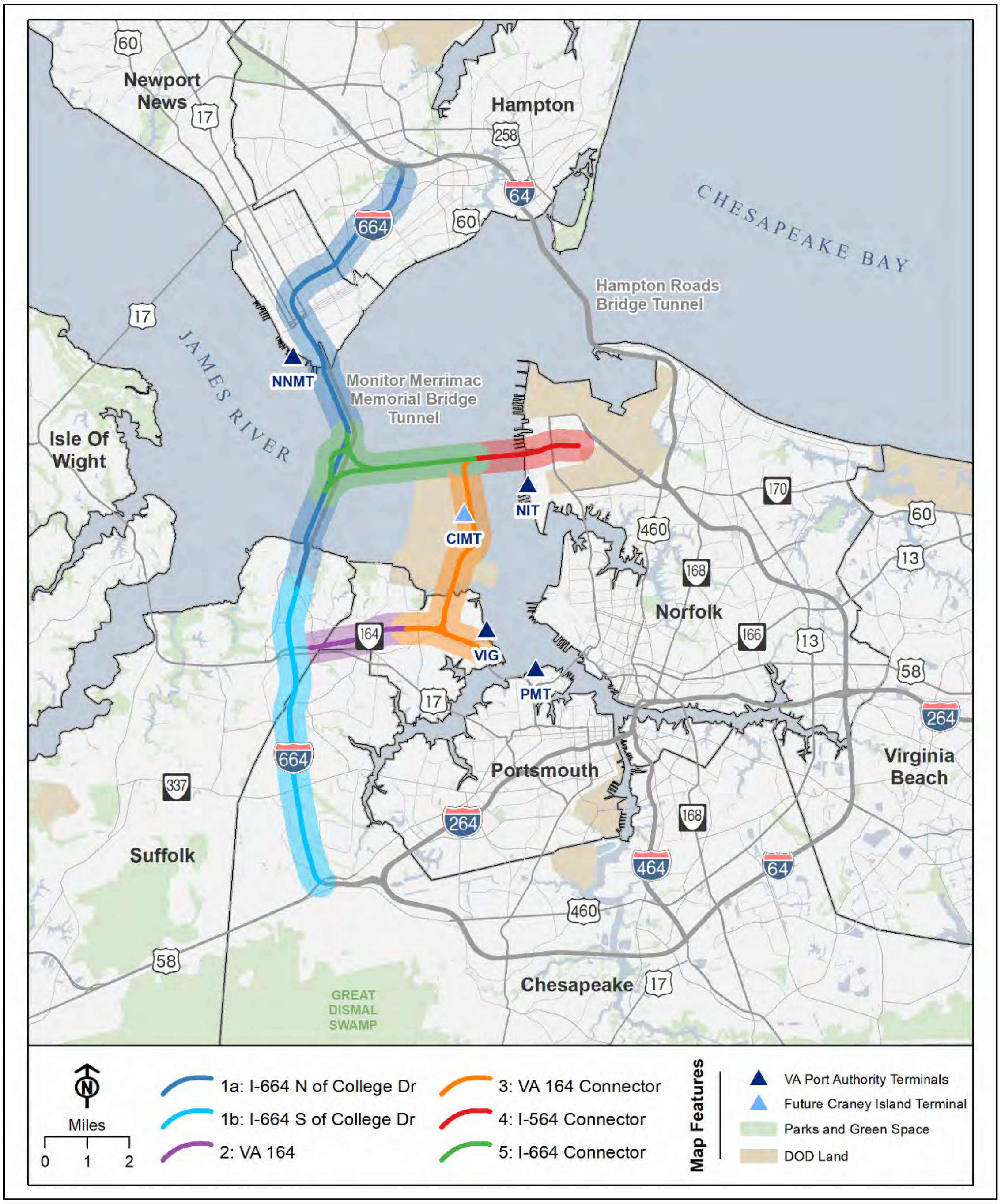


Figure 5: Hampton Roads Regional Connectors Study Mandated Segments

Phase III

Phase III concludes the Regional Connectors Study (RCS). Near the beginning of Phase III, the scope of work was modified to produce the Tiering recommendations described in the Overview section at the beginning of this document and as follows. In Phase III of the RCS, the consultant team scope of work included:

1) Evaluating mandatory segments on the basis of cost and construction complexity, permitting challenges, and project readiness;
2) Evaluating congestion relief, economic benefits, and cost; and
3) Using these analyses to differentiate the segments into:
    - Those ready to be advanced to the Hampton Roads 2050 Long Range Transportation Plan (Tier I),
    - Those which require further refinement recommended for the Hampton Roads Regional Transportation Vision Plan (Tier II), and
    - Those to be further considered by the community due to technical or other issues (Tier III).

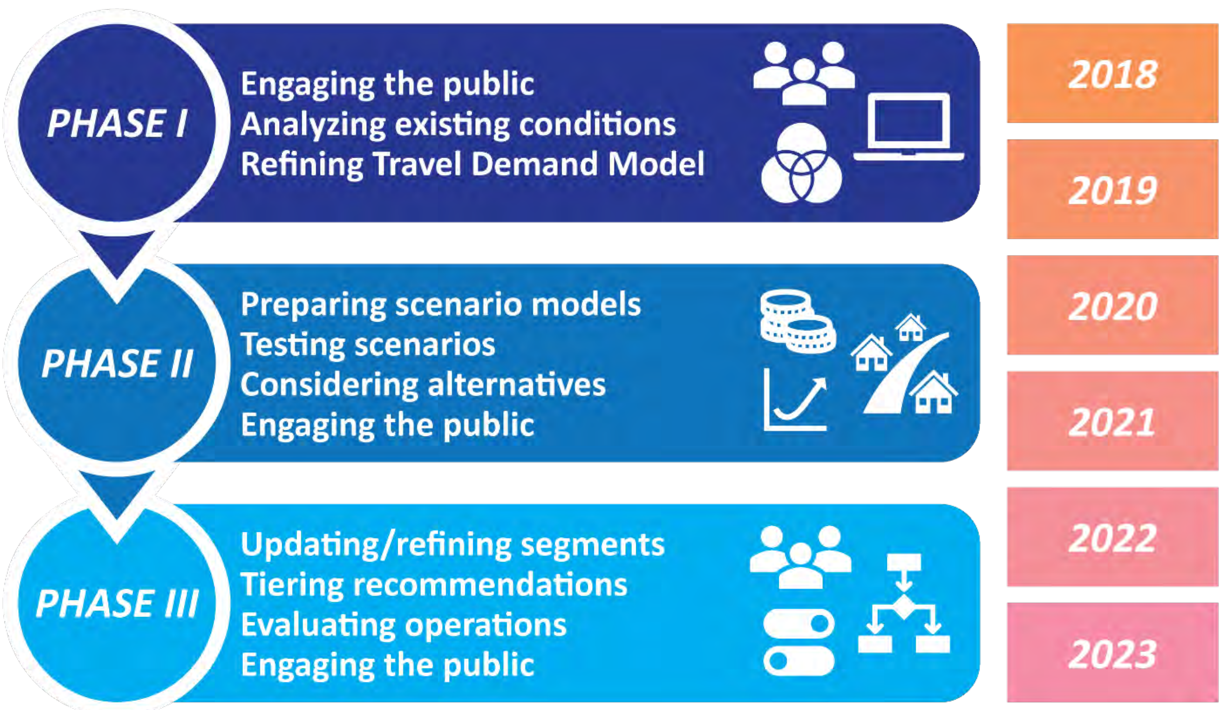


Figure 6: Three Study Phases of the Regional Connectors Study

Chapter 2: Phase III Step 1 Qualitative Analysis

The first step of Phase III consisted of refining the study segments and conducting a qualitative analysis of each segment with regard to permitting issues, readiness, and construction complexity. The original Step 1 qualitative analysis was presented to the RCS Joint Steering (Policy) Committee and Working Group at a meeting on April 26, 2022. As the study team proceeded with Step 2 analyses, the permitting issues and readiness evaluations were refined based on comments from committee members and stakeholders, and the final qualitative analysis was presented to the RCS Joint Steering (Policy) Committee and Working Group at a meeting on September 27, 2022. The construction complexity qualitative analysis was used to inform the segment cost estimates, as described in Chapter 3. This chapter provides a summary narrative of the three qualitative analyses (i.e., permitting issues, readiness, and construction complexity) as refined based on stakeholder comments. The stakeholder comments and final qualitative analyses detailed results are presented in Part II, Appendices A and B, respectively.

In each qualitative analysis, a series of criteria were developed, and each segment was rated high, medium, or low with respect to each criterion. The summary ratings are presented in the sections that follow, and additional detail is provided in Appendix B. The segment drawings upon which the ratings were based are a separate deliverable available from the RCS web site.

Permitting Issues

Overview

The purpose of this task was to evaluate the ease (or difficulty) of obtaining regulatory permits. The evaluation assessed the federal, state, and local regulatory requirements in conjunction with existing environmental conditions of the RCS segments. Based on the existing environmental conditions within each of the segment corridors, the study team was able to determine potential significant regulatory challenges by ranking evaluation factors to include timing implications, resource impacts, permitting complexity, and potential mitigation costs for each of the segments.

Methodology

Environmental, natural, cultural and social information was analyzed to establish a unified dataset for GIS-based review of the study segments. The regional mapping and environmental overlays show the location of sensitive resources. Subsequent risk analysis aims to avoid or minimize impacts to these sensitive resources and consider mitigation where such impacts are unavoidable. Table 1 provides an overview of all of the categories of data sources evaluated for environmental, natural, cultural, and social resources. Detailed data sources and identified resources for each segment are documented in the Permitting Issues Technical Resource Memos section of Appendix B.

Several key assumptions were taken into consideration throughout the evaluation process:

1) USACE will not permit a bundle of segments that would obstruct or restrict navigation to the Craney Island Dredged Material Management Area (CIDMMA), or that would otherwise impair USACE ability to maintain and operate the CIDMMA. See Appendix C for the meeting summary that documents this input.
2) USACE will have to assess the impact of the different bundles on the federally authorized Norfolk Harbor and Channel Federal Navigation Project and coordinate with maritime stakeholders on the impacts of those bundles of segments at a later stage of the design process than the RCS.
3) USACE can only permit the Least Environmentally Damaging Practicable Alternative (LEDPA) and cannot permit a bundle of segments that will adversely affect other federal navigation projects.
4) USACE, Virginia Department of Environmental Quality (DEQ), Virginia Marine Resources Commission (VMRC) and additional federal, state, and local agencies will offer comments on permitting issues for wetlands and Waters of the U.S. resources and mitigation requirements associated with the bundles at a later stage of the design process than the RCS.
5) Additional public and agency coordination will be required to assess all maritime and resource impacts at a later stage of the design process than the RCS.

Resource information was evaluated to determine regulatory challenges and viability of each segment and bundle. The data were evaluated to provide regional leaders and analysts with accurate information to make strong, technically supported decisions regarding regulatory challenges and viability.

Table 1: Resources Included in Permitting Issues Evaluation

Types of Resources Evaluated in Permitting Issues Qualitative Evaluation		
Department of Defense Resources	Architectural Resources / Historic Districts	Waterfront Recreational Land Acquisition
Transportation Facilities	Archaeological Resources	Waterfront Recreational Facilities
Virginia Port Authority (VPA)	Utilities	Waterfront Historic Properties
Businesses/Business Access	Water Quality	Terrestrial Wildlife / Habitat
Parks & Recreation	Floodplains	Essential Fish Habitat
Section 4(f) Properties	Sediment Transportation, Bank Erosion, Shoaling and Hydrodynamic Modeling	Anadromous Fish
Section 6(f) Properties	Dredging and Disposal of Dredged Material	Submerged Aquatic Vegetation
Places of Worship	Aquifers/Water Supply	Invasive Species
Cemetery	Coastal Natural Resource Areas	Farmlands
School/University	Aquatic Spawning, Nursery, and Feeding Grounds	Forestal Districts
Apartment Complexes/Residences	Coastal Primary Sand Dunes	Energy
Children's Health and Safety	Barrier Islands	Traffic
Environmental Justice	Significant Wildlife Habitat Areas	Air Quality
Tidal Waters/Tidal Streams/Subaqueous bottom	Sand And Gravel Resources	Noise
Non-Tidal Waters	Underwater Historic Sites	Hazardous Materials
Maintained Navigational Channels and Civil Works Projects	Highly Erodible Soils	Visual
Wetlands	Coastal High Hazard Areas, including floodplains	Protected Species
Commercial Ports	Community Waterfronts	Mitigation Complexity and Cost
Commercial Fishing Piers	Virginia Public Beaches	Permit Stakeholder Coordination
Colonial Waterbird Nesting	Virginia Outdoors Plan	Effect on planned or proposed Federal Navigation Projects
Benthic Species	Wildlife Management Areas	Potential Future Changes in Policy Issues

Permitting Issue Evaluation Parameters

Evaluation parameters were developed to determine environmental and regulatory viability of the segments. Each evaluation parameter was specific to the targeted environmental resource and potential impacts in conjunction with federal, state, and local laws and regulations to create a framework for risk analysis and segment prioritization. In addition, a series of regulatory permitting factors were evaluated to measure how each segment contributed to the direct and indirect environmental impacts. The evaluation of each data source (summarized in Table 1 and provided in detail in Appendix B) aligned each metric according to an established objective for the region, ranking evaluation factors which included timing implications, resource impacts, permitting complexity, and potential mitigation conceptual costs.

All evaluation measures were vetted with the Steering (Policy) Committee, Working Group and HRTPO staff.

Permits Considerations

A comprehensive review of the regulatory programs evaluated for each of the mandatory segments included, but were not limited to:

- Federal: USACE - Section 404 of Clean Waters Act (CWA) (Waters of the US) – Individual Permit (USACE and DEQ can only permit the LEDPA [Least Environmentally Damaging Practicable Alternative]).
- Federal: USACE - Section 408 permit under Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. 408). Work that may alter, occupy, or use a USACE Civil Works project, such as a USACE maintained navigation channel or USACE administered dredged material disposal area, requires authorization in the form of a Section 408 permit from the USACE under Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. 408).
- Federal: USACE - Section 10 permit.
- Federal: USCG Bridge Permit (when crossing navigable waterways).
- Federal: USFWS Migratory Bird Permit.
- State must certify that state water quality standards would not be violated by the Section 401 of CWA (enforced by DEQ) - Virginia Water Protection Permit (VWPP) Program (9 VAC 25-210) – Individual Permit regulates activities in navigable waters, including tidal wetlands.
- State: VMRC permit, under the authority of Chapter 12 of Title 28.2 of the Code of Virginia - Subaqueous Bottomlands Permit for subaqueous bottoms or bottomlands, tidal wetlands, and beaches and coastal primary sand dunes.
- State: VDEQ Virginia Construction General Permit (CGP) (VAR10) outlines specific measures that development projects must address, including the development of a Stormwater Pollution Prevention Plan (SWPPP).
- State: VDEQ's Ground Water Withdrawal Permitting Program in their Office of Water Supply - proximity of public drinking water sources (ground water wells, surface water intakes, and springs).
- State: VDEQ Air Permits (for construction).
- State: VMRC cannot issue a permit to encroach upon Baylor Grounds unless the Virginia General Assembly removes that portion of the Baylor Grounds from the official survey.

- State: the VDOT planning, and design process considers resiliency and mitigation of any impacts, including flooding.

The goal of this task was to assemble and evaluate the performance measures as determined by land use/environmental metrics, design alternatives, and reasonable constructability. This is a key step in understanding the comprehensive environmental impacts of each segment.

All regulatory permitting issue parameters and evaluations were conducted by reviewing federal, state, and local regulatory requirements in conjunction with existing environmental conditions, timing implications, resource impacts, permitting complexity, and potential mitigation conceptual costs for each of the mandatory segments. This information was used to determine potential regulatory challenges as well as develop draft tiering of the analyzed segments.

Impact Rating Concern – This evaluation category captures the potential effect of the project and its construction on the natural, cultural, and social environment. Some of the most common environmental impacts are related to:

- Social and community environment including relocations
- Noise impacts
- Water resources and wetlands
- Protected species
- Damage to ecosystems and loss of biodiversity
- Historic resources
- Regulatory requirements and complexity
- Mitigation cost and complexity
- Interdependence or conflict with other projects

Human well-being depends directly on biodiversity and ecosystems. It is therefore vital to measure, plan and minimize any segment activity that might alter the ecological balance. The permitting issues with these subjects were scored from minimal to high impact:

- Minimal: No or Minimal impacts to ecosystems (including natural, cultural, and social)
- Moderate: Impacts that have reasonable solutions to ecosystems (including natural, cultural, and social)
- High: Challenging or Unknown impacts to ecosystems (including natural, cultural, and social)

Resource Feasibility Concern **–** this category indicates whether the segment will interfere with the socioeconomic activities or other planned and proposed projects within the corridor. The permitting issues related to resource feasibility concerns or potential cumulative effects combined with other projects were scored from minimal to high impact:

- Minimal: No or Minimal impacts to existing operations or other transportation projects occurring within the segment

- Moderate: Impacts that have reasonable solutions to existing operations or other transportation projects occurring within the segment
- High: Challenging or Unknown impacts to existing operations or other transportation projects occurring within the segment

Timing Implication Concerns - It is important that such regionally significant projects can be reliably scheduled so that funding pipelines and adjacent projects are not disrupted by permitting setbacks. Below is a general range of how timing impacts were scored:

- Minimal: No or Minimal likelihood of timing issues or schedule impacts
- Moderate: Timing issues or schedule impacts that have reasonable solutions
- High: Challenging or Unknown (i.e., likelihood of future changes in policies related to permitting) significant timing issues or schedule impacts

Environmental, Natural, Cultural, and/or Socioeconomic Resource Impact Concerns - The RCS Corridor Evaluation Technical Memorandum Table of Resources provides a detailed overview of environmental natural, cultural, and/or socioeconomic resources potentially present within the segment. The permitting issues with these subjects were scored from minimal to high impact:

- Minimal: No or Minimal impacts to resources
- Moderate: Impacts that have reasonable solutions for resources
- High: Challenging or Unknown impacts to resources

The next step in the regulatory permitting issues analysis included the evaluation of environmental factors in conjunction with the design and construction factors as well as the four areas of concern characterized above and presented in Table 2.

Segment Evaluations

Segment 1a (I-664 Widening north of College Drive)

Segment 1a is proposed to add four new southbound travel lanes through a new tunnel west of the existing tunnel and change the existing tunnel to four northbound lanes. Approximately five miles of roadway would be widened to two lanes in each direction for express lanes (i.e., high-occupancy/toll lanes). Most community resources impacted are adjacent to the corridor. Construction activities would result in temporary closure of roads and interruptions to vehicular traffic; however, the analysis assumes that all transportation facilities will return to existing or improved functionality post construction. All segments have undergone an initial environmental justice review with additional evaluations to occur in the future as more detailed design information becomes available. The community and business resources immediately adjacent to the existing corridor that may require right-of-way acquisition and/or construction easements have been identified and detailed in the project appendices; however, further detailed design may avoid and/or minimize potential impacts to these resources.

Minority individuals make up more than 50% of all the community residents within 500 feet of the proposed construction to the north and south of the corridor, and more than 75% of most adjacent communities. In Newport News, within 500 feet of the proposed edge of the corridor, more than 25% of the residents in every community are low-income individuals; and in some adjacent communities, 75-100% of residents are low-income individuals. There are three apartment buildings, 11 apartment blocks, and 45 houses within 500 feet of the corridor in Newport News. In Hampton, poverty is less severe, though more than 25% of the residents are low-income individuals. The widening could impact the properties of 13 residences in Newport News, but no residential buildings are anticipated to be impacted by I-664 corridor widening. Future advanced, detailed design may avoid and/or minimize potential impacts to these resources.

Segment 1a crosses the James River (Newport News Channel) and tidal and non-tidal resources are located within the corridor. Water resources, including tidal waters, non-tidal waters, subaqueous bottom, shallow water habitat, wetlands, submerged aquatic vegetation, and benthic species were evaluated and detailed in the project appendices. At this time in the evaluation, only rough order of magnitude impacts can be determined. As design advances in future studies, detailed impact numbers will be available to determine specific avoidance, minimization, and mitigation measures.

This segment contains bridge and roadway structures within water and landside to federal navigation projects along the James River (Newport News Channel), Elizabeth River, and current operations at the Newport News Marine Terminals. No impacts are anticipated as all maintained navigational channels will be avoided by the tunnel design.

Compliance with federal (USACE Section 404; Section 408, and Section 10; USCG Bridge; NOAA Incidental Harassment Authorization); state (DEQ Section 401 Virginia Water Protection Permit, VMRC Subaqueous Bottomlands Permit, and DEQ Virginia Construction General Permit); as well as local Wetlands Board regulatory requirements would be required, involving extensive coordination. The regulatory requirements for the construction of Segment 1a are considered moderate in their complexity due to the identified resources within the corridor.

Segment 2 (VA 164 Widening)

Segment 2 is proposed to widen VA 164 to six lanes, three lanes in each direction, using existing right-of-way to the extent possible. Construction activities would result in potential temporary closure of roads and temporary interruptions to vehicular traffic. Construction activities would cause intermittent fluctuations in noise levels throughout the construction area. Noise impacts would vary, as they are directly related to the types of equipment used and the proximity to the noise-sensitive land uses. No considerable, long-term construction-related noise impacts are anticipated. The analysis assumes that all transportation facilities will return to existing or improved functionality post construction. At this time HRTPO does not have a plan to implement tolls on VA 164 widening. The HRTPO will work with regional, state, and other stakeholders to ensure that funding is in place to avoid tolls.

Communities within 500 feet of the preliminary limits of disturbance for VA 164 are diverse racially and in income. Expansion to the eastbound side of VA 164 may require a small easement from Ebony Heights Park, for example for drainage beyond the footprint of the roadway; however, further detailed design may avoid and/or minimize any potential impacts to this community resource. Similarly, additional community resources within 500 feet of the proposed construction to the north and south of the corridor are majority minority households with over 25% of households in poverty, 102 houses, 58 two-story apartments, 44 garden apartment blocks, and three churches. While adjacent parcels may see temporary construction easements (approximately 40 parcels) and an estimated 14 parcels will require a few feet of permanent right-of-way acquisition, no residents or neighboring communities would be relocated. Where the VDOT noise walls would be relocated within VDOT right-of-way, it should be noted that the existing right-of-way is adjacent to backyards and, though it serves as a drainage area, it is not necessarily perceived by residents as VDOT property. Thus, adjusting the noise walls within VDOT right-of-way may be perceived as reducing residents' backyards. Partnering and collaboration with neighboring communities through this and future studies will engage these communities to mitigate potential impacts.

Non-tidal US Waters and wetlands were identified within the segment; however, this segment does not cross any major rivers or harbors. Field surveys and additional detailed design may avoid and/or minimize impacts to further reduce potential impacts. As more detailed design continues the exploration of more project-specific measures to determine specific avoidance, minimization, and mitigation measures will be evaluated.

Compliance with Federal (USACE Section 404) and state (VDEQ Section 401 Virginia Water Protection Permit and VDEQ Virginia Construction General Permit) regulatory requirements would be required. The regulatory requirements for the construction of Segment 2 are considered low in their complexity due to the identified resources within the corridor. Any future designs of corridor widening would require hydrologic & hydraulic studies to ensure that the new roadway would not cause any additional flooding in downstream communities.

Segment 3 (VA 164 Connector)

Segment 3 is proposed to construct a new four-lane highway, two lanes in each direction, from a new interchange at VA 164 west of Cedar Lane across Portsmouth Landfill and Craney Island. The new highway will connect to a new interchange with I-564 Connector and/or I-664 Connector over the water. This segment traverses a host of Military/DOD/USACE facilities that have setback requirements for Anti-Terrorism Force Protection, Security Requirements, and Gate Access for all noted facilities. Consistent with the HRCS SEIS, this facility was assumed to be tolled at $1 per car and $3 per truck. The northern terminus of this segment falls within the Craney Island Dredged Material Management Area (CIDDMA). Coordination with the USACE shall continue to incorporate the operations requirements for the CIDDMA into the planning and design evaluations. As a result of the safety distance requirements from public highway to the facilities at Craney Island Fuel Terminal, the VA 164 connector corridor was evaluated with an 1,800-foot distance from the planned refueling in addition to a visual barrier in future design iterations. In addition, noise walls have been evaluated along a portion of the bridge on the outside edge to serve as visual barriers to the fuel line and future facility per the U.S. Navy's current force protection standard. The strategic importance of Craney Island within the context of U.S. Naval Station Norfolk, which serves both the strategic and regional needs of the Hampton Roads region, is of utmost importance. Communication with stakeholders like the U.S. Navy is vital to ensure that the design and construction process that does not impact operations.

Properties identified as sensitive resources are located outside of the limits of disturbance. Preliminary design evaluations show that there will be no impact on existing schools, residences, places of worship, or cemeteries. The preliminary design indicates that four total business property relocations, easements, or access impacts may be required. As detailed design continues in future studies, the exploration of more project-specific measures to determine specific avoidance, minimization, and mitigation measures will be evaluated. Outreach, partnering and collaboration with neighboring communities will continue to mitigate any potential impacts.

Tidal and non-tidal U.S. Waters and wetlands were identified within the boundaries of the segment LOD; therefore, compliance with federal (USACE Section 404; Section 408, and Section 10; USCG Bridge; NOAA Incidental Harassment Authorization); State (VDEQ Section 401 Virginia Water Protection Permit, VMRC Subaqueous Bottomlands Permit, and VDEQ Virginia Construction General Permit); as well as local Wetlands Board regulatory requirements would be required, involving extensive coordination. This segment contains a bridge over Craney Island Creek which is a tributary of the adjacent Elizabeth River, a maintained federal channel. Although the segment does not cross the Elizabeth River, construction activities are likely to require access to potential barge work zones and safe harbor sites in or adjacent to the Elizabeth River. As detailed design continues the exploration of project-specific measures to determine specific avoidance, minimization, and mitigation measures will be evaluated. The regulatory requirements for the construction of Segment 3 are considered high to moderate in their complexity due to the identified resources within the corridor.

Any future designs of new highway corridors would require hydrologic & hydraulic studies to ensure that the new roadway would not cause any additional flooding in downstream communities.

Segment 4 (I-564 Connector)

Segment 4 is proposed to construct a new four-lane highway, two lanes in each direction, from I-564 using a tunnel and bridge to a new mid-harbor island connection at the VA 164 Connector and/or I-664 Connector. This segment traverses through the Department of the Navy (DON) and Norfolk International Terminal (NIT) properties. As the project moves into design and construction, equipment height and clearance to accommodate the Navy's operational needs in Norfolk and the loss of operational use at the Lineage Logistics at Talon Marine Terminals, NIT Pier 3 are factors to be considered with continued evaluation. It should be noted that the fueling facility is within 300 feet of the existing Intermodal connector, which is currently planned to have the same alignment as the proposed I-564 connector. There are walls separating the Navy's fuel facility from the existing Intermodal connector. To satisfy the 1,800-foot setback from the fueling facility, this segment would require a significant re-evaluation of the I-564 connector by FHWA, VDOT, City of Norfolk, and the Port of Virginia. In addition, evolving security and visibility technology may resolve these security concerns as the I-564 corridor progresses from planning to design. Evolving transportation technology may change the corridor design as well. Horizontal and vertical clearances required by the U.S. Navy for essential security will be considered in the future planning and design process. Consistent with the HRCS SEIS, this facility was assumed to be tolled at $1 per car and $3 per truck.

Properties identified as sensitive resources are located outside of the limits of disturbance. Preliminary design evaluations show that there will be no impact on existing schools, residences, places of worship, or cemeteries. The preliminary design indicates that impacts to Fleet Recreation Park (e.g., park access/maintenance roads) may be required. Past and planned expansion of military installations like Naval Station Norfolk have separated neighboring communities; however, no residents or neighboring communities would be relocated. All segments have undergone an initial environmental justice review with additional evaluations occurring as detailed design information becomes available in future studies. Outreach, partnering and collaboration will engage these neighboring communities to mitigate any potential impacts.

Tidal and non-tidal resources are located within the corridor including the Elizabeth River and James River (Newport News Channel). No impacts to the maintained navigational channels and identified civil works projects are anticipated. All maintained navigational channels will be avoided by the tunnel design. Water resources, including tidal waters, non-tidal waters, subaqueous bottom, shallow water habitat, wetlands, submerged aquatic vegetation, and benthic species were evaluated and detailed in the project appendices. At this time in the evaluation, only rough order of magnitude impacts numbers for tidal and nontidal US Waters resources can be determined; however, as detailed design continues, complete impact numbers will be available to determine specific avoidance, minimization, and mitigation measures.

Compliance with federal (USACE Section 404; Section 408, and Section 10; USCG Bridge; NOAA Incidental Harassment Authorization); state (VDEQ Section 401 Virginia Water Protection Permit, VMRC Subaqueous Bottomlands Permit, and VDEQ Virginia Construction General Permit); as well as local Wetlands Board regulatory requirements would be required, involving extensive coordination. In addition, extensive stakeholder coordination with Military, DOD, USACE facilities, transportation facilities, lineage logistics at Talon Marine Terminals, NIT Pier 3, and railroad facilities will be required. As detailed design continues in future studies, specific avoidance, minimization, and mitigation measures will be evaluated. The regulatory requirements for the construction of Segment 4 are considered high in their complexity due to the identified resources within the corridor.

Segment 5 (I-664 Connector)

Segment 5 is proposed to construct a new four-lane highway, two lanes in each direction, from I-664 to a new mid-harbor island connection to I-564 Connector and/or VA 164 Connector. Segment 5 is dependent on improvements to I-664 (North MMMBT) segment. Consistent with the HRCS SEIS, this facility was assumed to be tolled at $1 per car and $3 per truck. This segment contains bridge and roadway structures within water and landside to federal navigation projects along the James River (Newport News Channel), Elizabeth River, and current operations at the USACE Craney Island Disposal Area. At the present time, the effect would be considered high; however, the status could change to Moderate once the US Army Corps of Engineers Craney Island Disposal Area is identified as end of operational life.

Preliminary design evaluations show that there will be no impact to existing schools, residences, places of worship, cemeteries businesses, or other sensitive resources.

Tidal resources are located within the corridor including along the James River and Elizabeth River. All maintained navigational channels will be avoided by the tunnel design. Water resources, including tidal waters, subaqueous bottom, shallow water habitat, submerged aquatic vegetation, and benthic species were evaluated and detailed in the project appendices. The entire footprint beneath the segment is considered potential hard clam habitat because the entire bottom is composed of sand, mud, or a combination suitable for hard clams. At this time in the evaluation, only rough order of magnitude impacts numbers for tidal resources can be determined; however, as design continues in future studies, detailed impact numbers will be available to determine specific avoidance, minimization, and mitigation measures.

Compliance with Federal (USACE Section 404; Section 408, and Section 10; USCG Bridge; NOAA Incidental Harassment Authorization); state (DEQ Section 401 Virginia Water Protection Permit, VMRC Subaqueous Bottomlands Permit, and VDEQ Virginia Construction General Permit); as well as Local Wetlands Board regulatory requirements would be required, involving extensive coordination. The segment crosses the Elizabeth River and James River (Newport News Channel); therefore, construction activities requiring access to potential barge work zones and safe harbor sites in or adjacent to the

Table 2: Summary Segment Evaluation of Permitting Issues for RCS segments

Permitting Issues	Segment 1a: I-664 north of College Drive	Segment 2: VA 164	Segment 3: VA 164 Connector	Segment 4: I-564 Connector	Segment 5: I-664 Connector
	1a	2	3	4	5
Community impacts (right-of-way, consistency with local plans)					
Sensitive property impacts (noise, community facilities, cultural)					
Environmental Justice (communities with low income and minority populations)					
USACE Section 404 Permit Issues					
USACE Section 408 Permit Issues					
USACE Section 10 Permit					
USCG Bridge Permit					
NOAA Incidental Harassment Authorization					
VDEQ Section 401 Virginia Water Protection Permit					
VMRC Subaqueous Bottomlands Permit					
VDEQ Virginia Construction General Permit					
Local Wetlands Board Permit Issues					
Mitigation Complexity and Cost					
Permit Stakeholder Coordination (i.e. Maritime Stakeholders)					
Effect on other Federal Navigation Projects					
Potential Future Changes in Policy Issues					

Range of Impact

High

Moderate

Minimal

Elizabeth River and the James River (Newport News Channel) will be required. As detailed design continues in future studies, specific avoidance, minimization, and mitigation measures will be evaluated. The regulatory requirements for the construction of Segment 5 are considered high in their complexity due to the identified resources within the corridor.

Summary
Permitting issues for each of the five segments were ranked considering permit and resource impacts, feasibility, timing on a general high-medium-low scale. Table 2 summarizes these evaluations and the fully detailed evaluations for each of the criteria are provided in Appendix B. Segment 2, VA 164 widening, has the fewest permitting issues of the five segments as it follows an existing alignment over land, with only impacts to adjacent parcels and communities. Segment 1a, I-664 widening, crossing and realignment, follows existing alignment for much of its extent, but has substantial changes in Newport News and across the James River that increase its impacts. The other three segments are proposed corridors with significant overwater impacts. They also have the most interaction with existing domestic and military property and security interests at several locations around the Port, especially around the Elizabeth River and Craney Island.

Project Readiness
Overview
Project readiness captures the effort required to move a project through the various phases of development.

The following criteria were used to evaluate and tier a project's readiness:
- Project Independence
- Project Development (Inclusion in local/regional plans)
- Funding Opportunities

Project Independence
Each of the RCS segments will improve the overall regional network. However, benefits are more easily achieved if a segment operates independently or functions as an extension of an ongoing project. Some segments can be phased and constructed with logical termini such that interim benefits are achieved. With the region's endorsement of providing travel time reliability via managed lanes, segments located within the Hampton Roads express lanes project (HREL) will support the completion of the region's vision. Definitions of the Project Independence criteria ratings are as follows.

Operational Independence/Benefits
- High: Segment provides operational benefits with existing logical termini currently under construction
- Moderate: Segment provides operational benefits with programmed improvements
- Low: Project operationally dependent on completion of adjacent project
- Unknown

Phasing Potential
- High: Project segments/phases provide operational benefits and are easily expanded for ultimate build out
- Moderate: Project segments/phases result in minor operational benefits but are easily expanded for ultimate build out
- Low: Project segments/phases do not result in operational benefits and/or create challenges for ultimate build out
- Unknown

Integration with HREL

- High: Project segments/phases will extend the HREL that is currently underway
- Moderate: Project segments/phases will create a future connection to the HREL network
- Low: Project segments/phases will not include HREL
- Unknown

Project Development

A key step in the project development process is gaining consensus in the regional planning process, which involves prioritizing projects using a wide range of inputs resulting in a project score used to rank regional projects and applying various funding sources to develop the region's fiscally constrained plan. Documented support from stakeholder engagements and municipal and county policymakers will improve project ranking. Given the complexity of the data to rank projects, some projects require independent studies to identify critical path items or challenges that need to be addressed to move the project forward. Definitions of the Project Development criteria ratings are as follows.

Adopted by a regional agency (i.e., In one or more existing LRTPs)

- High: Included in more than one LRTP and within the constrained model
- Moderate: Included in the LRTP vision plan
- Low: Not included in long-range planning efforts
- Unknown

Stakeholder / Review Agency Engagement (Excluding SEIS effort)

- High: Documentation of support by local, state, and federal agencies
- Moderate: Neither support nor opposition documented
- Low: Documentation of opposition by local, state, and/or federal agencies
- Unknown

Advancement of Project Study

- High: Project segment or phase is independently being studied or a standalone study has been completed within the last three to five years
- Moderate: Project segment or phase has been previously studied or is part of another study such as an interchange modification report
- Low: No activity has occurred beyond the SEIS
- Unknown

Funding Opportunities

All segments included in the RCS Phase II will have significant costs and the current regional needs far exceed available funding for traditional financial sources. Therefore, it is important to identify projects that may be able to take advantage of federal, state, or unique grant opportunities based on national significance of the facility and/or adjacent land use it supports. The Funding Opportunities criteria ratings are as follows.

HRTAC – Congestion Benefit (Transit not an option)

- High: Eligible; capacity improvements provide significant level of congestion relief
- Moderate: Unknown
- Low: Non-Eligible; capacity improvements provide non-congestion benefits

SMART SCALE High Priority Project

- High: Meets VTrans4 and is a High Priority need
- Moderate: Meets VTrans need
- Low: Does not meet VTrans need
- Unknown

Infrastructure Investment and Jobs Act (IIJA) Grant Funding
Funding not clearly defined at the time of evaluation; preliminary criteria identified two objectives: potential freight/rail crossing funding, and transit funding:

- High: N/A – not defined at this time
- Moderate: Priority – direct benefit to currently identified objectives
- Low: Non-Priority – no or indirect benefit to currently identified objectives
- Unknown

Segment Evaluations

Segment 1a (I-664 Widening north of College Drive)

This segment will add capacity between the I-64/I-664 interchange and College Drive. The segment provides the highest independent utility, but also connects to regionally significant projects at each terminus, both of which are either currently under construction or fully funded. The project can easily be constructed in multiple phases between interchanges and will support the HREL expansion project.

The segment has not been studied on a regional level and is only included in the HRTPO 2045 Vision Plan, and not the HRTPO fiscally constrained 2045 LRTP. However, the segment is eligible for Hampton Roads Transportation Accountability Commission (HRTAC) and SMARTSCALE funding because of the levels of congestion benefit and is included as a Corridor of Statewide Significance (COSS) in VTrans.

Segment 2 (VA 164 Widening)

This segment has independent benefit, but full benefits are realized on the completion of the I-664 widening and VA 164 connector projects. This segment is not included in the HREL network.

Segment 2 is included in the fiscally constrained 2045 LRTP. As discussed in the Comments and Responses section that follows, the City of Portsmouth is currently opposed to the widening based on potential impacts to the residents and local businesses that may include property takes and impacts to

[4] VTrans, is Virginia's statewide transportation plan. VTrans lays out the overarching vision and goals for transportation in the Commonwealth and plans to achieve those goals.

existing infrastructure. VA 164 is currently undergoing a detailed corridor study between Towne Point Road and the interchange with US58 just east of the bridge over the Western Branch of the Elizabeth River. The study will include detailed interchange analysis to address safety and congestion and identify recommendations to be included into the VDOT Six-Year Improvement Program. The study is being led by VDOT and stakeholders include the City of Portsmouth, the US Navy, Port of Virginia, US Coast Guard, Norfolk Southern Railroad, USACE, and FHWA.

The project is included in the HRTAC Plan of Finance and is eligible for SMART SCALE funding. Additionally, VA 164 improvements meet the criteria for IIJA grant funding designated for freight and maritime projects.

Segment 3 (VA 164 Connector)

The project will provide new connections to support east/west travel within Hampton Roads; however, Segment 3 relies on completion of VA 164 widening and/or I-564/I-664 connectors for operation. Based on the location of the segment, it cannot be phased and requires bundling with Segment 4 (I-564 Connector) to provide a logical terminus. Additionally, the segment is not included within the regional HREL project.

Segment 3 is included in the HRTPO 2045 Vision Plan, but not the fiscally constrained 2045 LRTP. However, a Craney Island Access Road study is currently funded (LRTP project no. 2045-604) and is intended to take a detailed look at constraints with the project corridor and address stakeholder concerns from the U.S. Navy and the USACE. The City of Portsmouth has been in opposition to Segment 3 as documented in the 2016 HRCS SEIS comments.

In Hampton Roads, SMART SCALE scoring is heavily weighted on congestion benefits. Current criteria favor improvements to existing overcapacity facilities that are captured in traditional metrics as opposed to system benefits associated with new facilities. While Segment 3 is a regionally significant roadway and eligible for HRTAC funding, because Segment 3 is a new facility, the congestion benefit is not as competitive as other existing regionally significant projects.

Segment 4 (I-564 Connector)

Like Segment 3, the I-564 connector is reliant on adjacent projects (VA 164, I-664 Connectors) to realize full benefit. Based on the location of the segment, it cannot be phased and requires bundling with Segment 3 (VA 164 Connector) or Segment 5 (I-664 Connector) to provide a logical terminus. Additionally, the segment is a water crossing and faces phasing and stakeholder challenges.

Segment 4 is currently included in the 2045 Vision Plan but not the fiscally constrained HRTPO 2045 LRTP.

The segment is a new facility. In Hampton Roads, SMART SCALE scoring is heavily weighted on congestion benefits. Current criteria favor direct improvements on existing overcapacity facilities that are captured in traditional metrics as opposed to system benefits associated with new facilities. While Segment 4 is a regionally significant roadway and eligible for HRTAC funding, the congestion benefit is not as competitive as other existing regionally significant projects.

Segment 5 (I-664 Connector)

Similar to Segments 3 and 4, the I-664 Connector is reliant on adjacent projects (I-564 Connector) to realize full benefit. Based on the location of the segment, it cannot be phased and requires bundling with Segment 4 (I-564 Connector) to provide a logical terminus. Additionally, the segment is a water crossing and faces phasing and stakeholder challenges.

Segment 5 is currently included in the 2045 Vision Plan but not the fiscally constrained 2045 LRTP.

The segment is a new facility. In Hampton Roads, SMART SCALE scoring is heavily weighted on congestion benefits. Current criteria favor direct improvements on existing overcapacity facilities that are captured in traditional metrics as opposed to system benefits associated with new facilities. While Segment 5 is a regionally significant roadway and eligible for HRTAC funding, the congestion relief is not as competitive as other existing regionally significant projects.

Table 3: Segment Evaluation of Readiness for RCS Segments

Readiness Issues	Segment 1a: I-664 north of College Drive	Segment 2: VA 164	Segment 3: VA 164 Connector	Segment 4: I-564 Connector	Segment 5: I-664 Connector
	1a	2	3	4	5
Project Independence					
Independence from other segments to achieve operational benefits					
Phasing Potential					
Integration with HREL					
Project Development					
Adopted by a regional agency					
Stakeholder / Review Agency Engagement					
Advancement of Project Study					
Funding Opportunities Eligibility					
HRTAC					
SMART Scale High Priority Project					
Infrastructure Investment and Jobs Act (IIJA) Grant Funding					

Range of Readiness

Least
Moderate
Most

Summary

Readiness for each of the five segments was rated on level of project development, eligibility for funding opportunities, and project independence. Segment 1a rates better than Segment 2, based on its extent of connecting Hampton, Newport News and Suffolk, and its status in state and regional funding as part of the I-664 corridor. The three new “Connector” segments (Segments 3, 4 and 5) score worse than the existing segments, in part because they require connections to other segments to be ready for construction, which scores low on independence, and because of overall lower readiness with respect to funding opportunities eligibility.

Construction Complexity

Overview

A segment’s construction complexity will have a direct impact on its ability to be implemented in a successful manner to benefit the region. The evaluation of construction complexity considered several factors that would affect the cost, time, and effort to implement a project. These same considerations were incorporated into the approach to the segment cost estimates described in Chapter 3. The cost estimates were the primary source of construction complexity in the tiering evaluation, and therefore the qualitative construction complexity results presented in this section do not appear in the Tiering discussions in later chapters.

Methodology

All segments were evaluated for construction complexity and drivers of cost and time impacts and assigned one of the following ratings:

- Minimal: No or very minor impacts that should be easily resolved as the project progresses.
- Moderate: Impacts that are consistent with significant projects of this scale and can be resolved/mitigated. Probable adverse impact to outside entity (i.e., local, state, federal agency, major business operation).
- High: Significant impact to the constructability of the segment that will require considerable efforts or resources to resolve. Likely to result in an adverse impact to outside entity.

Design and Construction

This group of measures addresses the complexity of a segment’s feasibility to be constructed given the circumstances as understood at the time of evaluation. Measures that may change over time are so indicated in the narrative that follows. The following issues were considered in evaluating a segment’s design and construction complexity:

- New construction of bridges as well as large or complex structures and widening existing structures.
- The need for a new tunnel.
- Constrained work areas.
- Construction within the bay adjacent to Craney Island Dredged Material Management Area (CIDMMA).
- Potential for poor soil conditions, including contaminated areas within corridors.
- Property availability for stormwater management facilities.

- Road\Bridge construction on CIDMMA.
- Construction access and mitigating potential negative impacts to existing infrastructure.
- Subsurface utilities coordination.

Constraints

Various constraints were evaluated for the segments. Examples included regional utilities, landfills, military installations, and USACE activities. Also, specific concerns indicating issues with the 2016 Hampton Roads Crossing Study SEIS – Alternatives Technical Report (2016 HRCS)[5] and/or RCS segments expressed by stakeholders during the RCS project were regarded as constraints in the evaluation. The following were considered in evaluating a segment's constraint issues:

- Local government or agency constraints or identified concerns.
- State agency constraints or identified concerns.
- Regional entity constraints or identified concerns.
- Federal entity, including DOD facilities, railroad coordination and secured construction access constraints or identified concerns.
- Design Dependency of Other Mandated Segments: Each segment was reviewed against other mandated segments to determine if one segment will impact the design of or impose constraints on other. For example, what limitations does the location of the tunnel island for an I-564 Connector have on I-664 and the VA 164 Connector.
- Traffic Disruptions: This category evaluates construction impacts on existing travel patterns and travel times.

Right of Way Cost

Right-of-Way acquisition is another measure of complexity applied to each segment. This was measured by the number of impacted parcels for each segment.

Mitigation of Environmental Factors

This measure assessed each segment for the challenges in mitigating environmental factors such as noise and wetlands impacts as documented in the Permitting Issues evaluation.

Timing Considerations

Regionally significant projects must be able to be reliably scheduled so that funding pipelines and adjacent projects are not disrupted by setbacks from the constructability issues identified in this evaluation. While these considerations are presented as notes for each category (details provided in the Step 1 Qualitative assessment), below is a general range of how the timing impacts were prepared:

- Minimal: No likelihood of timing or schedule impacts.
- Moderate: Timing and schedule likely to be impacted by the constructability issue but significant impacts are likely mitigated. There may be some uncertainty in the timing and schedule of the segment's implementation.

---

[5] Virginia Department of Transportation, *Hampton Roads Crossing Study SEIS – Alternatives Technical Report,*(2016) https://www.hrbtexpansion.org/documents/201608/finaltechnicalreports/alternatives_technical_report.pdf

- High: Significant challenges are foreseen with additional resources needed to overcome the issue. Project likely limited in its implementation due to factors associated with the segments itself or limitations from outside factors beyond the project's control.

Segment Evaluations

Segment 1a (I-664 Widening north of College Drive)

The alignment at the southern end of Newport News was adjusted to avoid impacting a proposed Hampton Roads Sanitation District (HRSD) facility adjacent to Harbor Road. The new alignment will require widening the existing tunnel island and constructing a new tunnel and bridge parallel to the existing tunnel and bridge across the James River. This new alignment avoids the proposed location and takes into consideration HRSD's proposed alignment for a new force main crossing between Suffolk and Newport News.

It is anticipated that seven overpass bridges will need widening. The portion of I-664 just south of the 25th/26th/27th street interchange is entirely on structure up to the MMMBT and will need to be widened. Modifications to existing bridges over I-664 would be necessary to accommodate access to I-664 express lanes pending determination of access locations.

Construction adjacent to the Dominion Terminal Associated coal shipping facility will be constrained due to the proximity of rail lines to the existing and proposed alignment of I-664. The work area is also constrained by the surrounding businesses from 0.75 miles east of Aberdeen Road to the Aberdeen Road interchange.

Based on the preliminary design evaluation, an estimated 60 parcels within the corridor were identified as potentially being impacted in some manner. Of the 60 parcels, half were identified as being impacted only temporarily and will be restored following the acquisition of temporary construction easements. Four commercial properties were identified as potentially requiring full acquisition. The remaining parcels were identified as needing partial right-of-way or easement acquisition. One small outbuilding or shed was identified as being impacted. No residential properties were identified as complete acquisitions at this planning level of analysis.

Approximately 3,330 feet of existing noise wall will need to be replaced. Changes in the surrounding area, due to construction and associated noise, may require additional noise walls to be included in the project.

Segment 2 (VA 164 Widening)

There is significant concern from the City of Portsmouth regarding potential impacts to the residents near the project, including impacts to local businesses, parcel takes to residents adjacent to VA 164, construction equipment negatively affecting the existing infrastructure and impacts to the City's stormwater system. The location of the rail within the median on lease to Commonwealth Railway from VDOT will require additional coordination.

The proposed widening shown in the 2016 Hampton Roads Crossing Study SEIS – Alternatives Technical Report (2016 HRCS)[6] is in the median that includes two Commonwealth Railway railroad tracks. The study team has proposed constructing the widening to the inside up to the Commonwealth Railway's leased area with most of the widening to the outside. Retaining walls and possibly a design exception for smaller inside shoulders should be considered to avoid impacting adjacent residential and commercial parcels.

The proposed widening from I-664 to Cedar Lane would connect to the proposed VA 164 Connector. The eastern terminus of the VA 164 widening may be constrained by the design needs of the VA 164 Connector. Additionally, the capacity needs from implementation of the VA 164 Connector may also impact the design of the widening for VA 164. The eastern terminus of the VA 164 widening, should it advance prior to the VA 164 Connector, should be studied to determine a logical terminus of an independent project.

Given the constrained environment, it is anticipated that traffic will be severely and adversely impacted during construction regardless of whether the widening is toward the median or shoulder. Single lane closures for extended periods may be likely.

Approximately 14 parcels may require partial, modest right-of-way acquisition of some manner. The acquisitions are proposed small takes to move back noise walls that might be avoided with the design waivers for smaller shoulders and/or retaining walls. In addition to the permanent acquisitions, approximately 40 parcels will require temporary construction easements.

Noise walls are present on both sides of VA 164 for the length of the proposed widening and will need to be replaced.

Segment 3 (VA 164 Connector)

The 2016 SEIS alignment bisected the current Portsmouth landfill and passed to the east of a significant U.S. Navy fuel depot and proposed port expansion at Craney Island. In order to accommodate a planned expansion of the fuel depot, the VA 164 Connector was realigned to the west to meet U.S. Navy force protection requirements. A visual wall has been added to the new location to comply with the U.S. Navy's visual setbacks.

The overwhelming majority of the VA 164 Connector is on structure. The southern terminus and portions of the interchange ramps with VA 164 may be on grade. The use of structures is necessary given the alignment of the low-lying wetland areas between VIG and Churchland High School, traversing a tributary of the Elizabeth River and the uncertain material deposited into the Portsmouth Landfill and the CIDMMA facility. Determining the suitability of construction over/through the Landfill and CIDMMA facility at the end of its lifecycle will be a challenge and will require significant resources to resolve. It is likely that the only feasible time for the VA 164 Connector to be constructed is following the end of the USACE's ongoing project at CIDMMA (See Appendix C). The latest approximate projection for that is 2050. However, this may be extended by technological advances at the site.

[6] Virginia Department of Transportation, *Hampton Roads Crossing Study SEIS – Alternatives Technical Report,*(2016) https://www.hrbtexpansion.org/documents/201608/finaltechnicalreports/alternatives_technical_report.pdf

The interchange with VA 164 will require replacing the bridges at Cedar Lane and at the entrance to VIG and tying into VA 164 at these locations. These impacts will be mitigated using a detailed maintenance of traffic plan at the time of construction that considers safety for motorists, bicyclists, pedestrians, workers, enforcement/emergency officials, and equipment as referenced in VDOT's Work Area Protection Manual.

The alignment shown for VA 164 Connector is directly adjacent to the expansion of the Port of Virginia at Craney Island. The alignment poses challenges in ensuring access to the expanded facility given its proximity. There is a desire to connect the Port to VA 164 Connector to access the regional network, but that connection's feasibility remains unclear. This challenge will require either to resolve the conflict with the landfill or delay the construction until the end of the landfill's lifespan. The vertical alignment was evaluated considering the landfill and CIDMMA facilities. Future fill heights at the landfill were assumed to be 60 feet above existing ground and at CIDMMA the future ground was assumed to be at an elevation of approximately 90 feet.

Approximately 30 parcels are projected to require right-of-way or easement acquisitions. It is anticipated that eight parcels (1 government, 3 industrial\commercial and 4 vacant) will be required to construct this segment. Most of the remaining parcel impacts will require minor acquisitions for right of way. No complete residential relocations are anticipated at this planning level of analysis.

The segment is projected to impact over 30 acres of wetlands. This will require either the purchase of wetland mitigation banking credits or remediation.

Segment 4 (I-564 Connector)

The SEIS alignment landside portion of the I-564 Connector required bridging over Hampton Boulevard and included a single point urban interchange (SPUI) for access to the port and U.S. Navy facilities. Both will be in constrained areas making construction difficult. The vertical alignment was reviewed by the U.S. Navy and was determined unacceptable for the roadway over the proposed SPUI interchange to be higher than the U.S. Navy's Gate 6 installed with the I-564 Intermodal project. The RCS Segment 4 alignment has been adjusted to bridge Hampton Boulevard along with the Intermodal Connector to the east and then begin descending into the tunnel under a modified interchange to the east of the pier, reducing the height of the alignment and restricting the visibility to Gate 6. However, the proximity of the SPUI to the proposed tunnel opening will also be a challenge.

The interchange ramps between I-664 Connector and VA 164 Connector will be entirely on structures since they are over water. The proposed SPUI for access to the port and U.S. Navy facilities will require significant coordination to design and implement.

Pier 4 at the Port of Virginia will need to be removed to accommodate the eastern opening of the tunnel for I-564. The tunnel is needed to go under the Elizabeth River to maintain the channel for access to the Port and federal facilities. Resolving the conflict with the pier will require significant resources and its resolution is uncertain.

The alignment is directly adjacent to U.S. Navy piers that support various vessels. It is unclear at this time what impacts and limitations this alignment will incur in addressing the U.S. Navy's needs. Resolving the conflicts with the U.S. Navy facility will require significant resources and coordination. It is unclear whether these challenges can ultimately be resolved.

I-564 Connector will need to be constructed with the I-664 Connector and/or VA 164 Connector. If a connection with VA 164 Connector is selected, I-564 Connector will ensure the two segments can be connected and constructed safely. Additionally, a connection to I-664 Connector will require connecting to the height of I-664 Connector over the water. This will directly impact the design constraints of the I-564 Connector. The I-564 Connector cannot be constructed by itself and must be constructed with either or both I-664 Connector or VA 164 Connector so that it is connected to the regional network.

Approximately eight parcels are projected to require full, partial, or temporary right-of-way acquisition.

Table 4: Segment tiering of Construction Complexity for RCS segments

Construction Complexity	Segment 1a: I-664 north of College Drive.	Segment 2: VA 164	Segment 3: VA 164 Connector	Segment 4: I-564 Connector	Segment 5: I-664 Connector
	1a	2	3	4	5
Design & Construction					
Bridges	High	Minimal	High	High	High
Tunnels	High	N/A	N/A	High	N/A
Constrained Work Areas	High	High	High	High	Moderate
Constraints of:					
Local Government or Agency	Moderate	High	High	Minimal	Minimal
State Agency	Minimal	Minimal	High	High	Minimal
Regional Entity	High	Minimal	Minimal	Minimal	Minimal
Federal Entity	Minimal	Minimal	High	High	High
Design Dependency of Other Mandated Segments	Minimal	Moderate	High	High	High
Traffic Disruptions	Moderate	High	Minimal	Minimal	Minimal
Right of Way Cost					
Acquisitions	High	Moderate	High	Minimal	N/A
Mitigation of Environmental Factors					
Noise	Moderate	Moderate	N/A	N/A	N/A
Wetlands	Minimal	Minimal	High	N/A	Minimal
Timing Considerations					
Timing and Schedule	Minimal	Minimal	High	High	High

Range of Complexity
High
Moderate
Minimal

Segment 5 (I-664 Connector)

The entirety of the I-664 Connector will be on structures since it is over water. This includes the interchange ramps with I-664, I-564 Connector and VA 164 Connector. The connection with I-664 is further complicated by the potential complexity of connecting to both the general purpose and express lanes, as described in Chapter 3.

The proximity to CIDMMA may restrict some of the working area. Additionally, the interchange ramps with I-664 may pose a challenge considering the need to work adjacent to the active roadway. Access to the CIDMMA site will need to be maintained as long as the site is open, and design will need to accommodate this.

I-664 Connector cannot be constructed by itself and must be constructed with I-564 Connector so that it is connected to the regional network.

Summary

Construction complexity informed constructability and construction cost estimating presented in Chapter 3. The qualitative summary for construction complexity tracks design complexity, property/security constraints, right-of-way acquisition needs, and disruptions to traffic to develop a similar qualitative ranking of each segment. As shown in Table 4, widenings of existing Segments 1a and 2 are less complex than new Segments 3, 4, and 5, but have more interactions with community and existing traffic flows. New Segments like 3, 4, and 5 also have more interactions with prior claims from federal and private entities.

Comments and Responses

Comments were received from stakeholders after both the April 2022 and September 2022 presentations of the qualitative analyses. Stakeholders with comments included the city of Portsmouth, the USACE, and Naval Station Norfolk. The detailed comments and the responses are included in Appendix A. A description of additional related coordination with City of Portsmouth is provided in the text box below.

VA 164 Widening and the City of Portsmouth

The City of Portsmouth sent comments to the study team in May of 2022. Their primary concerns centered around the VA 164 widening which falls mostly within the City of Portsmouth. The City has shared their opposition to the widening throughout the study. (See Appendix A.) Part of the apprehension is due to the constrained corridor and possible impacts to adjacent residential and commercial parcels. The City also noted the potential impacts to the Ebony Heights Park stating, “Any project that takes away from recreational opportunities within Portsmouth communities will be met with resistance." Additional uneasiness results from possible environmental justice issues and impacts to the nearby community. These concerns were documented in the Qualitative Analysis under Permitting Issues, Socioeconomic Impacts.

In response to the City’s concerns, HRTPO and the project team met with city staff members to discuss the widening of VA 164. The RCS team shared the assumptions for the RCS alignment including the opportunities and limits of encroachment of the rail corridor in the center of VA 164. The city staff stated their assumption that any widening to VA 164 could require managed (i.e., separated toll) lanes considering the agreements between VDOT and Elizabeth River Crossings. HRTPO discussed the requirements of the agreement with HRTAC representatives and did not agree with the City’s assessment on the basis that the VA 164 widening by itself or with the I-664 widening would not create a crossing competitive to the Elizabeth River Crossing tunnels. Nevertheless, the RCS team did run a preliminary design with a managed lane separation buffer to demonstrate that the widening could be built with minimal to no impact to adjacent properties. This scenario does not appear likely but was run as a “worst case” situation. In addition to review of the construction footprint of the draft design, future studies and design would have the opportunities to decrease the impacts with design waivers/exceptions for possibly smaller shoulders and/or the use of retaining walls along the outside of the project.

The city staff recommended that additional measures could be taken at a later stage to expedite construction time. These expedited measures may increase the cost of the overall project but may alleviate impacts to the adjacent communities and the negative impacts of construction on residents and businesses in the project vicinity.

Chapter 3: Phase III Step 2 Cost Estimation

Introduction

Previously, the memo Summary of Mandated Preliminary Alternatives, dated April 6, 2020, summarized the mandated segments to be reviewed under the RCS. The mandated segments summarized were those not selected for funding from the 2016 Hampton Roads Crossing Study SEIS – Alternatives Technical Report (2016 HRCS)[7]. The 2016 HRCS included cost estimates for construction, right-of-way, and preliminary engineering (PE). This chapter summarizes the revisions to the cost estimates for the mandated segments from the 2016 HRCS.

Updating & Revising 2016 HRCS Cost Estimates

Several adjustments were made to the previous cost estimates in producing the updated cost estimates of the mandated segments. Below are the listed adjustments:

1) The project data from the prior estimates was input into the latest version of the VDOT Project Cost Estimating System (PCES). The 2016 HRCS used version 7.1 of PCES spreadsheet tool and version 9.1 was used for the final updated estimates.
2) Project elements included in the estimate as lump sum items were inflated 19% from the previous estimate year of 2016 to the base estimate year in the spreadsheet of 2022.
3) The spreadsheet tool was adjusted to provide costs for Fiscal Year 2022.
4) The variable for percentage of PE work to be performed by consultants was revised from 30% to 80%. It is the opinion of the RCS consultant team that with such large projects, it is likely the overwhelming majority of PE work will be done by consultants and the PE estimates should be higher to reflect this.
5) The right-of-way estimates were carried forward from the 2016 HRCS study and were inflated 19% to FY 2022 and included in the PCES tool. The tool does not automatically inflate the right-of-way values.

Summary of Alignment Segments

The Build Alternatives from the 2016 HRCS were composed of the alignment segments listed in Table 5 below. These numbers correspond to the alignment segments shown in Figure 7 extracted from the 2016 HRCS SEIS. The mandated segment of I-664 is comprised of segments 1-7. Segments 1-3 and the southern portion of segment 4 have been included in the environmental assessment with the Bowers Hill Interchange Study. This segment is designated as I-664 1B South – (Bowers Hill to College Drive). This segment will not be discussed in this report. I-664 1A North – (College Drive to I-64 in Hampton) is comprised of segments 4 (north of College Drive)-7.

Segments 10, 11, 13 and 14 are the I-564 Connector, I-664 Connector, VA 164 Connector and VA 164, respectively. Segment 12 is the interchange between the I-564 and VA 164 Connectors and is included in

[7] Virginia Department of Transportation, *Hampton Roads Crossing Study SEIS – Alternatives Technical Report* (2016)

the estimate for VA 164 Connector. This was initially separated out due to the different combinations of segments in the 2016 HRCS. The detailed segment concept drawings are available at the Regional Connectors study resources page.

Table 5: List of segments from the 2016 HRCS

Number	2016 HRCS SEIS Segment
1*	I-664 from US 58 (Bowers Hill) to I-264
2*	I-664 from VA 164 to US 58 (Bowers Hill)
3*	I-664 and VA 164 Interchange
4*	I-664 from I-664 Connector to VA 164
5*	I-664 from Terminal Avenue Interchange to I-664 Connector
6*	I-664 Terminal Avenue Interchange
7*	I-664 from I-64 to Terminal Avenue Interchange
10	I-564 and I-564 Connector
11	I-664 Connector including I-664 Interchange
12	I-564 Connector, I-664 Connector, and VA 164 Connector Interchange
13	VA 164 Connector
14	VA 164

* Segments 1 – 7 from the 2016 HRCS SEIS comprise the I-664 segments within the RCS study

Figure 7: Map of segments from the 2016 HRCS

RCS Cost Estimates

Below in Table 6 are the revised (FY 2022) cost estimates for the RCS segments 1A-5.

Table 6 – Updated (FY 2022) Cost Estimates for Mandated RCS Segments

Segment	Construction Estimate	Preliminary Engineering Estimate	Right-of-way & Utilities Estimate	Estimated Total Cost
1A	$3,571,331,049	$399,989,077	$145,610,235	$4,116,930,361
2	$153,338,993	$17,173,967	$8,148,428	$178,661,388
3	$694,083,496	$77,737,352	$66,986,506	$838,807,354
4	$3,038,698,999	$340,334,288	$38,435,612	$3,417,468,899
5	$1,390,979,848	$166,917,582	$106,663,488	$1,664,560,918

Table 7 – 2016 HRCS Segment Total Cost

Segment	Total Cost Estimate
1	$53,600,000
2	$195,100,000
3	$123,200,000
4	$423,600,000
5C	$3,900,000,000
5D	$2,500,000,000
6C	$356,000,000
6D	$284,600,000
7C	$511,200,000
7D	$432,800,000
8	$64,100,000

Segment	Total Cost Estimate
9	$3,200,000,000
10BD	$2,600,000,000
10C	$4,500,000,000
11C	$1,500,000,000
11D	$1,100,000,000
12B	$229,200,000
12C	$577,100,000
12D	$514,300,000
13	$407,700,000
13	$119,500,000

RCS Segment Cost Estimate Assumptions

Segment 1a (I-664 Widening north of College Drive): Estimated as an Urban Principal Arterial System (UPAS) (GS-5) Interstate with a 70 mph design speed. The length of the project is 11.68 miles with 5.4 miles of two-lane widening and 5.5 miles of additional lanes and 4.9 miles of ramps and loops with 0.5 miles of additional lanes. These assumptions include the incorporation of express lanes. A new tunnel west of the existing tunnel and bridges west of the existing bridges will carry two new general purpose and two express lanes southbound and the existing tunnels and bridges will be converted to two general purpose and two express lanes northbound. The proposed widened eight-lane section in Suffolk and through Newport News and Hampton would include two general purpose lanes and two express lanes in each direction. The primary driver are the tunnel costs (approximately $1.1 billion) and the engineering and construction of 26 bridge structures, new and widened (approximately $750 million.) A 40% contingency of roughly $738 million was added to cover risks and other items. $ 137.5 million was added in consideration of right-of-way costs.

Segment 2 (VA 164 Widening): Estimated as an UPAS (GS-5) Interstate with a 70 mph design speed. The length of the project is 2.51 miles with 2.3 miles of two-lane widening and 1.7 miles of additional lanes and 1.4 miles of ramps and loops. $30 million is included in the roadway costs to cover railroad coordination and the possible need for retaining walls to minimize impacts to both the railroad and adjacent residential properties. A 40% contingency of roughly $26 million was added to cover risks and other items. $ 7.7 million was added in consideration of right-of-way costs.

Segment 3 (VA 164 Connector): Estimated as an UPAS (GS-5) Interstate with a 70 mph design speed. The length of the project is 6.25 miles with 1.9 miles of new four-lane roadway on new alignment. This segment also includes 0.5 miles of two-lane widening and 0.5 miles of additional lanes and 5.9 miles of ramps and loops with 2.3 miles of additional lanes. The primary driver is the engineering and construction of 16 bridge structures, mostly new and some widened (approximately $349 million) which account for 43% of the total project costs. The alignment through these facilities was assumed to be on structure. However, the cost analysis does not consider further height adjustment necessary to accommodate the Portsmouth Landfill nor the CIDMMA facility above 60 feet. A 40% contingency of the roadway items, roughly $46 million, was added to cover risks and other items. $63.2 million was added in consideration of right-of-way costs.

Segment 4 (I-564 Connector): Estimated as an UPAS (GS-5) Interstate with a 70 mph design speed. The length of the project is 2.66 miles with 1.3 miles of new four-lane roadway on new alignment. 1.3 miles of ramps and loops are also included. The primary driver are the tunnel costs (approximately $1.7 billion.) A 40% contingency of roughly $658 million was added to cover risks and other items. $ 33.3 million was added in consideration of right-of-way costs.

Segment 5 (I-664 Connector): Estimated as an UPAS (GS-5) Interstate with a 70 mph design speed. The length of the project is 2.75 miles of new two-lane bridges connecting I-664 to I-564 Connector and/or VA-164 Connector on new alignment. The primary driver is the engineering and construction of 15 new bridge structures (approximately $1.1 billion) which account for 70% of the total project costs. A 40% contingency of the roadway items, roughly $2.3 million, was added to cover risks and other items. $100.7 million was added in consideration of right-of-way costs.

As currently conceived, the proposed improvements to I-664 (Segment 1a) include both general purpose lanes and express lanes with positive separation. If constructed, the I-664 Connector (Segment 5) would interchange with Segment 1b over the water. When and if the I-664 Connector begins the next stage of development, a value engineering analysis will need to be conducted to determine the preferred configuration of access between the connector and I-664. For example, one decision could be to only connect Segment 5 to the general-purpose lanes of I-664 which means that connector traffic would not have access to the express lanes until some point elsewhere along I-664 by way of a slip-ramp, for example. This lower-cost proposal would involve the construction of four ramps to complete this over-water connection. Alternatively, a more complex connection would include dedicated ramps to and from both the I-664 general purpose lanes and the express lanes, which would necessitate a total of eight ramps over the water. The cost to connect directly to the express lanes is estimated to increase the Segment 5 cost by $290 million. As noted above, this solution would need to be tested for engineering feasibility and determined to be warranted from a value engineering standpoint. For the purpose of this Regional Connectors Study, the lower cost and lower impact concept was assumed.

Chapter 4: Definition of Bundles

To evaluate the RCS segments in the regional models for congestion and economic impacts, the segments were combined into "Bundles" for analysis. The study team created four segment bundles for use in Phase III analysis, as shown in Figure 8. The four bundles were approved by the Joint Steering (Policy) Committee and Working Group at their meeting on April 26, 2022.

Bundle A: Widening of I-664 north segment between College Drive in Suffolk and I-64 in Hampton (Segment 1a only).

Bundle B: Widening of I-664 north segment between College Drive in Suffolk and I-64 in Hampton as well as widening of VA 164 through Portsmouth from I-664 to Cedar Lane (Segment 1a & Segment 2).

Bundle C: Widening of I-664 north segment between College Drive in Suffolk and I-64 in Hampton as well as new construction of I-564 Connector and new construction of I-664 Connector (Segment 1a, Segment 4, and Segment 5).

Bundle D: Widening of I-664 north segment between College Drive in Suffolk and I-64 in Hampton as well as widening of VA 164 through Portsmouth from I-664 to Cedar Lane as well as new construction of interchange and connection with VA 164 Connector and I-564 Connector. (Segment 1a, Segment 2, Segment 3, and Segment 4).

Bundling the segments is necessary to capture the inter-relatedness of the proposed projects. For example, segments 3, 4, and 5 rely on the construction of other segments. The bundling approach also enables comparisons of the aggregate benefits of segment combinations; however, comparisons of the individual segment congestion and economic benefits require some inferences because the segments cannot be tested one at a time. These inferences use incremental impacts as well as direct comparisons of cost-effectiveness that compare the congestion and economic benefits of each bundle scaled to the combined cost of each bundle's segments.

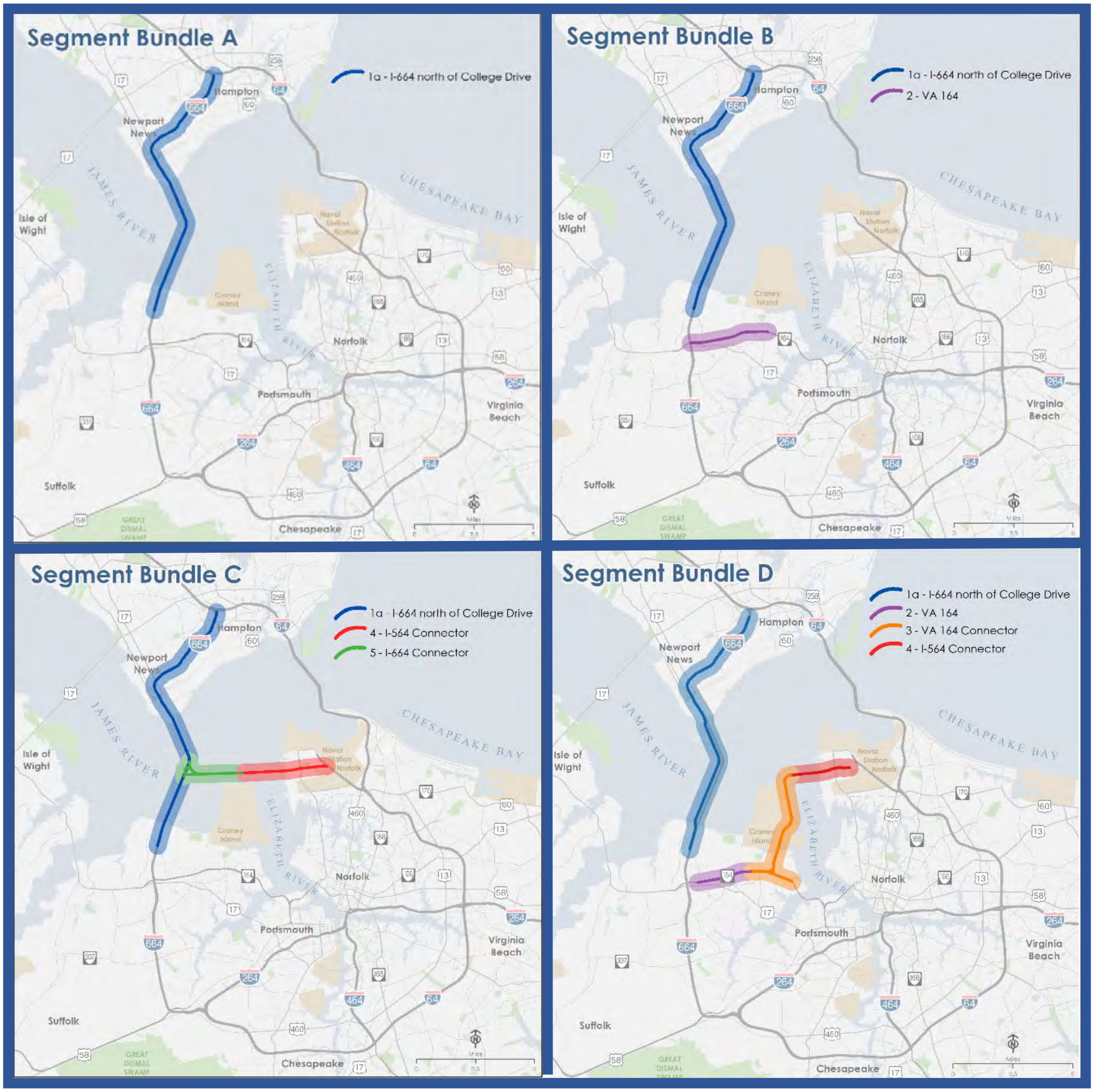


Figure 8. Hampton Roads Regional Connectors Study Segment Bundles

Chapter 5: Step 2 Congestion and Economic Benefits

Congestion Benefits

One of the centerpieces of this study is the measurement of transportation benefits associated with the inclusion of the RCS segments using a project-oriented travel model (RCS Model). This travel model, a derivative of the HRTPO regional travel model, is sensitive to congestion, travel time reliability, and accessibility in the context of scenario planning, focusing on accuracy for cross-harbor travel. This model is also responsive to the reaction of travelers of different income levels to specific scenarios, enabling the evaluation of economic impacts. The RCS Model was re-estimated and calibrated based on 2015 observed data, 2009 National Household Travel Survey (NHTS) data for Virginia, and GPS/mobile device origin-destination data from Streetlight Data. The final validation was based on 2017 observed average weekday daily traffic counts provided by VDOT. The travel model provides estimates for 2017 and 2045 based on 2015 household and employment data and 2045 land use forecasts provided by HRTPO.

Using the RCS Model, the Consultant Team evaluated segment bundles by performance measures characterizing congestion relief compared to the 2045 Baseline land use scenario with the 2045 RCS No Build network. The 2045 No Build transportation network was established by the RCS Joint Steering (Policy) Committee and includes the Existing plus Committed (E+C) network[8] plus any selected portions of the mandatory segments that overlap with the HRTAC Plan of Finance for 2045. All segment bundles assume the MMMBT 4+4 design option (four general-purpose and four express lanes) only. Performance measures include a combination of regional and location-specific measures reflecting the AM and PM peak period, as well as average weekday travel conditions. Regional congestion relief performance measures are direct model outputs and do not require any traffic analysis. These regional performance measures reflect average weekday conditions and include:

- Harbor crossing volumes
- Vehicle-Miles Traveled (VMT)
- Vehicle-Hours Traveled (VHT)
- Delay
- Average congested speed

Location-specific measures include volume, congested speed, and level of service.

[8] The Existing + Committed network includes all projects that are programmed for funding at the time the network is established. This threshold does not include all projects in the constrained 2045 LRTP, but rather those with dedicated funding included in the VDOT Six-Year Improvement Program and the HRTPO Transportation Improvement Program.

Summary of Regional Congestion Results

- Total regional travel levels — vehicle miles of travel (VMT)— are similar for the 2045 baseline and all four bundles, but vehicle hours of travel are reduced with all four bundles. This is a result of the reduction in congestion.
- Additional harbor crossing capacity reduces travelers' delay (i.e., the additional time spent driving due to congested conditions) by 10-14% daily and 12-17% in the peak periods relative to the 2045 RCS No Build.
- Bundles C and D have the greatest cumulative effect on congestion.

The figure below highlights some of the regional performance measures over the bundles. Percentage changes are with respect to the 2045 RCS No Build network.

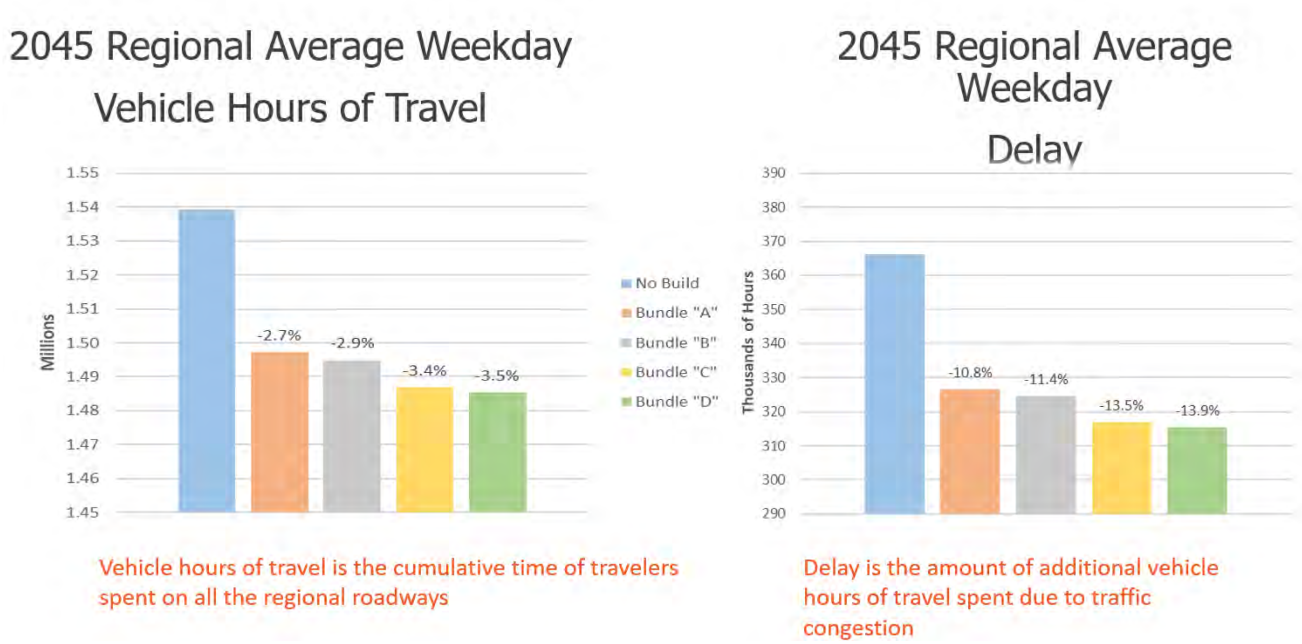


Figure 9: Regional Results of Congestion Analysis

Location-Specific Analysis

The map in Figure 10 below shows locations examined for the location-specific congestion analysis. Appendix D contains detailed information describing peak period volumes, speeds, and levels of congestion for these locations.

Analysis findings for key roadway facilities in the Hampton Roads area include:

1) Hampton Roads Bridge Tunnel (HRBT) sees some relief from implementing the bundles:
   - Reduced peak period volumes and increased speeds in managed lanes; less overall benefit to the general-purpose lanes. Referencing the data in Appendix D, HRBT PM peak period volume estimates drop from 43,762 in No Build to 36,566 in Bundle D – a reduction of 7,196 vehicles. Most of this reduction, 4,747, is associated with the managed lanes. This results in an average speed increase in the managed lanes from 25 mph in No Build to 33 mph in Bundle D. The other bundles provide volume reductions to a lesser degree, but the dynamics are the same.
2) Comparing the 2045 No Build network and bundles:
   - Bundle A results in the highest daily volumes across the three existing North-South harbor crossings.
   - Bundle D results in the lowest volumes.
3) Midtown and Downtown tunnels have slightly higher daily volumes with Bundles A and B, and 5-6% lower volumes with Bundles C and D.
4) Daily volumes on VA 164, just west of Cedar Lane, increase by 14% and 33% with Bundles B and D respectively. Bundle C results in a daily volume reduction of 7%.
5) Hampton Boulevard has lower daily volumes in Bundles C and D compared to the 2045 No Build network, providing some congestion relief.

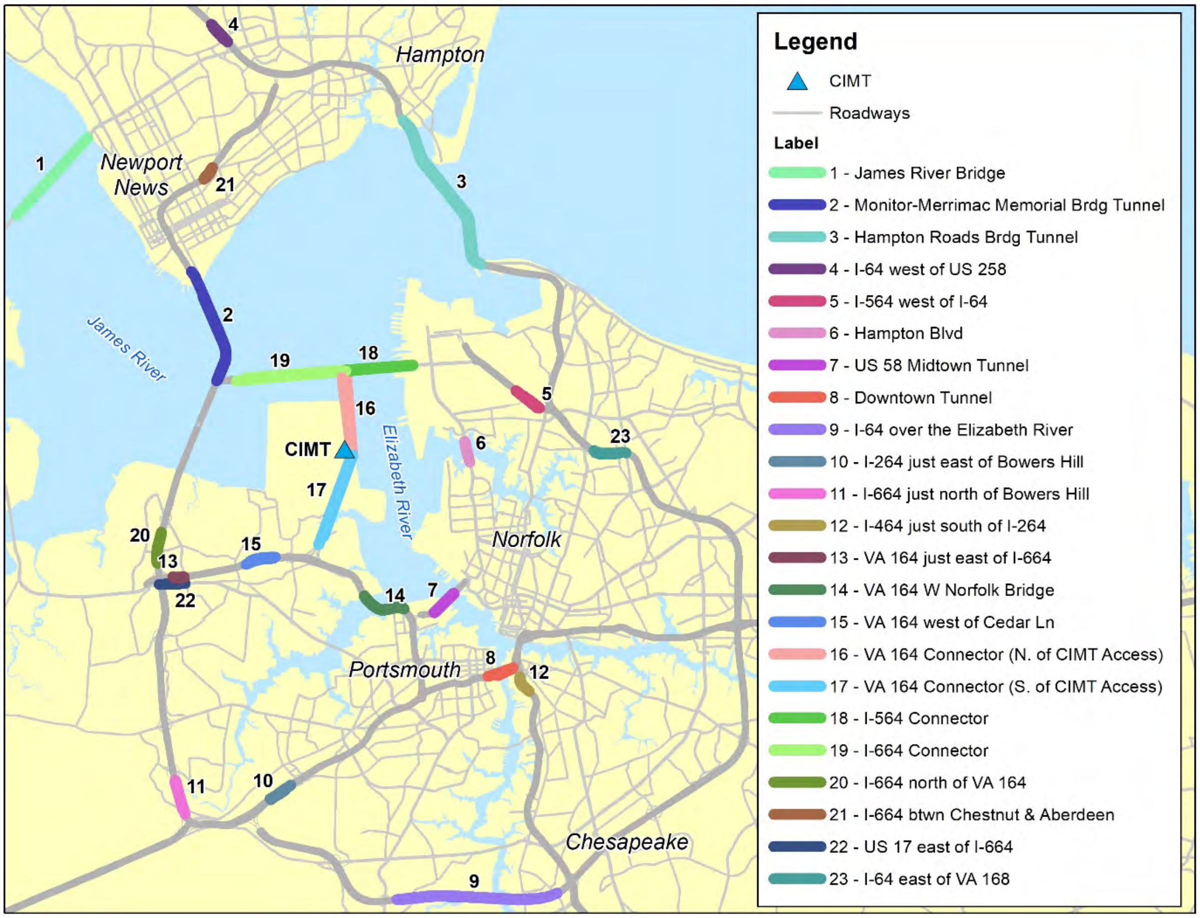


Figure 10: Map of roadway segments for modeling regional traffic

Congestion Benefits Relative to Cost

Combining the congestion relief analysis results with costs as presented in Chapter 3, an overall efficiency of the alignment segment(s) can be determined. Analysis required a decomposition of bundle level congestion relief results into segments or groups of segments since costs were estimated at the alignment segment level. Due to the interdependence of some segments with respect to bundle definitions, not all segments could have congestion relief differentiated.

Figure 11 shows the relative cost effectiveness of the segment(s) reflecting a comparison of average weekday delay reduction and cost. Note that results are indexed so that the most cost-effective segment(s) is assigned a score of ‘1.00’. Other segment combinations are assigned fractions based on their relative cost effectiveness. Segments 1a and 2 provide the greatest amount of congestion relief per unit cost.

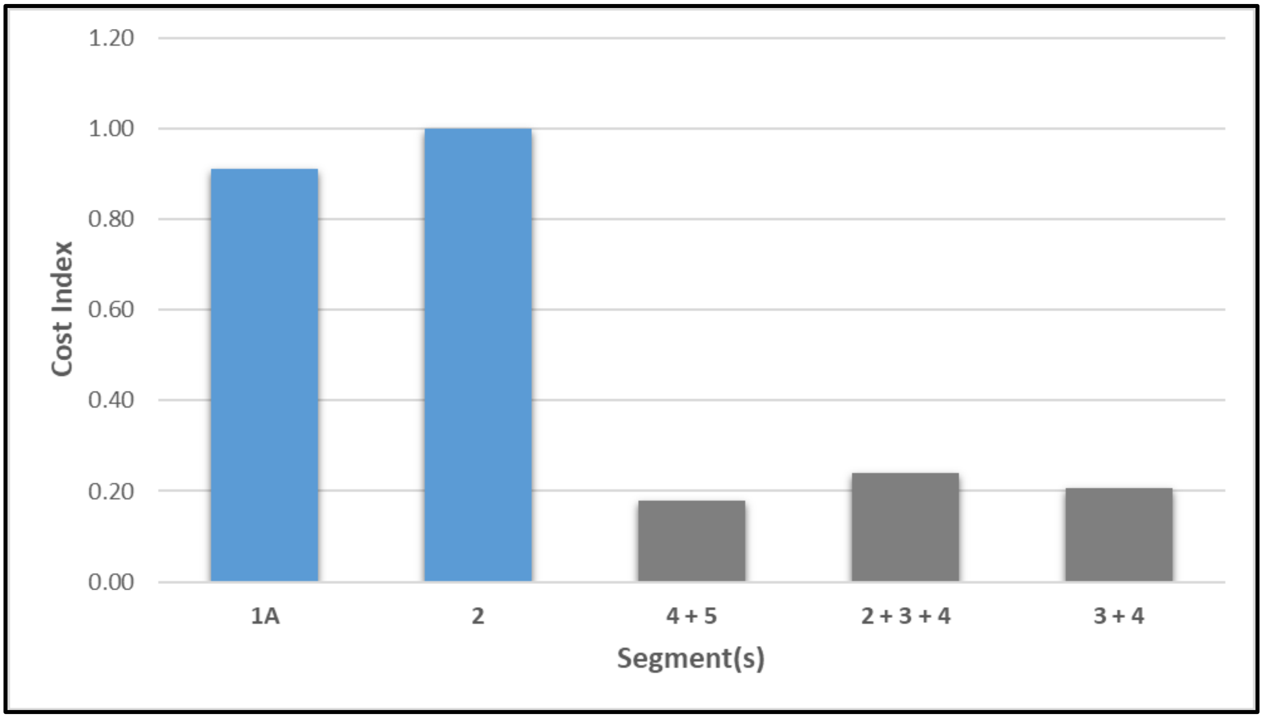


Figure 11: Congestion Benefits Relative to Costs by Bundle

Economic Benefits

This section summarizes the economic modeling results for Bundles A, B, C, and D compared to the 2045 RCS No Build network.

The consultant team employed TREDIS (the "Transportation Economic Development Impact System"),[9] an economic modeling software, to evaluate how each roadway improvement bundle enhances travel efficiency and thereby delivers societal benefits and supports regional economic growth. Additional methodological details and numerical results are provided in Appendix E. For each bundle, the economic modeling compares two conditions:

- Performance with the bundle in place in 2045
- Performance in the 2045 RCS baseline land use scenario, without the bundle improvements (i.e., the No Build network)

This means that many metrics are reported as the difference expected between the Build (with the bundle in place) and No Build (baseline without the bundle) conditions. This comparative analysis is conducted for each bundle in Step 2, and in Step 3 it was also conducted across all four regional growth scenarios.
Figure 12 illustrates how the economic analysis is driven by facets of the scenarios as well as the transportation network conditions with and without each bundle. Each scenario has growth, technology,

[9]TREDIS has been used in 43 US states and Canadian provinces. Users include a wide set of state departments of transportation and MPOs, as well as local transportation agencies, universities, and leading consulting firms. For more information: https://tredis.com/products/tredis-6/tredis-overview

and land use assumptions. Each bundle has a set of capacity improvements on the roadway network. Together, these result in changes in transportation performance, as measured by changes in trips by mode, travel distance and time, congestion, and crashes.

Transportation outcomes then serve as inputs into two types of economic analysis:

1) **Societal Benefits**: The first type of economic analysis quantifies the societal benefits stemming from each bundle's improvements to travel, expressed in monetary (dollar value) terms. This valuation reflects both market costs of travel (for example, the costs of operating a vehicle or paying a truck driver) and societal evaluation of other factors such as travel time, emissions, or crashes that are important but do not directly translate into monetary flows in the economy.
2) **Impacts on the Econom**y: The second analysis assesses how businesses in the region will respond to changes in travel costs, as expressed in growth of the economy.

These are separate ways of evaluating the economic performance of the scenarios, but they are linked in the same economic model runs and are based on the same measures of transportation performance.

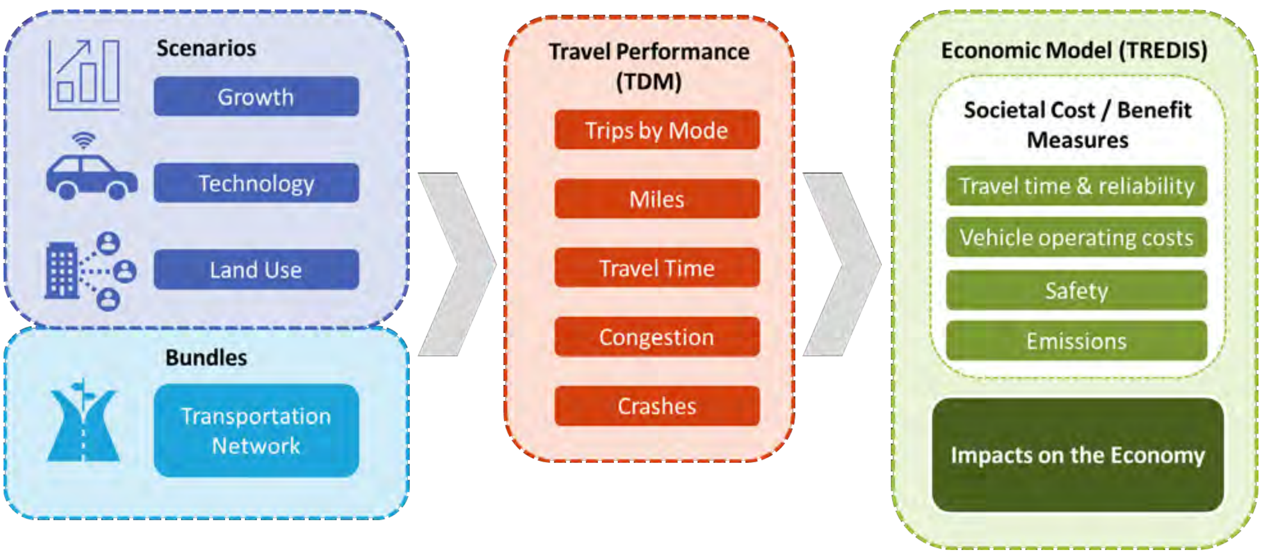


Figure 12. Economic Modeling Approach

Regional Drivers of Economic Results

Economic results are driven by the change in key travel indicators including average trip length, average trip time, average speed, and the fraction of VMT under congested conditions.
Figure 13 shows the change in these measures for each bundle, relative to the performance in the 2045 RCS No Build network without the bundle improvements. Average trip length for regional trips is minimally affected by the bundle improvements. The average time per trip decreases by a few percentage points, and average speed increases across all bundles. The share of congested travel decreases significantly, particularly for Bundles C and D, leading to improved reliability.

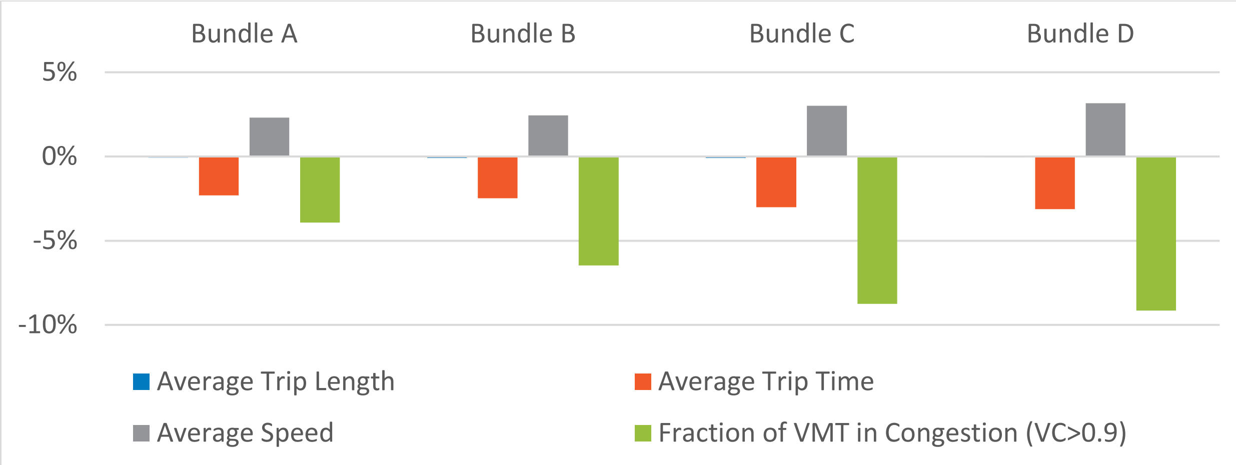


Figure 13. Regional Percent Change in Key Travel Indicators – Bundle Relative to 2045 RCS No Build

Regional Economic Results

Figure 14 depicts the annual societal benefits generated by each of the bundles in the year relative to the No Build network. Time and reliability savings from decreased trip time, increased speed, and lower shares of congested travel comprise the greatest share of the benefits generated. There are minimal effects related to VMT reductions, which drives benefits for emissions, safety, and vehicle operating costs.

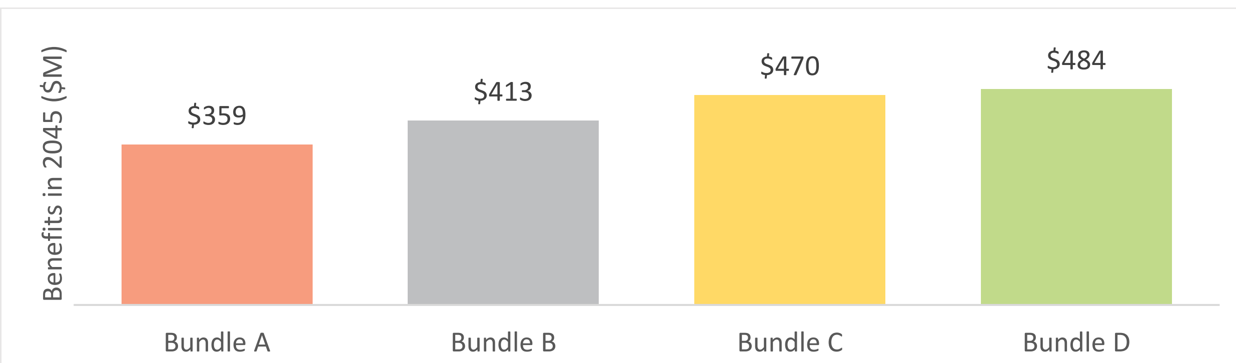


Figure 14. Regional Societal Benefits in 2045 (Annual, $M, Benefits of Each Bundle Relative to RCS No Build Network)

Figure 15 illustrates how transportation system improvements from each bundle also translate into gains in regional economic activity, measured in terms of value added (GRP)[10]. The greatest incremental increase in value added is from the addition of Segment 1a in Bundle A. The overall greatest increase in economic value from improvements to the transportation network comes from Bundle D.

[10] GRP – Gross Regional Product (total value of production minus intermediate goods and services). The 2045 GRP was projected to be $154 B.

Figure 15. Regional Economic Impact in 2045 (Annual, $M, Incremental Effects Relative to RCS No Build Network)

Figure 16 and Figure 17 respectively show the societal benefit and value added per cost index by bundle. These indices are calculated by dividing total benefit or value added per bundle by the respective cost and then normalizing the costs so that the most cost-effective bundle is assigned an index of one. All other bundles then receive an index value less than one based on their relative performance. Bundle A and Bundle B generate the greatest societal benefits and regional economic impact per dollar invested for regional trips.

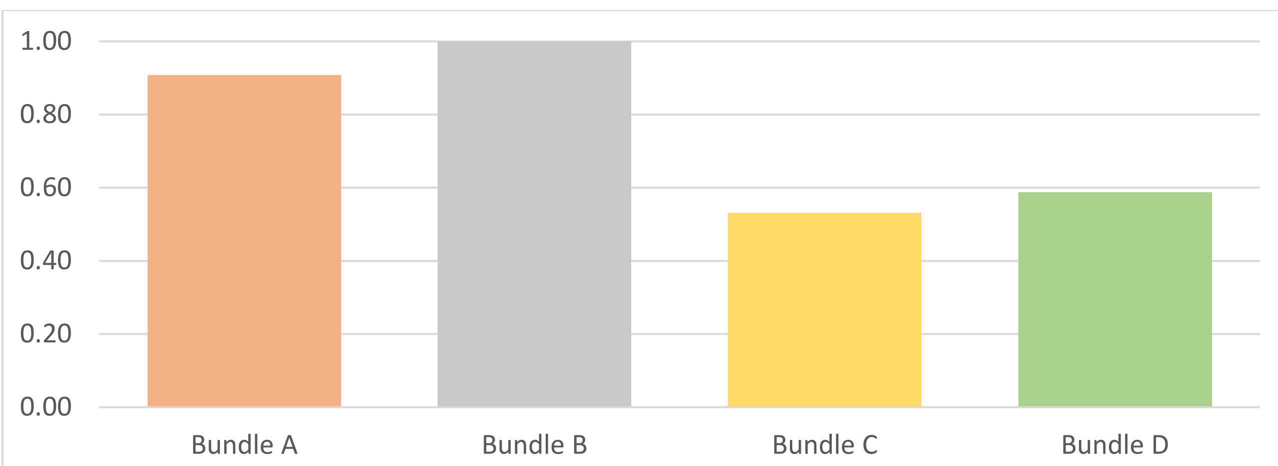


Figure 16. Regional Societal Benefit per Cost Index by Bundle (Incremental effects relative to RCS No Build network)
Note: Results are indexed so that the most cost-effective bundle is assigned a score of 1, and the other bundles are assigned fractions based on their relative cost effectiveness.

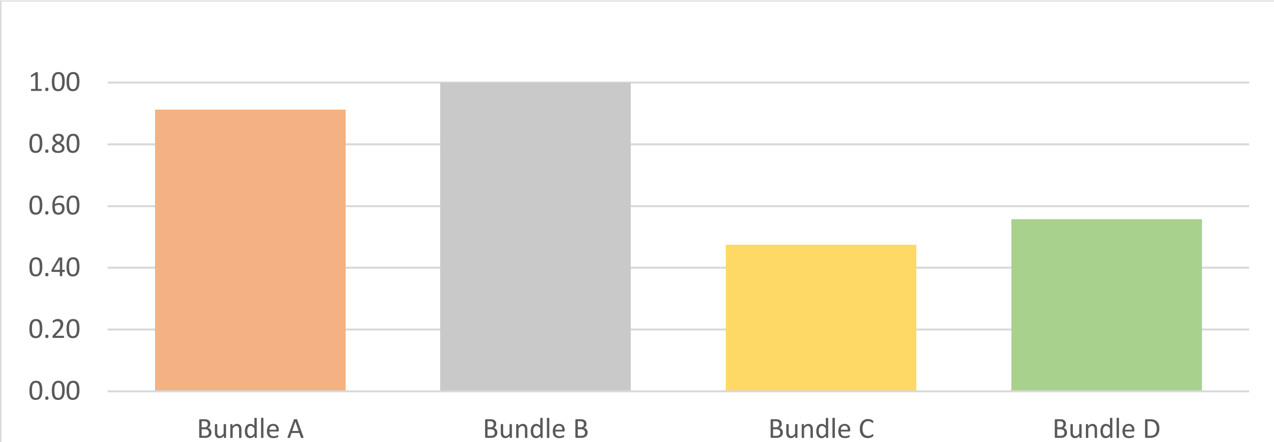


Figure 17. Regional Value Added per Cost Index by Bundle (Incremental effects relative to RCS No Build network)
Note: Results are indexed so that the most cost-effective bundle is assigned a score of 1, and the other bundles are assigned fractions based on their relative cost effectiveness.

Figure 18 and Figure 19 depict the societal benefit and value added per cost index by segment. Segment level results were generated from the bundle level results using the calculations described in Table 7. Per dollar invested, Segments 1a and 2 generate the greatest societal benefits and regional economic impact.

Table 7. Process for Identifying Segment Level Results from Bundle Level Results

Segment	Calculation	Descriptions
Segment 1a	Bundle "A" minus No Build	Benefit of Segment 1a relative to No Build
Segment 2	Bundle "B" minus Bundle "A"	Benefit of Segment 2 relative to Bundle "A"
Segments 4+5	Bundle "C" minus Bundle "A"	Benefit of Segments 4+5 relative to Bundle "A"
Segments 2 + 3 + 4	Bundle "D" minus Bundle "A"	Benefit of Segments 2+3+4 relative to Bundle "A"
Segments 3+4	Bundle "D" minus Bundle "B"	Benefit of Segments 3+4 relative to Bundle "B"

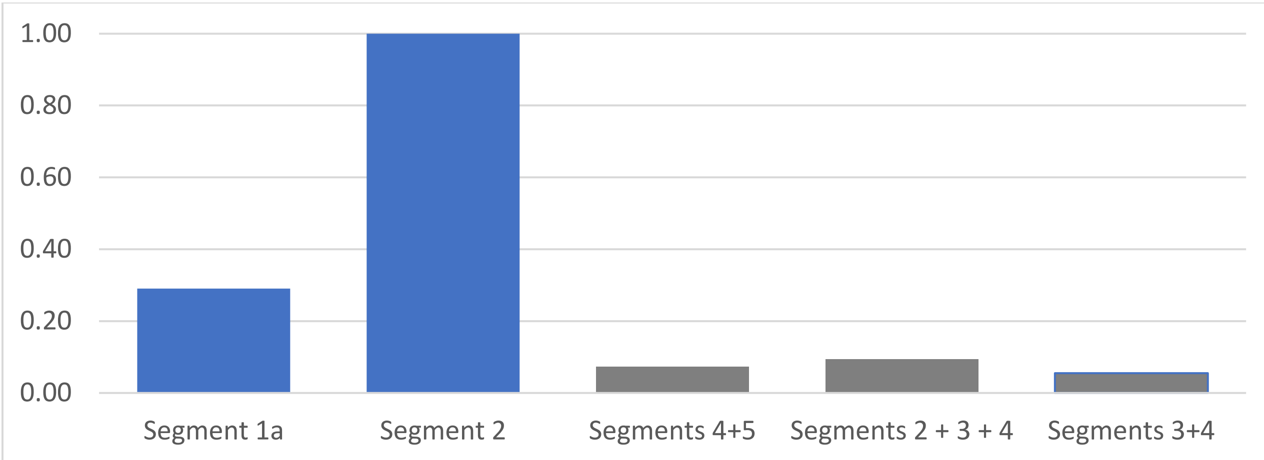


Figure 18. Regional Societal Benefit per Cost Index by Segment (Incremental effects relative to RCS No Build network)
Note: Results are indexed so that the most cost-effective segment is assigned a score of 1, and the other segments are assigned fractions based on their relative cost effectiveness.

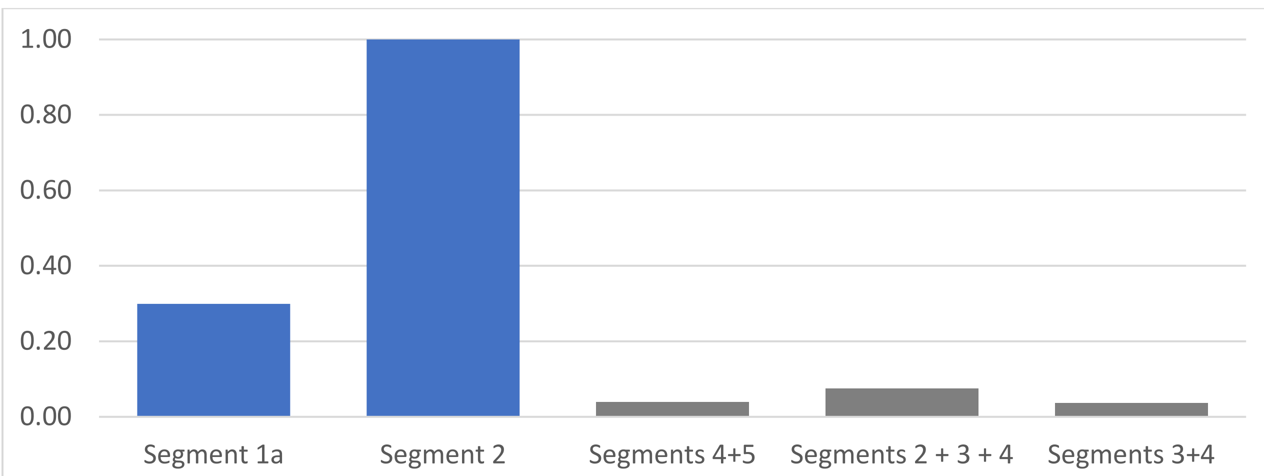


Figure 19. Regional Value Added per Cost Index by Segment (Incremental effects relative to RCS No Build network)
Note: Results are indexed so that the most cost-effective segment is assigned a score of 1, and the other segments are assigned fractions based on their relative cost effectiveness.

Cross-Harbor Drivers of Economic Results

The percent change in key travel indicators for cross-harbor trips are depicted in Figure 20. There are small but meaningful reductions in trip length across all bundles. All bundles see significant reductions in average trip times, with reductions ranging from 14% to 17%. Average speed increases by 15% to 19%. Each bundle has a major reduction in the share of congested travel, leading to improved reliability. Performance improvements are more pronounced for cross-harbor trips compared to regional results averaged across all trips. This reflects the focused intent of the bundles on improving cross-harbor connections.

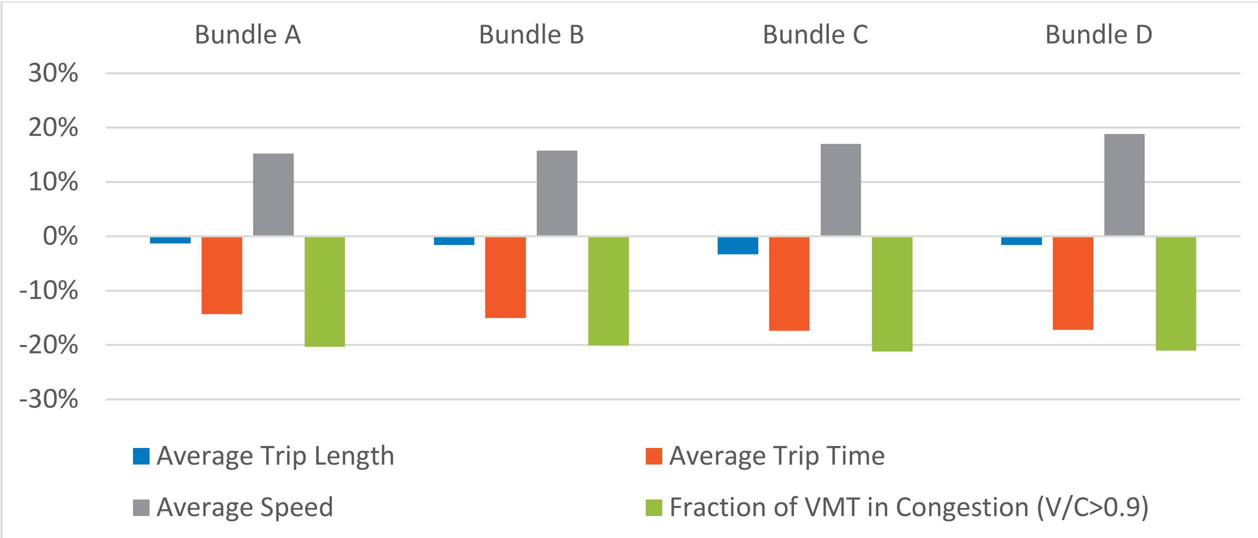


Figure 20. Cross-Harbor Percent Change in Key Travel Indicators – Bundle Relative to RCS Baseline (2045, No build network)

Cross-Harbor Economic Results

Societal benefits for cross-harbor trips are dominated by time and reliability savings, driven primarily by lower levels of congestion, decreased trip time, and greater speed. There are some minor effects related to VMT reductions (e.g., emissions, safety, vehicle operating costs). Unlike regional network results where Bundle D showed the greatest total regional benefits (Figure 15), Bundle C is the most beneficial bundle for cross-harbor trips, as shown in Figure 21. Note that cross-harbor benefits are actually greater in absolute magnitude than the regional results shown above. This is because the regional benefit totals include some minor disbenefits for non-cross-harbor-trips that detract from the regional totals but are marginal for individual travelers.

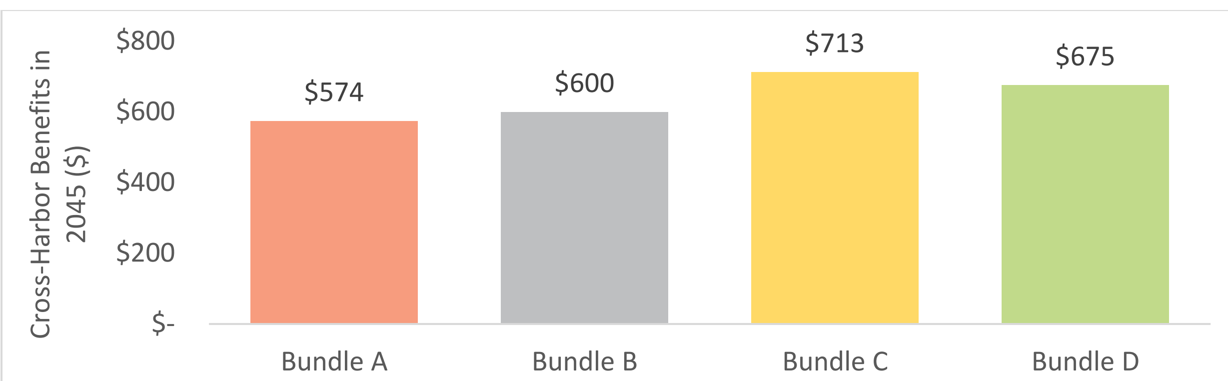


Figure 20. Cross-Harbor Societal Benefits in 2045 (Annual, $M, Benefits of each bundle are relative to RCS No Build network)

Figure 22 shows the societal benefit per cost index by bundle for cross-harbor trips in the No Build Scenario. Bundle A and Bundle B generate the greatest societal benefits and regional economic impact per dollar invested.

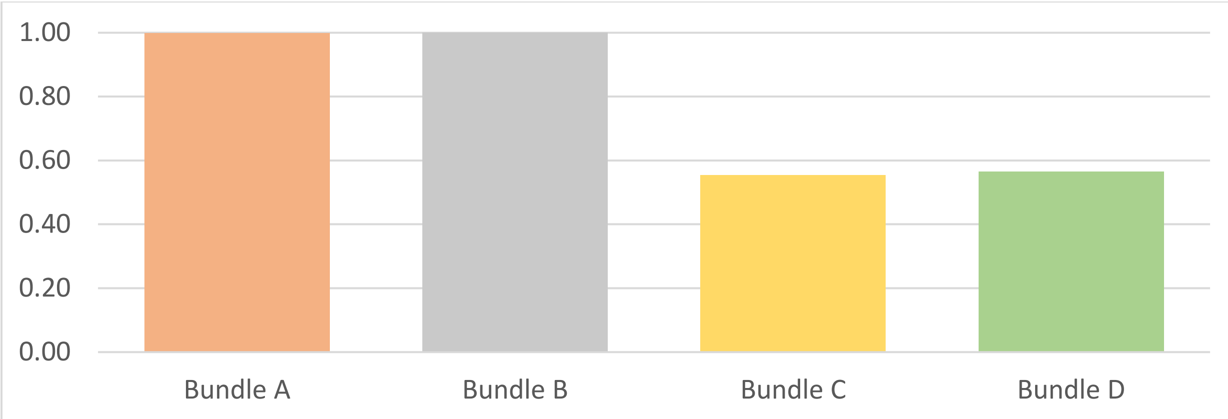


Figure 22. Cross-Harbor Societal Benefit per Cost Index by Bundle (Incremental effects relative to RCS No Build network)
Note: Results are indexed so that the most cost-effective bundle is assigned a score of 1, and the other bundles are assigned fractions based on their relative cost effectiveness.

Societal benefit per cost index by segment for cross-harbor trips is shown below in Figure 23. Per dollar invested, Segments 1a and 2 generate the greatest societal benefits for cross-harbor trips, as was the case in the regional results as well.

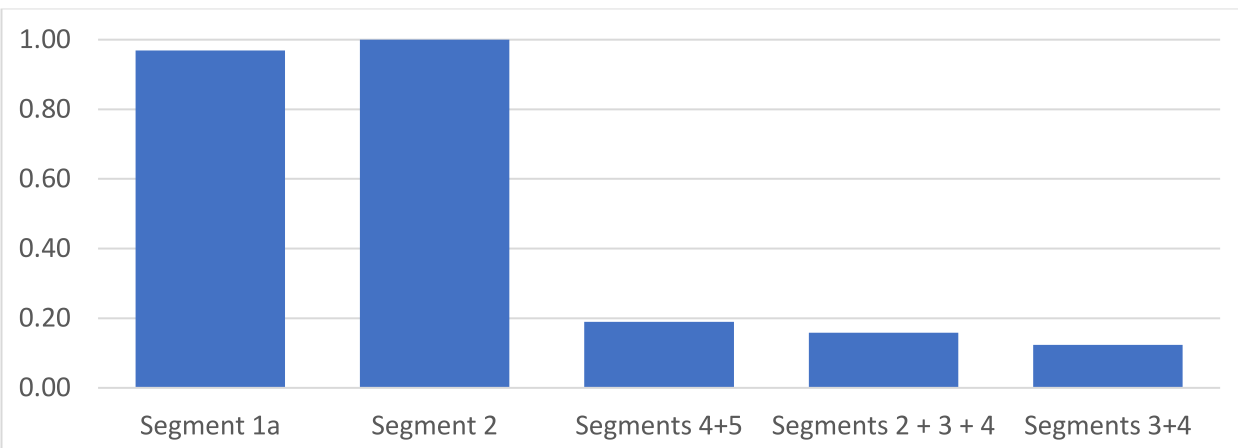


Figure 21. Cross-Harbor Societal Benefit per Cost Index by Segment (Incremental effects relative to RCS No Build network)
Note: Results are indexed so that the most cost-effective segment is assigned a score of 1, and the other segments are assigned fractions based on their relative cost effectiveness.

Chapter 6: Segment Tiering

Steps 1 and 2 of the Phase III analysis provided insights into the permitting issues, readiness, costs (which reflect construction complexity) and the congestion relief and economic benefits of the study segments. A synthesis of the detailed analyses was prepared to facilitate the evaluation of the segments for tiering by the RCS Joint Steering (Policy) Committee and Working Group.

The combined results of the quantitative (Chapters 3 and 5) and qualitative (Chapter 2) analysis of segments are summarized in ratings of high, medium, and low in Table 8. In this table, the high ratings are positive, and the low ratings are relatively negative. The quantitative analysis ratings reflect the combined cost and benefit analyses of bundles to deduce the relative cost-effectiveness of each segment. The qualitative analysis ratings consolidate the "ease of permitting" and readiness results into a single high, medium, or low rating for each segment.

Table 8 Summary of Segment Ratings

Segment	1a - I-664 Widening	2 – VA 164 Widening	3 – VA 164 Connector	4 - I-564 Connector	5 – I-664 Connector
Quantitative findings – benefits relative to cost	High	High	Low	Low	Low
Qualitative findings – Relative Segment Readiness	High	Medium	Low	Low	Low
Qualitative findings – Relative Segment Ease of Permitting	Medium	High	Low	Low	Low

Quantitative Analysis Insights

In the quantitative analysis, Bundle A is Segment 1a, and Bundle B is Segment 1a + Segment 2, facilitating a direct assessment of the cost-effectiveness of Segments 1a and 2. The findings of the congestion and economic benefits analysis show that the high benefits of Segment 1a compare favorably to the segment's high cost. The relative benefits of Segment 2 are much lower, but they are also cost-effective because of the segment's low cost. Further, the analysis showed a relatively widespread reliability benefit (specifically, a reduction in the time spent in congested conditions), a key driver of economic benefits, with Bundle B. The technical analysis does not provide a substantial distinction between Segments 1a and 2 that would differentiate them for tiering. (See Figure 11, Figure 16, and Figure 17.) Both Segment 1a and Segment 2 are therefore rated high in the synthesis of quantitative results.

The congestion and economic analyses show that the bundles including segments 3, 4 and 5 provide additional benefits, but when those benefits are compared to costs, the results are markedly lower than the results of bundles including only segments 1a and 2. For example, moving from Bundle B (segments 1a and 2), to Bundle D (segments 1a, 2, 3, and 4) increases regional benefits by 17 percent, but adds nearly 100 percent to the cost. Similarly, adding segments 4 and 5 to the segment 1a connection delivers 31 percent more benefit, but more than doubles the cost (> 100 percent increase) over segment 1a alone. (See Figure 11, Figure 16, and Figure 17 for benefits indexed by cost.) Segments 3, 4 and 5 therefore rate "low" in the synthesis of quantitative results.

Qualitative Analysis Insights

Readiness

The first qualitative assessment is *readiness*. Segment 1a (I-664 widening north of College Drive) scores high on readiness for the reasons discussed in Chapter 2. This project rates particularly high on project independence because it provides a missing link in the region's managed lane network, and it can be developed independently of other segments. It is also strong on funding opportunities. Across the readiness criteria as a whole, it has the highest ratings among the segments.

Segment 2 (VA 164 Widening) is rated medium for readiness in the synthesis because it has a range of scores, and though most are lower than Segment 1a, all but two of the nine ratings are better than Segments 3, 4 and 5. One of the higher-rated readiness aspects of Segment 2 is its inclusion in the adopted HRTPO 2045 LRTP and the HRTAC Plan of Finance. One of the lower ratings for Segment 2 acknowledges that there is some local opposition to the project.

Segments 3, 4 and 5 (VA 164 Connector, I-564 Connector, and I-664 Connector respectively) rate poorly on readiness and are rated low in the synthesis.

Ease of Permitting

The second qualitative assessment is expressed here as *ease of permitting* so that high ratings are positive. Segment 2 (VA 164 Widening) rates the highest overall in this evaluation, in large part because it is small in scope, over land, and will have modest impacts beyond existing right-of-way (ROW). Segment 2 is a corridor through established neighborhoods in Portsmouth, and the City of Portsmouth representatives have expressed concerns related to environmental justice and stakeholder concerns, detailed in Appendix A.

Segment 1a (I-664 widening north of College Drive) is rated lower than Segment 2 in all but three criteria, but it does not have a substantial number of ratings indicating a high degree of permitting issues which is the case for the connector Segments 3, 4, and 5 (VA 164 Connector, I-564 Connector, and I-664 Connector respectively). The high ratio of bridge and tunnel components and the environmental justice communities present in the corridor provide some of the medium ratings for Segment 1a. Lower ratings in ease of permitting for the connector segments reflect the high permitting requirements of new location facilities and facilities over water, as well as the uncertainty around impacts related to the Craney Island Dredge Material Management Area and the U.S. Navy facilities in Portsmouth and Norfolk. Consequently, Segment 1a is rated medium and Segments 3, 4, and 5 are rated low in the qualitative assessment synthesis.

Tiering Recommendations

As shown in Table 8, there is a clear distinction in the evaluation ratings of Segments 1a and 2 (i.e., the widening segments) in comparison to Segments 3, 4, and 5 (i.e., the new location connector segments). At the same time, there are not marked distinctions, particularly with respect to cost-effectiveness, between the segments within these two groupings. Further, the RCS Joint Steering (Policy) Committee and Working Group discussed the potential need to advance one or more connector segments for study even if they were not recommended for funding. The tiering recommendations are defined in Figure 24, highlighting that Tier I segments are recommended for evaluation in the fiscally constrained 2045 LRTP, whereas the Tier II segments are recommended for the Regional Transportation Vision Plan. Tier I segments will be evaluated along with other proposed projects and ranked for funding selection in the 2050 LRTP. Vision Plan projects are identified as meeting regional needs beyond those in the fiscally constrained 2045 LRTP and may be advanced for study without further HRTPO Policy Board action.

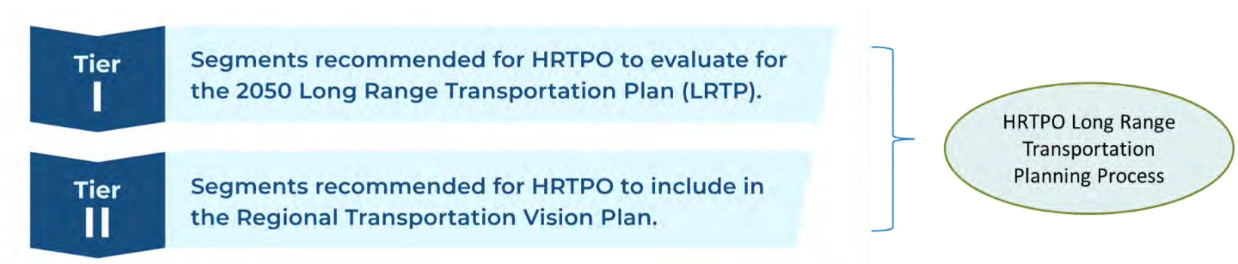


Figure 22 :Tiering recommendations informing the LRTP

At the Joint Steering (Policy) Committee and Working Group meeting on November 17, 2022, the two bodies took the following actions.

1) Recommended Segments 1a and 2 for Tier I
2) Recommended Segments 3, 4 and 5 for Tier II
3) Directed the consultant team to proceed to:
    - Analyze 3 bundles of Tier I and II segments in the scenario analysis
    - Analyze Tier I segments in traffic operations analysis

The scenario analyses and traffic operations analysis were conducted to further test the draft Tier I and Tier II segments, generating additional insights for RCS final recommendations.

Chapter 7: Step 3 Scenario Testing

Overview of Scenario Testing

The Scenario Planning process considered a baseline 2045 land use scenario and three alternative 2045 *Greater Growth* land use scenarios that present plausible futures with respect to economic, demographic and technology drivers. The Greater Growth scenarios are summarized in Figure 25 and described in detail in the *RCS Phase II Technical Guide*. The scenario analysis links alternative future economic and demographic trends with land use, and the resulting socioeconomic forecasts were tested with the regional travel demand model to understand the impacts to transportation performance measures. Outputs from the travel demand model were also analyzed in the economic model to evaluate the range of societal benefits and economic impact across the scenarios.

The scenario planning process consisted of testing three bundles of segments against each scenario to gauge the robustness of each investment with respect to the range of possible futures. One of the segment bundles included only the Tier 1 segments, and the others included combinations of Tier I and Tier II segments, specifically, Bundles C and D as shown in Figure 26. Combined with the 2045 RCS No Build network model run for each scenario, the process generated outcomes that informed the value of the segments in various combinations and under alternative futures.

The scenario outcomes provide a series of benchmarks against which to test the resilience of different transportation investments. This process seeks to identify transportation investments that provide the most cumulative benefit to the region regardless of which alternative future scenario is tested.

Congestion Benefits – Scenario Testing

Segment bundles were *coded* into the 2045 RCS No Build network using planning data available from HRTPO staff at the time of analysis. Coding includes information such as facility description, alignment, and capacity information associated with improvements. Coding also specified locations of toll assessment and toll values, if applicable. The consultant team reviewed and confirmed segment coding assumptions with HRTPO staff. One network represents each segment bundle.

Using the networks developed in earlier tasks and scenario specific socioeconomic data and parameters, the Consultant Team ran the travel demand model for each segment bundle over the Baseline land use and each of the three Greater Growth scenarios. The results for each bundle were compared against all bundles, all land use scenarios and the 2045 RCS No Build network demand estimates to uncover and flag any potential issues in the results.

GREATER GROWTH ON THE WATER	GREATER GROWTH IN URBAN CENTERS	GREATER SUBURBAN / GREENFIELD GROWTH*
» Growth in water-oriented activity » Port of Virginia becomes even more competitive with freight more multimodal » More dispersed housing locations » Moderate assumptions for CAV adoption & network adaptation	» Significant economic diversification » Low space requirements per job » Large role for "digital port" » New professionals prefer to live/work in urban settings » High level of CV adoption & low auto ownership or high TNC mode	» Growth is suburban / exurban, but growth includes walkable mixed use centers » Port of Virginia becomes even more competitive » "Digital port" brings additional jobs » Housing is more suburban » High level of AV adoption & network adaptation

WHAT THESE WILL HELP US TEST

Test greater cross-harbor travel in particular	Test more urban & multimodal travel patterns	Test more overall regional travel

Figure 23: Summary of Greater Growth Scenarios

Figure 24: Segment Bundles Selected for Congestion and Economic Analysis of Greater Growth Scenarios

Figure 27 and Figure 28 highlight regional performance measures for the bundles, comparing across Greater Growth scenarios. Key findings are as follows:

- Bundle B produces the most incremental reduction in regional delay for all scenarios (relative to the No Build network).
- Bundle D provides the greatest total reduction in delay across all scenarios, except in the suburban scenario where Bundle C performs slightly better.
- Greater Growth on the Water shows the greatest reduction in delay for Bundle C and Bundle D.
- Focusing on the regional freight network, which includes the Interstates and several arterials, as shown in Figure 29, the pattern of congestion relief is similar to the region overall, but the added benefits of Bundle C and D segments is even more pronounced in the Greater Growth on the Water scenario.

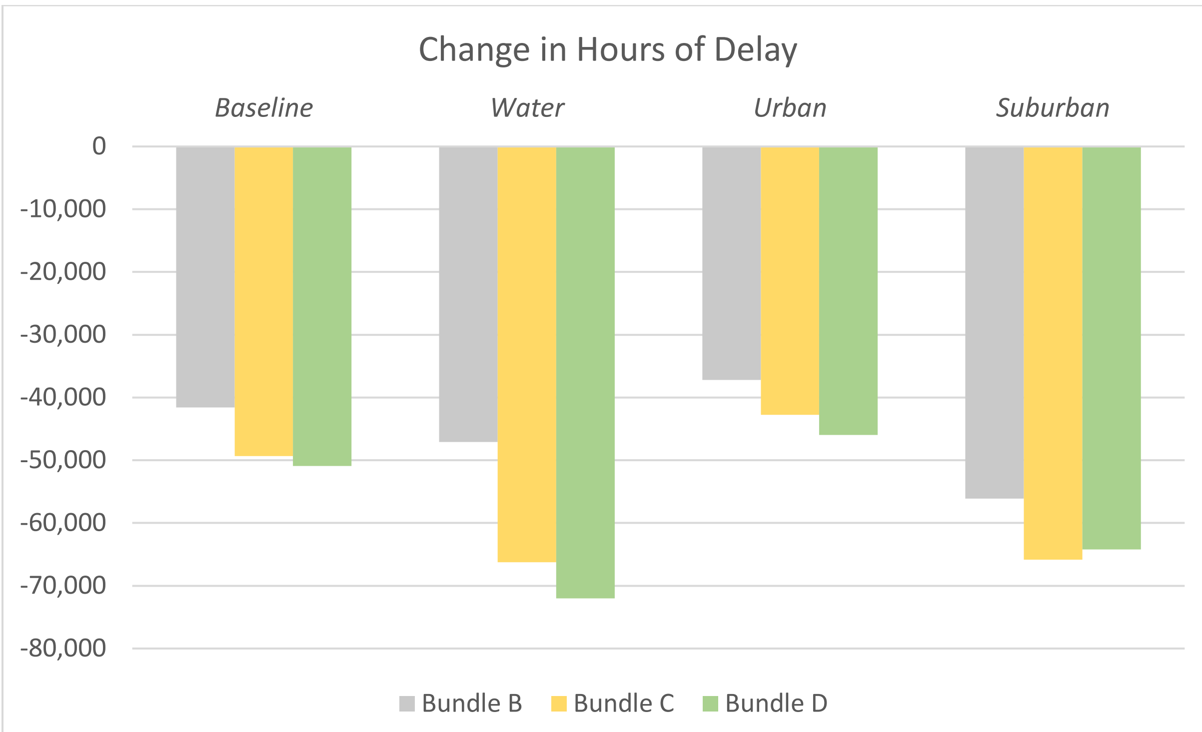


Figure 25: Percent Change in Daily Delay Relative to No Build Network

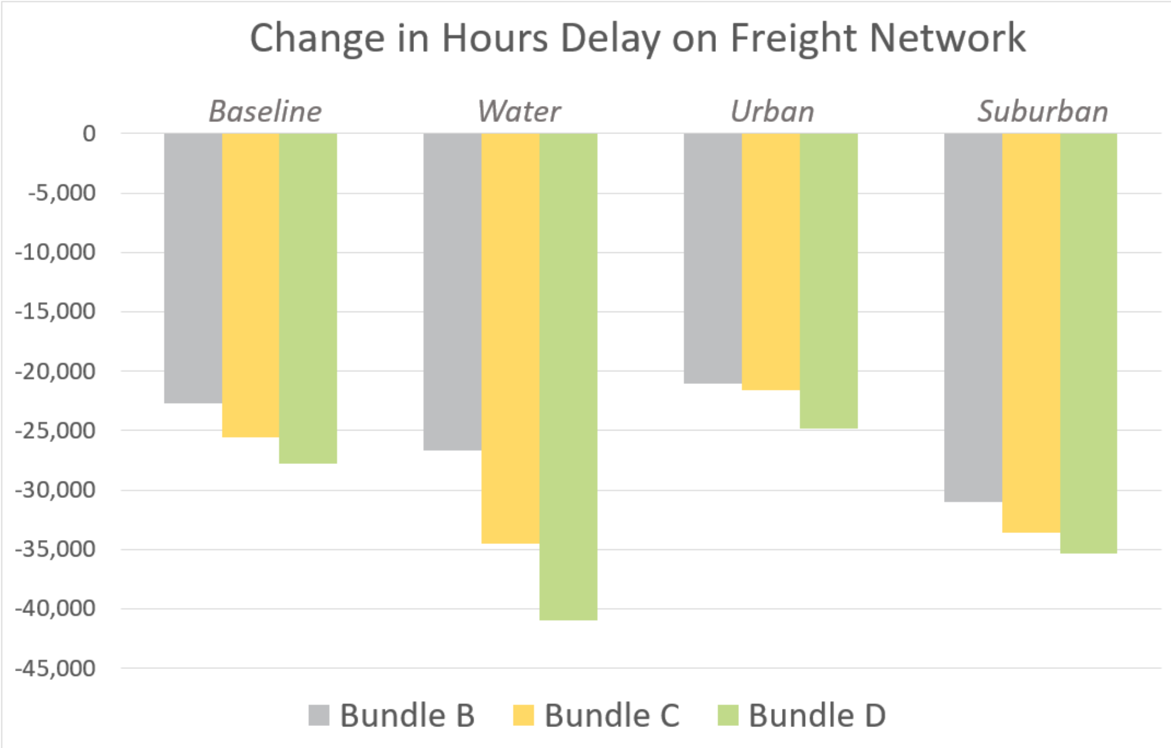


Figure 26: Change in Hours of Delay on Freight Network Relative to No Build

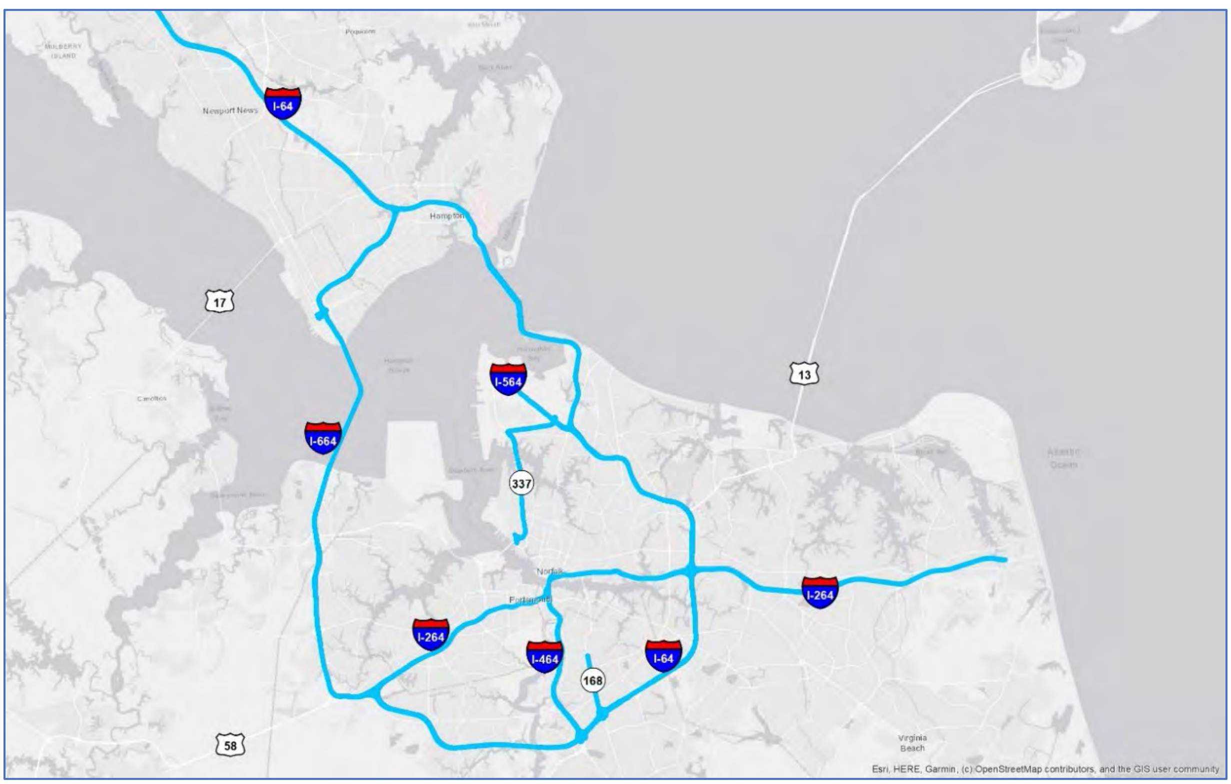


Figure 27: Hampton Roads Regional Freight Routes in Congestion Analysis, Based on USDOT Freight Network

Figure 30 and Figure 31 highlight reduction of delay in 2045 focusing on the two harbor tunnel crossings to gauge the effect of the bundles and scenarios. Even with the widening of HRBT, the RCS bundles have the potential to reduce future congestion on this harbor crossing. The results for the bundles, comparing across Greater Growth scenarios, include the following insights:

- There is a positive impact on HRBT as this crossing sees less delay for each bundle as compared with the No-Build over all scenarios and generally follows the pattern of regional delay reduction results across bundles.
- HRBT experiences the greatest delay reduction with Bundle "D" in the Water scenario and Bundle "C" in the Suburban scenario.
- MMMBT delay is also improved with all bundles in all scenarios although delay is higher with Bundle C, which directly connects across the harbor from Norfolk/I-64 to I-664 and the MMMBT
- Bundle B reduces cross-harbor delay by 48-53% across scenarios.
- Bundle D has the greatest total reduction in cross-harbor delay, adding 7-12% more reduction to Bundle B results.

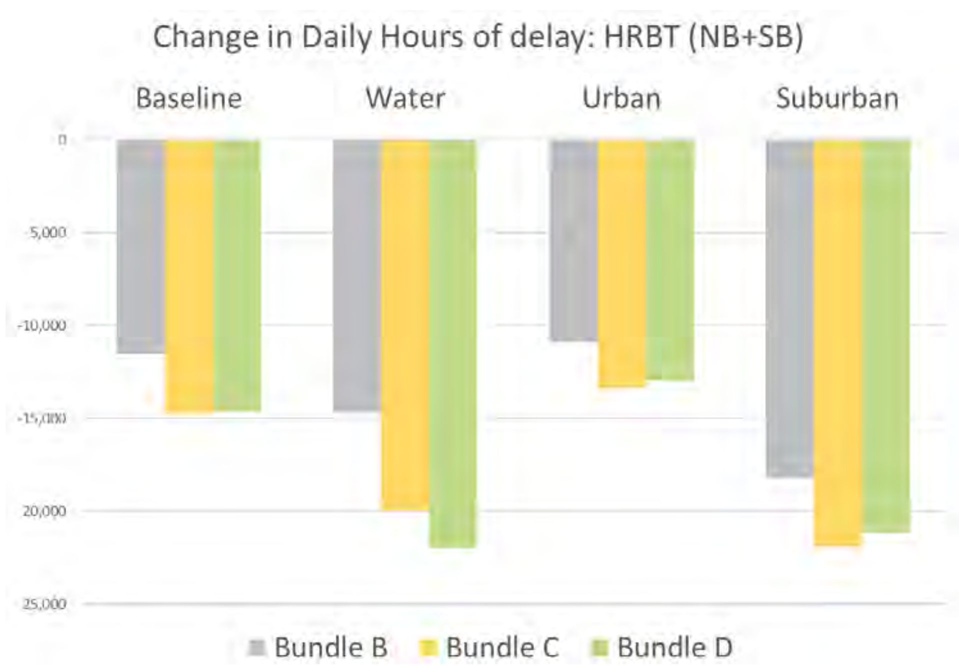


Figure 28: Change in Hours of Delay: HRBT Crossing

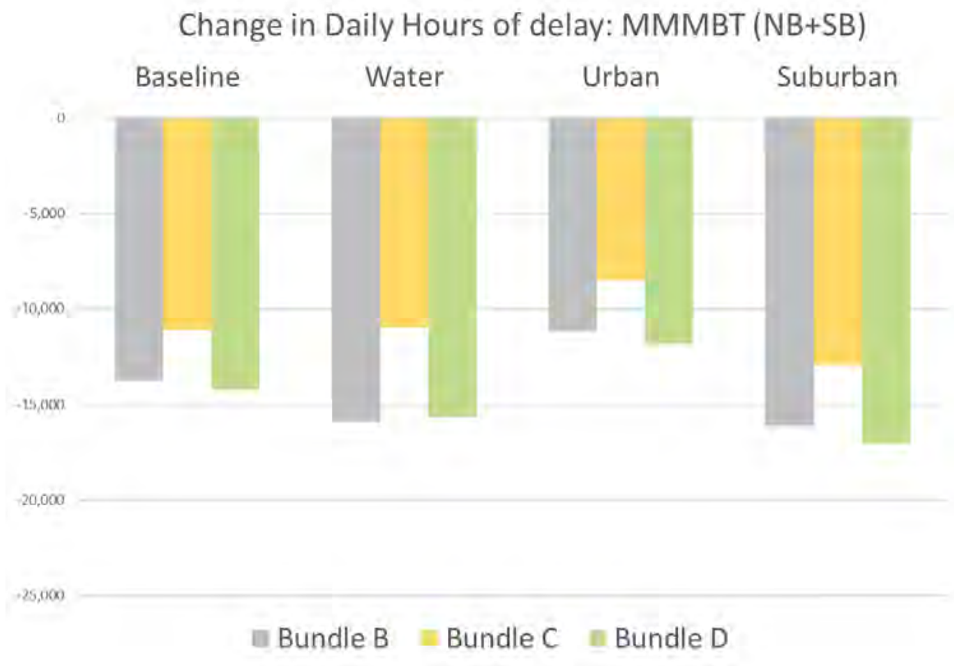


Figure 29: Change in Hours of Delay: MMMBT Crossing

Economic Benefits – Scenario Testing

This section explores the results from the TREDIS economic modeling runs of Bundles B, C, and D compared to the 2045 RCS No Build network across the Baseline and three Greater Growth scenarios – Water, Urban, and Suburban.

Regional Drivers of Economic Results

Figure 32 and Figure 33 show how each bundle results in changes from the No Build RCS network in average trip time and share of congested VMT. Bundle D provides the greatest reduction in regional average trip time and congested VMT across all scenarios, except in the Suburban Scenario where Bundle C performs slightly better. A similar pattern is evident for changes in congested VMT. There is minimal change in average trip length across all bundles and scenarios.

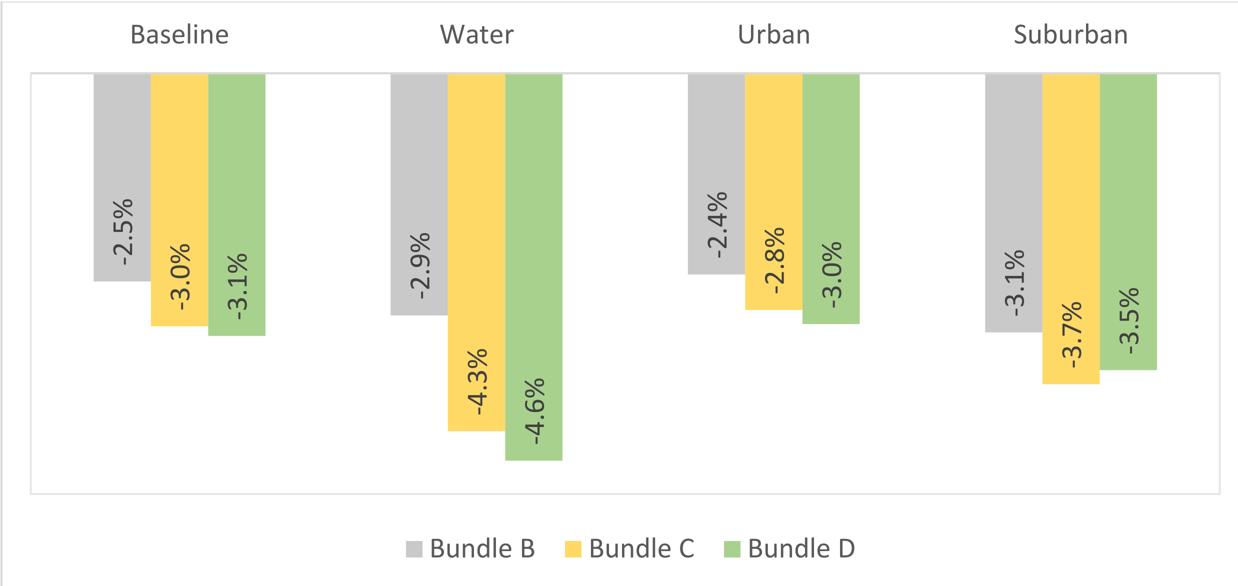


Figure 30. Regional Percent Change in Average Trip Time - Bundles Relative to 2045 RCS No Build Network

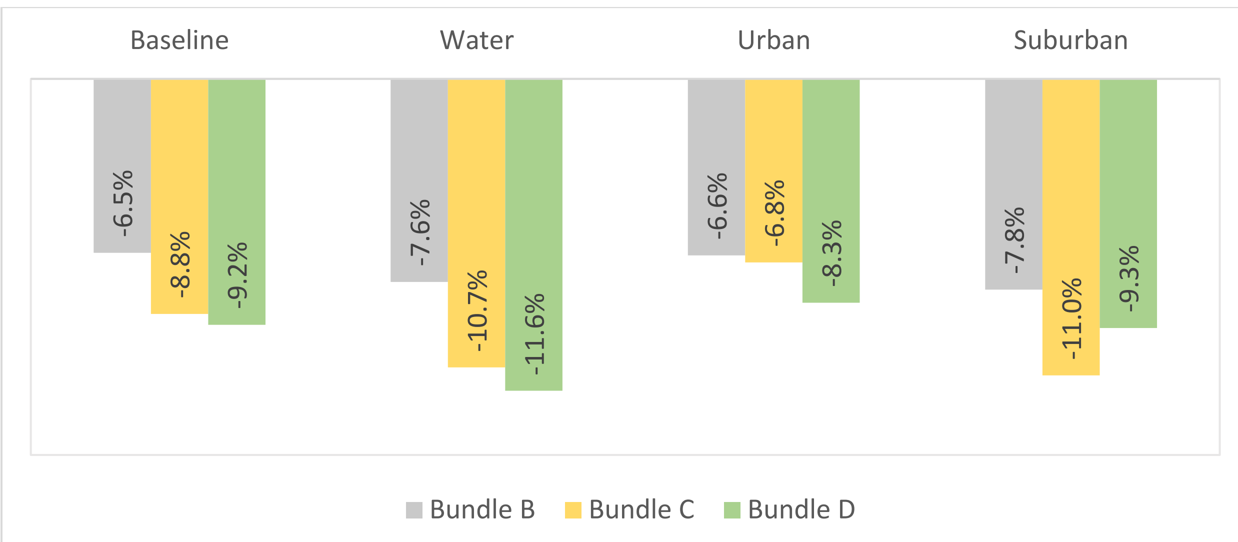


Figure 31. Regional Percent Change in Share of Congested VMT - Bundles Relative to 2045 RCS No Build Network

Regional Economic Results

Societal benefits from Bundles B, C, and D across all scenarios are shown in Figure 34. Bundle D provides the greatest total benefits among the bundles across all scenarios except in the Suburban scenario, where Bundle C is the best performing. The Greater Growth on the Water or in Suburban Areas tends to enhance the benefits of a regional connector, regardless of which bundle is selected.

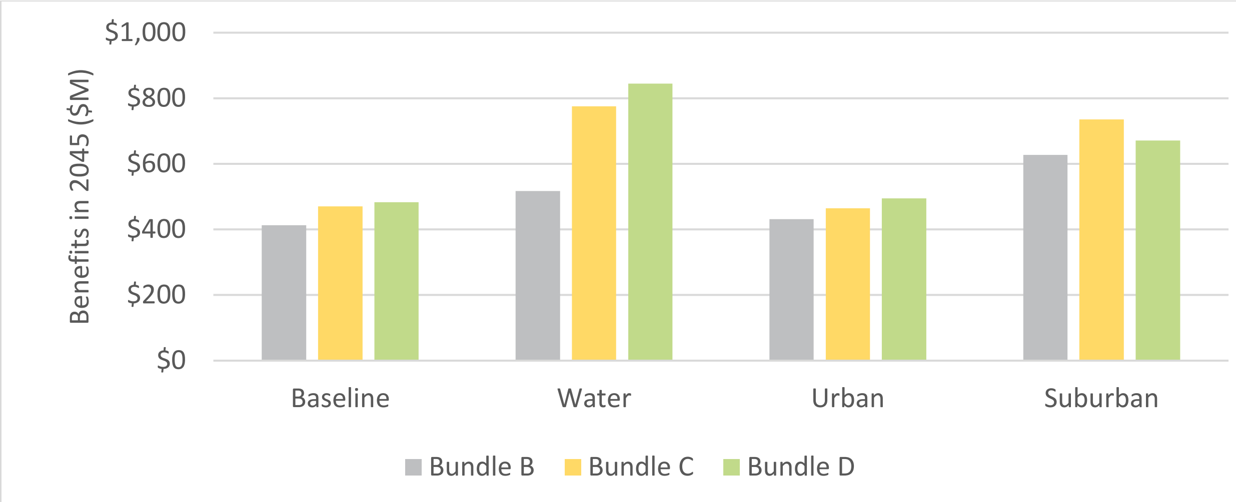


Figure 32. Regional Societal Benefits in 2045 (Annual, $M, benefits of each bundle are relative to 2045 RCS No Build Network)

Figure 35 and Figure 36 respectively show the societal benefit per cost index and value added per cost index by bundle for regional trips for all scenarios. Bundle B is the most cost effective across all scenarios. In the Water scenario, Bundle C and Bundle D are closest to Bundle B in relative cost-effectiveness. Bundle C and Bundle D provide additional east-west connectivity on the Southside which is particularly valuable when growth is concentrated along the water (including at Port of Virginia and military locations).

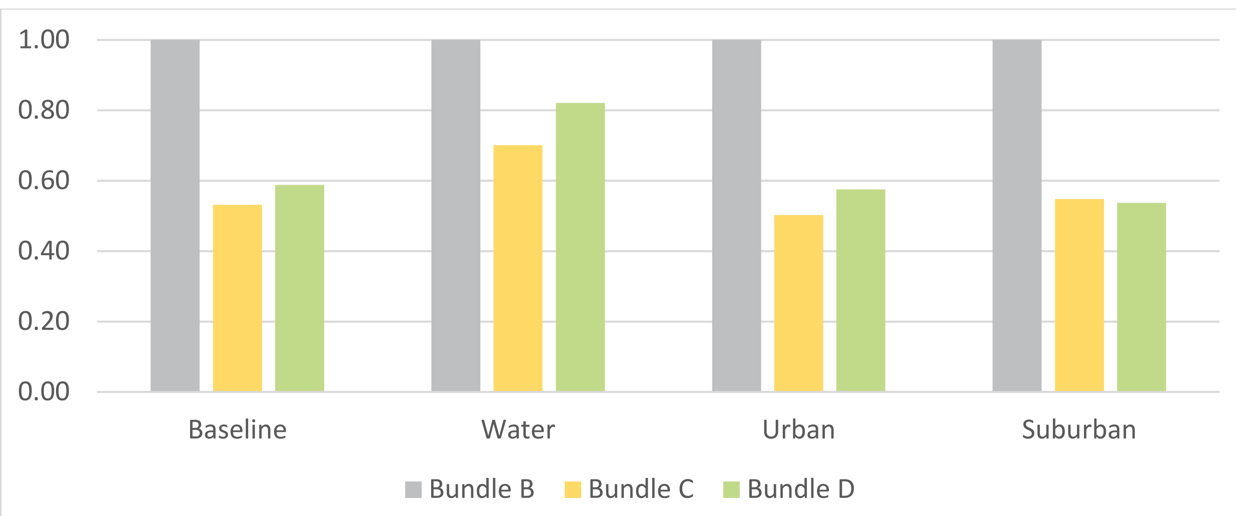


Figure 33. Societal Benefit per Cost Index by Bundle for Regional Trips

Note: Results are indexed so that the most cost-effective bundle is assigned a score of 1, and the other bundles are assigned fractions based on their relative cost effectiveness.

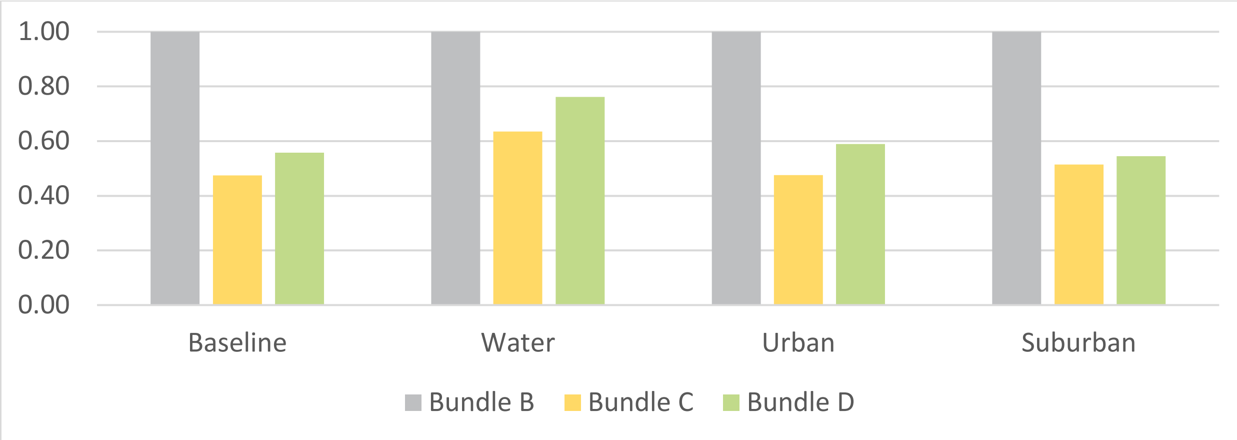


Figure 34. Value Added per Cost Index by Bundle

Note: Results are indexed so that the most cost-effective bundle is assigned a score of 1, and the other bundles are assigned fractions based on their relative cost effectiveness.

Cross-Harbor Drivers of Economic Results

For cross-harbor trips specifically, each bundle yields significant improvements in trip time and congestion. Across the scenarios, travelers moving between the Southside and the Peninsula save between seven and ten minutes per trip, as shown in Figure 37. Average trip length for these same connections is largely unchanged.

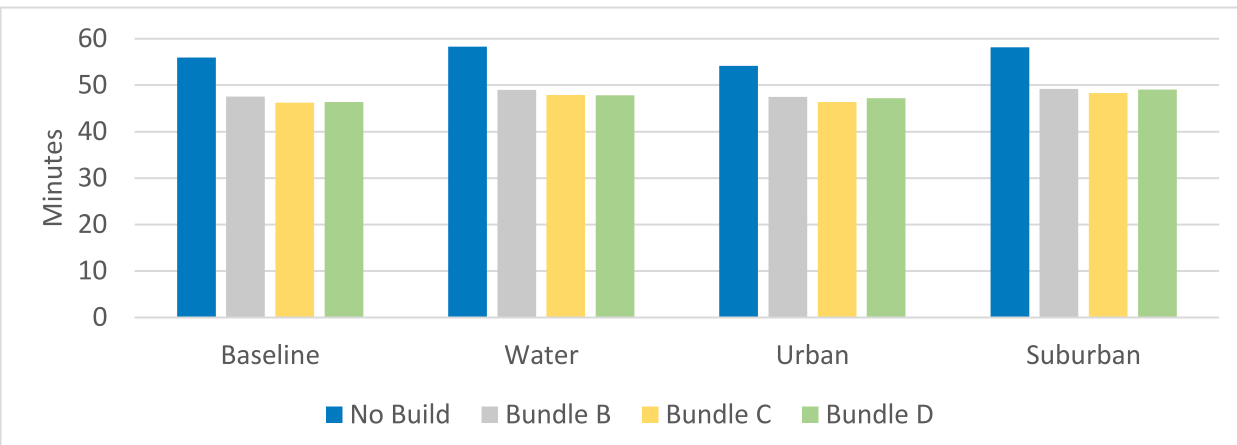


Figure 35. Average Trip Time in the Cross-Harbor Market by Bundle

Figure 38 and Figure 39 show percent changes from the 2045 RCS No Build network in average trip time and share of congested VMT across Bundles B, C, and D in all four scenarios. There are major improvements in trip time and congestion for cross-harbor trips. Bundle C provides the greatest reduction in average trip time for cross-harbor trips in most scenarios. This differs from regional results, which favored Bundle D. Either Bundle C or Bundle D provide the greatest improvement in cross-harbor congestion in three of the four scenarios.

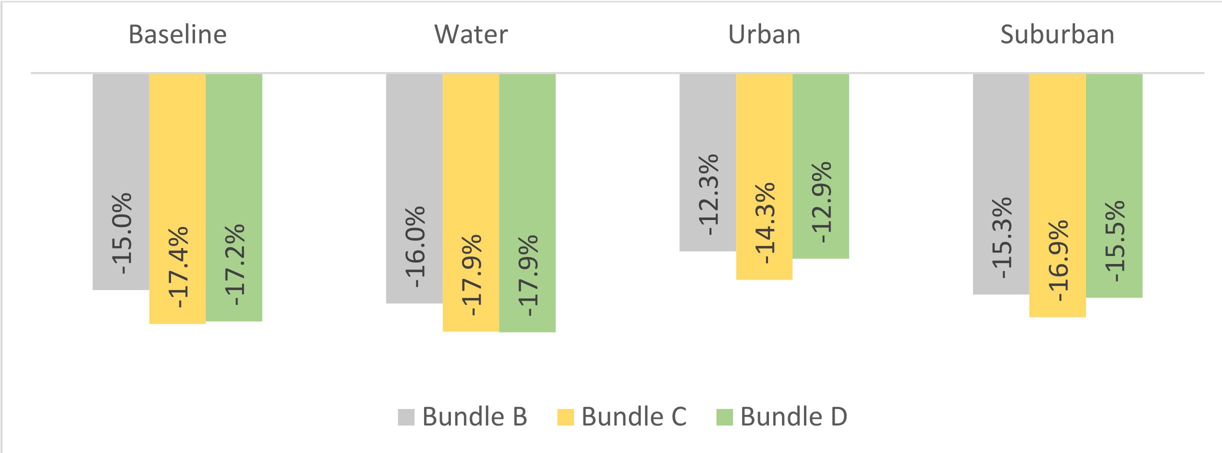


Figure 36. Cross-Harbor Percent Change in Average Trip Time Relative to 2045 RCS No Build Network

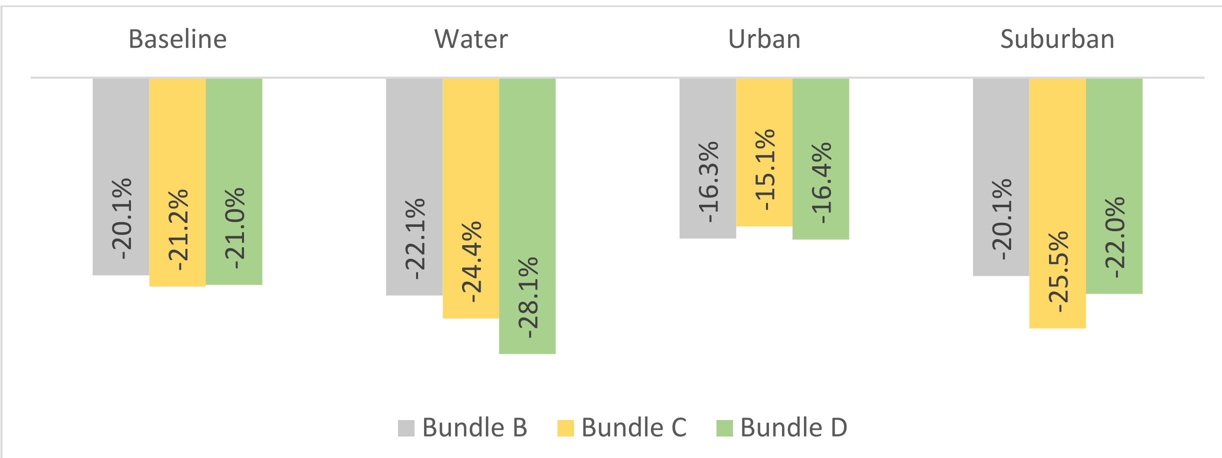


Figure 37. Cross-Harbor Percent Change in Share of Congested VMT Relative to 2045 RCS No Build Network

Cross-Harbor Economic Results

Per-trip societal benefits from Bundles B, C, and D for the cross-harbor market, across all scenarios, are shown in Figure 40. Bundle C provides the greatest per trip benefits for cross-harbor travelers across all scenarios, differing from regional results which generally favor Bundle D. Bundle B and Bundle D rank second, depending on the scenario.

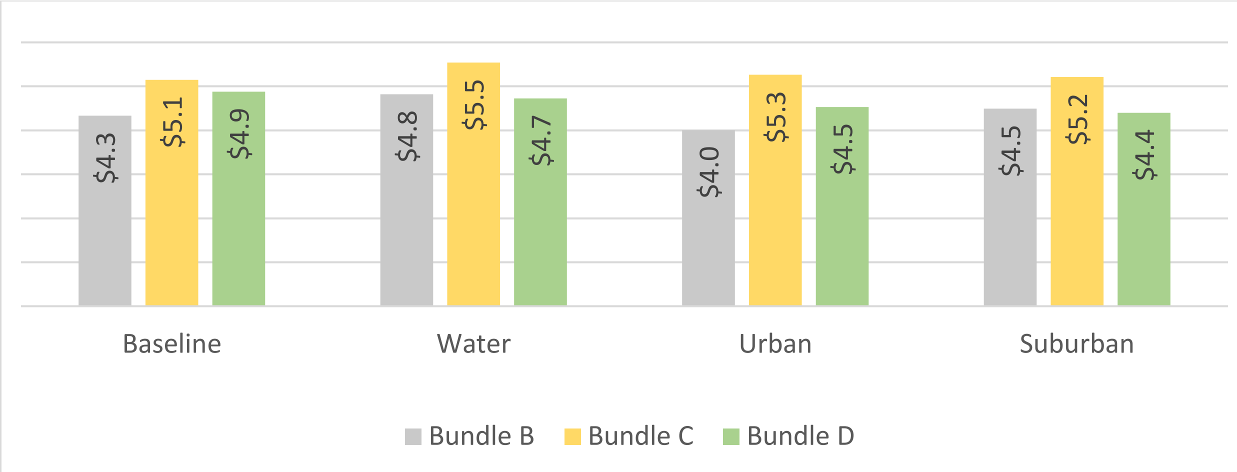


Figure 38. Societal Benefits in 2045 per Cross-Harbor Trip Relative to 2045 RCS No Build Network

The societal benefit per cost index for cross-harbor trips is shown in Figure 41. Across all scenarios, Bundle B is the most cost effective for improving cross-harbor trips. Bundle C and Bundle D show similar ability to improve cross-harbor trip performance across the scenarios.

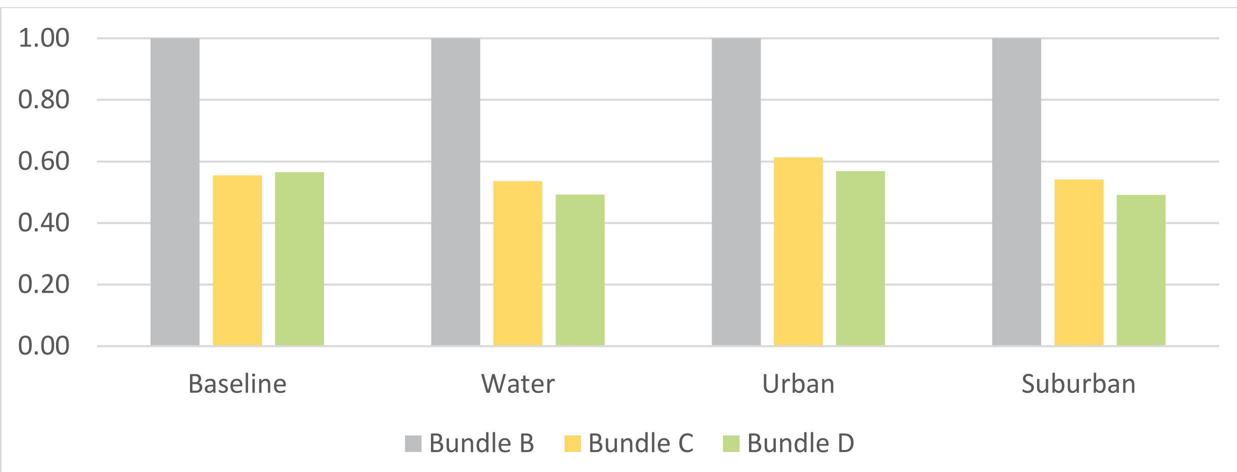


Figure 39. Cross-Harbor Societal Benefit per Cost Index (Benefits are Relative to 2045 RCS No Build Network)
Note: Results are indexed so that the most cost-effective bundle is assigned a score of 1, and the other bundles are assigned fractions based on their relative cost effectiveness.

Economic Modeling Conclusions

Results of the economic modeling runs across the various bundles and scenarios can be distilled into the following key takeaways:

- Without considering project cost, the larger projects deliver the greater benefit.
- Regionwide, Bundle D shows the greatest benefits in three out of the four scenarios.
- When focusing on cross-harbor trips only, Bundle C is the better performing bundle.
- Once cost is accounted for, Bundle B (Segments 1a and 2) is always more cost effective than Bundle B (Segments 1a, 4, and 5) and Bundle D (Segments 1a, 2, 3, and 4).

Depending on how the future evolves, Bundles C and D may merit additional consideration despite their high cost; these bundles improve not only cross-harbor performance, but also east-west connectivity on the Southside.

Chapter 8: Step 3 Operations Analysis

Step 3 of Phase III in the RCS is a stress test of the study recommendations to deepen an understanding of the segment benefits and to cross-check earlier findings. One component of the stress test is an operations analysis of the recommended Tier 1 segments to determine if they perform satisfactorily and to assess whether further refinements to segment design and/or cost assumptions are warranted. This chapter describes the methodology and results applied in the operations analysis. These refinements did *not* result in substantial changes to design assumptions or higher cost estimates for the segments.

The Highway Capacity Software 2023 (HCS2023) Freeway Facilities module was used to analyze the 2045 baseline growth scenario for the No-Build and Bundle B networks for the baseline as well as the 2045 water, urban, and suburban growth scenarios. A summary of findings is discussed below.
The following roadways were included in the operational analyses:

- I-64 Eastbound and Westbound between Mercury Boulevard and I-564
- I-664 Northbound and Southbound between I-64 (northern terminus) and I-264
- VA 164 Eastbound and Westbound between I-664 and MLK Freeway
- I-564 Eastbound and Westbound west of I-64

Capacity Analysis Results

Each freeway facility was divided into discrete segments in HCS2023, with each segment identified as either a Basic, Merge, Diverge, Weave, or Overlap segment and analyzed in accordance with the VDOT Traffic Operational and Safety Analysis Manual (TOSAM, February 2020). The Level of Service (LOS) of each segment was determined based on the level of traffic congestion. Level of Service (LOS) is a qualitative measure used to relate the quality of traffic operations using letters A through F, similar to a report card, where LOS A represents excellent, free-flow conditions and LOS F represents failing levels of congestion. A Technical Document that presents detailed analysis results for specific highway segments and ramp junctions using additional Measures of Effectiveness (MOEs) is included in Appendix F. Note that the analyses did not include the traffic signals or other at-grade intersections at ramp junctions along surface streets.

For freeway analysis, density is the MOE used to identify LOS, with each LOS representing a range of values. Density is a measure of the number of vehicles in a single mile in a single lane; more specifically, vehicles are measured in passenger car equivalents, with heavy vehicles being equivalent to two passenger cars.

Summary comparisons of the No Build and Bundle B conditions under the baseline growth scenario are presented in the figures below. The AM peak hour analysis results are presented in Figure 42, and the PM peak hour analysis results are presented in Figure 43.

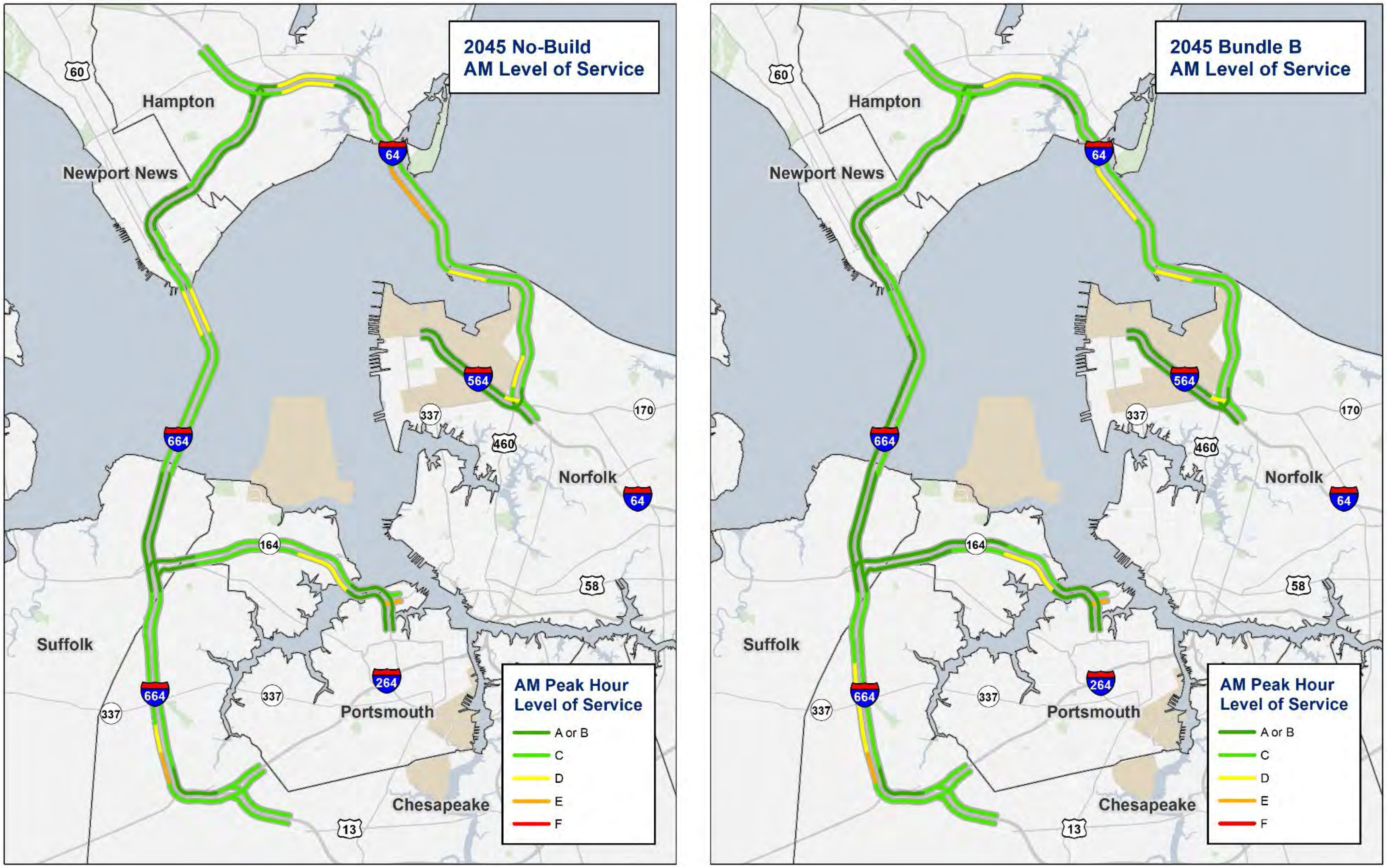
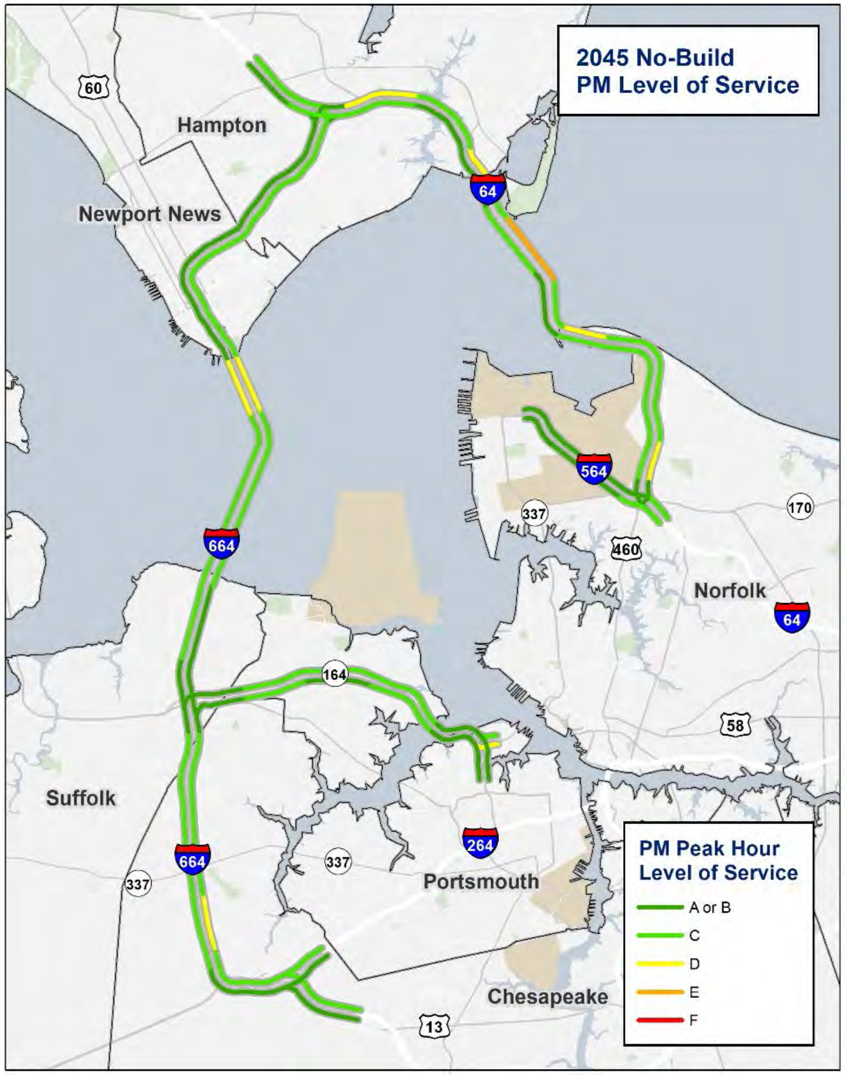


Figure 40: 2045 Baseline Scenario AM Peak Hour LOS Results Summary (No Build vs Bundle B)

NOTE: Only general-purpose highway network results shown; managed lanes operate at or near free-flow speeds, by design.



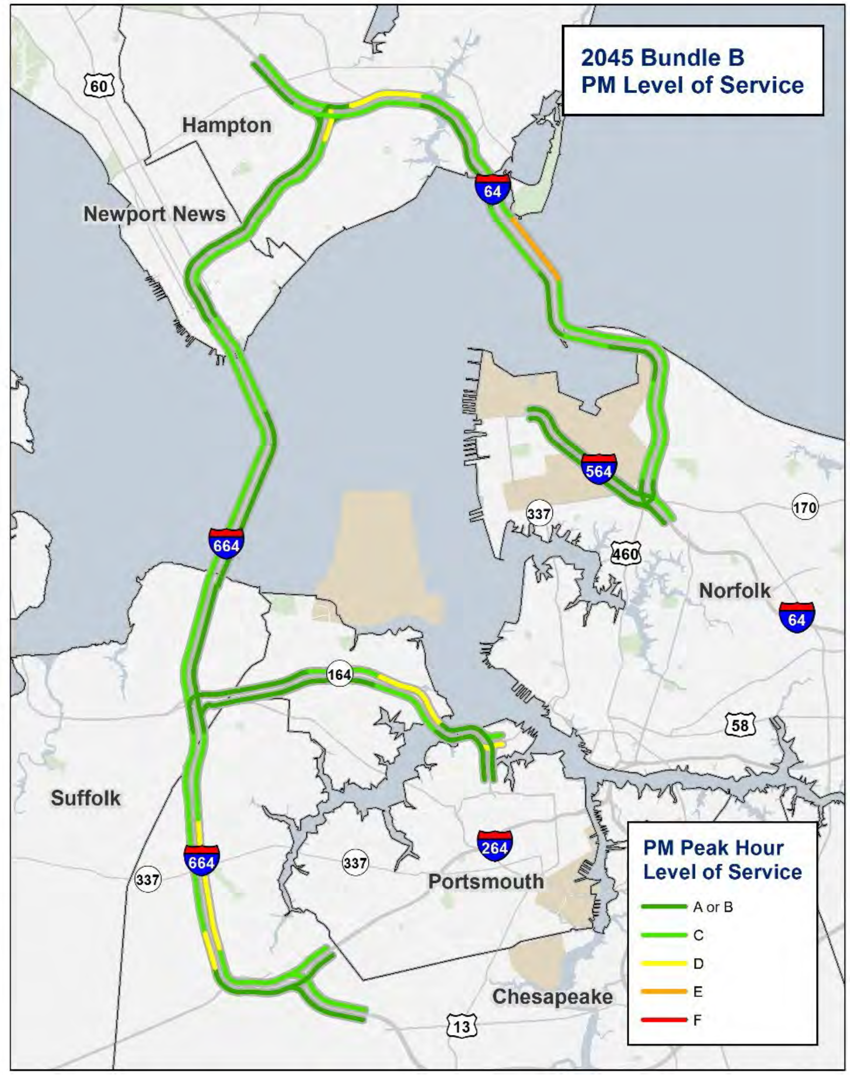


Figure 41: 2045 Baseline Scenario PM Peak Hour LOS Results Summary (No Build vs Bundle B)

NOTE: Only general-purpose highway network results shown; managed lanes operate at or near free-flow speeds, by design.

2045 Baseline No Build versus Bundle B

I-64 Eastbound and Westbound between I-664 and I-564

In the 2045 Baseline scenario, I-64 includes the HRBT expansion project which contains the future managed lanes along this segment. The analysis assumes that the managed lanes will always operate at or near free-flow speed. In general, the operational analysis results comparison between the 2045 Baseline No-Build and Bundle B scenarios shows that Bundle B will improve congestion along the I-64 general purpose lanes, particularly at the HRBT due to the volume reductions caused by the increased capacity of the managed lanes at the MMMBT.

During the AM peak hour, as shown in Figure 42, operations along the eastbound direction of the HRBT general purpose lanes are expected to improve from LOS E in the No-Build scenario to LOS D in the Bundle B scenario. The westbound direction of the HRBT is expected to maintain a similar LOS in both scenarios. The eastbound direction of I-64, just east of the I-664 interchange, improves from LOS D in the No-Build scenario to LOS C in the Bundle B scenario. Other I-64 roadway segments operate at a similar LOS when comparing the No-Build to the Bundle B scenario.

During the PM peak hour, as shown in Figure 43, operations along the westbound direction of the HRBT general purpose lanes are expected to remain at LOS E; however, the density is expected to significantly improve from the No-Build scenario to the Bundle B scenario. In the No-Build scenario, the density is just below the LOS F scenario, but in the Bundle B scenario, the density is just over the LOS E threshold. The westbound I-64 segment just west of the HRBT improves from LOS D in the No-Build scenario to LOS C in the Bundle B scenario. Other I-64 roadway segments operate at a similar LOS when comparing the No-Build to the Bundle B scenario.

I-664 Northbound and Southbound between I-64 and I-264

In the 2045 Baseline scenarios, the I-664 corridor includes the express lanes associated with the Bowers Hill Interchange project, which extend from Bowers Hill to College Drive. The analysis assumes that the managed lanes will always operate at or near free-flow speed. In general, the operational analysis results comparison between the 2045 Baseline No-Build and Bundle B scenarios shows that Bundle B will improve congestion along the I-664 general purpose lanes, particularly at the MMMBT as vehicles divert from the general-purpose lanes to the managed lanes in Bundle B.

During the AM peak hour, as shown in Figure 42, operations along the southbound direction of the MMMBT general purpose lanes are expected to improve from LOS D in the No-Build scenario to LOS C in the Bundle B scenario. The northbound direction of the MMMBT is also expected to improve from LOS D in the No-Build scenario to LOS C in the Bundle B scenario. It should also be noted that the congestion in the AM No-Build scenario along southbound I-664 in the vicinity of the Bowers Hill interchange is expected to extend further north in the Bundle B scenario. Other I-664 roadway segments operate at a similar LOS when comparing the No-Build to the Bundle B scenario.

During the PM peak hour, as shown in Figure 43, operations along the northbound direction of the MMMBT general purpose lanes are expected to improve from LOS D in the No-Build scenario to LOS C in the Bundle B scenario. Operations along the southbound direction of the MMMBT general purpose lanes are also expected to improve from LOS D in the No-Build scenario to LOS C in the Bundle B scenario. Several segments of both northbound and southbound I-664 just north of the Bowers Hill interchange degrade from LOS C to LOS D. Other I-664 roadway segments operate at similar LOS in the No-Build and the Bundle B scenarios.

VA 164 Eastbound and Westbound between I-664 and Martin Luther King Freeway

In general, the operational analysis results comparison between the 2045 Baseline No-Build and Bundle B scenarios shows that Bundle B will improve congestion along VA 164, particularly in the vicinity of the widening included in Bundle B.

During the AM peak hour, roadway segments along westbound VA 164 operate at LOS C or better in the No-Build scenario; all segments of westbound VA 164 operate at the same or better LOS in the Bundle B scenario. The eastbound VA 164 segment in the vicinity of the Cedar Road interchange operates at LOS D in both scenarios, and the ramp from eastbound State Route 164 to eastbound Martin Luther King Freeway operates at LOS E in both scenarios.

During the PM peak hour, the segment of westbound VA 164 in the vicinity of the Southern Branch of the Elizabeth River degrades from LOS C to LOS D. All other segments of VA 164 are expected to operate at similar LOS.

I-564 Eastbound and Westbound north of I-64

The operational analysis results comparison between the 2045 Baseline No-Build and Bundle B scenarios shows that Bundle B will have minimal impact to the I-564 freeway segments and ramp junctions.

Bundle B Greater Growth Scenarios

In general, the greater growth scenarios (Water, Urban, and Suburban) show minimal impacts to mainline traffic volumes during the AM and PM peak hours along the study area roadways when compared to the baseline growth scenario. Figure 44 shows the 2045 Total Peak Hour traffic for both the General purpose and managed lanes of the HRBT and MMMBT. As shown in the Figure 44, there are minimal changes in traffic volumes between the baseline and growth scenarios for the general-purpose lanes and managed lanes of the HRBT as well as the general-purpose lanes of the MMMBT. Traffic in the MMMBT managed lanes decreases in the Water and Urban growth scenarios when compared to the baseline growth. Traffic volumes in the MMMBT managed lanes increase in the Suburban growth scenario compared to the baseline growth, however these traffic volumes will not exceed he capacity of the managed lanes included in the Bundle B scenario. A Technical Document that presents detailed comparisons for specific highway segments and ramp junctions using additional Measures of Effectiveness (MOEs) is included in Appendix F.

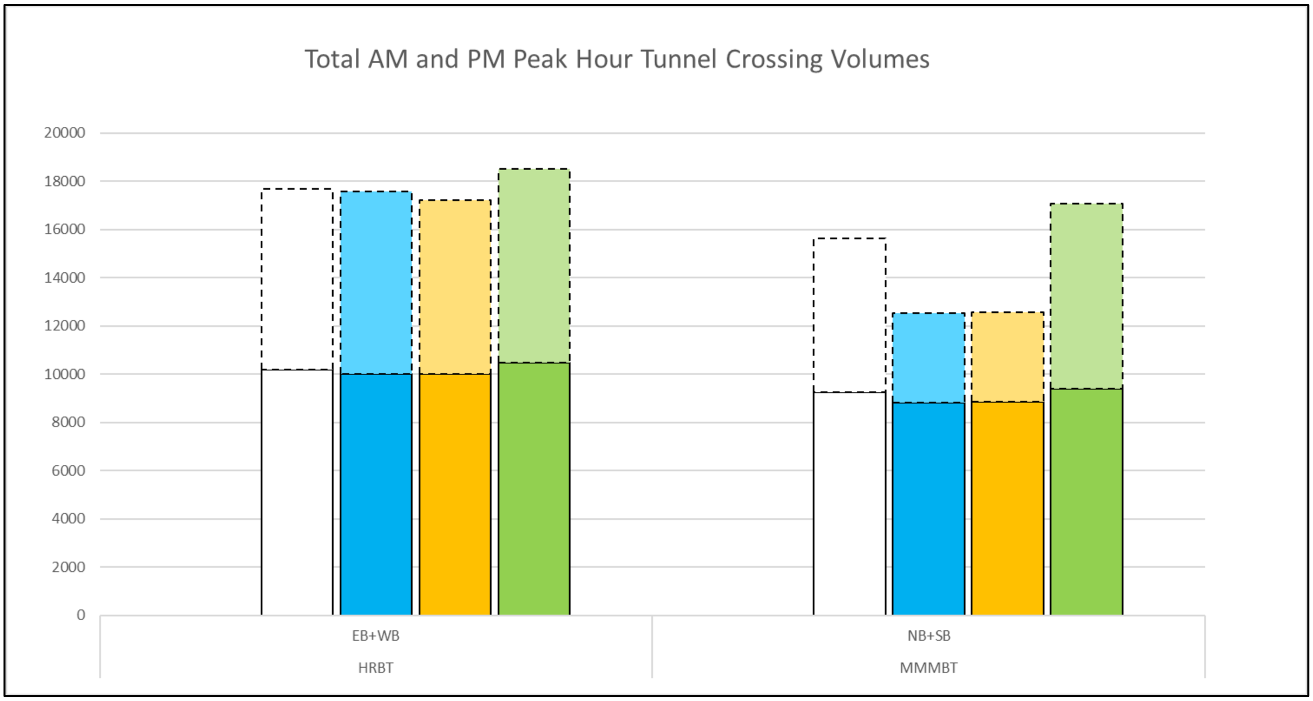


Figure 42: 2045 – Total AM and PM Peak Hour Tunnel Crossings. (HRBT crossings on left, MMMBT crossings on right.)

Chapter 9: Public Engagement

During Phase III of the RCS, public engagement was conducted to gather public input on the Step 1 and Step 2 analyses, the updated segments, and the draft tiering recommendations. In addition to sharing information, one focus of the engagement was gathering public input about the segments' potential benefits and the impacts or other qualities of the segments that would present burdens to the region's communities. Participants were also asked to offer ideas about how to balance the benefits and burdens. This discussion is particularly important for environmental justice (EJ) communities. Executive Order (E.O.) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* [11](1994) established the following definitions:

- Minority Individual: The E.O. references the U.S. Census Bureau classification of a minority individual as belonging to one of the following groups: American Indian or Alaskan native, Asian American, Native Hawaiian or Other Pacific Islander, Black (nor of Hispanic Origin), and Hispanic or Latino
- Low-Income Individual: A person whose household income is at or below the U.S. Department of Health and Human Services poverty guidelines

The E.O. 12898 of 1994 addresses the importance of avoiding, minimizing, and/or mitigating disproportionately high and adverse impacts to these populations and considering whether these populations share equally in the benefits of federal actions (i.e., projects with federal funding and/or permits). The full assessment of environmental justice effects occurs during the environmental impact analysis under NEPA, but it is encouraged to be considered during earlier planning studies such as the RCS. The goals of the E.O. 12898 of 1994 can best be achieved through community engagement, and for this reason environmental justice was examined and discussed in the RCS.

The Phase III public engagement activities began with one round of engagement in the winter of 2023, consisting of three pop-up meetings with a single poster and project fact sheet, followed by four open house meetings as shown in Table 9. The open house meetings were followed by an online open house that was active for three weeks. Next, on May 25, 2023, the RCS study team hosted a Regional Symposium that focused on inclusive participation of groups representing environmental justice communities and other traditionally underserved populations. Eighteen participants attended from groups including the National Association for the Advancement of Colored People (NAACP), several universities, civil rights and environmental justice specialists from state agencies, and agencies serving seniors, individuals with disabilities, unhoused individuals, low-income individuals, and minority individuals.

In both the winter 2023 public meetings and the regional symposium, participants were asked to share their impressions of potential benefits, burdens, and ways to balance the two when the regional connectors study segment projects move forward. The separate public engagement summary documents provide greater detail of the public input by segment. The themes of the public comments included congestion, tolls, having alternatives to personal vehicles, environmental concerns, and project timelines. The study team explained to the public that project timelines typically take at least 10 to 20 years from preliminary study (such as RCS) through construction. Table 10 and Table 11 provide

[11] 12898.pdf (archives.gov)

summaries of general public and Regional Symposium participant input, respectively, on benefits, burdens and balancing of the RCS segments.

Table 9: Winter 2023 Public Open Houses

Date	Location	City	Participants
February 1	Pearl Bailey Library	Newport News	15
February 2	Lambert's Point Community Center	Norfolk	18
February 7	Churchland Branch Library	Portsmouth	15
February 9	VDOT Hampton Roads District Office	Suffolk	20

Table 10: Public Open House Summary of Potential Benefits, Burdens, and Balancing of RCS Segments

Potential Benefits	Potential Burdens	Ideas for Balancing
Builds on Prior Studies	Cost and Tax Increases	Add Transit/Rail Modes
Addresses Congestion and/or Bottlenecks	Increased Development	Keep Speeds Low
Improved Commute Times	Environmental Impacts and Runoff	Compensate Property Owners Fairly
Improved Pedestrian/Bicyclist Safety	Community Impacts	Reduce/Remove Tolls
Reduced Truck Traffic and Emissions	Construction Impacts	Extend Segment 2 to Route 17
Economic Benefits to Businesses	More Congestion on Existing Routes	Address Environmental Impacts
	Tolls	Accelerate Construction
		Combine Segments
		Impose Costs on Private Sector

Table 11: Regional Symposium Summary of Potential Benefits, Burdens, and Balancing of RCS Segments

Potential Benefits	**Potential Burdens**	**Ideas for Balancing**
Access to Jobs	Construction Impacts (including concerns for populations with visual and mobility impairments)	Communication About Construction
Bus Reliability (especially with express lanes)	Adjacent Property Impacts	Bicyclist and Pedestrian Safety at Ramps and Crossings
Shorter Travel routes	Environmental Impacts	Add Recreation Access/Features
Lower Travel times	Visual Impacts	Manage Various Construction Impacts
Access to Tourism, Services, and Education	Tolls/Costs	

In the spring of 2023, the study team also made presentations on the project to the HRTPO Community Advisory Committee, the Pughsville Civic League, and the Churchland Civic League. The Pughsville Civic League raised concerns about flooding issues in their area which is an existing problem and is not adjacent to any of the RCS segments. Nevertheless the study team conferred with VDOT, Hampton Roads Planning District Commission (HRPDC), City of Suffolk, and City of Chesapeake to provide a response regarding grants and funded projects related to their concerns. The Churchland Civic League expressed concerns regarding tolling and the inequitable impacts of the Midtown Tunnel project on their community. As stated in the Overview section of this report, the Regional Connectors Study acknowledges that the Elizabeth River Crossing agreement has had a detrimental impact on Portsmouth and the goal is not to repeat this. there are no plans to implement tools on VA 164 widening. At this time HRTPO does not have a plan to implement tolls on VA 164 widening. HRTPO will work with regional, state, and other stakeholders to ensure that funding is in place to avoid tolls.

The Phase III public engagement activities concluded with a final round of engagement in the summer of 2023, consisting of three pop-up meetings with a single poster and project fact sheet, followed by four open house meetings as shown in Table 12. The open house meetings were followed by an online open house that was active for three weeks. As often is the case with mid-summer public engagement, the in-person participation was low. To encourage more participation in the online open house, the study team mailed over 16,000 postcards to single-family homes near the project areas located in Norfolk, Newport News, Portsmouth and Suffolk. The online open house was viewed 821 times with an average view time of 1 minute, 33 seconds, and 45 responses to questions were submitted. The themes of the public comments were generally consistent with prior input and included congestion; tolls and project costs; having alternatives to personal vehicles; using technology to improve transportation system performance; environmental concerns including flooding, water quality, marine life; and construction impact concerns.

Table 12: Summer 2023 Public Open Houses

Date	Location	City	Participants
July 31	Pearl Bailey Library	Newport News	8*
August 1	First Baptist Church Lambert's Point	Norfolk	3
August 2	Churchland Branch Library	Portsmouth	3
August 3	VDOT Hampton Roads District Office	Suffolk	6

*Several youths attended this meeting but only two signed in.

Chapter 10: Conclusions

The initial Tiering evaluation recommended Segment 1a (I-664 Widening north of College Drive) and Segment 2 (VA 164 Widening) for Tier I; and Segment 3 (VA 164 Connector), Segment 4 (I-564 Connector), and Segment 5 (I-664 Connector) for Tier II. These recommendations acknowledged the higher benefits of Segments 1a and 2 relative to their costs and the higher readiness of these two segments, compared to the greater permitting and construction challenges, timing issues, and interdependency of the “Connector” segments and the lower incremental benefit of these segments relative to their costs.

In the final analyses of Phase III, the Greater Growth Scenario analysis and operations analysis put the Tier I and Tier II recommendations through a stress test. These analyses were important to a) affirm or challenge the Tier I recommendations, and b) observe whether the Tier II segments belong in the Regional Transportation Vision Plan.

The operations analysis of Bundle B, made up of the Tier I segments, showed that the express lane network and general-purpose lanes work as intended to minimize congestion. The 2045 RCS No Build exhibited congestion on both harbor crossings that was resolved by Bundle B. This analysis supports the consideration of these segments in the fiscally constrained 2050 LRTP, which is the basis of Tier I recommendations.

In the Greater Growth scenario analysis, Bundle B consistently performed best when benefits were compared to costs, supporting the Tier I recommendations.

For the Tier II segments, the congestion and economic benefit analysis indicated that these segments would have more benefits in addition to those from Bundle B in certain greater growth scenarios. The segments in Bundle C (I-664 Widening plus the I-564 Connector and I-664 Connector), showed greater benefits in the Greater Suburban Growth scenario and particularly for harbor crossings. The segments in Bundle D (I-664 Widening and VA 164 Widening plus the VA 164 Connector and I-564 Connector) showed greater benefits with the Greater Growth on the Water scenario and provide enhanced east-west connectivity on the Southside. These insights support including the Tier II segments in the Regional Transportation Vision Plan.

Community engagement supported the potential benefits of the harbor crossing improvements including improved travel times, shorter trips, and improved access to jobs, tourism, and regional services and amenities. Citizens and stakeholders expressed concerns about construction impacts, project costs, tolling, and potential community and environmental impacts. Residents and stakeholders proposed strategies to balance projects benefits and burdens during project implementation including construction mitigation strategies, addressing multimodal accessibility during and after construction for all crossings and interchanges, adding recreational access to the project(s), and strong communication throughout construction.

Part II Technical Appendices

Appendix A: Comments in Response to Step 1, with Responses

Number	Page	Section	Source	Comment	Response
1		RCS	George Janek Norfolk District Regulatory Branch (May 3, 2022)	Each of the six mandated segments, and "bundled" combinations of these segments, must have independent utility and can only be permitted if they are separate and complete projects with logical termini.	Comment noted. The first tier review only included a segment evaluation while the second level of review is including segments joined into logical bundles for evaluations with logical termini.
2	8	RCS	George Janek Norfolk District Regulatory Branch (May 3, 2022)	As part of the Mitigation of Environmental Factors analysis, you should consider whether there are tidal and/or nontidal compensation credits available from approved commercial banks.	Comment noted. At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.
3	9	RCS	George Janek Norfolk District Regulatory Branch (May 3, 2022)	408, 404, and Section 10 permits are all related. If there are 408 issues with a segment, there will likely be permitting issues as well.	Comment noted and consultant agrees.
4	19	RCS	George Janek Norfolk District Regulatory Branch (May 3, 2022)	Segment 1A: Even if there are no wetland impacts from this alternative, potential impacts from bridges, tunnels, and island configurations could be significant.	Comment noted. All segments have undergone an initial environmental review with additional evaluations occurring as more detailed design information becomes available.
5		RCS	George Janek Norfolk District Regulatory Branch (May 3, 2022)	Environmental justice impacts of all segments must be identified early and coordinated with affected communities.	Comment noted. All segments have undergone an initial environmental justice review with additional evaluations occurring as more detailed design information becomes available.
6	61	I-664 N. of College Dr.	George Janek Norfolk District Regulatory Branch (May 3, 2022)	re: Colonial Waterbird nesting habitat: Anticipate strong interest in and public objections to impacts to colonial nesting birds. Mitigation requirements for displaced birds may be required under Migratory Bird Treaty Act.	Comment noted. Consultant will make note of all comments during the public involvement stage of this project.
7	62	I-664 N. of College Dr.	George Janek Norfolk District Regulatory Branch (May 3, 2022)	benthic species: Pilings and riprap from new bridge and tunnel structures are probably not sufficient to offset impacts to benthic species. This has not been considered compensation on other large projects.	Comment noted. No specific measures can be determined at this level of engineering design.
8	62	I-664 N. of College Dr.	George Janek Norfolk District Regulatory Branch (May 3, 2022)	benthic species: Construction BMPs like TOYR, dredging BMPs, etc. may help mitigate turbidity impacts. However, "compliance with the VESCH" and "strict adherence to erosion and sediment control measures" are statements that are too general. These practices are intended for upland construction and stormwater control and generally don't apply to marine construction. It's not too early to start exploring more project-specific measures to control turbidity. These types of vague general statements are used throughout this section of the document.	Comment noted. No specific measures can be determined at this level of engineering design.

Page numbers refer to Step 1 Evaluation Memo in
Joint Steering (Policy) Committee and Working Group meeting April 26, 2022 packet

Number	Page	Section	Source	Comment	Response
9	64	I-664 N. of College Dr.	George Janek Norfolk District Regulatory Branch (May 3, 2022)	Potential Future Changes in Policy Issues: Impacts to shallow water habitat (are less than 2 meters deep) may require in-kind compensation.	Comment noted.
10	22	VA 164	Carl Jackson - City of Portsmouth	"Constrained Work Areas High: "The widening shown in the SEIS is proposed to be into the median that includes two Commonwealth Railway railroad tracks. This poses a significant challenge to construction the widening and likely crash wall between the tracks and VA-164. Furthermore, should any widening occur along the outside shoulder to mitigate conflicts with the railroad, the corridor is constrained by adjacent residential and commercial parcels. Resolving the challenges involved with constructing toward either the railroad or adjacent residential and commercial properties will incur a significant impact to the timing of the project." The highlighted facts above should provide a more realistic assumption that widening VA 164 will have a high impact either widening to the median or on the outside.	Agreed. This is a constrained corridor that will be addressed as the planning process continues. More advanced conceptual design will be done later in the planning process that will further identify corridor constraints and impacts.
11	22	VA 164	Carl Jackson - City of Portsmouth	"Local Government or Agency Minimal/No impacts for local entities have been identified at this time" · Why are Local Government Agency constraints considered "minimal" if Portsmouth is opposed to this? Granted the roadway is owned and maintained by the state but I can't imagine VDOT or FHWA moving forward with a project with strong local opposition. This constraint should be considered 'High". Our opposition is listed (Page 51 "Documented opposition from stakeholders Portsmouth")	The qualitative rating for the the VA 164 segment will be changed to reflect Portsmouth's concerns. Portsmouth will be included in the discussion as the planning and design process outreach, with opportunities to raise, raise, document and resolve concerns. This inclusive process including Portsmouth will continue as detailed planning proceeds at a later date.
12	23	VA 164	Carl Jackson - City of Portsmouth	"Environmental Justice (low income and minority communities) Moderate: Moderate Expansion to the eastbound side of VA-164 may require a portion of easement from Ebony Heights Park; however, further detailed design may avoid and/or minimize any potential impacts. No residents or neighboring communities would be relocated." · Where is the detailed design showing no residents will be relocated? · It should also be noted that Impacts to Ebony Heights Park care significant as City Council has indicated that recreation is a priority and enhancing recreational opportunities is also a key part of the City Manager's holistic crime reduction strategy. · Any project that takes away from recreational opportunities within Portsmouth communities will be met with resistance.	Noted. We have seen that Ebony Heights Park is both a recreational and hallowed ground, and will pay close attention to this park as planning and design progresses by the project owner. More advanced conceptual design will be done later in the planning process. At this first tier planning stage, it does not appear that any residential structures fall within the preliminary and developing Limits of Disturbance. The planning process is still in its early stages, and will continue to solicit, document and resolve comments and concerns about relocation, displacement and property from Portsmouth in later stages of planning and design.
13		VA 164	Carl Jackson - City of Portsmouth	"Communities within 500 feet of the proposed construction to the north and south of the corridor are majority minority with over 25% of households in poverty. 102 houses 58 2-story apartments, 44 garden apartment blocks, and 3 churches." · This should be a non-starter for any roadway project that truly acknowledges Environmental Justice.	Noted. Communities within 500 feet of the preliminary Limits of Disturbance for VA 164 are diverse racially and in income. As this and future planning and project development processes continue, outreach, partnering and collaboration with neighboring communities will engage these communities to mitigate any potential impacts.

Number	Page	Section	Source	Comment	Response
14	39	VA 164	Carl Jackson - City of Portsmouth	"VDEQ Virginia Construction General Permit Minimal Assumption that all required stormwater controls and requirements pursuant to this permit will be obtained and adhered to. It is assumed for this segment that all additional stormwater controls would be located within the boundaries of the LOD." · The limits of disturbance for VA-164 do not include any space for stormwater management. How is this any different for the RCS? Where is this accounted for in the analysis?	At this early planning stage, it is unknown what additional impervious surface will be constructed. The future design process will develop better estimates of impervious surface burden to determine what best management practices to implement, and where, in the future timeframe that is indicated in the RCS segment tiering recommendation.
15		VA 164	Carl Jackson - City of Portsmouth	In summary, we believe that the analysis of VA 164 needs to be done with the assumptions of the SEIS and showing an outside widening which will reveal higher impacts to residential and commercial businesses and give the alternative a HIGH impact rating overall. This will provide a more realistic comparison to the other alternatives. The analysis for the VA 164 Connector showing HIGH impact ratings for almost every category is more consistent with the kind of analysis that should be done with VA 164.	Noted. The planning process is in its early stages. We appreciate your comments, as they provide us the opportunity to understand, respond, and work with Portsmouth to reach the development outcome that is best for the communities neighboring VA 164 , Portsmouth, and the region. The qualitative analysis presented in May of 2022 balanced widening to the inside of existing VA 164 per input from key stakeholders, and the next step of the quantitative analysis is further refining the design of the corridor for impact analysis.
16	70	VA 164	George Janek Norfolk District Regulatory Branch (May 3, 2022)	Environmental Justice: EJ is more than relocating residents or affected populations. Noise and air quality impacts must also be taken into account and coordinated early with stakeholders and affected communities.	Comment noted. All segments have undergone an initial environmental justice review with additional evaluations occurring as more detailed design information becomes available. At this qualitative stage, noise and air quality were not specifically measured or modeled, but described generally as potential impacts. Noise wall information will be incorporated into the more detailed planning and design reviews. As this and future planning and project development processes continue, outreach, partnering and collaboration with neighboring communities will engage these communities to mitigate any potential impacts.
17		VA 164 Connector	Cathie J. Vick, Chief Development and Government Afffairs Officer - Port of Virginia (Sept. 26, 2022)	We appreciate the opportunity to share these comments and commit to partnering with the study's stakeholders to find solutions that address design criteria and security requirements for the VA-164 Connector on the Craney Island Marine Terminal. We look forward to continued engagement with the Regional Connectors study team, the HRTPO, and HRTAC to prioritize the region's future transportation system investments and participating in the continued success of the region.	Comment noted and evaluation matrix text updated accordingly.
18		VA 164 Connector	D. Dees - US Navy	1. Following the 2016 letter the Navy completed the investigation for safety distance requirements from public highway to the facilities at Craney Island Fuel Terminal in relation to fueling operations to a public highway, referenced in paragraph (2) of the 2016 letter. A distance of approximately 1,800 feet is required with a physical barrier to prevent visual observation of the fueling operation systems (pump, tanks and fuel lines) from the public highway.	Understood. As a result of this required specification, the RCS Team is developing the VA 164 connector corridor with an 1,800-foot distance from the planned refueling in addition to a visual barrier in future design iterations.

Page numbers refer to Step 1 Evaluation Memo in
Joint Steering (Policy) Committee and Working Group meeting April 26, 2022 packet

Number	Page	Section	Source	Comment	Response
19		VA 164 Connector	D. Dees - US Navy	1.a. As proposed the I-164 Connector roadway is adjacent to the comer where Midway Road intersects Waterfront Drive. This area of Navy property has been approved and designated for the construction of four additional above ground fuel storage tanks. Site approval for this location to include Environmental approval has already occurred and the design is expected to begin in the near future.	Understood. As a result of this required buffer, the RCS Team is developing the VA 164 connector corridor with an 1,800-foot distance from the planned refueling in addition to a visual barrier in future design iterations.
20		VA 164 Connector	D. Dees - US Navy	1.b. Based on the Navy Security Engineering Planning Assessment, the minimum standoff distance from any non-DOD roadway or rail line is approximately 1,800 feet from the Navy Fuel Tanks. In addition, the roadway will need a wall along this stretch to prevent visual observation of the Fuel Facility and operations.	Understood. The RCS Team is developing the VA 164 connector corridor with an 1,800-foot distance from the planned refueling in addition to a visual barrier in future design iterations.
21		VA 164 Connector	D. Dees - US Navy	1.c. The current proposed 1-164 Connector crosses further West over Navy property where the above ground main fuel supply lines are located. A wall along the roadway will also be required where this crossing occurs to prevent visual observation of the fueling operation systems.	Understood. The RCS Team is developing the VA 164 connector corridor with an 1,800-foot distance from the planned refueling in addition to a visual barrier in future design iterations.
22		VA 164 Connector	D. Dees - US Navy	1.d. Defense Fuel Support Point (DFSP) Craney Island is a strategic, irreplaceable asset on the East Coast to not only Navy, but also to Air Force, Army, Marine, and Coast Guard. The strategic nature of Craney Island is largely due to 2 facts:	The RCS evaluation team acknowledges that strategic importance of Craney Island within the context of Naval Station Norfolk and are staying in communication with stakeholders like the Navy throughout the process to ensure that the planning process evolves into a design and construction process that serves both the strategic and regional needs of the Hampton Roads region.
23		VA 164 Connector	D. Dees - US Navy	1.d.1) Location. Craney Island is located on the Elizabeth River in Hampton Roads in close proximity to the Navy's largest single concentration of ships worldwide. The location also allows ready access to tankers to transport fuel from Gulf Coast refineries, and transshipment via the Atlantic sea lanes and the Atlantic Intracoastal Water Way.	Understood. The RCS report in May of 2022 was a qualitative assessment, and the RCS team is now working on refining the quantitative understanding of traffic demand modeling and design needs. The RCS team and the agencies that carry this planning process forward to design, construction and operations will work in partnership with the Navy to develop, design, and construct the VA 164 connector alignment, roadway, and facilities in a way that does not impair the planned functions of Craney Island.
24		VA 164 Connector	D. Dees - US Navy	1.d.2) Colonial Pipeline. Craney Island has resilient and redundant access to the refining capacity of the Gulf Coast via direct connection with the Colonial Pipeline. Secondarily, Craney Island can receive by tanker at the piers. This capability cannot be easily duplicated anywhere else.	Understood. The RCS report in May of 2022 was a qualitative assessment, and the RCS team is now working on refining the quantitative understanding of traffic demand modeling and design needs. The RCS team and the agencies that carry this planning process forward to design, construction and operations will work in partnership with the Navy to develop, design, and construct the VA 164 connector alignment, roadway, and facilities in a way that does not impair the planned functions of Craney Island.
25		VA 164 Connector	D. Dees - US Navy	Craney Island and the multi-billion dollars worth of fuel infrastructure cannot be moved and must be safeguarded to preserve critical fuel mission support to the warfighters.	Understood. The RCS report in May of 2022 was a qualitative assessment, and the RCS team is now working on refining the quantitative understanding of traffic demand modeling and design needs. The RCS team and the agencies that carry this planning process forward to design, construction and operations will work in partnership with the Navy to develop, design, and construct the VA 164 connector alignment, roadway, and facilities in a way that does not impair the planned functions of Craney Island.

Number	Page	Section	Source	Comment	Response
26		VA 164 Connector	D. Dees - US Navy	11. The VA-164 Connector over the Navy's Craney Island Fuel Terminal will need to provide measures that restrict vehicle and pedestrian access that meets all Federal security requirements without bisecting the DoD internal connectivity between the north and south areas.	Correct. The Regional Connectors Study is a conceptual planning stage of design. The future stages of the project will be carried forward by regional or commonwealth such as HRTAC and VDOT. They will maintain communication and coordination with stakeholders and decisionmakers throughout the planning, design, and construction process.
27		VA 164 Connector	Lesley Dobbins-Noble Chief, Operations Branch U.S. Army Corps of Engineers, Norfolk District	April 29, 2022 - Provided federal real estate GIS boundary of Craney Island Dredged Material Management Area (CIDMMA)	Received corrected GIS boundary file and included in project mapping.
28		VA 164 Connector	Lesley Dobbins-Noble Chief, Operations Branch U.S. Army Corps of Engineers, Norfolk District	May 5, 2022 - Reiterate that the concerns expressed in the 2016 letter from previous Norfolk District Corps of Engineers Commander, COL Jason Kelly, are still valid - Of utmost concern for the Norfolk District Operations Branch at this time are the potential impacts associated with the 164 Connector segment. - The raised roadway that transits alongside the eastern edge of Craney Island is of major concern to the Operations Branch as we routinely utilize the eastern side of Craney Island to access our rehandling basin and moor Corps and contractor vessels at the bulkhead. The raised roadway poses an access concern due to the restriction of passage of government vessels equipped with cranes, as they require greater overhead clearance.	Understood. We will continue to work with the COE to understand the operations requirements for the Craney Island Dredge Disposal Facility and incorporate all requirements into the planning and design. The RCS team will not be the project owner in the final stages of planning, design and construction.
29		VA 164 Connector	Lesley Dobbins-Noble Chief, Operations Branch U.S. Army Corps of Engineers, Norfolk District	5/5/2022 - As you are aware, the Norfolk District Corps of Engineers will be required to assess any proposed roadway alignment through the Section 408 evaluation process. During that review, district staff will determine whether the proposal poses a detrimental effect on our approved civil works projects.	Understood. Section 408 permit requirements for the Craney Island Dredge Disposal Facility will be taken into consideration during the permitability review efforts.
30		VA 164 Connector	George Janek Norfolk District Regulatory Branch (May 3, 2022)	June 2016 letter which outlines some of the Corps' concerns with transportation segments which may affect Craney Island and federal navigation channels	Comment noted. All concerns addressed in the June 2016 letter have been incorporated into the permitability review tables for each of the segments. Particular of note is the Craney Island Dredge Disposal Facility Section 408 status and new GIS boundary received May 2022.
31	24	VA 164 Connector	George Janek Norfolk District Regulatory Branch (May 3, 2022)	Segment 3: Concur with this statement: "Determining the suitability of construction over/through the CIDMMA facility at the end of its lifespan will be a significant challenge and will require significant resources to resolve." Until 408 issues associated with CIDMMA are resolved, Corps Regulatory will be unable to issue a permit.	Comment noted and consultant agrees.
32	25	VA 164 Connector	George Janek Norfolk District Regulatory Branch (May 3, 2022)	Segment 3: Wetland impacts are projected to be 31.3 acres. This will require either the purchase of credits or remediation. What does "remediation" mean? The Corps usually requires wetland credits to offset unavoidable wetland impacts, and depending on the type of wetland impacts (tidal vs. nontidal) there may be a shortage of available credits in this watershed.	Comment noted. At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.

Number	Page	Section	Source	Comment	Response
33	39	VA 164 Connector	George Janek Norfolk District Regulatory Branch (May 3, 2022)	Segment 3: This segment probably has "high" 408 issues, not moderate, due to its proximity to CIDMMA.	Comment noted. Craney Island Dredge Disposal Facility Section 408 status and new GIS boundary received May 2022. The status of this segment will be changed for ongoing and future tiering coordination.
34		I-564 Connector	D. Dees - US Navy	2. The proposed 1-564 Connector alignment as reflected in the Phase 3 Qualitative Analysis is approximately 300 feet south of the bulkhead at the southern edge of Naval Station Norfolk and existing fueling facility. Based on the Navy Security Engineering Planning Assessment noted above, the minimum standoff distance from any non-DOD roadway is approximately 1,800 feet from the Navy Fuel Tanks and fueling facility. The 1,800 feet safety distance is required between the existing fueling operation system at the southern end of Naval Station Norfolk (near the bulkhead) and a public roadway and the proposed 1-564 Connector. A visual and physical barrier would be required to prevent visual observation of the Fuel Facility, Security Entry Control (Gate 6) and naval operations inside the fence.	Understood. It should be noted that the fueling facility referred to in this comment is within 300 feet of the existing Intermodal connector, which is currently planned to have the same alignment as the proposed I-564 connector. There are currently walls separating the Navy's fuel facility from the existing Intermodal connector. To satisfy the 1,800 foot the setback from the fueling facility would require a significant re-evaluation of the I-564 connector by FHWA, VDOT, Norfolk, and Port of Virginia. At the time that the segment design is developed further the appropriate mitigation will be determined in consideration of the security protocols in place at that time.
35		I-564 Connector	D. Dees - US Navy	3. Based on the information available in the Phase 3 Qualitative Analysis for 1-564 Connector roadway plans and cross sections and utilizing nominal heights for street lighting, Navy team was able to identify concerns to the approach and departure corridor, transitional and imaginary surfaces and instrument precision approaches to runway 10 which would negatively impact current missions and operations at Chambers Field.	Understood. At the end of the Phase 3 (Step 2) Quantitative analysis, which we are conducting now, we will recommend tiering of the segments into three tiers that correspond to timing of/readiness for implementation, with Tier 1 the most ready. As the project moves into design and construction, the project owner will be able to make decisions about equipment height and clearance to accommodate the Navy's operational needs in Norfolk. The RCS team will not be the project owner in the final stages of planning, design and construction.
36		I-564 Connector	D. Dees - US Navy	4. The proposed 1-564 Connector is approximately 5,000 feet west by southwest of the end of runway 10 centerline. If cranes of similar heights to those used on the current VDOT Hampton Roads Bridge Tunnel (HRBT) and 1-64 widening projects are used for this proposed project flight operations would have restrictions placed on them due to crane height impacting the operational capability of the airfield and its ability to support worldwide operations. These restrictions would be significant and require excessive coordination that would significantly impact and likely result in the loss of mission sets such as the Air Mobility Command cargo mission from Chambers Field. In visual meteorological conditions (VMC) (clear) weather, daily coordination would be required to minimize impacts to flight operations with Chambers Field. In instrument meteorological conditions (IMC) weather or forecasted weather to be IMC, work on the tunnel would need to be immediately halted, the crane lowered and remain lowered until VMC was recovered due to the proximity of the construction area to Chamber's Field runway and precision landing path. This coordination and actions would impart additional risk to aircrew and airfield operations due to this need and result in a day for day extension to construction time for every IMC day. FAA Obstacle Evaluations with a lA survey level of accuracy would be required in order to minimize impacts to operations. Based on the information available today, the impacts to existing and future missions and operations are not fully known and the Navy reserves the opportunity to continue evaluating for temporary as well as permanent impacts as more information becomes available.	Understood. As the project moves into- design and construction, the project owner will be able to make decisions about equipment height and clearance to accommodate the Navy's operational needs in Norfolk. The RCS team will not be the project owner in the final stages of planning, design and construction.

Number	Page	Section	Source	Comment	Response
37		I-564 Connector	D. Dees - US Navy	5. As reflected in the Phase 3 Qualitative Analysis drawing and cross section for the 1-564 Connector the elevated overpasses over Naval Station Norfolk and in close proximity to the perimeter fence line near Gate 6, causes significant security issues for military personnel, for fuel operations, fuel barges and fuel tanks, ordnance movements, military vessels, piers, as well as other facilities and waterfront operations. The past and current land uses of the area identified for the proposed 1-564 Connector are compatible with current missions and operations adjacent to the southern boundary of Naval Station Norfolk.	Understood. At the end of the Phase 3 (Step 2) Quantitative analysis, which we are conducting now, we will recommend tiering of the segments into three tiers that correspond to timing of/readiness for implementation, with Tier 1 the most ready and Tier 3 the least ready. At the time of project design and construction, the project owner will be able to make decisions about equipment height and clearance to accommodate the Navy's operational needs in Norfolk. At this early planning stage of the segment tiering process the Regional Connectors study is not considering an elevated section between the end of the existing Intermodal connector and the end of Norfolk International Terminal Pier 3. Instead, the I-564 connector is planned to be underground along the length of existing NIT Pier 3 and tunnel under the Elizabeth River shipping lanes to surface at a bridge to the west of the NIT and to the north of Craney island. It may be possible to tunnel the I-564 connector further East approaching the Hampton Boulevard underpass, but that design will involve additional costs.
38		I-564 Connector	D. Dees - US Navy	6. Based on proposed alignment of 1-564 Connector and not having the minimum separation distances needed between public roadway and ordnance handling operations at NSN piers 1 through 3, these operations and missions are in jeopardy. Based on the projected traffic counts of the proposed new road, the installation would not qualify for a waiver if the 1-564 Connector is built given its proximity to the piers 1 through 3 and the expected traffic loading, resulting in a loss of mission and operational capability of weapon loading/unloading at piers l through 3. A contract award of $300M to replace submarine Pier 3 a WWI era pier was awarded in May 2022 and is expected to be completed in the year 2027 to support berthing of Los Angeles class, extended version of the Virginia class and Virginia Payload Module class submarines and allow for greater weapons onloading as supported by Naval Station Norfolk's current permits. This pier is mission essential to United States National Security and is projected to be in service for over 50 years.	Understood. The NIT pier alignment that the RCS alternatives is currently planning on using is nearest to Naval Station Norfolk's Pier 1. Evolving security and visibility technology may resolve these security concerns as the I-564 corridor progresses from planning to design. Evolving transportation technology may change the corridor design as well. Horizontal and vertical clearances required by the Navy for essential security will be considered in the future plannig and design process.
39		I-564 Connector	D. Dees - US Navy	7. The water area north of the proposed 1-564 Connector aligns with northern edge of Norfolk International Terminal's Pier 3, and falls within the military restricted area as established by the Army Corps of Engineers at 33 CFR 334.300. Additionally, permission coordination must be obtained from the Navy for construction personnel or work boats to access and operate inside the military restricted area and must meet Navy security requirements.	Understood. The boundaries of Naval Station Norfolk as codified in the CFR begin along the northern edge of NIT pier 3. The RCS study does not plan nor contemplate exceeding the northern edge of Pier 3 of the NIT during the construction or operations of the I-564 connector. The RCS team will plan for and produce cost estimates to account for the need for vetting and hiring personnel with sufficient security clearances to work in the vicinity of Norfolk Naval Station Pier 1.
40		I-564 Connector	D. Dees - US Navy	8. During the proposed bridge and tunnel construction detailed coordination will be required to avoid impacts to Navy ships and fuel barges transiting to and from Craney Island Fuel Terminal to Naval Station Norfolk.	Correct. The Regional Connectors Study is a conceptual planning stage of design. The future stages of the project will be carried forward by regional or commonwealth such as HRTAC and VDOT. They will maintain communication and coordination with stakeholders and decisionmakers throughout the planning, design, and construction process.

Number	Page	Section	Source	Comment	Response
41		I-564 Connector	D. Dees - US Navy	9. Construction and dredge disposal requires detailed coordination to avoid impacts to OWWO transport from Naval Norfolk to Craney Island Fuel Terminal as well as ships transitioning the channel.	Correct. The Regional Connectors Study is a conceptual planning stage of design. The future stages of the project will be carried forward by regional or commonwealth such as HRTAC and VDOT. They will maintain communication and coordination with stakeholders and decisionmakers throughout the planning, design, and construction process.
42		I-564 Connector	D. Dees - US Navy	10. Construction and dredge disposal requires detailed coordination to avoid impacts to OWWO transport from Naval Norfolk to Craney Island Fuel Terminal as well as ships transitioning the channel.	Correct. The Regional Connectors Study is a conceptual planning stage of design. The future stages of the project will be carried forward by regional or commonwealth such as HRTAC and VDOT. They will maintain communication and coordination with stakeholders and decisionmakers throughout the planning, design, and construction process.
43		I-564 Connector	D. Dees - US Navy	12. Based on the segment drawing and cross section it is unclear how the I-564 Connector Study considered the ongoing VDOT ATI Interchange that is currently at 100% design with expected completion in FY-24. The ATI Interchange and access improvements are located between the existing 1-564 and the SPUI at "D" Ave, and is relevant to the interchange spacing in the corridor.	Correct. The Regional Connectors Study is a conceptual planning stage of design. The future stages of the project will be carried forward by regional or commonwealth entities such as HRTAC and VDOT. They will maintain communication and coordination with stakeholders and decisionmakers throughout the planning, design, and construction process.
44		I-564 Connector	D. Dees - US Navy	13. Based on the current alignment of I-564 Connector it appears modifications may be required to the recent finalized 1-564 Intermodal Connector including: a. Bridge crossings over Hampton Boulevard b. Navy secured access to/from Commercial Vehicle Inspection Station c. Public Connector Ramp to Hampton Boulevard	Correct. The Regional Connectors Study is a conceptual planning stage of design. The future stages of the project will be carried forward by regional or commonwealth such as HRTAC and VDOT. They will maintain communication and coordination with stakeholders and decisionmakers throughout the planning, design, and construction process.
45	26	I-564 Connector	George Janek Norfolk District Regulatory Branch (May 3, 2022)	Segment 4: Even though there may not be wetland impacts associated with the I-564 Connector, mitigation may be required for impacts to EFH, shallow water areas, and other impacts to subaqueous bottom.	Comment noted. At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.
46	78	I-564 Connector	George Janek Norfolk District Regulatory Branch (May 3, 2022)	Colonial Waterbird nesting habitat: The use of bird dogs to discourage bird nesting within the LOD may be an effective deterrent but will not be considered as a mitigation measure for bird nesting impacts.	Comment noted. Additional mitigation measures for bird nesting impacts will be evaluated as more detailed design allows for the determination of potential bird nesting impacts. The RCS team will not be the project owner in the final stages of planning, design and construction.
47		I-564 Connector	Cathie J. Vick, Chief Development and Government Afffairs Officer - Port of Virginia (Aug 3, 2022)	As stakeholders in the Regional Connectors Study (RCS), we believe that identifying specific links that accomplish congestion relief and provide economic opportunities will benefit the region. As the RCS team continues to evaluate the segments through the Phase3 Qualitative Analysis component of the study, several stakeholders have shared challenges, including those relating to the Craney Island Dredge Management Area, the VA-164 Connector segment, and the 1-564 corridor alignment	Agreed
48		I-564 Connector	Cathie J. Vick, Chief Development and Government Afffairs Officer - Port of Virginia (Aug 3, 2022)	The 1-564 corridor is a key gateway for The Port of Virginia and since the inception of the 1-564 Intermodal Connector in the late-1990's, the port has partnered with regional partners, FHWA,VDOT, US Navy, and City of Norfolk to establish the 1-564 corridor investments by utilizing the FHWA guidelines to address the needs of all stakeholders. Examples of collaboration in meeting stakeholder needs include: the Air Terminal Interchange to provide enhanced access tothe Navy's Commercial Vehicles Inspection Station,the new connection to the port's North Gate at Norfolk International Terminals, and the Naval Station Norfolk's Gate 6.	Agreed. Thank you for the historical perspective of past improvements to the Hampton Roads region in response to increasing infrastructural needs.

Number	Page	Section	Source	Comment	Response
49		I-564 Connector	Cathie J. Vick, Chief Development and Government Afffairs Officer - Port of Virginia (Aug 3, 2022)	As a designated Port of National Defense, The Port of Virginia understands the importance of security requirements of the U.S. Navy and we recognize that security requirements change over time based on unforeseen events or conditions. Based on the uncertainty of when the 1-564 cross-harbor segment will move forward to construction, we believe that security requirements at the time of design and construction may be accommodated with hardened infrastructure or technology advancements.	Agreed. Thank you for acknowledging the heightened security requirements throughout the region and especially around the Port facilities and the Navy.
50		I-564 Connector	Cathie J. Vick, Chief Development and Government Afffairs Officer - Port of Virginia (Aug 3, 2022)	Based on the input and collaboration that has occurred over the last two decades, The Port of Virginia has been strategically investing in critical infrastructure with the understanding that the 1-564 corridor alignment would remain in its current location and consistent with the final design plans.	Acknowledged. The project team is working to determine the optimal form of corridor expansion and new connector(s) to satisfy regional and stakeholder needs.
51		I-564 Connector	Cathie J. Vick, Chief Development and Government Afffairs Officer - Port of Virginia (Aug 3, 2022)	Examples of these investments in proximity to 1-564 include: • working with the Army Corps of Engineers to collaborate on funding and creating the deepest East Coast channel providing access to a national strategic port and Naval Station Norfolk; • securing $20 million in federal Port Infrastructure Development funds to expand rail capacity of the Central Rail Yard at NIT; and • advancing a $650 million NIT North Optimization project - with Phase 1 scheduled for completion in 2025, with $266 million in funding provided by the Virginia General Assembly.	Acknowledged. The project team is working to determine the optimal form of corridor expansion and new connector(s) to satisfy regional and stakeholder needs. This comment indicates that the expectation of the regional connectors is already driving other infrastructural decisions, which is a compelling reason for the Regional Connectors Study and the project team to arrive at a balanced recommendation for the project owners to progress to design and construction.

Appendix B: Step 2 Qualitative Analysis – Detailed Sources & Results

REGIONAL CONNECTORS STUDY

Phase 3
Update of Qualitative Evaluation

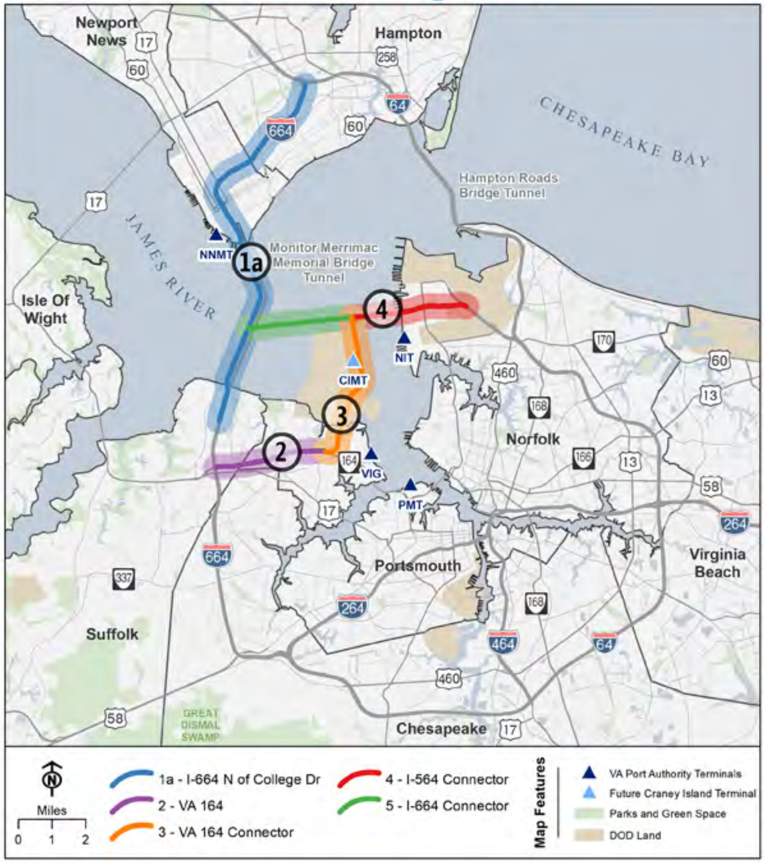
PREPARED SEPTEMBER 20, 2022

UPDATED FROM APRIL 15, 2022 DRAFT

RCS Phase 3 – Summary of Qualitative Evaluation of Mandated Segments

Table of Contents

Mandated Segments



Regional Connectors Study

Readiness Evaluation Criteria

Summary of Changes

Segment 1a: I-664 N. of College Dr.

Operational independence shift from moderate to most as a result of operational benefits.

Phasing potential shifted from moderate to most as a result of operational benefits.

HRTAC rating shifted from moderate to most as a result of congestion relief benefits.

Segment 3: VA 164 Connector

IIJA funding shifted from moderate to least due to lack of detail plan with no dedicated funding.

Segment 4: I-564 Connector

IIJA funding shifted from moderate to least due to lack of detail plan with no dedicated funding.

Permitting Issues Evaluation Criteria

Summary of Changes

Segment 2: VA 164

Stakeholder coordination shifted from moderate to high due to community impact concerns.

Segment 3: VA 164 Connector

404 permit issues changed from moderate to high with modifications to alignment.

408 permit issues changed from moderate to high with modifications to alignment.

Note that other segment ratings did not change, but all were re-examined with updated segment designs and/or new information as applicable. Additional observations are provided in the Technical Evaluation Tables.

Construction Complexity Evaluation Criteria

Omitted from this document and reflected in Cost Estimates going forward.

List of Abbreviations

Abbreviations	Meaning
AC	Acres
ACOE	Army Corps of Engineers
APE	Area of Potential Effects
BMP	Best Management Practices
CC	Collection Concern
CFR	Code of Federal Regulations
CGP	Construction General Permit
CIDMMA	Craney Island Dredged Material Management Area
CIFD	Craney Island Fuel Terminal
Conn	Connector
COSS	Corridor of Statewide Significance
CWA	Clear Water Act
DOD	Department of Defense
DON	Department of the Navy
E&S	Erosion Sediment
ERC	Elizabeth River Crossings
ESA	Environmental Site Assessment
FESE	Federal Endangered, State Endangered
FHWA	Federal Highway Administration
FIRMs	Flood Insurance Rate maps
FTSE	Federal Threatened, State Endangered
FTST	Federal Threatened, State Threatened
GWMA	Groundwater Management Areas
HOT	High Occupancy Toll
HRBT	Hampton Road Bridge Tunnel
HREL	Hampton Roads Express Lanes
HRSD	Hampton Roads Sanitation District
HRTAC	Hampton Roads Transportation Accountability Commission
HRTPO	Hampton Roads Transportation Planning Organization

Abbreviations	Meaning
IIJA	Infrastructure Investment and Job Act
IMR	Interchange Modification Report
LEDPA	Least Environmental Damaging Practicable Alternative
LOD	Limits of Disturbance
LRTP	Long Range Transportation Plan
LWCF	Land and Water Conservation Fund
MMBT	Monitor-Merrimac Bridge Tunnel
MMMBT	Monitor-Merrimac Memorial Bridge-Tunnel
N/A	Not Applicable
NAS	Naval Station
NAVSTA	Naval Station in Norfolk
NEPA	National Environmental Policy Act
NIT	Norfolk International Terminals
N-MMBT	Northern - Monitor-Merrimac Bridge Tunnel
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NRHP	National Register of Historic Places
NSA	Naval Support Activity
PCB	Polychlorinated biphenyls
RCRA	Resource Conservation and Recovery Act
RCSII	Regional Connectors Study Phase II
ROW	Right-of-way
SE	State Endangered
SEIS	Supplemental Environmental Impact Statement
SMART SCALE	System for the Management and Allocation of Resources for Transportation – Safety, Congestion Mitigation, Accessibility, Land Use, and Economic Development and environment
SPUI	Single Point Urban Interchange
ST	State Threatened
SWPPP	Stormwater Pollution Prevention Plan
TBD	To-Be-Determined

List of Abbreviations (continued)

Abbreviation	Meaning
TMDL	Total Maximum Daily Load
US	United States
USACE	United State Army Corps of Engineers
USACOE	United States Army Corps of Engineers
USCG	United States Coast Guard
USFWS	United State Fish and Wildlife Service
USS	United States Ship
VA	Virginia
VAC	Virginia Administration Code
VaFWIS	Virginia Fish and Wildlife Information Service
VDACS	Virginia Department of Agriculture and Consumer Services
VDEQ	Virginia Department of Environmental Quality

Abbreviation	Meaning
VDGIF	Virginia Department of Game and Inland Fisheries
VDOT	Virginia Department of Transportation
VESCH	Virginia Erosion and sediment Control Handbook
VIG	Virginia International Gateway
VIMS SAV	Virginia Institute of Marine Science - Submerged
VLR	Virginia Landmark Register
VMRC	Virginia Marine Resources Commission
VPA	Virginia Port Authority
VSMP	Virginia Storm Water Program
VTrans	Virginia's Statewide Transportation Plan
VWPP	Virginia Water Protection Permit
W-RNHT	Washington-Rochambeau Revolutionary Route National Historic Trail

Segments Evaluated

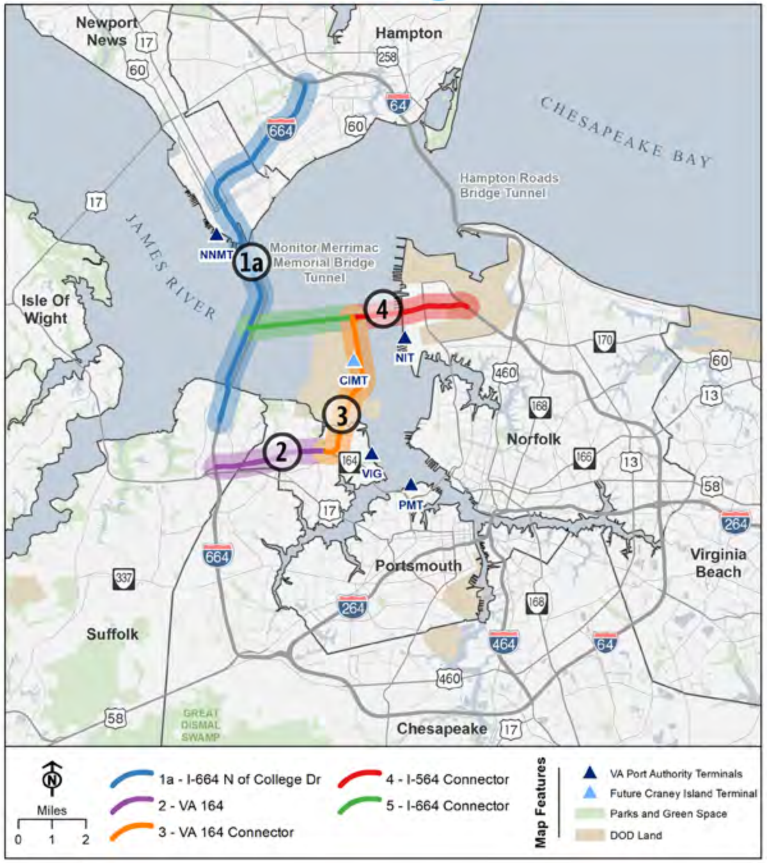
- 1a I-664 North of College Drive – Starting with general alignment of SEIS Alternative D – *adapted lane configuration* to 8 lanes with 4 GP lanes and 4 managed lanes.
- 2 VA 164 – Widen toward the median to 6 GP lanes per SEIS (adding one in each direction) – *expanded corridor by 20' each side as a cautionary measure to allow for inside crash wall depth for freight rail.*
- 3 VA 164 Connector – SEIS alignment (4 GP lanes)
- 4 I-564 Connector – SEIS Alternative D (4 GP lanes)
- 5 I-664 Connector – SEIS Alternative D (4 GP lanes)

For EJ evaluation, also considered demographics of surrounding 500' corridor

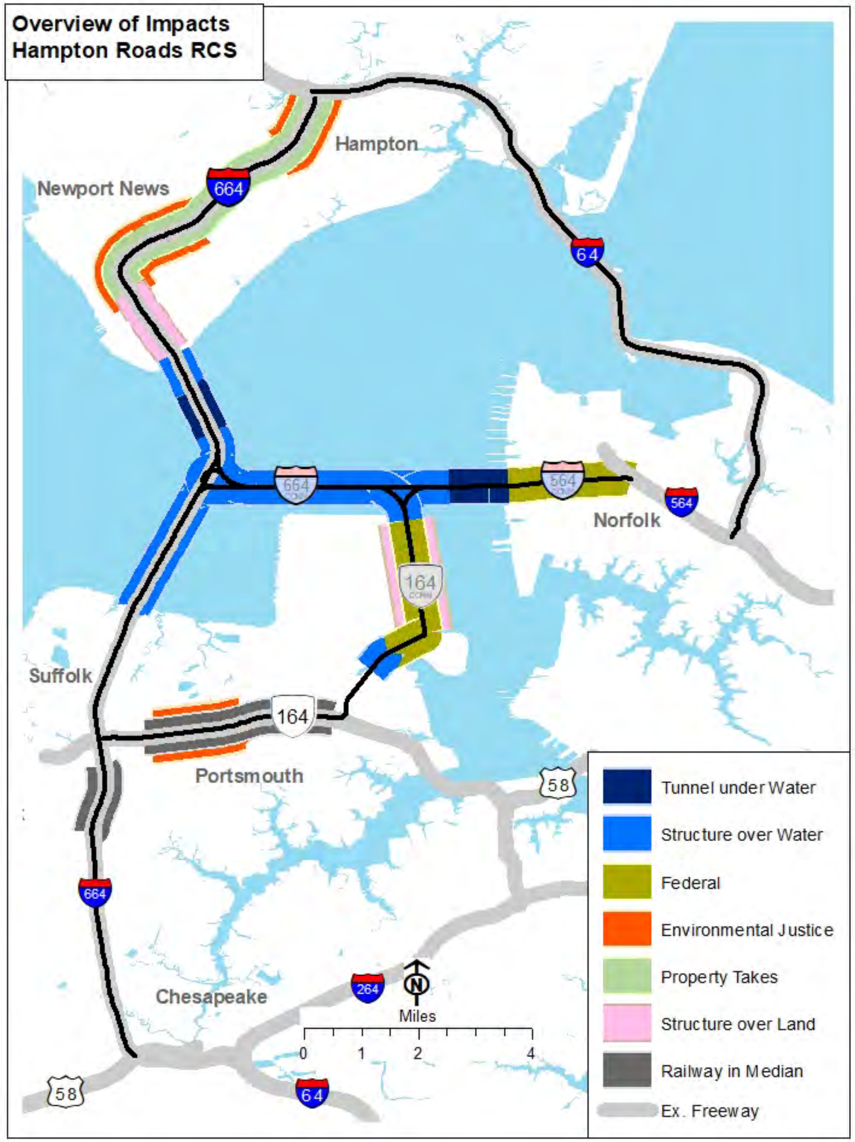
Final SEIS available at the HRBT Resources Page at https://www.hrbtexpansion.org/resources-and-documents/default.asp

Segment drawings showing limits of disturbance (LOD) and profiles available until October 16th *at https://eFTP.mbakerintl.com/message/2U2XgGTEX5nGQF3J0JKKue*

Mandated Segments



Evaluation Summary Tables and Map



Step 2 Qualitative Evaluation Highlights - Key Features

Permitting Issues Technical Evaluation

Permitting Issues Evaluation Criteria

Summary of Changes

Segment 2: VA 164 Connector

Stakeholder coordination shifted from moderate to high due to community impact concerns.

Segment 3: VA 164 Connector

404 permit issues changed from moderate to high with modifications to alignment.

408 permit issues changed from moderate to high with modifications to alignment.

Note that other segment ratings did not change, but all were re-examined with updated segment designs and/or new information as applicable. Additional observations are provided in the Technical Evaluation Tables.

REGIONAL CONNECTORS STUDY

Range of Impact

High

Moderate

Minimal

Step 1 Evaluation Measures – Segment Comparison

Permitting Issues and Key Environmental Impacts

Permitting Issues	*Segment 1a: I-664 N of College Dr.*	*Segment 2: VA 164*	*Segment 3: VA 164 Connector*	*Segment 4: I-564 Connector*	*Segment 5: I-664 Connector*
	1a	*2*	*3*	*4*	*5*
Community impacts (right-of-way, consistency with local plans)					
Sensitive property impacts (noise, community facilities, cultural)					
Environmental Justice (low income and minority communities)					
USACOE Section 404 Permit Issues			*		
USACOE Section 408 Permit Issues			*		
USACOE Section 10 permit					
USCG Bridge Permit					
NOAA Incidental Harassment Authorization					
VDEQ Section 401 Virginia Water Protection Permit					
VMRC Subaqueous Bottomlands Permit					
VDEQ Virginia Construction General Permit					
Local Wetlands Board Permit Issues					
Mitigation Complexity and Cost					
Permit Stakeholder Coordination (i.e. Maritime Stakeholders)		*			
Effect on other Federal Navigation Projects					
Potential Future Changes in Policy Issues					

* Evaluations that have been revised since original April 2022 draft

REGIONAL CONNECTORS STUDY

Step 1 Evaluation Measures – Segment Comparison

Range of Impact
High
Moderate
Minimal

Definitions of Evaluation Framework:

Impact Rating Concern – This evaluation category captures the potential effect of the project and its construction on the natural and social environment. Some of the most common environmental impacts are:

- social and community environment
- noise impacts
- water resources and wetlands
- protected species
- damage to ecosystems and loss of biodiversity
- historic resources
- regulatory requirements and complexity
- mitigation cost and complexity
- interdependence or conflict with other projects

Human well-being depends directly on biodiversity and ecosystems. It is therefore vital to try to measure, plan and minimize any segment activity that might alter the ecological balance.

- *Minimal: No or Minimal impacts to ecosystems (including social and natural)*
- *Moderate: Impacts that have reasonable solutions to ecosystems (including social and natural)*
- *High: Challenging or Unknown impacts to ecosystems (including social and natural)*

Feasibility Concern - Resource feasibility concerns indicate whether the segment will interfere with the socioeconomic activities within the corridor and identify potential issues and problems that could arise from pursuing the project.

- *Minimal: No or Minimal impacts to existing operations or other transportation projects occurring within the segment*
- *Moderate: Impacts that have reasonable solutions to existing operations or other transportation projects occurring within the segment*
- *High: Challenging or Unknown impacts to existing operations or other transportation projects occurring within the segment*

Timing Implications - It is important that such regionally significant projects can be reliably scheduled so that funding pipelines and adjacent projects are not disrupted by setbacks from the permitting issues being evaluated. While these considerations will be presented as notes for each category, below is a general range of how the timing impacts will be viewed:

- *Minimal: No or Minimal likelihood of timing issues or schedule impacts*
- *Moderate: Impacts that have reasonable solutions of timing issues or schedule impacts*
- *High: Challenging or Unknown (i.e. likelihood of future changes in policies related to permitting) impacts of timing issues or schedule impacts*

Resource Impacts – Reference to the HRTPO Corridor Evaluation Technical Memorandum Table of Resources for a detailed overview of resources potentially present within the segment.

- *Minimal: No or Minimal impacts to resources*
- *Moderate: Impacts that have reasonable solutions to resources*
- *High: Challenging or Unknown impacts to resources*

Range of Impact
High
Moderate
Minimal

SEGMENT: *1a: I-664 North of College Dr.*

1a: I-664 North of College Dr. Resource	Impact Rating	Comments on Resource Impacts or Timing Implications
Social Environment		
Community impacts (right-of-way, consistency with local plans)	Moderate	Most resources are adjacent to the LOD; however, final LOD requirements may show that minor right-of-way acquisitions will be needed and further detailed design may avoid and/or minimize potential impacts. Construction activities would result in temporary interruptions to vehicular traffic patterns, including the potential temporary closure of roads and temporary interruptions to vehicular traffic patterns. Construction activities would cause intermittent fluctuations in noise levels throughout the construction area. The degree of noise impact would vary, as it is directly related to the types of equipment used and the proximity to the noise-sensitive land uses within the project area. Based on a review of the project area, no considerable, long-term construction-related noise impacts are anticipated.
Sensitive property impacts (noise, community facilities, cultural)	Moderate	Most sensitive resources are located outside the LOD; however, final LOD requirements may show that minor right-of-way acquisitions will be needed. Some sensitive properties immediately adjacent to the limits of disturbance may be impacted including Park Place Playground and Kingdom Hall of Jehovah's Witnesses.
Environmental Justice (low income and minority communities)	Moderate	Widening of the existing corridor in an urban environment provides limited adjacent land for construction. Identified Environmental Justice impacts anticipated within the LOD; however, further detailed design may avoid and/or minimize potential impacts. All communities within 500 feet of the proposed construction to the north and south of the corridor are majority minority, with most over 75% minority. All communities in Newport News within 500 feet of the proposed edge of the corridor have over 25% poverty, and many have 75-100% poverty. There are 3 apartment buildings, 11 apartment blocks, and 45 houses within 500 feet of the corridor in Newport News. In Hampton, poverty is less severe, though the communities next to I-664 are also majority minority. In the indirectly impacted areas of Hampton that have over 25% poverty, there are 144 homes and a senior living facility, as well as a High School. *All segments have undergone an initial environmental justice review with additional evaluations occurring as more detailed design information becomes available.*

Range of Impact
High
Moderate
Minimal

1a: I-664 North of College Dr. Resource	Impact Rating	Comments on Resource Impacts or Timing Implications
Federal Permits		
USACOE Section 404 Permit Issues	Moderate	Tidal and non-tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with Federal Regulatory Agencies; however, the segment will be widening of the existing corridor. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design.
USACOE Section 408 Permit Issues	Moderate	Section 408 is the process that allows alteration to a federally authorized project. The proposed project cannot pose a risk to the public interest and will not impair the usefulness of the federally authorized project. Construction activities requiring access to the James River (Newport News Channel) maintained channel for potential barge work zones and safe harbor sites will most likely be required.
USACOE Section 10 permit	Moderate	Maintenance of operations and traffic will be required for all identified Maintained Federal Channels and the existing I664 Monitor Merrimack transportation corridor.
USCG Bridge Permit	Moderate	The segment does cross the James River (Newport News Channel), construction activities requiring access to potential barge work zones and safe harbor sites in or adjacent to the James River (Newport News Channel) will most likely be required.
NOAA Incidental Harassment Authorization	Moderate	There is moderate potential for incidental harassment within this segment.
State Permits		
VDEQ Section 401 Virginia Water Protection Permit	Moderate	Tidal and non-tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with State Regulatory Agencies; however, the segment will be widening of the existing corridor. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design.
VMRC Subaqueous Bottomlands Permit	Moderate	Tidal and non-tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with State Regulatory Agencies; however, the segment will be widening of the existing corridor. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design.
VDEQ Virginia Construction General Permit	Minimal	Assumption that all required stormwater controls and requirements pursuant to this permit will be obtained and adhered to. It is assumed for this segment that all additional stormwater controls would be located within the boundaries of the LOD.

REGIONAL CONNECTORS STUDY

RCS Corridor Evaluation Permitting Issues

Range of Impact
High
Moderate
Minimal

1a: I-664 North of College Dr. **Resource**	**Impact Rating**	**Comments on Resource Impacts or Timing Implications**
Local Permits		
Local Wetlands Board Permit Issues	Moderate	Tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with Local Wetlands Boards; however, the segment will be widening of the existing corridor. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design.
Additional Factors		
Mitigation Complexity and Cost	High	This segment does contain bridge and roadway structures within water and landside to Federal Navigation Projects along the James River (Newport News Channel), Elizabeth River, and current operations at the Newport News Marine Terminals. Moderate to extensive mitigation costs would be required for wetland and US waters impacts; however, field surveys and additional detailed design may avoid and/or minimize impacts to further reduce potential mitigation costs. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team. Additional coordination with mitigation banks to ensure sufficient capacity for required purchases will occur as design progresses and more precise impacts can be determined.*
Permit Stakeholder Coordination (i.e. Maritime Stakeholders)	High	Extensive stakeholder coordination with Federal Navigation Projects along the James River (Newport News Channel), Elizabeth River, rail facilities, and current operations at the Newport News Marine Terminals will be required and may pose design and/or construction schedule risk.
Effect on other Federal Navigation Projects	Moderate	This segment does contain bridge and roadway structures within water and landside to Federal Navigation Projects along the James River (Newport News Channel), Elizabeth River, and current operations at the Newport News Marine Terminals; however, the segment is the widening of the existing corridor.
Potential Future Changes in Policy Issues	Minimal	No major regulatory policy changes are anticipated at this time. *Impacts to shallow water habitat (are less than 2 meters deep) may require in-kind compensation.*

Strikethrough and italicized text reflects revision made in response to stakeholder comments.

SEGMENT: *2: VA 164*

2: VA 164 **Resource**	**Impact Rating**	**Comments on Resource Impacts or Timing Implications**
Social Environment		
Community impacts (right-of-way, consistency with local plans)	Minimal	Construction activities would result in temporary interruptions to vehicular traffic patterns, including the potential temporary closure of roads and temporary interruptions to vehicular traffic patterns. Construction activities would cause intermittent fluctuations in noise levels throughout the construction area. The degree of noise impact would vary, as it is directly related to the types of equipment used and the proximity to the noise-sensitive land uses within the project area. Based on a review of the project area, no considerable, long-term construction-related noise impacts are anticipated. *Communities within 500 feet of the preliminary Limits of Disturbance for VA 164 are diverse racially and in income. As this and future planning and project development processes continue, outreach, partnering and collaboration with neighboring communities will engage these communities to mitigate any potential impacts.*
Sensitive property impacts (noise, community facilities, cultural)	Minimal	Many sensitive property identified resources are located outside of the limits of disturbance. It does not appear that the LOD will exceed the ROW parcel edge along this segment; therefore, there will be no impact to existing businesses, schools, residences, places of worship, or cemeteries. Expansion to the eastbound side of VA-164 may require a portion of easement from Ebony Heights Park; however, further detailed design may avoid and/or minimize any potential impacts. *At this qualitative stage, noise and air quality were not specifically measured or modeled, but described generally as potential impacts. Noise wall information will be incorporated into the more detailed planning and design reviews.*
Environmental Justice (low income and minority communities)	Moderate	Expansion to the eastbound side of VA-164 may require a portion of easement from Ebony Heights Park; however, further detailed design may avoid and/or minimize any potential impacts. No residents or neighboring communities would be relocated. Communities within 500 feet of the proposed construction to the north and south of the corridor are majority minority with over 25% of households in poverty. 102 houses 58 2-story apartments, 44 garden apartment blocks, and 3 churches.

2: VA 164 **Resource**	**Impact Rating**	**Comments on Resource Impacts or Timing Implications**
Environmental Justice cont'd		*Communities within 500 feet of the preliminary Limits of Disturbance for VA 164 are diverse racially and in income. As this and future planning and project development processes continue, outreach, partnering and collaboration with neighboring communities will engage these communities to mitigate any potential impacts.*
Resource Federal Permits		
USACOE Section 404 Permit Issues	Minimal	Non-tidal US Waters and wetlands were identified within the segment; however, however, field surveys and additional detailed design may avoid and/or minimize impacts to further reduce potential impacts. *As more detailed design continues the exploration of more project-specific measures to control turbidity will be evaluated.*
USACOE Section 408 Permit Issues	Minimal	No rivers or harbors are located within the boundaries of the LOD evaluated.
USACOE Section 10 permit	Minimal	This segment does not contain bridge structures over or adjacent to Federal Navigation Projects nor does this segment cross any maintained Federal Channels.
USCG Bridge Permit	Minimal	This segment does not contain bridge structures over or adjacent to Federal Navigation Projects or mat.
NOAA Incidental Harassment Authorization	Minimal	There is no potential for incidental harassment within this segment.
State Permits		
VDEQ Section 401 Virginia Water Protection Permit	Minimal	Non-tidal US Waters and wetlands were identified within the segment; however, however, field surveys and additional detailed design may avoid and/or minimize impacts to further reduce potential impacts. *As more detailed design continues the exploration of more project-specific measures to control turbidity will be evaluated.*
VMRC Subaqueous Bottomlands Permit	Minimal	No subaqueous bottomlands were identified within the boundaries of the evaluated LOD.
VDEQ Virginia Construction General Permit	Minimal	Assumption that all required stormwater controls and requirements pursuant to this permit will be obtained and adhered to. It is assumed for this segment that all additional stormwater controls would be located within the boundaries of the LOD. *At this early planning stage, it is unknown what additional impervious surface will be constructed. The future design process will develop better estimates of impervious surface burden to determine what best management practices to implement, and where, in the future timeframe that is indicated in the RCS segment tiering recommendation.*

2: VA 164 Resource	Impact Rating	Comments on Resource Impacts or Timing Implications
Local Permits		
Local Wetlands Board Permit Issues	Minimal	No tidal US Waters or wetlands were identified within the boundaries of the LOD of this segment. Limited coordination would be required with Local Wetlands Boards.
Additional Factors		
Mitigation Complexity and Cost	Minimal	No business impacts are anticipated within the segment corridor. Minimal anticipated mitigation costs would be required for wetland and US waters; however, field surveys and additional detailed design may avoid and/or minimize impacts to further reduce potential mitigation costs.
Permit Stakeholder Coordination (i.e. Maritime Stakeholders)	High *	Transportation facilities identified within the LOD; however, it is the assumption that all transportation facilities will remain at existing or improved functionality. Stakeholder coordination with railroad facilities elevates this segment to Moderate status since coordination will be required and may pose design and/or construction schedule risk. *Portsmouth will be included in the discussion as the planning and design process outreach, with opportunities to raise, raise, document and resolve concerns. This inclusive process including Portsmouth will continue as detailed planning proceeds at a later date.*
Effect on other Federal Navigation Projects	Minimal	This segment does not contain bridge structures over or adjacent to Federal Navigation Projects.
Potential Future Changes in Policy Issues	Minimal	No major regulatory policy changes are anticipated at this time.

* Evaluations that have been revised since original April 2022 draft
Strikethrough and italicized text reflects revision made in response to stakeholder comments.

Range of Impact
High
Moderate
Minimal

SEGMENT: *3: VA 164 Connector*

3: VA 164 Connector **Resource**	**Impact Rating**	**Comments on Resource Impacts or Timing Implications**
Social Environment		
Community impacts (right-of-way, consistency with local plans)	High	Construction activities would result in temporary interruptions to vehicular traffic patterns, including the potential temporary closure of roads and temporary interruptions to vehicular traffic patterns. Construction activities would cause intermittent fluctuations in noise levels throughout the construction area. The degree of noise impact would vary, as it is directly related to the types of equipment used and the proximity to the noise-sensitive land uses within the project area. Based on a review of the project area, no considerable, long-term construction-related noise impacts are anticipated. Segment traverses through a host of Military/DOD/USACOE facilities. Setback requirements for Anti-Terrorism Force Protection, Security Requirements, and Gate Access for all noted facilities. *The northern terminus of this segment falls within the Craney Island Dredged Material Management Area (CIDDMA) updated boundary. We will continue to work with the COE to understand the operations requirements for the Craney Island Dredge Disposal Facility and incorporate all requirements into the planning and design. The RCS team will not be the project owner in the final stages of planning, design and construction.* *As a result of this required specification for safety distance requirements from public highway to the facilities at Craney Island Fuel Terminal, the RCS Team is developing the VA 164 connector corridor with an 1,800-foot distance from the planned refueling in addition to a visual barrier in future design iterations.* *There are also noise walls along a portion of the bridge on the outside edge to serve as visual barriers to the fuel line and future facility per the Navy's current force protection standard.*
Sensitive property impacts (noise, community facilities, cultural)	Minimal	Many sensitive property identified resources are located outside of the limits of disturbance. It does not appear that the LOD will exceed the ROW parcel edge along this segment; therefore, there will be no impact to existing schools, residences, places of worship, or cemeteries. ~~Current design has 2 total business takes required. Identified Businesses and/or Business Access impacts anticipated within the LOD; however, further detailed design may avoid and/or minimize potential impacts. Additional detailed design and analysis required.~~ *Current design has three total*

3: VA 164 Connector **Resource**	**Impact Rating**	**Comments on Resource Impacts or Timing Implications**
Sensitive property impacts, cont'd		*business takes required. Identified Businesses and/or Business Access impacts anticipated within the LOD; however, further detailed design may avoid and/or minimize potential impacts.*
Environmental Justice (low income and minority communities)	Minimal	Past and present growth and development - expansion of controlled access roadways have separated neighboring communities No residents or neighboring communities would be relocated. *All segments have undergone an initial environmental justice review with additional evaluations occurring as more detailed design information becomes available.*
Federal Permits		
USACOE Section 404 Permit Issues	High *	Tidal and non-tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with Federal Regulatory Agencies. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design. *Craney Island Dredge Disposal Facility Section 404 status and new GIS boundary received May 2022. The status of this segment will be changed for ongoing and future tiering coordination.* *A portion of this segment falls within the Craney Island Dredged Material Management Area (CIDDMA) updated boundary. We will continue to work with the COE to understand the operations requirements for the Craney Island Dredge Disposal Facility and incorporate all requirements into the planning and design. The RCS team will not be the project owner in the final stages of planning, design and construction.*
USACOE Section 408 Permit Issues	High *	Section 408 is the process that allows alteration to a federally authorized project. The proposed project cannot pose a risk to the public interest and will not impair the usefulness of the federally authorized project. Although the segment does not cross the Elizabeth River, construction activities requiring access to potential barge work zones and safe harbor sites in or adjacent to the Elizabeth River will most likely be required. *Craney Island Dredge Disposal Facility Section 408 status and new GIS boundary received May 2022. The status of this segment will be changed for ongoing and future tiering coordination.*

3: VA 164 Connector **Resource**	**Impact Rating**	**Comments on Resource Impacts or Timing Implications**
USACOE Section 408 Permit Issues, cont'd		*A portion of this segment falls within the Craney Island Dredged Material Management Area (CIDDMA) updated boundary. We will continue to work with the COE to understand the operations requirements for the Craney Island Dredge Disposal Facility and incorporate all requirements into the planning and design. The RCS team will not be the project owner in the final stages of planning, design and construction.*
USACOE Section 10 permit	Moderate	This segment does contain a bridge structures over Craney Island Creek which is a tributary of the adjacent Elizabeth River, a maintained Federal Channel. Although the segment does not cross the Elizabeth River, construction activities requiring access to potential barge work zones and safe harbor sites in or adjacent to the Elizabeth River will most likely be required.
USCG Bridge Permit	Moderate	This segment does contain a bridge structures over Craney Island Creek.
NOAA Incidental Harassment Authorization	Minimal	There is limited potential for incidental harassment within this segment.
State Permits		
VDEQ Section 401 Virginia Water Protection Permit	Moderate	Tidal and non-tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with State Regulatory Agencies. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design.
VMRC Subaqueous Bottomlands Permit	Moderate	Tidal and non-tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with State Regulatory Agencies. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design.
VDEQ Virginia Construction General Permit	Minimal	Assumption that all required stormwater controls and requirements pursuant to this permit will be obtained and adhered to. It is assumed for this segment that all additional stormwater controls would be located within the boundaries of the LOD.
Local Permits		
Local Wetlands Board Permit Issues	Moderate	Tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with Local Wetlands Boards. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design.

3: VA 164 Connector Resource	Impact Rating	Comments on Resource Impacts or Timing Implications
Additional Factors		
Mitigation Complexity and Cost	Moderate	Current design has total business take required. Identified Businesses and/or Business Access impacts anticipated within the LOD. Moderate to Extensive anticipated mitigation costs would be required for wetland and US waters impacts; however, field surveys and additional detailed design may avoid and/or minimize impacts to further reduce potential mitigation costs. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.*
Permit Stakeholder Coordination (i.e. Maritime Stakeholders)	High	Extensive stakeholder coordination with Military/DOD/USACOE facilities, the City of Portsmouth Landfill, and railroad facilities will be required and may pose design and/or construction schedule risk. *A portion of this segment falls within the Craney Island Dredged Material Management Area (CIDDMA) updated boundary. We will continue to work with the COE to understand the operations requirements for the Craney Island Dredge Disposal Facility and incorporate all requirements into the planning and design. The RCS team will not be the project owner in the final stages of planning, design and construction.* *The RCS evaluation team acknowledges that strategic importance of Craney Island within the context of Naval Station Norfolk and are staying in communication with stakeholders like the Navy throughout the process to ensure that the planning process evolves into a design and construction process that serves both the strategic and regional needs of the Hampton Roads region.* *The RCS report in May of 2022 was a qualitative assessment, and the RCS team is now working on refining the quantitative understanding of traffic demand modeling and design needs. The RCS team and the agencies that carry this planning process forward to design, construction and operations will work in partnership with the Navy to develop, design, and construct the VA 164 connector alignment, roadway, and facilities in a way that does not impair the planned functions of Craney Island.*

Range of Impact
High
Moderate
Minimal

3: VA 164 Connector Resource	Impact Rating	Comments on Resource Impacts or Timing Implications
Effect on other Federal Navigation Projects	High	This segment does contain roadway structures landside to Federal Navigation Projects along the Elizabeth River and current operations at the US Army Corps of Engineers Craney Island Disposal Area. At the present time, the affect would be considered High; however, the status would change to Moderate once the US Army Corps of Engineers Craney Island Disposal Area were identified as end of operational life. *Section 408 permit requirements for the Craney Island Dredge Disposal Facility will be taken into consideration.*
Potential Future Changes in Policy Issues	Minimal	No major regulatory policy changes are anticipated at this time. *Impacts to shallow water habitat (are less than 2 meters deep) may require in-kind compensation if policy regulations change.*

*   Evaluations that have been revised since original April 2022 draft
Strikethrough and italicized text reflects revision made in response to stakeholder comments

Range of Impact
High
Moderate
Minimal

SEGMENT: *4: I-564 Connector*

4: I-564 Connector Resource	Impact Rating	Comments on Resource Impacts or Timing Implications
Social Environment		
Community impacts (right-of-way, consistency with local plans)	High	Construction activities would result in temporary interruptions to vehicular traffic patterns, including the potential temporary closure of roads and temporary interruptions to vehicular traffic patterns. Construction activities would cause intermittent fluctuations in noise levels throughout the construction area. The degree of noise impact would vary, as it is directly related to the types of equipment used and the proximity to the noise-sensitive land uses within the project area. Based on a review of the project area, no considerable, long-term construction-related noise impacts are anticipated. Segment traverses through the DON and NIT properties. Need additional information regarding potential anti-terrorism force protection requirements. *As the project moves into design and construction, the project owner will be able to make decisions about equipment height and clearance to accommodate the Navy's operational needs in Norfolk.* *The loss of operational use at the Lineage Logistics at Talon Marine Terminals, NIT Pier 3 needs more information in order to determine all of the factors to be considered.* *It should be noted that the fueling facility referred to in this comment is within 300 feet of the existing Intermodal connector, which is currently planned to have the same alignment as the proposed I-564 connector. There are currently walls separating the Navy's fuel facility from the existing Intermodal connector. To satisfy the 1,800 foot the setback from the fueling facility would require a significant re-evaluation of the I-564 connector by FHWA, VDOT, Norfolk, and Port of Virginia.* *Evolving security and visibility technology may resolve these security concerns as the I-564 corridor progresses from planning to design. Evolving transportation technology may change the corridor design as well. Horizontal and vertical clearances required by the Navy for essential security will be considered in the future planning and design process.*

4: I-564 Connector Resource	Impact Rating	Comments on Resource Impacts or Timing Implications
Community impacts, cont'd		*At the end of the Phase 3 (Step 2) Quantitative analysis, which we are conducting now, we will recommend tiering of the segments into three tiers that correspond to timing of/readiness for implementation, with Tier 1 the most ready and Tier 3 the least ready. At the time of project design and construction, the project owner will be able to make decisions about equipment height and clearance to accommodate the Navy's operational needs in Norfolk. At this early planning stage of the segment tiering process the Regional Connectors study is not considering an elevated section between the end of the existing Intermodal connector and the end of Norfolk International Terminal Pier 3. Instead, the I-564 connector is planned to be underground along the length of existing NIT Pier 3 and tunnel under the Elizabeth River shipping lanes to surface at a bridge to the west of the NIT and to the north of Craney island.* *It may be possible to tunnel the I-564 connector further East approaching the Hampton Boulevard underpass, but that design will involve additional costs.*
Sensitive property impacts (noise, community facilities, cultural)	Minimal	Sensitive property resources are located outside of the limits of disturbance. It does not appear that the LOD will exceed the ROW parcel edge along this segment; therefore, there will be no impact to existing businesses, schools, residences, places of worship, or cemeteries. May have disturbance within the LOD for Fleet Recreation Park (park access/maintenance roads); however, further detailed design may avoid and/or minimize any potential impacts.
Environmental Justice (low income and minority communities)	Minimal	Past and present growth and development - expansion of controlled access facilities such as military installations like NAVSTA Norfolk have separated neighboring communities. No residents or neighboring communities would be relocated. *All segments have undergone an initial environmental justice review with additional evaluations occurring as more detailed design information becomes available.*
Federal Permits		
USACOE Section 404 Permit Issues	High	Tidal and non-tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with Federal Regulatory Agencies. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues*

4: I-564 Connector **Resource**	**Impact Rating**	**Comments on Resource Impacts or Timing Implications**
USACOE Section 404 Permit Issues, cont'd		*for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.* *Additional mitigation measures for bird nesting impacts will be evaluated as more detailed design allows for the determination of potential bird nesting impacts. The RCS team will not be the project owner in the final stages of planning, design and construction.*
USACOE Section 408 Permit Issues	High	Section 408 is the process that allows alteration to a federally authorized project. The proposed project cannot pose a risk to the public interest and will not impair the usefulness of the federally authorized project. The segment does cross the Elizabeth River and is adjacent to the James River (Newport News Channel), construction activities requiring access to potential barge work zones and safe harbor sites in or adjacent to the Elizabeth River and the James River (Newport News Channel) will most likely be required.
USACOE Section 10 permit	High	The loss of operational use at the Lineage Logistics at Talon Marine Terminals, NIT Pier 3 needs more information in order to determine all of the factors to be considered.
USCG Bridge Permit	High	The segment does cross the Elizabeth River and is adjacent to the James River (Newport News Channel), construction activities requiring access to potential barge work zones and safe harbor sites in or adjacent to the Elizabeth River and the James River (Newport News Channel) will most likely be required.
NOAA Incidental Harassment Authorization	High	There is moderate/high potential for incidental harassment within this segment.
State Permits		
VDEQ Section 401 Virginia Water Protection Permit	High	Tidal and non-tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with State Regulatory Agencies. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design.
VMRC Subaqueous Bottomlands Permit	High	Tidal and non-tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with State Regulatory Agencies. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design.

Range of Impact
High
Moderate
Minimal

4: I-564 Connector Resource	Impact Rating	Comments on Resource Impacts or Timing Implications
VDEQ Virginia Construction General Permit	Minimal	Assumption that all required stormwater controls and requirements pursuant to this permit will be obtained and adhered to. It is assumed for this segment that all additional stormwater controls would be located within the boundaries of the LOD.
Local Permits		
Local Wetlands Board Permit Issues	High	Tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with Local Wetlands Boards. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design.
Additional Factors		
Mitigation Complexity and Cost	High	No business impacts are anticipated within the segment corridor. High anticipated mitigation costs would be required for wetland and US waters impacts due to construction of the new island required for the tunnel segment. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.*
Permit Stakeholder Coordination (i.e. Maritime Stakeholders)	High	Extensive stakeholder coordination with Military/DOD/USACOE facilities, transportation facilities, Lineage Logistics at Talon Marine Terminals, NIT Pier 3, and railroad facilities will be required and may pose design and/or construction schedule risk. *The Regional Connectors Study is a conceptual planning stage of design. The future stages of the project will be carried forward by regional or commonwealth such as HRTAC and VDOT. They will maintain communication and coordination with stakeholders and decisionmakers throughout the planning, design, and construction process.*

Range of Impact
High
Moderate
Minimal

4: I-564 Connector Resource	Impact Rating	Comments on Resource Impacts or Timing Implications
Effect on other Federal Navigation Projects	Moderate	No impacts to Federal Navigational Channels and Civil Works Projects are anticipated. All Maintained Navigational Channels will be avoided by the tunnel design.
Potential Future Changes in Policy Issues	Minimal	No major regulatory policy changes are anticipated at this time.

Strikethrough and italicized text reflects revision made in response to stakeholder comments.

SEGMENT: *5: I-664 Connector*

5: I-664 Connector Resource	Impact Rating	Comments on Resource Impacts or Timing Implications
Social Environment		
Community impacts (right-of-way, consistency with local plans)	High	This segment does contain bridge and roadway structures within water and landside to Federal Navigation Projects along the James River (Newport News Channel), Elizabeth River, and current operations at the US Army Corps of Engineers Craney Island Disposal Area. At the present time, the affect would be considered High; however, the status would change to Moderate once the US Army Corps of Engineers Craney Island Disposal Area were identified as end of operational life. *Project limits are outside of the updated CIDDMA Site Boundary as received by the USACOE.*
Sensitive property impacts (noise, community facilities, cultural)	Minimal	No sensitive properties are located within the limits of disturbance.
Environmental Justice (low income and minority communities)	Minimal	No residents or neighboring communities would be relocated.
Federal Permits		
USACOE Section 404 Permit Issues	High	Tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with Federal Regulatory Agencies. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design. *As more detailed design continues the exploration of more project-specific measures to control turbidity will be evaluated.*
USACOE Section 408 Permit Issues	High	Section 408 is the process that allows alteration to a federally authorized project. The proposed project cannot pose a risk to the public interest and will not impair the usefulness of the federally authorized project. Construction activities requiring access to the Elizabeth River and James River (Newport News Channel) maintained channels for potential barge work zones and safe harbor sites will most likely be required.
USACOE Section 10 permit	High	This segment does contain bridge and roadway structures within water and landside to Federal Navigation Projects along the James River, Elizabeth River, and current operations at the US Army Corps of Engineers Craney Island Disposal Area. Need more information on the US Army Corps of Engineers Craney Island Disposal Area anticipated end of operational life.
USCG Bridge Permit	High	The segment does cross the Elizabeth River and James River (Newport News Channel), construction activities requiring access to potential barge work zones and

5: I-664 Connector **Resource**	**Impact Rating**	**Comments on Resource Impacts or Timing Implications**
USCG Bridge Permit, cont'd		safe harbor sites in or adjacent to the Elizabeth River and the James River (Newport News Channel) will most likely be required.
NOAA Incidental Harassment Authorization	High	There is moderate/high potential for incidental harassment within this segment.
State Permits		
VDEQ Section 401 Virginia Water Protection Permit	High	Tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with State Regulatory Agencies. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design. *As more detailed design continues the exploration of more project-specific measures to control turbidity will be evaluated.*
VMRC Subaqueous Bottomlands Permit	High	Tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with State Regulatory Agencies. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design.
VDEQ Virginia Construction General Permit	Minimal	Assumption that all required stormwater controls and requirements pursuant to this permit will be obtained and adhered to. It is assumed for this segment that all additional stormwater controls would be located within the boundaries of the LOD.
Local Permits		
Local Wetlands Board Permit Issues	High	Tidal US Waters and wetlands were identified within the boundaries of the LOD of this segment. Extensive coordination would be required with Local Wetlands Boards. Field surveys and additional detailed detail to avoid and/or minimize impacts would be evaluated with more detailed design.
Additional Factors		
Mitigation Complexity and Cost	High	This segment does contain bridge and roadway structures within water and landside to Federal Navigation Projects along the James River (Newport News Channel), Elizabeth River, and current operations at the US Army Corps of Engineers Craney Island Disposal Area. Moderate to extensive mitigation costs would be required for wetland and US waters impacts; however, field surveys and additional detailed design may avoid and/or minimize impacts to further reduce potential mitigation costs. *Additional coordination with mitigation banks to ensure sufficient capacity for required purchases will occur as design progresses and more precise impacts can be determined.*

5: I-664 Connector Resource	Impact Rating	Comments on Resource Impacts or Timing Implications
Mitigation Complexity and Cost, cont'd		*Impacts to shallow water habitat (are less than 2 meters deep) may require in-kind compensation if policy regulations change.* *Anticipate strong interest in and public objections to impacts to colonial nesting birds. Mitigation requirements for displaced birds may be required under Migratory Bird Treaty Act.*
Permit Stakeholder Coordination (i.e. Maritime Stakeholders)	High	Extensive stakeholder coordination with Military/DOD/USACOE facilities will be required and may pose design and/or construction schedule risk.
Effect on other Federal Navigation Projects	High	This segment does contain bridge and roadway structures within water and landside to Federal Navigation Projects along the James River, Elizabeth River, and current operations at the US Army Corps of Engineers Craney Island Disposal Area. Need more information on the US Army Corps of Engineers Craney Island Disposal Area anticipated end of operational life. *Project limits are outside of the updated CIDDMA Site Boundary as received by the USACOE.*
Potential Future Changes in Policy Issues	Minimal	No major regulatory policy changes are anticipated at this time. *Impacts to shallow water habitat (are less than 2 meters deep) may require in-kind compensation.*

Strikethrough and italicized text reflects revision made in response to stakeholder comments.

Note that detailed resource evaluations are documented in the Technical Resource Memos for Permitting

<u>Definitions of Tiering Framework:</u>

Impact Rating Concern – This evaluation category captures the potential effect of the project and its construction on the natural and social environment. Some of the most common environmental impacts are:

- social and community environment
- noise impacts
- water resources and wetlands
- protected species
- damage to ecosystems and loss of biodiversity
- historic resources
- regulatory requirements and complexity
- mitigation cost and complexity
- interdependence or conflict with other projects

Human well-being depends directly on biodiversity and ecosystems. It is therefore vital to try to measure, plan and minimize any segment activity that might alter the ecological balance.

- *Minimal: No or Minimal impacts to ecosystems (including social and natural)*
- *Moderate: Impacts that have reasonable solutions to ecosystems (including social and natural)*
- *High: Challenging or Unknown impacts to ecosystems (including social and natural)*

Feasibility Concern - Resource feasibility concerns indicate whether the segment will interfere with the socioeconomic activities within the corridor and identify potential issues and problems that could arise from pursuing the project.

- *Minimal: No or Minimal impacts to existing operations or other transportation projects occurring within the segment*
- *Moderate: Impacts that have reasonable solutions to existing operations or other transportation projects occurring within the segment*
- *High: Challenging or Unknown impacts to existing operations or other transportation projects occurring within the segment*

Timing Implications - It is important that such regionally significant projects can be reliably scheduled so that funding pipelines and adjacent projects are not disrupted by setbacks from the permitting issues being evaluated. While these considerations will be presented as notes for each category, below is a general range of how the timing impacts will be viewed:

- *Minimal: No or Minimal likelihood of timing issues or schedule impacts*
- *Moderate: Impacts that have reasonable solutions of timing issues or schedule impacts*
- *High: Challenging or Unknown (i.e. likelihood of future changes in policies related to permitting) impacts of timing issues or schedule impacts*

Resource Impacts – Reference to the HRTPO Corridor Evaluation Technical Memorandum Table of Resources for a detailed overview of resources potentially present within the segment.

- *Minimal: No or Minimal impacts to resources*
- *Moderate: Impacts that have reasonable solutions to resources*
- *High: Challenging or Unknown impacts to resources*

Readiness Technical Evaluation

Readiness Evaluation Criteria

Summary of Changes

Segment 1a: I-664 N. of College Dr.

Operational independence shift from moderate to most as a result of operational benefits. Phasing potential shifted from moderate to most as a result of operational benefits. "HRTAC" criterion shifted from moderate to most as a result of congestion relief benefits.

Segment 3: VA 164 Connector

IIJA funding shifted from moderate to least due to lack of detail plan with no dedicated funding.

Segment 4: I-564 Connector

IIJA funding shifted from moderate to least due to lack of detail plan with no dedicated funding.

Range of Readiness
Least
Moderate
Most

Project Readiness

Readiness Issues	*Segment 1a: I-664 N of College Dr.*	*Segment 2: VA 164*	*Segment 3: VA 164 Connector*	*Segment 4: I-564 Connector*	*Segment 5: I-664 Connector*
	1a	*2*	*3*	*4*	*5*
Project Independence					
Independence from other segments to achieve operational benefits	*				
Phasing Potential	*				
Integration with HREL					
Project Development					
Adopted by a regional agency					
Stakeholder / Review Agency Engagement					
Advancement of Project Study					
Funding Opportunities Eligibility					
HRTAC	*				
SMART Scale High Priority Project					
Infrastructure Investment and Jobs Act (IIJA) Grant Funding			*	*	

* Evaluations that have been revised since original April 2022 draft

Range of Readiness
Least
Moderate
Most

Definitions of Evaluation Framework:

Readiness – This evaluation category captures the effort required to move a project through development, to identify the independent nature of each segment, the ability to move through the regional planning and prioritization process, as well as the project's ability to obtain funding.

Level of Project Independence – Each segment of the RCS II will improve the overall regional network. However, benefits are more easily achieved if a segment function has independent benefits or functions as an extension of an ongoing project. Additionally, some segments can be phased to provide interim benefits in a cost-effective manner or extend the region's express lanes project (HREL) which has been identified as a regional priority project.

Operational Independence/Benefits

- *High Readiness:* *Segment provides operational benefits with existing logical termini currently under construction*
- *Moderate Readiness:* *Segment provides operational benefits with programmed improvements*
- *Low Readiness:* *Project operationally dependent on completion of adjacent project*
- *Unknown*

Phasing Potential

- *High Readiness:* *Project segments/phases provide operational benefits and are easily expanded for ultimate build out*
- *Moderate Readiness:* *Project segments/phases result in minor operational benefits but are easily expanded for ultimate build out*
- *Low Readiness:* *Project segments/phases do not result in operational benefits and/or create challenges for ultimate build out*
- *Unknown*

Integration with HREL

- *High Readiness:* *Project segments/phases will extend the HREL that is currently underway*
- *Moderate Readiness:* *Project segments/phases will create a future connection to the HREL network*
- *Low Readiness:* *Project segments/phases will not include HREL*
- *Unknown*

Level of Project Development – A key step in project development process is gaining consensus in the planning process which involves prioritizing projects and ranking based on cost and benefits. In order to increase projects rankings, independent efforts may have taken place or are underway that provide more detailed information that enhance a project ranking. Stakeholder engagements are included in every step of the project development, but input or concerns vary based on where a project is in the overall process.

Adopted by a regional agency (In the existing LRTP)

- *High Readiness:* *Included in more than one Long Range Transportation Plan (LRTP) and within the constrained model*
- *Moderate Readiness:* *Included in the LRTP vision plan*
- *Low Readiness:* *Not included in long-range planning*
- *Unknown*

Stakeholder / Review Agency Engagement (Excluding SEIS effort)

- *High Readiness:* *Documentation of support by local, state, and federal agencies*
- *Moderate Readiness:* *Neither support nor opposition documented*
- *Low Readiness:* *Documentation of opposition by local, state, and federal agencies*
- *Unknown*

Advancement of Project Study

- *High Readiness:* *Project segment or phase is independently being studied or standalone study has been completed within last 3-5 years*
- *Moderate Readiness:* *Project segment or phase has been previously studied or is part of another study such as an interchange modification report*
- *Low Readiness:* *No activity has occurred beyond the SEIS*
- *Unknown*

Funding Opportunities Eligibility – All of the segments included in the RCSII will have significant costs and the current regional needs far exceed available funding for traditional financial sources. Therefore, it is important to identify projects that may be able to take advantage of federal, state, or future earmark funding sources.

HRTAC – Congestion Benefit (Transit not an option)

- *High Readiness:* *Eligible; capacity improvements provide significant level of congestion relief*
- *Moderate Readiness:* *Unknown*
- *Low Readiness:* *Non-Eligible; capacity improvements provide non-congestion benefits*
- *Unknown* *N/A*

SMART Scale High Priority Project

- *High Readiness:* *Meets VTrans and is a High Priority Need*
- *Moderate Readiness:* *Meets VTrans need*
- *Low Readiness:* *Does not meet VTrans need*
- *Unknown*

Infrastructure Investment and Jobs Act (IIJA) Grant Funding – to be further defined as funding opportunities are documented

Funding not clearly defined at this time; preliminary criteria identified the following objectives

- o *Freight Funding – Rail Crossing (requires additional research)*
- o *Transit Funding (requires additional research)*

- *High Readiness:* *N/A – not defined at this time*

Range of Readiness
Least
Moderate
Most

- *Moderate Readiness:* *Priority – direct benefit to currently identified objectives*
- *Low Readiness:* *Non-Priority – no or indirect benefit to currently identified objectives*
- *Unknown*

Range of Readiness
Least
Moderate
Most

SEGMENT: *1a: I-664 North of College Dr.*

Readiness Criteria	Rating	Description of Readiness
Project Independence		
Independence from other RCS segments to achieve operational benefits	Most *	Segment adds capacity. Consistent mainline cross section with northeastern termini at I-664/I-64 interchange, which is part of HRBT expansion (currently under construction). Capacity improvements fully realized upon completion of I-664 S widening to Bowers Hill.
Phasing Potential	Most *	Capacity improvements would have incremental benefits if phasing occurred between interchanges. Interim solutions may create interim bottlenecks at termini. Ability to support HREL system, phasing will depend on points of entry to the HREL system within each segment. MMBT Project may be a standalone project if adjacent land side projects completed first; would be last phased segment;
Integration with HREL	Most	HREL included in adjacent HRBT project and referenced as Ph 4A/4B
Project Development		
Adopted by a regional agency	Moderate	Included in 2045 Vision Plan, not fiscally constrained plan
Stakeholder / Review Agency Engagement	Moderate	No documented support nor opposition from stakeholders
Advancement of Project Study	Least	No effort has occurred beyond SEIS
Funding Opportunities Eligibility		
HRTAC	Most *	Likely candidate for HRTAC Funding based on Level of congestion benefit and support HREL completion and transportation reliability
SMART Scale High Priority Project	Most	VTrans High Priority – Corridor of Statewide Significance (COSS)
Infrastructure Investment and Jobs Act (IIJA) Grant Funding	Least	Project is still within the concept phase with no current funding plan.

* Evaluations that have been revised since original April 2022 draft

Range of Readiness
Least
Moderate
Most

SEGMENT: *2: VA 164*

Readiness Criteria	Rating	Description of Readiness
Project Independence		
Independence from other RCS segments to achieve operational benefits	Moderate	Segment adds capacity. Inconsistent mainline cross section with eastern and western termini. Potential bottlenecks created until VA 164 Connector and I-664 widening projects completed.
Phasing Potential	Moderate	Capacity improvements would have incremental benefits if phasing occurred between interchanges. Interim solutions would create interim bottlenecks at termini.
Integration with HREL	Least	HREL not included along VA 164
Project Development		
Adopted by a regional agency	Most	Included in 2045 Fiscally Constrained Plan
Stakeholder / Review Agency Engagement	Least	Documented opposition from stakeholders (Portsmouth)
Advancement of Project Study	Moderate	~~Previous IMR completed by Port of Virginia~~ *VDOT is advancing a corridor planning study* *IMR/Final Report was completed by Port of Virginia in coordination with VDOT and FHWA. Given the time lapse since that Study, a new Interchange Analysis Report would need to be developed.*
Funding Opportunities Eligibility		
HRTAC	Most	Included in the HRTAC Plan of Finance
SMART Scale High Priority Project	Moderate	VTrans Priority, not COSS; benefits to VA 164 assist port/truck travel therefore promoting VTrans goals of economic prosperity and connected places
Infrastructure Investment and Jobs Act (IIJA) Grant Funding	Moderate	~~Currently Unknown as no specific criteria has been published~~ *Project moving forward in detail study and HRTAC funding has been identified*

Strikethrough and italicized text reflects revision made in response to stakeholder comments.

Range of Readiness
Least
Moderate
Most

SEGMENT: *3: VA 164 Connector*

Readiness Criteria	Rating	Description of Readiness
Project Independence		
Independence from other RCS segments to achieve operational benefits	Least	Requires either I-664 Connector or I-564 Connector for interstate connection OR requires VA 164 widening to be complete.
Phasing Potential	Least	Capacity improvements contingent on VA 164 widening and I-564 Connector project.
Integration with HREL	Least	HREL not included along VA 164
Project Development		
Adopted by a regional agency	Moderate	Included in 2045 Vision Plan, not Fiscally Constrained Plan
Stakeholder / Review Agency Engagement	Least	Noted challenges from ACOE, DOD
Advancement of Project Study	Moderate	Craney Island Access Road Study funded (LRTP proj. 2045-604)
Funding Opportunities Eligibility		
HRTAC	Least	New roadway facilities do not have existing congestion and unlike to support HRTAC funding criteria.
SMART Scale High Priority Project	Least	New roadway facilities do not have existing congestion, therefore do not achieve high scores within SMARTSCALE Criteria
Infrastructure Investment and Jobs Act (IIJA) Grant Funding	Least *	Project is still within the concept phase with no current funding plan.

* Evaluations that have been revised since original April 2022 draft

Range of Readiness
Least
Moderate
Most

SEGMENT: *4: I-564 Connector*

Readiness Criteria	Rating	Description of Readiness
Project Independence		
Independence from other RCS segments to achieve operational benefits	Least	Requires either VA 164 connector or I-664 connector for interstate connection
Phasing Potential	Least	Phases not feasible based on water crossing
Integration with HREL	Least	Project not adjacent to existing or proposed HREL expansion and would trigger an ERC compensation event
Project Development		
Adopted by a regional agency	Moderate	Included in 2045 Vision Plan, not Fiscally Constrained Plan
Stakeholder / Review Agency Engagement	Least	Noted challenges from ACOE, DOD
Advancement of Project Study	Least	No effort has occurred beyond SEIS
Funding Opportunities Eligibility		
HRTAC	Least	New roadway facilities do not have existing congestion and therefore are not eligible for HRTAC funding.
SMART Scale High Priority Project	Least	New roadway facilities do not have existing congestion, therefore do not achieve high scores within SMARTSCALE Criteria
Infrastructure Investment and Jobs Act (IIJA) Grant Funding	Least *	Project is still within the concept phase with no current funding plan.

* Evaluations that have been revised since original April 2022 draft

Range of Readiness
Least
Moderate
Most

SEGMENT: *5: I-664 Connector*

Readiness Criteria	Rating	Description of Readiness
Project Independence		
Independence from other RCS segments to achieve operational benefits	Least	Requires either VA 164 connector or I-564 connector for interstate connection
Phasing Potential	Least	Phases not feasible based on water crossing
Integration with HREL	Least	HREL not included along VA 164 connector and would trigger an ERC compensation event
Project Development		
Adopted by a regional agency	Moderate	Included in 2045 Vision Plan, not Fiscally Constrained Plan
Stakeholder / Review Agency Engagement	Least	Noted challenges from ACOE
Advancement of Project Study	Least	No effort has occurred beyond SEIS
Funding Opportunities Eligibility		
HRTAC	Least	New roadway facilities do not have existing congestion and therefore are not eligible for HRTAC funding.
SMART Scale High Priority Project	Least	New roadway facilities do not have existing congestion, therefore do not achieve high scores within SMARTSCALE Criteria
Infrastructure Investment and Jobs Act (IIJA) Grant Funding	Least	Project is still within the concept phase with no current funding plan.

Range of Readiness
Least
Moderate
Most

Definitions of Tiering Framework:

Readiness – This evaluation category captures the effort required to move a project through development, to identify the independent nature of each segment, the ability to move through the regional planning and prioritization process, as well as the project's ability to obtain funding.

Level of Project Independence – Each segment of the RCS II will improve the overall regional network. However, benefits are more easily achieved if a segment function has independent benefits or functions as an extension of an ongoing project. Additionally, some segments can be phased to provide interim benefits in a cost-effective manner or extend the region's express lanes project (HREL) which has been identified as a regional priority project.

Operational Independence/Benefits

- *High Readiness:* *Segment provides operational benefits with existing logical termini currently under construction*
- *Moderate Readiness:* *Segment provides operational benefits with programmed improvements*
- *Low Readiness:* *Project operationally dependent on completion of adjacent project*
- *Unknown*

Phasing Potential

- *High Readiness:* *Project segments/phases provide operational benefits and are easily expanded for ultimate build out*
- *Moderate Readiness:* *Project segments/phases result in minor operational benefits but are easily expanded for ultimate build out*
- *Low Readiness:* *Project segments/phases do not result in operational benefits and/or create challenges for ultimate build out*
- *Unknown*

Integration with HREL

- *High Readiness:* *Project segments/phases will extend the HREL that is currently underway*
- *Moderate Readiness:* *Project segments/phases will create a future connection to the HREL network*
- *Low Readiness:* *Project segments/phases will not include HREL*
- *Unknown*

Level of Project Development – A key step in project development process is gaining consensus in the planning process which involves prioritizing projects and ranking based on cost and benefits. In order to increase projects rankings, independent efforts may have taken place or are underway that provide more detailed information that enhance a project ranking. Stakeholder engagements are included in every step of the project development, but input or concerns vary based on where a project is in the overall process.

Adopted by a regional agency (In the existing LRTP)

- *High Readiness:* *Included in more than one Long Range Transportation Plan (LRTP) and within the constrained model*
- *Moderate Readiness:* *Included in the LRTP vision plan*
- *Low Readiness:* *Not included in long-range planning*

- *Unknown*

Stakeholder / Review Agency Engagement (Excluding SEIS effort)

- *High Readiness:* *Documentation of support by local, state, and federal agencies*
- *Moderate Readiness:* *Neither support nor opposition documented*
- *Low Readiness:* *Documentation of opposition by local, state, and federal agencies*
- *Unknown*

Advancement of Project Study

- *High Readiness:* *Project segment or phase is independently being studied or standalone study has been completed within last 3-5 years*
- *Moderate Readiness:* *Project segment or phase has been previously studied or is part of another study such as an interchange modification report*
- *Low Readiness:* *No activity has occurred beyond the SEIS*
- *Unknown*

Funding Opportunities Eligibility – All of the segments included in the RCSII will have significant costs and the current regional needs far exceed available funding for traditional financial sources. Therefore, it is important to identify projects that may be able to take advantage of federal, state, or future earmark funding sources.

HRTAC – Congestion Benefit (Transit not an option)

- *High Readiness:* *Eligible; capacity improvements provide significant level of congestion relief*
- *Moderate Readiness:* *Unknown*
- *Low Readiness:* *Non-Eligible; capacity improvements provide non-congestion benefits*
- *Unknown* *N/A*

SMART Scale High Priority Project

- *High Readiness:* *Meets VTrans and is a High Priority Need*
- *Moderate Readiness:* *Meets VTrans need*
- *Low Readiness:* *Does not meet VTrans need*
- *Unknown*

Infrastructure Investment and Jobs Act (IIJA) Grant Funding – to be further defined as funding opportunities are documented

Funding not clearly defined at this time; preliminary criteria identified the following objectives

- o *Freight Funding – Rail Crossing (requires additional research)*
- o *Transit Funding (requires additional research)*

- *High Readiness:* *N/A – not defined at this time*

- *Moderate Readiness:* *Priority – direct benefit to currently identified objectives*
- *Low Readiness:* *Non-Priority – no or indirect benefit to currently identified objectives*
- *Unknown*

Permitting Issues Technical Resource Memos

SEGMENT: *1a: I-664 North of College Dr.*

1a: I-664 N of College Dr. Resource	Resources Identified	Comments
Social Environment		
Community Resources		
Military/DOD/USACOE	n/a	No resources within the LOD
Transportation Facilities	North Side: ▪ Overpass at W. Queen Street ▪ Braemer Drive ▪ Balmoral Drive ▪ Keswick Lane ▪ Interchange at Powhatan Parkway ▪ 50th Street *(would need to be permanently closed due to LOD from Industry Drive to Howmet Drive)* ▪ Maxwell Drive *(would need to be permanently closed due to LOD from G Street to 50th Street)* ▪ *Partial closure of 50th Street (Business access relocation would be required)* ▪ Interchange at Aberdeen Road ▪ Overpass of Railway Line (near Greenlawn Avenue) ▪ *Railroad adjacent to 39th Street* ▪ Overpass at Chestnut Avenue ▪ Overpass at Roanoke Avenue ▪ Overpass at Marshall Avenue ▪ Overpass at 39th Street ▪ Overpass of Railway Lines (near Terminal Avenue) ▪ Terminal Avenue (several locations)*(may require partial closure or permanent re-route)* ▪ Overpass at 35th Street ▪ Overpass at 36th Street ▪ Interchange at Route 60 ▪ Overpass at 28th Street ▪ Overpass at 27th Street ▪ Overpass at 26th Street ▪ Overpass at 25th Street ▪ Overpass at 21th Street ▪ 19th Street ▪ 17th Street ▪ 14th Street ▪ Harbor Road ▪ Commonwealth Road ▪ Club Drive ▪ Wagon Road ▪ Armstead Road ▪ College Drive (VA-135)	Transportation facilities identified within the LOD. Assumption that all transportation facilities will remain at existing or improved functionality. Stakeholder coordination with railroad facilities will be required and may pose construction schedule risk.

1a: I-664 N of College Dr. **Resource**	**Resources Identified**	**Comments**
Virginia Port Authority (VPA)	Newport News Marine Terminals	May require right-of-way acquisition and/or construction easements. Maintenance of terminal operations and traffic will be required.
Businesses/Business Access	North Side: ▪ 1 utility impact ▪ 2 telecom impacts ▪ 1 active and 1 inactive rail corridor impact ▪ 1 police impact 1 house of worship impact ▪ 12-13 commercial impacts, including ▪ 1 restaurant impact ▪ 1 grocery impact ▪ 1 probable Navy impact ▪ 3 core structure impacts ▪ 6 Driveway impacts ▪ *Tidewater Tire* ▪ *Ashcraft Services – storage yard* ▪ *Chesapeake Bay Parking*	Identified Businesses and/or Business Access impacts anticipated within the LOD; however, further detailed design may avoid and/or minimize potential impacts.
Sensitive Resources		
Parks & Recreation	North Side: ▪ Superblock Park (2601 Washington Avenue) ▪ King Lincoln Park (600 Jefferson Ave) ▪ Park Place Playground (50th Street)	May have disturbance within the LOD for Park Place Playground; however, further detailed design may avoid and/or minimize potential impacts.
Section 4(f) Properties (publicly owned public parks, recreation areas, and wildlife or waterfowl refuges, or any publicly or privately owned historic site listed or eligible for listing on the National Register of Historic Places)	Section 4(f) resources are identified within the segment corridor – refer to individual line items for each resource type. North Side: ▪ Park Place Playground (50th Street)	It is anticipated that all efforts to avoid any identified Section 4(f) resource will be evaluated. All impacts to Section 4(f) properties are anticipated to either not be considered a Section 4(f) use, or are considered a *de minimis* use, per 23 CFR 774 and the Section 4(f) Policy Paper.
Section 6(f) Properties	Any property that was planned, purchased, or improved with Land and Water Conservation Fund (LWCF) money **(**recreational lands that are also regulated under Section 4(f)	No resources within the LOD
Places of Worship	North Side: ▪ New Covenant Baptist Church ▪ Agape Hands Cathedral Church ▪ Kingdom Hall of Jehovah's Witnesses	Kingdom Hall of Jehovah's Witnesses – impacts within LOD; however, further detailed design may avoid and/or minimize potential impacts.
Cemetery	North Side: ▪ Pleasant Shade Cemetery ▪ Greenlawn Cemetery ▪ Greenlawn Memorial Park	No resources within the LOD

1a: I-664 N of College Dr. **Resource**	**Resources Identified**	**Comments**
School/University	North Side: ▪ Hampton High School (adjacent to LOD) ▪ BT Washington Middle School (adjacent to LOD)	No resources within the LOD
Apartment Complexes/Residences	North Side: ▪ Tidewater Senior Apartments ▪ Single family residences along Braemar Drive ▪ Single family residences along Azaela Drive ▪ Single family residences along Birch Avenue ▪ Single family residences along Byrd Street	Most resources are adjacent to the LOD; however, final LOD requirements may show that minor right-of-way acquisitions will be needed.
Children's Health & Safety	The most likely locations of potential effects on children (other than at residences abutting right-of-way) would be at schools where there are outdoor activity areas for children. ▪ Hampton High School (adjacent to LOD) ▪ BT Washington Middle School (adjacent to LOD)	No resources within the LOD
Environmental Justice		
Environmental Justice	North Side: ▪ 35 private residence impacts in the Jefferson neighborhood and Azalea Garden subdivision, including ▪ 1 driveway impact ▪ 9 structure (outbuilding) impacts *(adjacent to 41st Street)* ▪ There may be a catering business on the 1100 block of 41st street ▪ Concentration of poverty and population is on the west side of the corridor in East End, Marshall & Huntington. Populations in this area south of I-664 are predominately African American south of I-664, with an increasing minority Hispanic population north of I-664	Identified Environmental Justice impacts anticipated within the LOD; however, further detailed design may avoid and/or minimize potential impacts. *All segments have undergone an initial environmental justice review with additional evaluations occurring as more detailed design information becomes available.*
Federal State, and Local Permits		
Water Resources		
Tidal Waters/Tidal Streams/Subaqueous bottom	North Side: ▪ *Newport News Creek (E1UBL) – most likely temporary construction access impacts (0.3 acres)* ▪ ~~Newport News Creek (E1UBL) – adjacent but direct impact~~ ▪ North Island Tunnel (24 acres) ▪ James River (E1UBL)(north bridge/trestle) ~~(16 acres~~) *(28 acres)* ▪ South Island Tunnel (27 acres) ▪ James River (E1UBL)(south bridge/trestle) (43 acres)	Impacts are not based on surveyed field delineations but are meant to provide a conservative quantitative estimate. Tidal Waters/Tidal Streams from Trestle construction: ~~59 acres~~ *71 acres* Subaqueous bottom for island construction: 51 acres

1a: I-664 N of College Dr. **Resource**	**Resources Identified**	**Comments**
		Field surveys and additional detail to avoid and/or minimize impacts would be evaluated with more detailed design. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.*
Non-Tidal Waters	North Side: ▪ Freshwater roadway drainage ditch at Howmet Corporation (approx. ~~190~~ *270* linear feet) ▪ Freshwater roadway drainage ditch W Pembroke Ave (approx. 1500 linear feet)	Impacts are not based on surveyed field delineations but are meant to provide a conservative quantitative estimate. Non-Tidal Waters: ~~1,690~~ *1,770* linear feet Field surveys and additional detail to avoid and/or minimize impacts would be evaluated with more detailed design. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.*

1a: I-664 N of College Dr. **Resource**	**Resources Identified**	**Comments**
Maintained Navigational Channels and Civil Works Projects	▪ Newport News Creek (E1UBL) – adjacent but direct impact ▪ Newport News Channel	No impacts to Maintained Navigational Channels and Civil Works Projects is anticipated. All Maintained Navigational Channels will be avoided by the tunnel design.
Wetlands	n/a	No resources within the LOD
Waterfront Development Areas		
Commercial Ports	▪ River Port ▪ Blue Night Energy Partners ▪ Chesapeake Bay Fish Packing ▪ Seafood Industrial Park ▪ Davis Boat Works ▪ Boat Marina along Seawall	Impacts TBD when southern terminus with tunnel structure LOD alignment is complete; ~~however anticipated to be outside limits of LOD.~~
Commercial Fishing Piers	▪ Green Mile Fishing Pier ▪ King-Lincoln Park Fishing Pier	No resources within the LOD
Wildlife Habitat		
Colonial Waterbird Nesting	▪ Urban, Newport News South, Newport News (outside LOD) ▪ 22nd Avenue (outside LOD) ▪ Peterson Yacht Basin (outside LOD) ▪ Salters Creek (outside LOD) ▪ Craney Island, Northwest (outside LOD)	No resources within the LOD Habitat is present for the Gull-billed tern, Piping plover, Red knot, and Wilson's plover. *Anticipate strong interest in and public objections to impacts to colonial nesting birds. Mitigation requirements for displaced birds may be required under Migratory Bird Treaty Act. Consultant will make note of all comments during the public involvement stage of this project.*
Benthic Species	▪ Hard Clam Habitat (571 acres) ▪ Hard Clam Habitat Tunnels (294 acres) ▪ Public Clamming Grounds (0 acres) ▪ Blue Crab (*Callinectes sapidus*) (0 acres) ▪ Oyster Reefs (*Crassostrea virginica*) (0 acres) ▪ Oyster Sanctuary (0 acres) ▪ Public Baylor Grounds (93 acres) ▪ Private Shellfish Leases (0 acres) The introduction of additional hard substrate such as pilings and riprap protection could provide beneficial habitat where it did not previously exist for oysters and other marine benthic organisms.	The entire footprint beneath each segment is considered potential hard clam habitat because the entire bottom is composed of sand, mud, or a combination suitable for hard clams. Construction BMPs, including conforming to the guidelines contained in the VESCH, would be employed to reduce turbidity and sediment disturbance. The time of year and length of dredging operations may need to be considered as prolonged dredging would result in disturbance to the benthos and adjacent water column over a longer period of time dependent upon the nature of the bottom substrate, tidal fluctuations, and estuarine dynamics. Strict adherence to erosion and

1a: I-664 N of College Dr. **Resource**	**Resources Identified**	**Comments**
		sediment control measures and permit requirements would minimize water quality impacts due to sedimentation and turbidity during construction. Long-term effects to benthic communities due to changes in water quality would be minimized and avoided through implementation of stormwater management plans designed to minimize impacts from increases in impervious surfaces, mitigate increases in runoff volume, and satisfy requirements to reduce pollutant loads below existing baseline conditions, as required by the VSMP regulations and Chesapeake Bay TMDL. *No specific mitigation measures can be determined at this level of engineering design.*
Historic Resources		
Architectural Resources / Historic Districts	North Side: ▪ 121-0032 (St. Vincent de Paul Catholic Church)(NRHP-Listed 2005) ▪ 121-0033 (Brown Manufacturing Coca-Cola Bottling Works, Daily Press Building)(Recommended Potentially Eligible 2016) ▪ 121-0157 (Peninsula Catholic High School/St. Vincent's School for Girls)(Recommended Potentially Eligible 2016) ▪ 121-0299 (Noland Company Building)(NRHP-Listed 2010) ▪ 121-5318 (Jefferson Avenue Commercial Historic District) ▪ 121-5277 (Jefferson Avenue Commercial Historic District) ▪ 121-0020 (Middle Ground Light Station)(NRHP Listing, VLR Listing)	The area of potential effects (APE) is the geographic area within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties. No direct APE impacts. No anticipated indirect APE (viewshed) impacts.
Archaeological Resources	North Side: ▪ Captain John Smith Chesapeake National Historic Trail (first water trail designated under the National Trails System Act) ▪ Washington-Rochambeau Revolutionary Route National Historic Trail (designated a National Historic Trail under the National Trails System Act)(The W-RNHT is located within what is now a highly	If any significant archaeological sites associated with the Captain John Smith Chesapeake National Historic Trail and Washington-Rochambeau Revolutionary Route National Historic Trail are eventually identified within the LOD, they likely would meet the regulatory exception to the requirements of Section 4(f)

1a: I-664 N of College Dr. **Resource**	**Resources Identified**	**Comments**
	industrialized and developed area in which few remnants of the historic landscape survive)	approval: the sites likely would be important chiefly for the information they contain, which can be retrieved through data recovery, and would have minimal value for preservation in place.
Additional Factors		
Mitigation Complexity and Cost	▪ Wetland, US waters, and subaqueous bottomlands impacts	High anticipated mitigation costs would be required for wetland and US waters impacts due to construction of the new island required for the tunnel segment. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.* *Additional coordination with mitigation banks to ensure sufficient capacity for required purchases will occur as design progresses and more precise impacts can be determined.*
Permit Stakeholder Coordination	▪ Transportation facilities identified within the LOD (north side). ▪ Newport News Marine Terminals identified within the LOD (north side). ▪ Railroad facilities identified within the LOD (north side). ▪ River Port LLC facilities identified within the LOD (north side). ▪ Blue Night Energy Partners facilities identified within the LOD (north side). ▪ Adjacent Property Owners (Residents and Businesses)	Extensive stakeholder coordination with Federal Navigation Projects along the James River (Newport News Channel), Elizabeth River, rail facilities, and current operations at the Newport News Marine Terminals will be required and may pose design and/or construction schedule risk.
Effect on other Federal Navigation Projects	▪ Newport News Creek (E1UBL) – adjacent but direct impact ▪ Newport News Channel	This segment does contain bridge and roadway structures within water and landside to Federal Navigation Projects along the James River (Newport News Channel), Elizabeth

1a: I-664 N of College Dr. **Resource**	**Resources Identified**	**Comments**
		River, and current operations at the Newport News Marine Terminals.
Potential Future Changes in Policy Issues		No major regulatory policy changes are anticipated at this time. *Impacts to shallow water habitat (are less than 2 meters deep) may require in-kind compensation.*

Strikethrough and italicized text reflects revision made in response to stakeholder comments.

SEGMENT: *2: VA 164*

2: VA 164 **Resource**	**Resources Identified**	**Comments**
Social Environment		
Community Resources		
Military/DOD/USACOE	n/a	No resources within the LOD
Transportation Facilities	▪ VA-164 ▪ Western Branch Boulevard ▪ College Drive ▪ Town Point Road ▪ Cedar Lane ▪ Railway Facilities	Transportation facilities identified within the LOD. Assumption that all transportation facilities will remain at existing or improved functionality. Stakeholder coordination with railroad facilities will be required and may pose construction schedule risk.
Businesses/Business Access	No business impacts.	~~No resources within the LOD.~~ *Businesses are located adjacent to the LOD; however, this is a constrained corridor that will be addressed as the planning process continues. More advanced conceptual design will be done later in the planning process that will further identify corridor constraints and impacts. There are business parking lots near the LOD to the western end of this segment.*
Sensitive Resources		
Parks & Recreation	Ebony Heights Park	Expansion to the eastbound side of VA-164 may require a portion of easement from Ebony Heights Park; however, ~~further detailed design may avoid and/or minimize any potential impacts.~~ *more advanced conceptual design will be done later in the planning process. At this first tier planning stage, it does not appear that Ebony Heights Park falls within the preliminary and developing Limits of Disturbance. The planning process is still in its early stages, and will continue to solicit, document and resolve comments and concerns about relocation, displacement and property from Portsmouth in later stages of planning and design.*
Section 4(f) Properties	Publicly owned public parks, recreation areas, and wildlife or waterfowl refuges, or any publicly or privately owned historic site listed or eligible for listing on the National Register of Historic Places. ▪ Ebony Heights Park	Expansion to the eastbound side of VA-164 may require a portion of easement from Ebony Heights Park; however, ~~further detailed design may avoid and/or minimize any potential impacts.~~

2: VA 164 **Resource**	**Resources Identified**	**Comments**
		more advanced conceptual design will be done later in the planning process. At this first tier planning stage, it does not appear that Ebony Heights Park falls within the preliminary and developing Limits of Disturbance. The planning process is still in its early stages, and will continue to solicit, document and resolve comments and concerns about relocation, displacement and property from Portsmouth in later stages of planning and design.
Section 6(f) Properties	Any property that was planned, purchased, or improved with Land and Water Conservation Fund (LWCF) money **(**recreational lands that are also regulated under Section 4(f)	No resources within the LOD
Places of Worship	▪ New Beginning Cristian Center ▪ New Beginning Pentecostal Church	No resources within the LOD
Cemetery	▪ New Beginning Pentecostal Church Cemetery ▪ *Churchland Cemetery in Ebony Heights Park.*	No resources within the LOD
School/University	n/a	No resources within the LOD
Apartment Complexes/Residences	▪ Stonebridge Apartments ▪ Churchland Square Apartments ▪ Westwinds Apartments ▪ Preston Trails Apartments ▪ 3833 Old Farm Rd – appears to have cleared into the right of way	~~No resources within the LOD~~ *At this first tier planning stage, it does not appear that any residential structures fall within the preliminary and developing Limits of Disturbance. The planning process is still in its early stages, and will continue to solicit, document and resolve comments and concerns about relocation, displacement and property from Portsmouth in later stages of planning and design.*
Children's Health & Safety	n/a	No resources within the LOD
Environmental Justice		
Environmental Justice	Past and present growth and development - expansion of controlled access roadways have separated neighboring communities. ▪ Expansion to the EB side of VA-164 may require a portion of easement from Ebony Heights Park	No residents or neighboring communities would be relocated. *Communities within 500 feet of the preliminary Limits of Disturbance for VA 164 are racially and income diverse. As this and future planning and project development processes continue, outreach, partnering and collaboration with neighboring communities will engage these*

2: VA 164 **Resource**	**Resources Identified**	**Comments**
		communities to mitigate any potential impacts.
Federal State, and Local Permits		
Water Resources		
Tidal Waters/Tidal Streams/Subaqueous bottom	n/a	No resources within the LOD
Non-Tidal Waters	▪ Non-Tidal channel at Lilac Drive (approx. 500 linear feet)	Impacts are not based on surveyed field delineations but are meant to provide a conservative quantitative estimate. Non-Tidal Waters: 500 linear feet Field surveys and additional detail to avoid and/or minimize impacts would be evaluated with more detailed design *as well as coordination with mitigation banks to ensure sufficient capacity for required purchases.*
Maintained Navigational Channels and Civil Works Projects	n/a	No resources within the LOD
Wetlands	Several wetland systems within the segment corridor are located outside the LOD. ▪ PFO at Harvey Street (0.06 acres) – adjacent to ROW ▪ PFO at Bowden Street (0.24 acres) – adjacent to ROW ▪ PFO at Pond Lane (0.18 acres) – adjacent to ROW	Impacts are not based on surveyed field delineations but are meant to provide a conservative quantitative estimate. PFO Wetlands: 0.48 acres Field surveys and additional detail to avoid and/or minimize impacts would be evaluated with more detailed design *as well as coordination with mitigation banks to ensure sufficient capacity for required purchases.*
Waterfront Development Areas		
Commercial Ports	n/a	No resources within the LOD
Commercial Fishing Piers	n/a	No resources within the LOD
Wildlife Habitat		
Colonial Waterbird Nesting	▪ Urban, Newport News South, Suffolk (outside LOD) Habitat is present for the Gull-billed tern, Piping plover, Red knot, and Wilson's plover.	No resources within the LOD.
Benthic Species	n/a	No resources within the LOD
Historic Resources		
Architectural Resources / Historic Districts	▪ 133-5542: Camellia Historic District (adjacent to ROW)	The area of potential effects (APE) is the geographic area within which an undertaking may directly or indirectly

2: VA 164 **Resource**	**Resources Identified**	**Comments**
	▪ 124-5264: Churchland West Historic District (adjacent to ROW) ▪ 124-5265: Churchland West Historic District (adjacent to ROW) ▪ 124-5261: Churchland Square Apartments (adjacent to ROW)(not eligible) ▪ 124-5262: Preston Trails Apartments (adjacent to ROW) (not eligible) ▪ 124-5260: Stone Ridge Apartments (adjacent to ROW) (not eligible) ▪ 124-5266: Merrifields Historic District (adjacent to ROW)	cause alterations in the character or use of historic properties. No direct APE impacts. No anticipated indirect APE (viewshed) impacts.
Archaeological Resources	n/a	No resources within the LOD
Additional Factors		
Mitigation Complexity and Cost	▪ Wetland, US waters, and subaqueous bottomlands impacts	Minimal anticipated mitigation costs would be required for wetland, US waters, and subaqueous bottomlands impacts throughout the corridor. *Additional coordination with mitigation banks to ensure sufficient capacity for required purchases will occur as design progresses and more precise impacts can be determined.*
Permit Stakeholder Coordination	▪ Transportation facilities identified within the LOD. ▪ Railroad facilities identified within the LOD. ▪ Adjacent Property Owners (Residents and Businesses) ▪ *City of Portsmouth*	Assumption that all transportation facilities will remain at existing functionality. Stakeholder coordination with railroad facilities will be required and may pose construction schedule risk. *Portsmouth will be included in the discussion as the planning and design process outreach, with opportunities to raise, raise, document and resolve concerns. This inclusive process including Portsmouth will continue as detailed planning proceeds at a later date.*
Effect on other Federal Navigation Projects	n/a	Resources outside the LOD.
Potential Future Changes in Policy Issues		No major regulatory policy changes are anticipated at this time.

Strikethrough and italicized text reflects revision made in response to stakeholder comments.

SEGMENT: *3: VA 164 Connector*

3: VA 164 Connector **Resource**	**Resources Identified**	**Comments**
Social Environment		
Community Resources		
Military/DOD/USACOE	▪ US Army Corps of Engineers Craney Island Disposal Area (CIDDMA) ▪ Craney Island Naval Supply Center ▪ US Coast Guard Sector Virginia ▪ US Coast Guard Base Portsmouth ▪ US Navy Craney Island Fuel Depot (CIFD Terminal) ▪ US Navy	Segment traverses through all the facilities noted. Would require major right-of-way acquisition and/or construction easements. Setback requirements for Anti-Terrorism Force Protection, Security Requirements, and Gate Access for all noted facilities. *The northern terminus of this segment falls within the Craney Island Dredged Material Management Area (CIDDMA) updated boundary. We will continue to work with the COE to understand the operations requirements for the Craney Island Dredge Disposal Facility and incorporate all requirements into the planning and design. The RCS team will not be the project owner in the final stages of planning, design and construction.* *As a result of this required specification for safety distance requirements from public highway to the facilities at Craney Island Fuel Terminal, the RCS Team is developing the VA 164 connector corridor with an 1,800-foot distance from the planned refueling in addition to a visual barrier in future design iterations.* *There are also noise walls along a portion of the bridge on the outside edge to serve as visual barriers to the fuel line and future facility per the Navy's current force protection standard.*
City of Portsmouth	▪ City of Portsmouth Landfill	Segment bisects the City of Portsmouth Landfill

3: VA 164 Connector **Resource**	**Resources Identified**	**Comments**
Transportation Facilities	▪ Outer limit ring road of US Army Corps of Engineers Craney Island Disposal Area ▪ Waterfront Drive ▪ Oyster Shell Drive ▪ Main Road ▪ Main Drive ▪ South Perimeter Road ▪ Coast Guard Boulevard ▪ Access Road off Coast Guard Boulevard ▪ Railroad Facilities ▪ Old Coast Guard Boulevard ▪ Renfrow Road ▪ Wyatt Drive ▪ Wild Duck Lane ▪ Western Freeway (VA-164) ▪ Cedar Lane ▪ West Norfolk Road ▪ Virginia International Gateway Boulevard ▪ Sunnyside Avenue ▪ Gail Court	Transportation facilities identified within the LOD. Stakeholder coordination with railroad facilities will be required and may pose construction schedule risk. *Noted: Segment alignment was proposed adjacent to the comer where Midway Road intersects Waterfront Drive, this area of Navy property has been approved and designated for the construction of four additional above ground fuel storage tanks. In addition, the proposed segment crosses further West over Navy property where the above ground main fuel supply lines are located. As a result of this required buffer, the RCS Team is developing the VA 164 connector corridor with an 1,800-foot distance from the planned refueling in addition to a visual barrier in future design iterations.*
Businesses/Business Access	▪ *Coast Guard Building & Parking Facility* ▪ Driveway impact on Commercial Ready Mix off Coast Guard Boulevard ▪ Aire Serv HVAC Contractor on W. Norfolk Rd off of the Old Coast Guard Road	Current design has *three* total business takes required. Identified Businesses and/or Business Access impacts anticipated within the LOD; however, further detailed design may avoid and/or minimize potential impacts.
Sensitive Resources		
Parks & Recreation	▪ Hoffler Creek Wildlife Preserve (Lake Ballard) ▪ *Churchland Park*	No resources within the LOD
Section 4(f) Properties	Publicly owned public parks, recreation areas, and wildlife or waterfowl refuges, or any publicly or privately owned historic site listed or eligible for listing on the National Register of Historic Places	No resources within the LOD
Section 6(f) Properties	Any property that was planned, purchased, or improved with Land and Water Conservation Fund (LWCF) money **(**recreational lands that are also regulated under Section 4(f)	No resources within the LOD
Places of Worship	Liberty Christian Fellowship Liberty New Testament Church West Norfolk Baptist	No resources within the LOD
Cemetery	n/a	No resources within the LOD
School/University	▪ Churchland High School	No resources within the LOD

3: VA 164 Connector **Resource**	**Resources Identified**	**Comments**
Apartment Complexes/Residences	West Norfolk Road Apartments	No resources within the LOD
Children's Health & Safety	The most likely locations of potential effects on children (other than at residences abutting right-of-way) would be at schools where there are outdoor activity areas for children.	No resources within the LOD
Environmental Justice		
Environmental Justice	Past and present growth and development - expansion of controlled access roadways have separated neighboring communities.	No residents or neighboring communities would be relocated. *All segments have undergone an initial environmental justice review with additional evaluations occurring as more detailed design information becomes available.*
Federal State, and Local Permits		
Water Resources		
Tidal Waters/Tidal Streams/Subaqueous bottom	▪ Estuarine and Marine Wetland (E2USN) at Craney Island Creek (~~2.25 acres~~) *Bridge structure (2.89 acres)* ▪ Estuarine and Marine Deepwater at Craney Island Creek (~~0.4~~ *0.3* acres) ~~▪ Estuarine and Marine Wetland (E2USN) at Craney Island Creek (3.01 acres)~~ ~~▪ Estuarine and Marine Wetland (E2USN) at Craney Island Creek (0.41 acres)~~ *The revised segment now includes the ramp connections to 564/664 Connector segments.*	Impacts are not based on surveyed field delineations but are meant to provide a conservative quantitative estimate. Tidal Waters/Tidal Streams: ~~5.67~~ *3.19* acres Subaqueous bottom: ~~0.4 acres~~ ▪ *Revised ramp inclusions: 43.6 acres* Field surveys and additional detail to avoid and/or minimize impacts would be evaluated with more detailed design. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.*
Non-Tidal Waters	▪ Non-Tidal channel (drainage ditch) on Craney Island (approx. ~~260~~ *190* linear feet)	Impacts are not based on surveyed field delineations but are meant to provide a conservative quantitative estimate.

3: VA 164 Connector **Resource**	**Resources Identified**	**Comments**
	▪ Non-Tidal channel (drainage ditch) on Craney Island (approx. ~~1400~~ *270* linear feet) ▪ Non-Tidal channel (drainage ditch) on Craney Island (approx. ~~650~~ *535* linear feet) ▪ Non-Tidal channel (drainage ditch) south of Craney Island Creek (approx. ~~325~~ *401* linear feet) ▪ Non-Tidal channel (drainage ditch) south of Craney Island Creek (approx. ~~325~~ *297* linear feet)	Non-Tidal Waters: ~~2,635~~ *1,693* linear feet Field surveys and additional detail to avoid and/or minimize impacts would be evaluated with more detailed design. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.*
Maintained Navigational Channels and Civil Works Projects	▪ Newport News Channel ▪ Elizabeth River ▪ *Craney Island Dredged Material Management Area (CIDDMA)*	~~No resources within the LOD~~ *A portion of this segment falls within the Craney Island Dredged Material Management Area (CIDDMA) updated boundary. We will continue to work with the COE to understand the operations requirements for the Craney Island Dredge Disposal Facility and incorporate all requirements into the planning and design. The RCS team will not be the project owner in the final stages of planning, design and construction.*
Wetlands	▪ Craney Island Disposal Area is classified as Lake (L2UBFh) – ~~(0 acres)~~ *15 acres with elevated structure / bridge* ▪ PEM wetland near ~~Oyster Shell Road~~ *Main Street* (~~1.25~~ *0.38 and 0.57* acres) ▪ PEM wetland south of Craney Island Creek (~~3.27~~ *3.18* acres) ▪ PFO at Coast Guard Boulevard (~~0.04~~ *3.1* acres) ▪ PFO at Coast Guard Boulevard ((~~13~~ *2.2* acres) ▪ *PSS at Coast Guard Boulevard (5.7 acres)* ▪ *PSS at Coast Guard Boulevard (3.6 acres)*	Impacts are not based on surveyed field delineations but are meant to provide a conservative quantitative estimate. ▪ Craney Island Disposal Area is classified as Lake (L2UBFh) – ~~(0 acres)~~ *15 acres with elevated structure / bridge will have limited footprint impacts* *Lake (L2UBFh) – 15 acres* *PEM Wetlands - 4.13 acres* *PSS Wetlands – 9.3 acres* PFO Wetlands: ~~31.31~~ *12.1* acres

3: VA 164 Connector Resource	Resources Identified	Comments
	▪ PFO at Wild Duck Lane (~~12~~ *5.5* acres) ▪ *PFO at Wyatt Drive (1.3 acres)* ▪ ~~PFO at Western Freeway (1.75 acres)~~	Field surveys and additional detail to avoid and/or minimize impacts would be evaluated with more detailed design. *At this time in the evaluation, we only have rough order of magnitude impacts numbers wetland resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.*
Waterfront Development Areas		
Commercial Ports	▪ VIG Portsmouth	Access to VIG Portsmouth
Commercial Fishing Piers	n/a	No resources within the LOD
Wildlife Habitat		
Colonial Waterbird Nesting	▪ Craney Island ▪ Urban, Norfolk North, Portsmouth ▪ Craney Island Northwest (outside LOD) ▪ Urban, Norfolk South, Portsmouth (outside LOD) ▪ Lovett Point (outside LOD) ▪ Pinehurst ▪ Winston Colony ▪ Winston	Colonial Waterbird Nesting sites located on the eastern terminus of the segment LOD. Habitat is present for the Gull-billed tern, Piping plover, Red knot, and Wilson's plover. *Additional mitigation measures for bird nesting impacts will be evaluated as more detailed design allows for the determination of potential bird nesting impacts. The RCS team will not be the project owner in the final stages of planning, design and construction.*
Benthic Species	▪ Hard Clam Habitat (~~0 acres~~) *43.6 acres* ▪ Hard Clam Habitat Tunnels (0 acres) ▪ Public Clamming Grounds (0 acres) ▪ Blue Crab (*Callinectes sapidus*) (0 acres) ▪ Oyster Reefs (*Crassostrea virginica*) (0 acres) ▪ Oyster Sanctuary (0 acres) ▪ Public Baylor Grounds (~~0 acres~~) *101 acres* ▪ Private Shellfish Leases (0 acres)	~~No resources within the LOD~~ The entire footprint beneath each segment is considered potential hard clam habitat because the entire bottom is composed of sand, mud, or a combination suitable for hard clams. Construction BMPs, including conforming to the guidelines contained in the VESCH, would be employed to reduce turbidity and

3: VA 164 Connector **Resource**	**Resources Identified**	**Comments**
		sediment disturbance. The time of year and length of dredging operations may need to be considered as prolonged dredging would result in disturbance to the benthos and adjacent water column over a longer period of time dependent upon the nature of the bottom substrate, tidal fluctuations, and estuarine dynamics. Strict adherence to erosion and sediment control measures and permit requirements would minimize water quality impacts due to sedimentation and turbidity during construction. Long-term effects to benthic communities due to changes in water quality would be minimized and avoided through implementation of stormwater management plans designed to minimize impacts from increases in impervious surfaces, mitigate increases in runoff volume, and satisfy requirements to reduce pollutant loads below existing baseline conditions, as required by the VSMP regulations and Chesapeake Bay TMDL. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.*
Historic Resources		
Architectural Resources / Historic Districts	n/a	No resources within the LOD
Archaeological Resources	▪ Captain John Smith Chesapeake National Historic Trail (first water trail designated under the National Trails System Act) ▪ Washington-Rochambeau Revolutionary Route National Historic Trail (designated a National Historic Trail under the National	If any significant archaeological sites associated with the Captain John Smith Chesapeake National Historic Trail and Washington-Rochambeau Revolutionary Route National Historic Trail are eventually

3: VA 164 Connector **Resource**	**Resources Identified**	**Comments**
	Trails System Act)(The W-RNHT is located within what is now a highly industrialized and developed area in which few remnants of the historic landscape survive)	identified within the LOD, they likely would meet the regulatory exception to the requirements of Section 4(f) approval: the sites likely would be important chiefly for the information they contain, which can be retrieved through data recovery, and would have minimal value for preservation in place.
Additional Factors		
Mitigation Complexity and Cost	▪ Wetland, US waters, and subaqueous bottomlands impacts ▪ Business Takes	Current design has total business take required. Identified Businesses and/or Business Access impacts anticipated within the LOD. Moderate to Extensive anticipated mitigation costs would be required for wetland and US waters impacts; however, field surveys and additional detailed design may avoid and/or minimize impacts to further reduce potential mitigation costs. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.*
Permit Stakeholder Coordination	▪ Transportation facilities identified within the LOD. ▪ Railroad facilities identified within the LOD. ▪ Maritime Stakeholders ▪ US Army Corps of Engineers Craney Island Disposal Area ▪ Craney Island Naval Supply Center ▪ US Coast Guard Sector Virginia ▪ US Coast Guard Base Portsmouth ▪ US Navy Craney Island Fuel Depot (CIFD Terminal) ▪ US Navy ▪ City of Portsmouth	May require major right-of-way acquisition and/or construction easements. Maintenance of terminal operations and traffic will be required. Extensive setback requirements for Anti-Terrorism Force Protection, Security Requirements, and Gate Access for all noted facilities. Stakeholder coordination with facilities will be required and may pose construction schedule risk.

3: VA 164 Connector **Resource**	**Resources Identified**	**Comments**
	▪ Adjacent Property Owners (Residents/Businesses)	*The RCS evaluation team acknowledges that strategic importance of Craney Island within the context of Naval Station Norfolk and are staying in communication with stakeholders like the Navy throughout the process to ensure that the planning process evolves into a design and construction process that serves both the strategic and regional needs of the Hampton Roads region.* *The RCS report in May of 2022 was a qualitative assessment, and the RCS team is now working on refining the quantitative understanding of traffic demand modeling and design needs. The RCS team and the agencies that carry this planning process forward to design, construction and operations will work in partnership with the Navy to develop, design, and construct the VA 164 connector alignment, roadway, and facilities in a way that does not impair the planned functions of Craney Island.*
Effect on other Federal Navigation Projects	▪ Newport News Channel ▪ Elizabeth River ▪ US Army Corps of Engineers Craney Island Disposal Area	No anticipated impact to the Newport News Channel. This segment does contain roadway structures landside to Federal Navigation Projects along the Elizabeth River and to current operations at the US Army Corps of Engineers Craney Island Disposal Area. *Section 408 permit requirements for the Craney Island Dredge Disposal Facility will be taken into consideration.*
Potential Future Changes in Policy Issues		No major regulatory policy changes are anticipated at this time. *Impacts to shallow water habitat (are less than 2 meters deep) may require in-kind compensation if policy regulations change.*

Strikethrough and italicized text reflects revision made in response to stakeholder comments.

SEGMENT: 4: I-564 Connector

4: I-564 Connector **Resource**	**Resources Identified**	**Comments**
Social Environment		
Community Resources		
Military/DOD/USACOE	▪ NSA Hampton Roads ▪ Norfolk International Terminals ▪ Norfolk Naval Station ▪ Norfolk Naval Air Station ▪ US Marine Corps ▪ United States Department of the Navy ▪ Marine Corps Personnel Support ▪ Camp Elmore ▪ NAS Norfolk Air Passenger Terminal	Segment traverses through the DON and NIT properties. Need additional information regarding potential anti-terrorism force protection requirements. *As the project moves into design and construction, the project owner will be able to make decisions about equipment height and clearance to accommodate the Navy's operational needs in Norfolk.* *It should be noted that the fueling facility referred to in this comment is within 300 feet of the existing Intermodal connector, which is currently planned to have the same alignment as the proposed I-564 connector. There are currently walls separating the Navy's fuel facility from the existing Intermodal connector. To satisfy the 1,800 foot the setback from the fueling facility would require a significant re-evaluation of the I-564 connector by FHWA, VDOT, Norfolk, and Port of Virginia.* *At the time that the segment design is developed further the appropriate mitigation will be determined in consideration of the security protocols in place at that time.*
Transportation Facilities	▪ Northgate Road ▪ Hampton Boulevard (337) ▪ Seabee Road ▪ Intermodal Connector ▪ Admiral Taussig Boulevard (564) ▪ Patrol Road ▪ VPA Rail Facilities	Transportation facilities identified within the LOD. Assumption that all transportation facilities will remain at existing or improved functionality. Stakeholder coordination with railroad facilities will be required and may pose construction schedule risk. *Evolving security and visibility technology may resolve these security concerns as the I-564 corridor*

4: I-564 Connector **Resource**	**Resources Identified**	**Comments**
		progresses from planning to design. Evolving transportation technology may change the corridor design as well. Horizontal and vertical clearances required by the Navy for essential security will be considered in the future planning and design process. *At the end of the Phase 3 (Step 2) Quantitative analysis, which we are conducting now, we will recommend tiering of the segments into three tiers that correspond to timing of/readiness for implementation, with Tier 1 the most ready and Tier 3 the least ready. At the time of project design and construction, the project owner will be able to make decisions about equipment height and clearance to accommodate the Navy's operational needs in Norfolk. At this early planning stage of the segment tiering process the Regional Connectors study is not considering an elevated section between the end of the existing Intermodal connector and the end of Norfolk International Terminal Pier 3. Instead, the I-564 connector is planned to be underground along the length of existing NIT Pier 3 and tunnel under the Elizabeth River shipping lanes to surface at a bridge to the west of the NIT and to the north of Craney island.* *It may be possible to tunnel the I-564 connector further East approaching the Hampton Boulevard underpass, but that design will involve additional costs.*
Norfolk International Terminals	Lineage Logistics at Talon Marine Terminals, NIT Pier 3	*The loss of operational use at the Lineage Logistics at Talon Marine Terminals, NIT Pier 3 needs more information in order to determine all of the factors to be considered.* *The boundaries of Naval Station Norfolk as codified in the CFR begin along the northern edge of NIT pier*

4: I-564 Connector **Resource**	**Resources Identified**	**Comments**
		3. The RCS study does not plan nor contemplate exceeding the northern edge of Pier 3 of the NIT during the construction or operations of the I-564 connector. The RCS team will plan for and produce cost estimates to account for the need for vetting and hiring personnel with sufficient security clearances to work in the vicinity of Norfolk Naval Station Pier 1. *The Regional Connectors Study is a conceptual planning stage of design. The future stages of the project will be carried forward by regional or commonwealth such as HRTAC and VDOT. They will maintain communication and coordination with stakeholders and decisionmakers throughout the planning, design, and construction process.*
Businesses/Business Access	n/a	Resources outside the LOD.
Sensitive Resources		
Parks & Recreation	▪ Fleet Recreation Park (DON facility) ▪ Sewells Point Golf Course (DON facility) (adjacent only)	May have disturbance within the LOD for Fleet Recreation Park (park access/maintenance roads).
Section 4(f) Properties	Publicly owned public parks, recreation areas, and wildlife or waterfowl refuges, or any publicly or privately owned historic site listed or eligible for listing on the National Register of Historic Places	Resources outside the LOD.
Section 6(f) Properties	Any property that was planned, purchased, or improved with Land and Water Conservation Fund (LWCF) money **(**recreational lands that are also regulated under Section 4(f)	Resources outside the LOD.
Places of Worship	n/a	Resources outside the LOD.
Cemetery	n/a	Resources outside the LOD.
School/University	n/a	Resources outside the LOD.
Apartment Complexes/Residences	n/a	Resources outside the LOD.
Children's Health & Safety	n/a	Resources outside the LOD.
Environmental Justice		

4: I-564 Connector **Resource**	**Resources Identified**	**Comments**
Environmental Justice	Past and present growth and development - expansion of controlled access facilities such as military installations like NAVSTA Norfolk have separated neighboring communities.	No residents or neighboring communities would be relocated. *All segments have undergone an initial environmental justice review with additional evaluations occurring as more detailed design information becomes available.*
Federal State, and Local Permits		
Water Resources		
Tidal Waters/Tidal Streams/Subaqueous bottom	▪ East tunnel (on upland) ▪ West tunnel (30 acres)	Impacts are not based on surveyed field delineations but are meant to provide a conservative quantitative estimate. Subaqueous bottom for island construction: 30 acres Field surveys and additional detail to avoid and/or minimize impacts would be evaluated with more detailed design. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.*
Non-Tidal Waters	• Non-tidal channel along Intermodal Connector (approx. 200 linear feet) • Non-tidal channel near Patrol Road (approx. 190 linear feet)	Impacts are not based on surveyed field delineations but are meant to provide a conservative quantitative estimate. Non-Tidal Waters: 390 linear feet Field surveys and additional detail to avoid and/or minimize impacts would be evaluated with more detailed design. *At this time in the evaluation, we only have rough order of magnitude*

4: I-564 Connector **Resource**	**Resources Identified**	**Comments**
		impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.
Maintained Navigational Channels and Civil Works Projects	▪ Newport News Channel ▪ Elizabeth River Channel	No impacts to Maintained Navigational Channels and Civil Works Projects is anticipated. All Maintained Navigational Channels will be avoided by the tunnel design.
Wetlands	Wetlands are adjacent to portions of the corridor but none identified within the bounds of the LOD	Impacts are not based on surveyed field delineations but are meant to provide a conservative quantitative estimate. Field surveys and additional detail to avoid and/or minimize impacts would be evaluated with more detailed design. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.*
Waterfront Development Areas		
Commercial Ports	▪ Virginia Port Authority - Lineage Logistics at Talon Marine Terminals, NIT Pier 3	The loss of operational use at the Lineage Logistics at Talon Marine Terminals, NIT Pier 3 needs more information in order to determine all of the factors to be considered.
Commercial Fishing Piers	n/a	Resources outside the LOD.
Wildlife Habitat		

4: I-564 Connector **Resource**	**Resources Identified**	**Comments**
Colonial Waterbird Nesting	▪ Craney Island ▪ Urban, Norfolk North, Portsmouth ▪ Craney Island, Northwest ▪ Willoughby Spit ▪ Hermitage (outside LOD) ▪ Algonquin Park (outside LOD) ▪ Lochhaven (outside LOD)	Colonial Waterbird Nesting sites are located within the LOD. Proactive measures such as the sue of bird dogs could be employed during construction within the bird nesting season (April – September 1) so as to deter colonial bird nesting in these sites. Habitat is present for the Gull-billed tern, Piping plover, Red knot, and Wilson's plover. *Additional mitigation measures for bird nesting impacts will be evaluated as more detailed design allows for the determination of potential bird nesting impacts. The RCS team will not be the project owner in the final stages of planning, design and construction.*
Benthic Species	▪ Hard Clam Habitat Tunnels (30 acres) ▪ Public Clamming Grounds (0 acres) ▪ Blue Crab (*Callinectes sapidus*) (0 acres) ▪ Oyster Reefs (*Crassostrea virginica*) (0 acres) ▪ Oyster Sanctuary (0 acres) ▪ Public Baylor Grounds (0 acres) ▪ Private Shellfish Leases (0 acres) The introduction of additional hard substrate such as pilings and riprap protection could provide beneficial habitat where it did not previously exist for oysters and other marine benthic organisms.	The entire footprint beneath each segment is considered potential hard clam habitat because the entire bottom is composed of sand, mud, or a combination suitable for hard clams. Construction BMPs, including conforming to the guidelines contained in the VESCH, would be employed to reduce turbidity and sediment disturbance. The time of year and length of dredging operations may need to be considered as prolonged dredging would result in disturbance to the benthos and adjacent water column over a longer period of time dependent upon the nature of the bottom substrate, tidal fluctuations, and estuarine dynamics. Strict adherence to erosion and sediment control measures and permit requirements would minimize water quality impacts due to sedimentation and turbidity during construction. Long-term effects to benthic communities due to changes in water quality would be minimized and avoided through implementation of stormwater management plans designed to minimize impacts from

4: I-564 Connector **Resource**	**Resources Identified**	**Comments**
		increases in impervious surfaces, mitigate increases in runoff volume, and satisfy requirements to reduce pollutant loads below existing baseline conditions, as required by the VSMP regulations and Chesapeake Bay TMDL. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.*
Historic Resources		
Architectural Resources / Historic Districts	▪ 121-0020 (Middle Ground Light Station)(NRHP Listing, VLR Listing) ▪ 122-0410 (Norfolk Naval Base Historic District) ▪ 122-5045 (Norfolk Naval Base Golf Historic District) ▪ 122-0334 (Sewells Point Docks (Historic); Virginia Port Authority (Current))	The area of potential effects (APE) is the geographic area within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties. Alignment segment does bisect the 122-0334 (Sewells Point Docks (Historic); Virginia Port Authority (Current)); however, the area is currently an operational facility for VPA and no direct APE impacts are anticipated. No anticipated indirect APE (viewshed) impacts are anticipated for the adjacent 122-5045 (Norfolk Naval Base Golf Historic District) since existing transportation facility exists in the corridor.
Archaeological Resources	▪ Captain John Smith Chesapeake National Historic Trail (first water trail designated under the National Trails System Act) ▪ Washington-Rochambeau Revolutionary Route National Historic Trail (designated a National Historic Trail under the National Trails System Act)(The W-RNHT is located within what is now a highly	If any significant archaeological sites associated with the Captain John Smith Chesapeake National Historic Trail and Washington-Rochambeau Revolutionary Route National Historic Trail are eventually identified within the LOD, they likely would meet the regulatory exception

4: I-564 Connector **Resource**	**Resources Identified**	**Comments**
	industrialized and developed area in which few remnants of the historic landscape survive)	to the requirements of Section 4(f) approval: the sites likely would be important chiefly for the information they contain, which can be retrieved through data recovery, and would have minimal value for preservation in place.
Additional Factors		
Mitigation Complexity and Cost	▪ Wetland, US waters, and subaqueous bottomlands impacts	High anticipated mitigation costs would be required for wetland and US waters impacts due to construction of the new island required for the tunnel segment. *At this time in the evaluation, we only have rough order of magnitude impacts numbers for tidal and nontidal US Waters resources. As detailed design continues for specific bundles, more detailed impact numbers will be available to the project owner and coordination on available credits with approved commercial banks will be completed. Final planning, design, and construction will continue under the project owner, after the term of the RCS team.*
Permit Stakeholder Coordination	▪ Transportation facilities identified within the LOD. ▪ Railroad facilities identified within the LOD. ▪ Craney Island ▪ Lineage Logistics at Talon Marine Terminals, NIT Pier 3 ▪ NSA Hampton Roads ▪ Norfolk International Terminals ▪ Norfolk Naval Station ▪ Norfolk Naval Air Station ▪ US Marine Corps ▪ United States Department of the Navy ▪ Marine Corps Personnel Support ▪ Camp Elmore ▪ NAS Norfolk Air Passenger Terminal ▪ Maritime Stakeholders ▪ Adjacent Property Owners	Extensive stakeholder coordination with Military/DOD/USACOE facilities, transportation facilities, Lineage Logistics at Talon Marine Terminals, NIT Pier 3, and railroad facilities will be required and may pose design and/or construction schedule risk. *The Regional Connectors Study is a conceptual planning stage of design. The future stages of the project will be carried forward by regional or commonwealth such as HRTAC and VDOT. They will maintain communication and coordination with stakeholders and decisionmakers throughout the planning, design, and construction process.*
Effect on other Federal Navigation Projects	▪ Newport News Channel ▪ Elizabeth River Channel (Norfolk Harbor Reach)	No impacts to Federal Navigational Channels and Civil Works Projects are anticipated. All Maintained

4: I-564 Connector **Resource**	**Resources Identified**	**Comments**
		Navigational Channels will be avoided by the tunnel design.
Potential Future Changes in Policy Issues		No major regulatory policy changes are anticipated at this time.

Strikethrough and italicized text reflects revision made in response to stakeholder comments.

SEGMENT: *5: I-664 Connector*

5: I-664 Connector **Resource**	**Resources Identified**	**Comments**
Social Environment		
Community Resources		
Military/DOD/USACOE	▪ US Army Corps of Engineers Craney Island Disposal Area	Maintenance of operations and traffic will be required for all identified Craney Island facilities, Maintained Federal Channels, and the connection to the existing I664 Monitor Merrimack transportation corridor. Need more information on the US Army Corps of Engineers Craney Island Disposal Area anticipated end of operational life. *Project limits are outside of the updated CIDDMA Site Boundary as received by the USACOE.*
Transportation Facilities	▪ I-664 (Monitor Merrimac Bridge Tunnel) ▪ US Army Corps of Engineers Craney Island Disposal Area North East Ring Road	Project is dependent on improvements to I664 (North MMMBT) segment.
Norfolk International Terminals	Lineage Logistics at Talon Marine Terminals, NIT Pier 3	No resource within the LOD
Businesses/Business Access	n/a	No resource within the LOD
Sensitive Resources		
Parks & Recreation	n/a	No resource within the LOD
Section 4(f) Properties	Publicly owned public parks, recreation areas, and wildlife or waterfowl refuges, or any publicly or privately owned historic site listed or eligible for listing on the National Register of Historic Places	No resource within the LOD
Section 6(f) Properties	Any property that was planned, purchased, or improved with Land and Water Conservation Fund (LWCF) money (recreational lands that are also regulated under Section 4(f)	No resource within the LOD
Places of Worship	n/a	No resource within the LOD
Cemetery	n/a	No resource within the LOD
School/University	n/a	No resource within the LOD
Apartment Complexes/Residences	n/a	No resource within the LOD
Children's Health & Safety	n/a	No resource within the LOD
Environmental Justice		
Environmental Justice	n/a	No resource within the LOD

5: I-664 Connector Resource	Resources Identified	Comments
Federal State, and Local Permits		
Water Resources		
Tidal Waters/Tidal Streams/Subaqueous bottom	▪ Bridge/Trestle (~~144 acres~~) *(153 acres)*	Impacts are not based on surveyed field delineations but are meant to provide a conservative quantitative estimate. ▪ Tidal Waters/Tidal Streams from Trestle construction: (~~144 acres~~) *(153 acres)* Field surveys and additional detail to avoid and/or minimize impacts would be evaluated with more detailed design. *As more detailed design continues the exploration of more project-specific measures to control turbidity will be evaluated.*
Non-Tidal Waters	n/a	No resource within the LOD
Maintained Navigational Channels and Civil Works Projects	▪ Newport News Channel ▪ Elizabeth River Channel	This segment does contain bridge and roadway structures within water and landside to Federal Navigation Projects along the James River, Elizabeth River, and current operations at the US Army Corps of Engineers Craney Island Disposal Area. *Project limits are outside of the updated CIDDMA Site Boundary as received by the USACOE.*
Wetlands	n/a	No resource within the LOD
Waterfront Development Areas		
Commercial Ports	n/a	No resource within the LOD
Commercial Fishing Piers	n/a	No resource within the LOD
Wildlife Habitat		
Colonial Waterbird Nesting	▪ Craney Island ▪ Urban, Norfolk North, Portsmouth ▪ Craney Island, Northwest ▪ Willoughby Spit ▪ Hermitage (outside LOD) ▪ Algonquin Park (outside LOD) ▪ Lochhaven (outside LOD)	Colonial Waterbird Nesting sites are located within the LOD. Proactive measures such as the sue of bird dogs could be employed during construction within the bird nesting season (April – September 1) so as to deter colonial bird nesting in these sites. Habitat is present for the Gull-billed tern, Piping plover, Red knot, and Wilson's plover.

5: I-664 Connector **Resource**	**Resources Identified**	**Comments**
		Anticipate strong interest in and public objections to impacts to colonial nesting birds. Mitigation requirements for displaced birds may be required under Migratory Bird Treaty Act.
Benthic Species	▪ Hard Clam Habitat (~~144 acres~~) *(153 acres)* ▪ Public Clamming Grounds (0 acres) ▪ Blue Crab (*Callinectes sapidus*) (0 acres) ▪ Oyster Reefs (*Crassostrea virginica*) (0 acres) ▪ Oyster Sanctuary (0 acres) ▪ Public Baylor Grounds (approx. ~~290 acres~~ *31 acres*) ▪ Private Shellfish Leases (0 acres) The introduction of additional hard substrate such as pilings and riprap protection could provide beneficial habitat where it did not previously exist for oysters and other marine benthic organisms.	The entire footprint beneath the segment is considered potential hard clam habitat because the entire bottom is composed of sand, mud, or a combination suitable for hard clams. Construction BMPs, including conforming to the guidelines contained in the VESCH, would be employed to reduce turbidity and sediment disturbance. The time of year and length of dredging operations may need to be considered as prolonged dredging would result in disturbance to the benthos and adjacent water column over a longer period of time dependent upon the nature of the bottom substrate, tidal fluctuations, and estuarine dynamics. Strict adherence to erosion and sediment control measures and permit requirements would minimize water quality impacts due to sedimentation and turbidity during construction. Long-term effects to benthic communities due to changes in water quality would be minimized and avoided through implementation of stormwater management plans designed to minimize impacts from increases in impervious surfaces, mitigate increases in runoff volume, and satisfy requirements to reduce pollutant loads below existing baseline conditions, as required by the VSMP regulations and Chesapeake Bay TMDL. *As more detailed design continues the exploration of more project-specific measures to control turbidity will be evaluated. Pilings and riprap from new bridge and tunnel structures are probably not sufficient to offset impacts to benthic species but no*

5: I-664 Connector **Resource**	**Resources Identified**	**Comments**
		specific measures can be determined at this level of engineering design.
Historic Resources		
Architectural Resources / Historic Districts	▪ 121-0020 (Middle Ground Light Station) (NRHP Listing, VLR Listing)	The area of potential effects (APE) is the geographic area within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties. No direct APE impacts are anticipated. No anticipated indirect APE (viewshed) impacts are anticipated.
Archaeological Resources	▪ Captain John Smith Chesapeake National Historic Trail (first water trail designated under the National Trails System Act) ▪ Washington-Rochambeau Revolutionary Route National Historic Trail (designated a National Historic Trail under the National Trails System Act) (The W-RNHT is located within what is now a highly industrialized and developed area in which few remnants of the historic landscape survive)	If any significant archaeological sites associated with the Captain John Smith Chesapeake National Historic Trail and Washington-Rochambeau Revolutionary Route National Historic Trail are eventually identified within the LOD, they likely would meet the regulatory exception to the requirements of Section 4(f) approval: the sites likely would be important chiefly for the information they contain, which can be retrieved through data recovery, and would have minimal value for preservation in place.
Additional Factors		
Mitigation Complexity and Cost	▪ Wetland, US waters, and subaqueous bottomlands impacts	This segment does contain bridge and roadway structures within water and landside to Federal Navigation Projects along the James River, Elizabeth River, and current operations at the US Army Corps of Engineers Craney Island Disposal Area. Moderate to extensive mitigation costs would be required for wetland and US waters impacts; however, field surveys and additional detailed design may avoid and/or minimize impacts to further reduce potential mitigation costs. *Additional coordination with mitigation banks to ensure sufficient capacity for required purchases will occur as design progresses and more precise impacts can be determined. Impacts to shallow water habitat (are less*

5: I-664 Connector **Resource**	**Resources Identified**	**Comments**
		than 2 meters deep) may require in-kind compensation if policy regulations change.
Permit Stakeholder Coordination	▪ Transportation facilities identified within the LOD. ▪ Maritime Stakeholders	Extensive stakeholder coordination with Military/DOD/USACOE facilities will be required and may pose design and/or construction schedule risk.
Effect on other Federal Navigation Projects	▪ Newport News Channel ▪ Elizabeth River Channel (Norfolk Harbor Reach)	This segment does contain bridge and roadway structures within water and landside to Federal Navigation Projects along the James River, Elizabeth River, and current operations at the US Army Corps of Engineers Craney Island Disposal Area. Need more information on the US Army Corps of Engineers Craney Island Disposal Area anticipated end of operational life. *Project limits are outside of the updated CIDDMA Site Boundary as received by the USACOE.*
Potential Future Changes in Policy Issues		No major regulatory policy changes are anticipated at this time. *Impacts to shallow water habitat (are less than 2 meters deep) may require in-kind compensation if policy regulations change.*

Strikethrough and italicized text reflects revision made in response to stakeholder comments.

Other Factors Evaluated and Considered

<table>
<tr><th>Resource</th><th>4: I-564 Connector</th><th>5: I-664 Connector</th><th>3: VA 164 Connector</th><th>1a: I-664 North of College Dr.</th><th>2: VA 164</th></tr>
<tr><td>Utilities</td><td colspan="5">Existing utilities are identified within the corridors; however, it is assumed that all required utility relocations would be properly coordinated prior to any construction activities. Utility relocations would need to be included in the schedule of construction for each of the segments evaluated.</td></tr>
<tr><td>Water Quality</td><td colspan="4">In compliance with Sections 303(d), 305(b), and 314 of the CWA and the Safe Drinking Water Act, VDEQ has developed a prioritized list of waterbodies that currently do not meet state water quality standards (impaired waters).
▪ James River – Hampton Roads (Aquatic Life & Fish Consumption) (Chlorophyll-a, Dissolved Oxygen; Aquatic Plants (Macrophytes); PCB in Fish Tissue)
▪ Elizabeth River Mainstem (Aquatic Life & Fish Consumption) (Estuarine Bioassessments (Benthics), Dissolved Oxygen)</td><td>No overwater components of the James River or Elizabeth River Mainstem.</td></tr>
<tr><td>Floodplains</td><td colspan="5">Flood Insurance Rate maps (FIRMs) depict the 100-year floodplain within the corridor and involve encroachment within regulatory floodplains. Segment would involve encroachment within regulatory floodplains but will not pose a significant flooding risk. Segment would be designed to be consistent with procedures for the location and hydraulic design of highway encroachments on floodplains contained in 23 CFR 650 Subpart A; therefore, the segment is not expected to increase flood elevations, the probability of flooding, or the potential for property loss and hazard to life.</td></tr>
<tr><td>Sediment Transportation, Bank Erosion, Shoaling and Hydrodynamic Modeling</td><td colspan="5">Not evaluated in detail at this time. Hydrodynamic Modeling evaluations is not included at this level of study.</td></tr>
<tr><td>Dredging and Disposal of Dredged Material</td><td colspan="5">Quantities of required dredge material have not been calculated at this level of evaluation. Not evaluated at this time. It is assumed that all regulatory requirements will be evaluated and adhered to at the appropriate time.</td></tr>
<tr><td>Aquifers/Water Supply (ground water wells, surface water intakes, and springs)</td><td colspan="5">The closest public ground-water well is approximately 4,000 feet south at the I-664 interchange with Route 460; there are no public surface water intakes, public springs, or reservoirs. The closest SSA is on the Eastern Shore of Virginia. Segment is within the Eastern Virginia Groundwater Management Areas (GWMA) which comprises all areas east of I-95. No project-related effect on public water supplies.</td></tr>
<tr><td>Coastal Natural Resource Areas</td><td colspan="5">Virginia’s coastal zone encompasses the 29 counties, 17 cities, and 42 incorporated towns in Tidewater Virginia, as defined in the Code of Virginia 28.2-100 (VDEQ, 2016d). All segments are entirely located within Virginia’s coastal zone. Anticipate the segment would be found to be consistent with the goals and objectives of the Virginia Coastal Resources Management Program. This process is completed during the design and permitting phase of a project with VDEQ as part of the Coastal Resources Management Consistency Certification.</td></tr>
</table>

<table>
<tr><th>Resource</th><th>4: I-564 Connector</th><th>5: I-664 Connector</th><th>3: VA 164 Connector</th><th>1a: I-664 North of College Dr.</th><th>2: VA 164</th></tr>
<tr><td>Aquatic Spawning, Nursery, and Feeding Grounds</td><td colspan="4">▪ James River
▪ Elizabeth River

Temporary increases in turbidity and releases of nutrients and potential contaminants from dredging activities are not expected to substantially impact juvenile or adult fish because of their mobility and because construction would be spread out over time and would occur within discrete areas. Spawning, eggs and larvae, however, would be more vulnerable to these impacts. Time-of-year restrictions would be implemented to avoid or minimize impacts on fish during early life stages. VDGIF typically recommends restrictions on all in-stream work within Anadromous Fish Use Areas and their tributaries between February 15 and June 30, though no time-of-year restrictions are recommended on the James River and its tributaries below the Route 17 Bridge or on the Elizabeth River unless the project spans the width of the River to an extent that it significantly impedes fish passage. Exact restrictions may vary depending on the species, type of work, and location.</td><td>No overwater components of the James River or Elizabeth River Mainstem.</td></tr>
<tr><td>Coastal Primary Sand Dunes</td><td colspan="5">No resources within the LOD</td></tr>
<tr><td>Barrier Islands</td><td colspan="5">No resources within the LOD</td></tr>
<tr><td>Significant Wildlife Habitat Areas</td><td colspan="5">No resources within the LOD</td></tr>
<tr><td>Sand And Gravel Resources</td><td colspan="5">No resources within the LOD</td></tr>
<tr><td>Underwater Historic Sites</td><td colspan="4">▪ 114-5471; Battle of Hampton Roads (no significant archaeological resources)
▪ 122-5426; Battle of Sewells Point
▪ 124-5267; Battle of Craney Island (NRHP-Eligible)(the battlefield is located within the bounds of the present day US Navy Fuel Depot)
▪ USS Cumberland (44NN0073) have been identified and are located roughly one mile northwest of the centerline of the proposed improvements to the west side of the existing MMMBT</td><td>No overwater components of the James River or Elizabeth River Mainstem.</td></tr>
</table>

Resource	4: I-564 Connector	5: I-664 Connector	3: VA 164 Connector	1a: I-664 North of College Dr.	2: VA 164
Underwater Historic Sites, cont'd	The APE is the geographic area within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties. If any significant underwater resources associated with the Battle of Hampton Roads are eventually identified within the HRCS LOD, they likely would meet the regulatory exception to the requirements of Section 4(f) approval: i.e., the sites likely would be important chiefly for the information they contain, which can be retrieved through data recovery, and would have minimal value for preservation in place [23 CFR §774.13(b)(1)].				
Highly Erodible Soils	No resources within the LOD				
Coastal High Hazard Areas, including floodplains	Flood Insurance Rate maps (FIRMs) depict the 100-year floodplain within the corridor and involve encroachment within regulatory floodplains. Segment would involve encroachment within regulatory floodplains but will not pose a significant flooding risk. Segment would be designed to be consistent with procedures for the location and hydraulic design of highway encroachments on floodplains contained in 23 CFR 650 Subpart A; therefore, the segment is not expected to increase flood elevations, the probability of flooding, or the potential for property loss and hazard to life.				
Community Waterfronts	No residential community waterfronts or industrial community's identified.				
Virginia Public Beaches	No resources within the LOD				
Virginia Outdoors Plan	No resources within the LOD				
Wildlife Management Areas	No resources within the LOD				
Waterfront Recreational Land Acquisition	No resources within the LOD				
Waterfront Recreational Facilities	No resources within the LOD				
Waterfront Historic Properties	No resources within the LOD				
Terrestrial Wildlife / Habitat	The majority of the existing land cover within the segment consists of developed lands, natural terrestrial communities, and open water. Expanses of terrestrial habitat are uncommon and fragmented as residential, commercial, industrial, government/military, and open water areas are common, resulting in predominantly low-quality edge habitat.				
Essential Fish Habitat	▪ James River (20 species) ▪ Elizabeth River (20 species) https://www.fisheries.noaa.gov/resource/map/essential-fish-habitat-mapper				No overwater components of the James River or Elizabeth River Mainstem.

Resource	4: I-564 Connector	5: I-664 Connector	3: VA 164 Connector	1a: I-664 North of College Dr.	2: VA 164
Essential Fish Habitat, cont'd	It is assumed that all time of year restrictions and construction special conditions as identified in regulatory permits will be strictly adhered to an will not cause impacts to construction schedule.				
Anadromous Fish	▪ James River (7 species) ▪ Elizabeth River (3 species) ▪ alewife, American shad, Atlantic Sturgeon, striped bass, blueback herring, yellow perch, and hickory shad It is assumed that all time of year restrictions and construction special conditions as identified in regulatory permits will be strictly adhered to an will not cause impacts to construction schedule.				No overwater components of the James River or Elizabeth River Mainstem.
Submerged Aquatic Vegetation	VIMS SAV Mapping (https://mobjack.vims.edu/sav/savwabmap/) – no SAVs identified				
Invasive Species	Construction equipment used in the study area could carry seeds or propagative plant parts from other construction projects or infested areas. Removal of sediment and soil to offsite locations could spread invasive species and placement of fill from borrow sites could introduce invasive species to the study area. Exposed soil also allows invasive species to spread, which could contribute to encroachment of invasive species on vegetation communities. The potential for the establishment of invasive animal or plant species during construction would be minimized by following provisions in VDOT's Road and Bridge Specifications.				
Section 106 Process	Coordination with VDHR for concurrence on project evaluation will be required.				
Farmlands	According to VDACS, there are no active farmlands within the Study Area Corridor.				
Forestal Districts	No land in the Study Area Corridor is currently zoned or used for agriculture.				
Energy	Qualitative comparison of energy consumption associated with the construction and maintenance of the evaluated segments and vehicle operation on the affected roadway network. Accurate construction energy costs cannot be determined given the uncertainty of field variables at this point in the study. An increase in capacity would consume more direct energy by roadway travelers; however, this consumption would be partially offset by reducing congestion over a larger area. Measures to mitigate the energy usage during construction may include limiting the idling of machinery and optimizing construction methods to lower overall fuel use.				
Traffic	Construction activities would result in temporary interruptions to vehicular traffic patterns, including the potential temporary closure of roads. Traffic modelling will be evaluated in Tier 2 of this study evaluation.				

Resource	4: I-564 Connector	5: I-664 Connector	3: VA 164 Connector	1a: I-664 North of College Dr.	2: VA 164
Air Quality	The air quality analyses will be evaluated as part of the travel demand model to evaluate peak hour volumes will then be used to support the air analysis. Temporary air quality impacts from construction would consist primarily of emissions produced during the construction of this project by heavy equipment and vehicle travel to and from the construction areas. Earthmoving and ground-disturbing operations would also generate airborne dust. Construction emissions would be temporary in nature.				
Noise	FHWA Traffic Noise Model evaluations is not included at this level of study. To assess the degree of impact of highway traffic and noise on human activity within the corridor, more detailed information is required. Construction activities would cause intermittent fluctuations in noise levels throughout the construction area. The degree of noise impact would vary, as it is directly related to the types of equipment used and the proximity to the noise-sensitive land uses within the project area. Based on a review of the project area, no considerable, long-term construction-related noise impacts are anticipated.				
Soils & Erosion	Construction would result in soil disturbance, soil exposure and compaction that could cause potential adverse effects on shallow soil permeability, and soil erosion caused by water and wind. An Erosion and Sediment (E&S) Plan will be developed as part of the construction documents. The plan will identify measures to minimize impact to the construction sites and surrounding water bodies as a result of construction-related soil erosion.				
Water Quality	Construction would potentially result in short-term impacts to water quality such as increased sedimentation, increased turbidity from in-stream work, and possible spills or non-point source pollutants entering groundwater or surface water from stormwater runoff. To minimize these impacts, appropriate erosion and sediment control practices would be implemented in accordance with the Virginia Erosion and Sediment Control Regulations.				
Hazardous Materials	Sites containing hazardous or contaminated materials may exist within the Study Area Corridor. These include sites regulated by the Resource Conservation and Recovery Act (RCRA), petroleum release sites and facilities registered with the VDEQ, and sites that participate in the Virginia Voluntary Remediation Program. Prior to the acquisition of right-of-way and construction, a Phase I Environmental Site Assessment (ESA) as well as Phase II ESA (as needed) will be conducted to determine whether any of the sites are actually contaminated, and, if so, the nature and extent of that contamination. Any additional hazardous material sites discovered during construction will be removed and disposed of in compliance with all applicable federal, state, and local regulations. All necessary remediation would be conducted in compliance with applicable federal, state, and local environmental laws and would be coordinated with the EPA, VDEQ, and other federal or state agencies as necessary.				
Visual	Temporary changes to the visual quality throughout the Study Area Corridor would occur during construction. These changes would primarily occur in the form of large construction equipment such as cranes and barges, as well as and materials, storage and yarding areas, construction fences/barriers, traffic control devices, and changes to the landscape associated with land clearing and earth moving operations. These visual changes from construction equipment would occur only during the construction period and would be removed at the completion of construction.				

Resource	4: I-564 Connector	5: I-664 Connector	3: VA 164 Connector	1a: I-664 North of College Dr.	2: VA 164	
Protected Species	**VaFWIS Database Search**					
All segments contain similar potential habitat for the identified protected species. Section 7 consultation will be completed before any irreversible or irretrievable commitments of resources are made expressly for construction activities.						
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	FESE - Confirmed	FESE - Confirmed	FESE - Not confirmed	FESE - Not confirmed	FESE - Not confirmed	FESE - Not confirmed
Woodpecker, red-cockaded (*Picoides borealis*)	FESE - Not confirmed	FESE - Not confirmed	FESE - Not confirmed	FESE - Not confirmed	FESE - Not confirmed	FESE - Not confirmed
Atlantic Sturgeon (*Acipenser oxyrinchus*)	FESE - Confirmed	FESE - Confirmed	FESE - Confirmed	FESE - Confirmed	FESE - Confirmed	FESE - Not confirmed
Leatherback Sea Turtle (*Dermochelys coriacea*)	FESE - Not confirmed	FESE - Not confirmed	FESE - Not confirmed	FESE - Not confirmed	FESE - Not confirmed	n/a
Hawksbill Sea Turtle (*Eretmochelys imbricate*)	FESE - Not confirmed	FESE - Not confirmed	FESE - Not confirmed	FESE - Not confirmed	FESE - Not confirmed	n/a
Loggerhead Sea Turtle (*Caretta caretta*)	FTST - Confirmed	FTST - Confirmed	FTST - Confirmed	FTST - Confirmed	FTST - Confirmed	FTST - Confirmed
Red Knot (*Calidris canutus rufa*)	FTST - Not confirmed	FTST - Not confirmed	FTST - Not confirmed	FTST - Not confirmed	FTST - Not confirmed	FTST - Not confirmed
Rail, eastern black (*Laterallus jamaicensis jamaicensis*)	FTSE - Not confirmed	FTSE - Not confirmed	FTSE - Not confirmed	FTSE - Not confirmed	FTSE - Not confirmed	FTSE - Not confirmed
Northern Long-eared Bat (*Myotis septentrionalis*)	FTST - Not confirmed	FTST - Not confirmed	FTST - Not confirmed	FTST - Not confirmed	FTST - Not confirmed	FTST - Not confirmed
Green Sea Turtle (*Chelonia mydas*)	FTST - Not confirmed	FTST - Not confirmed	FTST - Not confirmed	FTST - Not confirmed	FTST - Not confirmed	n/a
Piping Plover (*Charadrius melodus*)	FTST - Confirmed	FTST - Confirmed	FTST - Confirmed	FTST - Confirmed	FTST - Confirmed	FTST - Potential
Manatee, West Indian (*Trichechus manatus*)	n/a	n/a	FTSE - Not confirmed	FTSE - Not confirmed	FTSE - Not confirmed	FTSE - Not confirmed
Wilson's Plover (*Charadrius wilsonia*)	SE - Potential	SE - Potential	SE - Potential	SE - Potential	SE - Potential	SE - Potential

Resource	4: I-564 Connector	5: I-664 Connector	3: VA 164 Connector	1a: I-664 North of College Dr.	2: VA 164	
Little Brown Bat (*Myotis lucifigus lucifigus*)	SE - Not confirmed	SE - Not confirmed	n/a	SE - Not confirmed	SE - Not confirmed	n/a
Bat, Rafinesque's eastern big-eared (*Corynorhinus rafinesquii macrotis*)	SE - Not confirmed	SE - Not confirmed	SE - Not confirmed	SE - Not confirmed	SE - Not confirmed	SE - Not confirmed
Tri-colored Bat (*Perimyotis subflavus*)	SE - Not confirmed	SE - Not confirmed	SE - Not confirmed	SE - Not confirmed	SE - Not confirmed	SE - Not confirmed
Canebrake Rattlesnake (*Crotalus horridus*)	SE - Potential	SE - Potential	SE - Potential	SE - Potential	SE - Potential	SE - Potential
Peregrine Falcon (*Falco peregrinus*)	ST - Confirmed	ST - Confirmed	ST - Confirmed	ST - Confirmed	ST - Confirmed	ST - Confirmed
Shrike, loggerhead (*Lanius ludovicianus*)	ST - Not confirmed	ST - Not confirmed	ST - Not confirmed	ST - Not confirmed	ST - Not confirmed	ST - Not confirmed
Sparrow, Henslow's (*Centronyx henslowii*)	ST - Not confirmed	ST - Not confirmed	n/a	ST - Not confirmed	ST - Not confirmed	n/a
Gull-billed Tern (*Sterna nilotica*)	ST - Not confirmed	ST - Not confirmed	ST - Not confirmed	ST - Not confirmed	ST - Not confirmed	ST - Not confirmed
Mabee's Salamander (*Ambystoma mabeei*)	ST - Potential	ST - Potential	ST - Potential	ST - Potential	ST - Potential	ST - Potential
Shrike, migrant loggerhead (*Lanius ludovicianus migrans*)	ST - Not confirmed	ST - Not confirmed	ST - Not confirmed	ST - Not confirmed	ST - Not confirmed	ST - Not confirmed
Terrapin, northern diamond-backed (*Malaclemys terrapin terrapin*)	CC - Confirmed	CC - Confirmed	CC - Confirmed	CC - Confirmed	CC - Confirmed	CC - Confirmed
Turtle, spotted (*Clemmys guttata*)	CC - Confirmed	CC - Confirmed	CC - Confirmed	CC - Confirmed	CC - Confirmed	CC – Not Confirmed
Kingsnale, scarlet (*Lampropeltis elapsoides*)	n/a	n/a	CC – Confirmed	CC – Not Confirmed	CC – Not Confirmed	CC – Not Confirmed

Permits Considerations:

- Federal US Army Corps of Engineers - Section 404 of CWA (Waters of the US) – Individual Permit (*The USACE and VDEQ can only permit the LEDPA (Least Environmentally Damaging Practicable Alternative)*
- Federal: US Army Corps of Engineers - Section 408 permit under Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. 408). Work that may alter, occupy, or use a USACE Civil Works project, such as a USACE maintained navigation channel or USACE administered dredged material disposal area, requires authorization in the form of a Section 408 permit from the USACE under Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. 408).
- Federal: US Army Corps of Engineers - Section 10 permit
- Federal: USCG Bridge Permit (when crossing navigable waterways)
- Federal: USFWS Migratory Bird Permit
- State must certify that state water quality standards would not be violated by the Section 401 of CWA (VDEQ) - Virginia Water Protection Permit (VWPP) Program (9 VAC 25-210) – Individual Permit regulates activities in navigable waters, including tidal wetlands
- State: VMRC permit, under the authority of Chapter 12 of Title 28.2 of the Code of Virginia - Subaqueous Bottomlands Permit for subaqueous bottoms or bottomlands, tidal wetlands, and beaches and coastal primary sand dunes
- State: VDEQ Virginia Construction General Permit (CGP) (VAR10) outlines specific measures that development projects must address, including the development of a Stormwater Pollution Prevention Plan (SWPPP).
- State: VDEQ's Ground Water Withdrawal Permitting Program in their Office of Water Supply - proximity of public drinking water sources (ground water wells, surface water intakes, and springs)
- State: VDEQ Air Permits (for construction)
- State: VMRC cannot issue a permit to encroach upon Baylor Grounds unless the Virginia General Assembly removes that portion of the Baylor Grounds from the official survey.

Data sources matrix for resources evaluated within the mandatory segments.

Resource Evaluated	***Data Source***
Military/USACOE	▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Transportation Facilities	▪ Google Maps/Earth
Virginia Port Authority (VPA)	▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Businesses/Business Access	▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Parks & Recreation	▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Section 4(f) Properties	▪ Virginia Department of Historic Resources ▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Section 6(f) Properties	▪ Land and Water Conservation Fund (LWCF) Search ▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Places of Worship	▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Cemetery	▪ Virginia Department of Historic Resources ▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search

Resource Evaluated	*Data Source*
	▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
School/University	▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Apartment Complexes/Residences	▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Children's Health & Safety	▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Environmental Justice	▪ Google Maps/Google Earth ▪ 2010 & 2020 Census Data ▪ ACS B17019 (2019)
Tidal Waters/Tidal Streams/Subaqueous bottom	▪ USFWS National Wetlands Mapper ▪ USGS Topographic Maps ▪ Google Maps/Earth
Non-Tidal Waters	▪ USFWS National Wetlands Mapper ▪ USGS Topographic Maps ▪ Google Maps/Earth
Maintained Navigational Channels and Civil Works Projects	▪ US Army Corps of Engineers
Wetlands	▪ USFWS National Wetlands Mapper ▪ USGS Topographic Maps ▪ USGS Soil Surveys ▪ Google Maps/Earth
Commercial Ports	▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Commercial Fishing Piers	▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search

Resource Evaluated	*Data Source*
	▪ Google Maps/Earth
Colonial Waterbird Nesting	▪ USFWS Species Lists ▪ Virginia Department of Wildlife Resources Fish and Wildlife Information Service Database (VaFWIS)
Benthic Species	▪ Virginia Marine Resources Commission ▪ Virginia Institute of Marine Science ▪ National Oceanic and Atmospheric Administration
Architectural Resources / Historic Districts	▪ Virginia Department of Historic Resources ▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Archaeological Resources	▪ Virginia Department of Historic Resources ▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Utilities	▪ Google Maps/Earth ▪ Limited available as-built and design plan
Water Quality	▪ Virginia Department of Environmental Quality Impaired Waters
Floodplains	▪ Federal Emergency Management Agency ▪ Flood Insurance Rate Maps
Sediment Transportation, Bank Erosion, Shoaling and Hydrodynamic Modeling	Additional modeling efforts will be evaluated in a later stage of the design process.
Dredging and Disposal of Dredged Material	Additional disposal requirements will be evaluated in a later stage of the design process.
Aquifers/Water Supply	▪ USGS Groundwater Data for Virginia ▪ USGS Topographic Maps
Coastal Natural Resource Areas	▪ USGS Topographic Maps ▪ National Wetland Inventory Maps ▪ USFWS Cowardin Classifications ▪ Virginia Department of Conservation & Recreation
Aquatic Spawning, Nursery, and Feeding Grounds	▪ Virginia Fish & Wildlife Information Service Database ▪ Virginia Marine Resources Commission ▪ Virginia Institute of Marine Science
Coastal Primary Sand Dunes	▪ USGS Topographic Maps ▪ National Wetland Inventory Maps

Resource Evaluated	*Data Source*
	▪ USFWS Cowardin Classifications ▪ Virginia Department of Conservation & Recreation
Barrier Islands	▪ USGS Topographic Maps ▪ National Wetland Inventory Maps ▪ USFWS Cowardin Classifications ▪ Virginia Department of Conservation & Recreation ▪ Google Maps
Significant Wildlife Habitat Areas	▪ USGS Topographic Maps ▪ USFWS Cowardin Classifications ▪ Virginia Department of Conservation & Recreation ▪ Google Maps
Sand And Gravel Resources	▪ USGS Topographic Maps ▪ Google Maps
Underwater Historic Sites	▪ Virginia Department of Historic Resources
Highly Erodible Soils	▪ USGS Topographic Maps ▪ USDA Soil Surveys
Coastal High Hazard Areas, including floodplains	▪ Federal Emergency Management Agency ▪ Flood Insurance Rate Maps ▪ Nature Conservancy Coastal Resilience Tool
Community Waterfronts	▪ Federal Emergency Management Agency ▪ Flood Insurance Rate Maps ▪ Nature Conservancy Coastal Resilience Tool ▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Virginia Public Beaches	▪ Virginia Department of Conservation & Recreation ▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Virginia Outdoors Plan	▪ Virginia Department of Conservation & Recreation ▪ Google Maps/Earth
Wildlife Management Areas	▪ USGS Topographic Maps ▪ Virginia Department of Conservation & Recreation ▪ Virginia Fish & Wildlife Information Service ▪ Google Maps
Waterfront Recreational Land Acquisition	▪ Virginia Department of Conservation & Recreation

Resource Evaluated	***Data Source***
	▪ Google Maps/Earth
Waterfront Recreational Facilities	▪ Virginia Department of Conservation & Recreation ▪ Google Maps/Earth
Waterfront Historic Properties	▪ Virginia Department of Historic Resources ▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search ▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Terrestrial Wildlife / Habitat	▪ USGS Topographic Maps ▪ Virginia Department of Conservation & Recreation ▪ Virginia Fish & Wildlife Information Service ▪ Google Maps
Essential Fish Habitat	▪ NOAA Fisheries
Anadromous Fish	▪ NOAA Fisheries ▪ Virginia Fish & Wildlife Information Service
Submerged Aquatic Vegetation	▪ Virginia Institute of Marine Science
Invasive Species	▪ Virginia Department of Conservation & Recreation ▪ Virginia Fish & Wildlife Information Service ▪ Virginia Department of Forestry ▪ Virginia Department of Agriculture and Consumer Services
Farmlands	▪ Virginia Department of Conservation & Recreation ▪ Virginia Department of Agriculture and Consumer Services
Forestal Districts	▪ Virginia Department of Conservation & Recreation ▪ Virginia Fish & Wildlife Information Service ▪ Virginia Department of Forestry ▪ Virginia Department of Agriculture and Consumer Services
Energy	▪ Virginia Department of Energy
Traffic	▪ Traffic data evaluations and modelling were included as part of the Regional Corridor Study
Air Quality	▪ Virginia Department of Environmental Quality ▪ Hampton Roads Transportation Planning Organization
Noise	Additional noise evaluations, modelling, and requirements will be evaluated in a later stage of the design process.
Hazardous Materials	▪ Virginia Department of Environmental Quality ▪ City of Newport News Online Real Estate Search ▪ City of Suffolk Online Real Estate Search

Resource Evaluated	*Data Source*
	▪ City of Chesapeake Online Real Estate Search ▪ City of Norfolk Online Real Estate Search ▪ Google Maps/Earth
Visual	Temporary changes to the visual quality throughout the Study Area Corridor would occur during construction and will be evaluated at a later stage of the design process.
Protected Species	▪ USGS Topographic Maps ▪ US Fish and Wildlife Service ▪ Virginia Department of Conservation & Recreation ▪ Virginia Fish & Wildlife Information Service ▪ Google Maps
Mitigation Complexity and Cost	▪ US Army Corps of Engineers RIBITS
Permit Stakeholder Coordination	▪ Evaluation of Federal, State, and Local regulatory agencies
Effect on other Federal Navigation Projects	▪ US Army Corps of Engineers ▪ Virginia Port Authority
Potential Future Changes in Policy Issues	▪ Evaluation of Federal, State, and Local regulatory agencies policy newsletters, email updates, and policy public notices

Appendix C: Minutes of the 9:00 AM January 29, 2023 Meeting between Navy, USACE, & HRTPO

Meeting Minutes

January 29, 2021

==

Attendees:

- **Navy** – Michael King, Steve Jones, Julie Heup, Michael Lucas, Kevin Henderson, Joseph Howell
- **Corps of Engineers** – George Janek, Keith Lockwood, Jason Flowers, Michael Anderson, Robert Pruhs
- **HRTPO** – Pavithra Parthasarathi
- **Working Group Chairperson** – Bryan Stilley (Newport News)
- **Project Coordinator** - Camelia Ravanbakht
- **Consultant Team** – Craig Eddy, Anthony Donald, Claudette Lajoie

The meeting was held at 9:00 AM January 29 via WebEx. Agenda is attached. Noteworthy comments are outlined below:

- After welcome and introductions, the Consultant team displayed a satellite map of the Craney Island that depicted navigable channel boundaries, required shy distances around Craney Island, the future expansion of the Portsmouth landfill, the future expansion of the Navy Fuel Depot, and geometric alignments of the roadway segments proposed in the Hampton Roads Crossing Study Supplementary Environmental Impact Statement (HRCS SEIS). The team talked about the difficulties of providing a roadway connection from the mandated segments in the Hampton Roads Harbor (I-664 Connector and the I-564 Connector) to VA-164, known as the VA-164 Connector. The consultant team reached the conclusion that providing such a connection given all the constraints in the area is infeasible due to infringements on operation, maintenance, and safety concerns associated with the identified constraints.

- Alternative ways to potentially provide access to the proposed Craney Island Marine Terminal were then discussed. Options included an extension of Cedar Lane and utilization of space adjacent to the existing two-lane paved access road along the southern boundary of the southernmost dredging cell of Craney Island. Another proposed option could be a direct connection to I-664 over Craney Island, but such a connection would only be feasible after the Craney Island mission was complete (currently life cycle projection indicates that will occur in 2050) and no longer operating. An additional connection across the Elizabeth River was also discussed, either as a stand-alone facility or in conjunction with the previously mentioned connection that would in effect replace the I-664 Connector and the I-564 Connector.

- The Corps of Engineers reiterated their concerns that were documented in a letter (June 29, 2016) to VDOT during the HRCS SEIS. In short, the key items included in that letter are:
  - No conclusive decisions can be made on proposed projects until their design is at least 60 percent complete.
  - Proposed projects must not impair civil works or be injurious to the public
  - Obstruction or restriction of navigable access
  - Vertical clearance for vessels
  - Reduction of capacity of containment cells
  - Impacts on maintenance and construction activities on Craney Island
  - No components of constraints have changed since the 2016 letter
  - 2035 Sustainment Study identified the southeast corner of Craney Island is threatened at risk due to sea level rise
  - Concern with an elevated highway structure that would constrain heavy equipment access and maneuverability on Craney Island

- The Corps explained that 2050 is the current buildout horizon year for Craney Island, but that technological advancements have progressively pushed that date out over its years of operation and there is a chance that same dynamic may occur between now and 2050. Currently the maximum height of the cells is 60 feet.

- The Corps stated that there is an abandoned rail line north of the Portsmouth land fill near the southern access road, but that that area was assumed to be ideal for rail access to the proposed Craney Island Marine Terminal. Whether there is enough room to provide rail and road access in that corridor would need to be investigated.

- The Navy provided background information on the Fuel Depot and its expansion. The critical nature of the facility to the Department of Defense was conveyed (facility is now used by Navy, Air Force, and the Army due to the shift of the (closed) Yorktown fuel depot to this location). The current Navy Master Plan indicates that the Fuel Depot has a usable life until the 2050-2080 timeframe.

- The Navy also pointed out that in addition to the physical layout of their facilities, there are explosive arcs to be concerned about in planning any infrastructure in proximity to their facilities. There are no arcs near Craney Island, but there is one at Pier 1 by the Norfolk International Terminal (NIT). At a minimum, an additional 1800 feet from the facility's boundary needs to be provided for safety purposes and to minimize potential terrorist threats (one was actually received a few years ago). In addition, new shooter threat identified from a potential elevated roadway structure based on review of the Las Vegas shootings. This would directly affect any proposed elevated roadway in the vicinity of the Fuel Depot.

- The Corps pointed out that preliminary design details for the Craney Island Marine Terminal show construction at a significant depth so any tunnel from Craney Island to Norfolk under the Elizabeth River would be a difficult and very expensive endeavor.

- When asked, the Corps stated that 90-degree crossings of navigable channels are preferred, but there is not a restriction of the angle of intersection. Any tunnel under a navigable channel would have to provide the required protection for the amount of infrastructure that traverses the channel and be below the construction prism of the federal project.

- The Consultant team agreed to write draft minutes of the meeting and provide attendees the opportunity to comment on those minutes before the minutes are considered finalized.

Appendix D: Travel Demand Model Results

AM Peak Period (6-9AM) Traffic Volumes

ID	Location	2017 Existing	2045 Baseline Land Use Scenario: 2045 No-Build	2045 Bundle A	2045 Bundle B	2045 Bundle C	2045 Bundle D
1	James River Bridge	9,586	12,500	10,676	10,521	10,662	10,339
2	Monitor Merrimack Bridge Tunnel (GP)	16,570	22,243	16,430	16,112	18,323	15,477
102	Monitor Merrimack Bridge Tunnel (Managed Lanes)	-	-	12,296	11,593	10,314	9,999
3	Hampton Roads Bridge Tunnel (GP)	16,373	21,072	19,189	19,050	18,774	18,503
103	Hampton Roads Bridge Tunnel (Managed Lanes)	-	16,987	13,606	13,474	12,628	12,985
4	I-64 west of US 258 (Mercury Blvd) (GP)	25,992	31,439	31,114	30,870	30,812	30,670
104	I-64 west of US 258 (Mercury Blvd) (Managed Lanes)	3,161	6,946	6,623	6,578	6,741	6,515
5	I-564 west of I-64	25,497	20,999	21,050	20,918	21,445	20,916
6	Hampton Blvd over the Lafayette River	9,584	9,894	9,625	9,694	8,350	7,892
7	US 58 MidTown Tunnel	10,824	13,043	12,933	12,923	11,703	11,593
8	I-264 under the Elizabeth River (Downtown Tunnel)	15,901	17,811	17,755	17,706	17,465	17,673
9	I-64 over the Elizabeth River (GP)	19,356	23,726	23,783	23,780	23,477	23,757
109	I-64 over the Elizabeth River (Managed Lanes)	-	6,544	7,147	7,158	6,260	6,289
10	I-264 just east of Bowers Hill	13,377	17,459	17,348	17,504	17,122	17,333
11	I-664 just north of Bowers Hill (GP)	16,248	20,411	21,617	21,176	20,421	21,007
111	I-664 just north of Bowers Hill (Managed Lanes)	-	5,586	6,680	6,523	5,524	5,422
12	I-464 just south of I-264	15,589	18,181	17,938	17,942	18,202	18,254
13	VA 164 just east of I-664 (GP)	9,760	10,046	10,349	11,816	9,492	12,849
14	VA 164 West Norfolk Bridge	11,351	12,675	12,785	13,077	11,808	11,738
15	VA 164 West of Cedar Lane	10,150	11,301	11,372	12,918	10,320	15,745
16	VA 164 Connector (N. of CIMT Access)	-	-	-	-	-	7,565
17	VA 164 Connector (S. of CIMT Access)	-	-	-	-	-	8,046
18	I-564 Connector	-	-	-	-	8,694	7,565
19	I-664 Connector	-	-	-	-	8,694	-
20	I-664 between VA 164 and College Dr (GP)	13,800	13,701	16,524	16,033	15,301	15,226
120	I-664 between VA 164 and College Dr (Managed Lanes)	-	5,669	8,787	8,156	7,831	6,656
21	I-664 between Chestnut Ave and Aberdeen Rd (GP)	19,371	20,206	16,899	16,736	16,177	16,617
121	I-664 between Chestnut Ave and Aberdeen Rd (Managed Lanes)	-	-	7,868	7,571	8,580	6,715
22	US 17 east of I-664	4,422	5,722	5,645	4,964	5,391	5,194
23	I-64 east of VA 168 (GP)	23,999	23,307	21,952	21,824	23,085	22,503
123	I-64 east of VA 168 (Managed Lanes)	8,528	9,686	8,135	8,139	8,678	8,231
	Crossing Total	42,528	72,801	72,197	70,750	70,702	67,303

Notes: Volumes in green are greater than baseline; volumes in red are less than no-build

Bundle
A- I-664 from College Ave to I-64
B- I-664 and VA 164
C- I-664, I-664 Connector, I-564 Connector
D- I-664, VA 164, I-664 Connector, I-564 Connector, VA 164 Connector

AM Peak Period (6-9AM) Truck Traffic Volumes

ID	Location	2017 Existing	2045 Baseline Land Use Scenario: 2045 No-Build	2045 Bundle A	2045 Bundle B	2045 Bundle C	2045 Bundle D
1	James River Bridge	476	486	367	368	390	356
2	Monitor Merrimack Bridge Tunnel (GP)	1,016	1,324	1,588	1,575	1,554	1,589
102	Monitor Merrimack Bridge Tunnel (Managed Lanes)	-	-	-	-	-	-
3	Hampton Roads Bridge Tunnel (GP)	1,111	1,599	1,473	1,481	1,611	1,595
103	Hampton Roads Bridge Tunnel (Managed Lanes)	-	-	-	-	-	-
4	I-64 west of US 258 (Mercury Blvd) (GP)	1,539	2,237	2,258	2,255	2,256	2,289
104	I-64 west of US 258 (Mercury Blvd) (Managed Lanes)	-	9	10	10	79	10
5	I-564 west of I-64	452	527	530	528	568	517
6	Hampton Blvd over the Lafayette River	200	188	170	169	157	148
7	US 58 MidTown Tunnel	155	152	156	157	115	119
8	I-264 under the Elizabeth River (Downtown Tunnel)	490	513	523	524	521	513
9	I-64 over the Elizabeth River (GP)	1,084	1,368	1,401	1,393	1,387	1,433
109	I-64 over the Elizabeth River (Managed Lanes)	-	-	-	-	-	-
10	I-264 just east of Bowers Hill	546	629	625	622	584	597
11	I-664 just north of Bowers Hill (GP)	875	1,131	1,233	1,223	1,189	1,297
111	I-664 just north of Bowers Hill (Managed Lanes)	-	-	-	-	-	-
12	I-464 just south of I-264	376	477	453	452	468	457
13	VA 164 just east of I-664 (GP)	390	559	529	566	565	602
14	VA 164 West Norfolk Bridge	268	301	319	341	327	368
15	VA 164 West of Cedar Lane	401	687	700	751	711	826
16	VA 164 Connector (N. of CIMT Access)	-	-	-	-	-	132
17	VA 164 Connector (S. of CIMT Access)	-	-	-	-	-	312
18	I-564 Connector	-	-	-	-	345	132
19	I-664 Connector	-	-	-	-	345	-
20	I-664 between VA 164 and College Dr (GP)	893	1,085	1,323	1,301	1,174	1,321
120	I-664 between VA 164 and College Dr (Managed Lanes)	-	-	-	-	-	-
21	I-664 between Chestnut Ave and Aberdeen Rd (GP)	921	1,297	1,415	1,402	1,381	1,419
121	I-664 between Chestnut Ave and Aberdeen Rd (Managed Lanes)	-	-	-	-	-	-
22	US 17 east of I-664	71	145	147	132	155	143
23	I-64 east of VA 168 (GP)	915	1,260	1,167	1,175	1,303	1,218
123	I-64 east of VA 168 (Managed Lanes)	-	-	-	-	-	-
	Crossing Total	2,603	3,409	3,428	3,424	3,556	3,540

Notes: Volumes in green are greater than baseline; volumes in red are less than no-build

Bundle
A- I-664 from College Ave to I-64
B- I-664 and VA 164
C- I-664, I-664 Connector, I-564 Connector
D- I-664, VA 164, I-664 Connector, I-564 Connector, VA 164 Connector

AM Peak Period (6-9AM) Truck Traffic Volumes

ID	Location	2017 Existing	2045 Baseline Land Use Scenario					
			2045 No-Build	2045 Bundle A	2045 Bundle B	2045 Bundle C	2045 Bundle D
1	James River Bridge	5%	4%	3%	3%	4%	3%
2	Monitor Merrimack Bridge Tunnel (GP)	6%	6%	10%	10%	8%	10%
102	Monitor Merrimack Bridge Tunnel (Managed Lanes)	0%	0%	0%	0%	0%	0%
3	Hampton Roads Bridge Tunnel (GP)	7%	8%	8%	8%	9%	9%
103	Hampton Roads Bridge Tunnel (Managed Lanes)	0%	0%	0%	0%	0%	0%
4	I-64 west of US 258 (Mercury Blvd) (GP)	6%	7%	7%	7%	7%	7%
104	I-64 west of US 258 (Mercury Blvd) (Managed Lanes)	0%	0%	0%	0%	1%	0%
5	I-564 west of I-64	2%	3%	3%	3%	3%	2%
6	Hampton Blvd over the Lafayette River	2%	2%	2%	2%	2%	2%
7	US 58 MidTown Tunnel	1%	1%	1%	1%	1%	1%
8	I-264 under the Elizabeth River (Downtown Tunnel)	3%	3%	3%	3%	3%	3%
9	I-64 over the Elizabeth River (GP)	6%	6%	6%	6%	6%	6%
109	I-64 over the Elizabeth River (Managed Lanes)	0%	0%	0%	0%	0%	0%
10	I-264 just east of Bowers Hill	4%	4%	4%	4%	3%	3%
11	I-664 just north of Bowers Hill (GP)	5%	6%	6%	6%	6%	6%
111	I-664 just north of Bowers Hill (Managed Lanes)	0%	0%	0%	0%	0%	0%
12	I-464 just south of I-264	2%	3%	3%	3%	3%	3%
13	VA 164 just east of I-664 (GP)	4%	6%	5%	5%	6%	5%
14	VA 164 West Norfolk Bridge	2%	2%	2%	3%	3%	3%
15	VA 164 West of Cedar Lane	4%	6%	6%	6%	7%	5%
16	VA 164 Connector (N. of CIMT Access)	0%	0%	0%	0%	0%	2%
17	VA 164 Connector (S. of CIMT Access)	0%	0%	0%	0%	0%	4%
18	I-564 Connector	0%	0%	0%	0%	4%	2%
19	I-664 Connector	0%	0%	0%	0%	4%	0%
20	I-664 between VA 164 and College Dr (GP)	6%	8%	8%	8%	8%	9%
120	I-664 between VA 164 and College Dr (Managed Lanes)	0%	0%	0%	0%	0%	0%
21	I-664 between Chestnut Ave and Aberdeen Rd (GP)	5%	6%	8%	8%	9%	9%
121	I-664 between Chestnut Ave and Aberdeen Rd (Managed Lanes)	0%	0%	0%	0%	0%	0%
22	US 17 east of I-664	2%	3%	3%	3%	3%	3%
23	I-64 east of VA 168 (GP)	4%	5%	5%	5%	6%	5%
123	I-64 east of VA 168 (Managed Lanes)	0%	0%	0%	0%	0%	0%
	Crossing Total	6%	5%	5%	5%	5%	5%

Notes: Volumes in green are greater than baseline; volumes in red are less than no-build

Bundle

A- I-664 from College Ave to I-64

B- I-664 and VA 164

C- I-664, I-664 Connector, I-564 Connector

D- I-664, VA 164, I-664 Connector, I-564 Connector, VA 164 Connector

AM Peak Period (6-9AM) Congested Speeds

ID	Location	2017 Existing	2045 Baseline Land Use Scenario: 2045 No-Build	2045 Bundle A	2045 Bundle B	2045 Bundle C	2045 Bundle D
1	James River Bridge	40	24	29	30	29	30
2	Monitor Merrimack Bridge Tunnel (GP)	32	13	42	44	30	49
102	Monitor Merrimack Bridge Tunnel (Managed Lanes)	-	-	63	64	65	65
3	Hampton Roads Bridge Tunnel (GP)	18	15	20	20	20	21
103	Hampton Roads Bridge Tunnel (Managed Lanes)	-	23	25	26	30	28
4	I-64 west of US 258 (Mercury Blvd) (GP)	57	49	50	50	50	50
104	I-64 west of US 258 (Mercury Blvd) (Managed Lanes)	62	46	47	47	47	47
5	I-564 west of I-64	39	54	54	54	55	55
6	Hampton Blvd over the Lafayette River	24	30	30	30	32	32
7	US 58 MidTown Tunnel	11	18	18	19	21	21
8	I-264 under the Elizabeth River (Downtown Tunnel)	23	28	29	29	30	30
9	I-64 over the Elizabeth River (GP)	30	23	23	23	23	22
109	I-64 over the Elizabeth River (Managed Lanes)	-	61	61	61	62	62
10	I-264 just east of Bowers Hill	46	43	44	44	45	44
11	I-664 just north of Bowers Hill (GP)	39	60	59	59	60	60
111	I-664 just north of Bowers Hill (Managed Lanes)	-	66	66	66	67	67
12	I-464 just south of I-264	47	41	42	42	41	41
13	VA 164 just east of I-664 (GP)	51	54	53	60	55	56
14	VA 164 West Norfolk Bridge	20	27	27	26	28	31
15	VA 164 West of Cedar Lane	33	44	44	58	47	42
16	VA 164 Connector (N. of CIMT Access)	-	-	-	-	-	64
17	VA 164 Connector (S. of CIMT Access)	-	-	-	-	-	63
18	I-564 Connector	-	-	-	-	57	58
19	I-664 Connector	-	-	-	-	57	-
20	I-664 between VA 164 and College Dr (GP)	64	65	63	63	64	64
120	I-664 between VA 164 and College Dr (Managed Lanes)	-	67	65	65	65	66
21	I-664 between Chestnut Ave and Aberdeen Rd (GP)	54	57	62	62	63	62
121	I-664 between Chestnut Ave and Aberdeen Rd (Managed Lanes)	-	-	66	67	65	67
22	US 17 east of I-664	44	43	43	44	44	44
23	I-64 east of VA 168 (GP)	44	49	51	51	50	51
123	I-64 east of VA 168 (Managed Lanes)	59	63	65	65	64	64
	Crossings	28	18	35	35	32	37
	# of Locations with Increase in Speed (Congestion Relief)			**12**	**16**	**20**	**18**

Notes: Speeds in green are greater than baseline; volumes in red are less than no-build

Bundle
- A- I-664 from College Ave to I-64
- B- I-664 and VA 164
- C- I-664, I-664 Connector, I-564 Connector
- D- I-664, VA 164, I-664 Connector, I-564 Connector, VA 164 Connector

AM Peak Period (6-9AM) Volume/Capacity Ratios

ID	Location	2017 Existing	2045 Baseline Land Use Scenario: 2045 No-Build	2045 Bundle A	2045 Bundle B	2045 Bundle C	2045 Bundle D
1	James River Bridge	0.80	1.06	0.93	0.91	0.92	0.91
2	Monitor Merrimack Bridge Tunnel (GP)	0.99	1.22	0.94	0.92	1.04	0.89
102	Monitor Merrimack Bridge Tunnel (Managed Lanes)	-	-	0.64	0.61	0.54	0.53
3	Hampton Roads Bridge Tunnel (GP)	1.26	1.34	1.21	1.20	1.18	1.16
103	Hampton Roads Bridge Tunnel (Managed Lanes)	-	1.10	0.98	0.97	0.91	0.93
4	I-64 west of US 258 (Mercury Blvd) (GP)	0.71	0.84	0.83	0.82	0.82	0.82
104	I-64 west of US 258 (Mercury Blvd) (Managed Lanes)	0.60	0.80	0.80	0.80	0.80	0.80
5	I-564 west of I-64	0.92	0.69	0.70	0.70	0.65	0.65
6	Hampton Blvd over the Lafayette River	0.82	0.69	0.68	0.68	0.60	0.57
7	US 58 MidTown Tunnel	1.11	0.94	0.94	0.93	0.88	0.88
8	I-264 under the Elizabeth River (Downtown Tunnel)	1.07	1.03	1.03	1.03	1.01	1.01
9	I-64 over the Elizabeth River (GP)	1.02	1.18	1.18	1.18	1.16	1.18
109	I-64 over the Elizabeth River (Managed Lanes)	-	0.52	0.52	0.53	0.50	0.50
10	I-264 just east of Bowers Hill	0.78	0.85	0.85	0.85	0.83	0.84
11	I-664 just north of Bowers Hill (GP)	0.87	0.67	0.71	0.69	0.66	0.69
111	I-664 just north of Bowers Hill (Managed Lanes)	-	0.39	0.41	0.39	0.34	0.35
12	I-464 just south of I-264	0.82	0.92	0.91	0.91	0.91	0.92
13	VA 164 just east of I-664 (GP)	0.75	0.73	0.75	0.59	0.70	0.67
14	VA 164 West Norfolk Bridge	1.06	0.92	0.92	0.95	0.89	0.85
15	VA 164 West of Cedar Lane	0.92	0.85	0.85	0.65	0.80	0.84
16	VA 164 Connector (N. of CIMT Access)	-	-	-	-	-	0.46
17	VA 164 Connector (S. of CIMT Access)	-	-	-	-	-	0.49
18	I-564 Connector	-	-	-	-	0.56	0.48
19	I-664 Connector	-	-	-	-	0.56	-
20	I-664 between VA 164 and College Dr (GP)	0.46	0.45	0.54	0.53	0.50	0.50
120	I-664 between VA 164 and College Dr (Managed Lanes)	-	0.41	0.49	0.48	0.51	0.45
21	I-664 between Chestnut Ave and Aberdeen Rd (GP)	0.74	0.72	0.59	0.59	0.57	0.59
121	I-664 between Chestnut Ave and Aberdeen Rd (Managed Lanes)	-	-	0.44	0.43	0.50	0.39
22	US 17 east of I-664	0.40	0.49	0.48	0.42	0.46	0.44
23	I-64 east of VA 168 (GP)	0.83	0.80	0.76	0.76	0.79	0.77
123	I-64 east of VA 168 (Managed Lanes)	0.82	0.62	0.52	0.52	0.57	0.54
	Crossing Total	1.05	1.20	0.97	0.95	0.96	0.92

Bundle

A- I-664 from College Ave to I-64

B- I-664 and VA 164

C- I-664, I-664 Connector, I-564 Connector

D- I-664, VA 164, I-664 Connector, I-564 Connector, VA 164 Connector

PM Peak Period (3-6PM) Traffic Volumes

ID	Location	2017 Existing	2045 Baseline Land Use Scenario: 2045 No-Build	2045 Bundle A	2045 Bundle B	2045 Bundle C	2045 Bundle D
1	James River Bridge	10,636	14,151	12,742	12,547	12,577	12,173
2	Monitor Merrimack Bridge Tunnel (GP)	18,796	23,363	17,838	17,543	19,917	17,073
102	Monitor Merrimack Bridge Tunnel (Managed Lanes)	-	-	12,482	11,781	10,888	10,349
3	Hampton Roads Bridge Tunnel (GP)	18,586	23,397	21,824	21,610	21,244	20,948
103	Hampton Roads Bridge Tunnel (Managed Lanes)	-	20,365	16,820	16,461	15,675	15,618
4	I-64 west of US 258 (Mercury Blvd) (GP)	29,765	35,514	35,247	35,045	34,901	34,905
104	I-64 west of US 258 (Mercury Blvd) (Managed Lanes)	2,640	9,394	9,117	8,984	9,279	8,795
5	I-564 west of I-64	19,879	18,380	18,065	18,054	19,172	19,000
6	Hampton Blvd over the Lafayette River	11,520	12,382	11,947	11,892	10,524	9,690
7	US 58 MidTown Tunnel	12,226	15,758	15,600	15,630	14,472	14,330
8	I-264 under the Elizabeth River (Downtown Tunnel)	18,302	20,746	20,662	20,750	20,519	20,534
9	I-64 over the Elizabeth River (GP)	23,222	26,165	26,232	26,267	26,174	26,278
109	I-64 over the Elizabeth River (Managed Lanes)	-	8,249	8,693	8,671	8,012	7,976
10	I-264 just east of Bowers Hill	15,849	20,203	20,170	20,300	20,112	20,053
11	I-664 just north of Bowers Hill (GP)	19,534	23,223	24,259	23,934	23,530	24,218
111	I-664 just north of Bowers Hill (Managed Lanes)	-	6,235	7,163	6,884	6,092	6,003
12	I-464 just south of I-264	19,234	20,602	20,441	20,402	20,594	20,724
13	VA 164 just east of I-664 (GP)	12,124	12,579	12,601	14,750	11,815	15,766
14	VA 164 West Norfolk Bridge	14,993	16,933	17,115	17,398	15,730	15,919
15	VA 164 West of Cedar Lane	13,150	13,930	14,015	16,906	13,210	19,702
16	VA 164 Connector (N. of CIMT Access)	-	-	-	-	-	8,783
17	VA 164 Connector (S. of CIMT Access)	-	-	-	-	-	9,265
18	I-564 Connector	-	-	-	-	9,126	8,783
19	I-664 Connector	-	-	-	-	9,126	-
20	I-664 between VA 164 and College Dr (GP)	16,290	14,126	17,599	17,031	16,750	16,343
120	I-664 between VA 164 and College Dr (Managed Lanes)	-	6,793	9,259	9,164	9,448	8,517
21	I-664 between Chestnut Ave and Aberdeen Rd (GP)	23,508	23,942	20,862	20,707	19,970	20,630
121	I-664 between Chestnut Ave and Aberdeen Rd (Managed Lanes)	-	-	8,750	8,417	9,281	7,585
22	US 17 east of I-664	6,175	7,470	7,774	7,156	7,355	7,430
23	I-64 east of VA 168 (GP)	28,700	27,417	26,001	25,970	27,088	26,680
123	I-64 east of VA 168 (Managed Lanes)	8,514	11,201	9,685	9,640	9,945	9,612
	Crossing Total	48,019	81,276	81,705	79,943	80,301	76,161

Notes: Volumes in green are greater than baseline; volumes in red are less than no-build

Bundle

A- I-664 from College Ave to I-64

B- I-664 and VA 164

C- I-664, I-664 Connector, I-564 Connector

D- I-664, VA 164, I-664 Connector, I-564 Connector, VA 164 Connector

PM Peak Period (3-6PM) Truck Traffic Volumes

			2045 Baseline Land Use Scenario					
ID	Location	2017 Existing	2045 No-Build	2045 Bundle A	2045 Bundle B	2045 Bundle C	2045 Bundle D
1	James River Bridge	443	456	358	364	381	362
2	Monitor Merrimack Bridge Tunnel (GP)	1,010	1,337	1,576	1,557	1,524	1,571
102	Monitor Merrimack Bridge Tunnel (Managed Lanes)	-	-	-	-	-	-
3	Hampton Roads Bridge Tunnel (GP)	1,173	1,605	1,469	1,480	1,626	1,602
103	Hampton Roads Bridge Tunnel (Managed Lanes)	-	-	-	-	-	-
4	I-64 west of US 258 (Mercury Blvd) (GP)	1,638	2,210	2,235	2,244	2,239	2,281
104	I-64 west of US 258 (Mercury Blvd) (Managed Lanes)	-	51	57	57	112	58
5	I-564 west of I-64	509	701	687	687	750	696
6	Hampton Blvd over the Lafayette River	205	180	175	174	139	135
7	US 58 MidTown Tunnel	163	172	179	181	117	124
8	I-264 under the Elizabeth River (Downtown Tunnel)	503	503	503	508	489	496
9	I-64 over the Elizabeth River (GP)	1,046	1,338	1,426	1,412	1,375	1,416
109	I-64 over the Elizabeth River (Managed Lanes)	-	-	-	-	-	-
10	I-264 just east of Bowers Hill	558	611	641	598	580	602
11	I-664 just north of Bowers Hill (GP)	834	1,053	1,157	1,165	1,112	1,187
111	I-664 just north of Bowers Hill (Managed Lanes)	-	-	-	-	-	-
12	I-464 just south of I-264	399	460	439	443	448	454
13	VA 164 just east of I-664 (GP)	414	672	636	704	663	721
14	VA 164 West Norfolk Bridge	313	403	432	418	363	449
15	VA 164 West of Cedar Lane	436	757	728	817	716	861
16	VA 164 Connector (N. of CIMT Access)	-	-	-	-	-	152
17	VA 164 Connector (S. of CIMT Access)	-	-	-	-	-	334
18	I-564 Connector	-	-	-	-	363	152
19	I-664 Connector	-	-	-	-	363	-
20	I-664 between VA 164 and College Dr (GP)	889	1,121	1,358	1,362	1,181	1,355
120	I-664 between VA 164 and College Dr (Managed Lanes)	-	-	-	-	-	-
21	I-664 between Chestnut Ave and Aberdeen Rd (GP)	982	1,274	1,434	1,437	1,389	1,477
121	I-664 between Chestnut Ave and Aberdeen Rd (Managed Lanes)	-	-	-	-	-	-
22	US 17 east of I-664	63	104	112	121	107	115
23	I-64 east of VA 168 (GP)	973	1,339	1,220	1,231	1,395	1,277
123	I-64 east of VA 168 (Managed Lanes)	-	-	-	-	-	-
	Crossing Total	2,625	3,398	3,403	3,402	3,531	3,535

Notes: Volumes in green are greater than baseline; volumes in red are less than no-build

Bundle

A- I-664 from College Ave to I-64

B- I-664 and VA 164

C- I-664, I-664 Connector, I-564 Connector

D- I-664, VA 164, I-664 Connector, I-564 Connector, VA 164 Connector

PM Peak Period (3-6PM) Truck Traffic Volumes

ID	Location	2017 Existing	2045 Baseline Land Use Scenario: 2045 No-Build	2045 Bundle A	2045 Bundle B	2045 Bundle C	2045 Bundle D
1	James River Bridge	4%	3%	3%	3%	3%	3%
2	Monitor Merrimack Bridge Tunnel (GP)	5%	6%	9%	9%	8%	9%
102	Monitor Merrimack Bridge Tunnel (Managed Lanes)	0%	0%	0%	0%	0%	0%
3	Hampton Roads Bridge Tunnel (GP)	6%	7%	7%	7%	8%	8%
103	Hampton Roads Bridge Tunnel (Managed Lanes)	0%	0%	0%	0%	0%	0%
4	I-64 west of US 258 (Mercury Blvd) (GP)	6%	6%	6%	6%	6%	7%
104	I-64 west of US 258 (Mercury Blvd) (Managed Lanes)	0%	1%	1%	1%	1%	1%
5	I-564 west of I-64	3%	4%	4%	4%	4%	4%
6	Hampton Blvd over the Lafayette River	2%	1%	1%	1%	1%	1%
7	US 58 MidTown Tunnel	1%	1%	1%	1%	1%	1%
8	I-264 under the Elizabeth River (Downtown Tunnel)	3%	2%	2%	2%	2%	2%
9	I-64 over the Elizabeth River (GP)	5%	5%	5%	5%	5%	5%
109	I-64 over the Elizabeth River (Managed Lanes)	0%	0%	0%	0%	0%	0%
10	I-264 just east of Bowers Hill	4%	3%	3%	3%	3%	3%
11	I-664 just north of Bowers Hill (GP)	4%	5%	5%	5%	5%	5%
111	I-664 just north of Bowers Hill (Managed Lanes)	0%	0%	0%	0%	0%	0%
12	I-464 just south of I-264	2%	2%	2%	2%	2%	2%
13	VA 164 just east of I-664 (GP)	3%	5%	5%	5%	6%	5%
14	VA 164 West Norfolk Bridge	2%	2%	3%	2%	2%	3%
15	VA 164 West of Cedar Lane	3%	5%	5%	5%	5%	4%
16	VA 164 Connector (N. of CIMT Access)	0%	0%	0%	0%	0%	2%
17	VA 164 Connector (S. of CIMT Access)	0%	0%	0%	0%	0%	4%
18	I-564 Connector	0%	0%	0%	0%	4%	2%
19	I-664 Connector	0%	0%	0%	0%	4%	0%
20	I-664 between VA 164 and College Dr (GP)	5%	8%	8%	8%	7%	8%
120	I-664 between VA 164 and College Dr (Managed Lanes)	0%	0%	0%	0%	0%	0%
21	I-664 between Chestnut Ave and Aberdeen Rd (GP)	4%	5%	7%	7%	7%	7%
121	I-664 between Chestnut Ave and Aberdeen Rd (Managed Lanes)	0%	0%	0%	0%	0%	0%
22	US 17 east of I-664	1%	1%	1%	2%	1%	2%
23	I-64 east of VA 168 (GP)	3%	5%	5%	5%	5%	5%
123	I-64 east of VA 168 (Managed Lanes)	0%	0%	0%	0%	0%	0%
	Crossing Total	5%	4%	4%	4%	4%	5%

Notes: Volumes in green are greater than baseline; volumes in red are less than no-build

Bundle
A- I-664 from College Ave to I-64
B- I-664 and VA 164
C- I-664, I-664 Connector, I-564 Connector
D- I-664, VA 164, I-664 Connector, I-564 Connector, VA 164 Connector

PM Peak Period (3-6PM) Congested Speeds

ID	Location	2017 Existing	2045 Baseline Land Use Scenario: 2045 No-Build	2045 Bundle A	2045 Bundle B	2045 Bundle C	2045 Bundle D
1	James River Bridge	44	26	31	32	31	33
2	Monitor Merrimack Bridge Tunnel (GP)	34	14	41	43	29	46
102	Monitor Merrimack Bridge Tunnel (Managed Lanes)	-	-	64	65	65	66
3	Hampton Roads Bridge Tunnel (GP)	23	11	14	14	14	15
103	Hampton Roads Bridge Tunnel (Managed Lanes)	-	25	29	30	35	33
4	I-64 west of US 258 (Mercury Blvd) (GP)	58	48	49	49	49	49
104	I-64 west of US 258 (Mercury Blvd) (Managed Lanes)	64	48	49	50	47	51
5	I-564 west of I-64	43	59	59	59	59	59
6	Hampton Blvd over the Lafayette River	28	29	30	30	31	32
7	US 58 MidTown Tunnel	17	20	20	21	23	24
8	I-264 under the Elizabeth River (Downtown Tunnel)	26	23	23	23	23	23
9	I-64 over the Elizabeth River (GP)	30	16	16	16	16	16
109	I-64 over the Elizabeth River (Managed Lanes)	-	60	60	61	61	62
10	I-264 just east of Bowers Hill	40	38	38	38	39	39
11	I-664 just north of Bowers Hill (GP)	45	60	59	59	60	59
111	I-664 just north of Bowers Hill (Managed Lanes)	-	67	66	66	67	67
12	I-464 just south of I-264	47	41	42	42	41	41
13	VA 164 just east of I-664 (GP)	53	53	53	60	55	59
14	VA 164 West Norfolk Bridge	42	41	41	40	45	44
15	VA 164 West of Cedar Lane	38	43	43	56	47	44
16	VA 164 Connector (N. of CIMT Access)	-	-	-	-	-	64
17	VA 164 Connector (S. of CIMT Access)	-	-	-	-	-	64
18	I-564 Connector	-	-	-	-	58	58
19	I-664 Connector	-	-	-	-	58	-
20	I-664 between VA 164 and College Dr (GP)	64	65	63	63	63	64
120	I-664 between VA 164 and College Dr (Managed Lanes)	-	66	65	65	65	66
21	I-664 between Chestnut Ave and Aberdeen Rd (GP)	54	55	60	60	61	60
121	I-664 between Chestnut Ave and Aberdeen Rd (Managed Lanes)	-	-	67	67	66	67
22	US 17 east of I-664	42	41	40	41	41	39
23	I-64 east of VA 168 (GP)	42	46	48	48	47	48
123	I-64 east of VA 168 (Managed Lanes)	62	61	63	63	61	61
	Crossing Total	32	18	33	34	32	35
	# of Locations with Increase in Speed (Congestion Relief)			**12**	**15**	**14**	**15**

Notes: Speeds in green are greater than baseline; volumes in red are less than no-build

Bundle

A- I-664 from College Ave to I-64

B- I-664 and VA 164

C- I-664, I-664 Connector, I-564 Connector

D- I-664, VA 164, I-664 Connector, I-564 Connector, VA 164 Connector

PM Peak Period (3-6PM) Volume/Capacity Ratios

ID	Location	2017 Existing	2045 Baseline Land Use Scenario: 2045 No-Build	2045 Bundle A	2045 Bundle B	2045 Bundle C	2045 Bundle D
1	James River Bridge	0.78	1.03	0.93	0.92	0.93	0.90
2	Monitor Merrimack Bridge Tunnel (GP)	0.98	1.20	0.94	0.93	1.05	0.91
102	Monitor Merrimack Bridge Tunnel (Managed Lanes)	-	-	0.61	0.57	0.53	0.51
3	Hampton Roads Bridge Tunnel (GP)	1.15	1.33	1.23	1.22	1.20	1.19
103	Hampton Roads Bridge Tunnel (Managed Lanes)	-	1.12	0.98	0.97	0.90	0.92
4	I-64 west of US 258 (Mercury Blvd) (GP)	0.72	0.86	0.85	0.85	0.85	0.85
104	I-64 west of US 258 (Mercury Blvd) (Managed Lanes)	0.47	0.86	0.84	0.83	0.86	0.81
5	I-564 west of I-64	0.69	0.47	0.46	0.46	0.46	0.46
6	Hampton Blvd over the Lafayette River	0.73	0.76	0.73	0.73	0.64	0.59
7	US 58 MidTown Tunnel	0.94	0.95	0.95	0.95	0.89	0.87
8	I-264 under the Elizabeth River (Downtown Tunnel)	1.06	1.11	1.10	1.11	1.09	1.09
9	I-64 over the Elizabeth River (GP)	1.05	1.17	1.17	1.17	1.17	1.17
109	I-64 over the Elizabeth River (Managed Lanes)	-	0.53	0.54	0.53	0.50	0.49
10	I-264 just east of Bowers Hill	0.83	0.91	0.91	0.91	0.90	0.90
11	I-664 just north of Bowers Hill (GP)	0.88	0.69	0.72	0.71	0.70	0.72
111	I-664 just north of Bowers Hill (Managed Lanes)	-	0.38	0.42	0.41	0.34	0.36
12	I-464 just south of I-264	0.88	0.94	0.94	0.93	0.94	0.95
13	VA 164 just east of I-664 (GP)	0.77	0.80	0.80	0.62	0.76	0.67
14	VA 164 West Norfolk Bridge	0.79	0.84	0.85	0.87	0.78	0.79
15	VA 164 West of Cedar Lane	0.90	0.90	0.90	0.73	0.86	0.86
16	VA 164 Connector (N. of CIMT Access)	-	-	-	-	-	0.46
17	VA 164 Connector (S. of CIMT Access)	-	-	-	-	-	0.49
18	I-564 Connector	-	-	-	-	0.52	0.48
19	I-664 Connector	-	-	-	-	0.52	-
20	I-664 between VA 164 and College Dr (GP)	0.49	0.44	0.54	0.52	0.52	0.51
120	I-664 between VA 164 and College Dr (Managed Lanes)	-	0.43	0.48	0.48	0.47	0.47
21	I-664 between Chestnut Ave and Aberdeen Rd (GP)	0.77	0.77	0.67	0.66	0.64	0.66
121	I-664 between Chestnut Ave and Aberdeen Rd (Managed Lanes)	-	-	0.43	0.42	0.48	0.38
22	US 17 east of I-664	0.54	0.61	0.64	0.60	0.60	0.65
23	I-64 east of VA 168 (GP)	0.89	0.86	0.82	0.82	0.85	0.84
123	I-64 east of VA 168 (Managed Lanes)	0.76	0.68	0.60	0.59	0.62	0.61
	Crossing Total	1.00	1.19	0.97	0.96	0.97	0.93

Bundle

A- I-664 from College Ave to I-64

B- I-664 and VA 164

C- I-664, I-664 Connector, I-564 Connector

D- I-664, VA 164, I-664 Connector, I-564 Connector, VA 164 Connector

Appendix E: Detailed Economic Results

DRAFT
5/31/2023

2023

HRTPO Regional Connectors Study, Phase III Economic Analysis APPENDIX

Table of Contents

Appendix: Detailed Economic Results

Baseline Scenario

This section includes the detailed results from the TREDIS ("Transportation Development Transportation Economic Development Impact System") economic modeling runs of Bundles A, B, C, and D compared to the 2045 RCS Baseline, in the Baseline Scenario.

Table 1. Regional Societal Benefits and Economic Impacts in 2045 (Annual, $M, Incremental effects relative to RCS Baseline, Baseline Scenario)

	Bundle A	Bundle B	Bundle C	Bundle D
***REGIONAL** Societal Benefit*				
Total Societal Benefits	*$359.3*	*$413.0*	*$470.4*	*$483.5*
Emissions	$0.9	$1.4	$0.6	$0.0
Safety	$2.0	$2.1	$4.3	$1.5
Freight Time & Reliability (Shipper/Logistics)	$2.2	$3.7	$3.7	$4.1
Person-Based Time & Reliability (Personal and Business)	$349.2	$398.8	$456.0	$476.4
Vehicle Operating Costs	$5.1	$7.1	$5.8	$1.7
***REGIONAL** Economic Impact*				
Total Value Added (GRP)	*$76.2*	*$87.2*	*$88.6*	*$96.8*

Table 2. Cross-Harbor Societal Benefits in 2045 (Annual, $M, Incremental effects relative to RCS Baseline, Baseline Scenario)

	Bundle A	Bundle B	Bundle C	Bundle D
CROSS-HARBOR Societal Benefits	$574.1	$599.8	$712.6	$675.3
Emissions	$3.4	$3.7	$9.0	$4.6
Safety	$15.7	$17.5	$26.6	$17.9
Freight Time & Reliability (Shipper/Logistics)	$8.0	$8.3	$10.0	$9.2
Person-Based Time & Reliability (Personal and Business)	$521.7	$543.1	$612.6	$612.0
Vehicle Operating Costs	$25.3	$27.3	$54.4	$31.5

Note that cross-harbor benefits are actually greater in absolute magnitude than the regional results shown above. This is because the regional benefit totals include some minor disbenefits for non-cross-harbor-trips that detract from the regional totals but are marginal for individual travelers.

Scenario Resilience Testing

This section presents the detailed results from the TREDIS economic modeling runs of Bundles B, C, and D compared to the 2045 RCS Baseline across the Baseline and three greater growth scenarios – Water, Urban, and Suburban.

Table 3. Regional Societal Benefits in 2045 (Annual, $M, benefits of each bundle are relative to RCS Baseline)

Total Benefits by Scenario	Bundle B	Bundle C	Bundle D
Baseline	$413.0	$470.4	$483.5
Water	$516.8	$775.7	$844.9
Urban	$431.7	$464.4	$494.6
Suburban	$627.2	$735.6	$671.3

Table 4. Regional Economic Impact in 2045 (Annual, $M, impact of each bundle is relative to RCS Baseline)

Total Value Added (GRP) by Scenario	Bundle B	Bundle C	Bundle D
Baseline	$87.2	$88.6	$96.8
Water	$106.7	$145.2	$161.7
Urban	$87.8	$89.5	$103.1
Suburban	$137.8	$151.8	$149.5

Table 5. Cross-Harbor Societal Benefits in 2045 (Annual, $M, benefits of each bundle are relative to RCS Baseline)

Total Benefits by Scenario	Bundle B	Bundle C	Bundle D
Baseline	$599.8	$712.6	$675.3
Water	$716.1	$822.6	$702.1
Urban	$590.9	$776.5	$668.9
Suburban	$673.3	$780.7	$658.9

Note that cross-harbor benefits are actually greater in absolute magnitude than the regional results shown above. This is because the regional benefit totals include some minor disbenefits for non-cross-harbor-trips that detract from the regional totals but are marginal for individual travelers.

Appendix: Economic Modeling Methodology

The TREDIS Model

The economic modeling in the RCS is conducted using TREDIS.[1] TREDIS is a decision support system for transportation planners that spans benefit-costs analysis, economic impact analysis, and freight and trade impact analysis. It is used to evaluate economic outcomes of proposed projects, programs and policies. TREDIS is multimodal and each TREDIS license is calibrated to a specific local, regional, or state economy – in this case the economy of the Hampton Roads region.

TREDIS consists of several model elements including:

- A *travel cost module* that translates changes in traffic volumes, vehicle occupancy, speed, distance, reliability, and safety into travel efficiency changes and direct cost savings for household and business travel.
- A *benefit-cost module* that calculates benefits and costs over time. Valuation follows international best practice, including the benefit-cost guidance of USDOT modal agencies. This module can be used to conduct full benefit-cost analysis in which net benefits and costs are compared to assess the efficiency of a project or program. It can also be used, as in this project, to quantify and report the societal benefits associated with different transportation projects.
- An *economic adjustment module* that incorporates a dynamic, multi-regional economic-demographic model to estimate economic impacts over time from changes in transportation system performance. The model accounts for changes in productivity, capital investment, labor supply and demand, employment and wage shifts, and population migration. Changes in supply, demand, and prices redirect spending patterns to different industries and affect their relative profitability and competitiveness. In this way various transportation changes can affect the magnitude of economic growth.

Running the TREDIS Model

Economic Performance Measures in the RCS

The RCS uses TREDIS to translate travel data from the TDM into the performance measures listed below.

The first set of performance measures include Total Societal Benefits, which can include reductions in:

- **Environmental Costs of Emissions***:* This category is based on the change in emissions and reflect the value for each type of pollutant which includes Carbon Dioxide (CO_2), Nitrogen Oxide (NOx), Sulfur Dioxide (Sox), Volatile Organize Compounds (VOC), and Particulate Matter (PM). Changes in emissions are driven by changes in vehicle miles traveled (VMT) by mode, vehicle fuel

[1] TREDIS (Transportation Economic Development Impact System) has been used in 43 US states and Canadian provinces. Users include a wide set of state DOTs and MPOs, as well as local transportation agencies, universities and leading consulting firms. For more information: https://tredis.com/products/product-overview/inside-tredis

efficiency (including the introduction of electric autonomous vehicles), and changes in the proportion of vehicular travel occurring in congested conditions.

- **Safety Costs***:* Crashes result in fatalities, personal injuries, and property damage, with each type of crash having an associated value. The number of crashes reflect overall travel exposure (as measured by VMT), mode share (because some modes like public transportation are safer on a per mile basis compared to passenger car travel), and degree of CAV adoption (with increased adoption reducing overall crash rates).
- **Vehicle Operating Costs**: These include costs associated with tires, maintenance, depreciation, and fuel and are estimated on a per mile basis (reflecting changes in VMT). For mileage driven in congestion, additional fuel consumption costs reflect stop-and-go conditions. Electric autonomous vehicles incur lower per mile operating costs than conventional passenger vehicles.
- **Person-Based Travel Time and Reliability (Personal and Business):** Travel time costs include the value of time for drivers, passengers, and crew. Reliability costs capture additional time costs associated with the "buffer time" that travelers add on top of average travel time to ensure an on-time arrival 95% of the time.
- **Freight Time and Reliability (Shipper/Logistics) Costs:** As with passengers and crew, freight travel time has an opportunity cost, which is related to handling or storage costs, lost sales or late delivery penalties, and production costs associated with holding extra inventory or raw materials. These costs accrue to shippers and receivers of freight.

These performance measures are reported both at a regional level and for the subset of cross-harbor travel.

In addition, **impacts on the economy** of each bundle relative to the RCS Baseline are evaluated and expressed in terms of **value added**. Also known as Gross Regional Product (GRP), value added represents the total value of production minus the cost of intermediate goods and services. Value added is used to measure the scale of the economic response of regional businesses to changes in transportation system performance.

Economic Analysis Inputs from the Travel Demand Model

The economic analysis uses Travel Demand Model (TDM) outputs for each scenario-bundle combination as inputs to generate the economic performance measures. Model outputs from the TDM include a series of aggregate vehicle-based measures, provided either for the entire region, or specifically for cross-harbor trips. The three key measures are:

- Vehicle trips
- Vehicle miles traveled (VMT)
- Vehicle hours of travel (VHT)

For transit modes (i.e., bus and light rail), TDM outputs also include passenger trips and passenger miles. For all other modes, the TDM outputs include vehicle occupancy, which is used to translate vehicle trip data to passenger trip data. For non-transit modes, the TDM output contains the fraction of VMT under congested conditions (V/C>0.9). Finally, the TDM outputs include various measures of tolls or fares charged. Together these measures enable the calculation of costs incurred during travel.

All the outputs described above were provided from the TDM by mode, time period, and trip purpose. The modes considered in this analysis include:

- Passenger car
- Low-income passenger car
- Private connected and autonomous vehicles (CAVs)
- Private autonomous zero-passenger vehicles (ZPVs)
- Conventional ridehailing/transportation network company (TNC)
- Autonomous TNC
- Zero-passenger conventional TNC
- Zero-passenger autonomous TNC
- Passenger bus
- Light rail
- Tractor trailer truck

TREDIS includes mode specific parameters to account for factors such as vehicle operating costs and crash rates that vary by mode. TDM outputs are organized into two time periods: the morning/afternoon peak and the off-peak. This allows TREDIS to appropriately account for the effects of congestion.

Finally, TDM outputs were organized into four trip purposes: business, personal, commute, and freight. Trip purposes vary in their effects on regional economic activity. “On-the-clock” business and freight trips directly affect costs incurred by businesses, whereas personal trips are societally beneficial but do not directly affect the economy. Improvements to commute trips result in both societal benefits for the traveler and in benefits for businesses that affect economic activity. Improvements for commuters can translate into reductions in the wage premiums that employers have to pay their workers to overcome overly long or burdensome commutes.[2]

Data Validation

To confirm the reasonableness and consistency of the TDM outputs, the economic team performed a series of validation checks before proceeding with the economic analysis. For each set of TDM outputs, the team calculated average trip distance (i.e., total vehicle miles divided by total vehicle trips), average trip speed (i.e., total trip vehicle miles by total travel time), average trip time (i.e., total vehicle hours divided by total vehicle trips), and percent of VMT in congestion. Additional details on changes in these and other key drivers of economic results are described below in the section “Drivers of Economic Results.”

Data Transformations to Match TREDIS Format

The data required several transformations in order to match the input format needed to complete TREDIS analysis. First, the TDM outputs were presented as a daily measure of weekday vehicle travel. Because TREDIS analyzes annual travel data, these daily measures were annualized by multiplying all trip measures by a factor of 330. This factor assumes 260 weekdays and 105 weekend days per year, with weekend vehicle travel at 2/3 the level of weekday travel.

Second, the economics team subtracted low-income passenger car trips from all passenger car trips to calculate non-low-income passenger car trips. This was necessary because the passenger car trip

---

[2] Empirical studies indicate that the effect of higher commuting cost on employer-paid wage premiums typically averages around 50% of the wage rate for one hour of direct wage. For more information, see: https://tredis.com/pdf/User_Docs/TREDIS-5_Dynamic_Economic_Model_TechDoc.pdf

measures in the TDM outputs include travelers at all income levels and TREDIS requires that no mode-purpose combination be overlapping with another.

Third, ZPV trips (and their associated miles and hours of travel) were reallocated to their associated mode and vehicle occupancy was recalculated to account for "deadhead" vehicle miles without any passengers present. This was necessary because while the TDM tracks ZPV trips separately, TREDIS models them along with the occupied CAV or TNC trips that they support. To achieve this, the economic team proportionally reallocated by period and mode: private ZPV trips to private CAV trips, conventional ZPV TNC trips to conventional TNC trips, and CAV ZPV TNC trips to CAV TNC trips.

Additional TREDIS Inputs (Not from TDM)

Next, the transformed TDM outputs were paired with additional analytical inputs that TREDIS needs to calculate economic impacts and user benefits.

While TREDIS provides default crash rates by mode and crash severity, these crash rates needed to be adjusted to account for the influence of CAV penetration on safety outcomes in each scenario. Table 19 presents these adjusted crash rates and the Part II documentation provides greater detail on the development of these rates. Note that crash rates are the same in the Baseline and Greater Growth on the Water scenarios as these have the same assumptions regarding CAV adoption. The Greater Growth in Urban Centers scenario shows some improvements in safety and the Greater Suburban/Greenfield Growth scenario shows the greatest reductions in crash rates stemming from higher levels of CAV use.

Table 6. *Adjusted crash rates by scenario, mode, and severity (crash rates are per 100 million VMT)*

Mode	Severity	Baseline	Water	Urban	Suburban
Passenger Vehicle	Fatal	0.66	0.66	0.61	0.39
	Injury	79.51	79.51	72.17	43.71
	Overall	129.79	129.79	116.48	68.21
Passenger Bus	Fatal	0.36	0.36	0.34	0.27
	Injury	38.50	38.50	36.50	28.51
	Overall	56.25	56.25	53.03	40.17
Tractor Trailer Truck	Fatal	0.67	0.67	0.59	0.41
	Injury	12.24	12.24	10.64	6.89
	Overall	20.36	20.36	17.34	11.14

Next, TREDIS requires a per-vehicle mile fare estimate for TNC rides. While other fares and tolls are reported directly from the TDM, this fare is not. Based on an analysis of current Virginia rate structure from Lyft and Uber and individual ride cost estimates in Norfolk and Virginia Beach, the economic analysis assumed an average fare of $1 per vehicle mile. This estimate incorporates the initial cost and service fee of TNC rides, the price per mile, and the price per minute, as well as average travel time and trip length estimates for taxi/TNC trips in the 2017 National Household Travel Survey. Significant uncertainty exists regarding the future structure of the TNC industry in 2045. Nevertheless, this cost assumption is necessary to drive the response of the local transportation industry in the TREDIS model.

Finally, the economic team assigned a default TREDIS value for freight tons per tractor trailer truck (17.5 tons), as well as default fuel efficiencies and fuel cost by mode. All CAVs were assumed to be electric vehicles, while all trucks were assumed to be diesel powered, and all conventional passenger cars gasoline. Passenger car gasoline use per mile was assumed to be 0.0436 (about 22.9 miles per gallon), while truck diesel use per mile was assumed to be 0.1603 (about 6.2 miles per gallon). Electricity costs were set to 0.0946 cents per mile. Additional detail on default fixed factors is available in TREDIS software user documentation.

Adjusting Data to Focus on Existing Trips

The final step before executing TREDIS analysis runs was to adjust the TDM outputs to keep trips constant by mode and purpose between bundle and RCS baseline conditions. In the case of the regional analysis, this was necessary to control for the small amounts of model noise that would result in passenger trips not balancing perfectly between the no build (RCS baseline) and build (each bundle) conditions. In the case of the cross-harbor trips, this adjustment is needed because the bundles themselves can result in increases to the number of trips traveling across the harbor. In that case, any analysis comparing unadjusted vehicle trip characteristics in a bundle to the RCS baseline would be dominated by the increased costs of moving more people and more goods across the harbor. By holding the number of trips constant, we are able to achieve the desired focus on the changes in travel efficiency of the cross-harbor trips. While there is undoubtedly some benefit associated with the additional cross-harbor trips, we do not have sufficient information to appropriately characterize these benefits and therefore focus instead on benefits for existing cross-harbor trips.

To address this problem, the economic team held passenger and truck trips constant between the RCS baseline and each bundle (within a given scenario). This required calculating the ratio of trips in each bundle to trips in the RCS baseline. Passenger and truck vehicle trips, VMT, and VHT were then scaled down by these ratios for each combination of mode, period, and trip purpose, while preserving the underlying travel changes in average trip time, speed, distance, and congestion.

Economic Model Runs

After the completion of all the adjustments to the TDM outputs described above, the travel data was entered into TREDIS to support a series of TREDIS economic modeling runs. After each run, results from TREDIS's economic impact and benefit-cost modules were exported for inclusion as performance measures. The team completed thirteen regional TREDIS analysis runs and thirteen cross-harbor TREDIS analysis runs (Table 7). The effects of Bundles B, C, and D relative to the RCS Baseline were analyzed across all four scenarios (Baseline, Water, Urban, and Suburban). The effect of Bundle A relative to the RCS Baseline was only analyzed in the Baseline scenario.

Table 7: Matrix of TREDIS Comparative Analyses (13 total for regional and cross-harbor analysis)

TREDIS Analysis	Baseline	Water	Urban	Suburban
Bundle A, relative to RCS Baseline	X	Not analyzed	Not analyzed	Not analyzed
Bundle B, relative to RCS Baseline	X	X	X	X
Bundle C, relative to RCS Baseline	X	X	X	X
Bundle D, relative to RCS Baseline	X	X	X	X

Appendix F: Future Conditions Operational Capacity Analysis Technical Memorandum

Introduction

The Highway Capacity Software 2023 (HCS) Freeway Facilities module was used to analyze the 2045 No-Build, 2045 Baseline Build, and 2045 Greater Growth AM and PM peak hour operations along the study area roadways. Traffic volumes from the *Regional Connector Study Corridor Conditions Report (report dated 2019, data in the report is from August 2017 to July 2018)* were grown to 2045 volumes and used for the analyses. The study area roadways were divided into the following sections for the analyses:

I-64 Eastbound/Westbound

- Segment 1 – Mercury Boulevard Interchange to the Hampton Roads Bridge Tunnel
- Segment 2 – Hampton Roads Bridge Tunnel to the I-564/I-64 Interchange

I-664 Northbound/Southbound

- Segment 1 – I-64/I-664 Interchange near Hampton Coliseum to the Monitor Merrimac Memorial Bridge Tunnel
- Segment 2 - Monitor Merrimac Memorial Bridge Tunnel to the I-264/I-664 Interchange

State Route 164 Eastbound/Westbound

- Segment 1 – I-664/SR 164/US 17 Interchange to the Cedar Lane/SR 164 Interchange
- Segment 2 – Cedar Lane/SR 164 Interchange to the US 58/SR 164 Interchange

I-564 Eastbound/Westbound

- Admiral Taussig Boulevard to the I-564/I-64 Interchange
- Note that existing conditions data were collected for operations year 2017, at which time construction for the Intermodal Connector project was not yet complete. Lanes were open to traffic on the Intermodal Connector in phases, with access to NIT opening in December 2017 and access to Naval Station Norfolk opening in January 2021. Volumes for this interchange were derived from the travel demand models and validated using the same location-based services data source, StreetLight Analytics, for operations year 2021.

Each section was further divided into discrete segments (Basic, Merge, Diverge, Weave, or Overlap) and analyzed as a Freeway Facility in HCS. All facilities were segmented and analyzed in accordance with the VDOT Traffic Operational and Safety Analysis Manual (TOSAM, February 2020).

Development of HCS Models

The 2045 HCS models were developed from the existing conditions models described in the *Regional Connector Study Corridor Conditions Report*, with modified segmentations to reflect future conditions. The existing conditions models were calibrated to match existing operations by comparing observed typical travel times with the outputs of HCS. In instances where traffic conditions were either controlled by a tunnel or the beginning of analysis period is oversaturated, the following parameters were modified.

<u>Capacity Adjustment Factors</u>

- Definition: Factors that can adjust the capacity downwards to represent field measurements
- Condition applied in existing conditions models: Capacity Adjustment Factors were applied at the Hampton Roads Bridge Tunnel (HRBT) and Monitor Merrimac Memorial Bridge Tunnel (MMMBT)
- Condition applied in 2045 models: The same factors were retained from the existing conditions model. The new tunnels that will be constructed as part of the HRBT expansion and Bundle B were assumed to have similar constraints.

<u>Seeding Intervals</u>

- Definition: Additional periods added prior to the analysis period to populate the model to better represent conditions during the analysis period; seeding intervals are necessary when oversaturated conditions are observed or reported by the model
- Condition applied in existing conditions models: Seeding intervals were added to the I-64 Eastbound AM and PM models, I-64 Westbound PM model, and I-664 Southbound PM model. This process is described in the *Regional Connector Study Corridor Conditions Report.*
- Condition applied in 2045 models: It is expected that the additional capacity added to the networks due to the HRBT Expansion Project will continue to exceed demand growth by 2045, and the results of all 2045 models indicate no oversaturated segments. As such, no queueing is expected throughout these corridors, and thus no seeding intervals were applied in the future conditions models.

<u>Unmet Demand</u>

- Definition: The number of vehicles that are destined to travel through a network at a specific time but cannot do so due to capacity constraints
- Condition applied in existing conditions models: Unmet demand was added to the I-64 Eastbound AM and PM models, I-64 Westbound PM model, and I-664 Southbound PM model. This process is described in the *Regional Connector Study Corridor Conditions Report.*
- Condition Applied in 2045 models: Since queueing is not expected to occur under future conditions, no unmet demand is expected under typical AM and PM peak period conditions.

Future Year Volume Development

Future year 2045 volumes were developed by comparing the change in modeled demands between the various regional travel demand models developed for the Regional Connectors Study. Linear growth rates were calculated between the assignments in the No-Build 2045 baseline model and the 2017 existing conditions model. Overall growth rates were determined for each facility in the study area and these growth rates were applied to the first segment and ramp volumes of each existing conditions HCS model. Because the demand on interchange ramps can differ from one another by orders of magnitude, a fixed growth rate at all ramps may cause the developed mainline volumes to fall outside of the target growth rate, so ramp volumes were adjusted to maintain overall mainline balance using the link-by-link growth rates between the travel demand models. For conservatively growing from the existing volumes to the No-Build volumes, a minimum 0.5% annual growth rate was assumed for all models.

A similar process was repeated to develop the baseline Build condition volumes, comparing the No-Build and Build travel demand model outputs and applying link-by-link percent change to the No-Build HCS model volumes developed previously. Again, ramp volumes were adjusted to maintain overall percent change on the mainline of each model. Volumes were developed for the Greater Growth scenarios using the same process, comparing each Greater Growth scenario travel demand model with the Build conditions travel demand model.

Managed Lanes

The managed lanes in the No-Build and Build models are assumed to operate under dynamic tolling, in which toll prices increase based on managed lane usage in order to ensure constant speeds within 10 miles per hour of the posted speed. These speeds are assumed to be maintained at level of service (LOS) D or better. Where modeled demand on managed lanes exceeded that threshold, which varied based on posted speed and adjusted capacity, excess assigned vehicles were reassigned to the general purpose (GP) lanes. This occurred in only one model scenario: volume developed, as described above, for the I-64 Westbound managed lanes through the Hampton Roads Bridge Tunnel in the No-Build PM Peak model exceeded LOS D threshold volume, which was conservatively estimated at 2848 vehicles. Fifty excess vehicles were added to the GP lane volume.

Because the managed lanes are assumed to continuously operate at LOS D or better, and because the developed 2045 volumes were below the LOS D volume threshold for all models, only the GP lanes and any connections between GP and managed lanes (i.e., the merges to and diverges from the managed lanes) were analyzed for this study.

The locations and configurations of ramps and barrier openings connecting the GP lanes and the I-64 and I-664 managed lanes, included in the HRBT Expansion and I-664 Express lanes projects, respectively, were identified using the Hampton Roads Express Lanes simulations[1,2] and the Bowers Hill Interchange Improvements Study online mapping tool[3].

Bowers Hill Interchange Improvements

A sensitivity analysis was conducted in March 2023 to determine whether the Bowers Hill Interchange Improvement Project would impact traffic volumes between the Baseline and Bundle B scenarios so significantly that modifications to the previously approved Hampton Roads Transportation Planning Organization's (HRTPO) regional travel demand model would be required. Concept drawings of the Bowers Hill Interchange Improvement Project were not available when the 2045 Baseline scenario and 2045 Bundle B scenario were initially developed but have since been made available to the public. The Bowers Hill Interchange Improvement Project includes both new managed lanes and ramp modifications for several interchanges, most significantly at the US 13/US 58/US 460 interchange, along I-664 south of the MMMBT.

The only junction between the managed lanes and I-664 is just north of College Drive; the southern termini of the managed lanes are south of the study area on I-64, and direct ramps are proposed between the managed lanes and arterials at both the Portsmouth Boulevard and College Drive interchanges. The managed lanes were included in the 2045 travel demand models.

Most of the ramp modifications consist of changing loop ramp radii or otherwise shifting ramp locations in order to accommodate the new managed lanes; only the interchange modifications at the I-664/US 13/US 58/US 460 interchange are substantial enough to change the HCS2023 or travel demand models. The sensitivity analysis indicated that the impacts of the interchange reconfigurations on travel patterns and traffic volumes were not significant enough to modify the travel demand models. As a result, the interchange modification improvements were not included in the 2045 travel demand models and the operations analysis in this study. A technical memorandum detailing the sensitivity analysis can be found in **Appendix A**.

---

[1] "Hampton Roads Express Lanes simulation, I-664 to the Hampton Roads Bridge-Tunnel, eastbound, a.m." YouTube, uploaded by Virginia Department of Transportation, 20 May 2022, https://www.youtube.com/watch?v=QqLjVClu5ME.

[2] "Hampton Roads Express Lanes simulation, I-564 to the Hampton Roads Bridge-Tunnel, westbound, p.m." YouTube, uploaded by Virginia Department of Transportation, 20 May 2022, https://www.youtube.com/watch?v=QEPeeBC0c0c.

[3] Virginia Department of Transportation. "Bowers Hill Interchange Improvements Study" [Web Map]. Information date not provided. https://rkk.maps.arcgis.com/apps/webappviewer/index.html?id=e042a03eb7b64af7bd6499bccce87fab – (27 February 2023).

No-Build Capacity Analysis Results

The results of the HCS Freeway Facilities Capacity Analyses are presented in tabular and graphical form following this discussion. Maps displaying the LOS for each freeway component are shown in **Figure 4** through **Figure 20**. The corresponding freeway component densities are displayed in **Figure 21** through **Figure 37**. **Figure 72** through **Figure 79** present the detailed analysis results in tabular format. A summary of the results for each freeway corridor is below.

I-64: I-564/I-64 Interchange to Mercury Boulevard Interchange

In the No-Build condition, both directions of I-64 operate at acceptable LOS in all segments except HRBT itself. During each directional peak period, AM peak eastbound and PM peak westbound, HRBT is expected to operate at LOS E, indicating some reduction in travel speed but no buildup of queues, and the segments immediately downstream of HRBT operate at LOS D. The HRBT operates at LOS C during the PM peak eastbound and the AM peak westbound.

The remainder of eastbound I-64 within the study area operates at LOS D or better during both peak periods, with most segments operating at LOS C and travel speeds above 55 MPH. The weaving segment between I-664N and LaSalle Avenue operates at LOS D during the AM peak period, with travel speeds around 45 MPH. The weaving segment between Granby Street and I-564E operates at LOS D in the AM and LOS C in the PM, with travel speeds around 45 MPH in both peak periods.

The remainder of westbound I-64 within the study area operates at LOS D or better during both peak periods, with most segments operating at LOS C and travel speeds above 55 MPH. The weaving segments between State Route 134, LaSalle Avenue, and I-664S operate at LOS D during the both peak periods, with travel speeds near free-flow except at the weave between LaSalle Avenue and I-664S, where travel speeds are around 40 MPH.

I-664 Northbound/Southbound: I-64/I-664 Interchange to the I-264/I-664 Interchange

Both the northbound and southbound directions of the MMMBT operate at LOS D during both the AM and PM peaks.

I-664 generally operates with acceptable LOS in both directions during both the AM and PM peak hours, with most segments operating at LOS C or better and at travel speeds near free flow. However, segments in the vicinity of the Dock Landing Road interchange experience worse LOS in both directions. During the PM peak period, the northbound I-664 merge segment at the Dock Landing Road interchange operates at LOS E with travel speeds around 55 MPH. During the AM peak period, the southbound I-664 segments between Dock Landing Road and US 58 operate at LOS E with travel speeds around 55 MPH.

State Route 164: I-64/SR164/US17 Interchange to the US 58/SR164 Interchange

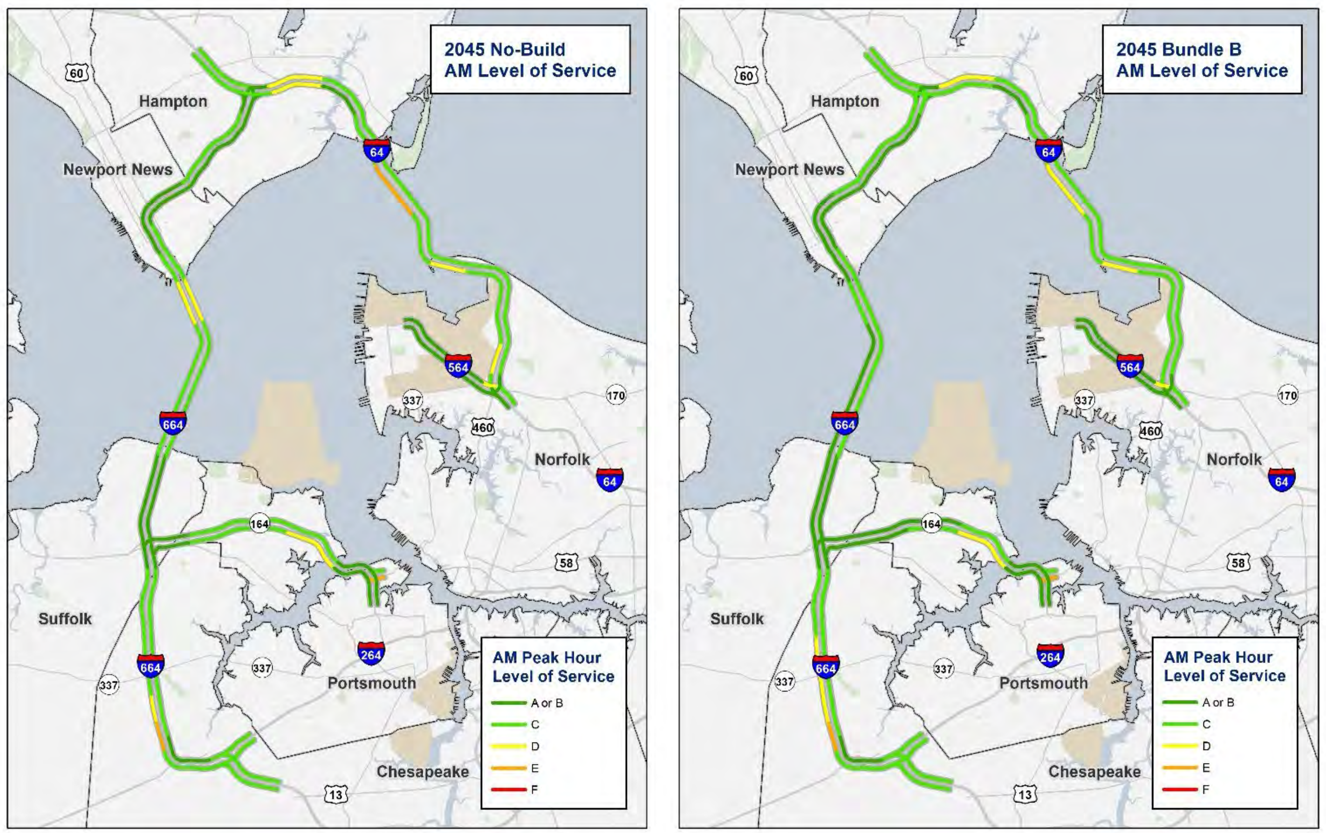
Roadway segments along State Route 164 operate between LOS E and LOS A during the peak hours. The LOS for the eastbound segments from the I-664 interchange to the Cedar Lane interchange range from LOS C to LOS D. The operations from Cedar Lane to the MLK Freeway at the terminus of the corridor range from LOS E to LOS B. The operating speeds along that section of SR 164 are between 50 and 55 MPH during the AM peak. The PM peak shows better operations, with operating speeds generally around 55 and 60 MPH.

Traveling westbound, the corridor operates between LOS D and LOS A during both peak periods. The operating speeds are favorable with speeds upwards of 60 MPH. The inclusion of the diverge to the HOT lanes between the Towne Point Road and I-664 interchanges does not adversely impact operations, with an LOS C during both peak periods.

I-564: Admiral Taussig Boulevard to the I-564/I-64 Interchange

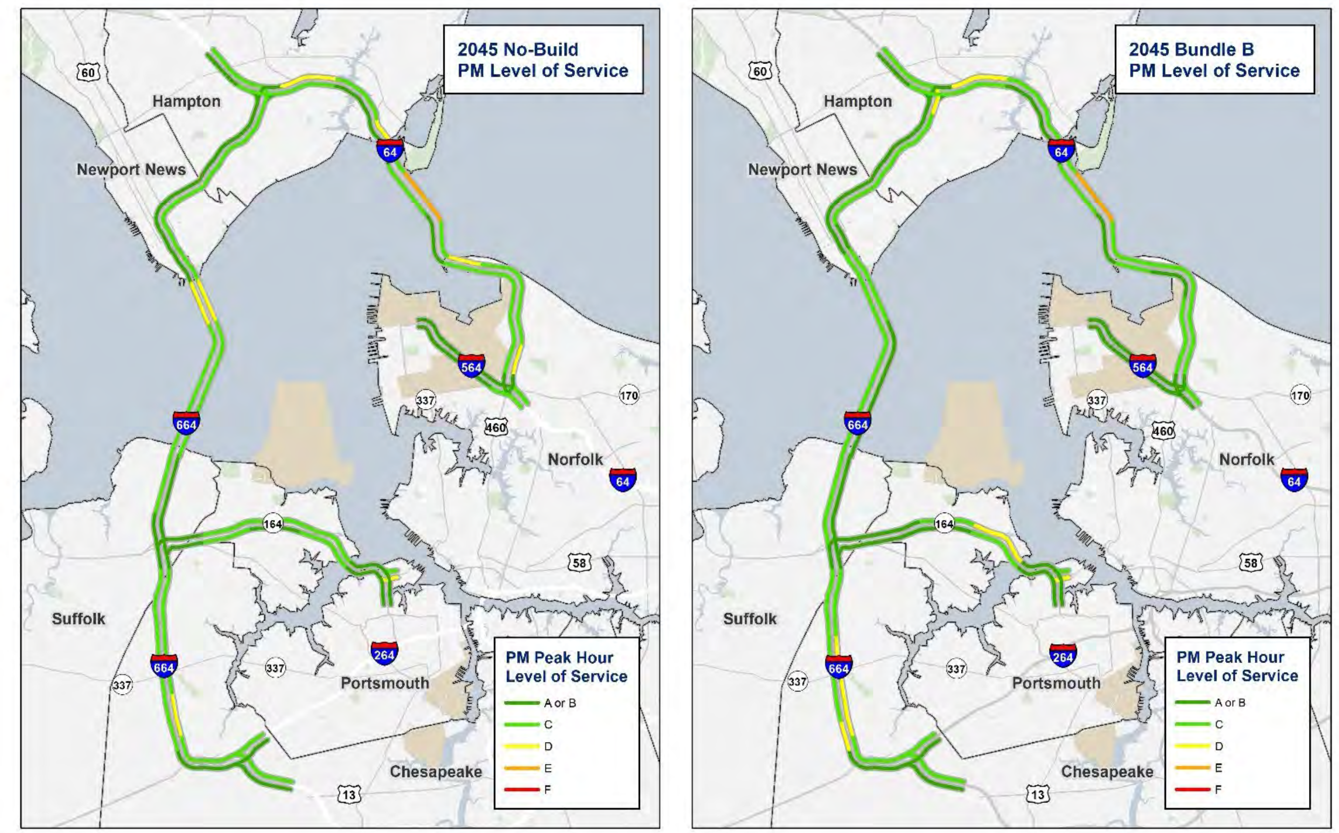
Based upon the HCS analysis, I-564 is expected to maintain acceptable operations during the AM and PM peak hours. The westbound segment just west of I-64 previously operated at LOS F during the AM peak hour; this has been improved to LOS D in the No-Build condition. The remainder of the of the corridor operates at LOS C or better during the AM peak hour. With the exception of the weave segment between the I-64 East on-ramp onto I-564 and Exit 2: Terminal Boulevard, speeds from the HCS analysis are maintained around 60 MPH. Similar to the Existing condition, Eastbound I-564 during the PM peak hour degrades from LOS B to LOS C as vehicles approach the I-64 interchange due to vehicles merging from Terminal Boulevard onto I-564. The PM peak hour speeds on the Eastbound I-564 segment approaching the terminus of the study area have improved from less than 35 MPH to around 60 MPH, as downstream operations along I-64 have been improved due to the managed lanes. due to downstream operations on I-64.

Figure 1: 2045 Baseline Scenario AM Peak Hour LOS Results



NOTE: Only general-purpose highway network results shown; managed lanes operate at or near free-flow speeds

Figure 2: 2045 Baseline Scenario PM Peak Hour LOS Results



NOTE: Only general-purpose highway network results shown; managed lanes operate at or near free-flow speeds

Build Capacity Analysis Results

2045 Baseline No-Build vs Bundle B

Summary comparisons of the No-Build and Bundle B conditions under the baseline growth scenario are presented in the figures above. The AM peak hour analysis results are presented in **Figure 1**, and the PM peak hour analysis results are presented in **Figure 2**. Maps displaying the LOS for each freeway component for the 2045 Bundle B scenario are shown in **Figure 38** through **Figure 54**, the corresponding freeway component densities are displayed in **Figure 55** through **Figure 71**, and **Figure 80** through **Figure 87** present the detailed analysis results in tabular format.

I-64 Eastbound and Westbound between I-664 and I-564

The 2045 Baseline scenario models of I-64 include the HRBT expansion project, which contains the future managed lanes along this segment. The analysis assumes that the managed lanes will always operate at or near free-flow speed. In general, the operational analysis results comparison between the 2045 Baseline No-Build and Bundle B scenarios shows that Bundle B will improve congestion along the I-64 general purpose lanes, particularly at the HRBT due to the volume reductions caused by the increased capacity of the managed lanes at the MMMBT.

During the AM peak hour, as shown in **Figure 1**, operations along the eastbound direction of the HRBT general purpose lanes are expected to improve from LOS E in the No-Build scenario to LOS D in the Bundle B scenario. The westbound direction of the HRBT is expected to maintain a similar LOS in both scenarios. The eastbound direction of I-64, just east of the I-664 interchange, improves from LOS D in the No-Build scenario to LOS C in the Bundle B scenario. Other I-64 roadway segments operate at a similar LOS when comparing the No-Build to the Bundle B scenario.

During the PM peak hour, as shown in **Figure 2**, operations along the westbound direction of the HRBT general purpose lanes are expected to remain at LOS E; however, the density is expected to significantly improve from the No-Build scenario to the Bundle B scenario. In the No-Build scenario, the density is just below the LOS F scenario, but in the Bundle B scenario, the density is just over the LOS E threshold. The westbound I-64 segment just west of the HRBT improves from LOS D in the No-Build scenario to LOS C in the Bundle B scenario. Other I-64 roadway segments operate at a similar LOS when comparing the No-Build to the Bundle B scenario.

I-664 Northbound and Southbound between I-64 and I-264

In the 2045 Baseline scenarios, the I-664 corridor includes the managed lanes associated with the Bowers Hill Interchange project, which extend from Bowers Hill to College Drive. The analysis assumes that the managed lanes will always operate at or near free-flow speed. In general, the operational analysis results comparison between the 2045 Baseline No-Build and Bundle B scenarios shows that Bundle B will improve congestion along the I-664 general purpose lanes, particularly at the MMMBT as vehicles divert from the general-purpose lanes to the managed lanes in Bundle B.

During the AM peak hour, as shown in **Figure 1**, operations along the southbound direction of the MMMBT general purpose lanes are expected to improve from LOS D in the No-Build scenario to LOS C in the Bundle B scenario. The northbound direction of the MMMBT is also expected to improve from LOS D in the No-Build scenario to LOS C in the Bundle B scenario. It should also be noted that the congestion in the AM No-Build scenario along southbound I-664 in the vicinity of the Bowers Hill interchange is expected to extend further north in the Bundle B scenario. Other I-664 roadway segments operate at a similar LOS when comparing the No-Build to the Bundle B scenario.

During the PM peak hour, as shown in **Figure 2**, operations along the northbound direction of the MMMBT general purpose lanes are expected to improve from LOS D in the No-Build scenario to LOS C in the Bundle B scenario. Operations along the southbound direction of the MMMBT general purpose lanes are also expected to improve from LOS D in the No-Build scenario to LOS C in the Bundle B scenario. Due to increases in mainline volumes, the basic segments both northbound and southbound between the Portsmouth Boulevard and Pughsville Road interchanges degrade from LOS C to LOS D. However, the northbound no-build density for this segment is exactly on the LOS C/LOS D threshold, where even a small change in volume or speed will change the reported LOS, and the southbound no-build density is 0.5 passenger cars per lane per hour below the LOS threshold. In both cases, LOS indicates a starker degradation in operations than is actually indicated by the slight increases in density. Other I-664 roadway segments operate at similar LOS in the No-Build and the Bundle B scenarios.

State Route 164 Eastbound and Westbound between I-664 and the Elizabeth River

In general, the operational analysis results comparison between the 2045 Baseline No-Build and Bundle B scenarios shows that Bundle B will improve congestion along the State Route 164, particularly in the vicinity of the widening included in Bundle B.

During the AM peak hour, roadway segments along westbound State Route 164 operate at LOS C or better in the No-Build scenario; all segments of westbound State Route 164 operate at the same or better LOS in the Bundle B scenario. The eastbound State Route 164 segment in the vicinity of the Cedar Hill interchange operates at LOS D in both scenarios, and the ramp from eastbound State Route 164 to southbound Martin Luther King Expressway operates at LOS E in both scenarios.

During the PM peak hour, the segment of westbound State Route 164 in the vicinity of the Elizabeth River degrades from LOS C to LOS D. All other segments of State Route 164 are expected to operate at similar LOS.

I-564 Eastbound and Westbound north of I-64

The operational analysis results comparison between the 2045 Baseline No-Build and Bundle B scenarios shows that Bundle B will have minimal impact to the I-564 freeway segments and ramp junctions.

Baseline Build Greater Growth Scenarios

Three greater growth scenarios were also analyzed in HCS:

- Water – Assumes additional growth along the ports and harbors in the Hampton Roads area; major corridors impacted are I-664 and State Route 164
- Urban – Assumes additional growth throughout the urban areas of Hampton Roads, including Norfolk, Chesapeake, Newport News, Hampton, Portsmouth, and Virginia Beach. I-64, I-664 and State Route 164 are impacted.
- Suburban – Assumes additional growth in the suburban areas in and around Hampton Roads in Suffolk and neighboring counties, including Isle of Wight, Southampton, and the City of Franklin. Major corridors impacted are I-64, I-664 and State Route 164

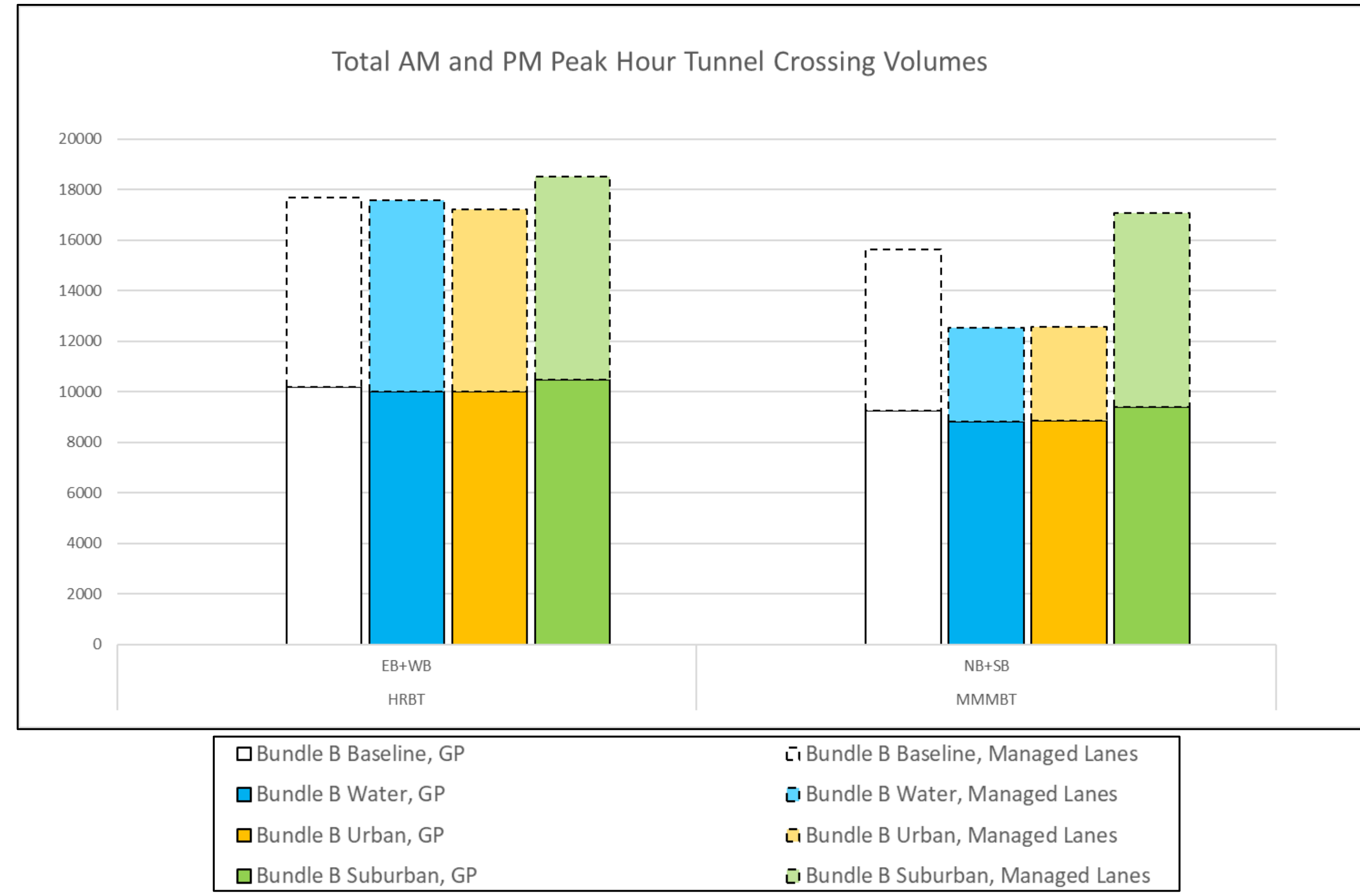
Traffic volumes were developed for each greater growth scenario in a manner consistent with the development of baseline scenario volumes. In this case, the travel demand model assignments for each greater growth scenario were compared with the assignments for the baseline Bundle B build scenario. The percent change in each link's assignment between the models was applied to the corresponding HCS segment link in the Bundle B build scenario HCS model.

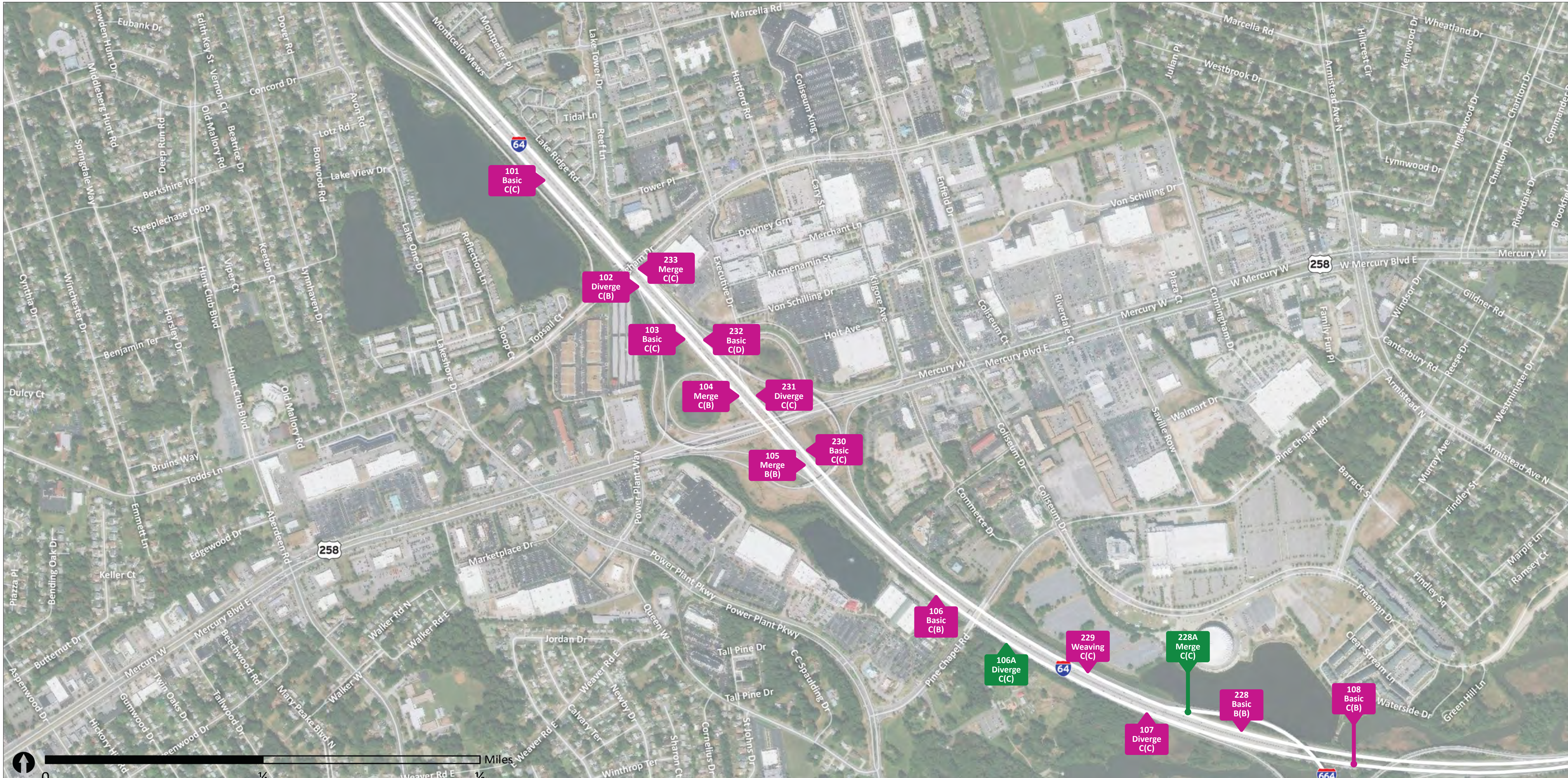
In general, the greater growth scenarios (Water, Urban, and Suburban) show minimal impacts to mainline traffic volumes during the AM and PM peak hours along the study area roadways when compared to the baseline Bundle B growth scenario. **Figure 3** shows the 2045 Total Peak Hour traffic for both the General purpose and managed lanes of the HRBT and MMMBT. There are minimal changes in traffic volumes between the baseline and growth scenarios for the general-purpose and managed lanes of the HRBT and the general-purpose lanes of the MMMBT. Traffic in the MMMBT managed lanes decreases in the Water and Urban growth scenarios when compared to the baseline growth. Traffic volumes in the MMMBT managed lanes increase in the Suburban growth scenario compared to the baseline growth, however these traffic volumes will not exceed the capacity of the managed lanes included in the Bundle B scenario.

Operationally, the majority of study area segments maintain similar LOS across all four build scenarios, with no segments degrading to LOS F. In the AM peak hour, the westbound I-64 weaving segment between the on-ramp from LaSalle Avenue and the off-ramp to southbound I-664 approaches the LOS F density threshold in the Water scenario due to increased mainline freeway volume. Also in the AM peak hour, both the merge segment from Dock Landing Road to southbound I-664 and the basic segment immediately after it approach the LOS F density threshold in all three greater growth scenarios. Similar density was observed in the Bundle B build scenario as well, though only in the merge segment.

Detailed greater growth scenario results, including LOS, density, average speed, and average travel time for all study area segments for the AM and PM peak hours, are provided in tabular form in **Figure 88** through **Figure 111**.

Figure 3: Total 2045 AM and PM Peak Hour Tunnel Crossings by Growth Scenario





LEGEND

General Purpose Segment

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) LOS

Managed Lane Junction

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 4

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

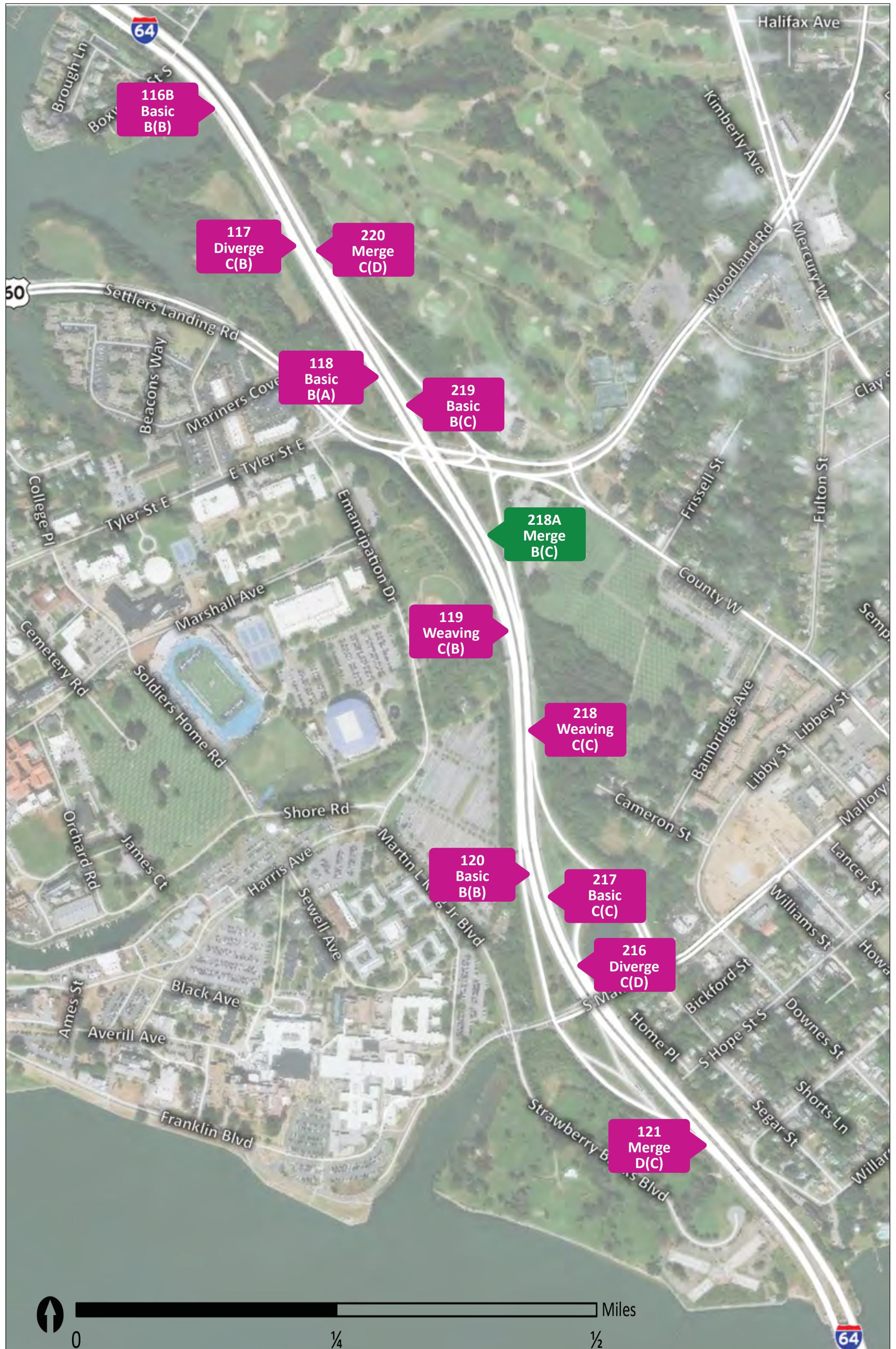
2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 5

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) LOS

Managed Lane Junction

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

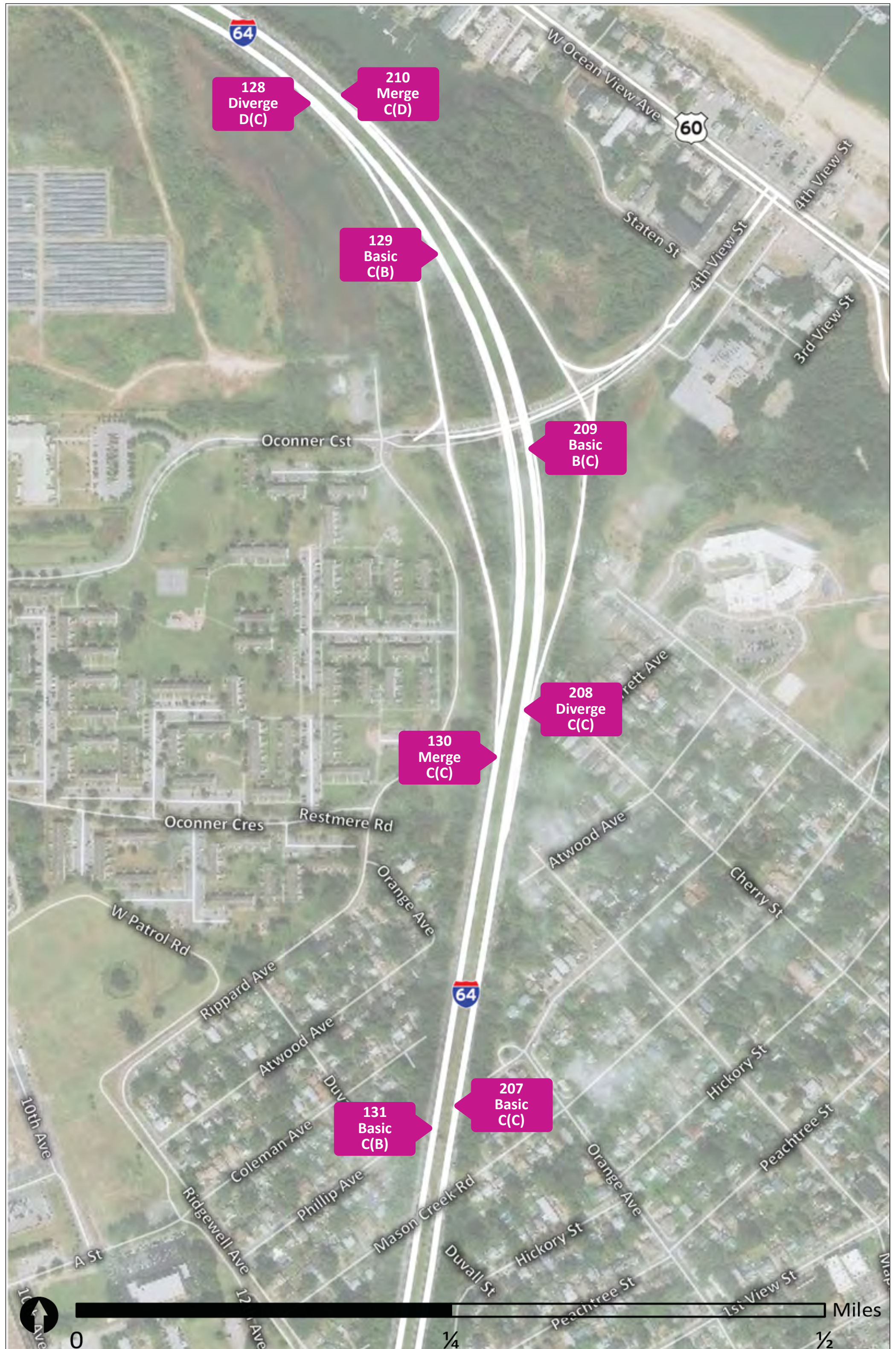
FIGURE 6

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) LOS

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 7

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228	Analysis ID Number
Basic	HCS2023 Freeway Analysis Type
A(A)	AM (PM) LOS

Managed Lane Junction

228	Analysis ID Number
Basic	HCS2023 Freeway Analysis Type
A(A)	AM (PM) LOS

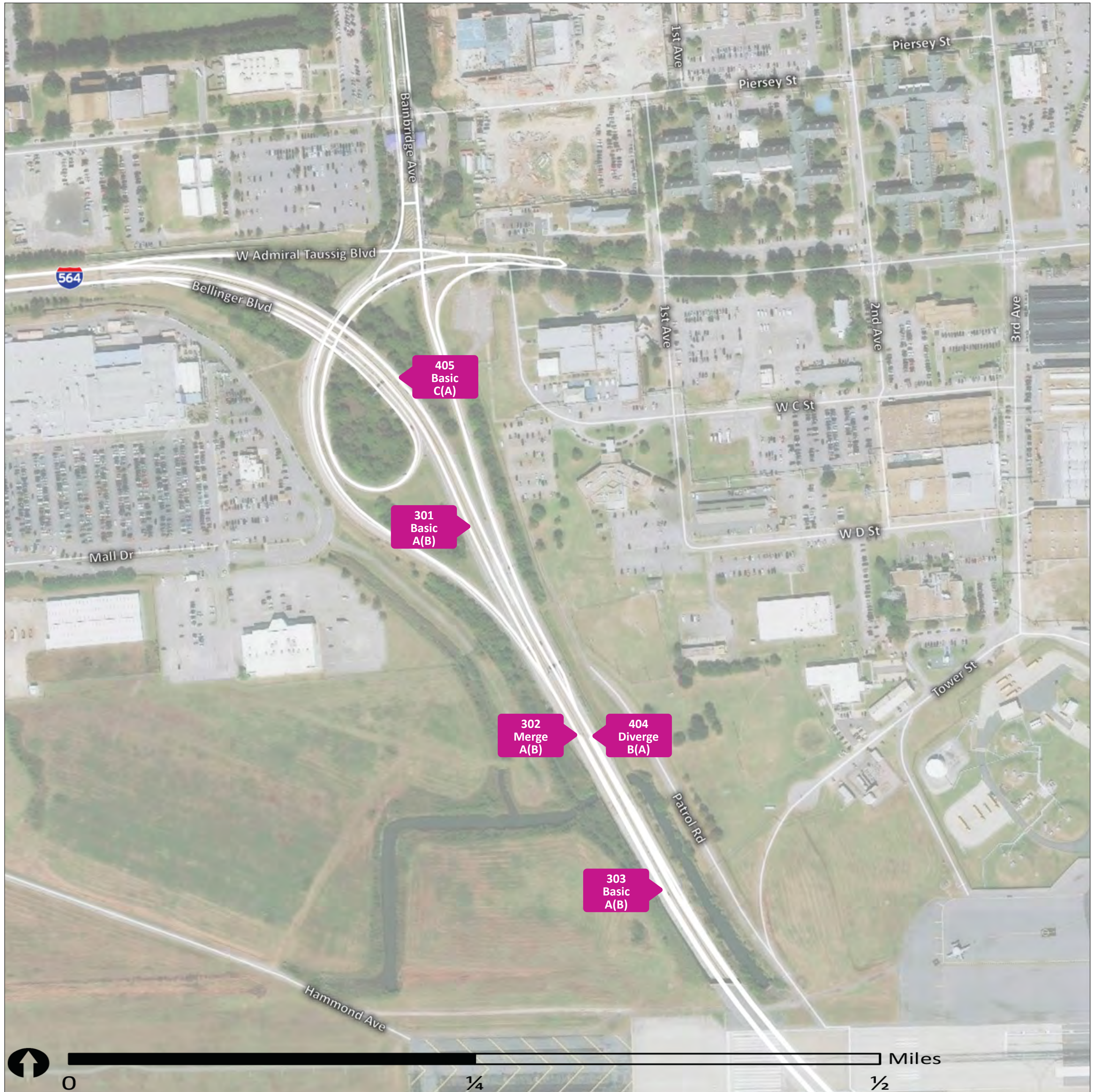
2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 8

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) LOS

Managed Lane Junction

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

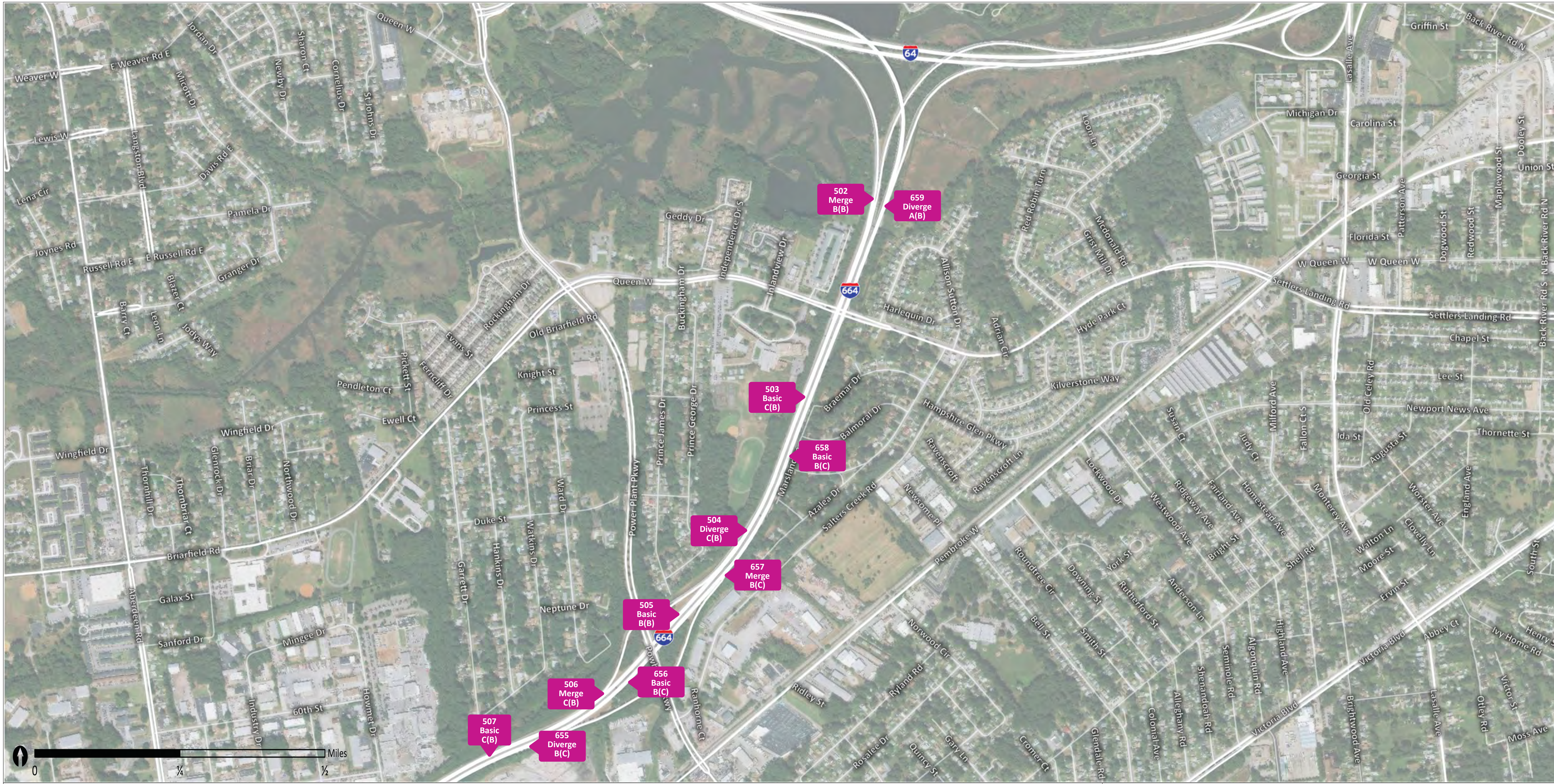
FIGURE 9

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

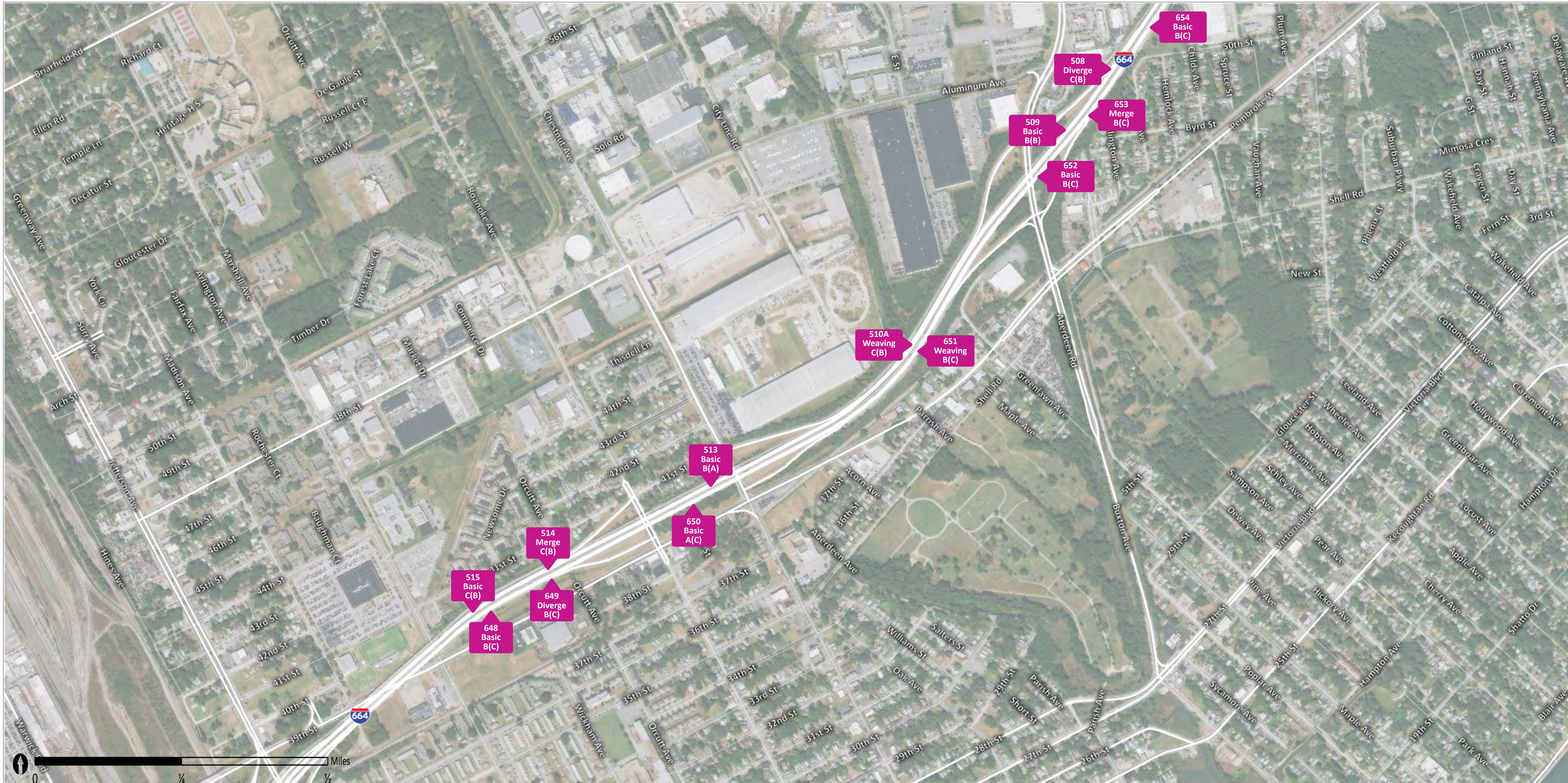
FIGURE 10

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) LOS

Managed Lane Junction

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

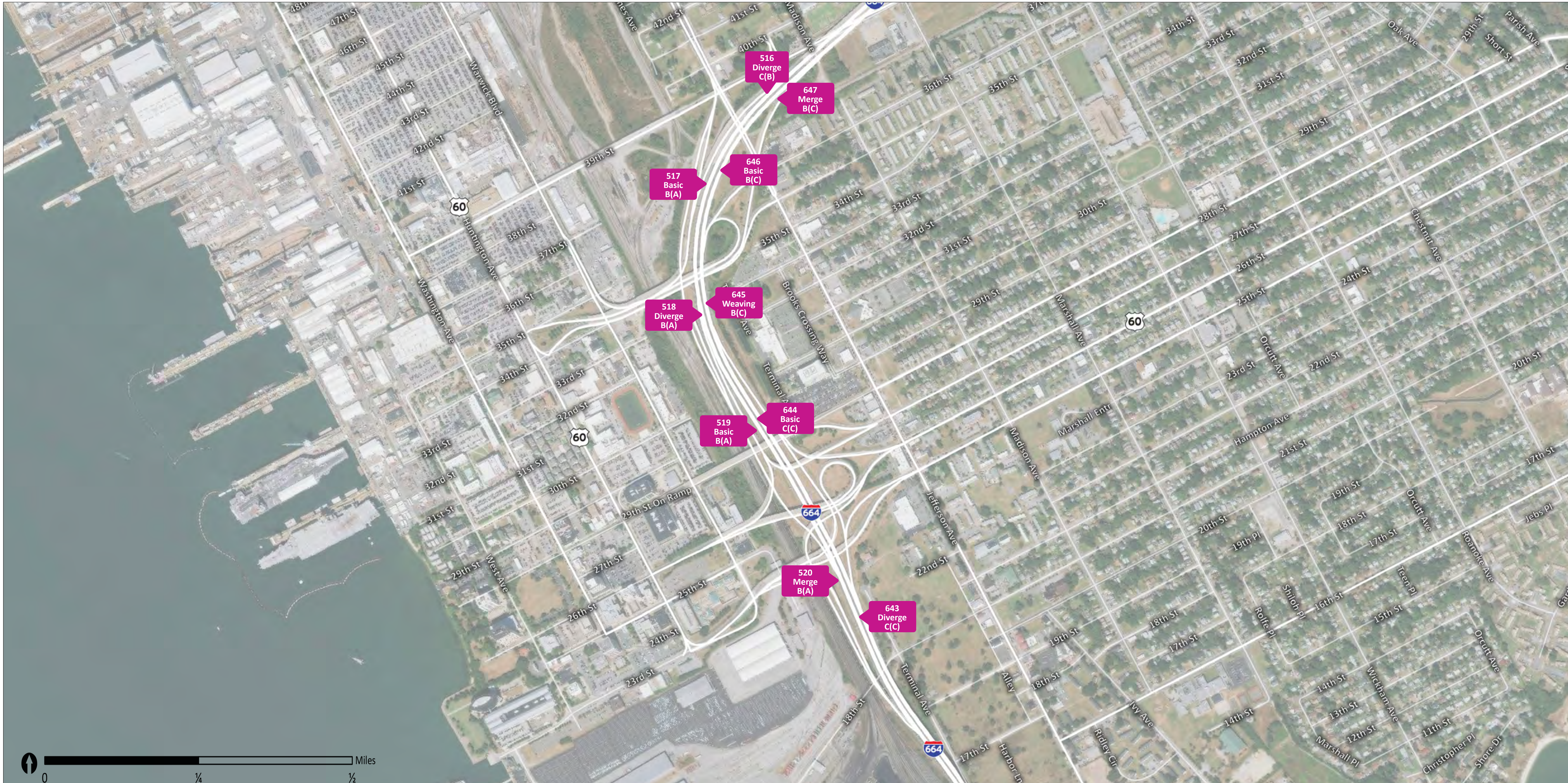
FIGURE 11

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) LOS

Managed Lane Junction

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

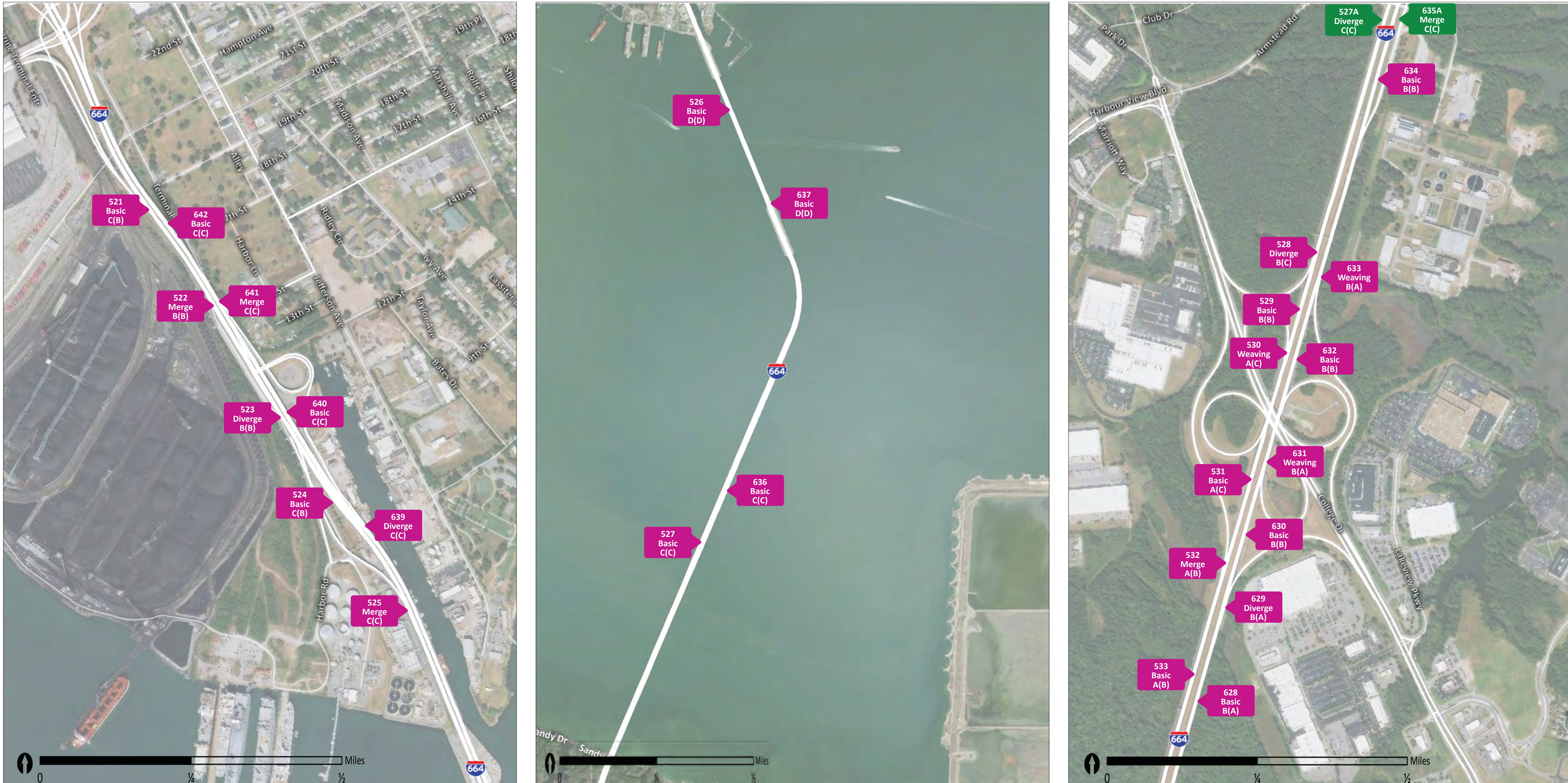
FIGURE 12

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number, HCS2023 Freeway Analysis Type, AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number, HCS2023 Freeway Analysis Type, AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

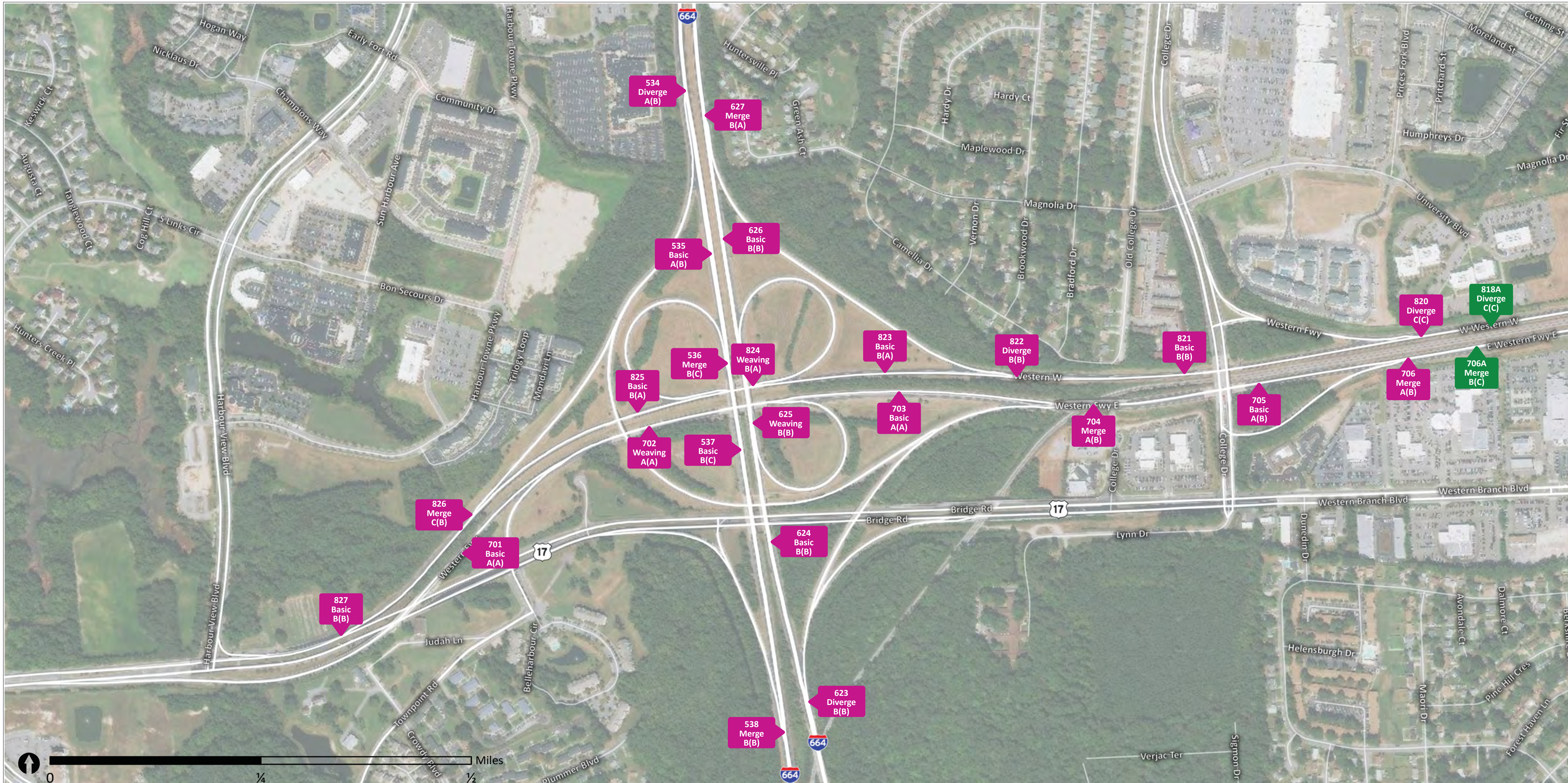
FIGURE 13

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

2045 BASELINE NO-BUILD

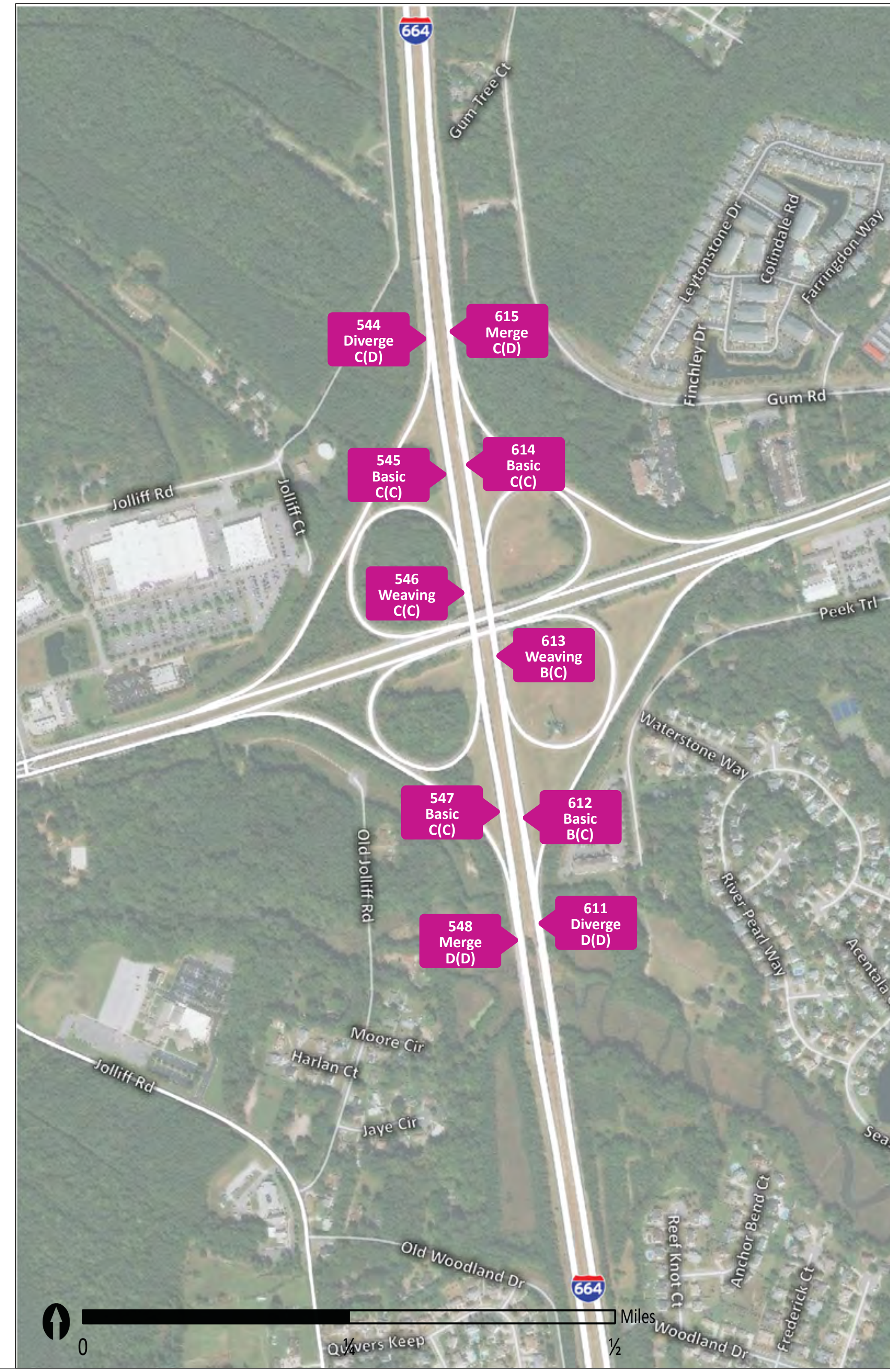
FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 14

Hampton Roads TPO — Michael Baker International

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

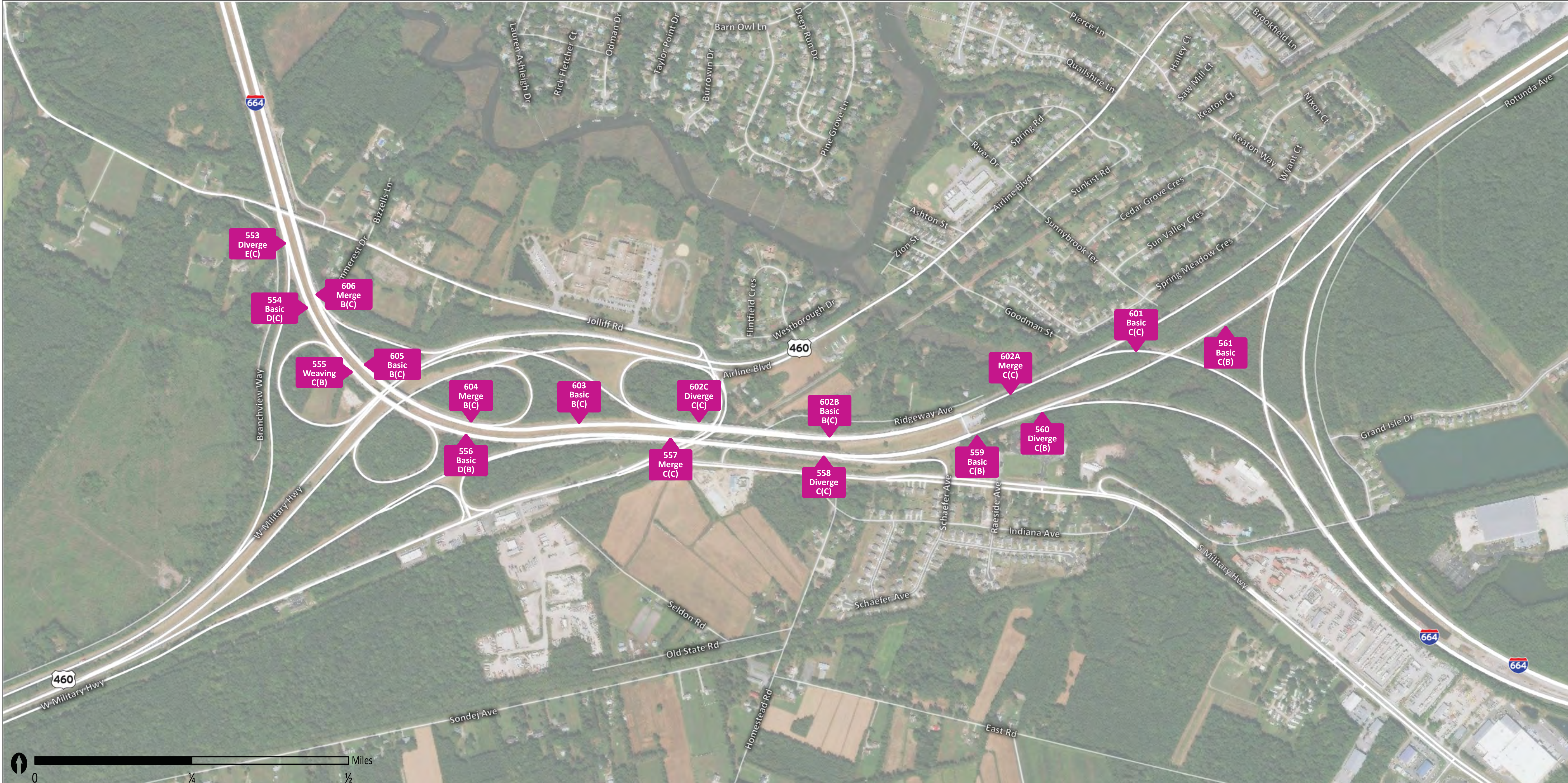
FIGURE 15

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number / HCS2023 Freeway Analysis Type / AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number / HCS2023 Freeway Analysis Type / AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

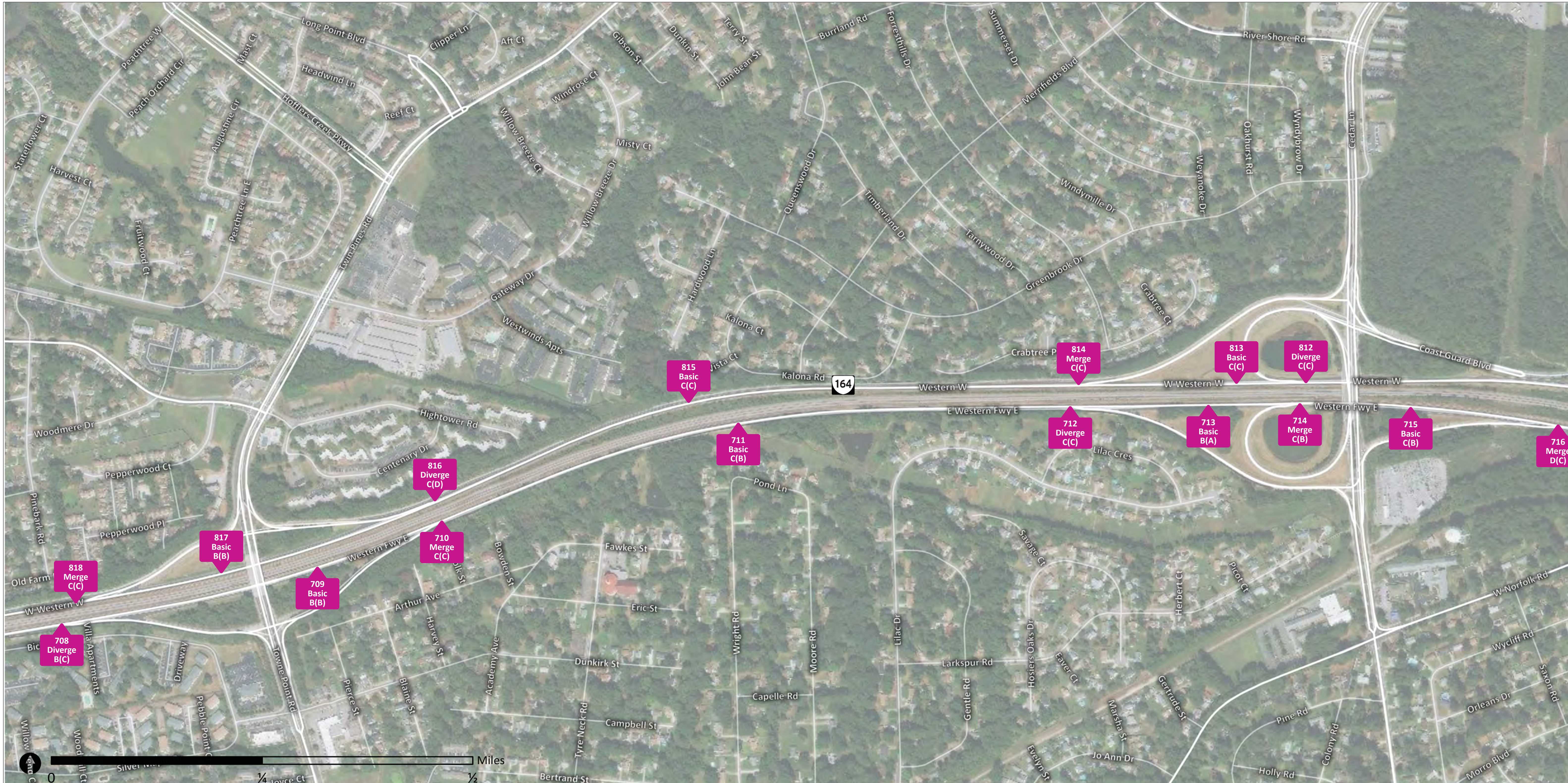
FIGURE 16

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 17

the heartbeat of HAMPTON ROADS TPO TRANSPORTATION PLANNING ORGANIZATION

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 18

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) LOS

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

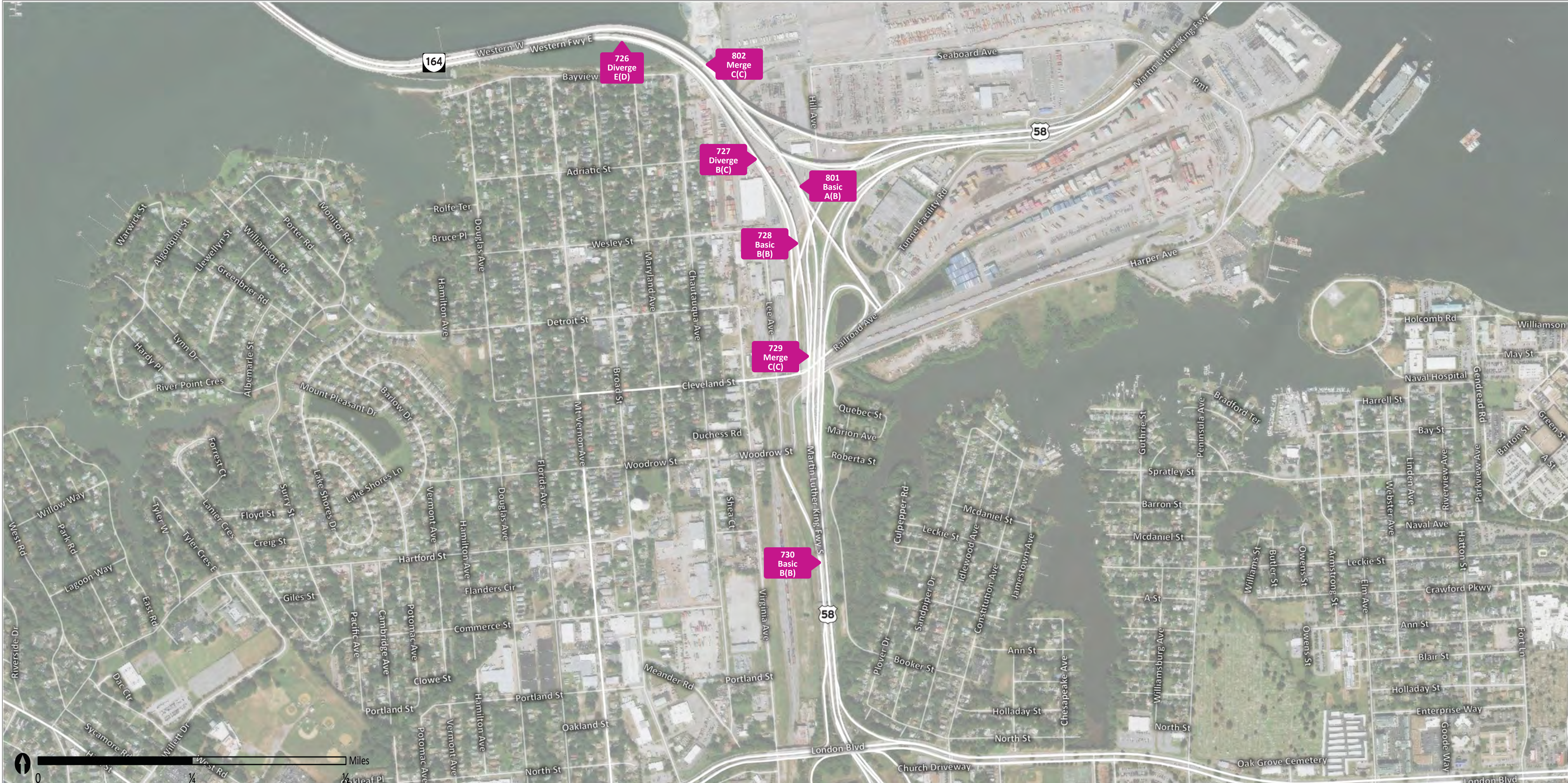
FIGURE 19

Hampton Roads TPO Transportation Planning Organization

Michael Baker International

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 20

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228	Analysis ID Number
Basic	HCS2023 Freeway Analysis Type
A(A)	AM (PM) Density, pc/mi/ln

Managed Lane Junction

228	Analysis ID Number
Basic	HCS2023 Freeway Analysis Type
A(A)	AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 21

the heartbeat of HAMPTON ROADS TPO TRANSPORTATION PLANNING ORGANIZATION

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

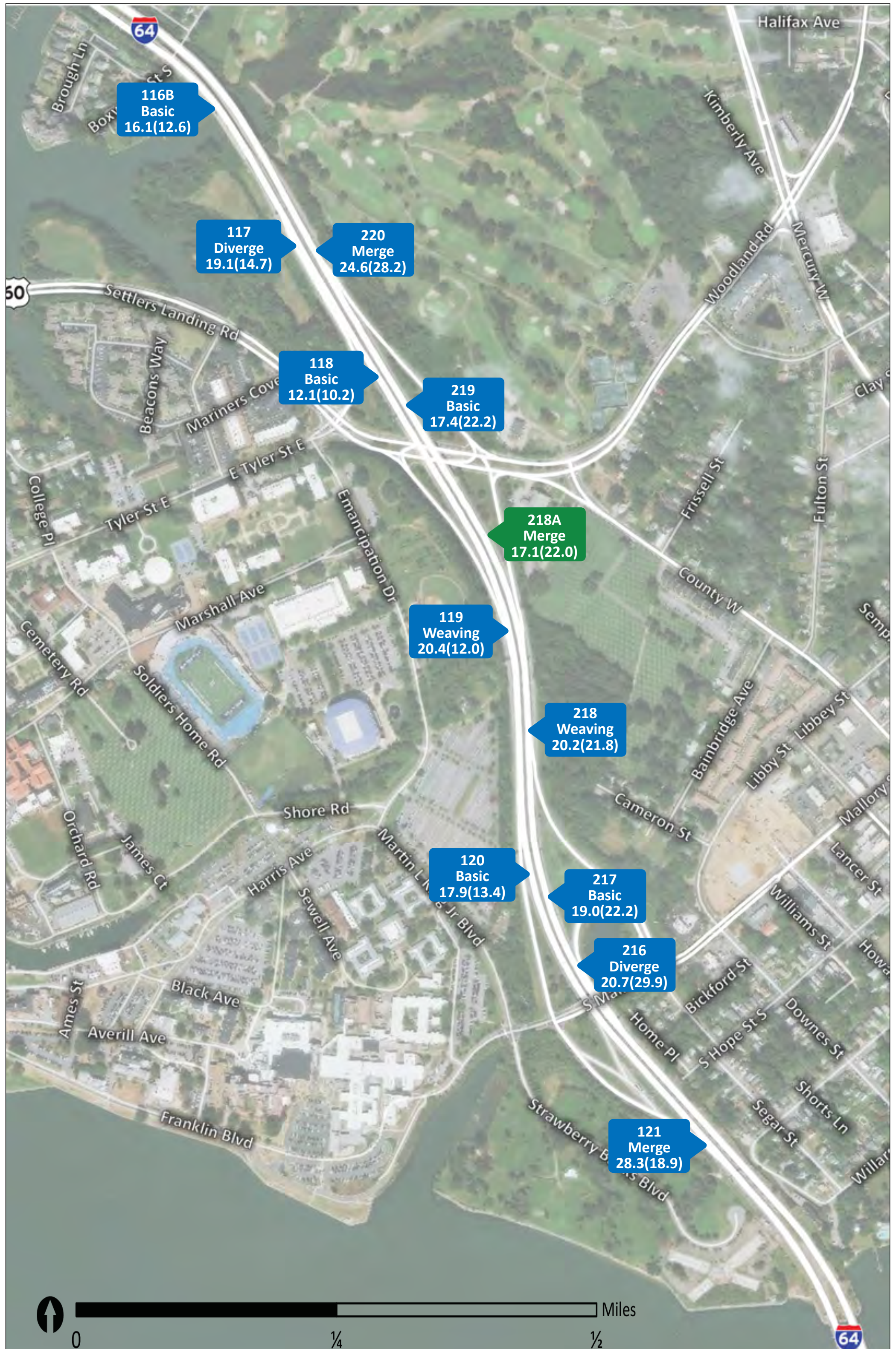
2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 22

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 23

Hampton Roads TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 24

Hampton Roads TPO
Michael Baker International

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228 Basic A(A)
- Analysis ID Number
- HCS2023 Freeway Analysis Type
- AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A)
- Analysis ID Number
- HCS2023 Freeway Analysis Type
- AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 25

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228	Analysis ID Number
Basic	HCS2023 Freeway Analysis Type
A(A)	AM (PM) Density, pc/mi/ln

Managed Lane Junction

228	Analysis ID Number
Basic	HCS2023 Freeway Analysis Type
A(A)	AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

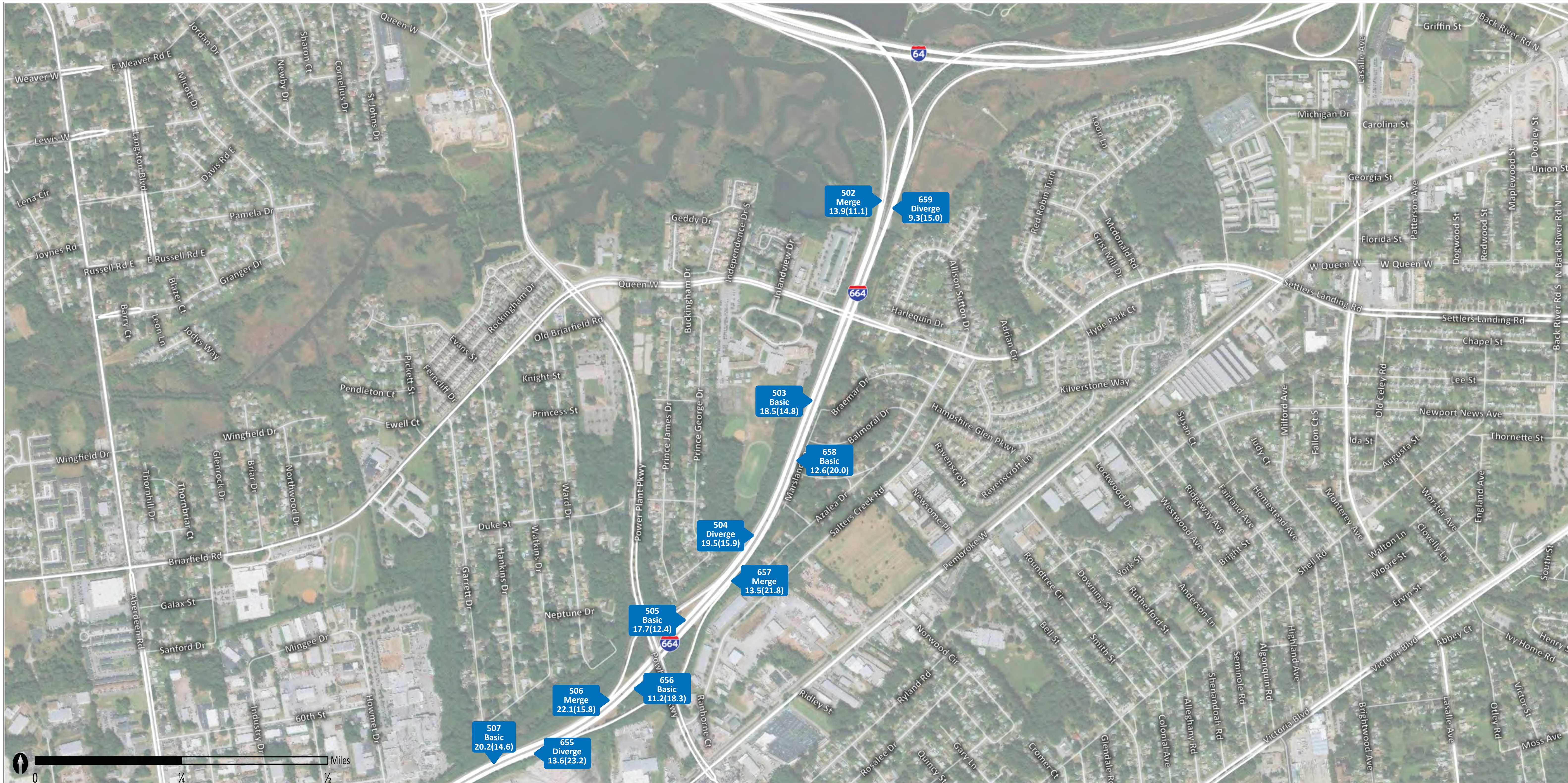
FIGURE 26

Hampton Roads TPO

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 27

Hampton Roads TPO

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 28

the heartbeat of HAMPTON ROADS TPO
Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 29

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD
FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 30

the heartbeat of HAMPTON ROADS TPO
Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 31

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 32

Hampton Roads TPO — Michael Baker International

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD
FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

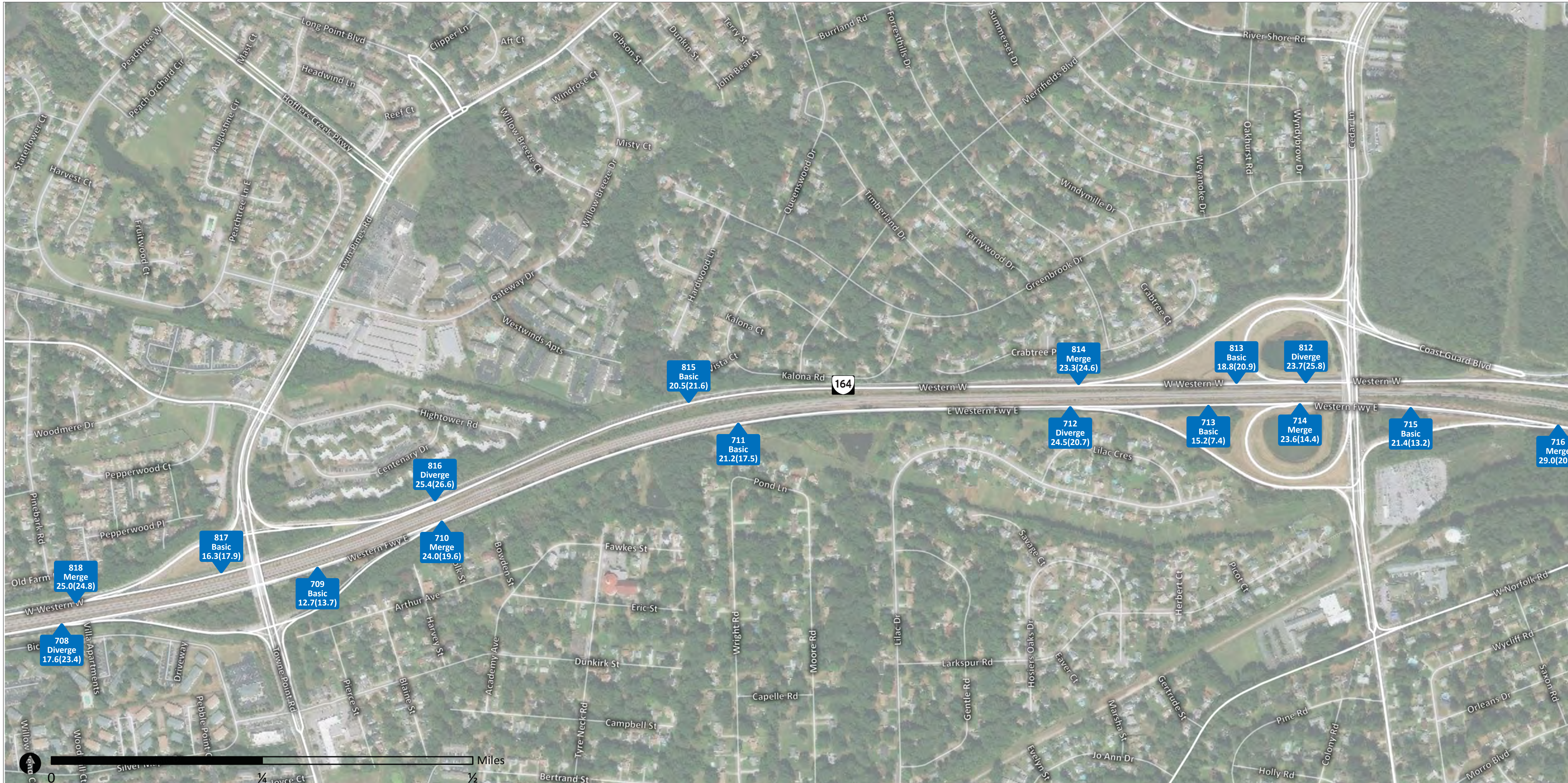
FIGURE 33

Hampton Roads TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 34

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 35

the heartbeat of HAMPTON ROADS TPO TRANSPORTATION PLANNING ORGANIZATION

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 36

REGIONAL CONNECTORS STUDY

AUGUST 2023

LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

2045 BASELINE NO-BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

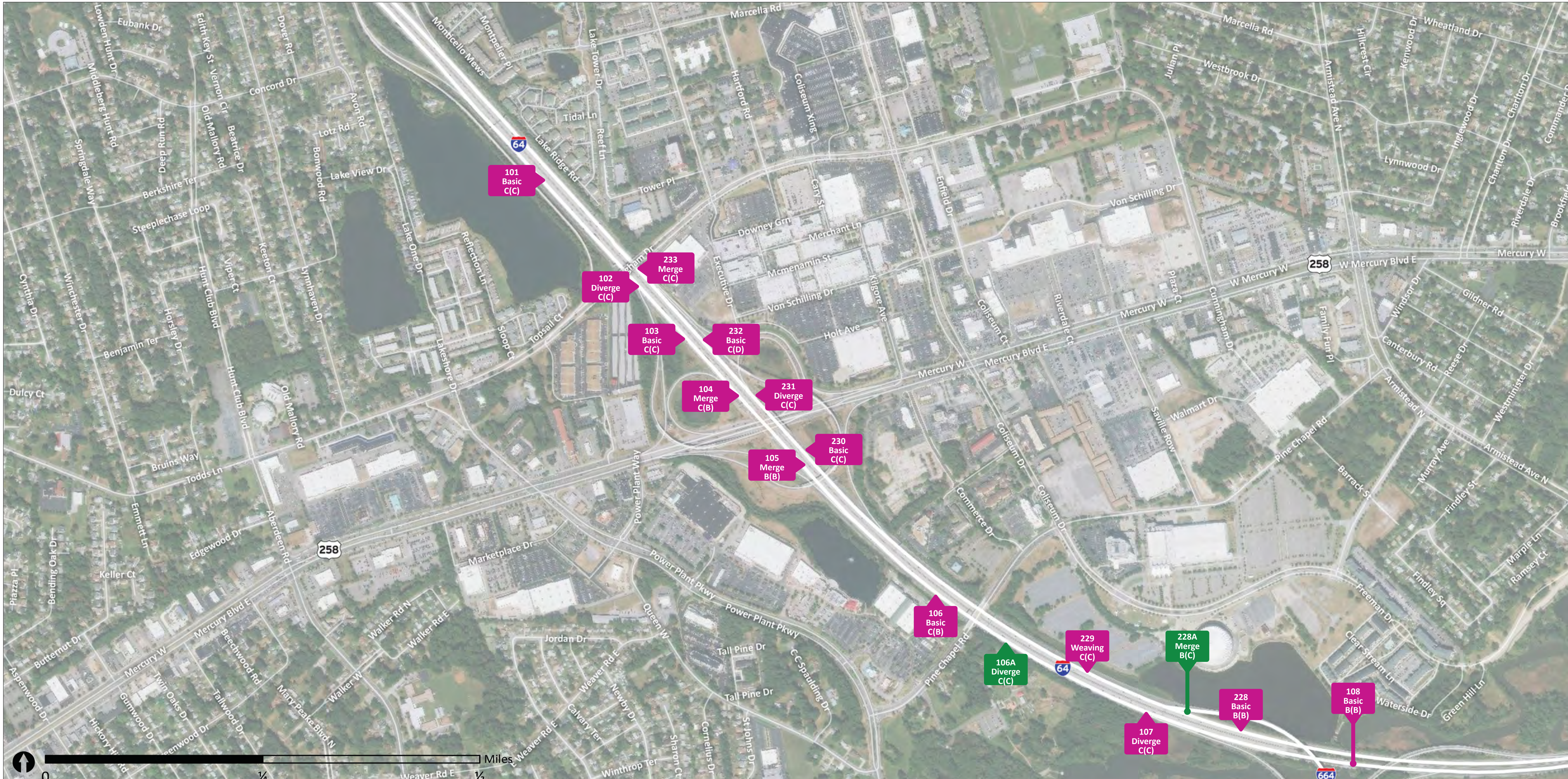
FIGURE 37

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 38

Hampton Roads TPO

Michael Baker International

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

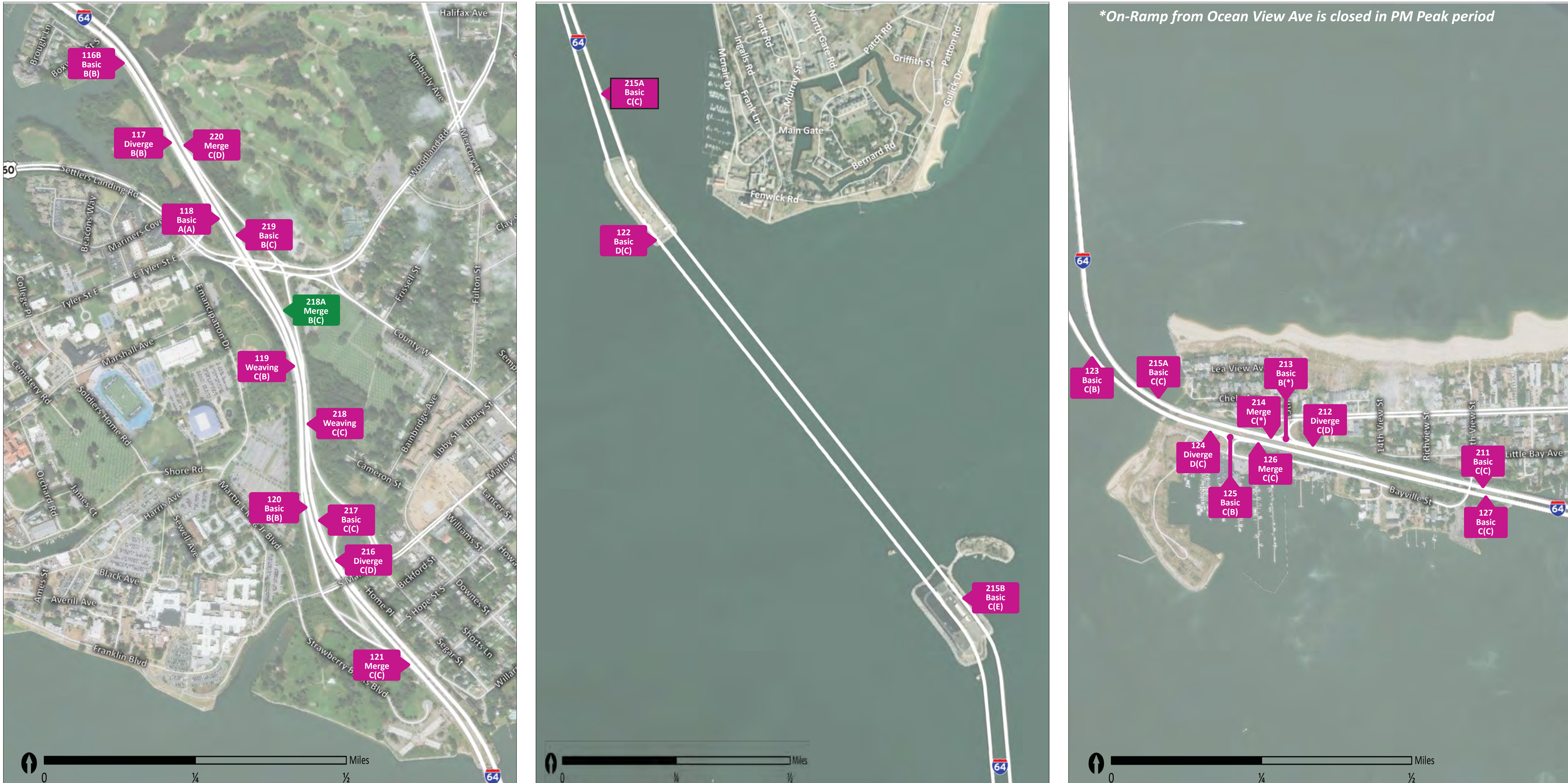
FIGURE 39

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number / HCS2023 Freeway Analysis Type / AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number / HCS2023 Freeway Analysis Type / AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

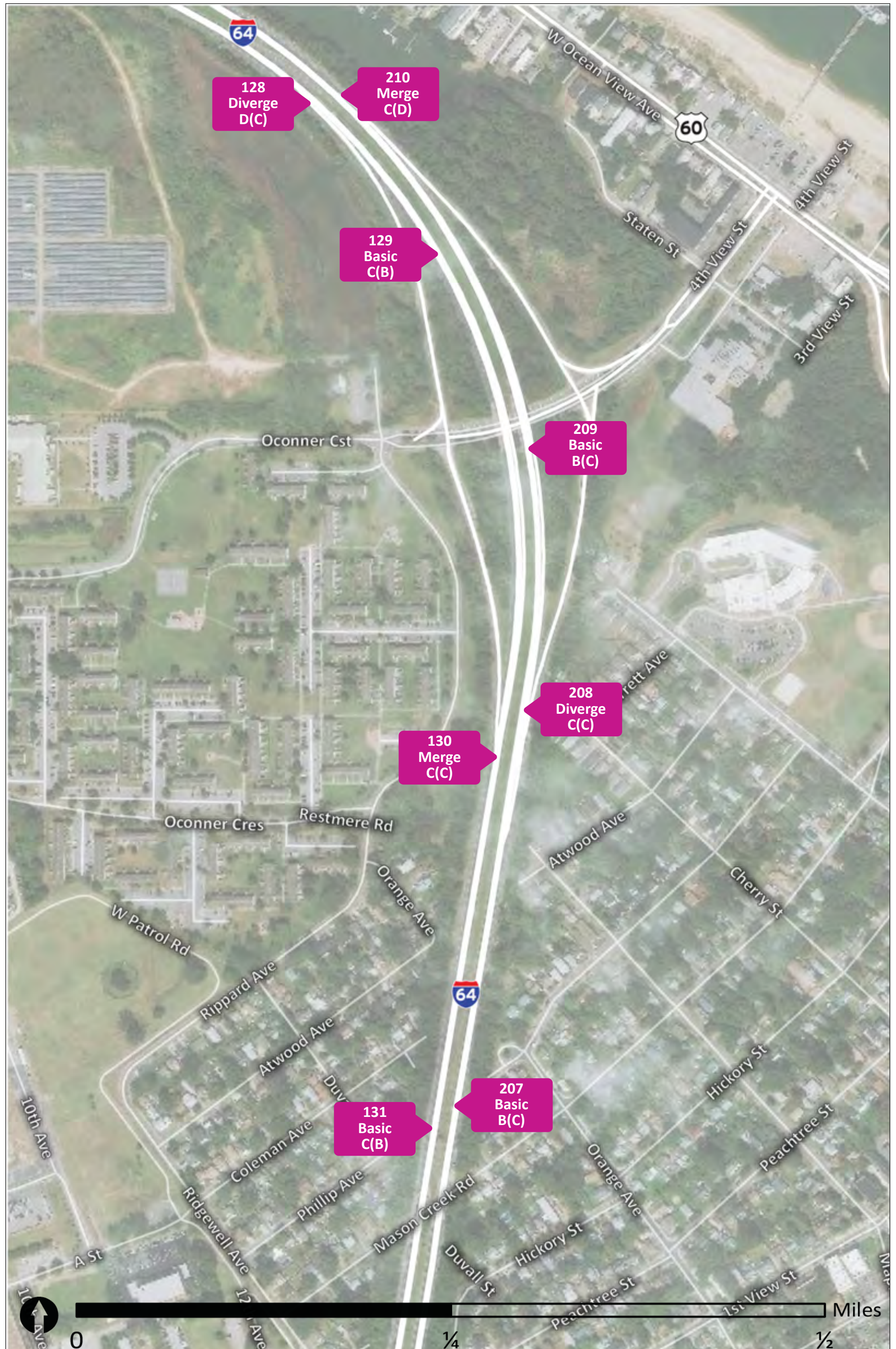
FIGURE 40

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) LOS

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 41

the heartbeat of HAMPTON ROADS TPO
TRANSPORTATION PLANNING ORGANIZATION

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number / HCS2023 Freeway Analysis Type / AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number / HCS2023 Freeway Analysis Type / AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

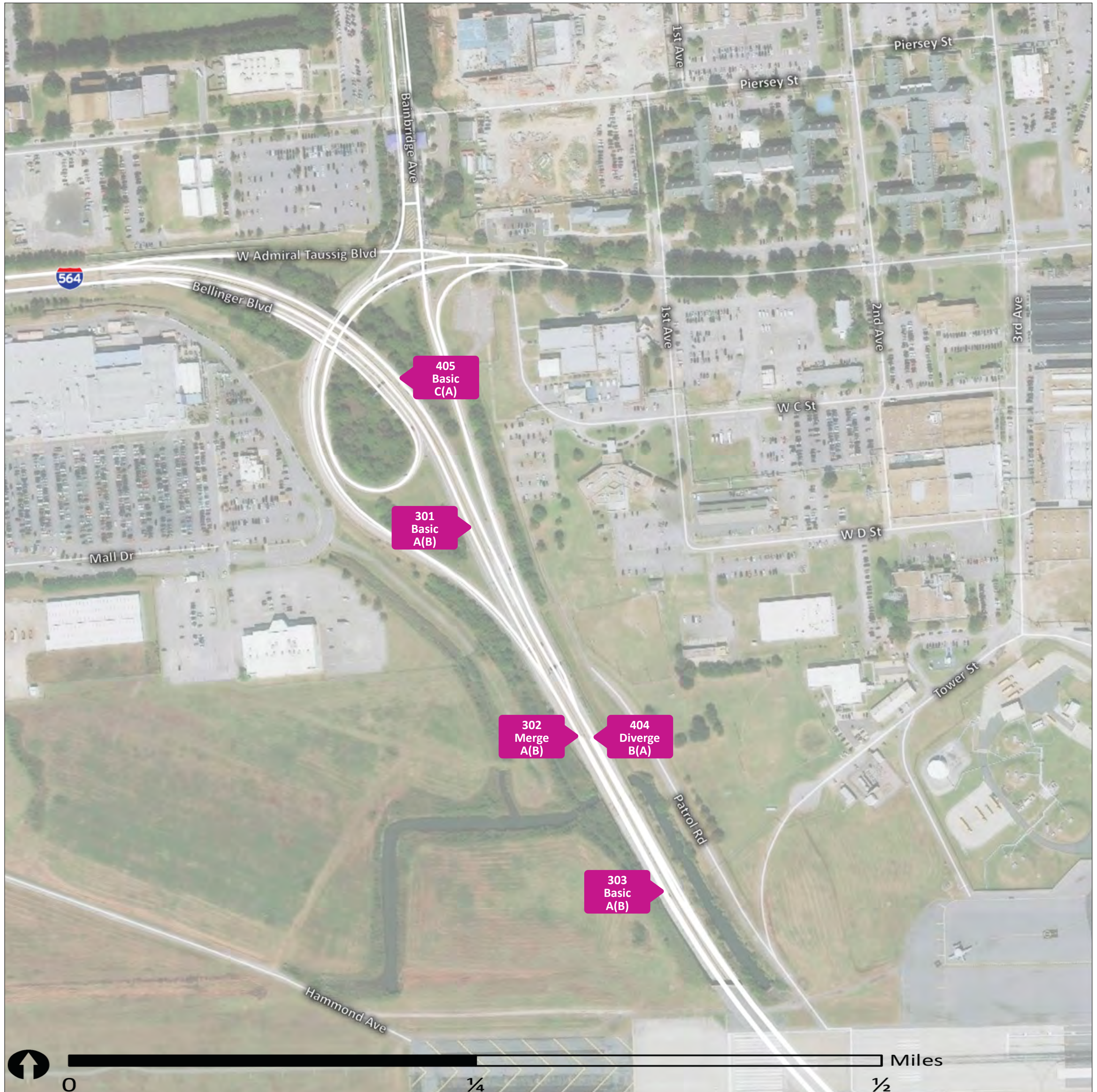
FIGURE 42

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number, HCS2023 Freeway Analysis Type, AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number, HCS2023 Freeway Analysis Type, AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

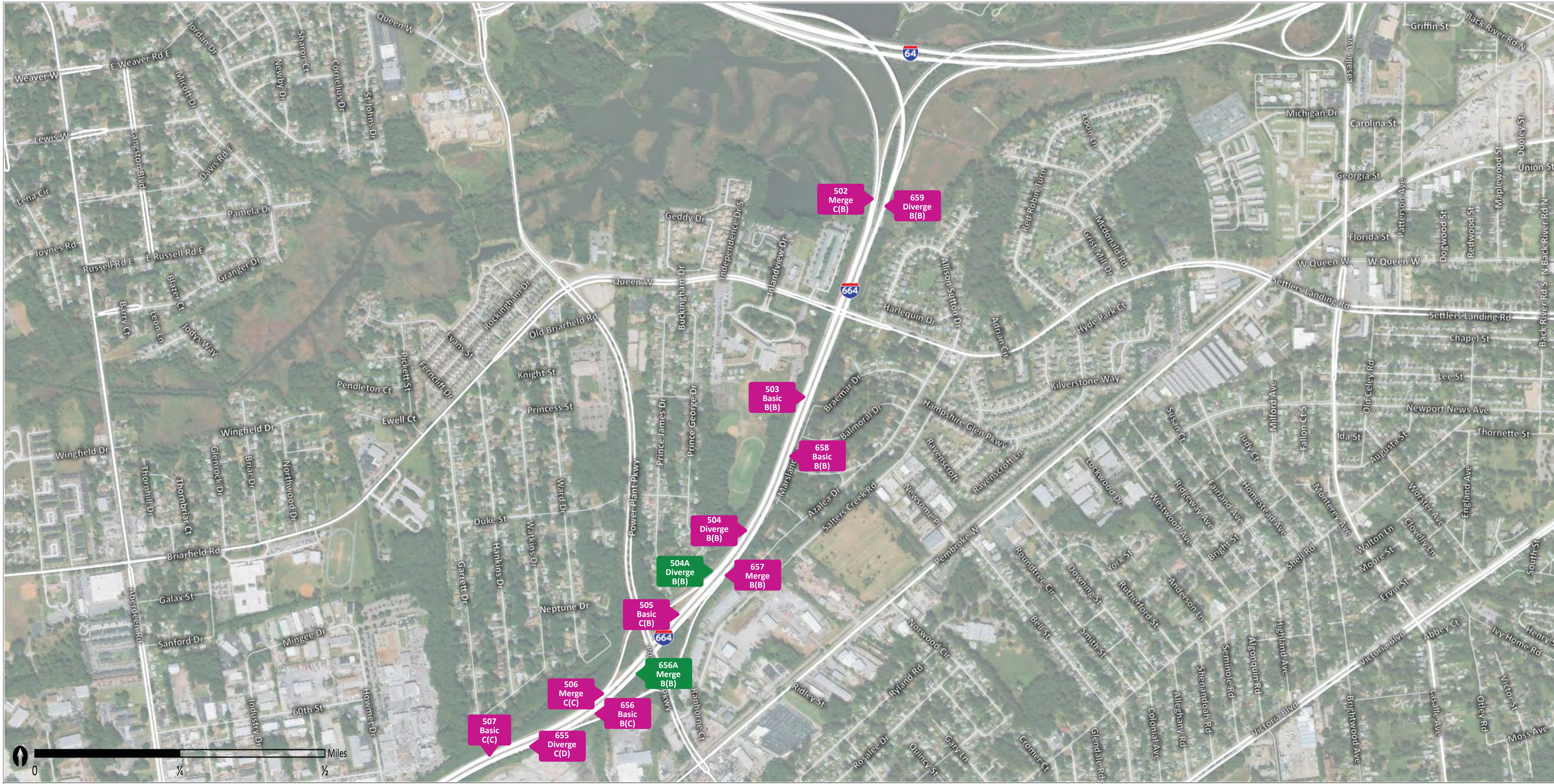
FIGURE 43

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) LOS

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

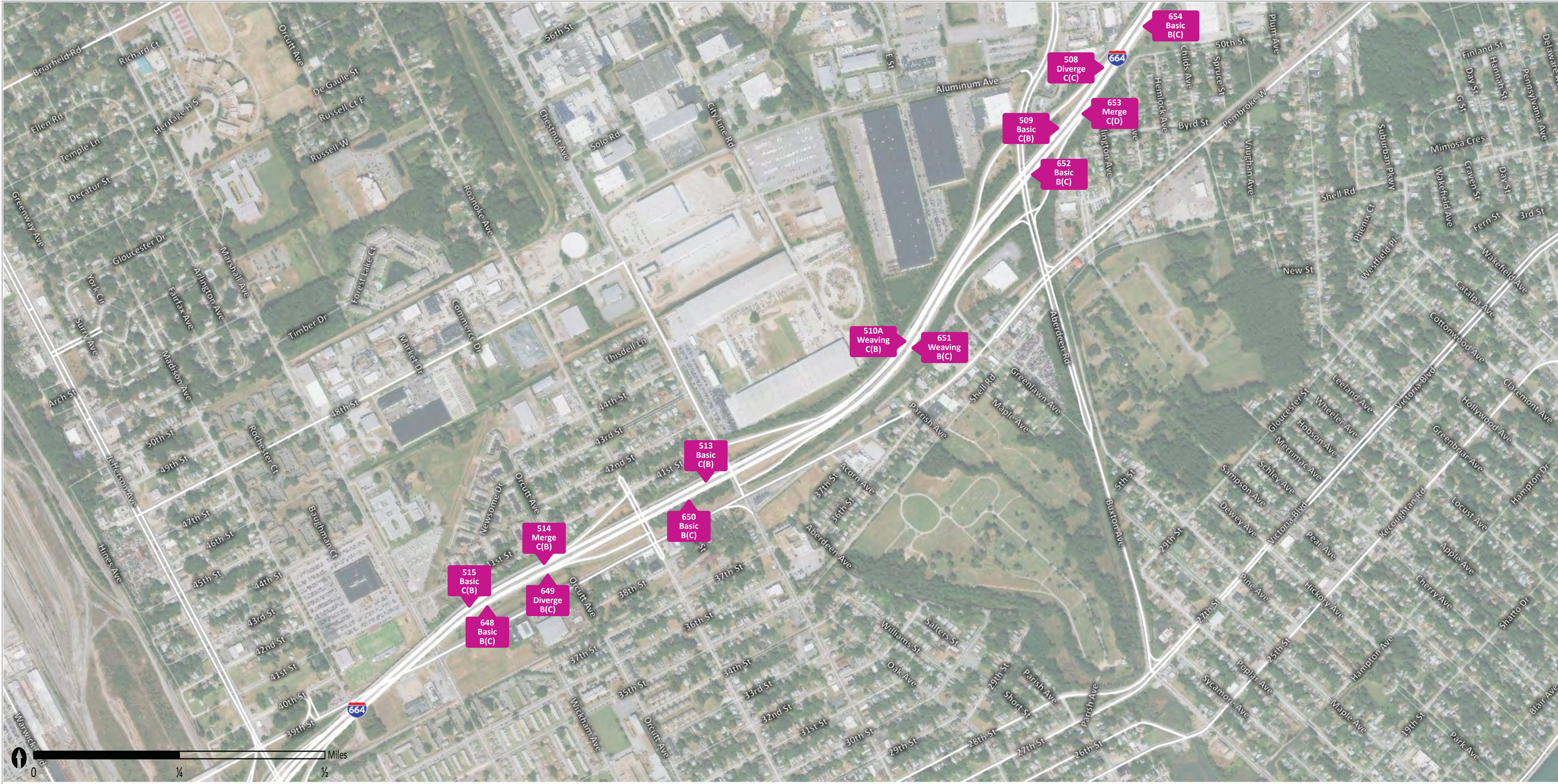
FIGURE 44

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 45

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number / HCS2023 Freeway Analysis Type / AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number / HCS2023 Freeway Analysis Type / AM (PM) LOS

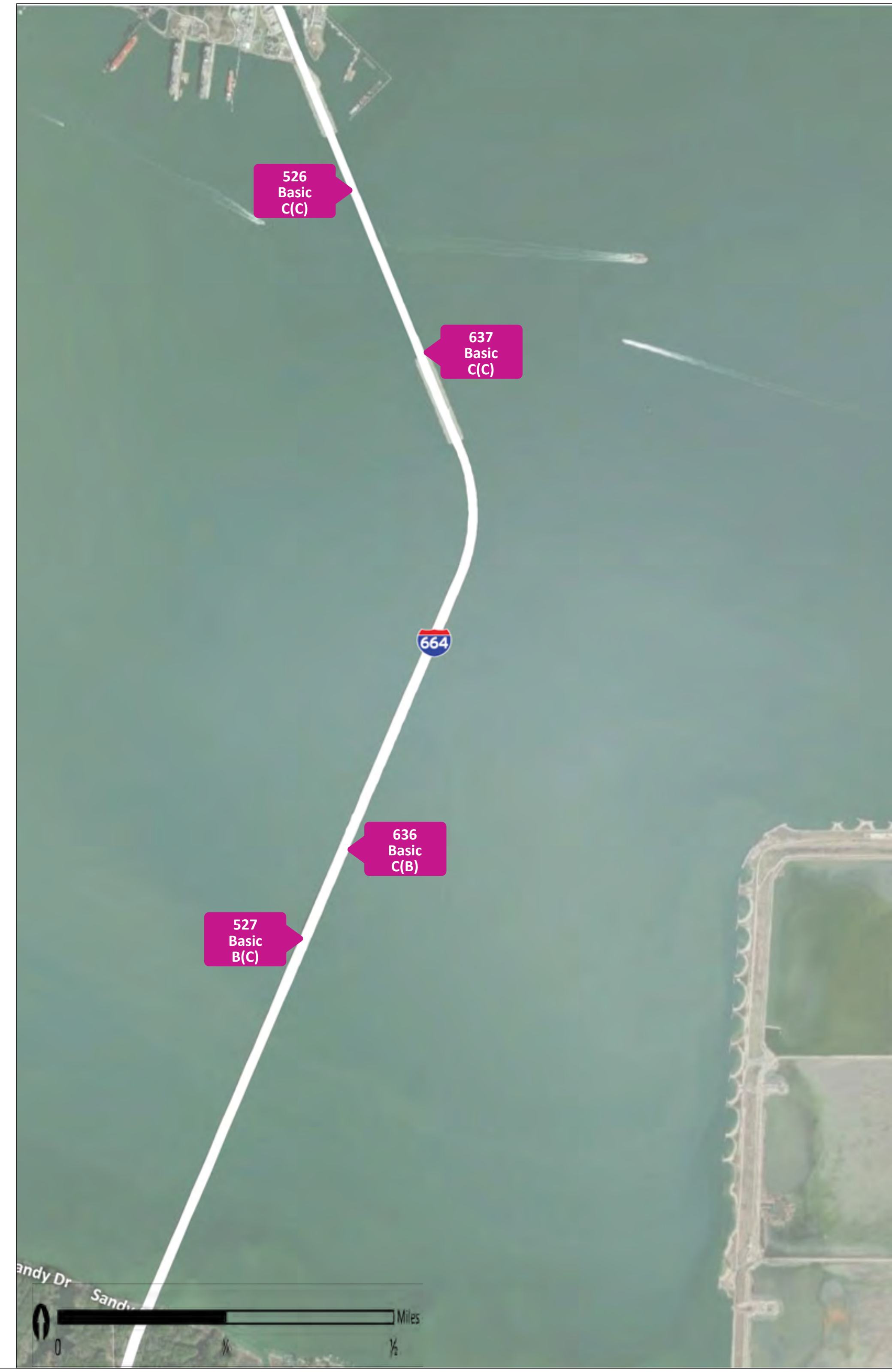
2045 BASELINE BUILD

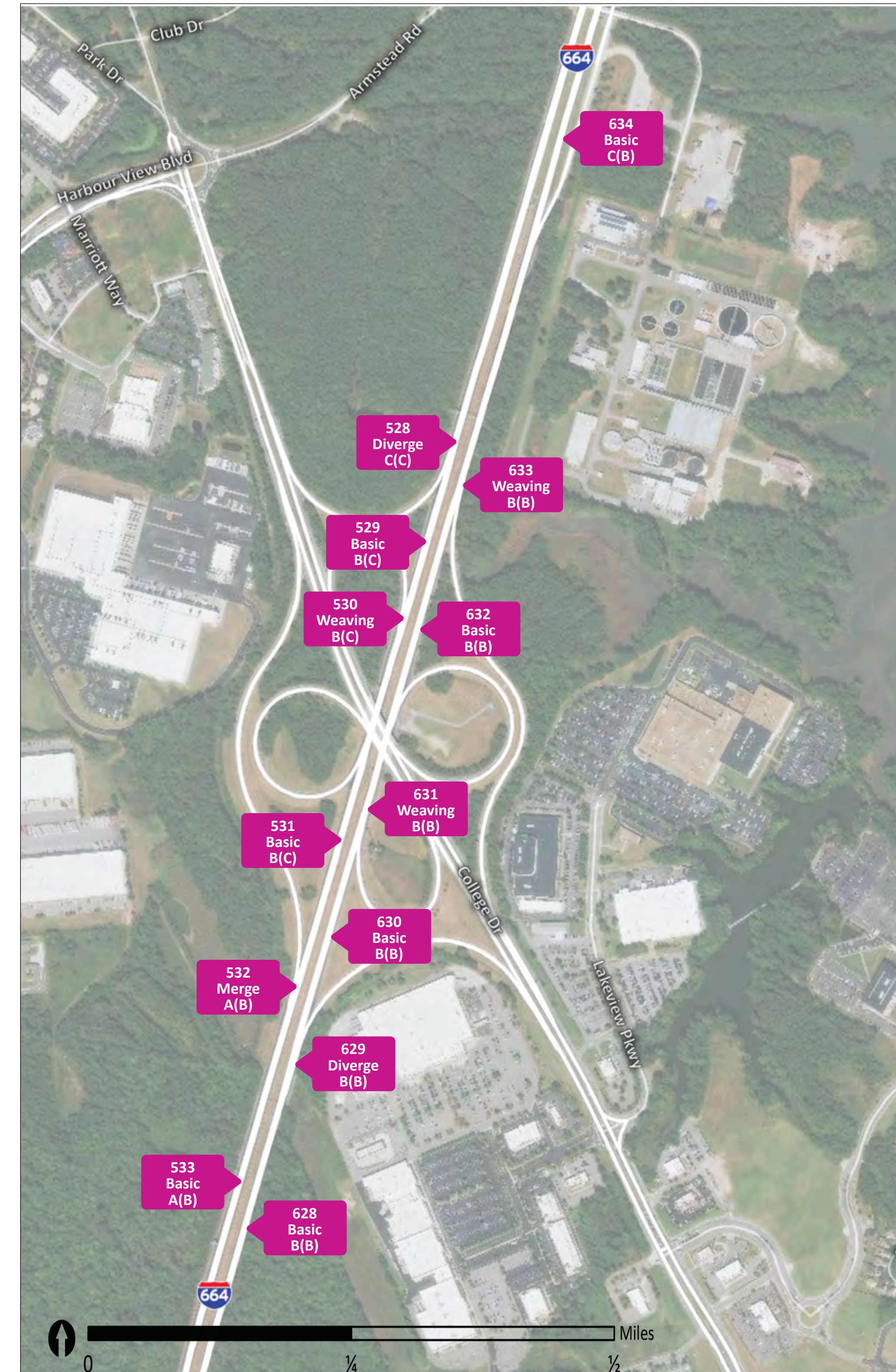
FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 46

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023





LEGEND

General Purpose Segment

228	Analysis ID Number
Basic	HCS2023 Freeway Analysis Type
A(A)	AM (PM) LOS

Managed Lane Junction

228	Analysis ID Number
Basic	HCS2023 Freeway Analysis Type
A(A)	AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

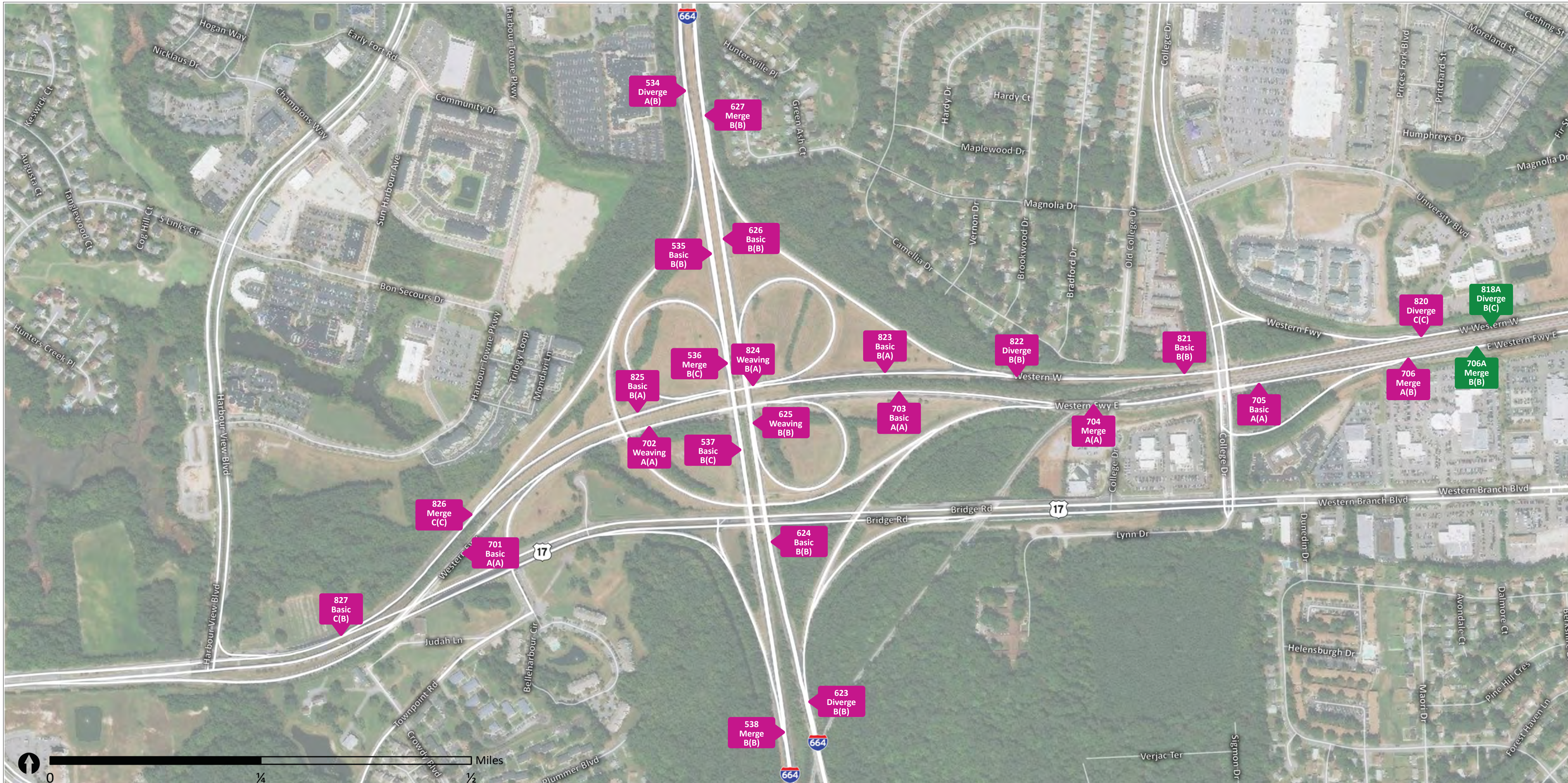
FIGURE 47

the heartbeat of HAMPTON ROADS TPO
TRANSPORTATION PLANNING ORGANIZATION

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) LOS

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) LOS

2045 BASELINE BUILD

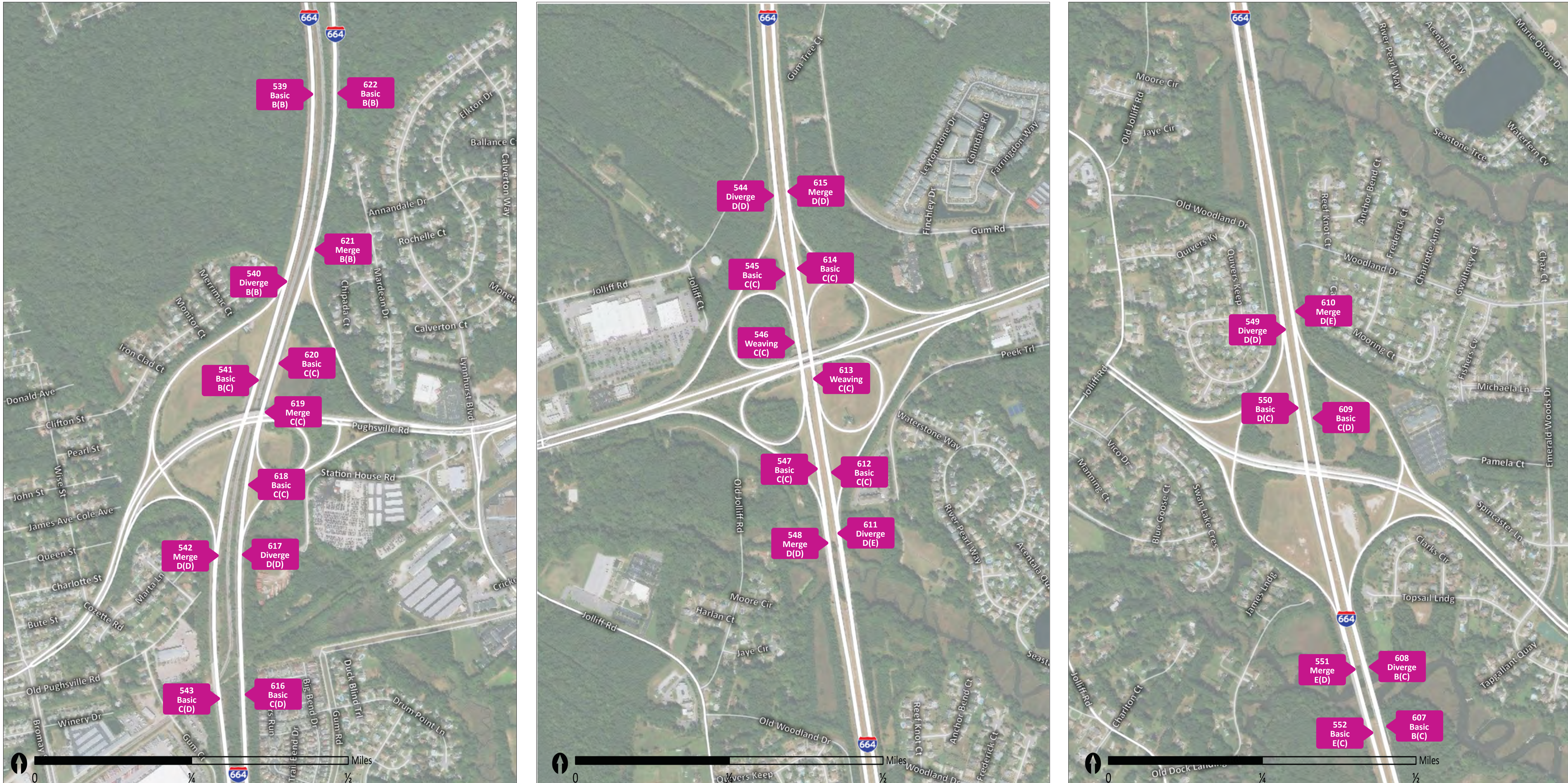
FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 48

Hampton Roads TPO
Michael Baker International

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number / HCS2023 Freeway Analysis Type / AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number / HCS2023 Freeway Analysis Type / AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

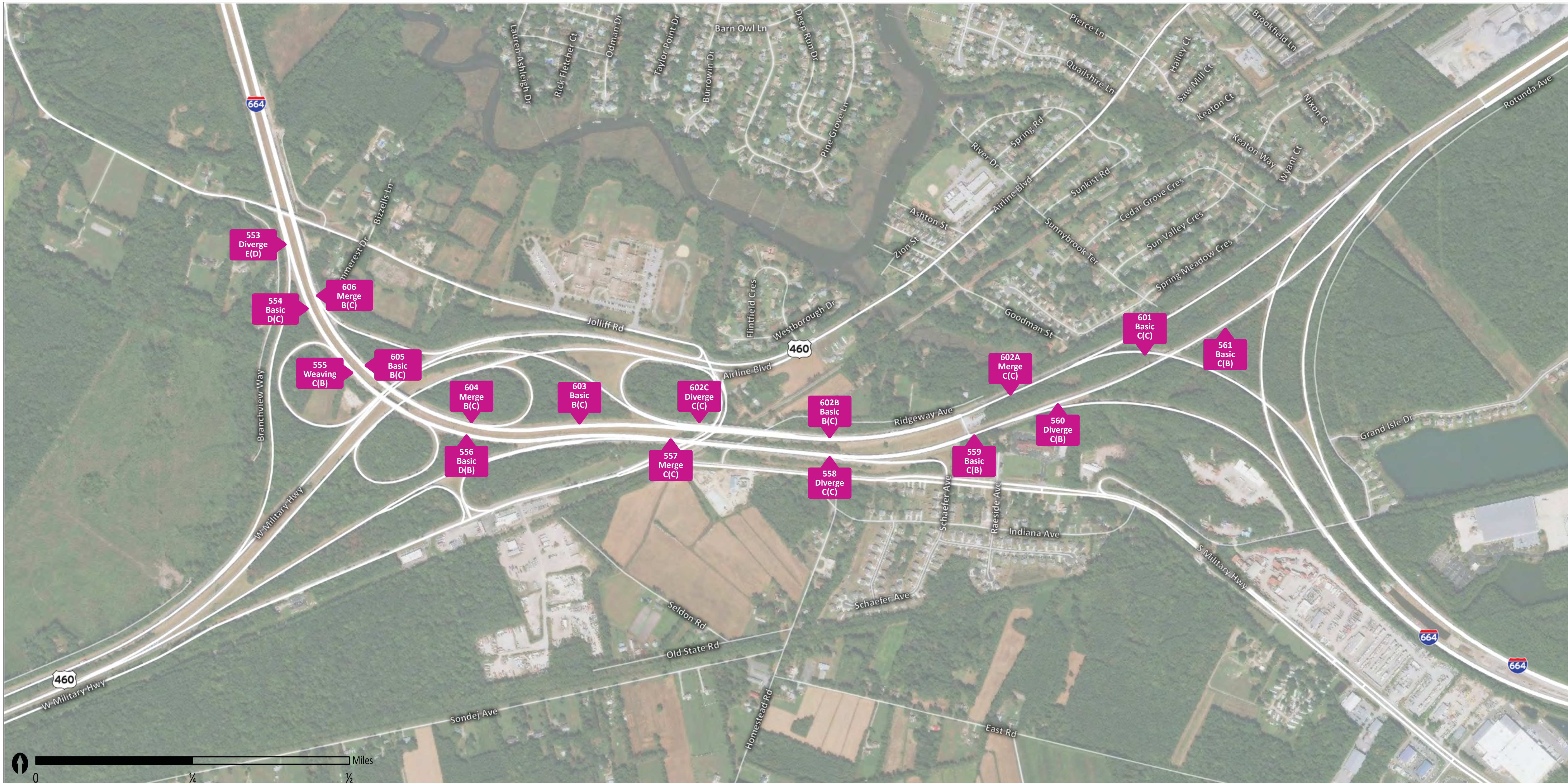
FIGURE 49

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) LOS

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

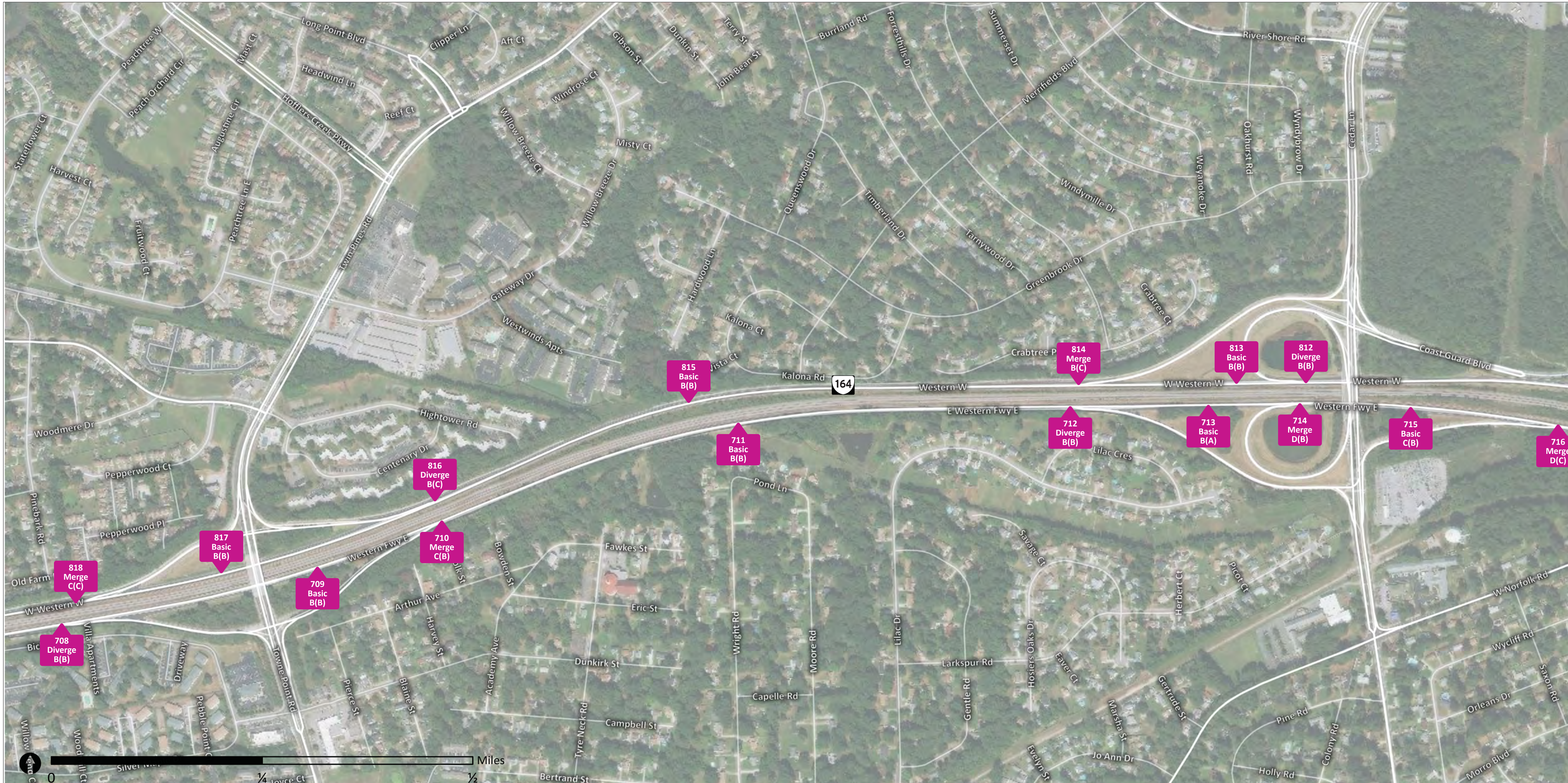
FIGURE 50

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

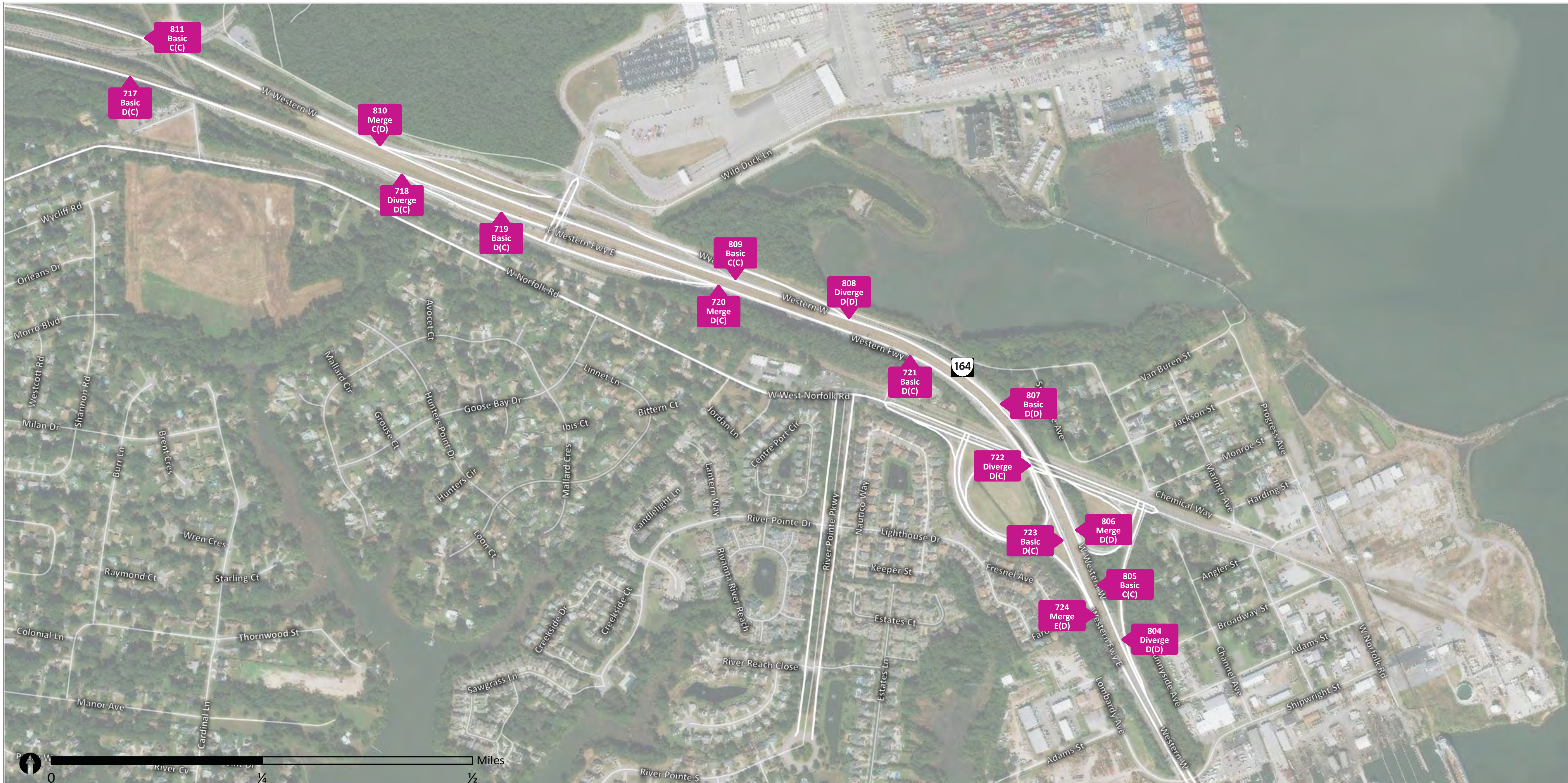
FIGURE 51

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

FIGURE 52

the heartbeat of HAMPTON ROADS TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

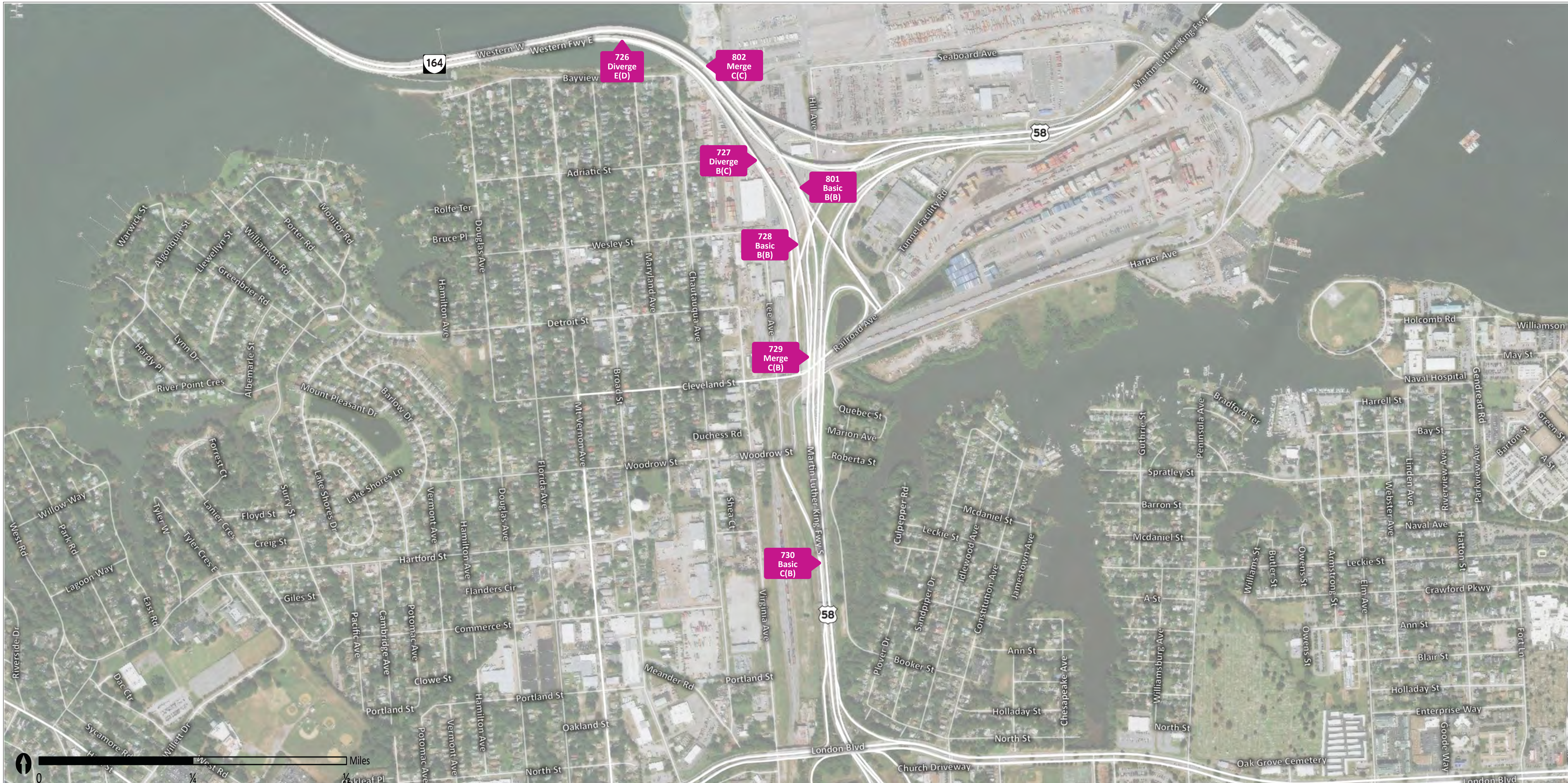
FIGURE 53

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) LOS

Managed Lane Junction

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) LOS

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS LEVEL OF SERVICE

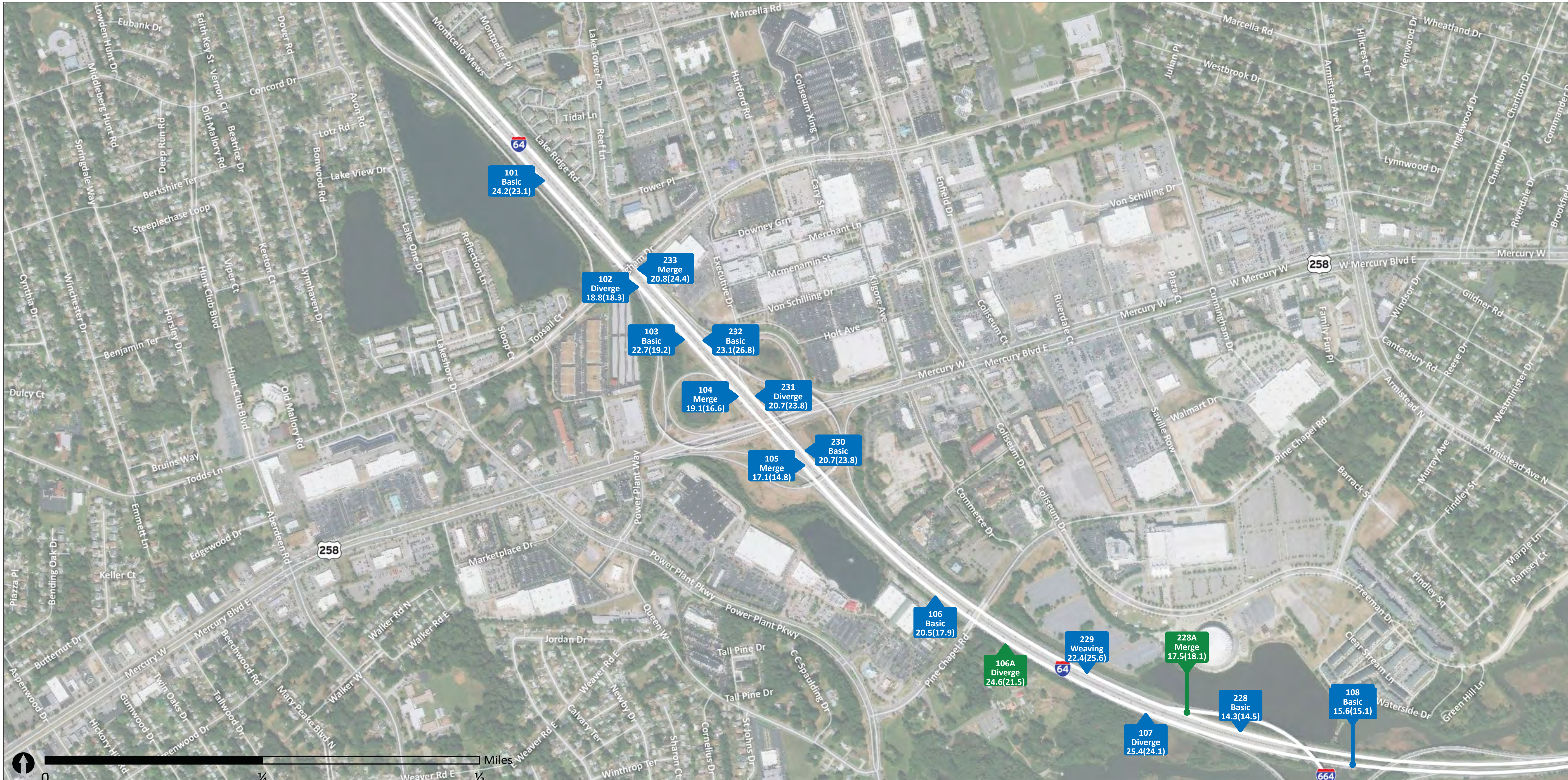
FIGURE 54

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 55

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

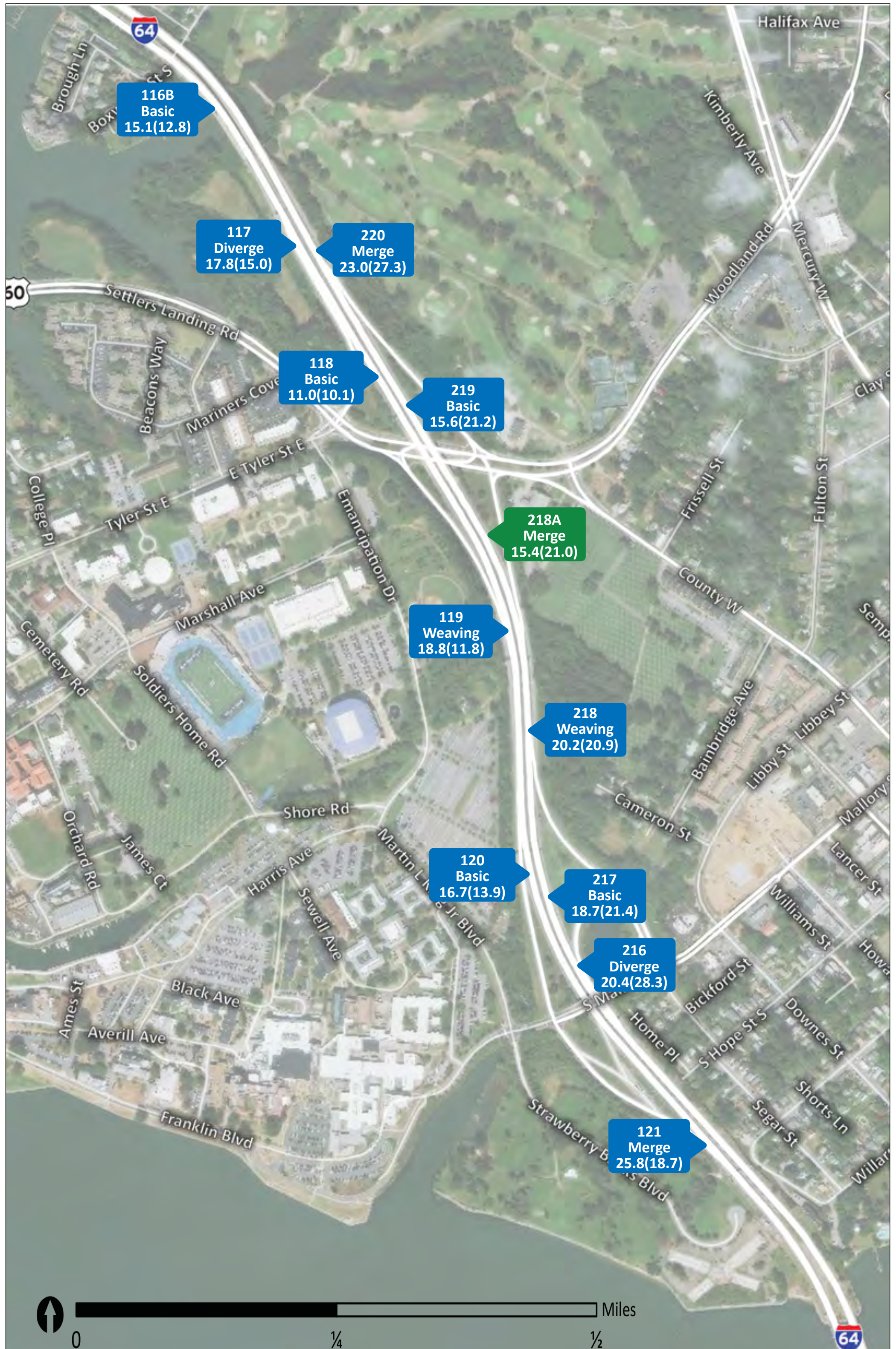
FIGURE 56

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 57

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 58

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 59

Hampton Roads TPO — Michael Baker International

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A)
- Analysis ID Number
- HCS2023 Freeway Analysis Type
- AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A)
- Analysis ID Number
- HCS2023 Freeway Analysis Type
- AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

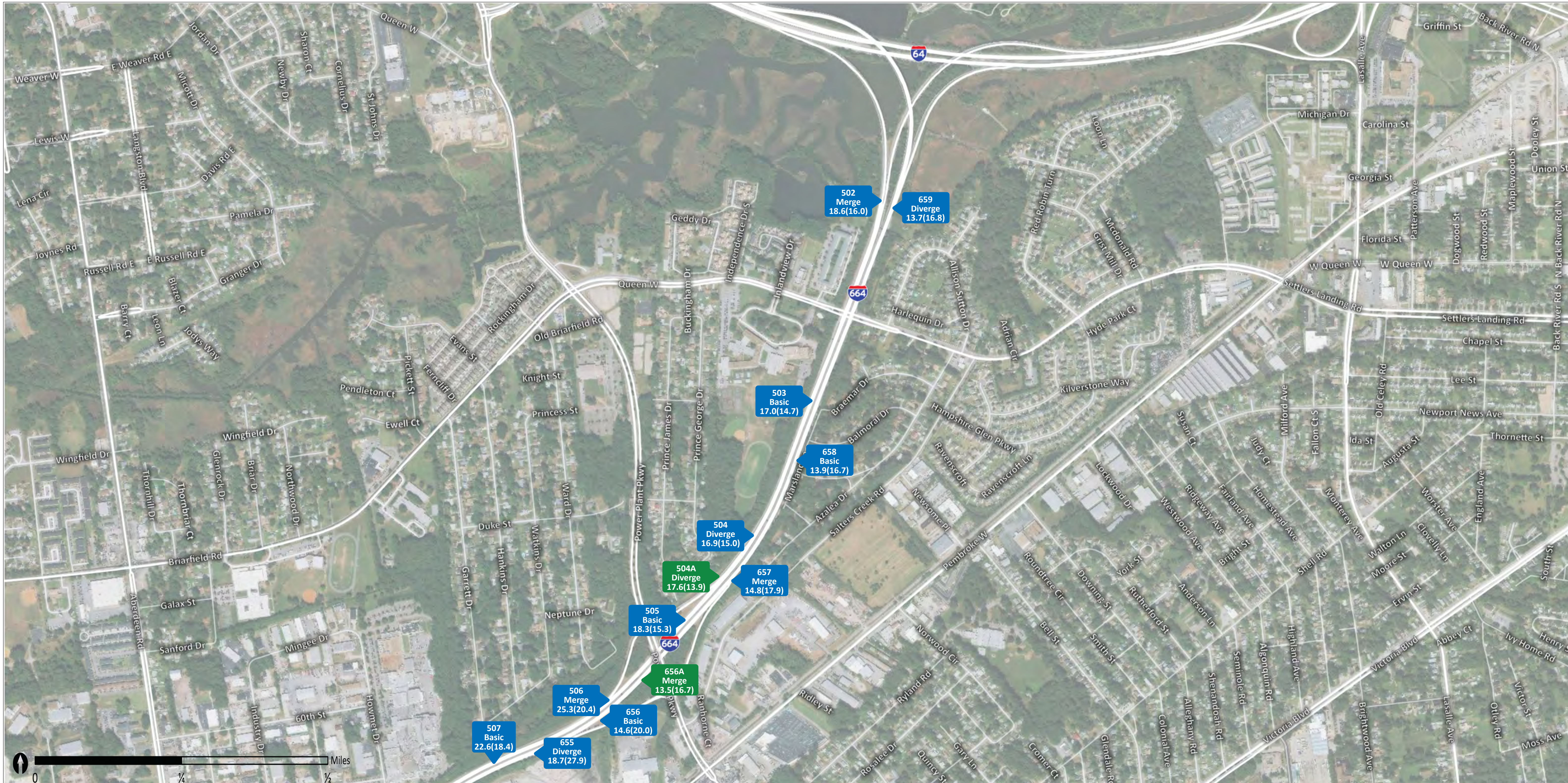
FIGURE 60

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228 Basic A(A)
- Analysis ID Number
- HCS2023 Freeway Analysis Type
- AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A)
- Analysis ID Number
- HCS2023 Freeway Analysis Type
- AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

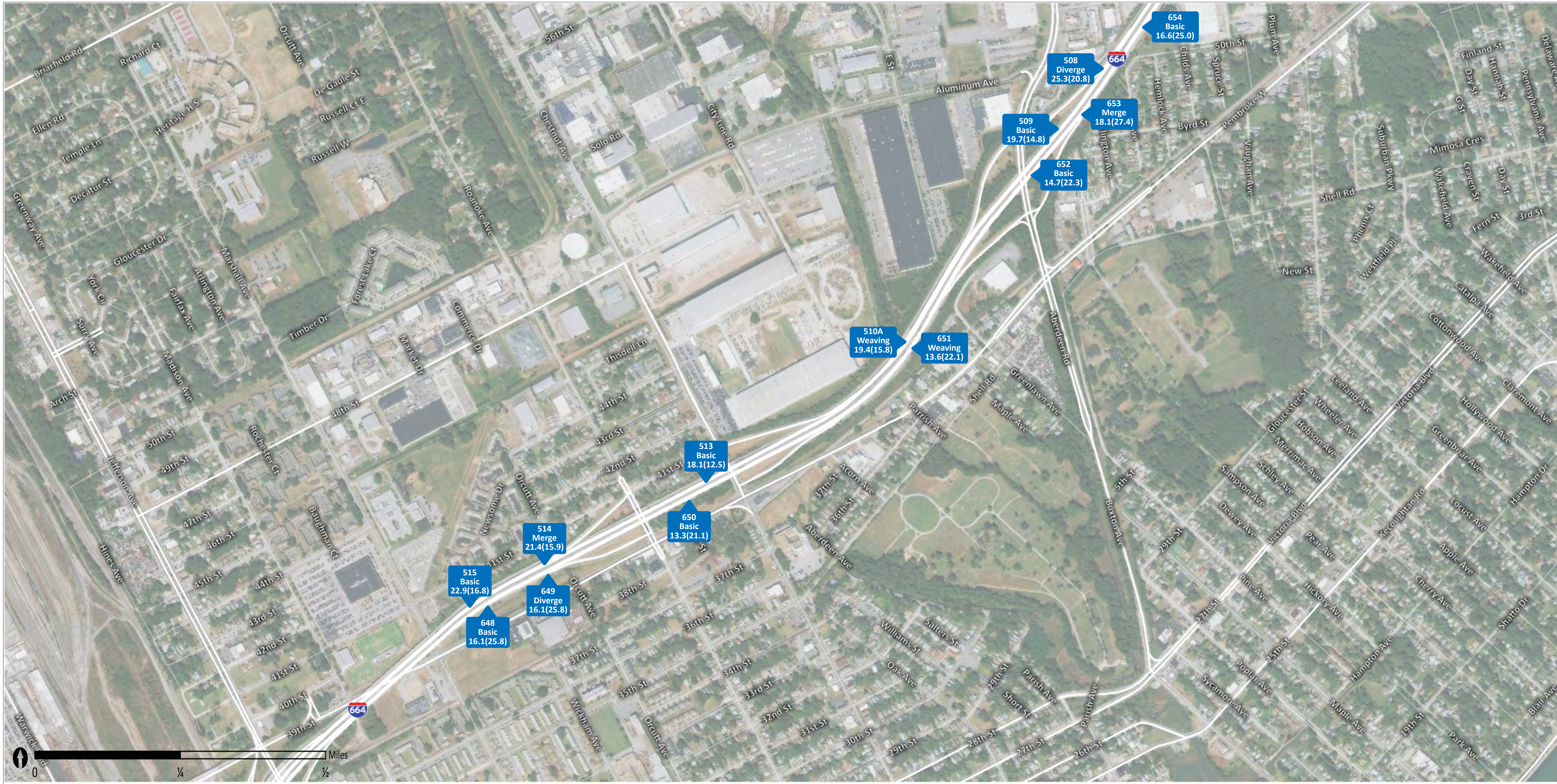
FIGURE 61

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 62

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 63

the heartbeat of HAMPTON ROADS TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 64

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 65

HAMPTON ROADS TPO

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 66

the heartbeat of Hampton Roads TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD
FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

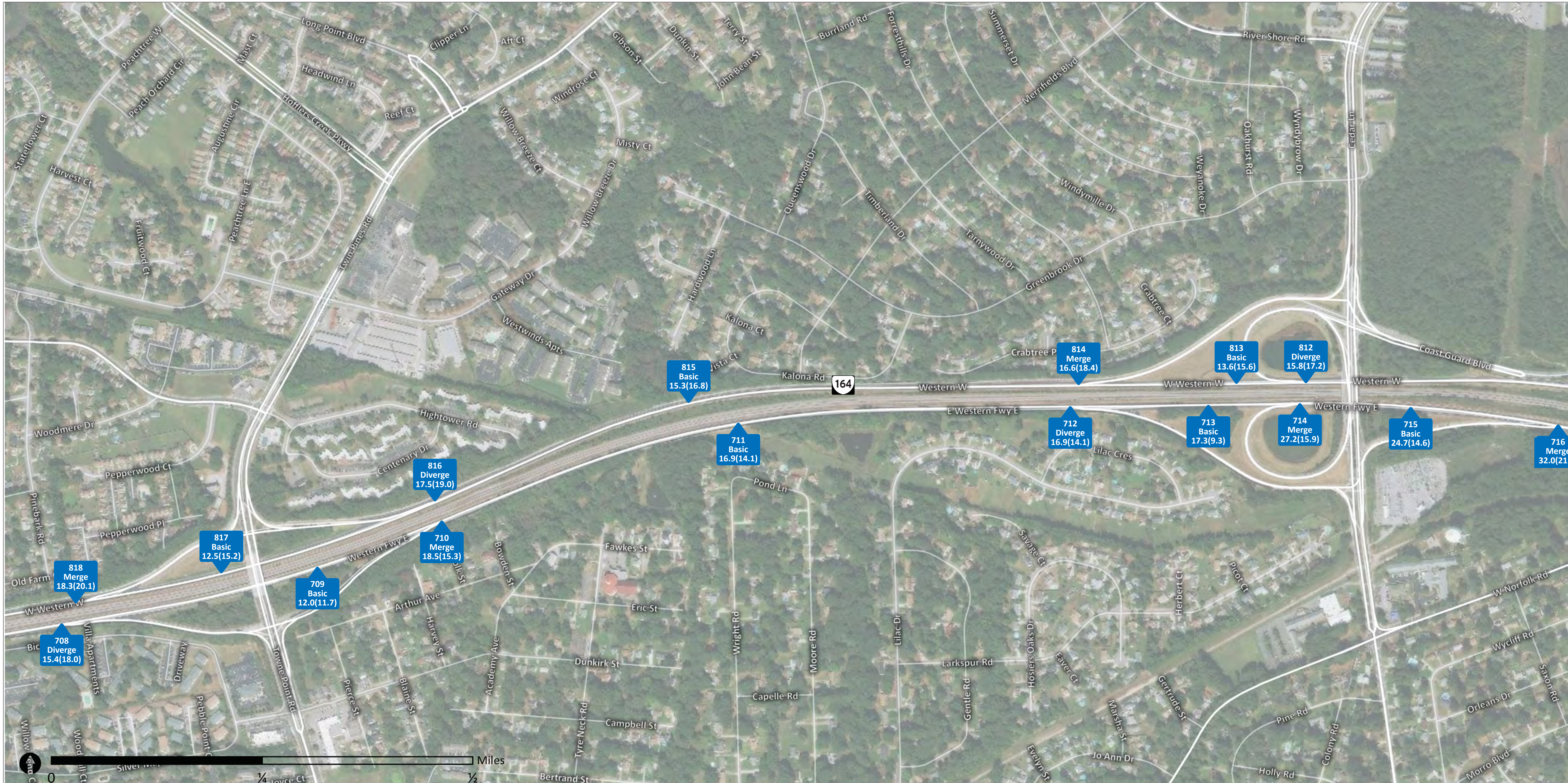
FIGURE 67

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023



LEGEND

General Purpose Segment

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

Managed Lane Junction

228
Basic
A(A)

Analysis ID Number
HCS2023 Freeway Analysis Type
AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 68

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 69

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A) — Analysis ID Number; HCS2023 Freeway Analysis Type; AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 70

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

LEGEND

General Purpose Segment

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) Density, pc/mi/ln

Managed Lane Junction

228 Basic A(A)	Analysis ID Number HCS2023 Freeway Analysis Type AM (PM) Density, pc/mi/ln

2045 BASELINE BUILD

FREEWAY CAPACITY ANALYSIS RESULTS DENSITY

FIGURE 71

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

SEPTEMBER 2023

I-64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
101		Basic	500	C	24.1	62.0	0.09
102	Mercury Boulevard	Diverge	1500	C	18.8	59.8	0.29
103		Basic	1015	C	22.4	61.7	0.19
104		Merge	1500	C	18.8	62.0	0.27
105		Merge	1500	B	16.5	57.2	0.30
106		Basic	250	C	20.0	60.8	0.05
106A	Managed Lanes Diverge	Diverge	250	C	24.0	61.2	0.05
107	I-664	Diverge	1500	C	23.5	59.6	0.29
108		Basic	1335	C	18.3	61.8	0.25
109		Basic	300	D	27.6	61.5	0.06
110		Weaving	3100	D	27.4	46.4	0.76
111	LaSalle Avenue	Basic	700	C	19.5	61.3	0.13
112		Merge	1035	D	26.7	55.2	0.21
113		Merge	500	D	29.6	54.7	0.10
114		Overlap	1000	D	30.7	52.7	0.22
115	Rip Rap Road	Diverge	500	D	30.7	52.7	0.11
116		Basic	500	C	22.7	57.9	0.10
116A	Managed Lanes Diverge	Diverge	1000	C	24.6	57.2	0.20
116B		Basic	4920	B	16.1	62.0	0.90
117	Settlers Landing Road	Diverge	1500	C	19.1	52.5	0.32
118		Basic	1360	B	12.1	61.1	0.25
119		Weaving	2060	C	20.4	46.0	0.51
120	S Mallory Street	Basic	835	B	17.9	60.5	0.16
121		Merge	1500	D	28.3	55.6	0.31
122	HRBT	Basic	12700	E	42.6	36.9	3.91
123		Basic	4270	C	25.4	62.0	0.78
124	W Ocean View Avenue	Diverge	1500	D	30.2	52.0	0.33
125		Basic	170	C	24.8	59.4	0.03
126		Merge	1500	D	28.0	55.7	0.31
127		Basic	5770	C	25.1	62.0	1.06

I-64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
128	4th View Street	Diverge	1500	D	28.3	55.0	0.31
129		Basic	2275	C	20.4	61.7	0.42
130		Merge	1500	C	24.6	56.1	0.30
131		Basic	3470	C	22.3	61.9	0.64
132	Naval Station	Merge	1500	D	27.5	55.3	0.31
133		Basic	2270	C	24.5	61.7	0.42
133A	Managed Lanes Merge	Merge	1500	C	22.7	62.0	0.27
134	I-564 W / US460	Weaving	2225	D	28.9	42.1	0.60
135		Basic	500	B	17.3	59.8	0.10

I-64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
201		Basic	2640	C	18.4	62.0	0.48
202	On-Ramp from I564 W	Merge	1500	C	24.3	57.1	0.30
203		Basic	370	C	22.4	60.9	0.07
203A	Managed Lanes Merge	Merge	1500	B	14.9	61.8	0.28
203B	US 460 / Managed Lanes Diverge	Weaving	1700	C	23.1	49.6	0.39
204A		Basic	1265	C	21.5	60.9	0.24
206	Naval Station	Diverge	1500	C	23.0	57.9	0.29
207		Basic	2590	C	18.1	61.9	0.48
208	4th View Street	Diverge	1500	C	20.1	55.8	0.31
209		Basic	2210	B	16.8	61.7	0.41
210		Merge	1500	C	20.6	56.8	0.30
211		Basic	4785	C	18.9	62.0	0.88
212	Ocean View Avenue	Diverge	1500	C	22.5	52.0	0.33
213		Basic	180	C	18.2	59.4	0.03
214		Merge	1500	C	21.7	55.8	0.31
215A		Basic	6895	C	19.6	62.0	1.26
215B	HRBT	Basic	9000	C	24.4	49.8	2.05
215		Basic	500	C	19.6	62.0	0.09
216	S Mallory Street	Diverge	1500	C	20.7	58.5	0.29
217		Basic	900	C	19.0	61.5	0.17
218	Settlers Landing Road	Weaving	1275	C	20.2	47.9	0.30
218A	Managed Lanes Merge	Merge	1500	B	17.1	60.5	0.28
219	Settlers Landing Road	Basic	250	B	17.4	61.6	0.05
220		Merge	1500	C	24.6	57.2	0.30
221		Basic	5770	C	22.2	62.0	1.06

I-64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
222	LaSalle Avenue	Diverge	1500	D	31.3	59.8	0.29
222A	Managed Lanes Diverge	Diverge	750	D	27.1	61.6	0.14
223	LaSalle Avenue	Basic	750	D	28.5	61.2	0.14
224		Diverge	1500	D	30.5	58.4	0.29
225		Basic	420	D	27.7	61.2	0.08
226	I-664 N	Weaving	2400	D	34.2	41.2	0.66
227		Basic	1700	C	22.2	61.2	0.32
228		Basic	300	B	14.8	61.9	0.06
228A	Managed Lanes Merge	Merge	500	C	18.8	56.6	0.10
229	I-664 S	Weaving	3895	C	21.6	48.9	0.91
230	Mercury Boulevard	Basic	900	C	19.1	61.7	0.17
231		Diverge	1500	C	19.1	62.0	0.27
232		Basic	1235	C	22.2	62.0	0.23
233		Merge	1500	C	20.3	57.7	0.30
234		Basic	2640	C	23.2	61.8	0.49

NO - BUILD
FREEWAY CAPACITY ANALYSIS RESULTS I-64 AM

FIGURE 72

Hampton Roads TPO
Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
101		Basic	500	C	22.7	62.0	0.09
102	Mercury Boulevard	Diverge	1500	B	18.0	58.6	0.29
103		Basic	1015	C	18.5	61.6	0.19
104		Merge	1500	B	15.9	61.9	0.28
105		Merge	1500	B	14.0	57.8	0.29
106		Basic	250	B	17.0	61.0	0.05
106A	Managed Lanes Diverge	Diverge	250	C	20.4	61.3	0.05
107	I-664	Diverge	1500	C	21.1	59.8	0.29
108		Basic	1335	B	16.0	61.8	0.25
109		Basic	300	C	24.0	61.9	0.06
110		Weaving	3100	D	29.4	44.6	0.79
111	LaSalle Avenue	Basic	700	C	19.5	61.2	0.13
112		Merge	1035	C	24.5	55.5	0.21
113		Merge	500	C	25.7	55.3	0.10
114		Overlap	1000	D	27.5	51.8	0.22
115	Rip Rap Road	Diverge	500	D	27.5	51.8	0.11
116		Basic	500	B	15.8	57.5	0.10
116A	Managed Lanes Diverge	Diverge	1000	B	16.9	57.9	0.20
116B		Basic	4920	B	12.6	62.0	0.90
117	Settlers Landing Road	Diverge	1500	B	14.7	52.9	0.32
118		Basic	1360	A	10.2	61.1	0.25
119		Weaving	2060	B	12.0	52.7	0.44
120	S Mallory Street	Basic	835	B	13.4	61.1	0.16
121		Merge	1500	C	18.9	56.7	0.30
122	HRBT	Basic	12700	C	20.7	51.7	2.79
123		Basic	4270	B	17.3	62.0	0.78
124	W Ocean View Avenue	Diverge	1500	C	20.6	52.1	0.33
125		Basic	170	B	17.0	59.4	0.03
126		Merge	1500	C	20.1	56.7	0.30
127		Basic	5770	C	18.3	62.0	1.06

64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
128	4th View Street	Diverge	1500	C	20.5	55.5	0.31
129		Basic	2275	B	15.9	61.7	0.42
130		Merge	1500	C	18.2	56.8	0.30
131		Basic	3470	B	16.6	61.9	0.64
132	Naval Station	Merge	1500	C	24.6	55.7	0.31
133		Basic	2270	C	22.1	61.7	0.42
133A	Managed Lanes Merge	Merge	1500	B	17.8	62.0	0.27
134	I-564 W / US460	Weaving	2225	C	23.9	43.0	0.59
135		Basic	500	B	14.5	59.9	0.09

64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
201		Basic	2640	C	20.3	62.0	0.48
202	On-Ramp from I564 W	Merge	1500	D	28.7	56.2	0.30
203		Basic	370	D	26.1	60.7	0.07
203A	Managed Lanes Merge	Merge	1500	C	19.2	61.7	0.28
203B	US 460 / Managed Lanes Diverge	Weaving	1700	D	34.9	43.5	0.44
204A		Basic	1265	C	23.6	60.3	0.24
206	Naval Station	Diverge	1500	C	25.4	57.7	0.30
207		Basic	2590	C	23.1	61.8	0.48
208	4th View Street	Diverge	1500	C	24.9	57.5	0.30
209		Basic	2210	C	21.5	61.8	0.41
210		Merge	1500	D	29.7	55.4	0.31
211		Basic	4785	D	26.7	61.7	0.88
212	Ocean View Avenue	Diverge	1500	D	28.5	57.7	0.30
215A	HRBT	Basic	8575	C	25.7	61.9	1.57
215B		Basic	9000	E	44.0	36.1	2.83
215		Basic	500	C	25.7	61.9	0.09
216	S Mallory Street	Diverge	1500	D	29.9	52.7	0.32
217		Basic	900	C	22.2	60.7	0.17
218	Settlers Landing Road	Weaving	1275	C	21.8	49.1	0.30
218A	Managed Lanes Merge	Merge	1500	C	22.0	60.6	0.28
219	Settlers Landing Road	Basic	250	C	22.2	61.7	0.05
220		Merge	1500	D	28.2	56.6	0.30
221		Basic	5770	C	25.8	61.9	1.06

64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
222	LaSalle Avenue	Diverge	1500	E	37.3	57.1	0.30
222A	Managed Lanes Diverge	Diverge	750	D	29.7	60.7	0.14
223	LaSalle Avenue	Basic	750	D	29.0	61.0	0.14
224		Diverge	1500	D	33.8	52.4	0.33
225		Basic	420	C	23.9	60.0	0.08
226	I-664 N	Weaving	2400	D	28.3	44.7	0.61
227		Basic	1700	C	23.4	61.4	0.31
228		Basic	300	B	15.6	61.9	0.06
228A	Managed Lanes Merge	Merge	500	C	19.1	61.9	0.09
229	I-664 S	Weaving	3895	C	25.1	51.8	0.85
230	Mercury Boulevard	Basic	900	C	23.1	61.8	0.17
231		Diverge	1500	C	23.1	62.0	0.27
232		Basic	1235	D	27.1	61.6	0.23
233		Merge	1500	C	24.5	56.0	0.30
234		Basic	2640	D	28.2	61.3	0.49

NO - BUILD
FREEWAY CAPACITY ANALYSIS RESULTS I-64 PM

FIGURE 73

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
601	I-64	Basic	2640	C	22.5	66.6	0.45
602A	I-264	Merge	1500	C	18.3	63.0	0.27
602B		Basic	685	B	17.4	66.3	0.12
602C	US 58 / US 460	Diverge	1500	C	20.2	57.7	0.30
603		Basic	1715	B	17.0	66.3	0.29
604		Merge	1500	B	14.6	66.9	0.25
605		Basic	395	B	14.7	67.0	0.07
606		Merge	1500	B	17.0	61.9	0.28
607		Basic	1260	B	15.7	66.5	0.22
608	Dock Landing Road	Diverge	1500	B	15.7	66.9	0.25
609		Basic	2520	C	22.3	66.6	0.43
610		Merge	1500	D	30.0	58.0	0.29
611	Portsmouth Boulevard	Diverge	1450	D	30.3	57.8	0.29
612		Basic	495	B	18.0	65.1	0.09
613		Weaving	1650	B	17.8	56.3	0.33
614		Basic	575	C	21.3	65.2	0.10
615		Merge	1500	C	25.3	60.1	0.28
616		Basic	5345	C	23.0	66.4	0.91
617	Pughsville Road	Diverge	1500	D	26.9	56.7	0.30
618		Basic	945	C	18.7	65.6	0.16
619		Merge	1500	C	23.4	59.0	0.29
620		Basic	165	C	20.7	64.9	0.03
621		Merge	1500	B	15.2	66.5	0.26
622		Basic	480	B	15.2	66.9	0.08
623	US 17 / SR 164	Diverge	1500	B	15.2	67.0	0.25
624		Basic	1015	B	16.5	67.0	0.17
625		Weaving	1710	B	13.9	57.5	0.34
626		Basic	645	B	14.7	65.6	0.11
627		Merge	1500	B	11.7	66.8	0.26
628		Basic	3900	B	11.7	67.0	0.66
629	College Drive	Diverge	1500	B	11.7	67.0	0.25
630		Basic	540	B	14.4	67.0	0.09
631		Weaving	1695	B	11.9	60.7	0.32
632		Basic	50	B	15.3	65.5	0.01
633		Weaving	2365	B	12.6	61.0	0.44
634		Basic	1125	B	17.1	66.6	0.19

I-664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
635	Inspection Station	Merge	1500	C	18.8	61.4	0.28
635A	Managed Lanes Merge	Merge	1500	C	23.5	59.6	0.29
636		Basic	15110	C	21.1	66.9	2.57
637	MMMBT	Basic	7600	D	26.9	52.5	1.65
638		Basic	500	C	22.6	62.5	0.09
639	Terminal Avenue	Diverge	1500	C	25.5	55.2	0.31
640		Basic	1700	C	20.5	66.1	0.29
641		Merge	1130	C	23.1	60.2	0.21
642		Overlap	370	C	25.5	54.7	0.08
643	35th Street / 26th Street / 27th Street / US 60	Diverge	1130	C	25.5	54.7	0.23
644		Basic	1900	C	18.7	65.9	0.33
645		Weaving	1975	B	17.1	54.3	0.41
646		Basic	1080	B	14.7	65.9	0.19
647		Merge	1070	B	11.6	66.8	0.18
648		Overlap	430	B	12.4	62.5	0.08
649	Roanoke Avenue	Diverge	1070	B	12.4	62.5	0.19
650		Basic	1950	A	10.8	66.6	0.33
651	Chestnut Avenue	Weaving	2815	B	12.0	56.9	0.56
652	Aberdeen Road	Basic	1250	B	11.4	66.6	0.21
653		Merge	1500	B	13.6	63.1	0.27
654		Basic	2010	B	12.8	66.8	0.34
655	Power Plant Parkway	Diverge	1500	B	13.6	62.9	0.27
656		Basic	1900	B	11.2	66.7	0.32
657		Merge	1500	B	13.5	62.6	0.27
658		Basic	1500	B	12.6	66.6	0.26
659	I-64	Diverge	1500	A	9.3	67.0	0.25
660		Basic	2640	B	15.6	67.0	0.45

I-664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
501	I-64	Basic	1000	B	11.2	67.0	0.17
502		Merge	1500	B	13.9	67.0	0.25
503		Basic	1090	C	18.5	67.0	0.18
504	Power Plant Parkway	Diverge	1500	C	19.5	63.5	0.27
505		Basic	1660	B	17.7	66.7	0.28
506		Merge	1500	C	22.1	61.2	0.28
507		Basic	3600	C	20.2	66.9	0.61
508	Aberdeen Road	Diverge	1500	C	21.6	62.8	0.27
509		Basic	1995	B	17.8	66.8	0.34
510A	Chestnut Avenue	Weaving	2050	C	21.3	47.4	0.49
513	Roanoke Avenue	Basic	3040	B	16.6	66.7	0.52
514		Merge	1200	C	18.7	61.9	0.22
515		Overlap	300	C	19.3	60.2	0.06
516	35th Street / 26th Street / 27th Street / US 60	Diverge	1200	C	19.3	60.2	0.23
517		Basic	1055	B	12.5	65.9	0.18
518		Diverge	1500	B	12.5	66.9	0.25
519		Basic	1960	B	14.9	67.0	0.33
520		Merge	1500	B	13.9	67.0	0.25
521		Basic	1000	C	20.8	66.9	0.17
522		Merge	1500	B	14.7	67.0	0.25
523	Terminal Avenue	Diverge	1200	B	16.3	60.4	0.23
524A		Basic	1000	B	14.2	65.9	0.17
524		Basic	500	C	21.3	66.7	0.09
525		Merge	1500	C	24.1	60.4	0.28
526	MMMBT	Basic	7600	D	33.5	43.4	1.99
527		Basic	15110	C	23.2	62.0	2.77
527A	Managed Lanes Diverge	Diverge	1500	C	23.9	60.2	0.28
528	College Drive	Diverge	1500	B	14.6	58.4	0.29
529		Basic	740	B	12.3	65.6	0.13
530		Weaving	1805	A	10.6	58.6	0.35
531		Basic	990	A	10.6	66.1	0.17
532		Merge	1500	A	7.7	66.9	0.25

I-664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
533		Basic	1550	A	7.7	67.0	0.26
534	US 17 / SR 164	Diverge	1500	A	7.7	67.0	0.25
535		Basic	1190	A	10.4	67.0	0.20
536		Merge	1500	B	13.6	62.6	0.27
537		Basic	685	B	12.7	66.3	0.12
538		Merge	1500	B	12.4	66.9	0.25
539		Basic	835	B	12.4	67.0	0.14
540	Pughsville Road	Diverge	1500	B	12.4	67.0	0.25
541		Basic	2435	B	16.1	67.0	0.41
542		Merge	1500	C	24.9	60.7	0.28
543		Basic	5245	C	22.7	66.5	0.90
544	Portsmouth Boulevard	Diverge	1500	C	25.1	60.0	0.28
545		Basic	565	C	22.0	65.7	0.10
546		Weaving	1710	C	21.8	54.5	0.36
547		Basic	485	C	25.1	64.9	0.08
548		Merge	1500	D	31.7	57.8	0.29
549	Dock Landing Road	Diverge	1500	D	31.5	58.3	0.29
550		Basic	2510	D	27.5	64.4	0.44
551		Merge	1500	E	42.9	53.1	0.32
552		Basic	710	E	41.3	55.1	0.15
553	US 58 / US 460	Diverge	1500	E	37.3	61.0	0.28
554		Basic	470	D	29.6	63.1	0.08
555		Weaving	2060	C	21.4	58.9	0.40
556		Basic	745	D	27.7	64.2	0.13
557		Merge	1500	C	22.9	61.5	0.28
558		Diverge	1500	C	23.4	60.4	0.28
559		Basic	970	C	18.5	66.1	0.17
560	I-64	Diverge	1500	C	22.0	56.4	0.30
561	I-264	Basic	1000	C	19.2	65.6	0.17

NO - BUILD
FREEWAY CAPACITY ANALYSIS RESULTS I-664 AM

FIGURE 74

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
601	I-64	Basic	2640	C	25.3	65.5	0.46
602A	I-264	Merge	1500	C	23.4	61.0	0.28
602B		Basic	685	C	21.7	66.0	0.12
602C	US 58 / US 460	Diverge	1500	C	25.4	57.1	0.30
603		Basic	1715	C	22.1	66.3	0.29
604		Merge	1500	C	18.6	66.9	0.25
605		Basic	395	C	18.8	67.0	0.07
606		Merge	1500	C	21.9	61.2	0.28
607		Basic	1260	C	20.0	66.4	0.22
608	Dock Landing Road	Diverge	1500	C	20.0	66.9	0.25
609		Basic	2520	D	27.9	64.1	0.45
610		Merge	1500	E	35.6	56.0	0.30
611	Portsmouth Boulevard	Diverge	1450	D	34.4	58.0	0.28
612		Basic	495	C	22.6	65.1	0.09
613		Weaving	1650	C	20.3	55.3	0.34
614		Basic	575	C	22.6	65.1	0.10
615		Merge	1500	D	28.5	59.3	0.29
616		Basic	5345	C	26.0	65.2	0.93
617	Pughsville Road	Diverge	1500	D	30.3	55.9	0.30
618		Basic	945	C	18.3	65.5	0.16
619		Merge	1500	C	22.1	59.2	0.29
620		Basic	165	C	19.6	65.0	0.03
621		Merge	1500	B	14.2	66.5	0.26
622		Basic	480	B	14.2	66.9	0.08
623	US 17 / SR 164	Diverge	1500	B	14.2	67.0	0.25
624		Basic	1015	B	15.3	67.0	0.17
625		Weaving	1710	B	12.4	58.2	0.33
626		Basic	645	B	12.8	65.7	0.11
627		Merge	1500	A	10.0	66.8	0.26
628		Basic	3900	A	10.1	67.0	0.66
629	College Drive	Diverge	1500	A	10.1	67.0	0.25
630		Basic	540	B	12.2	67.0	0.09
631		Weaving	1695	A	8.9	62.6	0.31
632		Basic	50	B	11.4	65.9	0.01
633		Weaving	2365	A	10.0	61.2	0.44
634		Basic	1125	B	13.8	66.7	0.19

664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
635	Inspection Station	Merge	1500	B	15.0	61.8	0.28
635A	Managed Lanes Merge	Merge	1500	C	23.3	59.6	0.29
636		Basic	15110	C	21.0	66.9	2.57
637	MMMBT	Basic	7600	D	26.6	52.7	1.64
638		Basic	500	C	20.4	67.0	0.08
639	Terminal Avenue	Diverge	1500	C	24.7	55.1	0.31
640		Basic	1700	C	19.7	66.1	0.29
641		Merge	1130	C	23.5	60.1	0.21
642		Overlap	370	C	25.6	55.1	0.08
643	35th Street / 26th Street / 27th Street / US 60	Diverge	1130	C	25.6	55.1	0.23
644		Basic	1900	C	20.3	66.0	0.33
645		Weaving	1975	C	21.6	51.7	0.43
646		Basic	1080	C	19.0	65.7	0.19
647		Merge	1070	C	19.3	66.8	0.18
648		Overlap	430	C	20.6	62.8	0.08
649	Roanoke Avenue	Diverge	1070	C	20.6	62.8	0.19
650		Basic	1950	C	18.1	66.6	0.33
651	Chestnut Avenue	Weaving	2815	C	20.3	54.0	0.59
652	Aberdeen Road	Basic	1250	C	19.5	66.5	0.21
653		Merge	1500	C	23.5	61.6	0.28
654		Basic	2010	C	21.7	66.7	0.34
655	Power Plant Parkway	Diverge	1500	C	23.2	62.4	0.27
656		Basic	1900	C	18.3	66.7	0.32
657		Merge	1500	C	21.8	61.4	0.28
658		Basic	1500	C	20.0	66.5	0.26
659	I-64	Diverge	1500	B	15.0	67.0	0.25
660		Basic	2640	C	22.9	66.5	0.45

664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
501	I-64	Basic	1000	A	6.8	67.0	0.17
502		Merge	1500	B	11.1	67.0	0.25
503		Basic	1090	B	14.8	67.0	0.18
504	Power Plant Parkway	Diverge	1500	B	15.9	62.6	0.27
505		Basic	1660	B	12.4	66.7	0.28
506		Merge	1500	B	15.8	62.1	0.27
507		Basic	3600	B	14.6	66.9	0.61
508	Aberdeen Road	Diverge	1500	B	15.7	62.4	0.27
509		Basic	1995	B	11.9	66.7	0.34
510A	Chestnut Avenue	Weaving	2050	B	14.1	51.9	0.45
513	Roanoke Avenue	Basic	3040	A	10.5	66.8	0.52
514		Merge	1200	B	12.9	62.7	0.22
515		Overlap	300	B	13.2	61.1	0.06
516	35th Street / 26th Street / 27th Street / US 60	Diverge	1200	B	13.2	61.1	0.22
517		Basic	1055	A	10.0	66.1	0.18
518		Diverge	1500	A	10.0	66.9	0.25
519		Basic	1960	A	10.1	67.0	0.33
520		Merge	1500	A	10.1	67.0	0.25
521		Basic	1000	B	15.1	67.0	0.17
522		Merge	1500	B	12.3	67.0	0.25
523	Terminal Avenue	Diverge	1200	B	13.9	59.4	0.23
524A		Basic	1000	B	11.2	65.7	0.17
524		Basic	500	B	16.8	66.6	0.09
525		Merge	1500	C	25.2	60.1	0.28
526	MMMBT	Basic	7600	D	30.3	50.1	1.72
527		Basic	15110	C	22.8	66.5	2.58
527A	Managed Lanes Diverge	Diverge	1500	C	24.7	61.4	0.28
528	College Drive	Diverge	1500	C	20.7	58.2	0.29
529		Basic	740	B	16.7	65.6	0.13
530		Weaving	1805	C	21.5	50.6	0.41
531		Basic	990	C	19.7	65.3	0.17
532		Merge	1500	B	15.3	66.8	0.26

664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
533		Basic	1550	B	15.3	67.0	0.26
534	US 17 / SR 164	Diverge	1500	B	15.3	67.0	0.25
535		Basic	1190	B	15.5	67.0	0.20
536		Merge	1500	C	19.6	62.0	0.27
537		Basic	685	C	18.1	66.1	0.12
538		Merge	1500	B	16.9	66.9	0.25
539		Basic	835	B	16.9	67.0	0.14
540	Pughsville Road	Diverge	1500	B	16.9	67.0	0.25
541		Basic	2435	C	18.9	67.0	0.41
542		Merge	1500	D	27.8	60.0	0.28
543		Basic	5245	C	25.5	65.4	0.91
544	Portsmouth Boulevard	Diverge	1500	D	28.1	59.4	0.29
545		Basic	565	C	22.2	65.6	0.10
546		Weaving	1710	C	24.2	49.9	0.39
547		Basic	485	C	20.7	64.1	0.09
548		Merge	1500	D	26.8	59.2	0.29
549	Dock Landing Road	Diverge	1500	D	27.5	57.7	0.30
550		Basic	2510	C	20.9	66.6	0.43
551		Merge	1500	D	26.3	60.0	0.28
552		Basic	710	C	23.8	65.8	0.12
553	US 58 / US 460	Diverge	1500	C	25.7	61.4	0.28
554		Basic	470	C	18.9	65.9	0.08
555		Weaving	2060	B	15.2	58.5	0.40
556		Basic	745	B	16.7	66.1	0.13
557		Merge	1500	C	20.7	56.5	0.30
558		Diverge	1500	C	19.7	59.4	0.29
559		Basic	970	B	13.8	66.0	0.17
560	I-64	Diverge	1500	B	16.6	55.8	0.31
561	I-264	Basic	1000	B	12.1	65.5	0.17

NO - BUILD

FREEWAY CAPACITY ANALYSIS RESULTS I-664 PM

FIGURE 75

REGIONAL CONNECTORS STUDY

AUGUST 2023

564 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
301		Basic	1670	A	3.1	62.0	0.31
302	Bellinger Boulevard	Merge	1500	A	7.0	62.0	0.27
303		Basic	2400	A	7.0	62.0	0.44
303A	Intermodal Connector	Merge	1500	A	4.2	60.2	0.28
303B		Basic	1380	A	5.0	61.8	0.25
303C		Basic	895	A	6.2	62.0	0.16
304	I-64 W / US 460	Diverge	1500	A	6.3	62.0	0.27
305		Basic	2400	A	5.8	62.0	0.44
306	Terminal Boulevard	Merge	1500	A	10.6	58.0	0.29
307		Basic	235	A	9.9	61.0	0.04

564 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
401	I-64	Basic	1500	C	19.2	62.0	0.27
402	Terminal Boulevard	Weaving	2155	D	28.2	40.7	0.60
403		Basic	1375	B	14.9	60.8	0.26
403A	Intermodal Connector	Diverge	1500	B	14.6	61.9	0.28
403B		Basic	5175	B	16.9	62.0	0.95
404	Bellinger Boulevard	Diverge	1500	B	17.9	58.8	0.29
405		Basic	2640	C	18.1	61.9	0.48

NO - BUILD

FREEWAY CAPACITY ANALYSIS RESULTS I-564 AM

FIGURE 76

Hampton Roads TPO

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-564 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
301		Basic	1670	B	11.6	62.0	0.31
302	Bellinger Boulevard	Merge	1500	B	16.4	62.0	0.27
303		Basic	2400	B	16.4	62.0	0.44
303A	Intermodal Connector	Merge	1500	A	9.2	59.9	0.28
303B		Basic	1380	A	11.0	61.8	0.25
303C		Basic	895	B	13.8	62.0	0.16
304	I-64 W / US 460	Diverge	1500	B	13.8	62.0	0.27
305		Basic	2400	B	14.4	62.0	0.44
306	Terminal Boulevard	Merge	1500	C	23.3	56.9	0.30
307		Basic	235	C	21.4	60.7	0.04

I-564 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
401	I-64	Basic	1500	A	4.7	62.0	0.27
402	Terminal Boulevard	Weaving	2155	A	7.1	51.6	0.47
403		Basic	1375	A	3.1	61.4	0.25
403A	Intermodal Connector	Diverge	1500	A	3.1	61.9	0.28
403B		Basic	5175	A	3.0	62.0	0.95
404	Bellinger Boulevard	Diverge	1500	A	3.2	59.0	0.29
405		Basic	2640	A	2.6	61.9	0.48

NO - BUILD
FREEWAY CAPACITY ANALYSIS RESULTS I-564 PM

FIGURE 77

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization
Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

164 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
701		Basic	2140	A	3.9	67.0	0.36
702	US 17 / I664	Weaving	2670	A	3.6	61.9	0.49
703		Basic	940	A	3.4	66.7	0.16
704		Merge	1500	A	8.4	62.8	0.27
705		Basic	615	A	7.8	66.2	0.11
706	College Drive	Merge	1500	A	10.3	61.1	0.28
706A	Managed Lanes Merge	Merge	1380	B	15.9	60.5	0.26
708	Towne Point Road	Diverge	1500	B	17.6	54.8	0.31
709		Basic	1905	B	12.7	66.2	0.33
710		Merge	1500	C	24.0	59.1	0.29
711		Basic	1370	C	21.2	66.2	0.24
712	Cedar Lane	Diverge	1500	C	24.5	57.8	0.29
713		Basic	1000	B	15.2	65.8	0.17
714		Merge	1500	C	23.6	60.6	0.28
715		Basic	110	C	21.4	65.3	0.02
716		Merge	1125	D	29.0	58.6	0.22
717		Basic	1500	D	26.1	65.1	0.26
718	VA International Gateway Boulevard	Diverge	1125	D	30.8	55.2	0.23
719		Basic	2270	C	25.8	65.3	0.40
720		Merge	1035	D	29.6	58.4	0.20
721		Basic	780	D	31.0	55.7	0.16
722	W Norfolk Road	Diverge	1035	D	31.0	55.7	0.21
723		Basic	605	C	24.3	64.0	0.11
724		Merge	1500	E	35.1	51.6	0.33
725		Basic	3600	D	31.9	56.8	0.72
726	US 58	Diverge	1500	E	36.1	50.1	0.34
727		Diverge	1390	B	17.2	51.9	0.30
728		Basic	1600	B	11.4	56.5	0.32
729		Merge	1500	C	19.0	54.1	0.32
730		Basic	2640	B	18.0	56.9	0.53

164 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
801	US 58	Basic	1060	A	10.1	57.0	0.21
802		Merge	1500	C	18.3	54.1	0.32
803A		Basic	2180	B	17.4	56.9	0.44
803		Basic	1600	D	26.1	57.0	0.32
804	W Norfolk Road	Diverge	1500	D	27.1	54.9	0.31
805		Basic	800	C	20.9	65.1	0.14
806		Merge	1265	C	24.7	60.0	0.24
807		Overlap	235	C	25.1	59.1	0.05
808	VA International Gateway Boulevard	Diverge	1265	C	25.1	59.1	0.24
809		Basic	2305	C	20.6	66.6	0.39
810		Merge	1500	C	23.5	59.5	0.29
811		Basic	1295	C	20.9	66.2	0.22
812	Cedar Lane	Diverge	1500	C	23.7	58.9	0.29
813		Basic	1180	C	18.8	66.1	0.20
814		Merge	1500	C	23.3	58.9	0.29
815		Basic	1430	C	20.5	66.2	0.25
816	Towne Point Road	Diverge	1500	C	25.4	54.1	0.32
817		Basic	1810	B	16.3	66.1	0.31
818		Merge	1500	C	25.0	59.3	0.29
818A	Managed Lanes Diverge	Diverge	1330	C	24.1	61.7	0.24
820	College Drive	Diverge	1500	C	22.1	56.0	0.30
821		Basic	1010	B	15.2	65.6	0.17
822	I-664	Diverge	1500	B	17.1	59.4	0.29
823		Basic	1245	B	12.4	66.2	0.21
824		Weaving	1605	B	13.3	55.1	0.33
825		Basic	1415	B	14.1	66.0	0.24
826		Merge	1030	C	19.2	59.4	0.20
827	US 17	Basic	2640	B	17.0	66.6	0.45

NO - BUILD
FREEWAY CAPACITY ANALYSIS RESULTS ROUTE 164 AM

FIGURE 78

REGIONAL CONNECTORS STUDY

AUGUST 2023

164 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
701		Basic	2140	A	5.6	67.0	0.36
702	US 17 / I-664	Weaving	2670	A	5.0	62.4	0.49
703		Basic	940	A	6.0	66.8	0.16
704		Merge	1500	B	12.3	62.6	0.27
705		Basic	615	B	11.4	66.2	0.11
706	College Drive	Merge	1500	B	17.1	60.7	0.28
706A	Managed Lanes Merge	Merge	1380	C	21.2	59.2	0.26
708	Towne Point Road	Diverge	1500	C	23.4	53.8	0.32
709		Basic	1905	B	13.7	66.2	0.33
710		Merge	1500	C	19.6	59.8	0.29
711		Basic	1370	B	17.5	66.3	0.23
712	Cedar Lane	Diverge	1500	C	20.7	56.5	0.30
713		Basic	1000	A	7.4	65.6	0.17
714		Merge	1500	B	14.4	61.7	0.28
715		Basic	110	B	13.2	65.6	0.02
716		Merge	1125	C	20.4	60.4	0.21
717		Basic	1500	C	18.4	66.2	0.26
718	VA International Gateway Boulevard	Diverge	1125	C	22.3	55.3	0.23
719		Basic	2270	C	18.3	66.3	0.39
720		Merge	1035	C	21.4	60.2	0.20
721		Basic	780	C	22.9	56.1	0.16
722	W Norfolk Road	Diverge	1035	C	22.9	56.1	0.21
723		Basic	605	C	18.6	64.1	0.11
724		Merge	1500	D	26.1	52.9	0.32
725		Basic	3600	C	24.2	56.9	0.72
726	US 58	Diverge	1500	D	26.8	51.5	0.33
727		Diverge	1390	C	19.2	52.0	0.30
728		Basic	1600	B	14.1	56.6	0.32
729		Merge	1500	C	18.2	54.1	0.32
730		Basic	2640	B	17.3	56.9	0.53

164 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
801	US 58	Basic	1060	B	14.1	57.0	0.21
802		Merge	1500	C	18.8	54.2	0.31
803A		Basic	2180	B	17.9	56.9	0.44
803		Basic	1600	D	26.8	57.0	0.32
804	W Norfolk Road	Diverge	1500	D	27.7	55.1	0.31
805		Basic	800	C	22.1	65.2	0.14
806		Merge	1265	C	25.8	59.7	0.24
807		Overlap	235	C	26.0	59.4	0.04
808	VA International Gateway Boulevard	Diverge	1265	C	26.0	59.4	0.24
809		Basic	2305	C	22.6	66.6	0.39
810		Merge	1500	C	25.8	59.0	0.29
811		Basic	1295	C	22.9	66.2	0.22
812	Cedar Lane	Diverge	1500	C	25.8	59.0	0.29
813		Basic	1180	C	20.9	66.1	0.20
814		Merge	1500	C	24.6	58.7	0.29
815		Basic	1430	C	21.6	66.2	0.25
816	Towne Point Road	Diverge	1500	D	26.6	54.2	0.31
817		Basic	1810	B	17.9	66.1	0.31
818		Merge	1500	C	24.8	59.3	0.29
818A	Managed Lanes Diverge	Diverge	1330	C	24.1	61.0	0.25
820	College Drive	Diverge	1500	C	18.9	55.9	0.30
821		Basic	1010	B	12.2	65.5	0.18
822	I-664	Diverge	1500	B	13.8	59.6	0.29
823		Basic	1245	A	10.1	66.2	0.21
824		Weaving	1605	A	10.9	55.1	0.33
825		Basic	1415	A	10.9	66.0	0.24
826		Merge	1030	B	17.8	59.6	0.20
827	US 17	Basic	2640	B	15.8	66.6	0.45

I-64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
101		Basic	500	C	24.2	62.0	0.09
102	Mercury Boulevard	Diverge	1500	C	18.8	59.9	0.28
103		Basic	1015	C	22.7	61.7	0.19
104		Merge	1500	C	19.1	62.0	0.27
105		Merge	1500	B	17.1	57.1	0.30
106		Basic	250	C	20.5	60.8	0.05
106A	Managed Lanes Diverge	Diverge	250	C	24.6	61.2	0.05
107	I-664	Diverge	1500	C	25.4	57.8	0.29
108		Basic	1335	B	15.6	61.6	0.25
109		Basic	300	C	23.5	61.9	0.06
110		Weaving	3100	C	25.4	46.4	0.76
111	LaSalle Avenue	Basic	700	B	17.0	61.3	0.13
112		Merge	1035	C	25.0	55.4	0.21
113		Merge	500	D	27.7	55.0	0.10
114		Overlap	1000	D	29.1	52.5	0.22
115	Rip Rap Road	Diverge	500	D	29.1	52.5	0.11
116		Basic	500	C	20.5	57.8	0.10
116A	Managed Lanes Diverge	Diverge	1000	C	22.2	57.4	0.20
116B		Basic	4920	B	15.1	62.0	0.90
117	Settlers Landing Road	Diverge	1500	B	17.8	52.5	0.32
118		Basic	1360	A	11.0	61.1	0.25
119		Weaving	2060	C	18.8	46.6	0.50
120	S Mallory Street	Basic	835	B	16.7	60.5	0.16
121		Merge	1500	C	25.8	56.0	0.30
122	HRBT	Basic	12700	D	33.8	42.8	3.37
123		Basic	4270	C	23.3	62.0	0.78
124	W Ocean View Avenue	Diverge	1500	D	27.8	52.0	0.33
125		Basic	170	C	22.8	59.4	0.03
126		Merge	1500	C	25.6	56.1	0.30
127		Basic	5770	C	23.2	62.0	1.06

I-64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
128	4th View Street	Diverge	1500	D	26.1	55.0	0.31
129		Basic	2275	C	18.5	61.7	0.42
130		Merge	1500	C	22.8	56.4	0.30
131		Basic	3470	C	20.8	61.9	0.64
132	Naval Station	Merge	1500	C	25.6	55.6	0.31
133		Basic	2270	C	23.0	61.7	0.42
133A	Managed Lanes Merge	Merge	1500	C	21.1	62.0	0.27
134	I-564 W / US460	Weaving	2225	D	28.7	41.0	0.62
135		Basic	500	B	16.0	59.7	0.10

I-64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
201		Basic	2640	B	17.1	62.0	0.48
202	On-Ramp from I564 W	Merge	1500	C	23.2	57.2	0.30
203		Basic	370	C	21.4	60.9	0.07
203A	Managed Lanes Merge	Merge	1500	B	14.3	61.8	0.28
203B	US 460 / Managed Lanes Diverge	Weaving	1700	C	22.1	50.2	0.38
204A		Basic	1265	C	21.1	60.9	0.24
206	Naval Station	Diverge	1500	C	22.6	57.9	0.29
207		Basic	2590	B	17.6	61.9	0.48
208	4th View Street	Diverge	1500	C	19.6	55.7	0.31
209		Basic	2210	B	16.3	61.7	0.41
210		Merge	1500	C	20.2	56.8	0.30
211		Basic	4785	C	18.5	62.0	0.88
212	Ocean View Avenue	Diverge	1500	C	22.0	52.0	0.33
213		Basic	180	B	17.8	59.4	0.03
214		Merge	1500	C	21.4	55.8	0.31
215A		Basic	6895	C	19.3	62.0	1.26
215B	HRBT	Basic	9000	C	23.8	50.2	2.04
215		Basic	500	C	19.3	62.0	0.09
216	S Mallory Street	Diverge	1500	C	20.4	58.5	0.29
217		Basic	900	C	18.7	61.5	0.17
218	Settlers Landing Road	Weaving	1275	C	20.2	47.7	0.30
218A	Managed Lanes Merge	Merge	1500	B	15.4	60.5	0.28
219	Settlers Landing Road	Basic	250	B	15.6	61.6	0.05
220		Merge	1500	C	23.0	57.4	0.30
221		Basic	5770	C	20.9	62.0	1.06

I-64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
222	LaSalle Avenue	Diverge	1500	D	29.3	60.1	0.28
222A	Managed Lanes Diverge	Diverge	750	C	25.4	61.7	0.14
223	LaSalle Avenue	Basic	750	D	27.5	61.5	0.14
224		Diverge	1500	D	29.6	58.4	0.29
225		Basic	420	D	26.9	61.2	0.08
226	I-664 N	Weaving	2400	D	34.4	40.8	0.67
227		Basic	1700	C	21.5	61.2	0.32
228		Basic	300	B	14.3	61.8	0.06
228A	Managed Lanes Merge	Merge	500	B	17.5	56.6	0.10
229	I-664 S	Weaving	3895	C	22.4	52.2	0.85
230	Mercury Boulevard	Basic	900	C	20.7	61.8	0.17
231		Diverge	1500	C	20.7	62.0	0.27
232		Basic	1235	C	23.1	62.0	0.23
233		Merge	1500	C	20.8	57.7	0.30
234		Basic	2640	C	23.8	61.8	0.49

BUILD
FREEWAY CAPACITY ANALYSIS RESULTS I-64 AM

FIGURE 80

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
101		Basic	500	C	23.1	62.0	0.09
102	Mercury Boulevard	Diverge	1500	C	18.3	58.7	0.29
103		Basic	1015	C	19.2	61.6	0.19
104		Merge	1500	B	16.6	61.9	0.28
105		Merge	1500	B	14.8	57.7	0.30
106		Basic	250	B	17.9	61.0	0.05
106A	Managed Lanes Diverge	Diverge	250	C	21.5	61.3	0.05
107	I-664	Diverge	1500	C	24.1	58.1	0.29
108		Basic	1335	B	15.1	61.6	0.25
109		Basic	300	C	22.6	61.9	0.06
110		Weaving	3100	D	28.5	44.9	0.78
111	LaSalle Avenue	Basic	700	C	19.3	61.2	0.13
112		Merge	1035	C	24.3	55.5	0.21
113		Merge	500	C	25.5	55.4	0.10
114		Overlap	1000	D	27.2	51.8	0.22
115	Rip Rap Road	Diverge	500	D	27.2	51.8	0.11
116		Basic	500	B	15.4	57.5	0.10
116A	Managed Lanes Diverge	Diverge	1000	B	16.5	58.0	0.20
116B		Basic	4920	B	12.8	62.0	0.90
117	Settlers Landing Road	Diverge	1500	B	15.0	52.8	0.32
118		Basic	1360	A	10.1	61.1	0.25
119		Weaving	2060	B	11.8	53.3	0.44
120	S Mallory Street	Basic	835	B	13.9	61.2	0.16
121		Merge	1500	C	18.7	56.7	0.30
122	HRBT	Basic	12700	C	20.4	51.8	2.79
123		Basic	4270	B	17.1	62.0	0.78
124	W Ocean View Avenue	Diverge	1500	C	20.3	52.1	0.33
125		Basic	170	B	16.8	59.4	0.03
126		Merge	1500	C	19.8	56.7	0.30
127		Basic	5770	C	18.1	62.0	1.06

I-64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
128	4th View Street	Diverge	1500	C	20.3	55.5	0.31
129		Basic	2275	B	15.6	61.7	0.42
130		Merge	1500	C	18.2	56.8	0.30
131		Basic	3470	B	16.6	61.9	0.64
132	Naval Station	Merge	1500	C	24.3	55.8	0.31
133		Basic	2270	C	21.8	61.7	0.42
133A	Managed Lanes Merge	Merge	1500	B	16.5	62.0	0.27
134	I-564 W / US460	Weaving	2225	C	23.3	42.4	0.60
135		Basic	500	B	13.2	59.8	0.10

I-64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
201		Basic	2640	C	18.7	62.0	0.48
202	On-Ramp from I564 W	Merge	1500	D	26.6	56.6	0.30
203		Basic	370	C	24.3	60.8	0.07
203A	Managed Lanes Merge	Merge	1500	B	17.9	61.7	0.28
203B	US 460 / Managed Lanes Diverge	Weaving	1700	D	31.8	45.2	0.43
204A		Basic	1265	C	23.1	60.5	0.24
206	Naval Station	Diverge	1500	C	24.8	57.7	0.30
207		Basic	2590	C	22.4	61.8	0.48
208	4th View Street	Diverge	1500	C	24.2	57.4	0.30
209		Basic	2210	C	20.3	61.8	0.41
210		Merge	1500	D	27.8	55.7	0.31
211		Basic	4785	C	25.0	62.0	0.88
212	Ocean View Avenue	Diverge	1500	D	26.9	57.7	0.30
215A	HRBT	Basic	8575	C	24.1	62.0	1.57
215B		Basic	9000	E	36.7	40.7	2.51
215		Basic	500	C	24.1	62.0	0.09
216	S Mallory Street	Diverge	1500	D	28.3	52.8	0.32
217		Basic	900	C	21.4	60.7	0.17
218	Settlers Landing Road	Weaving	1275	C	20.9	49.6	0.29
218A	Managed Lanes Merge	Merge	1500	C	21.0	60.7	0.28
219	Settlers Landing Road	Basic	250	C	21.2	61.7	0.05
220		Merge	1500	D	27.3	56.7	0.30
221		Basic	5770	C	25.0	62.0	1.06

I-64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
222	LaSalle Avenue	Diverge	1500	E	36.1	57.2	0.30
222A	Managed Lanes Diverge	Diverge	750	D	28.5	61.2	0.14
223	LaSalle Avenue	Basic	750	D	27.9	61.4	0.14
224		Diverge	1500	D	32.6	52.5	0.32
225		Basic	420	C	23.4	60.0	0.08
226	I-664 N	Weaving	2400	D	29.7	43.0	0.63
227		Basic	1700	C	21.8	61.3	0.32
228		Basic	300	B	14.5	61.9	0.06
228A	Managed Lanes Merge	Merge	500	C	18.1	61.9	0.09
229	I-664 S	Weaving	3895	C	25.6	52.0	0.85
230	Mercury Boulevard	Basic	900	C	23.8	61.8	0.17
231		Diverge	1500	C	23.8	62.0	0.27
232		Basic	1235	D	26.8	61.7	0.23
233		Merge	1500	C	24.4	56.0	0.30
234		Basic	2640	D	28.0	61.4	0.49

BUILD
FREEWAY CAPACITY ANALYSIS RESULTS I-64 PM

FIGURE 81

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
601	I-64	Basic	2640	C	23.2	66.4	0.45
602A	I-264	Merge	1500	C	18.7	62.9	0.27
602B		Basic	685	B	17.8	66.3	0.12
602C	US 58 / US 460	Diverge	1500	C	20.6	57.9	0.29
603		Basic	1715	B	17.9	66.3	0.29
604		Merge	1500	B	15.0	67.0	0.25
605		Basic	395	B	15.1	67.0	0.07
606		Merge	1500	B	17.6	61.8	0.28
607		Basic	1260	B	16.3	66.4	0.22
608	Dock Landing Road	Diverge	1500	B	16.3	66.9	0.25
609		Basic	2520	C	23.3	66.3	0.43
610		Merge	1500	D	31.5	57.5	0.30
611	Portsmouth Boulevard	Diverge	1450	D	31.5	57.9	0.28
612		Basic	495	C	19.3	65.1	0.09
613		Weaving	1650	C	19.2	55.2	0.34
614		Basic	575	C	22.2	65.1	0.10
615		Merge	1500	D	26.5	59.8	0.29
616		Basic	5345	C	24.0	66.1	0.92
617	Pughsville Road	Diverge	1500	D	27.9	56.8	0.30
618		Basic	945	C	19.7	65.6	0.16
619		Merge	1500	C	24.7	58.7	0.29
620		Basic	165	C	21.8	64.8	0.03
621		Merge	1500	B	15.9	66.4	0.26
622		Basic	480	B	15.9	66.9	0.08
623	US 17 / SR 164	Diverge	1500	B	15.9	67.0	0.25
624		Basic	1015	B	17.5	67.0	0.17
625		Weaving	1710	B	14.7	57.6	0.34
626		Basic	645	B	16.0	65.6	0.11
627		Merge	1500	B	12.7	66.8	0.26
628		Basic	3900	B	12.8	67.0	0.66
629	College Drive	Diverge	1500	B	12.8	67.0	0.25
630		Basic	540	B	16.0	67.0	0.09
631		Weaving	1695	B	12.6	61.0	0.32
632		Basic	50	B	16.4	65.5	0.01
633		Weaving	2365	B	13.3	61.1	0.44
634		Basic	1125	C	18.2	66.7	0.19

I-664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
635	Inspection Station	Merge	1500	C	18.8	61.4	0.28
635A	Managed Lanes Merge	Merge	1500	C	23.5	59.6	0.29
636		Basic	15110	C	21.1	66.9	2.57
637	MMMBT	Basic	7600	D	26.9	52.5	1.65
638		Basic	500	C	22.6	62.5	0.09
639	Terminal Avenue	Diverge	1500	C	25.5	55.2	0.31
640		Basic	1700	C	20.5	66.1	0.29
641		Merge	1130	C	23.1	60.2	0.21
642		Overlap	370	C	25.5	54.7	0.08
643	35th Street / 26th Street / 27th Street / US 60	Diverge	1130	C	25.5	54.7	0.23
644		Basic	1900	C	18.7	65.9	0.33
645		Weaving	1975	B	17.1	54.3	0.41
646		Basic	1080	B	14.7	65.9	0.19
647		Merge	1070	B	11.6	66.8	0.18
648		Overlap	430	B	12.4	62.5	0.08
649	Roanoke Avenue	Diverge	1070	B	12.4	62.5	0.19
650		Basic	1950	A	10.8	66.6	0.33
651	Chestnut Avenue	Weaving	2815	B	12.0	56.9	0.56
652	Aberdeen Road	Basic	1250	B	11.4	66.6	0.21
653		Merge	1500	B	13.6	63.1	0.27
654		Basic	2010	B	12.8	66.8	0.34
655	Power Plant Parkway	Diverge	1500	B	13.6	62.9	0.27
656		Basic	1900	B	11.2	66.7	0.32
657		Merge	1500	B	13.5	62.6	0.27
658		Basic	1500	B	12.6	66.6	0.26
659	I-64	Diverge	1500	A	9.3	67.0	0.25
660		Basic	2640	B	15.6	67.0	0.45

I-664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
501	I-64	Basic	1000	B	11.7	67.0	0.17
502		Merge	1500	C	18.6	61.0	0.28
503		Basic	1090	B	17.0	66.3	0.19
504	Power Plant Parkway	Diverge	1500	B	16.9	66.9	0.25
504A	Managed Lanes Diverge	Diverge	1500	B	17.6	63.0	0.27
505	Power Plant Parkway	Basic	160	C	18.3	66.0	0.03
506		Merge	1500	C	25.3	59.4	0.29
507		Basic	3600	C	22.6	66.6	0.61
508	Aberdeen Road	Diverge	1500	C	25.3	59.4	0.29
509		Basic	1995	C	19.7	66.6	0.34
510A	Chestnut Avenue	Weaving	2050	C	19.4	53.0	0.44
513	Roanoke Avenue	Basic	3040	C	18.1	66.8	0.52
514		Merge	1200	C	21.4	60.4	0.23
515		Overlap	300	C	22.9	56.5	0.06
516	35th Street / 26th Street / 27th Street / US 60	Diverge	1200	C	22.9	56.5	0.24
517		Basic	1055	B	12.3	65.3	0.18
518		Diverge	1500	B	14.1	58.6	0.29
519		Basic	1960	A	9.2	66.5	0.33
520		Merge	1500	B	16.8	60.0	0.28
521		Basic	1000	B	15.1	66.1	0.17
522		Merge	1500	C	18.2	61.2	0.28
523	Terminal Avenue	Diverge	1200	C	19.9	56.1	0.24
524		Basic	1500	B	15.9	65.8	0.26
525		Merge	1500	C	18.1	61.2	0.28
526	MMMBT	Basic	7600	C	19.2	57.7	1.50
527		Basic	16610	B	16.4	67.0	2.82
528	College Drive	Diverge	1500	C	18.8	58.4	0.29
529		Basic	740	B	16.0	65.6	0.13
530		Weaving	1805	B	13.3	58.4	0.35
531		Basic	990	B	14.3	66.1	0.17
532		Merge	1500	A	10.1	66.9	0.25
533		Basic	1550	A	10.1	67.0	0.26

I-664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
534		Diverge	1500	A	10.1	67.0	0.25
535	US 17 / SR 164	Basic	1190	B	12.8	67.0	0.20
536		Merge	1500	B	16.2	62.4	0.27
537		Basic	685	B	15.1	66.2	0.12
538		Merge	1500	B	13.5	66.9	0.25
539		Basic	835	B	13.5	67.0	0.14
540	Pughsville Road	Diverge	1500	B	13.5	67.0	0.25
541		Basic	2435	B	17.8	67.0	0.41
542		Merge	1500	D	26.5	60.3	0.28
543		Basic	5245	C	24.2	66.0	0.90
544	Portsmouth Boulevard	Diverge	1500	D	26.7	60.0	0.28
545		Basic	565	C	23.4	65.7	0.10
546		Weaving	1710	C	22.9	54.1	0.36
547		Basic	485	C	26.0	64.8	0.09
548		Merge	1500	D	32.9	57.4	0.30
549	Dock Landing Road	Diverge	1500	D	32.4	58.2	0.29
550		Basic	2510	D	28.5	63.8	0.45
551		Merge	1500	E	44.6	52.6	0.32
552		Basic	710	E	44.1	53.3	0.15
553	US 58 / US 460	Diverge	1500	E	38.7	60.7	0.28
554		Basic	470	D	29.9	62.9	0.08
555		Weaving	2060	C	21.6	58.8	0.40
556		Basic	745	D	28.0	64.1	0.13
557		Merge	1500	C	23.0	61.5	0.28
558		Diverge	1500	C	23.4	60.3	0.28
559		Basic	970	C	18.4	66.1	0.17
560	I-64	Diverge	1500	C	21.9	56.4	0.30
561	I-264	Basic	1000	C	18.9	65.6	0.17

BUILD

FREEWAY CAPACITY ANALYSIS RESULTS I-664 AM

FIGURE 82

Hampton Roads TPO

Michael Baker International

REGIONAL CONNECTORS STUDY

AUGUST 2023

664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
601	I-64	Basic	2640	C	25.1	65.6	0.46
602A	I-264	Merge	1500	C	23.4	61.0	0.28
602B		Basic	685	C	21.4	66.0	0.12
602C	US 58 / US 460	Diverge	1500	C	25.2	56.7	0.30
603		Basic	1715	C	21.6	66.2	0.29
604		Merge	1500	C	19.1	66.9	0.25
605		Basic	395	C	19.1	67.0	0.07
606		Merge	1500	C	22.4	61.1	0.28
607		Basic	1260	C	20.5	66.4	0.22
608	Dock Landing Road	Diverge	1500	C	20.5	66.9	0.25
609		Basic	2520	D	28.7	63.7	0.45
610		Merge	1500	E	36.6	55.5	0.31
611	Portsmouth Boulevard	Diverge	1450	E	35.2	57.8	0.29
612		Basic	495	C	22.7	65.1	0.09
613		Weaving	1650	C	21.4	54.5	0.34
614		Basic	575	C	23.7	64.9	0.10
615		Merge	1500	D	29.9	58.8	0.29
616		Basic	5345	D	27.3	64.5	0.94
617	Pughsville Road	Diverge	1500	D	31.5	55.9	0.30
618		Basic	945	C	19.4	65.5	0.16
619		Merge	1500	C	23.4	59.0	0.29
620		Basic	165	C	20.6	64.9	0.03
621		Merge	1500	B	15.1	66.5	0.26
622		Basic	480	B	15.0	66.9	0.08
623	US 17 / SR 164	Diverge	1500	B	15.0	67.0	0.25
624		Basic	1015	B	16.2	67.0	0.17
625		Weaving	1710	B	13.6	57.9	0.34
626		Basic	645	B	14.4	65.6	0.11
627		Merge	1500	B	12.8	66.8	0.26
628		Basic	3900	B	12.8	67.0	0.66
629	College Drive	Diverge	1500	B	12.8	67.0	0.25
630		Basic	540	B	15.9	67.0	0.09
631		Weaving	1695	B	11.7	61.7	0.31
632		Basic	50	B	15.0	65.7	0.01
633		Weaving	2365	B	12.3	61.2	0.44
634		Basic	1125	B	16.8	66.7	0.19

664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
635	Inspection Station	Merge	1500	C	18.4	61.4	0.28
636		Basic	16610	B	16.8	67.0	2.82
637	MMMBT	Basic	7600	C	19.9	56.8	1.52
638		Basic	500	B	16.4	67.0	0.08
639	Terminal Avenue	Diverge	1500	C	19.9	55.1	0.31
640		Basic	1700	B	15.5	66.1	0.29
641		Merge	1130	C	18.8	60.8	0.21
642		Overlap	370	C	20.8	55.0	0.08
643	35th Street / 26th Street / 27th Street / US 60	Diverge	1130	C	20.8	55.0	0.23
644		Basic	1900	B	16.1	66.0	0.33
645		Weaving	1975	B	17.3	52.5	0.43
646		Basic	1080	B	13.6	65.8	0.19
647		Merge	1070	C	25.4	59.9	0.20
648		Overlap	430	C	25.8	59.0	0.08
649	Roanoke Avenue	Diverge	1070	C	25.8	59.0	0.21
650		Basic	1950	C	21.1	66.3	0.33
651	Chestnut Avenue	Weaving	2815	C	22.1	53.6	0.60
652	Aberdeen Road	Basic	1250	C	22.3	66.5	0.21
653		Merge	1500	D	27.4	59.8	0.29
654		Basic	2010	C	25.0	65.7	0.35
655	Power Plant Parkway	Diverge	1500	D	27.9	58.8	0.29
656		Basic	400	C	20.0	65.2	0.07
656A	Managed Lanes Merge	Merge	1500	B	16.7	63.3	0.27
657	Power Plant Parkway	Merge	1500	B	17.9	62.7	0.27
658		Basic	1500	B	16.7	66.6	0.26
659	I-64	Diverge	1500	B	16.8	66.7	0.26
660		Basic	2640	D	26.5	64.9	0.46

664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
501	I-64	Basic	1000	A	8.5	67.0	0.17
502		Merge	1500	B	16.0	61.6	0.28
503		Basic	1090	B	14.7	66.3	0.19
504	Power Plant Parkway	Diverge	1500	B	15.0	65.8	0.26
504A	Managed Lanes Diverge	Diverge	1500	B	13.9	63.9	0.27
505	Power Plant Parkway	Basic	160	B	15.3	66.2	0.03
506		Merge	1500	C	20.4	60.2	0.28
507		Basic	3600	C	18.4	66.9	0.61
508	Aberdeen Road	Diverge	1500	C	20.8	59.1	0.29
509		Basic	1995	B	14.8	66.5	0.34
510A	Chestnut Avenue	Weaving	2050	B	15.8	52.1	0.45
513	Roanoke Avenue	Basic	3040	B	12.5	66.8	0.52
514		Merge	1200	B	15.9	61.0	0.22
515		Overlap	300	B	16.8	57.8	0.06
516	35th Street / 26th Street / 27th Street / US 60	Diverge	1200	B	16.8	57.8	0.24
517		Basic	1055	B	12.0	65.5	0.18
518		Diverge	1500	B	13.8	58.3	0.29
519		Basic	1960	A	7.8	66.5	0.33
520		Merge	1500	B	14.1	60.2	0.28
521		Basic	1000	B	12.7	66.1	0.17
522		Merge	1500	B	17.9	59.6	0.29
523	Terminal Avenue	Diverge	1200	C	19.2	55.8	0.24
524		Basic	1500	B	14.5	65.7	0.26
525		Merge	1500	C	22.0	60.7	0.28
526	MMMBT	Basic	7600	C	24.3	54.9	1.57
527		Basic	16610	C	19.9	67.0	2.82
528	College Drive	Diverge	1500	C	22.9	58.3	0.29
529		Basic	740	C	18.9	65.6	0.13
530		Weaving	1805	C	22.3	51.7	0.40
531		Basic	990	C	22.2	65.4	0.17
532		Merge	1500	B	16.8	66.8	0.26
533		Basic	1550	B	16.8	67.0	0.26

664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
534	US 17 / SR 164	Diverge	1500	B	17.6	64.2	0.27
535		Basic	1190	B	16.6	66.7	0.20
536		Merge	1500	C	21.2	61.8	0.28
537		Basic	685	C	19.5	66.1	0.12
538		Merge	1500	B	17.8	66.8	0.26
539		Basic	835	B	17.8	67.0	0.14
540	Pughsville Road	Diverge	1500	B	17.8	67.0	0.25
541		Basic	2435	C	20.1	67.0	0.41
542		Merge	1500	D	29.0	59.6	0.29
543		Basic	5245	D	26.7	64.8	0.92
544	Portsmouth Boulevard	Diverge	1500	D	29.2	59.2	0.29
545		Basic	565	C	22.5	65.5	0.10
546		Weaving	1710	C	24.7	49.8	0.39
547		Basic	485	C	21.4	64.1	0.09
548		Merge	1500	D	27.6	59.0	0.29
549	Dock Landing Road	Diverge	1500	D	28.2	57.7	0.30
550		Basic	2510	C	21.5	66.6	0.43
551		Merge	1500	D	26.9	59.9	0.28
552		Basic	710	C	24.5	65.8	0.12
553	US 58 / US 460	Diverge	1500	D	26.3	61.4	0.28
554		Basic	470	C	19.3	65.9	0.08
555		Weaving	2060	B	15.5	58.5	0.40
556		Basic	745	B	17.2	66.1	0.13
557		Merge	1500	C	19.2	61.7	0.28
558		Diverge	1500	C	20.0	59.2	0.29
559		Basic	970	B	13.8	65.9	0.17
560	I-64	Diverge	1500	B	16.6	55.8	0.31
561	I-264	Basic	1000	B	12.1	65.5	0.17

BUILD

FREEWAY CAPACITY ANALYSIS RESULTS I-664 PM

FIGURE 83

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-564 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
301		Basic	1670	A	3.1	62.0	0.31
302	Bellinger Boulevard	Merge	1500	A	7.0	62.0	0.27
303		Basic	2400	A	7.0	62.0	0.44
303A	Intermodal Connector	Merge	1500	A	4.2	60.2	0.28
303B		Basic	1380	A	5.0	61.8	0.25
303C		Basic	895	A	6.2	62.0	0.16
304	I-64 W / US460	Diverge	1500	A	6.3	62.0	0.27
305		Basic	2400	A	5.8	62.0	0.44
306	Terminal Boulevard	Merge	1500	A	10.6	58.0	0.29
307		Basic	235	A	9.9	61.0	0.04

I-564 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
401	I-64	Basic	1500	C	19.1	62.0	0.27
402	Terminal Boulevard	Weaving	2155	D	28.1	40.7	0.60
403		Basic	1375	B	14.7	60.8	0.26
403A	Intermodal Connector	Diverge	1500	B	14.4	61.9	0.28
403B		Basic	5175	B	16.8	62.0	0.95
404	Bellinger Boulevard	Diverge	1500	B	17.6	58.9	0.29
405		Basic	2640	C	18.1	61.9	0.48

BUILD
FREEWAY CAPACITY ANALYSIS RESULTS I-564 AM

FIGURE 84

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-564 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
301		Basic	1670	B	11.9	62.0	0.31
302	Bellinger Boulevard	Merge	1500	B	16.0	62.0	0.27
303		Basic	2400	B	16.0	62.0	0.44
303A	Intermodal Connector	Merge	1500	A	9.0	60.0	0.28
303B		Basic	1380	A	10.8	61.8	0.25
303C		Basic	895	B	13.5	62.0	0.16
304	I-64 W / US460	Diverge	1500	B	13.5	62.0	0.27
305		Basic	2400	B	14.0	62.0	0.44
306	Terminal Boulevard	Merge	1500	C	23.4	56.8	0.30
307		Basic	235	C	21.4	60.7	0.04

I-564 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
401	I-64	Basic	1500	A	4.6	62.0	0.27
402	Terminal Boulevard	Weaving	2155	A	7.1	51.7	0.47
403		Basic	1375	A	3.2	61.4	0.25
403A	Intermodal Connector	Diverge	1500	A	3.1	61.9	0.28
403B		Basic	5175	A	3.1	62.0	0.95
404	Bellinger Boulevard	Diverge	1500	A	3.2	59.1	0.29
405		Basic	2640	A	2.7	61.9	0.48

BUILD
FREEWAY CAPACITY ANALYSIS RESULTS
I-564 PM

FIGURE 85

the heartbeat of HAMPTON ROADS TPO
TRANSPORTATION PLANNING ORGANIZATION

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

164 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
701		Basic	2140	A	4.4	67.0	0.36
702	US 17 / I664	Weaving	2670	A	4.1	61.5	0.49
703	US 17 / I664	Basic	940	A	4.0	66.7	0.16
704	US 17 / I664	Merge	1500	A	7.3	67.0	0.25
705		Basic	615	A	7.3	67.0	0.10
706	College Drive	Merge	1500	A	10.0	62.7	0.27
706A	Managed Lanes Merge	Merge	1380	B	14.7	61.7	0.25
708	Towne Point Road	Diverge	1500	B	15.4	58.9	0.29
709	Towne Point Road	Basic	1905	B	12.0	66.5	0.33
710	Towne Point Road	Merge	1500	C	18.5	61.2	0.28
711		Basic	1370	B	16.9	66.4	0.23
712	Cedar Lane	Diverge	1500	B	16.9	66.9	0.25
713	Cedar Lane	Basic	1000	B	17.3	67.0	0.17
714	Cedar Lane	Merge	1500	D	27.2	59.8	0.29
715	Cedar Lane	Basic	110	C	24.7	65.0	0.02
716	Cedar Lane	Merge	1125	D	32.0	57.6	0.22
717		Basic	1500	D	29.1	63.4	0.27
718	VA International Gateway Boulevard	Diverge	1125	D	33.4	55.2	0.23
719	VA International Gateway Boulevard	Basic	2270	D	28.7	63.6	0.41
720	VA International Gateway Boulevard	Merge	1035	D	32.7	57.3	0.21
721		Basic	780	D	33.7	55.6	0.16
722	W Norfolk Road	Diverge	1035	D	33.7	55.6	0.21
723	W Norfolk Road	Basic	605	D	26.3	64.0	0.11
724	W Norfolk Road	Merge	1500	E	37.6	51.1	0.33
725		Basic	3600	D	34.3	56.1	0.73
726	US 58	Diverge	1500	E	38.6	49.8	0.34
727	US 58	Diverge	1390	B	17.7	51.9	0.30
728	US 58	Basic	1600	B	12.0	56.5	0.32
729	US 58	Merge	1500	C	19.4	54.0	0.32
730	US 58	Basic	2640	C	18.4	56.9	0.53

164 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
801	US 58	Basic	1060	B	11.1	57.0	0.21
802	US 58	Merge	1500	C	18.4	57.0	0.30
803A		Basic	2180	B	18.0	57.0	0.43
803		Basic	1600	D	27.5	57.0	0.32
804	W Norfolk Road	Diverge	1500	D	28.5	55.0	0.31
805	W Norfolk Road	Basic	800	C	22.4	65.1	0.14
806	W Norfolk Road	Merge	1265	D	26.4	59.6	0.24
807		Overlap	235	D	26.6	59.1	0.05
808	VA International Gateway Boulevard	Diverge	1265	D	26.6	59.1	0.24
809	VA International Gateway Boulevard	Basic	2305	C	22.0	66.6	0.39
810	VA International Gateway Boulevard	Merge	1500	C	25.1	59.2	0.29
811		Basic	1295	C	22.2	66.2	0.22
812	Cedar Lane	Diverge	1500	B	15.8	62.7	0.27
813	Cedar Lane	Basic	1180	B	13.6	66.5	0.20
814	Cedar Lane	Merge	1500	B	16.6	61.5	0.28
815		Basic	1430	B	15.3	66.5	0.24
816	Towne Point Road	Diverge	1500	B	17.5	58.4	0.29
817	Towne Point Road	Basic	1810	B	12.5	66.4	0.31
818	Towne Point Road	Merge	1500	C	18.3	61.5	0.28
818A	Managed Lanes Diverge	Diverge	1330	B	16.8	66.4	0.23
820	College Drive	Diverge	1500	C	23.6	55.8	0.31
821		Basic	1010	B	15.7	65.5	0.18
822	I-664	Diverge	1500	B	17.8	59.3	0.29
823	I-664	Basic	1245	B	12.7	66.2	0.21
824	I-664	Weaving	1605	B	13.0	56.8	0.32
825	I-664	Basic	1415	B	14.2	66.1	0.24
826	I-664	Merge	1030	C	20.7	59.2	0.20
827	US 17	Basic	2640	C	18.3	66.6	0.45

BUILD
FREEWAY CAPACITY ANALYSIS RESULTS ROUTE 164 AM

FIGURE 86

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

164 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
701		Basic	2140	A	5.6	67.0	0.36
702	US 17 / I664	Weaving	2670	A	5.0	62.4	0.49
703		Basic	940	A	6.0	66.8	0.16
704		Merge	1500	B	12.3	62.6	0.27
705		Basic	615	B	11.4	66.2	0.11
706	College Drive	Merge	1500	B	17.1	60.7	0.28
706A	Managed Lanes Merge	Merge	1380	C	21.2	59.2	0.26
708	Towne Point Road	Diverge	1500	C	23.4	53.8	0.32
709		Basic	1905	B	13.7	66.2	0.33
710		Merge	1500	C	19.6	59.8	0.29
711		Basic	1370	B	17.5	66.3	0.23
712	Cedar Lane	Diverge	1500	C	20.7	56.5	0.30
713		Basic	1000	A	7.4	65.6	0.17
714		Merge	1500	B	14.4	61.7	0.28
715		Basic	110	B	13.2	65.6	0.02
716		Merge	1125	C	20.4	60.4	0.21
717		Basic	1500	C	18.4	66.2	0.26
718	VA International Gateway Boulevard	Diverge	1125	C	22.3	55.3	0.23
719		Basic	2270	C	18.3	66.3	0.39
720		Merge	1035	C	21.4	60.2	0.20
721		Basic	780	C	22.9	56.1	0.16
722	W Norfolk Road	Diverge	1035	C	22.9	56.1	0.21
723		Basic	605	C	18.6	64.1	0.11
724		Merge	1500	D	26.1	52.9	0.32
725		Basic	3600	C	24.2	56.9	0.72
726	US 58	Diverge	1500	D	26.8	51.5	0.33
727		Diverge	1390	C	19.2	52.0	0.30
728		Basic	1600	B	14.1	56.6	0.32
729		Merge	1500	C	18.2	54.1	0.32
730		Basic	2640	B	17.3	56.9	0.53

164 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
801	US 58	Basic	1060	B	15.1	57.0	0.21
802		Merge	1500	C	19.3	57.0	0.30
803A		Basic	2180	C	18.9	57.0	0.43
803		Basic	1600	D	28.9	57.0	0.32
804	W Norfolk Road	Diverge	1500	D	30.0	55.0	0.31
805		Basic	800	C	24.1	65.1	0.14
806		Merge	1265	D	27.8	59.2	0.24
807		Overlap	235	D	27.8	59.2	0.05
808	VA International Gateway Boulevard	Diverge	1265	D	27.7	59.4	0.24
809		Basic	2305	C	24.3	66.0	0.40
810		Merge	1500	D	27.7	58.6	0.29
811		Basic	1295	C	24.7	65.8	0.22
812	Cedar Lane	Diverge	1500	B	17.2	63.1	0.27
813		Basic	1180	B	15.6	66.6	0.20
814		Merge	1500	C	18.4	61.2	0.28
815		Basic	1430	B	16.8	66.5	0.24
816	Towne Point Road	Diverge	1500	C	19.0	59.3	0.29
817		Basic	1810	B	15.2	66.5	0.31
818		Merge	1500	C	20.1	61.4	0.28
818A	Managed Lanes Diverge	Diverge	1330	C	18.4	66.4	0.23
820	College Drive	Diverge	1500	C	22.7	55.6	0.31
821		Basic	1010	B	14.3	65.5	0.18
822	I-664	Diverge	1500	B	16.2	58.8	0.29
823		Basic	1245	A	9.8	66.1	0.21
824		Weaving	1605	A	10.2	56.7	0.32
825		Basic	1415	A	10.0	66.1	0.24
826		Merge	1030	C	19.2	59.4	0.20
827	US 17	Basic	2640	B	17.0	66.6	0.45

BUILD
FREEWAY CAPACITY ANALYSIS RESULTS ROUTE 164 PM

FIGURE 87

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
101		Basic	500	C	24.4	62.0	0.09
102	Mercury Boulevard	Diverge	1500	C	19.0	59.7	0.29
103		Basic	1015	C	22.7	61.7	0.19
104		Merge	1500	C	19.0	62.0	0.27
105		Merge	1500	B	17.2	57.2	0.30
106		Basic	250	C	20.6	60.8	0.05
106A	Managed Lanes Diverge	Diverge	250	C	24.7	61.2	0.05
107	I-664	Diverge	1500	C	25.2	58.5	0.29
108		Basic	1335	C	19.1	56.2	0.27
109		Basic	300	C	26.0	60.5	0.06
110		Weaving	3100	C	26.0	46.8	0.75
111	LaSalle Avenue	Basic	700	C	18.6	61.3	0.13
112		Merge	1035	C	23.9	55.6	0.21
113		Merge	500	D	26.5	55.2	0.10
114		Overlap	1000	D	27.8	52.7	0.22
115	Rip Rap Road	Diverge	500	D	27.8	52.7	0.11
116		Basic	500	C	20.3	57.9	0.10
116A	Managed Lanes Diverge	Diverge	1000	C	21.9	57.4	0.20
116B		Basic	4920	B	14.7	62.0	0.90
117	Settlers Landing Road	Diverge	1500	B	17.3	52.8	0.32
118		Basic	1360	B	11.9	61.1	0.25
119		Weaving	2060	C	19.6	46.2	0.51
120	S Mallory Street	Basic	835	B	16.9	60.5	0.16
121		Merge	1500	C	24.9	56.1	0.30
122	HRBT	Basic	12700	D	31.3	44.7	3.23
123		Basic	4270	C	23.4	59.7	0.81
124	W Ocean View Avenue	Diverge	1500	D	26.9	52.0	0.33
125		Basic	170	C	22.0	59.4	0.03
126		Merge	1500	C	24.8	56.2	0.30
127		Basic	5770	C	22.5	62.0	1.06

64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
128	4th View Street	Diverge	1500	C	25.3	55.0	0.31
129		Basic	2275	B	17.9	61.7	0.42
130		Merge	1500	C	22.5	56.4	0.30
131		Basic	3470	C	20.4	61.9	0.64
131	Naval Station	Merge	1500	C	25.4	55.6	0.31
133		Basic	2270	C	22.8	61.7	0.42
133A	Managed Lanes Merge	Merge	1500	C	21.1	62.0	0.27
134	I-564 W / US 460	Weaving	2225	D	28.8	41.0	0.62
135		Basic	500	B	16.3	59.7	0.10

64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
201		Basic	2640	B	15.7	62.0	0.48
202	On-Ramp from I564 W	Merge	1500	C	22.7	57.3	0.30
203		Basic	370	C	20.9	61.0	0.07
203A	Managed Lanes Merge	Merge	1500	B	14.0	61.8	0.28
203B	US 460 / Managed Lanes Diverge	Weaving	1700	C	23.0	49.1	0.39
204A		Basic	1265	C	20.6	60.8	0.24
206	Naval Station	Diverge	1500	C	22.0	57.9	0.29
207		Basic	2590	B	17.1	61.9	0.48
208	4th View Street	Diverge	1500	C	19.0	55.7	0.31
209		Basic	2210	B	15.4	61.7	0.41
210		Merge	1500	C	20.0	56.8	0.30
211		Basic	4785	C	18.3	62.0	0.88
212	Ocean View Avenue	Diverge	1500	C	21.8	52.0	0.33
213		Basic	180	B	17.6	59.4	0.03
214		Merge	1500	C	21.6	55.8	0.31
215A		Basic	6895	C	19.4	62.0	1.26
215B	HRBT	Basic	9000	C	24.1	50.0	2.05
215		Basic	500	C	19.4	62.0	0.09
216	S Mallory Street	Diverge	1500	C	20.6	58.5	0.29
217		Basic	900	C	18.9	61.5	0.17
218	Settlers Landing Road	Weaving	1275	C	21.3	47.1	0.31
218A	Managed Lanes Merge	Merge	1500	B	16.2	60.4	0.28
219	Settlers Landing Road	Basic	250	B	16.4	61.6	0.05
220		Merge	1500	C	24.4	57.1	0.30
221		Basic	5770	C	22.1	62.0	1.06

64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
222	LaSalle Avenue	Diverge	1500	D	31.0	60.1	0.28
222A	Managed Lanes Diverge	Diverge	750	D	27.6	61.5	0.14
223	LaSalle Avenue	Basic	750	D	28.6	61.1	0.14
224		Diverge	1500	D	30.6	58.4	0.29
225		Basic	420	D	28.1	61.2	0.08
226	I-664 N	Weaving	2400	E	41.1	35.3	0.77
227		Basic	1700	C	23.3	61.0	0.32
228		Basic	300	B	15.6	61.8	0.06
228A	Managed Lanes Merge	Merge	500	C	19.7	56.6	0.10
229	I-664 S	Weaving	3895	C	23.6	48.6	0.91
230	Mercury Boulevard	Basic	900	C	20.7	61.7	0.17
231		Diverge	1500	C	20.7	62.0	0.27
232		Basic	1235	C	23.9	62.0	0.23
233		Merge	1500	C	21.3	57.5	0.30
234		Basic	2640	C	24.4	61.8	0.49

GREATER GROWTH - WATER

FREEWAY CAPACITY ANALYSIS RESULTS I-64 AM

FIGURE 88

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
101		Basic	500	C	23.7	62.0	0.09
102	Mercury Boulevard	Diverge	1500	C	18.7	58.9	0.29
103		Basic	1015	C	20.1	61.6	0.19
104		Merge	1500	B	17.3	61.9	0.28
105		Merge	1500	B	15.5	57.5	0.30
106		Basic	250	C	18.6	60.9	0.05
106A	Managed Lanes Diverge	Diverge	250	C	22.4	61.3	0.05
107	I-664	Diverge	1500	C	24.1	58.7	0.29
108		Basic	1335	C	18.2	56.2	0.27
109		Basic	300	C	24.7	60.5	0.06
110		Weaving	3100	D	28.8	45.2	0.78
111	LaSalle Avenue	Basic	700	C	20.5	61.2	0.13
112		Merge	1035	C	25.2	55.4	0.21
113		Merge	500	D	26.2	55.3	0.10
114		Overlap	1000	D	28.0	51.7	0.22
115	Rip Rap Road	Diverge	500	D	28.0	51.7	0.11
116		Basic	500	B	15.7	57.4	0.10
116A	Managed Lanes Diverge	Diverge	1000	B	16.7	58.2	0.20
116B		Basic	4920	B	13.9	62.0	0.90
117	Settlers Landing Road	Diverge	1500	B	16.4	52.7	0.32
118		Basic	1360	A	10.5	61.1	0.25
119		Weaving	2060	B	11.6	53.6	0.44
120	S Mallory Street	Basic	835	B	13.6	61.2	0.16
121		Merge	1500	C	18.5	56.8	0.30
122	HRBT	Basic	12700	C	20.2	51.9	2.78
123		Basic	4270	C	20.2	52.0	0.93
124	W Ocean View Avenue	Diverge	1500	C	20.1	52.1	0.33
125		Basic	170	B	16.7	59.4	0.03
126		Merge	1500	C	19.0	56.8	0.30
127		Basic	5770	B	17.4	62.0	1.06

I-64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
128	4th View Street	Diverge	1500	C	19.5	55.3	0.31
129		Basic	2275	B	14.3	61.7	0.42
130		Merge	1500	B	17.2	56.8	0.30
131		Basic	3470	B	15.7	61.9	0.64
132	Naval Station	Merge	1500	C	23.6	55.8	0.31
133		Basic	2270	C	21.3	61.7	0.42
133A	Managed Lanes Merge	Merge	1500	B	16.7	62.0	0.27
134	I-564 W / US 460	Weaving	2225	C	23.7	42.1	0.60
135		Basic	500	B	13.1	59.8	0.10

I-64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
201		Basic	2640	B	17.9	62.0	0.48
202	On-Ramp from I564 W	Merge	1500	C	25.5	56.8	0.30
203		Basic	370	C	23.4	60.9	0.07
203A	Managed Lanes Merge	Merge	1500	B	17.4	61.7	0.28
203B	US 460 / Managed Lanes Diverge	Weaving	1700	D	31.5	45.0	0.43
204A		Basic	1265	C	23.5	60.5	0.24
206	Naval Station	Diverge	1500	C	25.2	57.6	0.30
207		Basic	2590	C	22.5	61.8	0.48
208	4th View Street	Diverge	1500	C	24.4	57.2	0.30
209		Basic	2210	C	19.5	61.8	0.41
210		Merge	1500	D	26.8	55.9	0.30
211		Basic	4785	C	24.1	62.0	0.88
212	Ocean View Avenue	Diverge	1500	C	25.9	57.7	0.30
215A	HRBT	Basic	8575	C	23.3	62.0	1.57
215B		Basic	9000	D	33.8	42.6	2.40
215		Basic	500	C	23.3	62.0	0.09
216	S Mallory Street	Diverge	1500	D	27.2	52.9	0.32
217		Basic	900	C	21.0	60.7	0.17
218	Settlers Landing Road	Weaving	1275	C	20.1	50.4	0.29
218A	Managed Lanes Merge	Merge	1500	C	20.6	60.8	0.28
219	Settlers Landing Road	Basic	250	C	20.7	61.7	0.05
220		Merge	1500	D	27.3	56.7	0.30
221		Basic	5770	C	25.0	62.0	1.06
222	LaSalle Avenue	Diverge	1500	E	36.1	57.2	0.30

I-64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
222A	Managed Lanes Diverge	Diverge	750	D	28.5	61.2	0.14
223	LaSalle Avenue	Basic	750	D	27.9	61.4	0.14
224		Diverge	1500	D	32.5	52.8	0.32
225		Basic	420	C	24.6	60.1	0.08
226	I-664 N	Weaving	2400	D	29.6	44.1	0.62
227		Basic	1700	C	24.0	61.4	0.31
228		Basic	300	B	16.0	61.9	0.06
228A	Managed Lanes Merge	Merge	500	C	19.2	61.9	0.09
229	I-664 S	Weaving	3895	D	26.3	51.5	0.86
230	Mercury Boulevard	Basic	900	C	24.0	61.8	0.17
231		Diverge	1500	C	24.0	62.0	0.27
232		Basic	1235	D	27.1	61.6	0.23
233		Merge	1500	C	25.2	55.6	0.31
234		Basic	2640	D	28.8	61.1	0.49

GREATER GROWTH - WATER

FREEWAY CAPACITY ANALYSIS RESULTS I-64 PM

FIGURE 89

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
601	I-64	Basic	2640	C	23.7	66.2	0.45
602A	I-264	Merge	1500	C	20.1	62.4	0.27
602B		Basic	685	C	19.0	66.2	0.12
602C	US 58 / US 460	Diverge	1500	C	22.4	56.9	0.30
603		Basic	1715	B	17.9	66.3	0.29
604		Merge	1500	B	13.5	66.9	0.25
605		Basic	395	B	13.5	67.0	0.07
606		Merge	1500	B	15.7	62.1	0.27
607		Basic	1260	B	14.6	66.5	0.22
608	Dock Landing Road	Diverge	1500	B	14.6	66.9	0.25
609		Basic	2520	C	20.6	67.0	0.43
610		Merge	1500	D	27.9	58.6	0.29
611	Portsmouth Boulevard	Diverge	1450	D	28.4	58.0	0.28
612		Basic	495	B	17.2	65.1	0.09
613		Weaving	1650	C	18.9	54.2	0.35
614		Basic	575	C	21.4	64.9	0.10
615		Merge	1500	C	25.6	60.0	0.28
616		Basic	5345	C	23.2	66.4	0.91
617	Pughsville Road	Diverge	1500	D	27.1	56.8	0.30
618		Basic	945	C	19.1	65.6	0.16
619		Merge	1500	C	24.2	58.8	0.29
620		Basic	165	C	21.4	64.9	0.03
621		Merge	1500	B	15.6	66.4	0.26
622		Basic	480	B	15.7	66.9	0.08
623	US 17 / SR 164	Diverge	1500	B	15.7	67.0	0.25
624		Basic	1015	B	16.5	67.0	0.17
625		Weaving	1710	B	14.0	57.6	0.34
626		Basic	645	B	15.0	65.6	0.11
627		Merge	1500	B	11.8	66.8	0.26
628		Basic	3900	B	11.9	67.0	0.66
629	College Drive	Diverge	1500	B	11.9	67.0	0.25
630		Basic	540	B	14.7	67.0	0.09
631		Weaving	1695	B	11.8	60.8	0.32
632		Basic	50	B	15.1	65.5	0.01
633		Weaving	2365	B	12.1	61.6	0.44

I-664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
634		Basic	1125	B	16.7	66.7	0.19
635	Inspection Station	Merge	1500	C	18.3	61.4	0.28
636	Managed Lanes Merge	Basic	16610	B	16.8	67.0	2.82
637		Basic	7600	C	19.8	56.8	1.52
638	MMMBT	Basic	500	B	18.0	62.5	0.09
639		Diverge	1500	C	20.4	55.1	0.31
640	Terminal Avenue	Basic	1700	B	16.0	66.1	0.29
641		Merge	1130	C	18.3	60.8	0.21
642		Overlap	370	C	20.3	54.8	0.08
643		Diverge	1130	C	20.3	54.8	0.23
644	35th Street / 26th Street / 27th Street / US 60	Basic	1900	B	15.0	66.0	0.33
645		Weaving	1975	B	13.9	55.6	0.40
646		Basic	1080	B	12.1	66.0	0.19
647		Merge	1070	B	16.3	61.2	0.20
648		Overlap	430	B	16.9	59.2	0.08
649		Diverge	1070	B	16.9	59.2	0.21
650	Roanoke Avenue	Basic	1950	B	14.0	66.3	0.33
651		Weaving	2815	B	14.1	56.9	0.56
652	Chestnut Avenue	Basic	1250	B	15.0	66.6	0.21
653	Aberdeen Road	Merge	1500	C	18.5	61.5	0.28
654		Basic	2010	B	17.0	66.7	0.34
655		Diverge	1500	C	19.1	59.6	0.29
656	Power Plant Parkway	Basic	400	B	15.0	65.4	0.07
656A		Merge	1500	A	10.3	64.4	0.26
657		Merge	1500	B	11.4	63.7	0.27
658		Basic	1500	A	10.9	66.7	0.26
659	I-64	Diverge	1500	A	10.6	67.0	0.25
660		Basic	2640	C	18.3	67.0	0.45

I-664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
501	I-64	Basic	1000	B	11.1	67.0	0.17
502		Merge	1500	B	16.9	61.8	0.28
503		Basic	1090	B	15.6	66.4	0.19
504	Power Plant Parkway	Diverge	1500	B	15.5	66.9	0.25
504A	Managed Lanes Diverge	Diverge	1500	B	15.4	65.6	0.26
505	Power Plant Parkway	Basic	160	C	20.7	66.6	0.03
506		Merge	1500	D	28.4	58.6	0.29
507		Basic	3600	C	25.4	65.5	0.62
508	Aberdeen Road	Diverge	1500	D	28.0	59.4	0.29
509		Basic	1995	C	22.4	66.6	0.34
510A	Chestnut Avenue	Weaving	2050	C	22.3	51.8	0.45
513	Roanoke Avenue	Basic	3040	C	20.2	66.8	0.52
514		Merge	1200	C	23.9	60.0	0.23
515		Overlap	300	C	25.5	56.3	0.06
516	35th Street / 26th Street / 27th Street / US 60	Diverge	1200	C	25.5	56.3	0.24
517		Basic	1055	B	13.8	65.3	0.18
518		Diverge	1500	B	15.9	58.2	0.29
519		Basic	1960	A	9.4	66.5	0.33
520		Merge	1500	B	16.8	60.0	0.28
521		Basic	1000	B	15.1	66.1	0.17
522		Merge	1500	B	17.9	61.2	0.28
523	Terminal Avenue	Diverge	1200	C	19.6	56.0	0.24
524		Basic	1500	B	15.5	65.8	0.26
525		Merge	1500	B	17.7	61.3	0.28
526	MMMBT	Basic	7600	C	21.8	49.7	1.74
527		Basic	16610	B	16.0	67.0	2.82
528	College Drive	Diverge	1500	C	18.4	58.4	0.29
529		Basic	740	B	15.4	65.6	0.13
530		Weaving	1805	B	13.1	57.8	0.35
531		Basic	990	B	13.5	66.0	0.17
532		Merge	1500	A	9.7	66.9	0.25
533		Basic	1550	A	9.7	67.0	0.26

I-664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
534	US 17 / SR 164	Diverge	1500	A	9.7	67.0	0.25
535		Basic	1190	B	11.4	67.0	0.20
536		Merge	1500	B	15.0	62.5	0.27
537		Basic	685	B	14.0	66.2	0.12
538		Merge	1500	B	13.3	66.9	0.25
539		Basic	835	B	13.3	67.0	0.14
540	Pughsville Road	Diverge	1500	B	13.3	67.0	0.25
541		Basic	2435	B	16.5	67.0	0.41
542		Merge	1500	C	26.0	60.5	0.28
543		Basic	5245	C	23.7	66.2	0.90
544	Portsmouth Boulevard	Diverge	1500	D	26.3	59.8	0.29
545		Basic	565	C	22.2	65.6	0.10
546		Weaving	1710	C	22.5	53.6	0.36
547		Basic	485	C	24.7	64.7	0.09
548		Merge	1500	D	31.6	57.8	0.29
549	Dock Landing Road	Diverge	1500	D	31.4	58.2	0.29
550		Basic	2510	D	27.2	64.5	0.44
551		Merge	1500	E	43.3	52.9	0.32
552		Basic	710	E	41.8	54.8	0.15
553	US 58 / US 460	Diverge	1500	E	37.6	60.8	0.28
554		Basic	470	D	28.9	63.5	0.08
555		Weaving	2060	C	21.1	58.8	0.40
556		Basic	745	D	26.8	64.8	0.13
557		Merge	1500	C	23.7	60.9	0.28
558		Diverge	1500	C	23.9	60.5	0.28
559		Basic	970	C	19.2	66.1	0.17
560	I-64	Diverge	1500	C	22.8	56.4	0.30
561	I-264	Basic	1000	C	20.1	65.6	0.17

GREATER GROWTH - WATER

FREEWAY CAPACITY ANALYSIS RESULTS I-664 AM

FIGURE 90

Hampton Roads TPO

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
601	I-64	Basic	2640	C	26.0	65.2	0.46
602A	I-264	Merge	1500	C	25.1	60.1	0.28
602B		Basic	685	C	22.7	65.8	0.12
602C	US 58 / US 460	Diverge	1500	D	27.1	55.6	0.31
603		Basic	1715	C	21.4	66.2	0.29
604		Merge	1500	B	18.0	66.9	0.25
605		Basic	395	B	18.0	67.0	0.07
606		Merge	1500	C	21.2	61.3	0.28
607		Basic	1260	C	19.4	66.4	0.22
608	Dock Landing Road	Diverge	1500	C	19.4	66.9	0.25
609		Basic	2520	D	26.4	65.0	0.44
610		Merge	1500	D	34.3	56.5	0.30
611	Portsmouth Boulevard	Diverge	1450	D	33.4	58.0	0.28
612		Basic	495	C	21.6	65.1	0.09
613		Weaving	1650	C	20.9	54.3	0.35
614		Basic	575	C	22.6	64.9	0.10
615		Merge	1500	D	29.3	59.0	0.29
616		Basic	5345	D	26.7	64.8	0.94
617	Pughsville Road	Diverge	1500	D	30.9	55.8	0.31
618		Basic	945	C	18.6	65.5	0.16
619		Merge	1500	C	23.1	59.0	0.29
620		Basic	165	C	20.3	64.9	0.03
621		Merge	1500	B	15.1	66.5	0.26
622		Basic	480	B	15.1	66.9	0.08
623	US 17 / SR 164	Diverge	1500	B	15.1	67.0	0.25
624		Basic	1015	B	16.4	67.0	0.17
625		Weaving	1710	B	13.9	57.4	0.34
626		Basic	645	B	14.5	65.6	0.11
627		Merge	1500	B	12.7	66.7	0.26
628		Basic	3900	B	12.7	67.0	0.66
629	College Drive	Diverge	1500	B	12.7	67.0	0.25
630		Basic	540	B	15.3	67.0	0.09
631		Weaving	1695	B	11.5	61.3	0.31
632		Basic	50	B	14.4	65.6	0.01
633		Weaving	2365	B	12.2	60.8	0.44
634		Basic	1125	B	16.6	66.6	0.19

I-664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
635	Inspection Station	Merge	1500	C	18.2	61.5	0.28
636	Managed Lanes Merge	Basic	16610	B	16.7	67.0	2.82
637		Basic	7600	C	19.6	56.8	1.52
638	MMMBT	Basic	500	B	17.3	62.5	0.09
639		Diverge	1500	C	19.7	55.1	0.31
640	Terminal Avenue	Basic	1700	B	15.3	66.1	0.29
641		Merge	1130	C	19.4	60.7	0.21
642		Overlap	370	C	21.4	55.0	0.08
643		Diverge	1130	C	21.4	55.0	0.23
644	35th Street / 26th Street / 27th Street / US 60	Basic	1900	B	16.4	66.0	0.33
645		Weaving	1975	C	18.5	52.0	0.43
646		Basic	1080	B	15.1	65.7	0.19
647		Merge	1070	D	27.8	59.3	0.21
648		Overlap	430	D	27.9	59.0	0.08
649		Diverge	1070	D	27.9	59.0	0.21
650	Roanoke Avenue	Basic	1950	C	23.1	66.3	0.33
651		Weaving	2815	C	24.4	52.5	0.61
652	Chestnut Avenue	Basic	1250	C	23.8	66.1	0.21
653	Aberdeen Road	Merge	1500	D	29.6	59.2	0.29
654		Basic	2010	D	27.1	64.6	0.35
655		Diverge	1500	D	29.7	59.0	0.29
656	Power Plant Parkway	Basic	400	C	22.4	65.3	0.07
656A		Merge	1500	B	15.4	63.8	0.27
657		Merge	1500	B	16.9	62.9	0.27
658		Basic	1500	B	15.9	66.6	0.26
659	I-64	Diverge	1500	B	15.8	67.0	0.25
660		Basic	2640	C	25.6	65.4	0.46

I-664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
501	I-64	Basic	1000	A	7.1	67.0	0.17
502		Merge	1500	B	13.6	62.3	0.27
503		Basic	1090	B	12.7	66.4	0.19
504	Power Plant Parkway	Diverge	1500	B	12.9	65.7	0.26
504A	Managed Lanes Diverge	Diverge	1500	B	11.4	66.3	0.26
505	Power Plant Parkway	Basic	160	B	15.9	66.8	0.03
506		Merge	1500	C	21.2	60.1	0.28
507		Basic	3600	C	19.0	66.9	0.61
508	Aberdeen Road	Diverge	1500	C	21.6	59.1	0.29
509		Basic	1995	B	15.3	66.5	0.34
510A	Chestnut Avenue	Weaving	2050	B	16.9	51.5	0.45
513	Roanoke Avenue	Basic	3040	B	13.4	66.7	0.52
514		Merge	1200	B	17.3	60.9	0.22
515		Overlap	300	C	18.3	57.5	0.06
516	35th Street / 26th Street / 27th Street / US 60	Diverge	1200	C	18.3	57.5	0.24
517		Basic	1055	B	12.2	65.5	0.18
518		Diverge	1500	B	14.1	58.2	0.29
519		Basic	1960	A	7.6	66.5	0.33
520		Merge	1500	B	13.7	60.3	0.28
521		Basic	1000	B	12.3	66.1	0.17
522		Merge	1500	B	17.0	59.6	0.29
523	Terminal Avenue	Diverge	1200	C	18.2	55.8	0.24
524		Basic	1500	B	13.4	65.7	0.26
525		Merge	1500	C	20.5	61.0	0.28
526	MMMBT	Basic	7600	C	24.9	50.2	1.72
527		Basic	16610	C	18.7	67.0	2.82
528	College Drive	Diverge	1500	C	21.5	58.2	0.29
529		Basic	740	B	17.6	65.6	0.13
530		Weaving	1805	C	20.9	52.2	0.39
531		Basic	990	C	20.9	65.5	0.17
532		Merge	1500	B	16.3	66.8	0.26
533		Basic	1550	B	16.3	67.0	0.26

I-664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
534	US 17 / SR 164	Diverge	1500	B	17.0	64.2	0.27
535		Basic	1190	B	16.1	66.7	0.20
536		Merge	1500	C	21.2	61.8	0.28
537		Basic	685	C	19.5	66.1	0.12
538		Merge	1500	B	17.7	66.8	0.26
539		Basic	835	B	17.7	67.0	0.14
540	Pughsville Road	Diverge	1500	B	17.7	67.0	0.25
541		Basic	2435	C	19.8	67.0	0.41
542		Merge	1500	D	28.8	59.7	0.29
543		Basic	5245	D	26.5	64.9	0.92
544	Portsmouth Boulevard	Diverge	1500	D	29.2	58.8	0.29
545		Basic	565	C	20.9	65.5	0.10
546		Weaving	1710	C	23.5	49.2	0.39
547		Basic	485	C	18.6	64.0	0.09
548		Merge	1500	C	24.9	59.7	0.29
549	Dock Landing Road	Diverge	1500	C	25.8	57.7	0.30
550		Basic	2510	C	19.4	66.6	0.43
551		Merge	1500	C	24.6	60.4	0.28
552		Basic	710	C	22.2	65.9	0.12
553	US 58 / US 460	Diverge	1500	C	23.9	62.0	0.27
554		Basic	470	C	19.6	66.0	0.08
555		Weaving	2060	B	15.7	58.4	0.40
556		Basic	745	B	17.5	66.1	0.13
557		Merge	1500	C	20.7	60.9	0.28
558		Diverge	1500	C	21.1	59.5	0.29
559		Basic	970	B	15.2	66.0	0.17
560	I-64	Diverge	1500	C	18.1	56.1	0.30
561	I-264	Basic	1000	B	14.3	65.6	0.17

GREATER GROWTH - WATER

FREEWAY CAPACITY ANALYSIS RESULTS I-664 PM

FIGURE 91

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-564 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
301		Basic	1670	A	3.9	62.0	0.31
302	Bellinger Boulevard	Merge	1500	A	8.3	62.0	0.27
303		Basic	2400	A	8.3	62.0	0.44
303A	Intermodal Connector	Merge	1500	A	5.1	60.2	0.28
303B		Basic	1380	A	6.0	61.8	0.25
303C		Basic	895	A	7.5	62.0	0.16
304	I64 W / US 460	Diverge	1500	A	7.6	62.0	0.27
305		Basic	2400	A	6.6	62.0	0.44
306	Terminal Boulevard	Merge	1500	B	11.3	58.1	0.29
307		Basic	235	A	10.6	61.0	0.04

I-564 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
401	I-64	Basic	1500	C	21.2	62.0	0.27
402	Terminal Boulevard	Weaving	2155	D	31.6	39.6	0.62
403		Basic	1375	B	16.5	60.7	0.26
403A	Intermodal Connector	Diverge	1500	B	16.3	61.9	0.28
403B		Basic	5175	C	18.5	62.0	0.95
404	Bellinger Boulevard	Diverge	1500	C	19.6	58.7	0.29
405		Basic	2640	C	20.3	61.9	0.48

GREATER GROWTH - WATER

FREEWAY CAPACITY ANALYSIS RESULTS I-564 AM

FIGURE 92

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

564 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
301		Basic	1670	B	12.1	62.0	0.31
302	Bellinger Boulevard	Merge	1500	B	17.4	62.0	0.27
303		Basic	2400	B	17.4	62.0	0.44
303A	Intermodal Connector	Merge	1500	A	9.9	59.8	0.29
303B		Basic	1380	B	11.8	61.8	0.25
303C		Basic	895	B	14.8	62.0	0.16
304	I64 W / US 460	Diverge	1500	B	14.8	62.0	0.27
305		Basic	2400	B	15.5	62.0	0.44
306	Terminal Boulevard	Merge	1500	C	25.1	56.5	0.30
307		Basic	235	C	22.9	60.7	0.04

564 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
401	I-64	Basic	1500	A	4.8	62.0	0.27
402	Terminal Boulevard	Weaving	2155	A	7.7	51.6	0.47
403		Basic	1375	A	3.5	61.4	0.25
403A	Intermodal Connector	Diverge	1500	A	3.5	61.9	0.28
403B		Basic	5175	A	3.3	62.0	0.95
404	Bellinger Boulevard	Diverge	1500	A	3.5	59.2	0.29
405		Basic	2640	A	3.1	61.9	0.48

GREATER GROWTH - WATER
FREEWAY CAPACITY ANALYSIS RESULTS I-564 PM

FIGURE 93

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

164 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
701		Basic	2140	A	4.9	67.0	0.36
702	US 17 / I664	Weaving	2670	A	4.6	61.5	0.49
703	US 17 / I664	Basic	940	A	4.6	66.7	0.16
704	US 17 / I664	Merge	1500	A	8.3	67.0	0.25
705		Basic	615	A	8.3	67.0	0.10
706	College Drive	Merge	1500	A	10.9	62.6	0.27
706A	Managed Lanes Merge	Merge	1380	B	14.5	61.8	0.25
708	Towne Point Road	Diverge	1500	B	15.3	58.9	0.29
709	Towne Point Road	Basic	1905	B	11.9	66.5	0.33
710	Towne Point Road	Merge	1500	C	19.7	60.9	0.28
711		Basic	1370	B	17.9	66.4	0.23
712	Cedar Lane	Diverge	1500	B	17.9	66.9	0.25
713	Cedar Lane	Basic	1000	C	18.2	62.9	0.18
714	Cedar Lane	Merge	1500	D	26.2	60.0	0.28
715	Cedar Lane	Basic	110	C	23.7	65.1	0.02
716	Cedar Lane	Merge	1125	D	31.8	57.7	0.22
717		Basic	1500	D	28.9	63.5	0.27
718	VA International Gateway Boulevard	Diverge	1125	D	33.3	55.2	0.23
719	VA International Gateway Boulevard	Basic	2270	D	28.5	63.8	0.40
720	VA International Gateway Boulevard	Merge	1035	D	32.4	57.4	0.20
721		Basic	780	D	33.5	55.6	0.16
722	W Norfolk Road	Diverge	1035	D	33.5	55.6	0.21
723	W Norfolk Road	Basic	605	C	26.0	64.0	0.11
724	W Norfolk Road	Merge	1500	E	37.9	51.0	0.33
725		Basic	3600	D	34.5	56.0	0.73
726	US 58	Diverge	1500	E	38.5	50.2	0.34
727	US 58	Diverge	1390	C	21.1	51.6	0.31
728	US 58	Basic	1600	B	13.2	56.5	0.32
729	US 58	Merge	1500	C	21.0	54.0	0.32
730	US 58	Basic	2640	C	19.9	56.9	0.53

164 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
801	US 58	Basic	1060	B	11.2	57.0	0.21
802	US 58	Merge	1500	C	20.8	57.0	0.30
803A		Basic	2180	C	20.4	57.0	0.43
803		Basic	1600	D	31.3	56.9	0.32
804	W Norfolk Road	Diverge	1500	D	32.5	54.8	0.31
805	W Norfolk Road	Basic	800	C	25.3	65.1	0.14
806	W Norfolk Road	Merge	1265	D	30.1	58.5	0.25
807		Overlap	235	D	30.1	58.5	0.05
808	VA International Gateway Boulevard	Diverge	1265	D	29.9	59.0	0.24
809	VA International Gateway Boulevard	Basic	2305	C	25.1	65.6	0.40
810	VA International Gateway Boulevard	Merge	1500	D	28.5	58.4	0.29
811		Basic	1295	C	25.4	65.5	0.22
812	Cedar Lane	Diverge	1500	B	17.7	62.8	0.27
813	Cedar Lane	Basic	1180	B	15.5	66.5	0.20
814	Cedar Lane	Merge	1500	C	18.6	61.2	0.28
815		Basic	1430	B	17.0	66.5	0.24
816	Towne Point Road	Diverge	1500	C	19.4	58.6	0.29
817	Towne Point Road	Basic	1810	B	14.2	66.4	0.31
818	Towne Point Road	Merge	1500	C	19.8	61.4	0.28
818A	Managed Lanes Diverge	Diverge	1330	C	18.1	66.4	0.23
820	College Drive	Diverge	1500	D	28.3	55.7	0.31
821		Basic	1010	C	19.4	65.5	0.18
822	I-664	Diverge	1500	C	21.9	59.4	0.29
823	I-664	Basic	1245	B	16.7	66.2	0.21
824	I-664	Weaving	1605	B	16.6	55.5	0.33
825	I-664	Basic	1415	B	17.9	66.0	0.24
826	I-664	Merge	1030	D	26.3	58.2	0.20
827	US 17	Basic	2640	C	23.1	66.4	0.45

GREATER GROWTH - WATER
FREEWAY CAPACITY ANALYSIS RESULTS ROUTE 164 AM

FIGURE 94

HAMPTON ROADS TPO
Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

164 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
701		Basic	2140	A	8.2	67.0	0.36
702	US 17 / I664	Weaving	2670	A	7.5	60.8	0.50
703		Basic	940	A	8.6	66.7	0.16
704		Merge	1500	A	10.6	67.0	0.25
705		Basic	615	A	10.6	67.0	0.10
706	College Drive	Merge	1500	B	15.0	62.2	0.27
706A	Managed Lanes Merge	Merge	1380	B	17.9	61.0	0.26
708	Towne Point Road	Diverge	1500	C	19.1	57.4	0.30
709		Basic	1905	B	12.6	66.4	0.33
710		Merge	1500	B	16.5	61.6	0.28
711		Basic	1370	B	15.2	66.5	0.23
712	Cedar Lane	Diverge	1500	B	15.2	66.9	0.25
713		Basic	1000	B	11.4	62.9	0.18
714		Merge	1500	C	18.3	61.4	0.28
715		Basic	110	B	16.8	65.5	0.02
716		Merge	1125	C	24.2	59.8	0.21
717		Basic	1500	C	21.7	66.1	0.26
718	VA International Gateway Boulevard	Diverge	1125	D	26.2	55.2	0.23
719		Basic	2270	C	21.4	66.2	0.39
720		Merge	1035	C	25.5	59.4	0.20
721		Basic	780	D	27.0	56.0	0.16
722	W Norfolk Road	Diverge	1035	D	27.0	56.0	0.21
723		Basic	605	C	21.8	64.1	0.11
724		Merge	1500	D	30.4	52.4	0.33
725		Basic	3600	D	28.0	56.9	0.72
726	US 58	Diverge	1500	D	31.3	51.0	0.33
727		Diverge	1390	C	19.8	51.9	0.30
728		Basic	1600	B	14.2	56.5	0.32
729		Merge	1500	C	19.5	54.0	0.32
730		Basic	2640	C	19.6	53.8	0.56

164 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
801	US 58	Basic	1060	B	16.1	57.0	0.21
802		Merge	1500	C	19.0	57.0	0.30
803A		Basic	2180	C	18.6	57.0	0.43
803		Basic	1600	D	28.5	57.0	0.32
804	W Norfolk Road	Diverge	1500	D	29.5	55.0	0.31
805		Basic	800	C	23.6	65.1	0.14
806		Merge	1265	D	27.7	59.2	0.24
807		Overlap	235	D	27.7	59.3	0.05
808	VA International Gateway Boulevard	Diverge	1265	D	27.7	59.3	0.24
809		Basic	2305	C	24.1	66.0	0.40
810		Merge	1500	D	27.7	58.6	0.29
811		Basic	1295	C	24.7	65.8	0.22
812	Cedar Lane	Diverge	1500	B	17.2	62.8	0.27
813		Basic	1180	B	15.0	66.5	0.20
814		Merge	1500	C	18.1	61.3	0.28
815		Basic	1430	B	16.6	66.5	0.24
816	Towne Point Road	Diverge	1500	C	18.8	59.0	0.29
817		Basic	1810	B	14.5	66.5	0.31
818		Merge	1500	C	19.8	61.4	0.28
818A	Managed Lanes Diverge	Diverge	1330	C	18.2	66.4	0.23
820	College Drive	Diverge	1500	C	25.9	55.3	0.31
821		Basic	1010	B	15.9	65.5	0.18
822	I-664	Diverge	1500	C	18.1	59.0	0.29
823		Basic	1245	B	11.8	66.1	0.21
824		Weaving	1605	B	12.5	55.1	0.33
825		Basic	1415	B	11.7	66.0	0.24
826		Merge	1030	C	19.9	59.3	0.20
827	US 17	Basic	2640	B	17.6	66.6	0.45

GREATER GROWTH - WATER

FREEWAY CAPACITY ANALYSIS RESULTS ROUTE 164 PM

FIGURE 95

REGIONAL CONNECTORS STUDY

AUGUST 2023

64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
101		Basic	500	C	23.2	62.0	0.09
102	Mercury Boulevard	Diverge	1500	B	18.0	60.0	0.28
103		Basic	1015	C	21.7	61.7	0.19
104		Merge	1500	C	18.2	62.0	0.27
105		Merge	1500	B	16.3	57.3	0.30
106		Basic	250	C	19.6	60.9	0.05
106A	Managed Lanes Diverge	Diverge	250	C	23.6	61.2	0.05
107	I-664	Diverge	1500	C	23.8	58.7	0.29
108		Basic	1335	B	18.0	56.2	0.27
109		Basic	300	C	24.5	60.5	0.06
110		Weaving	3100	C	25.2	46.8	0.75
111	LaSalle Avenue	Basic	700	B	17.4	61.3	0.13
112		Merge	1035	C	24.0	55.6	0.21
113		Merge	500	D	26.6	55.2	0.10
114		Overlap	1000	D	28.0	52.6	0.22
115	Rip Rap Road	Diverge	500	D	28.0	52.6	0.11
116		Basic	500	C	20.1	57.8	0.10
116A	Managed Lanes Diverge	Diverge	1000	C	21.6	57.6	0.20
116B		Basic	4920	B	15.3	62.0	0.90
117	Settlers Landing Road	Diverge	1500	C	18.1	52.4	0.33
118		Basic	1360	A	10.6	61.1	0.25
119		Weaving	2060	C	18.1	46.7	0.50
120	S Mallory Street	Basic	835	B	15.8	60.5	0.16
121		Merge	1500	C	24.5	56.2	0.30
122	HRBT	Basic	12700	D	30.5	45.3	3.19
123		Basic	4270	C	23.1	59.7	0.81
124	W Ocean View Avenue	Diverge	1500	D	26.5	52.0	0.33
125		Basic	170	C	21.8	59.4	0.03
126		Merge	1500	C	24.5	56.2	0.30
127		Basic	5770	C	22.2	62.0	1.06

64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
128	4th View Street	Diverge	1500	C	25.0	55.1	0.31
129		Basic	2275	B	17.8	61.7	0.42
130		Merge	1500	C	22.3	56.4	0.30
131		Basic	3470	C	20.3	61.9	0.64
132	Naval Station	Merge	1500	C	25.9	55.5	0.31
133		Basic	2270	C	23.2	61.7	0.42
133A	Managed Lanes Merge	Merge	1500	C	20.7	62.0	0.27
134	I-564 W / US 460	Weaving	2225	D	28.0	41.7	0.61
135		Basic	500	B	16.5	59.8	0.10

64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
201		Basic	2640	B	16.3	62.0	0.48
202	On-Ramp from I564 W	Merge	1500	C	21.8	57.4	0.30
203		Basic	370	C	20.2	61.0	0.07
203A	Managed Lanes Merge	Merge	1500	B	13.5	61.8	0.28
203B	US 460 / Managed Lanes Diverge	Weaving	1700	C	21.5	50.0	0.39
204A		Basic	1265	C	21.1	60.9	0.24
206	Naval Station	Diverge	1500	C	22.6	57.9	0.29
207		Basic	2590	B	18.0	61.9	0.48
208	4th View Street	Diverge	1500	C	20.1	55.6	0.31
209		Basic	2210	B	16.1	61.7	0.41
210		Merge	1500	C	20.0	56.8	0.30
211		Basic	4785	C	18.3	62.0	0.88
212	Ocean View Avenue	Diverge	1500	C	21.8	52.0	0.33
213		Basic	180	B	17.7	59.4	0.03
214		Merge	1500	C	21.5	55.8	0.31
215A		Basic	6895	C	19.3	62.0	1.26
215B	HRBT	Basic	9000	C	23.8	50.2	2.04
215		Basic	500	C	19.3	62.0	0.09
216	S Mallory Street	Diverge	1500	C	20.5	58.5	0.29
217		Basic	900	C	18.6	61.5	0.17
218	Settlers Landing Road	Weaving	1275	C	20.3	47.6	0.30
218A	Managed Lanes Merge	Merge	1500	B	14.8	60.5	0.28
219	Settlers Landing Road	Basic	250	B	15.0	61.6	0.05
220		Merge	1500	C	21.9	57.6	0.30
221		Basic	5770	C	20.0	62.0	1.06

64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
222	LaSalle Avenue	Diverge	1500	D	28.0	60.2	0.28
222A	Managed Lanes Diverge	Diverge	750	C	24.3	61.7	0.14
223	LaSalle Avenue	Basic	750	D	27.1	61.6	0.14
224		Diverge	1500	D	29.1	58.4	0.29
225		Basic	420	D	26.6	61.2	0.08
226	I-664 N	Weaving	2400	E	37.9	36.1	0.76
227		Basic	1700	C	21.2	61.1	0.32
228		Basic	300	B	14.2	61.8	0.06
228A	Managed Lanes Merge	Merge	500	B	16.7	56.6	0.10
229	I-664 S	Weaving	3895	C	21.6	48.6	0.91
230	Mercury Boulevard	Basic	900	C	18.7	61.7	0.17
231		Diverge	1500	C	18.7	62.0	0.27
232		Basic	1235	C	21.8	62.0	0.23
233		Merge	1500	C	19.8	57.9	0.29
234		Basic	2640	C	22.4	61.9	0.48

GREATER GROWTH - URBAN

FREEWAY CAPACITY ANALYSIS RESULTS I-64 AM

FIGURE 96

Hampton Roads TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
101		Basic	500	C	23.0	62.0	0.09
102	Mercury Boulevard	Diverge	1500	C	18.2	58.8	0.29
103		Basic	1015	C	19.2	61.6	0.19
104		Merge	1500	B	16.5	61.9	0.28
105		Merge	1500	B	14.6	57.7	0.30
106		Basic	250	B	17.7	61.0	0.05
106A	Managed Lanes Diverge	Diverge	250	C	21.3	61.3	0.05
107	I-664	Diverge	1500	C	22.7	58.9	0.29
108		Basic	1335	B	17.0	56.2	0.27
109		Basic	300	C	23.1	60.5	0.06
110		Weaving	3100	D	27.5	45.5	0.77
111	LaSalle Avenue	Basic	700	C	19.4	61.2	0.13
112		Merge	1035	C	25.1	55.4	0.21
113		Merge	500	D	26.2	55.3	0.10
114		Overlap	1000	D	27.9	51.9	0.22
115	Rip Rap Road	Diverge	500	D	27.9	51.9	0.11
116		Basic	500	B	16.3	57.5	0.10
116A	Managed Lanes Diverge	Diverge	1000	B	17.4	58.0	0.20
116B		Basic	4920	B	13.6	62.0	0.90
117	Settlers Landing Road	Diverge	1500	B	15.9	52.9	0.32
118		Basic	1360	A	11.0	61.1	0.25
119		Weaving	2060	B	12.9	52.0	0.45
120	S Mallory Street	Basic	835	B	14.0	61.0	0.16
121		Merge	1500	C	19.1	56.7	0.30
122	HRBT	Basic	12700	C	21.0	51.6	2.80
123		Basic	4270	B	17.5	62.0	0.78
124	W Ocean View Avenue	Diverge	1500	C	20.8	52.1	0.33
125		Basic	170	B	17.2	59.4	0.03
126		Merge	1500	C	20.1	56.7	0.30
127		Basic	5770	C	18.4	62.0	1.06

I-64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
128	4th View Street	Diverge	1500	C	20.6	55.5	0.31
129		Basic	2275	B	16.2	61.7	0.42
130		Merge	1500	C	19.0	56.7	0.30
131		Basic	3470	B	17.4	61.9	0.64
132	Naval Station	Merge	1500	C	24.1	55.8	0.31
133		Basic	2270	C	21.7	61.7	0.42
133A	Managed Lanes Merge	Merge	1500	B	17.2	62.0	0.27
134	I-564 W / US 460	Weaving	2225	C	23.7	42.4	0.60
135		Basic	500	B	13.3	59.8	0.10

I-64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
201		Basic	2640	C	19.0	62.0	0.48
202	On-Ramp from I564 W	Merge	1500	D	26.6	56.6	0.30
203		Basic	370	C	24.3	60.8	0.07
203A	Managed Lanes Merge	Merge	1500	C	18.1	61.7	0.28
203B	US 460 / Managed Lanes Diverge	Weaving	1700	D	30.5	46.3	0.42
204A		Basic	1265	C	23.8	60.6	0.24
206	Naval Station	Diverge	1500	C	25.5	57.7	0.30
207		Basic	2590	C	22.9	61.8	0.48
208	4th View Street	Diverge	1500	C	24.9	57.1	0.30
209		Basic	2210	C	19.6	61.8	0.41
210		Merge	1500	D	26.7	55.9	0.30
211		Basic	4785	C	24.1	62.0	0.88
212	Ocean View Avenue	Diverge	1500	C	25.9	57.7	0.30
215A	HRBT	Basic	8575	C	23.2	62.0	1.57
215B		Basic	9000	D	33.7	42.7	2.40
215		Basic	500	C	23.2	62.0	0.09
216	S Mallory Street	Diverge	1500	D	27.1	53.0	0.32
217		Basic	900	C	21.0	60.7	0.17
218	Settlers Landing Road	Weaving	1275	C	20.1	50.1	0.29
218A	Managed Lanes Merge	Merge	1500	C	20.0	60.7	0.28
219	Settlers Landing Road	Basic	250	C	20.1	61.7	0.05
220		Merge	1500	D	26.9	56.7	0.30
221		Basic	5770	C	24.5	62.0	1.06

I-64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
222	LaSalle Avenue	Diverge	1500	E	35.4	57.3	0.30
222A	Managed Lanes Diverge	Diverge	750	D	28.0	61.2	0.14
223	LaSalle Avenue	Basic	750	D	27.6	61.5	0.14
224		Diverge	1500	D	32.3	52.6	0.32
225		Basic	420	C	23.5	60.0	0.08
226	I-664 N	Weaving	2400	D	29.4	43.5	0.63
227		Basic	1700	C	22.5	61.3	0.32
228		Basic	300	B	15.0	61.9	0.06
228A	Managed Lanes Merge	Merge	500	C	18.2	61.9	0.09
229	I-664 S	Weaving	3895	C	24.9	51.8	0.85
230	Mercury Boulevard	Basic	900	C	22.9	61.8	0.17
231		Diverge	1500	C	22.9	62.0	0.27
232		Basic	1235	C	25.8	61.9	0.23
233		Merge	1500	C	23.9	56.3	0.30
234		Basic	2640	D	26.8	61.7	0.49

GREATER GROWTH - URBAN

FREEWAY CAPACITY ANALYSIS RESULTS I-64 PM

FIGURE 97

Hampton Roads TPO

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
601	I-64	Basic	2640	C	22.2	66.7	0.45
602A	I-264	Merge	1500	B	17.8	63.1	0.27
602B		Basic	685	B	17.0	66.3	0.12
602C	US 58 / US 460	Diverge	1500	C	19.3	59.0	0.29
603		Basic	1715	C	18.6	66.4	0.29
604		Merge	1500	B	16.2	67.0	0.25
605		Basic	395	B	16.4	67.0	0.07
606		Merge	1500	C	18.6	61.8	0.28
607		Basic	1260	B	17.2	66.4	0.22
608	Dock Landing Road	Diverge	1500	B	17.2	66.9	0.25
609		Basic	2520	C	24.4	65.9	0.43
610		Merge	1500	D	31.8	57.4	0.30
611	Portsmouth Boulevard	Diverge	1450	D	31.7	57.8	0.29
612		Basic	495	C	19.0	65.1	0.09
613		Weaving	1650	C	19.9	54.5	0.34
614		Basic	575	C	23.0	64.9	0.10
615		Merge	1500	D	27.3	59.6	0.29
616		Basic	5345	C	24.7	65.8	0.92
617	Pughsville Road	Diverge	1500	D	28.7	56.8	0.30
618		Basic	945	C	20.2	65.6	0.16
619		Merge	1500	C	25.1	58.6	0.29
620		Basic	165	C	22.1	64.8	0.03
621		Merge	1500	B	16.0	66.4	0.26
622		Basic	480	B	16.1	66.9	0.08
623	US 17 / SR 164	Diverge	1500	B	16.1	67.0	0.25
624		Basic	1015	B	17.2	67.0	0.17
625		Weaving	1710	B	14.7	57.2	0.34
626		Basic	645	B	15.6	65.5	0.11
627		Merge	1500	B	12.0	66.7	0.26
628		Basic	3900	B	12.1	67.0	0.66
629	College Drive	Diverge	1500	B	12.1	67.0	0.25
630		Basic	540	B	15.1	67.0	0.09
631		Weaving	1695	B	12.1	60.8	0.32
632		Basic	50	B	15.5	65.5	0.01
633		Weaving	2365	B	12.3	61.6	0.44
634		Basic	1125	B	17.0	66.7	0.19

664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
635	Inspection Station	Merge	1500	C	18.6	61.4	0.28
636	Managed Lanes Merge	Basic	16610	B	17.1	67.0	2.82
637		Basic	7600	C	20.2	56.7	1.52
638	MMMBT	Basic	500	B	17.1	67.0	0.08
639		Diverge	1500	C	20.8	55.1	0.31
640	Terminal Avenue	Basic	1700	B	16.3	66.1	0.29
641		Merge	1130	C	18.3	60.8	0.21
642		Overlap	370	C	20.3	54.8	0.08
643		Diverge	1130	C	20.3	54.8	0.23
644	35th Street / 26th Street / 27th Street / US 60	Basic	1900	B	15.0	66.0	0.33
645		Weaving	1975	B	14.0	55.4	0.41
646		Basic	1080	B	12.1	66.0	0.19
647		Merge	1070	B	17.3	61.1	0.20
648		Overlap	430	B	17.8	59.2	0.08
649		Diverge	1070	B	17.8	59.2	0.21
650	Roanoke Avenue	Basic	1950	B	14.8	66.3	0.33
651		Weaving	2815	B	14.7	56.9	0.56
652	Chestnut Avenue	Basic	1250	B	15.9	66.6	0.21
653	Aberdeen Road	Merge	1500	C	19.5	61.4	0.28
654		Basic	2010	B	17.9	66.7	0.34
655		Diverge	1500	C	20.1	59.7	0.29
656	Power Plant Parkway	Basic	400	B	16.1	65.4	0.07
656A		Merge	1500	B	11.2	64.3	0.27
657		Merge	1500	B	12.2	63.6	0.27
658		Basic	1500	B	11.6	66.7	0.26
659	I-64	Diverge	1500	B	11.4	67.0	0.25
660		Basic	2640	C	19.2	67.0	0.45

664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
501	I-64	Basic	1000	B	11.2	67.0	0.17
502		Merge	1500	B	16.3	62.1	0.27
503		Basic	1090	B	15.2	66.4	0.19
504	Power Plant Parkway	Diverge	1500	B	15.1	66.9	0.25
504A	Managed Lanes Diverge	Diverge	1500	B	14.8	65.9	0.26
505	Power Plant Parkway	Basic	160	C	20.6	66.7	0.03
506		Merge	1500	D	26.9	59.0	0.29
507		Basic	3600	C	24.0	66.1	0.62
508	Aberdeen Road	Diverge	1500	D	26.8	59.3	0.29
509		Basic	1995	C	20.8	66.5	0.34
510A	Chestnut Avenue	Weaving	2050	C	20.1	53.4	0.44
513	Roanoke Avenue	Basic	3040	C	19.4	66.8	0.52
514		Merge	1200	C	22.7	60.2	0.23
515		Overlap	300	C	24.1	56.6	0.06
516	35th Street / 26th Street / 27th Street / US 60	Diverge	1200	C	24.1	56.6	0.24
517		Basic	1055	B	13.6	65.3	0.18
518		Diverge	1500	B	15.6	58.6	0.29
519		Basic	1960	A	10.4	66.5	0.33
520		Merge	1500	B	17.8	60.0	0.28
521		Basic	1000	B	15.9	66.1	0.17
522		Merge	1500	C	18.1	61.2	0.28
523	Terminal Avenue	Diverge	1200	C	19.7	56.1	0.24
524		Basic	1500	B	15.8	65.8	0.26
525		Merge	1500	B	17.8	61.3	0.28
526	MMMBT	Basic	7600	C	22.0	49.7	1.74
527		Basic	16610	B	16.2	67.0	2.82
528	College Drive	Diverge	1500	C	18.6	58.4	0.29
529		Basic	740	B	15.7	65.6	0.13
530		Weaving	1805	B	13.1	58.4	0.35
531		Basic	990	B	14.0	66.1	0.17
532		Merge	1500	A	10.0	66.9	0.25
533		Basic	1550	A	10.0	67.0	0.26

664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
534		Diverge	1500	A	10.0	67.0	0.25
535	US 17 / SR 164	Basic	1190	B	12.0	67.0	0.20
536		Merge	1500	B	15.9	62.4	0.27
537		Basic	685	B	14.8	66.2	0.12
538		Merge	1500	B	13.4	66.9	0.25
539		Basic	835	B	13.4	67.0	0.14
540	Pughsville Road	Diverge	1500	B	13.4	67.0	0.25
541		Basic	2435	B	17.4	67.0	0.41
542		Merge	1500	D	26.6	60.3	0.28
543		Basic	5245	C	24.3	66.0	0.90
544	Portsmouth Boulevard	Diverge	1500	D	26.8	59.7	0.29
545		Basic	565	C	22.4	65.6	0.10
546		Weaving	1710	C	22.8	53.7	0.36
547		Basic	485	C	25.8	64.8	0.09
548		Merge	1500	D	32.7	57.4	0.30
549	Dock Landing Road	Diverge	1500	D	32.3	58.2	0.29
550		Basic	2510	D	28.3	63.9	0.45
551		Merge	1500	E	44.0	52.6	0.32
552		Basic	710	E	42.7	54.2	0.15
553	US 58 / US 460	Diverge	1500	E	38.2	60.5	0.28
554		Basic	470	D	28.2	64.0	0.08
555		Weaving	2060	C	20.7	59.0	0.40
556		Basic	745	D	26.4	65.0	0.13
557		Merge	1500	C	21.8	61.8	0.28
558		Diverge	1500	C	22.4	60.3	0.28
559		Basic	970	B	17.5	66.1	0.17
560	I-64	Diverge	1500	C	20.8	56.3	0.30
561	I-264	Basic	1000	B	17.6	65.6	0.17

GREATER GROWTH - URBAN

FREEWAY CAPACITY ANALYSIS RESULTS I-664 AM

FIGURE 98

REGIONAL CONNECTORS STUDY

AUGUST 2023

664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
601	I-64	Basic	2640	C	24.4	65.9	0.46
602A	I-264	Merge	1500	C	22.4	61.5	0.28
602B		Basic	685	C	20.5	66.1	0.12
602C	US 58 / US 460	Diverge	1500	C	24.1	57.2	0.30
603		Basic	1715	C	21.3	66.3	0.29
604		Merge	1500	C	19.4	66.9	0.25
605		Basic	395	C	19.4	67.0	0.07
606		Merge	1500	C	22.9	61.0	0.28
607		Basic	1260	C	20.9	66.4	0.22
608	Dock Landing Road	Diverge	1500	C	20.9	66.9	0.25
609		Basic	2520	D	29.6	63.1	0.45
610		Merge	1500	E	37.9	54.9	0.31
611	Portsmouth Boulevard	Diverge	1450	E	36.0	57.8	0.29
612		Basic	495	C	23.1	65.1	0.09
613		Weaving	1650	C	21.4	54.7	0.34
614		Basic	575	C	23.5	65.0	0.10
615		Merge	1500	D	29.7	58.9	0.29
616		Basic	5345	D	27.1	64.6	0.94
617	Pughsville Road	Diverge	1500	D	31.3	55.9	0.30
618		Basic	945	C	19.4	65.5	0.16
619		Merge	1500	C	23.7	58.9	0.29
620		Basic	165	C	20.8	64.9	0.03
621		Merge	1500	B	15.2	66.5	0.26
622		Basic	480	B	15.2	66.9	0.08
623	US 17 / SR 164	Diverge	1500	B	15.2	67.0	0.25
624		Basic	1015	B	16.3	67.0	0.17
625		Weaving	1710	B	13.7	57.7	0.34
626		Basic	645	B	14.5	65.6	0.11
627		Merge	1500	B	12.6	66.8	0.26
628		Basic	3900	B	12.6	67.0	0.66
629	College Drive	Diverge	1500	B	12.6	67.0	0.25
630		Basic	540	B	15.2	67.0	0.09
631		Weaving	1695	B	11.4	61.6	0.31
632		Basic	50	B	14.3	65.7	0.01
633		Weaving	2365	B	11.9	61.2	0.44
634		Basic	1125	B	16.2	66.7	0.19

664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
635	Inspection Station	Merge	1500	B	17.8	61.5	0.28
636	Managed Lanes Merge	Basic	16610	B	16.3	67.0	2.82
637		Basic	7600	C	21.2	51.5	1.68
638	MMMBT	Basic	500	B	15.9	67.0	0.08
639		Diverge	1500	C	19.3	55.1	0.31
640	Terminal Avenue	Basic	1700	B	15.0	66.1	0.29
641		Merge	1130	C	18.6	60.8	0.21
642		Overlap	370	C	20.6	55.0	0.08
643		Diverge	1130	C	20.6	55.0	0.23
644	35th Street / 26th Street / 27th Street / US 60	Basic	1900	B	15.9	66.0	0.33
645		Weaving	1975	B	17.6	52.5	0.43
646		Basic	1080	B	14.4	65.8	0.19
647		Merge	1070	C	25.8	59.8	0.20
648		Overlap	430	D	26.1	59.1	0.08
649		Diverge	1070	D	26.1	59.1	0.21
650	Roanoke Avenue	Basic	1950	C	21.7	66.3	0.33
651		Weaving	2815	C	22.7	53.4	0.60
652	Chestnut Avenue	Basic	1250	C	23.1	66.4	0.21
653	Aberdeen Road	Merge	1500	D	28.3	59.6	0.29
654		Basic	2010	C	25.8	65.3	0.35
655		Diverge	1500	D	28.5	59.0	0.29
656	Power Plant Parkway	Basic	400	C	21.2	65.3	0.07
656A		Merge	1500	B	14.9	63.8	0.27
657		Merge	1500	B	16.3	62.9	0.27
658		Basic	1500	B	15.3	66.6	0.26
659	I-64	Diverge	1500	B	15.3	67.0	0.25
660		Basic	2640	C	24.4	65.9	0.46

664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
501	I-64	Basic	1000	A	7.9	67.0	0.17
502		Merge	1500	B	14.2	62.3	0.27
503		Basic	1090	B	13.2	66.4	0.19
504	Power Plant Parkway	Diverge	1500	B	13.4	65.7	0.26
504A	Managed Lanes Diverge	Diverge	1500	B	11.9	66.3	0.26
505	Power Plant Parkway	Basic	160	B	16.7	66.8	0.03
506		Merge	1500	C	21.8	60.0	0.28
507		Basic	3600	C	19.5	66.9	0.61
508	Aberdeen Road	Diverge	1500	C	22.1	59.0	0.29
509		Basic	1995	B	15.6	66.5	0.34
510A	Chestnut Avenue	Weaving	2050	B	16.8	51.9	0.45
513	Roanoke Avenue	Basic	3040	B	13.5	66.8	0.52
514		Merge	1200	B	17.1	60.9	0.22
515		Overlap	300	B	18.0	57.7	0.06
516	35th Street / 26th Street / 27th Street / US 60	Diverge	1200	B	18.0	57.7	0.24
517		Basic	1055	B	12.6	65.5	0.18
518		Diverge	1500	B	14.5	58.3	0.29
519		Basic	1960	A	8.5	66.5	0.33
520		Merge	1500	B	14.6	60.2	0.28
521		Basic	1000	B	13.1	66.1	0.17
522		Merge	1500	B	17.7	59.6	0.29
523	Terminal Avenue	Diverge	1200	C	18.9	55.8	0.24
524		Basic	1500	B	14.1	65.7	0.26
525		Merge	1500	C	20.8	60.9	0.28
526	MMMBT	Basic	7600	C	25.3	50.1	1.72
527		Basic	16610	C	18.9	67.0	2.82
528	College Drive	Diverge	1500	C	21.8	58.2	0.29
529		Basic	740	B	17.9	65.6	0.13
530		Weaving	1805	C	21.8	51.8	0.40
531		Basic	990	C	21.9	65.4	0.17
532		Merge	1500	B	16.9	66.8	0.26
533		Basic	1550	B	16.9	67.0	0.26

664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
534		Diverge	1500	B	17.7	64.0	0.27
535	US 17 / SR 164	Basic	1190	B	16.3	66.7	0.20
536		Merge	1500	C	21.9	61.6	0.28
537		Basic	685	C	20.1	66.1	0.12
538		Merge	1500	B	17.9	66.8	0.26
539		Basic	835	B	17.9	67.0	0.14
540	Pughsville Road	Diverge	1500	B	17.9	67.0	0.25
541		Basic	2435	C	20.3	67.0	0.41
542		Merge	1500	D	29.5	59.5	0.29
543		Basic	5245	D	27.2	64.6	0.92
544	Portsmouth Boulevard	Diverge	1500	D	29.6	59.3	0.29
545		Basic	565	C	23.4	65.6	0.10
546		Weaving	1710	C	25.6	49.3	0.39
547		Basic	485	C	21.7	64.0	0.09
548		Merge	1500	D	28.6	58.8	0.29
549	Dock Landing Road	Diverge	1500	D	29.1	57.8	0.29
550		Basic	2510	C	22.7	66.5	0.43
551		Merge	1500	D	28.4	59.5	0.29
552		Basic	710	C	26.0	65.2	0.12
553	US 58 / US 460	Diverge	1500	D	27.7	61.0	0.28
554		Basic	470	C	19.3	65.8	0.08
555		Weaving	2060	B	15.4	58.7	0.40
556		Basic	745	B	17.4	66.1	0.13
557		Merge	1500	C	18.3	62.1	0.27
558		Diverge	1500	C	19.3	59.0	0.29
559		Basic	970	B	13.0	65.9	0.17
560	I-64	Diverge	1500	B	15.7	55.5	0.31
561	I-264	Basic	1000	A	10.8	65.5	0.17

GREATER GROWTH - URBAN

FREEWAY CAPACITY ANALYSIS RESULTS I-664 PM

FIGURE 99

Hampton Roads TPO — Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

564 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
301		Basic	1670	A	3.5	62.0	0.31
302	Bellinger Boulevard	Merge	1500	A	8.4	62.0	0.27
303		Basic	2400	A	8.4	62.0	0.44
303A	Intermodal Connector	Merge	1500	A	5.1	60.2	0.28
303B		Basic	1380	A	6.0	61.8	0.25
303C		Basic	895	A	7.6	62.0	0.16
304	I-64 W / US 460	Diverge	1500	A	7.7	62.0	0.27
305		Basic	2400	A	7.8	62.0	0.44
306	Terminal Boulevard	Merge	1500	B	13.5	57.8	0.29
307		Basic	235	B	12.6	61.0	0.04

564 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
401	I-64	Basic	1500	B	17.2	62.0	0.27
402	Terminal Boulevard	Weaving	2155	C	24.5	42.5	0.58
403		Basic	1375	B	13.6	60.9	0.26
403A	Intermodal Connector	Diverge	1500	B	13.3	61.9	0.28
403B		Basic	5175	B	15.7	62.0	0.95
404	Bellinger Boulevard	Diverge	1500	B	16.5	58.9	0.29
405		Basic	2640	B	16.6	61.9	0.48

GREATER GROWTH - URBAN

FREEWAY CAPACITY ANALYSIS RESULTS I-564 AM

FIGURE 100

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-564 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
301		Basic	1670	B	11.3	62.0	0.31
302	Bellinger Boulevard	Merge	1500	B	15.3	62.0	0.27
303		Basic	2400	B	15.3	62.0	0.44
303A	Intermodal Connector	Merge	1500	A	8.4	60.0	0.28
303B		Basic	1380	A	10.1	61.8	0.25
303C		Basic	895	B	12.7	62.0	0.16
304	I-64 W / US 460	Diverge	1500	B	12.7	62.0	0.27
305		Basic	2400	B	13.1	62.0	0.44
306	Terminal Boulevard	Merge	1500	C	21.7	57.1	0.30
307		Basic	235	C	20.0	60.8	0.04

I-564 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
401	I-64	Basic	1500	A	5.5	62.0	0.27
402	Terminal Boulevard	Weaving	2155	A	7.9	50.4	0.49
403		Basic	1375	A	3.4	61.3	0.25
403A	Intermodal Connector	Diverge	1500	A	3.3	61.9	0.28
403B		Basic	5175	A	3.3	62.0	0.95
404	Bellinger Boulevard	Diverge	1500	A	3.5	58.9	0.29
405		Basic	2640	A	2.8	61.9	0.48

GREATER GROWTH - URBAN

FREEWAY CAPACITY ANALYSIS RESULTS I-564 PM

FIGURE 101

Hampton Roads TPO

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

164 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
701		Basic	2140	A	4.5	67.0	0.36
702		Weaving	2670	A	4.2	61.5	0.49
703	US 17 / I664	Basic	940	A	4.0	66.7	0.16
704		Merge	1500	A	7.6	67.0	0.25
705		Basic	615	A	7.6	67.0	0.10
706	College Drive	Merge	1500	A	10.4	62.7	0.27
706A	Managed Lanes Merge	Merge	1380	B	13.6	61.9	0.25
708	Towne Point Road	Diverge	1500	B	14.4	58.6	0.29
709		Basic	1905	A	10.7	66.5	0.33
710		Merge	1500	B	17.3	61.3	0.28
711		Basic	1370	B	15.8	66.4	0.23
712		Diverge	1500	B	15.8	66.9	0.25
713		Basic	1000	B	16.7	62.9	0.18
714	Cedar Lane	Merge	1500	C	25.8	60.1	0.28
715		Basic	110	C	23.3	65.1	0.02
716		Merge	1125	D	31.2	57.9	0.22
717		Basic	1500	D	28.3	63.9	0.27
718		Diverge	1125	D	32.7	55.2	0.23
719	VA International Gateway Boulevard	Basic	2270	D	27.5	64.4	0.40
720		Merge	1035	D	31.6	57.7	0.20
721		Basic	780	D	32.8	55.6	0.16
722		Diverge	1035	D	32.8	55.6	0.21
723	W Norfolk Road	Basic	605	C	25.3	64.0	0.11
724		Merge	1500	E	35.1	51.6	0.33
725		Basic	3600	D	31.9	56.8	0.72
726		Diverge	1500	E	36.0	50.4	0.34
727		Diverge	1390	C	19.8	51.8	0.30
728	US 58	Basic	1600	B	13.2	56.5	0.32
729		Merge	1500	C	21.8	53.9	0.32
730		Basic	2640	C	21.8	53.8	0.56

164 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
801	US 58	Basic	1060	B	11.8	57.0	0.21
802		Merge	1500	C	21.8	57.0	0.30
803A		Basic	2180	C	21.4	57.0	0.43
803		Basic	1600	D	32.9	56.6	0.32
804		Diverge	1500	D	34.1	54.6	0.31
805	W Norfolk Road	Basic	800	D	26.1	65.1	0.14
806		Merge	1265	D	31.6	58.0	0.25
807		Overlap	235	D	31.6	58.0	0.05
808		Diverge	1265	D	31.0	59.0	0.24
809	VA International Gateway Boulevard	Basic	2305	D	26.3	65.0	0.40
810		Merge	1500	D	29.8	58.0	0.29
811		Basic	1295	D	26.7	64.8	0.23
812		Diverge	1500	C	18.5	62.4	0.27
813	Cedar Lane	Basic	1180	B	15.2	66.5	0.20
814		Merge	1500	C	18.2	61.3	0.28
815		Basic	1430	B	16.7	66.5	0.24
816		Diverge	1500	C	19.2	58.2	0.29
817	Towne Point Road	Basic	1810	B	13.2	66.4	0.31
818		Merge	1500	C	18.7	61.5	0.28
818A	Managed Lanes Diverge	Diverge	1330	B	17.2	66.4	0.23
820	College Drive	Diverge	1500	C	26.0	55.4	0.31
821		Basic	1010	B	16.5	65.5	0.18
822		Diverge	1500	C	18.6	59.4	0.29
823		Basic	1245	B	13.9	66.2	0.21
824	I-664	Weaving	1605	B	14.3	55.8	0.33
825		Basic	1415	B	15.0	66.0	0.24
826		Merge	1030	C	22.9	58.9	0.20
827	US 17	Basic	2640	C	20.1	66.6	0.45

GREATER GROWTH - URBAN

FREEWAY CAPACITY ANALYSIS RESULTS ROUTE 164 AM

FIGURE 102

REGIONAL CONNECTORS STUDY

AUGUST 2023

164 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
701		Basic	2140	A	7.1	67.0	0.36
702	US 17 / I664	Weaving	2670	A	6.5	61.2	0.50
703		Basic	940	A	7.4	66.7	0.16
704		Merge	1500	A	9.9	67.0	0.25
705		Basic	615	A	9.9	67.0	0.10
706	College Drive	Merge	1500	B	14.8	62.2	0.27
706A	Managed Lanes Merge	Merge	1380	B	17.4	61.0	0.26
708	Towne Point Road	Diverge	1500	C	18.6	57.3	0.30
709		Basic	1905	B	12.3	66.4	0.33
710		Merge	1500	B	16.2	61.6	0.28
711		Basic	1370	B	14.9	66.5	0.23
712	Cedar Lane	Diverge	1500	B	14.9	66.9	0.25
713		Basic	1000	B	11.1	62.9	0.18
714		Merge	1500	B	18.0	61.4	0.28
715		Basic	110	B	16.5	65.5	0.02
716		Merge	1125	C	25.7	59.4	0.22
717		Basic	1500	C	23.0	66.1	0.26
718	VA International Gateway Boulevard	Diverge	1125	D	27.6	55.3	0.23
719		Basic	2270	C	22.8	66.3	0.39
720		Merge	1035	D	27.2	59.0	0.20
721		Basic	780	D	28.7	55.8	0.16
722	W Norfolk Road	Diverge	1035	D	28.7	55.8	0.21
723		Basic	605	C	22.6	64.0	0.11
724		Merge	1500	D	32.2	52.2	0.33
725		Basic	3600	D	29.5	56.9	0.72
726	US 58	Diverge	1500	D	33.1	50.7	0.34
727		Diverge	1390	C	19.5	52.0	0.30
728		Basic	1600	B	14.0	56.6	0.32
729		Merge	1500	B	18.0	54.1	0.32
730		Basic	2640	C	18.1	53.8	0.56

164 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
801	US 58	Basic	1060	B	15.5	57.0	0.21
802		Merge	1500	C	18.5	57.0	0.30
803A		Basic	2180	C	18.2	57.0	0.43
803		Basic	1600	D	27.8	57.0	0.32
804	W Norfolk Road	Diverge	1500	D	28.8	55.1	0.31
805		Basic	800	C	23.1	65.2	0.14
806		Merge	1265	D	27.5	59.3	0.24
807		Overlap	235	D	27.5	59.4	0.04
808	VA International Gateway Boulevard	Diverge	1265	D	27.5	59.4	0.24
809		Basic	2305	C	24.0	66.1	0.40
810		Merge	1500	D	27.4	58.7	0.29
811		Basic	1295	C	24.4	65.9	0.22
812	Cedar Lane	Diverge	1500	B	17.3	62.2	0.27
813		Basic	1180	B	13.8	66.5	0.20
814		Merge	1500	B	16.7	61.5	0.28
815		Basic	1430	B	15.3	66.5	0.24
816	Towne Point Road	Diverge	1500	B	17.5	58.6	0.29
817		Basic	1810	B	12.9	66.4	0.31
818		Merge	1500	C	18.2	61.6	0.28
818A	Managed Lanes Diverge	Diverge	1330	B	16.7	66.5	0.23
820	College Drive	Diverge	1500	C	24.1	55.2	0.31
821		Basic	1010	B	13.9	65.5	0.18
822	I-664	Diverge	1500	B	15.8	59.0	0.29
823		Basic	1245	A	9.8	66.1	0.21
824		Weaving	1605	A	11.0	54.4	0.34
825		Basic	1415	A	9.2	65.9	0.24
826		Merge	1030	B	17.9	59.5	0.20
827	US 17	Basic	2640	B	15.9	66.6	0.45

GREATER GROWTH - URBAN

FREEWAY CAPACITY ANALYSIS RESULTS ROUTE 164 PM

FIGURE 103

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
101		Basic	500	C	24.7	62.0	0.09
102	Mercury Boulevard	Diverge	1500	C	19.2	59.8	0.29
103		Basic	1015	C	23.1	61.7	0.19
104		Merge	1500	C	19.5	62.0	0.27
105		Merge	1500	B	17.5	57.0	0.30
106		Basic	250	C	21.0	60.8	0.05
106A	Managed Lanes Diverge	Diverge	250	C	25.1	61.2	0.05
107	I-664	Diverge	1500	D	26.3	57.3	0.30
108		Basic	1335	B	16.9	56.2	0.27
109		Basic	300	C	22.9	60.5	0.06
110		Weaving	3100	C	25.8	46.1	0.76
111	LaSalle Avenue	Basic	700	B	17.0	61.3	0.13
112		Merge	1035	C	25.5	55.4	0.21
113		Merge	500	D	28.3	54.9	0.10
114		Overlap	1000	D	29.6	52.6	0.22
115	Rip Rap Road	Diverge	500	D	29.6	52.6	0.11
116		Basic	500	C	21.2	57.8	0.10
116A	Managed Lanes Diverge	Diverge	1000	C	22.9	57.3	0.20
116B		Basic	4920	B	15.2	62.0	0.90
117	Settlers Landing Road	Diverge	1500	B	17.9	52.6	0.32
118		Basic	1360	B	11.4	61.1	0.25
119		Weaving	2060	C	19.5	46.0	0.51
120	S Mallory Street	Basic	835	B	16.6	60.5	0.16
121		Merge	1500	D	26.5	55.9	0.30
122	HRBT	Basic	12700	E	35.9	41.3	3.49
123		Basic	4270	C	23.9	62.0	0.78
124	W Ocean View Avenue	Diverge	1500	D	28.5	52.0	0.33
125		Basic	170	C	24.3	57.7	0.03
126		Merge	1500	D	26.3	56.0	0.30
127		Basic	5770	C	23.7	62.0	1.06

64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
128	4th View Street	Diverge	1500	D	26.8	55.0	0.31
129		Basic	2275	C	19.1	61.7	0.42
130		Merge	1500	C	23.7	56.3	0.30
131		Basic	3470	C	21.5	61.9	0.64
132	Naval Station	Merge	1500	D	26.8	55.4	0.31
133		Basic	2270	C	24.0	61.7	0.42
133A	Managed Lanes Merge	Merge	1500	C	21.9	62.0	0.27
134	I-564 W / US 460	Weaving	2225	D	29.9	40.8	0.62
135		Basic	500	B	17.0	59.7	0.10

64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
201		Basic	2640	C	18.1	62.0	0.48
202	On-Ramp from I564 W	Merge	1500	C	23.4	57.2	0.30
203		Basic	370	C	21.6	60.9	0.07
203A	Managed Lanes Merge	Merge	1500	B	14.4	61.8	0.28
203B	US 460 / Managed Lanes Diverge	Weaving	1700	C	22.7	49.8	0.39
204A		Basic	1265	C	21.3	60.9	0.24
206	Naval Station	Diverge	1500	C	22.8	57.9	0.29
207		Basic	2590	B	18.0	61.9	0.48
208	4th View Street	Diverge	1500	C	20.0	55.6	0.31
209		Basic	2210	B	16.2	61.7	0.41
210		Merge	1500	C	20.2	56.8	0.30
211		Basic	4785	C	18.5	62.0	0.88
212	Ocean View Avenue	Diverge	1500	C	22.0	52.0	0.33
213		Basic	180	B	17.8	59.4	0.03
214		Merge	1500	C	21.7	55.8	0.31
215A		Basic	6895	C	19.5	62.0	1.26
215B	HRBT	Basic	9000	C	24.7	49.0	2.09
215		Basic	500	C	19.5	62.0	0.09
216	S Mallory Street	Diverge	1500	C	20.7	58.5	0.29
217		Basic	900	C	19.0	61.5	0.17
218	Settlers Landing Road	Weaving	1275	C	21.2	47.2	0.31
218A	Managed Lanes Merge	Merge	1500	B	16.2	60.4	0.28
219	Settlers Landing Road	Basic	250	B	16.5	61.6	0.05
220		Merge	1500	C	24.3	57.2	0.30
221		Basic	5770	C	22.0	62.0	1.06

64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
222	LaSalle Avenue	Diverge	1500	D	30.9	59.9	0.28
222A	Managed Lanes Diverge	Diverge	750	D	26.8	61.7	0.14
223	LaSalle Avenue	Basic	750	D	28.5	61.2	0.14
224		Diverge	1500	D	30.5	58.4	0.29
225		Basic	420	D	27.8	61.2	0.08
226	I-664 N	Weaving	2400	E	35.7	40.4	0.68
227		Basic	1700	C	22.2	61.2	0.32
228		Basic	300	B	14.8	61.8	0.06
228A	Managed Lanes Merge	Merge	500	C	18.6	56.6	0.10
229	I-664 S	Weaving	3895	C	25.8	47.8	0.93
230	Mercury Boulevard	Basic	900	C	21.9	61.7	0.17
231		Diverge	1500	C	21.9	62.0	0.27
232		Basic	1235	C	24.5	62.0	0.23
233		Merge	1500	C	22.2	57.2	0.30
234		Basic	2640	C	25.2	61.8	0.49

GREATER GROWTH - SUBURBAN
FREEWAY CAPACITY ANALYSIS RESULTS I-64 AM

FIGURE 104

Hampton Roads TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
101		Basic	500	C	25.0	62.0	0.09
102	Mercury Boulevard	Diverge	1500	C	19.9	58.4	0.29
103		Basic	1015	C	21.0	61.5	0.19
104		Merge	1500	B	17.8	61.9	0.28
105		Merge	1500	B	15.8	57.5	0.30
106		Basic	250	C	19.1	60.9	0.05
106A	Managed Lanes Diverge	Diverge	250	C	22.9	61.3	0.05
107	I-664	Diverge	1500	C	25.1	57.8	0.29
108		Basic	1335	B	16.9	56.2	0.27
109		Basic	300	C	23.0	60.5	0.06
110		Weaving	3100	D	29.4	44.5	0.79
111	LaSalle Avenue	Basic	700	C	19.5	61.2	0.13
112		Merge	1035	C	24.7	55.5	0.21
113		Merge	500	C	25.9	55.3	0.10
114		Overlap	1000	D	27.7	51.8	0.22
115	Rip Rap Road	Diverge	500	D	27.7	51.8	0.11
116		Basic	500	B	15.9	57.5	0.10
116A	Managed Lanes Diverge	Diverge	1000	B	17.0	57.9	0.20
116B		Basic	4920	B	12.6	62.0	0.90
117	Settlers Landing Road	Diverge	1500	B	14.8	52.8	0.32
118		Basic	1360	A	9.6	61.1	0.25
119		Weaving	2060	B	12.2	52.1	0.45
120	S Mallory Street	Basic	835	B	13.5	61.1	0.16
121		Merge	1500	C	19.5	56.7	0.30
122	HRBT	Basic	12700	C	21.4	51.5	2.80
123		Basic	4270	B	17.8	62.0	0.78
124	W Ocean View Avenue	Diverge	1500	C	21.2	52.1	0.33
125		Basic	170	B	17.5	59.4	0.03
126		Merge	1500	C	20.7	56.7	0.30
127		Basic	5770	C	18.9	62.0	1.06

I-64 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
128	4th View Street	Diverge	1500	C	21.1	55.5	0.31
129		Basic	2275	B	16.4	61.7	0.42
130		Merge	1500	C	19.3	56.7	0.30
131		Basic	3470	B	17.6	61.9	0.64
132	Naval Station	Merge	1500	C	25.4	55.6	0.31
133		Basic	2270	C	22.7	61.7	0.42
133A	Managed Lanes Merge	Merge	1500	C	18.2	62.0	0.27
134	I-564 W / US 460	Weaving	2225	C	24.9	42.3	0.60
135		Basic	500	B	14.4	59.8	0.10

I-64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
201		Basic	2640	C	19.7	62.0	0.48
202	On-Ramp from I564 W	Merge	1500	D	27.6	56.4	0.30
203		Basic	370	C	25.1	60.8	0.07
203A	Managed Lanes Merge	Merge	1500	C	18.3	61.7	0.28
203B	US 460 / Managed Lanes Diverge	Weaving	1700	D	33.0	44.7	0.43
204A		Basic	1265	C	23.6	60.4	0.24
206	Naval Station	Diverge	1500	C	25.4	57.7	0.30
207		Basic	2590	C	22.9	61.8	0.48
208	4th View Street	Diverge	1500	C	24.8	57.4	0.30
209		Basic	2210	C	21.0	61.8	0.41
210		Merge	1500	D	28.9	55.5	0.31
211		Basic	4785	C	25.9	61.9	0.88
212	Ocean View Avenue	Diverge	1500	D	27.8	57.7	0.30
215A	HRBT	Basic	8575	C	24.9	62.0	1.57
215B		Basic	9000	E	40.8	37.9	2.70
215		Basic	500	C	24.9	62.0	0.09
216	S Mallory Street	Diverge	1500	D	29.3	52.7	0.32
217		Basic	900	C	21.7	60.7	0.17
218	Settlers Landing Road	Weaving	1275	C	22.0	48.8	0.30
218A	Managed Lanes Merge	Merge	1500	C	21.6	60.6	0.28
219	Settlers Landing Road	Basic	250	C	21.7	61.7	0.05
220		Merge	1500	D	28.2	56.5	0.30
221		Basic	5770	C	25.7	61.9	1.06
222	LaSalle Avenue	Diverge	1500	E	37.1	57.2	0.30

I-64 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
222A	Managed Lanes Diverge	Diverge	750	D	29.7	60.7	0.14
223	LaSalle Avenue	Basic	750	D	29.7	60.7	0.14
224		Diverge	1500	D	34.3	52.5	0.32
225		Basic	420	C	24.6	60.0	0.08
226	I-664 N	Weaving	2400	D	32.0	41.9	0.65
227		Basic	1700	C	22.0	61.3	0.32
228		Basic	300	B	14.7	61.9	0.06
228A	Managed Lanes Merge	Merge	500	C	18.2	61.9	0.09
229	I-664 S	Weaving	3895	C	25.7	52.9	0.84
230	Mercury Boulevard	Basic	900	C	25.0	61.8	0.17
231		Diverge	1500	C	25.0	62.0	0.27
232		Basic	1235	D	28.4	61.2	0.23
233		Merge	1500	D	26.6	54.9	0.31
234		Basic	2640	D	30.4	60.4	0.50

GREATER GROWTH - SUBURBAN

FREEWAY CAPACITY ANALYSIS RESULTS I-64 PM

FIGURE 105

Hampton Roads TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
601	I-64	Basic	2640	C	22.6	66.6	0.45
602A	I-264	Merge	1500	B	17.4	63.3	0.27
602B		Basic	685	B	16.6	66.4	0.12
602C	US 58 / US 460	Diverge	1500	C	18.6	59.8	0.29
603		Basic	1715	C	19.3	66.5	0.29
604		Merge	1500	B	15.9	67.0	0.25
605		Basic	395	B	16.0	67.0	0.07
606		Merge	1500	C	18.7	61.7	0.28
607		Basic	1260	B	17.3	66.4	0.22
608	Dock Landing Road	Diverge	1500	B	17.3	66.9	0.25
609		Basic	2520	C	24.9	65.7	0.44
610		Merge	1500	D	33.7	56.7	0.30
611	Portsmouth Boulevard	Diverge	1450	D	33.3	57.8	0.29
612		Basic	495	C	20.4	65.1	0.09
613		Weaving	1650	C	21.3	53.6	0.35
614		Basic	575	C	23.7	64.8	0.10
615		Merge	1500	D	28.4	59.3	0.29
616		Basic	5345	C	25.8	65.3	0.93
617	Pughsville Road	Diverge	1500	D	29.8	56.5	0.30
618		Basic	945	C	20.3	65.6	0.16
619		Merge	1500	C	25.7	58.5	0.29
620		Basic	165	C	22.6	64.8	0.03
621		Merge	1500	B	16.4	66.4	0.26
622		Basic	480	B	16.5	66.9	0.08
623	US 17 / SR 164	Diverge	1500	B	16.5	67.0	0.25
624		Basic	1015	C	18.3	67.0	0.17
625		Weaving	1710	B	15.6	56.8	0.34
626		Basic	645	B	16.4	65.5	0.11
627		Merge	1500	B	12.9	66.7	0.26
628		Basic	3900	B	13.0	67.0	0.66
629	College Drive	Diverge	1500	B	13.0	67.0	0.25
630		Basic	540	B	16.0	67.0	0.09
631		Weaving	1695	B	12.9	60.4	0.32
632		Basic	50	B	16.3	65.4	0.01
633		Weaving	2365	B	13.1	61.2	0.44
634		Basic	1125	B	18.0	66.7	0.19

I-664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
635	Inspection Station	Merge	1500	C	19.7	61.3	0.28
636	Managed Lanes Merge	Basic	16610	B	18.0	67.0	2.82
637		Basic	7600	C	21.6	56.1	1.54
638	MMMBT	Basic	500	B	18.0	67.0	0.08
639		Diverge	1500	C	22.0	55.0	0.31
640	Terminal Avenue	Basic	1700	B	17.1	66.1	0.29
641		Merge	1130	C	19.1	60.7	0.21
642		Overlap	370	C	21.2	54.8	0.08
643		Diverge	1130	C	21.2	54.8	0.23
644	35th Street / 26th Street / 27th Street / US 60	Basic	1900	B	15.7	66.0	0.33
645		Weaving	1975	B	14.9	54.9	0.41
646		Basic	1080	B	12.7	66.0	0.19
647		Merge	1070	B	16.6	61.2	0.20
648		Overlap	430	B	17.2	59.2	0.08
649		Diverge	1070	B	17.2	59.2	0.21
650	Roanoke Avenue	Basic	1950	B	14.1	66.3	0.33
651		Weaving	2815	B	14.6	56.7	0.56
652	Chestnut Avenue	Basic	1250	B	15.6	66.6	0.21
653	Aberdeen Road	Merge	1500	C	19.2	61.4	0.28
654		Basic	2010	B	17.6	66.7	0.34
655		Diverge	1500	C	19.9	59.5	0.29
656	Power Plant Parkway	Basic	400	B	15.4	65.4	0.07
656A		Merge	1500	B	14.4	63.5	0.27
657		Merge	1500	B	15.7	63.0	0.27
658		Basic	1500	B	14.8	66.6	0.26
659	I-64	Diverge	1500	B	14.7	67.0	0.25
660		Basic	2640	C	24.4	65.9	0.46

I-664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
501	I-64	Basic	1000	B	12.0	67.0	0.17
502		Merge	1500	C	20.2	59.9	0.28
503		Basic	1090	C	18.2	66.1	0.19
504	Power Plant Parkway	Diverge	1500	B	18.0	66.9	0.25
504A	Managed Lanes Diverge	Diverge	1500	C	19.3	61.6	0.28
505	Power Plant Parkway	Basic	160	B	17.6	65.6	0.03
506		Merge	1500	C	25.4	59.4	0.29
507		Basic	3600	C	22.8	66.5	0.62
508	Aberdeen Road	Diverge	1500	C	25.4	59.5	0.29
509		Basic	1995	C	20.1	66.6	0.34
510A	Chestnut Avenue	Weaving	2050	C	20.5	52.3	0.45
513	Roanoke Avenue	Basic	3040	C	18.9	66.8	0.52
514		Merge	1200	C	22.6	60.2	0.23
515		Overlap	300	C	24.1	56.4	0.06
516	35th Street / 26th Street / 27th Street / US 60	Diverge	1200	C	24.1	56.4	0.24
517		Basic	1055	B	13.0	65.3	0.18
518		Diverge	1500	B	15.0	58.4	0.29
519		Basic	1960	A	9.3	66.5	0.33
520		Merge	1500	B	17.0	60.0	0.28
521		Basic	1000	B	15.3	66.1	0.17
522		Merge	1500	C	18.8	61.1	0.28
523	Terminal Avenue	Diverge	1200	C	20.5	56.1	0.24
524		Basic	1500	B	16.4	65.8	0.26
525		Merge	1500	C	18.8	61.2	0.28
526	MMMBT	Basic	7600	C	20.0	57.5	1.50
527		Basic	16610	B	17.0	67.0	2.82
528	College Drive	Diverge	1500	C	19.5	58.4	0.29
529		Basic	740	B	16.5	65.6	0.13
530		Weaving	1805	B	13.7	58.4	0.35
531		Basic	990	B	15.1	66.1	0.17
532		Merge	1500	A	10.8	66.9	0.25
533		Basic	1550	A	10.8	67.0	0.26

I-664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
534		Diverge	1500	A	10.8	67.0	0.25
535	US 17 / SR 164	Basic	1190	B	13.5	67.0	0.20
536		Merge	1500	B	17.3	62.2	0.27
537		Basic	685	B	16.1	66.2	0.12
538		Merge	1500	B	13.8	66.9	0.25
539		Basic	835	B	13.8	67.0	0.14
540	Pughsville Road	Diverge	1500	B	13.8	67.0	0.25
541		Basic	2435	B	17.9	67.0	0.41
542		Merge	1500	D	26.7	60.3	0.28
543		Basic	5245	C	24.4	65.9	0.90
544	Portsmouth Boulevard	Diverge	1500	D	26.8	59.9	0.28
545		Basic	565	C	23.3	65.7	0.10
546		Weaving	1710	C	22.9	54.1	0.36
547		Basic	485	D	26.1	64.8	0.09
548		Merge	1500	D	33.1	57.3	0.30
549	Dock Landing Road	Diverge	1500	D	32.6	58.2	0.29
550		Basic	2510	D	28.6	63.7	0.45
551		Merge	1500	E	44.9	52.6	0.32
552		Basic	710	E	44.5	53.0	0.15
553	US 58 / US 460	Diverge	1500	E	38.9	60.6	0.28
554		Basic	470	D	29.5	63.2	0.08
555		Weaving	2060	C	21.5	58.6	0.40
556		Basic	745	D	27.3	64.5	0.13
557		Merge	1500	C	22.6	61.5	0.28
558		Diverge	1500	C	23.1	60.2	0.28
559		Basic	970	B	18.0	66.1	0.17
560	I-64	Diverge	1500	C	21.5	56.2	0.30
561	I-264	Basic	1000	C	18.3	65.6	0.17

GREATER GROWTH - SUBURBAN

FREEWAY CAPACITY ANALYSIS RESULTS I-664 AM

FIGURE 106

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
601	I-64	Basic	2640	C	25.3	65.5	0.46
602A	I-264	Merge	1500	C	23.5	61.0	0.28
602B		Basic	685	C	21.4	66.0	0.12
602C	US 58 / US 460	Diverge	1500	C	25.2	56.8	0.30
603		Basic	1715	C	21.7	66.2	0.29
604		Merge	1500	C	19.4	66.9	0.25
605		Basic	395	C	19.4	67.0	0.07
606		Merge	1500	C	23.0	61.0	0.28
607		Basic	1260	C	21.0	66.4	0.22
608	Dock Landing Road	Diverge	1500	C	21.0	66.9	0.25
609		Basic	2520	D	29.4	63.2	0.45
610		Merge	1500	E	38.1	54.8	0.31
611	Portsmouth Boulevard	Diverge	1450	E	36.2	57.7	0.29
612		Basic	495	C	23.1	65.1	0.09
613		Weaving	1650	C	22.0	54.2	0.35
614		Basic	575	C	24.2	64.9	0.10
615		Merge	1500	D	30.8	58.6	0.29
616		Basic	5345	D	28.2	64.0	0.95
617	Pughsville Road	Diverge	1500	D	32.3	55.9	0.30
618		Basic	945	C	20.2	65.5	0.16
619		Merge	1500	C	24.7	58.7	0.29
620		Basic	165	C	21.7	64.8	0.03
621		Merge	1500	B	15.7	66.4	0.26
622		Basic	480	B	15.7	66.9	0.08
623	US 17 / SR 164	Diverge	1500	B	15.7	67.0	0.25
624		Basic	1015	B	17.5	67.0	0.17
625		Weaving	1710	B	14.7	57.8	0.34
626		Basic	645	B	16.2	65.6	0.11
627		Merge	1500	B	13.8	66.8	0.26
628		Basic	3900	B	13.7	67.0	0.66
629	College Drive	Diverge	1500	B	13.7	67.0	0.25
630		Basic	540	B	16.8	67.0	0.09
631		Weaving	1695	B	12.7	60.8	0.32
632		Basic	50	B	15.6	65.5	0.01
633		Weaving	2365	B	13.0	60.8	0.44
634		Basic	1125	B	17.6	66.6	0.19

I-664 NORTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
644		Basic	1900	B	17.2	66.0	0.33
645	35th Street / 26th Street / 27th Street / US 60	Weaving	1975	C	18.7	52.0	0.43
646		Basic	1080	B	14.9	65.7	0.19
647		Merge	1070	D	27.2	59.4	0.20
648		Overlap	430	D	27.4	59.0	0.08
649		Diverge	1070	D	27.4	59.0	0.21
650	Roanoke Avenue	Basic	1950	C	22.5	66.3	0.33
651		Weaving	2815	C	23.5	53.0	0.60
652	Chestnut Avenue	Basic	1250	C	23.3	66.3	0.21
653	Aberdeen Road	Merge	1500	D	28.6	59.5	0.29
654		Basic	2010	D	26.1	65.1	0.35
655		Diverge	1500	D	29.1	58.4	0.29
656	Power Plant Parkway	Basic	400	C	19.4	65.2	0.07
656A		Merge	1500	C	18.3	62.7	0.27
657		Merge	1500	C	19.2	62.5	0.27
658		Basic	1500	B	17.9	66.6	0.26
659	I-64	Diverge	1500	C	18.1	66.4	0.26
660		Basic	2640	D	28.4	63.9	0.47

I-664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
501	I-64	Basic	1000	A	9.7	67.0	0.17
502		Merge	1500	B	17.4	61.2	0.28
503		Basic	1090	B	15.9	66.3	0.19
504	Power Plant Parkway	Diverge	1500	B	16.2	65.7	0.26
504A	Managed Lanes Diverge	Diverge	1500	B	15.3	62.7	0.27
505	Power Plant Parkway	Basic	160	B	14.9	65.9	0.03
506		Merge	1500	C	21.7	60.0	0.28
507		Basic	3600	C	19.4	66.9	0.61
508	Aberdeen Road	Diverge	1500	C	22.1	59.0	0.29
509		Basic	1995	B	15.6	66.5	0.34
510A	Chestnut Avenue	Weaving	2050	B	17.0	51.5	0.45
513	Roanoke Avenue	Basic	3040	B	13.4	66.7	0.52
514		Merge	1200	B	17.2	60.9	0.22
515		Overlap	300	C	18.2	57.6	0.06
516	35th Street / 26th Street / 27th Street / US 60	Diverge	1200	C	18.2	57.6	0.24
517		Basic	1055	B	12.6	65.5	0.18
518		Diverge	1500	B	14.5	58.2	0.29
519		Basic	1960	A	8.1	66.5	0.33
520		Merge	1500	B	14.4	60.2	0.28
521		Basic	1000	B	13.0	66.1	0.17
522		Merge	1500	B	17.9	59.6	0.29
523	Terminal Avenue	Diverge	1200	C	19.2	55.8	0.24
524		Basic	1500	B	14.2	65.7	0.26
525		Merge	1500	C	21.8	60.8	0.28
526	MMMBT	Basic	7600	D	26.7	49.7	1.74
527		Basic	16610	C	19.8	67.0	2.82
528	College Drive	Diverge	1500	C	22.8	58.2	0.29
529		Basic	740	C	18.7	65.6	0.13
530		Weaving	1805	C	22.4	51.5	0.40
531		Basic	990	C	22.1	65.4	0.17
532		Merge	1500	B	17.1	66.8	0.26
533		Basic	1550	B	17.1	67.0	0.26

I-664 SOUTH

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
534	US 17 / SR 164	Diverge	1500	B	17.8	64.3	0.27
535		Basic	1190	B	17.2	66.7	0.20
536		Merge	1500	C	22.0	61.6	0.28
537		Basic	685	C	20.2	66.1	0.12
538		Merge	1500	C	18.2	66.8	0.26
539		Basic	835	C	18.2	67.0	0.14
540	Pughsville Road	Diverge	1500	C	18.2	67.0	0.25
541		Basic	2435	C	20.5	67.0	0.41
542		Merge	1500	D	30.2	59.2	0.29
543		Basic	5245	D	27.9	64.2	0.93
544	Portsmouth Boulevard	Diverge	1500	D	30.2	59.2	0.29
545		Basic	565	C	23.4	65.5	0.10
546		Weaving	1710	C	25.6	49.4	0.39
547		Basic	485	C	21.8	64.0	0.09
548		Merge	1500	D	29.1	58.6	0.29
549	Dock Landing Road	Diverge	1500	D	29.5	57.7	0.30
550		Basic	2510	C	22.7	66.5	0.43
551		Merge	1500	D	28.4	59.5	0.29
552		Basic	710	C	25.9	65.2	0.12
553	US 58 / US 460	Diverge	1500	D	27.5	61.4	0.28
554		Basic	470	C	20.4	65.9	0.08
555		Weaving	2060	B	16.4	58.3	0.40
556		Basic	745	C	18.4	66.1	0.13
557		Merge	1500	C	18.6	62.2	0.27
558		Diverge	1500	C	19.6	58.9	0.29
559		Basic	970	B	13.1	65.9	0.17
560	I-64	Diverge	1500	B	15.9	55.5	0.31
561	I-264	Basic	1000	A	11.0	65.5	0.17

GREATER GROWTH - SUBURBAN
FREEWAY CAPACITY ANALYSIS RESULTS
I-664 PM

FIGURE 107

REGIONAL CONNECTORS STUDY

AUGUST 2023

I-564 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
301		Basic	1670	A	2.7	62.0	0.31
302	Bellinger Boulevard	Merge	1500	A	5.8	62.0	0.27
303		Basic	2400	A	5.8	62.0	0.44
303A	Intermodal Connector	Merge	1500	A	3.6	60.2	0.28
303B		Basic	1380	A	4.3	61.8	0.25
303C		Basic	895	A	5.3	62.0	0.16
304	I-64 W / US 460	Diverge	1500	A	5.4	62.0	0.27
305		Basic	2400	A	5.3	62.0	0.44
306	Terminal Boulevard	Merge	1500	A	10.3	57.9	0.29
307		Basic	235	A	9.7	61.0	0.04

I-564 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
401	I-64	Basic	1500	C	19	62.0	0.27
402	Terminal Boulevard	Weaving	2155	D	27.7	41.0	0.60
403		Basic	1375	B	14.8	60.8	0.26
403A	Intermodal Connector	Diverge	1500	B	14.5	61.9	0.28
403B		Basic	5175	B	16.9	62.0	0.95
404	Bellinger Boulevard	Diverge	1500	B	17.9	58.6	0.29
405		Basic	2640	B	17.7	61.9	0.48

GREATER GROWTH - SUBURBAN
FREEWAY CAPACITY ANALYSIS RESULTS I-564 AM

FIGURE 108

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

564 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
301		Basic	1670	B	11.7	62.0	0.31
302	Bellinger Boulevard	Merge	1500	B	16.1	62.0	0.27
303		Basic	2400	B	16.1	62.0	0.44
303A	Intermodal Connector	Merge	1500	A	9.0	60.0	0.28
303B		Basic	1380	A	10.8	61.8	0.25
303C		Basic	895	B	13.5	62.0	0.16
304	I-64 W / US 460	Diverge	1500	B	13.5	62.0	0.27
305		Basic	2400	B	14.1	62.0	0.44
306	Terminal Boulevard	Merge	1500	C	23.2	56.9	0.30
307		Basic	235	C	21.3	60.7	0.04

564 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
401	I-64	Basic	1500	A	4.7	62.0	0.27
402	Terminal Boulevard	Weaving	2155	A	7.2	51.0	0.48
403		Basic	1375	A	3	61.4	0.25
403A	Intermodal Connector	Diverge	1500	A	2.9	61.9	0.28
403B		Basic	5175	A	2.8	62.0	0.95
404	Bellinger Boulevard	Diverge	1500	A	2.9	59.2	0.29
405		Basic	2640	A	2.5	61.9	0.48

GREATER GROWTH - SUBURBAN

FREEWAY CAPACITY ANALYSIS RESULTS I-564 PM

FIGURE 109

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization

Michael Baker INTERNATIONAL

REGIONAL CONNECTORS STUDY

AUGUST 2023

164 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
701		Basic	2140	A	4.7	67.0	0.36
702	US 17 / I664	Weaving	2670	A	4.3	61.6	0.49
703		Basic	940	A	4.2	66.7	0.16
704		Merge	1500	A	7.6	67.0	0.25
705		Basic	615	A	7.6	67.0	0.10
706	College Drive	Merge	1500	A	9.9	62.8	0.27
706A	Managed Lanes Merge	Merge	1380	B	15.0	61.6	0.25
708	Towne Point Road	Diverge	1500	B	15.7	59.2	0.29
709		Basic	1905	B	12.6	66.5	0.33
710		Merge	1500	C	18.9	61.1	0.28
711		Basic	1370	B	17.3	66.4	0.23
712	Cedar Lane	Diverge	1500	B	17.3	66.9	0.25
713		Basic	1000	B	17.7	62.9	0.18
714		Merge	1500	D	27.7	59.6	0.29
715		Basic	110	C	25.2	65.0	0.02
716		Merge	1125	D	31.8	57.7	0.22
717		Basic	1500	D	28.8	63.6	0.27
718	VA International Gateway Boulevard	Diverge	1125	D	33.2	55.2	0.23
719		Basic	2270	D	28.4	63.8	0.40
720		Merge	1035	D	32.7	57.3	0.21
721		Basic	780	D	33.7	55.6	0.16
722	W Norfolk Road	Diverge	1035	D	33.7	55.6	0.21
723		Basic	605	D	26.2	64.0	0.11
724		Merge	1500	E	38.4	50.9	0.33
725		Basic	3600	E	35.1	55.8	0.73
726	US 58	Diverge	1500	E	39.3	49.7	0.34
727		Diverge	1390	B	17.6	51.7	0.31
728		Basic	1600	A	10.8	56.5	0.32
729		Merge	1500	B	17.0	54.2	0.31
730		Basic	2640	B	17.1	53.8	0.56

164 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
801	US 58	Basic	1060	B	12.9	57.0	0.21
802		Merge	1500	C	19.8	57.0	0.30
803A		Basic	2180	C	19.4	57.0	0.43
803		Basic	1600	D	29.7	57.0	0.32
804	W Norfolk Road	Diverge	1500	D	30.9	54.8	0.31
805		Basic	800	C	23.9	65.1	0.14
806		Merge	1265	D	28.4	59.0	0.24
807		Overlap	235	D	28.4	59.0	0.05
808	VA International Gateway Boulevard	Diverge	1265	D	28.4	59.0	0.24
809		Basic	2305	C	23.5	66.3	0.40
810		Merge	1500	D	26.8	58.8	0.29
811		Basic	1295	C	23.9	66.1	0.22
812	Cedar Lane	Diverge	1500	B	16.7	62.8	0.27
813		Basic	1180	B	14.5	66.5	0.20
814		Merge	1500	B	18.0	61.3	0.28
815		Basic	1430	B	16.5	66.5	0.24
816	Towne Point Road	Diverge	1500	C	18.9	58.5	0.29
817		Basic	1810	B	13.6	66.4	0.31
818		Merge	1500	C	19.2	61.4	0.28
818A	Managed Lanes Diverge	Diverge	1330	B	17.6	66.4	0.23
820	College Drive	Diverge	1500	C	24.5	55.8	0.31
821		Basic	1010	B	16.5	65.5	0.18
822	I-664	Diverge	1500	C	18.7	59.3	0.29
823		Basic	1245	B	13.5	66.2	0.21
824		Weaving	1605	B	14.4	55.6	0.33
825		Basic	1415	B	15.4	66.0	0.24
826		Merge	1030	C	23.4	58.8	0.20
827	US 17	Basic	2640	C	20.5	66.6	0.45

GREATER GROWTH - SUBURBAN

FREEWAY CAPACITY ANALYSIS RESULTS ROUTE 164 AM

FIGURE 110

HAMPTON ROADS TPO
Michael Baker INTERNATIONAL
REGIONAL CONNECTORS STUDY
AUGUST 2023

164 EAST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
701		Basic	2140	A	6.9	67.0	0.36
702	US 17 / I664	Weaving	2670	A	6.5	60.9	0.50
703	US 17 / I664	Basic	940	A	7.1	66.7	0.16
704	US 17 / I664	Merge	1500	A	9.3	67.0	0.25
705		Basic	615	A	9.3	67.0	0.10
706	College Drive	Merge	1500	B	13.9	62.2	0.27
706A	Managed Lanes Merge	Merge	1380	C	18.3	60.7	0.26
708	Towne Point Road	Diverge	1500	C	19.3	57.6	0.30
709	Towne Point Road	Basic	1905	B	13.3	66.4	0.33
710	Towne Point Road	Merge	1500	B	17.0	61.6	0.28
711		Basic	1370	B	15.6	66.5	0.23
712	Cedar Lane	Diverge	1500	B	15.6	66.9	0.25
713	Cedar Lane	Basic	1000	B	11.1	62.9	0.18
714	Cedar Lane	Merge	1500	B	18.0	61.4	0.28
715	Cedar Lane	Basic	110	B	16.5	65.5	0.02
716	Cedar Lane	Merge	1125	C	24.2	59.8	0.21
717		Basic	1500	C	21.6	66.1	0.26
718	VA International Gateway Boulevard	Diverge	1125	D	26.1	55.3	0.23
719	VA International Gateway Boulevard	Basic	2270	C	21.5	66.3	0.39
720	VA International Gateway Boulevard	Merge	1035	C	25.5	59.4	0.20
721		Basic	780	D	27.1	56.0	0.16
722	W Norfolk Road	Diverge	1035	D	27.1	56.0	0.21
723	W Norfolk Road	Basic	605	C	21.8	64.1	0.11
724	W Norfolk Road	Merge	1500	D	30.5	52.4	0.33
725		Basic	3600	D	28.0	56.9	0.72
726	US 58	Diverge	1500	D	31.2	51.2	0.33
727	US 58	Diverge	1390	C	21.4	51.9	0.30
728	US 58	Basic	1600	B	15.6	56.5	0.32
729	US 58	Merge	1500	C	18.9	54.1	0.32
730	US 58	Basic	2640	C	19.0	53.8	0.56

164 WEST

Seg ID	Crossing Route	Type	Length (ft)	LOS	Density	Speed	Travel Time
801	US 58	Basic	1060	B	14.9	57.0	0.21
802	US 58	Merge	1500	C	19.9	57.0	0.30
803A		Basic	2180	C	19.5	57.0	0.43
803		Basic	1600	D	29.9	57.0	0.32
804	W Norfolk Road	Diverge	1500	D	31.0	55.0	0.31
805	W Norfolk Road	Basic	800	C	24.9	65.1	0.14
806	W Norfolk Road	Merge	1265	D	28.7	59.0	0.24
807		Overlap	235	D	28.7	59.0	0.05
808	VA International Gateway Boulevard	Diverge	1265	D	28.5	59.4	0.24
809	VA International Gateway Boulevard	Basic	2305	C	25.1	65.6	0.40
810	VA International Gateway Boulevard	Merge	1500	D	28.7	58.3	0.29
811		Basic	1295	C	25.6	65.4	0.23
812	Cedar Lane	Diverge	1500	B	17.7	63.2	0.27
813	Cedar Lane	Basic	1180	B	16.2	66.6	0.20
814	Cedar Lane	Merge	1500	C	19.2	61.2	0.28
815		Basic	1430	B	17.5	66.5	0.24
816	Towne Point Road	Diverge	1500	C	19.8	59.3	0.29
817	Towne Point Road	Basic	1810	B	15.8	66.5	0.31
818	Towne Point Road	Merge	1500	C	20.8	61.3	0.28
818A	Managed Lanes Diverge	Diverge	1330	C	19.1	66.4	0.23
820	College Drive	Diverge	1500	C	22.3	55.8	0.31
821		Basic	1010	B	14.7	65.5	0.18
822	I-664	Diverge	1500	B	16.7	59.0	0.29
823	I-664	Basic	1245	A	10.6	66.1	0.21
824	I-664	Weaving	1605	A	10.5	57.0	0.32
825	I-664	Basic	1415	A	10.5	66.1	0.24
826	I-664	Merge	1030	C	19.9	59.3	0.20
827	US 17	Basic	2640	B	17.6	66.6	0.45

GREATER GROWTH - SUBURBAN

FREEWAY CAPACITY ANALYSIS RESULTS ROUTE 164 PM

FIGURE 111

the heartbeat of HAMPTON ROADS TPO Transportation Planning Organization
Michael Baker INTERNATIONAL
REGIONAL CONNECTORS STUDY
AUGUST 2023

Appendix A

Bowers Hill Interchange Improvement Project

Sensitivity Analysis

Michael Baker INTERNATIONAL

Memorandum

TO:
FROM:
DATE: August 28, 2023
SUBJECT: Regional Connector Study Sensitivity Analysis – Bowers Hill Interchange

Purpose and Background

As part of the Regional Connectors Study (RCS), Michael Baker was tasked with the evaluation of the Hampton Roads Transportation Planning Organization's (HRTPO) regional Travel Demand Model (TDMs). The purpose of this memorandum is to document the results of a sensitivity analysis conducted for the Bowers Hill interchange between the 2045 Baseline scenario and the 2045 Bundle B scenario. The Baseline scenario includes the improvements along I-64 associated with the Hampton-Roads Bridge-Tunnel (HRBT) project that is currently ongoing. The Bundle B scenario includes the HRBT improvements, as well as improvements to I-664 north of the College Drive interchange and the proposed Virginia Route 164 Connector.

Concept drawings of the Bowers Hill Interchange Improvement Project were not available when the 2045 Baseline scenario and 2045 Bundle B scenario were initially developed but have since been made available. This sensitivity analysis was conducted to determine if changes in traffic volumes between the Baseline and Bundle B scenarios were significant enough to modify the approved TDM for the scenarios to include the newly available Bower's Hill interchange concept.

2045 Baseline & Bundle B Analysis

The sensitivity analysis was conducted by comparing the traffic volumes for each scenario on the I-664 mainline, north and south of the Bowers Hill interchange. The comparison included links for the general purpose (GP) lanes, high-occupancy toll (HOT) lanes, and hard shoulder lanes. The general-purpose lanes were selected on either side of the interchange, and the links selected were out of the merge and diverge influence areas. The AM peak hour comparison results for the two scenarios are presented in Table 1. The PM peak hour comparison are presented in Table 2.

Table 1: 2045 AM Peak Period Analysis

LOCATION	ROUTE	LANE TYPE	DISTANCE	LANES	CAPACITY/LANE	2045 Baseline AM	2045 BundleB AM	Volume Change	% Difference
North of Bowers Hill	I-664 NB	GP	0.80	3	2000	3176	3310	134	4%
	I-664 NB	HOT	0.88	1	1900	430	527	97	23%
	I-664 NB	Shoulder	0.79	1	1900	22	167	145	659%
	I-664 SB	GP	0.66	3	2000	4246	4390	144	3%
	I-664 SB	HOT	0.63	1	1900	991	1010	19	2%
	I-664 SB	Shoulder	0.64	1	1900	588	669	81	14%
South of Bowers Hill	I-664 NB	GP	0.14	4	2000	4684	4822	138	3%
	I-664 NB	HOT	0.81	1	2000	430	527	97	23%
	I-664 NB	Shoulder	0.51	1	1900	21	166	145	690%
	I-664 SB	GP	0.37	4	2000	6570	6692	122	2%
	I-664 SB	HOT	0.77	1	1900	991	1010	19	2%
	I-664 SB	Shoulder	0.81	1	1900	588	669	81	14%

The changes in traffic volumes between the two regional model networks are minimal in the AM Peak period, with the percent difference in volume varying between three and four percent along the general-purpose lanes. The southbound shoulder lanes experience 14 percent higher volume in the Bundle B scenario, but this only equates to an increase of 81 vehicles. While the traffic along the northbound shoulder lanes increases by almost 700 percent, the change in volume increases only from 21 and 22 vehicles in the Baseline model to 166 and 167, respectively. The HOT lanes traveling northbound see an increase of 97 vehicles, which equate to a percentage increase of 23 percent. The HOT lanes traveling southbound features only a 2 percent difference in volume between the Baseline and Bundle B scenario.

Table 2: 2045 PM Peak Period Analysis

LOCATION	ROUTE	LANE TYPE	DISTANCE	LANES	CAPACITY/LANE	2045 Baseline PM	2045 BundleB PM	Volume Change	% Difference
North of Bowers Hill	I-664 NB	GP	0.80	3	2000	4070	4210	140	3%
	I-664 NB	HOT	0.88	1	1900	869	870	1	0%
	I-664 NB	Shoulder	0.79	1	1900	671	670	-1	0%
	I-664 SB	GP	0.66	3	2000	3803	3903	100	3%
	I-664 SB	HOT	0.63	1	1900	574	769	195	34%
	I-664 SB	Shoulder	0.64	1	1900	0	24	24	---
South of Bowers Hill	I-664 NB	GP	0.14	4	2000	6441	6570	129	2%
	I-664 NB	HOT	0.81	1	2000	869	870	1	0%
	I-664 NB	Shoulder	0.51	1	1900	671	670	-1	0%
	I-664 SB	GP	0.37	4	2000	5143	5221	78	2%
	I-664 SB	HOT	0.77	1	1900	574	769	195	34%
	I-664 SB	Shoulder	0.81	1	1900	0	24	24	---

The changes in traffic volumes between the two scenarios during the PM Peak period are less pronounced than those in the AM Peak period. The traffic volume in the general-purpose lanes only increase two to three percent. Along northbound I-664, there were almost no changes in traffic volume between the two scenarios along the HOT and shoulder lanes. The largest increase in volume occurred along the southbound HOT lanes, with a 34% increase in volume in the Bundle B scenario, however, this only equates to a 195 vehicle per hour increase and the total volume is well below the capacity for that lane.

Conclusion

Overall, changes in traffic volume on I-664 in the area of the Bowers Hill Interchange improvements are minimal between the 2045 Baseline and 2045 Bundle B scenarios.

It is important to note that the Bowers Hill Interchange Improvement Study included a detailed Traffic and Transportation Technical Report (April 2019). This report includes the results of a detailed VISSIM analysis showing that the Bowers Hill Interchange improvements will ease congestion and operate with acceptable conditions in the year 2037.

Based on the above results of the sensitivity analysis and the results shown in Bowers Hill Interchange Improvement Study Traffic and Transportation Technical Report, changes to the TDM and HCS networks for the Regional Connector Study are not needed.

Appendix G: Meeting Materials

(Presentations of Phase III Results)

Joint Steering (Policy) Committee and Working Group Meeting, April 26, 2022

the heartbeat of HAMPTON ROADS TPO
TRANSPORTATION PLANNING ORGANIZATION

REGIONAL CONNECTORS STUDY

JOINT STEERING (POLICY) COMMITTEE/WORKING GROUP MEETING

April 26, 2022

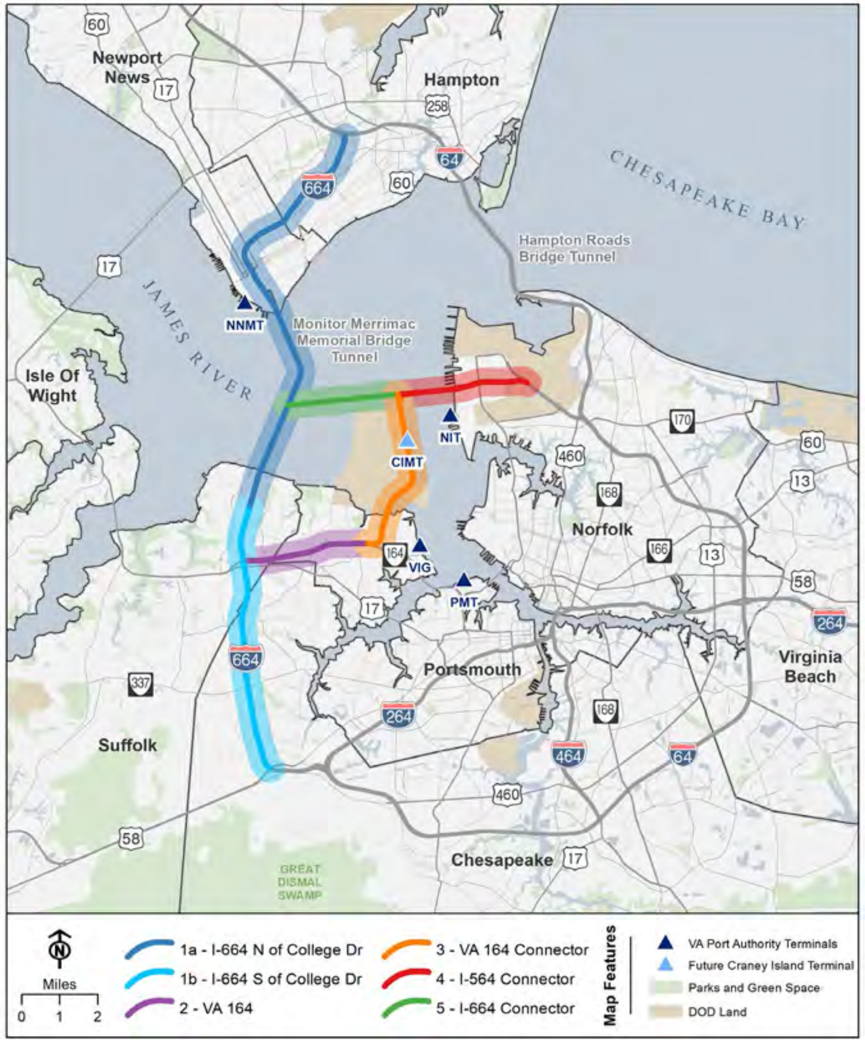
Michael Baker INTERNATIONAL

RCS Phase 3 – Summary of Qualitative Analysis

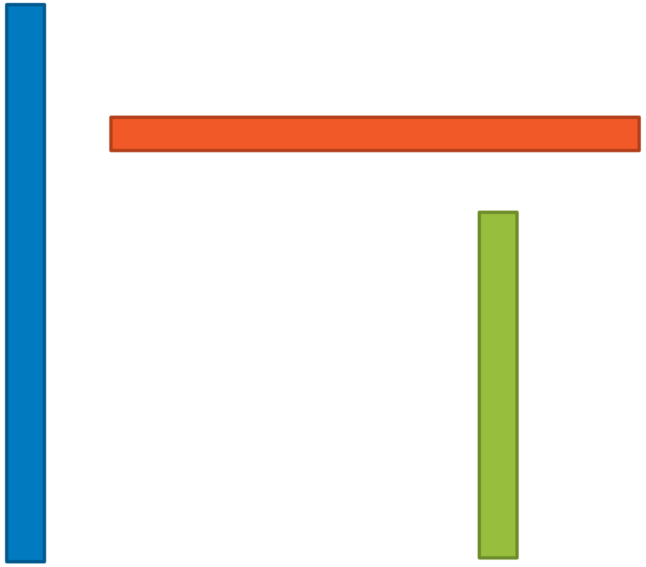
Agenda

- Overview of Process and Progress
- Step 1 evaluation highlights
  - Construction Complexity
  - Permitting Issues
  - Readiness
- Bundling Recommendations
- Next Steps

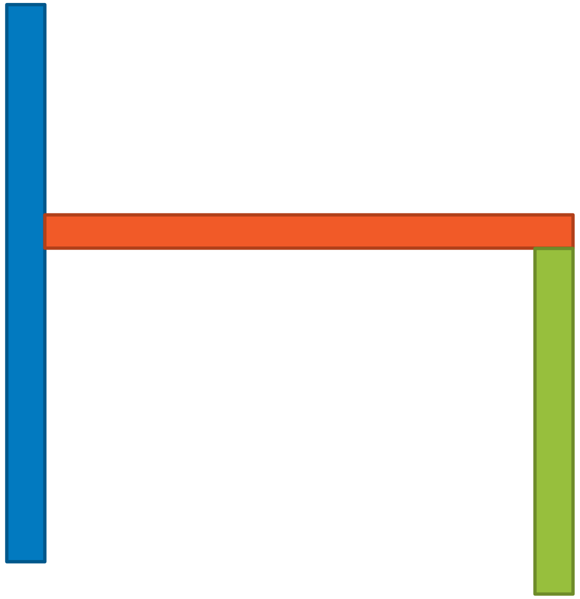
Mandated Segments



Segments vs Bundles



SEGMENTS



BUNDLE

Tiering

SEGMENT TIERING

Tier 1 — Segments ready for advancement and recommended for consideration in the fiscally constrained portion of the 2050 HRTPO Long Range Transportation Plan.

Tier 2 — Segments which require further refinement and maturation, and will be recommended for consideration in the 2050 Vision Plan, as developed by the HRTPO.

Tier 3 — Segments that due to technical challenges and uncertainties, will be further developed at an appropriate time in the future.

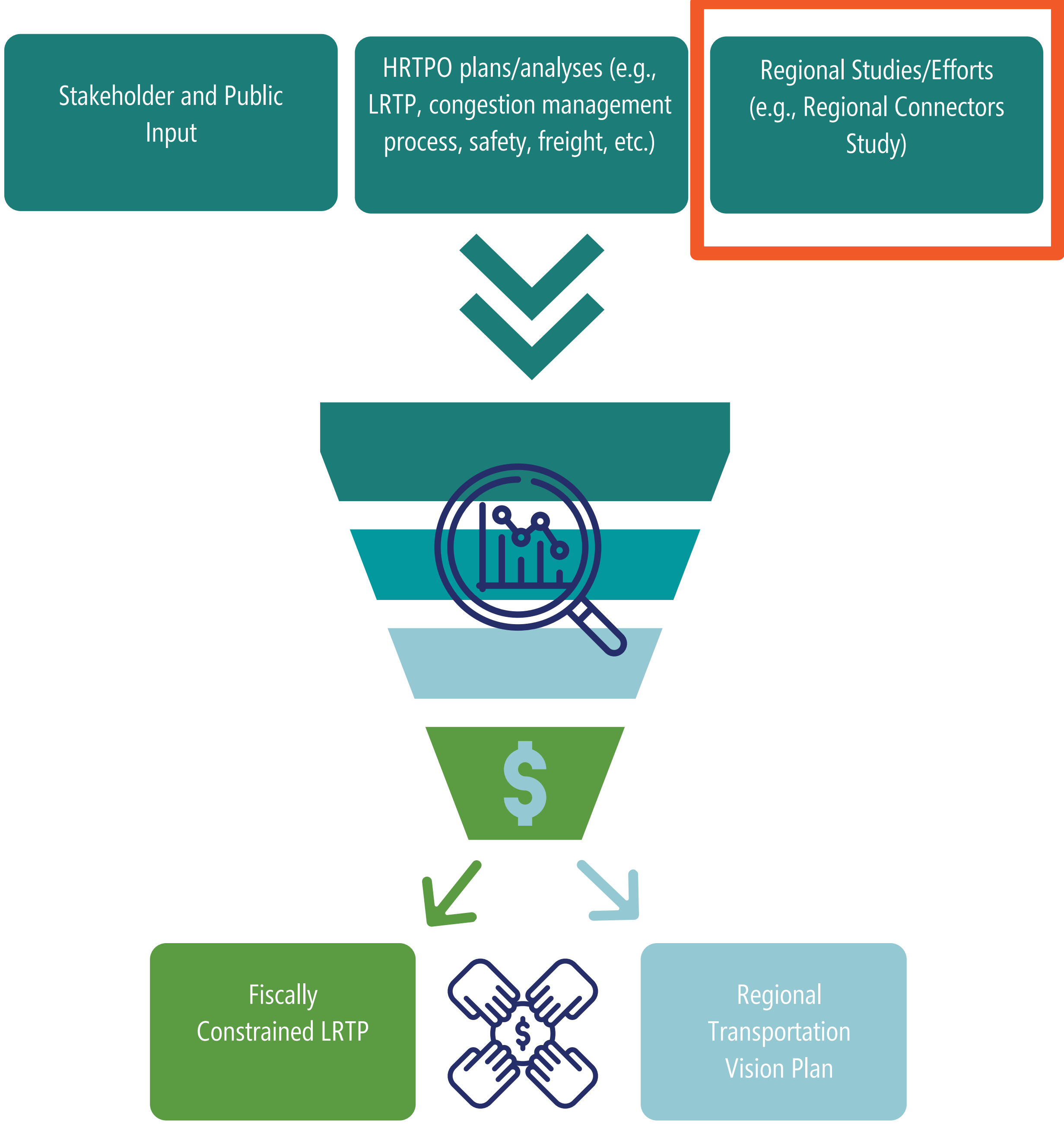
Long-Range Transportation Plan

- The LRTP is the region's transportation blueprint
- 20-year timeframe, updated every 5 years
- Must be fiscally constrained
- All regionally significant transportation projects must be included in the LRTP, regardless of funding source

- Assess Current Conditions
- Forecast Growth - Assess Future Conditions
- Evaluate and Prioritize (Across Scenarios)
- Identify Funding (Fiscal Constraint)

Long-Range Transportation Plan

- Assess Current Conditions
- Forecast Growth - Assess Future Conditions
- Evaluate and Prioritize (Across Scenarios)
- Identify Funding (Fiscal Constraint)



Phase 3 Approved Process Graphic

Step 1	Step 2	Step 3	Step 4
Qualitative Assessment of Construction, Permitting, & Readiness	Congestion Reduction Evaluation Revised Design & Cost Estimation	Scenario Analysis Traffic Operations Analysis	Final Documentation of Design, Evaluation & Recommendations
DRAFT SEGMENT TIERING	FINAL SEGMENT TIERING	FULL RECOMMENDATIONS TO HRTPO	FINAL REPORT
Website Update	Public Meetings	Regional Connectivity Symposium	Public Meetings

Recommended Process Update

Step 1:

Qualitative Assessment

✓Construction Complexity
✓Permitting Issues
✓Readiness

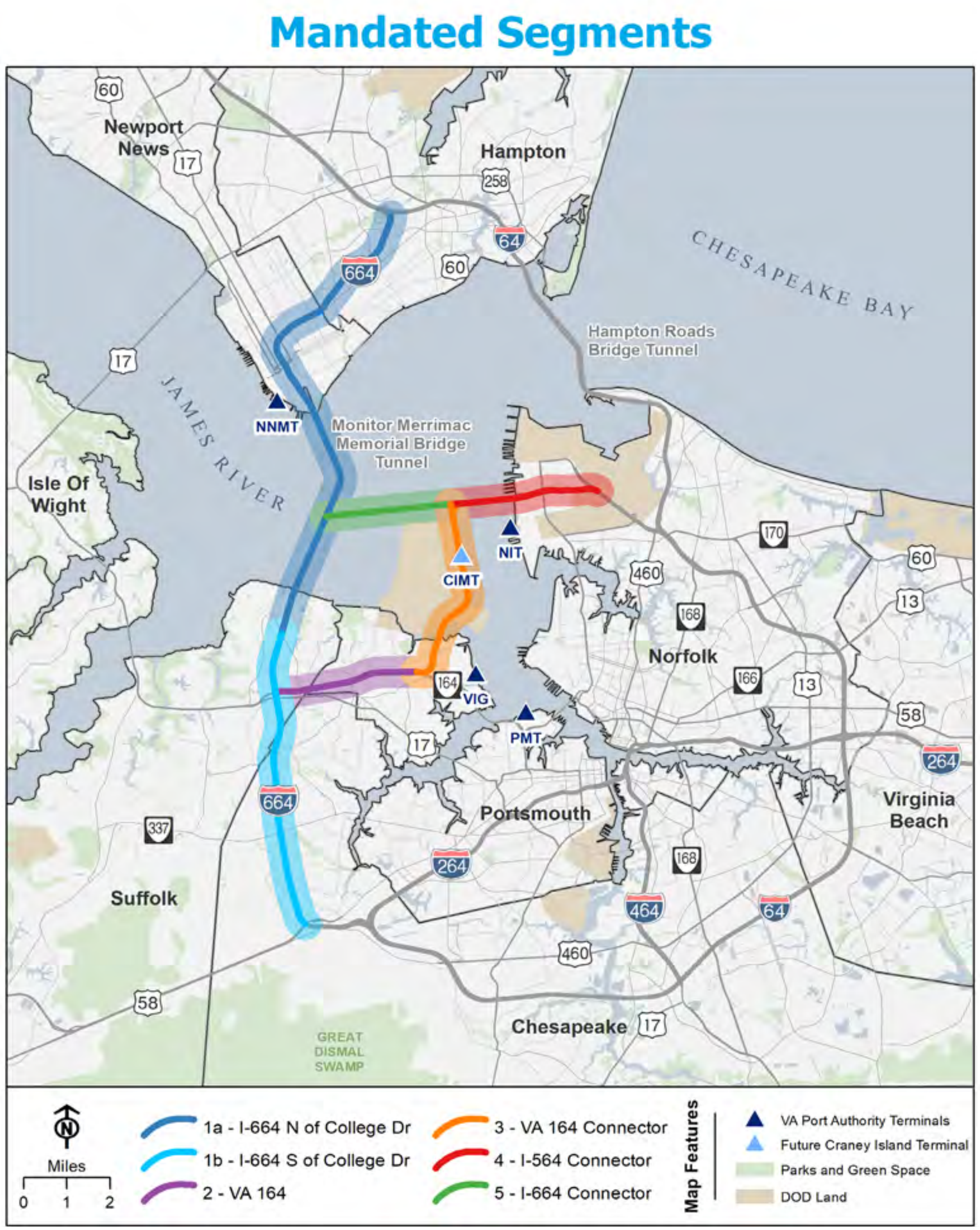
→ Segment Bundles

Step 2:

Congestion reduction evaluation
Refined design and **cost estimate**

Step 1 + Step 2:

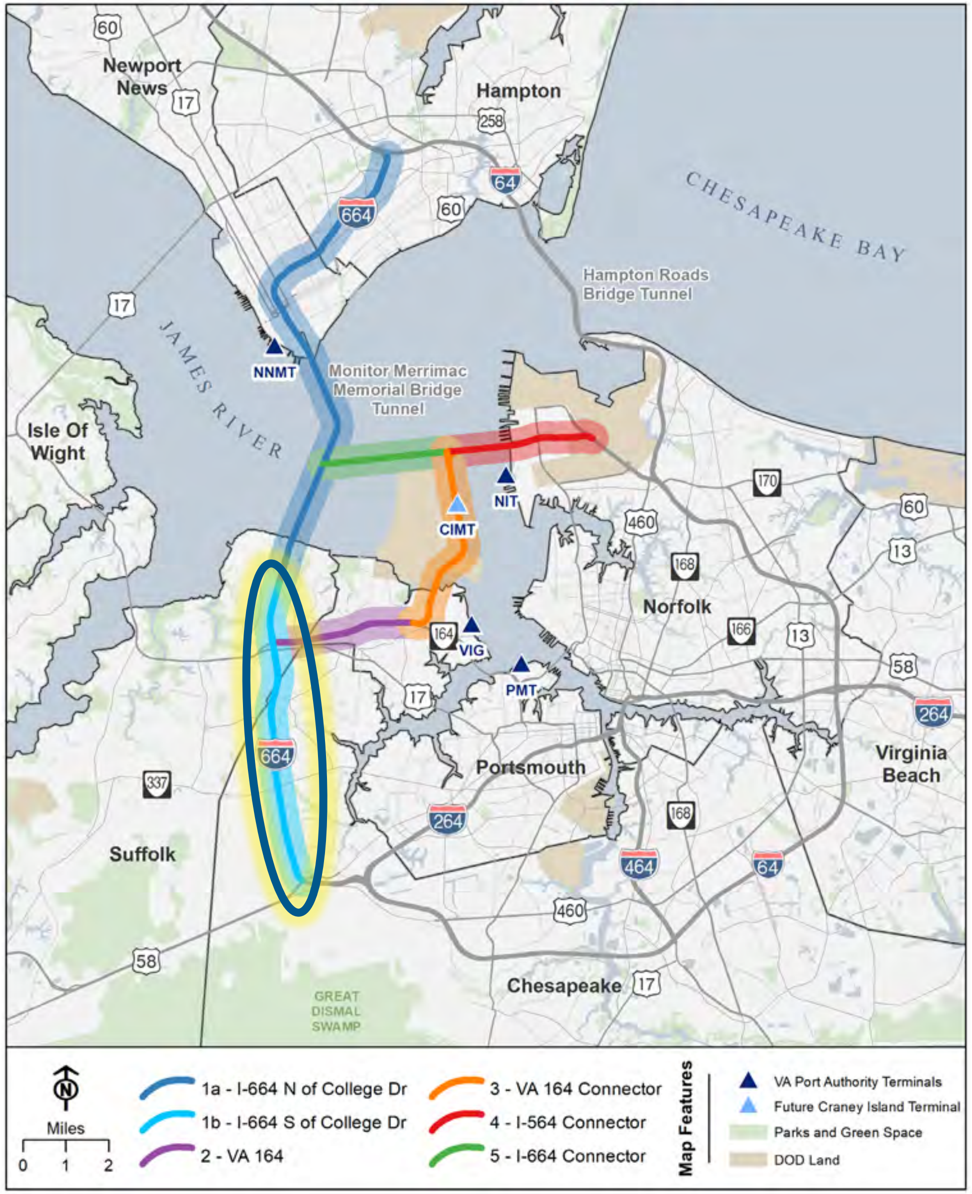
→ Segment Tiers



Step 1 Scope Includes:

Using the Step 1 Readiness Evaluation, differentiate "overlapping" HRTAC Funded Segments to include in an RCS 2045 Baseline Network (in addition to the E+C network)

Mandated Segments



Highlights of Results

- SEGMENTS EVALUATED
- EVALUATION MEASURES
- KEY FINDINGS

Step 1 Evaluation Highlights – Study Segments

The segments evaluated in the qualitative analysis are based on the SEIS segments as follows:

- I-664 North of College Drive – Starting with general alignment of SEIS Alternative D – *adapted lane configuration* to 8 lanes with 4 GP lanes and 4 managed lanes.
- I-664 South of College Drive, using Bowers Hill Interchange Study Alternative C.
- VA 164 – Widen toward the median to 6 GP lanes per SEIS (add one in each direction) – *expanded corridor by 20' each side as a precaution to accommodate RR crash wall depth.*
- VA 164 Connector – SEIS alignment (4 GP lanes)
- I-564 Connector – SEIS Alternative D (4 GP lanes)
- I-664 Connector – SEIS Alternative D (4 GP lanes)

For EJ analysis, also considered demographics of surrounding 500' corridor

Construction Complexity Evaluation Factors

Design & Construction

- Bridges, Tunnels, Constrained Work Areas

Constructability Constraints

- Agency Land or Projects
- Design Dependency
- Traffic Disruptions

Cost Considerations

- Right of Way, Environmental Mitigation

Permitting Issues Evaluation Factors

Social Environment

- Community, Sensitive Property, EJ Impacts

Permits

- Federal, State, and Local
- Primarily factors over water

Additional Factors

- Mitigation Complexity & Cost, Maritime Stakeholders, Effect on other Federal Navigation Projects

Project Readiness Evaluation Factors

Project Independence

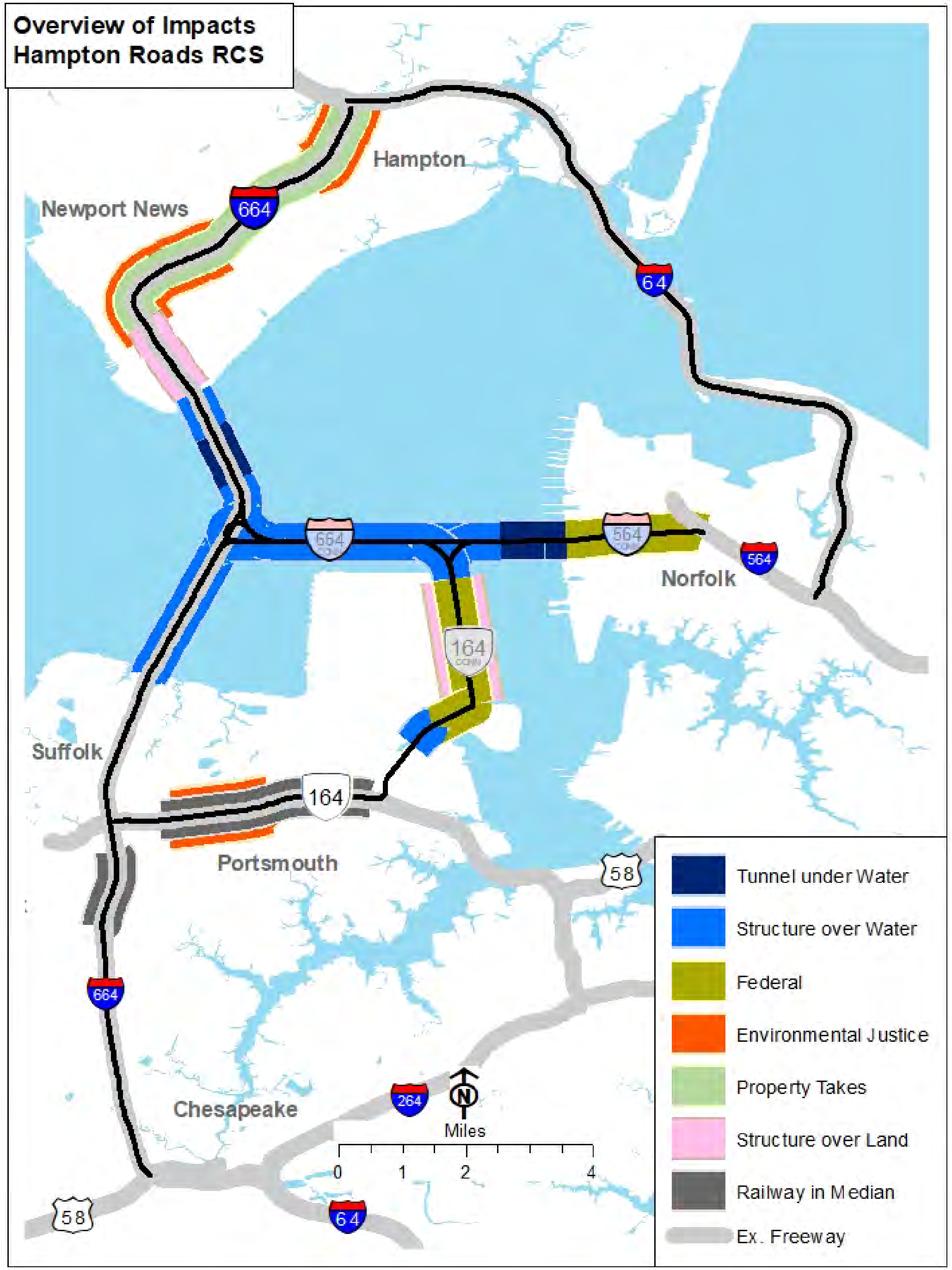
- Independence/Phasing
- Integration with HREL

Project Development

- Adopted by a Regional Agency, Engagement with Stakeholder/Review Agency, Advancement of Project Study

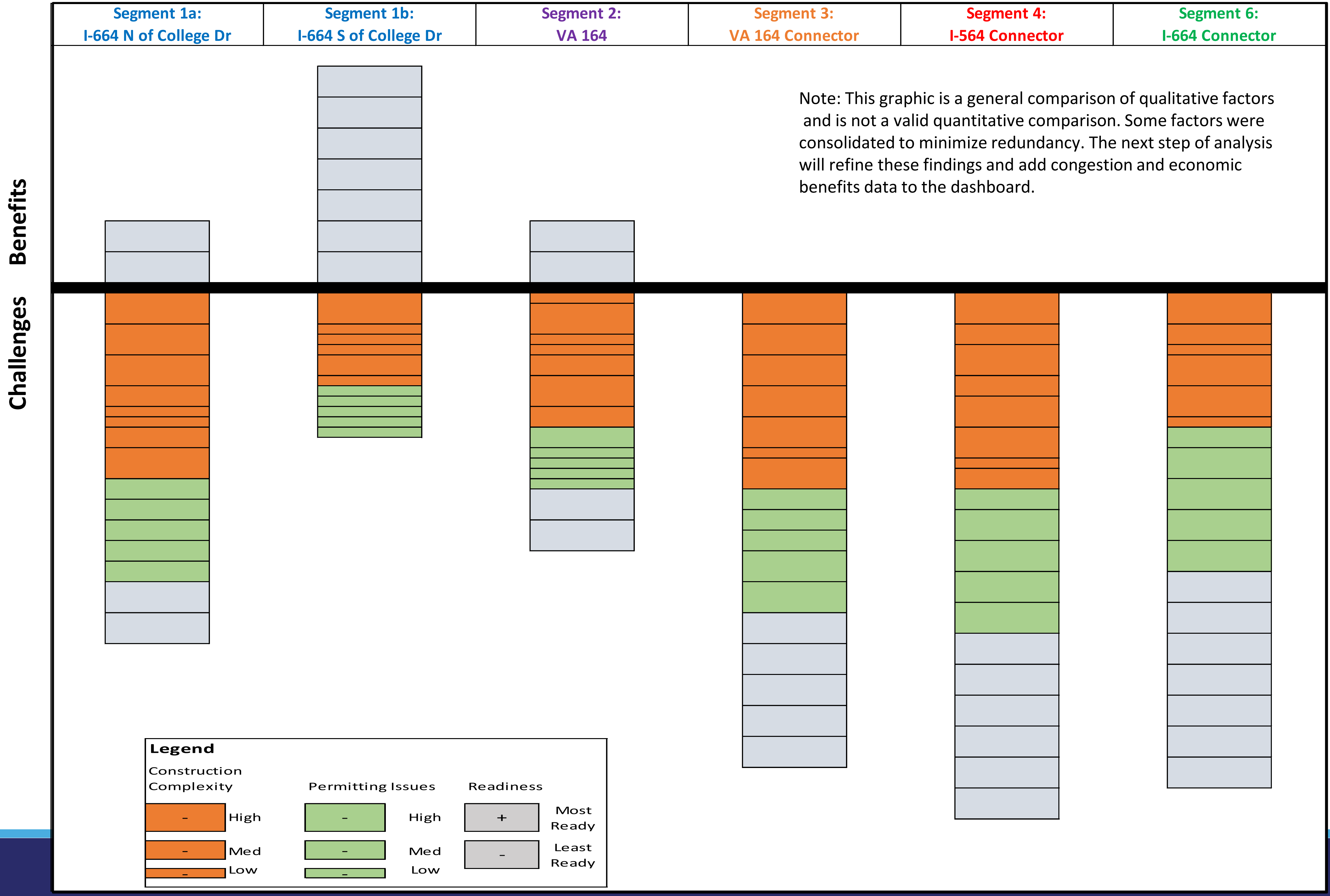
Funding Opportunities/Eligibility

- HRTAC, SMART SCALE, IIJA Grant Funding



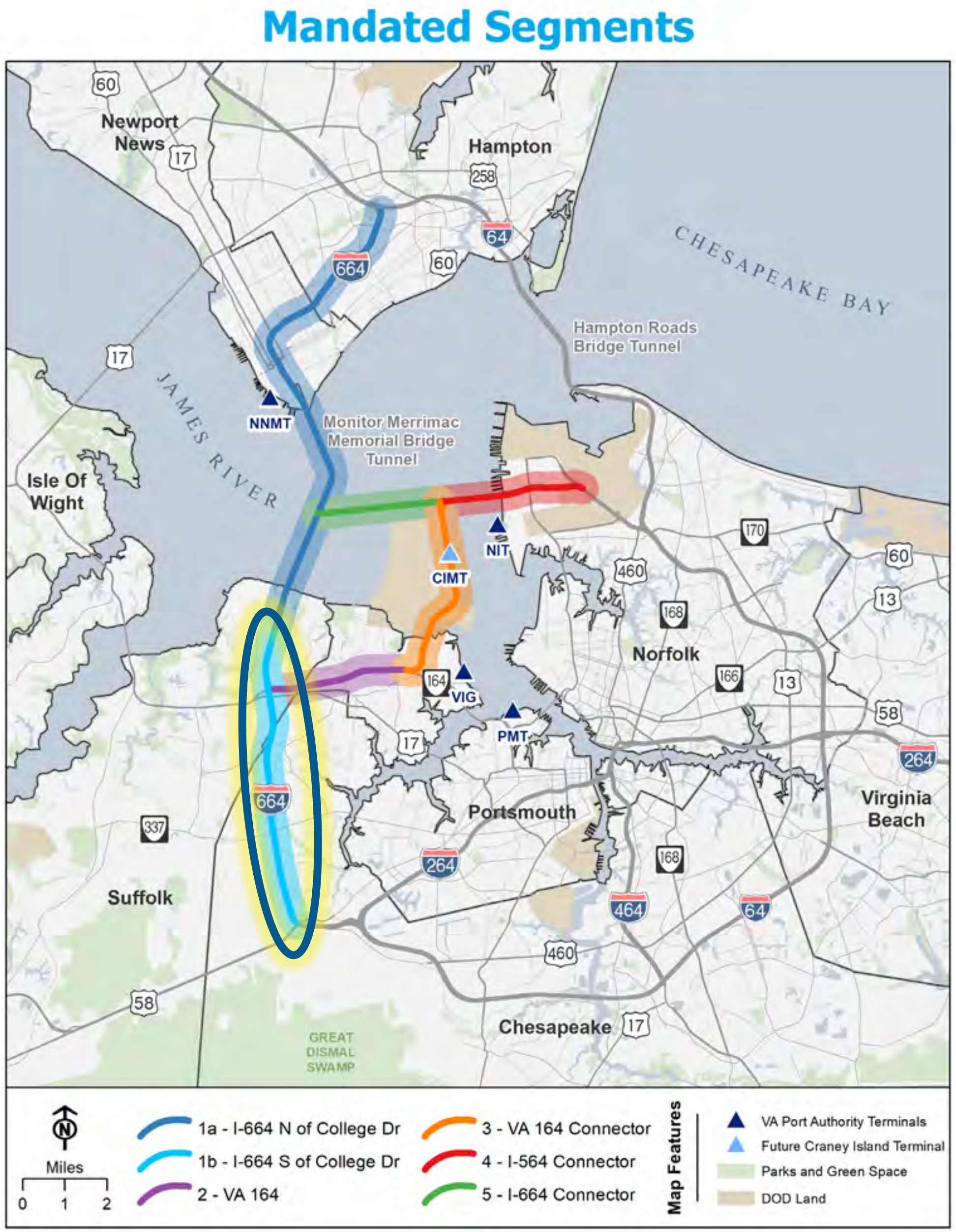
Step 1 Qualitative Evaluation Highlights – Key Features

Step 1 Qualitative Evaluation Dashboard



Step 1 Qualitative Evaluation Highlights

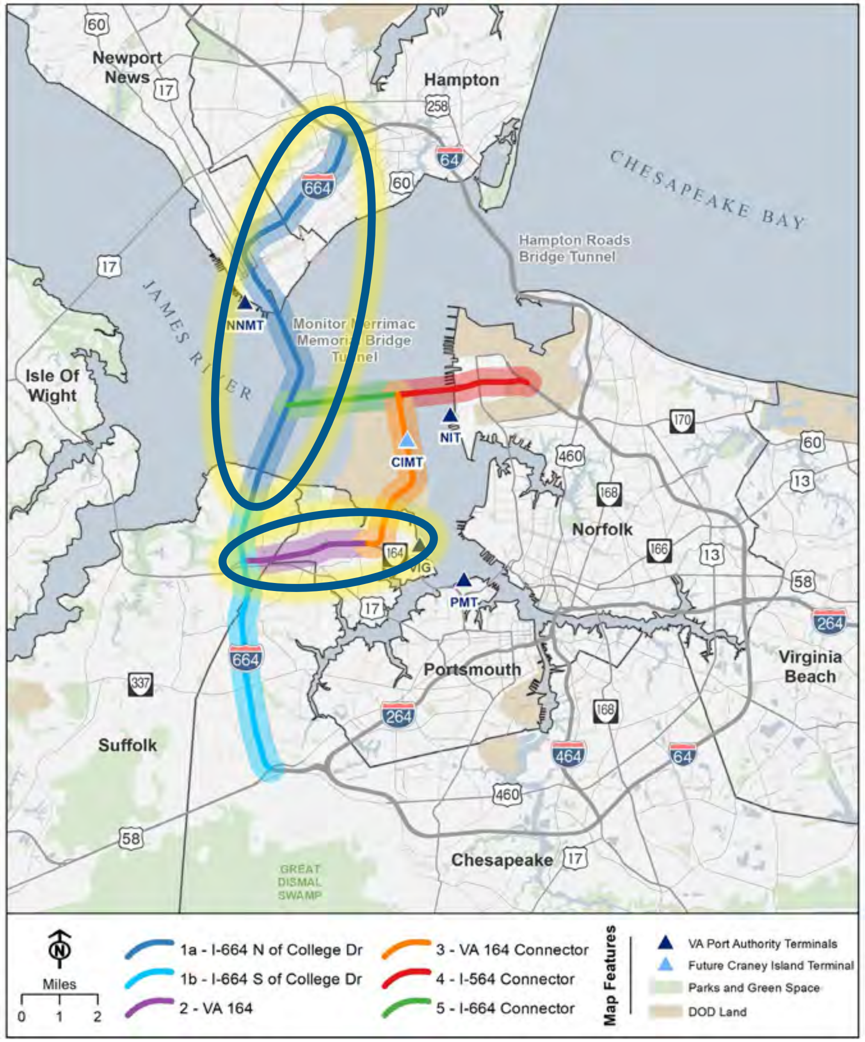
- I-664 South of College Drive – **recommend including in RCS 2045 Baseline Network**



Step 1 Qualitative Evaluation Highlights

- Widening of existing highways [I-664 North of College Drive, VA 164] – have challenges but score well in the qualitative criteria
  - Both I-664 (Hampton) and VA 164 (Portsmouth) have potential indirect EJ impacts
  - I-664 complicated by pipeline and expansion over water vs land
  - I-664 has importance to completion of the HREL network
  - VA 164 rates well on construction complexity and permitting issues

Mandated Segments

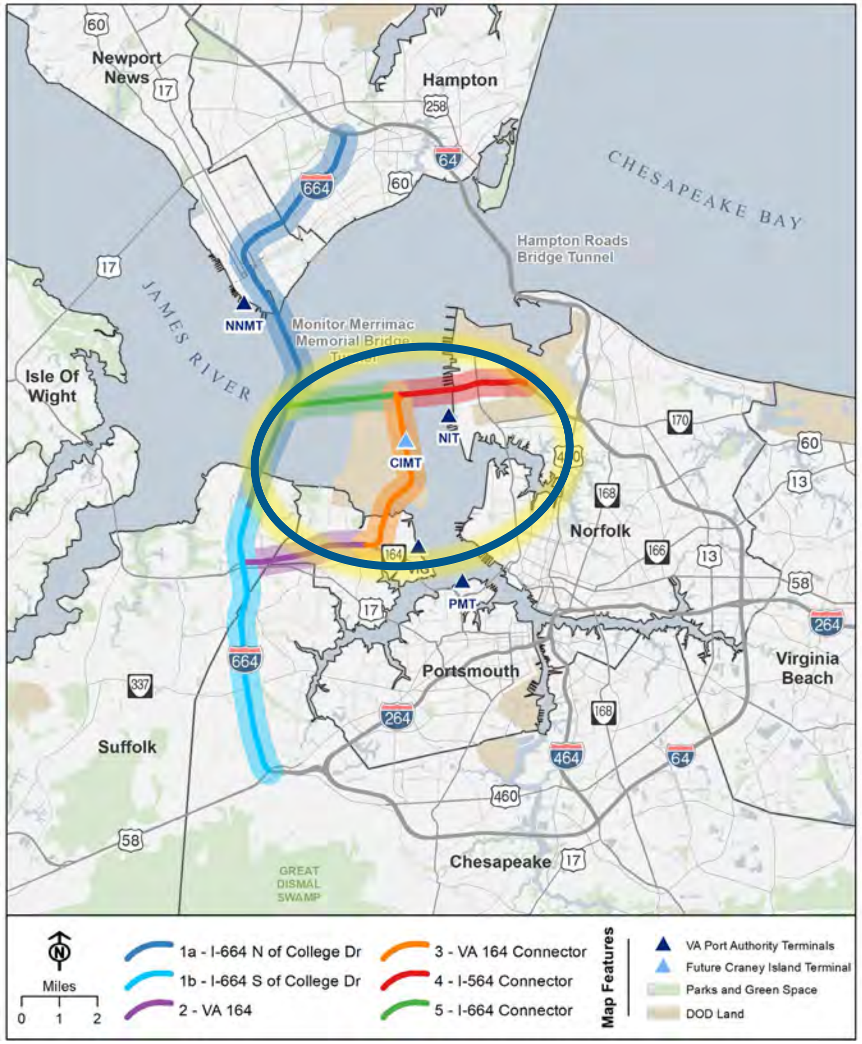


Continued…

Step 1 Qualitative Evaluation Highlights

- New location segments are lowest in readiness and have greatest construction complexity and permitting issues [VA 164 connector, I-564 connector, I-664 connector]
  - Each depends on completion of other segments
  - I-564 tunnel construction method affects tie-in location of all three segments
  - Segments over water and adjacent to federal facilities have the greatest permitting issues

Mandated Segments



The benefits of bundling before tiering

- The information we have now is mostly what is *difficult* about the segments. Without the *benefit* information, it is hard to complete tiering.
  - A less difficult corridor will tier differently depending on whether it moves the needle on congestion
  - Strategic bundling will bring insights on the congestion benefits to inform tiering

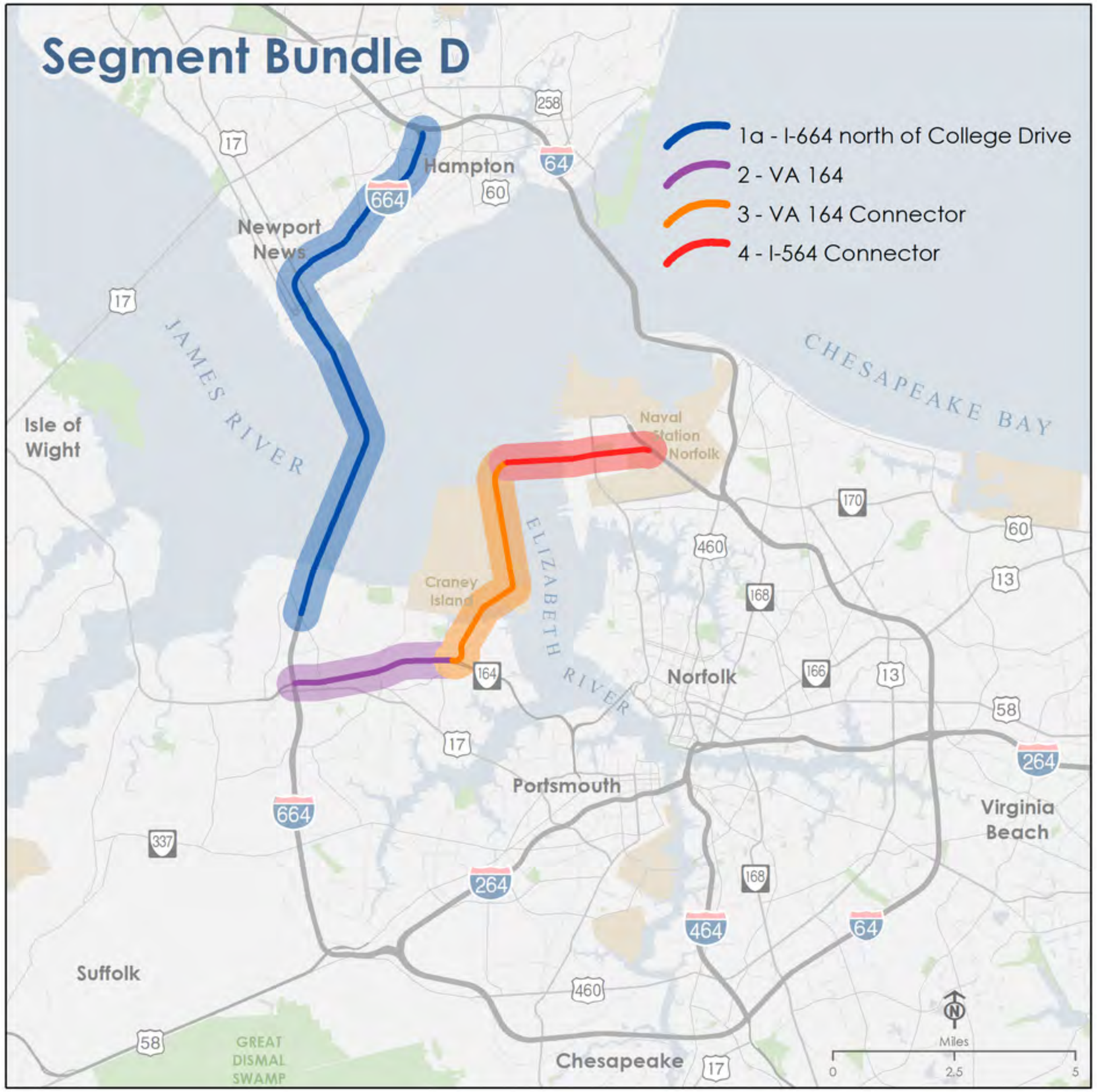
Strategic Bundling will bring insights on benefits

	Segment 1a: I-664 N of College Drive	Segment 2: VA-164	Segment 3: VA-164 Conn	Segment 4: I-564 Conn	Segment 5: I-664 Conn
Bundle A	■				
Bundle B	■	■			
Bundle C	■			■	■
Bundle D	■	■	■	■	

Segment 1b (I664 South of College Drive) included in the 2045 RCS Baseline Network

- Bundles B, C, and D represent different east-west alternatives across the harbor
- Comparison of Bundles B and D will add insight on Segment 3 benefits
- Comparison of Bundles C and D will add insight to the benefits of the three segments with greatest construction and permitting challenges

Segment 1b (I664 South of College Drive) included in the 2045 RCS Baseline Network



Segment 1b (I664 South of College Drive) included in the 2045 RCS Baseline Network

Steering Committee – Recommended Actions

- Approve including I-664 widening Bowers Hill to College Drive in the RCS 2045 Baseline network
- Approve the recommended bundles for congestion analysis

Next Steps

- Step 2 – Quantitative Analysis

Step 2

Congestion Reduction Evaluation

Revised Design & Cost Estimation

Final Draft Segment Tiering

- Public Engagement

Step 2 Schedule
May through July (3 months)
Steering (Policy) Committee & Working Group Meetings - June & July

Extra slides

Schedule

	2022: JAN–APR	2022: MAY–JUL	2022: AUG – 2023: FEB	2023: MAR–JUN
	Step 1	Step 2	Step 3	Step 4
Study of:	Segments	Up to 4 Bundles	Up to 3 Bundles of Tier 1 and Tier 2 Segments	Documentation
Task 2 (Design)	Qualitative Review	Revised Design* Cost Estimates	Refined Tier 1 Design and Cost Estimate	Documentation
Task 3 (Evaluation)	Permit Challenges Readiness **DRAFT TIERING**	Congestion Relief Econ. Performance **FINAL TIERING**		Documentation
Task 4 (Scenarios & Traffic Operations)			Congestion and Economic Evaluation of Tier 1 and Tier 2 Segments in up to 3 Bundles (Baseline + 3 Greater Growth Scenarios) Traffic Operations Analysis (see Scope) **Full Recommendations to HRTPO**	Documentation
Task 1 (Public Engagement)	Website Updates	Round of Meetings	Regional Connectivity Symposium	Round of Meetings
Committee Meetings	2 (January, April)	2 (June, July)	2 (December, February)	1 (May)

** Extent of conceptual design varies by tier*

REGIONAL CONNECTORS STUDY

Joint Steering (Policy) Committee and Working Group Meeting, August 9, 2022

the heartbeat of HAMPTON ROADS TPO
TRANSPORTATION PLANNING ORGANIZATION

REGIONAL CONNECTORS STUDY

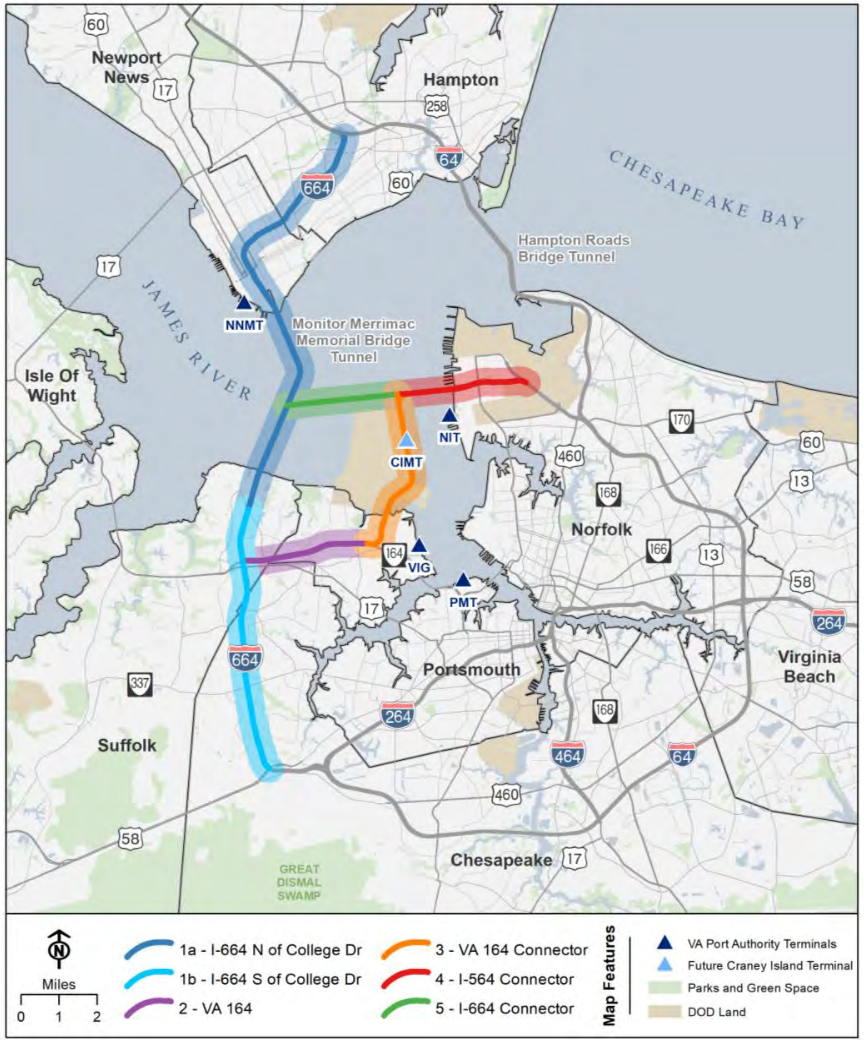
STEERING (POLICY) COMMITTEE AND WORKING GROUP MEETING
AUGUST 9, 2022

Michael Baker INTERNATIONAL

RCS Phase 3 – Agenda

- Qualitative Evaluation of Mandated Segments and Segment Bundling - Comments and Responses
- Congestion Reduction Evaluation and Economic Impact Analysis
- Public Engagement Plan – Proposed Outreach
- Next Steps

Mandated Segments

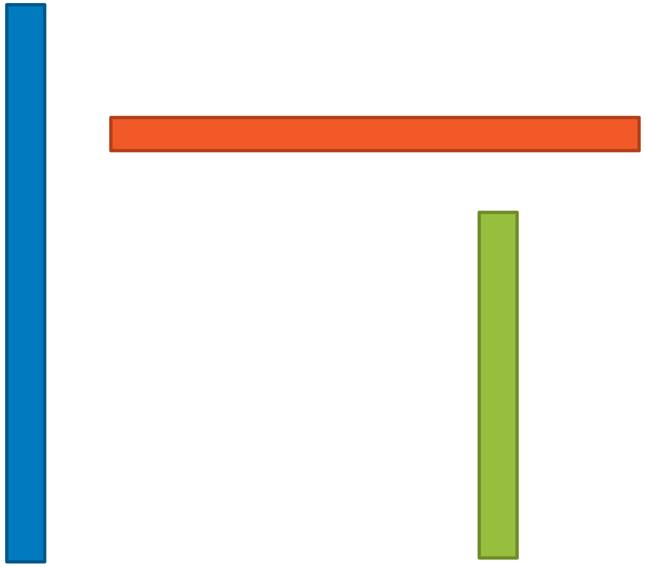


Phase 3 Process Graphic

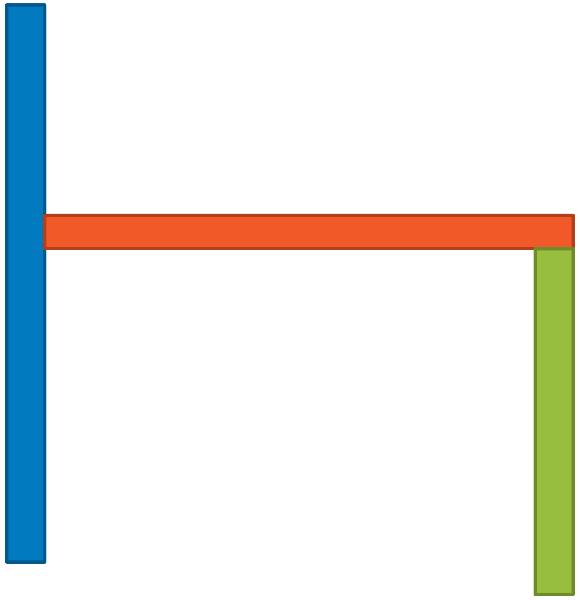
We are here

Step 1	Step 2	Step 3	Step 4
Qualitative Assessment of Construction, Permitting, & Readiness	Congestion Reduction Evaluation Revised Design & Cost Estimation	Scenario Analysis Traffic Operations Analysis	Final Documentation of Design, Evaluation & Recommendations
SEGMENT BUNDLING FOR STEP 2	FINAL DRAFT SEGMENT TIERING	FULL RECOMMENDATIONS TO HRTPO	FINAL REPORT
Website Update	Public Meetings	Regional Connectivity Symposium	Public Meetings

Segments vs Bundles



SEGMENTS



BUNDLE

Tiering

SEGMENT TIERING

Tier 1

Segments ready for advancement and recommended for consideration in the fiscally constrained portion of the 2050 HRTPO Long Range Transportation Plan.

Tier 2

Segments which require further refinement and maturation, and will be recommended for consideration in the 2050 Vision Plan, as developed by the HRTPO.

Tier 3

Segments that due to technical challenges and uncertainties, will be further developed at an appropriate time in the future.

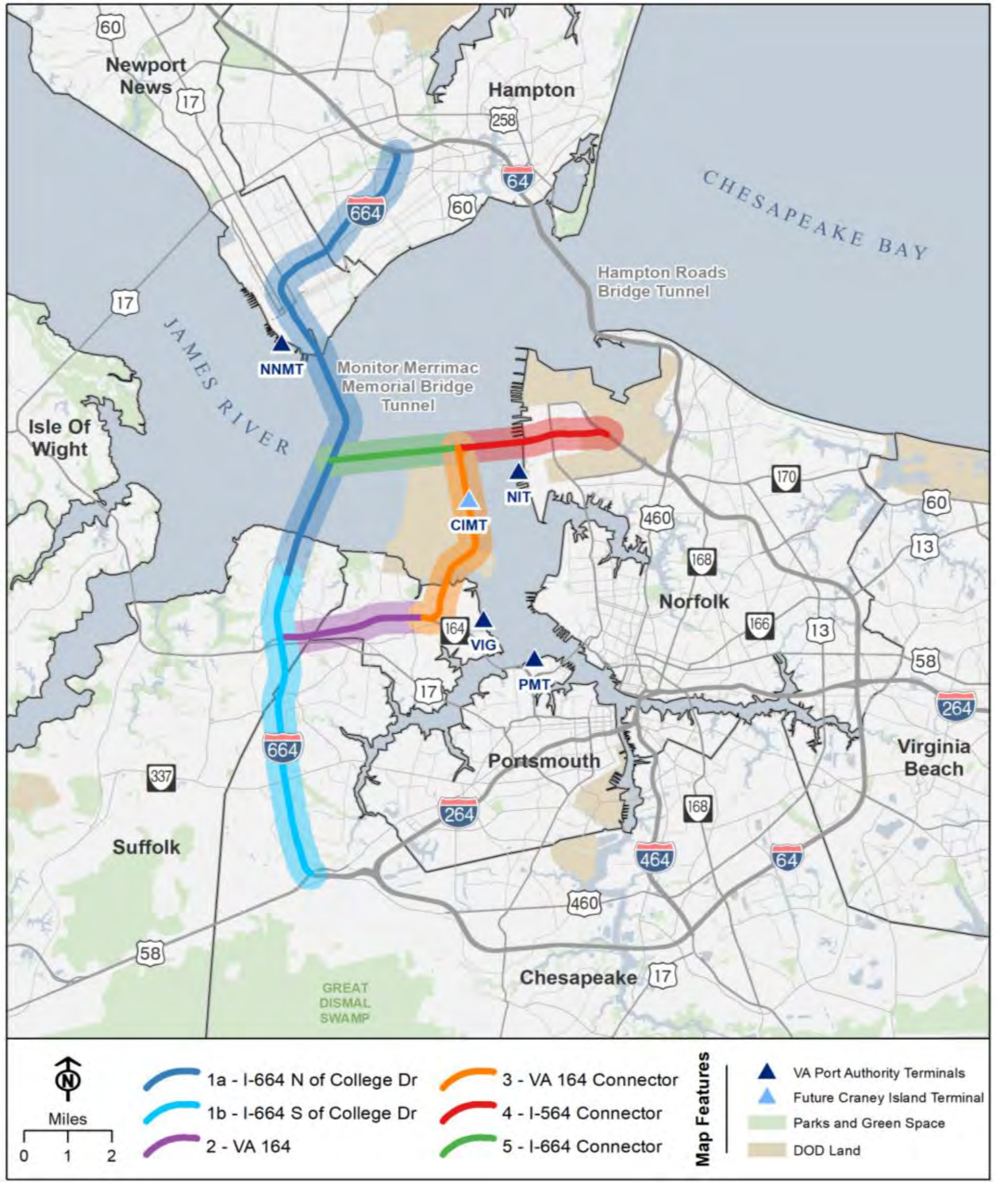
REGIONAL CONNECTORS STUDY

QUALITATIVE EVALUATION OF MANDATED SEGMENTS AND SEGMENT BUNDLING - COMMENTS AND RESPONSES

Comments Received

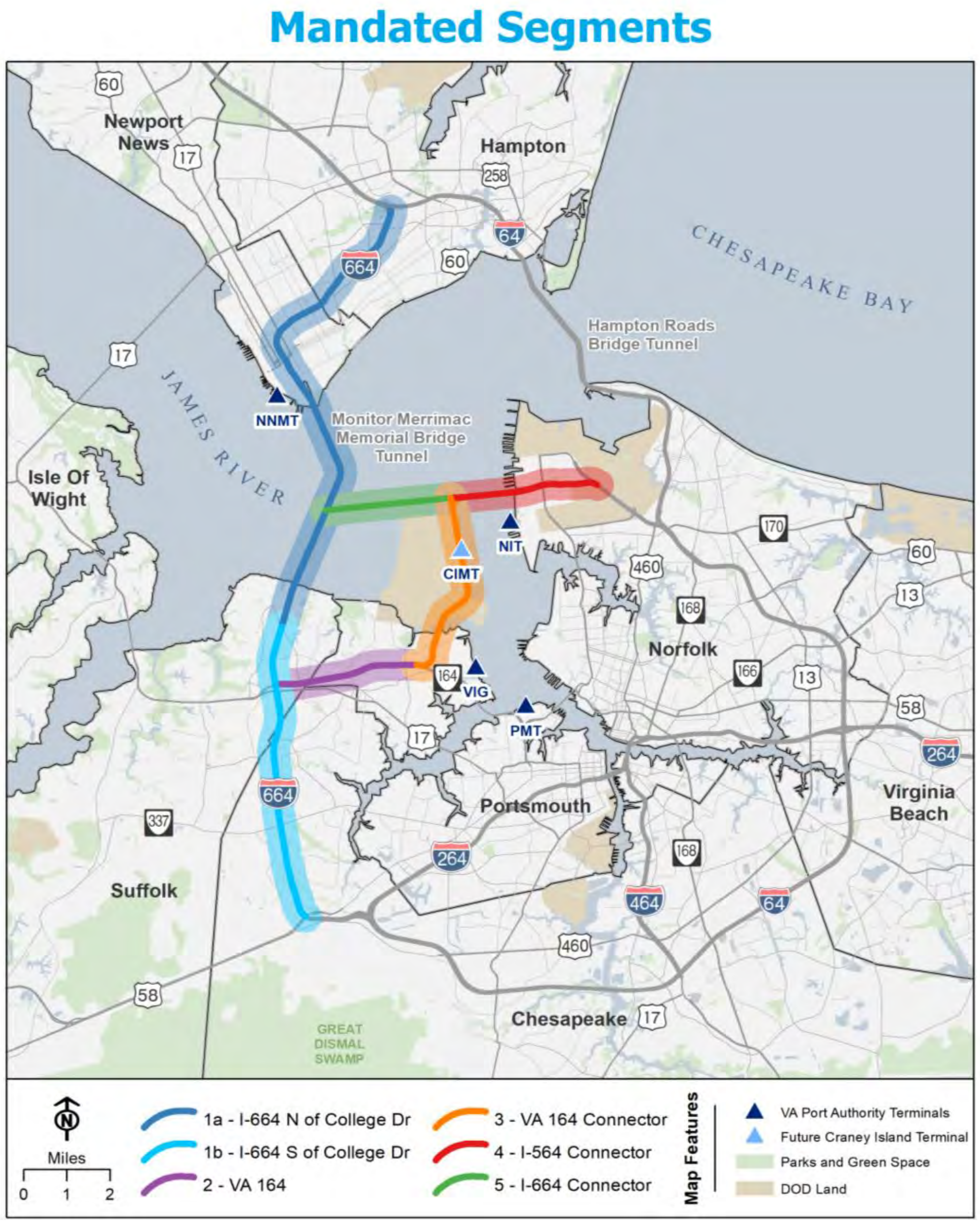
- Portsmouth – VA 164 Widening
  - Alignment assumptions need refinement
  - Ratings re: local impacts and local opposition
  - Environmental Justice
  - Stormwater management
- US Navy – 164 Connector
  - Security Requirements of Navy Fuel Depot
  - Security Requirements of Fuel pipeline facilities
  - Strategic nature of the Fuel Depot and Colonial Pipeline

Mandated Segments



Comments Received

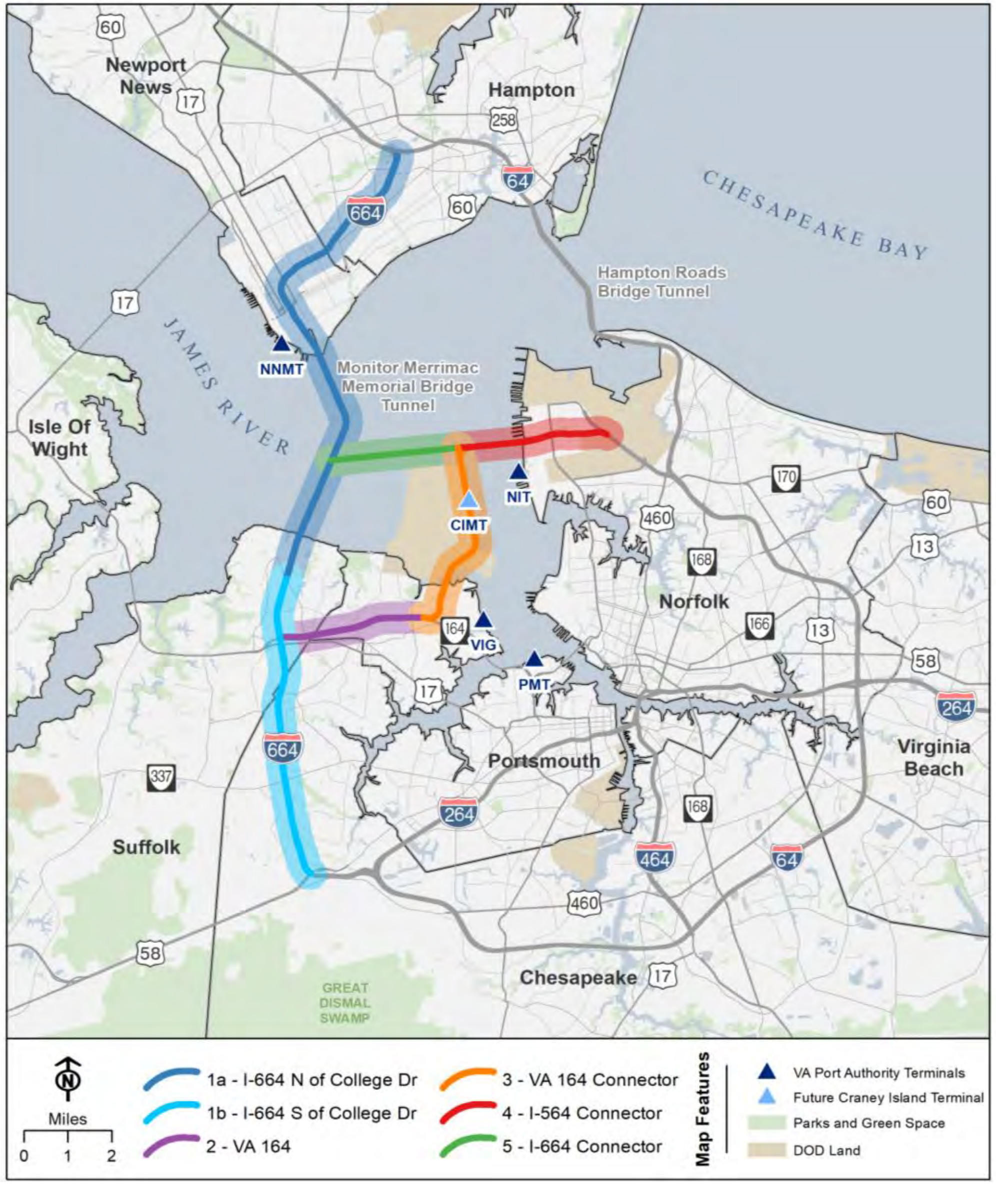
- US Navy – I-564 Connector
  - Security Requirements of Navy fueling facility
  - Height restrictions of facilities in flight paths (including construction limitations)
  - Strategic nature of the Fuel Depot and Colonial Pipeline
  - Security concerns proximate to/in view of Gate 6
  - Security concerns proximate to NSN piers 1-3 including construction limitations
  - Changing assumptions re: ATI interchange and I-564 Intermodal Connector



Comments Received

- USACE Operations –164 Connector
  - Provided updated GIS data of CIDMMA
  - East-side Craney Island operations concerns and clearance requirements
  - Section 408 Permit requirements
- USACE Regulatory
  - Reference to June 2016 letter re: 164 Connector
  - Independent utility reminder
  - Various future permitting requirements/considerations
  - Wetland impact & remediation reminders
  - Environmental justice
  - 164 Connector Section 408 rating should be higher
  - Benthic & Endangered Species evaluations & measures

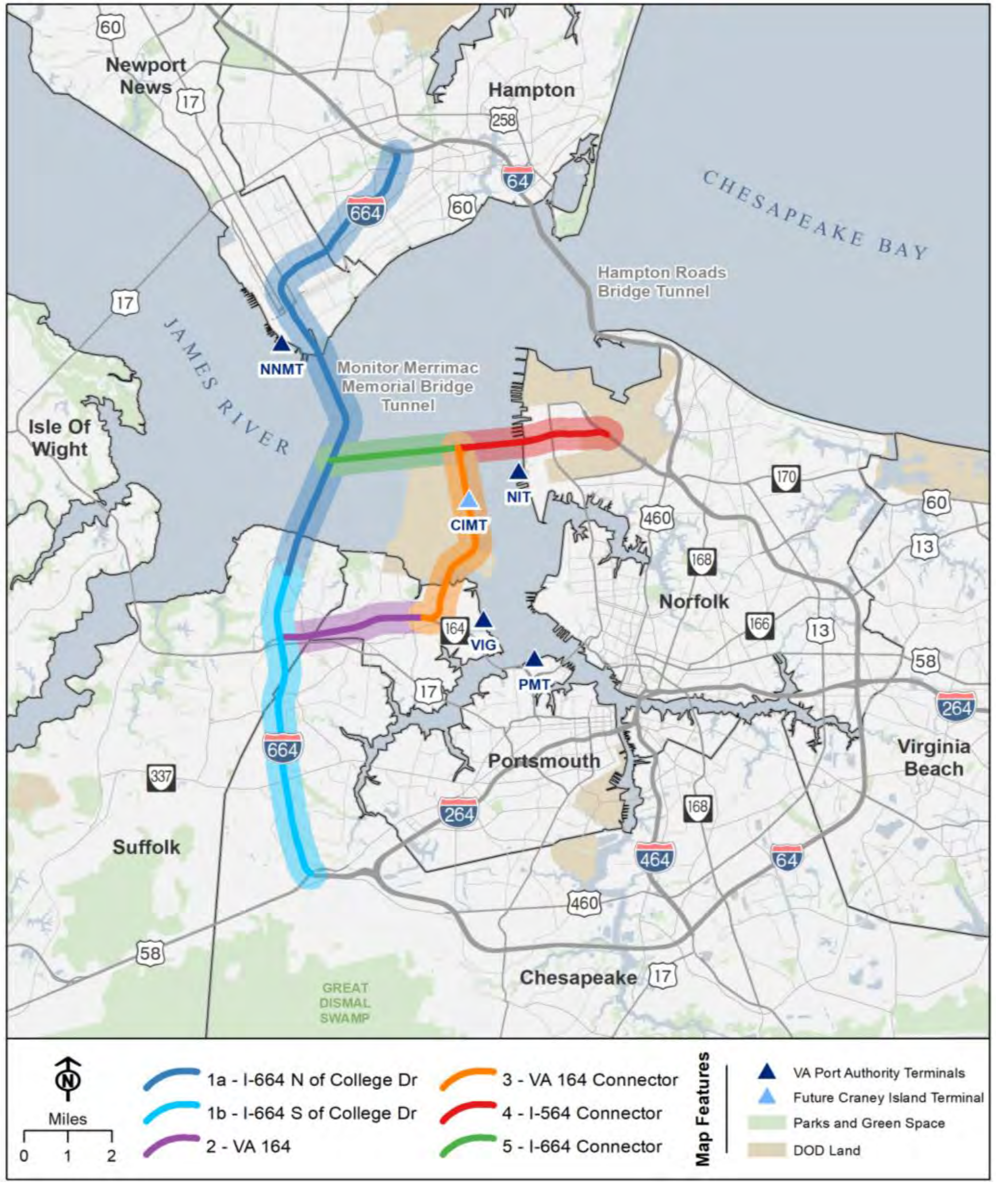
Mandated Segments



Comments Received

- Port of Virginia
  - Supportive of I-564 and VA-164 Connectors
  - Confident that Navy and Port security concerns can be resolved during later stages of project development
  - Continue progress on planning and conceptual design

Mandated Segments



Comment Responses – Overview and Impacts to Study

- Very helpful to constructability, permitting and readiness considerations that should be documented at this stage and factor into qualitative ratings as well as cost estimates (i.e., contingencies)
- Some concerns can be addressed in the Step 2 evaluation update based on the additional engineering analysis of corridors
- Good documentation of key issues that will need to be addressed at future stages of project development – provides continuity and does include some new issues/considerations related to security in particular
- Acknowledge that the circumstances and standards in place at the time of later design should drive corridor location and design decisions, for example, I-564 proximity to sensitive Navy facilities
- Port comments received after meeting agenda was released. Responses will be prepared shortly

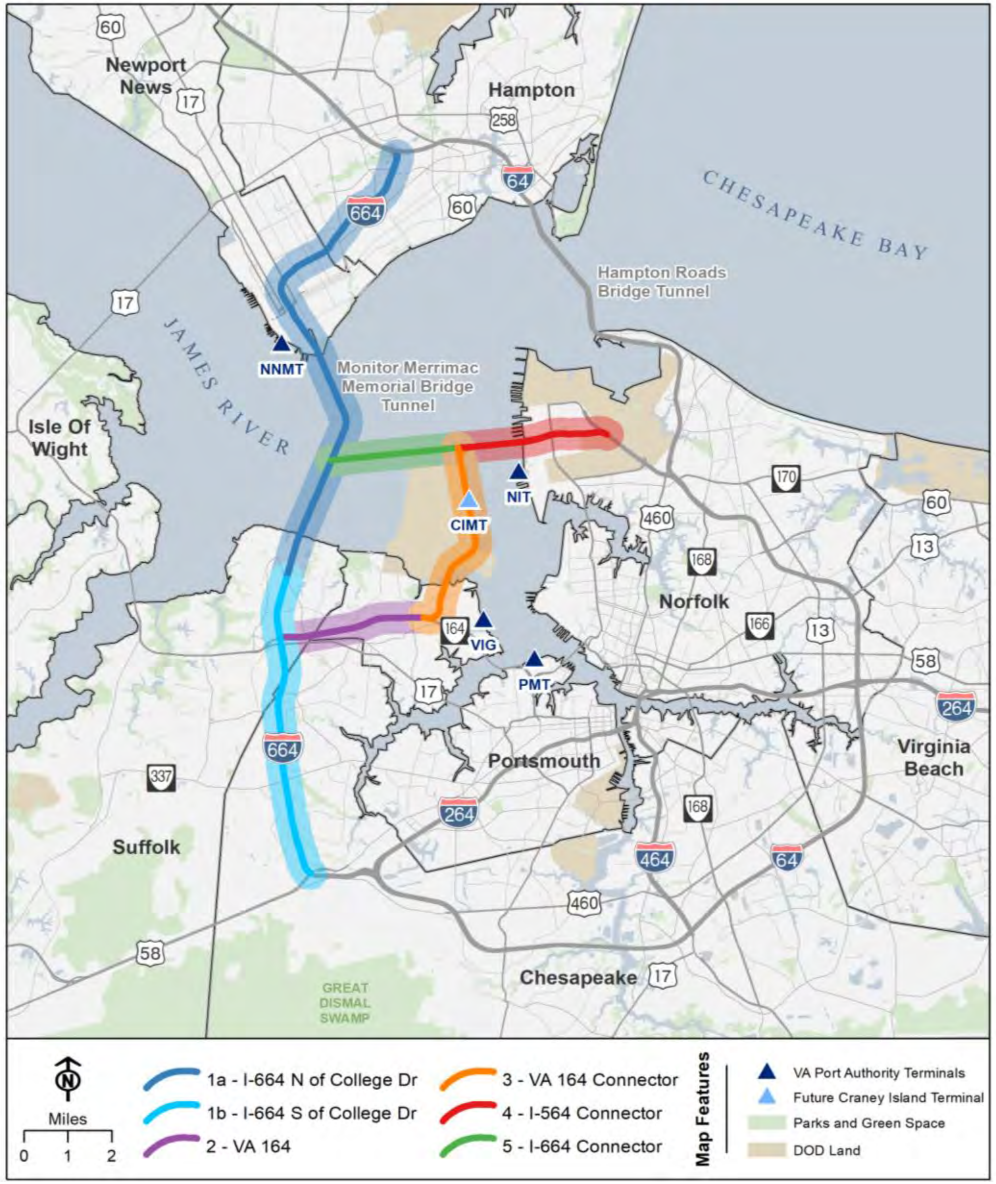
REGIONAL CONNECTORS STUDY

CONGESTION REDUCTION EVALUATION AND ECONOMIC IMPACT ANALYSIS

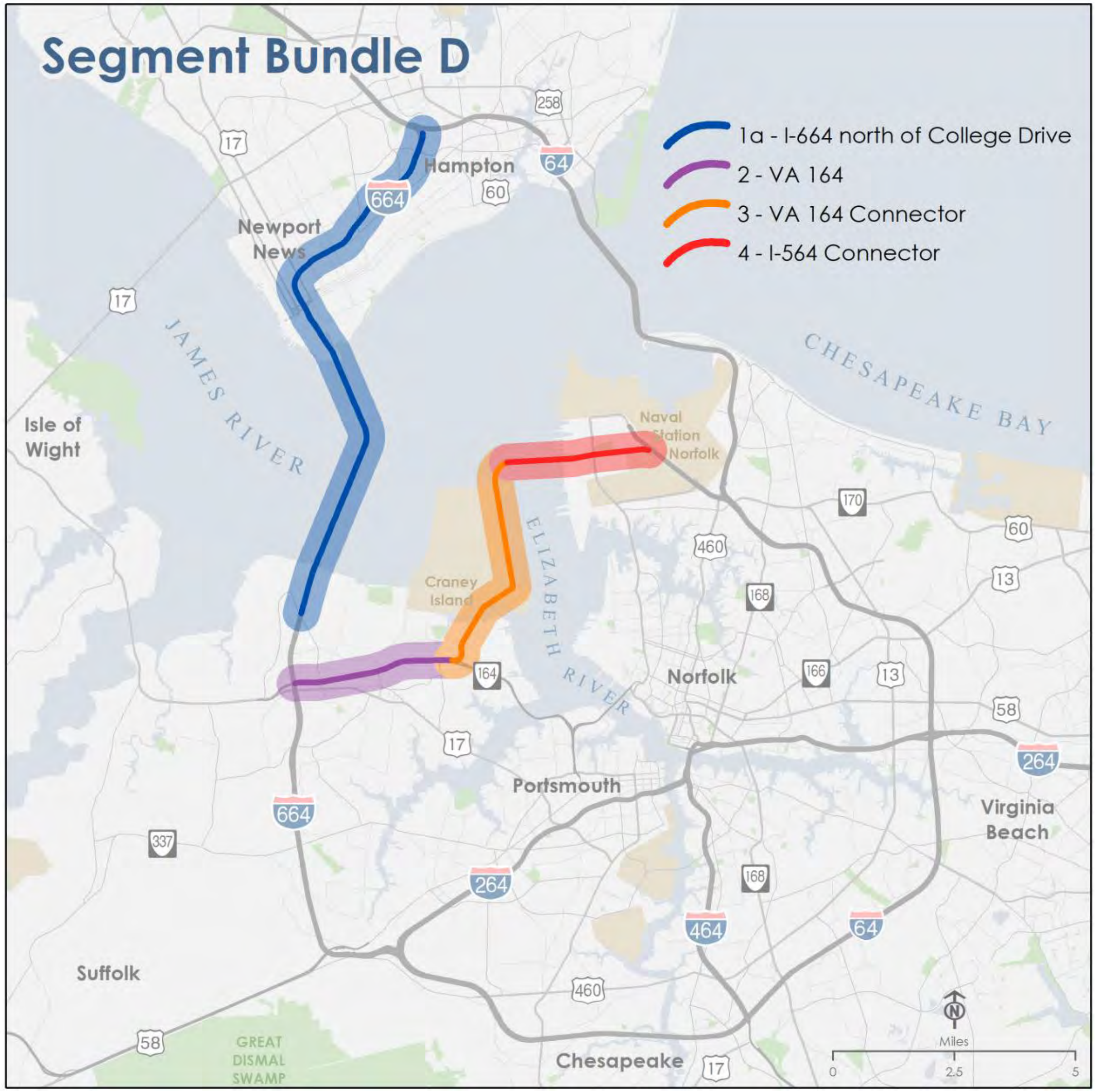
Overview

- Summary of Congestion Results
  - Regional Results
  - Key Facilities
- Summary Economic Results

Mandated Segments



Segment 1b (I-664 South of College Drive) included in the 2045 RCS Baseline Network



Segment 1b (I-664 South of College Drive) included in the 2045 RCS Baseline Network

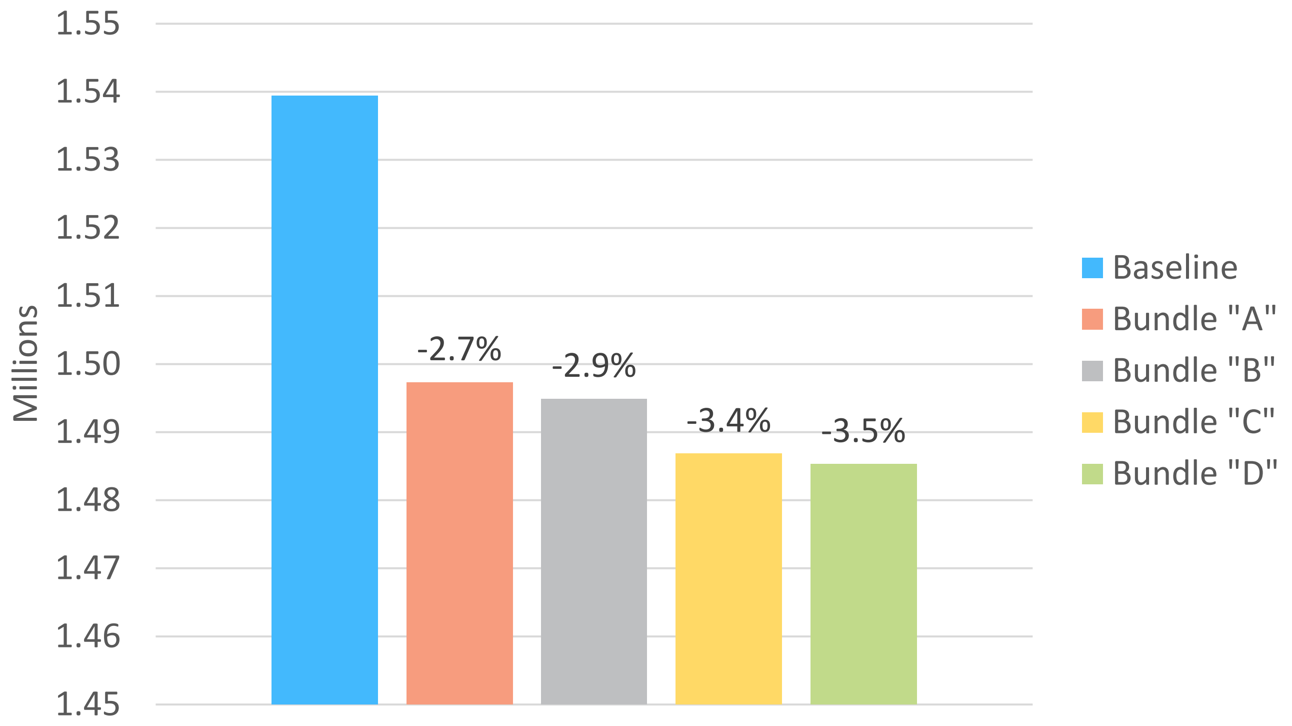
Congestion Analysis Takeaways – Regional Results

- Total regional travel levels (vehicle miles of travel - VMT) are similar for the 2045 baseline and all four bundles, but vehicle **hours** of travel are reduced with all four bundles. This is a result of reduction of congestion.
- Additional harbor crossing capacity reduces travelers' delay (the additional time spent driving due to congested conditions) by 10-14% daily and 12-17% in the peak periods relative to the 2045 baseline.
- Bundles C and D have the greatest cumulative effect on congestion.

Cost estimates for segments (next meeting) will bring greater insight on cost-effectiveness of the congestion benefits

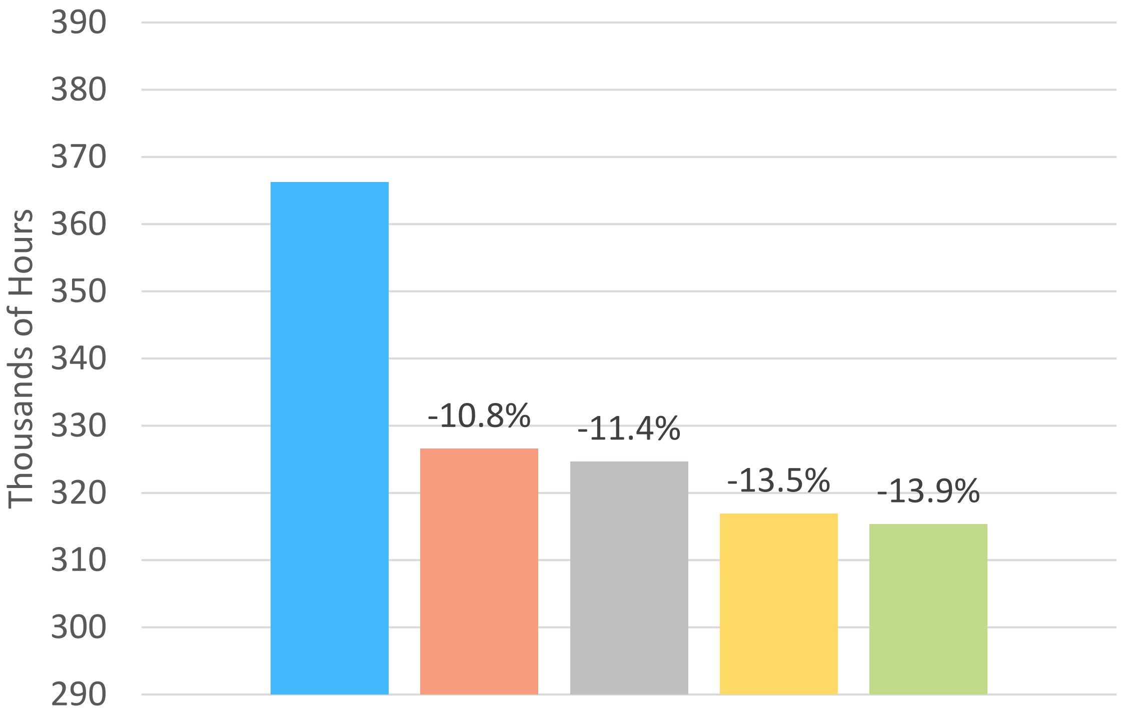
Regional Results of Congestion Analysis

2045 Regional Vehicle Hours of Travel



Vehicle hours of travel is the cumulative time of travelers spent on all the regional roadways

2045 Regional Delay

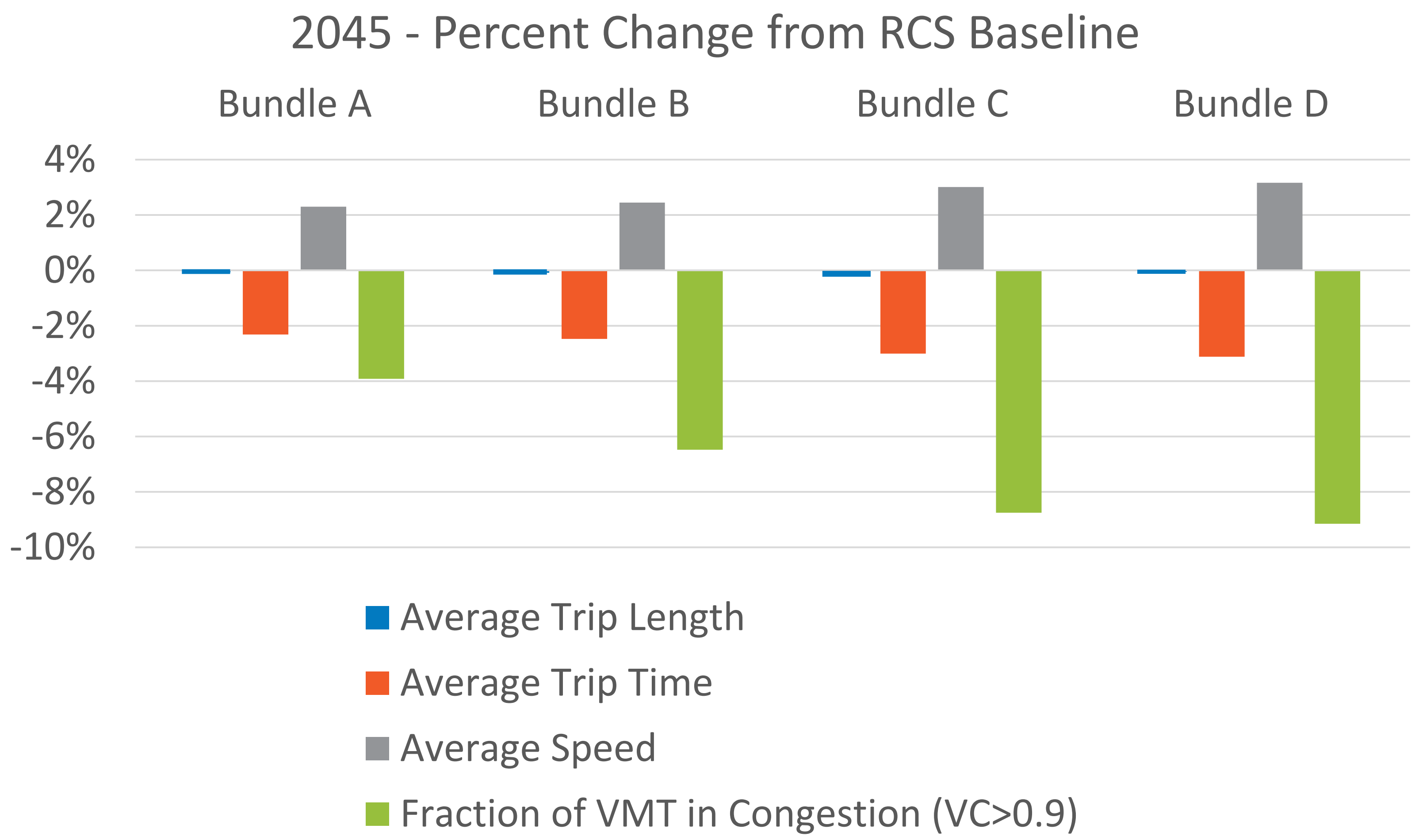


Delay is the amount of vehicle hours of travel spent due to traffic congestion

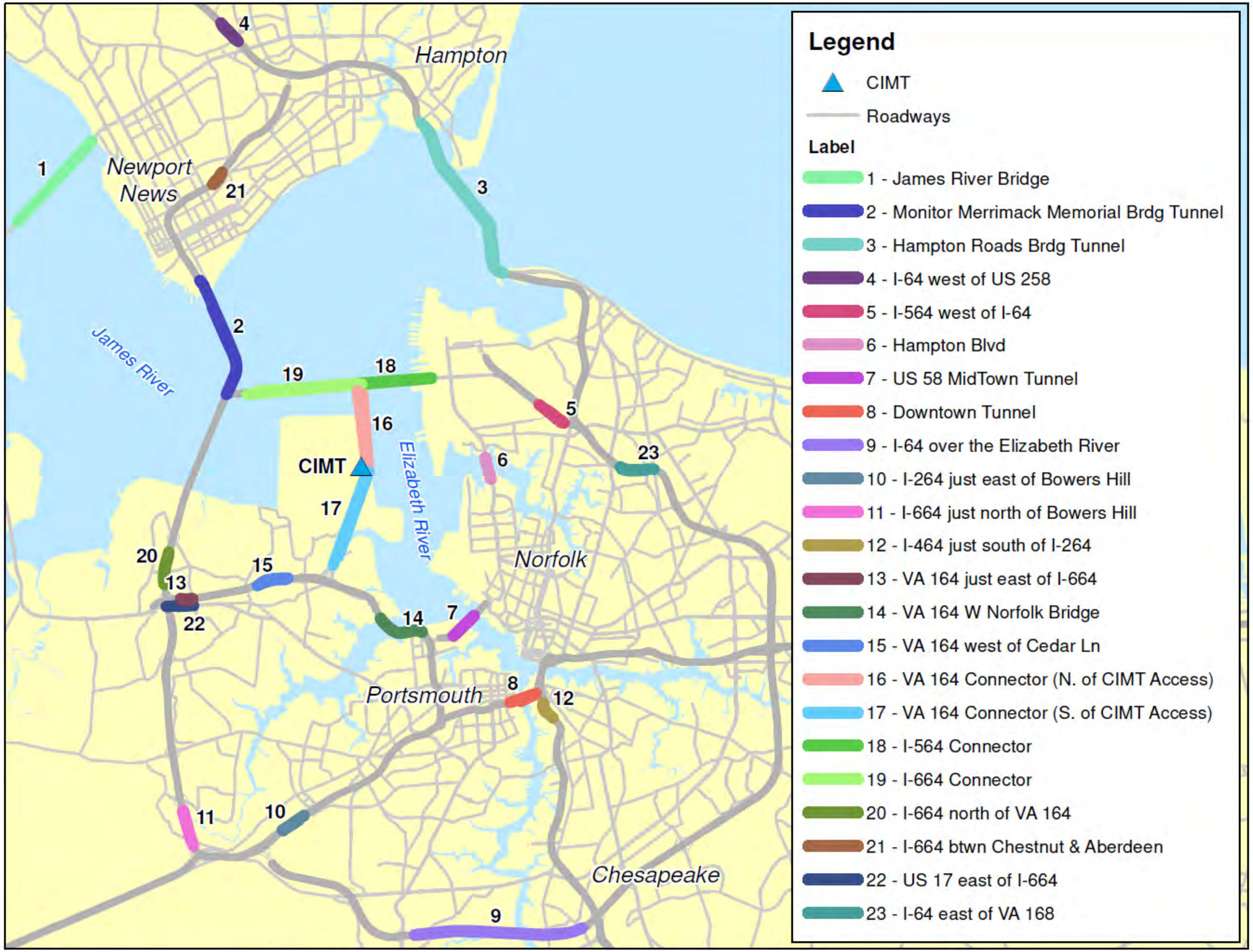
Percentage changes are in comparison to the baseline

Congestion Analysis Takeaways – Regional Results

- Average trip length varies little
- Average trip time decreases
- Average speed increases
- Share of congested travel decreases significantly, leading to improved reliability



Locations Examined in Congestion Analysis



Example Congestion Analysis Findings – Key Facilities

- Hampton Roads Bridge Tunnel sees some relief from the bundles
  - Reduced peak period volumes and increased speeds in managed lanes; less overall benefit to the general-purpose lanes
- Comparing the 2045 Baseline and Bundles, Bundle A results in the highest daily volumes across the three existing North-South harbor crossings while Bundle D results in the lowest volumes.
- Midtown and Downtown tunnels have slightly higher daily volumes with Bundles A and B, and 5-6% lower volumes with Bundles C and D
- Hampton Boulevard has lower daily volumes in Bundles C and D compared to the 2045 baseline, providing some congestion relief.

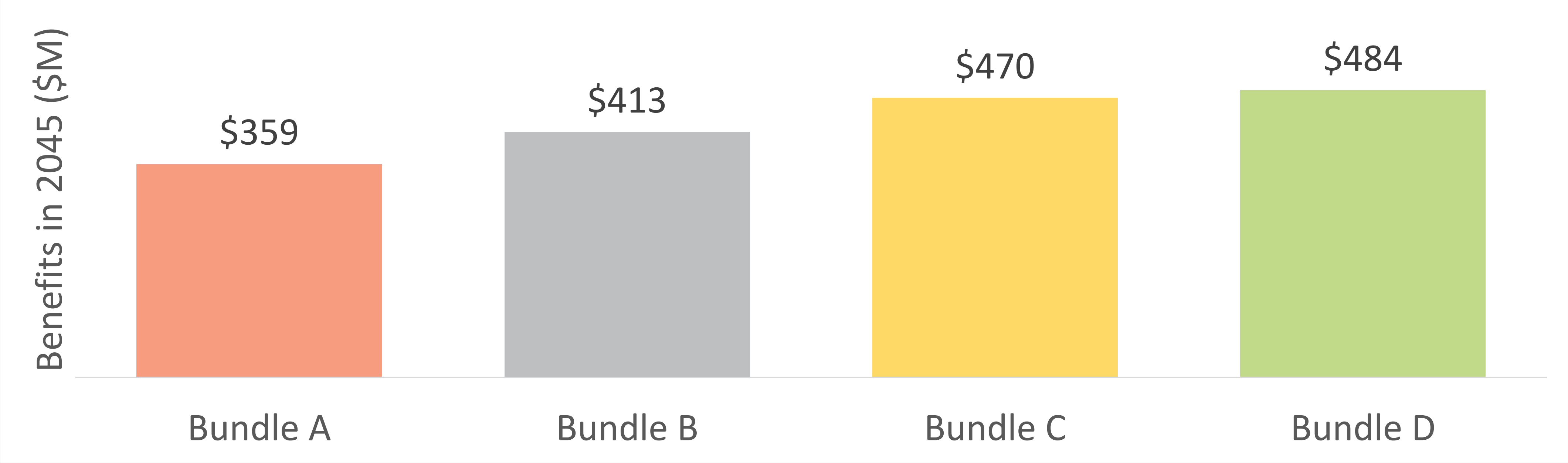
the heartbeat of HAMPTON ROADS TPO TRANSPORTATION PLANNING ORGANIZATION

REGIONAL CONNECTORS STUDY

SUMMARY ECONOMIC IMPACT ANALYSIS

Michael Baker INTERNATIONAL

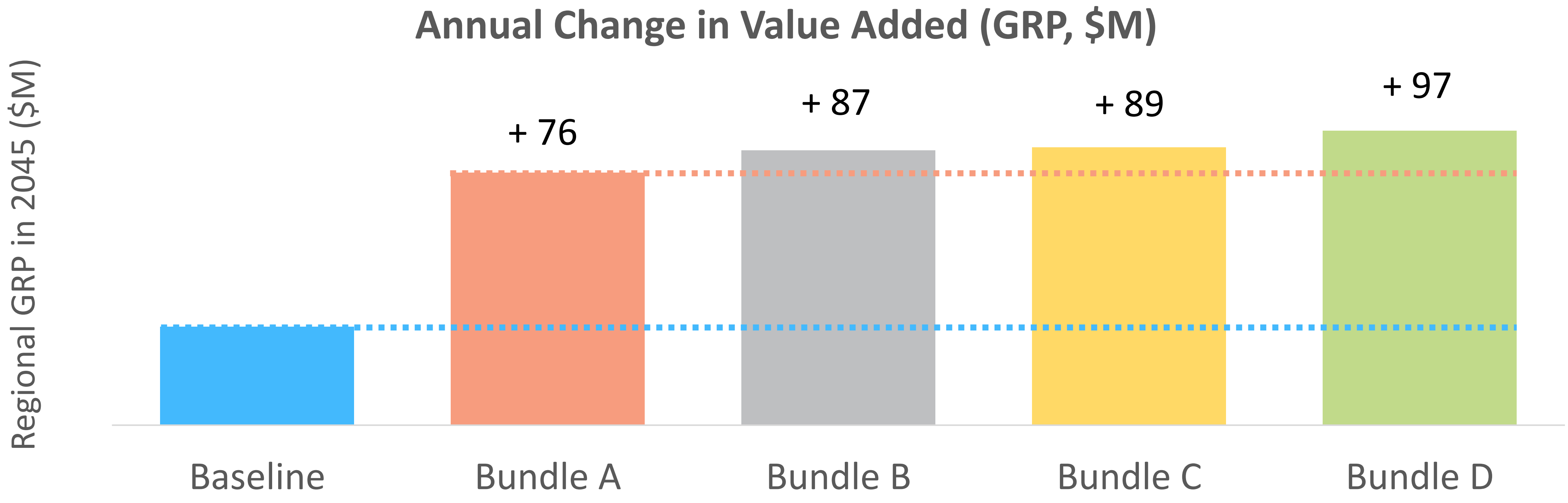
Societal Benefits in 2045
(Annual, $M, benefits of each bundle are relative to 2045 baseline)



- Benefits dominated by time and reliability savings
- Very minimal effects related to VMT reductions (emissions, safety, vehicle operating costs)

Regional Economic Impact in 2045

(Annual, $M, incremental effects relative to 2045 baseline)



- Greatest incremental economic impacts from Segment 1A in Bundle A
- Greatest overall economic value from Bundle D

GRP – Gross Regional Product (total value of production minus intermediate goods and services). The 2020 GRP was $154 B.

the heartbeat of HAMPTON ROADS TPO
TRANSPORTATION PLANNING ORGANIZATION

REGIONAL CONNECTORS STUDY

PUBLIC ENGAGEMENT PLAN – PROPOSED OUTREACH

Michael Baker INTERNATIONAL

Updates to Public Meetings Plan

Four In-Person Meetings

- Lower Peninsula, Norfolk, Suffolk, Portsmouth

Three Pop-Up Meetings

- Add geographic coverage, go to people at events

Online Engagement

- Reach parties unable to attend meetings

Proposed Meeting Locations Map

With Transit and Demographics

Proposed Meeting Locations Map

With Transit and Demographics

Proposed Meeting Locations Map

With Transit and Demographics

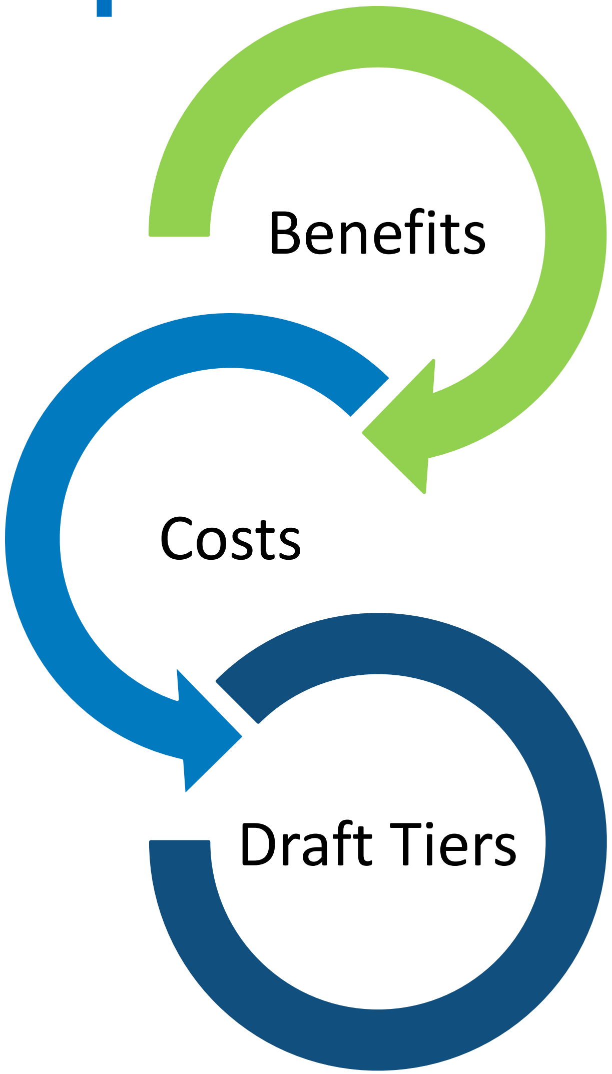
Proposed Meeting Locations Map

With Transit and Demographics

Proposed Meeting Locations Map

With Transit and Demographics

Next Steps



Next Meeting: September 27

Step 2

Congestion Reduction Evaluation

Revised Design & Cost Estimation

Final Draft Segment Tiering

REGIONAL CONNECTORS STUDY

Joint Steering (Policy) Committee and Working Group Meeting, Tiering Recommendations, September 27, 2022

the heartbeat of HAMPTON ROADS TPO
TRANSPORTATION PLANNING ORGANIZATION

REGIONAL CONNECTORS STUDY

STEERING (POLICY) COMMITTEE AND WORKING GROUP
SEPTEMBER 27, 2022

Michael Baker
INTERNATIONAL

Phase 3 Process Graphic

We are here

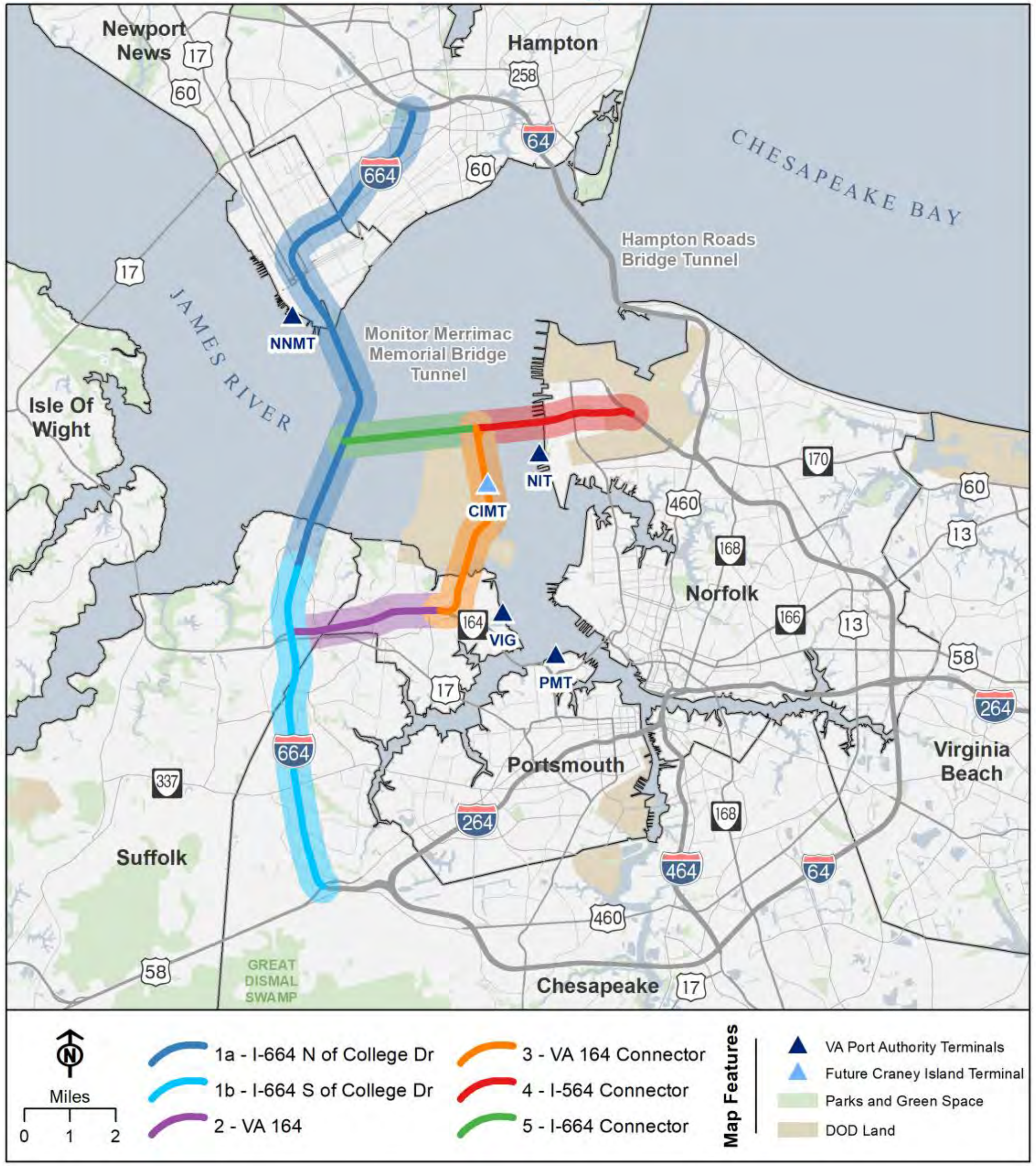
Step 1	Step 2	Step 3	Step 4
Qualitative Assessment of Construction, Permitting, & Readiness	Congestion Relief Evaluation Revised Design & Cost Estimation	Scenario Analysis Traffic Operations Analysis	Final Documentation of Design, Evaluation & Recommendations
SEGMENT BUNDLING FOR STEP 2	FINAL DRAFT SEGMENT TIERING	FULL RECOMMENDATIONS TO HRTPO	FINAL REPORT
Website Update	Public Meetings	Regional Connectivity Symposium	Public Meetings

RCS Phase 3 – Draft Tiering

Agenda

- Comment/Response highlights
- Step 1 Qualitative Evaluation Updates
- Step 2 Quantitative Analysis
  - Congestion Benefits
  - Economic Benefits
  - Cost estimates
- Draft Tiering Recommendations
- Scenario Analysis Bundles
- Public Engagement Update

Mandated Segments



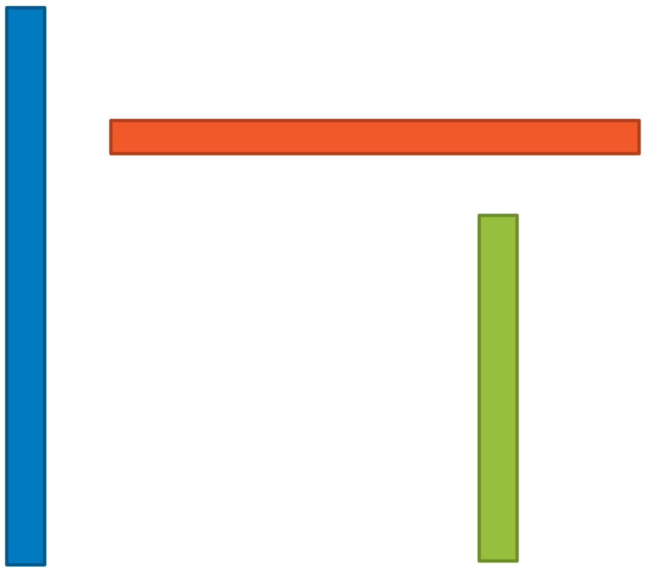
the heartbeat of HAMPTON ROADS TPO
TRANSPORTATION PLANNING ORGANIZATION

REGIONAL CONNECTORS STUDY

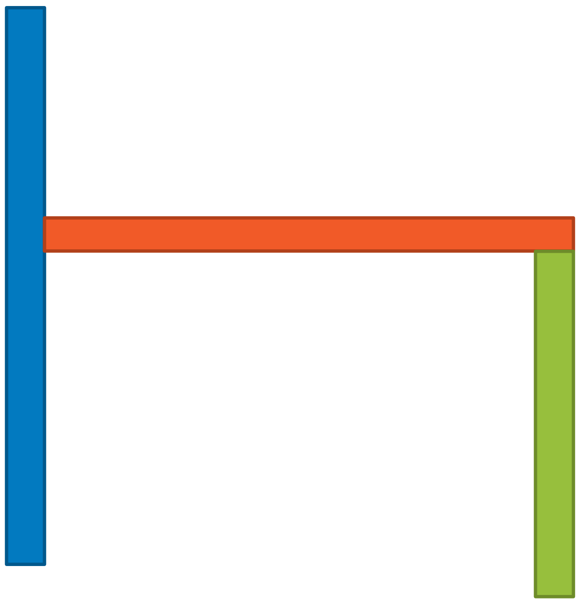
INTRODUCTORY SLIDES

Michael Baker
INTERNATIONAL

Segments vs Bundles



SEGMENTS



BUNDLE

Tiering

SEGMENT TIERING

Tier I	Segments ready for advancement and recommended for consideration in the fiscally constrained portion of the 2050 HRTPO Long Range Transportation Plan.
Tier II	Segments which require further refinement and maturation, and will be recommended for consideration in the 2050 Vision Plan, as developed by the HRTPO.
Tier III	Segments that due to technical challenges and uncertainties, will be further developed at an appropriate time in the future.

REGIONAL CONNECTORS STUDY

UPDATES FROM STEP 1

Summary of comments on qualitative evaluation (Step 1)

- US Navy
  - Security, hardening and setbacks from sensitive areas related to fuel facilities, gates and piers
- USACOE
  - Concerns about impacts to Craney Island/Dredge Mgmt Area, channel(s), habitat, wetlands, environmental justice (EJ), independent utility
- Portsmouth
  - Concerns about VA 164 widening feasibility and impacts regarding residential communities, EJ & railroad
- Port of Virginia
  - Criticality and need for I-564 and VA-164 corridor improvements regarding Port mission and future

Summary of actions in response during Step 2

- Coordination: VDOT and HRSD
  - Need to make I-664 alignment adjustments to accommodate HRSD programmed infrastructure projects
- **Response to Comments and Coordination:**
  1. Alignment Adjustments
  2. Update of Qualitative Readiness and Permitting Issues Evaluations
  3. Cost Estimates

Alignment Changes

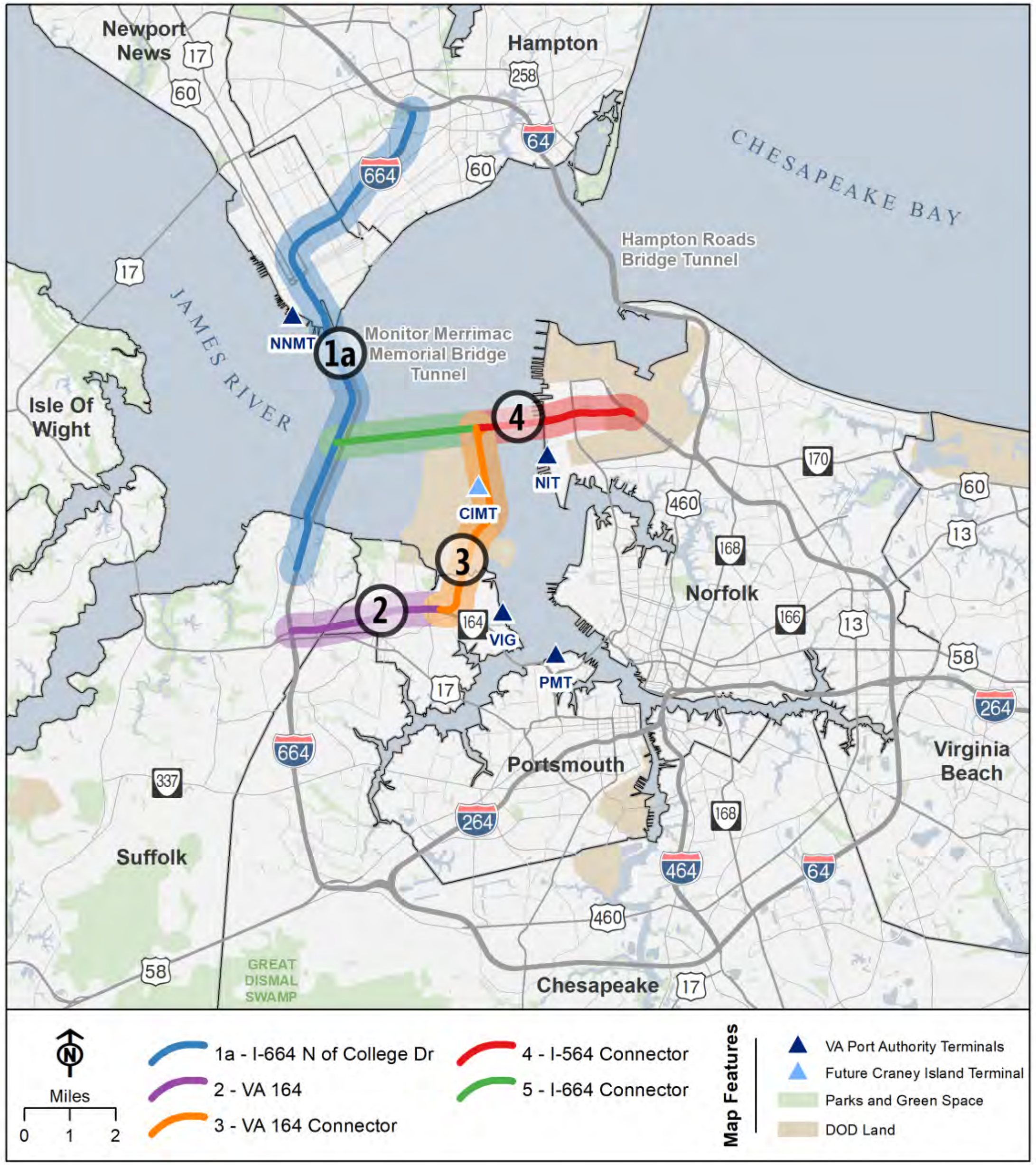
1a Updated I-664 Terminal Ave interchange and shifted bridge\tunnel to avoid new HRSD facility.

2 Updated typical section for VA-164. Road shifted away from railroad to accommodate railroad minimum offset and crash wall

3 Realigned VA 164 Connector to meet Navy force protection standards for fuel lines and future expansion area of fuel depot.

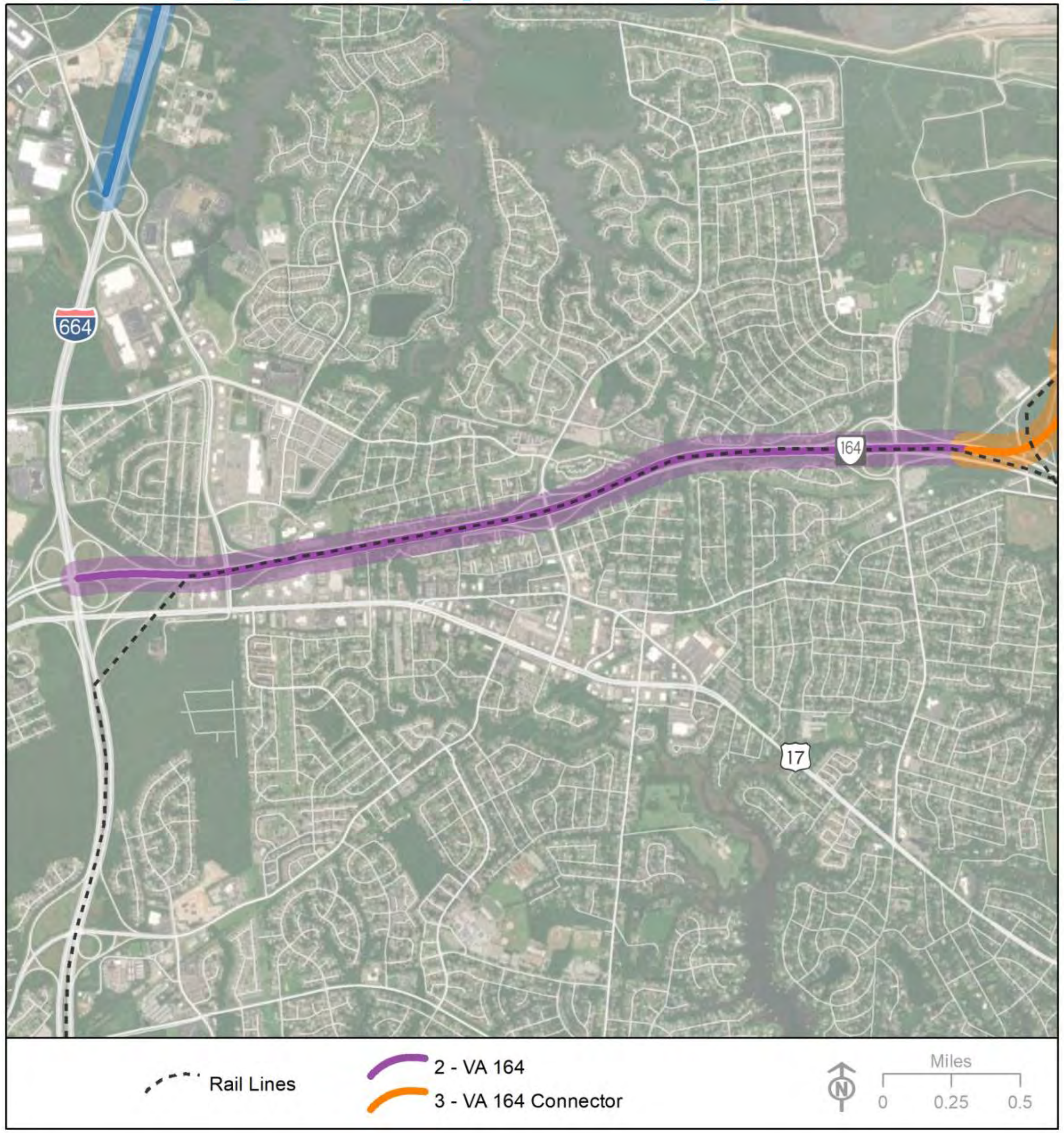
4 Created an alternative for I-564 Connector by lowering profile under Gate 6 interchange in response to Navy comments

Mandated Segments



Alignment Update - Segment 1a

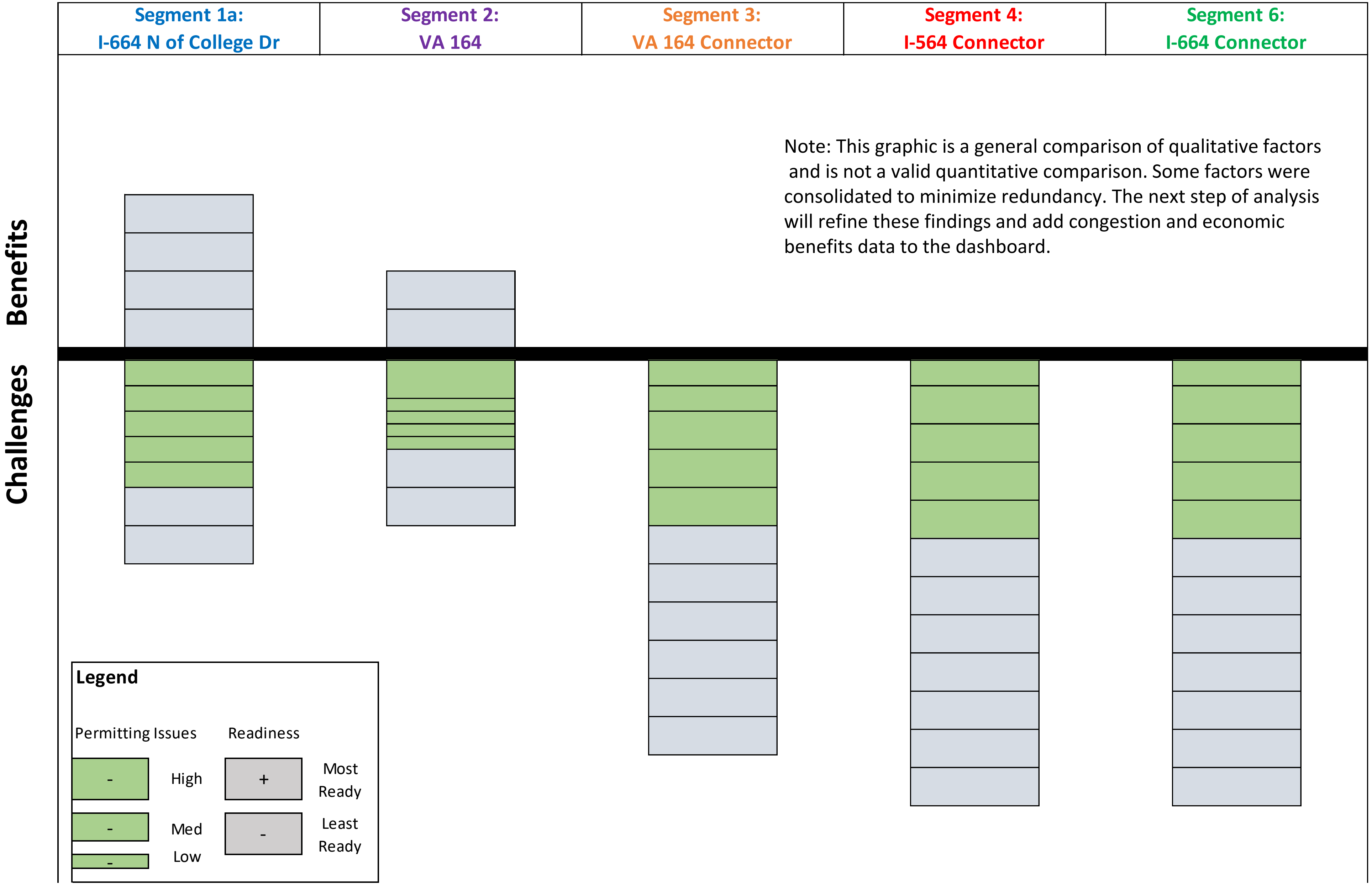
Alignment Update - Segment 2



Alignment Update - Segment 3

Alignment Update - Segment 4

Step 1 Qualitative Evaluation Dashboard - UPDATED



Note: This graphic is a general comparison of qualitative factors and is not a valid quantitative comparison. Some factors were consolidated to minimize redundancy. The next step of analysis will refine these findings and add congestion and economic benefits data to the dashboard.

REGIONAL CONNECTORS STUDY

QUANTITATIVE ANALYSIS

Quantitative Analysis

- Congestion Benefits – delay reduction
  (introduced in August meeting)

- Economic Benefits – societal benefit, regional economic impact
  (introduced in August meeting)

- Segment Cost Estimates

Cost Estimates of Mandated Segments

- Based on cost-per-mile in VDOT's cost estimating program (PCES)
- Hybrid approach that considered the 2016 Supplemental Environmental Impact Statement (SEIS) information and recent tunnel/island cost estimates
- Added cost elements and/or contingencies to reflect constructability and security issues identified in this project
- Specific cost of non-standard items (e.g. retaining walls) based on recent data from comparable projects
- Cost reflecting 2022 dollars and include a 40% contingency

Segment drawings showing limits of disturbance (LOD) and profiles are available until Oct 16 at the following link:

https://eFTP.mbakerintl.com/message/2U2XgGTEX5nGQF3J0JKKue

Cost Estimates of Mandated Segments

Segment	Costs ($ M) 2022$	Key factors related to cost
1a. I-664 Widening (North of College Drive)	$3,918	New tunnel and islands, sheer length of new roadway over water, significant number of new/widened bridges
2. VA 164 Widening	$286	Improvements to existing alignment, entirely over land, helps control cost; includes coordination with railroad, crash walls for railroad, and is partially widened to the outside
3. VA 164 Connector	$1,097	Significant structures over Craney Island, Navy security requirements, landfill and Corp of Engineers coordination requirements. Includes interchange with I-564 Connector
4. I-564 Connector	$3,242	New tunnel and island, Navy security requirements
5. I-664 Connector	$1,534	Entire segment on structure over water

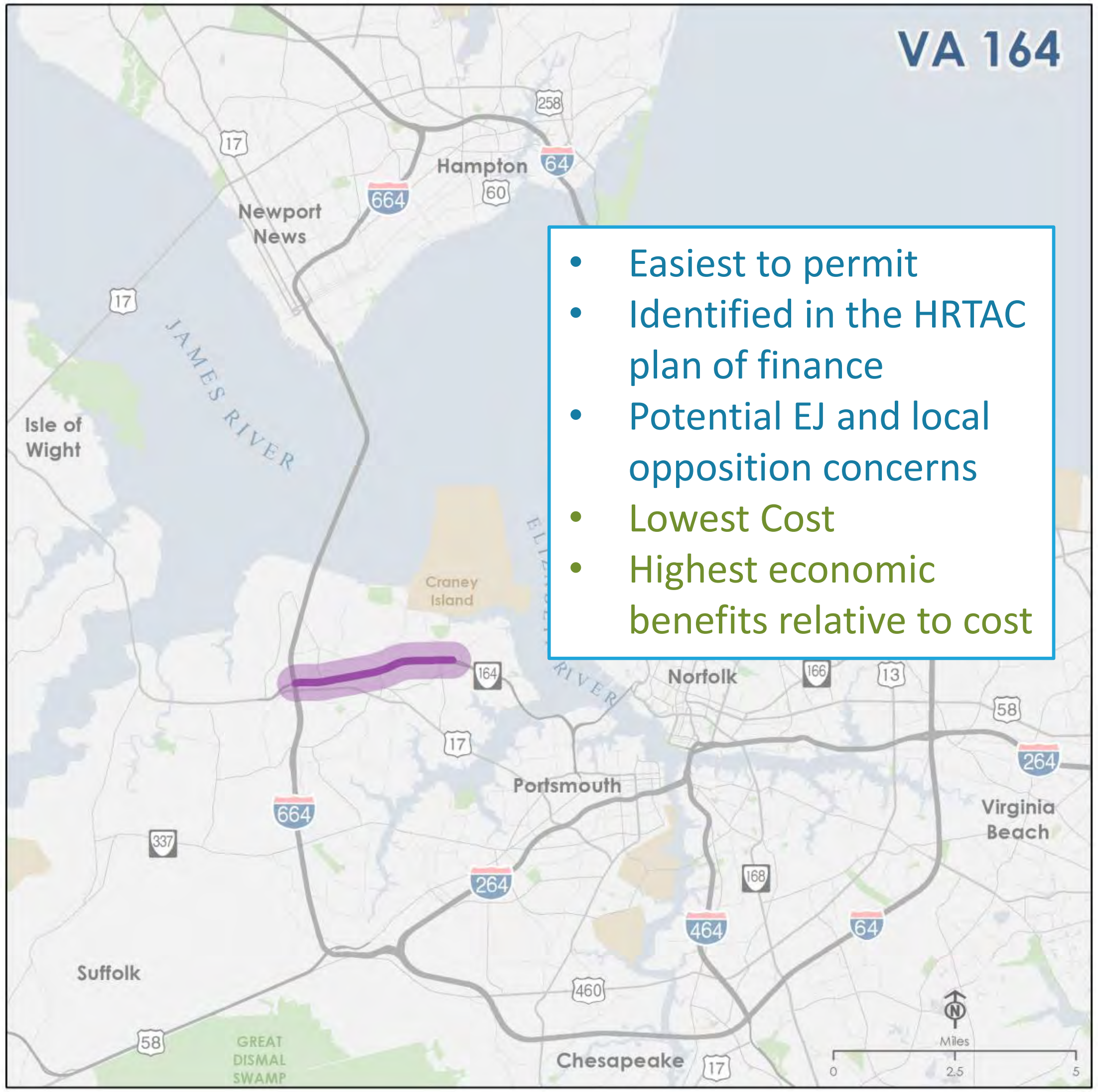
- Planning level estimates using VDOT Cost Estimating System (PCES), supplemented with project-specific elements such as security needs and relying on recent examples of key project elements such as tunnels. These preliminary cost estimates are as of Sept 2022 and may change as RCS project development continues

Quantitative Evaluation

- Used the segment bundle congestion benefits and economic benefits data together with costs to examine cost effectiveness
- Findings:
  - Segment 1a has a high cost, but the benefits are the highest and it rates as cost-effective
    - Most cost-effective for Congestion Benefits
    - Second-most cost effective for Economic Benefits
  - Segment 2 has a relatively low cost, and enough benefits that it also rates as cost-effective
    - Most cost-effective for Economic Benefits
    - Second-most cost effective for Congestion Benefits
  - Segments 3, 4 and 5 have high cost and lower incremental benefits, resulting in substantially lower cost-effectiveness compared to Segment 1a and Segment 2

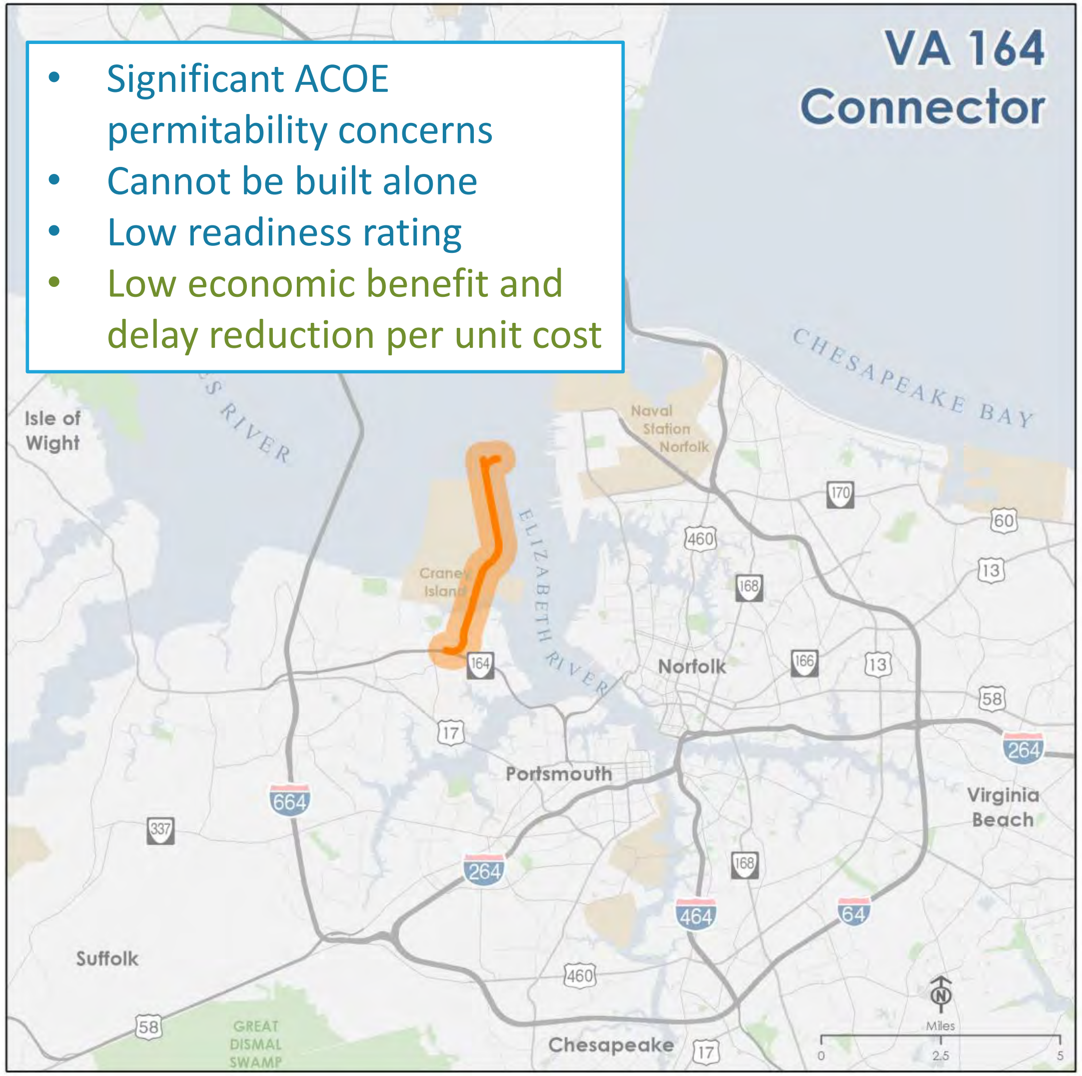
Findings by segment

- Highest readiness rating
- Completes the HREL network
- Community and potential EJ impacts on peninsula
- Permitting issues with harbor crossing
- Largest benefits to congestion and economy
- Highest congestion benefits relative to cost

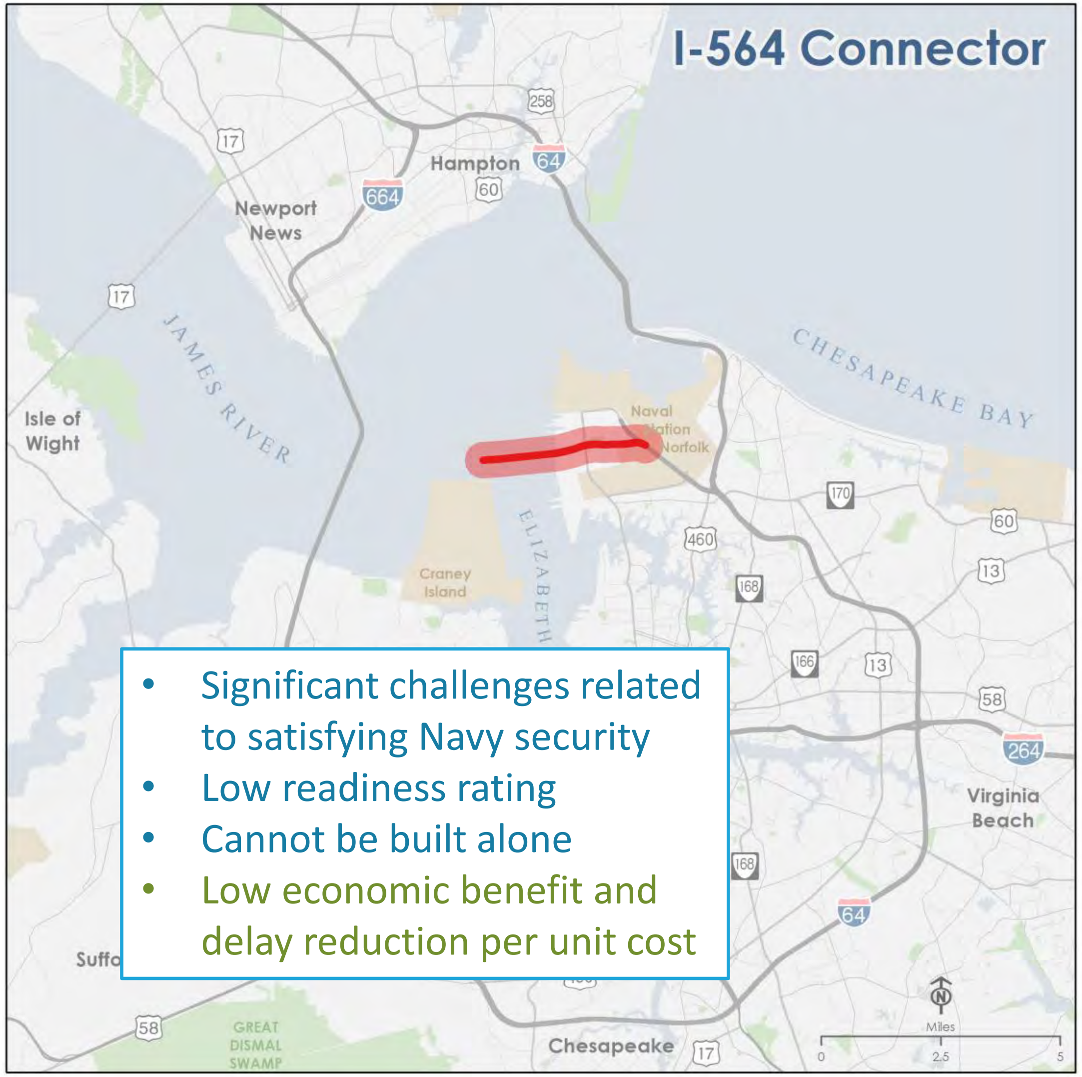


- Easiest to permit
- Identified in the HRTAC plan of finance
- Potential EJ and local opposition concerns
- Lowest Cost
- Highest economic benefits relative to cost

Findings by segment

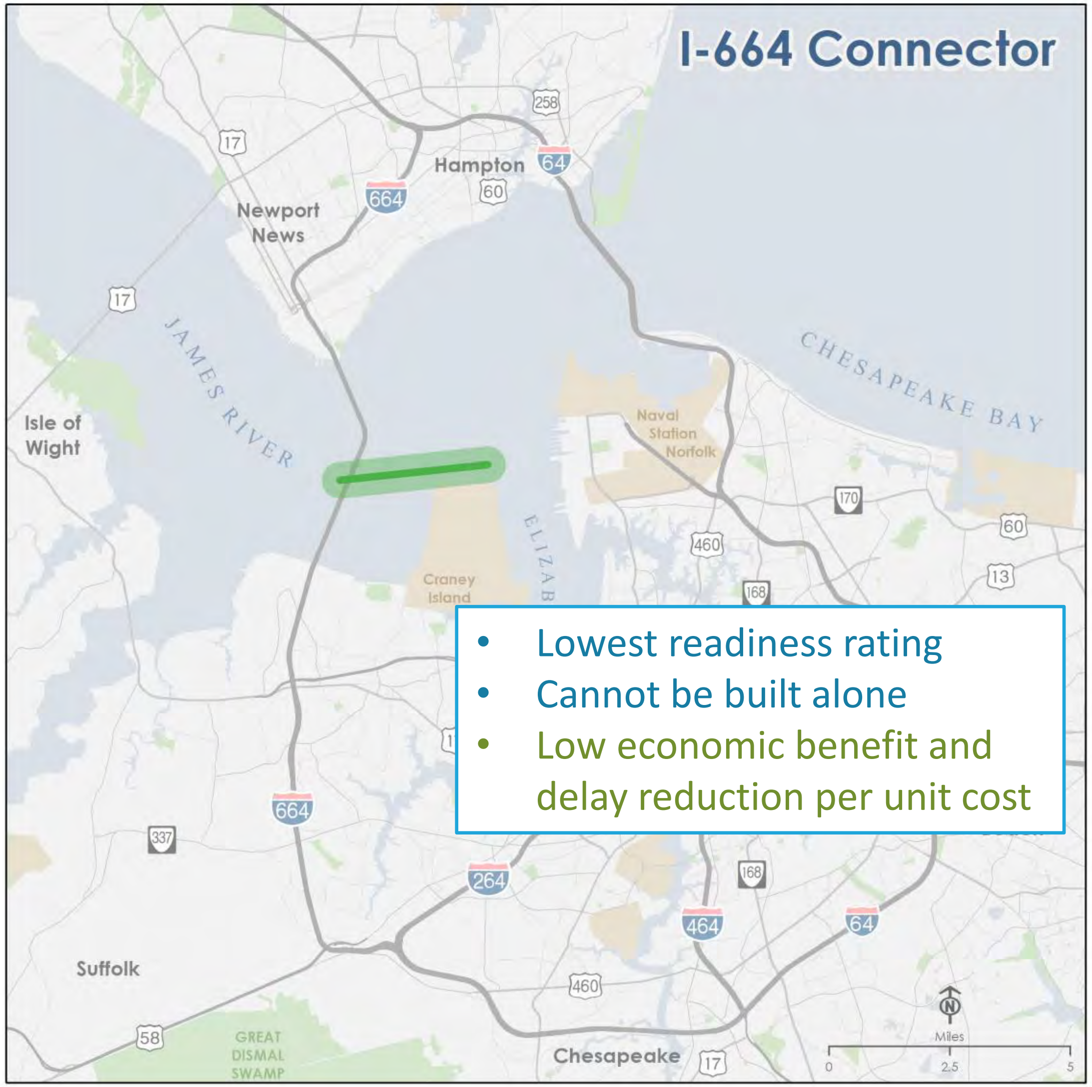


- Significant ACOE permitability concerns
- Cannot be built alone
- Low readiness rating
- Low economic benefit and delay reduction per unit cost



- Significant challenges related to satisfying Navy security
- Low readiness rating
- Cannot be built alone
- Low economic benefit and delay reduction per unit cost

Findings by segment



- Lowest readiness rating
- Cannot be built alone
- Low economic benefit and delay reduction per unit cost

Summary of Segment Evaluations

Segment	1a - I-664 Widening	2 – VA 164 Widening	3 – VA 164 Connector	4 - I-564 Connector	5 – I-664 Connector
Quantitative findings – benefits relative to cost	**High**	**High**	**Low**	**Low**	**Low**

Summary of Segment Evaluations

Segment	1a - I-664 Widening	2 – VA 164 Widening	3 – VA 164 Connector	4 - I-564 Connector	5 – I-664 Connector
Quantitative findings – benefits relative to cost	**High**	**High**	**Low**	**Low**	**Low**
Qualitative findings – Relative Segment Readiness	**High**	**Medium**	**Low**	**Low**	**Low**
Qualitative findings – Relative Segment Ease of Permitting	**Medium**	**High**	**Low**	**Low**	**Low**

Tiering Recommendations - Approach

Qualitative Evaluation + Quantitative Evaluation

Qualitative Evaluation

- Readiness
- Permitting Issues

Quantitative Evaluation

$$\frac{\text{Congestion Benefits} \quad \text{Economic Benefits}}{\text{Segment Costs}}$$

Tiering Definitions

SEGMENT TIERING

Tier I

Segments ready for advancement and recommended for consideration in the fiscally constrained portion of the 2050 HRTPO Long Range Transportation Plan.

Tier II

Segments which require further refinement and maturation, and will be recommended for consideration in the 2050 Vision Plan, as developed by the HRTPO.

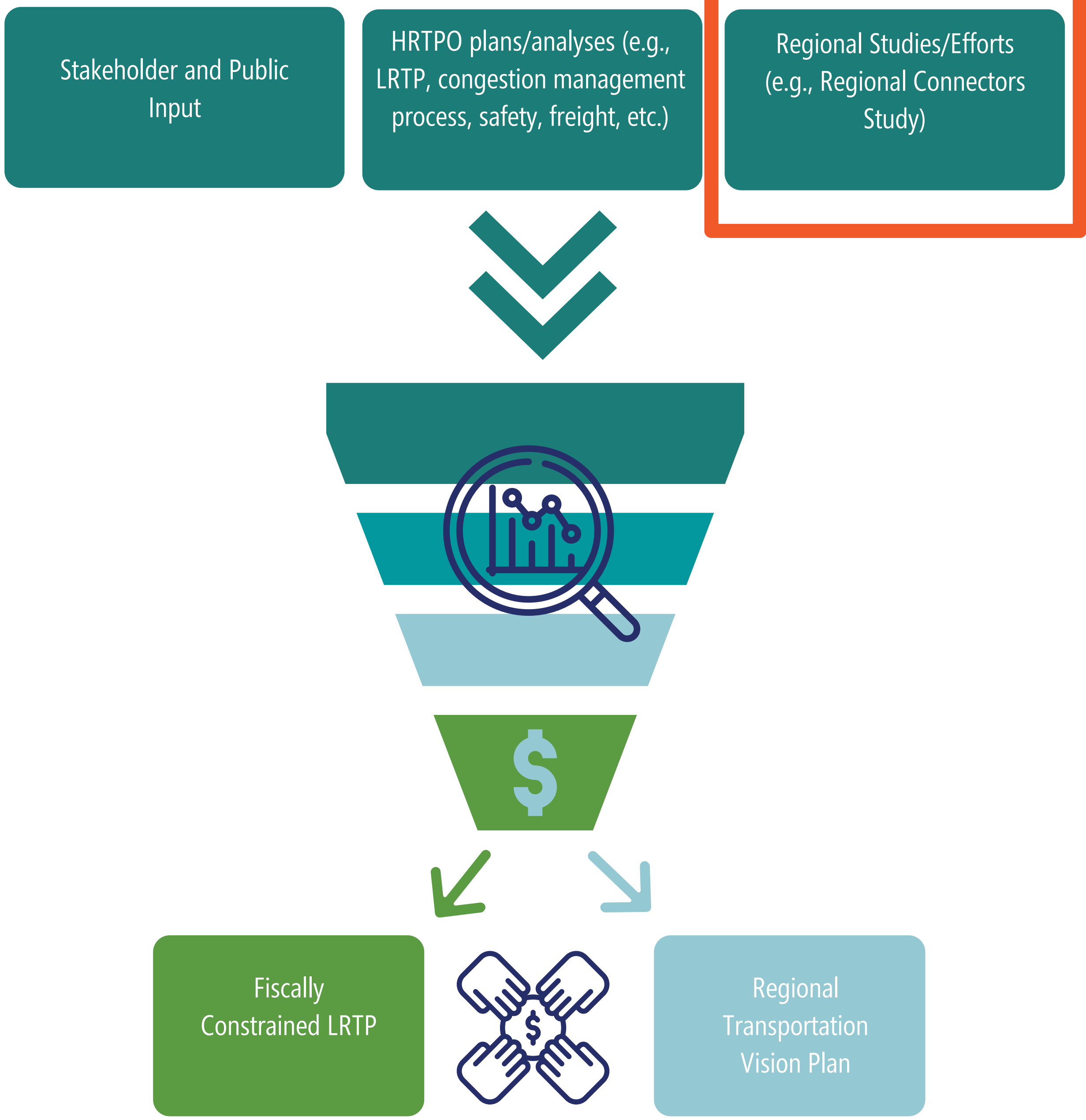
Tier III

Segments that due to technical challenges and uncertainties, will be further developed at an appropriate time in the future.

LRTP Planning Process

Long-Range Transportation Plan (LRTP)

- Assess Current Conditions
- Forecast Growth - Assess Future Conditions
- Evaluate and Prioritize (Across Scenarios)
- Identify Funding (Fiscal Constraint)



Basis for Tiering

- There is a clear distinction between the stronger qualitative benefits and cost-effectiveness of Segments 1a and 2 in comparison to the other segments
  - The high benefits of Segment 1a overcome the segment's high cost
  - The relative benefits of Segment 2 are cost-effective because of the low cost
- The TPO Long Range Transportation Plan process will ultimately determine what is in the constrained LRTP and what is in the vision plan
- The technical analysis does not provide a substantial distinction between Segments 1a and 2 that would differentiate them for tiering

→ **Consultant Team Recommends Segment 1a and Segment 2 for Tier I**

Basis for Tiering

- Segments 3, 4 and 5 have similar qualitative evaluations – no "readiness" benefits, and permitting issues that produce mitigation and timing obstacles
- After Segment 1a benefits, the incremental benefits of Segments 3, 4, and 5 are much lower relative to segment costs.
- The technical analysis does not provide a substantial distinction between Segments 3, 4 and 5 that would differentiate them for tiering

➡ **Consultant Team Recommends Segment 3, Segment 4 and Segment 5 for Tier III**

Draft Tiering

SEGMENT TIERING

Tier I	Segments ready for advancement and recommended for consideration in the fiscally constrained portion of the 2050 HRTPO Long Range Transportation Plan.
Tier II	Segments which require further refinement and maturation, and will be recommended for consideration in the 2050 Vision Plan, as developed by the HRTPO.
Tier III	Segments that due to technical challenges and uncertainties, will be further developed at an appropriate time in the future.

1a (I-664 widening)

2 (164 widening)

LRTP Planning Process

3 (164 connector)

4 (I-564 connector)

5 (I-664 connector)

Recommended Action Item #6

- Approve draft tiering of mandated segments for public input

Hampton Roads TPO — the heartbeat of Hampton Roads — Transportation Planning Organization

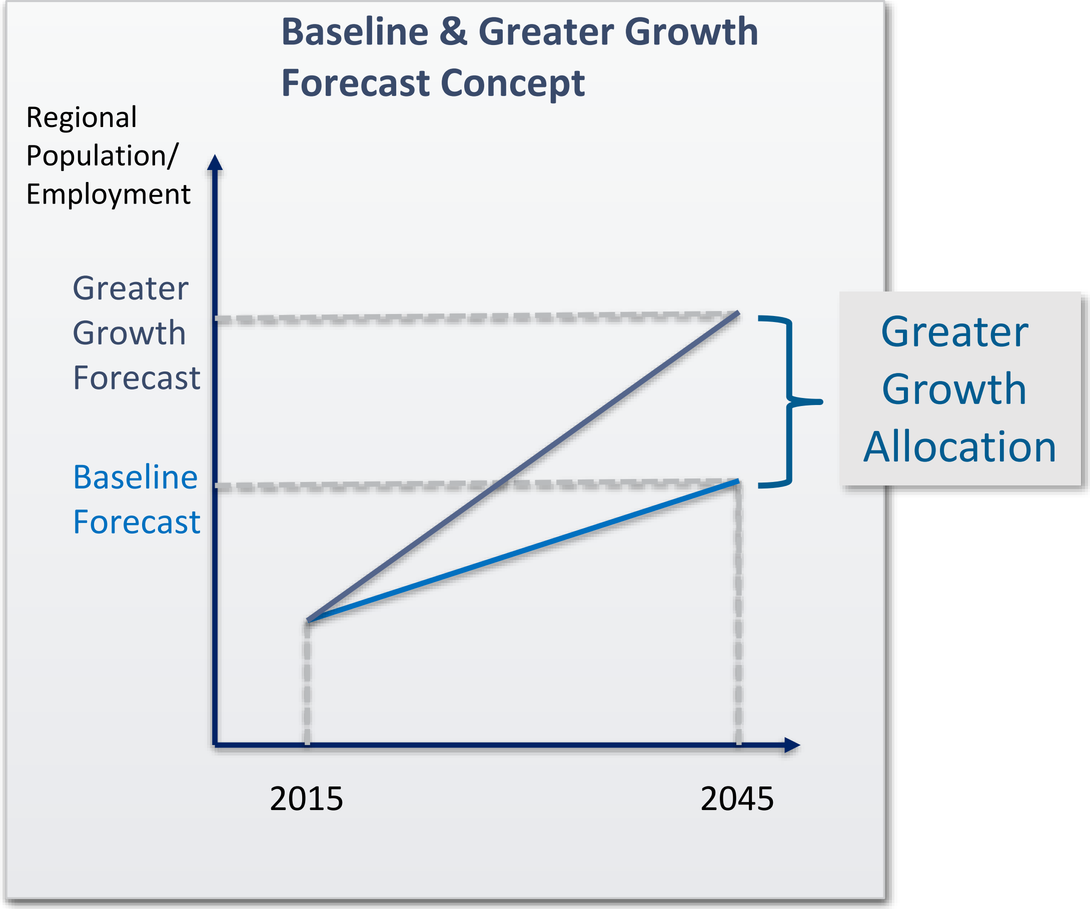
REGIONAL CONNECTORS STUDY

SCENARIO ANALYSIS BUNDLES

Michael Baker INTERNATIONAL

Scenario Analysis

- Compare 2045 Baseline and 3 Greater Growth Scenarios
  - Greater Growth Scenarios reflect 2x the employment growth from 2015-2045 and associated increase in population growth
  - "Stress test" of the transportation network and harbor crossings in particular
  - Scope of work allows testing of baseline and up to 3 bundles of segments in Tiers I and II



Greater Growth Scenarios

Greater Growth on the Water	What happens if jobs focus on the waterfront, housing choices are varied, and transportation technology adoption is moderate?
Greater Growth in Urban Centers	What happens if jobs and housing focus in urban areas, with greater multimodal availability and high adoption of connected vehicle technology?
Greater Suburban/ Greenfield Growth	What happens if jobs and housing are developed in dispersed activity centers, with a higher level of truck transportation and high adoption of autonomous vehicle technology?

Approved by Steering (Policy) Committee 7/09/2019

Consultant Team Recommendation – Scenario Bundles

Recommended Action Item # 7

- Approve the recommended bundles of segments for scenario analysis

REGIONAL CONNECTORS STUDY

PUBLIC ENGAGEMENT UPDATE

Upcoming Public Engagement

Purpose

- Provide an overall update on the study and findings to-date
- Present the draft tiering of segments
- Engage residents in discussion of future segment projects' benefits and burdens

Upcoming Public Engagement

Purpose

- Provide an overall update on the study and findings to-date
- Present the draft tiering of segments
- Engage residents in discussion of future segment projects' benefits and burdens

Activities

- In-Person Public Meetings
- On-Line Engagement
- Pop-Up Meetings
- Social Media engagement and advertising
- October Community Advisory Committee (CAC)

Public Meeting Schedule

Date	Venue	City
Tuesday, November 15	Churchland Branch Library	Portsmouth
Thursday, November 17	VDOT Hampton Roads Office	Suffolk
Tuesday, November 29	Main Street Library	Newport News
Wednesday, November 30	Lambert's Point Community Center	Norfolk

- Meetings scheduled 5:30-7:30 PM
- Presentations given at 6:00 and 7:00 PM
- All locations are accessible by transit; VDOT location also accessible to VA 164 corridor residents

Anticipated Pop-Up Meetings

Provide information on the project and the November public meetings:

- Virginia Beach Central Library (during after school programs)
- Hampton event to-be-determined (in October)
- Chesapeake Farmer's Market at City Park October 15 or 22

REGIONAL CONNECTORS STUDY

NEXT STEPS

STUDY TIMELINE

2022: JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

2023: JAN FEB MAR APR MAY JUN JUL

STEP 1

DRAFT SEGMENT BUNDLING

- Qualitative Assessment of Construction, Permitting, and Readiness

STEP 2

DRAFT SEGMENT TIERING

- Design and Cost Estimation
- Congestion Relief Evaluation

STEP 3

FINAL STUDY REVIEW AND EVALUATION

- Scenario Analysis
- Public Meetings
- Traffic Operational Analysis

STEP 4

DOCUMENTATION AND RECOMMENDATIONS

- Public Meetings
- Final Report and Recommendations Presented to HRTPO

REGIONAL CONNECTORS STUDY

Joint Steering (Policy) Committee and Working Group Meeting, Tiering Recommendations, November 17, 2022

REGIONAL CONNECTORS STUDY

STEERING (POLICY) COMMITTEE AND WORKING GROUP
NOVEMBER 17, 2022

Phase 3 Process Graphic

We are here

Step 1	Step 2	Step 3	Step 4
Qualitative Assessment of Construction, Permitting, & Readiness	Congestion Relief Evaluation Revised Design & Cost Estimation	Scenario Analysis Traffic Operations Analysis	Final Documentation of Design, Evaluation & Recommendations
SEGMENT BUNDLING FOR STEP 2	FINAL DRAFT SEGMENT TIERING	FULL RECOMMENDATIONS TO HRTPO	FINAL REPORT
Website Update	Public Meetings	Regional Connectivity Symposium	Public Meetings

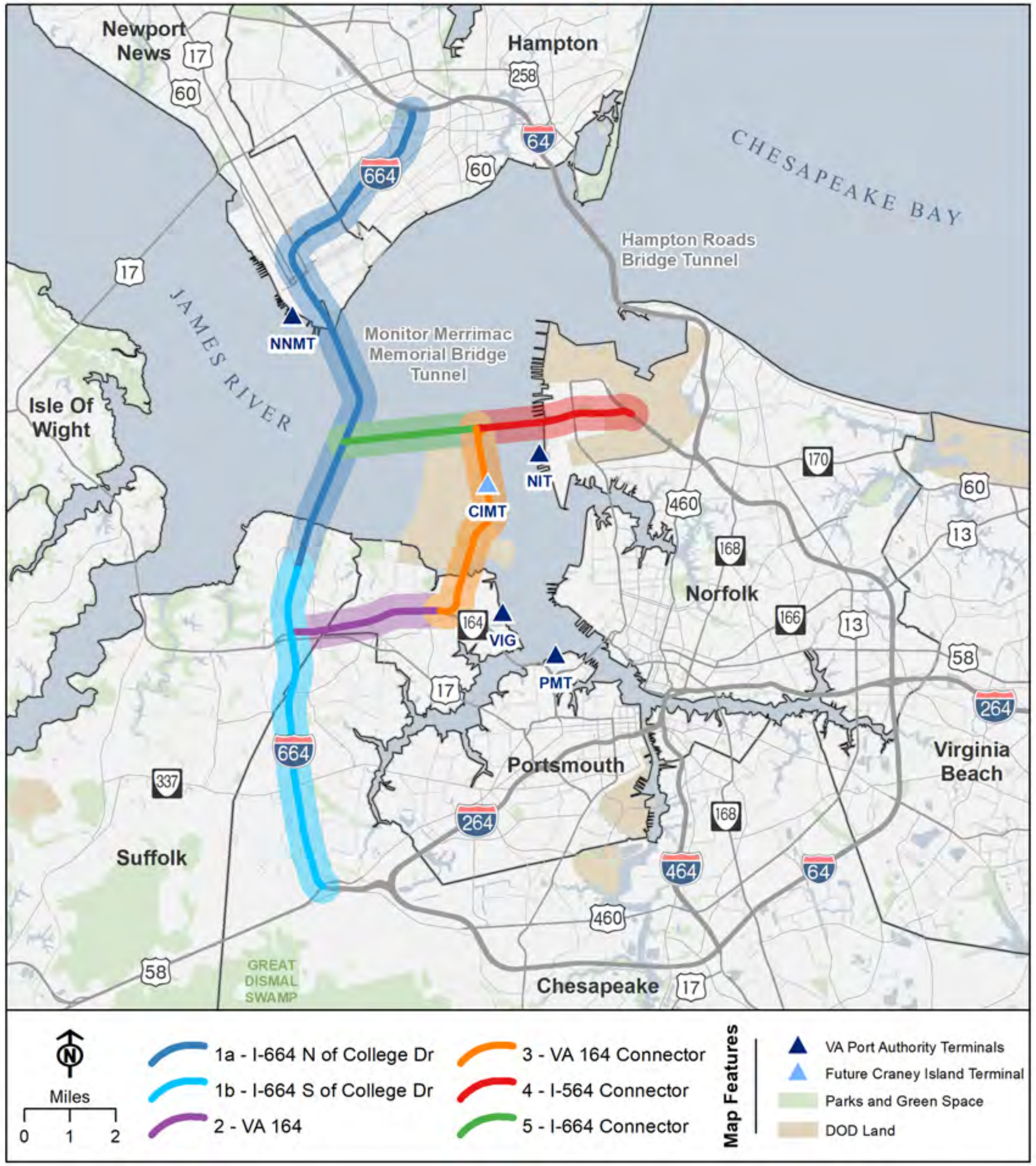
RCS Phase 3 – Draft Tiering

Agenda

- Step 2 Quantitative Analysis Recap
- Draft Segment Tiering Recommendations*
- Scenario Analysis Bundles*
- Public Engagement Update (handout)

* Action Item

Mandated Segments



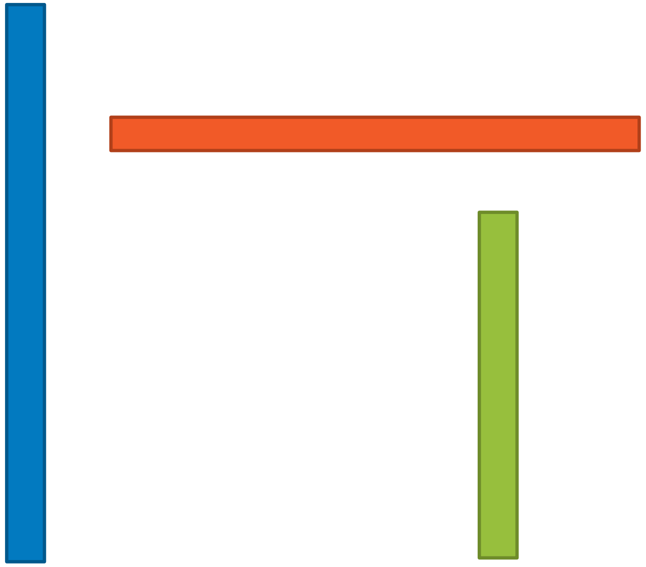
the heartbeat of HAMPTON ROADS TPO
TRANSPORTATION PLANNING ORGANIZATION

REGIONAL CONNECTORS STUDY

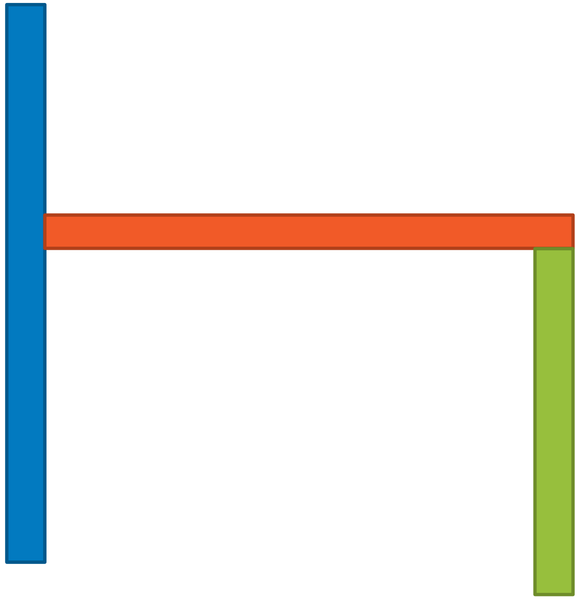
INTRODUCTORY SLIDES

Michael Baker INTERNATIONAL

Segments vs Bundles



SEGMENTS



BUNDLE

Tiering

SEGMENT TIERING

Tier I	Segments ready for advancement and recommended for consideration in the fiscally constrained portion of the 2050 HRTPO Long Range Transportation Plan.
Tier II	Segments which require further refinement and maturation, and will be recommended for consideration in the 2050 Vision Plan, as developed by the HRTPO.
Tier III	Segments that due to technical challenges and uncertainties, will be further developed at an appropriate time in the future.

REGIONAL CONNECTORS STUDY

QUANTITATIVE ANALYSIS RECAP

Quantitative Analysis

- Congestion Benefits – delay reduction
  (introduced in August meeting)

- Economic Benefits – societal benefit, regional economic impact
  (introduced in August meeting)

- Segment Cost Estimates

Cost Estimates of Mandated Segments

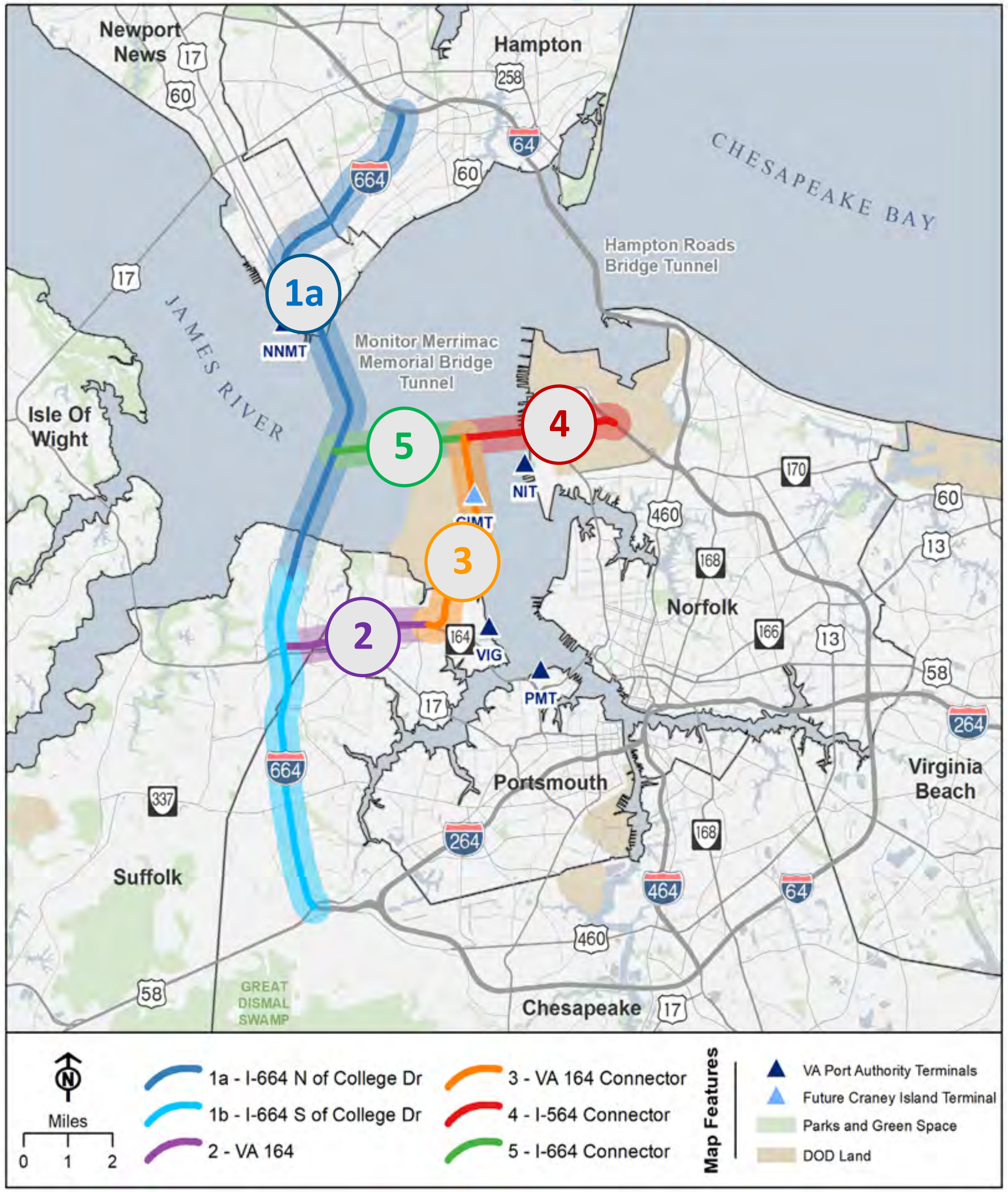
Segment	Costs ($ M) 2022$	Key factors related to cost
1a. I-664 Widening (North of College Drive)	$3,918	New tunnel and islands, sheer length of new roadway over water, significant number of new/widened bridges
2. VA 164 Widening	$174	Improvements to existing alignment, entirely over land which helps control cost; includes coordination with railroad, crash walls for railroad, and is partially widened to the outside
3. VA 164 Connector	$800	Significant structures over Craney Island, Navy security requirements, landfill and Corp of Engineers coordination requirements. Includes interchange with I-564 Connector & VA 164
4. I-564 Connector	$3,242	New tunnel and island, Navy security requirements
5. I-664 Connector	$1,534	Entire segment on structure over water

- Planning level estimates using VDOT Cost Estimating System (PCES), supplemented with project-specific elements such as security needs and relying on recent examples of key project elements such as tunnels. These preliminary cost estimates are as of Sept 2022 and may change as RCS project development continues

Quantitative Evaluation

- Segment bundle **congestion benefits** and **economic benefits** data together with **costs** → *cost effectiveness*
- Findings:
  - Segment 1a has high cost and high benefits → cost-effective
  - Segment 2 also cost-effective due to low-cost relative to benefits
  - Segments 3, 4 and 5 have high cost and lower incremental benefits → lower cost-effectiveness

Mandated Segments



Tiering Recommendations - Approach

Qualitative Evaluation + Quantitative Evaluation

Readiness

Permitting Issues

Congestion Benefits

Economic Benefits

Segment Costs

Summary of Segment Evaluations

Segment	1a - I-664 Widening	2 – VA 164 Widening	3 – VA 164 Connector	4 - I-564 Connector	5 – I-664 Connector
Quantitative findings – benefits relative to cost	**High**	**High**	**Low**	**Low**	**Low**

Summary of Segment Evaluations

Segment	1a - I-664 Widening	2 – VA 164 Widening	3 – VA 164 Connector	4 - I-564 Connector	5 – I-664 Connector
Quantitative findings – benefits relative to cost	**High**	**High**	**Low**	**Low**	**Low**
Qualitative findings – Relative Segment Readiness	**High**	**Medium**	**Low**	**Low**	**Low**
Qualitative findings – Relative Segment Ease of Permitting	**Medium**	**High**	**Low**	**Low**	**Low**

Tiering Definitions

SEGMENT TIERING

Tier I	Segments ready for advancement and recommended for consideration in the fiscally constrained portion of the 2050 HRTPO Long Range Transportation Plan.
Tier II	Segments which require further refinement and maturation, and will be recommended for consideration in the 2050 Vision Plan, as developed by the HRTPO.
Tier III	Segments that due to technical challenges and uncertainties, will be further developed at an appropriate time in the future.

HRTPO LRTP Planning Process

Basis for Tiering

- There are stronger qualitative benefits and cost-effectiveness for Segments 1a (I-664 north widening) and 2 (VA 164 widening)
  - The **high benefits** of Segment 1a overcome the segment's high cost
  - The relative benefits of Segment 2 are cost-effective because of the **low cost**
- The technical analysis does not provide a substantial distinction *between* Segments 1a and 2 that would differentiate them for tiering

Consultant Team Recommends Segment 1a (I-664 north of College Dr) and Segment 2 (VA 164) for **Tier I**

Basis for Tiering

- Segments 3, 4 and 5 have similar qualitative evaluations
  - No "readiness" benefits, and technical & timing obstacles
- After Segment 1a benefits, the incremental benefits of Segments 3, 4, and 5 are *much lower* relative to costs.
- No substantial distinction between Segments 3, 4 and 5 evaluations that would differentiate them for tiering

Consultant Team Recommends Segment 3 (VA 164 Connector), Segment 4 (I-564 Connector) and Segment 5 (I-664 Connector) for **Tier III**

Draft Tiering

SEGMENT TIERING

Tier I — Segments ready for advancement and recommended for consideration in the fiscally constrained portion of the 2050 HRTPO Long Range Transportation Plan.

Tier II — Segments which require further refinement and maturation, and will be recommended for consideration in the 2050 Vision Plan, as developed by the HRTPO.

Tier III — Segments that due to technical challenges and uncertainties, will be further developed at an appropriate time in the future.

1a (I-664 widening)

2 (164 widening)

HRTPO LRTP Planning Process

3 (164 connector)

4 (I-564 connector)

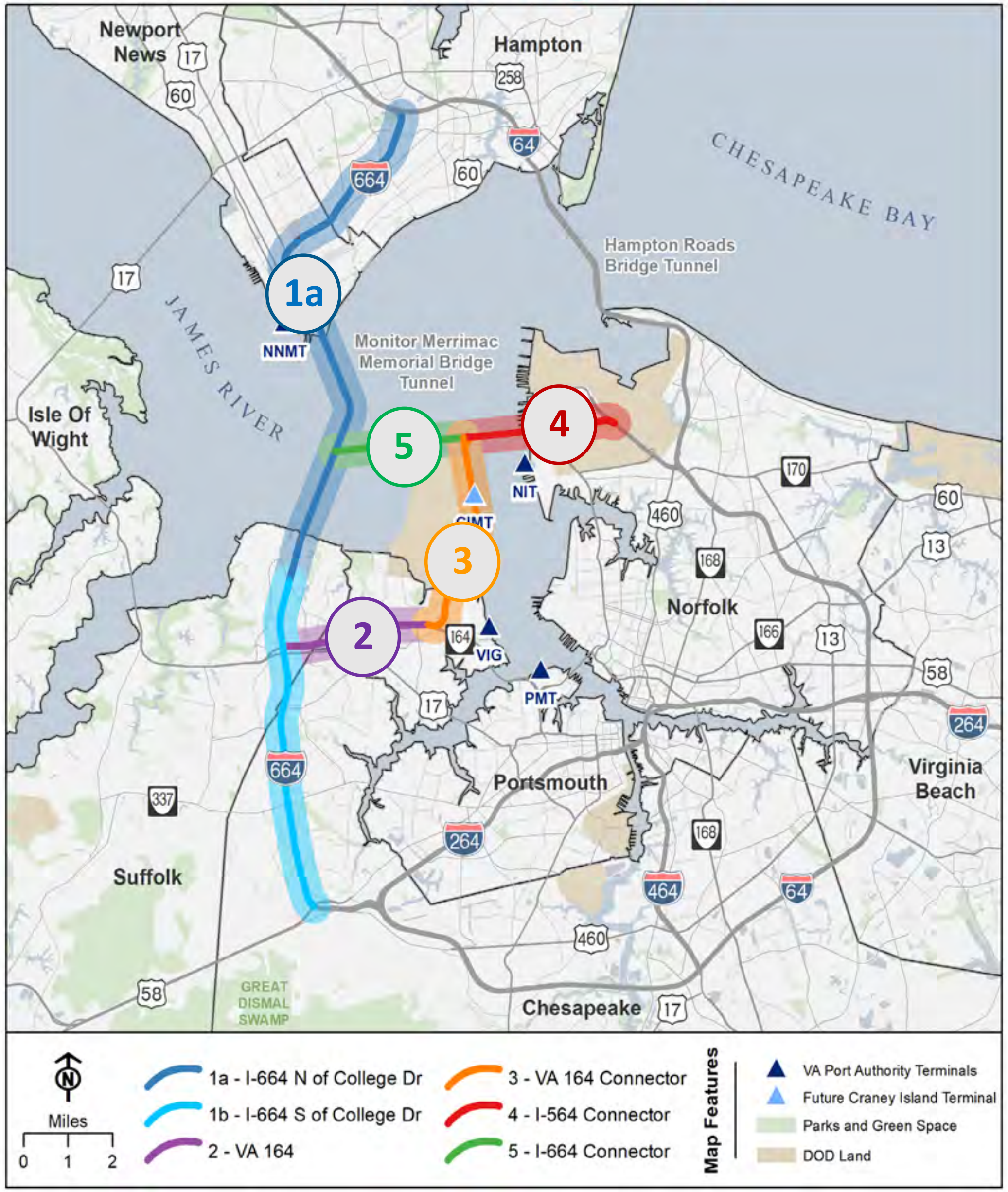
5 (I-664 connector)

Recommended Action Item #5

Approve draft tiering of mandated segments for public input:

- Tier I: Segments 1a & 2
- Tier III: Segments 3, 4 & 5

Mandated Segments

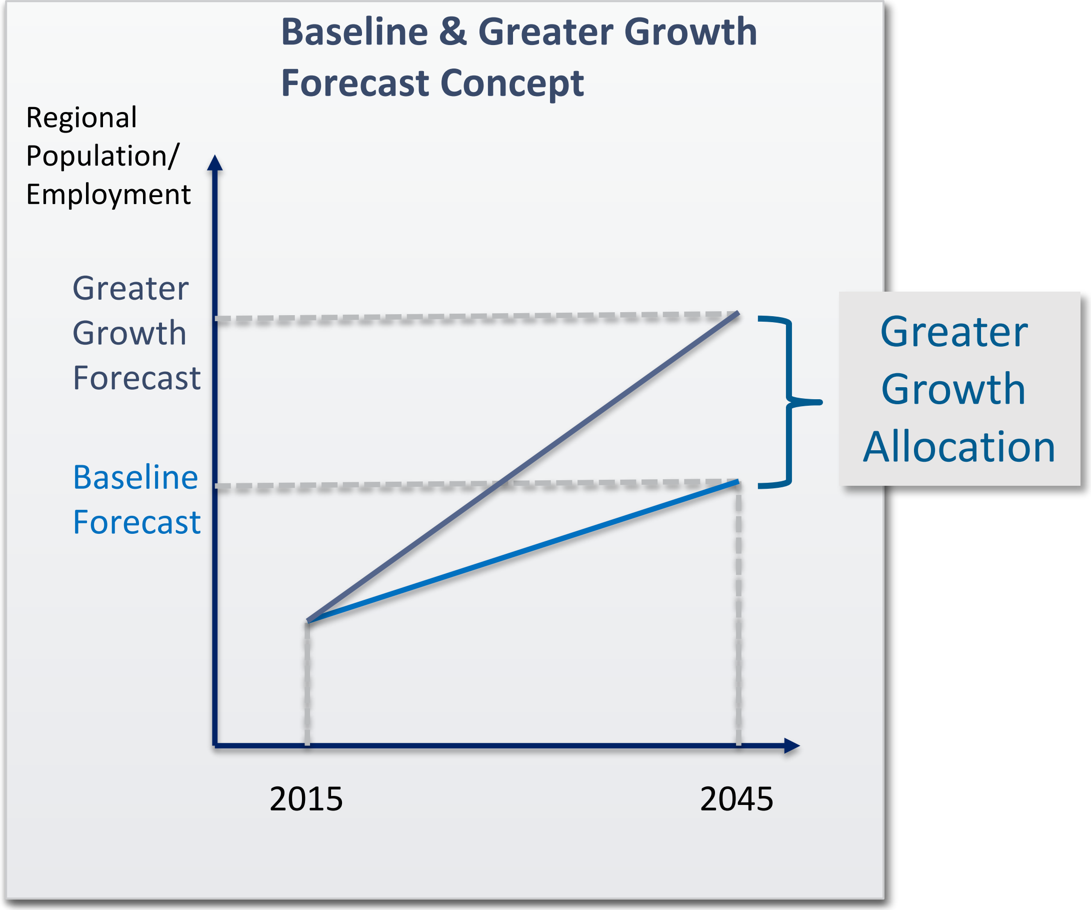


REGIONAL CONNECTORS STUDY

SCENARIO ANALYSIS BUNDLES

Scenario Analysis

- Compare 2045 Baseline and 3 Greater Growth Scenarios
  - Greater Growth Scenarios reflect 2x the employment growth from 2015-2045 and associated increase in population growth
  - "Stress test" of the transportation network and harbor crossings in particular
  - Scope of work allows testing of baseline and up to 3 bundles of segments in Tiers I and II



Greater Growth Scenarios

Greater Growth on the Water	What happens if jobs focus on the waterfront, housing choices are varied, and transportation technology adoption is moderate?
Greater Growth in Urban Centers	What happens if jobs and housing focus in urban areas, with greater multimodal availability and high adoption of connected vehicle technology?
Greater Suburban/ Greenfield Growth	What happens if jobs and housing are developed in dispersed activity centers, with a higher level of truck transportation and high adoption of autonomous vehicle technology?

Approved by Steering (Policy) Committee 7/09/2019

Consultant Team Recommendation – Scenario Bundles

Recommended Action Item # 6

- Approve the recommended bundles of segments for scenario analysis

Next Steps

Step 1	Step 2	Step 3	Step 4
Qualitative Assessment of Construction, Permitting, & Readiness	Congestion Relief Evaluation Revised Design & Cost Estimation	Scenario Analysis Traffic Operations Analysis	Final Documentation of Design, Evaluation & Recommendations
SEGMENT BUNDLING FOR STEP 2	FINAL DRAFT SEGMENT TIERING	FULL RECOMMENDATIONS TO HRTPO	FINAL REPORT
Website Update	Public Meetings	Regional Connectivity Symposium	Public Meetings

REGIONAL CONNECTORS STUDY

PUBLIC ENGAGEMENT UPDATE

Upcoming Public Engagement

Purpose

- Provide an overall update on the study and findings to-date
- Present the draft tiering of segments
- Engage residents in discussion of future segment projects' benefits and burdens

Upcoming Public Engagement

Purpose

- Provide an overall update on the study and findings to-date
- Present the draft tiering of segments
- Engage residents in discussion of future segment projects' benefits and burdens

Activities

- In-Person Public Meetings
- On-Line Engagement
- Pop-Up Meetings
- Social Media engagement and advertising
- October Community Advisory Committee (CAC)

Public Meeting Schedule

Date	Venue	City
Early February - TBD	Churchland Branch Library	Portsmouth
Early February - TBD	VDOT Hampton Roads Office	Suffolk
Early February - TBD	Pearl Bailey Library	Newport News
Early February - TBD	Lambert's Point Community Center	Norfolk

- Meetings scheduled 5:30-7:30 PM
- Presentations given at 6:00 and 7:00 PM
- All locations are accessible by transit; VDOT location also accessible to VA 164 corridor residents

Anticipated Pop-Up Meetings

Provide information on the project and the winter public meetings:

- Virginia Beach Central Library (during after school programs)
- Hampton event TBD
- Chesapeake location or event TBD

Joint Steering (Policy) Committee and Working Group Meeting, February 13, 2023

REGIONAL CONNECTORS STUDY

JOINT STEERING (POLICY) COMMITTEE AND WORKING GROUP
FEBRUARY 13, 2023

Phase 3 Process Graphic

We are here

Step 1	Step 2	Step 3	Step 4
Qualitative Assessment of Construction, Permitting, & Readiness	Congestion Relief Evaluation Revised Design & Cost Estimation	Scenario Analysis Traffic Operations Analysis	Final Documentation of Design, Evaluation & Recommendations
SEGMENT BUNDLING FOR STEP 2	FINAL DRAFT SEGMENT TIERING	FULL RECOMMENDATIONS TO HRTPO	FINAL REPORT
Website Update	Public Meetings	Regional Connectivity Symposium	Public Meetings

RCS Phase 3 Update

Agenda

- Progress Update
- Scenario Analysis: Regional Congestion & Economic Benefits
- Public Engagement Overview
- Wrapping Up the Study

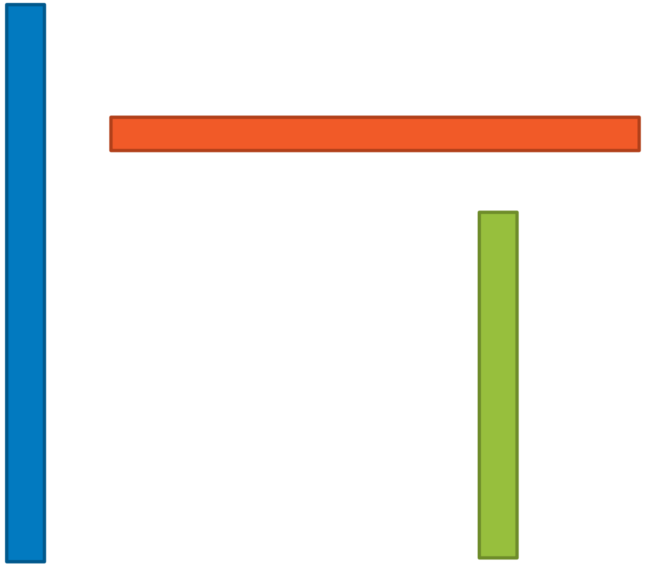
the heartbeat of HAMPTON ROADS TPO TRANSPORTATION PLANNING ORGANIZATION

REGIONAL CONNECTORS STUDY

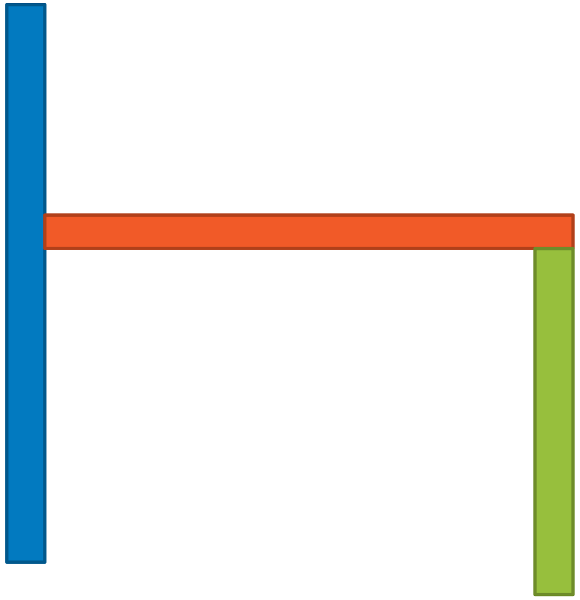
INTRODUCTORY SLIDES

Michael Baker INTERNATIONAL

Segments vs Bundles



SEGMENTS



BUNDLE

Tiering

- The RCS will propose roadway segments that are ready to move forward and appear the most cost effective as Tier I recommendations.
- Segments that require further refinement and have hurdles to advancing are Tier II recommendations.

Tier I	Segments recommended for HRTPO to evaluate for the 2050 Long Range Transportation Plan (LRTP).
Tier II	Segments recommended for HRTPO to include in the Regional Transportation Vision Plan.

HRTPO Long Range Transportation Planning Process

November 17 Actions:

- Recommended Segments 1a and 2 for Tier I
- Recommended Segments 3, 4 and 5 for Tier II
- Directed the consultant team to proceed
  - Analyze 3 bundles of Tier I and II segments in the scenario analysis
  - Analyze Tier I segments in traffic operations analysis

the heartbeat of HAMPTON ROADS TPO TRANSPORTATION PLANNING ORGANIZATION

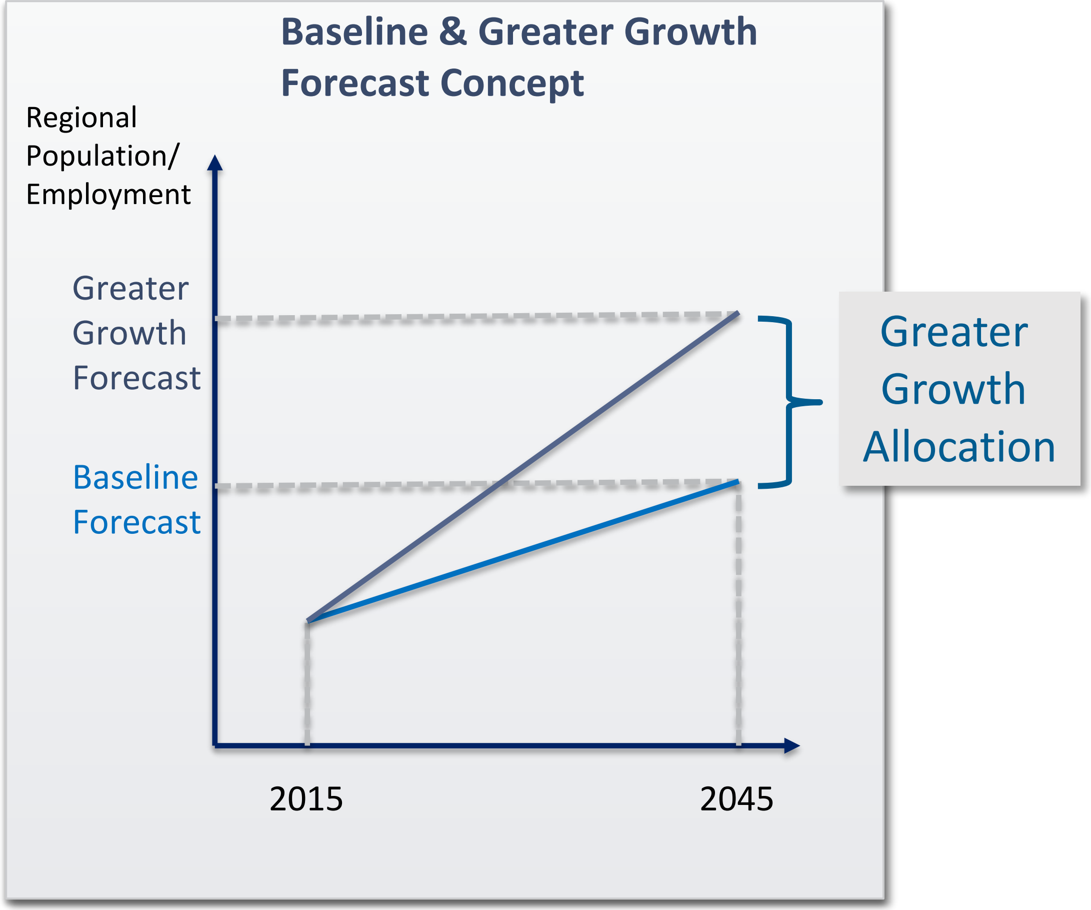
REGIONAL CONNECTORS STUDY

SCENARIO ANALYSIS

Michael Baker INTERNATIONAL

Scenario Analysis

- Compare 2045 Baseline and 3 Greater Growth Scenarios
  - Greater Growth Scenarios reflect 2x the employment growth from 2015-2045 and associated increase in population growth
  - “Stress test” of the transportation network and harbor crossings in particular
  - Scope of work allows testing of baseline and up to 3 bundles of segments in Tiers I and II



Greater Growth Scenario Narratives

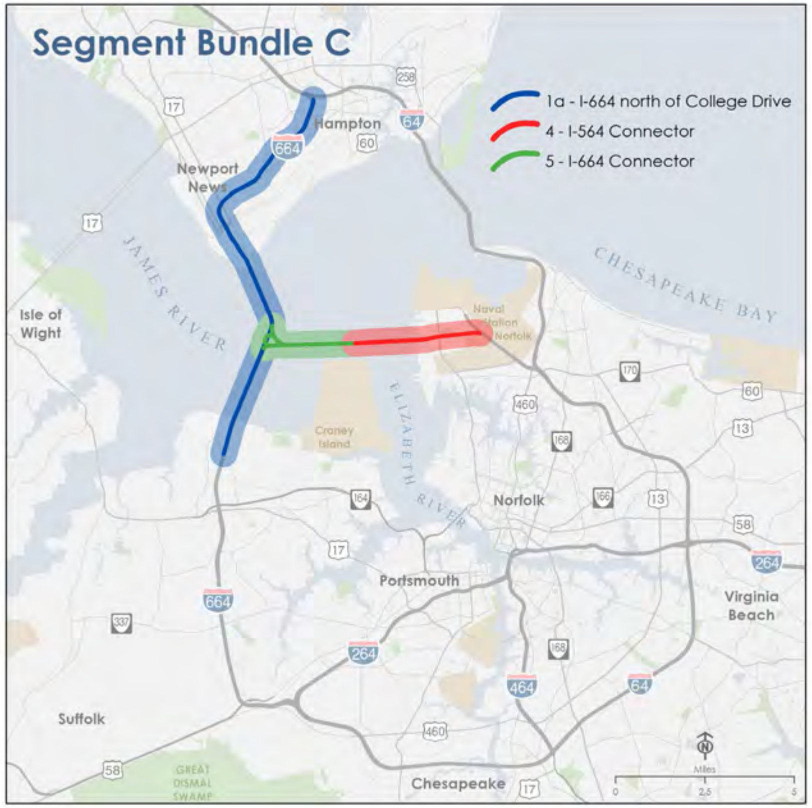
GREATER GROWTH ON THE WATER	GREATER GROWTH IN URBAN CENTERS	GREATER SUBURBAN / GREENFIELD GROWTH*
» Growth in water-oriented activity » Port of Virginia becomes even more competitive with freight more multimodal » More dispersed housing locations » Moderate assumptions for CAV adoption & network adaptation	» Significant economic diversification » Low space requirements per job » Large role for "digital port" » New professionals prefer to live/work in urban settings » High level of CV adoption & low auto ownership or high TNC mode	» Growth is suburban / exurban, but growth includes walkable mixed use centers » Port of Virginia becomes even more competitive » "Digital port" brings additional jobs » Housing is more suburban » High level of AV adoption & network adaptation

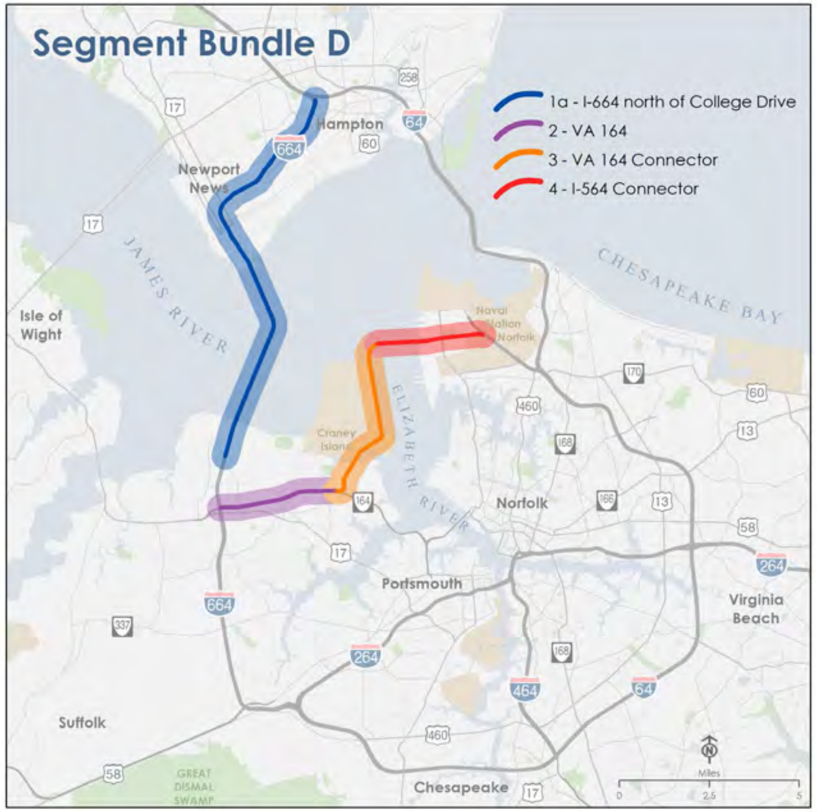
WHAT THESE WILL HELP US TEST

Water	Urban	Suburban
Test greater cross-harbor travel in particular	Test more urban & multimodal travel patterns	Test more overall regional travel

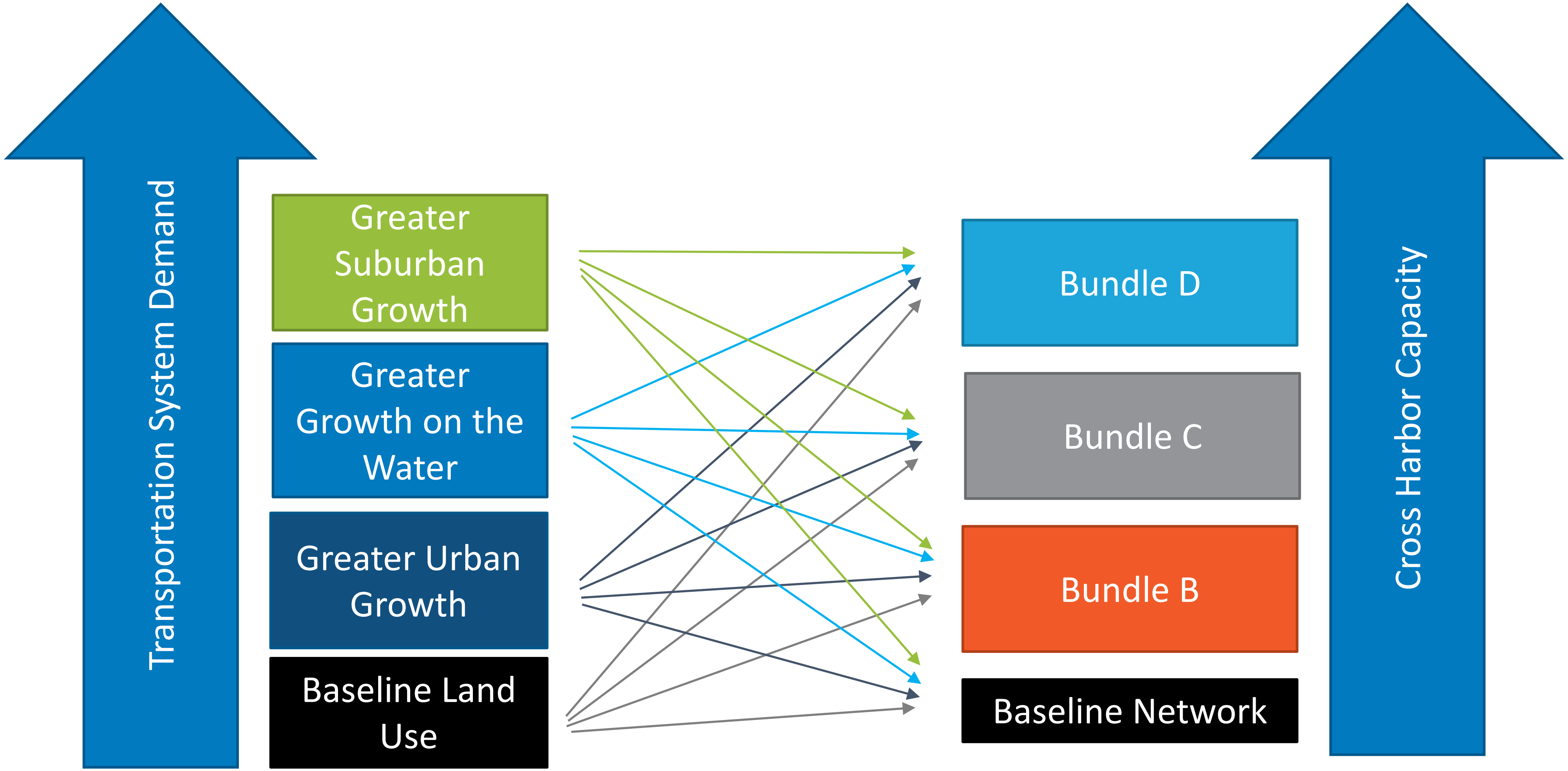
Approved by Steering (Policy) Committee 7/09/2019

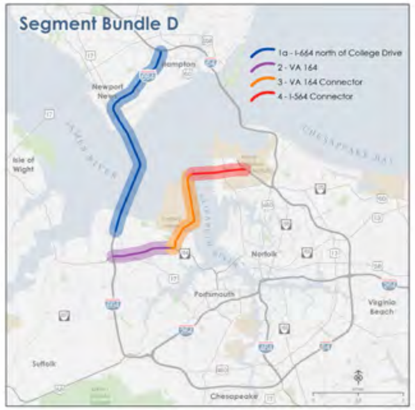
Consultant Team Selected Bundles B, C and D for analysis





Scenario Planning – "Stress Test"

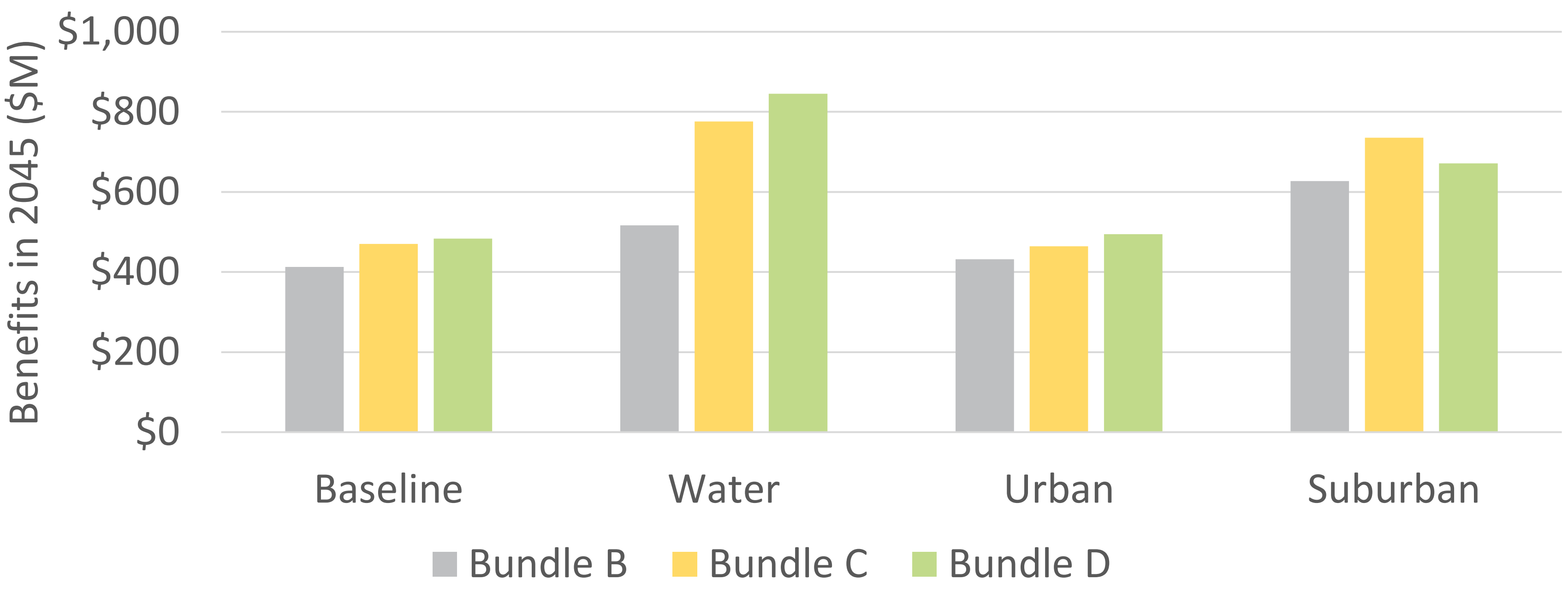


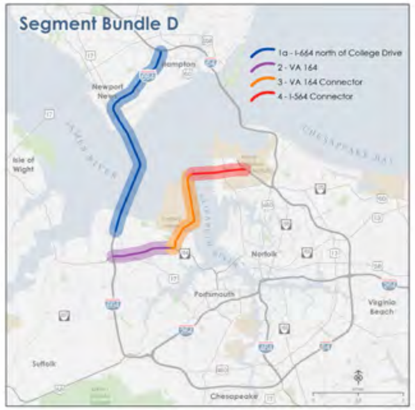


Congestion & Economic Results - Takeaways

- Comparing benefits and costs, Bundle B (Tier I segments) consistently delivers the best results
- Total travel is impacted more by the land use scenarios than the bundles
- There is more congestion overall with greater growth scenarios
- With greater congestion, scenarios show additional benefits from the segments

Societal Benefits in 2045

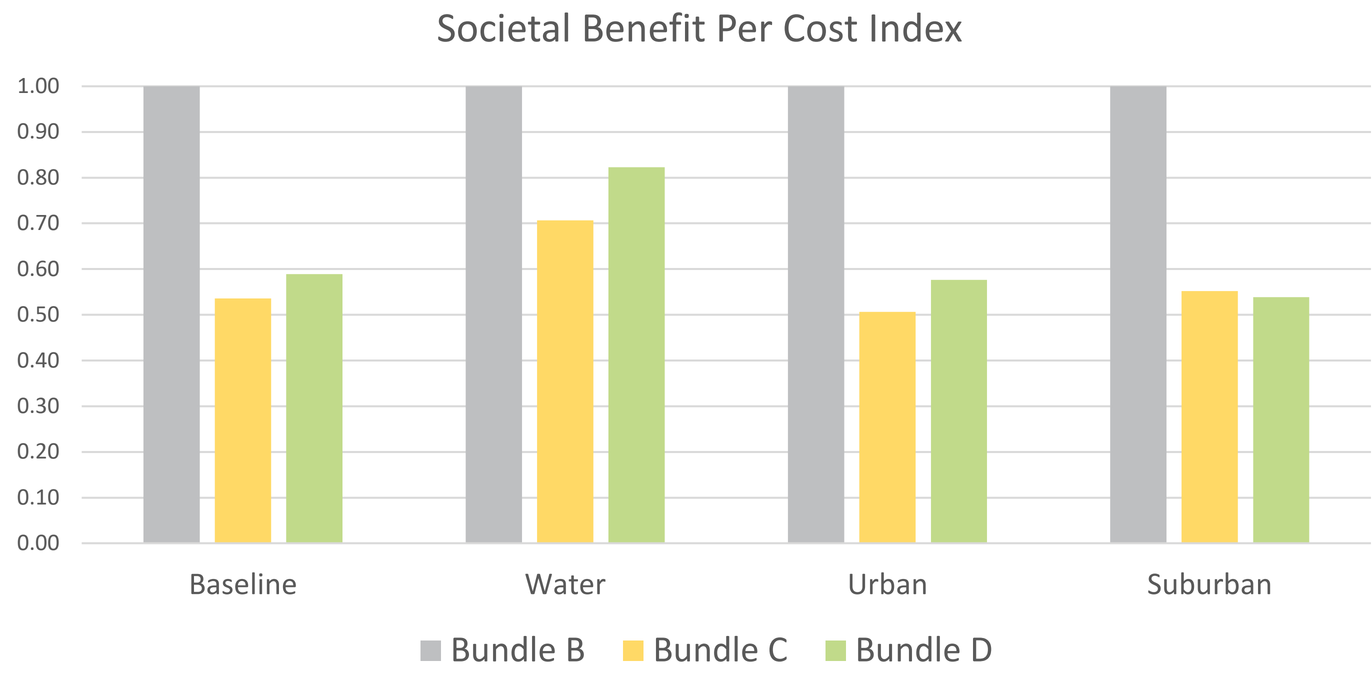




- **Bundle D** has the greatest total economic value among the bundles across all scenarios except the suburban scenario where **Bundle C** is the best performing.
- Greater growth along the water or in suburban areas tends to enhance the benefits of the segments (regardless of which bundle is selected)

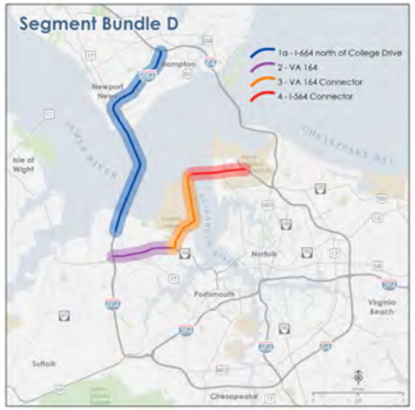
(Annual, $M, benefits of each bundle are relative to 2045 baseline)

Societal Benefits Relative to Cost



- **Bundle B** is always the most cost effective across all scenarios.
- **Bundle C** and **Bundle D** are closest to **Bundle B** in relative cost-effectiveness in the <u>Water Scenario</u>.

Note: Results are indexed so that the most cost-effective bundle is assigned a score of 1, and the other bundles are assigned fractions based on their relative cost effectiveness.



REGIONAL CONNECTORS STUDY

PUBLIC ENGAGEMENT UPDATE

Public Engagement

- Pop Ups were held Jan 19, 23, 24

Attendance: 68 total

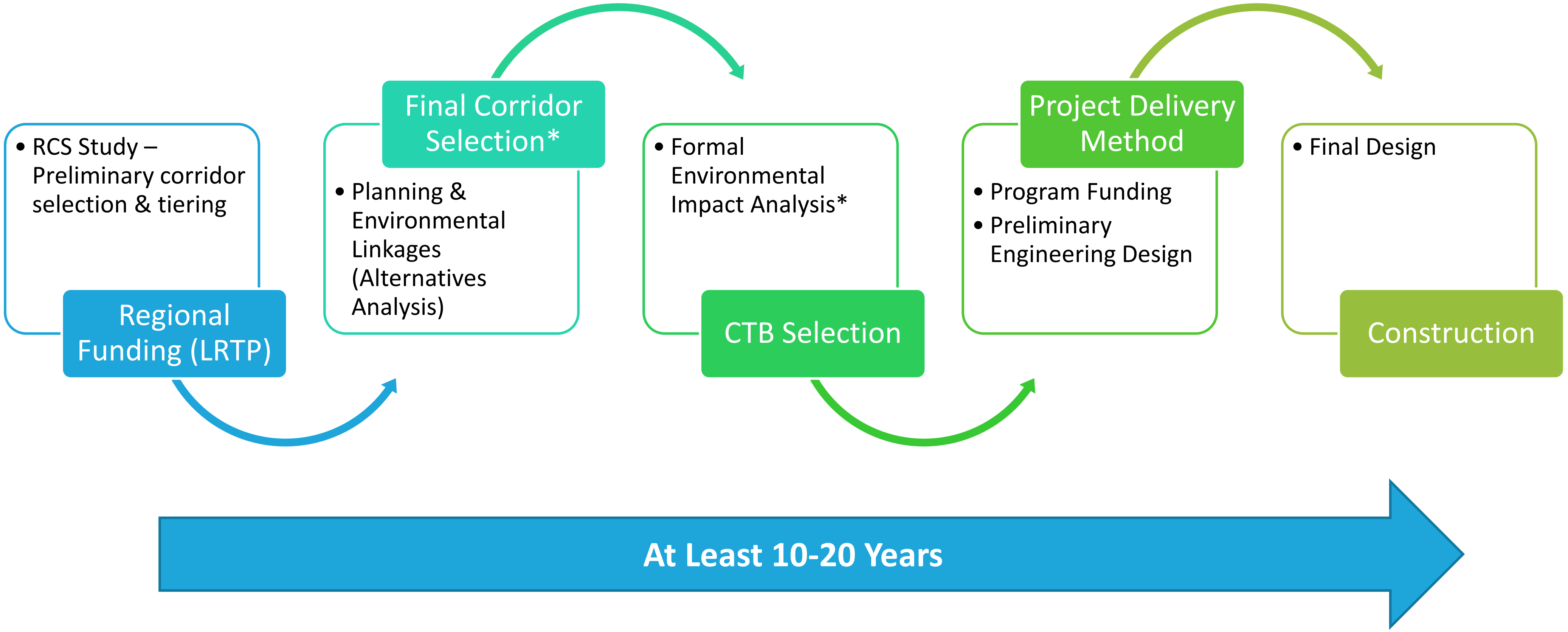
15 18 15 20

Public Engagement – Comment Themes

- Congestion
- Tolls
- Alternatives to Personal Vehicles
- Environment
- "Benefits and Burdens" Feedback
- Project Timelines

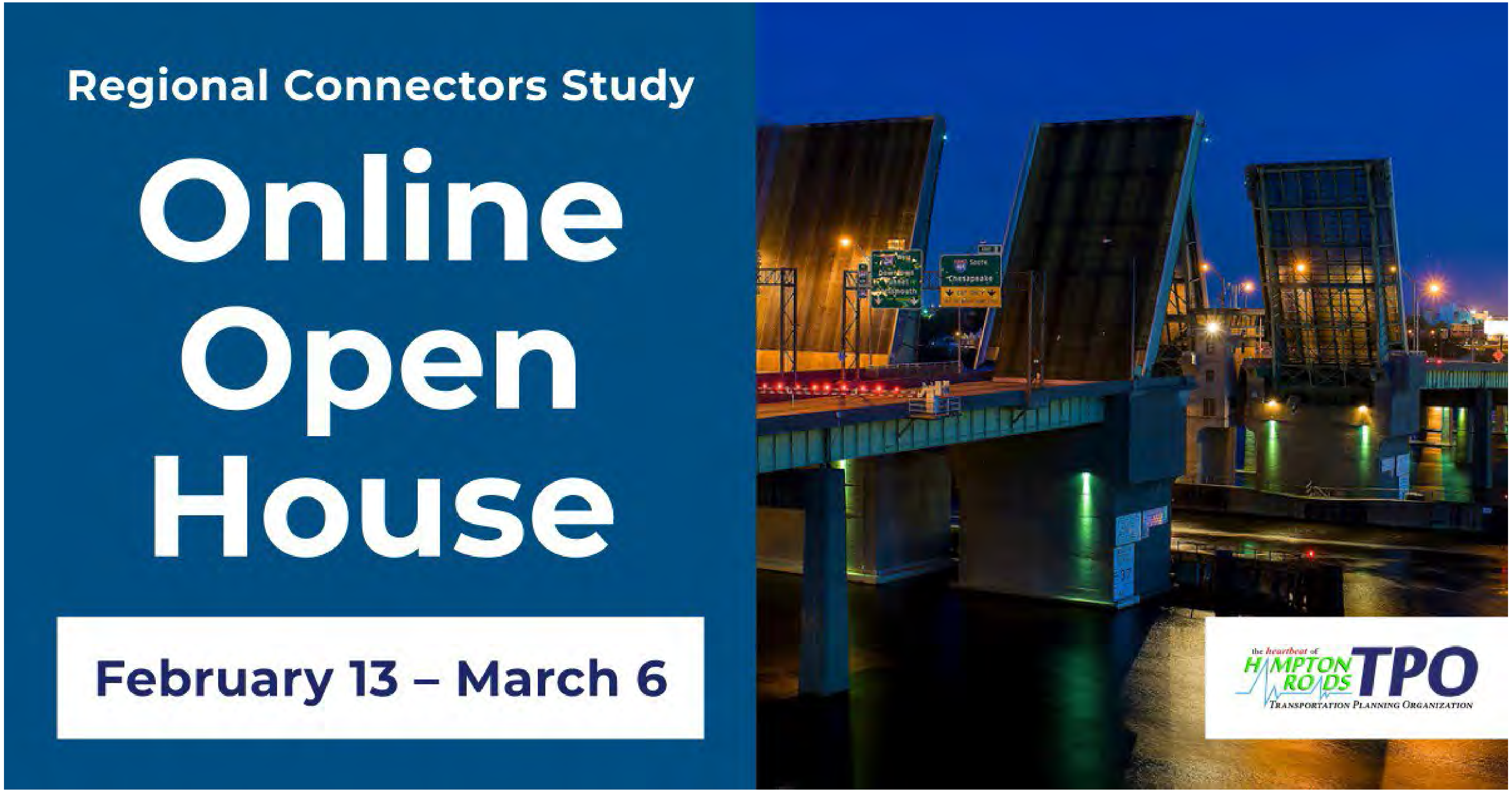
Project Development Process

- Many public questions & conversations addressed project development and timelines



* Ongoing coordination with HRTPO, HRTAC, FHWA and other regional and resource agency stakeholders

Please Share! www.connectorstudy.org/openhouse



the heartbeat of HAMPTON ROADS TPO TRANSPORTATION PLANNING ORGANIZATION

REGIONAL CONNECTORS STUDY

WRAPPING UP THE STUDY

Michael Baker INTERNATIONAL

Next Steps

Step 1	Step 2	Step 3	Step 4
Qualitative Assessment of Construction, Permitting, & Readiness	Congestion Relief Evaluation Revised Design & Cost Estimation	Scenario Analysis Traffic Operations Analysis	Final Documentation of Design, Evaluation & Recommendations
SEGMENT BUNDLING FOR STEP 2	FINAL DRAFT SEGMENT TIERING	FULL RECOMMENDATIONS TO HRTPO	FINAL REPORT
Website Update	Public Meetings	Regional Connectivity Symposium	Public Meetings

Regional Connectors Study Project Completion Schedule (Steps 3 and 4)

Task	Step	Fall 2022	Winter 2022-2023	Spring 2023	Summer 2023
Code and run 2045 RCS Baseline Network for 4 Land Use Scenarios	3				
Code and run up to 3 bundle networks for 4 Land Use Scenarios	3				
Evaluate congestion and economic performance of all of the above	3				
Operational analysis - code/refine segments for analysis	3				
Operational analysis - analyze bundle networks and land use scenarios	3				
Finalize segment cost estimates	3				
Final documentation of study findings	4				
Steering Committee/Working Group Meetings		✓	✓	✓	✓
Public Engagement:					
Plan and Hold Regional Connectivity Symposium	3				
HRTPO Community Advisory Comm. Meeting	3,4	✓	✓	✓	
Plan, restart, continue social media	3,4				
Draft promotion materials, promotion plan for public meetings	3,4				
Plan/attend pop-up events	3,4		Jan. 19, 23, 24		TBD
Plan/Prepare/Publicize public meetings	3,4				
Hold public meetings	3,4		Feb. 1, 2, 7, 9		TBD

Completed Activities

Activities Underway

Future Activities

REGIONAL CONNECTORS STUDY

Joint Steering (Policy) Committee and Working Group Meeting, June 16, 2023

HAMPTON ROADS TPO

REGIONAL CONNECTORS STUDY

JOINT STEERING (POLICY) COMMITTEE AND WORKING GROUP
JUNE 16, 2023

Michael Baker INTERNATIONAL

Phase 3 Process Graphic

We are here

Step 1	Step 2	Step 3	Step 4
Qualitative Assessment of Construction, Permitting, & Readiness	Congestion Relief Evaluation Revised Design & Cost Estimation	Scenario Analysis Traffic Operations Analysis	Final Documentation of Design, Evaluation & Recommendations
SEGMENT BUNDLING FOR STEP 2	FINAL DRAFT SEGMENT TIERING	FULL RECOMMENDATIONS TO HRTPO	FINAL REPORT
Website Update	Public Meetings	Regional Connectivity Symposium	Public Meetings

RCS Phase 3 Update

Agenda

- Study Recap
- Congestion Evaluation & Economic Benefits of Tier I and Tier II Segments
- Traffic Operations Analysis – Tier I Segments
- Public Engagement Update
- Wrapping Up the Study

HAMPTON ROADS TPO

REGIONAL CONNECTORS STUDY

STUDY RECAP

Michael Baker INTERNATIONAL

Regional Connectors Study – 2018 to today

PHASE 1

Engaging the public
Analyzing existing conditions
Refining Travel Demand Model

2018

2019

Regional Connectors Study – 2018 to today

PHASE 1
- Engaging the public
- Analyzing existing conditions
- Refining Travel Demand Model

PHASE 2
- Testing scenarios
- Updating segments
- Considering alternatives
- Engaging the public

2018

2019

2020

2021

Regional Connectors Study – 2018 to today

PHASE 1
- Engaging the public
- Analyzing existing conditions
- Refining Travel Demand Model

PHASE 2
- Testing scenarios
- Updating segments
- Considering alternatives
- Engaging the public

PHASE 3
- Tiering recommendations
- Evaluating operations
- Refining segments
- Engaging the public

2018

2019

2020

2021

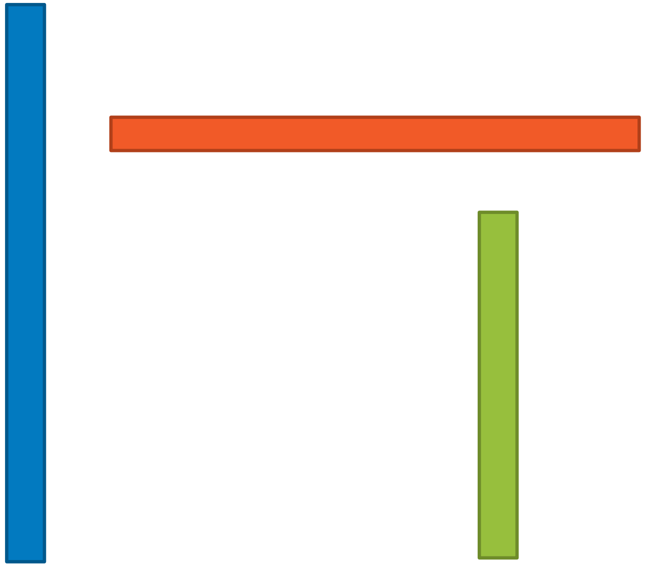
2022

2023

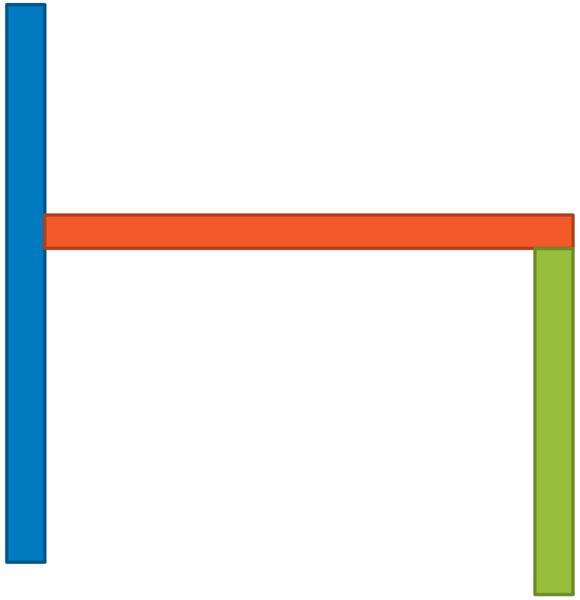
Regional Connectors Study End Products

Tiering Recommendations	Study Documentation
Hand-off to HRTPO: ▪ Tier I → Evaluate for 2050 Fiscally Constrained Long Range Transportation Plan ▪ Tier II → Include in 2050 Vision Plan	▪ Record of the entire process (committee meetings, webinars, public engagement summaries) ▪ Technical documentation of each phase ▪ Refined segment concept drawings

Segments vs Bundles



SEGMENTS



BUNDLE

Tiering

- The RCS will propose roadway segments that are ready to move forward and appear the most cost effective as Tier I recommendations.
- Segments that require further refinement and have hurdles to advancing are Tier II recommendations.

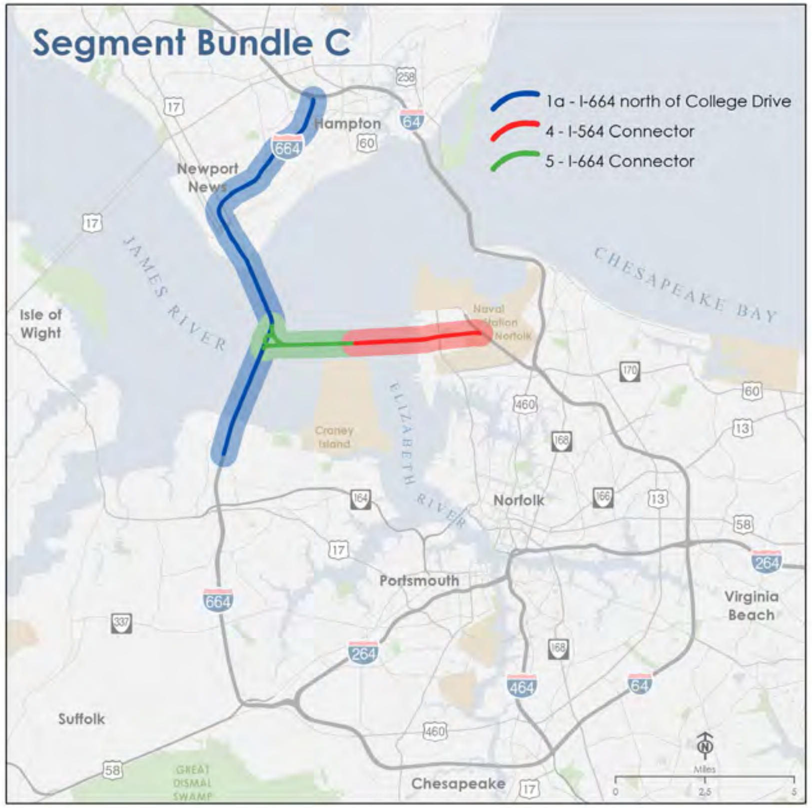
Tier I	**Segments recommended for HRTPO to evaluate for the 2050 Long Range Transportation Plan (LRTP).**
Tier II	**Segments recommended for HRTPO to include in the Regional Transportation Vision Plan.**

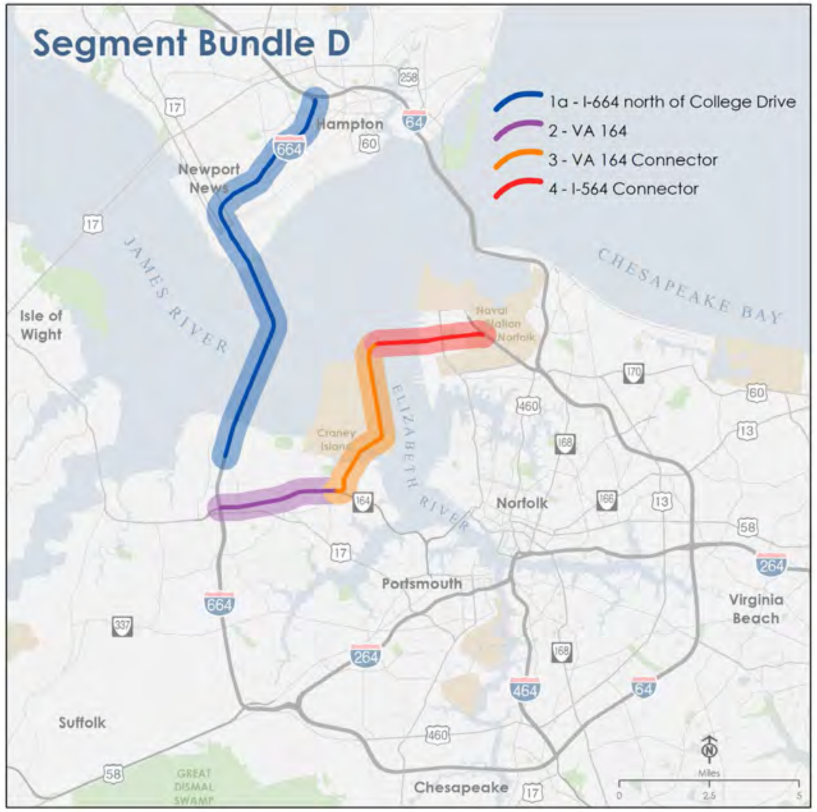
HRTPO Long Range Transportation Planning Process

November 17, 2022 Actions Shaping Step 3 Analysis:

- Recommended Segments 1a and 2 for Tier I
- Recommended Segments 3, 4 and 5 for Tier II
- Directed the consultant team to proceed
  - Analyze 3 bundles of Tier I and II segments in the scenario analysis
  - Analyze Tier I segments in traffic operations analysis

Consultant Team Selected Bundles B, C and D for analysis





Scope of work allows testing of baseline and up to 3 bundles of segments in Tiers I and II

HAMPTON ROADS TPO

REGIONAL CONNECTORS STUDY

RESULTS OF CONGESTION & ECONOMIC ANALYSIS

Michael Baker INTERNATIONAL

Greater Growth Scenarios

- Greater Growth Scenarios reflect 2x the employment growth from 2015-2045 and associated increase in population growth

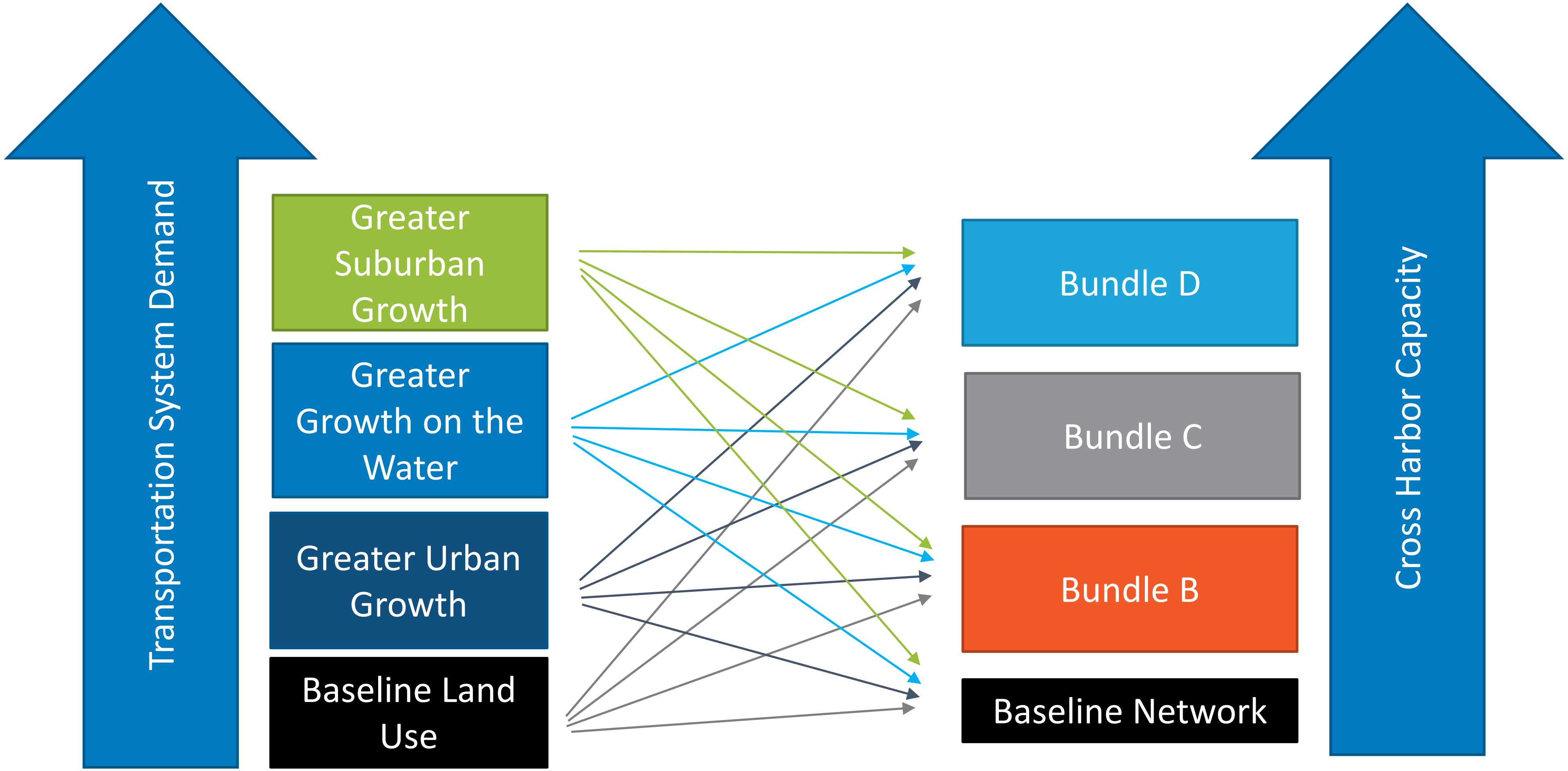
Approved by Steering (Policy) Committee 7/09/2019

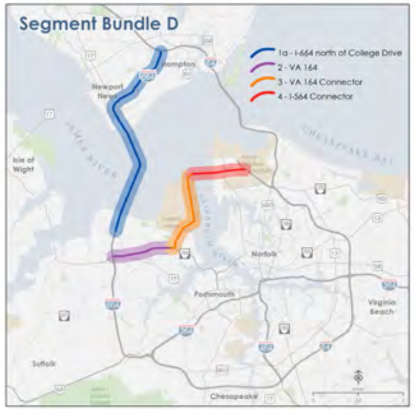
GREATER GROWTH ON THE WATER	GREATER GROWTH IN URBAN CENTERS	GREATER SUBURBAN / GREENFIELD GROWTH*
» Growth in water-oriented activity » Port of Virginia becomes even more competitive with freight more multimodal » More dispersed housing locations » Moderate assumptions for CAV adoption & network adaptation	» Significant economic diversification » Low space requirements per job » Large role for "digital port" » New professionals prefer to live/work in urban settings » High level of CV adoption & low auto ownership or high TNC mode	» Growth is suburban / exurban, but growth includes walkable mixed use centers » Port of Virginia becomes even more competitive » "Digital port" brings additional jobs » Housing is more suburban » High level of AV adoption & network adaptation

WHAT THESE WILL HELP US TEST

Water	Urban	Suburban
Test greater cross-harbor travel in particular	Test more urban & multimodal travel patterns	Test more overall regional travel

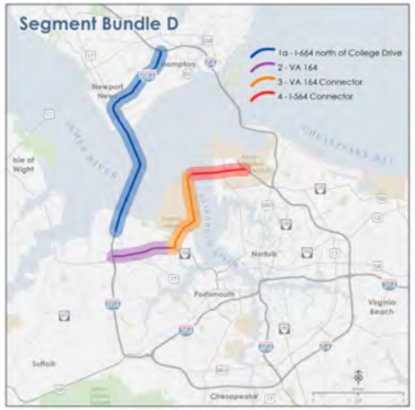
Scenario Planning – "Stress Test"

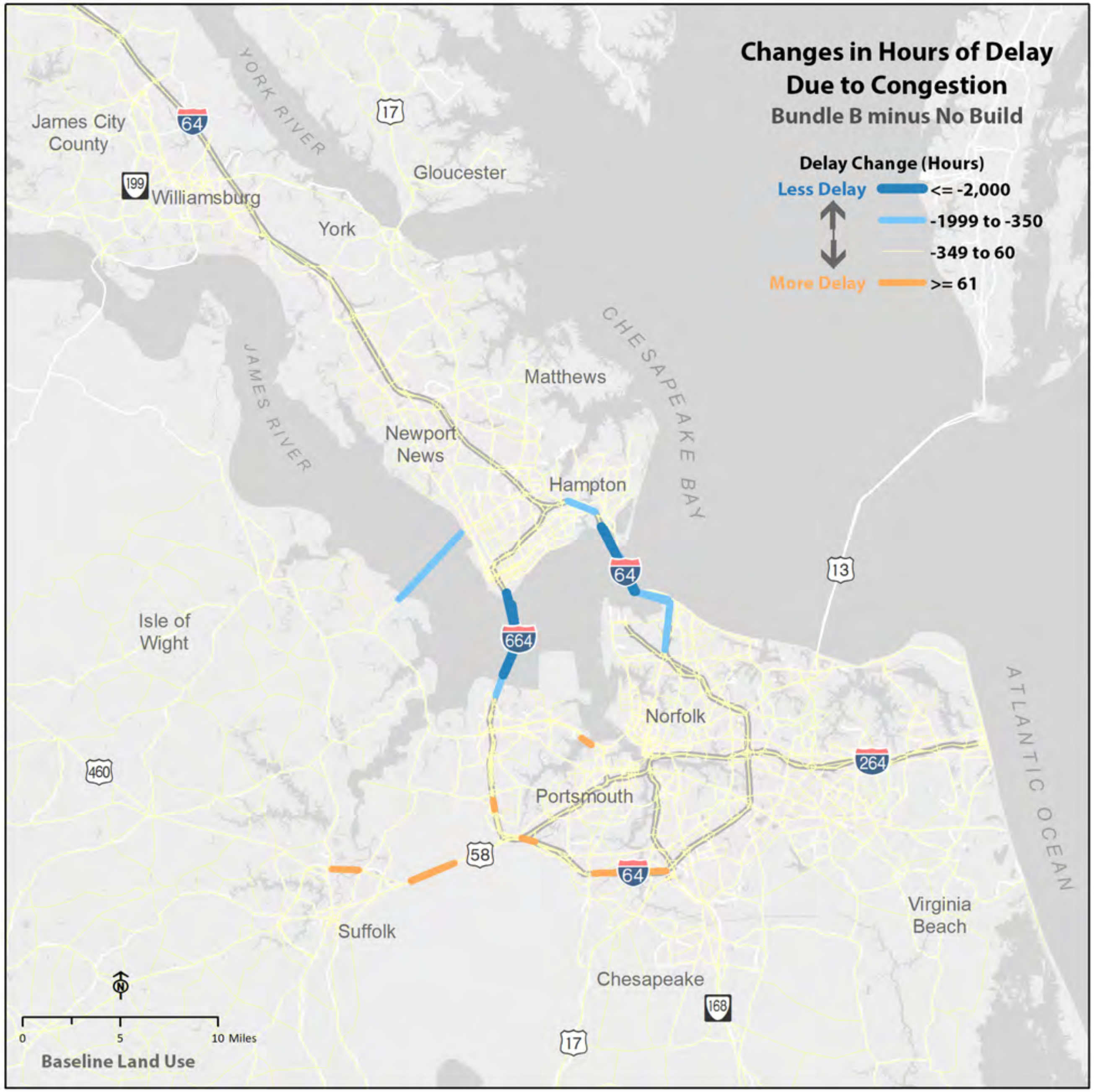




Regional Congestion Results

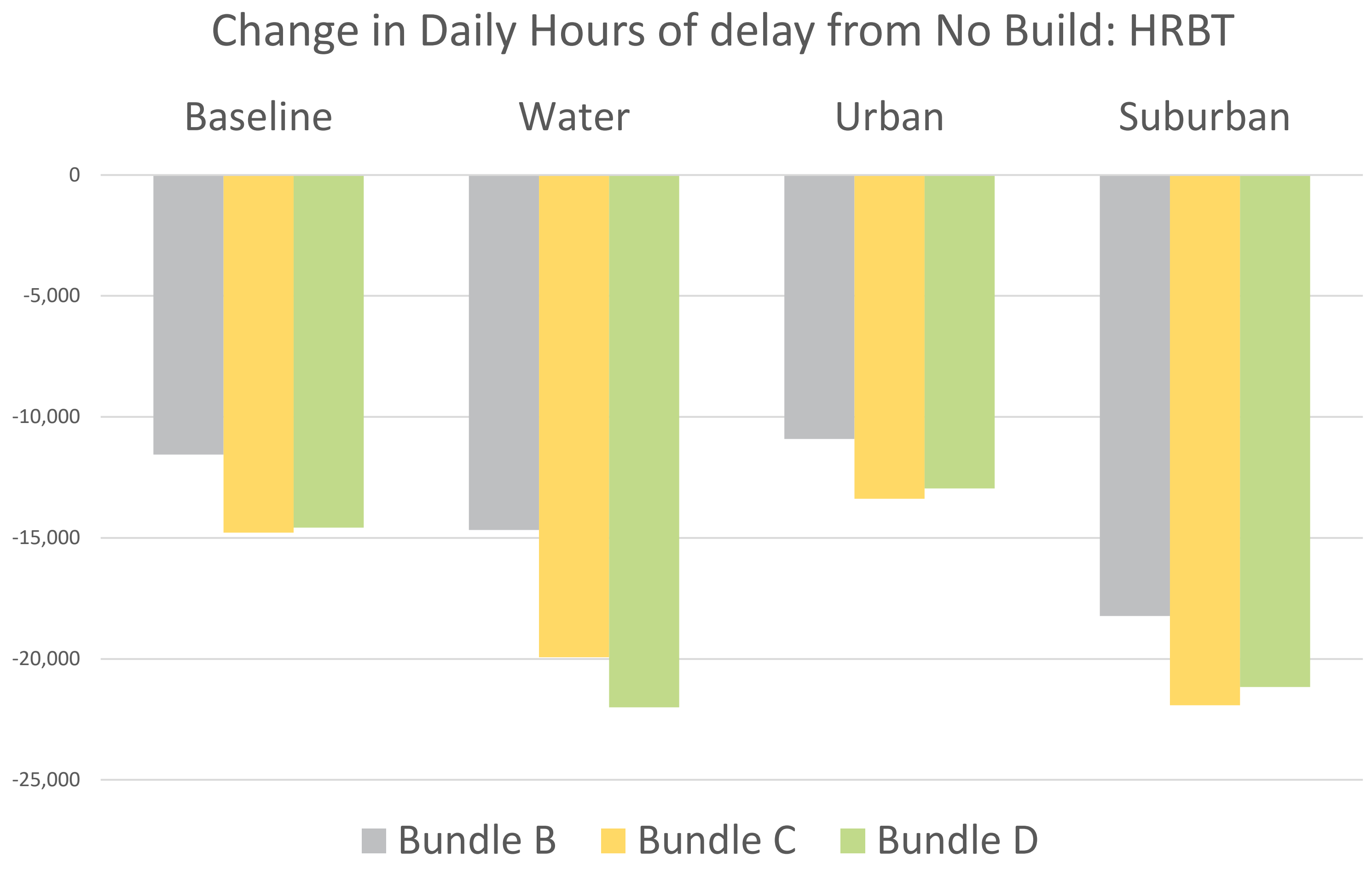
- The Greater Growth scenarios increase regional congestion. There is a minor increase in Greater Urban Growth and more substantial increases with Greater Growth on the Water and Greater Suburban Growth.
- **Bundle B** produces the most incremental reduction in regional delay for all scenarios (relative to the No Build network)
- **Bundle D** provides the greatest total reduction in delay across all scenarios, except in the suburban scenario where **Bundle C** performs slightly better
- **Bundle C** and **Bundle D** provide the most additional benefit (reduction in delay in addition to Bundle B) under Greater Growth on the Water

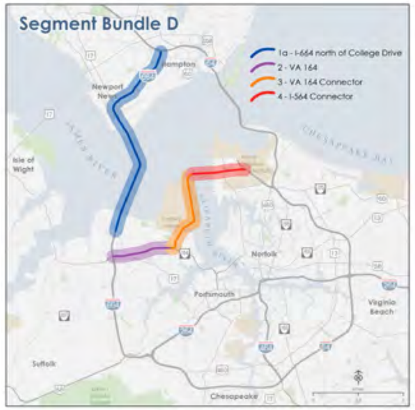




Congestion Results for Bundle B

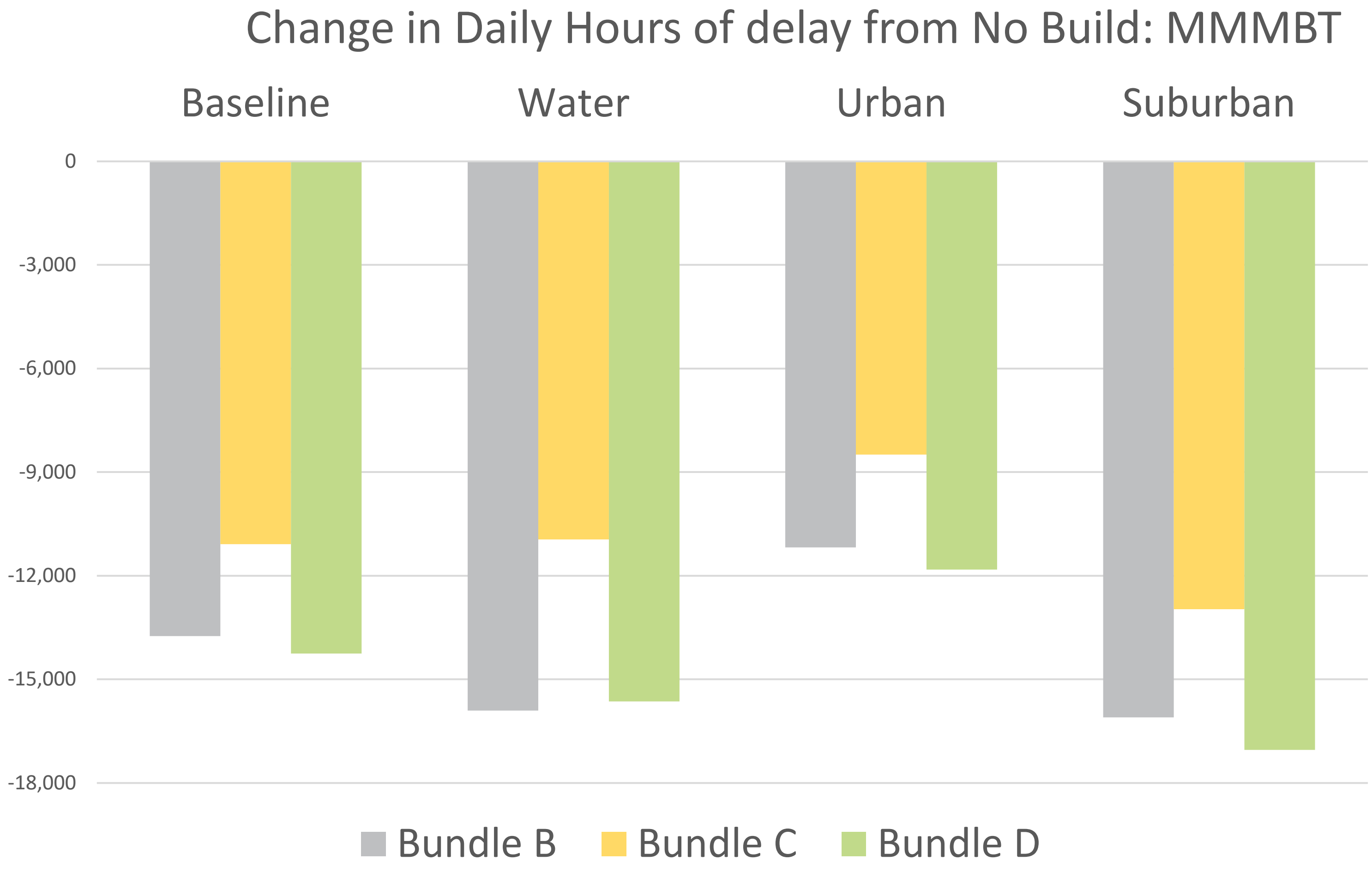
Regional Crossings: 2045 Congestion on HRBT

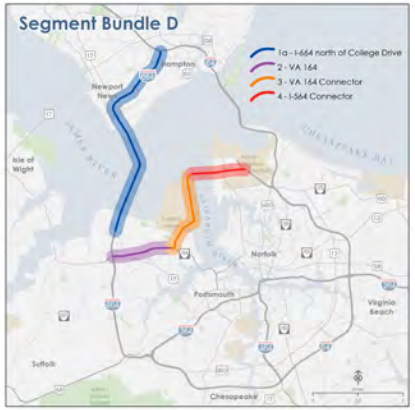




- HRBT sees more delay with greater growth scenarios, generally following pattern of regional bundle results.

Regional Crossings: 2045 Congestion on MMMBT



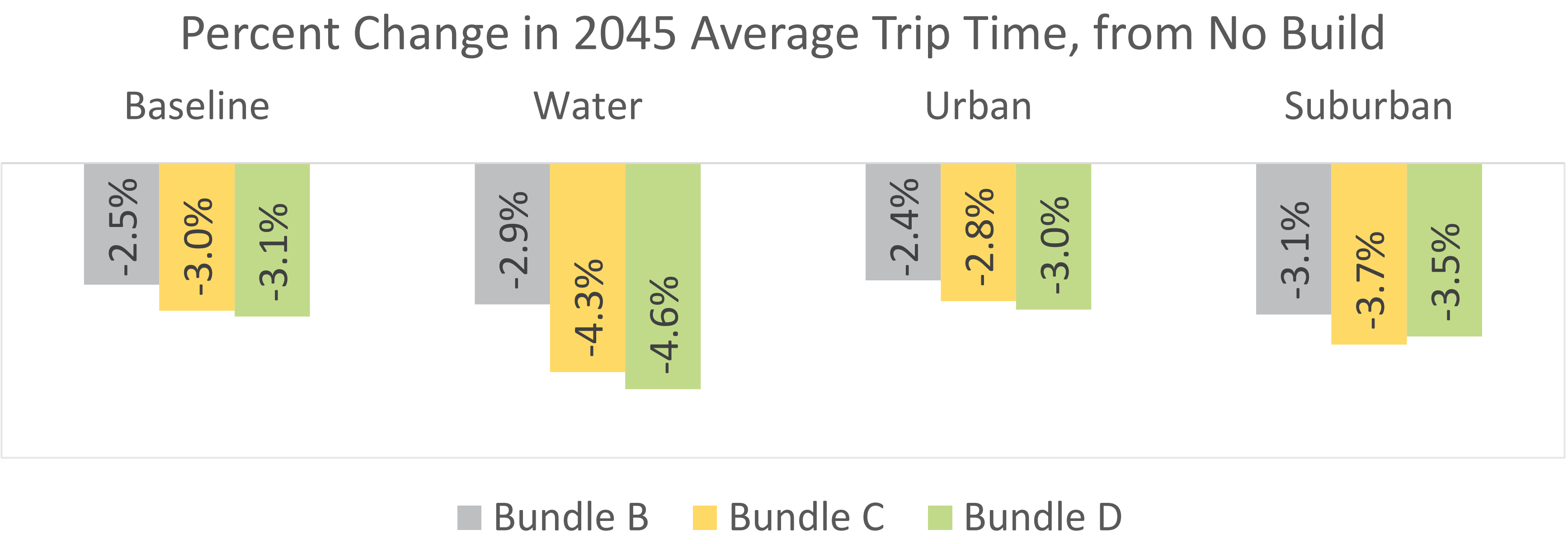


- MMMBT delay dramatically improved with all bundles in all scenarios although delay is higher with **Bundle C**

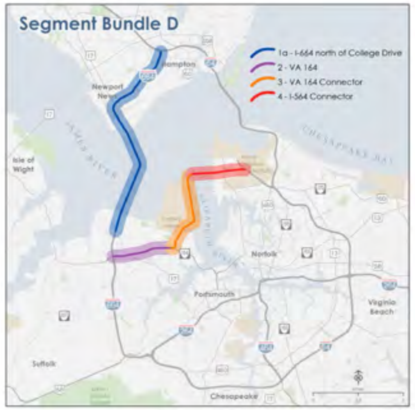
REGIONAL CONNECTORS STUDY

HAMPTON ROADS TPO

Improvement in Regional Average Trip Times

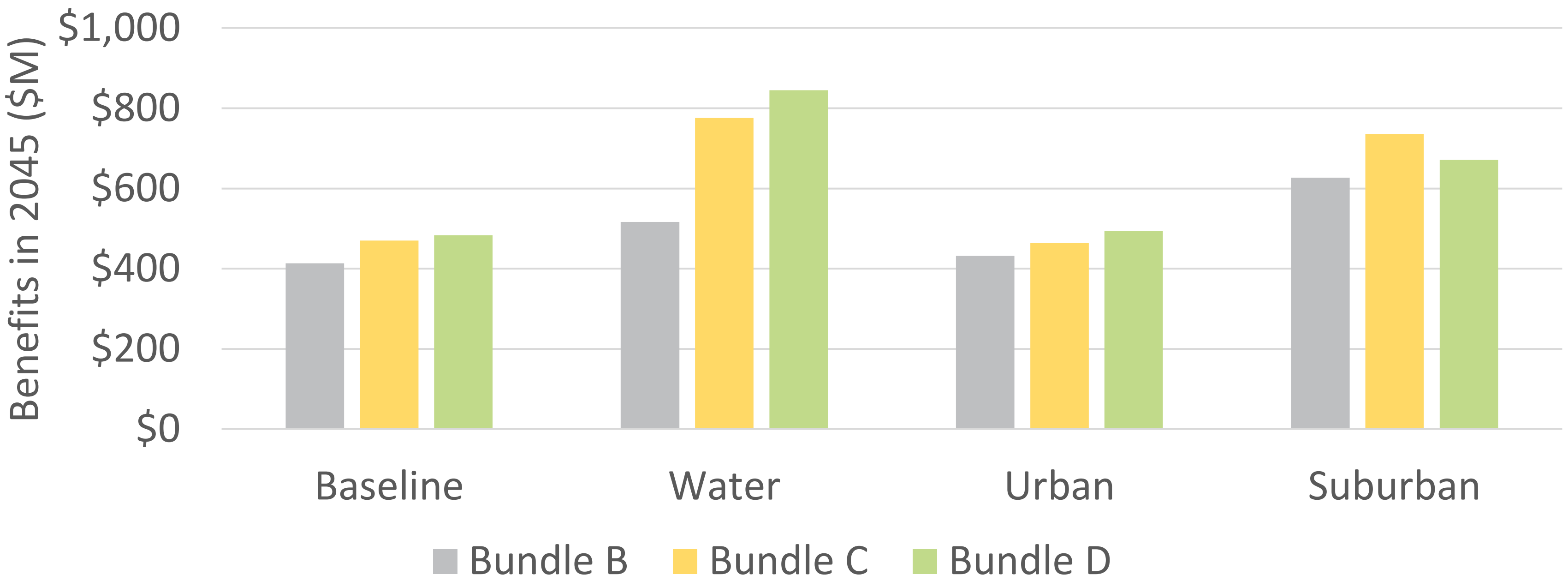


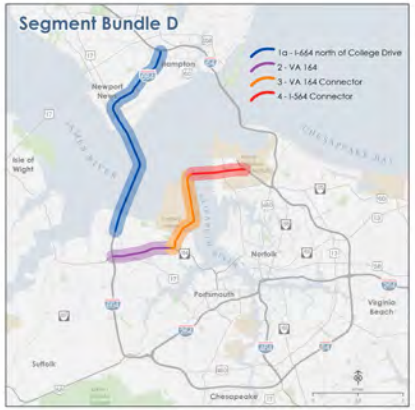
- Minimal change in average trip length across all bundles and scenarios
- **Bundle D** provides the greatest reduction in average trip time and congestion across all scenarios, except in the suburban scenario where **Bundle C** performs a little bit better



Societal Benefits in 2045

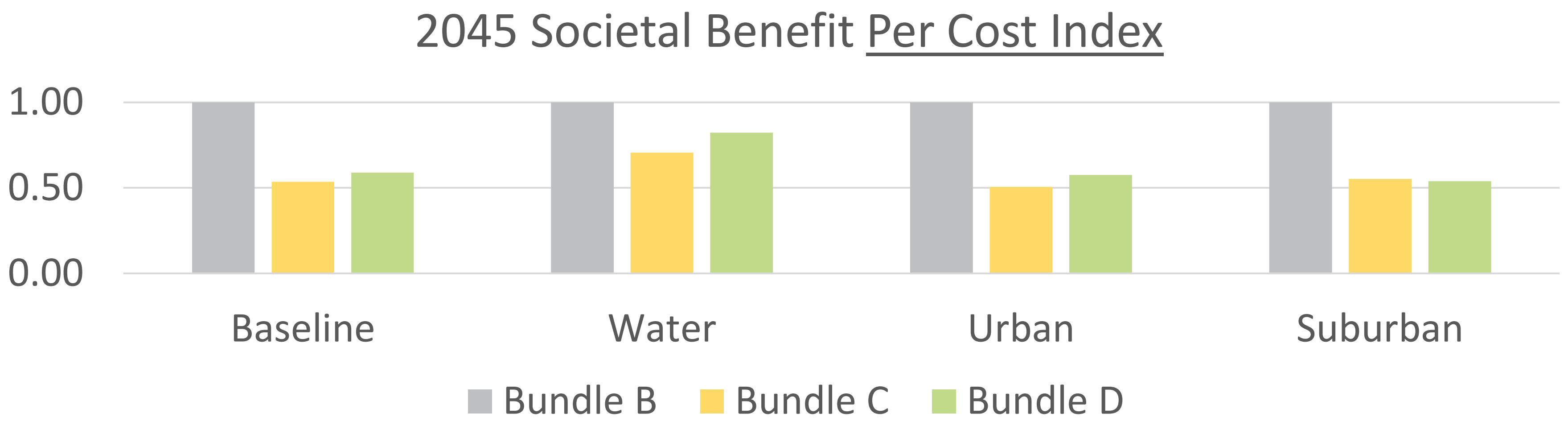
(Annual, $M, benefits of each bundle are relative to 2045 No Build)





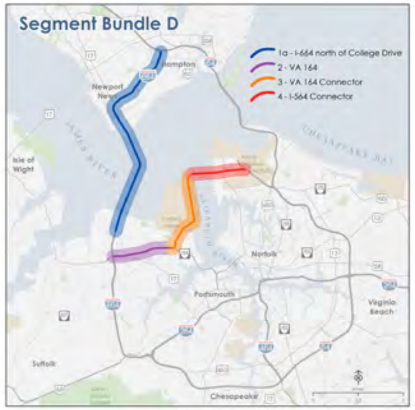
- **Bundle D** has the greatest total economic value among the bundles across all scenarios except the suburban scenario where **Bundle C** is the best performing.
- Greater growth along the water or in suburban areas tends to enhance the benefits of a regional connector (regardless of which bundle is selected)

Societal Benefit Relative to Cost (Bundles)



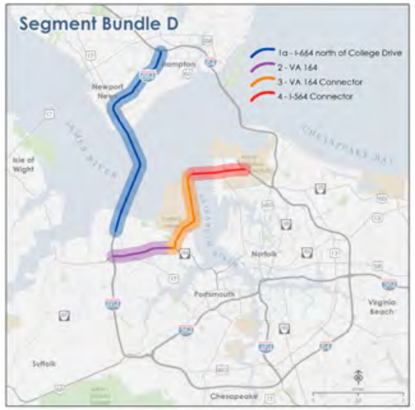
Note: Results are indexed so that the most cost-effective bundle is assigned a score of 1, and the other bundles are assigned fractions based on their relative cost effectiveness.

- **Bundle B** is always the most cost effective across all scenarios.
- **Bundle C** and **Bundle D** are closest to **Bundle B** in relative cost-effectiveness in the Greater Growth on the Water Scenario.



Congestion & Economic Results - Takeaways

- Comparing benefits and costs, Bundle B (Tier I segments) has the strongest results in any growth scenario
- There is more congestion overall with greater growth scenarios
- With greater congestion, scenarios show additional benefits from the segments including Tier 2 segments
  - Bundle C and D may merit future consideration despite their high cost, depending on how the future evolves, particularly under the Greater Growth on the Water assumptions



HAMPTON ROADS TPO

REGIONAL CONNECTORS STUDY

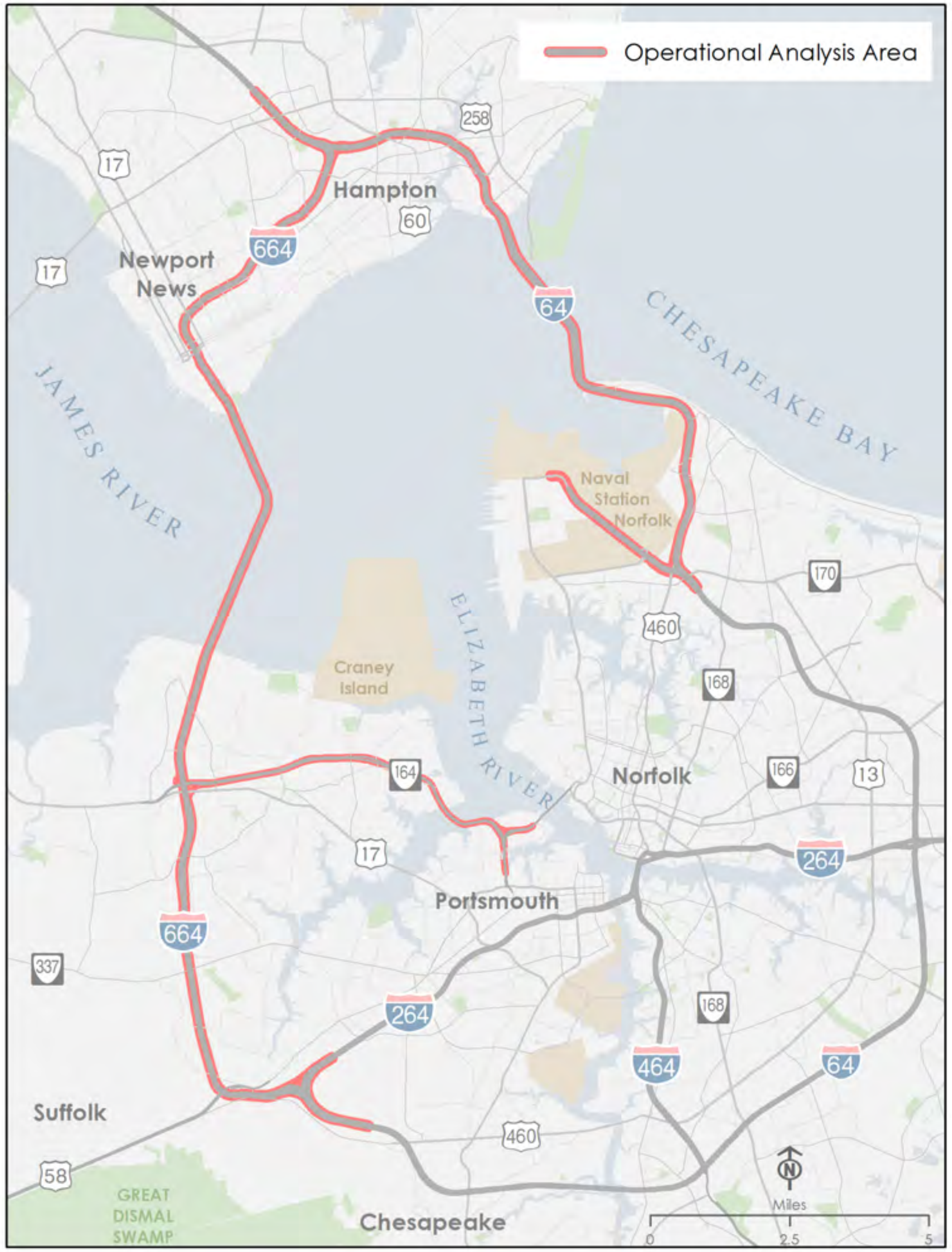
RESULTS OF OPERATIONS ANALYSIS

Michael Baker INTERNATIONAL

Overview

Conducted **traffic operational analyses** for study roadways and ramp junctions

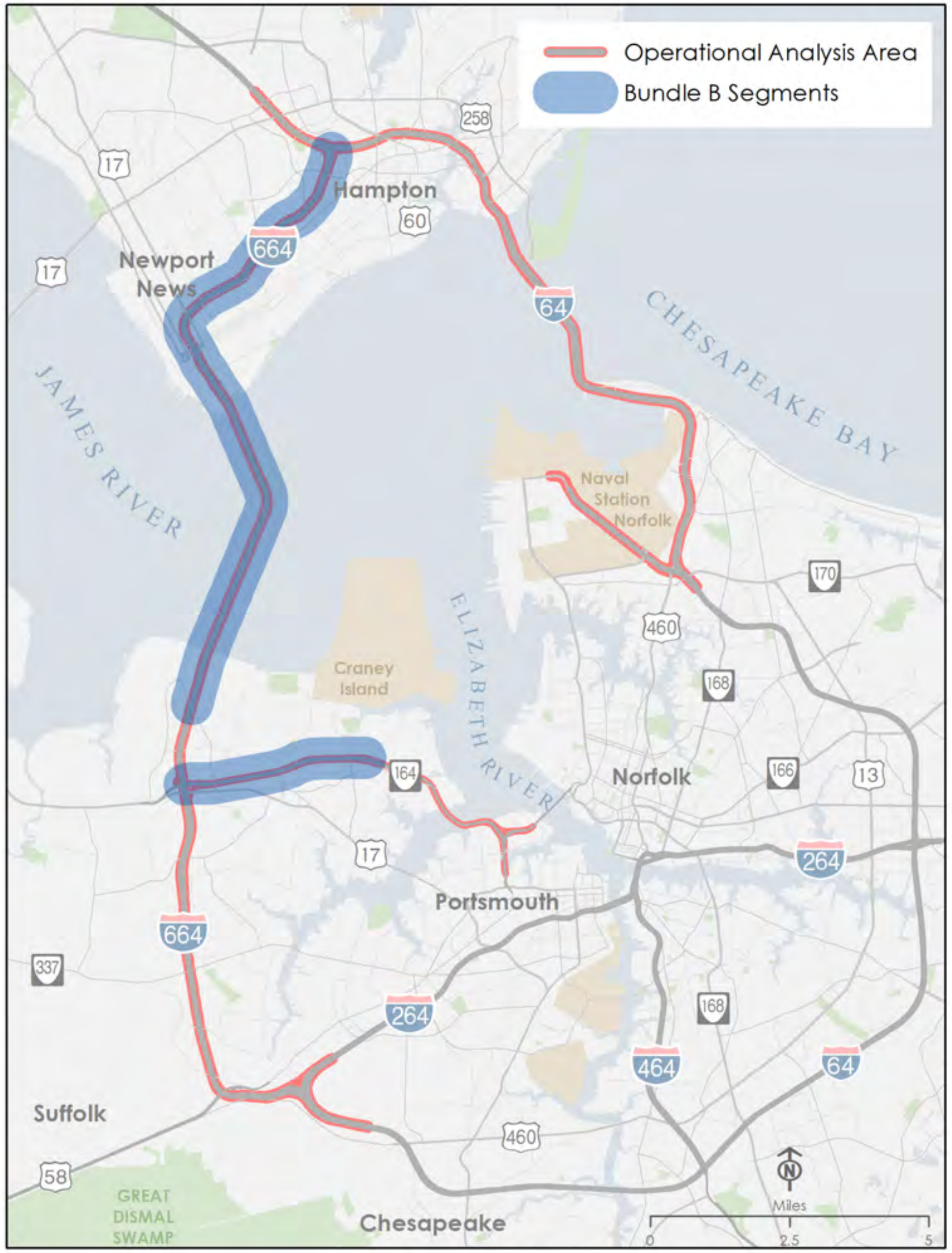
- I-64
- I-664
- I-564
- VA 164



Overview

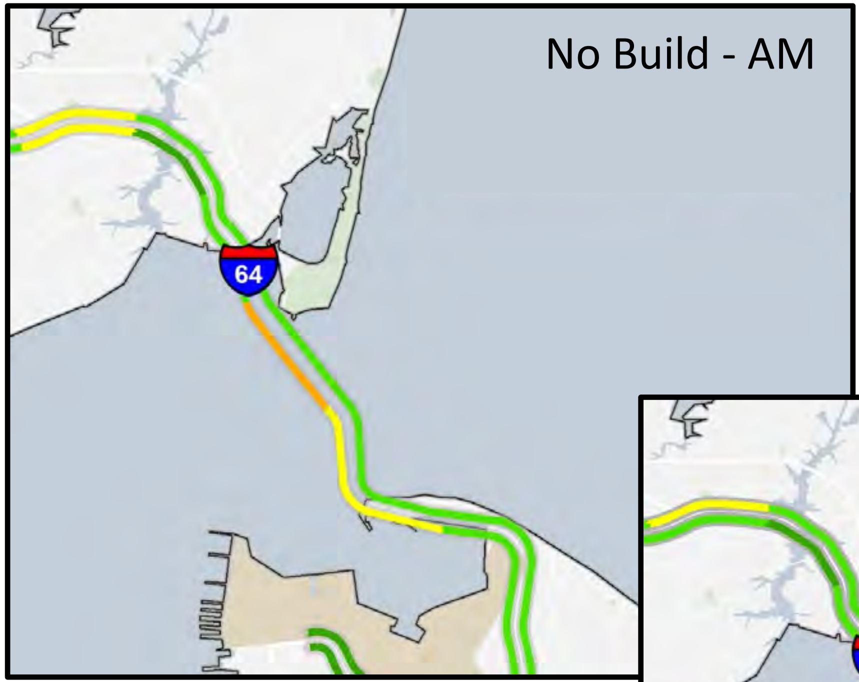
Conducted **traffic operational analyses** for study roadways and ramp junctions

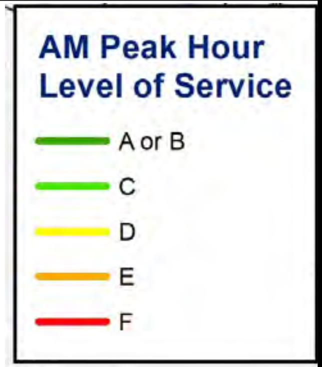
- I-64
- I-664
- I-564
- VA 164

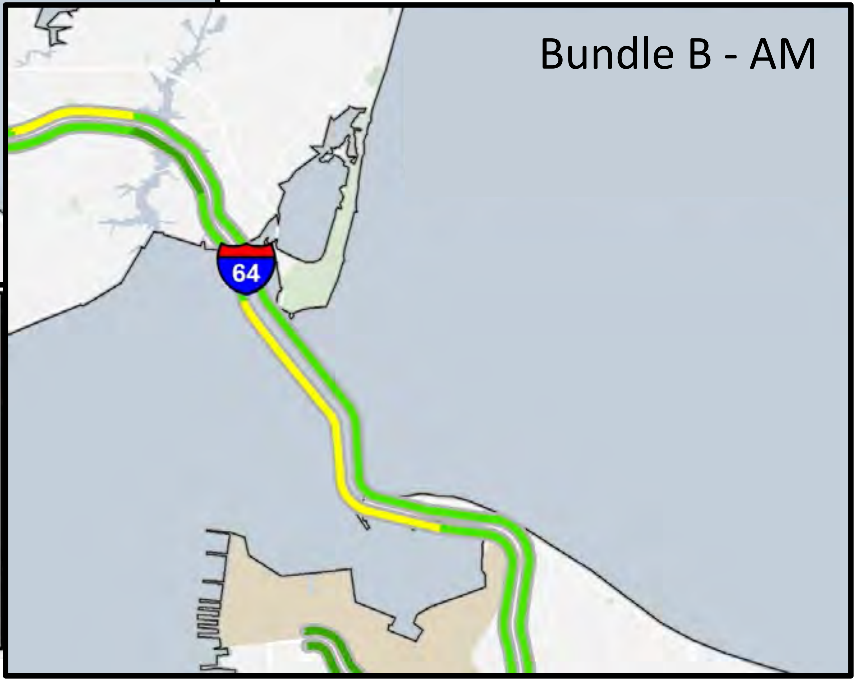


Results Summary – 2045 AM – HRBT Operations

- Eastbound improves from Level of Service (LOS) E to LOS D



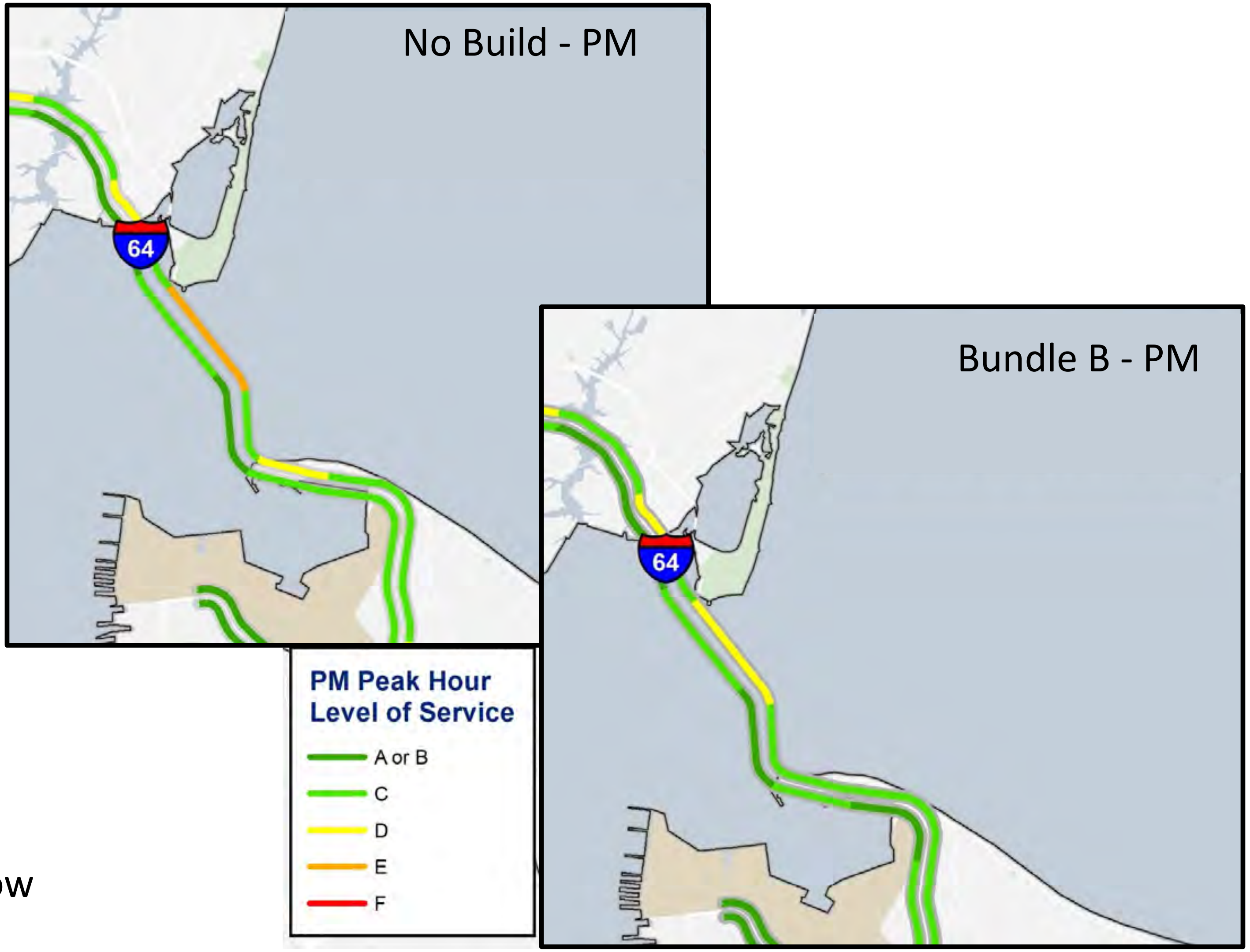




*Maps show general purpose network
Managed Lanes always operate at or near free-flow
Analyses reflect 2045 baseline land use

Results Summary – 2045 PM – HRBT Operations

- Westbound improves from LOS E to LOS D



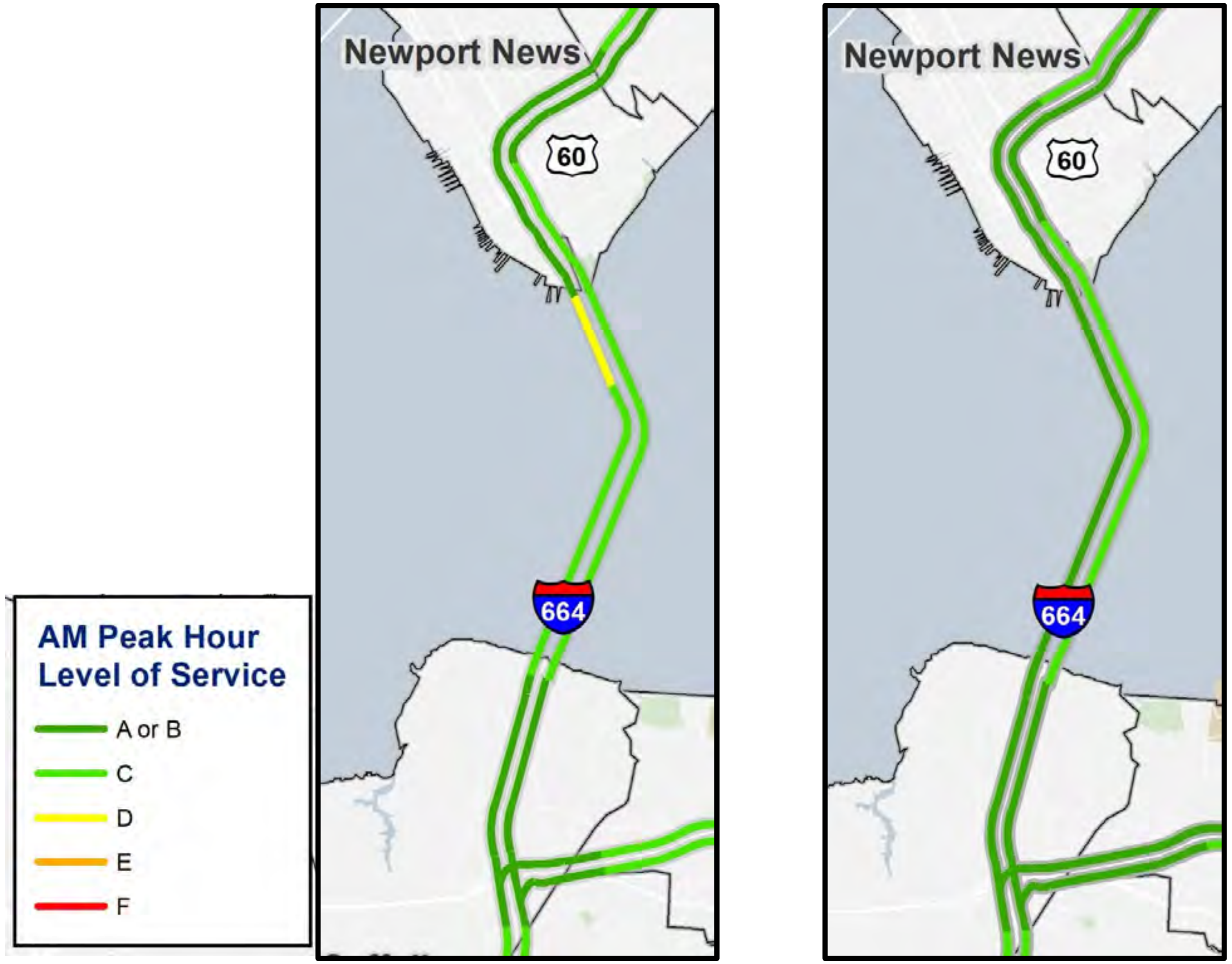
*Maps show general purpose network
Managed Lanes always operate at or near free-flow
Analyses reflect 2045 baseline land use

Results Summary – 2045 AM – MMMBT Operations

- Southbound improves from LOS D to LOS C

No Build - AM

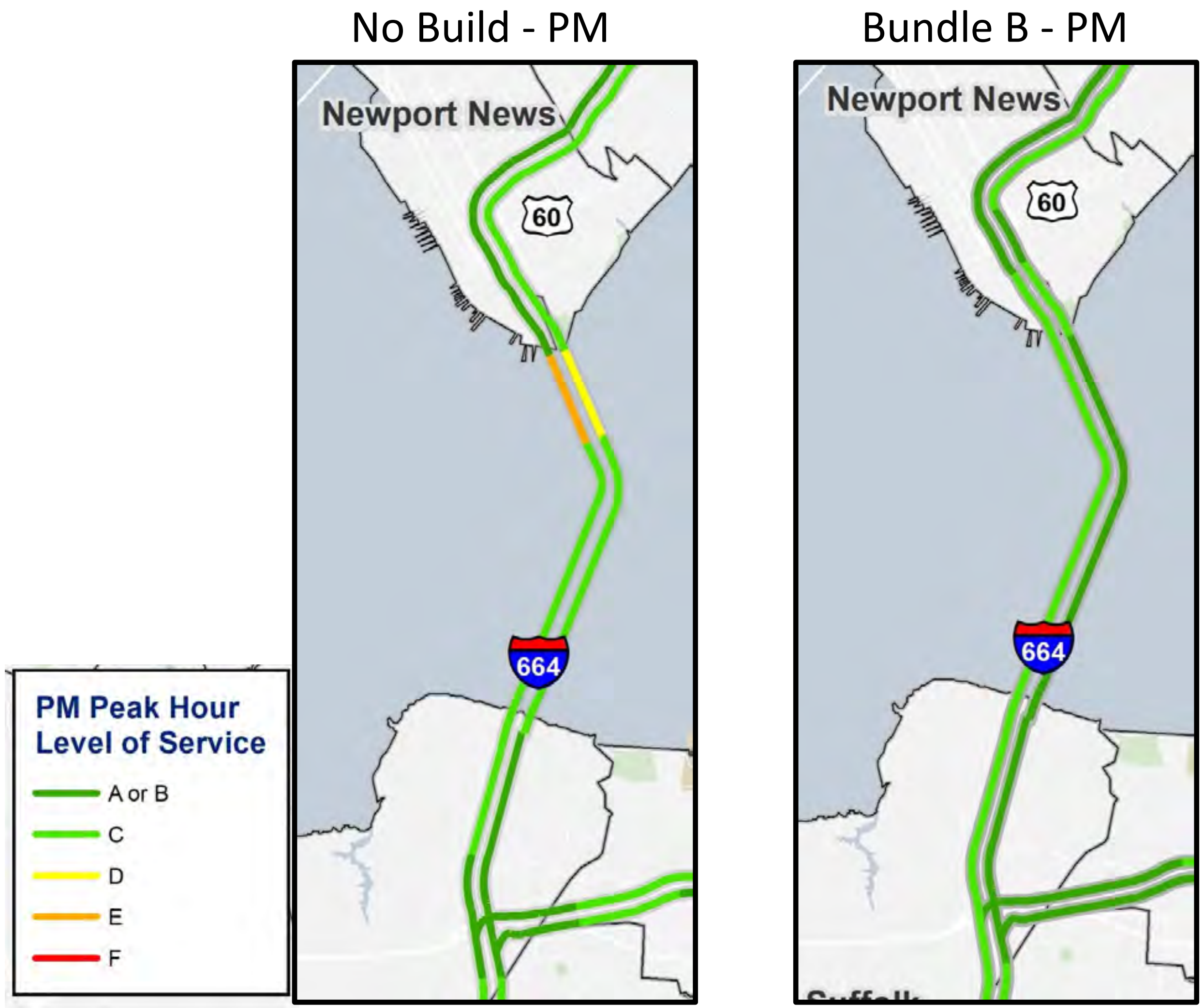
Bundle B - AM



*Maps show general purpose network
Managed Lanes always operate at or near free-flow
Analyses reflect 2045 baseline land use

Results Summary – 2045 PM – MMMBT Operations

- Northbound improves from LOS D to LOS C
- Southbound improves from LOS E to LOS C



*Maps show general purpose network
Managed Lanes always operate at or near free-flow
Analyses reflect 2045 baseline land use

Operations Analysis – Key Take-Aways

HRBT and MMMBT corridor volume comparison

- In their improved configuration, the two tunnel crossings were tested by the study team for their future operational performance
- For both facilities in 2045, as General Purpose lanes approach capacity, travelers will either decide to divert to the other tunnel crossing or utilize the available express lanes
- For all growth scenarios, both the HRBT and improved MMMBT facilities will have sufficient capacity to handle 2045 demand

Summary of Step 3 Analysis Findings

The findings support the Tier I and Tier II recommendations

- Tier I: Segments 1a and 2
  - Consistently most cost-effective segments and greatest increment of regional benefits supporting their nomination for the 2050 HRTPO Constrained Long Range Plan
- Tier II: Segments 3, 4 and 5
  - The analyses show that Greater Growth scenario assumptions increase the benefits of the Tier II segments, supporting their inclusion in the 2050 HRTPO Vision Plan

HAMPTON ROADS TPO

REGIONAL CONNECTORS STUDY

PUBLIC ENGAGEMENT UPDATE

Michael Baker INTERNATIONAL

Regional Symposium Summary

- Invited a wide range of groups representing underserved populations throughout the study area
- 18 participants attended from groups including NAACP, several universities, Civil rights and environmental justice specialists from state agencies, and agencies serving seniors, people with disabilities, unhoused, low income, and minorities.
- Worked in small groups throughout the workshop to address questions about the segments' potential benefits, potential impacts (burdens), and strategies to improve the outcomes from implementing the segment projects.
- Materials are posted on the website for additional circulation and input

Regional Symposium Summary

Benefits

- Access to jobs
- Bus reliability (esp. with express lanes)
- Shorter travel routes
- Lower travel times
- Access to tourism, services & education

Burdens

- Construction impacts
- Adjacent property impacts
- Environmental impacts
- Visual impacts
- Tolls/costs

Balancing

- Communication re: construction
- Bike/ped safety at ramps & crossings
- Add recreation access/features
- Manage various construction impacts

Final Public Meetings

- Similar approach as winter meetings
  - 3-4 advance pop-ups
  - 3-4 open house meetings
- Open House meetings between July 31 and August 16
- Online Open House afterward

HAMPTON ROADS TPO

REGIONAL CONNECTORS STUDY

WRAPPING UP THE STUDY

Michael Baker INTERNATIONAL

Next Steps

Step 1	Step 2	Step 3	Step 4
Qualitative Assessment of Construction, Permitting, & Readiness	Congestion Relief Evaluation Revised Design & Cost Estimation	Scenario Analysis Traffic Operations Analysis	Final Documentation of Design, Evaluation & Recommendations
SEGMENT BUNDLING FOR STEP 2	FINAL DRAFT SEGMENT TIERING	FULL RECOMMENDATIONS TO HRTPO	FINAL REPORT
Website Update	Public Meetings	Regional Connectivity Symposium	Public Meetings

REGIONAL CONNECTORS STUDY

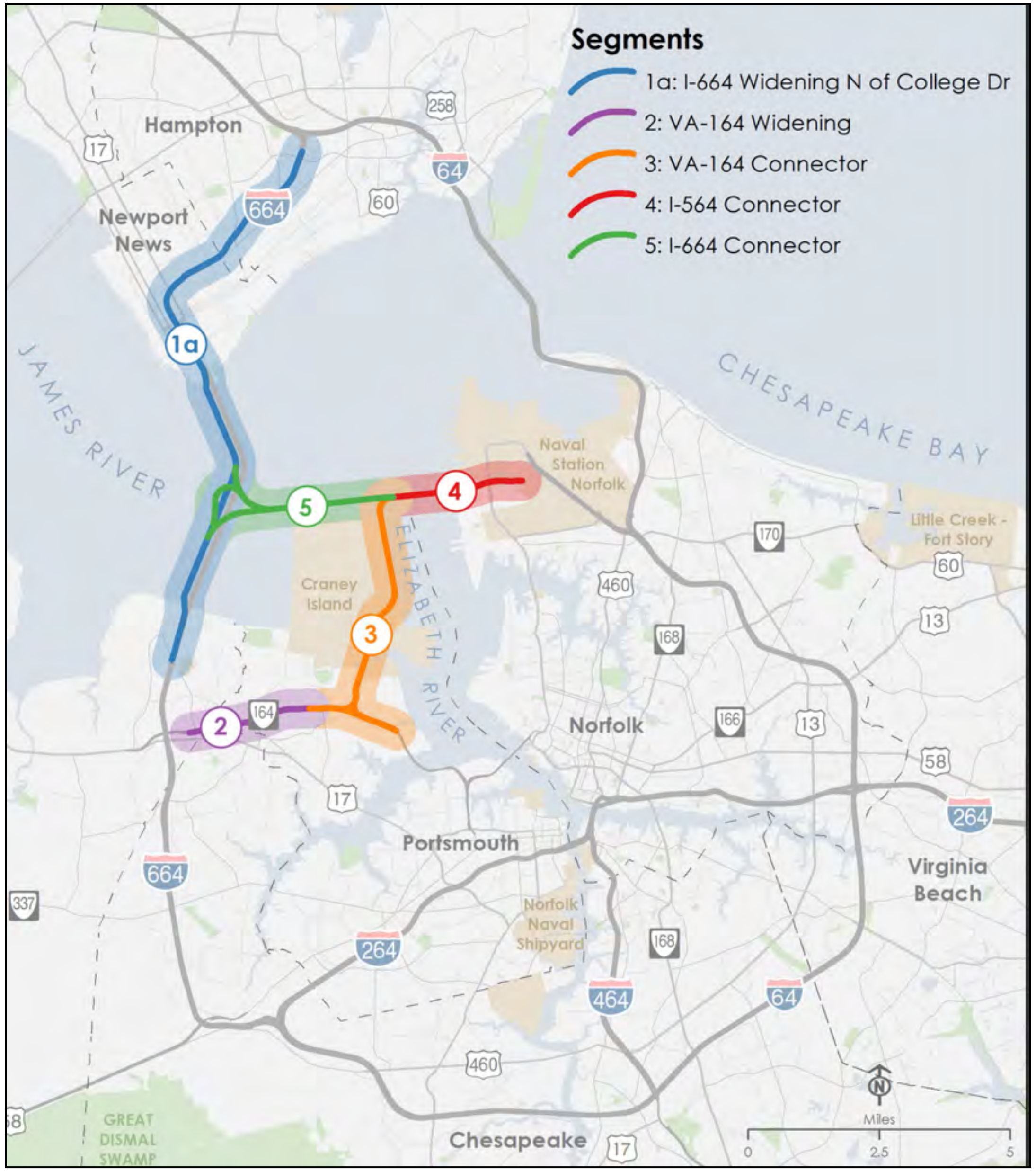
Joint Steering (Policy) Committee and Working Group Meeting, September 15, 2023

REGIONAL CONNECTORS STUDY

JOINT STEERING COMMITTEE & WORKING GROUP MEETING
SEPTEMBER 15, 2023

Agenda

- Synopsis of the RCS Study
- Final Public Engagement
- Phase III Technical Guide
- Action Items
- Next Steps



Regional Connectors Study (RCS) 2018 to today

PHASE I
- Engaging the public
- Analyzing existing conditions
- Refining Travel Demand Model

PHASE II
- Preparing scenario models
- Testing scenarios
- Considering alternatives
- Engaging the public

PHASE III
- Updating/refining segments
- Tiering recommendations
- Evaluating operations
- Engaging the public

2018
2019
2020
2021
2022
2023

Phase 3 Process Graphic

Step 1

Qualitative Assessment of Construction, Permitting, & Readiness

SEGMENT BUNDLING FOR STEP 2

Website Update

Step 2

Congestion Relief Evaluation

Revised Design & Cost Estimation

FINAL DRAFT SEGMENT TIERING

Public Meetings

Step 3

Scenario Analysis

Traffic Operations Analysis

FULL RECOMMENDATIONS TO HRTPO

Regional Connectivity Symposium

Step 4

Final Documentation of Design, Evaluation & Recommendations

FINAL REPORT

Public Meetings

Tiering

- The RCS will propose roadway segments that are ready to move forward and appear the most cost effective as Tier I recommendations.
- Segments that require further refinement and have hurdles to advancing are Tier II recommendations.

Tier I	**Segments recommended for HRTPO to evaluate for the 2050 Long Range Transportation Plan (LRTP).**
Tier II	**Segments recommended for HRTPO to include in the Regional Transportation Vision Plan.**

HRTPO Long Range Transportation Planning Process

Tiering Recommendations - Approach

Qualitative Evaluation

Readiness	Permitting Issues
Project Readiness considers the ability of the project to proceed independent of other segments, its status in plans and funding programs, and its integration with the region's managed lane network.	Permitting Issues consider the projected social and environmental impacts and the complexity of environmental permits and related factors that will add to the time, cost, and effort for project implementation.

+

Quantitative Evaluation

Congestion Benefits

Economic Benefits

Segment Costs

Tiering Recommendations and Stress Test

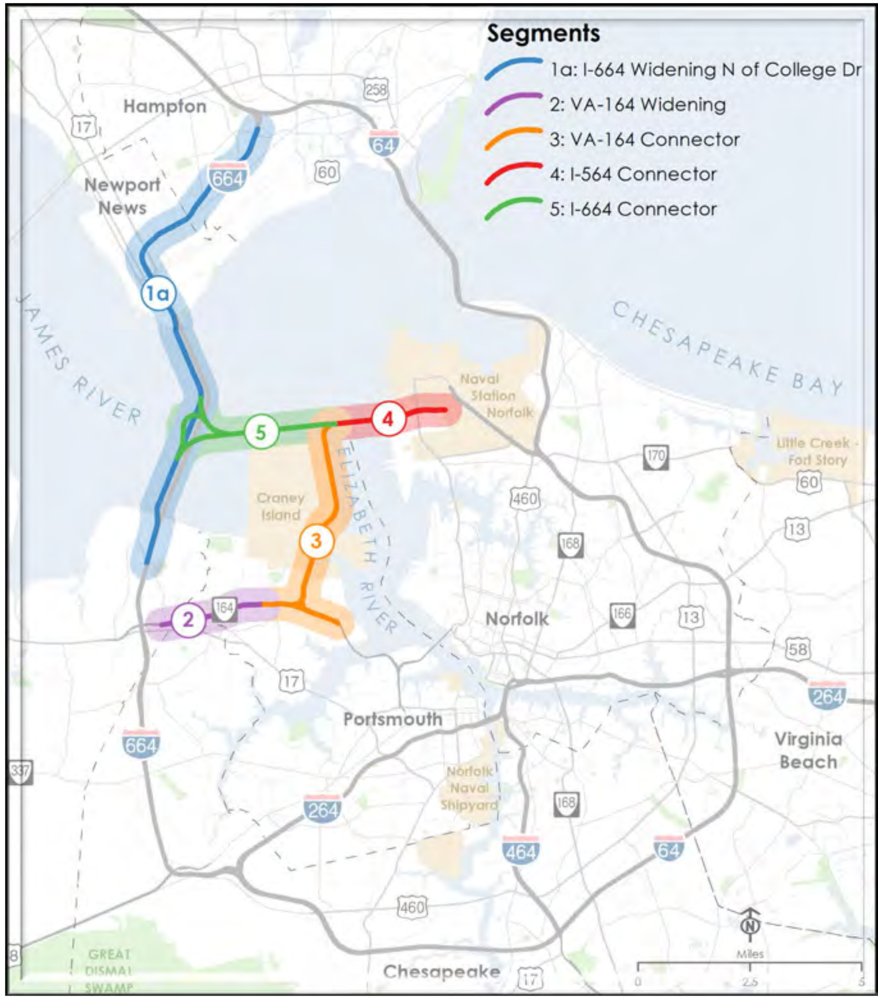
The final analysis was a stress test of the tiering recommendations:

- Scenario Testing
- Traffic Operations Analysis

Summary of Stress Test Findings

Findings support Tier I and Tier II recommendations

Tier I Segments 1a, 2	Tier II Segments 3,4,5
• Most cost-effective • Positive results for 2045 harbor crossing operations	• Benefits increase with Greater Growth scenario assumptions



Final Public Engagement

Regional Connectors Study
Community Pop-ups

Tuesday, July 18	Wednesday, July 19	Thursday, July 20
10 am-Noon	9 am-Noon	4-6 pm
West Hampton Community Center, Hampton	Chesapeake Farmer's Market at City Park, Chesapeake	Mount Trashmore Park, Virginia Beach

Regional Connectors Study
Open Houses

5:30 – 7:30 p.m.

July 31	August 1	August 2	August 3
Pearl Bailey Library, Newport News	First Baptist Church Lambert's Point, Norfolk	Churchland Branch Library, Portsmouth	VDOT Hampton Roads District Office, Suffolk

Regional Connectors Study

Online Open House

August 16 – 31

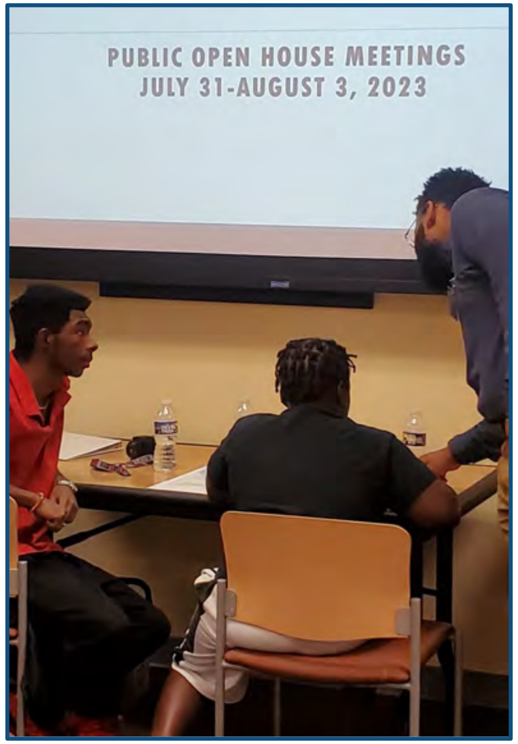
REGIONAL CONNECTORS STUDY

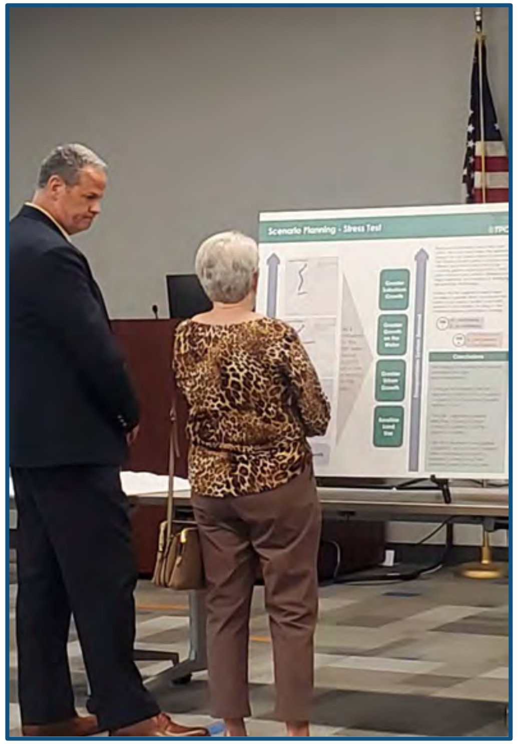
HAMPTON ROADS TPO

Public Engagement

- The study team hosted three Community Pop-ups (July 18-20) in Hampton, Chesapeake, and Virginia Beach
- The final four Open Houses (July 31-August 3) had more than 20 participants attend
- The final Online Open House (August 16-31) had 821 views and 45 comment form responses

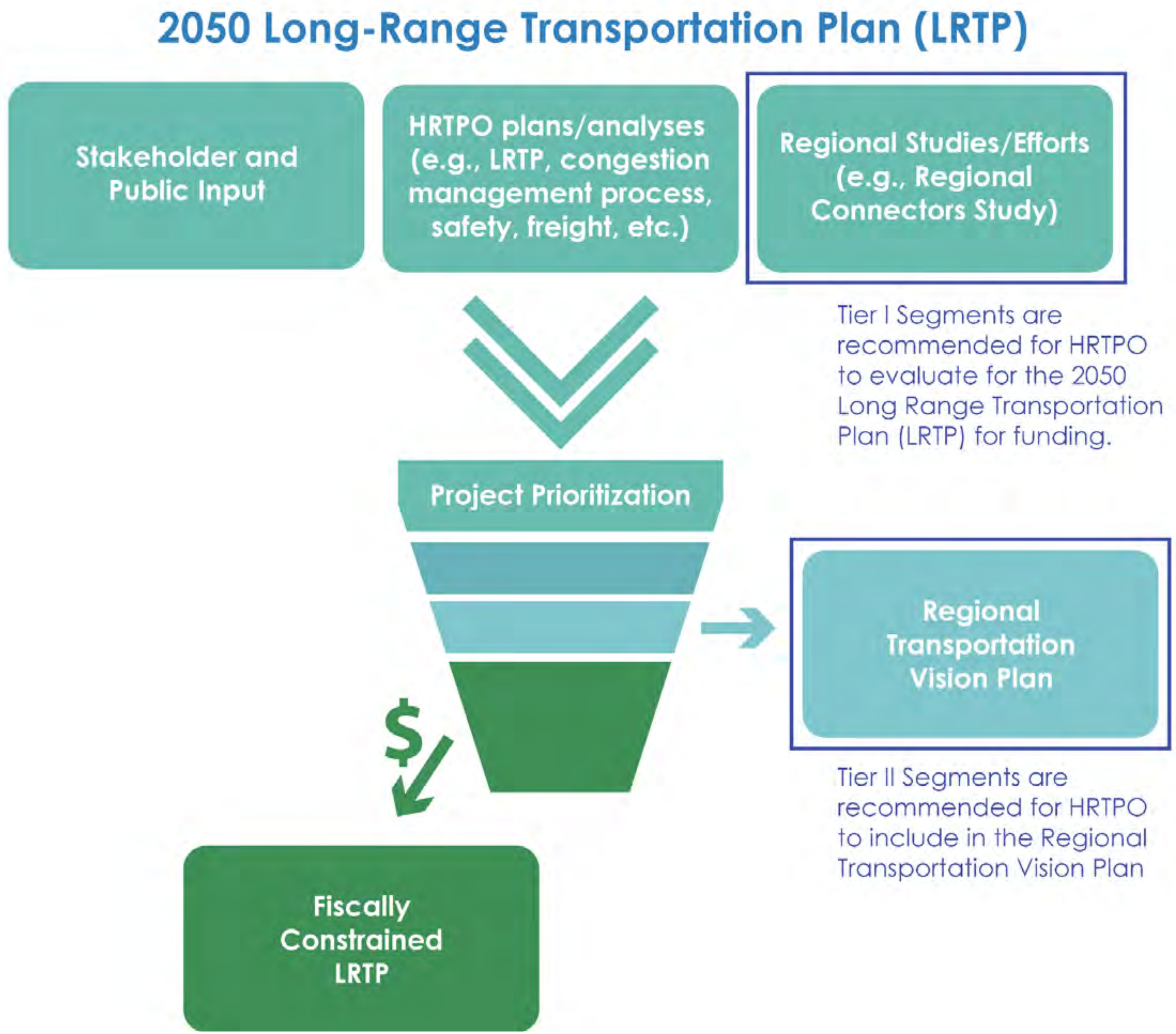
Public Engagement – Comment Themes





- Segment 1a was the top choice for providing the greatest convenience for travel
- Congestion
  - Truck traffic on Hampton Blvd.
- Tolls
- Environment
  - Marine life and bird life on Craney Island
- Alternatives to personal vehicles
  - More investment in rail, buses, and public transportation

Where Do We Go From Here?



RCS End Products

Tiering Recommendations

Hand-off to HRTPO:

- **Tier I** → Evaluate for 2050 fiscally constrained Long Range Transportation Plan
- **Tier II** → Include in 2050 Vision Plan

Study Documentation

- Process record (committee meetings, webinars, public engagement summaries)
- Technical documentation of each phase
- Refined segment concept drawings

Overview of the Technical Report

- Step 1 Qualitative Analysis
  - Permitting Issues
  - Readiness
  - Construction Complexity
- Step 2 Quantitative Analysis
  - Cost Estimation and Segment Descriptions
  - Congestion and Economic Analysis
  - Tiering Recommendations
- Step 3 "Stress Test" Analysis
  - Congestion and Economic Analysis of Greater Growth Scenarios (Tier I and II segments)
  - Operations Analysis and Greater Growth Scenarios (Tier 1 segments)
- Public Engagement
- Conclusions
- Appendices – details of each analysis

Action Items

Recommended Actions:

- Approve the RCS Phase 3 Final Technical Report, pending no adverse public comments received.
- Recommend HRTPO Board endorsement of the RCS Phase 3 Final Technical Report.

Next Steps

- Submit comments on Phase III Technical Guide by September 22
  - Email to lparkins@mbakerintl.com
- Final public engagement documentation
- Brief study summary report
- Final Phase III Technical Guide
- HRTPO Board Meeting – final approval

Appendix H: Comments in Response to Phase 3 Draft Report, with Responses

Number	Page	Section	Source	Comment	Response
Written comments on September 1 Draft Phase III Technical Guide					
1	i, ii		B Swets, City of Portsmouth	when citing or referencing appendices, provide links from the reference directly to the relevant technical section; why aren't there links for the appendices	The final PDF will include links to each appendix within the document.
2	3	Overview	B Swets, City of Portsmouth	With reference to Segment 2 description: Widen VA 164 to six lanes, three lanes in each direction. Use existing right-of-way to the extent possible for widening VA 164. Comment: to what extent is this possible? how many Portsmouth properties will/could be taken?	This information is provided in the qualitative assessments of VA 164 on pages 23 and 24 and page 37. Approximately 14 parcels are projected to require partial, modest right-of-way acquisition of some manner. The acquisitions are proposed small takes to move back noise walls that might be avoided with the design waivers for smaller shoulders and/or retaining walls. In addition to the permanent acquisitions, approximately 40 parcels will require temporary construction easements.
3	3	Overview	B Swets, City of Portsmouth	With reference to Segment 3 VA 164 Connector description: will the state be taking the Portsmouth landfill?	No, the study assumes the landfill would be crossed after the City has completed its use of the site. This point is clarified on page 31-32.
4	3	Overview	B Swets, City of Portsmouth	With reference to footnote 2: Tolls were assumed to be $1.00 for cars and $3.00 for trucks for each segment (Segments 3, 4 and 5) Comment: why are the toll assumptions so much lower than the current tolls?	The tolls are based on the SEIS toll assumptions and were presented to the RCS Working Group at their April 8, 2021 meeting.
5	13	Ch 2, Permitting Issues	B Swets, City of Portsmouth	[Table 1] doesn't include cost to Portsmouth for losing landfill or impacts to Navy facilities	These are considered in the constructability and cost evaluation measures (pages 31-32 and page 40)
6	15	Ch. 2, Permitting Issues	B Swets, City of Portsmouth	With reference to Impact Rating Concern: Social and community environment Comment: does this include having your house taken?	Yes, it would if that were to occur based on the conceptual engineering evaluation. This has been added in the list.
7	15	Ch. 2, Permitting Issues	B Swets, City of Portsmouth	With respect to the statement: Human well-being depends directly on biodiversity and ecosystems. Comment: and shelter	Shelter falls under social and community environment as noted above in response to Comment #6, and does not fit in the natural environment section as proposed by this comment.
8	17	Ch 2, Permitting Issues	B Swets, City of Portsmouth	With reference to Segment 2 (VA 164) discussion noting: "The analysis assumes that all transportation facilities will return to existing or improved functionality post construction." Comment: Why is this assumed? The Maersk terminal made traffic worse, and this will bring much more traffic to 164	This assumption was made up front for environmental analysis and confirmed in congestion analysis. Future analysis of the corridor will consider traffic forecasts and environmental effects based on additional detail, so this is not a final assessment.

9	17	Ch 2, Permitting Issues	B Swets, City of Portsmouth	With reference to "Expansion to the eastbound side of VA 164 may require a portion of easement from Ebony Heights Park" Comment: What does this mean? Is that another way of saying eminent domain will be used to take property?	It means that, in the context of the writeup, the worst-case effect would be an eminent domain property take of a small portion of the park. As noted in the text that follows, this impact appears likely to be avoidable. The meaning of "easement" was clarified.
10	18	Ch 2, Permitting Issues	B Swets, City of Portsmouth	With reference to the mention of Portsmouth Landfill under Segment 3 (VA 164 Connector) Comment: What about impacts to the City from losing the landfill?	No, the study assumes the landfill would be crossed after the City has completed its use of the site. This point was clarified in the discussion of constructability (pages 31-32).
11	20	Ch 2, Permitting Issues	B Swets, City of Portsmouth	With reference to the discussion of Segment 5 having no impact to residences Comment: what about impacts to property values in River Shores from a new bridge dominating the water views?	The text was clarified to be clear there are no direct impacts to residences. At this level of design, we would not be able to predict any changes to potential property values (positive or negative). Housing market values are dependent on many variables that are outside the purview of this study. Indirect and cumulative effects would be examined further at the NEPA stage.
12	21	Ch 2, Permitting Issues	B Swets, City of Portsmouth	With reference to the ratings in Table 2 for VA 164 widening, Sensitive property impacts: Comment: the people who all of a sudden have a highway running through their backyard would not describe the impacts as "minimal"	The VA 164 widening is projected to fit within existing VDOT ROW, which does include drainage easements in existing backyards. This type of impact was clarified as appropriate for this level of study. The analysis of potential noise walls or visual barriers would be determined in later additional design phases as well as other NEPA documentation and public involvement components of the further refined project design.
13	22	Ch 2, Permitting Issues	B Swets, City of Portsmouth	With respect to the statement in the Summary paragraph "VA 164 widening . . . Only impacts to adjacent parcels and communities.	Agreed that this is not worded clearly - was clarified in the final report. The word "only" was intended to be followed by "minimal."
14	24	Ch 2, Project Readiness	B Swets, City of Portsmouth	With respect to the description of Segment 2 VA 164 widening, "the City of Portsmouth is currently opposed to the widening"	While the basis of the City's opposition is referenced in the preceding text as being detailed later in this section, the final document was clarified in this regard.
15	25	Ch 2, Project Readiness	B Swets, City of Portsmouth	With respect to the description of Segment 3 VA 164 Connector Comment: why doesn't it say we're opposed to this project as well?	Document has been updated to reflect Portsmouth's opposition to VA 164 Connector dating back to the SEIS.
16	27	Ch 2, Project Readiness	B Swets, City of Portsmouth	With respect to the Summary paragraph, indicating that the connector segments score worse than the existing segments, partially because they require connections to other segments to be ready for construction. Comment: what are the other parts?	This is a summary of the detailed evaluation in the preceding pages and does not include the full detail of the analysis.

17	32	Ch 2, Construction Complexity	B Swets, City of Portsmouth	With respect to the rating of Segment 2 VA 164 widening, Constraints score: Comment: Portsmouth and Navy opposition should result in at least a moderate difficulty rating	This rating was changed after the draft document and this edit was omitted from this draft document. This table has been udpated to show the correct rating. Note that this does not affect the summary qualitative evaluation because constructability informed the cost estimates in the quantitative evaluation.
18	39	Ch 3, Cost Estimate Assumptions	B Swets, City of Portsmouth	With regard to Segment 3, VA 164 Connector: is there a breakdown of what kinds of vehicles would make up the 26,900? Heavy truck use would impact traffic flows much differently than car traffic	This narrative was updated and the volumes are no longer referenced to avoid inconsistencies because the traffic volumes vary by bundle in the Phase III modeling. To address this comment, truck volume data was added to Appendix D Travel Demand Model Results to provide the modeled truck volumes. Note that this is raw model data for the peak traffic volume periods, which are not necessarily the peak truck volume periods. Any future study of VA 164 would likely gather current data on truck volumes as a consideration.
19	40	Ch 4, Definition of Bundles	B Swets, City of Portsmouth	Why isn't there a bundle that includes all five segments.	First, the consultant scope of work specifies that up to four bundles will be evaluated in this analysis. Second, the utility of a bundle with all segments is limited as the segments provide alternative means of crossing the harbor and it was not considered likely that they would all be constructed.
20	43	Ch 5, Summary of Regional Congestion Results	B Swets, City of Portsmouth	With regard to Figure 9: "Why aren't the no build options on the graph?"	For clarity, the No Build data has been added to the charts.
21	44	Ch 5, Location-Specific Analysis	B Swets, City of Portsmouth	With regard to the conclusion: Reduced peak period volumes and increased speeds in managed lanes; less overall benefit to the general-purpose lanes. Comment: can you be more specific?	Additional detail has been provided in the narrative.
22	44	Ch 5, Location-Specific Analysis	B Swets, City of Portsmouth	With regard to the conclusion: Midtown and Downtown tunnels have slightly higher daily volumes with Bundles A and B, and 5-6% lower volumes with Bundles C and D. Comment: What about 164?	As shown in Figure 10, two locations along VA 164 were analyzed and specific data is provided in Appendix D. This is the best way to answer reader questions given that there are 5 model runs, 23 locations, and three performance measures provided. Nevertheless, an additional summary statement regarding volumes on VA 164 in the central segment (segment 2) was added to this section.
23	45	Ch 5, Congestion Benefits Relative to Cost	B Swets, City of Portsmouth	With regard to Figure 11 Congestion Benefits Relative to Costs by Bundle. Comment: what if segment 5 were included in the last two bundles?	To limit the potential number of "what if" questions, the scope of work was limited to 4 bundles. The comparisons provided demonstrate that there are diminishing returns to the cross-harbor segments relative to their costs.
24	48	CH 5 Regional Economic Benefits	B Swets, City of Portsmouth	With regard to Figure 15 Regional Economic Impact in 2045 (Annual, $M, Incremental Effects Relative to RCS No Build Network) Comment: so can we say that segment 2 generates $11M in regional economic impact (Bundle B-Bundle A)?	We can infer that adding Segment 2 to Segment 1A adds $11M in annual regional Economic Benefit by comparing Bundle A results to Bundle B results.

25	48	CH 5 Regional Economic Benefits	B Swets, City of Portsmouth	With regard to footnote 10: GRP – Gross Regional Product (total value of production minus intermediate goods and services). The 2020 GRP was $154 B. Comment: what is it projected to be in 2045	Thie figure and footnote have been clarified in the document.
26	51	CH 5 Cross-Harbor Drivers of Economic Results	B Swets, City of Portsmouth	the bundles are misleading. lumping 164 (minimal benefits) in with 664 (major benefits) makes it look like the 164 project is more important than it is. instead, it looks better because it's compared to other options that aren't as good, not because it stands well on it's own	Comment noted. The study focuses on harbor crossings, so each bundle addresses harbor crossings and that is one reason why VA164 is not evaluated alone.
27	58	CH 7, Congestion Benefits, Scenario Testing	B Swets, City of Portsmouth	these bundle choices are misleading, as it lumps the 164 widening (which has minimal benefits) in with the 664 widening (which has much greater benefits), making it look like the 164 widening impacts are much greater than they are. the analyses make 164 look good COMPARED TO THE OTHER BUNDLES, not necessarily by itself	Comment noted. The preceding analysis illustrates that the incremental congestion benefit of Segment 2 is substantial particularly in comparison to the cost of the segment. The analysis and documentation in Chapter 7 do not imply that VA 164 widening by itself has the results of Bundle A.
28	67	Ch 7, Economic Modeling Conclusions	B Swets, City of Portsmouth	repeat comment: the bundles are misleading. lumping 164 (minimal benefits) in with 664 (major benefits) makes it look like the 164 project is more important than it is. instead, it looks better because it's compared to other options that aren't as good, not because it stands well on it's own	Comment noted. The preceding analysis illustrates that the incremental congestion benefit of Segment 2 is substantial particularly in comparison to the cost of the segment. The analysis and documentation in Chapter 7 do not imply that VA 164 widening by itself has the results of Bundle A.
29	69	Ch 8 Step 3 Operations Analysis	B Swets, City of Portsmouth	With regard to the introduction that the operations analysis was performed on Bundle B Comment: why not the other bundles?	The scope of work approved by the RCS Steering (Policy) Committee includes the highly detailed and resource-intensive operations analysis only for the Tier 1 recommendations, which is Bundle B.
30	75	Ch 8 Step 3 Operations Analysis	B Swets, City of Portsmouth	With regard to Figure 42 2045 Baseline Scenario AM Peak Hour LOS Results Comment: Is there a difference in LOS between regular lanes and tolled lanes?	Please see the note below the graphic: NOTE: Only general-purpose highway network results shown; managed lanes operate at or near free-flow speeds, by design.
31	78	CH 10 Conclusions	B Swets, City of Portsmouth	With regard to the sentence: These recommendations acknowledged the higher benefits of Segments 1a and 2 relative to their costs and the higher readiness of these two segments, compared to the greater permitting and construction challenges, timing issues, and interdependency of the “Connector” segments and the lower incremental benefit of these segments relative to their costs. Comment: These aren't reasons to do a project!	This comment is relevant to a purpose and need statement for an individual project, which is not the scope of work of this regional study. This study does not include segment-level purpose and need, but rather, a planning-level assessment of the qualitative and quantitative factors included in the analysis (permitting issues, readiness, cost, regional congestion benefits, regional economic benefits, and the stress test components of scenario analysis and operational analsysis). The Tier 1 recommendations will be subject to the HRTPO prioritization analysis before it is determined if they will be funded in the 2050 Constrained LRTP. Any future studies would determine the purpose and need of the project, and much more detailed environmental and engineering would be completed before the project would be approved for construction.

32	78	CH 10 Conclusions	B Swets, City of Portsmouth	With regard to the statement: In the Greater Growth scenario analysis, Bundle B consistently performed best when benefits were compared to costs, supporting the Tier I recommendations. Comment: again, this isn't a reason to do a project. The goal should be tangible improvement in congestion, not to have a good CBA	This statement is based on the Regional Connectors Study scope of work to recommend the five segments for Tier 1 or Tier 2 based on the agreed-upon methodology. The congestion benefits were identified in the regional congestion analysis and the Greater Growth scenario analysis confirmed the results.
From Portsmouth Meeting October 4, 2023					
33		Overview, Step 2 summary		Clarify the project benefits - what measures were considered and how are benefits shown for segments?	This information is clarified in the final document and also presented in the project summary document.
34		Segment 2 descriptions - tolling		Clearly state the reason for assuming the segment is not tolled	The document is updated to say that the Elizabeth River Crossing agreement has had a detrimental impact on Portsmouth and the goal is not to repeat this. At this time HRTPO does not have a plan to implement tolls on VA 164 widening. The HRTPO will work with regional, state and other stakeholder to ensure that funding is in place to avoid tolls.
35		Chapter 2 Property Impacts		Property Acquisition: 14 parcels for 164 widening and 29 parcels for 164 connector. The report needs to state more clearly what types of impacts would occur, esp. add info on the 164 Connector and potential EJ impacts.	This information is clarified in Chapter 2 based on information provided in the Permitting Issues evaluation appendix.
36		Chapter 2 Constructability and Segment Descriptions		164 Interchanges: What are the impacts of 164 interchanges to VIG and Cedar lane interchanges such as impacts to safety, police, fire, residents and EJ communities?	Segment 3 description and narrative in Chapter 2 on Constructability are updated to address the construction phase impacts at a high level. More detail would be available in future (NEPA) studies when engineering design and construction impact analysis would be more advanced.
37		Chapter 2 Constructability and Segment Descriptions		VA 164 widening potential stormwater impacts need to be described clearly.	Segment 2 description and Constructability narrative are updated to address this topic.
38		Chapter 2 permitting Issues		Acknowledge the potential flooding issues in Portsmouth	Narrative addressing this point is added to the Technical Guide
39		VA-164 Connector Feasibility/Timing and, as appropriate, VA 164 widening		The report needs to include a thorough description of the useful life of the Craney Island CIDMMA. USACE acknowledged they are updating the elevation which currently stands at 60 ft. The report also needs to acknowledge the Navy Fuel Depot and Portsmouth Landfill - Portsmouth to provide additional information regarding the Landfill.	This information is in project documentation and report appendices but has been updated and elevated to the Technical Guide and Summary Report. The consultant team prepared a vertical elevation of VA 164 connector to confirm feasibilty of higher elevations over Portsmouth Landfill and/or Craney Island and added related text to segment descriptions in Chapter 5 and the RCS Summary Report.
40		Public Engagement		Portsmouth inquired about the extent of public engagement and the impact of public input.	A complete summary of study public engagement has been prepared as a separate deliverable, and the project summary report and final technical guide include more details of the Phase III public engagement.
41		RCS Scope of Work		Acknowledge that this is a planning study and further issues may be identified in future more advanced studies, and what the public may need to know.	The project summary report, the Technical Guide Overview, and the updated segment descriptions include this information.