



VTrans2040 Multimodal Transportation Plan

Corridors of Statewide Significance Needs Assessment

East-West Corridor (C)



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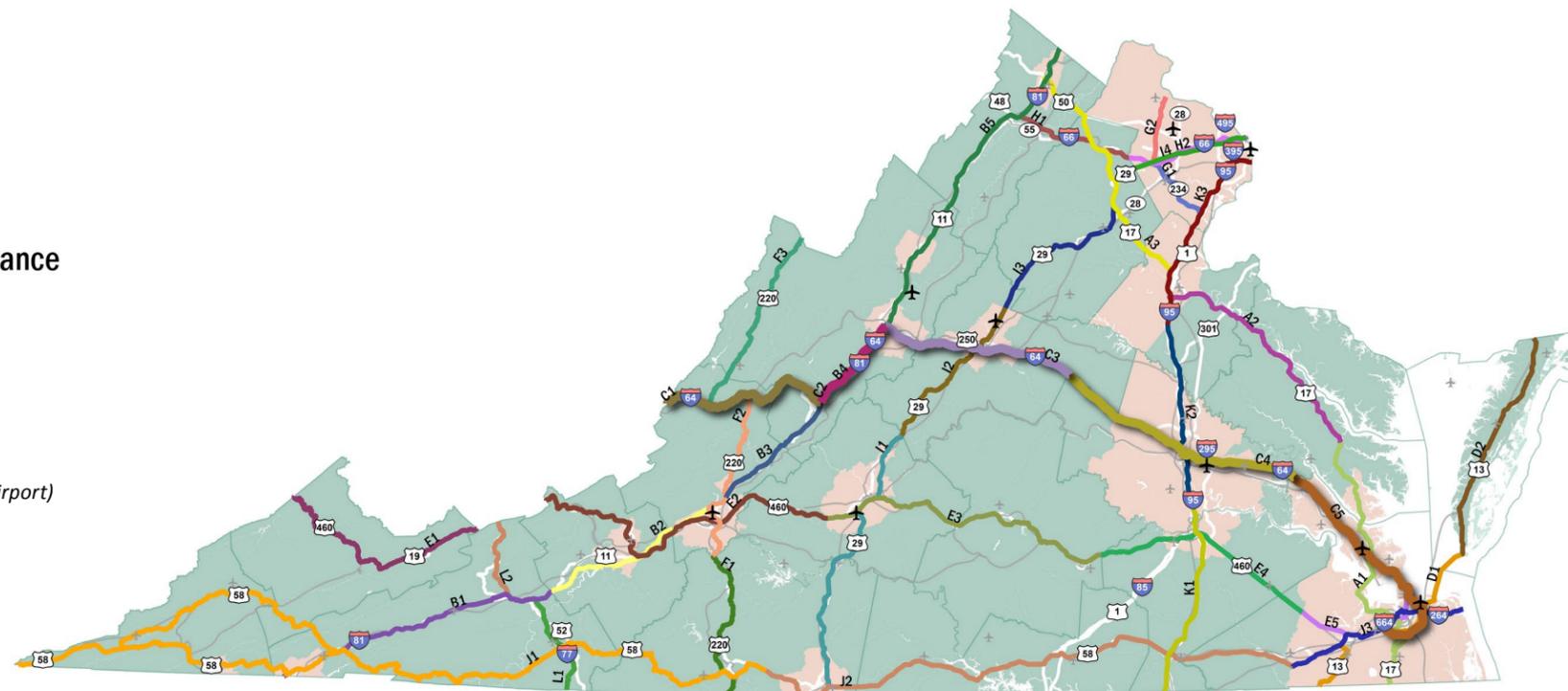
See *Corridors of Statewide Significance, Needs Assessment: Executive Summary and Methodology Report* for details on the overall assessment approach, data sources, and performance measures used throughout this report.

I. Corridor Overview

Corridors of Statewide Significance

A	Coastal Corridor (US 17)
B	Crescent Corridor (I-81)
C	East-West Corridor (I-64)
D	Eastern Shore Corridor (US 13)
E	Heartland Corridor (US 460)
F	North Carolina to West Virginia Corridor (US 220)
G	North-South Corridor (Route 234)
H	Northern Virginia Corridor (I-66)
I	Seminole Corridor (US 29)
J	Southside Corridor (US 58)
K	Washington to North Carolina Corridor (I-95)
L	Western Mountain Corridor (I-77)

- Corridor of Statewide Significance
(color varies by segment)
- Railroad
- Airport Facility
(grey denotes not a commercial service airport)
- Metropolitan Planning Organization Area



The East-West Corridor (Corridor C) is primarily defined by I-64, a multi-lane interstate highway that runs from Virginia to Missouri. The western terminus of I-64 is located near St. Louis, Missouri, although the roadway is under construction to connect with I-70 west of this location. The eastern terminus lies in the Hampton Roads Area, where the East-West Corridor includes the Hampton Roads Beltway (I-64 and I-664) and the I-264 spur to Virginia Beach. I-64 traverses approximately 300 miles of Virginia, with its western terminus located west of Covington, at the West Virginia state line.

In urbanized areas such as Richmond, Hampton Roads, and Charlottesville, I-64 serves as a major commuter route. The East-West Corridor also provides access to educational facilities, such as the University of Virginia, the College of William and Mary, and multiple institutions in the Richmond and Hampton Roads Areas. I-64 provides an important route over the mountains of western Virginia and is an important corridor for both freight and passenger rail. In addition, I-64 connects to the important I-81 and I-95 freight corridors.

Several parallel roadways are included in the East-West Corridor, including US 60 and US 250. US 60 runs along the East-West Corridor east of the City of Richmond and into Hampton Roads. US 250 acts as the major local-access roadway between Staunton and Richmond. For the portion running concurrently with I-81 between Staunton and Lexington, US 11 acts as the main parallel roadway and provides local access. West of Lexington, US 60

is the main parallel highway facility and local access road for the East-West Corridor.

Passengers in the East-West Corridor have several travel options in addition to driving. These include:

- Numerous Park-and-Ride facilities, especially around Charlottesville and Richmond, and between the two cities;
- High-occupancy vehicle (HOV) facilities in the Hampton Roads Area along portions of I-64 and I-264;
- Three Greyhound bus stations that operate in the Hampton Roads Area, one each in Norfolk, Hampton, and Virginia Beach; stations are also available in Williamsburg, Richmond, and Charlottesville;
- Amtrak service, available from eight stations within the corridor;
- Multiple airports, including four providing commercial service, operating within the East-West Corridor; and
- A number of line-haul transit routes that provide intercity service along the East-West Corridor:
 - The Alleghany Highlands Mountain Express is a deviated, fixed-route service that connects Iron Gate, Clifton Forge, and Covington;
 - The Greater Richmond Transit Company (GRTC) operates peak-hour commuter routes that travel the corridor, connecting residents of Henrico County to downtown Richmond; and

- Hampton Roads Transit provides commuter routes called the Metro Area Express (MAX). These routes travel portions of the East-West Corridor providing connections between Newport News, Hampton, Norfolk, Virginia Beach, Chesapeake, and Portsmouth.

CSX operates rail lines along the length of the corridor, which are used for both freight and passenger rail. The CSX Coal Corridor runs along I-64 between Hampton Roads and Charlottesville before traveling south toward Lynchburg. It parallels I-64 again west of Clifton Forge into West Virginia and the coal fields there. Two short-line railroads also run along the East-West Corridor for short distances in the Hampton Roads Area. In addition, Norfolk Southern's Crescent Corridor parallels I-64 where it runs concurrently with I-81 between Lexington and Staunton (Segment C2).

The East-West Corridor serves as a major freight route. I-64 provides direct access to other major East Coast freight corridors, including I-81 and I-95. I-64 is the only interstate that accesses the Hampton Roads Area, where multiple Port of Virginia facilities are located. I-64 also provides access to the James River and York River navigational channels for moving freight farther inland via barge. The corridor also provides access from the rest of the state to the military facilities located in that area. In addition, all lanes of I-64, including HOV lanes, are reversible in the event of an emergency evacuation.

Corridor Components

Highway Facilities

- Primary Facility**
 - I-64
- Other Highway Facilities**
 - I-664
 - I-564
 - I-464
 - I-264
 - US 60
 - US 60 Business
 - US 250
 - US 250 Business
 - US 11

Transit Services

- Amtrak
- Intercity bus service

Rail Facilities

- CSX Coal Corridor
- Norfolk Southern Crescent Corridor

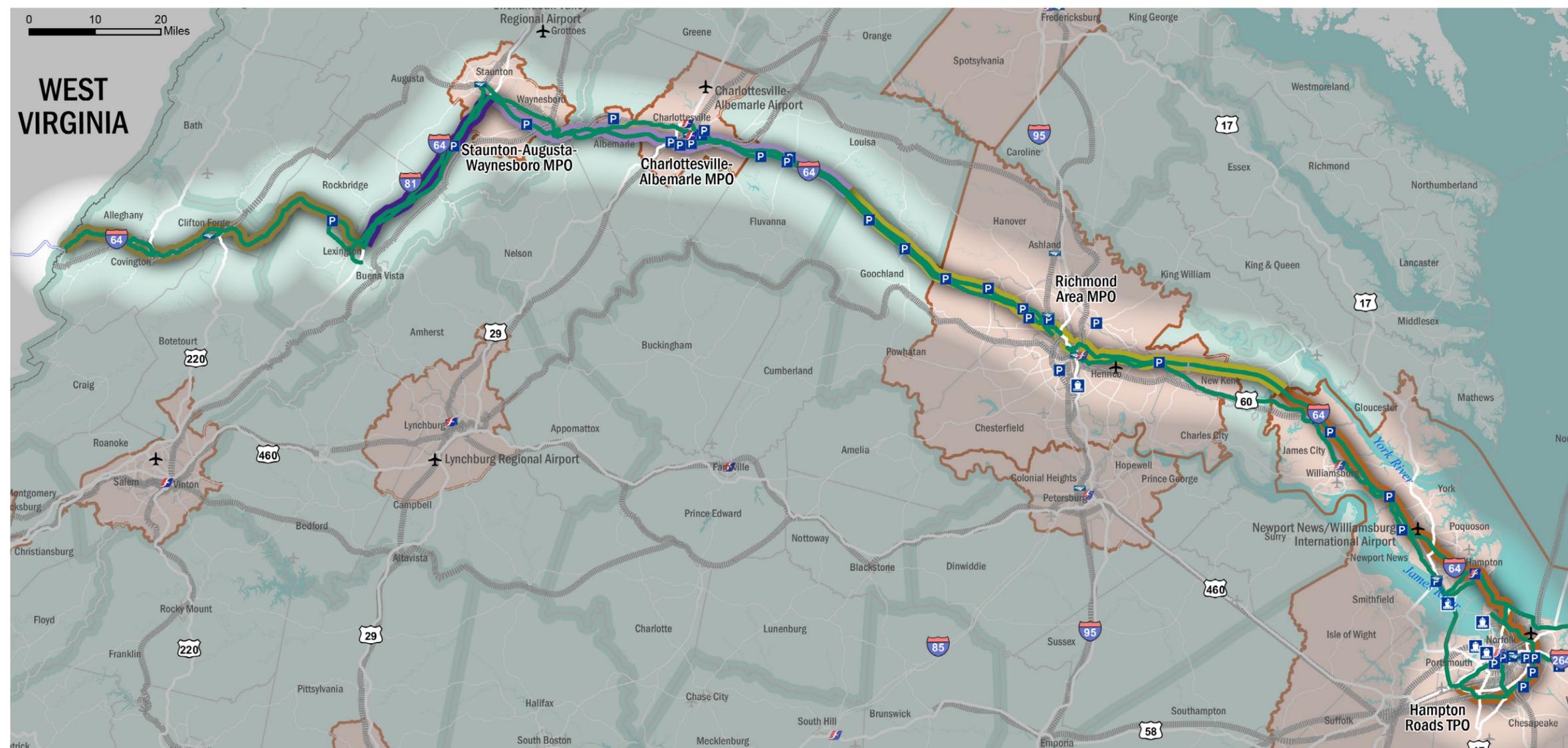
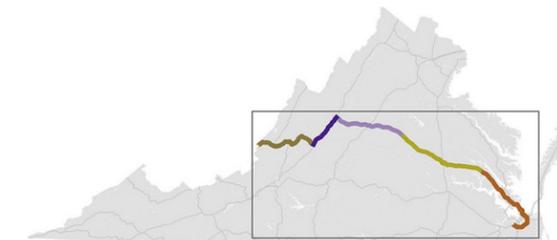
Port Facilities

- Port of Richmond
- Newport News Marine Terminal
- Norfolk International Terminal
- Portsmouth Marine Terminal
- Virginia International Gateway

Airport Facilities

- Norfolk International
- Newport News/Williamsburg International
- Richmond International
- Charlottesville-Albemarle Airport

- Corridor Segments**
 - C1
 - C2
 - C3
 - C4
 - C5
- Corridor Component Road**
- Railroad**
- MPO Area**
- Planning District Area**
- Amtrak Facility**
- Greyhound Facility**
- VRE Facility**
- Metrorail Facility**
- Port Facility**
- Park & Ride Facility**
- Airport Facility**



CORRIDOR C OVERVIEW

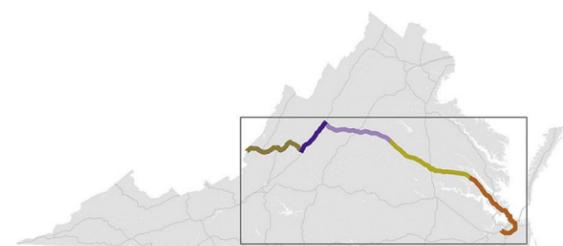
Demographics and Economic Trends

The primary population centers with greater than 500 persons per square mile along Corridor C are currently found in the City of Richmond and adjoining Henrico and Chesterfield Counties, as well as Norfolk, Hampton, and Newport News in the Hampton Roads Area. Alleghany and Rockbridge Counties have the lowest population density along the route with less than 50 persons per square mile. The most densely-populated segments along the corridor are Segments C4, around Richmond, and C5, in the Hampton Roads Area.

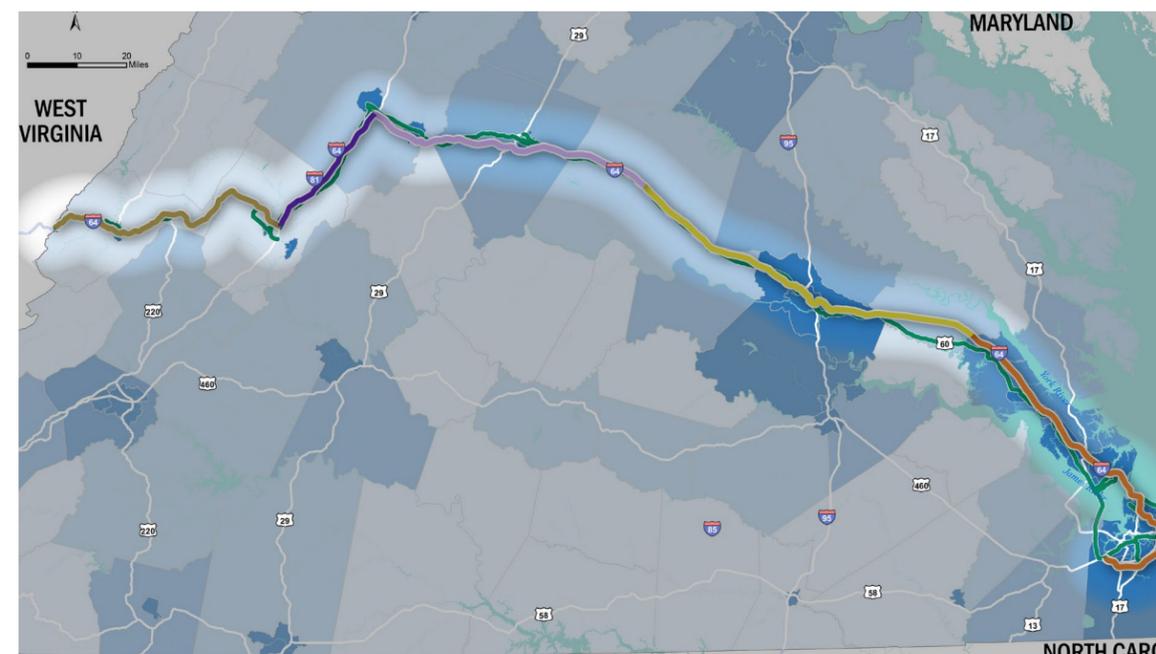
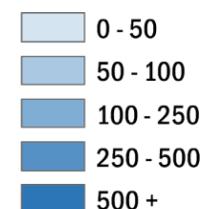
Between 2012 and 2025, James City and Hanover Counties are anticipated to see the largest population growth (greater than 25 percent) among counties along the corridor. Population is expected to decline in Alleghany County and the already densely-populated cities of Richmond, Hampton, and Virginia Beach. Overall, population is expected to grow except along the western end of the corridor.

Current employment centers follow patterns similar to those of the population centers, with employment highly concentrated in the more urbanized areas. Employment growth tracks a similar pattern along the corridor, except in Alleghany County, where employment increases while population decreases. Military employment is substantial in the Hampton Roads Area.

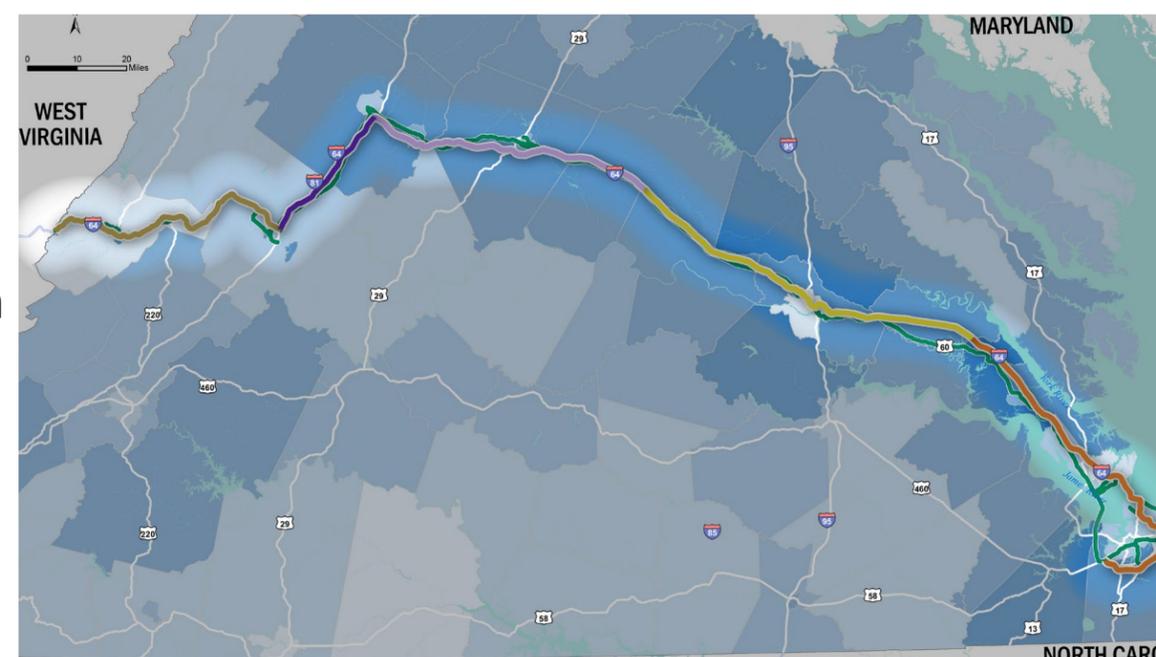
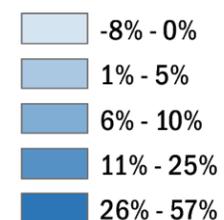
Corridor B passes through four Metropolitan Planning Organization (MPO) areas along its route, each with a different size and focus for its local economy. The Hampton Roads Transportation Planning Organization (TPO) Area has the highest gross domestic product (GDP) of any of the MPO areas in the corridor. The largest industry sectors in the corridor include wholesale trade, retail trade, and health care.



2012 Population Density Persons / Square Mile

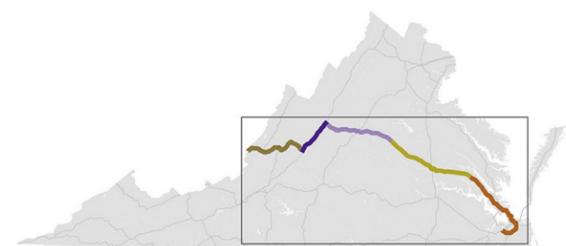
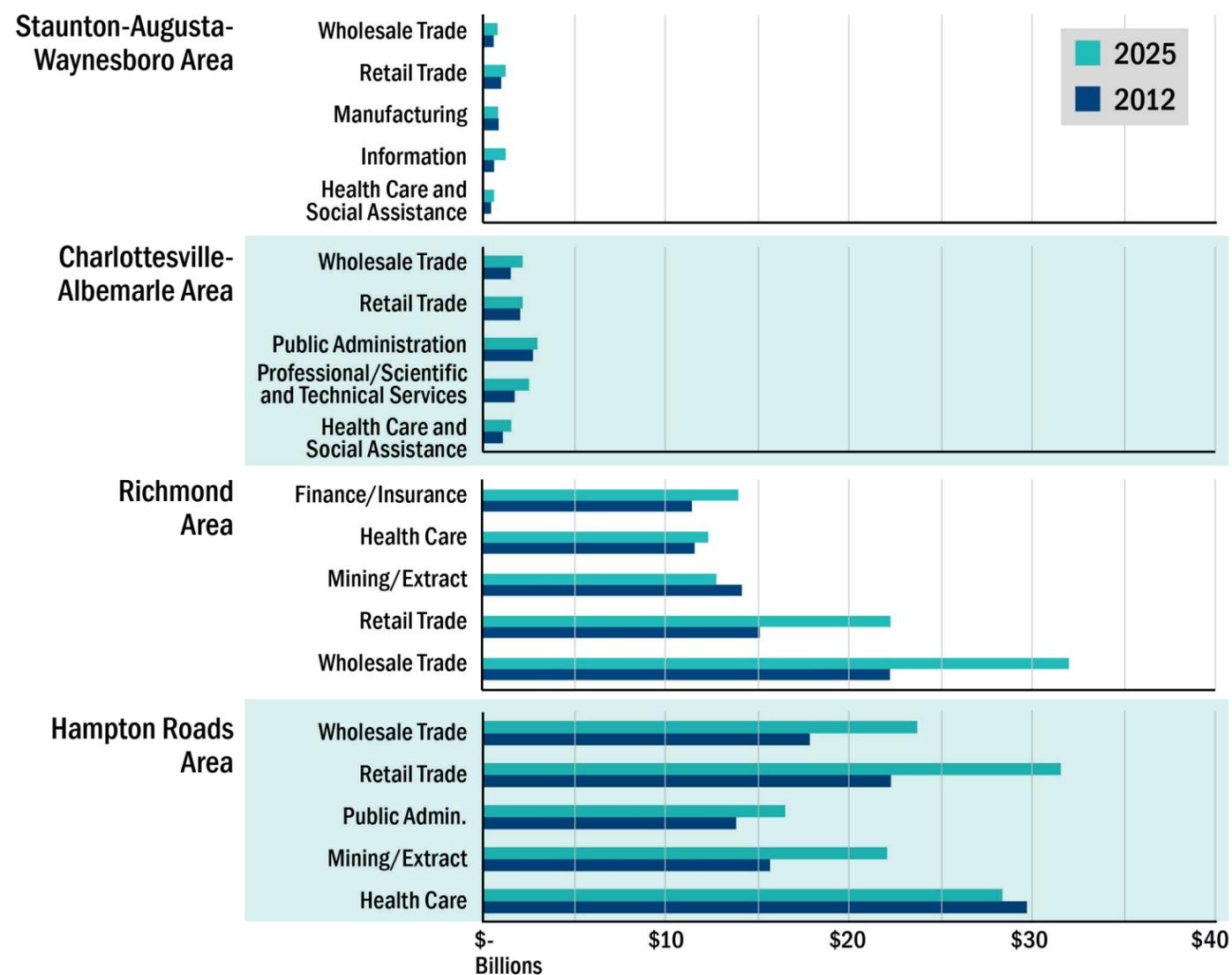


Population Growth (2012-2025) Percent Change

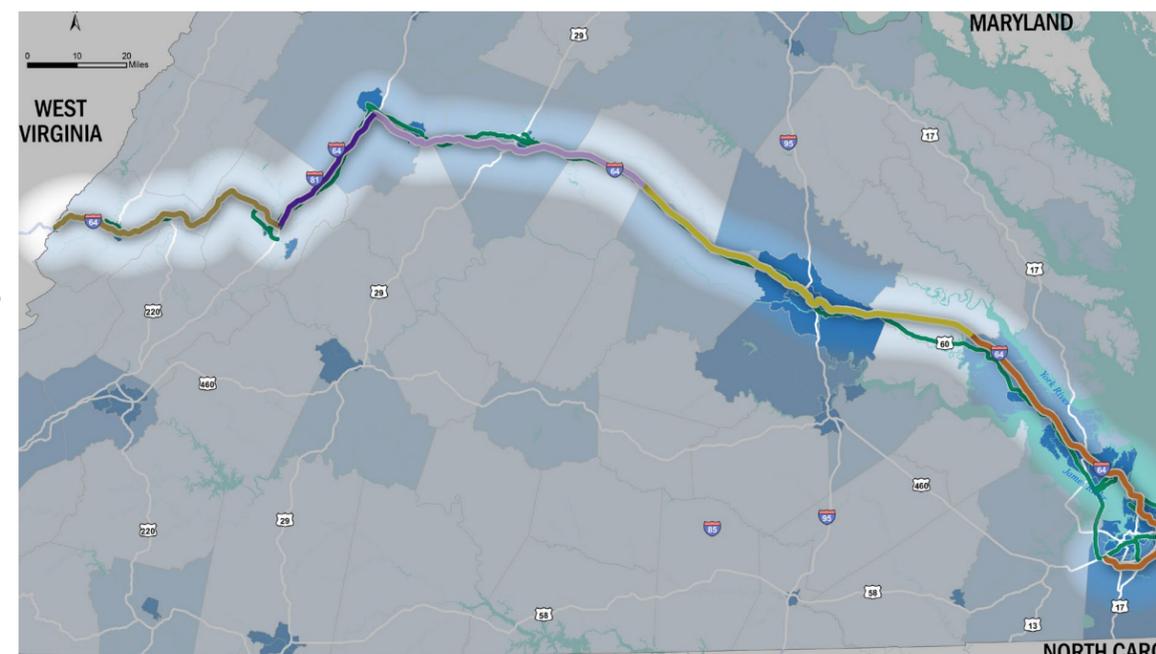
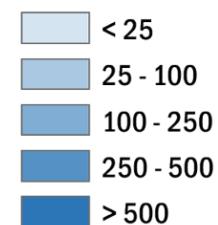


CORRIDOR C OVERVIEW

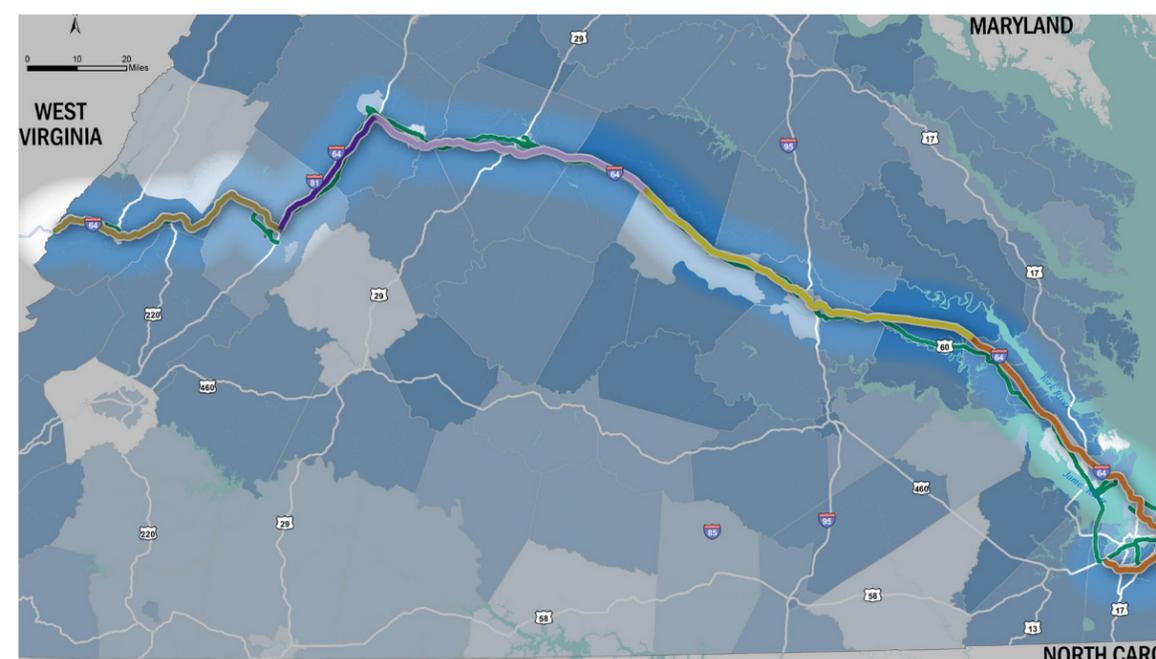
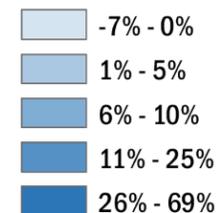
Top Industries (GDP)



2012 Employment Density Jobs / Square Mile



Employment Growth (2012-2025) Percent Change



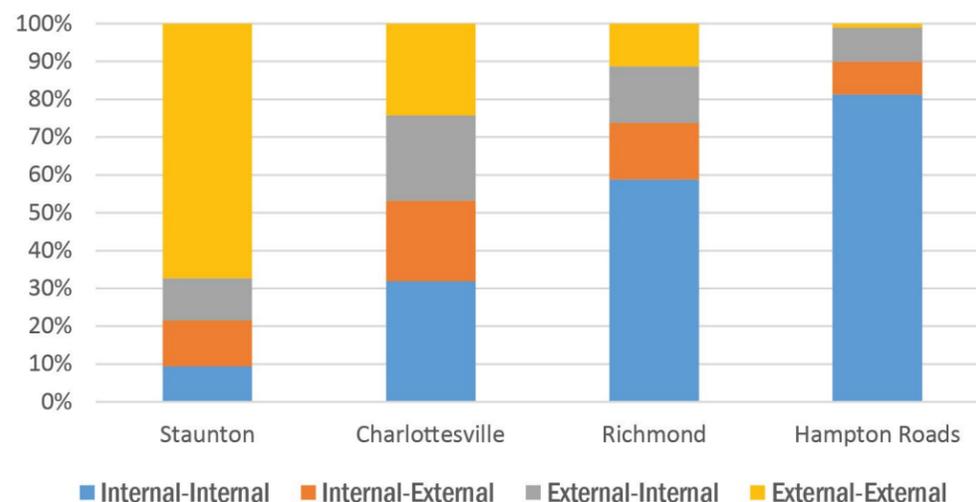
CORRIDOR C OVERVIEW

Corridor Travel Patterns

Passenger

Corridor C connects to West Virginia and passes through four MPO areas from west to east: Staunton-Augusta-Waynesboro, Charlottesville-Albemarle, Richmond, and Hampton Roads. Within the Staunton-Augusta-Waynesboro Area, Corridor C is dominated by through traffic, with more than 70 percent of the personal traffic on the corridor having both an origin and destination outside the MPO Area. The percentage of through traffic is much higher on the interstates, as the parallel facilities (US 11 and US 250) accommodate more than 50 percent local traffic. Traffic along Corridor C through Charlottesville is less dominated by through traffic (only 24 percent) while over 30 percent is entirely local traffic with both origins and destinations inside the MPO Area. The percentage of local traffic is much higher on the parallel facility (US 250) than on the interstate. Traffic along Corridor C in the Richmond Area is dominated by local traffic, which comprises more than 60 percent of traffic. Through traffic accounts for only 11 percent of the traffic on these facilities. In the Hampton Roads Area, through traffic along Corridor C is minimal, and the vast majority of traffic (approximately 80 percent) is comprised of internal trips occurring within the MPO Area.

Distribution of Internal and External Travel



Freight

By truck, Corridor C carried 149 million tons of freight worth \$246 billion in 2012, and is estimated to carry 208 million tons of freight worth \$393 billion in 2025. A large proportion of truck freight traffic on Corridor C, representing approximately 40 percent of total corridor tonnage and approximately 50 percent of the corridor value, passes through Virginia. Between three and four percent of the total truck freight tonnage travels along Corridor C between Pennsylvania and North Carolina. Besides this through traffic, a significant portion of the truck freight on Corridor C originates from (around 13 percent) or is destined for (between 13 and 18 percent) Norfolk and Portsmouth and their port facilities.

By rail, Corridor C carried 44 million tons of freight worth \$5 billion in 2012, and is estimated to carry 46 million tons of freight worth \$7 billion in 2025. Nearly all rail freight on Corridor C (approximately 95 percent of total tonnage) is destined for Virginia, with less than one percent of freight passing through the Commonwealth. This is primarily because large quantities of freight are traveling to/from the port facilities in the Hampton Roads Area. Large amounts of low value rail freight (around two-thirds of the total corridor rail freight tonnage but only around 20 percent of the corridor rail freight value) travel eastbound from West Virginia and Kentucky to the marine terminal located at Newport News.

Truck Freight

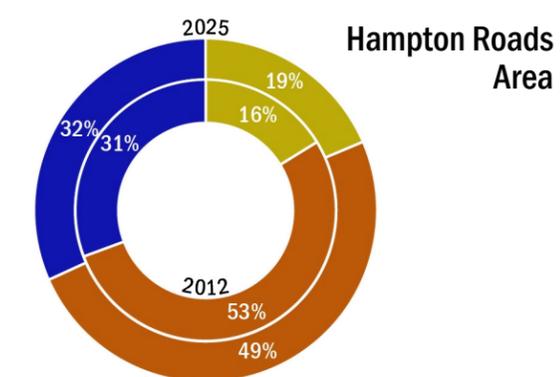
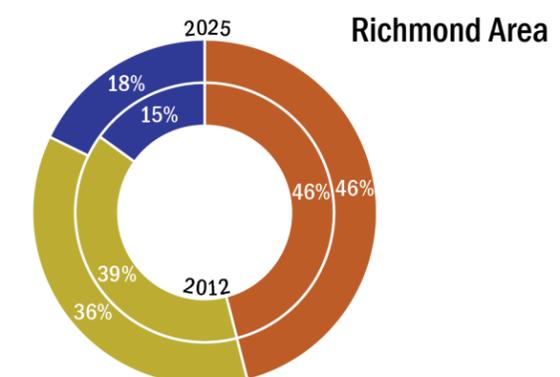
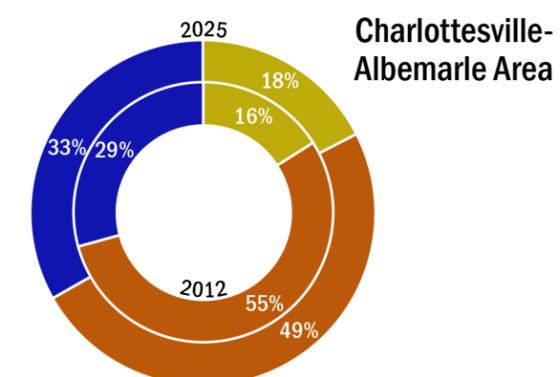
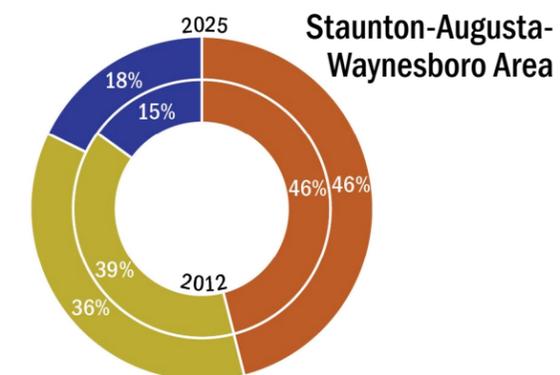
2012	2025
Rail Freight Value	Rail Freight Value
\$5 Billion	\$7 Billion
Rail Freight Tonnage	Rail Freight Tonnage
44 Million Tons	46 Million Tons
Freight Value per Ton	Freight Value per Ton
\$121	\$146
Corridor Tonnage Passing Through	Corridor Tonnage Passing Through
1%	1%

Rail Freight

2012	2025
Truck Freight Value	Truck Freight Value
\$246 Billion	\$393 Billion
Truck Freight Tonnage	Truck Freight Tonnage
149 Million Tons	208 Million Tons
Freight Value per Ton	Freight Value per Ton
\$1648	\$1891
Corridor Tonnage Passing Through	Corridor Tonnage Passing Through
40%	38%

GDP by Sector, 2012 and 2025

- Freight Dependent
- Local Serving
- Knowledge-based



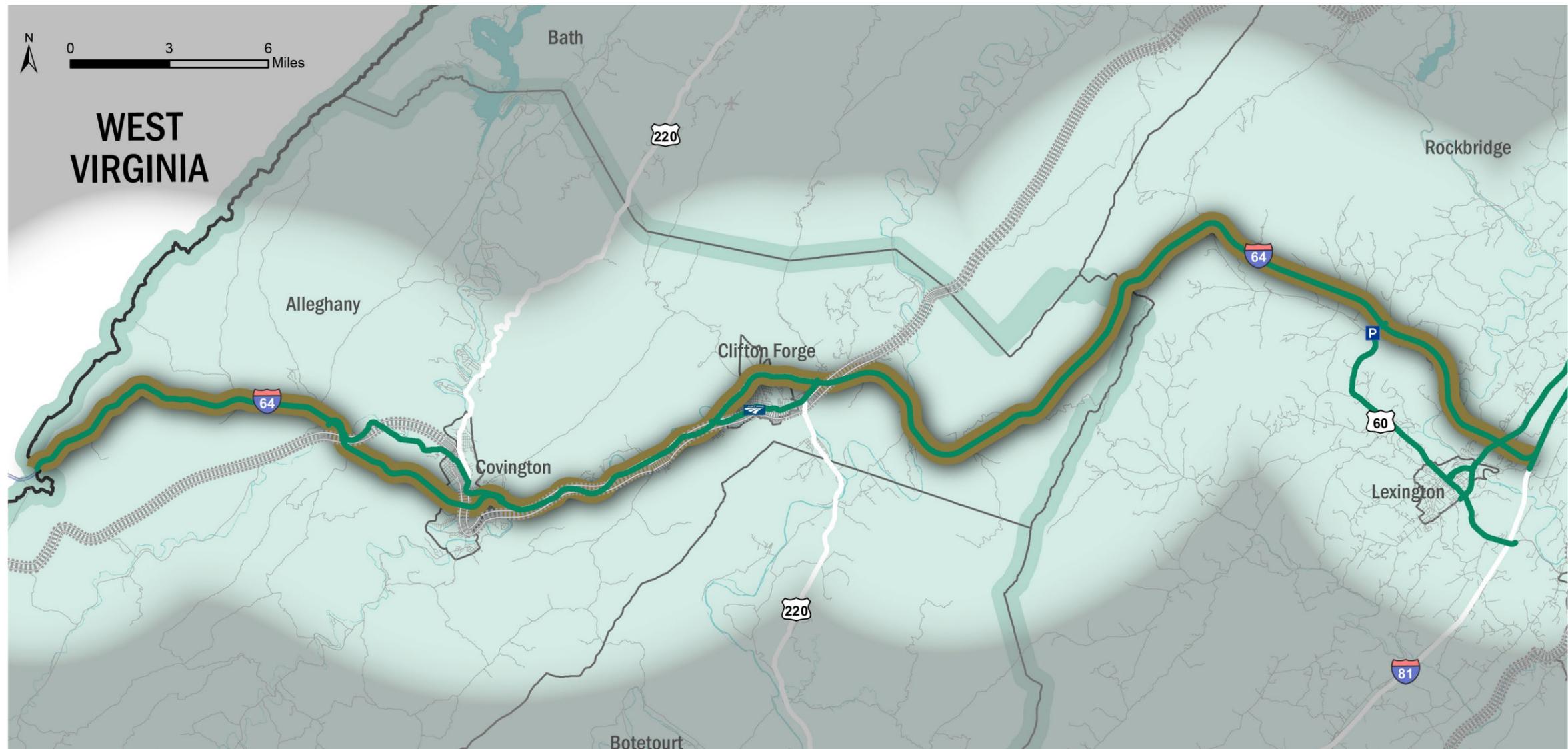
II. Segment C1

-  C1
-  Corridor Component Road
-  Railroad
-  MPO Area
-  Planning District Area
-  Amtrak Facility
-  Greyhound Facility
-  VRE Facility
-  Metrorail Facility
-  Port Facility
-  Park & Ride Facility
-  Airport Facility



Corridor Segment C1 Components

- I-64
- US 60
- US 60 Business
- Amtrak
- CSX Coal Corridor



C1 SEGMENT PROFILE

Segment C1 begins at the West Virginia border and progresses east to the junction of Interstates I-64 and I-81. This segment serves Alleghany and Rockbridge Counties, as well as the Cities of Covington and Lexington. The segment does not travel through any area covered by an MPO. The segment includes portions of US 60 and runs concurrently with a portion of US 220. Segment C1 acts as a major corridor for through freight travel in Virginia, providing access to the mountains and areas west. Segment C1 also connects smaller urban areas, such as Clifton Forge and Covington, as well as multiple natural, historical, and cultural resources.

Highway Facilities: I-64 is primarily a rural highway with four lanes in Segment C1. When not running concurrently with I-64, US 60 (in Covington and Lexington) and US 60 Business (in Clifton Forge) run parallel to I-64 in the urbanized areas within the segment.

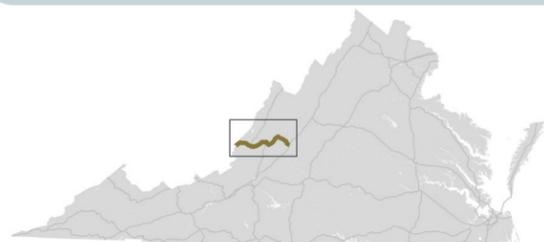
Transit Services: Amtrak offers service at Clifton Forge in Segment C1. RADAR, a non-profit transit agency based in the Roanoke Valley, operates the Mountain Express, which provides a transit connection between Covington and Clifton Forge. There is one Park-and-Ride location within close proximity to I-64 northwest of Lexington.

Rail Facilities: CSX's Coal Corridor runs through Segment C1.

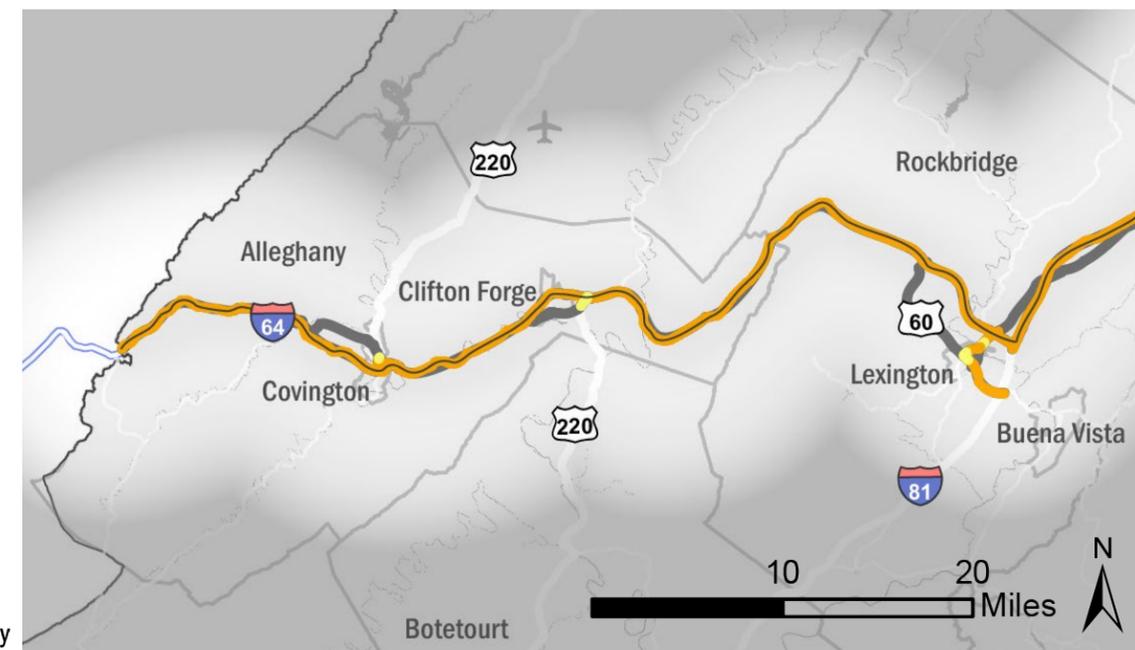
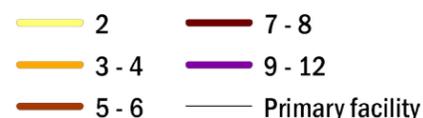
Port Facilities: Although there are no port facilities located directly adjacent to Segment C1, CSX's Coal Corridor does provide connections to multiple Port of Virginia facilities in the Hampton Roads Area.

Airport Facilities: There are no commercial airports in this segment.

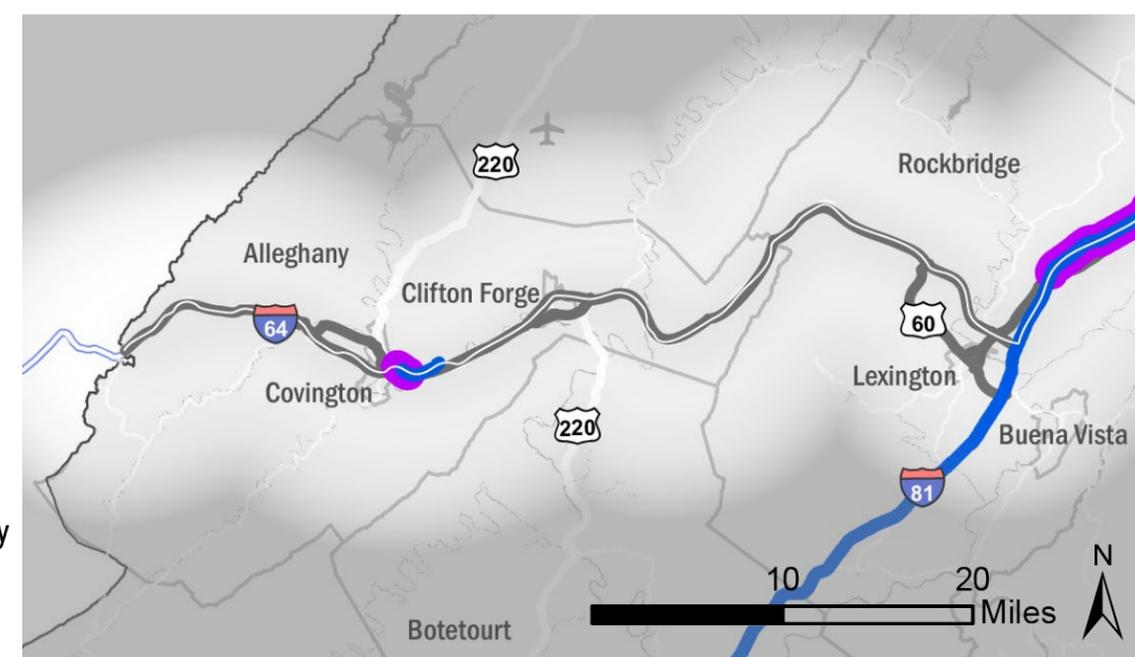
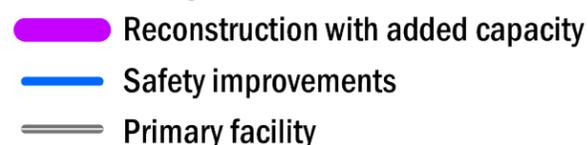
Major planned and future projects include: There are no major planned projects to improve safety or increase capacity on this segment at this time.



Number of Lanes (both directions)



Future Projects



C1 SEGMENT PROFILE

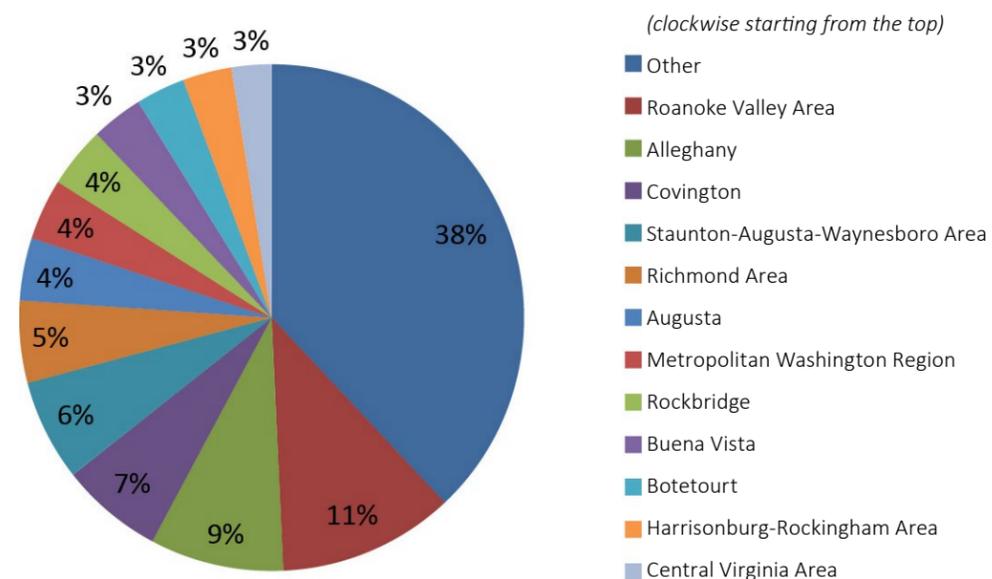
Travel Demand



Passenger Demand

The westernmost segment of Corridor C stretches from the West Virginia border to the intersection with I-81 through Alleghany County via Covington and through Rockbridge County via Lexington, and includes a portion that is concurrent with Segment F3. Intercity passenger travel from these jurisdictions accounts for a small percentage of the total intercity travel in the Commonwealth (approximately 1.2 percent). However, major markets in this segment include travel between Covington and Lexington (22 percent total), the Roanoke area (11 percent), and the Richmond area (five percent), all of which may use portions of Segment C1. Travel to West Virginia represents a surprisingly small portion of travel from these jurisdictions, at only two percent.

Travel from Jurisdictions along Segment C1 to...



C1 SEGMENT PROFILE

Freight Demand

By truck, Segment C1 carried 11 million tons of freight worth \$21 billion in 2012, and is estimated to carry 16 million tons of freight worth \$52 billion in 2025. A large proportion of truck freight traffic on Corridor C, representing approximately 40 percent of total corridor tonnage and approximately 50 percent of the corridor value, passes through Virginia. Besides this through-traffic, a significant proportion of the truck freight on Corridor C originates from (around 13 percent) or is destined for (between 13 and 18 percent) Norfolk and Portsmouth. Another major truck freight movement on Corridor C is between Nevada and the ports in the Hampton Roads Area, which accounts for 4,000 tons of freight worth \$5 billion in 2012 and is expected to increase significantly in value to \$28 billion in 2025, corresponding with only a modest gain in the freight tonnage to 4,300 tons. Truck freight originating from or destined for counties adjacent to Segment C1 accounts for just a small percentage of the total freight tonnage and value on Corridor C. Botetourt County, located near Segment C1, is the largest generator of truck freight along the corridor segment, producing around one percent of the total truck freight tonnage in both 2012 and estimated for 2025.

By rail, Segment C1 carried 38 million tons of freight worth \$3 billion in 2012, and is estimated to carry 39 million tons of freight worth \$4 billion in 2025. Nearly all rail freight on Corridor C (approximately 95 percent of total tonnage) is destined for Virginia, with less than one percent of freight passing through the Commonwealth. This is primarily because large quantities of freight are traveling to/from the port facilities in the Hampton Roads Area. Large amounts of low value rail freight (around two-thirds of the total corridor rail freight tonnage but only around 20 percent of the corridor rail freight value) travels eastbound from West Virginia and Kentucky to the marine terminal located at Newport News. The City of Covington, adjacent to Segment C1, is a significant attractor of rail freight for the corridor, accounting for between six and nine percent of the total rail freight value in 2012 and 2025, with much of this freight arriving from Pennsylvania and the Carolinas.

Truck Freight

Major Origins (by Tonnage)

1. Virginia (36% / 37%)
2. North Carolina (15% / 13%)
3. Pennsylvania (7% / 7%)
4. City of Norfolk* (6% / 6%)
5. New Jersey (5% / 5%)

Corridor Tonnage Originating in Segment C1:
2% / 2%

Major Origin-Destination Pairs for Freight

- North Carolina and Pennsylvania
- North Carolina and New York
- North Carolina and Maryland
- City of Norfolk* and North Carolina
- North Carolina and New Jersey

Percentages represent 2012 / 2025 values.
*Includes freight passing through the Port of Virginia.

Major Destinations (by Tonnage)

1. Virginia (40% / 41%)
2. North Carolina (10% / 10%)
3. Pennsylvania (7% / 7%)
4. City of Norfolk* (7% / 7%)
5. New York (7% / 6%)

Corridor Tonnage Destined for Segment C1:
2% / 2%

Rail Freight

Major Origins (by Tonnage)

1. West Virginia (74% / 71%)
2. Virginia (9% / 11%)
3. Kentucky (8% / 8%)
4. Dickenson County (3% / 3%)
5. Hanover County (2% / 3%)

Corridor Tonnage Originating in Segment C1:
<1% / <1%

Major Origin-Destination Pairs for Freight

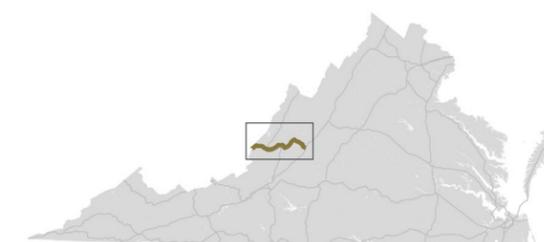
- City of Newport News* and West Virginia
- City of Norfolk* and West Virginia
- City of Newport News* and Kentucky
- Dickenson County and City of Newport News*
- Hanover County and City of Newport News*

Percentages represent 2012 / 2025 values.
*Includes freight passing through the Port of Virginia.

Major Destinations (by Tonnage)

1. Virginia (96% / 95%)
2. City of Newport News* (73% / 71%)
3. City of Norfolk* (11% / 10%)
4. City of Covington (2% / 2%)
5. Rockingham County (1% / 2%)

Corridor Tonnage Destined for Segment C1:
2% / 3%

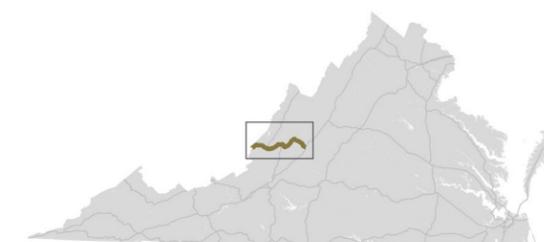


C1 SEGMENT PROFILE

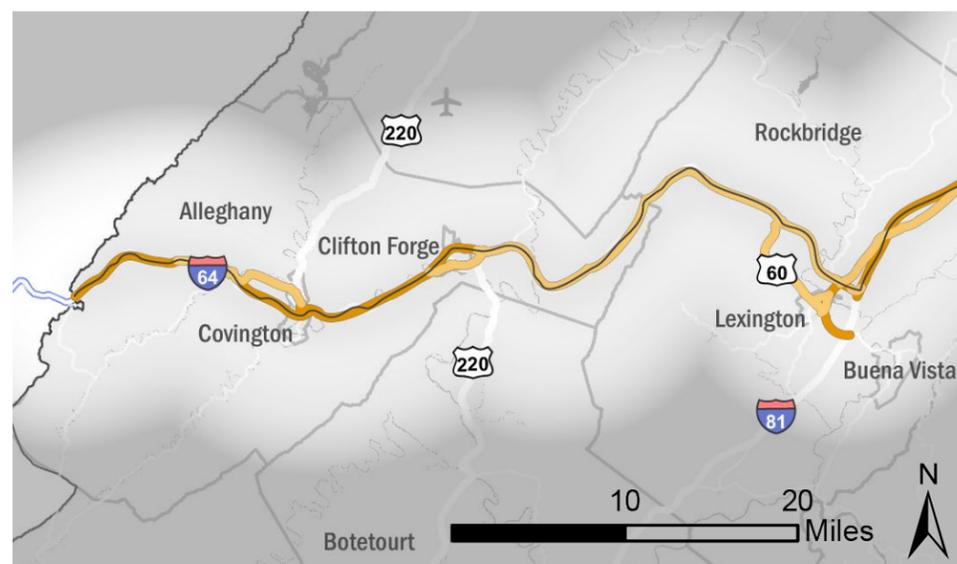
Traffic Conditions

Traffic Volume and AADT

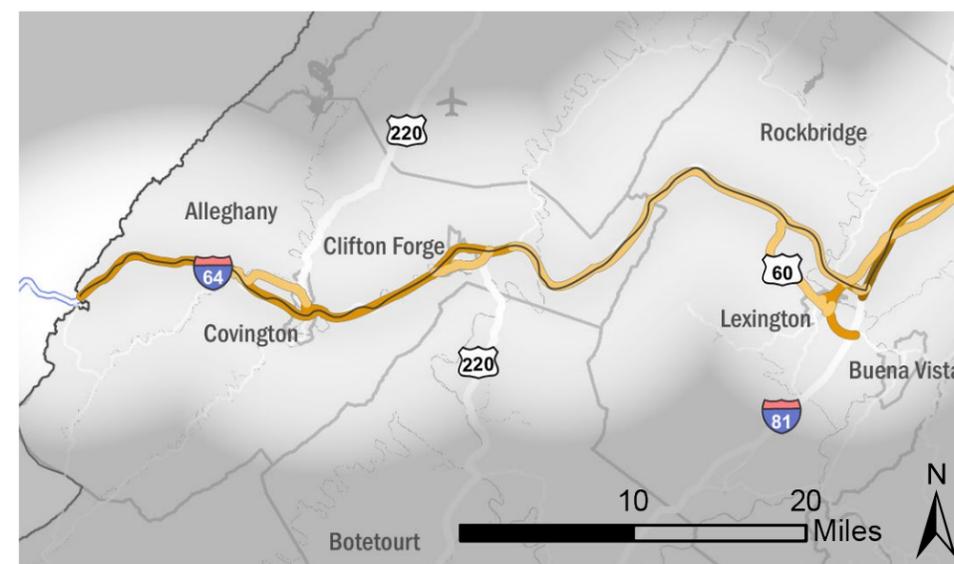
Traffic volume on Segment C1 is the lowest compared to traffic volumes on other segments of Corridor C. Average traffic volumes on I-64 are less than 18,000 vehicles per day throughout Segment C1, and are generally higher west of Clifton Forge. Traffic on the parallel facilities in the urban areas is much lower, with volumes below 7,000 vehicles per day throughout Segment C1. Minimal traffic growth is forecast for Segment C1 by 2025, with traffic increases of no more than 2,000 vehicles per day, except on US 60 in Lexington. By 2025, traffic volumes along I-64 between the West Virginia border and Clifton Forge are projected to range from 11,000 to 19,000 vehicles per day. By 2025, traffic volumes along I-64 east of Clifton Forge are projected to range from 8,000 to 11,000 vehicles per day.



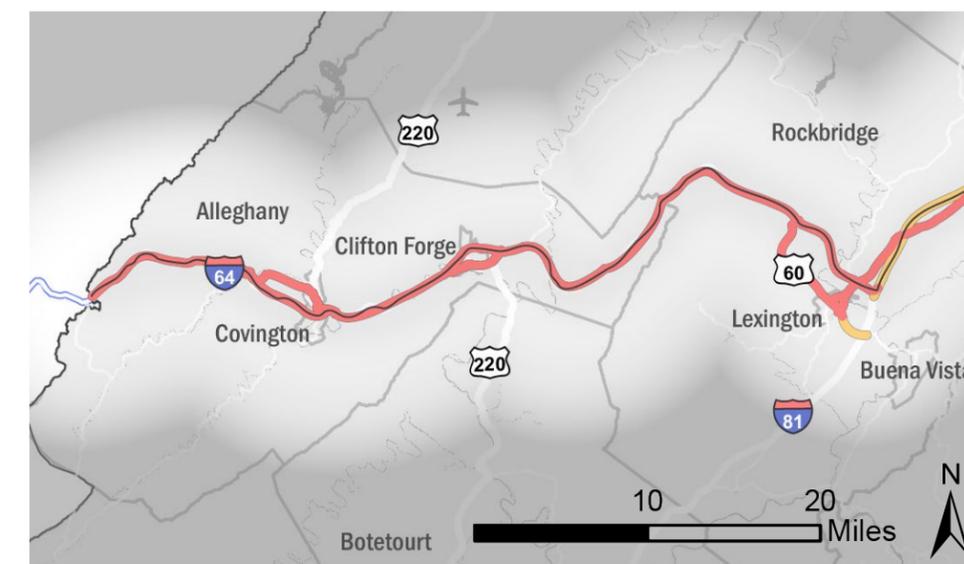
Traffic Volume 2014 (AADT)



Traffic Volume 2025 (AADT)



Change in Traffic Volume 2014- 2025 (AADT)



C1 SEGMENT PROFILE

Traffic Distribution

On average, traffic on Segment C1 is distributed throughout the day as shown in the graphs below. Weekday traffic shows steady increase in the flow throughout the day, peaking between 4 and 5 p.m. The combined weekday traffic between 7 a.m. and 7 p.m. accounts for 76 percent of the total daily traffic. Peaking patterns for truck traffic show a relatively steady flow of trucks during the midday period between 11 a.m. and 5 p.m., with a peak hourly flow of 6.2 percent of daily traffic. Weekend traffic patterns are also different from the typical commute patterns, showing a single peak during the middle of the day, with the highest percentage of hourly traffic occurring between 2 and 3 p.m. (8.3 percent of daily traffic) for all traffic, and 3 to 4 p.m. (6.4 percent of daily traffic) for truck traffic.

Weekday traffic volumes on Segment C1 vary by as much as 58 percent throughout the year, with the highpoint in August (around 10,000 vehicles per day) and the low point in January (around 6,000 vehicles per day). Truck volumes vary less than passenger volumes throughout the year, with the September high (around 2,000 vehicles per day) 20 percent higher than the January low (around 1,700 vehicles per day). Weekend traffic levels show a distinct peaking pattern in the late Spring over the course of the year, and the highest levels of weekend traffic (June, around 10,000 vehicles per day) are 113 percent higher than February levels (around 5,000 vehicles per day). Weekend truck traffic is much more steady than all vehicle traffic, and the September high is only 21 percent higher than the July low. Truck volumes account for a significant portion of traffic on Segment C1 (24 percent of overall daily traffic for weekdays and 14 percent of overall daily traffic for weekends); as a result, truck traffic has an impact on overall traffic conditions.

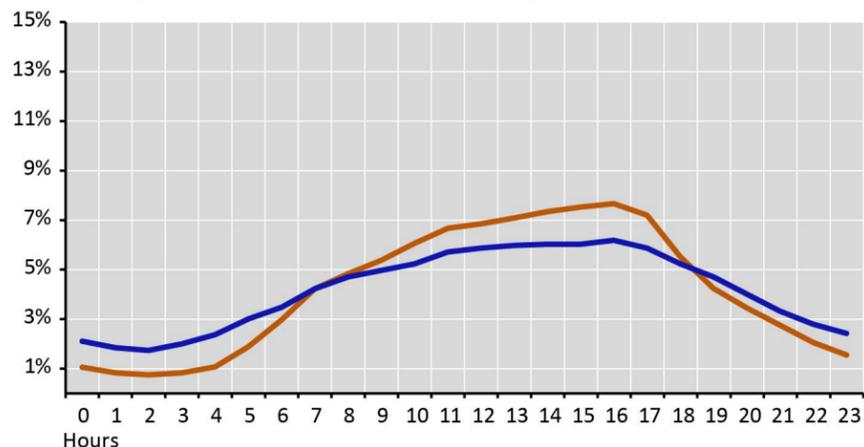
Truck Volume

The percent of average daily traffic comprised of heavy trucks on Segment C1 is high compared to most other segments of Corridor C. On average, heavy trucks on I-64 comprise 11 percent of total traffic throughout Segment C1. Trucks comprise a smaller proportion of daily traffic on the parallel facilities.

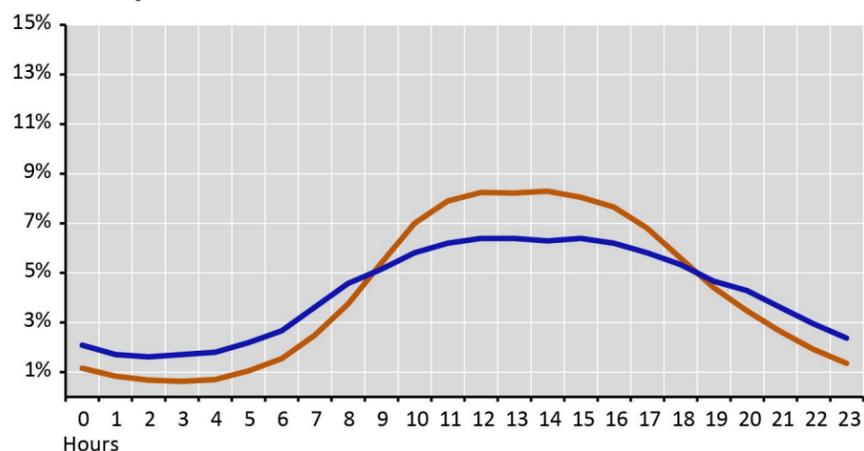
Percent Heavy Trucks



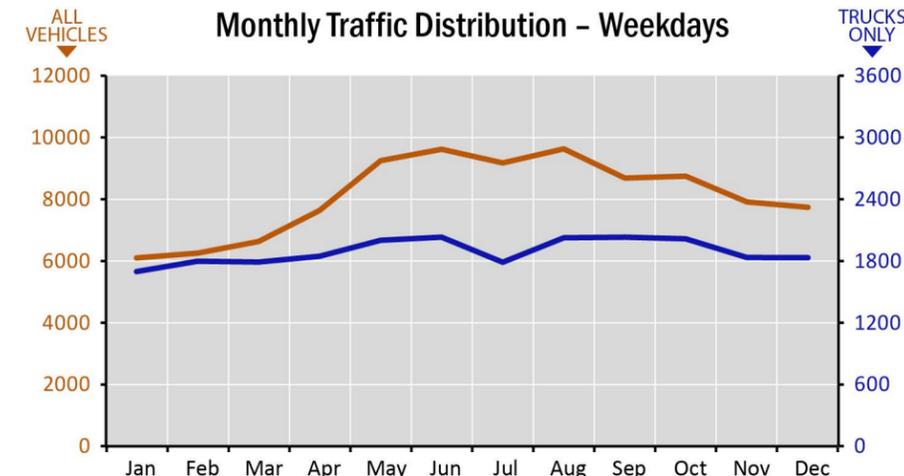
Hourly Traffic Distribution – Weekdays



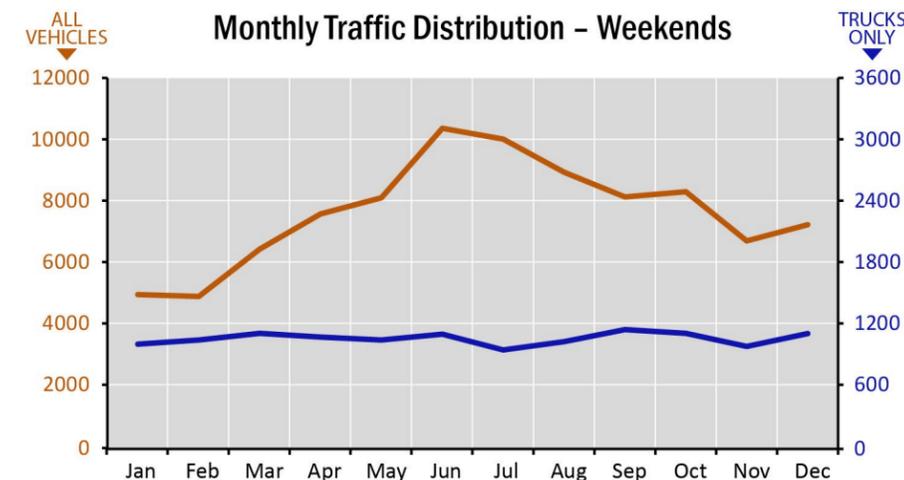
Hourly Traffic Distribution – Weekends



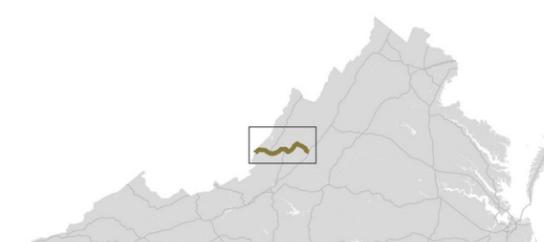
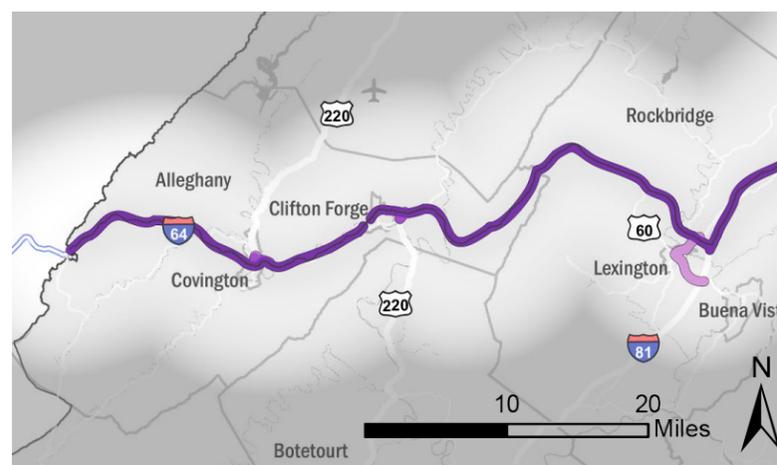
Monthly Traffic Distribution – Weekdays



Monthly Traffic Distribution – Weekends



 All Vehicles
 Trucks

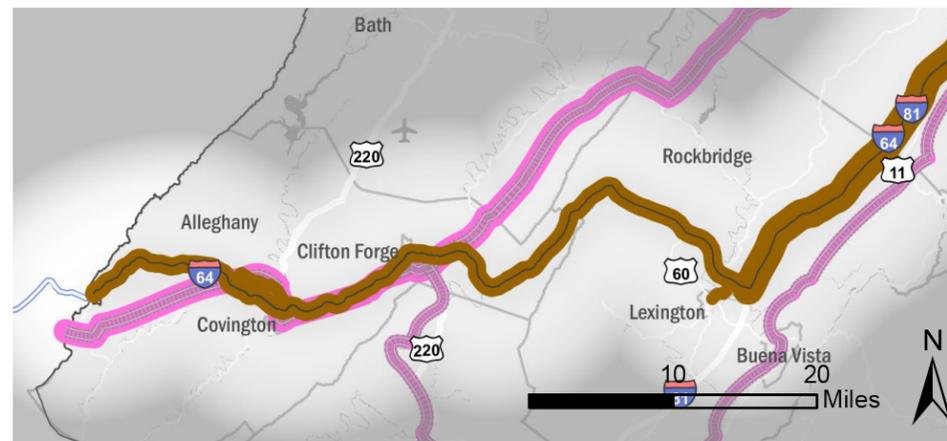


C1 SEGMENT PROFILE

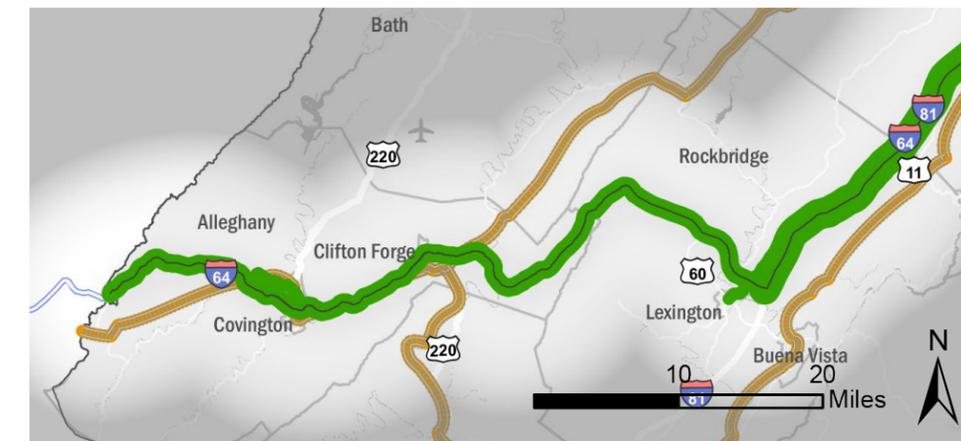
Freight Flows

Near Covington and Clifton Forge, freight is moved primarily by rail in terms of tonnage but not value. In total, 11 million tons (22 percent) of freight is moved through Segment C1 of the East-West Corridor by truck, compared to 38 million tons by rail. By value, the difference is nearly the opposite, with \$21 billion (86 percent) of freight value traveling by truck, compared to \$3.5 billion by rail. This contrast is probably due to the fact that the corridor carries large amounts of coal. On average, a ton of freight traveling through Segment C1 by truck is worth \$1,946 while a ton of freight traveling by rail is worth \$90. In 2025, both rail and truck freight tonnages and total values in Segment C1 are expected to increase, and the percentage of the freight traveling by truck is expected to increase to 29 percent by tonnage and 93 percent by value. Value per ton on both trucks and rail is expected to grow by 2025, with an average of \$3,277 per ton on trucks and \$102 per ton on rail.

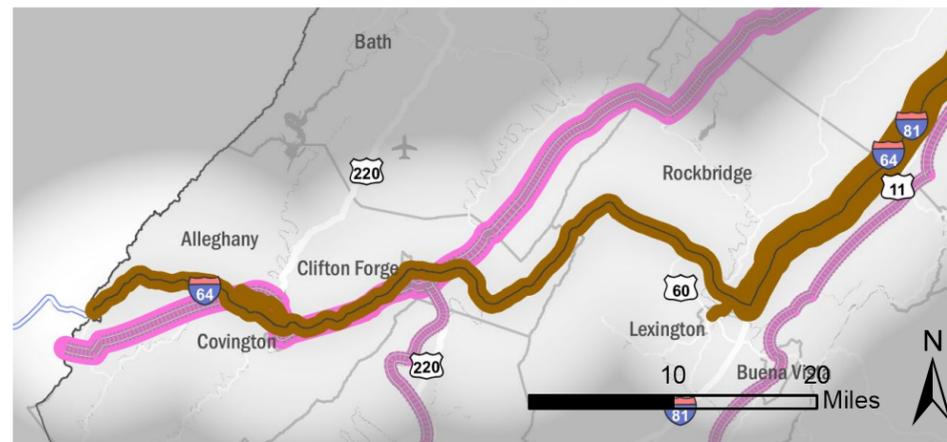
Annual Freight by Tonnage, 2012



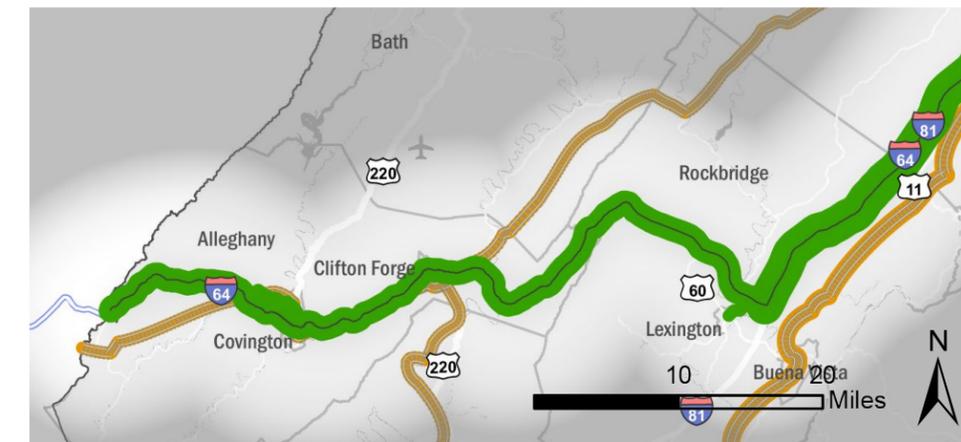
Annual Freight by Value, 2012



Annual Freight by Tonnage, 2025



Annual Freight by Value, 2025



Truck Freight (in tons)



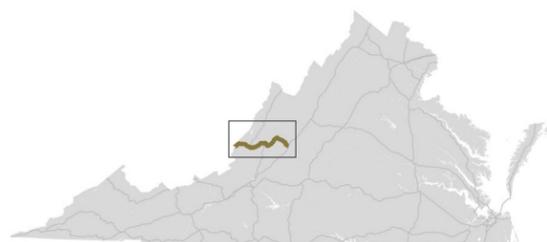
Rail Freight (in tons)



Truck Freight



Rail Freight



C1 SEGMENT NEEDS

Redundancy and Mode Choice



Passenger trips on Segment C1 of the East-West Corridor have limited travel options, both in terms of travel path and mode choice. While US 60 does serve as a parallel facility in the urban areas, its use for long-range travel is limited in this segment. Amtrak offers once-per-day service to the rest of the corridor from Clifton Forge. Within Segment C1, RADAR, a non-profit transit agency based in the Roanoke Valley, operates the Mountain Express, providing a transit connection between Covington and Clifton Forge.

Park-and-Ride

Within Segment C1, commuters can utilize one Park-and-Ride location in Rockbridge County. This location, northwest of Lexington, has only 12 spaces and a 25 percent utilization rate, which is far below the statewide average of 76 percent for Park-and-Ride utilization.

Comparable Travel Options

Staunton to Clifton Forge / Covington

Inter-City Bus

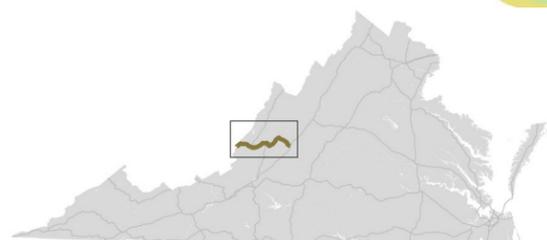
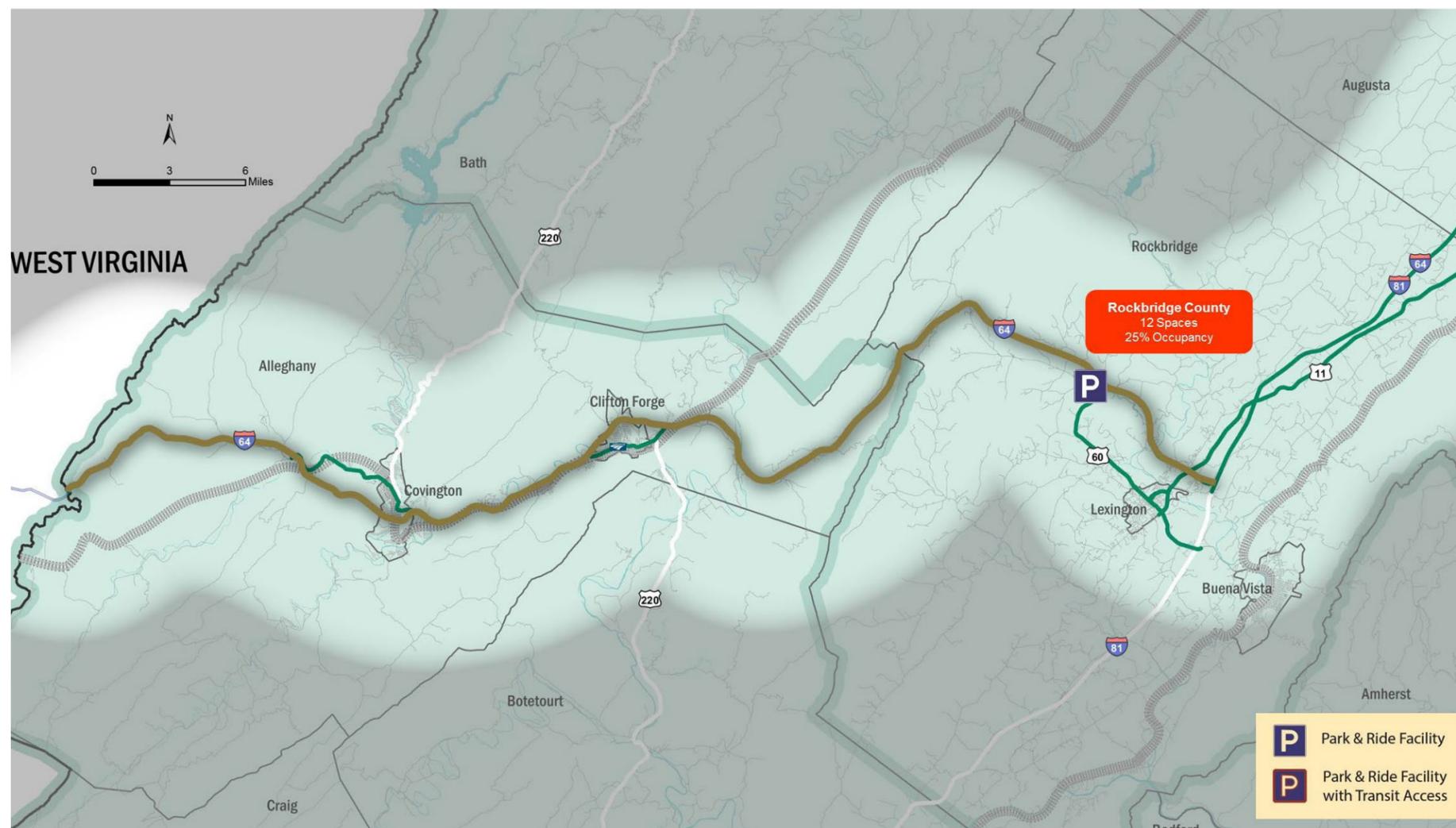
0 Trips per Day
0:00 Travel Time
\$0 Est. Cost

Train

1 Trips per Day
1:19 Travel Time
\$18 Est. Cost

Auto

Via I-64: 1:00 Travel Time \$36 Est. Cost
Via Rt. 11 / I-64: 1:10 Travel Time \$36 Est. Cost

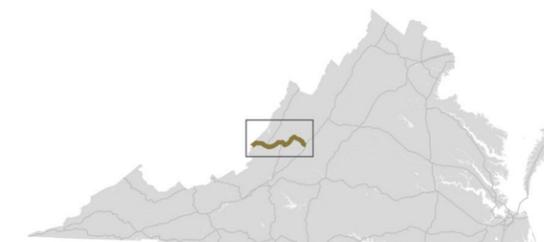


C1 SEGMENT NEEDS

Safety



Between 2010 and 2012, only 12 severe crashes occurred on Segment C1; this is one of the lowest totals in the Commonwealth. Only one area along Segment C1 experienced a clustering of severe crashes. On US 60 (East Madison Street) in Covington between South Carolton Drive and Miller Street, four collisions occurred.



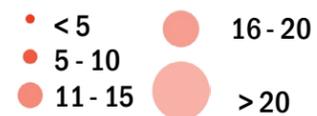
Performance Metrics:

Number of Severe Crashes **4**

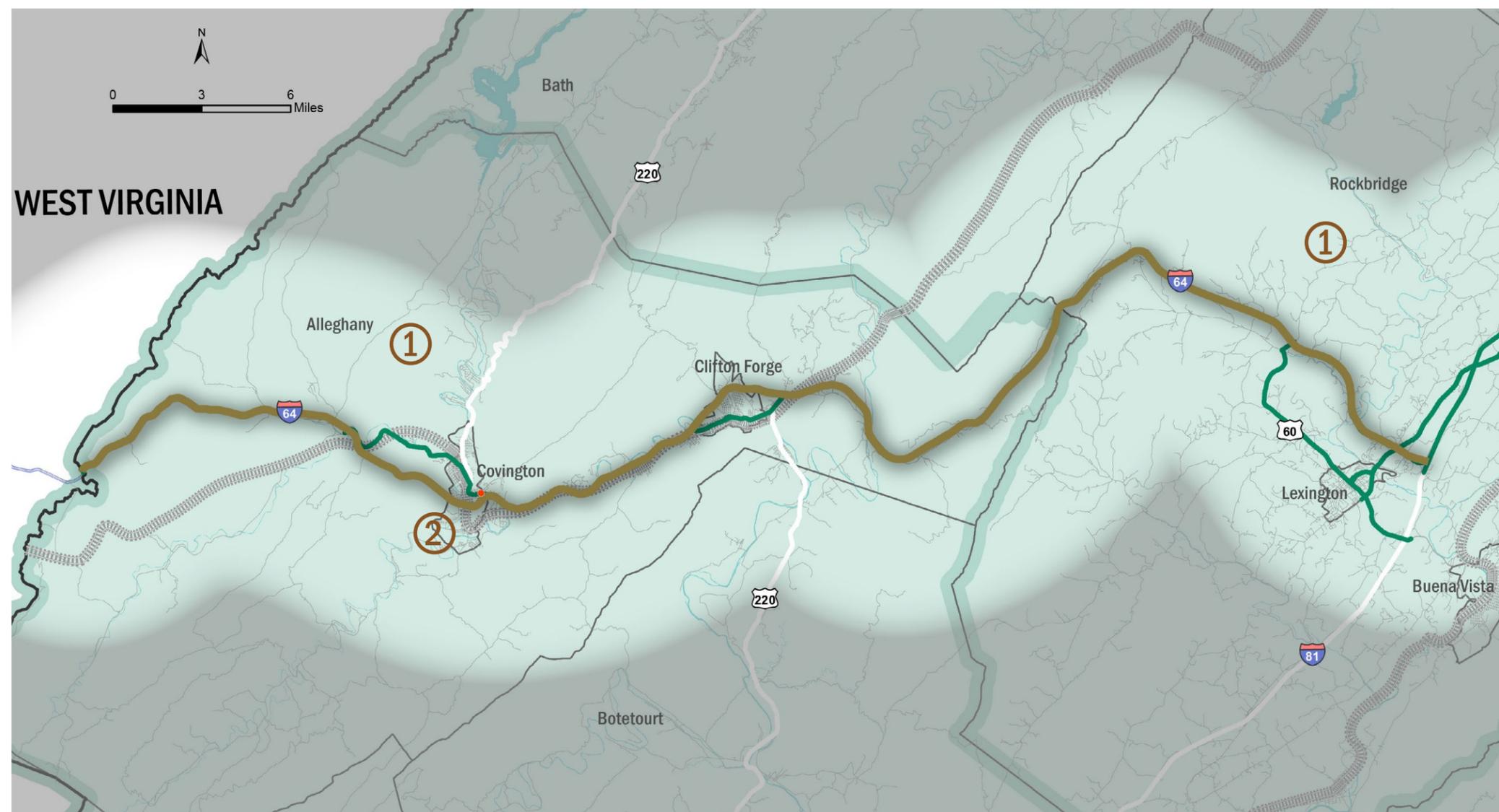
Severe Crashes/Million VMT **0.0**

Number of Railroad Crashes **5**

Fatality and Injury Crashes (2010 - 2012)



Railroad Incidents/Accidents per County (2011-2014)



C1 SEGMENT NEEDS

Congestion



Passenger Delays

Segment C1 does not experience substantial passenger congestion - with only around 270 person-hours of delay along the entire segment, it represents one of the lowest totals for CoSS segments. As such, there are no locations along the segment where passenger delays exceed 100 person-hours per mile. While there are not many delays throughout the day, peak-period passenger delays do account for about 40 percent, which is average for the peak-period share of congestion on other CoSS segments.

Performance Metrics:

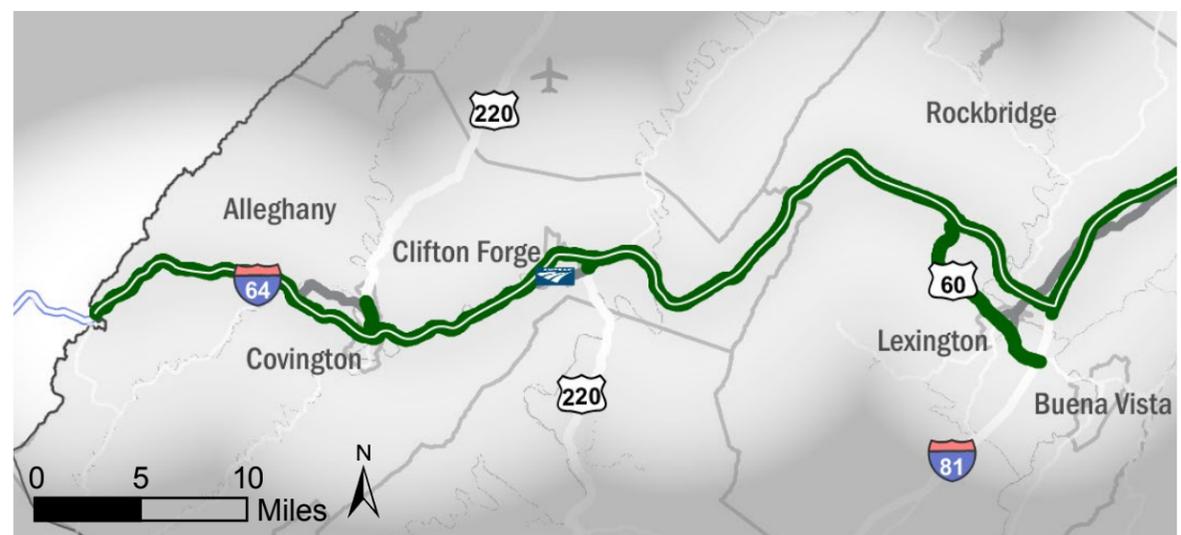
Person Hours of Delay per Mile **2**

Freight Ton Hours of Delay per Mile **4.6K**

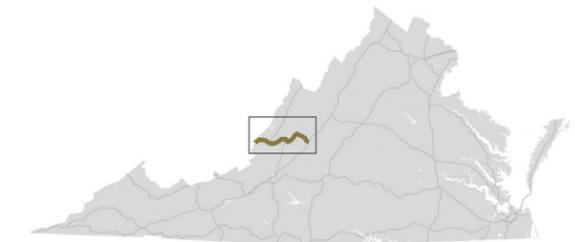
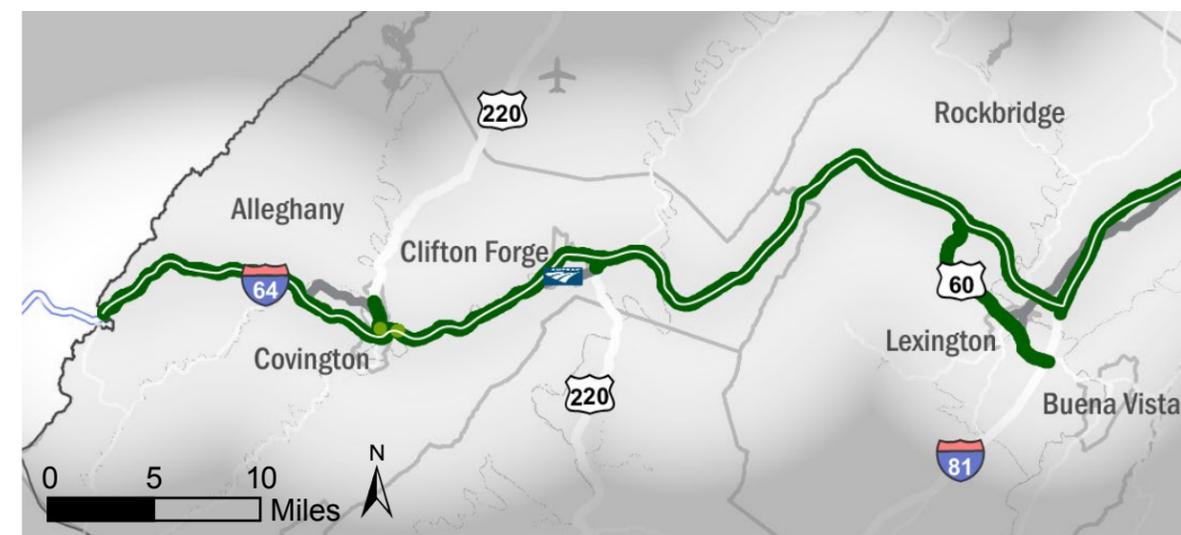
Freight Delays

Similar to passenger traffic, significant freight traffic congestion does not occur along Segment C1, with only around 630,000 ton-hours of delay daily. As such, there are no locations of significant freight delay exceeding 250,000 ton-hours per mile along Segment C1. Peak-period freight delays account for little more than one-third of the daily congestion.

Daily Person Hours of Delay per Mile



Daily Freight Ton Hours of Delay per Mile



C1 SEGMENT NEEDS

Reliability

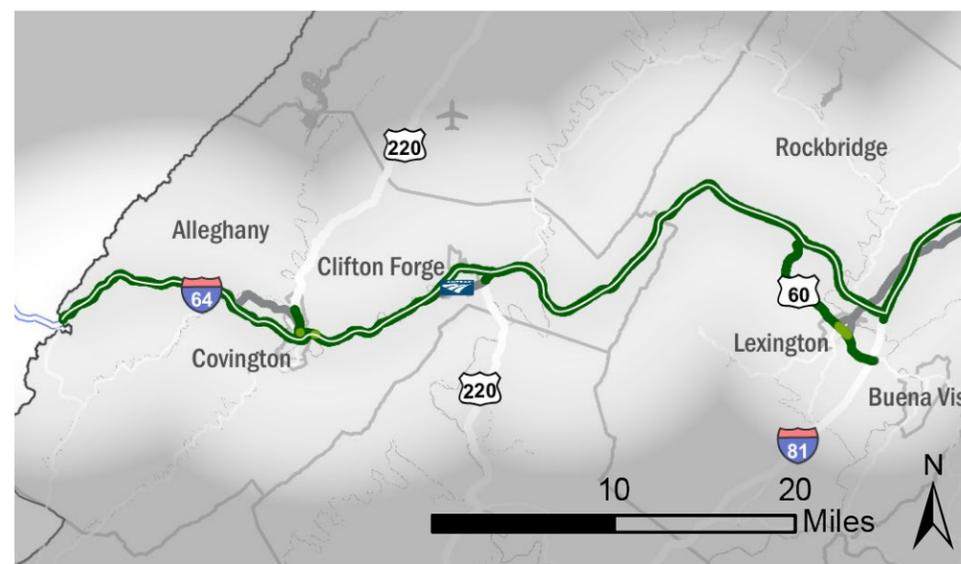
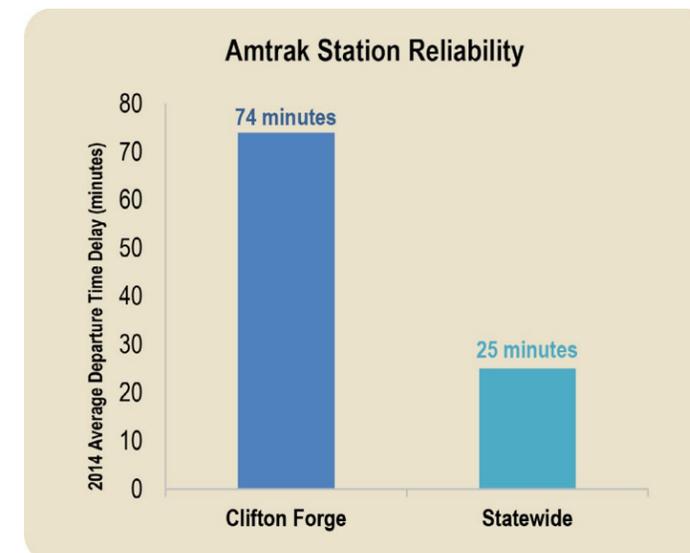


Reliability Index

- < 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- > 0.8
- Primary facility (in white)

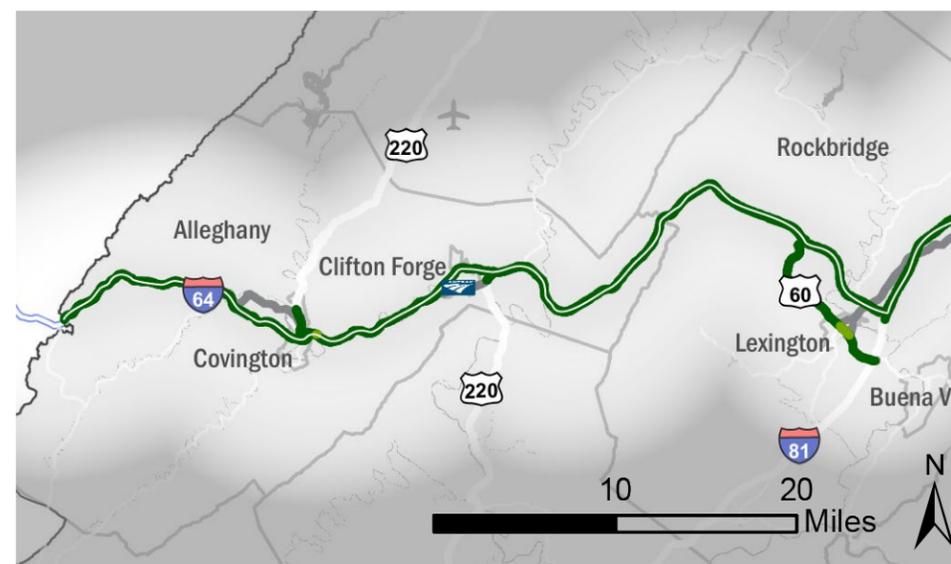
Statewide reliability index thresholds have been set for weekday peak, weekday and weekend travel to assess the reliability of travel on each segment on all corridors of statewide significance. A higher reliability index indicates that travel times are more unreliable. The following are the reliability index thresholds:

- Weekday Peak - 0.80
- Weekday - 0.40
- Weekend - 0.60



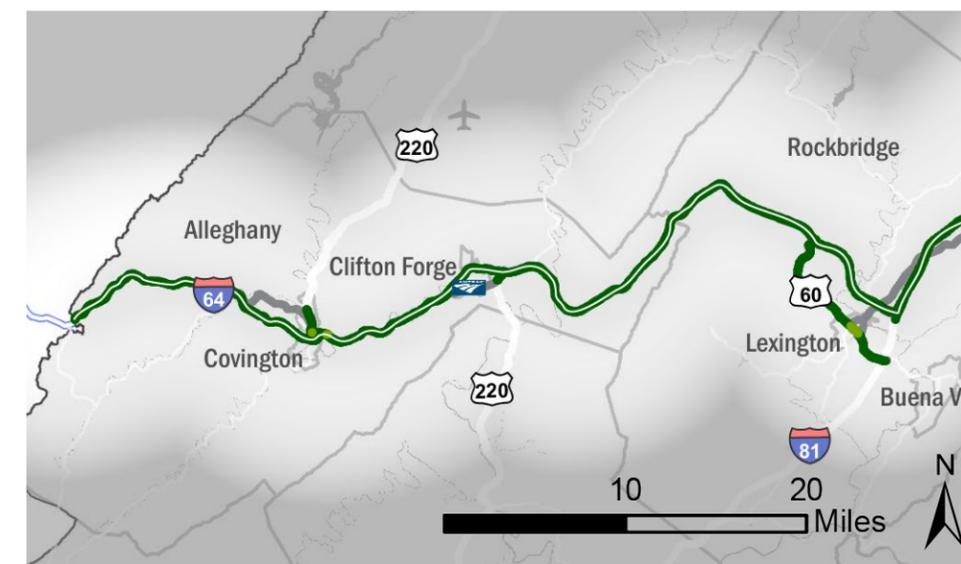
Weekday Peak

Reliability of travel during the peak period on a typical weekday on Segment C1 ranges from 0.01 to 0.40 in terms of reliability index, with an average value of 0.06. This segment has a weekday peak period reliability index much lower than average for the CoSS segments statewide, and none of the locations along Segment C1 have reliability index values exceeding the statewide threshold.



Weekday

Reliability of travel during a typical weekday ranges from 0.02 to 0.26 in terms of reliability index, with an average value of 0.06. This segment has a weekday reliability index lower than average for the CoSS segments statewide, and none of the locations along Segment C1 have reliability index values exceeding the statewide threshold.



Weekend

Reliability of travel during a typical weekend ranges from 0.00 to 0.25 in terms of reliability index, with an average value of 0.04. This segment has a weekend reliability index much lower than average for the CoSS segments statewide, and none of the locations along Segment C1 have reliability index values exceeding the statewide threshold.

C1 SEGMENT NEEDS

Summary of Needs

Identified locations are approximate. See "Summary of Needs" table on the following page for details.

Mode Choice



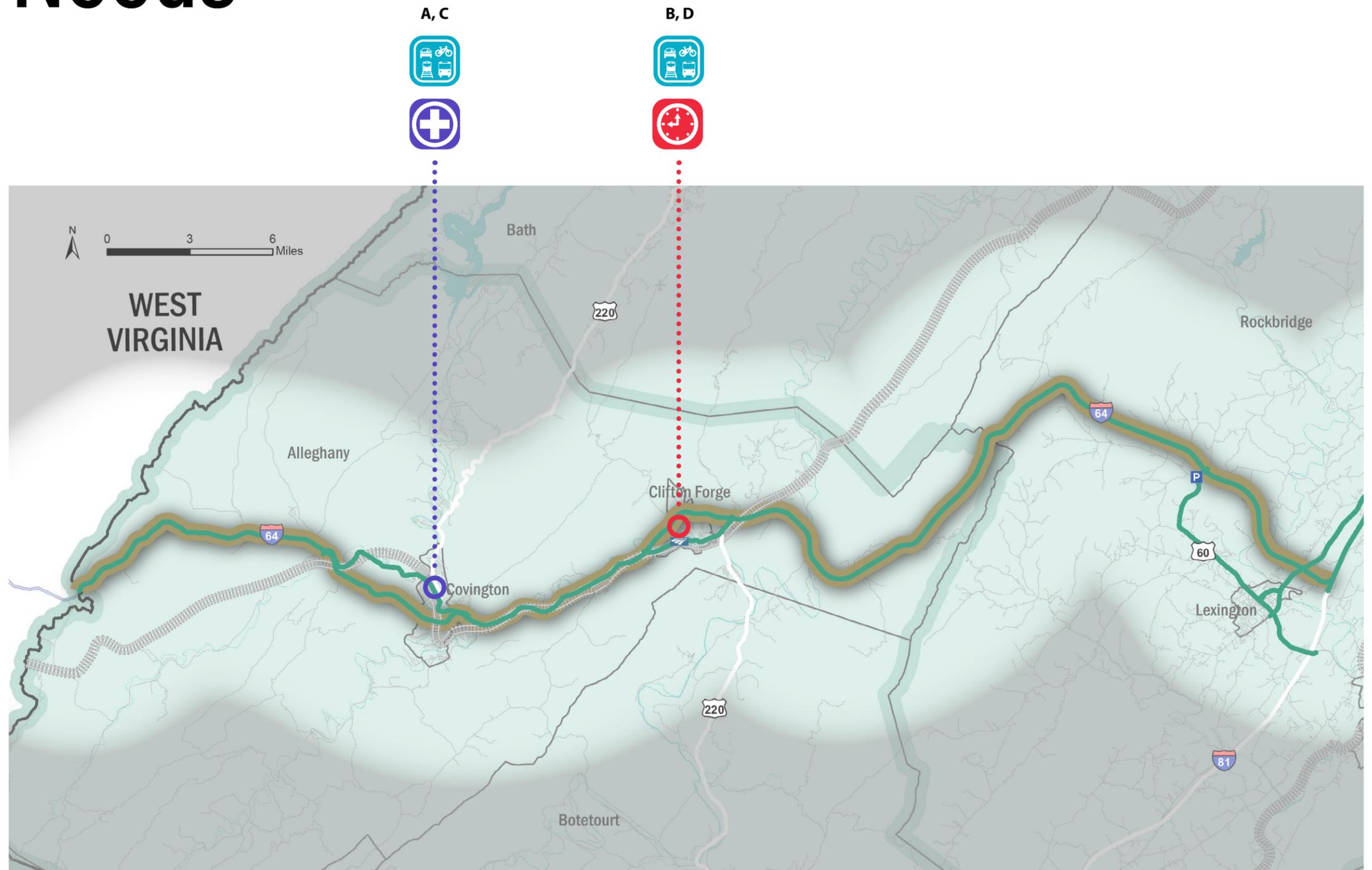
Safety



Congestion



Reliability



C1 SEGMENT NEEDS

Summary of Needs - C1 Segment

A.		US 60 in Covington: four severe crashes
B.		Unreliable Amtrak service from Clifton Forge station. Average departure delay is 74 minutes (highest in the State) totaling almost 1,500 person-hours of delay from this segment.
C.		No passenger rail service from Covington to other cities in the corridor, bus service between cities in corridor is limited to Clifton Forge
D.		Passenger rail service from Clifton Forge is limited to once per day, bus service between cities in corridor is limited to Clifton Forge

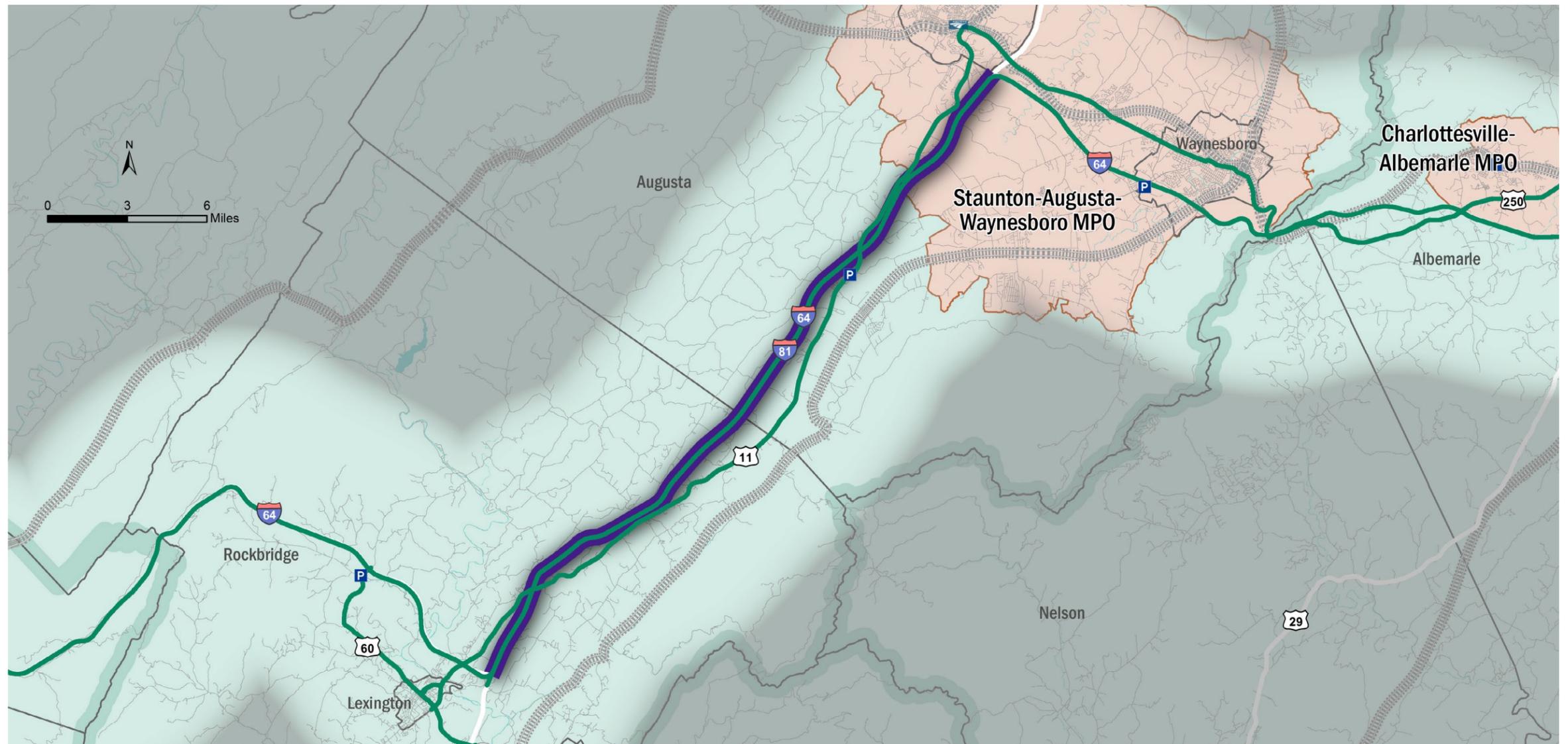
III. Segment C2

- C2
- Corridor Component Road
- Railroad
- MPO Area
- Planning District Area
- Amtrak Facility
- Greyhound Facility
- VRE Facility
- Metrorail Facility
- Port Facility
- Park & Ride Facility
- Airport Facility



Corridor Segment C2 Components

- I-64
- US 11
- Amtrak
- Norfolk Southern Crescent Corridor



C2 SEGMENT PROFILE

Segment C2 begins at the junction of I-64 and I-81 and north of Lexington and progresses north to the junction of I-64 and I-81 near Staunton. This segment serves Rockbridge and Augusta Counties and serves a portion of the Staunton-Augusta-Waynesboro Area. I-64 runs concurrently with I-81 through the entire segment (as Segment B4). The segment also includes US 11. Segment C2 acts as a major corridor for through freight travel in Virginia and also connects smaller urban areas, such as Lexington and Staunton, as well as multiple natural, historical, and cultural resources.

Highway Facilities: I-64 is primarily a rural highway with four lanes in Segment B4. US 11 runs parallel to I-64 throughout the segment.

Transit Services: There is no line-haul transit service within Segment B4. There is one Park-and-Ride facility near I-64 in Greenville.

Rail Facilities: Norfolk Southern’s Crescent Corridor rail lines pass through Segment C2 connecting locations south and west of the Virginia Inland Port, near Corridor B south of Winchester.

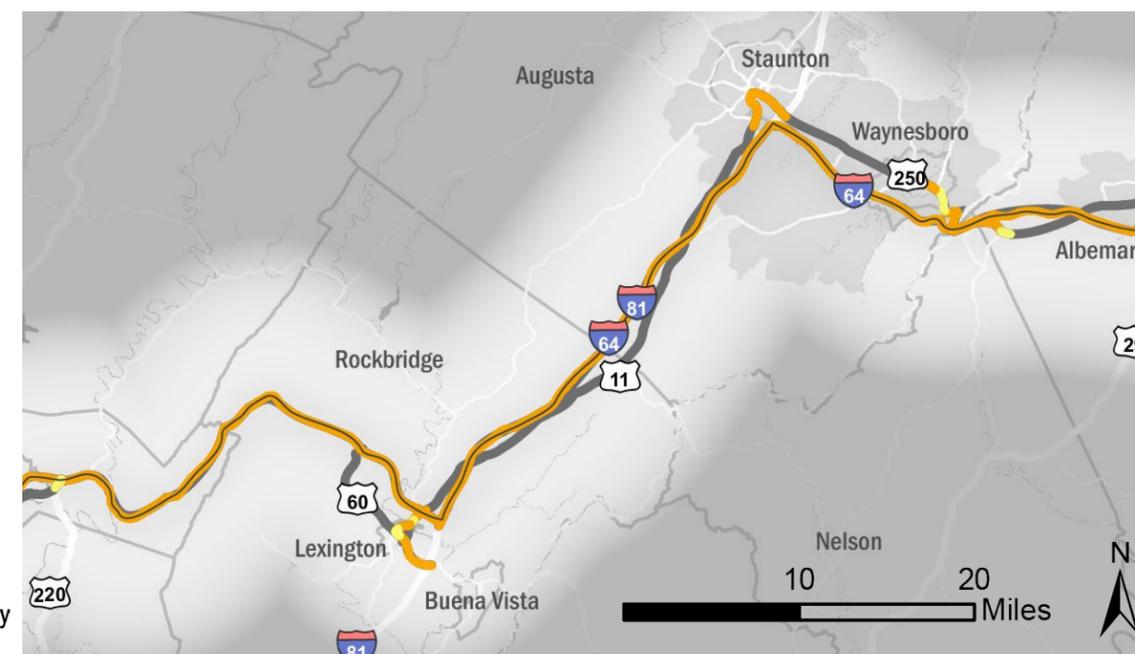
Port Facilities: No port facilities are located directly adjacent to Segment C2, but the Crescent Corridor does provide direct access to the Virginia Inland Port south of Winchester.

Airport Facilities: There are no commercial airports in this segment.

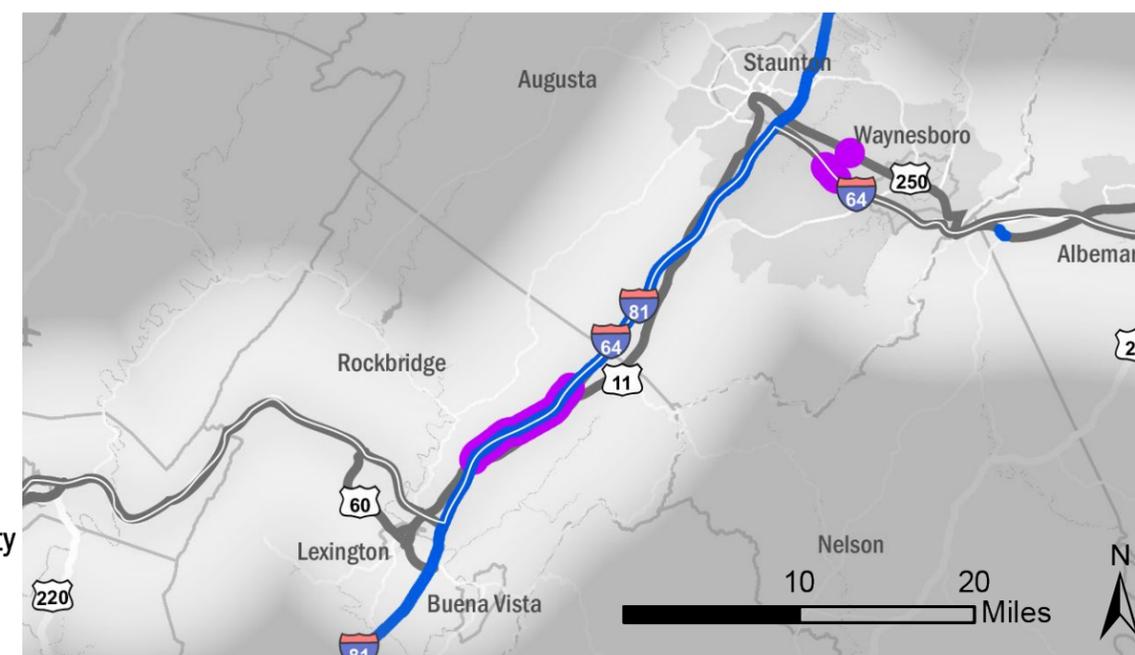
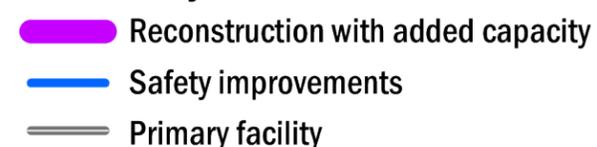
Major planned and future projects include: There are no major planned projects to improve safety or reliability in this segment at this time.



Number of Lanes (both directions)



Future Projects



C2 SEGMENT PROFILE

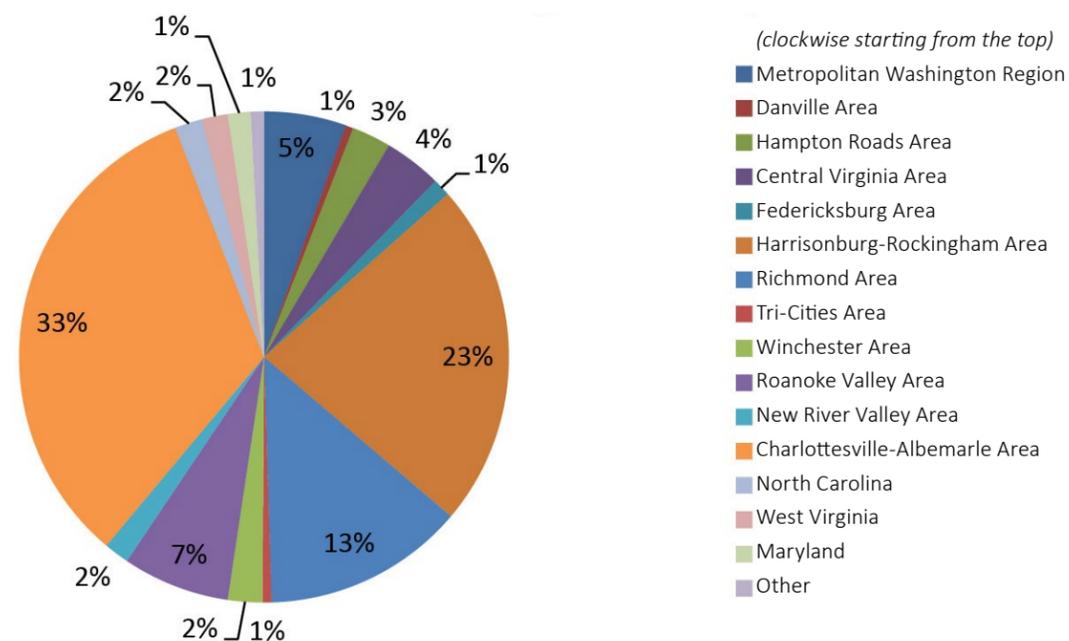
Travel Demand



Passenger Demand

Segment C2 is concurrent with Segment B4 and connects the two discrete sections of I-64 between Lexington and Staunton. Intercity travel from the Staunton-Augusta-Waynesboro Area is distributed to a large number of regions in the state, mostly regions to the north and east that do not require use of Segment C2. Of the intercity passenger traffic originating in Staunton, approximately seven percent is destined for the Roanoke Valley Area and an additional two percent is destined for the New River Valley Area.

Travel from Staunton-Augusta-Waynesboro Area to...



C2 SEGMENT PROFILE

Freight Demand

By truck, Segment C2 carried 83 million tons of freight worth \$167 billion in 2012, and is estimated to carry 113 million tons of freight worth \$270 billion in 2025. A large proportion of truck freight traffic on Corridor C, representing approximately 40 percent of total corridor tonnage and approximately 50 percent of the corridor value passes through Virginia. Between three and four percent of the total truck freight tonnage travels along Corridor C between Pennsylvania and North Carolina, almost entirely on Segment C2, which runs concurrently with I-81 (Segment B4). The jurisdictions adjacent to Segment C2 are not significant generators or attractors of truck freight on Corridor C.

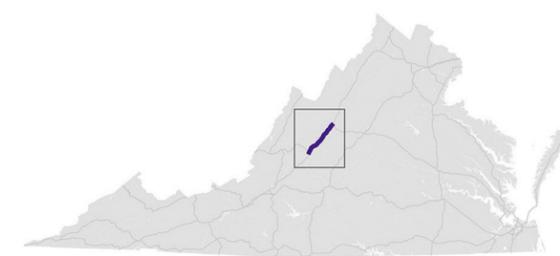
Truck Freight

Major Origins (by Tonnage) 1. Virginia (36% / 37%) 2. North Carolina (15% / 13%) 3. Pennsylvania (7% / 7%) 4. City of Norfolk* (6% / 6%) 5. New Jersey (5% / 5%)	Major Origin-Destination Pairs for Freight North Carolina and Pennsylvania North Carolina and New York North Carolina and Maryland City of Norfolk* and North Carolina North Carolina and New Jersey	Major Destinations (by Tonnage) 1. Virginia (40% / 41%) 2. North Carolina (10% / 10%) 3. Pennsylvania (7% / 7%) 4. City of Norfolk* (7% / 7%) 5. New York (7% / 6%)
Corridor Tonnage Originating in Segment C2: 1% / 1%	<small>Percentages represent 2012 / 2025 values. *Includes freight passing through the Port of Virginia.</small>	Corridor Tonnage Destined for Segment C2: 1% / 1%

By rail, Segment C2 carried six million tons of freight worth \$7 billion in 2012, and is estimated to carry seven million tons of freight worth \$10 billion in 2025. Nearly all rail freight on Corridor C (approximately 95 percent of total tonnage) is destined for Virginia, with less than one percent of freight passing through the Commonwealth. This is primarily because large quantities of freight are traveling to/from the port facilities in the Hampton Roads Area. Large amounts of low value rail freight (around two-thirds of the total corridor rail freight tonnage but only around 20 percent of the corridor rail freight value) travel eastbound from West Virginia and Kentucky to the marine terminal located at Newport News. Less than one percent of the total rail freight tonnage on Corridor C originates in the counties adjacent to Segment C2. However, Augusta County accounts for around three percent of the total value of rail freight arriving in the corridor, with major freight movements originating in Missouri, Maryland, and Illinois.

Rail Freight

Major Origins (by Tonnage) 1. West Virginia (74% / 71%) 2. Virginia (9% / 11%) 3. Kentucky (8% / 8%) 4. Dickenson County (3% / 3%) 5. Hanover County (2% / 3%)	Major Origin-Destination Pairs for Freight City of Newport News* and West Virginia City of Norfolk* and West Virginia City of Newport News* and Kentucky Dickenson County and City of Newport News* Hanover County and City of Newport News*	Major Destinations (by Tonnage) 1. Virginia (96% / 95%) 2. City of Newport News* (73% / 71%) 3. City of Norfolk* (11% / 10%) 4. City of Covington (2% / 2%) 5. Rockingham County (1% / 2%)
Corridor Tonnage Originating in Segment C2: 0% / <1%	<small>Percentages represent 2012 / 2025 values. *Includes freight passing through the Port of Virginia.</small>	Corridor Tonnage Destined for Segment C2: <1% / <1%



C2 SEGMENT PROFILE

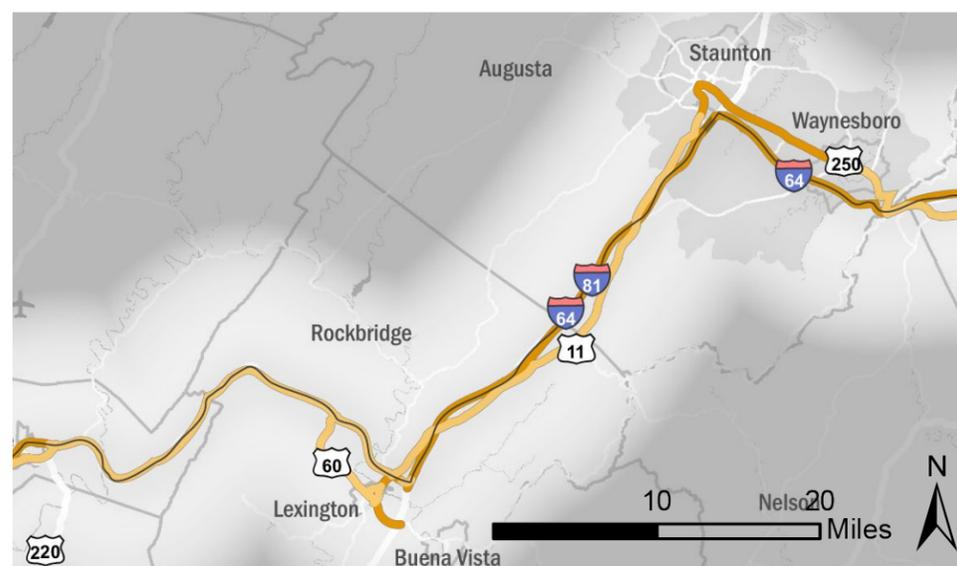
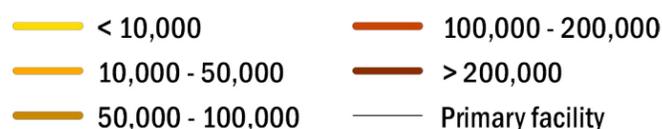
Traffic Conditions

Traffic Volume and AADT

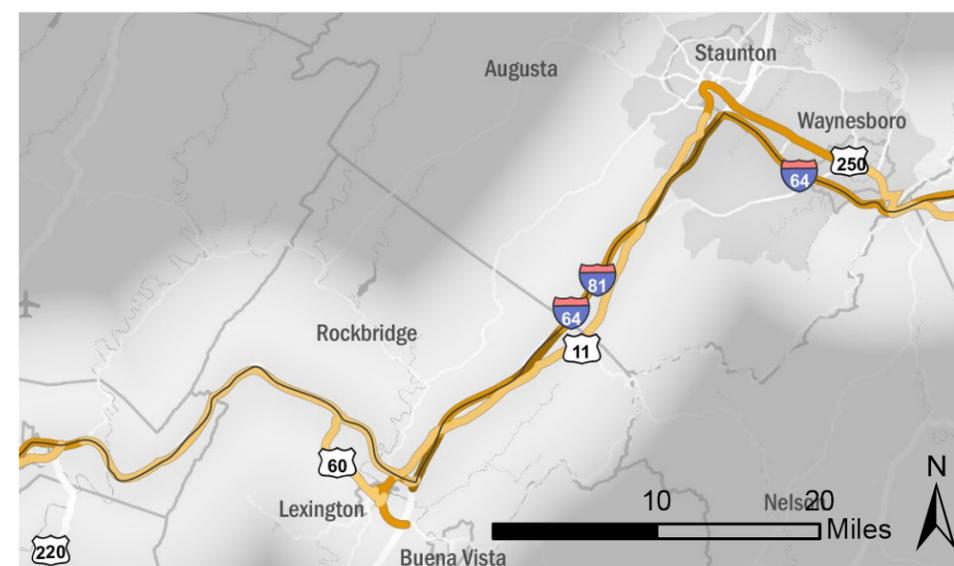
Traffic volume on Segment C2 is high compared with other segments in the western half of Corridor C and low compared to segments in the eastern half of Corridor C. On I-64, average daily traffic volumes range from 43,000 to 47,000 vehicles throughout the segment, except directly south of the split with I-64 in Staunton where volumes reach 60,000 vehicles per day. By 2025, average daily traffic volumes on I-64 are projected to increase by about 7,000 vehicles to a range of 50,000 to 55,000 vehicles per day. Traffic volumes on US 11 are much lower, and range between 3,500 and 7,500 vehicles per day. Only minimal traffic growth is projected for US 11 by 2025.



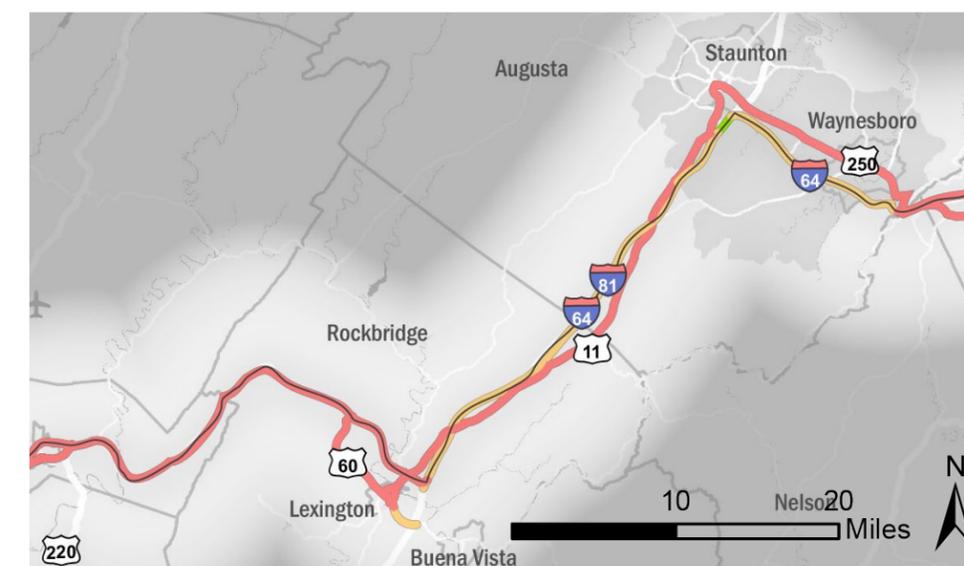
Traffic Volume 2014 (AADT)



Traffic Volume 2025 (AADT)



Change in Traffic Volume 2014- 2025 (AADT)



C2 SEGMENT PROFILE

Traffic Distribution

On average, traffic on Segment C2 is distributed throughout the day as shown in the graphs below. Weekday traffic shows a steady increase in the flow from 7 a.m. to 3 p.m., which is quite different from the typical commute patterns. The highest hourly traffic occurs between 3 and 4 p.m., which accounts for 7.4 percent of daily traffic. The combined weekday traffic from 7 a.m. to 7 p.m. period accounts for 74 percent of total daily traffic. Peaking patterns for truck traffic show a relatively steady flow of trucks during the midday period between 10 a.m. and 7 p.m., with a peak hourly flow of 5.8 percent of daily traffic. Weekend traffic shows a single peak during the midday period, and the highest percentage of hourly traffic occurring between 2 and 3 p.m. (7.8 percent of daily traffic) for all traffic, and 1 to 2 p.m. (6.2 percent of daily traffic) for truck traffic.

Weekday traffic volumes on Segment C2 vary by as much as 54 percent throughout the year, with the highpoint in August (around 49,000 vehicles per day) and the low point in February (around 32,000 vehicles per day). Truck volumes vary less than passenger volumes, with the June high (around 14,000 vehicles per day) 21 percent higher than the January low (around 11,000 vehicles per day). Weekend traffic levels also vary over the course of the year and are significantly lower during January and February than during the rest of the year. The highest levels of weekend traffic (June, around 48,000 vehicles per day) are 86 percent higher than January levels (around 26,000 vehicles per day). Weekend truck traffic is more steady than all vehicle traffic, with the June high 33 percent higher than the July low. Truck volumes account for a significant portion of traffic on Segment C2 (30 percent of overall daily traffic for weekdays and 21 percent of overall daily traffic for weekends); as a result truck traffic has an impact on overall traffic conditions.

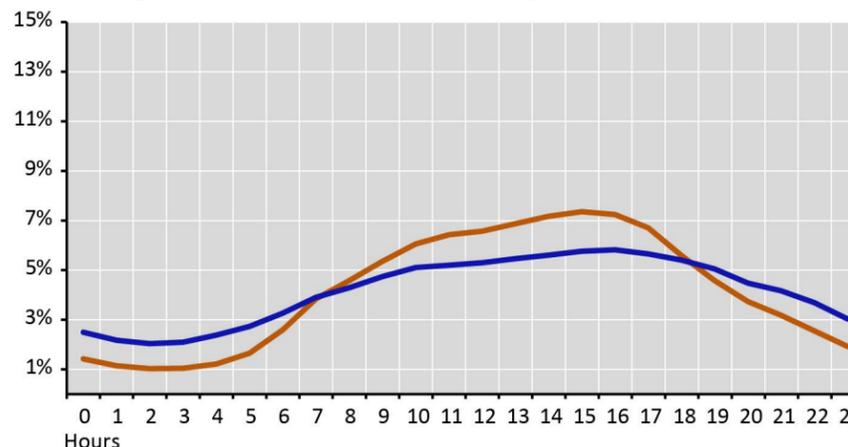
Truck Volumes

On Segment C2, 14 percent of the daily traffic consists of heavy trucks. This is high relative to most other segments in the Commonwealth.

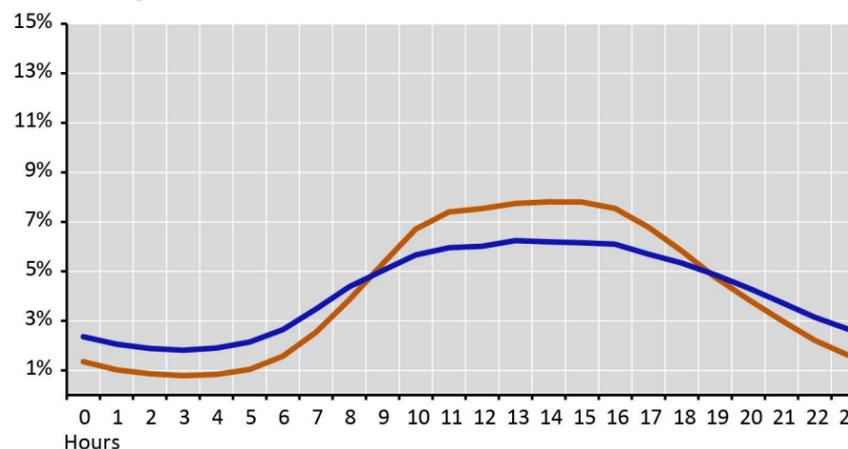
Percent Heavy Trucks



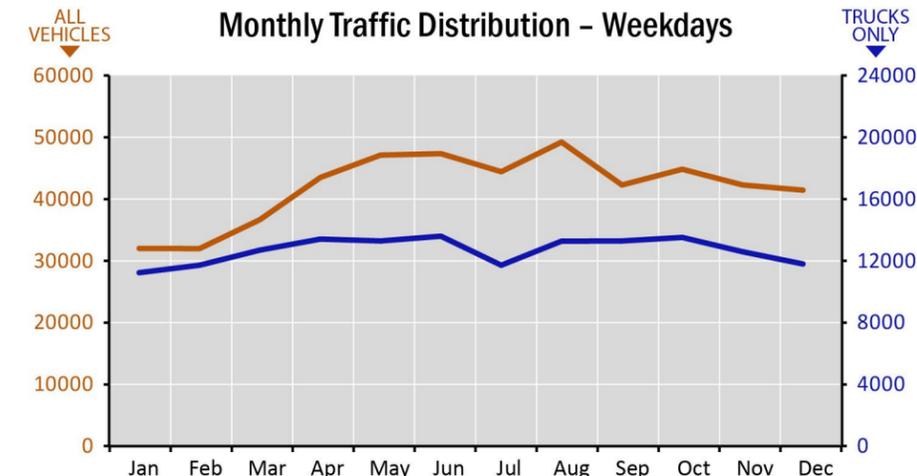
Hourly Traffic Distribution – Weekdays



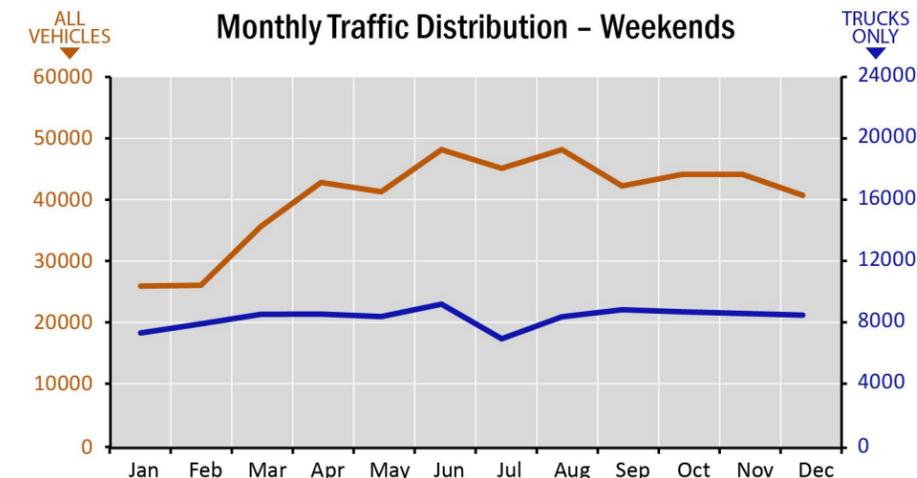
Hourly Traffic Distribution – Weekends



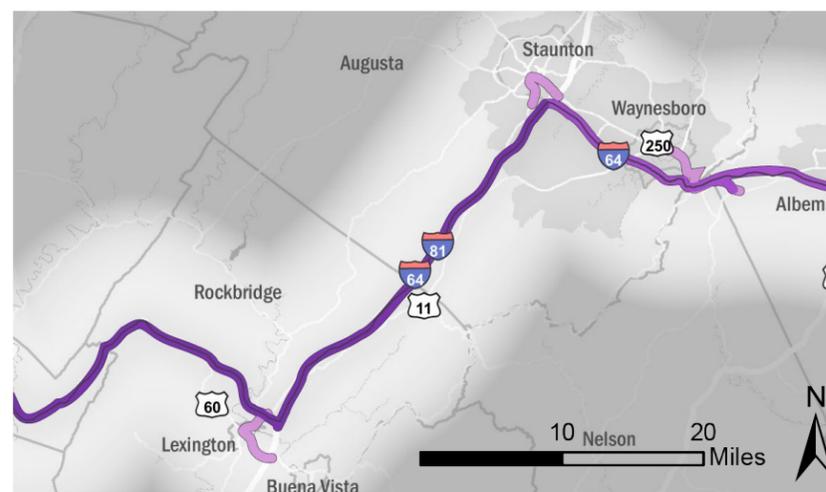
Monthly Traffic Distribution – Weekdays



Monthly Traffic Distribution – Weekends



All Vehicles
 Trucks



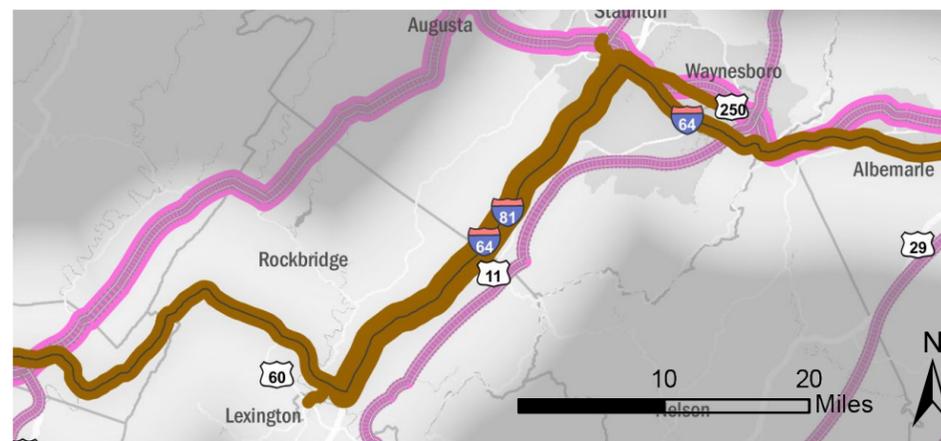
C2 SEGMENT PROFILE

Freight Flows

At the southern end of Segment C2, north of Lexington, freight is moved primarily by truck, in terms of both tonnage and value. In total, 74 million tons (92 percent) of freight is moved through this section of Segment C2 by truck, compared to 6 million tons by rail. By value, trucks are favored even more, with \$147 billion (95 percent) of freight traveling by truck, compared to \$7.5 billion by rail. On average, a ton of freight traveling through this section of Segment C2 by truck is worth \$1,991 while a ton of freight traveling by rail is worth \$1,219. In 2025, both rail and truck freight tonnages and total values in the southern end of Segment C2 are expected to increase, but the percentages of tonnage and value moved by truck are expected to remain nearly the same. Value per ton on both trucks and rail is expected to grow by 2025, with an average of \$2,209 per ton on trucks and \$1,393 on rail.

At the northern end of Segment C2, south of Staunton, freight is also moved primarily by truck, in terms of both tonnage and value. In total, 83 million tons (93 percent) of freight is moved through this section of Segment C2 by truck, compared to 6 million tons by rail. By value, trucks are favored even more, with \$167 billion (96 percent) of freight value traveling by truck, compared to \$7.5 billion by rail. On average, a ton of freight traveling through this section of Segment C2 by truck is worth \$2,003 while a ton of freight traveling by rail is worth \$1,217. In 2025, both rail and truck freight tonnages and total values in the northern end of Segment C2 are expected to increase, but the percentages of tonnage and value moved by truck are expected to remain nearly the same. Value per ton on both trucks and rail is expected to grow by 2025, with an average of \$2,382 per ton on trucks and \$1,396 on rail.

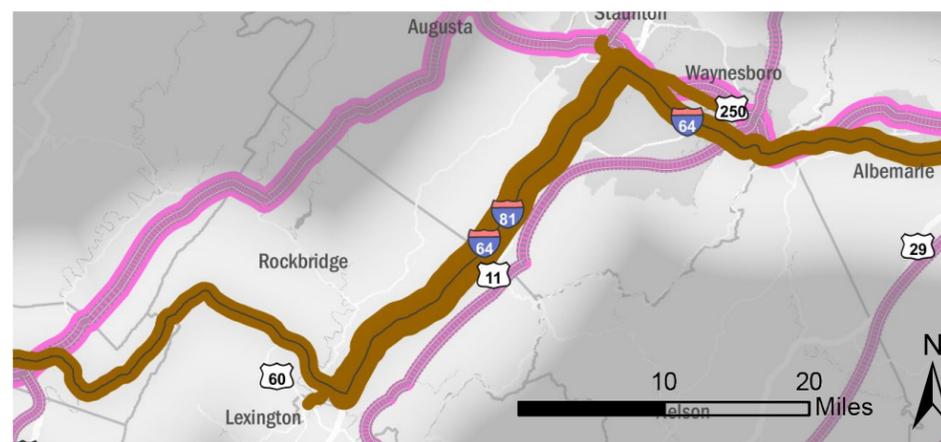
Annual Freight by Tonnage, 2012



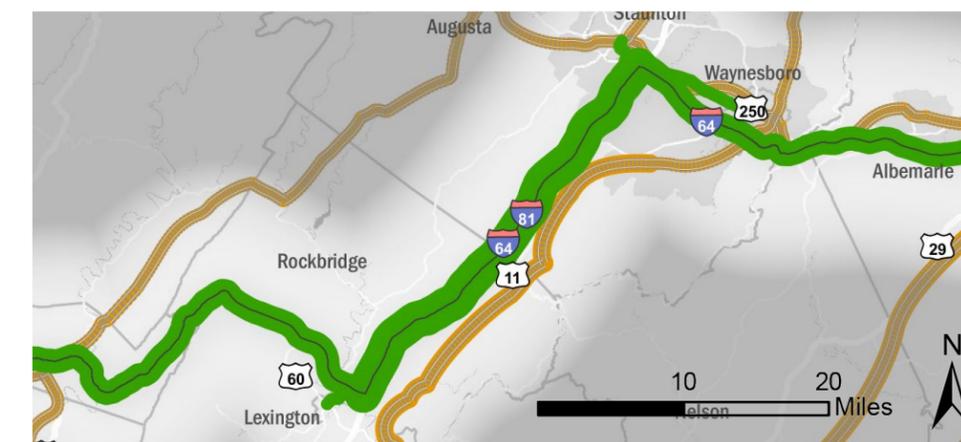
Annual Freight by Value, 2012



Annual Freight by Tonnage, 2025



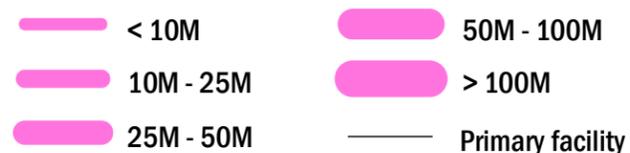
Annual Freight by Value, 2025



Truck Freight (in tons)



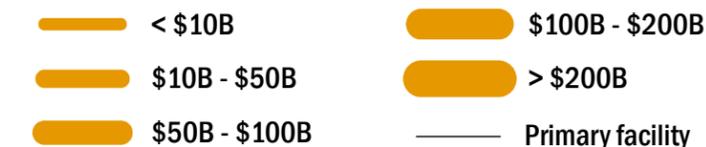
Rail Freight (in tons)



Truck Freight

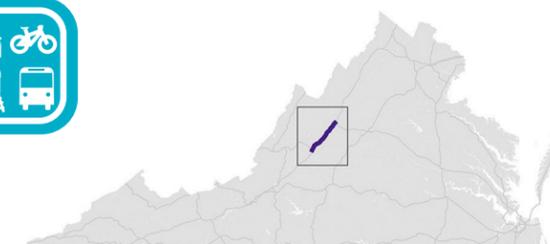


Rail Freight



C2 SEGMENT NEEDS

Redundancy and Mode Choice



Passenger trips on Segment C2 of the East-West Corridor have few travel options, both in terms of travel path and mode choice. While US 11 does serve as a parallel facility, its use for long-range travel is limited by speed and capacity and its use as a parallel facility is primarily local access and for bypassing incidents causing congestion on sections of I-64/I-81. No alternate modes are available along Segment C2.

Park-and-Ride

Within Segment C2, commuters can utilize one Park-and-Ride location in Augusta County. This location, near Greenville, has only 11 spaces and a 27 percent utilization rate, which is far below the statewide average of 76 percent for Park-and-Ride utilization.

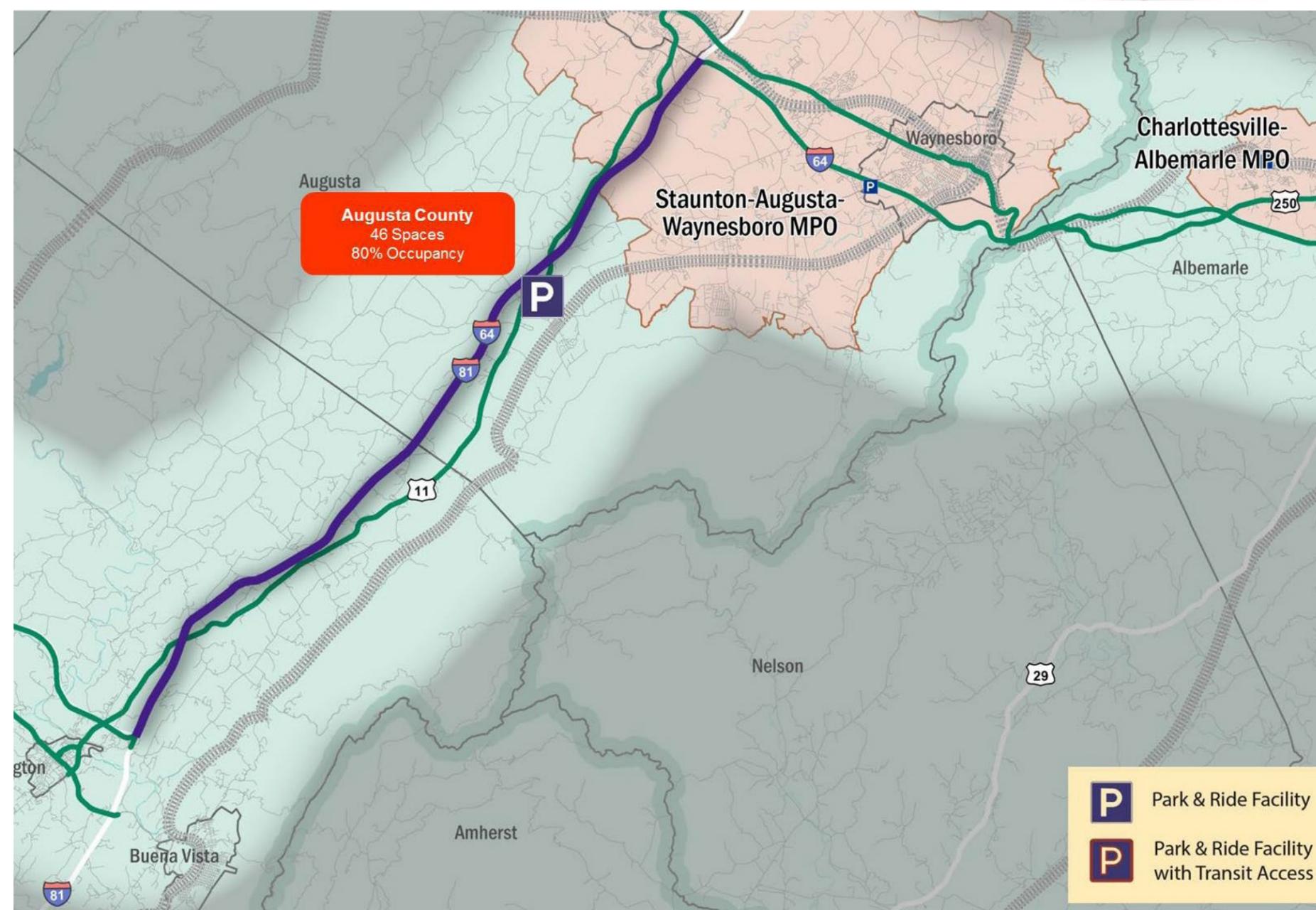
Comparable Travel Options

Stanton to Lexington

Inter-City Bus 0 Trips per Day 0:00 Travel Time \$0 Est. Cost	Train 0 Trips per Day 0:00 Travel Time \$0 Est. Cost
Auto	
Via I-64: 0:40 Travel Time \$22 Est. Cost	
Via Rt. 11: 0:55 Travel Time \$20 Est. Cost	

Stanton to Clifton Forge / Covington

Inter-City Bus 0 Trips per Day 0:00 Travel Time \$0 Est. Cost	Train 1 Trips per Day 1:19 Travel Time \$18 Est. Cost
Auto	
Via I-64: 1:00 Travel Time \$36 Est. Cost	
Via Rt. 11 / I-64: 1:10 Travel Time \$36 Est. Cost	



C2 SEGMENT NEEDS

Safety



Between 2010 and 2012, 24 severe crashes occurred on Segment C2, in three different geographic areas. On US 11 (North Lee Highway) in East Lexington, there were four collisions between Greenhouse Road and Hunter Hill Road. On US 11, between Fairfield and Vesuvius, four incidents occurred over a 1.4 mile stretch approximately 2.6 miles south of Route 56 (Raphine Road). In Staunton, along US 11, there were 16 collisions that took place within approximately one mile between W. Village Drive and Mary Gray Lane (as also noted for Segment B5).



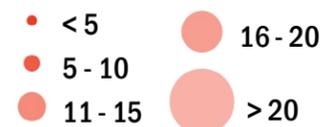
Performance Metrics:

Number of Severe Crashes **24**

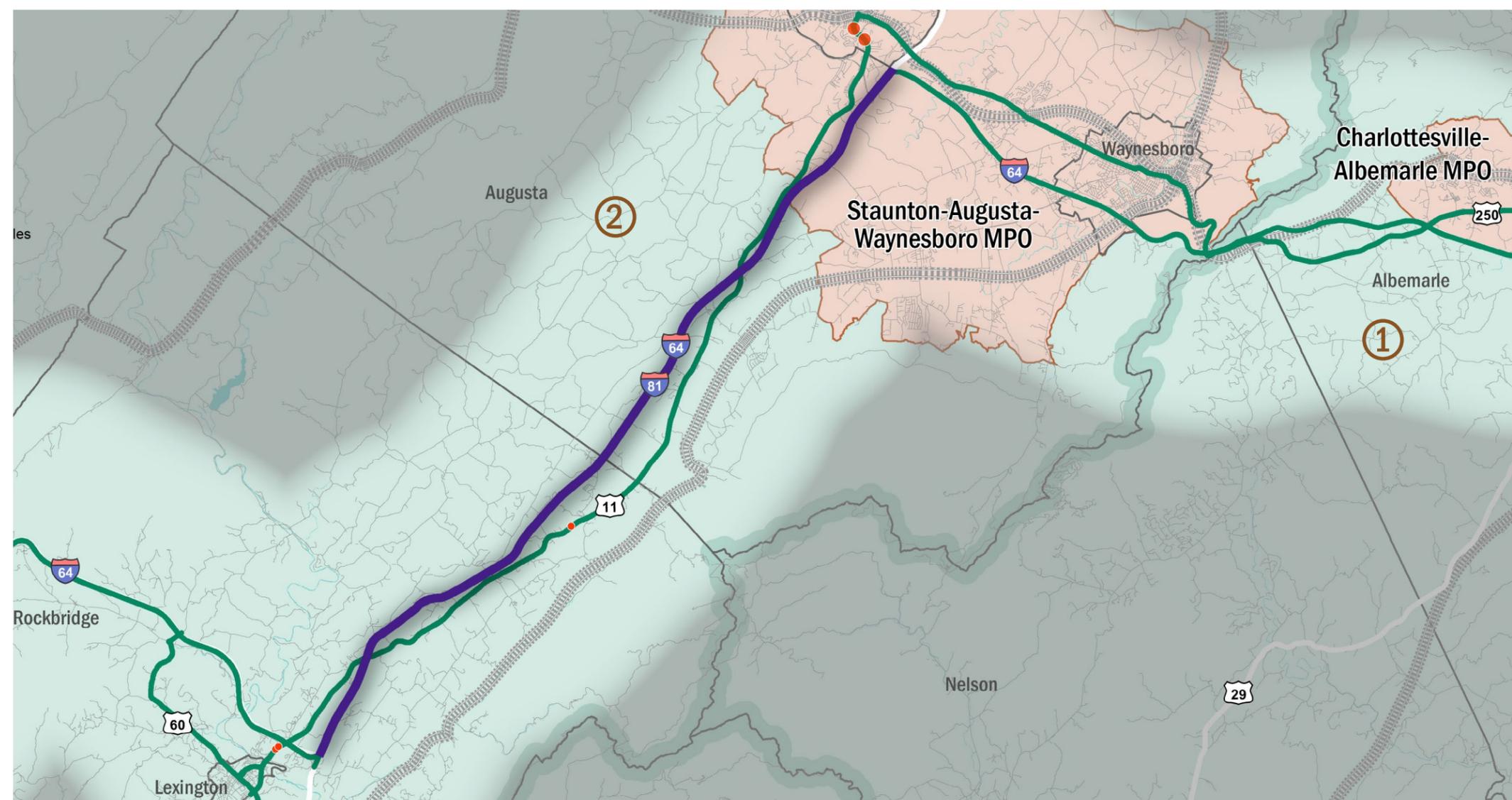
Severe Crashes/Million VMT **0.5**

Number of Railroad Crashes **3**

Fatality and Injury Crashes (2010 - 2012)



Railroad Incidents/Accidents per County (2011-2014)



C2 SEGMENT NEEDS

Congestion



Performance Metrics:

Person Hours of Delay per Mile

0

Freight Ton Hours of Delay per Mile

7

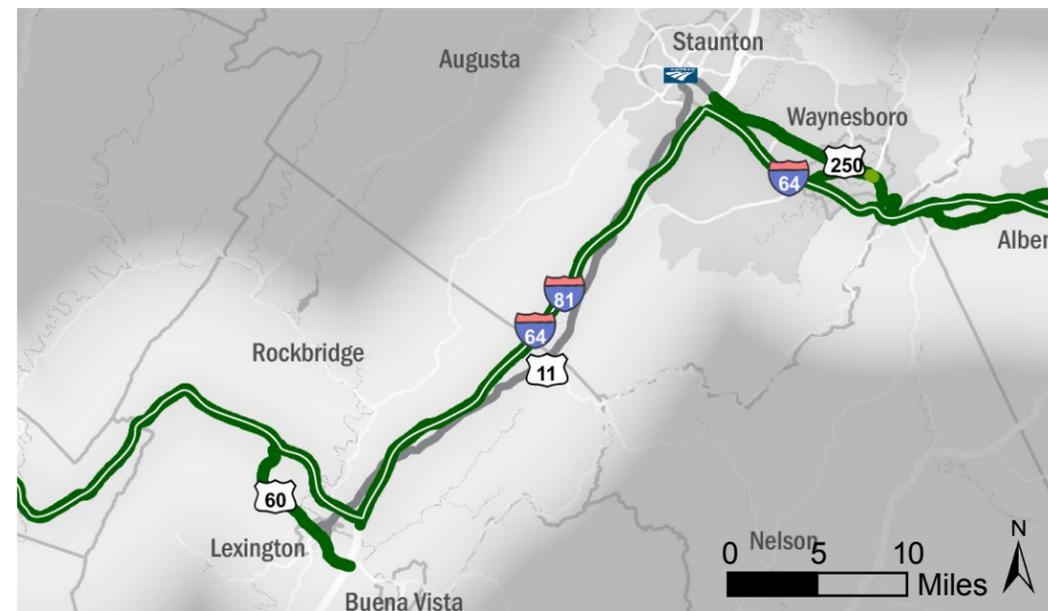
Passenger Delays

Segment C2 experiences almost no passenger delays. Overlapping with Segment B4, this segment has the lowest passenger congestion among all CoSS segments, with no locations along the segment where passenger delays exceed 100 person-hours per mile.

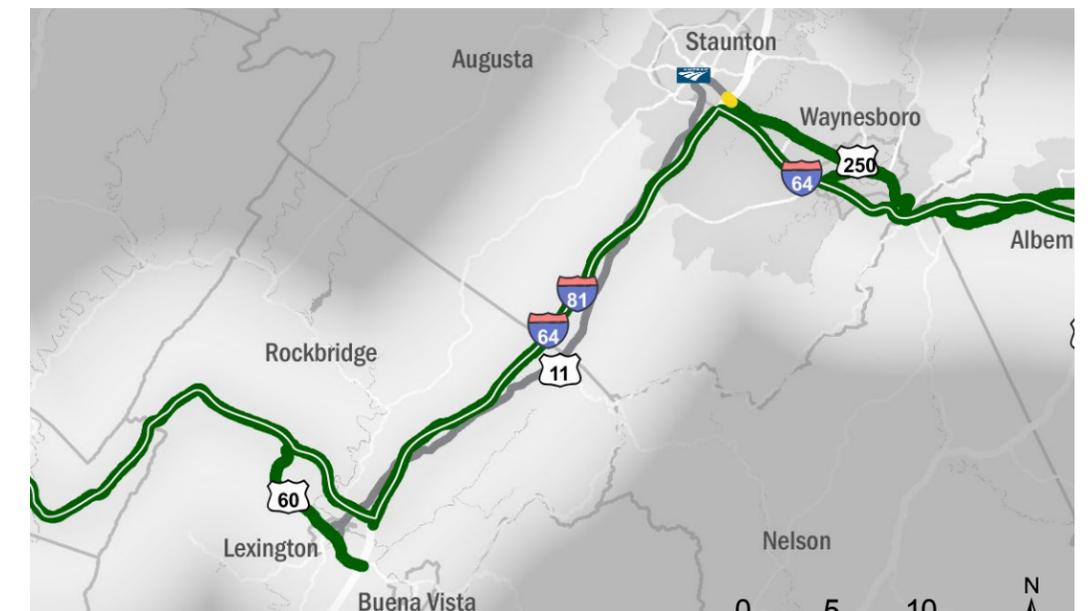
Freight Delays

As with passenger congestion, Segment C2 experiences the lowest freight delays among CoSS segments, with only 400 ton-hours of delay daily. As such, there are no locations along Segment C2 where the freight delays exceed 250,000 ton-hours per mile.

Daily Person Hours of Delay per Mile

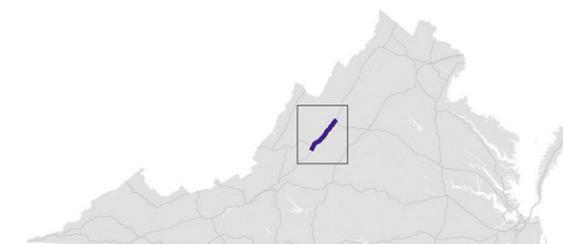


Daily Freight Ton Hours of Delay per Mile



C2 SEGMENT NEEDS

Reliability

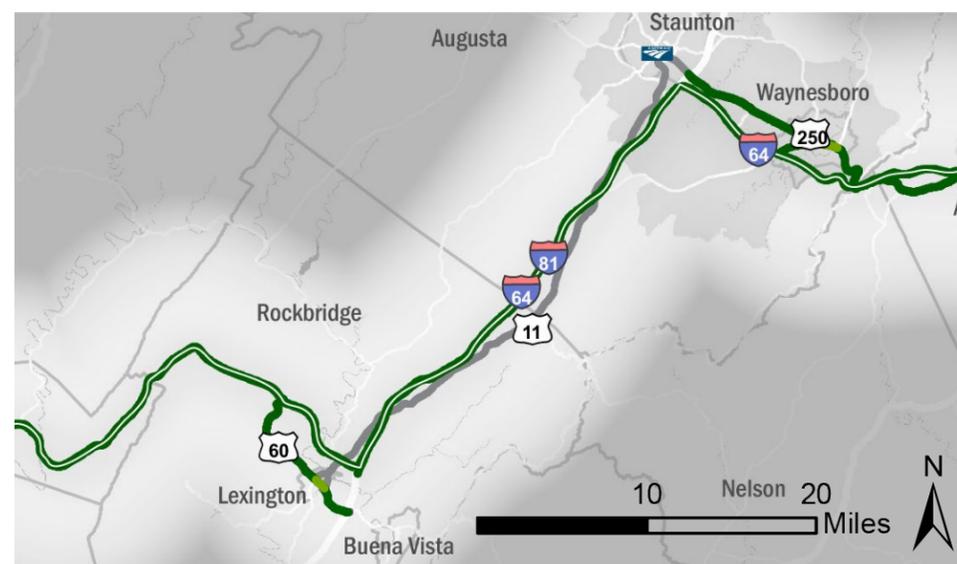


Reliability Index

— < 0.2	— 0.6 - 0.8
— 0.2 - 0.4	— > 0.8
— 0.4 - 0.6	 Primary facility (in white)

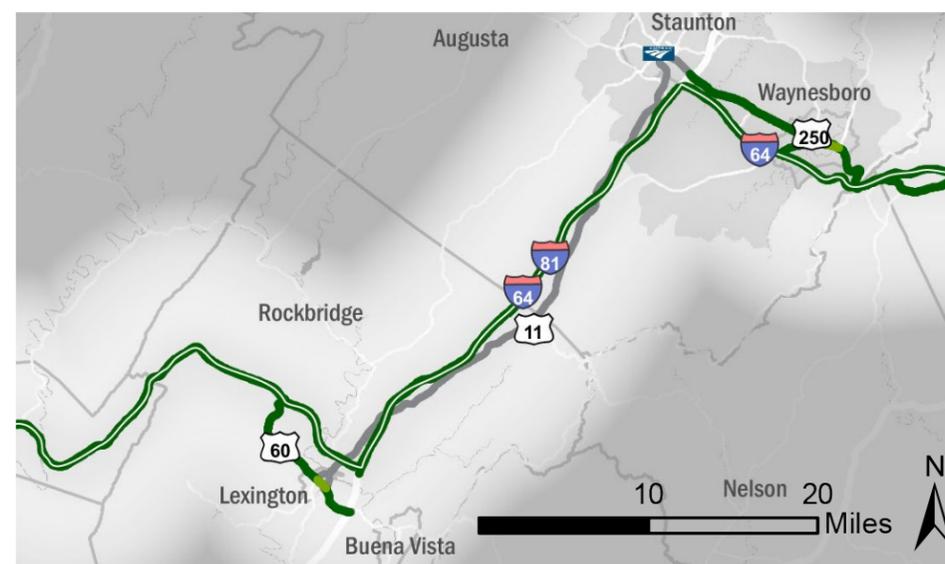
Statewide reliability index thresholds have been set for weekday peak, weekday and weekend travel to assess the reliability of travel on each segment on all corridors of statewide significance. A higher reliability index indicates that travel times are more unreliable. The following are the reliability index thresholds:

- Weekday Peak - 0.80
- Weekday - 0.40
- Weekend - 0.60



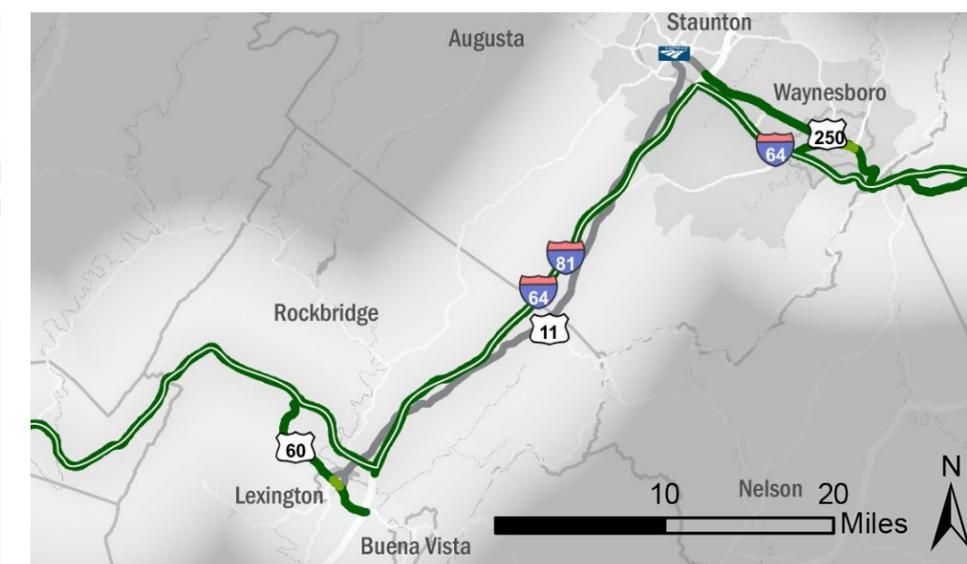
Weekday Peak

Reliability of travel during the peak period on a typical weekday on Segment C2 ranges from 0.01 to 0.04 in terms of reliability index, with an average value of 0.02. This segment has a peak period reliability index much lower than average for the CoSS segments statewide, and none of the locations along Segment C2 have reliability index values exceeding the statewide threshold.



Weekday

Reliability of travel during a typical weekday ranges from 0.02 to 0.04 in terms of reliability index, with an average value of 0.03. This segment has a weekday reliability index much lower than average for the CoSS segments statewide, and none of the locations along Segment C2 have reliability index values exceeding the statewide threshold.



Weekend

Reliability of travel during a typical weekend ranges from 0.01 to 0.04 in terms of reliability index, with an average value of 0.03. This segment has a weekend reliability index much lower than average for the CoSS segments statewide, and none of the locations along Segment C2 have reliability index values exceeding the statewide threshold.

C2 SEGMENT NEEDS

Summary of Needs

Identified locations are approximate. See "Summary of Needs" table on the following page for details.

Redundancy



Mode Choice



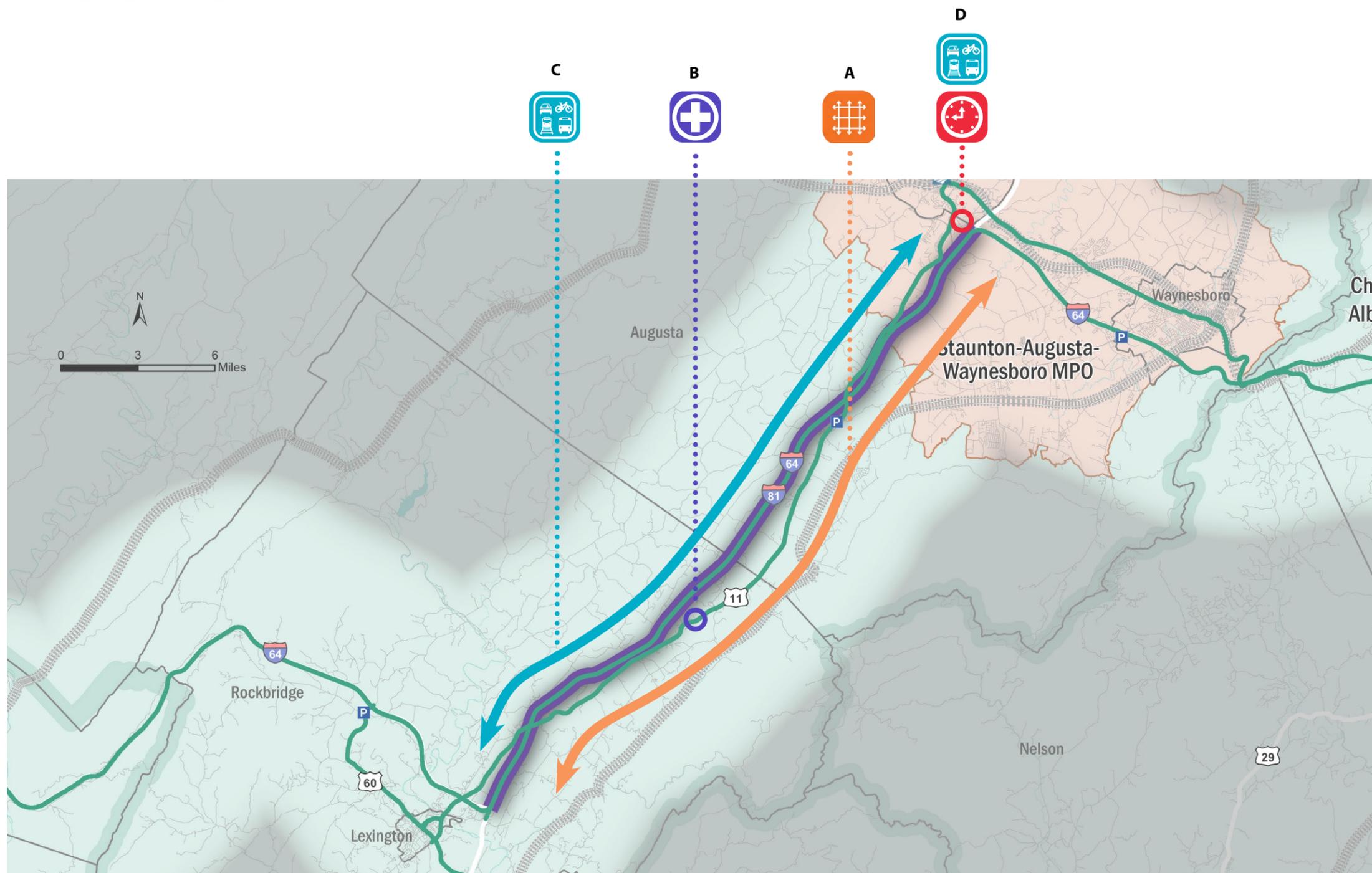
Safety



Congestion



Reliability



C2 SEGMENT NEEDS

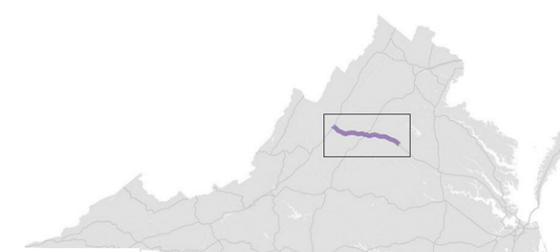
Summary of Needs - C2 Segment

A.		<p>Redundancy issues along Corridor C: US 11 not able to handle overflow when incident occurs on I-81 resulting in significant delays</p>
B.		<p>US 11 south of Raphine Rd in Rockbridge County: 4 severe crashes</p>
C.		<p>No bus service is available in the segment</p>
D.		<p>Unreliable Amtrak service from Staunton station. Average departure delay is 73 minutes totaling over 4,100 person-hours of delay from this segment.</p>



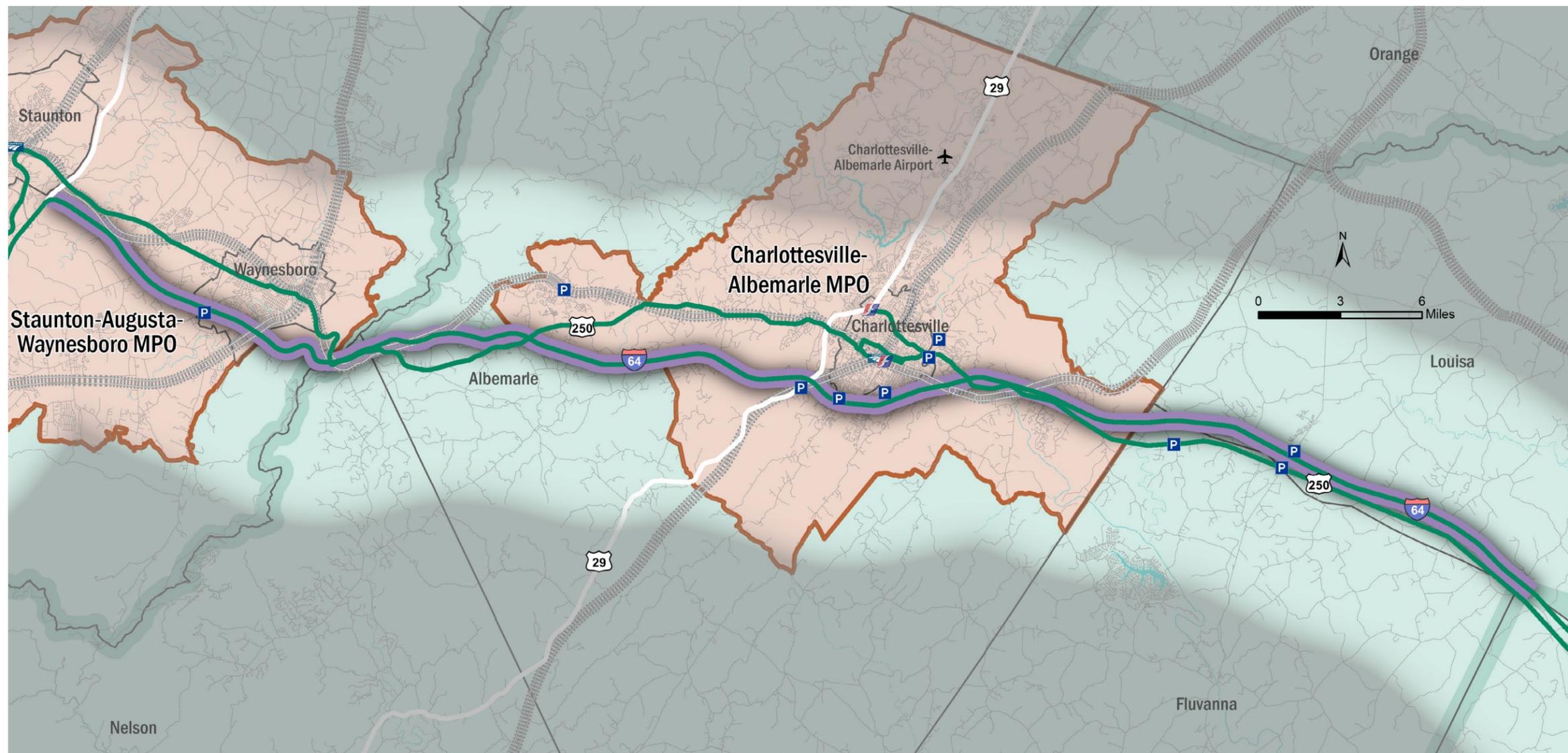
IV. Segment C3

- C3
- Corridor Component Road
- Railroad
- MPO Area
- Planning District Area
- Amtrak Facility
- Greyhound Facility
- VRE Facility
- Metrorail Facility
- Port Facility
- Park & Ride Facility
- Airport Facility



Corridor Segment C3 Components

- I-64
- US 250
- Charlottesville-Albemarle Airport
- Amtrak
- CSX Coal Corridor



C3 SEGMENT PROFILE

Segment C3 begins at I-81 near Staunton and progresses east to the boundary of the Richmond Regional Planning District. This segment serves Augusta, Albemarle, Fluvanna, and Louisa Counties, as well as the Cities of Waynesboro and Charlottesville. The segment travels through the Charlottesville-Albemarle Area. The segment also includes portions of US 250. Segment C3 acts as a major corridor for through freight travel in Virginia. Within urbanized areas the segment serves as a commuter route, connecting Staunton, Waynesboro, and Charlottesville, in addition to surrounding rural communities. Segment C3 also provides a connection to the University of Virginia, as well as multiple natural, historical, and cultural resources in the region.

Highway Facilities: I-64 is primarily a rural highway with four lanes in Segment C3. US 250 is a two- to four-lane roadway that runs parallel to I-64 throughout the segment.

Transit Services: In Segment C3, Amtrak and Greyhound both have stations in Charlottesville. Amtrak provides service within the corridor from Charlottesville along its Cardinal Route, as well as north-south along its Crescent Route. There are several Park-and-Ride facilities near I-64, with the largest number clustered in and around Charlottesville.

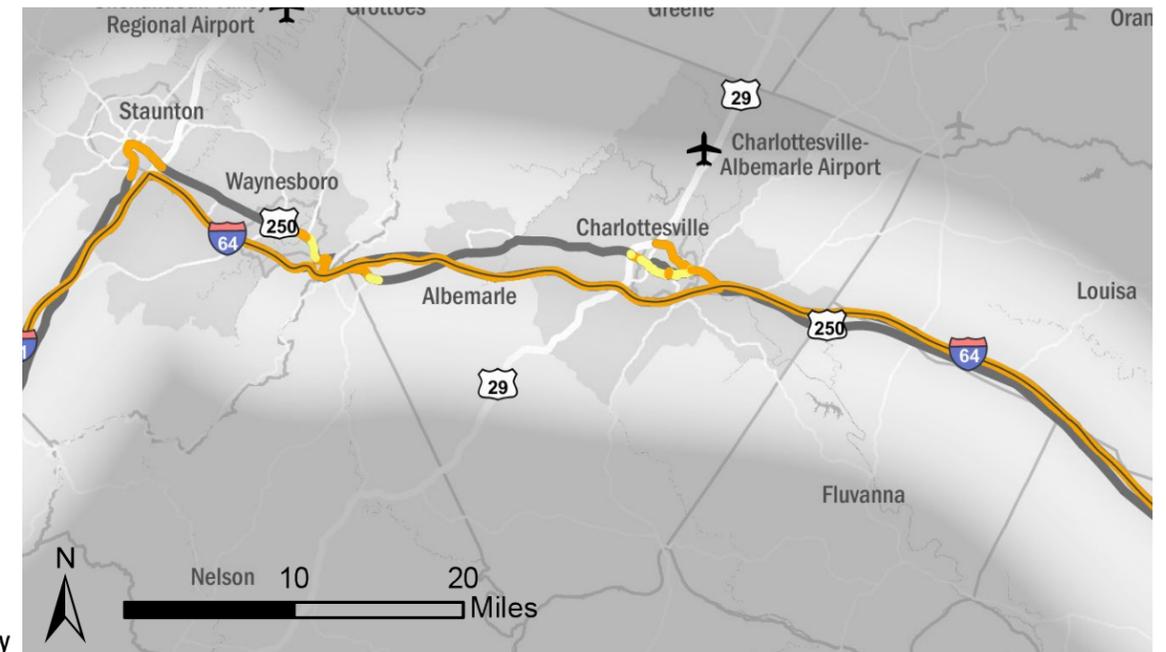
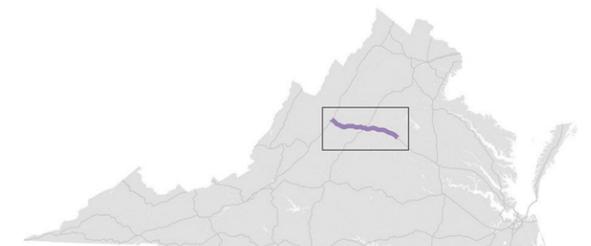
Rail Facilities: CSX's Coal Corridor rail lines pass through Segment C3 connecting locations west to the Port of Virginia facilities in the Hampton Roads Area. Norfolk Southern's Crescent Corridor also intersects the segment providing connections to the north and south.

Port Facilities: Although there are no port facilities located directly adjacent to Segment C3, CSX's Coal Corridor does provide connections to multiple Port of Virginia facilities in the Hampton Roads Area.

Airport Facilities: Charlottesville-Albemarle Airport is the only commercial airport in this segment.

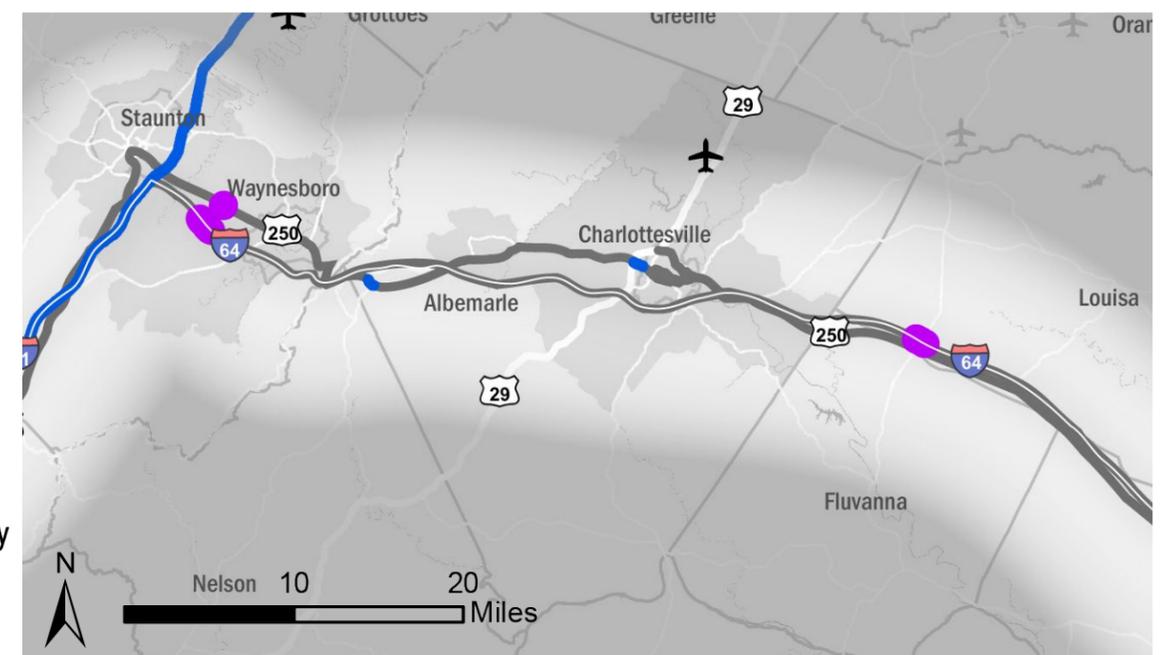
Major planned and future projects include:

- Widening the bridge portion of I-64 from 0.465 to 0.494 miles west of Route 285 in Augusta County.



Number of Lanes (both directions)

- 2
- 3 - 4
- 5 - 6
- 7 - 8
- 9 - 12
- Primary facility



Future Projects

- Reconstruction with added capacity
- Safety improvements
- Primary facility

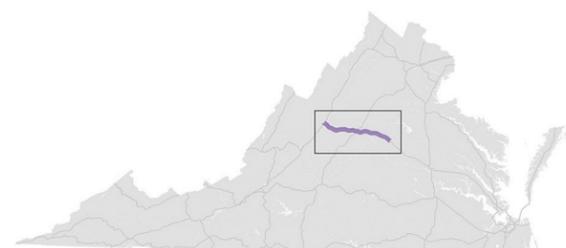
C3 SEGMENT PROFILE

Travel Demand

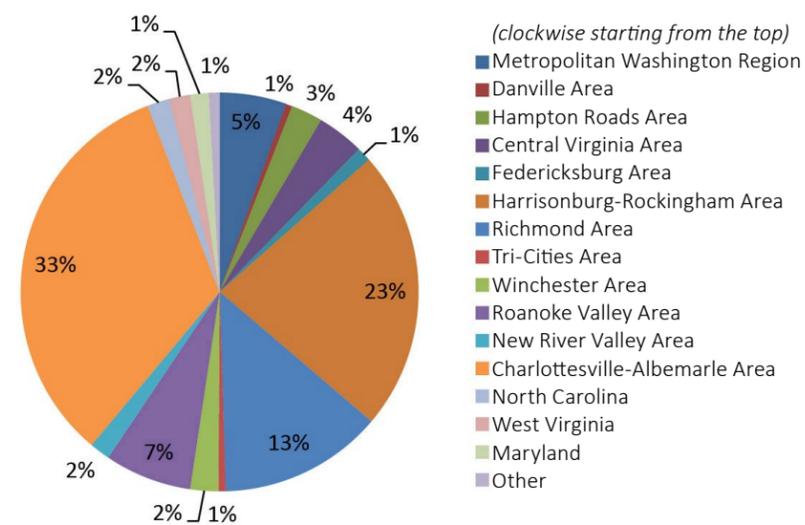
Passenger Demand

Segment C3 connects the Staunton-Augusta-Waynesboro Area in the west to the Richmond Area in the east, via the Charlottesville-Albemarle Area. Travel between these three Areas accounts for approximately 4.2 percent of intercity passenger travel within the Commonwealth, with notable levels of daily travel between Staunton and Charlottesville.

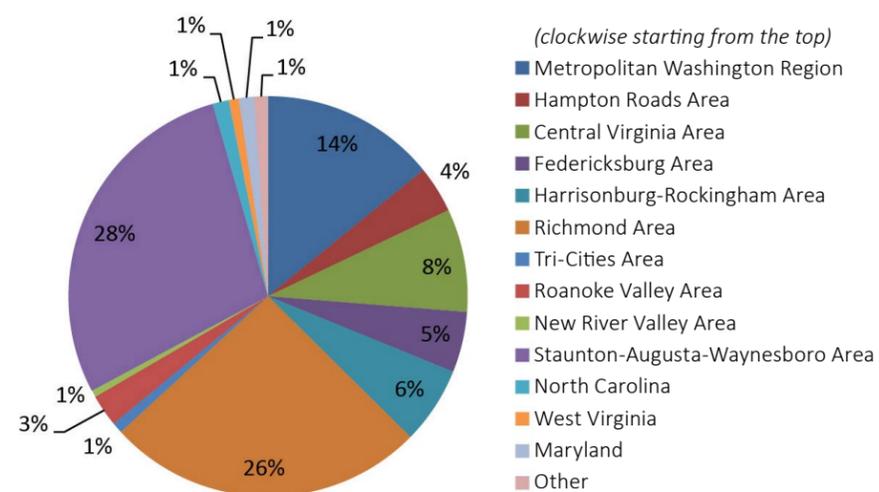
Intercity travel from the Staunton-Augusta-Waynesboro Area is distributed to a large number of regions in the state, many of which are likely to use Segment C3 including one third of intercity passenger trips destined for Charlottesville, 13 percent of trips destined for Richmond, and three percent of trips destined for the Hampton Roads Area. Intercity passenger travel from the Charlottesville-Albemarle Area is also dominated by trips using Segment C3 including 28 percent destined for the Staunton-Augusta-Waynesboro Area and 26 percent destined for the Richmond Area. Travel from the Richmond Area is more distributed along other segments, and the largest market using Segment C3 is intercity passenger travel destined for Charlottesville (five percent).



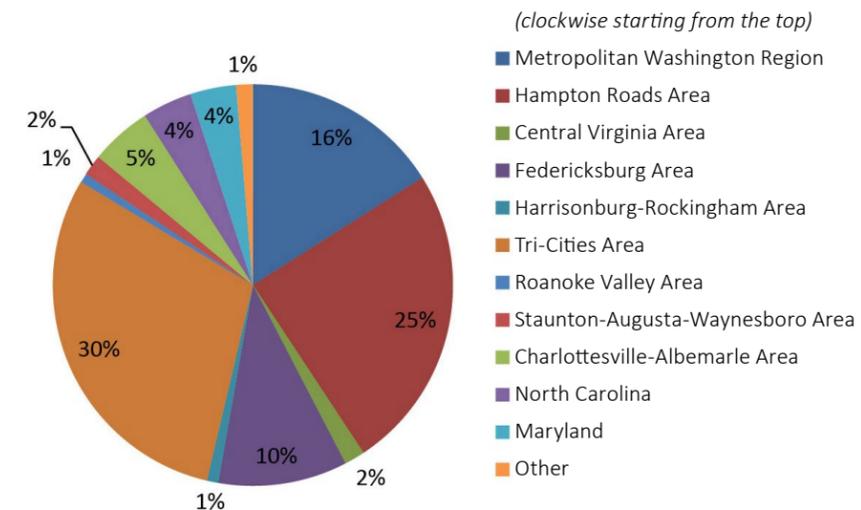
Travel from Staunton-Augusta-Waynesboro Area to...



Travel from Charlottesville-Albemarle to...



Travel from Richmond Area to...



C3 SEGMENT PROFILE

Freight Demand

By truck, Segment C3 carried 21 million tons of freight worth \$37 billion in 2012, and is estimated to carry 29 million tons of freight worth \$76 billion in 2025. A large proportion of truck freight traffic on Corridor C, representing approximately 40 percent of total corridor tonnage and approximately 50 percent of the corridor value, passes through Virginia. Besides this through traffic, a significant portion of the truck freight on Corridor C originates from (around 13 percent) or is destined for (between 13 and 18 percent) Norfolk and Portsmouth and their port facilities. Another major truck freight movement on Corridor C is between Nevada and the maritime terminals in the Hampton Roads Area, which accounts for 4,000 tons of freight worth \$5 billion in 2012 and is expected to increase significantly in value to \$28 billion in 2025, corresponding with only a modest gain in the freight tonnage to 4,300 tons. The jurisdictions adjacent to Segment C3 are not major producers or attractors of truck freight traffic on this corridor. There is a significant volume of truck freight traveling from North Carolina to the City of Waynesboro, located near Segment C3. The tonnage for this origin-destination pair is estimated to significantly increase from 2012 (32,000 tons) to 2025 (1.8 million tons).

Truck Freight

Major Origins (by Tonnage)

1. Virginia (36% / 37%)
2. North Carolina (15% / 13%)
3. Pennsylvania (7% / 7%)
4. City of Norfolk* (6% / 6%)
5. New Jersey (5% / 5%)

Corridor Tonnage Originating in Segment C3:
3% / 3%

Major Origin-Destination Pairs for Freight

- North Carolina and Pennsylvania
- North Carolina and New York
- North Carolina and Maryland
- City of Norfolk* and North Carolina
- North Carolina and New Jersey

Percentages represent 2012 / 2025 values.
*Includes freight passing through the Port of Virginia.

Major Destinations (by Tonnage)

1. Virginia (40% / 41%)
2. North Carolina (10% / 10%)
3. Pennsylvania (7% / 7%)
4. City of Norfolk* (7% / 7%)
5. New York (7% / 6%)

Corridor Tonnage Destined for Segment C3:
2% / 2%

By rail, Segment C3 carried 32 million tons of freight worth \$3 billion in 2012, and is estimated to carry 33 million tons of freight worth \$3 billion in 2025. Nearly all rail freight on Corridor C (approximately 95 percent of total tonnage) is destined for Virginia, with less than one percent of freight passing through the Commonwealth. This is primarily because large quantities of freight are traveling to/from the port facilities in the Hampton Roads Area. Large amounts of low value rail freight (around two-thirds of the total corridor rail freight tonnage but only around 20 percent of the corridor rail freight value) travels eastbound from West Virginia and Kentucky to the marine terminal located at Newport News. The counties adjacent to Segment C3 do not produce a significant amount of rail freight, accounting for less than one percent of the Corridor C rail freight tonnage and value. However, the City of Harrisonburg is a minor attractor of rail freight near the corridor, accounting for three percent of rail freight value, most of which arrives from the Midwest.

Rail Freight

Major Origins (by Tonnage)

1. West Virginia (74% / 71%)
2. Virginia (9% / 11%)
3. Kentucky (8% / 8%)
4. Dickenson County (3% / 3%)
5. Hanover County (2% / 3%)

Corridor Tonnage Originating in Segment C3:
<1% / <1%

Major Origin-Destination Pairs for Freight

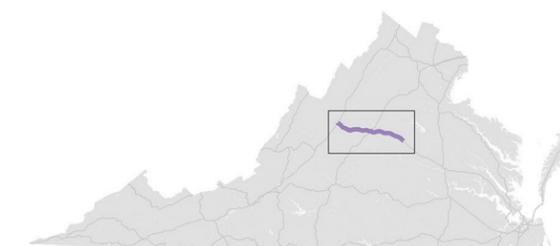
- City of Newport News* and West Virginia
- City of Norfolk* and West Virginia
- City of Newport News* and Kentucky
- Dickenson County and City of Newport News*
- Hanover County and City of Newport News*

Percentages represent 2012 / 2025 values.
*Includes freight passing through the Port of Virginia.

Major Destinations (by Tonnage)

1. Virginia (96% / 95%)
2. City of Newport News* (73% / 71%)
3. City of Norfolk* (11% / 10%)
4. City of Covington (2% / 2%)
5. Rockingham County (1% / 2%)

Corridor Tonnage Destined for Segment C3:
1% / 1%

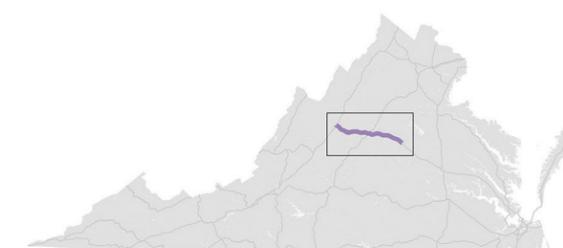


C3 SEGMENT PROFILE

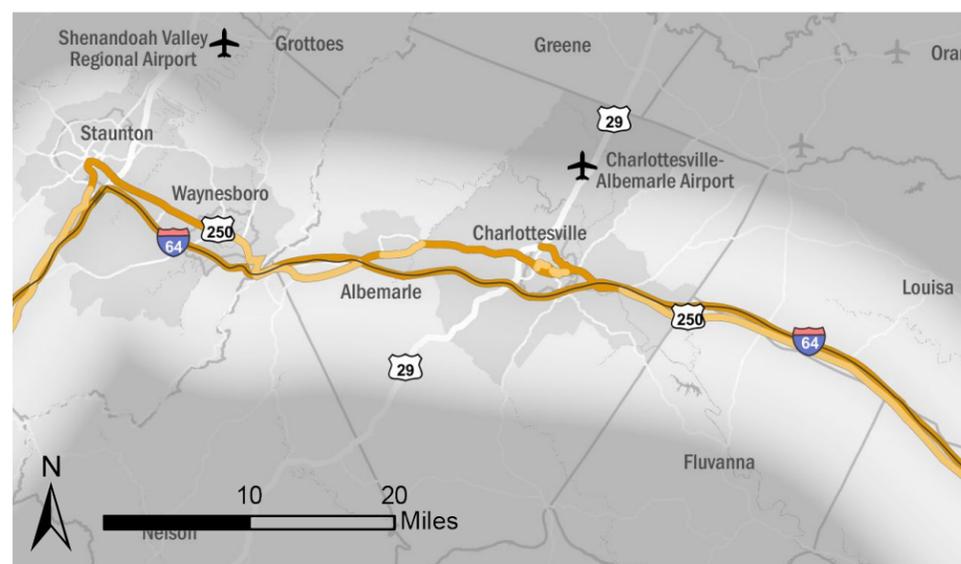
Traffic Conditions

Traffic Volume and AADT

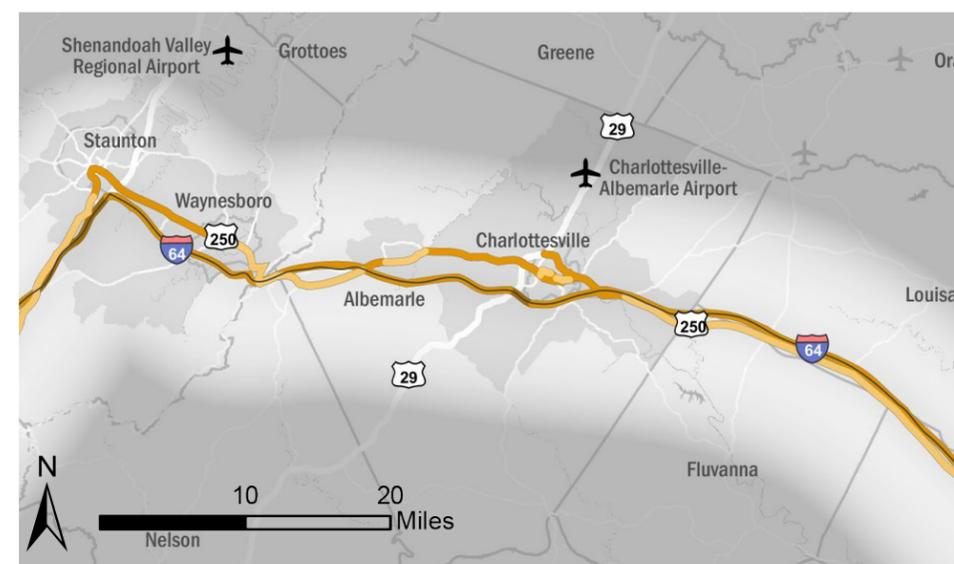
Traffic volume on Segment C3 is generally less than traffic volumes on most other sections of Corridor C. Average daily traffic volumes along I-64 in Segment C3 typically range from 33,000 to 39,000 vehicles, with average daily volumes greater than 44,000 vehicles on a short section of I-64 south of Charlottesville. Traffic on US 250 is generally lower, with volumes as low as 1,500 vehicles per day in Fluvanna County, but greater than 35,000 vehicles per day in the City of Charlottesville. Traffic volumes are projected to increase by 2025 throughout Segment C3, with the greatest increase projected to be about 12,000 additional vehicles per day on I-64 southeast of Charlottesville, and more than 5,000 additional vehicles per day on US 250 in Charlottesville. By 2025, typical traffic volumes on I-64 are projected to range from 34,000 to 49,000 vehicles per day.



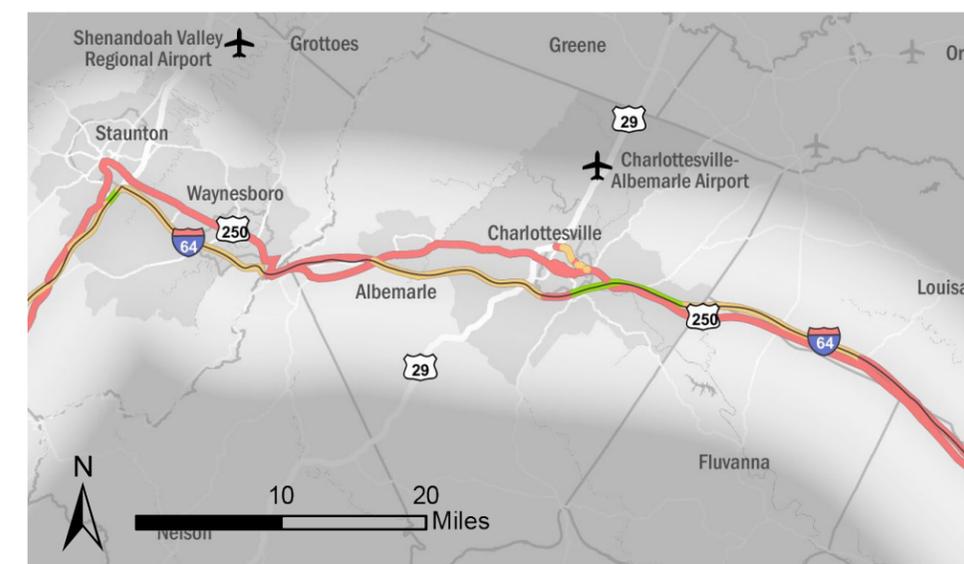
Traffic Volume 2014 (AADT)



Traffic Volume 2025 (AADT)



Change in Traffic Volume 2014- 2025 (AADT)



C3 SEGMENT PROFILE

Traffic Distribution

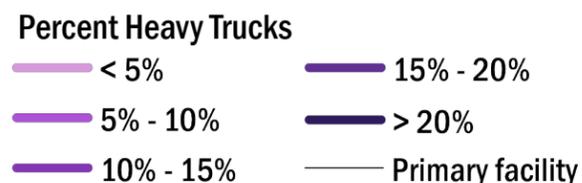
On average, traffic on Segment C3 is distributed throughout the day as shown in the graphs below.

Weekday traffic shows two peak periods over the course of the day, with the highest hourly traffic occurring between 5 and 6 p.m. which accounts for 8.2 percent of daily traffic. The morning peak hour is less busy, with the 7 to 8 a.m. hour accounting for 6.1 percent of daily traffic. The combined weekday traffic in the two peak periods (from 6 to 10 a.m. and from 3 to 7 p.m.) accounts for 52 percent of total daily traffic. Peaking patterns for truck traffic show a single peak during the midday period, with a peak hourly flow of 6.3 percent of daily traffic. Weekend traffic patterns are also different from the typical commute patterns, with the highest percentage of hourly traffic occurring between 3 and 4 p.m. (7.9 percent of daily traffic) for all traffic, and 1 to 2 p.m. (5.9 percent of daily traffic) for truck traffic.

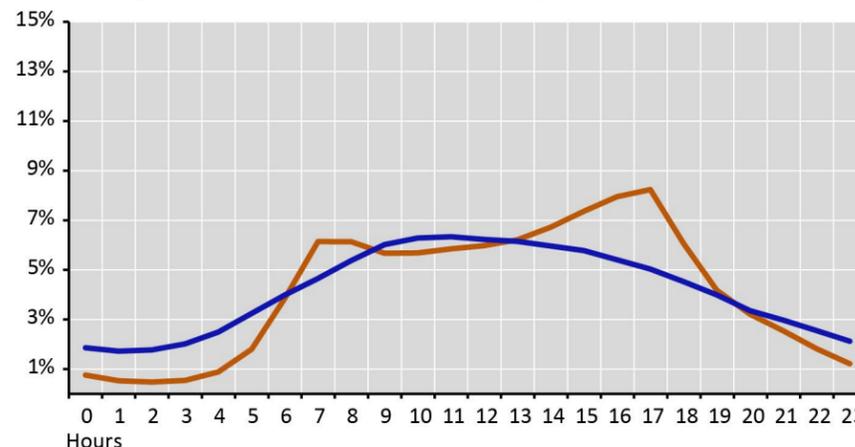
Weekday traffic volumes on Segment C3 vary by as much as 30 percent throughout the year, with the highpoint in August (around 38,000 vehicles per day) and the low point in January (around 29,000 vehicles per day) with a notable lull during July. Truck volumes vary similarly throughout the year, with the June high (around 4,000 vehicles per day) 30 percent higher than the July low (around 3,000 vehicles per day). Weekend traffic levels also vary over the course of the year, and the highest levels of weekend traffic (October, around 39,000 vehicles per day) are 57 percent higher than January levels (around 25,000 vehicles per day). Weekend truck traffic is more steady than all vehicle traffic, with the June high 40 percent higher than the July low. Since truck volumes account for a relatively small portion of traffic on Segment C3, traffic conditions are much more responsive to variations in automobile traffic than truck traffic.

Truck Volumes

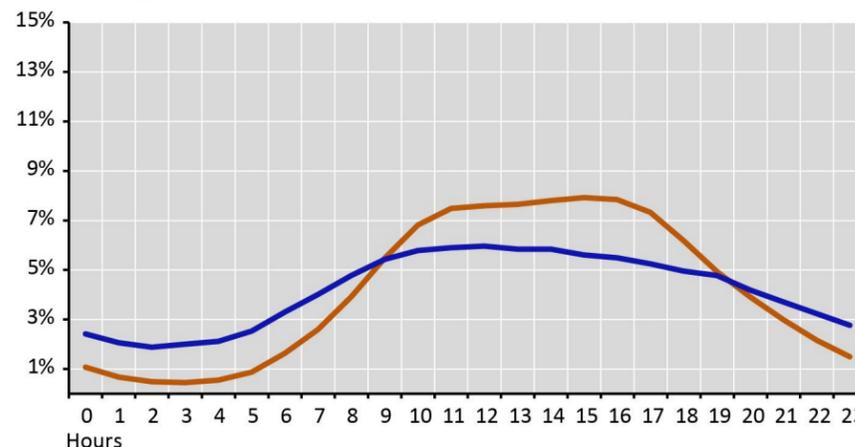
The percent of daily traffic comprised of heavy trucks on Segment C3 is moderate relative to most other segments in Corridor C. From Staunton to Charlottesville along I-64, heavy trucks comprise eight to nine percent of total daily traffic. To the east of Charlottesville, heavy trucks comprise only five percent of total daily traffic on I-64. Trucks comprise a lower percentage of daily traffic on US 250 – typically less than five percent – except for the portion crossing Afton Mountain east of Waynesboro.



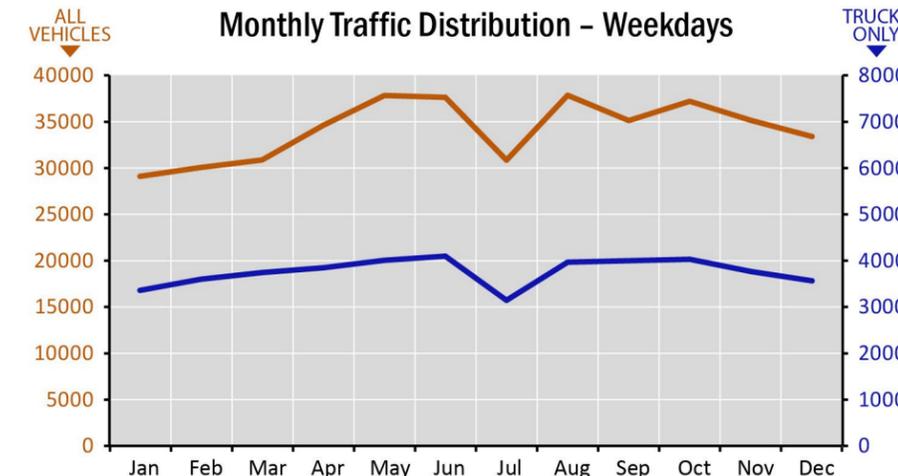
Hourly Traffic Distribution – Weekdays



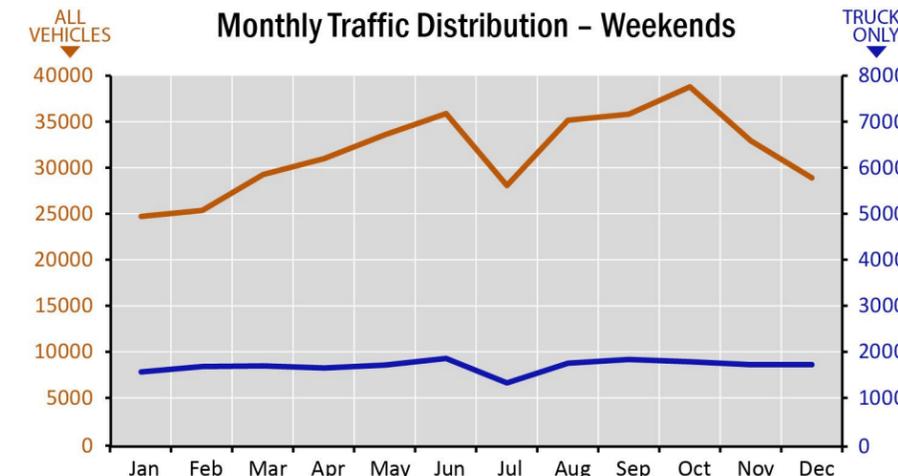
Hourly Traffic Distribution – Weekends



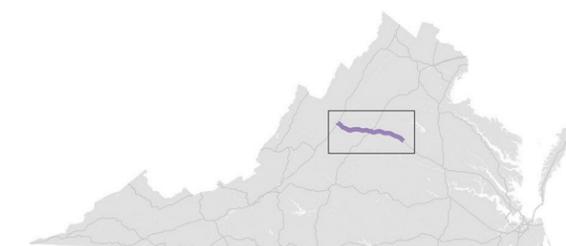
Monthly Traffic Distribution – Weekdays



Monthly Traffic Distribution – Weekends



 All Vehicles
 Trucks

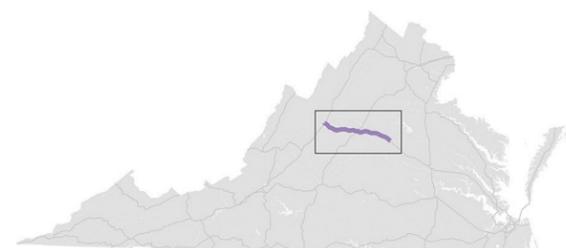


C3 SEGMENT PROFILE

Freight Flows

At the western end of Segment C3, east of Staunton, freight is moved primarily by rail in terms of tonnage but not value. In total, 21.5 million tons (40 percent) of freight is moved through this section of Segment C3 by truck, compared to 32 million tons by rail. By value, trucks are carrying far more freight, with \$37 billion (93 percent) of freight value traveling by truck, compared to \$3 billion by rail. This contrast is probably due to the fact that the corridor carries large amounts of coal. On average, a ton of freight traveling through this section of Segment C3 by truck is worth \$1,727 while a ton of freight traveling by rail is worth \$91. In 2025, both rail and truck freight tonnages and total values in the western end of Segment C3 are expected to increase, and the percentage of the freight that travels by truck is expected to increase to 47 percent by tonnage and 96 percent by value. Value per ton on both trucks and rail is expected to grow by 2025, with an average of \$2,592 per ton on trucks and \$101 on rail.

East of Afton Mountain, west of Charlottesville, freight is similarly moved primarily by rail in terms of tonnage but not value. In total, 19 million tons (37 percent) of freight is moved through this section of Segment C3 by truck, compared to 32 million tons by rail. By value, trucks are carrying far more freight, with \$34 billion (92 percent) of freight value traveling by truck, compared to \$3 billion by rail. This contrast is probably due to the fact that the corridor carries large amounts of coal. On average, a ton of freight traveling through this section of Segment C3 by truck is worth \$1,836 while a ton of freight traveling by rail is worth \$87. In 2025, both rail and truck freight tonnages and total values in this section of Segment C3 are expected to increase, and the percentage of the freight traveling by truck is expected to increase to 44 percent by tonnage and 96 percent by value. Value per ton on both trucks and rail is expected to grow by 2025, with an average of \$2,797 per ton on trucks and \$96 on rail.



Annual Freight by Tonnage, 2012



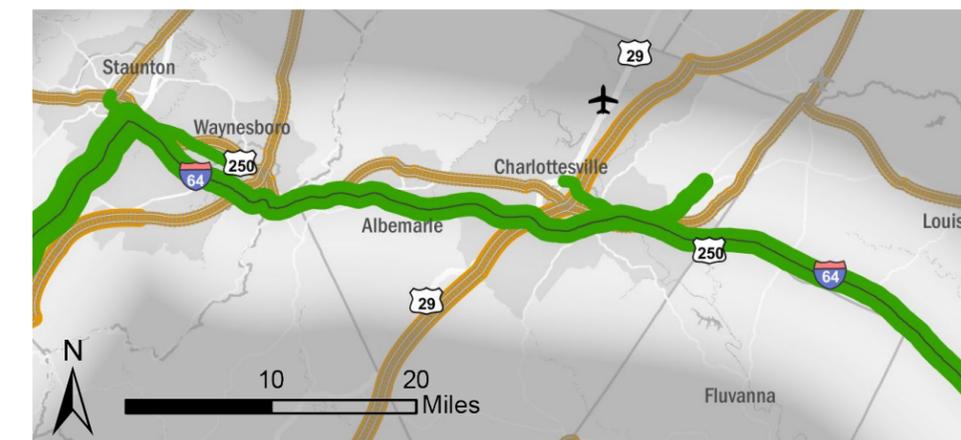
Annual Freight by Value, 2012



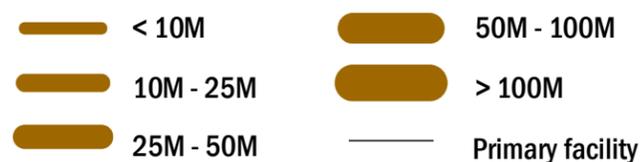
Annual Freight by Tonnage, 2025



Annual Freight by Value, 2025



Truck Freight (in tons)



Rail Freight (in tons)



Truck Freight



Rail Freight



C3 SEGMENT NEEDS

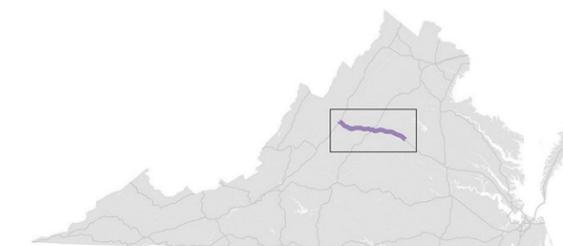
Redundancy and Mode Choice



Passenger trips on Segment C3 of the East-West Corridor have a limited range of travel options in terms of mode choice, although a parallel highway facility (US 250) is available the entire length of the segment. Based on the 2014 federal standard mileage rate of 56 cents per mile, trips between Staunton, Charlottesville, and Richmond would be more expensive by automobile than by the other available modes. The alternate modes, including bus and rail, are all limited by the frequency of service and have longer travel times than the typical automobile trip. Amtrak provides service along the corridor from Staunton and Charlottesville. Greyhound also serves Charlottesville.

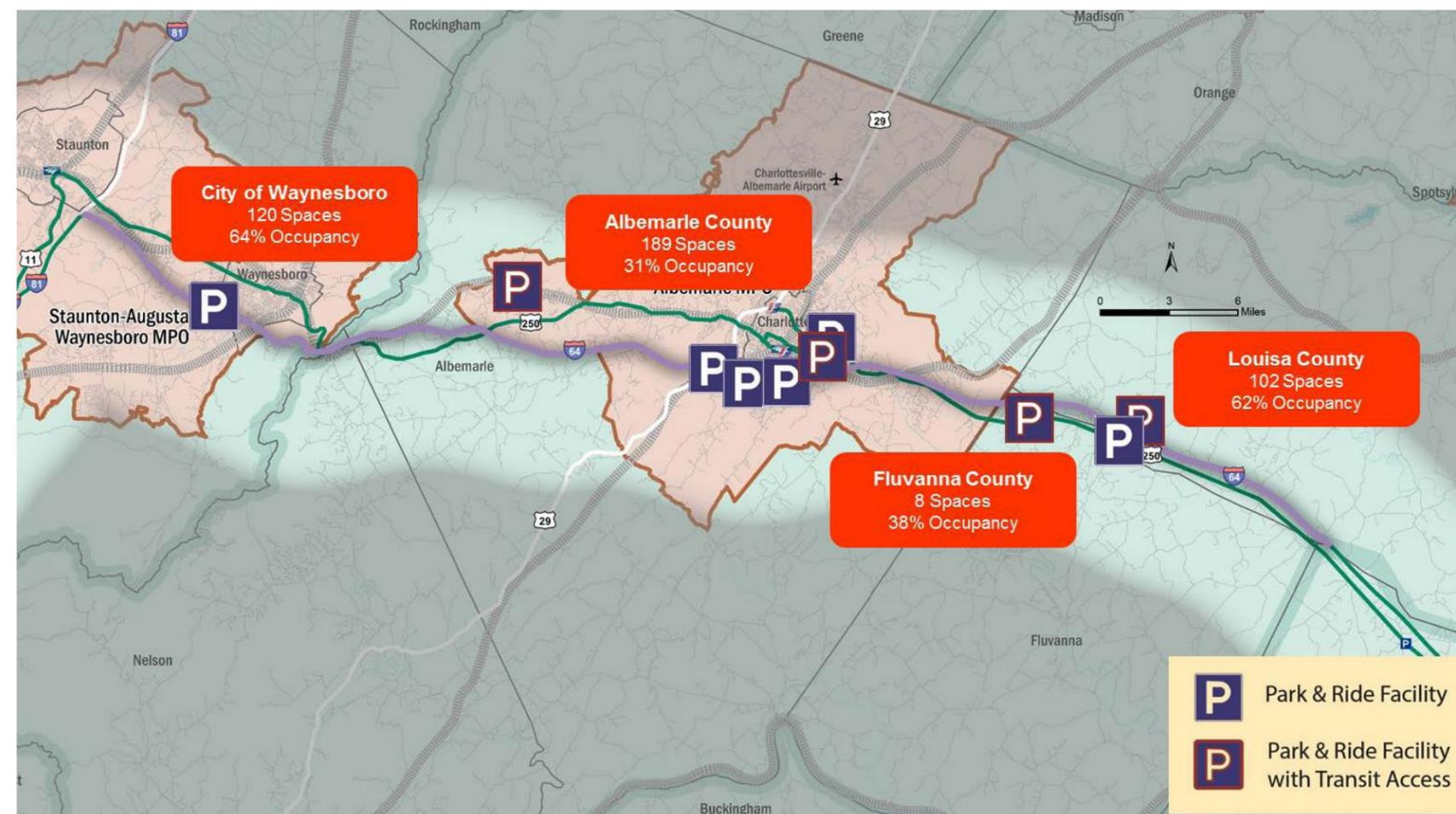
Park-and-Ride

Within Segment C3, commuters can utilize many Park-and-Ride locations. Albemarle County provides the highest number of Park-and-Ride spaces and locations, while Augusta County has the highest utilization rate of spaces available in the region. At 80 percent, only Augusta County has a rate higher than the statewide average of 76 percent for Park-and-Ride utilization.



Comparable Travel Options

Route	Mode	Trips per Day	Travel Time	Est. Cost	
Richmond to Staunton	Inter-City Bus	0	0:00	\$0	
		3	0:00	\$0	
	Train	3	3:29	\$42	
		0	0:00	\$0	
	Auto		Via I-64: 1:38 Travel Time \$60 Est. Cost		
	Auto		Via Rt. 250 / I-64: 2:16 Travel Time \$62 Est. Cost		
Charlottesville to Harrisonburg	Inter-City Bus	0	0:00	\$0	
		0	0:00	\$0	
	Train	0	0:00	\$0	
		0	0:00	\$0	
	Auto		Via I-64: 1:00 Travel Time \$36 Est. Cost		
	Auto		Via Rt. 250 / I-81: 1:30 Travel Time \$37 Est. Cost		
Richmond to Charlottesville	Inter-City Bus	3	1:51	\$13	
		0	0:00	\$0	
	Train	9	1:45	\$28	
		1	1:02	\$15	
	Auto		Via I-64: 1:10 Travel Time \$40 Est. Cost		
	Auto		Via Rt. 250: 1:44 Travel Time \$41 Est. Cost		
Charlottesville to Staunton	Inter-City Bus	0	0:00	\$0	
		0	0:00	\$0	
	Train	1	1:02	\$15	
		0	0:00	\$0	
	Auto		Via I-64: 0:40 Travel Time \$22 Est. Cost		
	Auto		Via Rt. 250: 1:01 Travel Time \$23 Est. Cost		

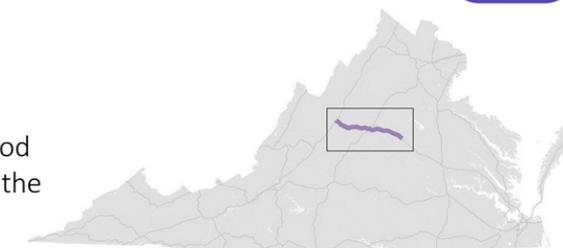


C3 SEGMENT NEEDS

Safety

Between 2010 and 2012, 302 severe crashes occurred in Segment C3. Several areas exhibit high concentrations of severe collisions along the segment. On US 250 (Richmond Avenue) in Staunton, 66 crashes occurred over a distance of approximately 1.4 miles between Statler Boulevard and I-81. Of these, 22 crashes were at the intersection with Statler Boulevard and 14 were at the intersection with Frontier Drive. On US 250 (Main Street) in Waynesboro, 39 incidents occurred along a one mile stretch between Low Dewitt Boulevard and Hopeman Parkway. Of the 39 incidents, 13 incidents were at the Low Dewitt

Boulevard intersection and seven were at the Vedette Avenue intersection. On US 250 Business (High Street/West Main Street) in Charlottesville, 36 crashes took place between Jefferson Park Avenue and 7th Street NE. Of these, 19 crashes occurred near the intersection of West Main Street and 7th Street SW. Also in Charlottesville, there were 48 collisions along a stretch approximately 2.8 miles long on US 250 Bypass between Birdwood Road and Peter Jefferson Parkway; 24 of the 48 crashes were at the intersection of US 250 Business and McIntire Road.



Performance Metrics:

Number of Severe Crashes **262**

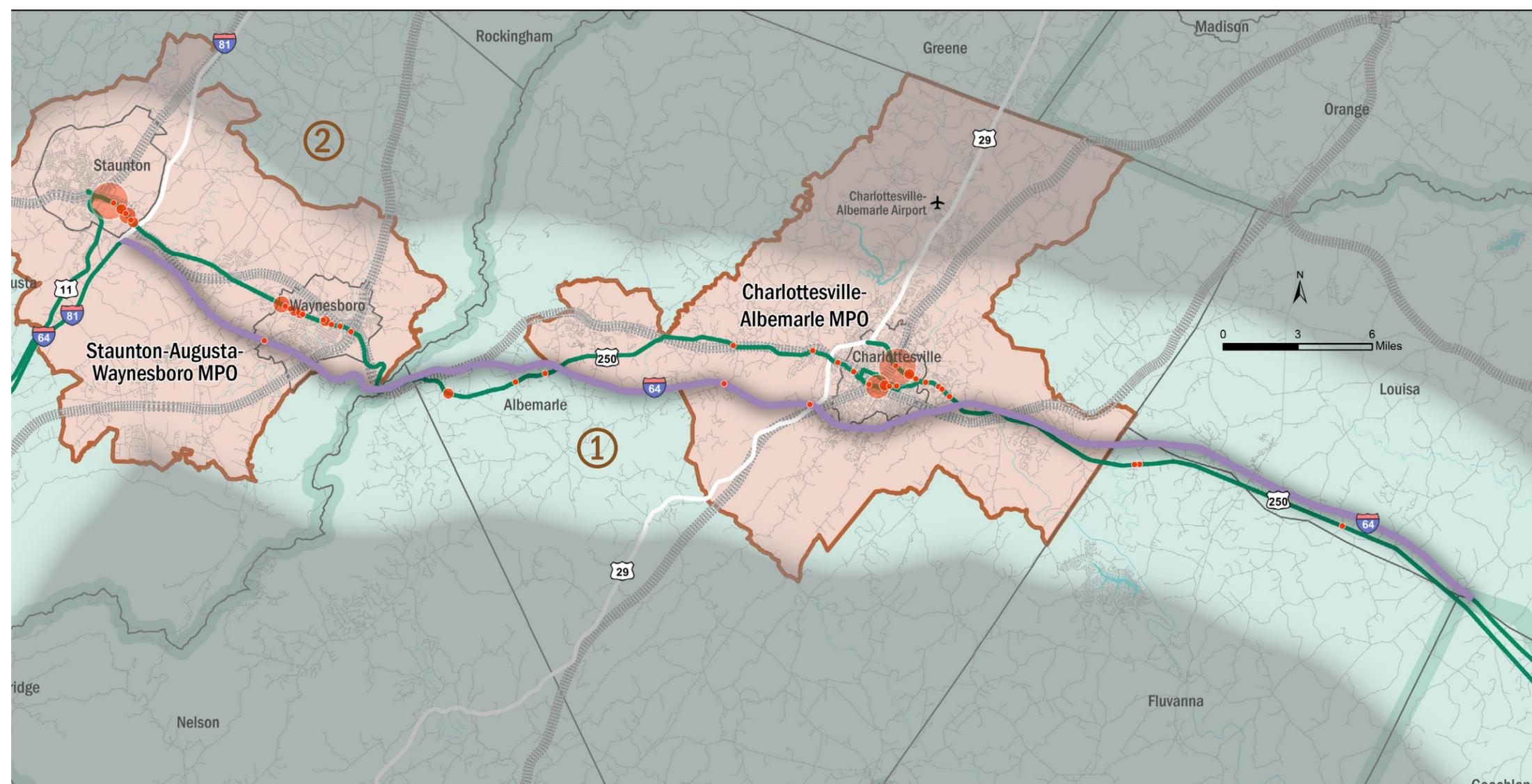
Severe Crashes/Million VMT **0.5**

Number of Railroad Crashes **3**

Fatality and Injury Crashes (2010 - 2012)

- < 5
- 5 - 10
- 11 - 15
- 16 - 20
- > 20

Railroad Incidents/Accidents per County (2011-2014)



C3 SEGMENT NEEDS

Congestion



Performance Metrics:

Person Hours of Delay per Mile

11

Freight Ton Hours of Delay per Mile

6.9K

Passenger Delays

There is moderate passenger congestion along Segment C3, with around 2,600 person-hours delay daily. Locations where passenger delays exceed 100 person-hours per mile include:

- US 250 between I-64 in Albemarle County (east of Charlottesville) and US 29 Business in Charlottesville; and
- US 250 Business near the University of Virginia at US 29 Business.

About half of passenger delays along Segment C3 occur during the peak period, which is above the average peak period share of congestion for CoSS.

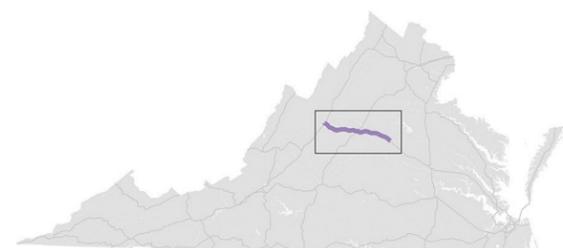
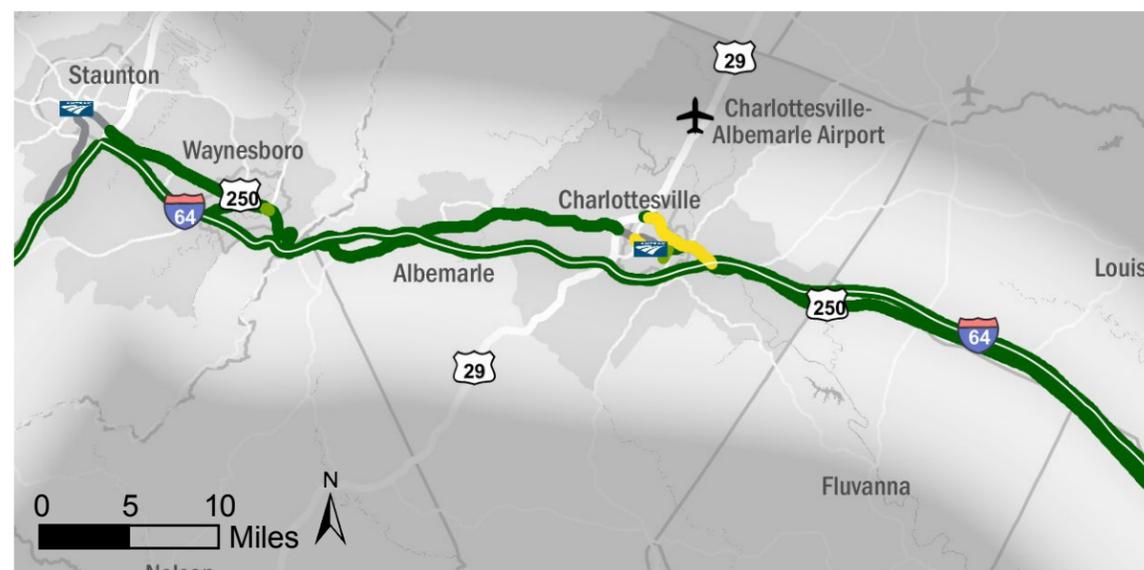
Freight Delays

Segment C3 has relatively minor freight congestion, accounting for around 1.7 million ton-hours of delay daily. While most of the corridor segment has low freight delays, there are a couple of locations where the freight delay exceeds 250,000 ton-hours per mile:

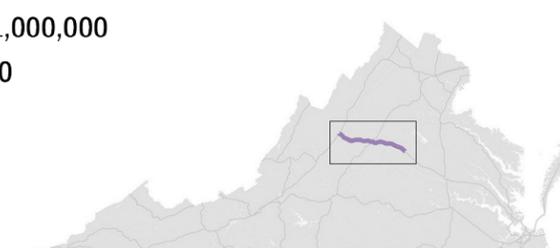
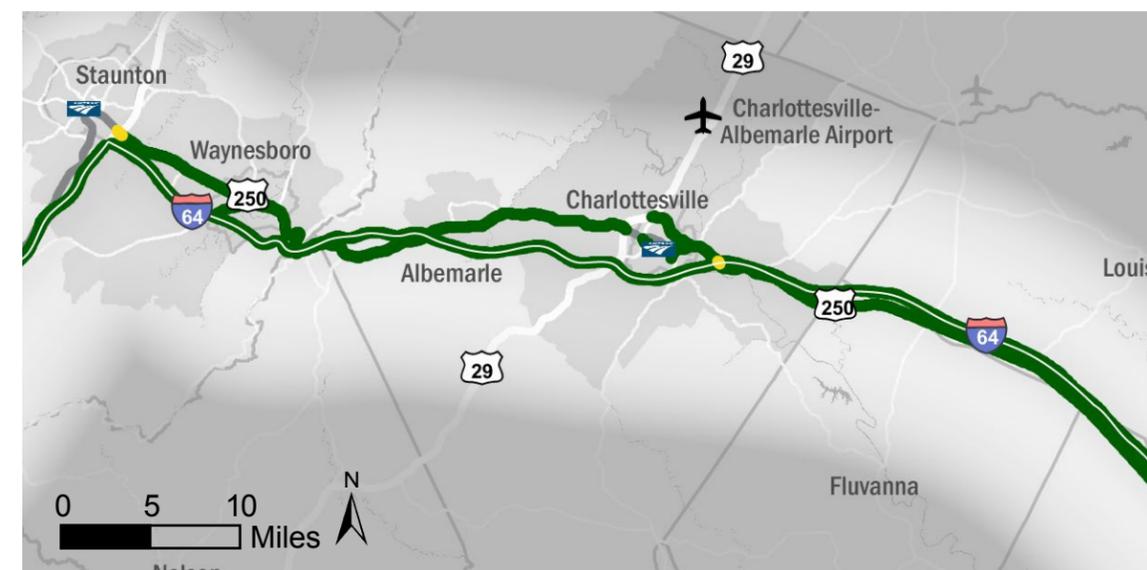
- In Augusta County on US 250 near the I-81 interchange; and
- In Albemarle County on US 250 near the I-64 interchange (east of Charlottesville).

Peak-period freight delays account for a little more than 40 percent of daily congestion.

Daily Person Hours of Delay per Mile



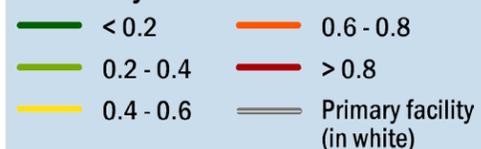
Daily Freight Ton Hours of Delay per Mile



C3 SEGMENT NEEDS

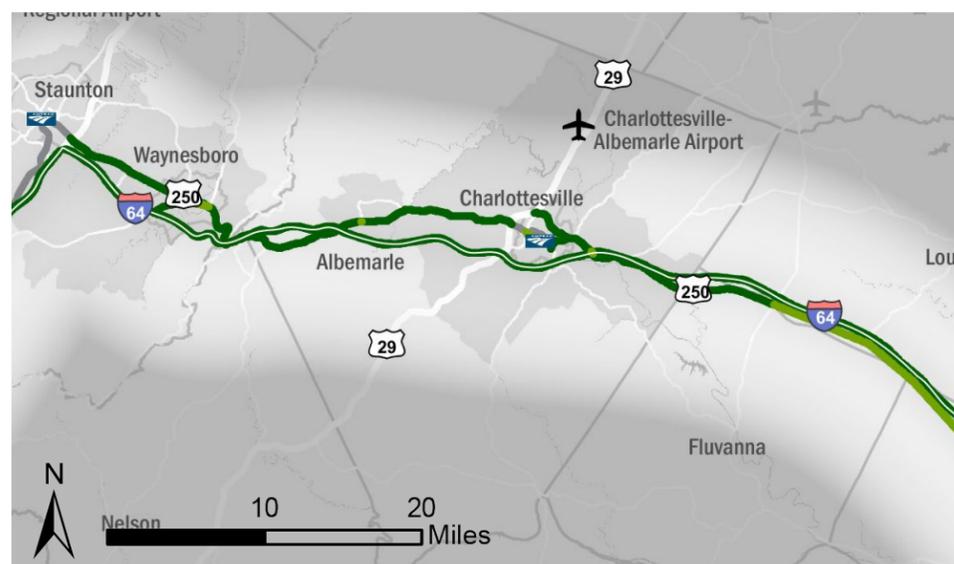
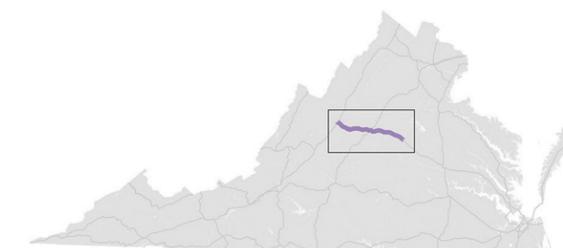
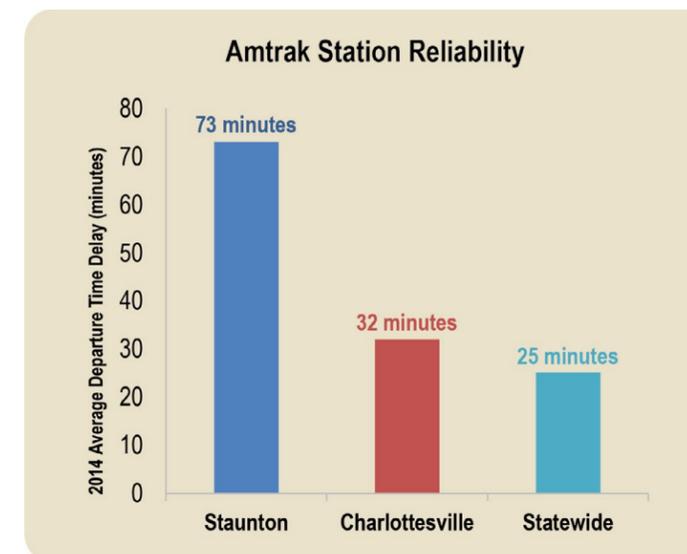
Reliability

Reliability Index



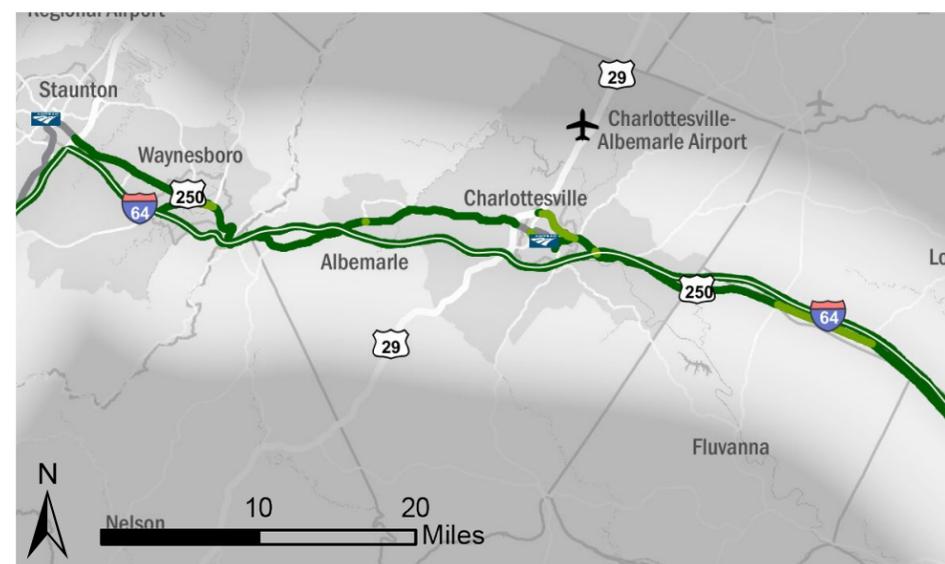
Statewide reliability index thresholds have been set for weekday peak, weekday and weekend travel to assess the reliability of travel on each segment on all corridors of statewide significance. A higher reliability index indicates that travel times are more unreliable. The following are the reliability index thresholds:

- Weekday Peak - 0.80
- Weekday - 0.40
- Weekend - 0.60



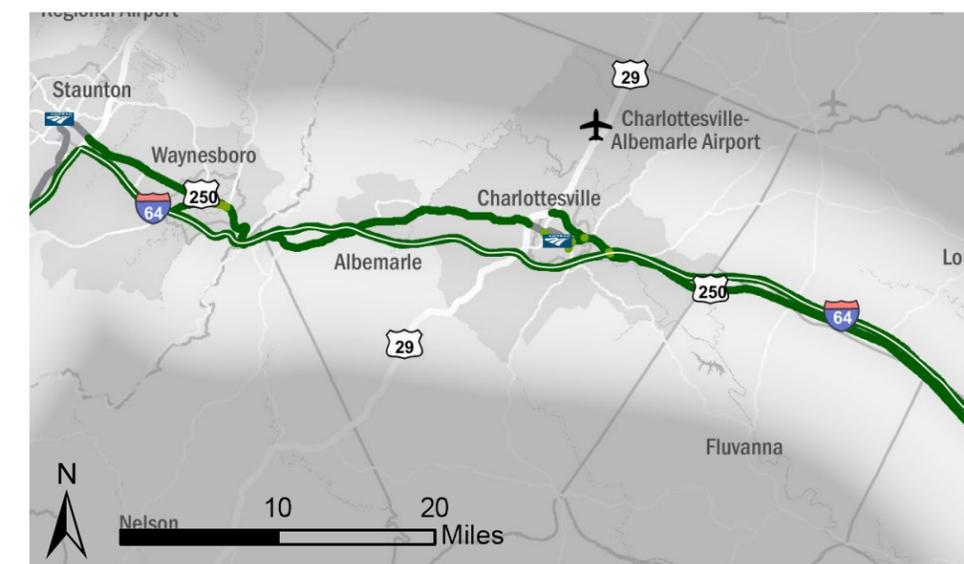
Weekday Peak

Reliability of travel during the peak period on a typical weekday on Segment C3 ranges from 0.00 to 0.39 in terms of reliability index, with an average value of 0.09. None of the locations along Segment C3 have reliability index values exceeding the statewide threshold.



Weekday

Reliability of travel during a typical weekday ranges from 0.01 to 0.34 in terms of reliability index, with an average value of 0.09. None of the locations along Segment C3 have reliability index values exceeding the statewide threshold.



Weekend

Reliability of travel during a typical weekend ranges from 0.01 to 0.55 in terms of reliability index, with an average value of 0.09. While this segment's weekday reliability index is higher than the average for CoSS segments statewide, none of the locations along the Segment C3 have reliability index values exceeding the maximum threshold values.

C3 SEGMENT NEEDS

Summary of Needs

Identified locations are approximate. See "Summary of Needs" table on the following page for details.

Redundancy **Mode Choice**



Safety



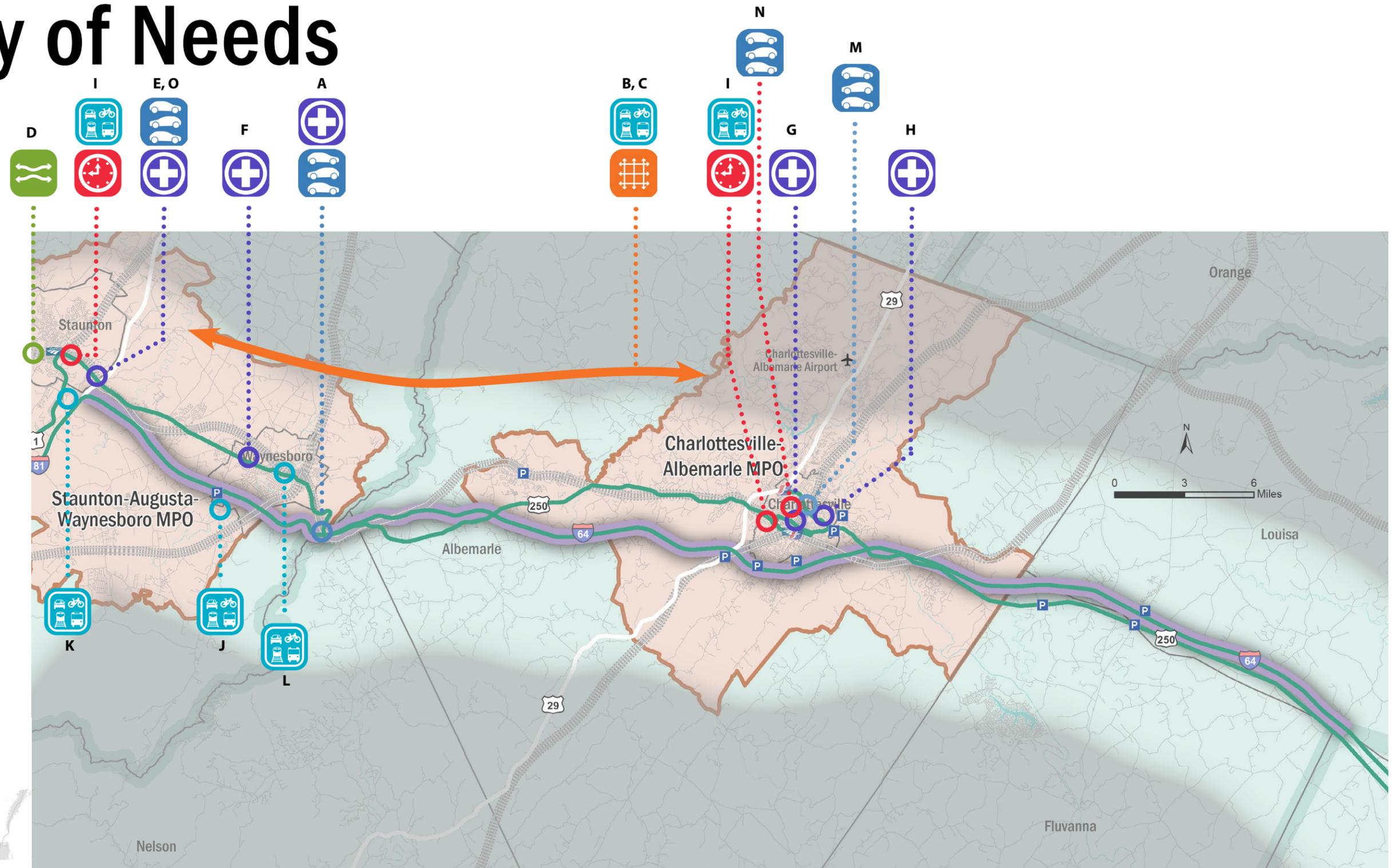
Congestion



Bottlenecks



Reliability



C3 SEGMENT NEEDS

Summary of Needs - C3 Segment

A.		Travel demand between Charlottesville and Staunton region results in peak period congestion and safety issues on Afton Mountain
B.		Redundancy issues along Segment C3: US 250 not able to handle overflow when incident occurs on I-64 resulting in significant delays
C.		Limited transit options between Staunton, Waynesboro, and Charlottesville
D.		Freight rail capacity bottleneck: No capacity for double stacking
E.		US 250 between Statler Blvd and I-81 in Staunton: 66 severe crashes
F.		US 250 between Lew Dewitt Blvd and Hopeman Pkwy in Waynesboro: 39 severe crashes
G.		US 250-Business between Jefferson Park Ave and 7th St NE in Charlottesville: 36 severe crashes

Summary of Needs - C3 Segment

H.		US 250 Bypass between Birdwood Road and Peter Jefferson Pkwy in Charlottesville: 48 severe crashes, including 24 at the intersection with McIntire Road
I.		Unreliable Amtrak service from Staunton station (73 minutes average departure delay) and Charlottesville (32 minutes average departure delay) totaling almost 40,000 person-hours of delay from this segment.
J.		Park and Ride lots in Augusta County have higher utilization rates than statewide average
K.		No bus service from Staunton to other cities in the corridor
L.		No passenger rail or bus service from Waynesboro to other cities in the corridor
M.		Congestion issue on US 250 between US 29 Business and I-64 in Charlottesville
N.		Congestion issue on US 250 Business between US 29 Business (Emmett Street) and Ridge Street/McIntire Avenue in Charlottesville
O.		Congestion issue on US 250 at junction with I-81 near Staunton

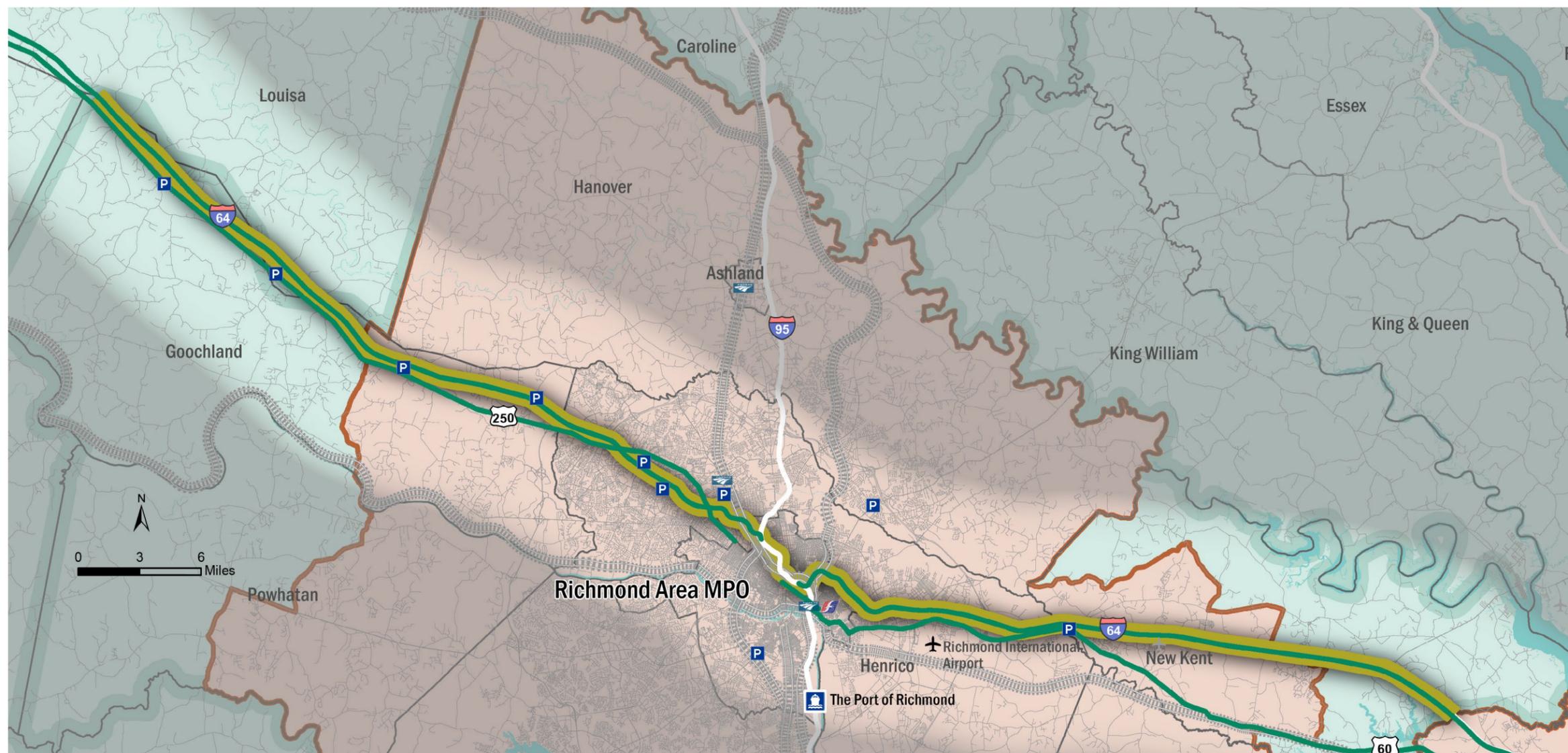
V. Segment C4

- C4
- Corridor Component Road
- Railroad
- MPO Area
- Planning District Area
- A Amtrak Facility
- G Greyhound Facility
- VRE VRE Facility
- M Metrorail Facility
- P Port Facility
- P Park & Ride Facility
- A Airport Facility



Corridor Segment C4 Components

- I-64
- US 250
- US 60
- Port of Richmond
- James River
- Amtrak
- CSX Coal Corridor
- Richmond International Airport



C4 SEGMENT PROFILE

Segment C4 begins at the western boundary of Goochland County and progresses through the Richmond Area. The segment serves Goochland, Louisa, Henrico, and New Kent Counties, as well as the City of Richmond. The segment also includes portions US 250 and US 60, and overlaps briefly with I-95 in the City of Richmond. Segment C4 acts as a major corridor for through freight travel in Virginia. Within the urbanized areas surrounding Richmond, the segment serves as a major commuter route. Segment C4 also provides a connection to military facilities, as well as multiple natural, historical, and cultural resources in the region.

Highway Facilities: I-64 is primarily a rural highway with four lanes in Segment C4, except in Richmond and Henrico County, where it is a major commuter highway with up to eight lanes. US 250 runs parallel to I-64 west of Richmond, while US 60 runs parallel east of Richmond. I-95 runs concurrently with I-64 for a short portion in the City of Richmond.

Transit Services: Amtrak has two stations in Richmond, providing service to the Northeast Corridor. Greyhound and Megabus also provide service to Richmond. Commuter bus service is offered by the GRTC, connecting residents of Chesterfield and Henrico Counties to downtown Richmond. There are several Park-and-Ride facilities near I-64, the majority of which are located west of Richmond.

Rail Facilities: CSX's Coal Corridor rail lines pass through Segment C4 connecting locations west to the Port of Virginia facilities in the Hampton Roads Area.

Port Facilities: No port facilities are directly accessible from Segment C4, but the East-West Corridor does provide access to the Port of Richmond, the navigational channels of the James River, and the Port of Virginia facilities in the Hampton Roads Area.

Airport Facilities: Richmond International Airport is the only commercial airport in this segment.

Major planned and future projects include:

City of Richmond: Widening of I-64 from four to six lanes from about a mile west of Route 623 to a half mile west of I-295;

Henrico County: Pedestrian accommodations at seven signalized intersections on Broad Street leading up to the I-64 interchange in unincorporated part of Richmond;

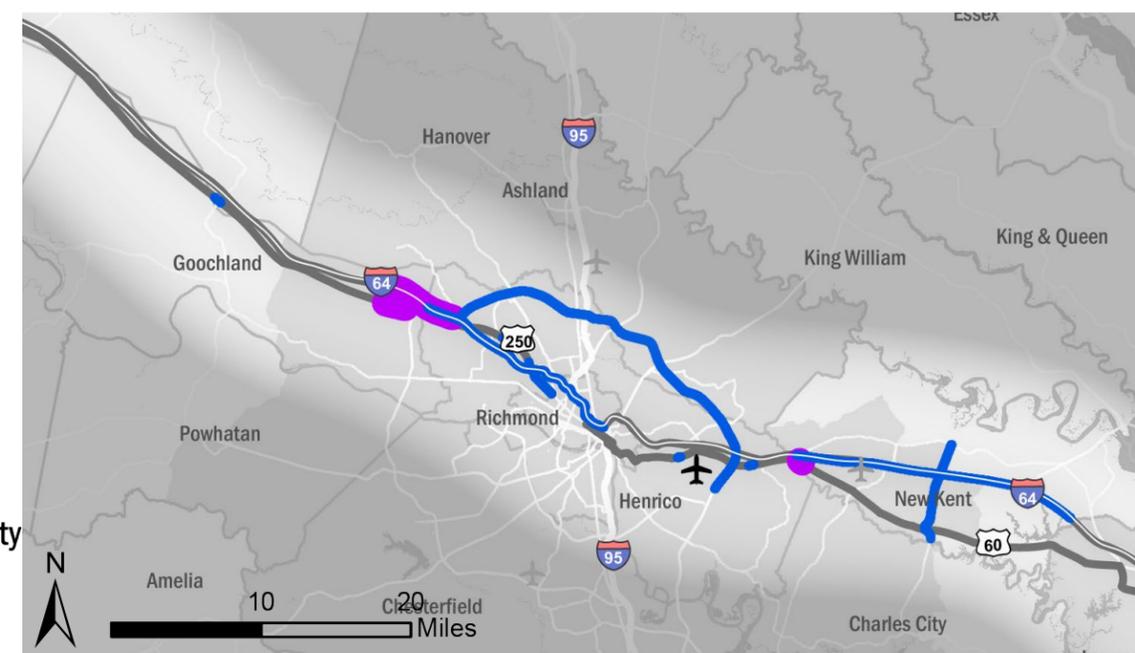
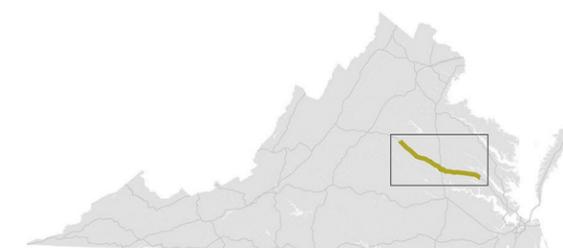
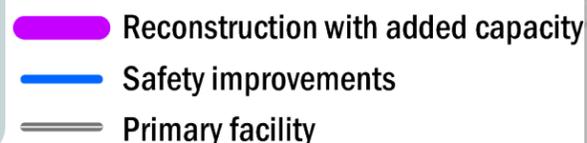
City of Richmond and Henrico County: Installing overhead message boards, CCTV, and fiber optic lines on the portion of I-64 that is concurrent with I-95; and

New Kent County: Widening of North Courthouse Road (Route 155) underneath I-64 to accommodate bicyclists.

Number of Lanes (both directions)



Future Projects



C4 SEGMENT PROFILE

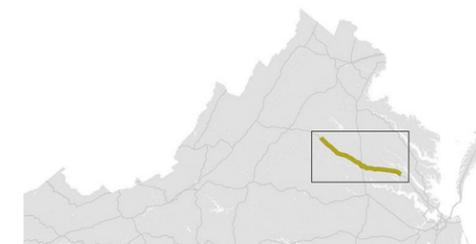
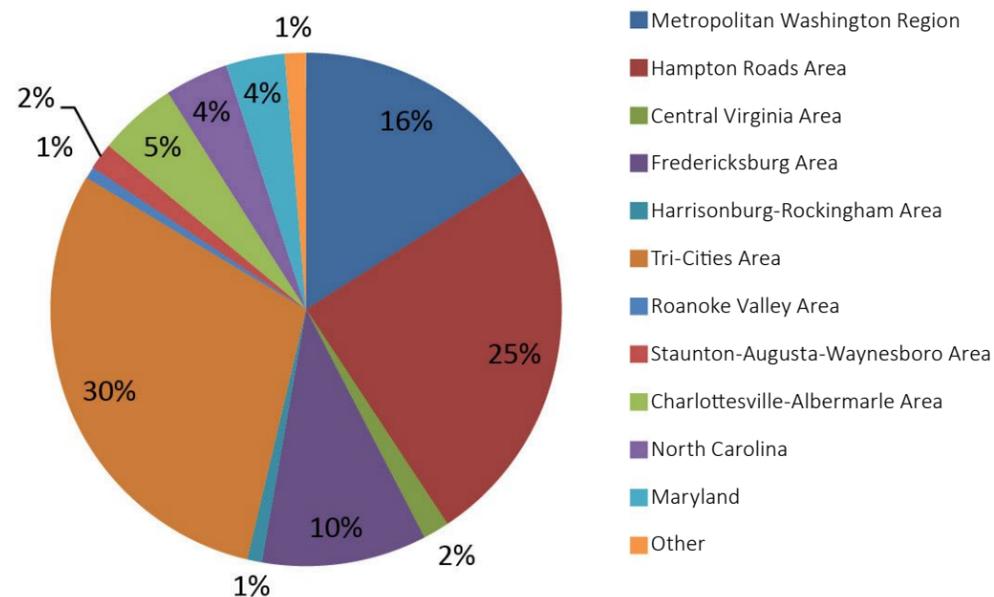
Travel Demand

Passenger Demand

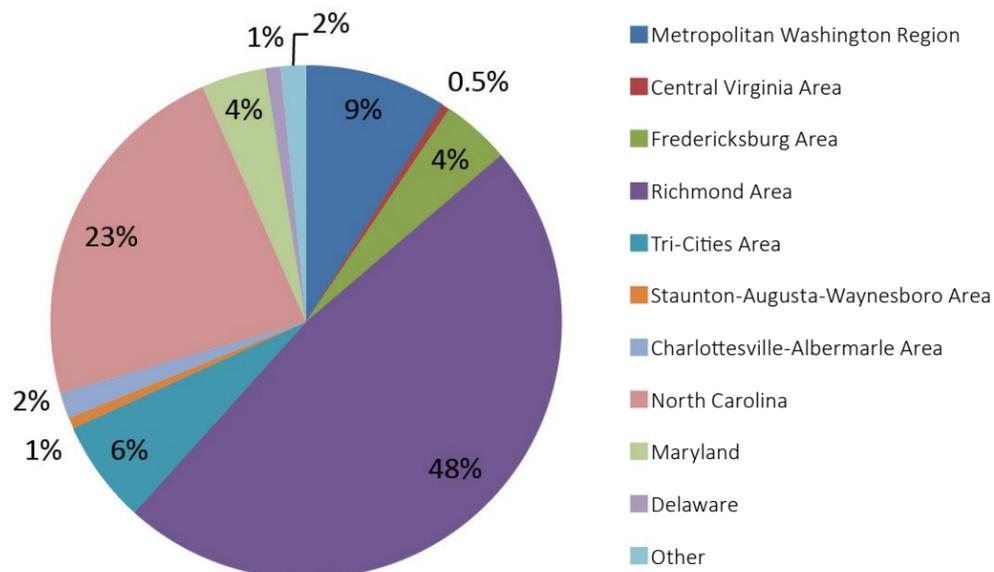
Segment C4 traverses the breadth of the Richmond Area, and provides connections towards Charlottesville to the west and the Hampton Roads Area to the east. Significant portions of the intercity passenger travel in the Commonwealth occur on this segment including more than nine percent between Richmond and Hampton Roads and 2.4 percent to western destinations such as Charlottesville and Staunton. This accounts for a total of more than 11 percent of the intercity passenger travel in the Commonwealth.

Significant portions of the intercity passenger travel originating in the Richmond Area may use Segment C4 to access the final destination, including one quarter of travel destined for the Hampton Roads Area and five percent destined for the Charlottesville area. Large portions of the intercity passenger travel originating in the Hampton Roads Area will also make use of portions of Segment C4; almost half of the intercity passenger traffic originating in the Hampton Roads Area is destined for the Richmond Area. Some of the additional nine percent destined for the Metropolitan Washington region may also use portions of Segment C4, although other travel options are available.

Travel from Richmond Area to...



Travel from Hampton Roads Area to...



C4 SEGMENT PROFILE

Freight Demand

By truck, Segment C4 carried 26 million tons of freight worth \$49 billion in 2012, and is estimated to carry 40 million tons of freight worth \$95 billion in 2025. A large proportion of truck freight traffic on Corridor C, representing approximately 40 percent of total corridor tonnage and approximately 50 percent of the corridor value passes through Virginia. Besides this through traffic, a significant portion of the truck freight on Corridor C originates from (around 13 percent) or is destined for (between 13 and 18 percent) Norfolk and Portsmouth and their port facilities. Another major truck freight movement on Corridor C is between Nevada and the port facilities in the Hampton Roads Area, which accounts for 4,000 tons of freight worth \$5 billion in 2012 and is expected to increase significantly in value to \$28 billion in 2025, corresponding with only a modest gain in the truck freight tonnage to 4,300 tons. Along Segment C4, there are some minor truck flow patterns from Hanover County to Maryland and North Carolina. In this corridor, the City of Richmond is a significant attractor of truck freight, mostly from the Cities and ports of Norfolk and Portsmouth.

Truck Freight



By rail, Segment C4 carried 33 million tons of freight worth \$2 billion in 2012, and is estimated to carry 39 million tons of freight worth \$2 billion in 2025. Nearly all rail freight on Corridor C (approximately 95 percent of total tonnage) is destined for Virginia, with less than one percent of freight passing through the Commonwealth. This is primarily because large quantities of freight are traveling to/from the port facilities in the Hampton Roads Area. Large amounts of low value rail freight (around two-thirds of the total corridor rail freight tonnage but only around 20 percent of the corridor rail freight value) travels eastbound from West Virginia and Kentucky to the marine terminal located at Newport News. In terms of total rail freight value, the City of Hopewell is the largest origin of freight value on Corridor C, and produced more than 20 percent of the total rail freight value. Around three-quarters of this freight is destined for Midwest locations and Pennsylvania. The jurisdictions surrounding Segment C4 are significant attractors of rail freight on the corridor, accounting for 12 percent of the total rail freight value. Within Segment C4, there are major rail freight flows from Louisiana, California, and the Midwest region to Henrico County and the City of Richmond.

Rail Freight



C4 SEGMENT PROFILE

Traffic Conditions

Traffic Volume and AADT

Traffic volume on Segment C4 is high compared to traffic volumes on segments in the western half of Corridor C. Average daily traffic volumes along I-64 in Goochland and Louisa Counties range from 29,000 to 42,000 vehicles. Traffic volumes are much higher in Henrico County and Richmond, progressively increasing from 64,000 vehicles per day near I-295 to 138,000 vehicles per day near the I-95 interchange. Traffic volumes vary considerably along I-64 on the east side of Richmond, decreasing from 94,000 vehicles per day near downtown Richmond to 33,000 vehicles per day near the I-295 interchange. Along I-64 in New Kent County, average daily traffic volumes range from 54,000 to 63,000 vehicles. Traffic volumes on US 250 west of Richmond are generally lower than on I-64, and typically range from 12,000 vehicles per day in rural areas to over 42,000 vehicles in the City of Richmond. Volumes on US 60 east of Richmond range from 5,000 to 14,000 vehicles per day.

Daily traffic volumes are projected to increase by 2025 throughout Segment C4, with the greatest increases occurring along the stretch of I-64 from near the western intersection with I-295. Projected increases in daily traffic volumes along this section range from 11,000 to 19,000 additional vehicles. Traffic volumes also are projected to increase by 12,000 vehicles on I-64 in New Kent County by 2025, where average daily traffic volumes are projected to range from 60,000 to 80,000 vehicles. By 2025, average daily traffic volumes along I-64/I-95 near downtown Richmond are projected to range from 141,000 to 154,000 vehicles. Traffic growth on US 60 and US 250 are forecast to be somewhat lower, with up to 6,000 additional vehicles per day by 2025.



Traffic Volume 2014 (AADT)



Traffic Volume 2025 (AADT)



Change in Traffic Volume 2014- 2025 (AADT)



C4 SEGMENT PROFILE

Traffic Distribution

On average, traffic on Segment C4 is distributed throughout the day as shown in the graphs below. Weekday traffic shows two peak periods over the course of the day, with the highest hourly traffic occurring between 5 and 6 p.m. which accounts for 8.3 percent of daily traffic and a morning peak hour between 7 and 8 a.m. accounting for 7.4 percent of daily traffic. The combined weekday traffic in the two peak periods (from 6 to 10 a.m. and from 3 to 7 p.m.) accounts for 54 percent of total daily traffic. Peaking patterns for truck traffic show a single peak during the midday period, with a peak hourly flow of 6.9 percent of daily traffic. Weekend traffic patterns are also different from the typical commute patterns, with the highest percentage of hourly traffic occurring between 3 and 4 p.m. (7.3 percent of daily traffic) for all traffic, and earlier in the day (9 to 10 a.m.) for truck traffic.

Weekday traffic volumes on Segment C4 vary by as much as 41 percent throughout the year, with the highpoint in October (around 74,000 vehicles per day) and the low point in February (around 52,000 vehicles per day). Truck volumes vary less than passenger volumes throughout the year, with the October high (around 3,000 vehicles per day) 36 percent higher than the July low (around 2,000 vehicles per day). Weekend traffic levels also vary over the course of the year, and the highest levels of weekend traffic (October, around 58,000 vehicles per day) are 41 percent higher than February levels (around 41,000 vehicles per day). Weekend truck traffic shows similar variations with the November high 42 percent higher than the July low. Since truck volumes account for a relatively small portion of traffic on Segment C4, traffic conditions are much more responsive to variations in automobile traffic than truck traffic.

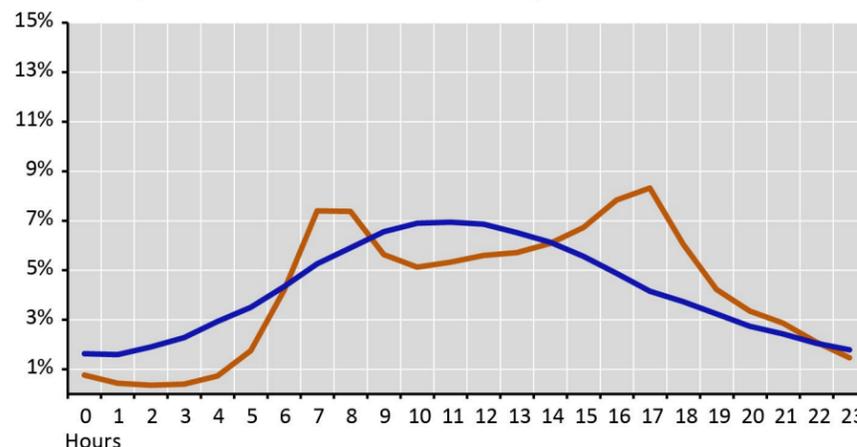
Truck Volumes

The percent of daily traffic comprised of heavy trucks on Segment C4 is low relative to most other segments in Corridor C. Outside of the most urbanized areas, trucks comprise four to five percent of daily traffic on I-64. In the City of Richmond and Henrico County, trucks comprise no more than two percent of daily traffic. Trucks also make up a small portion of traffic on US 250 in this segment and on US 60 in New Kent County (two percent or less). Trucks do, however, account for six percent of daily traffic on US 60 in Henrico County.

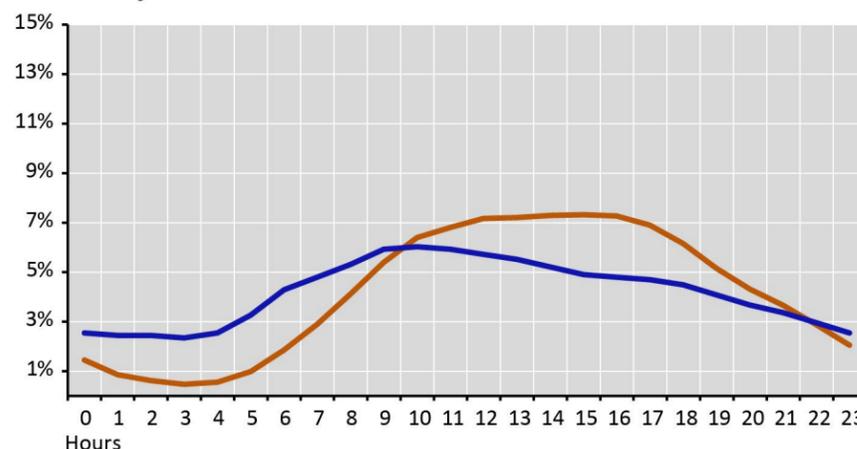
Percent Heavy Trucks



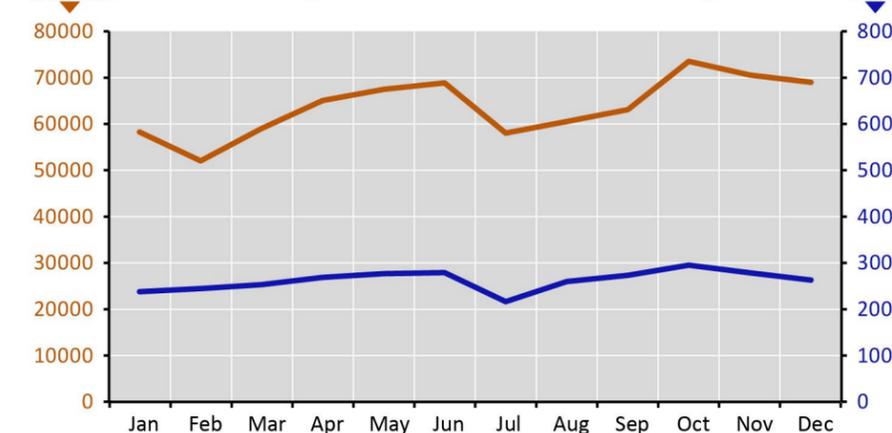
Hourly Traffic Distribution – Weekdays



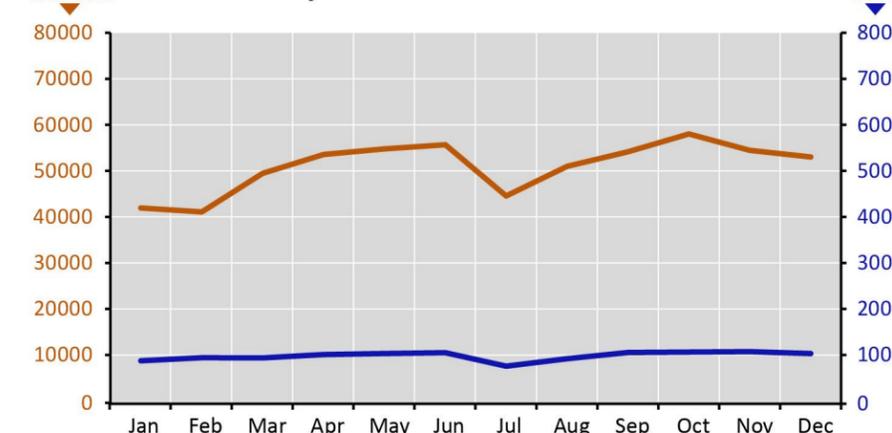
Hourly Traffic Distribution – Weekends



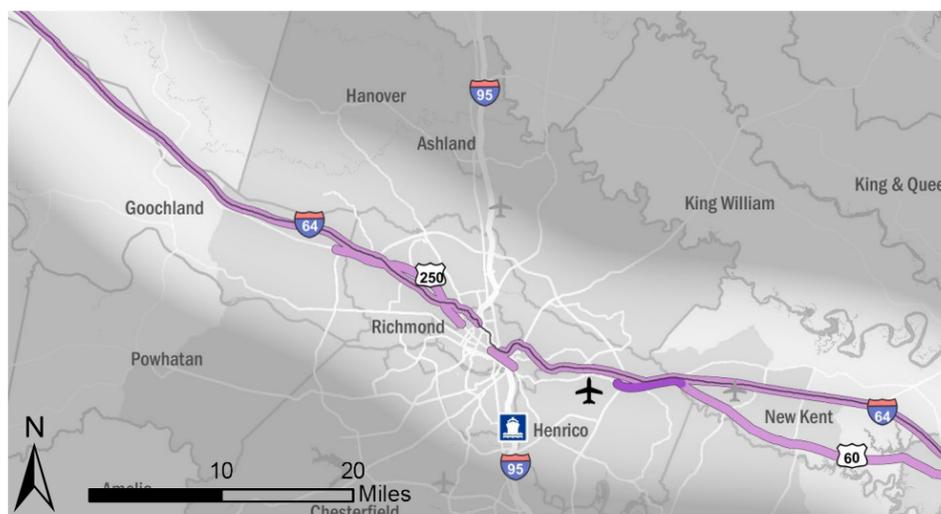
Monthly Traffic Distribution – Weekdays



Monthly Traffic Distribution – Weekends



 All Vehicles
 Trucks



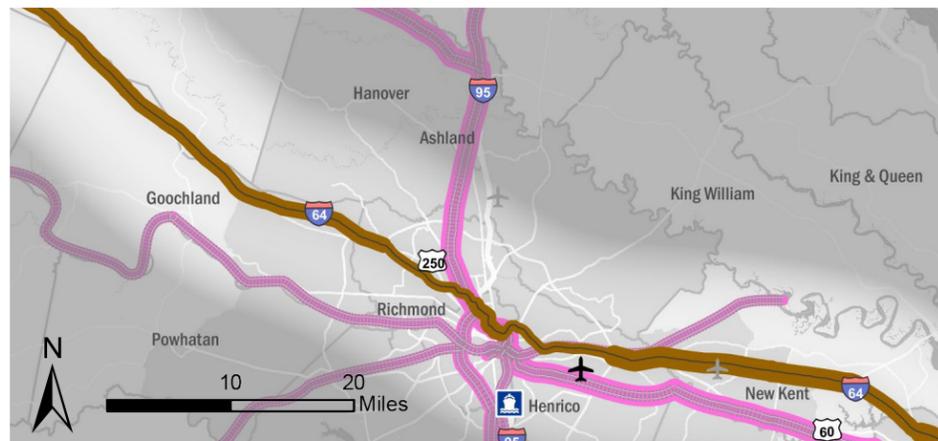
C4 SEGMENT PROFILE

Freight Flows

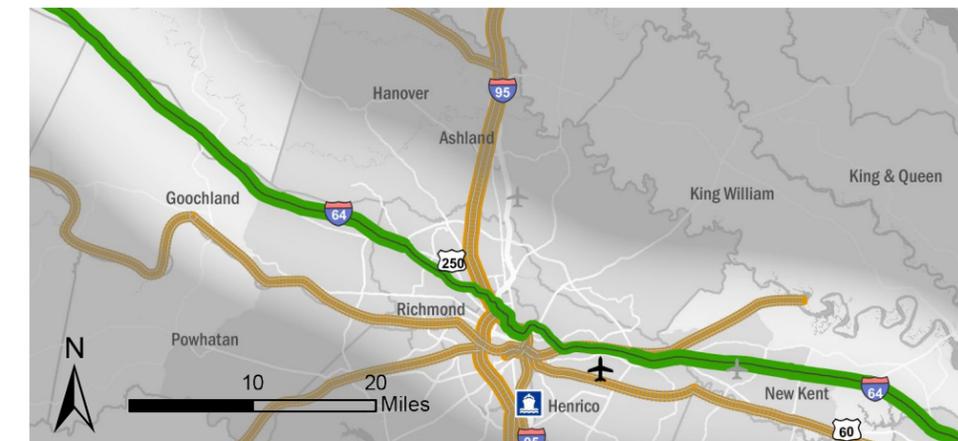
At the western end of Segment C4, in Goochland County, freight is overwhelmingly moved by truck, in terms of both tonnage and value. In total, 13 million tons (98 percent) of freight is moved through this section of Segment C4 by truck, compared to 295,000 tons by rail. By value, trucks are favored even more, with \$27 billion (99.9 percent) of freight value traveling by truck, compared to \$23 million by rail. On average, a ton of freight traveling through this section of Segment C4 by truck is worth \$2,037 while a ton of freight traveling by rail is worth \$77. In 2025, both rail and truck freight tonnages and total values in this section of Segment C4 are expected to increase, but the percentages of tonnage and value moved by truck are expected to remain nearly the same. Value per ton on trucks is expected to grow by 2025, with an average of \$3,180 per ton, while value per ton will decrease slightly to \$71 on rail.

At the eastern end of Segment C4, in New Kent County, freight is moved primarily by rail in terms of tonnage but not value. In total, 26 million tons (44 percent) of freight is moved through this section of Segment C4 by truck, compared to 33 million tons by rail. By value, trucks are carrying far more freight, with \$48.5 billion (97 percent) of freight value traveling by truck, compared to \$2 billion by rail. This contrast is probably due to the fact that the corridor carries large amounts of coal. On average, a ton of freight traveling through this section of Segment C4 by truck is worth \$1,854 while a ton of freight traveling by rail is worth \$52. In 2025, both rail and truck freight tonnages and total values in this section of Segment C4 are expected to increase, and the percentage of the freight that travels by truck is expected to increase to 54 percent by tonnage and 98 percent by value. Value per ton on both trucks and rail is expected to grow by 2025, with an average of \$2,368 per ton on trucks and \$54 on rail.

Annual Freight by Tonnage, 2012



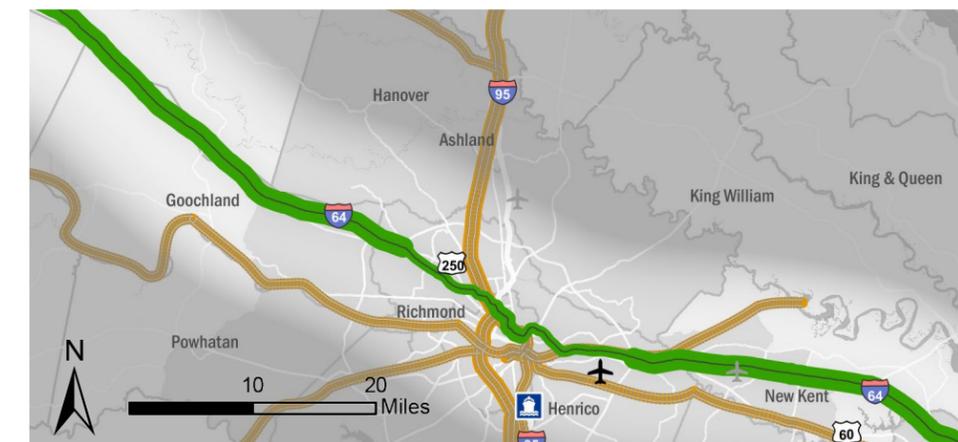
Annual Freight by Value, 2012



Annual Freight by Tonnage, 2025



Annual Freight by Value, 2025



Truck Freight (in tons)



Rail Freight (in tons)



Truck Freight



Rail Freight



C4 SEGMENT NEEDS

Redundancy and Mode Choice



Passenger trips on Segment C4 of the East-West Corridor have a relatively wide range of travel options, both in terms of travel path and mode choice. West of Richmond, US 250 serves as a parallel route to Interstate I-64 while US 60 serves as the parallel route east of Richmond. In addition to supporting trips on the East-West Corridor, Richmond serves as a transfer point for trips heading north and south along the Washington-North Carolina Corridor.

Based on the 2014 federal standard mileage rate of 56 cents per mile, trips through Richmond would be more expensive by automobile than by the other available modes. The alternate modes, including bus and rail, are all limited by the frequency of service and have longer travel times than the typical automobile trip. Richmond is served by Greyhound, Megabus, and two Amtrak stations.

Comparable Travel Options

Hampton Roads (Norfolk) to Richmond

Inter-City Bus 5 Trips per Day 2:00 Travel Time \$11 Est. Cost	Train 5 Trips per Day 2:03 Travel Time \$23 Est. Cost
Auto Via I-64: 1:35 Travel Time \$52 Est. Cost Via Rt. 60: 2:21 Travel Time \$52 Est. Cost	

Richmond to Charlottesville

Inter-City Bus 3 Trips per Day 1:51 Travel Time \$13 Est. Cost	Train 9 Trips per Day 1:45 Travel Time \$28 Est. Cost
Auto Via I-64: 1:10 Travel Time \$40 Est. Cost Via Rt. 250: 1:44 Travel Time \$41 Est. Cost	

Richmond to Staunton

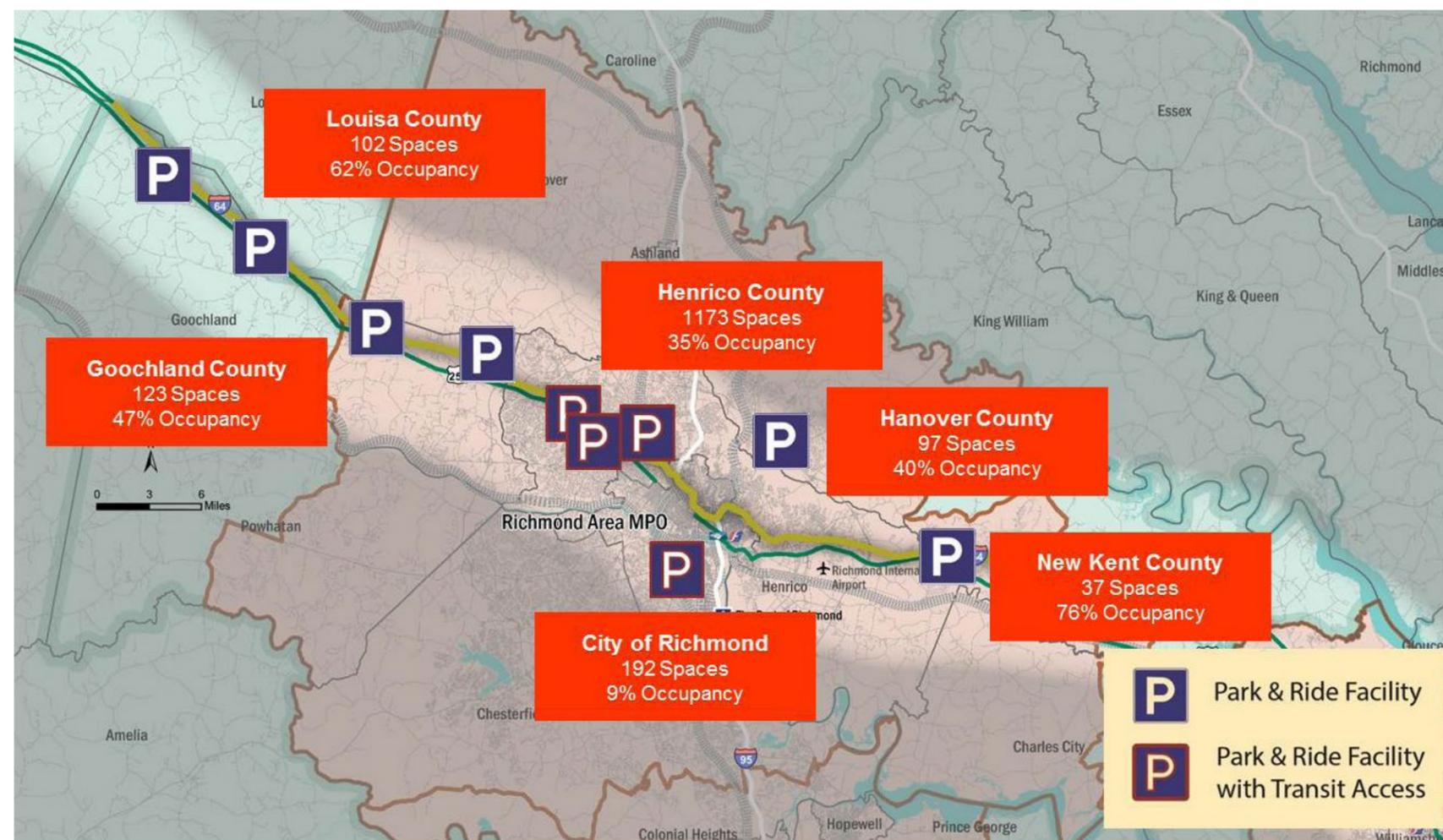
Inter-City Bus 0 Trips per Day 0:00 Travel Time \$0 Est. Cost	Train 3 Trips per Day 3:29 Travel Time \$42 Est. Cost
Auto Via I-64: 1:38 Travel Time \$60 Est. Cost Via Rt. 250 / I-64: 2:16 Travel Time \$62 Est. Cost	

Hampton Roads (Norfolk) to DC

Inter-City Bus 5 Trips per Day 5:35 Travel Time \$20 Est. Cost	Train 6 Trips per Day 4:44 Travel Time \$42 Est. Cost	Air 4 Trips per Day 1:00 Travel Time \$285 Est. Cost
Auto Via I-64: 2:45 Travel Time \$100 Est. Cost Via Rt. 60 / I-295 / I-95: 3:25 Travel Time \$111 Est. Cost		

Hampton Roads (Norfolk) to Petersburg

Inter-City Bus 0 Trips per Day 0:00 Travel Time \$0 Est. Cost	Train 7 Trips per Day 4:26 Travel Time \$31 Est. Cost
Auto Via I-64: 1:29 Travel Time \$53 Est. Cost Via Rt. 60 / I-295 / I-64: 2:37 Travel Time \$63 Est. Cost	



Park-and-Ride

Within Segment C4, commuters can utilize many Park-and-Ride locations, as well as commuter bus service provided by the GRTC. Goochland, Louisa, and Henrico Counties each have three Park-and-Ride locations. Henrico County has the highest number of spaces, while New Kent County has the highest utilization rate of spaces in the region. New Kent County matches the 76 percent statewide average for Park-and-Ride utilization.

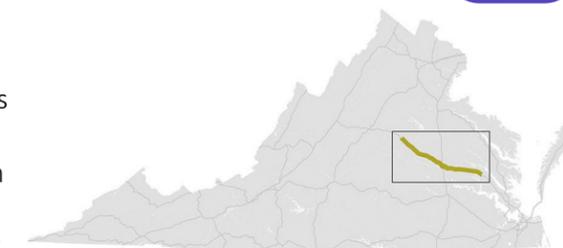
C4 SEGMENT NEEDS

Safety

Between 2010 and 2012, Segment C4 experienced the second highest number of severe crashes (818) of any CoSS in the state, resulting in the highest crash rate along the East-West Corridor. The vast majority of these crashes occurred in the City of Richmond and surrounding Henrico County. The largest concentration of severe crashes along Segment C4 occurred on US 250 (West Broad Street) northwest of Richmond in Henrico County. Over a distance of approximately eight miles, between Gayton Road and Dickens Road, 344 crashes took place. Within the eight-mile span, there were 92 crashes over a one-mile stretch between Spring Oak Drive and the on-ramp to I-64 East, 26 collisions at the intersection with Gaskins Road, 52

crashes between Coppermill Terrace and Skipwith Road, 22 incidents between the Fountain Square Shopping Center and the Westland Shopping Center, and 29 collisions at the intersection with Glenside Drive.

Several other areas along Segment C4 also have large concentrations of severe crashes. In downtown Richmond, along US 250 (West Broad Street), 74 collisions took place over two miles between North Hancock Street and N 21st Street. Of these, 43 crashes were at intersections. Also, in Richmond, on I-64, there were 33 crashes that occurred north of the on-ramp to I-95 N.



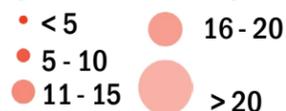
Performance Metrics:

Number of Severe Crashes **520**

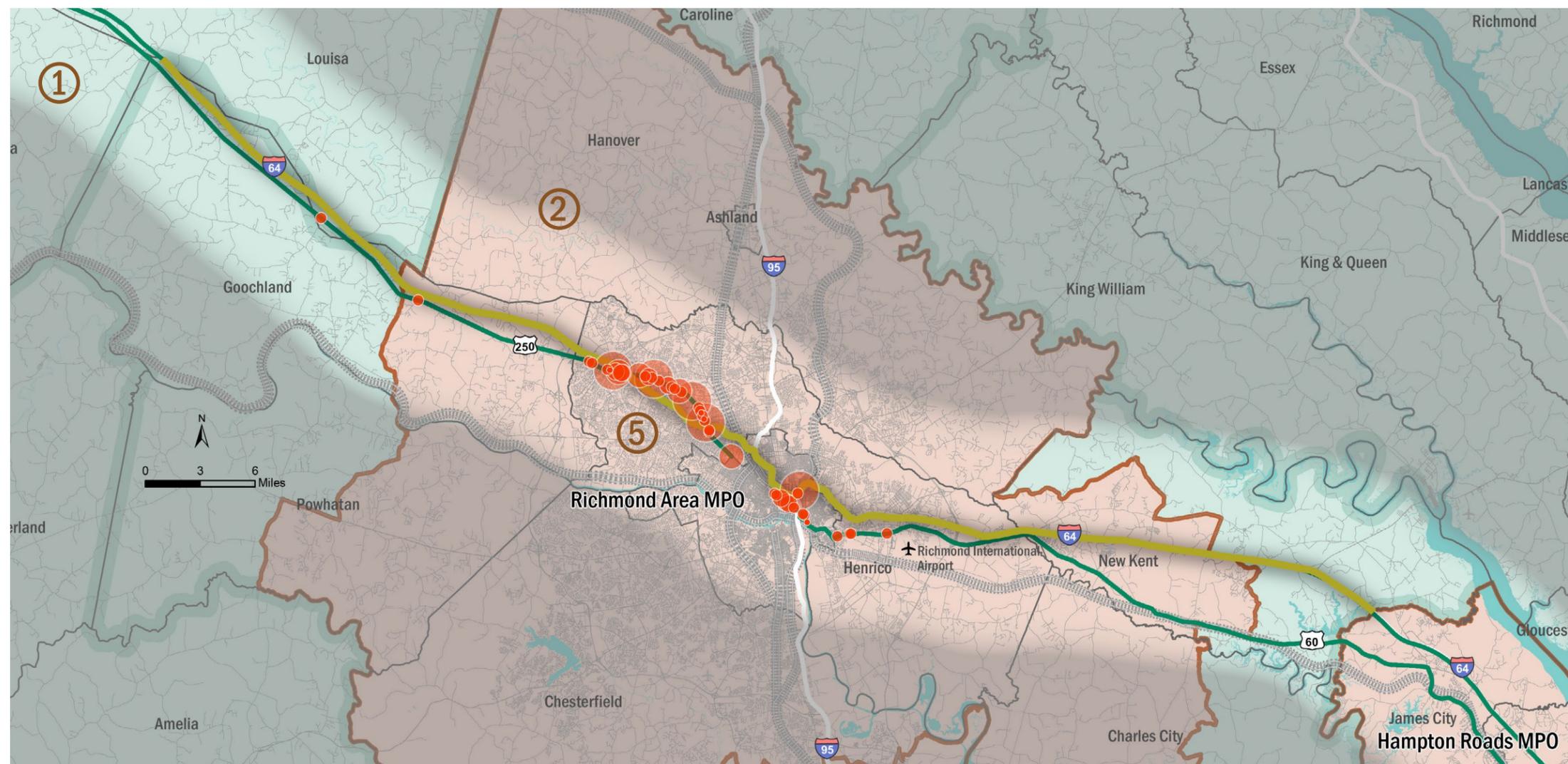
Severe Crashes/Million VMT **0.6**

Number of Railroad Crashes **8**

Fatality and Injury Crashes (2010 - 2012)



Railroad Incidents/Accidents per County (2011-2014)



C4 SEGMENT NEEDS

Congestion



Performance Metrics:

Person Hours of Delay per Mile **21**

Freight Ton Hours of Delay per Mile **7.5K**

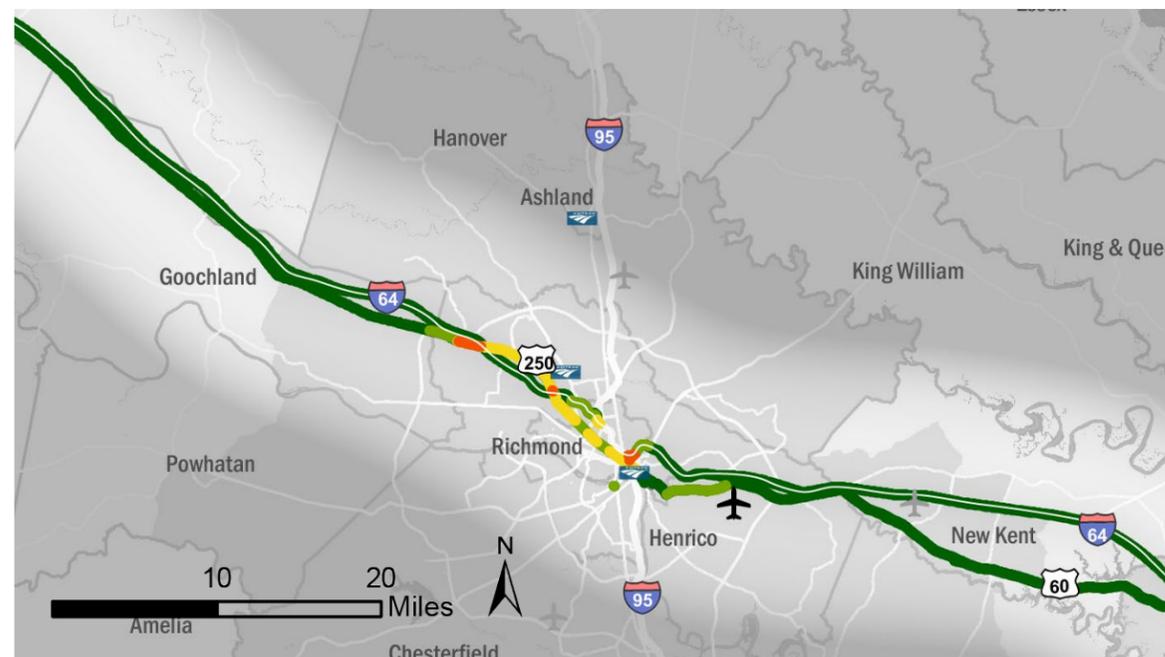
Passenger Delays

Segment C4 is moderately congested overall with around 6,400 person-hours of passenger delay daily. This averages to around 21 person-hours per mile across the entire segment. However, much of the delays exceeding 250,000 ton-hours per mile on Segment C4 are concentrated near Richmond. In Henrico County, there are significant passenger delays on US 250 beginning near Short Pump and continuing into the City of Richmond to US 360. In the City of Richmond, there are significant passenger delays in the area where I-64 and I-85 run concurrently. At 57 percent of the total daily passenger delay, this segment has one of the largest peak-period passenger delay shares among the CoSS segments, likely influenced by daily commuting patterns in and out of Richmond.

Freight Delays

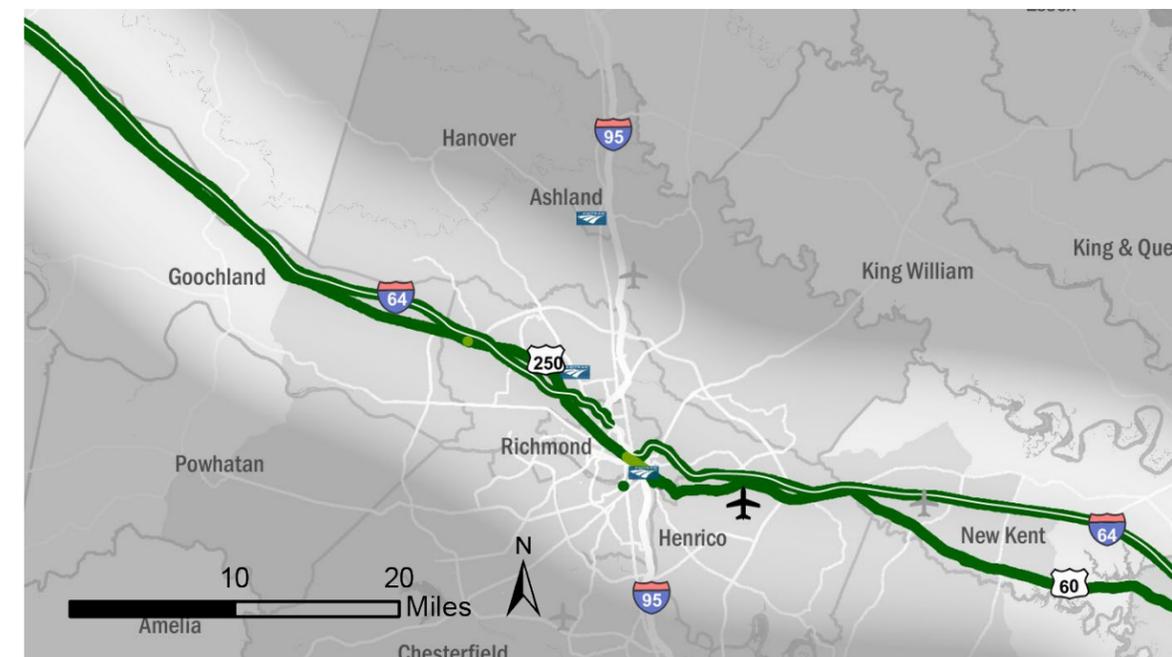
As with passenger delays, freight congestion along Segment C4 is minimal for much of the segment and highest to the west of and near downtown Richmond. However, unlike passenger traffic, there are no locations along the segment with freight delays exceeding 250,000 ton-hours per mile. Peak-period freight delays account for 47 percent of daily congestion, which is significantly higher than the peak period share of congestion for other CoSS segments.

Daily Person Hours of Delay per Mile

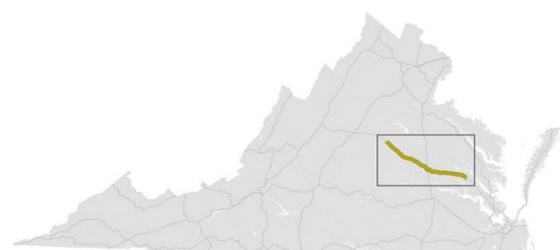


- < 50
- 51 - 100
- 101 - 250
- 251 - 500
- > 500

Daily Freight Ton Hours of Delay per Mile



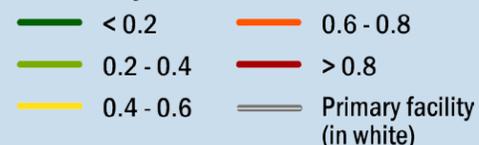
- < 100,000
- 100,001 - 250,000
- 250,001 - 500,000
- 500,001 - 1,000,000
- > 1,000,000



C4 SEGMENT NEEDS

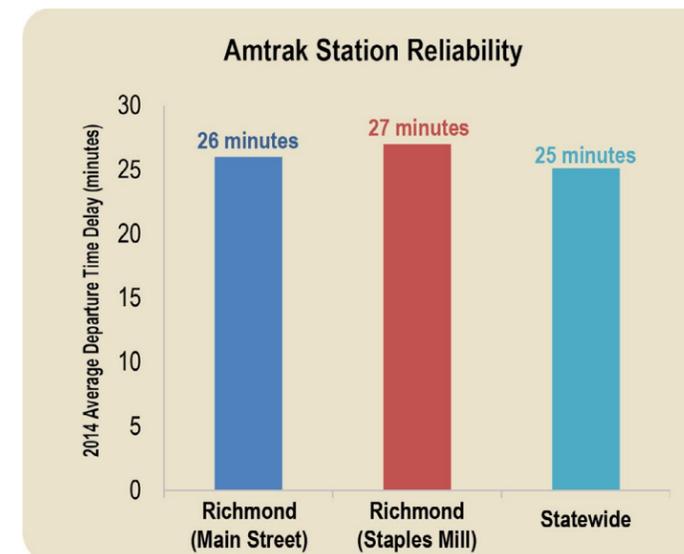
Reliability

Reliability Index



Statewide reliability index thresholds have been set for weekday peak, weekday and weekend travel to assess the reliability of travel on each segment on all corridors of statewide significance. A higher reliability index indicates that travel times are more unreliable. The following are the reliability index thresholds:

- Weekday Peak - 0.80
- Weekday - 0.40
- Weekend - 0.60



Weekday Peak

Reliability of travel during the peak period on a typical weekday on Segment C4 ranges from 0.00 to 1.03 in terms of reliability index, with an average value of 0.18. The segment has an average weekday peak period reliability index higher than the average for CoSS segments statewide and includes several locations that exceed the statewide threshold:

- I-64 in Henrico County, between US 33 and the interchange with I-95;
- I-64/I-95 in the City of Richmond, immediately east of the junction with I-95; and
- I-64 in the City of Richmond, east of where I-64 diverges from I-95.



Weekday

Reliability of travel during a typical weekday ranges from 0.00 to 0.75 in terms of reliability index, with an average value of 0.12. The segment has an average weekday reliability index higher than the average for CoSS segments statewide. Locations that exceed the statewide threshold include US 250 at the intersection with US 33 in Henrico County and I-64/I-95 just east of the merge between the two interstates in the City of Richmond.



Weekend

Reliability of travel during a typical weekend ranges from 0.00 to 0.53 in terms of reliability index, with an average value of 0.09. None of the locations along Segment C4 have reliability index values exceeding the statewide threshold.

C4 SEGMENT NEEDS

Summary of Needs

Identified locations are approximate. See "Summary of Needs" table on the following page for details.

Redundancy **Mode Choice**



Safety



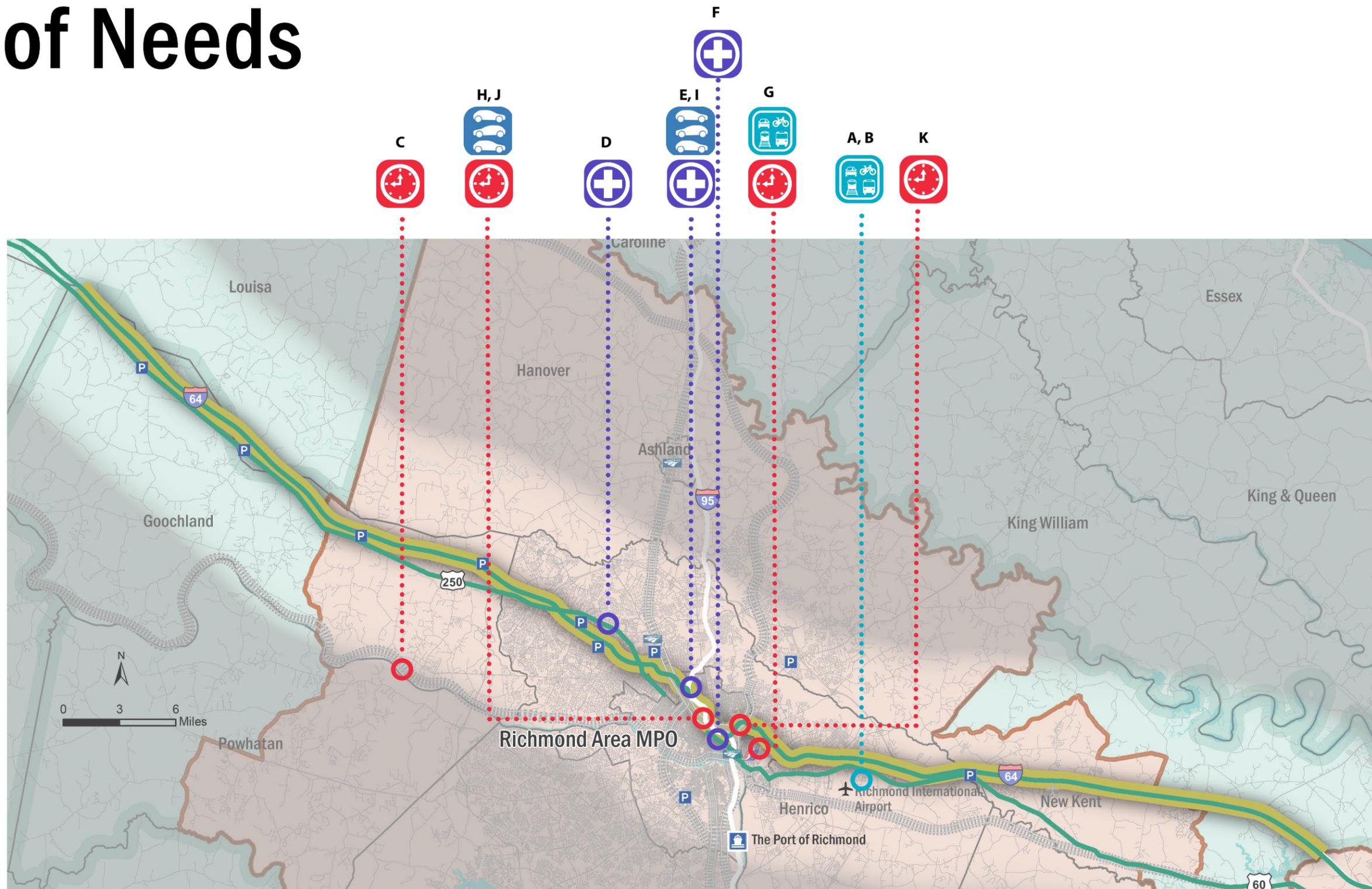
Congestion



Bottlenecks



Reliability



C4 SEGMENT NEEDS

Summary of Needs - C4 Segment

A.		No public transit service provided to Richmond International Airport
B.		Unutilized capacity for freight at Richmond International Airport
C.		Unreliability of freight rail service in the corridor
D.		US 250 between Gayton Rd and Dickens Rd in Henrico County: 344 severe crashes
E.		Safety concerns at interchange of I-95 and I-64: 33 severe crashes on I-64 near interchange with I-95
F.		US 250 between North Hanock St and N 21St in Richmond: 74 severe crashes
G.		Unreliable Amtrak service from Main Street station (26 minutes average departure delay) and Staples Mill Station (27 minutes average departure delay) totaling over 88,000 person-hours of delay from this segment.
H.		Congestion issue on US 250 (Broad Street) between North Gayton Road in Short Pump and US 360 (North 18th Street) in Richmond
I.		Congestion issue at both I-64 and I-95 junctions in Richmond
J.		Reliability issue on I-64 between West Broad Street (Exit 183) and North Boulevard (Exit 78 on I-64/I-95) in Richmond
K.		Reliability issue on I-64 between I-64/I-95 and Mechanicsville Turnpike (Exit 192) in Richmond

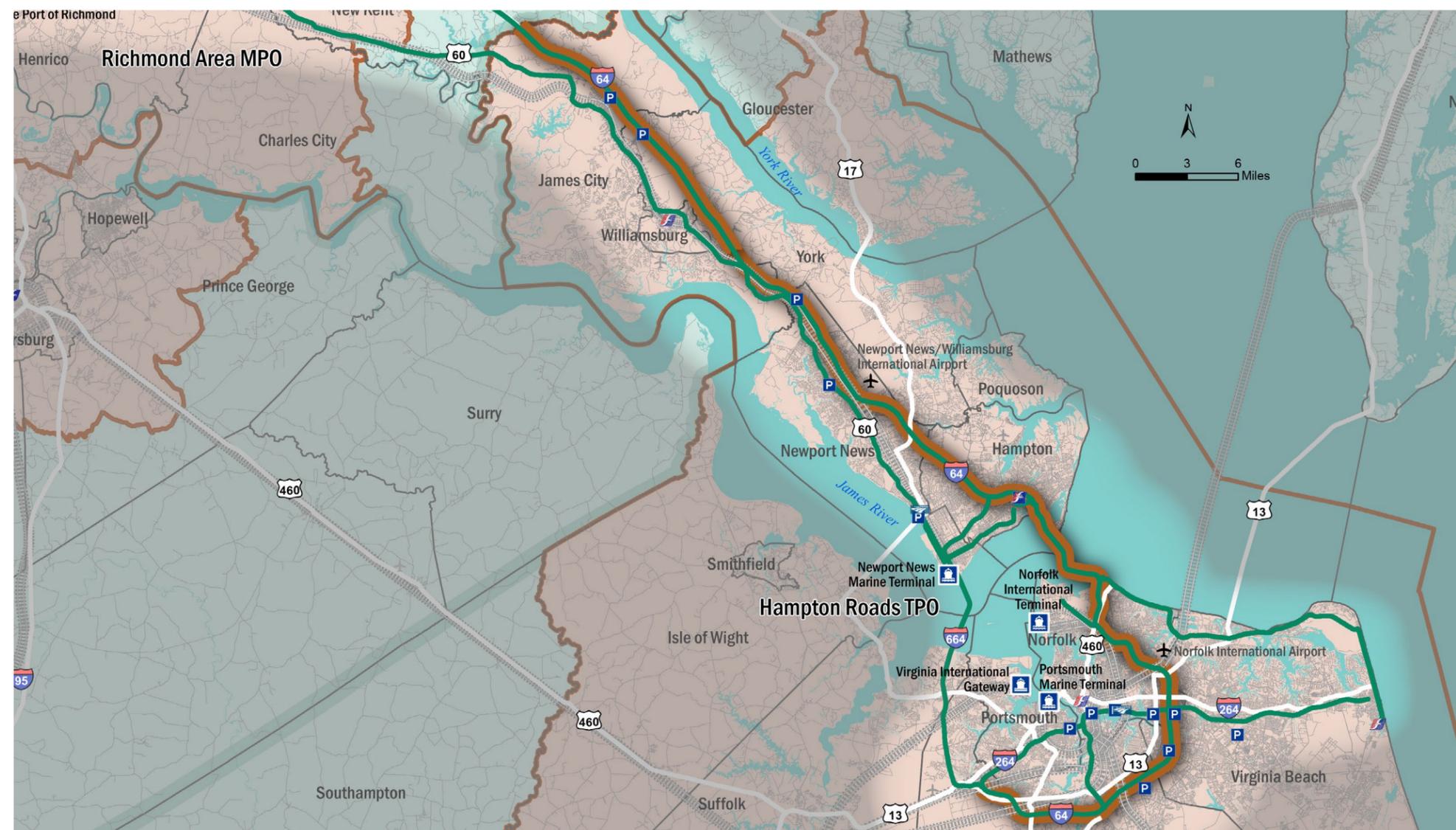
VI. Segment C5

-  C5
-  Corridor Component Road
-  Railroad
-  MPO Area
-  Planning District Area
-  Amtrak Facility
-  Greyhound Facility
-  VRE Facility
-  Metrorail Facility
-  Port Facility
-  Park & Ride Facility
-  Airport Facility



Corridor Segment C4 Components

- I-64
- US 60
- I-664
- I-564
- I-264
- I-464
- Newport News Marine Terminal
- Norfolk International Terminal
- Portsmouth Marine Terminal
- Virginia International Gateway
- York River
- James River
- CSX Coal Corridor
- Amtrak
- Norfolk International Airport
- Newport News/Williamsburg International Airport



C5 SEGMENT PROFILE

Segment C5 begins at the western boundary of James City County and progresses to the Hampton Roads Beltway. This segment serves James City and York County, as well as the Cities of Williamsburg, Newport News, Poquoson, Hampton, Suffolk, Chesapeake, Portsmouth, Virginia Beach, and Norfolk. The segment traverses the area covered by the Hampton Roads TPO. The segment also includes portions of US 60 along its length, and several other facilities in the Hampton Roads Area. Segment C5 acts as a major corridor for through freight travel in Virginia. Within the Hampton Roads Area, the segment serves as a major commuter route, as well as a route for major tourist destinations. Segment C5 serves as an important evacuation route to the west for the Hampton Roads Area. The segment also provides a connection to the numerous military facilities located in the region.

Highway Facilities: I-64 is a major commuter and freight highway in Segment C5. US 60 runs parallel to I-64 through the segment, except where it runs concurrently through the Hampton Roads Bridge Tunnel. There are several spurs branching from I-64, including I-264, I-464, I-564, and I-664. There are multiple HOV-2 facilities available on I-64 and I-264.

Transit Services: Amtrak has stations in Williamsburg, Newport News, Norfolk and Virginia Beach, serving the Northeast Corridor. Greyhound provides service from stations in Williamsburg, Norfolk, Hampton, and Virginia Beach. The commuter bus service, Metro Area Express, is offered by Hampton Roads Transit (HRT). There are multiple Park-and-Ride facilities near I-64, the largest cluster of which is located in Norfolk.

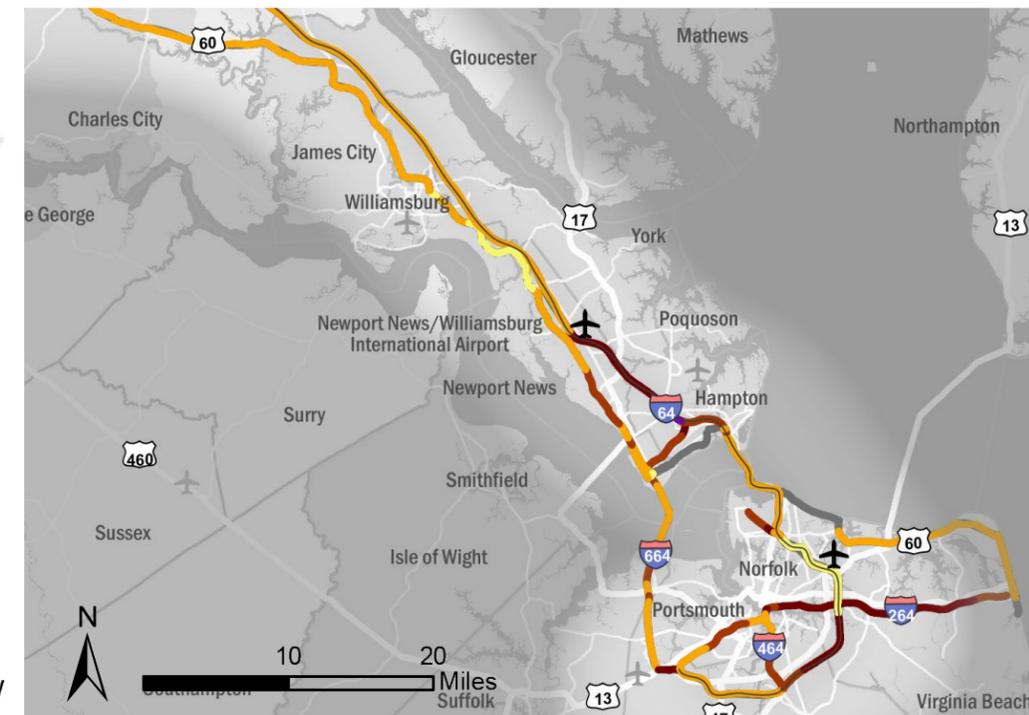
Rail Facilities: CSX's Coal Corridor rail lines pass through Segment C5 connecting locations west to the Port of Virginia facilities in the Hampton Roads Area.

Port Facilities: I-64 and its spurs also provide connections to the Port of Virginia facilities in the Hampton Roads Area, as well as access to the navigational channels of the James and York Rivers.

Airport Facilities: Norfolk International Airport and Newport News-Williamsburg International Airport provide commercial air service in this segment.

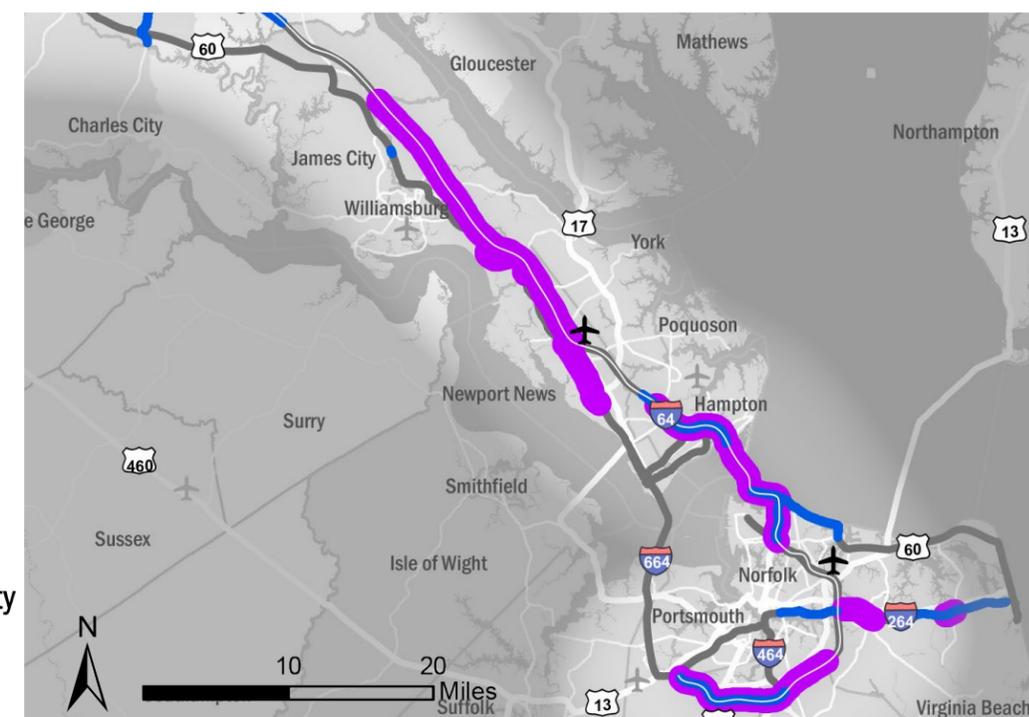
Major planned and future projects include:

- James City County:** Widening I-64 to three lanes from Route 199 west of Williamsburg (exit 234) to about a half-mile east of Route 238;
- City of Newport News:** Replacing I-64 Fort Eustis interchange (exit 250) to mitigate congestion and improve safety;
- City of Newport News:** Relocation of the Amtrak station to the Newport News Multimodal Center;
- City of Hampton:** New road construction on I-64 between Hampton Coliseum in Hampton and I-564 in the City of Norfolk;
- City of Norfolk:** Widening of Route 165 (N Military Hwy) underneath I-64;
- City of Norfolk:** Patriot's Crossing, a third highway crossing of Hampton Roads, currently in preliminary engineering and environmental assessment; and
- City of Virginia Beach:** Reconstruction and added capacity at the I-64/I-264 interchange.



Number of Lanes (both directions)

- 2
- 3 - 4
- 5 - 6
- 7 - 8
- 9 - 12
- Primary facility



Future Projects

- Reconstruction with added capacity
- Safety improvements
- Primary facility

C5 SEGMENT PROFILE

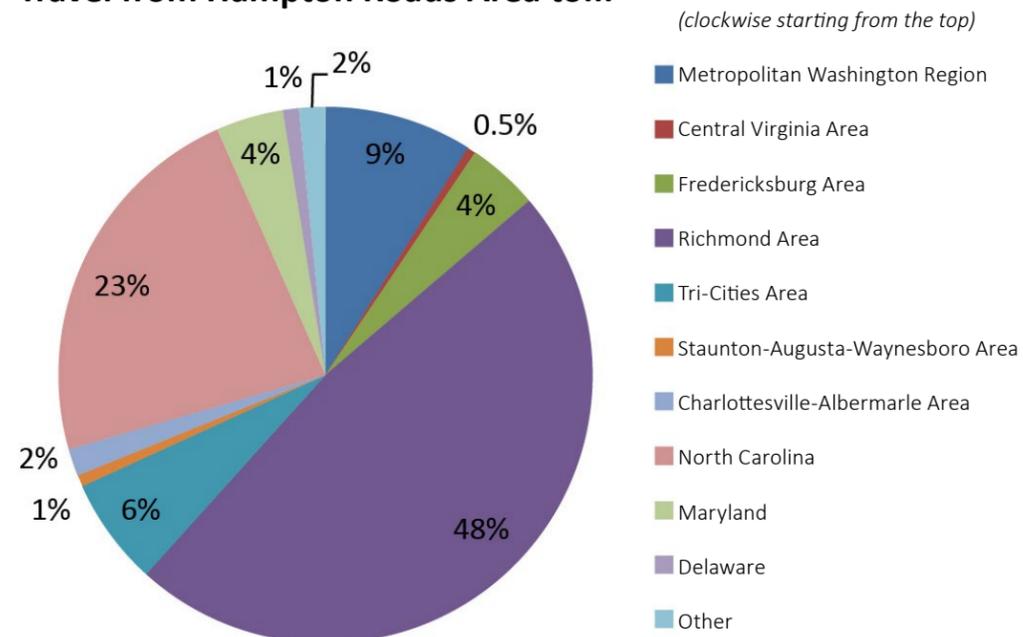
Travel Demand

Passenger Demand

The easternmost segment of Corridor C exists entirely within the Hampton Roads TPO Area, and accommodates large amounts of traffic local to the region. Significant portions of the intercity passenger travel in the Commonwealth occur on this segment including more than nine percent between Hampton Roads and Richmond. Of the intercity traffic originating in this region, almost half (48 percent) is destined for the Richmond Area and is likely to use Segment C5. An additional nine percent is destined for the Metropolitan Washington region and may also use portions of Segment C5, although other options are available.



Travel from Hampton Roads Area to...



C5 SEGMENT PROFILE

Freight Demand

By truck, Segment C5 carried 22 million tons of freight worth \$43 billion in 2012, and is estimated to carry 33 million tons of freight worth \$89 billion in 2025. A large proportion of truck freight traffic on Corridor C, representing approximately 40 percent of total corridor tonnage and approximately 50 percent of the corridor value passes through Virginia. Besides this through traffic, a significant portion of the truck freight on Corridor C originates from (around 13 percent) or is destined for (between 13 and 18 percent) Norfolk and Portsmouth and their port facilities, including a large amount of truck freight traveling from North Carolina. Another major truck freight movement on Corridor C is between Nevada and the ports in the Hampton Roads Area, which accounts for 4,000 tons of freight worth \$5 billion in 2012 and is expected to increase significantly in value to \$28 billion in 2025, corresponding with only a modest gain in the truck freight tonnage to 4,300 tons. The jurisdictions surrounding Segment C5 are major generators of truck freight, producing approximately 15 percent of the total truck freight tonnage on Corridor C and attracting more than 20 percent of the corridor truck freight tonnage. These numbers include freight passing through the Port of Virginia facilities in these jurisdictions. On Segment C5, there are also significant truck freight movements between North Carolina, Maryland, Pennsylvania and the Hampton Roads Area.

By rail, Segment C5 carried 23 million tons of freight worth \$14 billion in 2012, and is estimated to carry 23 million tons of freight worth \$17 billion in 2025. Nearly all rail freight on Corridor C (approximately 95 percent of total tonnage) is destined for Virginia, with less than one percent of freight passing through the Commonwealth. This is primarily because large quantities of freight are traveling to/from the port facilities in the Hampton Roads Area. Large amounts of low value rail freight (around two-thirds of the total corridor rail freight tonnage but only around 20 percent of the corridor rail freight value) travels eastbound from West Virginia and Kentucky to the marine terminal located at Newport News. Likewise, approximately 85 percent of the rail freight tonnage in Corridor C is destined for the jurisdictions adjacent to Segment C5, including the ports at Newport News, Norfolk, and Portsmouth, representing 35 percent of the rail freight value on Corridor C. Less than one percent of the total corridor rail tonnage and value originates in the jurisdictions adjacent to Segment C5, corresponding to a one-directional, eastbound movement of rail freight throughout this segment of Corridor C to the ports.

Truck Freight

<p>Major Origins (by Tonnage)</p> <ol style="list-style-type: none"> 1. Virginia (36% / 37%) 2. North Carolina (15% / 13%) 3. Pennsylvania (7% / 7%) 4. City of Norfolk* (6% / 6%) 5. New Jersey (5% / 5%) 	<p>Major Origin-Destination Pairs for Freight</p> <p>North Carolina and Pennsylvania North Carolina and New York North Carolina and Maryland City of Norfolk* and North Carolina North Carolina and New Jersey</p> <p><small>Percentages represent 2012 / 2025 values. *Includes freight passing through the Port of Virginia.</small></p>	<p>Major Destinations (by Tonnage)</p> <ol style="list-style-type: none"> 1. Virginia (40% / 41%) 2. North Carolina (10% / 10%) 3. Pennsylvania (7% / 7%) 4. City of Norfolk* (7% / 7%) 5. New York (7% / 6%)
<p>Corridor Tonnage Originating in Segment C5: 14% / 16%</p>		<p>Corridor Tonnage Destined for Segment C5: 20% / 22%</p>

Rail Freight

<p>Major Origins (by Tonnage)</p> <ol style="list-style-type: none"> 1. West Virginia (74% / 71%) 2. Virginia (9% / 11%) 3. Kentucky (8% / 8%) 4. Dickenson County (3% / 3%) 5. Hanover County (2% / 3%) 	<p>Major Origin-Destination Pairs for Freight</p> <p>City of Newport News* and West Virginia City of Norfolk* and West Virginia City of Newport News* and Kentucky Dickenson County and City of Newport News* Hanover County and City of Newport News*</p> <p><small>Percentages represent 2012 / 2025 values. *Includes freight passing through the Port of Virginia.</small></p>	<p>Major Destinations (by Tonnage)</p> <ol style="list-style-type: none"> 1. Virginia (96% / 95%) 2. City of Newport News* (73% / 71%) 3. City of Norfolk* (11% / 10%) 4. City of Covington (2% / 2%) 5. Rockingham County (1% / 2%)
<p>Corridor Tonnage Originating in Segment C5: <1% / <1%</p>		<p>Corridor Tonnage Destined for Segment C5: 87% / 84%</p>



C5 SEGMENT PROFILE

Traffic Conditions

Traffic Volume and AADT

Traffic volume on Segment C5 is high compared to other segments in Corridor C, and average daily traffic volumes vary considerably on different facilities throughout the segment as follows:

- I-64, highest in the Cities of Hampton, Virginia Beach and Norfolk: 60,000 to 163,000 vehicles per day;
- I-264, highest in Virginia Beach: 41,000 to 184,000 vehicles per day;
- I-464, highest near I-64 in Chesapeake: 46,000 to 55,000 vehicles per day;
- I-564, highest at the interchange with I-64 in Norfolk: 21,000 to 56,000 vehicles per day;

- I-664, highest near I-264 in Chesapeake: 53,000 to 96,000 vehicles per day; and
- US 60, highest in Newport News: 2,000 to 40,000 vehicles per day.

Daily traffic volumes are projected to increase by 2025 throughout Segment C5, as follows:

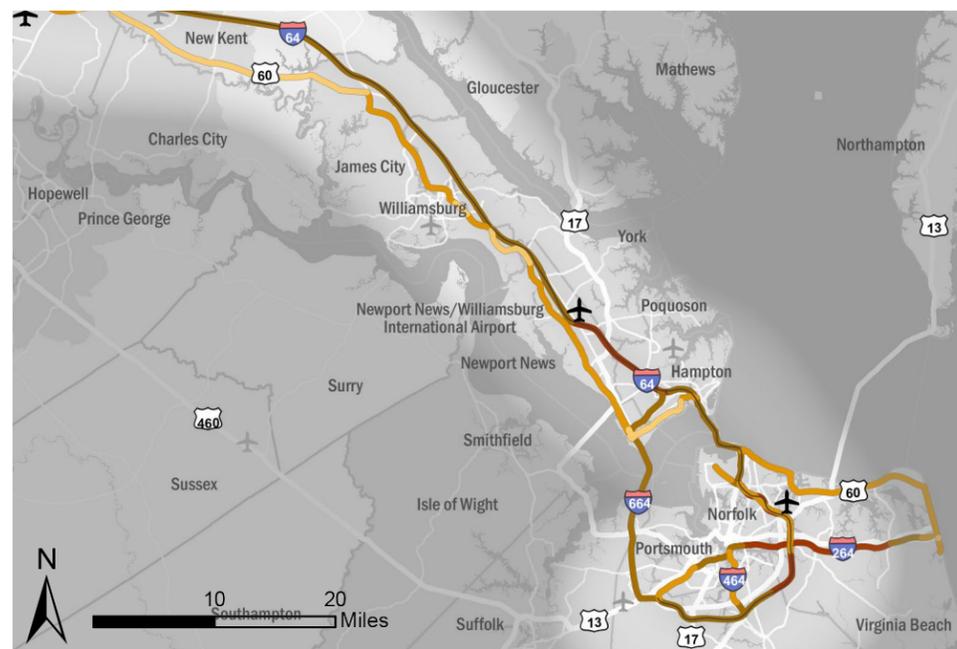
- I-64: growth of 4,000 to 26,000 vehicles, with higher growth expected on the Peninsula north of the James River;
- I-264: growth of 7,000 to 27,000 vehicles;
- I-464: growth of 4,000 to 10,000 vehicles;

- I-664: growth of 10,000 to 23,000 vehicles, with the highest growth expected approaching I-264 in Chesapeake; and
- US 60: growth of less than 4,000 vehicles across almost all sections

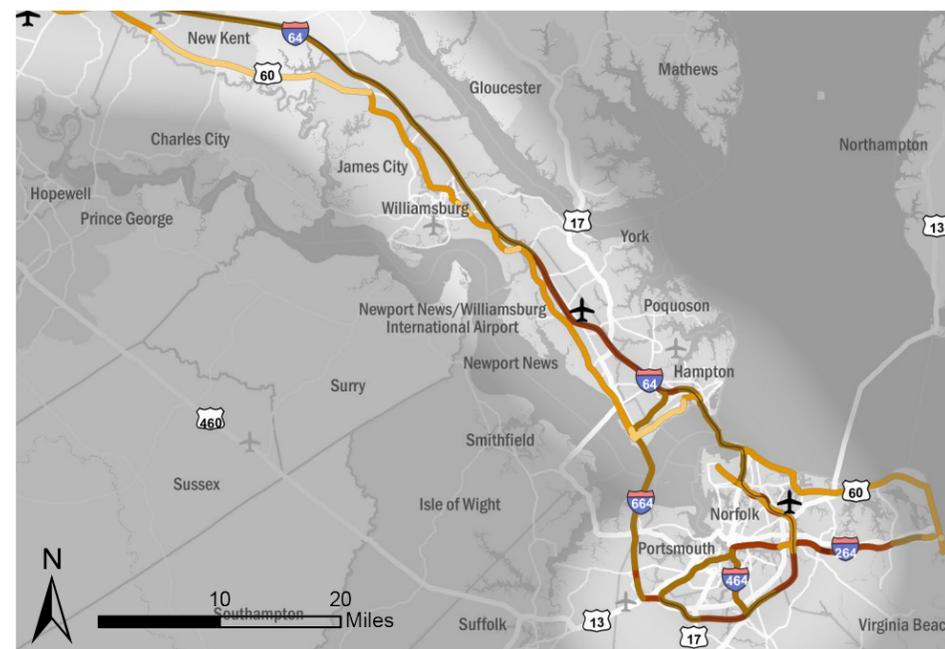
By 2025, the increases detailed above are projected to result in the highest traffic volumes in Segment C5 occurring on I-264 in Virginia Beach. Volumes in this area may exceed 200,000 vehicles per day.



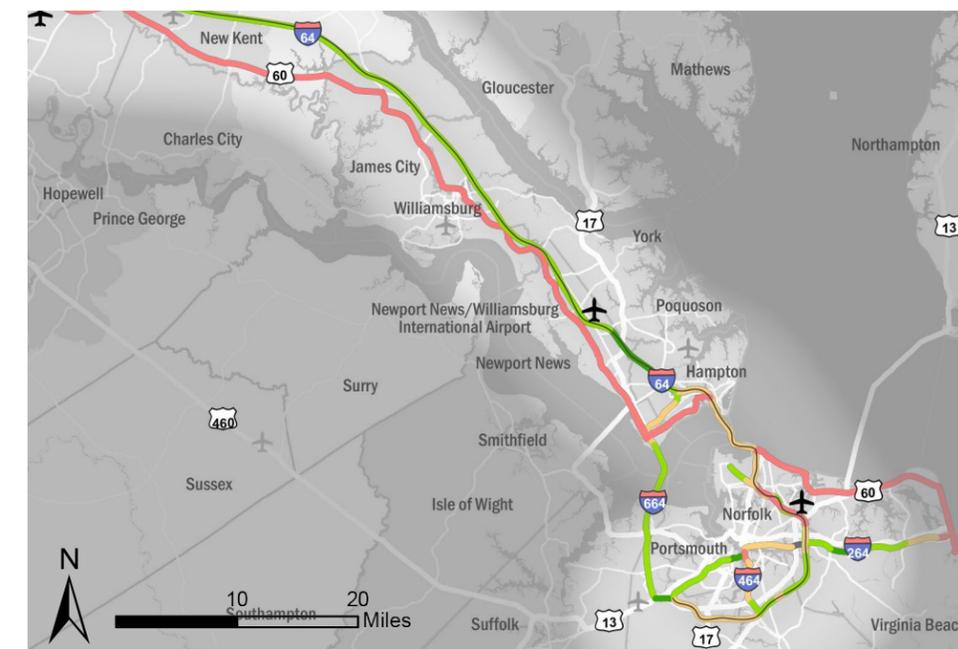
Traffic Volume 2014 (AADT)



Traffic Volume 2025 (AADT)



Change in Traffic Volume 2014- 2025 (AADT)



C5 SEGMENT PROFILE

Traffic Distribution

On average, traffic on Segment C5 is distributed throughout the day as shown in the graphs below. Weekday traffic shows two peak periods over the course of the day, with the highest hourly traffic occurring between 4 and 5 p.m. which accounts for 7.6 percent of daily traffic and a morning peak hour between 7 and 8 a.m. accounting for 6.9 percent of daily traffic. The combined weekday traffic in the two peak periods (from 6 to 10 a.m. and from 3 to 7 p.m.) accounts for 52 percent of total daily traffic. Peaking patterns for truck traffic are different from commuter traffic, with a single peak during the midday period and a peak hourly flow of 7.3 percent of daily traffic. Weekend traffic patterns are also different from the typical commute patterns, with the highest percentage of hourly traffic occurring between 2 and 3 p.m. (7.2 percent of daily traffic) for all traffic, and 9 to 10 a.m. (6.4 percent of daily traffic) for truck traffic.

Weekday traffic volumes on Segment C5 vary by as much as 36 percent throughout the year, with the highpoint in August (around 100,000 vehicles per day) and the low point in January (around 74,000 vehicles per day). Truck volumes vary less than passenger volumes throughout the year, with the April high (around 5,000 vehicles per day) 20 percent higher than the January low (around 4,000 vehicles per day). Weekend traffic levels also vary over the course of the year, and the highest levels of weekend traffic (August, around 92,000 vehicles per day) are 58 percent higher than January levels (around 58,000 vehicles per day). Weekend truck traffic is steadier than all vehicle traffic, with the September high 26 percent higher than the July low. Since truck volumes account for a relatively small portion of traffic on Segment C5, traffic conditions are much more responsive to variations in automobile traffic than truck traffic.

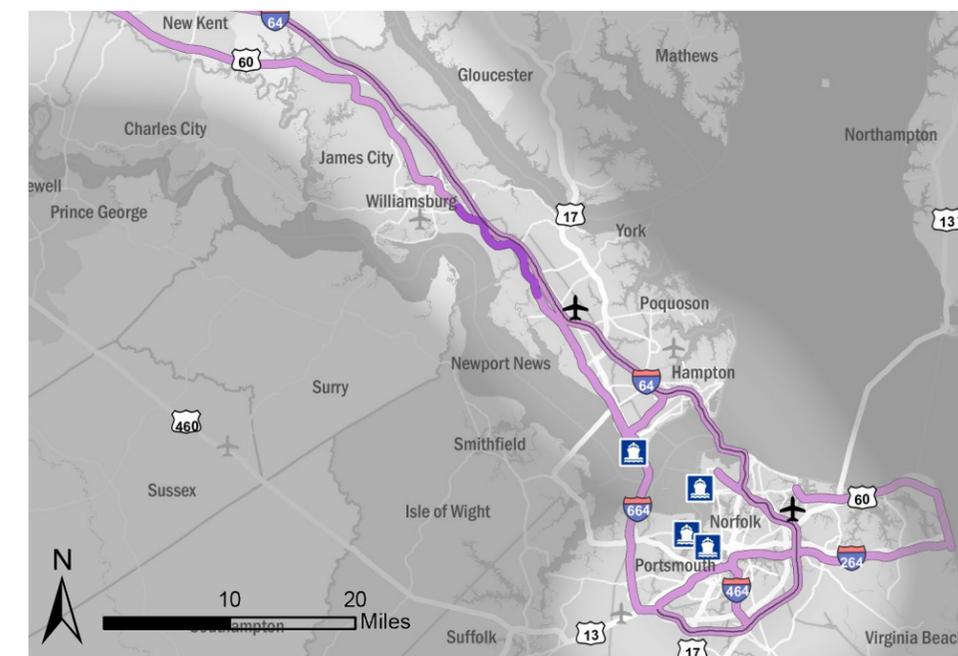


Truck Volumes

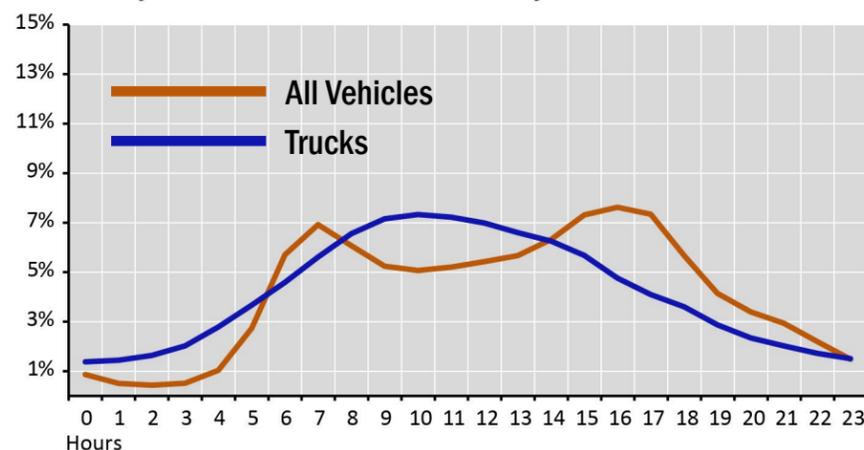
The percent of average daily traffic comprised of heavy trucks on Segment C5 is generally the lowest of all segments in Corridor C, due primarily to the large amounts of commuter traffic carried on these facilities. On facilities throughout Segment C5, trucks comprise less than five percent of daily traffic, except on a portion of US 60 between Williamsburg and Route 173 in Newport News, where trucks account for six percent of daily traffic.

Percent Heavy Trucks

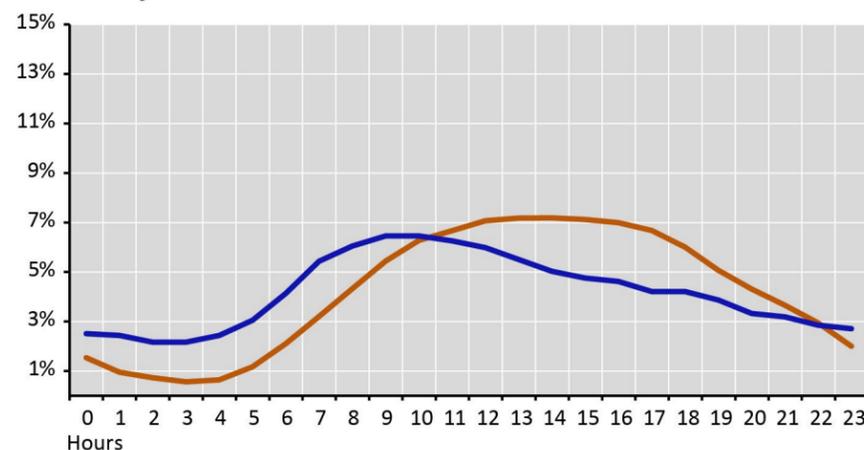
- < 5%
- 5% - 10%
- 10% - 15%
- 15% - 20%
- > 20%
- Primary facility



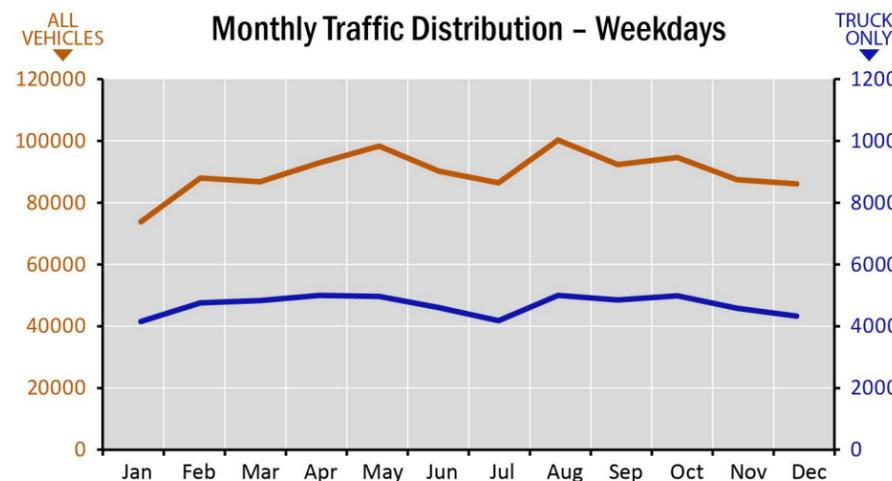
Hourly Traffic Distribution – Weekdays



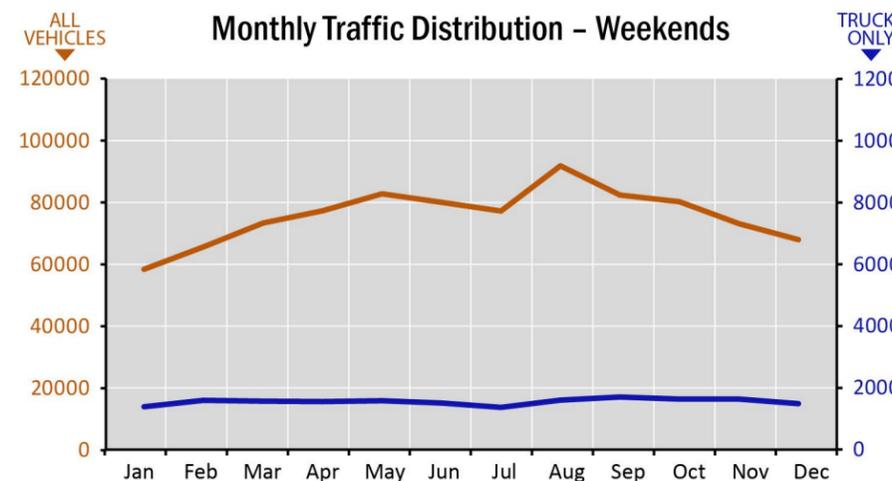
Hourly Traffic Distribution – Weekends



Monthly Traffic Distribution – Weekdays



Monthly Traffic Distribution – Weekends



C5 SEGMENT PROFILE

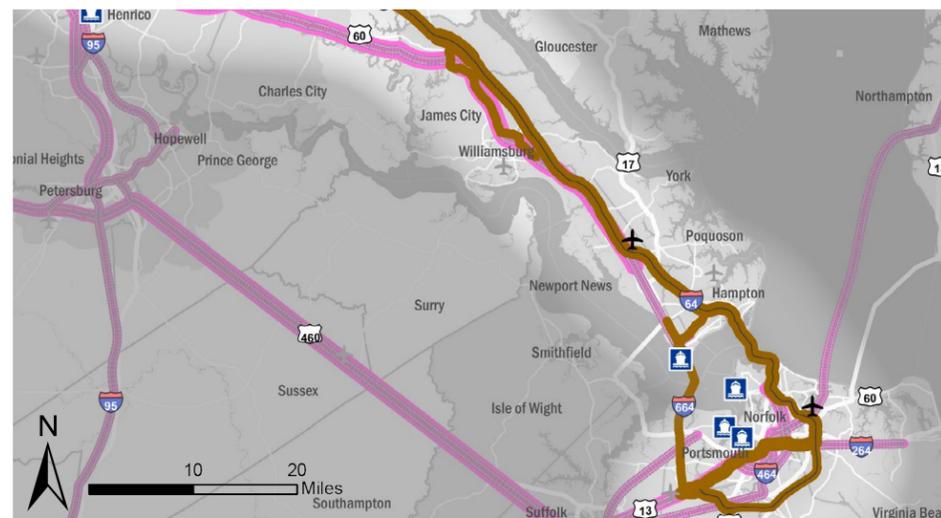
Freight Flows

At the western end of Segment C5 in Newport News, freight is overwhelmingly moved by truck, in terms of both tonnage and value. In total, 22 million tons (99 percent) of freight tonnage is moved through this section of Segment C5 by truck, compared to 243,000 tons by rail. By value, trucks are favored even more, with \$43 billion (99.9 percent) of freight value traveling by truck, compared to \$2 million by rail. On average, a ton of freight traveling through this section of Segment C5 by truck is worth \$1,933 while a ton of freight traveling by rail is worth only \$9. In 2025, both rail and truck freight tonnages and total values in this section of Segment C5 are expected to increase, but the percentages of tonnage and value moved by truck are expected to remain nearly the same. Value per ton on trucks is expected to grow by 2025, with an average of \$2,673 per ton, while value per ton will remain the same on rail.

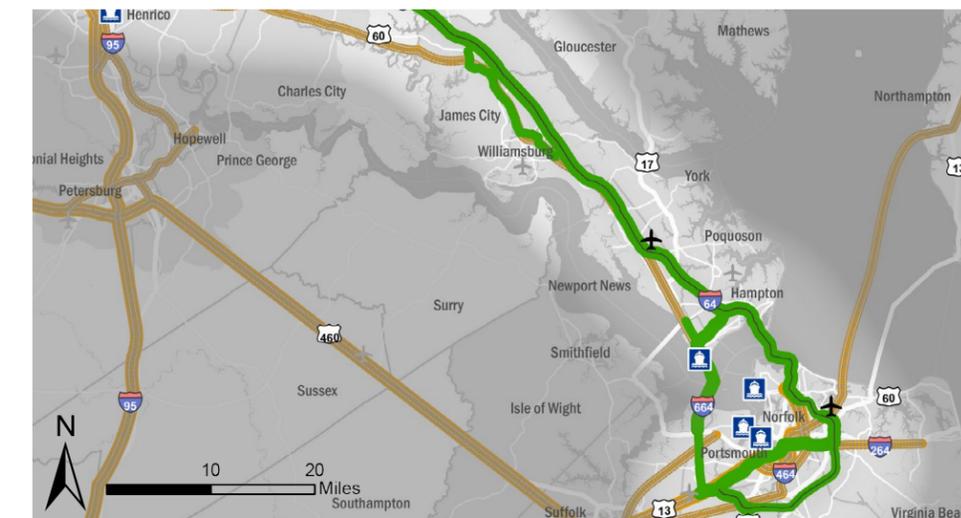
At the eastern end of Segment C5 in Norfolk, freight is moved primarily by rail, in terms of both tonnage and value. In total, five million tons (18 percent) of freight is moved through this section of Segment C5 by truck, compared to 22.5 million tons by rail. By value, rail is also favored, although to a lesser degree, with \$7 billion (33 percent) of freight value traveling by truck, compared to \$14 billion by rail. On average, a ton of freight traveling through this section of Segment C5 by truck is worth \$1,408 while a ton of freight traveling by rail is worth \$606. In 2025, both rail and truck freight tonnages and total values in this section of Segment C5 are expected to increase, and the percentage of the freight that travels by truck is expected to increase to 23 percent by tonnage and 34 percent by value. Value per ton on trucks is expected to decrease by 2025, with an average of \$1,253 per ton, while value per ton will increase to \$744 on rail.



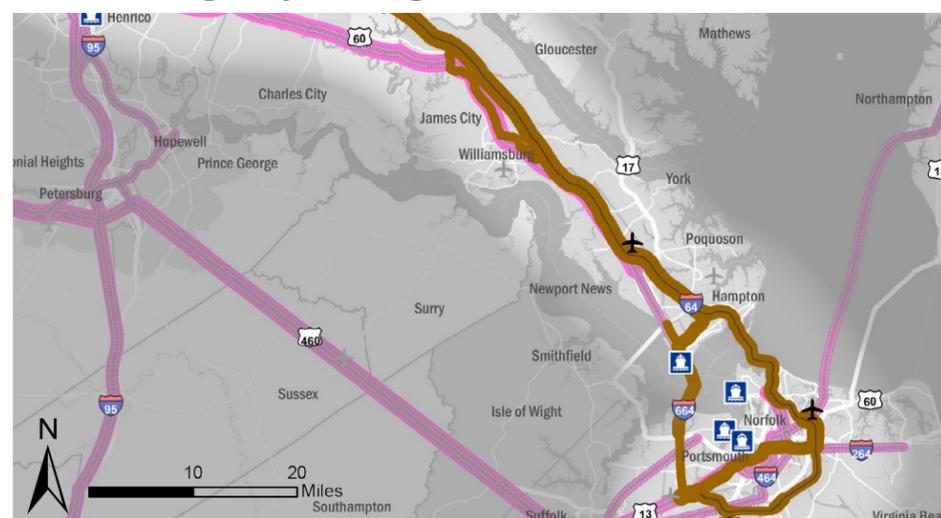
Annual Freight by Tonnage, 2012



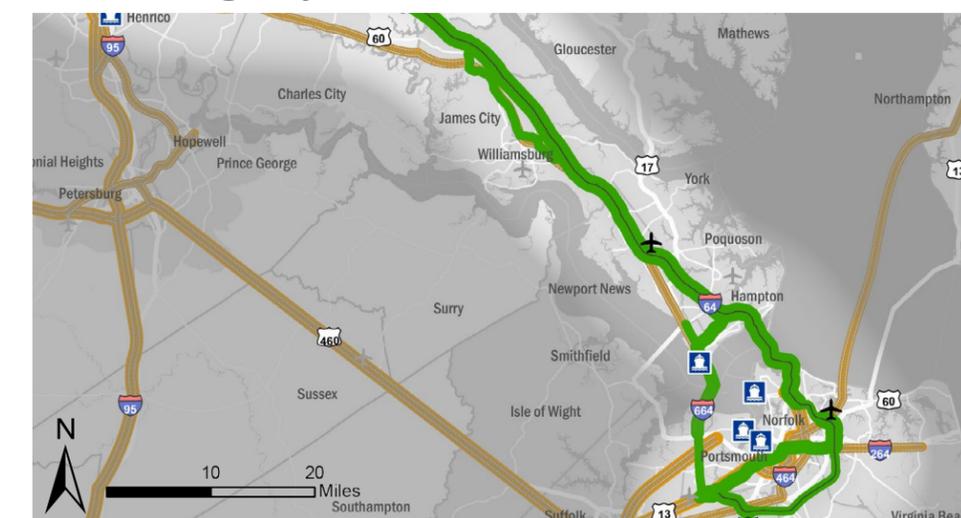
Annual Freight by Value, 2012



Annual Freight by Tonnage, 2025



Annual Freight by Value, 2025



C5 SEGMENT NEEDS

Redundancy and Mode Choice



Passenger trips on Segment C5 of the East-West Corridor have a wide range of travel options, both in terms of travel path and mode choice. US 60 serves as the parallel route to I-64 through most of Segment C5, and many other routes are available within the cities of the Hampton Roads Area. Based on the 2014 federal standard mileage rate of 56 cents per mile, trips to and from the Hampton Roads Area would be more expensive by automobile than by the other available modes. The alternate modes, including bus and rail, are all limited by the frequency of service and have longer travel times than the typical automobile trip. In Segment C5, Amtrak has stations in Williamsburg, Newport News, Norfolk and Virginia Beach. Greyhound provides service in Segment C5 from stations located in Williamsburg, Norfolk, Hampton, and Virginia Beach.

Park-and-Ride

Within Segment C5, commuters can use many Park-and-Ride locations, which are evenly spread throughout the region, as well as commuter bus service provided by HRT. Virginia Beach provides the most Park-and-Ride spaces and has the highest utilization rate of spaces in the region. However, no county or city within the Segment C5 area has a rate higher than the 76 percent statewide average for Park-and-Ride utilization.



Comparable Travel Options

Hampton Roads (Norfolk) to Richmond

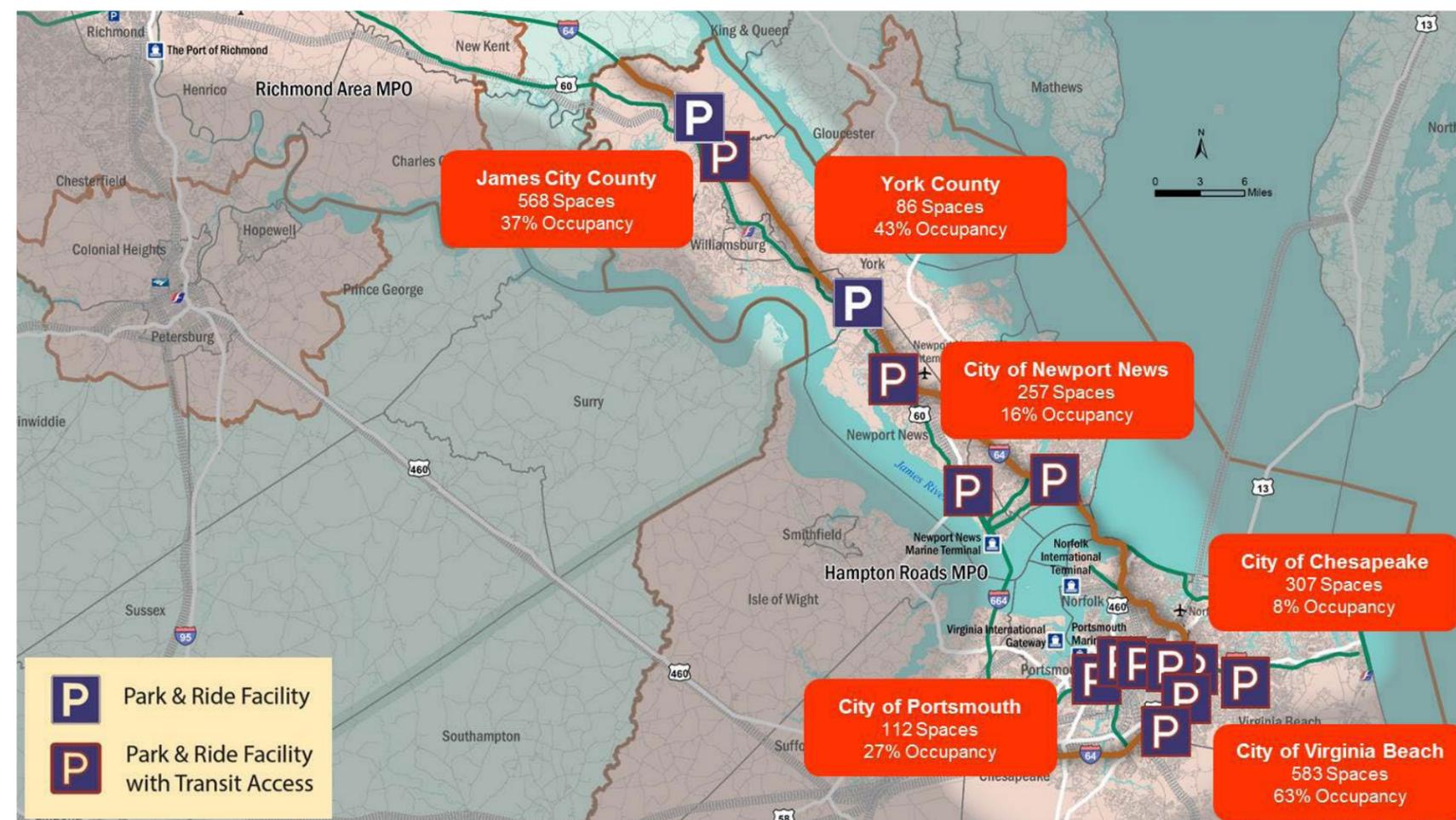
Inter-City Bus 5 Trips per Day 2:00 Travel Time \$11 Est. Cost	Train 5 Trips per Day 2:03 Travel Time \$23 Est. Cost
Auto	
Via I-64: 1:35 Travel Time \$52 Est. Cost Via Rt. 60: 2:21 Travel Time \$52 Est. Cost	

Hampton Roads (Norfolk) to Petersburg

Inter-City Bus 0 Trips per Day 0:00 Travel Time \$0 Est. Cost	Train 7 Trips per Day 4:26 Travel Time \$31 Est. Cost
Auto	
Via I-64: 1:29 Travel Time \$53 Est. Cost Via Rt. 60 / I-295 / I-64: 2:37 Travel Time \$63 Est. Cost	

Hampton Roads (Norfolk) to DC

Inter-City Bus 5 Trips per Day 5:35 Travel Time \$20 Est. Cost	Train 6 Trips per Day 4:44 Travel Time \$42 Est. Cost	Air 4 Trips per Day 1:00 Travel Time \$285 Est. Cost
Auto		
Via I-64: 2:45 Travel Time \$100 Est. Cost Via Rt. 60 / I-295 / I-95: 3:25 Travel Time \$111 Est. Cost		



C5 SEGMENT NEEDS

Safety

Between 2010 and 2012, Segment C5 experienced a high number of severe crashes (613), but it actually has one of the lowest crash rates in the Corridor. Within the C5 Segment, several areas experienced high concentrations of severe crashes. In Williamsburg, along US 60, there were 58 collisions within 3.5 miles between Lightfoot Road and Route 612. Of the 58 incidents, 36 incidents were at intersections. Along US 60 (Warwick Boulevard) in Newport News, 324 crashes happened over a stretch of approximately ten miles. In the northernmost portion of this ten-mile span, 267 crashes took place over a distance of 6.3 miles between Lees Mill Drive and the Peninsula Memorial Park Cemetery. Of the 267 crashes, 78 crashes

were at intersections including 39 at the intersection of Warwick Boulevard and Denbigh Boulevard adjacent to the Warwick Denbigh Shopping Center and Denbigh Village Center. The remaining 57 collisions that occurred within the southernmost portion of the ten-mile span took place between Middlesex Road and Milford Road. On I-64 at Willoughby Bay, there were 51 incidents over a distance of approximately 0.5 miles near the southern entrance to the Hampton Roads Bridge-Tunnel. Also on I-64 in Norfolk, there were 50 collisions north of the on-ramp to I-264. Along US 60 (East Ocean View Avenue/Shore Drive) in Norfolk, there were 85 crashes over 7.6 miles between Chesapeake Boulevard and Pleasure House Road.



Performance Metrics:

Number of Severe Crashes **613**

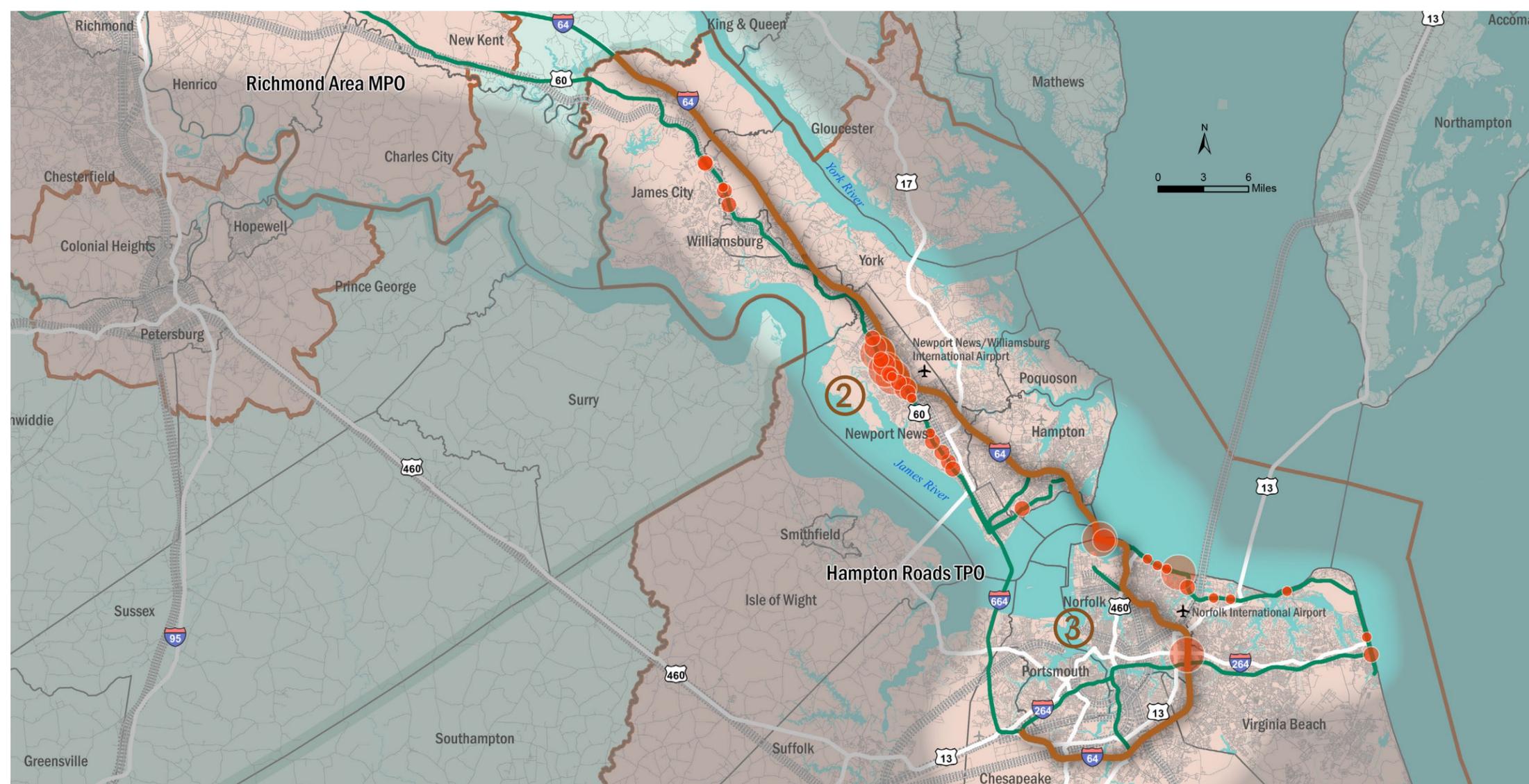
Severe Crashes/Million VMT **0.2**

Number of Railroad Crashes **5**

Fatality and Injury Crashes (2010 - 2012)

- < 5
- 5 - 10
- 11 - 15
- 16 - 20
- > 20

Railroad Incidents/Accidents per County (2011-2014)



C5 SEGMENT NEEDS

Congestion

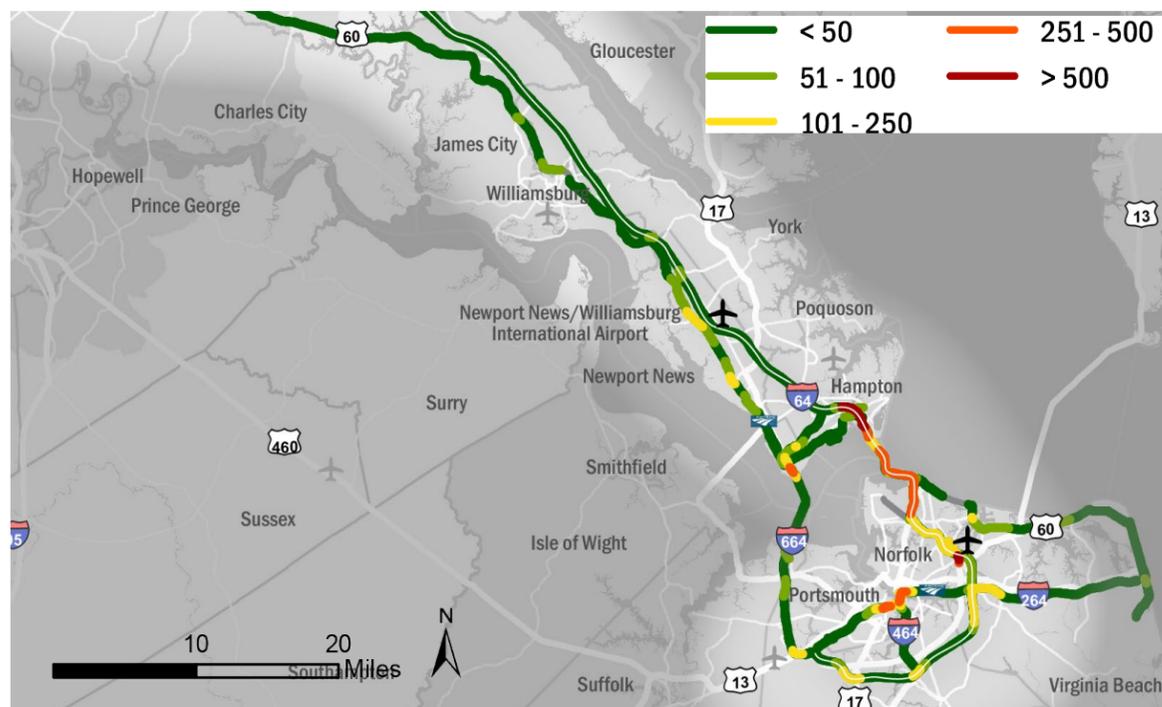
Passenger Delays

Passenger congestion on Segment C5 is the highest among all segments along the East-West Corridor (Corridor C), accounting for nearly 15,000 person-hours of delay, which averages to over 36 person-hours per mile across the segment. Throughout the Hampton Roads Area, there are several locations where passenger delays exceed 100 person-hours including:

- In the City of Hampton there are severe passenger delays, approaching 920 person-hours per mile, on I-64 approaching the Hampton Roads Bridge-Tunnel. Significant passenger delays on I-64 continue through the bridge tunnel into the City of Norfolk until reaching Route 165;
- There are significant passenger delays on I-264 near the Berkley Bridge in Norfolk continuing to I-464 and the I-264 Downtown Tunnel heading into the City of Portsmouth;
- In the City of Virginia Beach, there are locations of significant passenger delay on I-64 and I-264;
- In the City of Chesapeake, there are significant delays along I-64 and I-664, particularly near major interchanges; and
- In Newport News, there are several areas of significant passenger delay on US 60 and along I-664 approaching the Monitor-Merrimac Memorial Bridge-Tunnel.

At 73 percent of the total daily passenger delay, Segment C5 has the largest peak-period passenger delay share among the CoSS segments.

Daily Person Hours of Delay per Mile



Performance Metrics:

Person Hours of Delay per Mile **36**

Freight Ton Hours of Delay per Mile **22.6K**



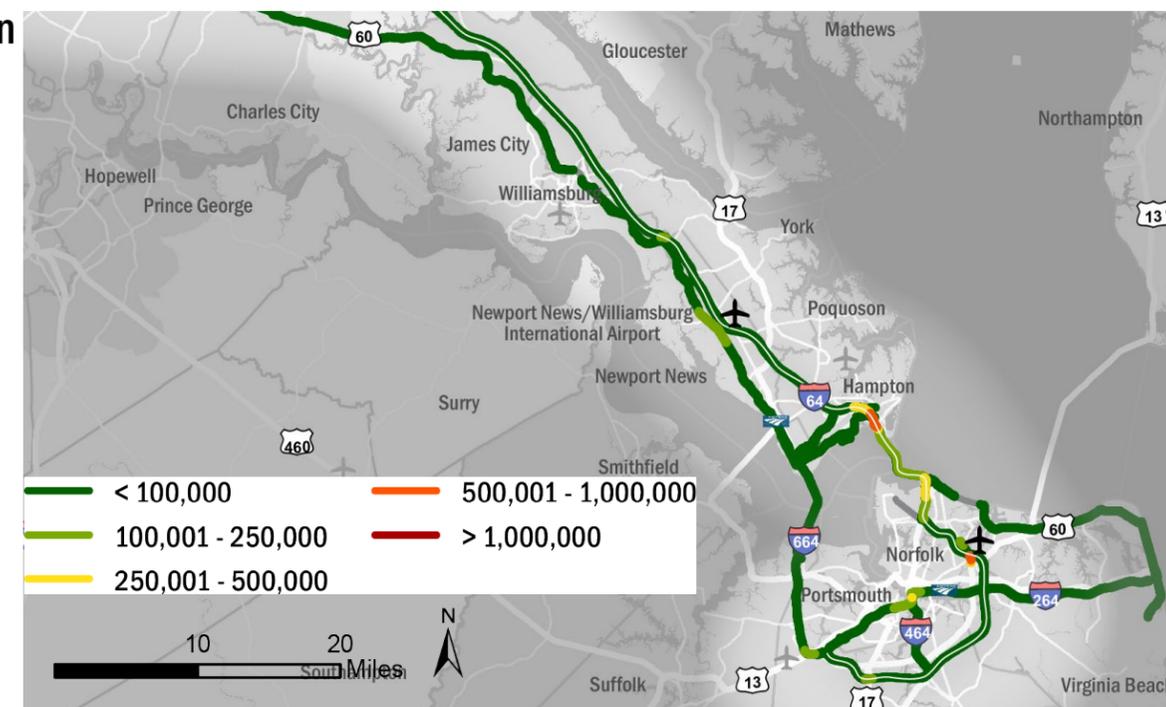
Freight Delays

Freight delays on Segment C5 rank near the top among CoSS segments, with over 9.5 million ton-hours of delay averaging to over 22,000 ton-hours of freight delay per mile. There are several areas of significant freight delay in the Hampton Roads Area, including:

- In the City of Hampton, on I-64 approaching the Hampton Roads Bridge-Tunnel, as well as on the other approach to the bridge tunnel on I-64 in the City of Norfolk; and
- In Norfolk at US 13 and I-264 on the Berkley Bridge.

At 67 percent of the total daily freight delay, this corridor segment has the one of the largest peak-period freight delay shares among the CoSS segments.

Daily Freight Ton Hours of Delay per Mile



C5 SEGMENT NEEDS

Reliability

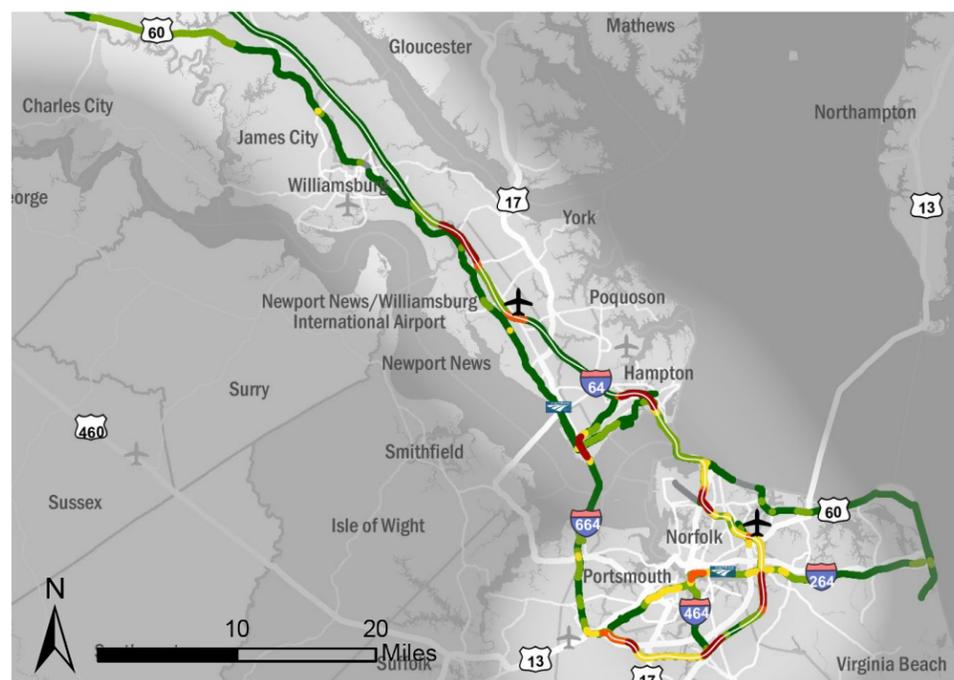
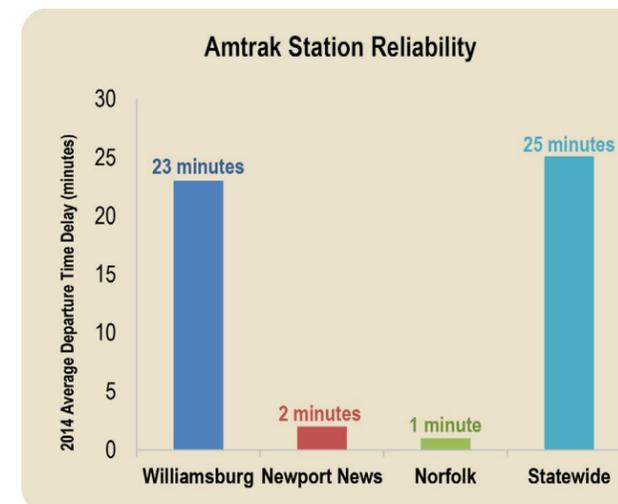
Reliability Index

- < 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- > 0.8
- Primary facility (in white)

Statewide reliability index thresholds have been set for weekday peak, weekday and weekend travel to assess the reliability of travel on each segment on all corridors of statewide significance. A higher reliability index indicates

that travel times are more unreliable. The following are the reliability index thresholds:

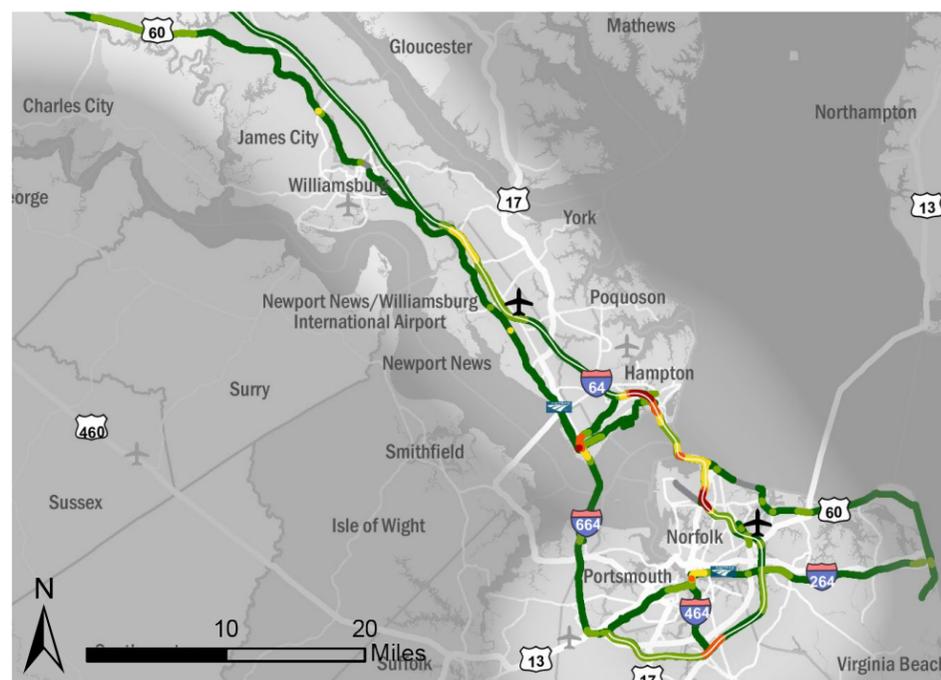
- Weekday Peak - 0.80
- Weekday - 0.40
- Weekend - 0.60



Weekday Peak

Reliability of travel during the peak period on a typical weekday on Segment C5 ranges from 0.00 to 2.94 in terms of reliability index, with an average value of 0.23. The weekday peak reliability is one of the worst in the Commonwealth, and is the worst for any CoSS segment outside of Northern Virginia. Locations where the peak period reliability index exceeds the statewide threshold include:

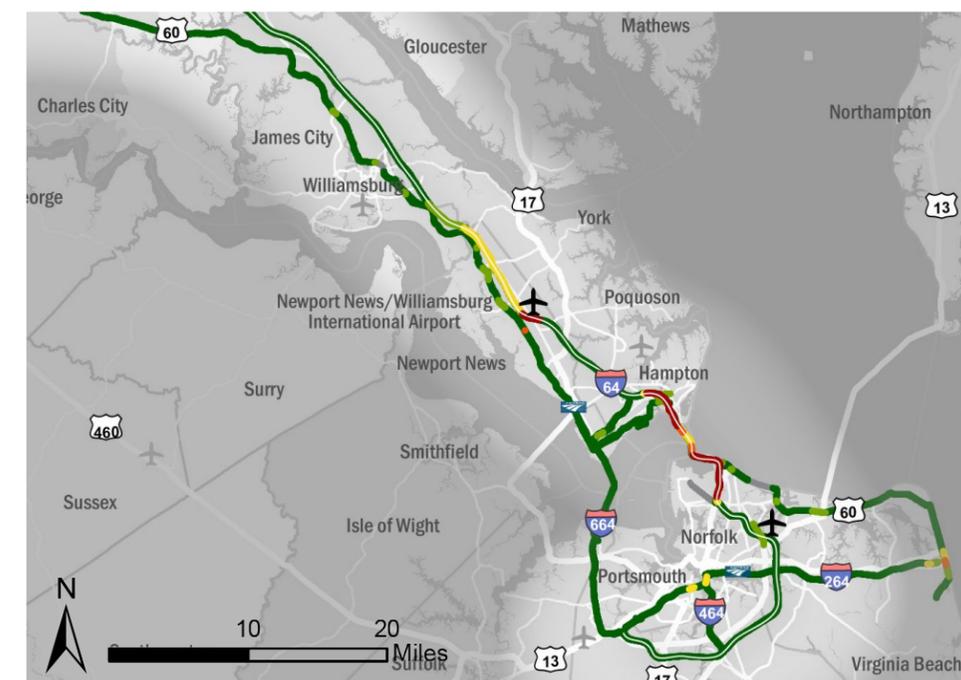
- I-64 in Hampton approaching the Hampton Roads Bridge-Tunnel;
- I-64 in Norfolk near the interchange with I-564;
- I-64 in Virginia Beach, south of the interchange with I-295;
- I-64 in Chesapeake near the interchanges with I-464 and US 17;
- I-664 in Newport News near US 60; and
- I-64 in Newport News near the border with James City County.



Weekday

Reliability of travel during a typical weekday ranges from 0.00 to 1.03 in terms of reliability index, with an average value of 0.16. Weekday reliability is above average compared to other CoSS segments statewide, and includes several locations where the weekday reliability index exceeds the statewide threshold:

- US 60 in James City County north of Route 199;
- I-64 in Newport News near the border with James City County;
- US 60 in Newport News at the intersection with Route 171;
- I-64 on both sides of the Hampton Roads Bridge-Tunnel (from Route 134 in Hampton past I-564 in Norfolk);
- I-64 in Chesapeake between the interchanges with I-464 and Route 168;
- I-664 in Newport News near US 60; and
- I-264 at the interchange with I-464 in Norfolk.



Weekend

Reliability of travel during a typical weekend ranges from 0.01 to 2.20 in terms of reliability index, with an average value of 0.13. Weekend reliability is above average compared to other CoSS segments statewide, and includes several locations where the weekend reliability index exceeds the statewide threshold:

- I-64 in Newport News near the Route 143 interchange;
- US 60 in Newport News at the intersection with Route 171;
- I-64 on both sides of the Hampton Roads Bridge-Tunnel (from Route 134 in Hampton to I-564 in Norfolk); and
- US 60 in Virginia Beach at the interchange with I-264.

C5 SEGMENT NEEDS

Summary of Needs

Identified locations are approximate. See "Summary of Needs" table on the following page for details.

Redundancy **Mode Choice**



Safety



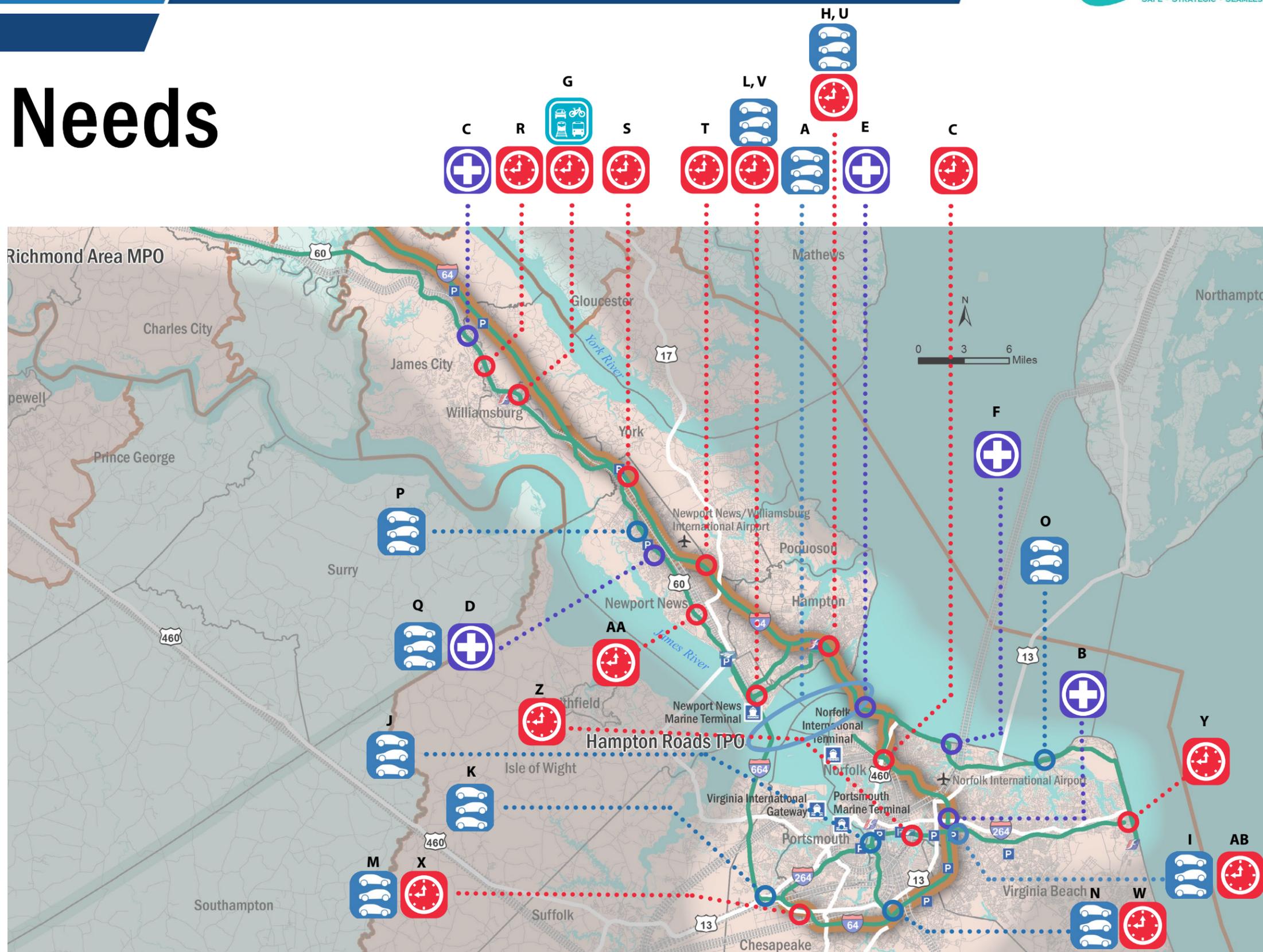
Congestion



Bottlenecks



Reliability



C5 SEGMENT NEEDS

Summary of Needs - C5 Segment

A.		Congestion between Hampton and Norfolk on all available facilities - very high demand, especially during peak periods
B.		I-64 near interchange with I-264 in Norfolk: 50 severe crashes related to lane changes/lane drops at interchange
C.		US 60 between Lightfoot Rd and Route 612 in Williamsburg: 58 severe crashes
D.		US 60 between Ft. Eustis Blvd and Todds Lane in Newport News: 324 severe crashes
E.		I-64 near southern entrance to Hampton Roads Bridge-Tunnel in Norfolk: 51 severe crashes
F.		US 60 between Chesapeake Blvd and Pleasure House Rd in Norfolk: 85 severe crashes
G.		Unreliable Amtrak service from Williamsburg station. Average departure delay is 23 minutes totaling almost 12,000 person-hours of delay from this segment.
H.		Congestion issue on I-64 between I-664 junction in Hampton and Exit 282 (Northampton Boulevard) in Norfolk, through Hampton Roads Bridge Tunnel
I.		Congestion issue on I-64 between I-264 and Exit 286 (Indian River Road) and on I-264 between I-64 and Exit 16 (South Witchduck Road) in Virginia Beach
J.		Congestion issue on I-264 between Exit 5 (US 17) in Portsmouth and Exit 11 (Campostella Road) in Norfolk
K.		Congestion issue on I-664 at interchange with I-264/US 13/US 460 in Chesapeake
L.		Congestion issue on I-664 between Exit 5 (Jefferson Avenue) and Monitor-Merrimac Memorial Bridge Tunnel in Newport News
M.		Congestion issue on I-64 near Exit 297 (US 13/US 460) in Chesapeake
N.		Congestion issue on I-64 near Exit 291 (I-464) in Chesapeake

Summary of Needs - C5 Segment

O.		Congestion issue at US 60 (Shore Dr) and VA Route 170 (East Little Creek Road) in Norfolk
P.		Congestion issue at US 60 (Warwick Boulevard) and VA Route 173 (Denbigh Boulevard) in Newport News
Q.		Congestion issue at US 60 (Warwick Boulevard) and VA Route 312 (Avenue of the Arts) in Newport News
R.		Reliability issue at US 60 and Route 614 (Centerville Road) in Lightfoot.
S.		Reliability issue on I-64 between Exit 247 (VA Route 143) and Exit 150 (Fort Eustis Boulevard) in Newport News
T.		Reliability issue on I-64 near Exit 255 (VA Route 143) in Newport News
U.		Reliability issue on I-64 between I-664 junction in Hampton and Exit 277 (Tidewater Drive) in Norfolk, through Hampton Roads Bridge Tunnel
V.		Reliability issue on I-664 between Exit 5 (Jefferson Avenue) and Monitor-Merrimac Memorial Bridge Tunnel in Newport News
W.		Reliability issue on I-64 between Exit 290 (North Battlefield Boulevard) and Exit 292 (Great Bridge Boulevard) in Chesapeake
X.		Reliability issue on I-64 near Exit 297 (US 13/US 460) in Chesapeake
Y.		Reliability issue on US 60 near Virginia Beach Boulevard (US 58 Business) at the Virginia Beach oceanfront
Z.		Reliability issue on I-264 between I-464 and Exit 11 (Campostella Road) in Norfolk
AA.		Reliability issue at US 60 (Warwick Boulevard) and VA Route 171 (Oyster Point Road) in Newport News
AB.		Reliability issue on I-64 between I-264 and Exit 286 (Indian River Road) in Virginia Beach