COMMONWEALTH of VIRGINIA

Commonwealth Transportation Board

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Agenda item # 17

RESOLUTION
OF THE
COMMONWEALTH TRANSPORTATION BOARD

September 15, 2021

MOTION

Made By: Mr. Rucker **Seconded By:** Mr. Johnsen
Action: Motion carried, unanimously

Title: Approval of the I-64 and I-95 Corridor Improvement Plans and Addition of Interstate Operations and Enhancement Program Projects to the Six-Year Improvement Program for Fiscal Years 2022-2027

WHEREAS, Section 33.2-214(B) of the *Code of Virginia* requires the Commonwealth Transportation Board (Board) to adopt by July 1st of each year a Six-Year Improvement Program (Program) of anticipated projects and programs and that the Program shall be based on the most recent official revenue forecasts and a debt management policy; and

WHEREAS, after due consideration the Board adopted a Final Fiscal Years 2022-2027 Program on June 23, 2021; and

WHEREAS, pursuant to §33.2-372 of the *Code of Virginia* the Board is required to establish the Interstate Operations and Enhancement Program (IOEP) to improve the safety, reliability, and travel flow along interstate highway corridors in the Commonwealth; and

WHEREAS, §33.2-372 requires the Board, with the assistance of Office of Intermodal Planning and Investment (OIPI), to establish a process to evaluate and prioritize potential strategies and improvements under the IOEP with priority given first to operational and transportation demand management strategies that improve reliability and safety of travel; and

WHEREAS, the Board approved the Policy for the IOEP, as required by §33.2-372, on June 23, 2021; and

WHEREAS, §33.2-372 permits the Board to use funds in the IOEP to address identified needs in the Statewide Transportation Plan pursuant to §33.2-353 of the Code of Virginia or an interstate corridor plan approved by the Board through operational and transportation demand management strategies and other transportation improvements, strategies, or services; and

WHEREAS, pursuant to §33.2-214, the Board shall only include a project or program wholly or partially funded with funds from the IOEP in the Six-Year Improvement Program if the allocation of funds from the IOEP and other funding committed to such project or program within the six-year horizon of the Six-Year Improvement Program is sufficient to complete the project or program; and

WHEREAS, certain short-term operational and transportation demand management strategies were included in the FY2022-2027 Six-Year Improvement Program adopted by the Board June 23, 2021; and

WHEREAS, on July 20, 2021, the Board was presented a proposed list of additional projects, including operational, transportation demand management, and capital improvements to be added to the Six-Year Improvement Program; and

WHEREAS, on January 15, 2020, the Board adopted an interim I-95 Corridor Improvement Plan in response to House Joint Resolution 581 and Senate Joint Resolution 276 of the 2019 Session of the General Assembly with an intent to complete an I-64 Corridor Improvement Plan and to undertake a prioritization of capital improvements identified in the interim I-95 Corridor Improvement Plan, both at a later date, to provide a more holistic picture of transportation needs on these two corridors; and

WHEREAS, the Board, OIPI, the Virginia Department of Transportation, and the Department of Rail and Public Transportation, have developed proposed I-64 and I-95 Corridor Improvement Plans, soliciting input from local elected officials, state legislators, citizens, and other affected stakeholders through a series of public meetings and hearings held along the I-64 and I-95 corridors, and have presented to the Board both Corridor Improvement Plans; and

WHEREAS, the proposed I-64 Corridor Improvement Plan (set forth in Appendix A) and the proposed I-95 Corridor Improvement Plan (set forth in Appendix B) identify targeted improvements along the entire I-64 and I-95 corridors, respectively; and

WHEREAS, needs on other interstate corridors were also evaluated and projects were identified to address needs on those corridors; and

WHEREAS, the projects set forth in Appendix C were included in the I-64 and I-95 Corridor Improvement Plans and/or address a need identified in the Statewide Transportation Plan, but were not included in the FY 2022-2027 Six-Year Improvement Program adopted by the Board on June 23, 2021, nor subsequently added to the Program; and

WHEREAS, the Board recognizes that the projects set forth in Appendix C are appropriate for the efficient movement of people and freight and, therefore, for the common good of the Commonwealth and further, that said projects are consistent with the Interstate Operations and Enhancement Program Policy.

NOW THEREFORE, BE IT RESOLVED, by the Commonwealth Transportation Board, that the proposed I-64 Corridor Improvement Plan set forth in Appendix A is hereby approved and adopted.

BE IT FURTHER RESOLVED, by the Commonwealth Transportation Board, that the proposed I-95 Corridor Improvement Plan set forth in Appendix B, which encompasses both project recommendations identified in the interim I-95 Corridor Improvement Plan approved by the Board on January 15, 2020 as well as additional project recommendations, is hereby approved and adopted.

BE IT FURTHER RESOLVED, by the Commonwealth Transportation Board, that the projects shown in Appendix C are added to the Six-Year Improvement Program of projects and programs for Fiscal Years 2022 through 2027 and are approved.

####

CTB Decision Brief

Approval of the I-64 and I-95 Corridor Improvement Plans and Addition of Interstate Operations and Enhancement Program Projects to the Six-Year Improvement Program for Fiscal Years 2022 - 2027

Issue: Pursuant to §33.2-372 of the *Code of Virginia*, the Commonwealth Transportation Board (CTB) is required to establish the Interstate Operations and Enhancement Program (IOEP) to improve the safety, reliability, and travel flow along interstate highway corridors in the Commonwealth. To effectuate implementation of the IOEP, the CTB is being requested to approve Corridor Improvement Plans for Interstates 64 and 95 and to approve the addition of certain projects to the Six-Year Improvement Program (Program).

Facts: The CTB must adopt a Program of anticipated projects and programs by July 1st of each year in accordance with § 33.2-214(B) of the *Code of Virginia*. On June 23, 2021, after due consideration, the CTB adopted a Final FY 2022-2027 Six-Year Improvement Program.

Pursuant to §33.2-372, the CTB is required to establish the Interstate Operations and Enhancement Program to improve the safety, reliability, and travel flow along interstate highway corridors in the Commonwealth. On June 23, 2021, after due consideration, the CTB adopted an Interstate Operations and Enhancement Program Policy.

Section 33.2-372 permits the CTB to use funds in the IOEP to address identified needs in the Statewide Transportation Plan pursuant to §33.2-353 of the *Code of Virginia* or an interstate corridor plan approved by the CTB through operational and transportation demand management strategies and other transportation improvements, strategies, or services.

On January 15, 2020, the CTB adopted an interim I-95 Corridor Improvement Plan in response to House Joint Resolution 581 and Senate Joint Resolution 276 of the 2019 Session of the General Assembly with an intent to complete an I-64 Corridor Improvement Plan and to undertake a prioritization of capital improvements identified in the interim I-95 Corridor Improvement Plan, both at a later date, to provide a more holistic picture of transportation needs on these two corridors.

The CTB, Office of Intermodal Planning and Investment, the Virginia Department of Transportation, and the Department of Rail and Public Transportation, have developed proposed I-64 and I-95 Corridor Improvement Plans, soliciting input from local elected officials, state legislators, citizens, and other affected stakeholders through a series of public meetings and hearings held along the I-64 and I-95 corridors.

The proposed I-64 Corridor Improvement Plan (set forth in Appendix A) and the proposed I-95 Corridor Improvement Plan (set forth in Appendix B) identify targeted improvements along the entire I-64 and I-95 corridors, respectively, and were presented to the CTB on July 20, 2021, along with a proposed list of related projects, including operational, transportation demand management, and capital improvements to be added to the Program.

In addition, needs on other interstate corridors were also evaluated and projects were identified to address needs on those corridors.

The projects set forth in Appendix C are included in the I-64 and I-95 Corridor Improvement Plans and/or address a need identified in the Statewide Transportation Plan and would accomplish the purposes of the IOEP, but have not thus far been included in the FY 2022-2027 Six-Year Improvement Program.

Recommendations: The Virginia Department of Transportation recommends adoption of the proposed I-64 Corridor Improvement Plan (set forth in Appendix A) and the proposed I-95 Corridor Improvement Plan (set forth in Appendix B) and the addition of the projects in Appendix C to the Six-Year Improvement Program for FY 2022–2027.

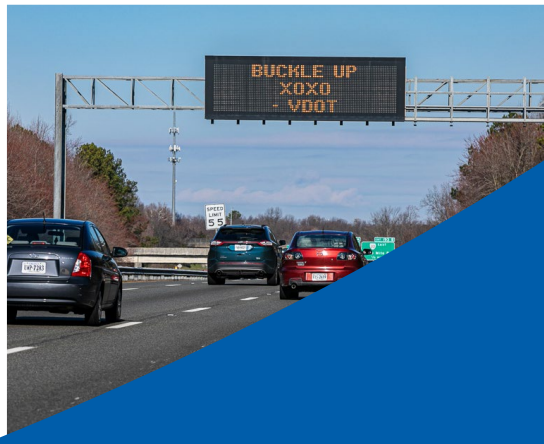
Action Required by CTB: The CTB will be presented with a resolution for a formal vote to approve/adopt the proposed Interstate Corridor Improvement Plans and to add the projects listed in Appendix C to the Six-Year Improvement Program for FY 2022–2027 to meet the CTB's statutory requirements and facilitate implementation of the IOEP.

Result, if Approved: If the resolution is approved, the proposed I-64 Corridor Improvement Plan and the proposed I-95 Corridor Improvement Plan will be implemented and the projects listed in Appendix C will be added to the Six-Year Improvement Program for FY 2022-2027.

Options: Approve, Deny, or Defer.

Public Comments/Reactions: None

Appendix A



Final Report

Interstate 64/664

Corridor Improvement Plan

September 2021

VDOT

Office of INTERMODAL Planning and Investment

DRPT
Virginia Department of Rail and Public Transportation

INTERSTATE 64/664

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Introduction

I-64 is the primary east-west interstate corridor in Virginia stretching more than 300 miles from the West Virginia border to Hampton Roads, where I-664 connects to I-64. The corridor serves as a critical commuter route for residents in Covington, Lexington, Staunton, Waynesboro, Charlottesville, and the metropolitan regions of Richmond and Hampton Roads. In the summertime, the I-64/664 corridor sees a marked increase in traffic as travelers make their way to Virginia's beaches. The I-64/664 corridor provides for the east-west movement of people, goods, and freight through various modes of transportation while supporting daily commuters as shown in **Figure 1**. More than 7 million trucks and approximately $135 billion in goods are moved through the corridor per year, according to Transearch Global Insights data. Additionally, the corridor serves as a key route for goods and freight entering and leaving the Port of Virginia.

FIGURE 1 SIGNIFICANCE OF THE I-64/664 CORRIDOR

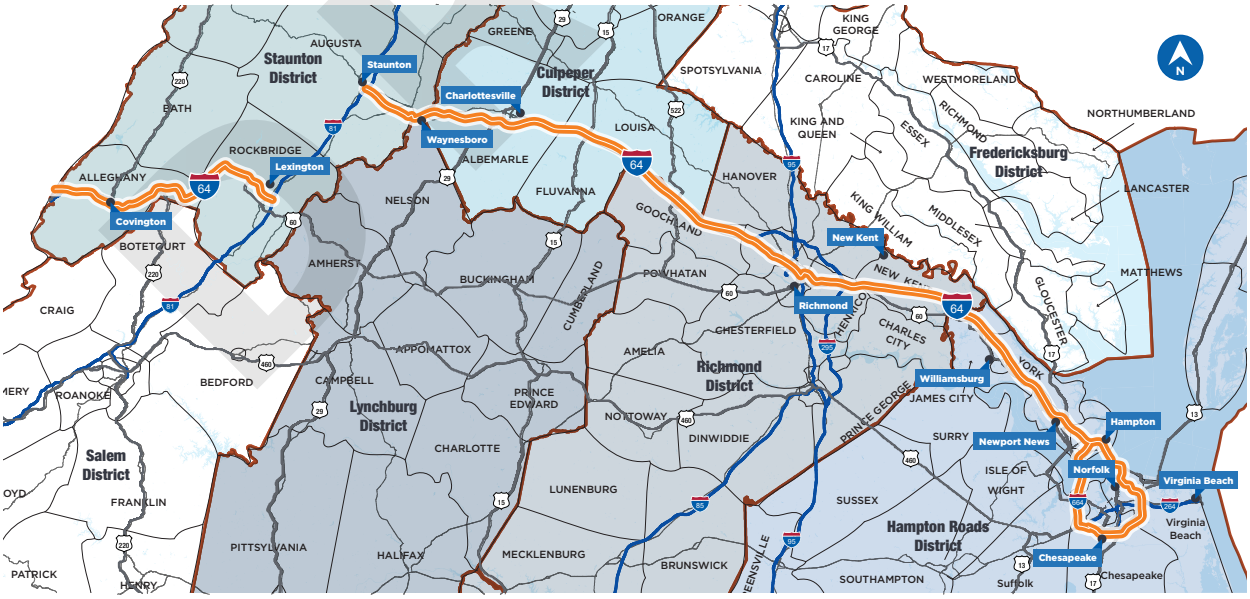
Study Request

In similar fashion to the I-81 and I-95 corridor improvement plans, the Secretary of Transportation and the Commonwealth Transportation Board (CTB) requested a study of the I-64 corridor to identify potential options for improvements to the corridor. The Office of Intermodal Planning and Investment (OIPI), the Virginia Department of Transportation (VDOT), and the Department of Rail and Public Transportation (DRPT) jointly conducted this study resulting in the I-64/664 Corridor Improvement Plan (Plan).

The Secretary of Transportation and study team determined that since the I-664 corridor is inextricably linked to the I-64 corridor in the Hampton Roads region, both corridors would be evaluated. In addition, the approximate 2.5-mile section of the I-95/I-64 overlap in Richmond was also included in the study area. However, the 25.3-mile section of the I-81/I-64 overlap in Augusta County was not included in the study area, as the needs on this portion of the corridor were addressed in the I-81 Corridor Improvement Plan and subsequent program of projects adopted by the CTB. The resulting length of the corridor is approximately 300 miles and is shown in **Figure 2**. The I-64/664 corridor traverses 12 counties, 13 cities, and four VDOT construction districts: Staunton, Culpeper, Richmond, and Hampton Roads. Also, this study includes the development of a corridor-wide operations improvement plan and evaluation of key parallel arterial routes along the I-64/664 corridor to identify strategies and improvements to more efficiently accommodate diversions of traffic, especially during major incidents on I-64 and I-664.

The results of the I-64/664 Corridor Improvement Plan will be folded into the Interstate Operations and Enhancement Program (IOEP), which is intended to improve the safety, reliability, and travel flow along interstate highway corridors in the Commonwealth. The IOEP was developed in accordance with Chapters 1230 and 1275 of the *2020 Virginia Acts of Assembly,* as codified in §33.2-372 and through amendments to § 33.2-232 and §33.2-358 of the *Code of Virginia,* in which the General Assembly of Virginia directed the CTB to prepare interstate corridor improvement plans for those interstate corridors with more than 10 percent of their vehicle miles traveled comprised of Federal Highway Administration (FHWA) Class 6 vehicles and above. These corridors (I-81, I-95, and I-64) receive dedicated funding from the IOEP. The IOEP policy text is provided in **Appendix A**.

FIGURE 2 STUDY AREA FOR I-64/664 CORRIDOR IMPROVEMENT PLAN



Study Purpose

The purpose of this plan is to identify a package of targeted operational, multimodal, and capital improvements that are expected to deliver safer and more reliable travel throughout the I-64 and I-664 corridors in Virginia.

Challenges in the Corridor

As the I-64 corridor spans the Commonwealth, from rural and mountainous western Virginia to the major metropolitan centers of Richmond and Hampton Roads, it faces varied challenges, differing and dependent on context.

On sections of I-64 in western Virginia, road users face the greatest risk of being involved in a serious crash, especially crashes impacted by steep terrain, winding roadway, or inclement weather. Although there is a lower number of overall crashes, there is a higher crash rate on many sections of I-64 west of the I-81 overlap compared to the busier sections of the corridor in the Richmond and Hampton Roads regions, as shown in **Figure 4** on page 6.

In Richmond, I-64 converges with I-95 through the center of the city. Significant congestion and safety issues are prevalent approaching the I-95/I-64 overlap and intensify at both the Bryan Park and I-95/I-64 East interchanges.

In the Richmond and Hampton Roads regions, more than $300 million has been invested in widening I-64 to three lanes in each direction, with another $244 million expected to complete Segment 3 of the project in the Williamsburg area.

- Segment A: Exit 200 to Exit 205
- Segment 1: Exit 247 to Exit 255
- Segment 2: Exit 242 to Exit 247
- Segment 3: Exit 234 to Exit 242

The projects address previous capacity deficiencies of I-64 by adding an additional travel lane in each direction. However, following project completion, a "gap" will remain between I-64 Exit 205 - Bottoms Bridge and Exit 234 - Lightfoot.

There are severe reliability and congestion issues along the I-64/664 corridor in the Hampton Roads region, where the interstate system connects the Peninsula to the Southside through the Hampton Roads Bridge-Tunnel (I-64) and the Monitor-Merrimac Memorial Bridge-Tunnel (I-664). Multibillion-dollar investments through the Hampton Roads Bridge-Tunnel Expansion, I-64 Southside/High Rise Bridge, and Hampton Roads Express Lanes projects aim to mitigate congestion and eliminate existing bottlenecks throughout the corridor. The Plan assumes that these projects are fully implemented. Finally, the Hampton Roads region faces significant challenges in creating a multimodal culture, where only approximately 1–1.5 percent of travelers use transit. Although the COVID-19 pandemic has substantially reduced transit ridership throughout the nation, existing investments in managed lanes facilities in the Hampton Roads region are anticipated to improve the reliability of the I-64/664 corridor, and aid in fostering a commuter culture less dependent on single-occupancy vehicles (SOV).

Approach to Solutions

Realizing that solutions to the challenges in the I-64/664 corridor involve various modes of travel and different types of expenditures, the study team used a stepped approach to identify improvements. As specified in section 33.2-372 of the Code of Virginia, this meant first identifying operational improvements to maximize efficiency of existing infrastructure and then multimodal options, which represent the next lowest cost solution that builds upon the overall goal of moving people. Finally, the team identified highway capital projects where performance issues could not be adequately addressed by either operational or multimodal improvements.

Existing Conditions

To understand the current travel conditions in the corridor, the study team gathered data from a variety of sources. This data included travel speeds; numbers and types of crashes; numbers, types, and durations of incidents; origins and destinations of passenger cars and trucks; numbers and types of traffic; multimodal service; and location, number of spaces and utilization rates at park-and-ride lots.

Depending on the time of day, the day of week, and the month of the year, travel in the corridor varies greatly. These differences were important to understand as the study team developed potential improvements.

Performance Measures

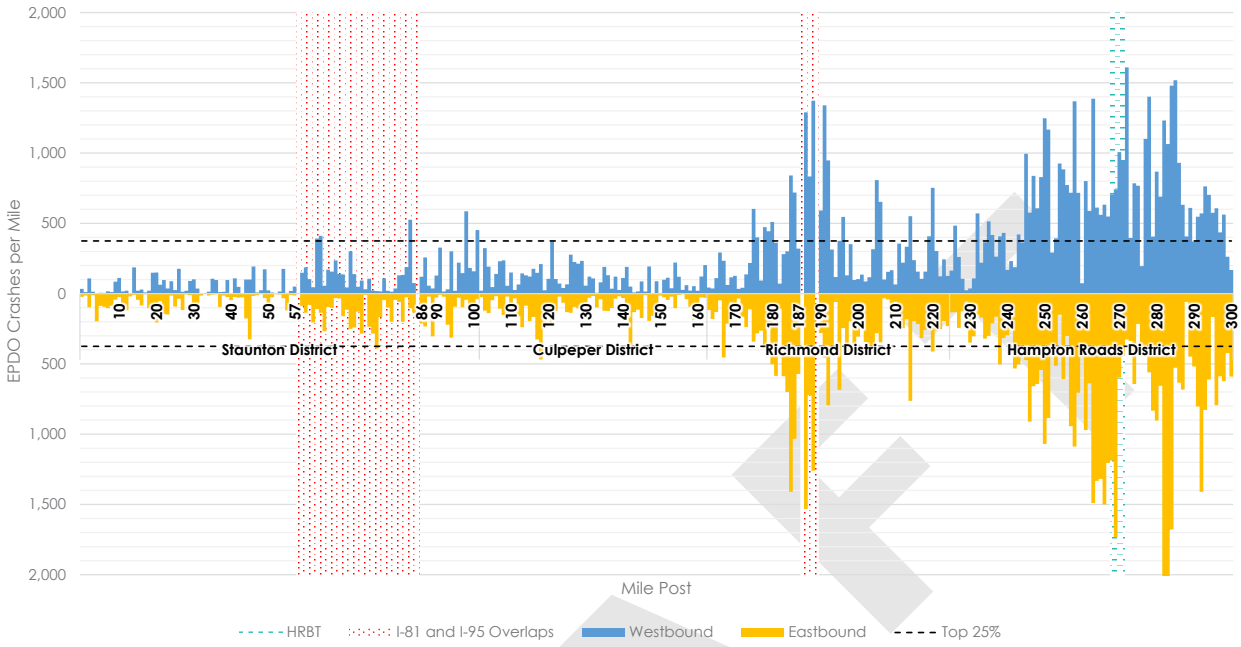
Based on a review of the available data in the corridor, the study team developed four performance measures to evaluate the existing operational and safety issues throughout the corridor. The team collected and summarized crash, delay, and Annual Average Daily Traffic (AADT) data for 5 years, from 2014 through 2018, in 1-mile segments by direction. For segments along I-64 that intersected with I-81, I-95, or I-664/264 (Bower's Hill Interchange), the team measured the segment to the nearest I-64 milepost and normalized the data on a per-mile basis. The study team then ranked the 1-mile segments and highlighted the top 25 percent of segment performance issues, regardless of direction, to be reviewed for potential improvements. The team employed the same process to determine the top 25 percent of segments along I-664. The four performance measures include:

- ***Crash frequency and severity:*** The total number of crashes, weighted by severity using the equivalent property damage only (EPDO) scale. *Source: VDOT Roadway Network System*
- ***Crash severity rate:*** The total rate of crashes, weighted by severity, per 100-million-vehicle-miles traveled. *Source: VDOT Roadway Network System and VDOT Traffic Monitoring System*
- ***Total delay:*** The total person hours of delay caused by the impacts of congestion, incidents, and weather events. *Source: INRIX*
- ***Incident delay:*** The total person hours of delay caused by incidents (crashes and disabled vehicles) that lead to at least one lane of the interstate to be closed for an hour or more. *Source: Regional Integrated Transportation Information System*

The team included performance measures data along the I-81 and I-95 overlaps for visual comparison only—the I-81 and I-95 overlap data did not impact the top 25 percent of performance measures along I-64. **Appendix B** includes histograms detailing each performance measure for I-64 and I-664.

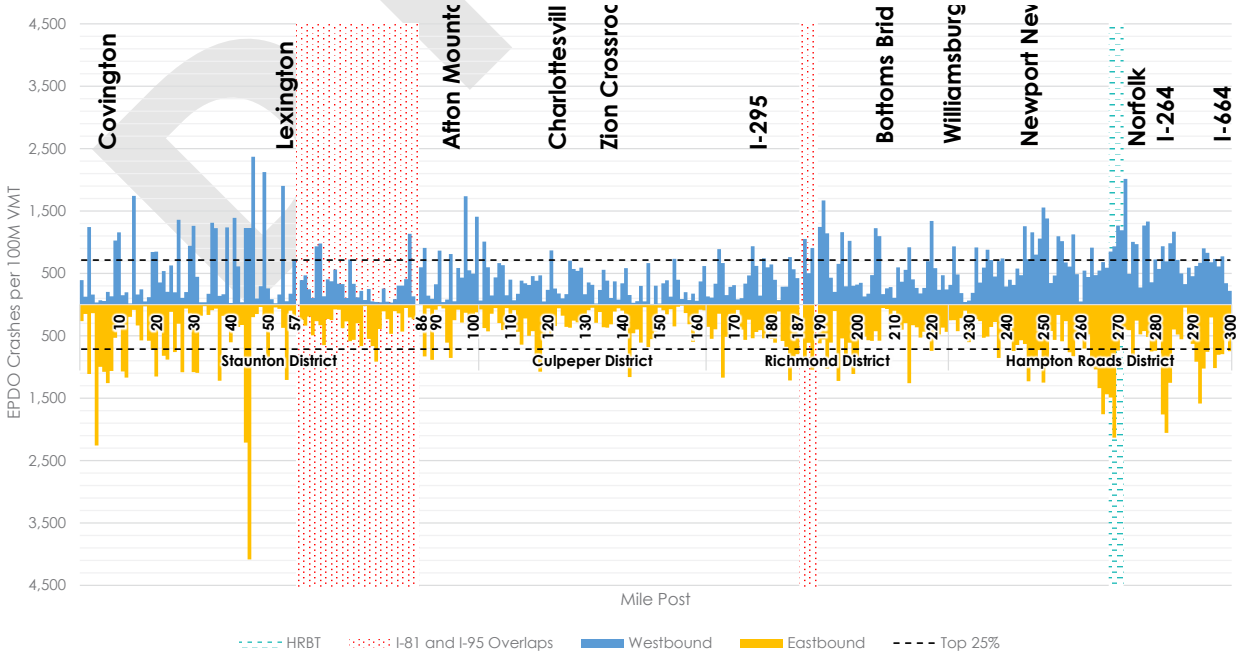
A histogram detailing the EPDO crashes per mile is shown in **Figure 3**.

FIGURE 3 I-64 EQUIVALENT PROPERTY DAMAGE ONLY (EPDO) CRASHES PER MILE



Whereas the EPDO crashes per mile data highlights crash trends predominantly in the metropolitan regions along the I-64 corridor, the following histogram detailing the EPDO crash severity rate, **Figure 4**, highlights significant crash trends along the mountainous western portion of the corridor. The study team used this information to focus on improvements that would provide the greatest safety benefit to road users.

FIGURE 4 I-64 EQUIVALENT PROPERTY DAMAGE ONLY (EPDO) CRASHES PER 100M VMT



In addition to the crash data, person hours of delay data revealed highly congested stretches of I-64 east and west of the I-95/64 overlap in Richmond and throughout Hampton Roads. The most prominent delay and incident delay hot spots occur along westbound I-64 between the I-64/264 interchange and the Hampton Roads Bridge-Tunnel and along eastbound I-64 approaching the Hampton Roads Bridge-Tunnel, as shown in **Figure 5** and **Figure 6**. The Plan assumes the programmed improvements between the Hampton Roads Bridge-Tunnel and I-64/664 Interchange at Bowers Hill will improve traffic along the most highly congested stretches, but congestion hot spots will likely remain, especially near the I-64/464 interchange.

FIGURE 5 I-64 ANNUAL PERSON HOURS OF DELAY

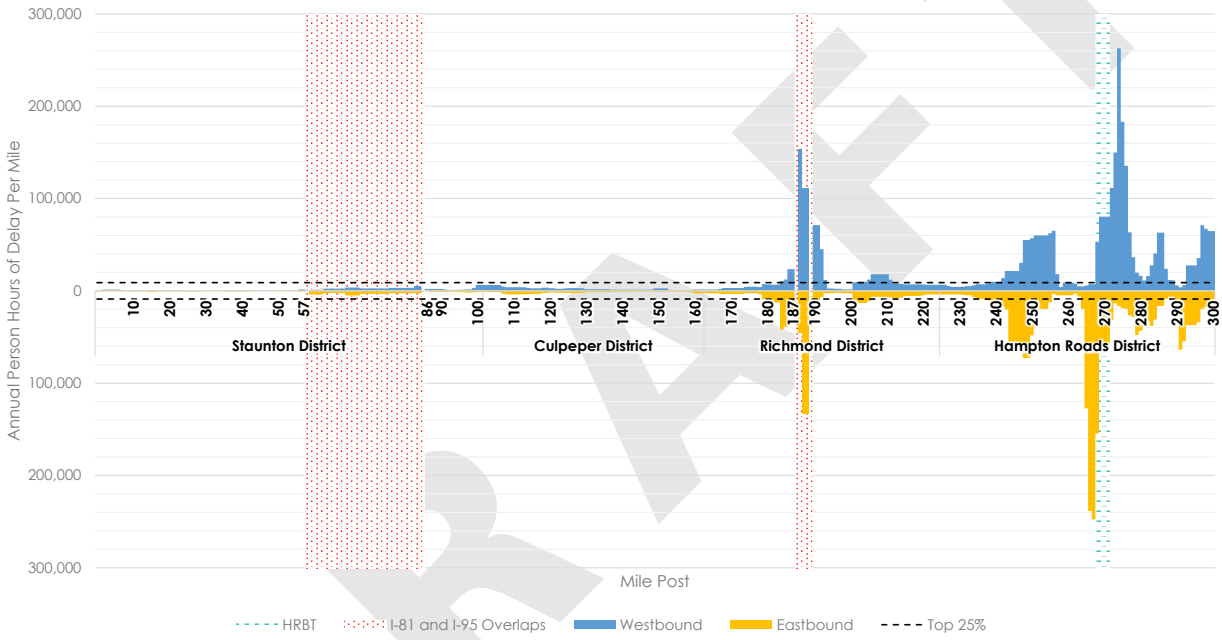
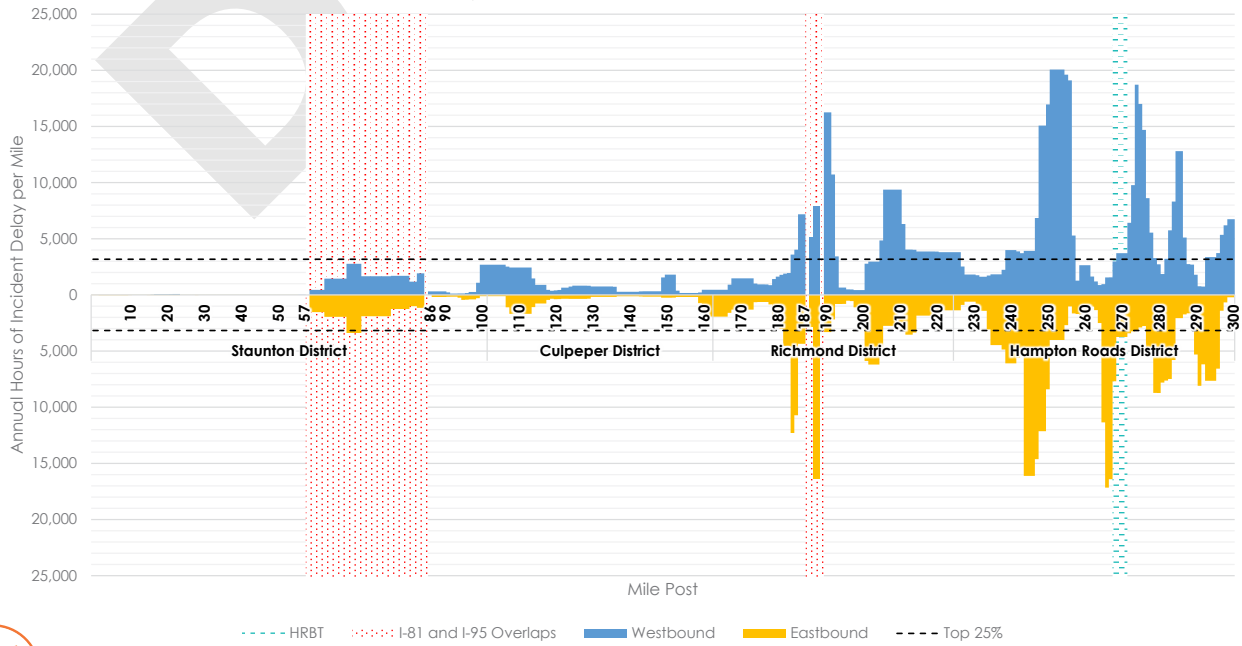


FIGURE 6 I-64 ANNUAL PERSON HOURS OF INCIDENT DELAY



Person hours of delay data along I-664, pictured below in **Figure 7**, showed heavy congestion approaching the Monitor-Merrimac Memorial Bridge-Tunnel, further highlighting the dependence on and volatility of the I-64/664 corridor bridge-tunnel network and the need for the planned investments in this area. Finally, the highest crash hot spots along I-664 occurred along the Monitor-Merrimac Memorial Bridge-Tunnel, as shown in **Figure 8**.

FIGURE 7 I-664 ANNUAL PERSON HOURS OF DELAY

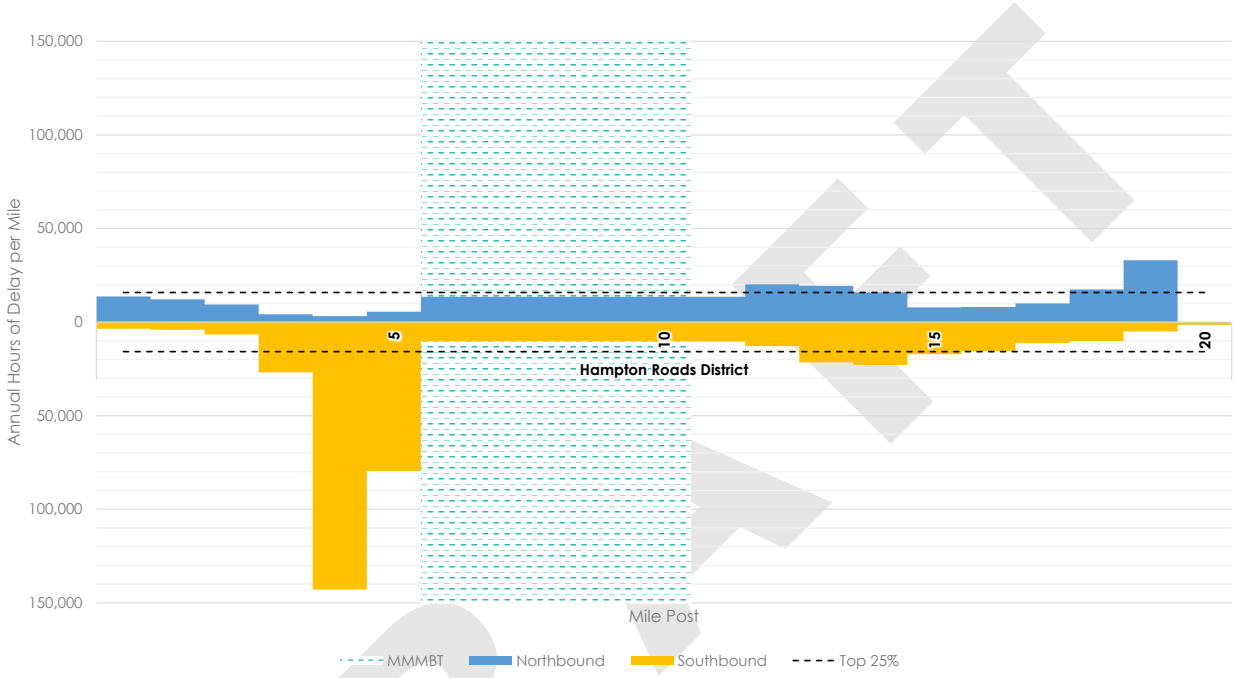
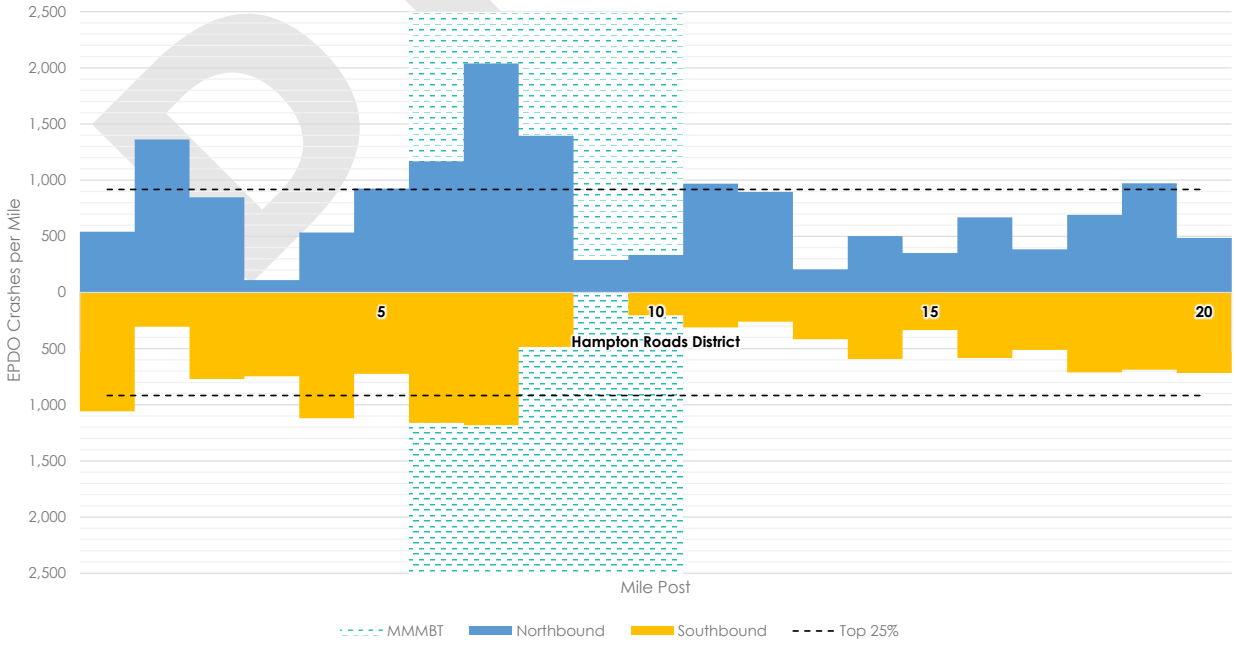


FIGURE 8 I-664 EQUIVALENT PROPERTY DAMAGE ONLY (EPDO) CRASHES PER MILE



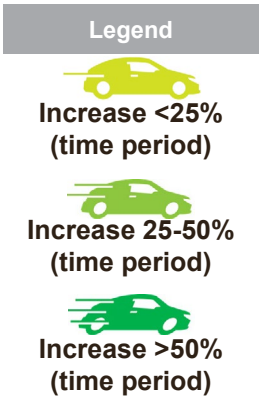
Projects Completed by 2026

The study team reviewed projects already funded in the VDOT Six-Year Improvement Program (SYIP) to determine how those projects may resolve issues in the corridor relating to two performance measures: crash frequency and severity and total delay. Additional SYIP project details are presented in **Appendix C**. The study team did not review 1-mile segments for additional improvements if the safety and delay benefits from the funded projects were projected to remove the segment from the top 25 percent of segments for all performance measures. The study team evaluated the potential benefits of the following seven projects.

- Hampton Roads Bridge-Tunnel Expansion
- Hampton Roads Express Lanes Network
- Peninsula Widening Segment A: from I-295 to Bottoms Bridge
- Peninsula Widening Segment I: from Route 238/Yorktown Road to Jefferson Avenue
- Peninsula Widening Segment II: from Humelsine Parkway/Marquis Center Parkway to Route 238
- Peninsula Widening Segment III: from Route 199 (Lightfoot) to Humelsine Parkway/Marquis Center Parkway
- I-64 Southside / High Rise Bridge

Projected changes in PM peak period speed for three of these programmed improvements are shown in **Figure 9**.

FIGURE 9 PEAK PERIOD SPEED BENEFITS FROM PROGRAMMED IMPROVEMENTS



Project Description	Projected Change in Travel Speed (PM Peak)	
	Eastbound	Westbound
Hampton Roads Bridge Tunnel		
Hampton Roads Express Lanes		
High-Rise Bridge		

The study team used Hampton Roads Express Lanes analysis data to project traffic conditions in 2026. Based on Hampton Roads Express Lanes assumptions, existing bottlenecks at the Hampton Roads Bridge-Tunnel were effectively mitigated. However, the team identified significant congestion during future conditions along other sections of the I-64 Hampton Roads corridor, namely on I-64 eastbound (Hampton Roads Beltway inner loop) approaching the I-64/464 Interchange in Chesapeake.

Supplementary Data

The study team collected and summarized additional data to supplement the four performance measures for the identification of problem areas and project identification. The supplementary data includes the following information:

- **Speed data:** The study team collected INRIX data in 15-minute intervals to summarize average speed patterns and variability in speeds throughout the corridor per time of day, day of week, and time of year for 2018.
- **Origin-destination data:** The study team collected StreetLight data and summarized origin-destination patterns on I-64 and I-664 in 2018. The study team summarized the following by time of day and day of week:
  - Statewide interchange-to-interchange travel patterns as shown in **Figure 10**
  - Route choice between the Hampton Roads Bridge-Tunnel and Monitor-Merrimac Memorial Bridge-Tunnel for passenger cars and trucks traveling between the Peninsula and the Southside in Hampton Roads during the a.m. and p.m. peak periods.
- **Incident data:** The study team collected and summarized additional incident data from VA Traffic, including the number of total or lane-impacting incidents and the average time to clear a lane or scene.

The incident data was used to help identify specific countermeasures at various locations along the corridor. For example, the incident clearance time hot spot graphic highlighted that the western regions of the Richmond and Staunton maintenance districts have experienced the longest incident clearance times, as shown in **Figure 11**. The study team has proposed to expand safety service patrol programs to better serve these locations.

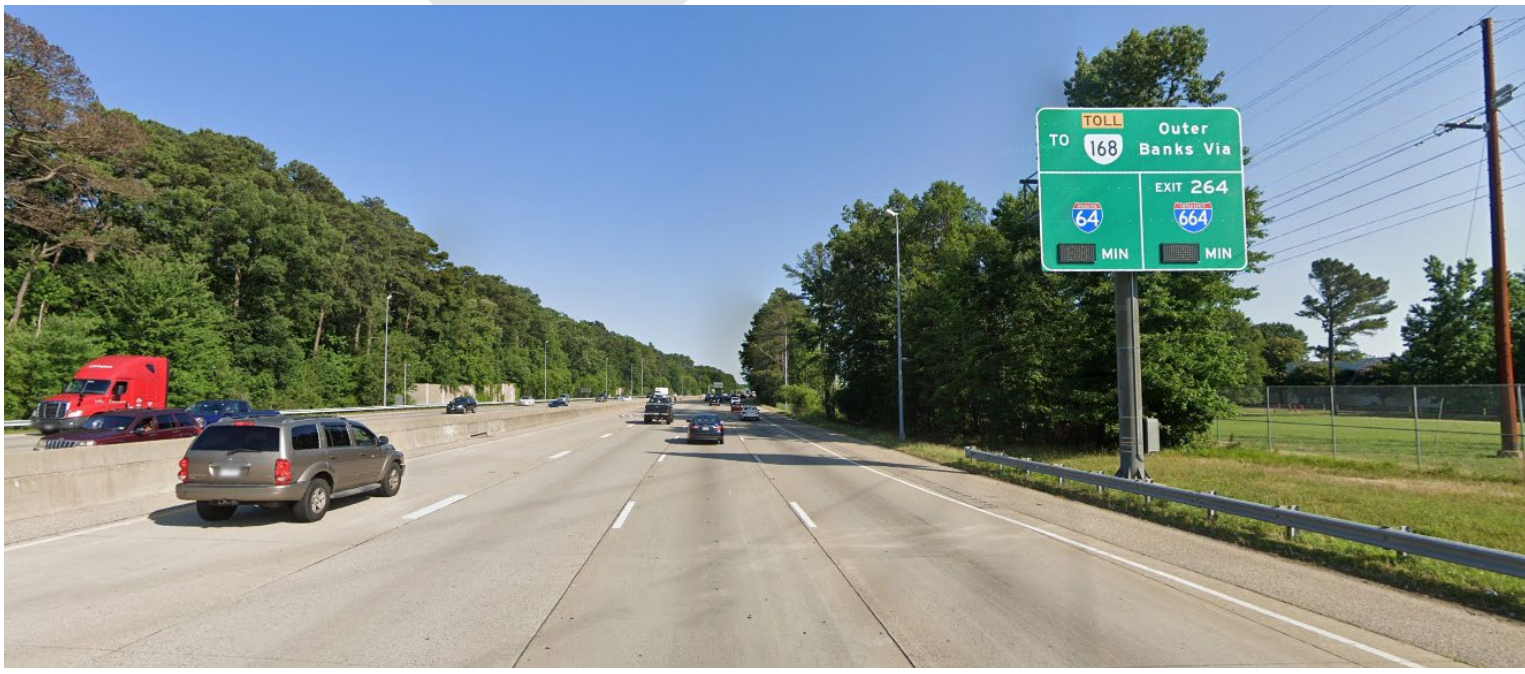


FIGURE 10 I-64 ORIGIN-DESTINATION PATTERNS BY INTERCHANGE

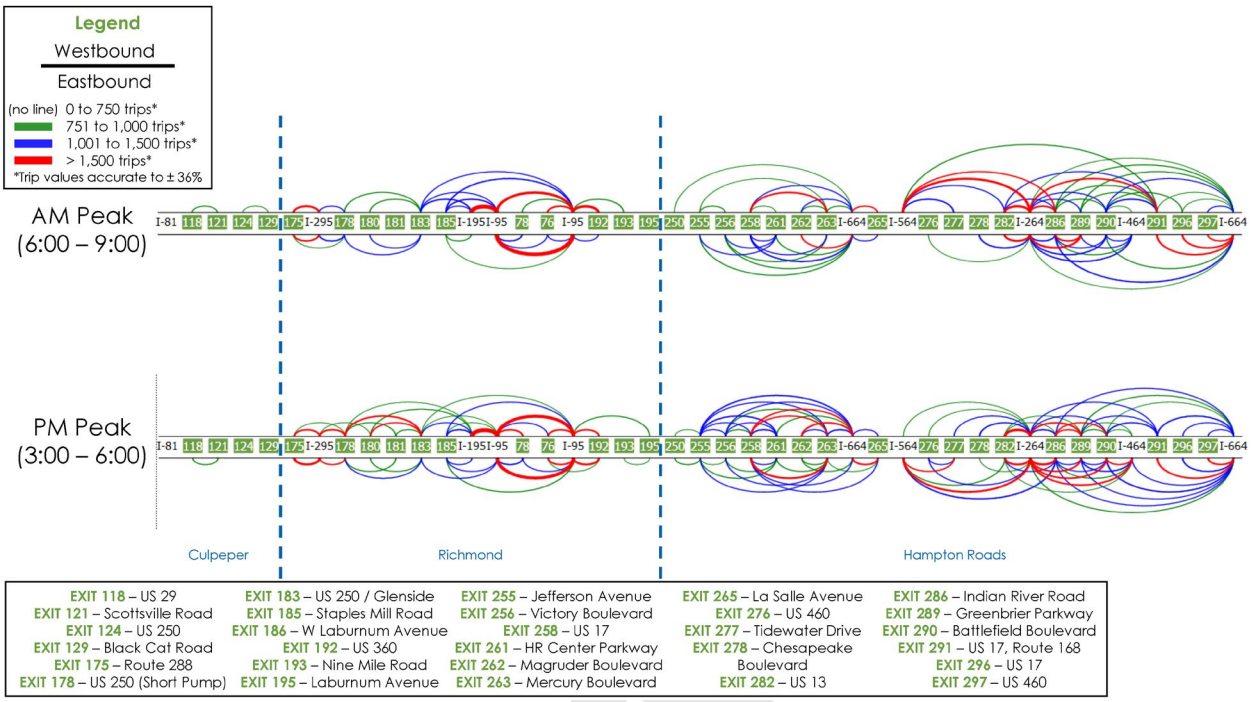
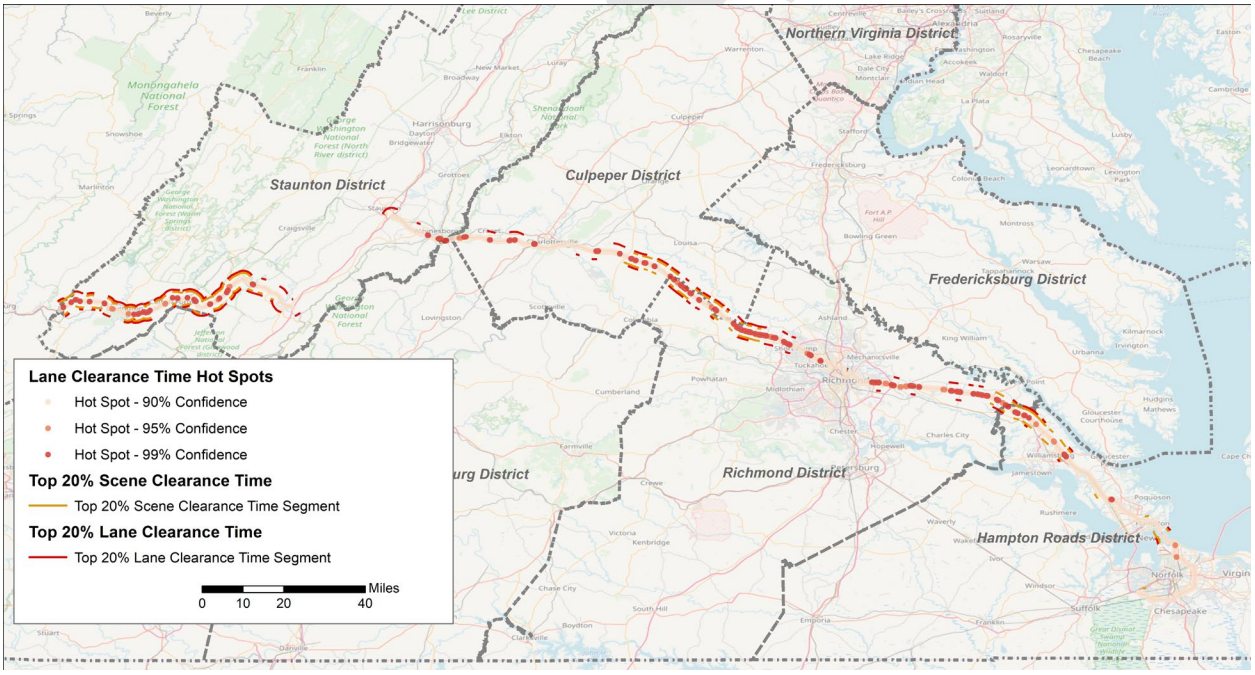


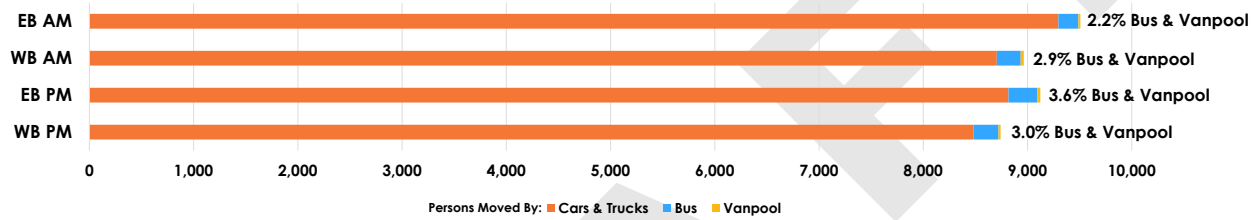
FIGURE 11 I-64 INCIDENT CLEARANCE TIME HOT SPOTS



Multimodal Corridor Characteristics

The I-64/664 corridor has a wide range of multimodal travel options—such as bus, rail, carpool, and vanpool—which have an opportunity to contribute greatly to moving people in the I-64/664 corridor, offering an array of alternatives to SOV travel. However, the usage of these alternatives is limited. Rail service along the corridor is provided by Amtrak, which serves a number of cities along the corridor, including Clifton Forge, Charlottesville, Richmond and Newport News. Commuter bus service is available in Richmond and Hampton Roads and supports the usage of park-and-ride lots. **Figure 12** provides a sample of how people are using multimodal options in the Hampton Roads region at a major bottleneck for travel in the corridor, the Hampton Roads Bridge Tunnel.

FIGURE 12 SINGLE AND HIGH OCCUPANCY VEHICLE ON I-64 AT THE HAMPTON ROADS BRIDGE TUNNEL



Park-and-ride lots contribute positively to multimodal travel along the corridor. The availability of commuter parking not only enables more people to make use of bus and vanpool systems when co-located with transit hubs, but also helps enable a robust culture of carpooling. Commuter assistance programs, such as Traffix, Ridefinders, RideShare, and RIDE Solutions, provide residents, employers, and workers along the I-64/664 corridor with travel options information, trip planning, guaranteed rides home, and multimodal ride matching services.

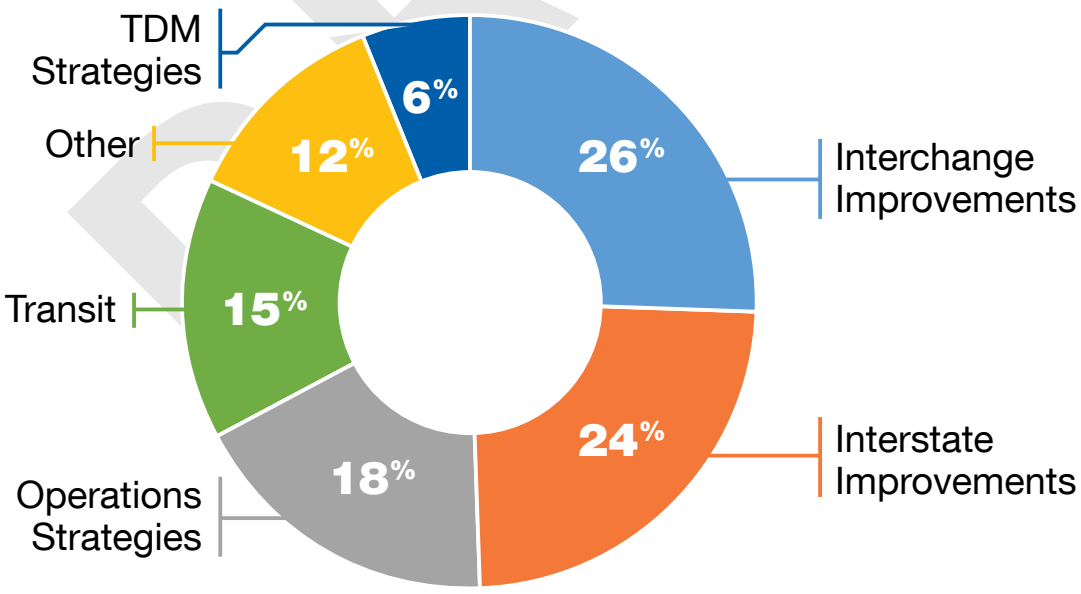
Additionally, the presence of the I-64 Express Lanes in Norfolk and future Hampton Roads Express Lanes network make bus transit travel along the corridor more reliable and incentivizes carpooling and vanpooling, as vehicles with two or more people do not pay a toll. Traffic occupancy counts and modeling indicate that during peak periods, on a per-lane basis, the express lanes on I-64 could carry more persons than the general purpose lanes.

Public Outreach

The COVID-19 pandemic began at the beginning of the I-64/664 Corridor Improvement Plan study and required the study team to facilitate public outreach through digital formats. The study team hosted an online public engagement website (www.i-64-664publicinfo.com/), which included informative videos on the study process and allowed participants to comment on existing conditions and potential improvements on the I-64/664 corridor. VDOT shared social media blasts to targeted audiences based on their proximity to the I-64/664 corridor to encourage participation in MetroQuest surveys in July and October. Virtual public meeting display boards are included in **Appendix D**.

The first MetroQuest survey was available from July 13, 2020 -August 15, 2020 and focused on existing conditions along the corridor. More than 4,500 participants provided feedback and placed nearly 7,500 map markers at various locations within the study area. The second MetroQuest survey was available from October 20, 2020 – November 22, 2020 and focused on potential solutions along the corridor. Nearly 1,400 participants ranked their preference of the potential solutions while also providing feedback about their preferred funding allocation. The number of comments received by category are shown in **Figure 13**.

FIGURE 13 PUBLIC COMMENTS BY CATEGORY



Public engagement meeting summaries and public survey results are included in **Appendix E**.

Operations Improvement Plan

Mainline Operations Strategies Identification and Summary

Mainline operations strategies are used to address the impacts of non-recurring congestion such as vehicle crashes and weather events and respond to those incidents as quickly as possible. These strategies are integral to the function of the freeway and are currently being used on I-64, I-664, and other roadways in Virginia. Mainline operations strategies include the following types of improvements:

- Closed-circuit television (CCTV) cameras
- Changeable message signs (CMS)
- Safety service patrol (SSP)
- Freeway incident management program tools

These infrastructure improvements and incident response tools require proper integration and coordination with VDOT Traffic Operations Centers to be used most effectively. The study team used a combination of input from the VDOT Regional Operations Directors (RODs); corridor characteristics; corridor performance measures; return on investment analysis; and coordination with other parallel facilities and roadway improvements to determine proposed locations for the strategies.

CCTV Cameras

CCTV cameras are in use along the corridor to help identify incidents and monitor the corridor. They are useful in verification of traffic and weather conditions as well. There are approximately 313 cameras in operation along I-64 and I-664. Camera expansions are based on two goals:

1. Have a camera at key interchanges to support detour management after incidents occur
2. Have cameras at rural locations with crashes and incidents as demonstrated by the corridor performance measures

There are five recommended camera expansion locations for the I-64 corridor as shown in **Table 1**.

TABLE 1 RECOMMENDED CAMERA EXPANSION

Sites	Camera Expansion Locations
Interchanges	Exits: 211, 220, 227, 231
High Incident Locations	Relocate camera from mile marker 102.1 to 102.4 to improve viewshed

Changeable Message Signs

Message signs are in use along the corridor to inform drivers of travel conditions ahead and to help manage detours. There are approximately 196 message signs in operation along I-64 and I-664. Message signs are often installed at key decision points on the mainline highway, and the recommended message signs are for this same purpose. Two additional signs are recommended to alert motorists prior to the interchanges of I-64 with US 29 and US 250 in Charlottesville, which provide alternative routes to I-64 and I-81. These are summarized in **Table 2**.

TABLE 2 RECOMMENDED MESSAGE SIGN EXPANSION

Changeable Message Sign Expansion Locations	
Install New	➡ I-64 eastbound approaching Exit 118 ➡ I-64 westbound approaching Exit 124

Safety Service Patrols (SSP)

SSP is a system of support vehicles that are used to assist disabled vehicles, identify incidents, and assist with the clearance of debris and incidents from the roadway. Varying levels of coverage exist along much of the corridor including between I-64 Exit 87 (I-81) and Exit 136 (US 15), I-64 Exit 175 (VA-288) and Exit 299 (I-664), and all of I-664 as well as the I-64/I-81 overlap.

The study team identified potential locations for SSP expansion using incident history and hourly traffic volume data. The analysis also considered extenuating circumstances that impact typical traffic conditions, such as special events. The analysis revealed the need for expanded SSP coverage on the weekends in the Charlottesville area between Exit 114 and Exit 130.

Additional SSP strategies were identified to enhance the functionality of service in the I-64/I-664 corridor. This includes installing lift-and-tow devices on a portion of the fleet, which will allow these SSP trucks to relocate disabled vehicles (in non-injury situations) from travel lanes to the roadside to clear blocked lanes faster. Automated hazard alerts are recommended for the corridor fleet, which will provide real-time digital alerts to approaching drivers using the Waze navigation app when SSP are on-scene with amber lights activated. This will give additional time for drivers to slow down and move over. Recommended SSP strategies for the I-64/I-664 corridor are summarized in **Table 3**.

TABLE 3 RECOMMENDED SAFETY SERVICE PATROL EXPANSION

Safety Service Patrol Expansion	
Expand Charlottesville Route	• Add weekend (Saturday–Sunday) SSP coverage on I-64 from Exit 114 to Exit 130
Lift-and-Tow Devices	• Equip a portion of the I-64/I-664 corridor SSP fleet (approximately 25 trucks) with lift-and-tow devices
Automated Hazard Alerts	• Equip I-64/I-664 corridor SSP fleet (approximately 100 trucks) with automated hazard alert capabilities

Freeway Incident Management Program Tools

This program area includes strategies with a combined purpose to provide better data tools and resources to access and respond to incident events properly. These tools enable the right resources to be brought to the scene which minimizes rework and delay.

While the Virginia State Police are often the first responder to incidents directly on I-64/I-664, localities can respond to and support interstate incidents as well. Localities also respond to incidents along the parallel facilities. Information about the location and status of both interstate and parallel facilities incidents is essential for effective incident management.

VDOT has developed a program to share information from local authorities responding to freeway incidents directly to VDOT's Traffic Operations Centers by way of Public Safety Answering Point (PSAP) integration. Counties or localities requiring PSAP integration in the I-64/I-664 corridor are shown in **Table 4**.

TABLE 4 COUNTIES/LOCALITIES REQUIRING PSAP INTEGRATION

Corridor	# Entities	Locations	
I-64	**9**	• Alleghany County • Rockbridge County • Augusta County • City of Staunton • Albemarle County	• Louisa County • Goochland County • New Kent County • City of Virginia Beach

Parallel Facilities Improvements Identification and Summary

During traffic incidents or periods of congestion on the I-64/664 corridor, motorists choose to use roadway facilities parallel to the corridor to avoid or minimize delays. A major incident on the interstate can result in a road closure of the impacted interstate segments and result in temporary routing of traffic onto these parallel facilities. The ***Virginia Freeway Traffic Management Incident Detour Plan*** specifies parallel facilities to be used during road closures between each segment of the I-64/664 corridor. The study team evaluated parallel facilities to identify improvements that could enhance safety and improve operations during significant traffic incidents or periods of congestion. Highest priority was given to improvements that support the capabilities to directly influence or mitigate traffic during an incident at locations where safety and congestion performance measures rank in the top 25 percent. The study team identified intersection improvements totaling more than $100 million, which were prioritized and organized into funding tiers.

The study team compiled available information such as the crash data, asset data for traffic signal infrastructure, and the status of planned or programmed projects on the detour routes. The study team then identified systemic improvements, such as traffic signal timing optimization, traffic signal equipment upgrades, communications upgrades, and deployment of automated traffic signal performance measures (ATSPM) to address operational limitations of the parallel facilities. In addition, locations were identified for the installation of CCTV cameras to provide improved monitoring and detection capabilities for incidents and response times and to be able to provide additional notification to drivers. Nearly 2,500 individual improvements at 670 locations were identified along parallel facilities. Planning-level cost estimates were developed for each of the identified potential improvements. **Table 5** summarizes the number of potential parallel facility improvement locations in each district.

TABLE 5 NUMBER OF IDENTIFIED PARALLEL FACILITY IMPROVEMENTS BY DISTRICT

Jurisdiction	Staunton	Culpeper	Lynchburg	Richmond	Hampton Roads	Total
VDOT	42	27	1	109	32	211
Locality	24	2	0	43	390	459
Total	**66**	**29**	**1**	**144**	**422**	**670**

*Consists of improvements to enhance operations along incident detour routes, including ATSPM, communications, ATC controllers, and CCTV cameras

To pare down the 670 intersection improvements that totaled more than $100 million, to targeted priorities, the study team established four tiers among the incident detour route signalized intersections. Tier 1 intersections were highest priority and are on detour routes serving sections of mainline I-64/664 with the highest prevalence of performance measures. The study team recommended two corridors consisting of Tier 1 intersections—along US 33 (Staples Mill Road) between I-64 and I-295 in the Richmond District and along Route 199 in the Hampton Roads District—for funding. These corridors were prioritized due to their logical termini for funding and their use as detour routes by the Districts. Based on follow-up conversations with the Districts, two fiber communications installation projects were selected to be delivered with I-64 Corridor Improvement Plan arterial operations funds to support improved operations along the recommended corridors. These improvements are presented in **Table 6**.

TABLE 6 PARALLEL FACILITIES PRIORITIZED IMPROVEMENTS

District	Route	Extents	Project Description	Cost Estimate
Hampton Roads	Humelsine Parkway (Route 199)	I-64 Exit 242 to I-64 Exit 234	Installation of fiber optic communications along Route 199.	$1.3M
Richmond	I-64	I-64 Exit 177 to I-64 Exit 187	Installation of fiber optic communications. Enables future connectivity along the Staples Mill Rd corridor.	$3.1M

Return on Investment (ROI) Analysis

An ROI analysis was conducted for each of the operational improvement needs identified. Capital costs as well as the 10-year operations and maintenance (O&M) costs were calculated for each improvement and weighed against anticipated benefits. The results of the analysis can be seen in the recommendations in **Table 7** and **Table 8**.

TABLE 7 MAINLINE OPERATIONS IMPROVEMENTS RETURN ON INVESTMENT

Proposed Operational Improvement	Implementation Cost	O&M Cost (10 Years)	Benefit (10 Years)	ROI (10 Years)
CCTV Cameras (5)	$915K	$258K	$4.3M	**3.5**
Changeable Message Signs (2)	$1.0M	$486K	$10.5M	**7.0**
Safety Service Patrols	$875K	$2.2M	$11.1M	**3.6**
PSAP Integration	$800k	-	$8.6M	**10.7**

TABLE 8 PARALLEL FACILITIES OPERATIONS IMPROVEMENTS RETURN ON INVESTMENT

Proposed Operational Improvement	Implementation Cost	O&M Cost (10 Years)	Benefit (10 Years)	ROI (10 Years)
Signal Upgrades*	**$4.1M - $4.6M**	**$725,000**	**$140.0M**	**27.2**
ATSPM	$1.2M - $1.3M	$150,000		
Communications	$0.8M - $0.9M	$500,000		
ATC Controller Upgrade	$1.9M - $2.1M	$50,000		
Signal Timing	$0.2M - $0.3M	$25,000		
CCTV Cameras - Arterials	**$0.3M - $0.4M**	**$75,000**	**$4.0M**	**9.6**

* Includes upgrades to ATSPM, Communications, ATC Controller, and Signal Timing

Multimodal Improvements Plan

Development of Multimodal Improvements

A cooperative process involving VDOT, DRPT, regional transit providers and OIPI, rooted in existing planning efforts and public feedback, was conducted to define and fully develop the specific multimodal improvements that will be included in the plan. The following steps were conducted to develop the final list of potential improvements:

1. Review existing plans, studies, and planned activities in coordination with local transit providers.
2. Screen projects using subjective and objective evaluation factors
3. Conduct secondary screening based on project focus areas
4. Conduct modified SMART SCALE project scoring
5. Allocate funding based on IOEP policy

Existing Plans and Studies

Based on the existing wealth of recent multimodal planning and the expedited time constraints of this study, the Secretary of Transportation directed the study to focus on identifying improvements that have been previously documented in lieu of conducting new modeling or analysis. To identify multimodal and commuter assistance improvements in the corridor, the study team looked to recently-completed plans and studies that have targeted the I-64/664 corridor. Additionally, rail-related improvements included in this study are informed by ongoing, long-term efforts throughout the Commonwealth, including the Virginia Statewide Rail Plan and Transforming Rail in Virginia Program.

Project Screening

The improvements that were compiled underwent several rounds of screening by the study team to evaluate their performance compared against the overall goal of the I-64/664 Corridor Improvement Plan, to provide faster, safer, and more reliable travel along the I-64/664 corridor.

Preliminary Screening

Following a review of existing plans, 378 potential recommendations were identified. The first preliminary round of screening occurred in February 2020 through which the project team recommended to the Commonwealth a list of 49 projects that had the potential to be carried forward based on the potential impact to performance of I-64 and I-664, as well as the objective and subjective evaluation factors listed below. The objective screening factors were assessed by data from existing studies and did not incorporate new analysis. Any projects that were duplicates or included in the baseline scenario (funded to be complete by 2026) were not included.

Secondary Screening and Refinement

During Spring 2020, to further narrow down the list of potential multimodal recommendations, projects were compared using the criteria described above and the following direction from the Secretary of Transportation:

- Support options for intercity non-SOV travel
- Focus on solutions for the top origin-destination pairs
- Support mode shift from SOVs in Richmond and Hampton Roads

This resulted in a list of 16 projects that could be advanced for the SMART SCALE-like evaluation described in the following section. Before the evaluation, the project list was refined based on the following:

- Coordination with and input from transit providers
- Availability of defined alignments, ridership projections, and costs
- Consideration of park-and-ride needs that had developed following the completion of the previous studies
- Decision that commuter assistance programs would be considered but not as individual projects

Multimodal Improvements

After the project screening process described above, a total of 16 multimodal projects have been proposed to be prioritized for funding, for a total of $57.94 million. These 16 projects represent the priorities out of the 378 total multimodal projects initially identified for consideration in the four VDOT districts. The plan includes potential multimodal improvements as laid out in **Table 9**—commuter bus service, local bus service, park-and-ride lots, and commuter assistance programs. The multimodal improvements are part of a suite of proposed improvements along I-64/664 including operational improvements on I-64/664, improvements on parallel facilities (such as VA 199), and capital projects on I-64/664.

TABLE 9 TYPE OF MULTIMODAL IMPROVEMENT

Type of Multimodal Improvement
Commuter/Local Bus: Improvements such as new express bus routes from the western suburbs of Richmond to Downtown Richmond or increased frequencies for routes serving Newport News Shipbuilding.
Park-and-Ride: Improvements such as expansion of existing lots and construction of new lots.
Commuter Assistance Programs: Improvements such as enhanced multimodal ridematching, rewards for non-SOV travel, and strategic marketing and promotion of multimodal travel options and services, with emphasis on the most congested segments of I-64/664.

Commuter and Local Bus

The provision of commuter and local bus service is an important part of the congestion solution along the I-64/664 corridor, and especially in the Hampton Roads region. Today, commuter buses move a limited number of passengers across the James River in the peak period because they have to experience the same congestion as SOV do. However, there is an opportunity for increased use of bus service in Hampton Roads with the construction of the Hampton Roads Express Lanes. The express lanes will allow for more reliable and frequent service to major employment destinations, such as the Newport News Shipbuilding, Naval Station Norfolk, and the Port of Virginia.

Previous studies conducted by Hampton Roads Transit (HRT) and Greater Richmond Transit Company (GRTC) have shown demand for and recommended commuter bus service originating at suburban park-and-ride lot locations in each of these major metropolitan areas along the I-64/664 corridor, serving key destinations.

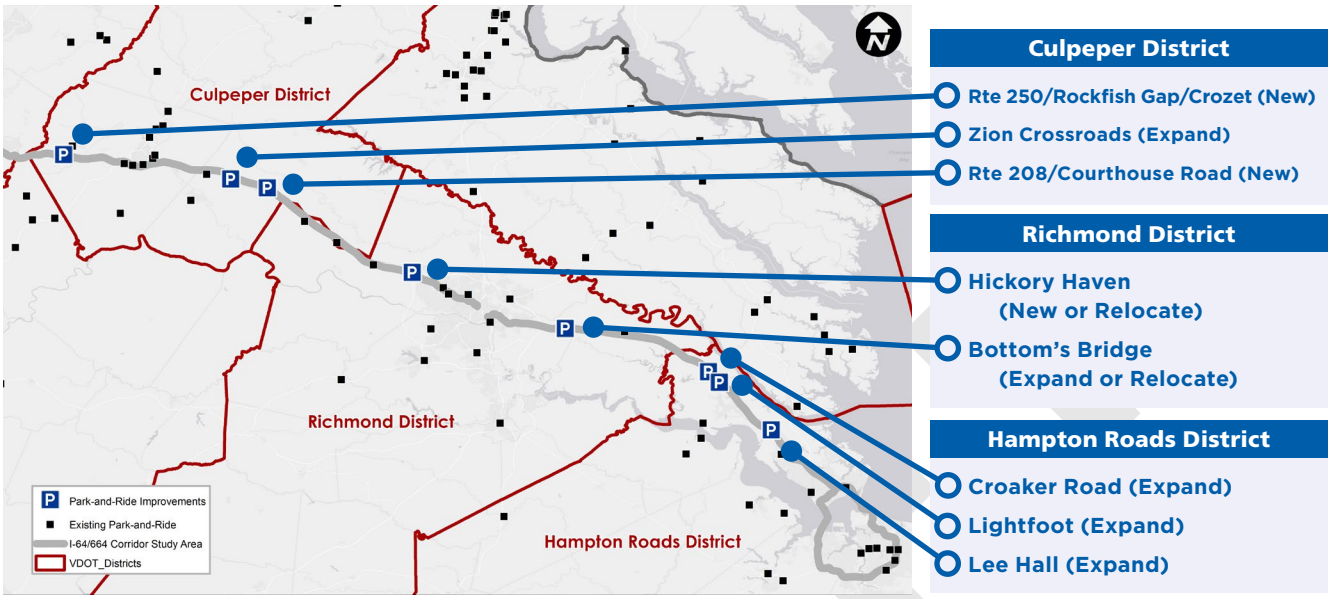
Potential service improvements identified in this study include commuter and local routes in Richmond connecting to Short Pump and enhanced frequencies from Downtown Richmond east to the Richmond airport. Improvements in Hampton Roads include enhanced frequencies for existing local routes in Newport News and MAX express routes serving the Peninsula and Southside.

Park-and-Ride Lots

Park-and-ride lots are a common transportation feature along the I-64/664 corridor and include state-owned, privately-owned, and informal lots. Under the oversight of VDOT, these facilities allow commuters—particularly long-distance commuters—to park their vehicles at a convenient location and then finish their commute using alternative transportation modes including carpool, vanpool, bus, train, bike, or walking.

This plan recommends enhancement, expansion, or new construction of eight park-and-ride lots at key points along the I-64/664 corridor as shown in **Figure 14**. When combined, these recommendations could contribute more than 1,000 new parking spaces to the existing 4,300 spaces in the corridor—a 23 percent increase. Many park-and-ride lots will provide connections to existing and future commuter bus service, and all newly-constructed lots will be designed to accommodate and optimize carpool and vanpool operations.

FIGURE 14 PROPOSED PARK-AND-RIDE IMPROVEMENTS



Commuter Assistance Programs

Building new and widening existing roads alone is not enough to meet Virginia's current and future transportation needs. Congestion was identified by the first public survey as the most important issue to address. To effectively improve mobility, provide more travel options, move more people, and promote and sustain economic growth, there is a necessity to move more people with fewer vehicles by sharing rides and using high-capacity modes such as bus or rail. Commuter assistance programs are part of the solution to ensure people know about and are supported in using non-SOV modes of travel.

Commuter assistance programs provide transportation choices, make Virginia's transportation more efficient, and help improve air quality. This is accomplished by moving more people in fewer vehicles, reducing vehicle miles traveled, reducing vehicle trips, and moving peak period trips to off-peak times. The focus of commuter assistance programs is to move more people in fewer vehicles. Examples of how this is achieved are programs and services that:

- Promote transit, vanpools, carpools, telework, and biking
- Provide free ride matching and trip planning
- Increase the use of vanpools, carpools, transit, telework, and biking
- Work with employers to establish worksite programs for telework, carpool and vanpool formation, transit and vanpool employee benefits, biking to work, and alternative work schedules
- Help commuters realize the true cost of driving alone and the benefits of transit, vanpooling, carpooling, telework, and biking

To advance and build upon the Commonwealth's commuter assistance efforts, DRPT will further target the I-64 corridor with strategic marketing and promotion of travel options, including:

- Marketing that is targeted to corridor travelers with an emphasis on the most congested segments of I-64/664
- Coordinated marketing messaging with local commuter assistance programs
- Targeting of employers with a high concentration of employees that commute on I-64/664
- Commute!VA website and mobile app multimodal travel options and ride matching
- Carpool, vanpool, transit, rail, and telework options
- Commute!VA rewards for carpool, vanpool, transit, and commuter rail
- Existing carpool and vanpool incentives and formation assistance
- Using the express lanes free with EZ-Pass Flex and a carpool/vanpool of 2+ (including driver)

Corridor Costs and Potential Benefits

Summary of Costs

The projects listed in the sections above are summarized in **Table 10**. In total, there are 16 multimodal projects that total approximately $57.94 million. Total costs from transit projects include 3 years of operating costs in addition to capital costs of vehicles and infrastructure investments.

TABLE 10 MULTIMODAL IMPROVEMENT COSTS

Type of Project	Number of Projects	Capital Costs	Annual Operating Cost	Total Cost
Commuter/Local Bus	8	$18,782,797	$8,255,963	$27,038,761
Park-and-Ride	8	$30,900,000		$30,900,000
TOTAL	**16**	**$49,682,797**	**$8,255,963**	**$57,938,761**

Benefits

Targeted improvements to transit and carpooling offer the greatest opportunities to not only improve performance on I-64/664 itself, but to provide fast and reliable trips along more parts of the corridor to more people. The recommended transit improvements are expected to serve over 400,000 trips along I-64 annually.

The suite of multimodal improvements included in this study offer unique opportunities to address peak-period traffic conditions that can be implemented at a lower cost, a much greater ability to safely move people, and more flexibility to adapt to changing travel patterns.

Mainline Roadway Improvements Plan

Mainline Roadway Improvements Identification and Summary

The study team considered performance measures, supplementary data, existing roadway geometry, recently completed studies, and public input to develop potential capital improvements. The team also reviewed recently-constructed projects and projects already funded in the SYIP to determine how those projects may resolve issues in the corridor relating to the performance measures.

The study team reviewed crash data for the 1-mile segments in the top 25 percent to determine the underlying causes of crashes and what solutions, if any, could mitigate the crashes. In several cases, capital improvements were not recommended to improve safety if there was no discernible crash pattern or if there were several crashes caused by miscellaneous factors that are not likely to be remedied by changes to the roadway. Miscellaneous factors include mechanical failure, medical issues, behavioral issues, such as alcohol or distracted driving, or crashes that involved animals or occurred in an active work zone.

Table 11 describes the types of mainline roadway improvements considered and their associated benefits. The study team only recommended an interchange improvement if it was recommended in a previously completed study. **Table 12** displays the number of mainline roadway improvements per type that were proposed in each district and scored using a SMART SCALE-like method. **Appendix F** includes performance measure detail information used to develop the mainline roadway improvements.

TABLE 11 TYPES OF I-64/664 CAPITAL IMPROVEMENTS

Type of Improvement	Locations to Consider	Benefit
Auxiliary Lane: An extra lane constructed to connect on- and off-ramps between closely spaced interchanges to reduce the impacts of traffic entering and exiting the interstate	• Where spacing between an on-ramp and the subsequent off-ramp is less than 2 miles • Where there are many crashes between exits • Where there are large volumes between interchanges	• Reduces the potential for crashes caused by traffic entering and exiting the interstate • Gives entering and exiting traffic more space to maneuver
Widening by One Lane: An extra lane constructed for multiple miles to increase the capacity of the interstate	• Where there are high person hours of delay and incidents/ crashes with a lane closure • Where there are high traffic volumes • Where there are long distances that vehicles need to pass, merge, or travel through multiple interchanges	• Reduces the likelihood of congestion by providing additional roadway capacity • Reduces the potential for crashes by allowing more space for vehicles to maneuver

Type of Improvement	Locations to Consider	Benefit
Acceleration or Deceleration Lane Extension: Longer lengths to accelerate when entering the interstate and decelerate when exiting the interstate	• Where there are many crashes involving lane merges • Where acceleration or deceleration lane lengths are less than the VDOT standards	• Reduces the potential for crashes caused by slower moving traffic entering or exiting the interstate • Provides more time for entering vehicles to match the speed of the interstate traffic and exiting vehicles to slow down to safely exit the interstate
Shoulder Widening: Widening the paved inside or outside shoulder	• Where there is high-crash frequency or severity with roadway departure crashes • Where the shoulder width is deficient	• Reduces the potential for roadway departure crashes by giving drivers a wider shoulder for recovery • Provides shoulder space to clear crashes or other incidents
Truck Climbing Lane: An extra lane constructed for multiple miles to increase the capacity of the interstate	• Where there is an uphill grade • Where there are many truck crashes and rear-end crashes • Where there is a speed differential between trucks and cars	• Reduces the potential for crashes due to the impacts of slow-moving vehicles • Provides space for slow-moving vehicles to move to the right on uphill grades to improve speeds and safety for all vehicles
Curve Improvements: A variety of improvements that reduce the potential for crashes through horizontal curves, such as LED-lit chevron sign and high-friction surface treatments	• Where there is high crash frequency or severity in a horizontal curve • Where there are many roadway-departure crashes	• Reduces the potential for roadway-departure crashes in horizontal curves • Provides low-cost, high-benefit countermeasures that can be constructed quickly
Interchange Improvement: A variety of improvements that improve safety and reduce delay at interchanges by modifying the existing interchange configuration	• Where there are high person hours of delay or crashes caused by vehicles entering and exiting the interstate • Where short weaves exist on the interstate • Where congestion on the arterial affects the interstate	• Reduces the potential for crashes caused by traffic entering and exiting the interstate • Reduces person hours of delay on the arterial and interstate
Express Lanes: Separate lanes that allow drivers to pay a toll or rideshare to utilize the facility	• Where there are high traffic volumes • Where widening by one lane is not predicted to meet future demand	• Reduces congestion and accommodates travel demand more efficiently • Provides greater reliability of travel times

TABLE 12 MAINLINE ROADWAY IMPROVEMENTS BY TYPE BY DISTRICT

Improvement Type	Staunton	Culpeper	Richmond	Hampton Roads	Total
Auxiliary Lane			5	2	**7**
Widening by One Lane			3	1	**4**
Acceleration or Deceleration Lane Extension		2	7	11	**20**
Shoulder Widening					
Curve Improvements*	6		1		**7**
Truck Climbing Lane	2	1			**3**
Interchange Improvement			3	2	**5**
Total	**8**	**3**	**19**	**16**	**46**
Projected Cost (Millions)	$250.7	$396.4	$940.6	$654.1	**$2,241.8**

* Includes High-Friction Surface Pavement and Flashing Chevron improvements

The study team evaluated widening of the I-64 corridor between MM 205-234 by one lane in each direction to address capacity and safety issues. These issues typically occur during the summer months and are more frequent on weekends. The analysis showed that I-64 was forecast to be congested again within a 30-year time frame even with these additional lanes. As a result, this segment of the I-64 corridor is recommended for evaluation of managed lanes.

Improvements and Locations Requiring Further Study

The study team also identified several improvements with the potential to resolve issues in the corridor relating to the performance measures that had not been recommended in a previously completed study. These improvements were not advanced to project prioritization because there is insufficient information to evaluate the projects. **Table 13** displays the number of mainline roadway, park-and-ride, and transit improvements by type in each district that were recommended for further study. **Appendix G** contains a list of individual improvements and locations identified by the study team that were recommended for further study. The study team identified 18 improvements and locations that are recommended priorities for advancing through concept development and study.

TABLE 13 PROPOSED IMPROVEMENTS FOR FURTHER STUDY BY TYPE BY DISTRICT

Improvement Type	Staunton	Culpeper	Richmond	Hampton Roads	Total
Interchange	0	1	3	2	**6**
Park-and-Ride	0	4	3	1	**8**
Transit	0	2	0	2	**4**
Total	**0**	**7**	**6**	**5**	**18**

Available Funding

Upon development of planning level cost estimates for recommended projects, the study team determined that the needs identified far exceeded available revenues. In addition, the needs do not account for planning level cost estimates associated with "improvements and or locations identified for further study." **Table 14** outlines the estimated distribution of IOEP funding for I-64 in the coming years and the anticipated funds available for prioritization.

TABLE 14 DISTRIBUTION OF IOEP FUNDING FOR I-64 (IN MILLIONS)

		Previous	FY22	FY23	FY24	FY25	FY26	FY27	TOTAL
I-64 Dedicated IOEP Funding		$32.1	$9.9	$18.5	$18.5	$19.4	$20.3	$19.3	$137.9
Proposed Funding for I-64 Operations Improvements	Capital Projects in SYIP	$14.0							$14.0
	Operations and Maintenance			$0.16	$0.16	$0.17	$0.17	$0.18	$0.85
I-64 Remaining Funds for Prioritization		**$18.1**	**$9.9**	**$18.3**	**$18.3**	**$19.2**	**$20.2**	**$19.1**	**$123.1**

Prioritization of Improvements

The prioritization process for I-64 followed the process outlined in the IOEP. The I-64/664 Corridor Improvement Plan identified the top 25 percent problem areas for congestion, safety, and reliability and the identified operational strategies, transportation demand management (TDM) strategies, and roadway capital improvements to address those issues in the corridor. All of these strategies improve reliability and safety of travel. The operational strategies were evaluated using an ROI methodology. The TDM and roadway capital improvements were evaluated using a SMART SCALE-like methodology using the following scoring weights:

- 40% for person hours of delay reduction
- 40% for reduction of fatal and severe injury crashes
- 20% for accessibility to jobs

These measures are the same as those used in SMART SCALE and represent those measures that correlate with the IOEP goal defined in §33.2-372 of improving the safety, reliability, and travel flow along interstate corridors.

This scoring methodology resulted in the list of TDM and capital projects recommended for funding as part of the I-64/664 Corridor Improvement Plan shown in **Table 15**. According to the IOEP, available funding will be allocated to the projects based on the prioritization ranking, and scheduled according to constructability, risk, and the Board's discretion. At this time, the first 19 projects are recommended for funding, as indicated. Additionally, projects labeled as tentative may be considered for funding at the Board's discretion should there be available remaining funding. Detailed improvement prioritization scoring results are included in **Appendix H**.

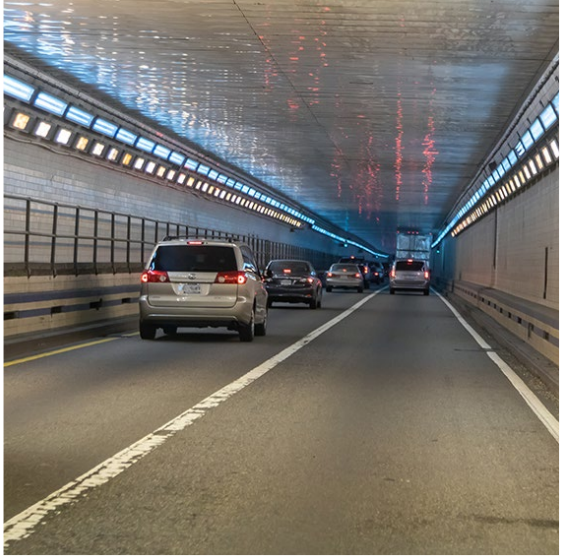
TABLE 15 I-64/664 CORRIDOR IMPROVEMENT PLAN SCORING AND PROGRAMMED COSTS

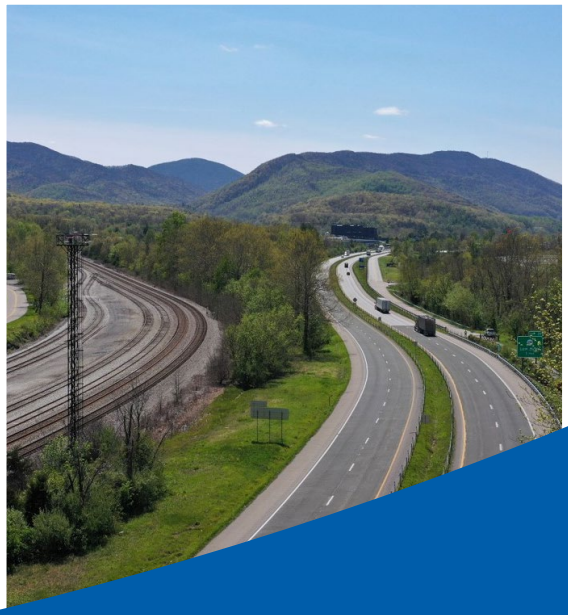
Project Description	Cost	SMART SCALE Score	Recommended for Funding
I-64 EB - NB I-81 Exit 221 to EB I-64 - Install high-friction surface pavement	$600,000	27.23	Yes
I-64 Both - Route 972 (Tidewater to NNSB via HRBT)	$898,598	13.35	Yes
I-64 EB - MM 23 - Install flashing chevrons	$120,000	11.75	Yes
I-64 WB - Exit 87 - I-64 WB to I-81 SB Ramp - Install high-friction surface pavement	$480,000	10.35	Yes
I-64 Both - Broad Street – Short Pump Bus Service	$3,744,635	3.83	Yes
I-64 WB - MM 19 to MM 21 - Install high-friction surface pavement	$2,300,000	3.69	Yes

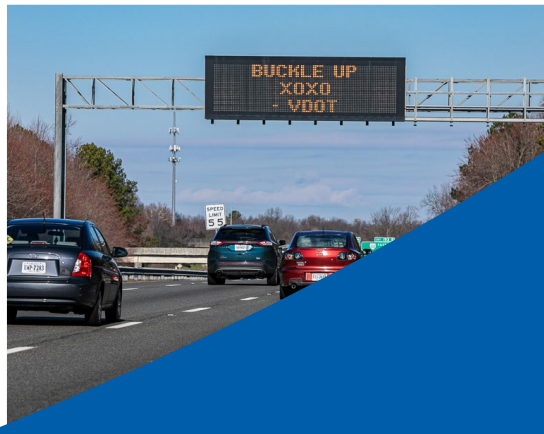
Project Description	Cost	SMART SCALE Score	Recommended for Funding
I-64 Both - Create a new express route (22x) from Short Pump to downtown	$3,017,484	3.39	Yes
I-64 Both - Newport News Route 106 (Newport News / Warwick Boulevard / Denbigh Fort Eustis)	$4,033,729	3.19	Yes
I-64 Both - Newport News Route 107 (Newport News / Warwick Boulevard / Denbigh)	$3,511,492	2.96	Yes
I-64 WB - Exit 284 - Extend acceleration lane	$3,700,000	2.84	Yes
I-64 Both - Hickory Haven - New PnR or Relocate	$5,100,000	2.80	Yes
I-64 EB - Exit 256 - Extend acceleration lane	$2,600,000	2.27	Yes
I-64 Both - Increase bus frequency on Route 7 (Nine Mile) to 15 minutes	$7,816,397	2.23	Yes
I-64 WB - Exit 181 - Improve Interchange Configuration	$12,000,000	2.12	Yes
I-64 EB - Exit 284 - Extend acceleration lane	$4,300,000	1.96	Yes
I-64 Both - Bottom's Bridge - Expand PnR or Relocate	$3,100,000	1.87	Yes
I-64 WB - Exit 282 - Extend acceleration lane	$4,700,000	1.84	Yes
I-64 Both - Exit 291/ I-464 Interchange - Improve Interchange Configuration (Alternative 4A)	$140,000,000	1.48	Yes (IOEP)
I-64 EB - Exit 278 - Extend acceleration lane	$5,100,000	1.47	Yes (IOEP)
I-64 Both - Croaker Road - Expand PnR/Enhance	$2,500,000	1.41	Tentative (IOEP)
I-64 EB - Exit 265B to Exit 265C - Construct auxiliary lane	$8,500,000	1.40	Tentative (IOEP)
I-64 EB - Exit 185 - Extend deceleration lane - B	$3,500,000	1.35	Tentative (IOEP)
I-64 EB - Exit 279 - Extend acceleration lane	$4,700,000	1.30	Tentative (IOEP)
I-64 Both - Airport via Route 60 Bus Service	$2,833,600	1.21	Tentative (IOEP)
I-64 EB - WC to Exit 214 - Construct auxiliary lane	$6,500,000	1.10	Tentative (IOEP)
I-64 Both - Rte 208 /Courthouse Rd & Crew Rd - New PnR	$2,200,000	1.03	No
I-664 NB - Exit 13 - Extend acceleration lane	$5,300,000	0.90	No
I-64 Both - MM 224 to MM 233 - Median Widening (to six lanes)	$190,000,000	0.88	No
I-64 WB - Exit 185 - Extend acceleration lane	$4,200,000	0.86	No
I-64 EB - Exit 185 - Extend deceleration lane - A	$4,200,000	0.84	No
I-64 Both - Lightfoot - Expand PnR	$2,300,000	0.82	No
I-64 Both - MM 205 to MM 211 - Median Widening (to six lanes)	$120,000,000	0.74	No
I-64 EB - Exit 277 - Extend acceleration lane	$4,500,000	0.68	No
I-64 WB - Exit 261 - Extend acceleration lane	$7,300,000	0.67	No
I-64 EB - MM 23.8 to MM 24 - Install high-friction surface pavement	$240,000	0.67	No
I-664 NB - Exit 2 - Extend acceleration lane	$13,000,000	0.62	No
I-64 WB - Exit 192 - Extend acceleration lane	$7,000,000	0.60	No
I-64 WB - Exit 279 - Extend acceleration lane	$9,400,000	0.55	No

Project Description	Cost	SMART SCALE Score	Recommended for Funding
I-64 Both - MM 211 to MM 218 - Median Widening (to six lanes)	$190,000,000	0.50	No
I-64 Both - Lee Hall - Expand PnR	$3,800,000	0.43	No
I-64 EB - Exit 118 - Extend acceleration lane	$3,200,000	0.42	No
I-64 Both - MM 218 to MM 224 - Median Widening (to six lanes)	$230,000,000	0.37	No
I-64 WB - WC to Exit 214 - Construct auxiliary lane	$12,000,000	0.36	No
I-64 Both - Rte 250 /Rockfish Gap Tpk; Crozet - New PnR	$3,000,000	0.36	No
I-64 EB - Exit 118 - Extend deceleration lane	$3,200,000	0.35	No
I-64 EB - Exit 180 to Exit 181 - Construct auxiliary lane	$26,000,000	0.27	No
I-64 Both - Reimplement parkway shuttle to link Williamsburg, Jamestown, and Yorktown	$1,182,826	0.26	No
I-64 EB - Exit 195 - Extend deceleration lane	$4,700,000	0.26	No
I-64 WB - Exit 195 - Extend deceleration lane	$5,600,000	0.21	No
I-64 EB - Interchange Improvements at 64/264	$210,000,000	0.21	No
I-64 Both - Zion Crossroads - PnR Expansion	$7,500,000	0.19	No
I-664 NB - Exit 6 to Exit 7 - Construct auxiliary lane	$37,000,000	0.17	No
I-64 WB - MM 100 to MM 105 - Construct Truck Climbing Lane	$390,000,000	0.14	No
I-64 EB - MM 12 to MM 13 - Widen left shoulder	$12,000,000	0.10	No
I-64 EB - Exit 178 to Exit 180 - Construct auxiliary lane	$77,000,000	0.07	No
I-64 EB - Exit 167 - Extend acceleration lane	$3,400,000	0.07	No
I-64 WB - Exit 178 to Exit 180 - Construct auxiliary lane	$73,000,000	0.07	No
I-64 EB - Exit 178 - Improve Interchange Configuration	$89,000,000	0.07	No
I-64 WB - MM 44 to MM 48 - Construct Truck Climbing Lane	$170,000,000	0.05	No
I-64 WB - Exit 180 - Improve Interchange Configuration	$65,000,000	0.04	No
I-64 WB - MM 26 to MM 28 - Construct Truck Climbing Lane	$65,000,000	0.03	No
Grand Total	**$2,293,078,761**		

Above bold lines, costs have been inflated to year of expenditure and have undergone a preliminary refinement based on a process similar to SMART SCALE. Costs below the lines are planning level costs used for initial project prioritization.







VDOT

Office of INTERMODAL Planning and Investment

DRPT
Virginia Department of Rail and Public Transportation

INTERSTATE 64/664

Appendix B

Final Report - DRAFT

Interstate 95

Corridor Improvement Plan

August 2021

VDOT Office of INTERMODAL Planning and Investment DRPT Virginia Department of Rail and Public Transportation

INTERSTATE 95

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Introduction

The results of the I-95 Corridor Improvement Plan will be folded into the Interstate Operations and Enhancement Program (IOEP), which is intended to improve the safety, reliability, and travel flow along interstate highway corridors in the Commonwealth. The IOEP was developed in accordance with Chapters 1230 and 1275 of the 2020 Virginia Acts of Assembly, as codified in §33.2-372 and through amendments to §§ 33.2-232 and 33.2-358 of the Code of Virginia, in which the General Assembly of Virginia directed the Commonwealth Transportation Board (CTB) to prepare interstate corridor improvement plans for those interstate corridors with more that 10 percent of their vehicle miles traveled comprised of Federal Highway Administration (FHWA) Class 6 vehicles and above. These corridors (I-81, I-95 and I-64) receive dedicated funding from the IOEP.

I-95 is the primary interstate corridor on the East Coast of the US with more than 1,900 miles between Maine and Florida. This corridor serves a region that contains 38 percent of all US jobs, and considered by itself would represent the second largest economy in the world.[1] According to the I-95 Corridor Coalition, by 2035, 100 percent of the urban segments will be heavily congested, and 55 percent of the non-urban segments will see increased congestion. I-95 serves as a vital conduit for Virginia's urban crescent, connecting the Richmond, Fredericksburg, and Washington, DC, metropolitan regions—a population of almost 3.5 million. In Virginia, I-95 provides north-south movement of people, goods, and freight, with every mode of transportation represented, as shown by the breadth of travel options and amenities in **Figure 1**. Approximately 9 million trucks and almost $200 billion in goods are moved through the corridor per year, second only to the I-81 corridor in Virginia.

Figure 1 Significance of the I-95 Corridor

1 A 2040 Vision for the I-95 Coalition Region, I-95 Corridor Coalition, December 2008, https://tetcoalition.org/wp-content/uploads/2015/03/2040_Vision_for_I-95_Region_Executive_Summary.pdf?x70560
2 2012 Global Insight/ Transearch data
3 Ibid
4 VDOT Crash Data
5 Ibid

Rail transportation is another critical mode currently operating within the I-95 Corridor. On April 30, 2021, the Commonwealth signed an agreement with CSX Transportation (CSXT), Amtrak, and Virginia Railway Express (VRE) formalizing the Transforming Rail in Virginia Program, a $3.7 billion investment expanding capacity for passenger, commuter, and freight rail in the I-95 corridor and throughout the state. This new Virginia-led rail expansion program is expected to remove 5 million cars and 1 million trucks off Virginia's highways each year, while propelling the Port of Virginia towards its goal of moving 40 percent of containers by rail.

CSXT's north-south intermodal freight mainline in Virginia is part of CSXT's multistate National Gateway Initiative, generally paralleling I-95. This route provides service from Washington, DC, to Richmond and then farther south via Petersburg and Emporia. At Weldon, south of the Virginia/North Carolina border, this mainline has an eastward extension to the Port of Virginia facilities in Hampton Roads. The CSXT National Gateway Initiative has improved the efficiency of double stack container movements between the Mid-Atlantic and the Northeast/Midwest, and has improved train operations to and from the Port of Virginia.

Study Request

During the 2019 Virginia General Assembly Session, the Senate and House of Delegates approved similar resolutions (SJR 276 and HJR 581) requesting the CTB study the 52 miles of the I-95 corridor between Exit 118 (Thornburg) in Spotsylvania County and Exit 170 (I-495/I-395) in Fairfax County along with potential financing options for improvements to the corridor. The Secretary of Transportation and the CTB requested that the study area be expanded to include all 179 miles of I-95 in Virginia between the North Carolina state line and the Woodrow Wilson Bridge in Alexandria. The corridor traverses 12 counties, six cities, and four VDOT construction districts: Northern Virginia, Fredericksburg, Richmond, and Hampton Roads.

According to SJR 276 and HJR 581, a 2017 nationwide study conducted by the Texas Transportation Institute ranked southbound I-95 at Exit 133A in Fredericksburg as having the worst traffic congestion in the nation. According to that study, this location is projected to cost drivers $2.3 billion from 2017 through 2026 in time lost, fuel wasted, and carbon emitted. Additionally, northbound I-95 between Exit 126 (US 1/Route 17) in Spotsylvania County and Exit 143 (Route 610) in Stafford County was ranked the seventh worst traffic hot spot in the nation with a projected cost to drivers of $1.1 billion through 2026. According to the National Capital Region Transportation Board, the Northern Virginia portion of the Washington, DC, metropolitan region is projected to grow by 20 percent in population and 25 percent in employment by 2040, placing additional strain on the I-95 corridor and the transportation system in general.

The Office of Intermodal Planning and Investment (OIPI), the Virginia Department of Transportation (VDOT), and the Department of Rail and Public Transportation (DRPT) jointly conducted this study resulting in the I-95 Corridor Improvement Plan (Plan).

Study Purpose

The purpose of this plan is to identify a package of targeted operational, multimodal, and capital improvements that are expected to deliver faster, safer, and more reliable travel on I-95 throughout Virginia. It also includes the evaluation of two key parallel routes to I-95 (US 1 and US 301) and the rail cooridor to identify strategies and improvements to more effectively accommodate diversions of traffic, especially during major incidents on I-95.

Multimodal Corridor Characteristics

The I-95 corridor is one of the most multimodal interstate corridors within Virginia. Multimodal travel options such as bus, rail, carpool, and vanpool contribute greatly to moving people in the I-95 corridor, offering a wide array of alternatives to single-occupancy vehicle (SOV) travel. Rail service along the corridor is provided by Virginia Railway Express (VRE) (commuter rail), Amtrak (intercity and long-distance passenger rail), and Washington Metropolitan Area Transportation Authority (WMATA) (Metrorail/heavy rail). Commuter bus service is a popular commuting choice along the northern section of the I-95 corridor, with several providers offering service to key employment hubs including Tysons, Mark Center, the Pentagon, Crystal City, Rosslyn, Ballston, and Washington, DC.

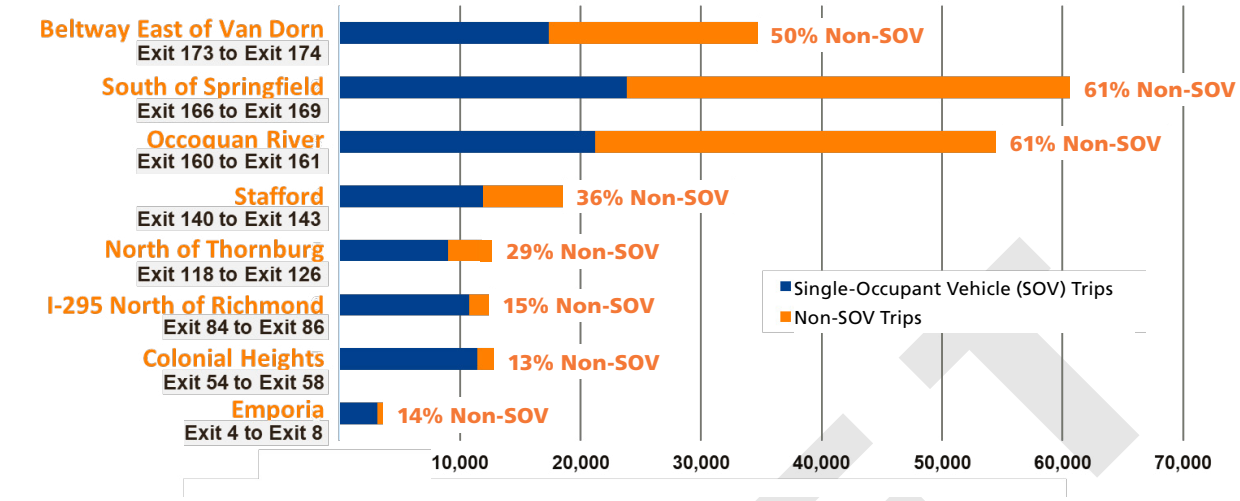
Park-and-ride lots also contribute positively to multimodal travel along the corridor. The availability of commuter parking not only enables even more people to make use of bus and rail systems when co-located with transit hubs but also helps to enable a robust culture of carpooling and vanpooling, including slugging—ad hoc, informal carpools for purposes of commuting. Commuter assistance programs provide residents, employers, and workers along the I-95 corridor with travel options information, trip planning, guaranteed ride home, and multimodal ride matching services.

Additionally, the presence of the I-95 Express Lanes between the Fredericksburg region and the I-495 Beltway around Washington, DC, makes bus travel along the corridor more reliable and incentivizes carpooling and vanpooling as vehicles with three or more people do not pay a toll. Traffic and occupancy counts indicate that during peak periods, the Express Lanes on I-95 are carrying more people than the general purpose lanes.

Throughout the corridor, the availability of these multimodal travel options facilitates tens of thousands of commutes each weekday, as shown in **Figure 2**. Multimodal travel is most prominent in the areas of Northern Virginia and Fredericksburg that are characterized by higher densities of population, employment, and transit service. As an example, between the Occoquan River and I-495, more than 60 percent of all weekday commute trips are made by a combination of rail, bus, vanpool, and carpool trips. The proportion of multimodal trips at the southern end of the corridor is consistent with the more limited amount of commute options available and generally lower density of development.

The commuting data shown is reflective of travel behavior prior to the onset of the global COVID-19 pandemic in early 2020. The pandemic, and corresponding shutdowns did impact travel behaviors with marked increases in telecommuting and peak periods. As vaccination rates have risen in Virginia, traffic volumes have shown gradual increases toward pre-pandemic levels. OIPI will continue to monitor these trends and any long-term changes in travel behaviors will be captured in subsequent updates of the interstate corridor improvement plans.

Figure 2 Single and High Occupancy Vehicle Use Along I-95

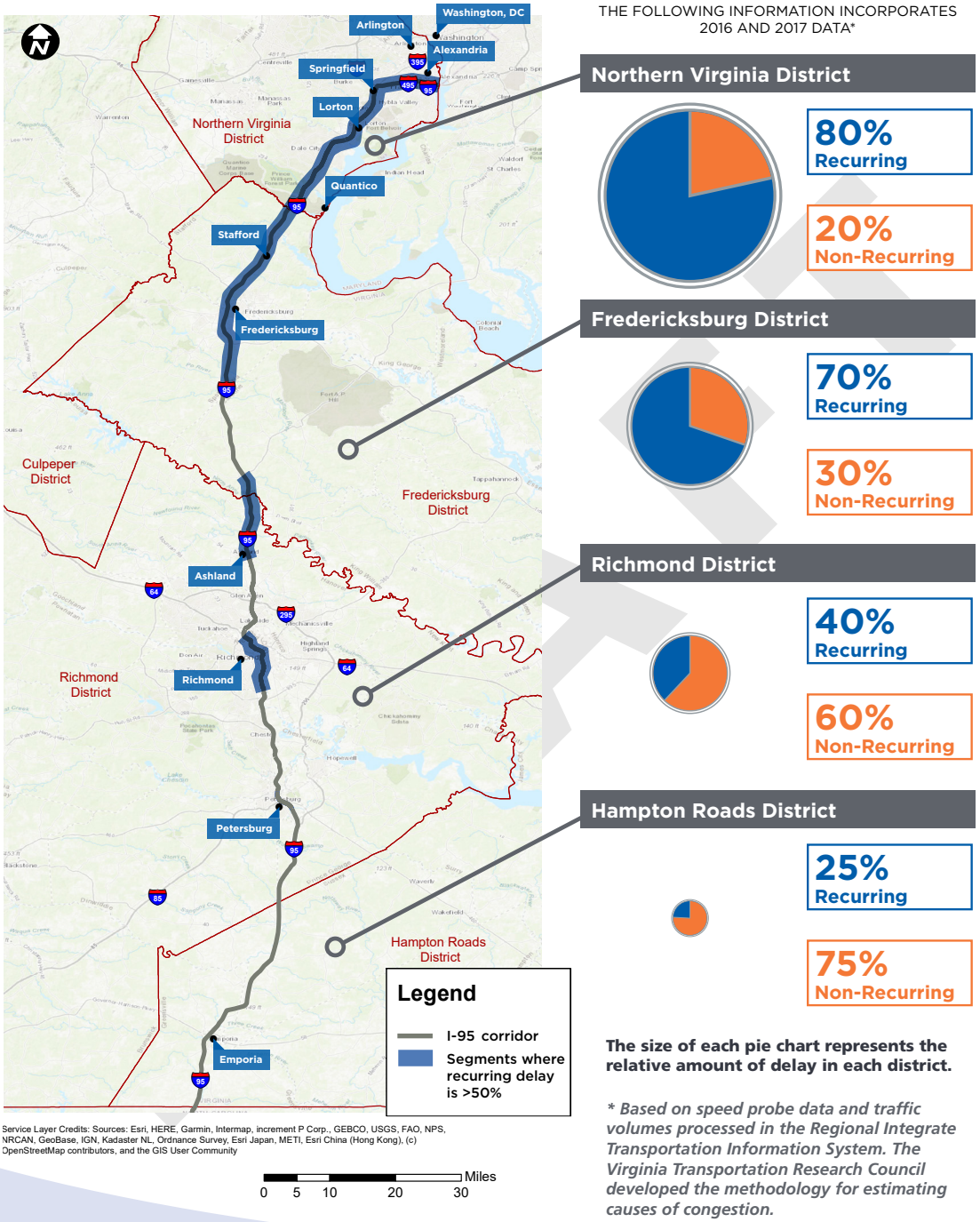


Challenges in the Corridor

While robust and overwhelmingly successful, the existing multimodal system needs improvement to address passenger travel demand along the I-95 corridor. Existing conditions include limited commuter bus service south of Dale City, a lack of off-peak and weekend commuter train service, and, while improvements to the capacity-constrained Long Bridge across the Potomac River are coming, in the interim, it remains a major rail bottleneck limiting immediate passenger rail growth. In addition, many park-and-ride lots with convenient access to I-95 are at or near capacity during weekdays.

Travel and reliability characteristics change drastically as motorists travel from south to north. Travel south of the Fredericksburg area (south of Exit 126) is typically much more reliable than the segments to the north. As shown in **Figure 3**, a greater amount of overall and recurring delays (typically caused by congestion during peak periods) exist in the corridor to the north of Fredericksburg. The area between Fredericksburg and Richmond experiences reliability issues that are expected to worsen as development continues to expand into this area. There are a few areas in the Richmond District where recurring delay exists, specifically in the I-95/I-64 overlap, but the predominant type of delay is non-recurring delay, which is typically caused by incidents, crashes, weather, and/or special events.

Figure 3 Recurring Delay in the Corridor



While the I-95 corridor has definitive segments that experience significant recurring peak hour weekday delays, several portions of the corridor experience weekend and seasonal delays. A key challenge on the I-95 corridor was to identify how travel changed by the time of the day, day of the week, and month of the year. For example, reliability issues that were prevalent on Sunday afternoons in the summer were not issues on Thursday afternoons in the summer.

Another challenge was to identify improvements that could reduce congestion in the corridor to the north of the Fredericksburg area. In addition to the $2.2 million investment in Transforming Rail in Virginia through 2025, Virginia is investing more than $1 billion through 2025 in the capital improvements shown in **Appendix A**. These investments, along with other improvements under construction while the study was being performed, and their expected benefits were taken into consideration when identifying the top 25 percent of locations for congestion, safety, and reliability. As targeted capital improvement recommendations were identified in the areas of greatest need, the study team quickly determined that highway capital improvements alone are unlikely to make a significant enough impact to improve safety and increase speeds in the northern portion of the corridor. Using the travel demand model from the National Capital Region Transportation Planning Board, the study team conducted a hypothetical analysis that added one, two, and three additional general purpose lanes in each direction on I-95 between Exit 118 (Thornburg) and Exit 170 (Springfield Interchange: I-95/I-395/I-495). This analysis showed minor to no speed improvements in 2040 at a planning level cost estimate of more than $12.5 billion for a single additional lane in each direction. Based on the hypothetical widening analysis, the study team anticipates that multimodal recommendations and the promotion of managed lane facilities that incentivize non-single occupant travel will be key components of any solution development along the I-95 corridor in Northern Virginia and Fredericksburg.

To capture performance benefits for non-single occupant travel, the study team adopted an approach that focused on person movement. Additional commuter bus and commuter train service during the peak hours were evaluated. Analyses showed that the number of people moved during those peak hours by bus and rail is projected to be equivalent or greater than the number of persons moved from adding one lane in each direction as described in more detail in the multimodal section of this summary. These types of multimodal solutions must also include the construction of new and/or expanded park-and-ride lots in strategic locations to allow commuters to safely and efficiently access the other modes of transportation.

Approach to Solutions

Realizing that solutions to the challenges in the I-95 corridor involve various modes of travel and different types of expenditures, the study team used a stepped approach to identify improvements. This meant first identifying operational improvements to maximize efficiency of existing infrastructure[6] and then multimodal options, which represent the next lowest cost solution that builds upon the overall goal of moving people. Finally, the team identified highway capital projects where performance issues could not be adequately addressed by either operational or multimodal improvements.

6 Code of Virginia §§33.2-372 requires priority to be given first to operational and transportation demand strategies that improve reliability and safety of travel

Existing Conditions

To more thoroughly understand the current travel conditions in the corridor, the study team gathered data from a variety of sources. This data included travel speeds; numbers and types of crashes; numbers, types, and durations of incidents; origins and destinations of passenger cars and trucks; numbers and types of traffic; multimodal service; and location, number of spaces, and utilization rates at park-and-ride lots.

Depending on the time of day, the day of week, and the month of year, travel in the corridor varies greatly. These differences were important to understand as the study team developed potential improvements.

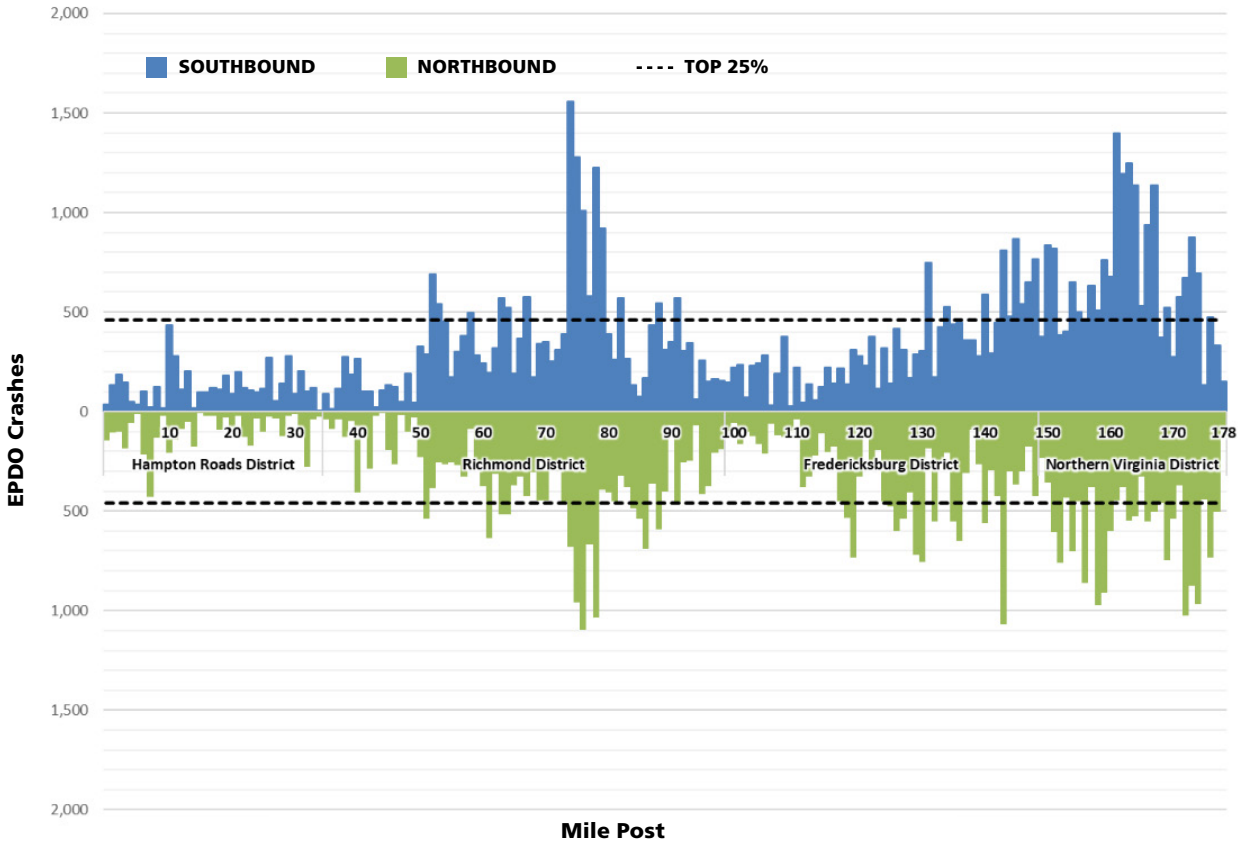
Performance Measures

Based on a review of the available data in corridor, the study team developed four performance measures to evaluate the existing operational and safety issues throughout the corridor. The team collected and summarized crash and delay data for 4 years, 2015 through 2018, in 1-mile segments. The study team then ranked the segments and highlighted the top 25 percent of segments, regardless of direction, to be reviewed for potential improvements. The four performance measures included:

- **Crash frequency and severity:** The total number of crashes, weighted by severity using the equivalent property damage only (EPDO) scale. Source: VDOT Roadway Network System
- **Crash severity rate:** The total rate of crashes, weighted by severity, per 100 million vehicle-miles traveled. Source: VDOT Roadway Network System and VDOT Traffic Monitoring System
- **Total delay:** The total person hours of delay caused by the impacts of congestion, incidents, and weather events. Source: INRIX
- **Incident delay:** The total person hours of delay caused by incidents (crashes and disabled vehicles) that lead to at least one lane of the interstate to be closed for an hour or more. Source: INRIX and VA Traffic

An example histogram detailing the EPDO crashes per 1-mile segments is shown in **Figure 4**. The highest crash location along the corridor occurred in the I-95/64 overlap in downtown Richmond, one of the older segments of the corridor constructed prior to the establishment of interstate standards. The next highest crash location occurred on I-95 southbound at the Occoquan River (Exit 160, Route 123).

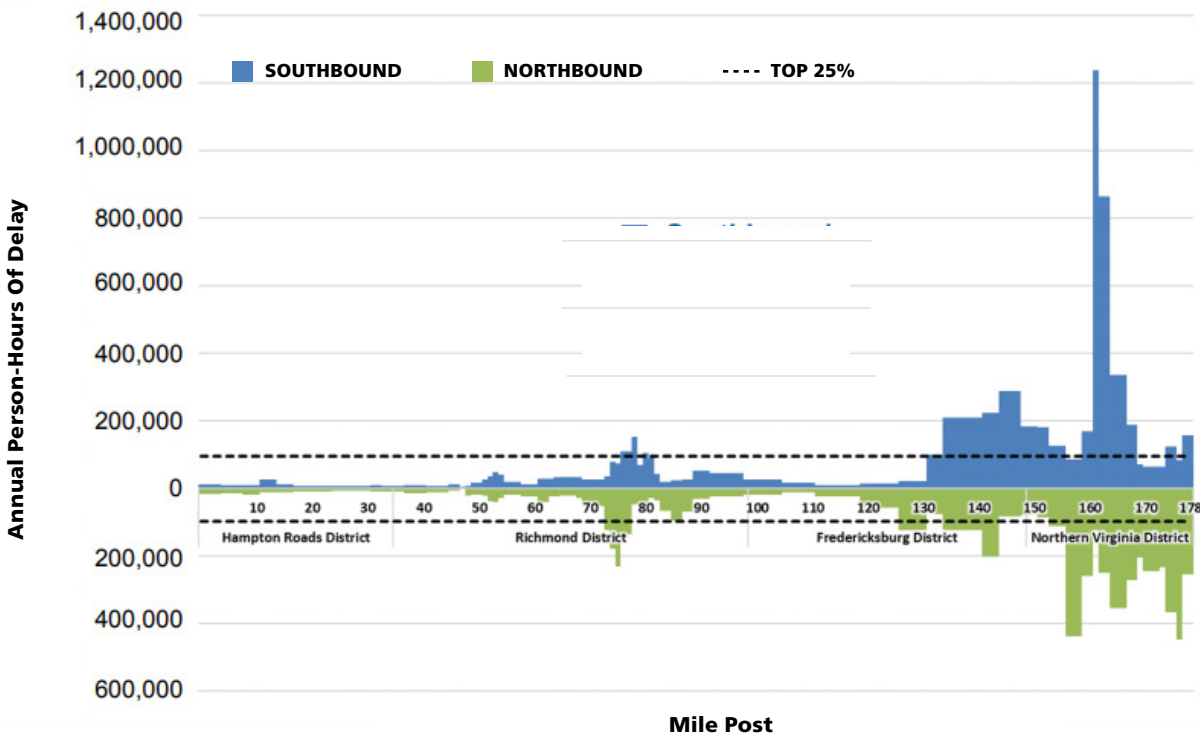
Figure 4 Equivalent Property Damage Only (EPDO) Crashes



In addition to the crash data, person hours of delay data showed that I-95 southbound at the Occoquan River (Exit 160, Route 123) had the highest person hours of delay along the entire corridor: more than 1.2 million hours annually as shown in **Figure 5**.

The study team used this information to focus on improvements that would provide the greatest delay reduction for the stretch of I-95 between Exit 158 and Exit 177 in both directions.

Figure 5 Annual Person-Hours of Delay



Supplementary Data

The study team collected and summarized additional data to supplement the four performance measures for the identification of problem areas and project identification. The supplementary data included the following information:

- INRIX speed data to summarize average speed patterns and variability in speeds throughout the corridor by time of day, day of week, and time of year for 2018
- StreetLight origin-destination data to summarize origin-destination patterns on I-95 in 2018 (**Figure 6**)
- VA Traffic Incident data to summarize the number of total or lane-impacting incidents and the average time to clear a lane or scene

This information was used to help identify specific countermeasures at various locations along the corridor. For example, the origin-destination analysis shown in **Figure 7** highlighted that a large percentage of vehicles traveling across the Occoquan River during the p.m. peak period were coming from Fort Belvoir. Given the large workforce at Fort Belvoir and the relatively short distance on I-95 from Fort Belvoir to the popular destinations, DRPT, OIPI and VDOT plan to coordinate with Fort Belvoir in the future to discuss multimodal solutions.

Figure 6 Statewide Origin-Destination Patterns by Interchange

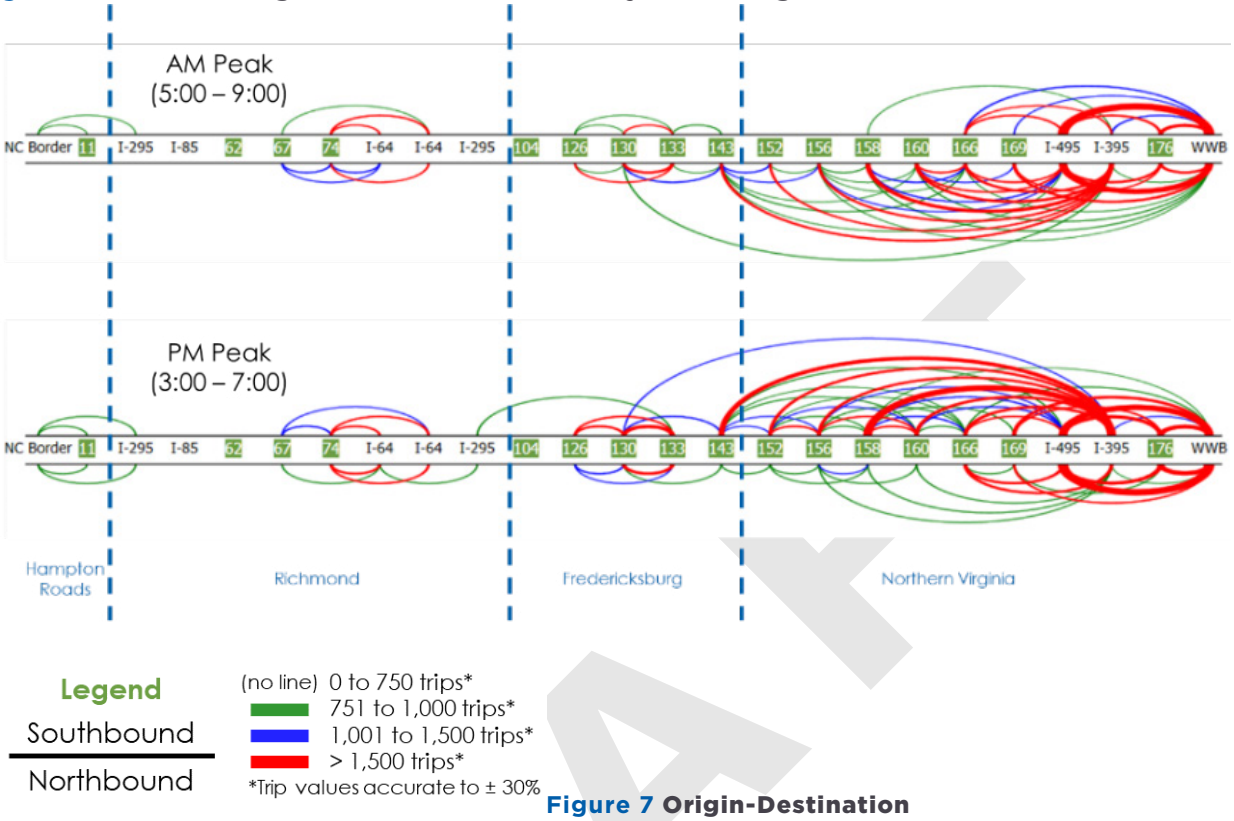
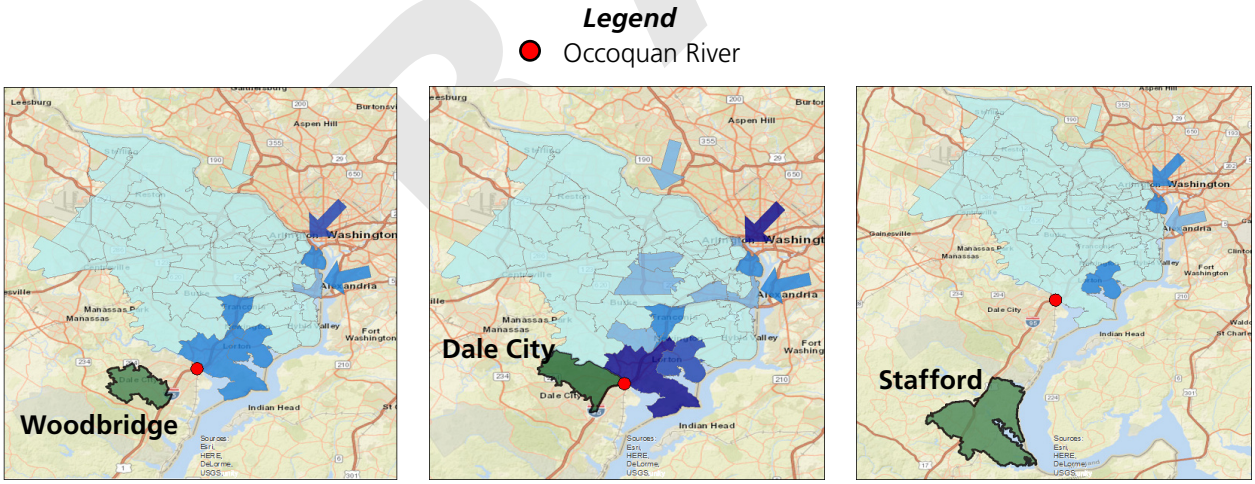


Figure 7 Origin-Destination Patterns at the Occoquan River



Top 3 Origins to WOODBRIDGE

1. Lorton
2. Southbound I-395 from DC
3. **Fort Belvoir**

Top 3 Origins to DALE CITY

1. Southbound 1-395 from DC
2. **Fort Belvoir**
3. Lorton

Top 3 Origins to STAFFORD

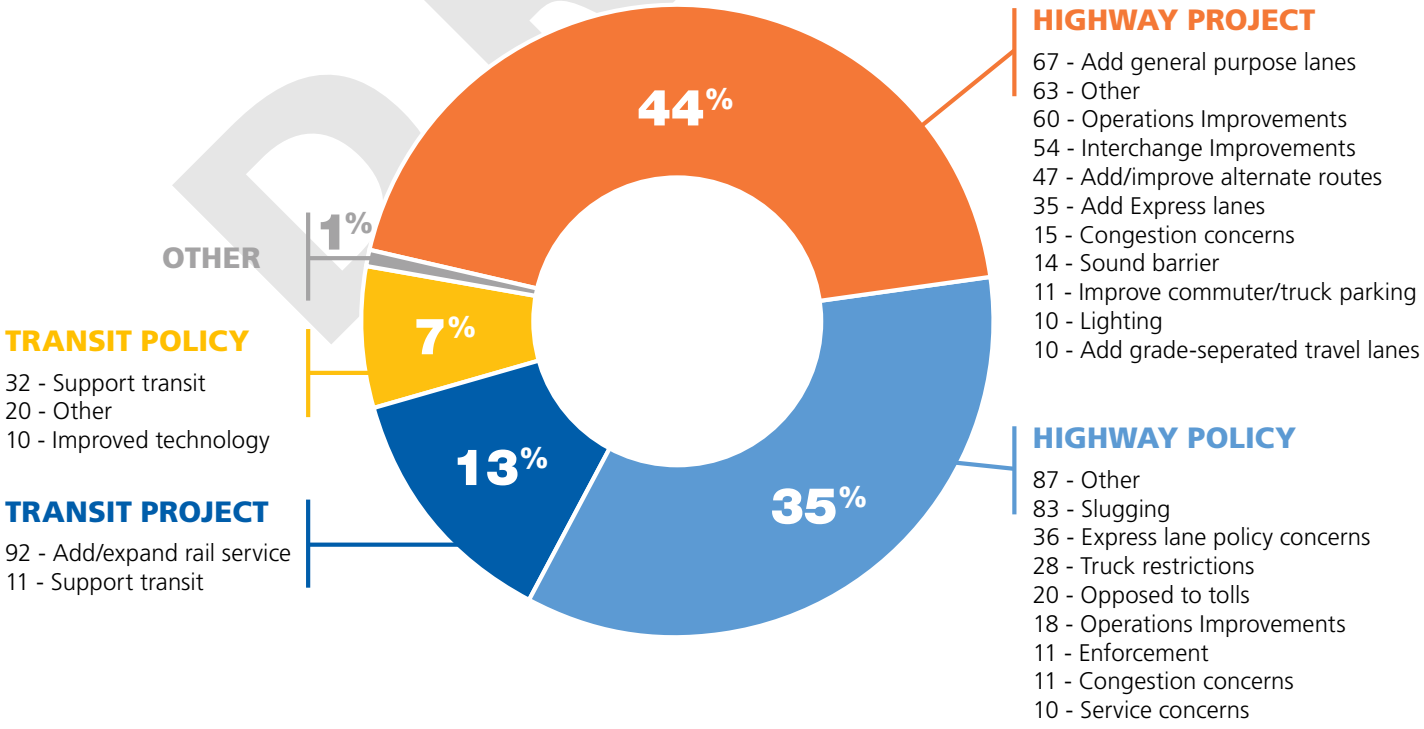
1. Arlington
2. Southbound I-395 from DC
3. **Fort Belvoir**

Public Meetings

Public engagement was encouraged throughout the development of the I-95 Corridor Improvement Plan and served as a critical component of developing the Plan. The study team created a website (**www.va95corridor.org**) to provide information and to gather public input. In addition, an email address was established for receiving comments and a public phone number was made available. The study team also made presentations to local governments and organizations and held public meetings, where attendees were able to view maps of the corridor in their respective area; listen to a presentation about the plan and its progress; identify and validate problem areas; ask questions; and submit comments and suggestions. The display boards and presentations also were made available on the project website.

An online survey tool, MetroQuest, was used to obtain feedback from the public at the July and October meetings. Over 3,000 people provided input to the July MetroQuest survey. The respondents placed nearly 11,750 map markers, with over 75% related to congestion issues. The remainder related to safety, need for alternative routes, multimodal options, technology, and other issues. **Appendix B** contains summary information from the MetroQuest surveys. The study team used comments from this tool to inform the documentation, identification and verification of problem areas in the corridor and develop proposed improvements for consideration. The public was also given the opportunity to identify how they currently use the corridor and document the types of improvements on which they would spend available resources. The public submitted over 850 comments during the course of the study. Those comments are categorized and shown graphically in **Figure 8**.

Figure 8 Public Comment Summary



Operations Improvements Plan

The Plan outlines critical foundational elements for enhancements to operations on the corridor and innovative strategies to improve safety, reduce delay, and enhance customer experience. The operational improvements were identified on both mainline I-95 and on parallel arterials, such as US 1 and US 301.

Using the performance measures for locations within the top 25 percent for incident-related delay on I-95, the study team initially identified more than $200 million in freeway operations and parallel facilities upgrades for the corridor. Using this list as a starting point, the team identified strategies with the greatest need which resulted in a targeted operational upgrade plan totaling $60-$68 million. See **Appendix C** for maps that show the location of operational improvements.

Mainline Operations

Foundational Operations Strategies

Foundational operations strategies are used to address the impacts of non-recurring congestion, such as vehicle crashes and weather events, and respond to those incidents as quickly as possible. These strategies are integral to the function of the freeway and are currently being used throughout Virginia. Foundational operations strategies are infrastructure improvements and/or incident response tools that include following types of improvements:

- Closed-circuit television (CCTV) cameras
- Changeable message signs (CMS)
- Safety service patrol (SSP)
- Towing programs
- Miscellaneous low-cost operations improvements

The study team used a combination of input from the VDOT District Regional Operations Directors (RODs); corridor characteristics; data analysis of traffic volumes and crashes; return on investment analysis; and coordination with other arterial and roadway improvements to determine proposed locations for the foundational strategies.

VDOT determined that CCTV coverage should be expanded to cover 100 percent of the corridor in urban areas, interchanges in rural areas, and locations with high incident rates in the rural areas. To date, the VDOT Regions have begun the preliminary engineering work to design and construct the CCTVs with some CCTVs starting to come online in early 2022. The Regions also identified five new mainline CMS and three replacement CMS to better communicate traffic conditions to the public.

SSP is currently in use along portions of corridor. The study team recommended that select routes be extended and new routes be added to cover existing gaps.

The Towing and Recovery Incentive Program (TRIP) pays incentives to heavy duty recovery companies to clear collisions in less than 90 minutes. The study team identified Greensville, Sussex, Caroline, Spotsylvania, and Stafford Counties as candidates for expanding TRIP. The study team also recommended that instant towing be expanded to the urban areas in the Richmond and Northern Virginia Districts and contract towing be implemented in select locations in Fredericksburg and Northern Virginia.

The study team identified additional low-cost improvements that include Public Safety Answering Point (PSAP) integration, deployment of fiber-optic cabling, and an update to the Active Traffic Management System (ATMS) software.

Innovative Operations Strategies

While the foundational strategies mainly address non-recurring congestion, the innovative strategies address both recurring and non-recurring congestion. The following list includes proposed innovative operations strategies that could be implemented as well as strategies that are already moving forward on the I-95 corridor (those marked with an * are already underway and being implemented).

- Ramp metering*
- Variable speed limits (VSL)*
- Geofenced emergency notifications
- Advanced technologies for work zone management
- Regional Multimodal Mobility Program (RM3P)*

Ramp Metering

Ramp metering involves a signalized meter that regulates the flow of traffic entering a freeway according to current traffic conditions to ease traffic congestion. The study team identified 14 candidate on-ramp locations for ramp metering. Once these ramp metering improvements are implemented, it is recommended that they be operated together within an overall ATMS to be most effective.

Variable Speed Limits (VSL)

VSL is a system that modifies the speed displayed on changeable speed limit signs based on traffic conditions. The VSL system uses traffic detectors and advanced predictive algorithms to identify the ideal speed limit to improve traffic congestion and harmonize traffic flow. To date, a pilot location along the corridor south of Fredericksburg (from Exit 118 to Exit 130) has been identified, along with the preparation of a concept of operations for the system. Preliminary engineering for the pilot has been completed, and a contractor is building the system.

Geofenced Emergency Notification System

The geofenced digital notification system is a tool that alerts drivers stuck in extended periods of congestion. When a large crash occurs and motorists become stranded, the geofenced digital notification system will send information to motorists' mobile phones directly through an alert system.

Advanced Technologies for Work Zone Management

Advanced technologies for work zone management provide the Traffic Operations Center (TOC) the ability to actively manage and inform the public of work zones while also managing work zones along the corridor. The tools for work zone management include additional technology such as the Work Zone Builder application, SmartCone sensors, SmartVests, mobile work zone cameras, dedicated SSP, and mobile message signs.

The Work Zone Builder application should be deployed to the contractor community to facilitate the generation and management of higher resolution work zone data. SmartCones, SmartVests, and the Work Zone Builder application are currently under research in Virginia. Once these technologies are approved for implementation, the study team recommends that they be integrated in work zones throughout the I-95 corridor.

Regional Multimodal Mobility Program (RM3P)

RM3P's mission is to leverage the collaborative use of real-time data to improve travel safety, reliability, and mobility, and to give the public the tools to make more informed travel choices. RM3P consists of five interrelated initiatives designed to reduce corridor congestion and improve multimodal transportation. The study team recommended an area-wide deployment of the following strategies:

- Data-exchange platform (DEP)
- AI-based decision support system (AI-DSS)
- Commuter parking information system (CPIS)
- Multi-Modal analytical planner (MMAP)
- Dynamic incentivization (DI)

The RM3P effort is currently in the planning stages, with the DEP likely to begin later in 2021. Implementation of the remaining areas will follow in 2022 and beyond.

Data-Exchange Platform (DEP)

The DEP is a reliable, continuously updated, cloud-based data storage and exchange system. It will be used by regional partners and third-party providers to capture, process, and exchange information on real-time and historic multimodal travel conditions.

AI-Based Decision Support System (AI-DSS)

The AI-DSS will help predict the impact of disruptions to the transportation network and provide coordinated response options to agencies. The automated tool for operators will use travel data to monitor emerging conditions and recommend plans for coordinated, multiagency responses to congestion, incidents, and events.

Commuter Parking Information System (CPIS)

The CPIS will entail a real-time, app-based parking availability information system that provides reliable information about parking space availability at lots serving bus, vanpool, and carpool commuters.

Multi-Modal Analytical Planner (MMAP)

The MMAP will be a collaboration tool for transportation service providers to pinpoint unmet needs in the transportation network. This highly interactive tool will enable mobility providers to study the impacts of "what-if" scenarios and better plan for travel demand by identifying underserved areas, especially during disruptive events.

Dynamic Incentivization (DI)

DI will be a data-driven system offering the public incentives to modify their travel choices and behaviors in response to real-time travel conditions.

Arterial Operations

During traffic incidents or periods of congestion on the I-95 corridor, motorists choose to use the parallel facilities of US 1 and US 301 to avoid delays. A major incident on the interstate can result in a road closure of the impacted interstate segments and lead to temporary routing of traffic onto these parallel facilities. Because of this, the parallel facilities of US 1 and US 301 were evaluated for improvements that could improve operations during significant traffic incidents or periods of congestion. Highest priority was given to improvements that support the capabilities to mitigate traffic during an incident and at locations where incident frequency is highest. More than 300 locations were studied, and 2,000 improvements identified. The study team worked with the Districts to refine the recommended improvements. See **Appendix D** for a summary listing of the improvements. Arterial improvements consisted of strategies to enhance operations along incident detour routes, including ATSPM, lane reconfigurations, signing and pavement marking, communications upgrades, advanced traffic signal controllers, CCTV cameras, and changeable signage.

Table 1 summarizes the number of parallel facility improvements recommended for funding in each district.

Table 1 Parallel Facility Improvement Implementation Summary

Agency with Jurisdiction	Number of Improvement Locations			
	NOVA	Fredericksburg	Richmond	Total
VDOT	100	25	2	**127**
Locality	3	5	11	**19**
TOTAL	**103**	**30**	**13**	**146**

To date, the regions have made progress in implementing the proposed arterial improvements. The regions have performed initial scoping analysis and planning efforts to expedite the programming and deployment of the arterial improvements.

Figure 12 provides an example of a detour route and potential improvements identified at an intersection In this example, installing a dynamic LED blank-out sign is expected to allow for greater capacity to process turning vehicles along the detour route, reduce queue spillback toward I-95 and improve efficiency of signal operations.

Return on Investment (ROI)

ROI analyses were conducted for each of the operational improvement needs identified using safety, mobility, and environmental measures. Capital costs, as well as the 10-year operations and maintenance (O&M) costs, were calculated for each improvement and weighed against anticipated benefits.

The results of the analysis can be seen in the recommendations in **Table 2** and **Table 3**. The implementation of operational upgrades to the I-95 corridor is in keeping with CTB desires to move forward with operational improvements that offer the highest ROI and fastest potential for implementation along interstate corridors in Virginia.

Figure 12 Example Detour Route (I-95 Between Exit 150 And Exit 152)

**Example detour route is provided for illustrative purposes only and elements of the route may change.*

Table 2 Freeway Operations Improvements ROI

Proposed Operational Improvement	Implementation Cost	O&M Cost (10 Years)	Benefit (10 Years)	ROI (10 Years)
CCTV Cameras	$15.6M	$4.6M	$134.6M	7.0
Changeable Message Signs	$3.2M	$1.9M	$18.6M	3.9
Safety Service Patrols	$4.1M	$27.0M	$88.2M	2.9
TRIP Towing Program	$2.2M	$15.3M	$84.5M	4.9
Towing Program	$1.2M	$9.8M	$141.2M	12.9
Variable Speed Limits	$15.2M	$15.6M	$117.5M	3.9
Ramp Metering	$5.7M	$2.1M	$71.7M	9.7
Geofenced Emergency Notifications	$0.2M	$1.0M	$1.4M	1.3
Advanced Work Zone Technology	$1.0M	$4.1M	$19.2M	3.9
Regional Multimodal Mobility Project (RM3P)	$5.4*	$9.6M	$28.2M	2.9
Misc. Low-Cost Operations Improvements	$4.3M	$14.2M	$98.3M	5.4

* Innovation and Technology Transportation Funds (ITTF) are allocated to cover implementation costs

Table 3 Arterial Operations Improvements ROI

Proposed Operational Improvement	Implementation Cost	O&M Cost (10 Years)	Benefit (10 Years)	ROI (10 Years)
CCTV Cameras - Arterials	$3.2M–$3.5M	$0.9M	$28.6M	7.0
ATSPM*	$10.2M–$11.2M	$2.5M	$65.1M	5.2
Blank-Out Signs	$0.3–$0.4M	$0.7M	$2.5M	8.1

* Includes communications and/or controller upgrades to support the deployment of ATSPM

Multimodal Improvements

I-95: A Multimodal Corridor—Development of Multimodal Improvements

Through a cooperative process involving VDOT, DRPT, OIPI and regional transit providers rooted in existing planning efforts and public feedback, the study team defined and developed the specific multimodal improvements that will be included in the Plan. The process included the following steps to develop the final list of potential improvements:

1. Review existing plans and studies
2. Screen projects using subjective and objective evaluation factors
3. Conduct secondary screening with VDOT, DRPT, OIPI, and regional provider staff based on project focus areas
4. Conduct modified SMART SCALE project scoring
5. Refine and finalize list of potential improvements in coordination with the CTB.

Multimodal Improvements

After the project screening process, a total of 10 multimodal projects have been proposed to be prioritized for funding for a total of $59.5 million. These 10 projects represent the priorities out of the 130 total multimodal projects initially identified for consideration. The plan includes potential multimodal improvements as laid out in each of the areas below—commuter bus service and park-and-ride lots. The multimodal improvements are part of the suite of proposed improvements along I-95 including operational improvements on I-95, improvements on parallel facilities (such as US 1 and US 301), and capital projects on I-95. These multimodal improvements are complemented by existing transportation demand management (TDM) or commuter assistance programs (CAP) in the corridor such as multimodal ride matching, rewards for non-SOV travel, and strategic marketing and promotion of multimodal travel options and services, with emphasis on the most congested segments of I-95.

Type of Multimodal Improvement
Commuter Bus: Improvements such as new express bus routes from Stafford and Prince William Counties to destinations north of the Occoquan River.
Park-and-Ride: Improvements such as expansion of existing lots and construction of new lots.

Commuter Bus

Today, commuter buses move about 3,000 people across the Occoquan River—a key corridor crossing—in the peak period. The provision of commuter bus service is an important part of the congestion solution along the I-95 corridor, especially in the Fredericksburg region, where until recently public commuter bus service had not been available (In 2019 the I-395 Commuter Choice program recommended funding commuter bus service between Stafford and Washington, DC, and Stafford and the Pentagon, both of which are now operational).

Previous studies conducted by DRPT and the Fredericksburg Area Metropolitan Planning Organization (FAMPO) have shown demand for and recommended commuter bus service originating in Spotsylvania and Stafford Counties to key destinations in Northern Virginia such as the Pentagon, Alexandria, and Rosslyn as well as Downtown Washington, DC. This study advances four new commuter routes that originate in Stafford County, Caroline County, Prince William County, and Fredericksburg, connecting to key employment destinations including the Pentagon, Rosslyn, Crystal City, Alexandria, and Downtown Washington, DC. These recommendations include service that is expected to carry more than 150 riders from Spotsylvania and Stafford to points north each morning. **Table 4** shows the existing and proposed commuter bus service in the I-95 corridor. Compared to other mobility options, the provision of commuter bus is relatively inexpensive and nimbler to adjust based on changing travel patterns and needs.

Table 4 Existing and Proposed Commuter Bus in the I-95 Corridor

Origin		DESTINATION					
		Tysons (via I-495)	Mark Center	Old Town Alexandria (via I-95/I-495)	Pentagon/ Crystal City	Rosslyn/ Ballston	Washington DC
Fairfax County	Springfield	○	○		○		○
Occoquan River							
Prince William County	Lake Ridge	○	○	●	○		○
	Dale City		○		○	○	○
	Montclair/ Dumfries				○		○
Stafford County	Aquia Harbor		●		●		●
	Stafford		●		●		○ ●
Fredericksburg	Fredericksburg				●		●
Spotslyvania	Massaponax				●	●	●

Commuter Bus Key	
Existing (Baseline) Service	○
Proposed New Service	●
Proposed Additional Service	○ ●

Transforming Rail in Virginia Program

In the I-95 Corridor Improvement Plan Interim report, additional rail service options were evaluated including the potential addition of increased peak hour VRE service. During the refinement of the I-95 Corridor Improvement Plan, Governor Northam announced a landmark rail agreement between the commonwealth and CSXT, Amtrak, and VRE, known as the Transforming Rail in Virginia Program. While separate from the I-95 Corridor Improvement Plan, the program will provide considerable benefits to the I-95 corridor with infrastructure improvements that will enable doubled Amtrak round-trip service between Washington, DC and Richmond and expanded Virginia Railway Express (VRE) service with 15-minute intervals during peak periods and added night/weekend service, among other improvements across the commonwealth over the next several decades. Additionally, as part of the 2020 Virginia General Assembly, funding was also dedicated to improving

commuter rail service on the VRE Manassas Line, which parallels I-95 along its northern segments. These improvements will collectively address the rail needs originally identified as potential improvements in the Interim Report. More information can be found at the project website.[7]

Park-and-Ride Lots

Park-and-ride lots are a common transportation feature along the I-95 corridor and include state-owned, privately-owned, and informal lots. Under the oversight of VDOT, these facilities allow commuters—particularly long-distance commuters—to park their vehicles at a convenient location and then finish their commute using alternative transportation modes including carpool, vanpool, bus, train, bike, or walking.

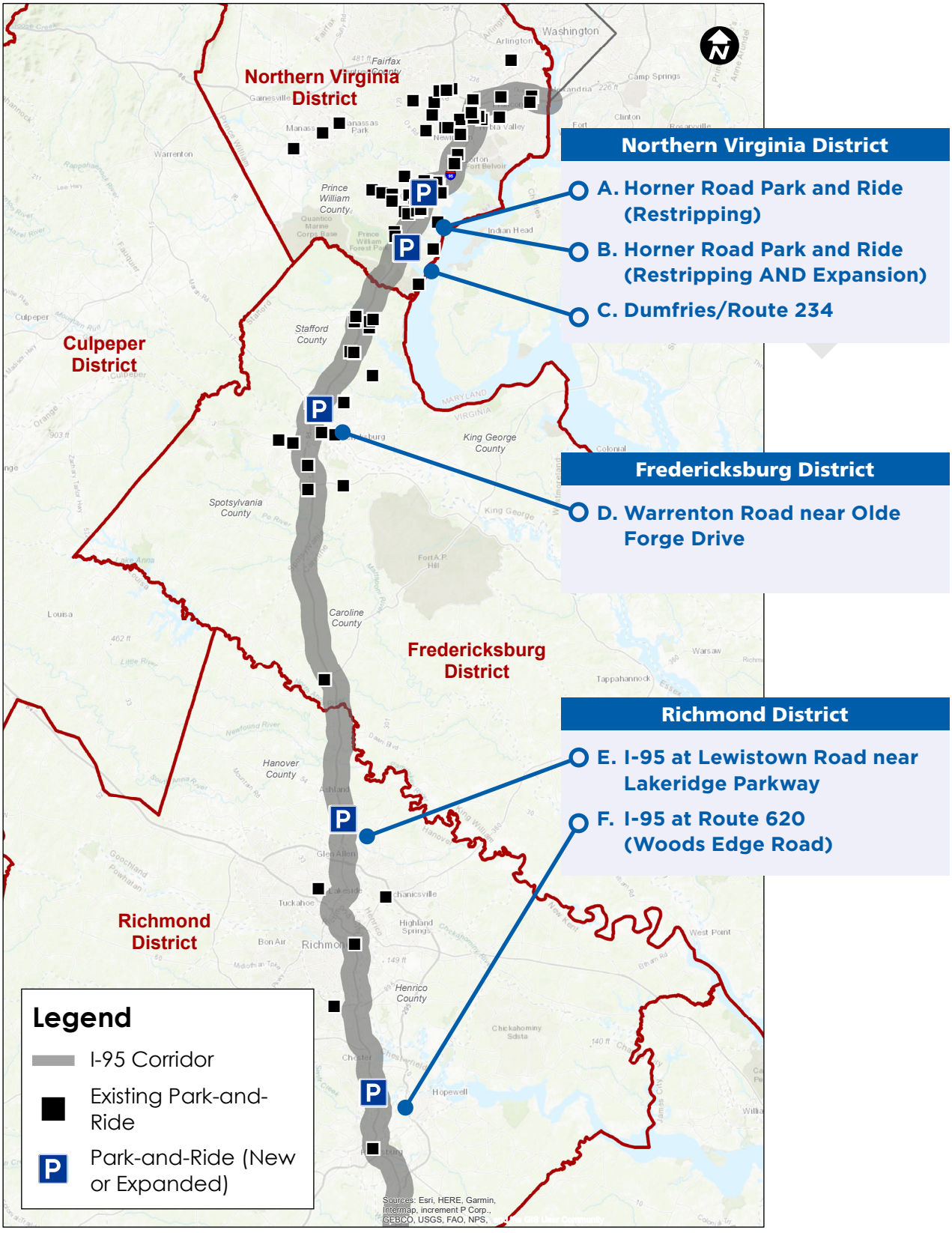
This Plan recommends enhancement, expansion, or new construction of six park-and-ride lots at key points along the I-95 corridor as shown on **Table 5** and in **Figure 9**. When combined, these recommendations would contribute more than 1,450 new parking spaces to the existing 18,000 spaces in the corridor—a seven percent increase. Many park-and-ride lots provide connections to existing and future commuter bus service, and all newly-constructed lots will be designed to accommodate and optimize carpool, vanpool, and slugging operations.

Table 5 Proposed Park and Ride Improvements

Map ID	Park-and-Ride Lot	Exit	Interchange	Description	Space Increase
A	Horner Road Park and Ride	158	Route 294 (Prince William Parkway)	Restriping of existing lot.	80
B	Horner Road Park and Ride	158	Route 294 (Prince William Parkway)	Restriping and expansion of existing lot.	304
C	Dumfries/Route 234	152	Route 234 (Dumfries Road)	Restriping of existing lot.	65
D	Warrenton Road near Olde Forge Drive	133	Route 17 (Warrenton Road)	New park and ride lot.	537
E	I-95 at Lewistown Road near Lakeridge Parkway	89	Route 802 (Lewistown Road)	New park and ride lot.	241
F	I-95 at Route 620 (Woods Edge Road);	58	Route 620 (Woods Edge Road)	New park and ride lot.	224
				Total	1,451

7 https://transformingrailva.com/

Figure 9 Proposed Park-And-Ride Improvements



Leveraging Commuter Assistance Programs to Move More People

Building new and widening existing roads alone is not enough to meet Virginia's current and future transportation needs. Congestion was identified by the public survey as the most important issue to address. Modeling efforts completed as part of the study concluded that adding a general purpose lane to I-95 in both directions between Exit 118 and Exit 170 would only temporarily relieve congestion issues and cost $12.5 billion. To effectively improve mobility, provide more travel options, move more people, and promote and sustain economic growth, there is a necessity to move more people with fewer vehicles by sharing rides and using high-capacity modes such as bus or rail. Commuter assistance programs are part of the solution to ensure people know about and are supported in using non-SOV modes of travel. Commuter assistance programs provide transportation choices, make Virginia's transportation more efficient, and help improve air quality. This is accomplished by moving more people in fewer vehicles, reducing vehicle miles traveled, reducing vehicle trips, and moving peak period trips to off-peak times.

Many statewide, regional, and local TDM initiatives are present today that cover the I-95 corridor. To maximize the effectiveness of capital and transit operational improvements as part of the Corridor Improvement Plan, DRPT, through its existing programs and coordinaiton will continue to work with local and regional entities and further target the I-95 corridor with strategic marketing and promotion of travel options, including:

- Targeted marketing that is targeted to corridor travelers with an emphasis on the most congested segments of I-95
- Coordinated marketing messaging with local commuter assistance programs
- Targeted communication with employers with a high concentration of employees that commute on I-95
- Use of the Commute!VA website and mobile app for multimodal travel options and ridematching
- Options for carpool, vanpool, transit, rail, and telework
- Use of Commute!VA rewards for carpool, vanpool, transit, and commuter rail
- Incentives for existing carpool and vanpool as well as assistance forming new ones
- Use of the express lanes free with EZ-Pass Flex and a carpool/vanpool of 3+ (including driver)

Corridor Costs and Potential Benefits

Summary of Costs

The projects listed in the sections above are summarized in **Table 6**. In total, there are 10 multimodal projects that total $59.5 million.

Table 6 Summary of Costs

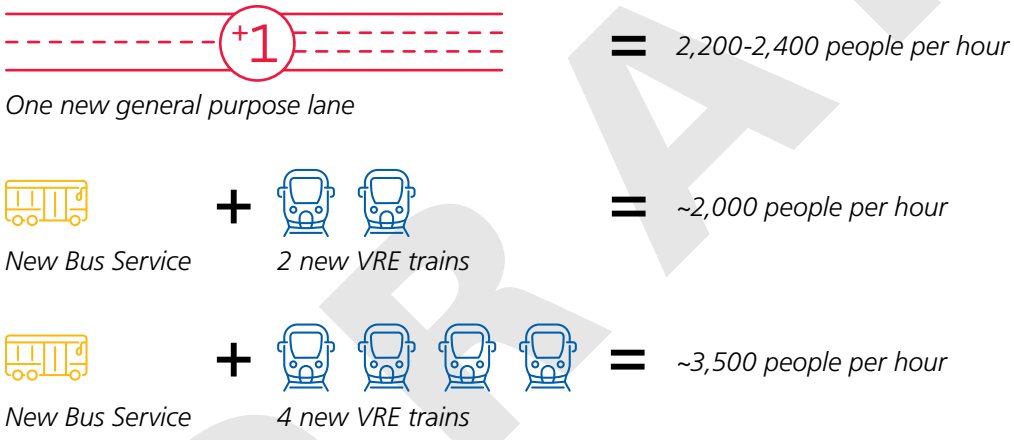
Type of Project	Number of Projects	Project Costs (2020)[8]
Commuter Bus	4	$24,390,000
Park-and-Ride	6	$35,110,000
TOTAL	**10**	**$59,500,000**

Benefits

Today, more than 60 percent of commuters between the Occoquan River and I-495 are moved by modes other than driving alone. Targeted improvements to transit, rail, and carpooling offer the greatest opportunities to not only improve performance on I-95 itself, but to provide fast and reliable trips along more parts of the corridor to more people.

The suite of multimodal improvements included in this study plus the ongoing Transforming Rail in Virginia program offer unique opportunities to address peak period traffic conditions that can be implemented with far lower cost, a much greater ability to safely move people, and more flexibility to adapt to changing travel patterns and needs than that of a large-scale widening of I-95 as shown in **Figure 10**.

Figure 10 People Moving Capacity

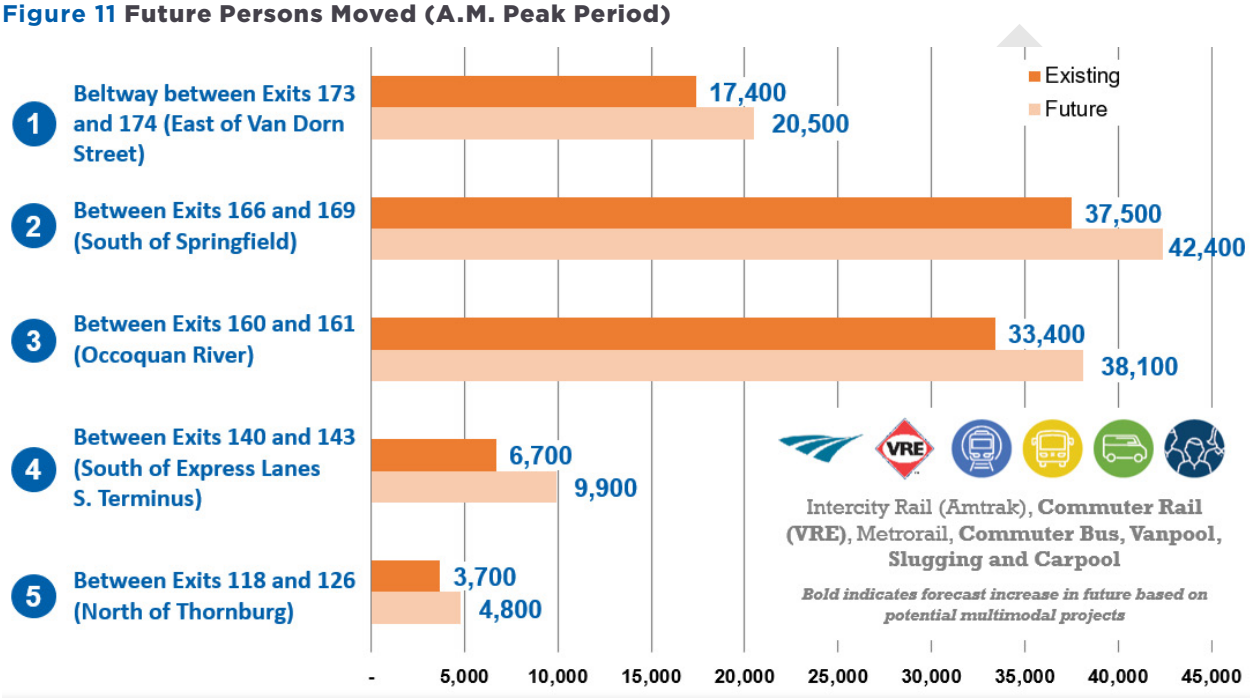


The proposed multimodal improvements in the Northern Virginia and Fredericksburg Districts cost considerably less ($59.5 million[9]) than building an additional lane of capacity ($12.5 billion). These improvements, when bundled with the Transforming Rail Initiative, result in a total benefit with significant cost savings. As part of the previously-mentioned hypothetical analysis of adding a lane in each direction on I-95 between Exits 118 and 170, the proposed multimodal improvements were evaluated. The multimodal improvements are projected to increase the number of persons moved in the corridor by non-SOV modes. As a direct result of the projects, increases are projected in the number of people carpooling (including slugging), vanpooling, and taking commuter bus during the morning peak period (**Figure 11**) in the five northernmost portions of the corridor. Other increases

8 Includes capital costs and operating costs in 2020 dollars.
9 Only includes I-95 Corridor Improvement Plan projects (commuter bus and park and ride lots)

in other modes may be possible but were not forecasted as part of this effort. The commuter rail total includes an assumed future four additional trains per peak period on the VRE Fredericksburg Line, but does not include any additional assumed improvements to the VRE Manassas Line, which received funding in the General Assembly action. At the Occoquan River, a major bottleneck along the corridor, the study team projects an increase of approximately 4,700 multimodal persons moved during the morning peak period. Other increases throughout the corridor vary depending on location.

Figure 11 Future Persons Moved (A.M. Peak Period)



Mainline Roadway Improvements Plan

The study team considered performance measures, supplementary data, existing roadway geometry, recently completed studies, and public input to develop potential capital improvements. The team also reviewed recently constructed projects and projects already funded in the Six-Year Improvement Program (SYIP) to determine how those projects may resolve issues in the corridor relating to the performance measures. The study team also examined recently constructed projects to determine how those projects may resolve issues in the corridor and whether crashes and delays in those areas may have been due to work zones.

The study team recommended the following types of capital improvements in the corridor based on the contributing factors (e.g. traffic volume, geometrics, and ramp spacing) for evaluation.

- **Auxiliary lanes:** An extra lane constructed to connect on- and off-ramps between closely spaced interchanges to reduce the impacts of traffic entering and exiting the interstate
- **Widening by one lane:** an extra lane constructed for multiple miles to increase the capacity of the interstate
- **Acceleration and deceleration lane extensions:** Longer lengths to accelerate when entering the interstate and decelerate when exiting the interstate
- **Hard Shoulder Running:** operating a managed lane on the existing shoulder during one or more peak periods
- **Interchange improvement:** A variety of improvements that improve safety and reduce delay at interchanges by modifying the existing interchange configuration

Table 7 shows the number of proposed mainline improvements by type and by district.

Table 7 Proposed Mainline Roadway Improvements By Type By District

Improvement Type	Hampton Roads	Richmond	Fredericksburg	Northern Virginia	Total
Auxiliary Lane	0	0	0	1	1
Widening by One Lane	0	0	2	0	2
Acceleration or Deceleration Lane Extension	2	6	2	2	12
Hard Shoulder Running*	0	0	0	1	1
Interchange Improvement	0	3	0	3	6
Total	2	9	5	7	22
Projected Cost (Millions)	$17.3	$213.2	$194.3	$604.5	$1,029.3

* The two hard shoulder running alternatives span parts of the Fredericksburg and Northern Virginia Districts but are included only in the Northern Virginia District numbers and cost projections.

Improvements and Locations Requiring Further Study

The study team also identified several improvements with the potential to resolve issues in the corridor relating to the performance measures that had not been recommended in a previously-completed study. These improvements would not be advanced to project prioritization because there is insufficient information to evaluate the projects. **Appendix E** contains a list of individual improvements and locations identified by the study team that were recommended for further study.

Available Funding

Table 8 outlines the estimated distribution of IOEP funding for I-95 in the coming years.

Table 8 Distribution of IOEP Funding For I-95 (In Millions)

Description	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	TOTAL
I-95	$13.2	$25.8	$25.8	$27.0	$28.4	$26.9	**$194.2**

In addition to those funds, additional IOEP funding is available to allocate to additional operations and capital projects as shown in **Table 9**. These funds reflect remaining balance after commitments for operational improvements on I-95.

Table 9 Additional Funding For Operations and Capital Projects For I-95 (In Millions)

Description	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	TOTAL
I-95	$0.0	$12.6	$13.2	$19.4	$28.2	$26.9	**$119.8**

Upon development of planning level cost estimates for recommended projects, the study team determined that the needs identified far exceeded available revenues. In addition, the needs do not account for planning level cost estimates associated with "improvements and or locations identified for further study." As a result, there was a need to prioritize improvements in order to stay within the projected funding levels.

Prioritization of Improvements

The prioritization process for I-95 followed the process outlined in the IOEP. The I-95 Corridor Improvement Plan identified the top 25 percent problem areas for congestion, safety, and reliability and the identified operational strategies, TDM strategies, and roadway capital improvements to address those issues in the corridor. All of these strategies improve reliability and safety of travel. The operational strategies were evaluated using an ROI methodology. The transportation demand management strategies and roadway capital improvements were evaluated using a SMART SCALE-like methodology using the following scoring weights:

- 40% for person hours of delay reduction
- 40% for reduction of fatal and severe injury crashes
- 20% for accessibility to jobs

These measures are a subset of those used in SMART SCALE and represent those measures that provide the greatest differentiation between segments and correlate with the IOEP goal defined in §33.2-372 of improving the safety, reliability, and travel flow along interstate corridors.

This scoring methodology resulted in the list of transportation demand management and capital projects recommended for funding as part of the I-95 Corridor Improvement Plan shown in **Table 10**[10]. According to the IOEP, available funding will be allocated to the projects based on the prioritization ranking, and scheduled according to constructability, risk, and the Board's discretion. At this time, 10 projects are recommended for funding, as indicated. Additionally, projects labeled as tentative may be considered for funding at the Board's discretion should there be available remaining funding. Detailed improvement prioritization scoring results are included in **Appendix F**.

Table 10 I-95 Corridor Improvement Plan Scoring And FY 2020 Project Costs

Mile Marker	Project Description	SMART SCALE Score	Project Cost	Recommended for Funding
Exit 166	Construct Flyover from I95 NB to Fairfax County Parkway NB	0.08	$ 94,418,000	No
Exit 163	Extend Southbound Acceleration Lane	0.32	$ 7,697,000	No
Exit 163	Extend Northbound Acceleration Lane	0.20	$ 9,982,000	No
Exit 160	Southbound Interchange Improvements	1.45	$ 76,000,000	Yes (IOEP)
Exit 160A	Northbound Interchange Improvements	0.53	$ 28,900,000	No
Exit 158 to Exit 160	Construct Northbound Auxiliary Lane	0.51	$ 40,785,000	No

10 Costs for projects recommended or tentatively recommended for funding have been inflated to year of expenditure and have undergone a preliminary refinement based on a process similar to SMART SCALE. Costs for the remaining projects are planning level costs that were used for initial project prioritization.

Mile Marker	Project Description	SMART SCALE Score	Project Cost	Recommended for Funding
Exit 158	Park-And-Ride Lot Enhancement, Restriping, and Expansion	2.29	$ 16,200,000	Yes
Exit 158	Park-and-Ride Lot Enhancement and Restriping	13.21	$ 840,000	Yes
Exit 152	Park-and-Ride Lot Enhancement and Restriping	20.10	$ 660,000	Yes
Exit 136	Extend Northbound Acceleration Lane	0.63	$ 3,543,000	No
Exit 133	New Park-and-Ride Lot	3.66	$ 14,900,000	Yes
Exit 133	Construct a Managed Lane (HSR) On Existing Left Shoulders	0.97	$ 387,784,000	No
Exit 126	Widen Northbound to Four Lanes	0.38	$ 87,723,000	No
Exit 126B	Extend Northbound Deceleration Lane	0.09	$ 33,747,000	No
Exit 126	Widen Southbound to Four Lanes	0.17	$ 69,261,000	No
Exit 89	New Park-And-Ride Lot	1.14	$ 11,400,000	Tentative (IOEP)
Exit 81	Extend Northbound Deceleration Lane	0.02	$ 29,624,000	No
Exit 76	Northbound PARCLO Interchange Improvements	0.79	$ 50,000,000	No
Exits 74 and 75 NB	Consolidate Access Points and Replace With C-D System	0.76	$ 70,000,000	No
Exit 73	Extend Northbound Deceleration Lane	0.21	$ 2,497,000	No
Exit 62	Extend Northbound Acceleration Lane	0.76	$ 3,504,000	No
Exit 61	Interchange Improvements and Park-and-Ride Lot Phase II	1.07	$ 26,898,000	No
Exit 58	New Park-and-Ride Lot	3.72	$ 7,100,000	Yes
Exit 53	Extend SB Acceleration Lane	2.44	$ 4,500,000	Yes
Exit 51	Construct Flyover Ramp from I95 NB to I85 SB	0.15	$ 30,754,000	No
Exit 50	Southbound Interchange Improvements	0.19	$ 128,974,772	No
Exit 41	Extend Southbound Acceleration Lane	0.29	$ 3,142,000	No
Exit 13	Extend Southbound Acceleration Lane	0.02	$ 10,539,000	No
Exit 11	Extend Southbound Deceleration Lane	0.17	$ 2,152,000	No
Exit 4	Extend Northbound Deceleration Lane	0.04	$ 2,491,000	No

VDOT

Office of INTERMODAL Planning and Investment

DRPT
Virginia Department of Rail and Public Transportation

INTERSTATE 95

Appendix C

Proposed Interstate Operations and Enhancement Program Projects
Amended to the FY2022-2027 Six-Year Improvement Program

UPC	District	Route	Official Description	Fund Source	Total Cost
TBD	Hampton Roads	64	I-64 Both - Route 972 (Tidewater to NNSB via HRBT)	64	$898,598
TBD	Hampton Roads	64	I-64 Both - Newport News Route 106 (Newport News / Warwick Boulevard / Denbigh Fort Eustis)	64	$4,033,729
TBD	Hampton Roads	64	I-64 Both - Newport News Route 107 (Newport News / Warwick Boulevard / Denbigh)	64	$3,511,492
TBD	Hampton Roads	64	I-64 WB - Exit 284 - Extend acceleration lane	64	$5,700,000
TBD	Hampton Roads	64	I-64 EB - Exit 256 - Extend acceleration lane	64	$3,000,000
TBD	Hampton Roads	64	I-64 EB - Exit 284 - Extend acceleration lane	64	$5,400,000
TBD	Hampton Roads	64	I-64 WB - Exit 282 - Extend acceleration lane	64	$5,200,000
TBD	Richmond	64	I-64 Both - Broad Street – Short Pump Bus Service	64	$3,744,635
TBD	Richmond	64	I-64 Both - Create a new express route (22x) from Short Pump to downtown	64	$3,017,484
TBD	Richmond	64	I-64 Both - Hickory Haven - New PnR or Relocate	64	$6,500,000
TBD	Richmond	64	I-64 Both - Increase bus frequency on Route 7 (Nine Mile) to 15 minutes	64	$7,816,397
TBD	Richmond	64	I-64 WB - Exit 181 - Improve Interchange Configuration	64	$12,000,000
TBD	Richmond	64	I-64 Both - Bottom's Bridge - Expand PnR or Relocate	64	$3,100,000
-25993	Staunton	64	I-64 EB - NB I-81 Exit 221 to EB I-64 - Install high-friction surface pavement	64	$600,000
-25995	Staunton	64	I-64 EB - MM 23 - Install flashing chevrons	64	$120,000
-25996	Staunton	64	I-64 WB - Exit 87 - I-64 WB to I-81 SB Ramp - Install high-friction surface pavement	64	$480,000
-25997	Staunton	64	I-64 WB - MM 19 to MM 21 - Install high-friction surface pavement	64	$2,300,000
-26005	Fredericksburg	95	I-95 Both - Exit 133 - New Park-And-Ride Lot	95	$21,200,000
-25999	Fredericksburg/Northern Virginia	395	I-395 Both - Exit 140 - West Stafford County to Capitol Hill (Route 4)	95	$4,456,941
-26000	Fredericksburg/Northern Virginia	395	I-395 Both - Exit 126 to Exit 10 - North Caroline County to DC Core (Route 1)	95	$6,934,144
-26001	Fredericksburg/Northern Virginia	395	I-395 Both - Exit 133 to Exit 9 - Fredericksburg to the Pentagon and Crystal City	95	$9,155,000
TBD	Northern Virginia	95	I-95 Both - Exit 152 - Park-And-Ride Lot Enhancement and Restriping	95	$660,000
TBD	Northern Virginia	95	I-95 Both - Exit 158 - Park-And-Ride Lot Enhancement and Restriping	95	$840,000
TBD	Northern Virginia	95	I-95 Both - Exit 158 - Park-And-Ride Lot Enhancement, Restriping, and Expansion	95	$16,200,000
TBD	Northern Virginia	95	I-95 Both - Exit 160 to Exit 177 - Central Prince William County to Downtown Alexandria	95	$6,169,000
TBD	Richmond	95	I-95 Both - Exit 58 - New Park-And-Ride Lot	95	$7,100,000
TBD	Richmond	95	I-95 SB - Exit 53 - Extend Acceleration Lane	95	$4,500,000
TBD	Bristol	77	CCTV Cameras	Other	$370,000
TBD	Bristol	77	Towing Programs - TRIP	Other	$150,000
TBD	Bristol	77	Portable CMS	Other	$210,000
TBD	Bristol	77	PSAP Integrations (3)	Other	$270,000
TBD	Bristol	77	SSP Automated Hazard Alerts	Other	$23,000
TBD	Culpeper	66	I-66 WB - MM 22.5 to MM 22.0 - Install Sequential Dynamic LED Chevrons	Other	$700,000
TBD	Culpeper	66	I-66 WB - Exit 31 - Extend Deceleration Lane and Install Warning Signs	Other	$1,100,000
TBD	Northern Virginia	66	CCTV Cameras	Other	$185,000
TBD	Northern Virginia	66	PSAP Integration (1)	Other	$90,000
TBD	Northern Virginia	66	CMS	Other	$350,000
TBD	Northern Virginia	495	I-495 NB - Express Lanes Extension (NEXT)	Other	$57,600,000
TBD	Richmond	85	CCTV Cameras	Other	$925,000
TBD	Richmond	85	CMS	Other	$350,000
TBD	Richmond	85	SSP Route	Other	$360,000
TBD	Richmond	85	Signs and Markings US 1	Other	$250,000

Appendix C

Proposed Interstate Operations and Enhancement Program Projects
Amended to the FY2022-2027 Six-Year Improvement Program

UPC	District	Route	Official Description	Fund Source	Total Cost
TBD	Richmond	85	PSAP Integrations (3)	Other	$270,000
TBD	Richmond	85	Portable CMS	Other	$140,000
TBD	Richmond	295	CCTV Cameras	Other	$1,480,000
TBD	Richmond	295	CMS	Other	$1,750,000
TBD	Richmond	295	SSP Route	Other	$360,000
TBD	Richmond	295	High Wind Warning	Other	$200,000
-25994	Staunton	66	I-66 WB - MM 13 to MM 10 - Install Sequential Dynamic LED Chevrons	Other	$970,000
TBD	Hampton Roads	64	I-64 Both - Exit 291/ I-464 Interchange - Improve Interchange Configuration (Alternative 4A)	Other/I-64	$140,000,000
TBD	Hampton Roads	64	I-64 EB - Exit 278 - Extend acceleration lane	Other/I-64	$5,100,000
TBD	Northern Virginia	95	I-95 SB - Exit 160 - Interchange Improvements	Other/I-95	$76,000,000
Total					**$433,840,420**