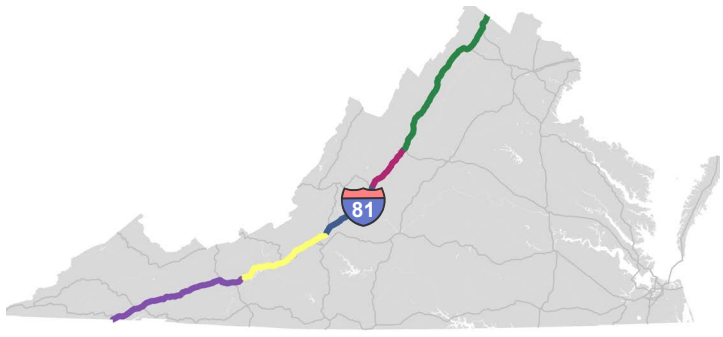
VTrans2040 Multimodal Transportation Plan

Corridors of Statewide Significance Needs Assessment

Crescent Corridor (B)



Office of INTERMODAL Planning and Investment

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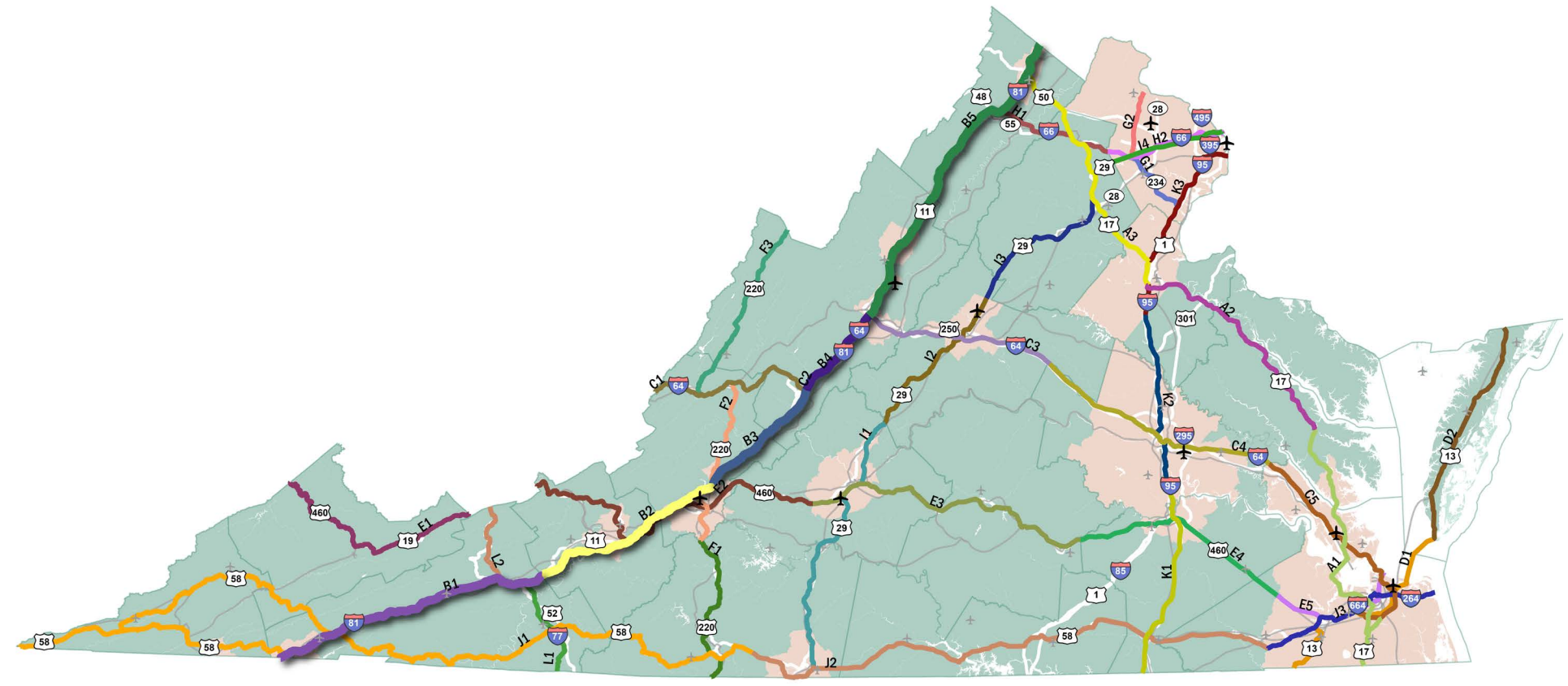
I. Corridor Overview



Corridor of Statewide Significance
(color varies by segment)

Railroad

Airport Facility
(grey denotes not a commercial service airport)

Metropolitan Planning Organization Area

The Crescent Corridor (Corridor B) runs along the Appalachian Mountains in western Virginia and is generally defined by I-81. The Crescent Corridor includes two auxiliary routes for I-81: I-381, a very short spur into the City of Bristol, and I-581, a longer spur into the City of Roanoke. I-81 is a multi-lane interstate highway that stretches from Tennessee to New York, with a large portion paralleling the Appalachian Mountains in Virginia. The interstate serves as a major trucking and freight corridor along the East Coast and is one of the top eight truck routes in the United States. I-81 traverses approximately 325 miles of Virginia, making it the state's longest interstate highway. The southern terminus of I-81 in Virginia lies near Bristol, at the Tennessee border, and its northern terminus is located north of Winchester, at the West Virginia state line.

I-81 is primarily a rural highway through Virginia, although it provides access to some urban areas in addition to a large number of educational facilities and recreational tourist areas. It connects Winchester and Harrisonburg to the north with Roanoke, Blacksburg/Christiansburg, and Bristol to the south. I-81 is used primarily as a long-distance throughway to and from points north and south of Virginia, and is the most heavily-used trucking corridor in Virginia. It is used somewhat as a commuting corridor, especially between some of the closely-spaced urban areas like Roanoke and Blacksburg/ Christiansburg and Staunton and Harrisonburg.

US 11 parallels I-81 for its entire length, although it runs concurrently with I-81 for several stretches. Other US and interstate highways that run concurrently with parts of I-81 include I-64, I-77, US 52, US 58, and US 220.

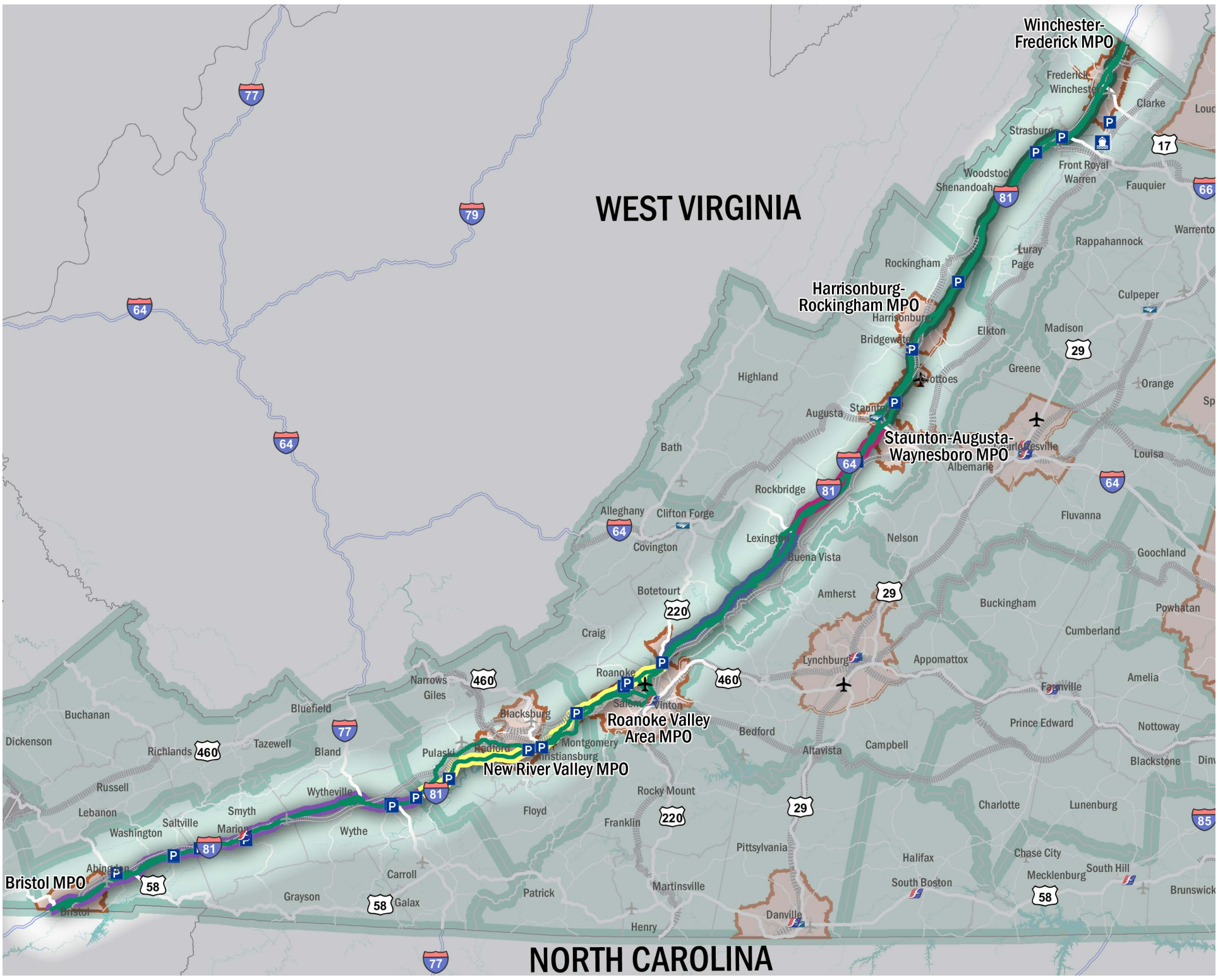
Passenger travel along the Crescent Corridor is accomplished primarily via the highway facilities. Other travel options include:

- Numerous Park-and-Ride facilities, available up and down the corridor, most serving the Blacksburg and Roanoke areas;
- Limited transit options, typically express bus services connecting larger urban areas, such as the Smartway Bus that offers service between Blacksburg and Roanoke;
- A major national bike route, US Bike Route 76, that traverses the Crescent Corridor;
- Greyhound bus service along the Crescent Corridor, with stops in Marion in Smyth County and in Wytheville in Wythe County;
- Amtrak passenger rail service, which does not run along the Crescent Corridor, although the station in Staunton allows passengers to connect with east-west rail service along the Cardinal Route, which runs from Chicago to New York City; and
- Two airports offering commercial service (Shenandoah Valley and Roanoke), and an additional nine general aviation facilities that are present along the corridor.

The Crescent Corridor provides access to the Virginia Inland Port. Norfolk Southern rail lines run along the entire corridor, supporting its role as a major freight corridor. Three short-line railroads also support freight movement in the corridor: the Shenandoah Valley Railroad, the Chesapeake Western Railroad, and the Winchester and Western Railroad.

Corridors of Statewide Significance

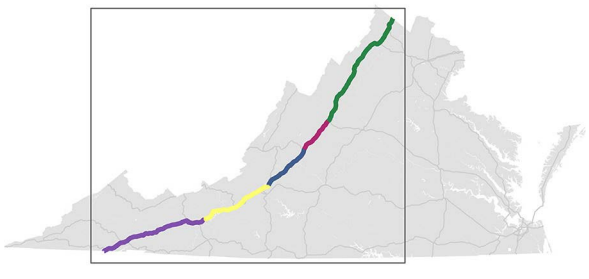
A	Coastal Corridor (US 17)
B	Crescent Corridor (I-81)
C	East-West Corridor (I-64)
D	Eastern Shore Corridor (US 13)
E	Heartland Corridor (US 460)
F	North Carolina to West Virginia Corridor (US 220)
G	North-South Corridor (Route 234)
H	Northern Virginia Corridor (I-66)
I	Seminole Corridor (US 29)
J	Southside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



Corridor Segments:
- B1
- B2
- B3
- B4
- B5

- Corridor Component Road
- Railroad
- Airport Facility
- Amtrak Facility
- Greyhound Facility
- VRE Facility
- Metrorail Facility
- Port Facility
- Park & Ride Facility

- MPO Area
- Planning District Area



Corridor Components

Highway Facilities	
Primary Facility	• I-81
Other Highway Facilities	• I-381 • I-581 • US 11 • US 11 Alt
Transit Services	
	• Intercity bus service
Rail Facilities	
	• Norfolk Southern Crescent Corridor
Port Facilities	
	• Virginia Inland Port
Airport Facilities	
	• Roanoke Regoinal Airport • Shenandoah Valley Regional Airport

Demographics and Economic Trends

Small pockets with populations greater than 500 persons per square mile lie along Corridor B. These population centers are found in the Cities of Bristol, Radford, Salem, Lexington, Buena Vista, Staunton, Harrisonburg, and Winchester. The City of Roanoke is the largest densely-populated area along the corridor with a population of 250 to 500 persons per square mile. Rockbridge County has the lowest population density along the route with less than 50 persons per square mile. The most densely-populated segment along the corridor is Segment B2 which passes through the Cities of Roanoke, Radford, Blacksburg, Christiansburg, and Salem.

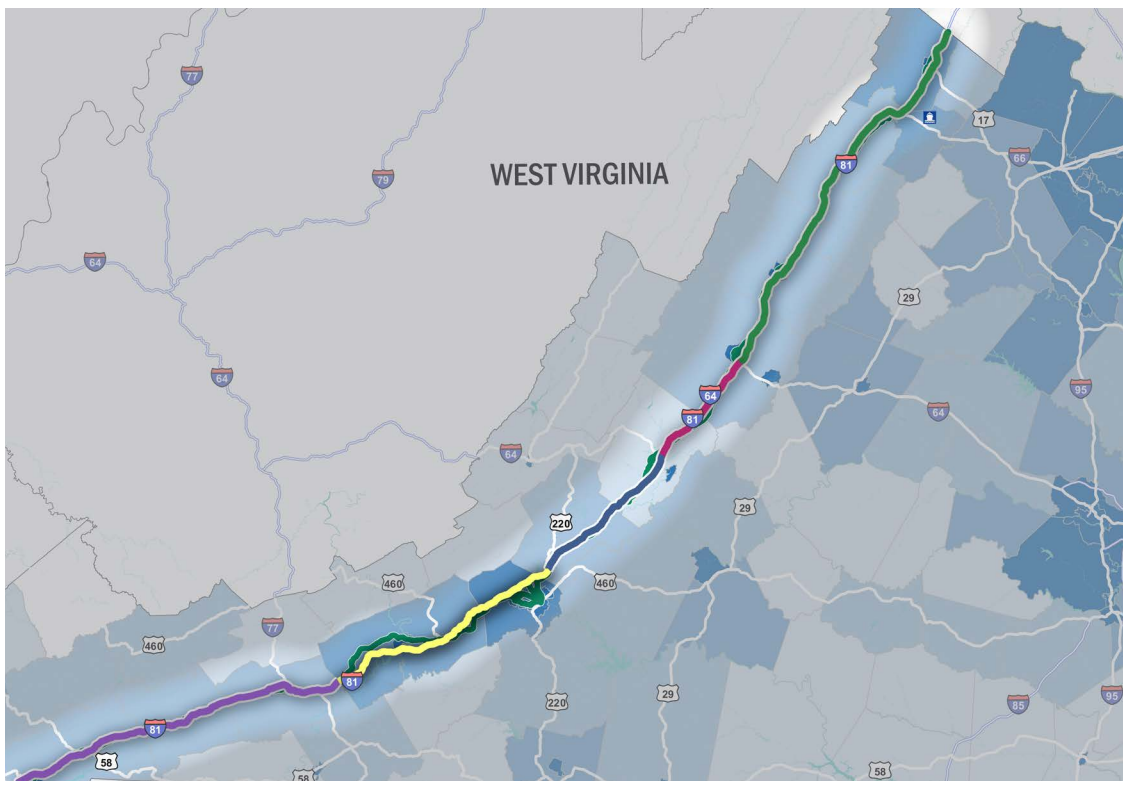
Between 2012 and 2025, Frederick County is anticipated to experience the largest population growth (greater than 25 percent) of counties along the corridor. Montgomery County, due to its proximity to Roanoke and Blacksburg, and Augusta, Rockingham, and Shenandoah Counties, is anticipated to have the next highest population growth (between 11 and 25 percent). Washington, Smyth, Rockbridge, Wythe, and Pulaski Counties, in the south, are expected to show the lowest growth. Overall, population along Segments B4 and B5 is expected to increase significantly.

Current employment centers follow a pattern similar to the population centers. In general, employment growth tracks a similar pattern along the corridor, but employment levels are anticipated to decrease in Pulaski and Shenandoah Counties.

Corridor B passes through six Metropolitan Planning Organization (MPO) areas along its route, each with a different size and focus for its local economy. The Roanoke Valley 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 manufacturing, public administration, and retail trade.

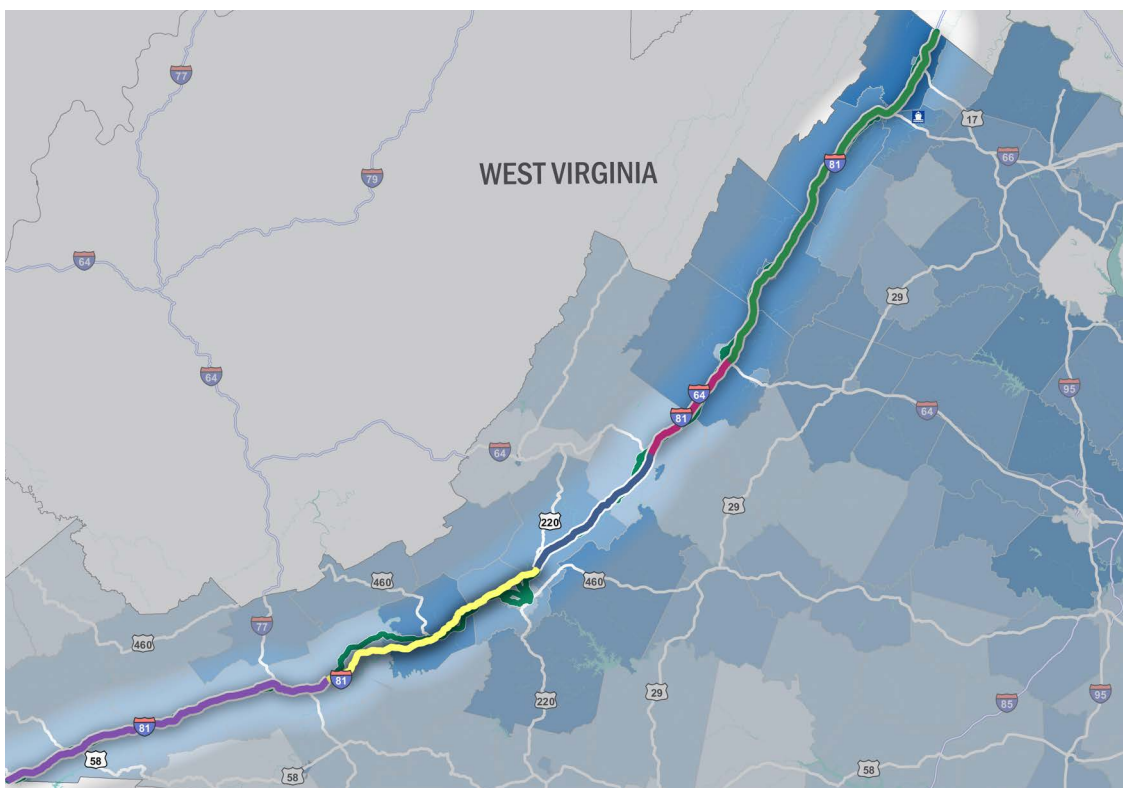
2012 Population Density Persons / Square Mile

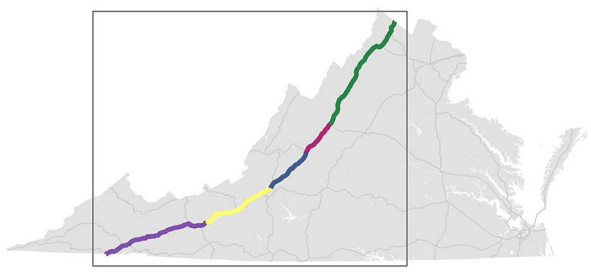
- 0 - 50
- 50 - 100
- 100 - 250
- 250 - 500
- 500 +



Population Growth (2012-2025 Percent Change)

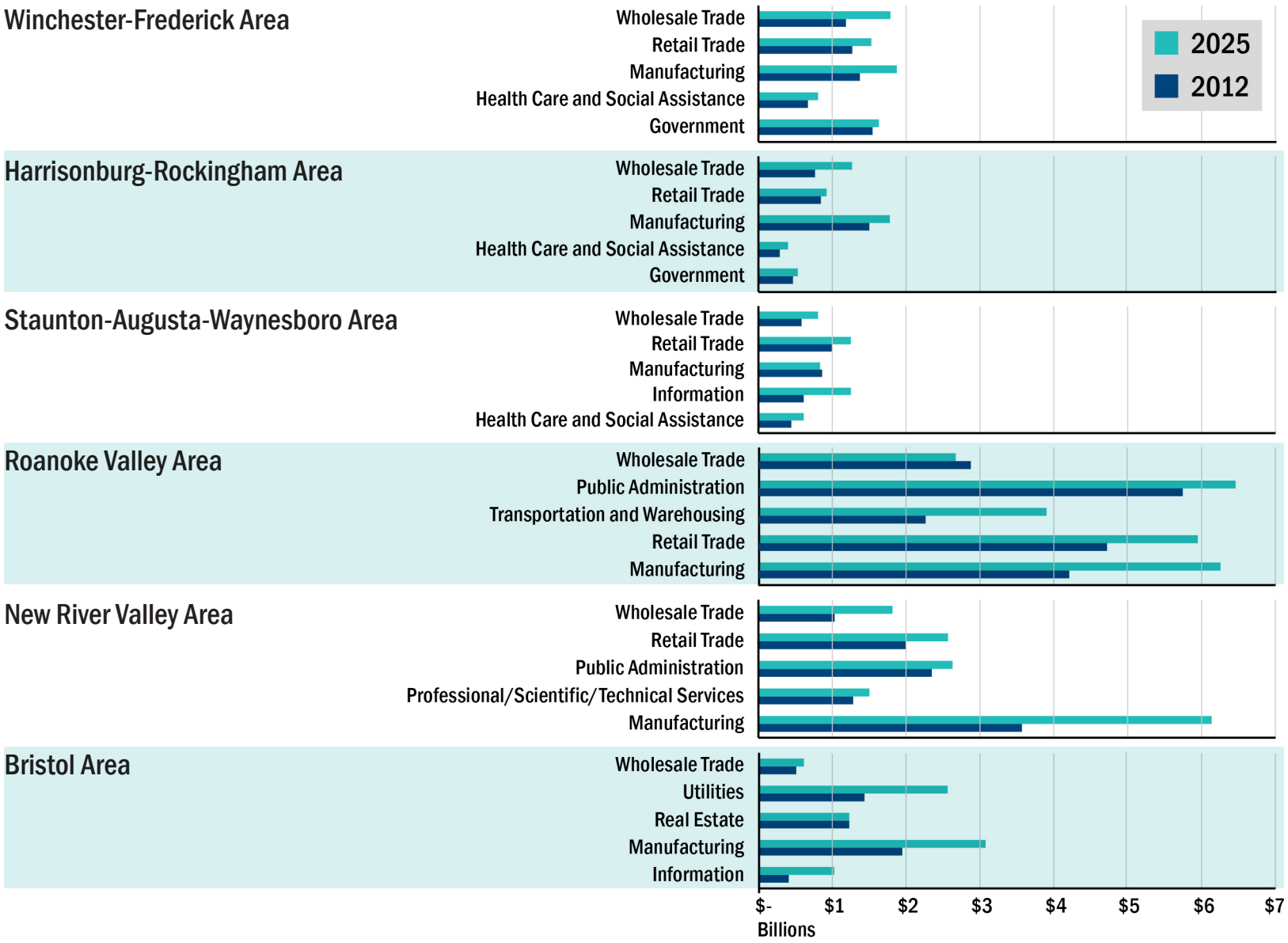
- -8% - 0%
- 1% - 5%
- 6% - 10%
- 11% - 25%
- 26% - 57%





CORRIDOR B OVERVIEW

Top Industries (GDP)

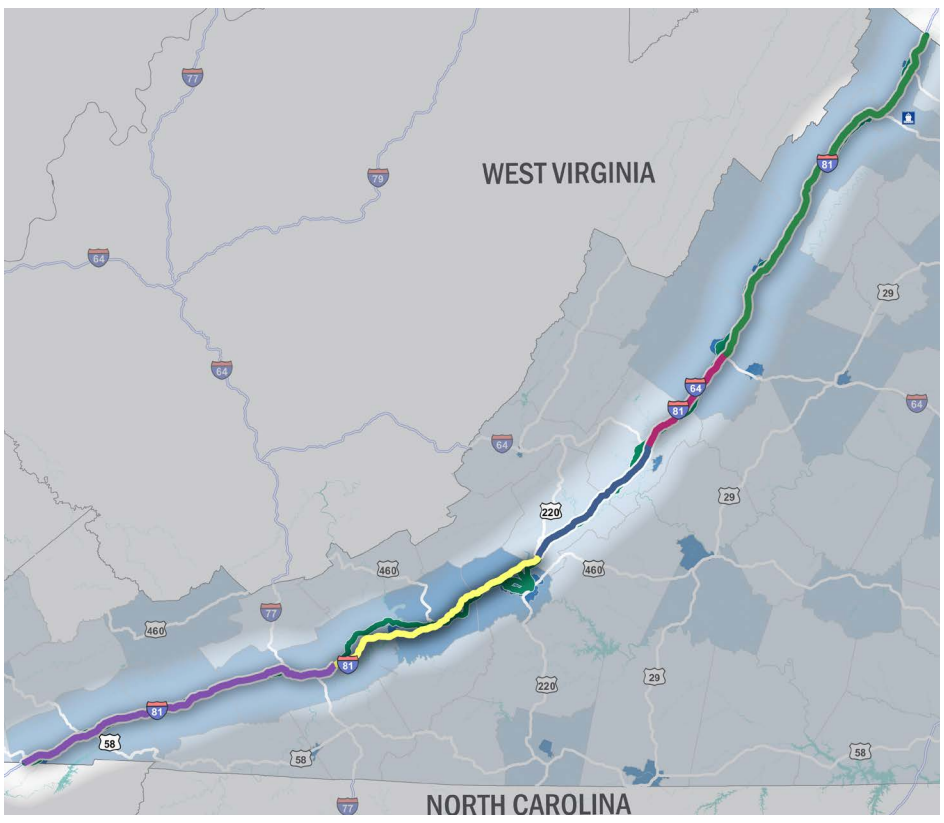


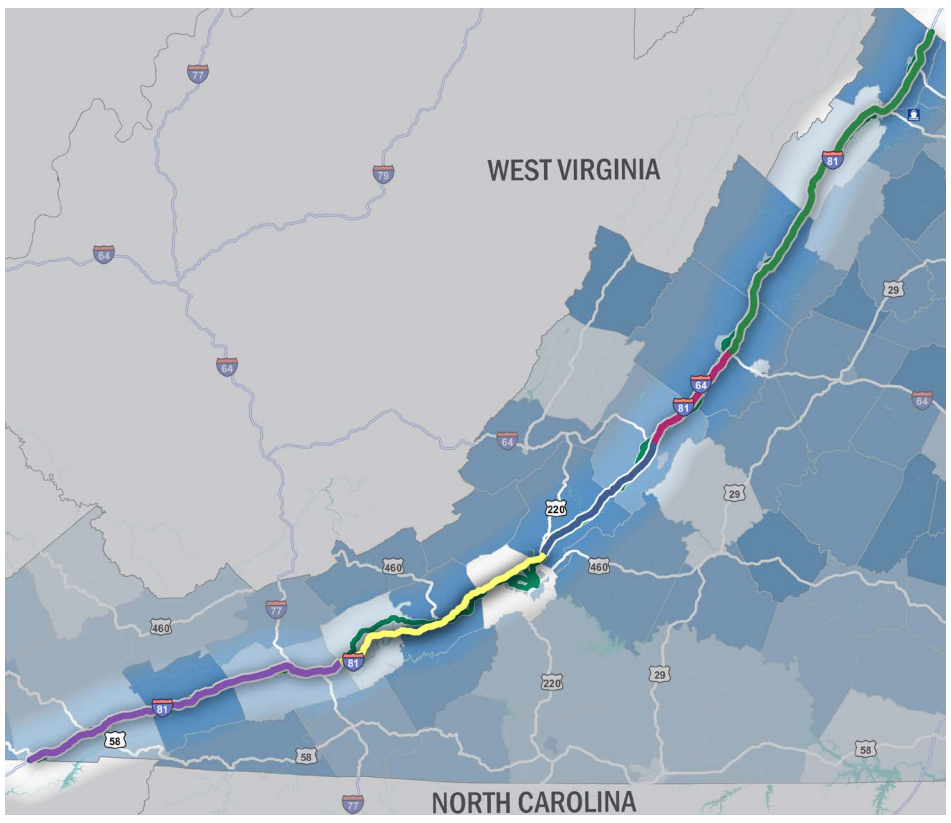
2012 Employment Density Jobs / Square Mile

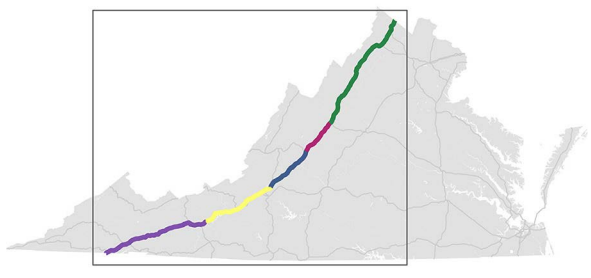
- < 25
- 25 - 100
- 100 - 250
- 250 - 500
- > 500

Employment Growth (2012-2025 Percent Change)

- -7% - 0%
- 1% - 5%
- 6% - 10%
- 11% - 25%
- 26% - 69%



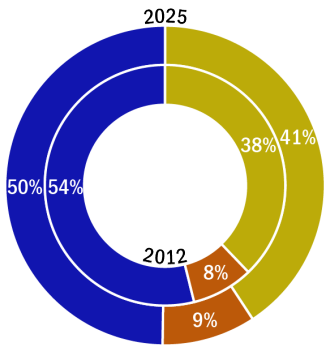




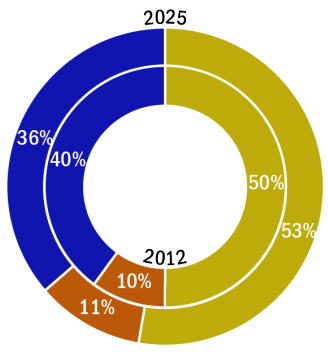
CORRIDOR B OVERVIEW

Corridor Travel Patterns

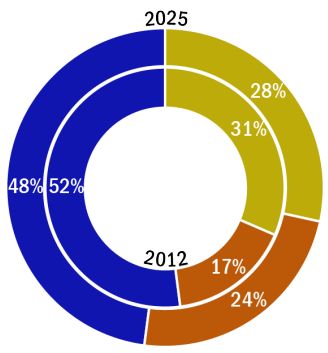
Winchester-Frederick Area



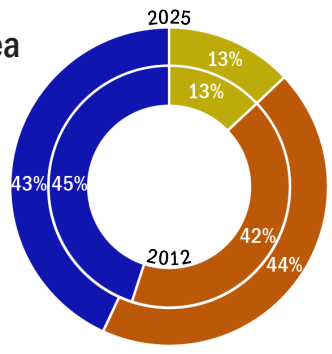
Harrisonburg-Rockingham Area



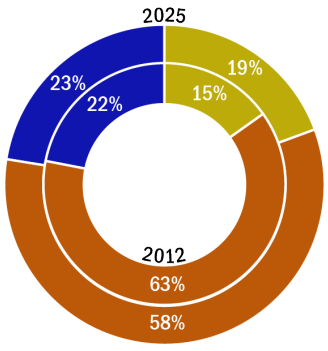
Staunton-Augusta-Waynesboro Area



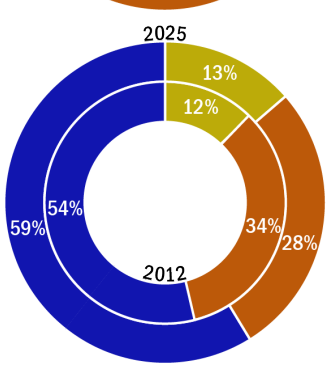
Roanoke Valley Area



New River Valley Area



Bristol Area



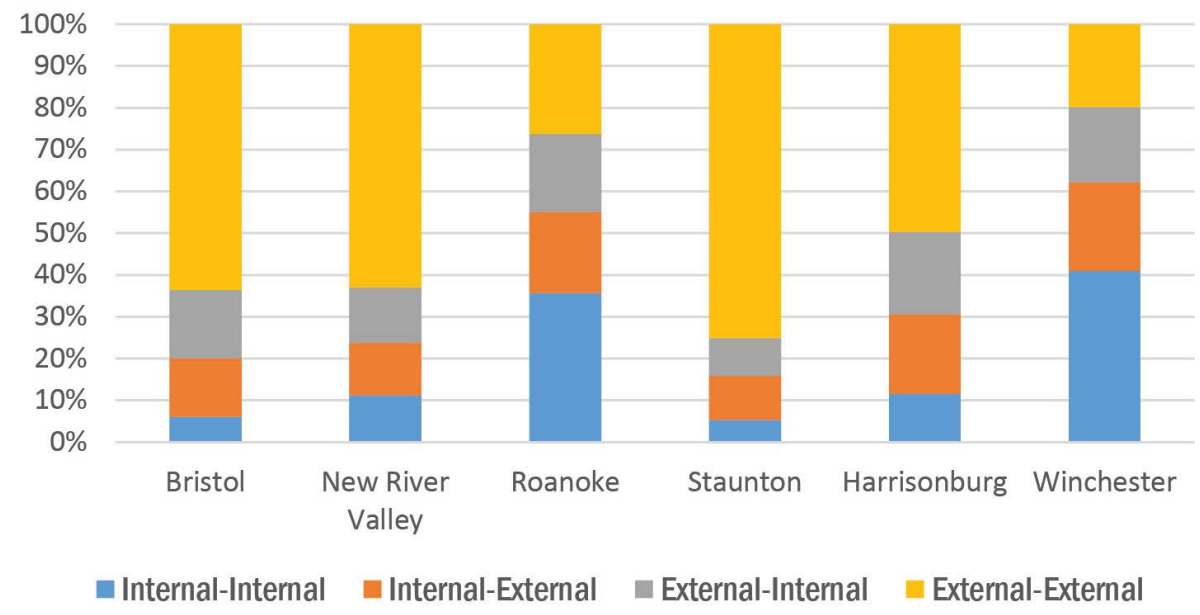
GDP by Sector, 2012 and 2025

- Freight Dependent
- Local Serving
- Knowledge-based

Passenger

Corridor B connects Tennessee to West Virginia and passes through six MPO Areas along its route: Bristol, New River Valley, Roanoke Valley, Staunton-Augusta-Waynesboro, Harrisonburg-Rockingham, and Winchester-Frederick. Throughout most of its length, traffic along Corridor B is dominated by pass-through trips, with the exception of the Roanoke Valley and Winchester-Frederick Areas. In the Bristol and the New River Valley Areas, more than 60 percent of the traffic is related to pass-through trips, and only small portions are related to local internal trips. In the Roanoke Valley Area, travel patterns are more evenly split between local and pass-through traffic, with 36 percent attributed to local internal trips, and an additional 38 percent of the trips beginning or ending inside the Area. Corridor B in the Staunton-Augusta-Waynesboro Area has the highest percentage of pass-through traffic in the corridor (more than 70 percent) and the lowest percentage of local internal trips (five percent). Through the Harrisonburg-Rockingham Area, Corridor B has approximately 50 percent pass-through traffic, and a significant portion of trips that begin or end in the MPO area. The Winchester-Frederick Area has the highest proportion of local internal trips within the entire Corridor B (40 percent), and the smallest proportion of pass-through traffic (20 percent). In all six MPO Areas, the percentage of pass-through traffic is much higher on the primarily facility (I-81) than on the parallel US 11.

Distribution of Internal and External Travel



Freight

By truck, Corridor B carried 160 million tons of freight worth $264 billion in 2012, and is estimated to carry 213 million tons of freight worth $383 billion in 2025. The major truck freight flows in Corridor B are interstate through traffic, accounting for approximately 60 percent of truck freight tonnage and over 75 percent of truck freight value in the corridor in 2012 and 2025. By rail, Corridor B carried 70 million tons of freight worth $46 billion in 2012, and is estimated to carry 78 million tons of freight worth $78 billion in 2025. Interstate through traffic also accounts for a major portion of rail freight traffic, representing 45 percent of rail freight tonnage in 2012, and 47 percent of rail freight tonnage in 2025.

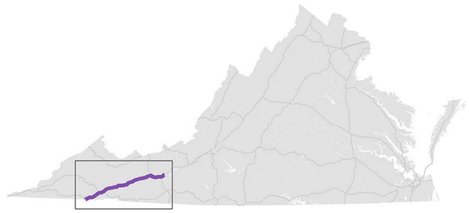
Truck Freight

2012	2025
Truck Freight Value	
$264 Billion	$383 Billion
Truck Freight Tonnage	
160 Million Tons	213 Million Tons
Freight Value per Ton	
$1643	$1803
Corridor Tonnage Passing Through	
59%	61%

Rail Freight

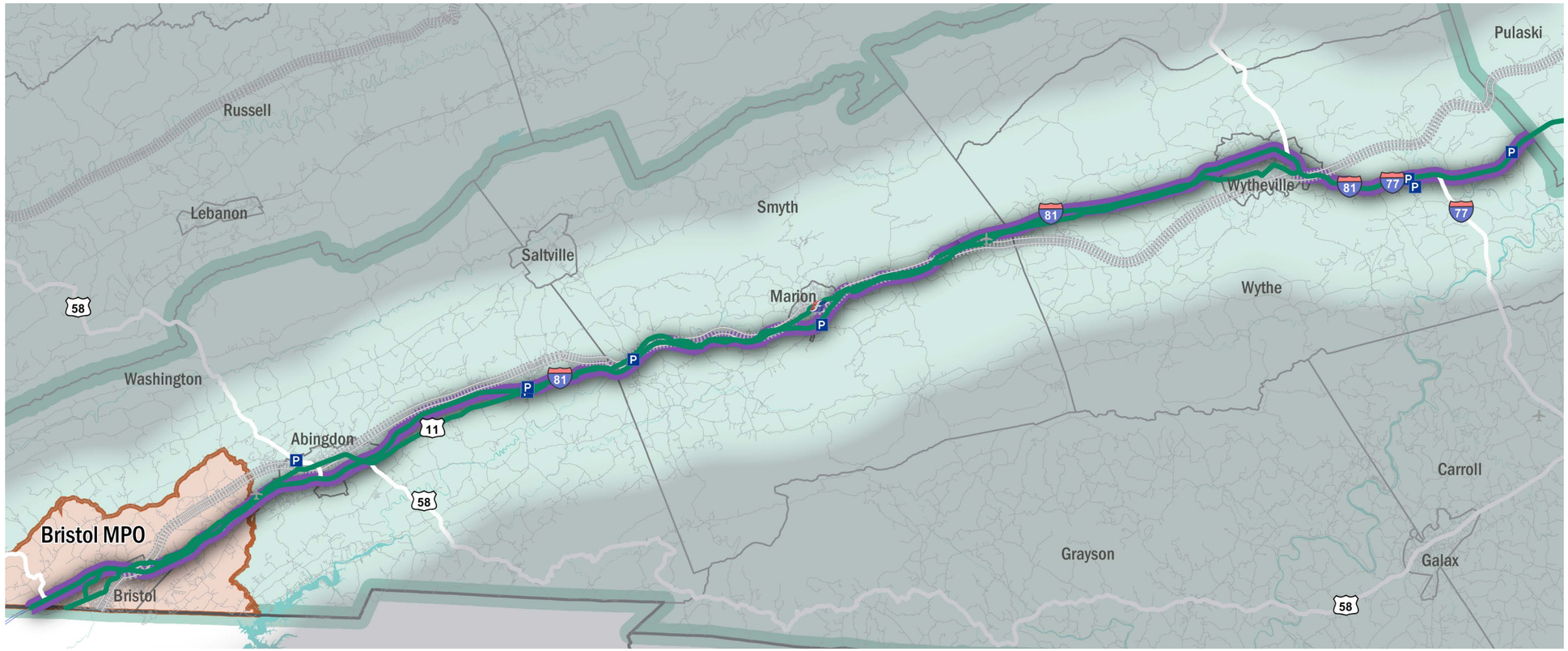
2012	2025
Rail Freight Value	
$47 Billion	$61 Billion
Rail Freight Tonnage	
70 Million Tons	78 Million Tons
Freight Value per Ton	
$653	$774
Corridor Tonnage Passing Through	
46%	47%

II. Segment B1



Corridor Segment B1 Components

- I-81
- US 11
- I-381
- Norfolk Southern Crescent Corridor



- Segment B1
- Corridor Component Road
- Railroad
- Airport Facility
- Amtrak Facility
- Greyhound Facility
- VRE Facility
- Metrorail Facility
- Port Facility
- Park & Ride Facility
- MPO Area
- Planning District Area

B1 SEGMENT PROFILE

Segment B1 begins at the Tennessee border and progresses north, serving Washington, Smyth, and Wythe Counties, as well as the City of Bristol. The segment travels through the Bristol Area. The segment includes portions of and overlaps with I-77, US 11, US 52, and US 58. Segment B1 acts as a major corridor for through-freight travel in Virginia and also connects smaller urban areas, such as Wytheville and Bristol, as well as multiple natural, historical, and cultural resources.

Highway Facilities: I-81 is primarily a rural four-lane highway in Segment B1, although six-lane cross sections can be found in the City of Bristol and in Wythe County where I-81 runs concurrently with I-77. I-381, a spur of I-81, serves the City of Bristol. US 11 runs parallel to I-81 in Segment B1 except for west of the interchange with I-77 in Wytheville where US 11 runs concurrently with I-77/I-81.

Transit Service: Greyhound offers service from stations in Marion and Wytheville. Several Park-and-Ride locations are in close proximity to I-81, with multiple locations near Glade Spring and Fort Chiswell.

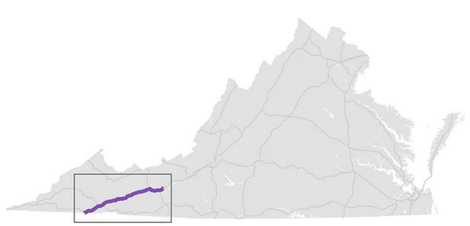
Rail Facilities: Norfolk Southern rail lines pass through Segment B1 connecting locations south and west of the Virginia Inland Port, near Corridor B south of Winchester.

Port Facilities: No port facilities are located directly adjacent to Segment B1, but the Crescent Corridor does provide direct access to the Virginia Inland Port south of Winchester.

Airport Facilities: No commercial air service is available in Segment B1, though two general aviation facilities do exist.

Major planned and future projects include:

- Upgrade the sign panels and sign structure along I-81 in Bristol;
- Widen existing US 11 (Lee Highway) just north of junction with I-81 from two to four lanes;
- Widen and add center two-way left turn lane on US 11 (Lee Highway);
- Reconstruction with added capacity on Lee Highway (US 11) between Linden Drive and Old Airport Road to improve traffic flow on Old Airport Road at I-81;
- Reconstruction with added capacity on Lee Highway (US 11) between Old Airport Road and Resting Tree Drive;
- Widen Lee Highway (US 11) between Mount Vernon Drive and F-310 to include raised median, sidewalks, and bike path; and
- Reconstruction with added capacity on I-81 from 0.23 miles to 1.2 miles east of off-ramp at Route 121 (just west of the I-77 interchange).



Number of Lanes (both directions)

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

Future Projects

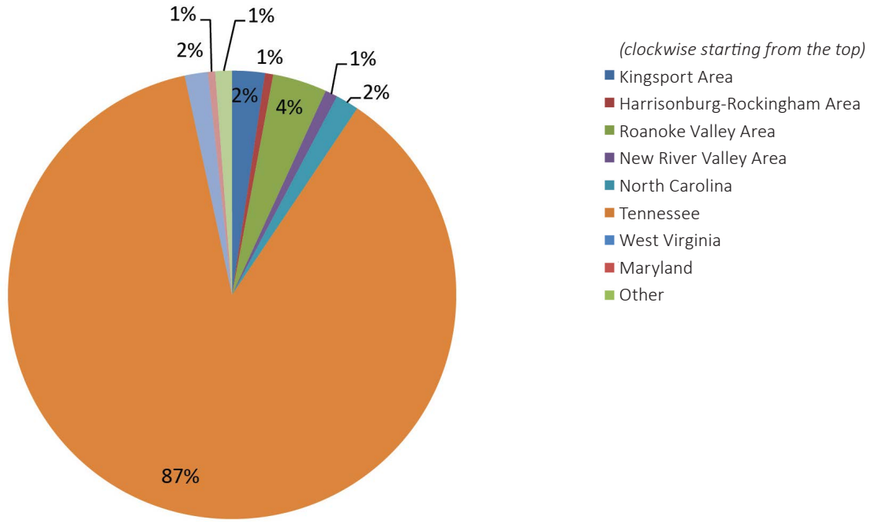
Reconstruction with added capacity | Safety improvements | Primary facility

Travel Demand

Passenger Demand

The southernmost segment of the Crescent Corridor (Corridor B) connects Tennessee and the Bristol Area to the New River Valley Area. The vast majority (87 percent) of intercity travel originating in the Bristol Area is destined for locations in Tennessee. Many of the other major destinations for intercity travel from Bristol are located along Corridor B, including Roanoke (four percent) and smaller portions of travel to the New River Valley Area, Harrisonburg-Rockingham Area, and even farther north in Maryland. Travel from the New River Valley Area to the Bristol Area accounts for only one percent of intercity traffic originating in the New River Valley Area.

Travel from Bristol Area to...



B1 SEGMENT PROFILE

Freight Demand

By truck, Segment B1 carried 55 million tons of freight worth $107 billion in 2012, and is estimated to carry 77 million tons of freight worth $167 billion in 2025. The major truck freight flows in Corridor B are interstate through traffic, accounting for approximately 60 percent of truck freight tonnage and over 75 of truck freight value in the corridor in 2012 and 2025. There is significant truck freight traffic along Corridor B between North Carolina and Ohio, accounting for four percent of the total corridor freight tonnage and value. Pennsylvania and Tennessee are also significant generators of truck freight tonnage along Corridor B. Around eight percent of the total truck freight on Corridor B, by value, is destined for New York, while another six to eight percent of truck freight on Corridor B is destined for non-US North American destinations. The jurisdictions adjacent to Segment B1 are not major generators or attractors of truck freight, as only two percent of Corridor B's total truck freight value originates along Segment B1 and only one percent is destined for this segment.

By rail, Segment B1 carried six million tons of freight worth $11 billion in 2012, and is estimated to carry eight million tons of freight worth $16 billion in 2025. In terms of tonnage, the largest rail freight flows in Corridor B consist of low-value freight traveling between West Virginia and North Carolina, accounting for between 18 and 22 percent of the total rail freight corridor tonnage in 2012 and 2025, respectively. The City of Norfolk (including its Port facility) is a major destination for rail freight on Corridor B, accounting for between 18 and 20 percent of the total corridor tonnage, with these rail freight flows originating mainly from West Virginia, Wise County, and Buchanan County. In terms of value, freight rail flows between Illinois and the Cities of Norfolk and Portsmouth (including their Port facilities) account for more than 20 percent of the total rail freight value in the corridor. The jurisdictions adjacent to Segment B1 are not major generators or attractors of rail freight, with one or less than one percent of the total corridor value and tonnage either originating from or destined for this corridor segment.

Truck Freight

Major Origins (by Tonnage)
1. Virginia (25% / 23%)
2. North Carolina (13% / 12%)
3. Pennsylvania (8% / 8%)
4. Ohio (6% / 7%)
5. Tennessee (6% / 6%)

Major Origin-Destination Pairs for Freight
North Carolina and Ohio
North Carolina and Pennsylvania
North Carolina and West Virginia
Ohio and Florida
North Carolina and Indiana

Percentages represent 2012 / 2025 values.

Major Destinations (by Tonnage)
1. Virginia (22% / 22%)
2. North Carolina (14% / 15%)
3. Pennsylvania (8% / 8%)
4. New York (6% / 6%)
5. Tennessee (4% / 5%)

Corridor Tonnage Originating in Segment B1: 3% / 3%

Corridor Tonnage Destined for Segment B1: 3% / 4%

Rail Freight

Major Origins (by Tonnage)
1. Virginia (31% / 28%)
2. West Virginia (30% / 26%)
3. Wise County (12% / 10%)
4. Illinois (8% / 10%)
5. Ohio (6% / 8%)

Major Origin-Destination Pairs for Freight
West Virginia and North Carolina
City of Norfolk* and West Virginia
Wise County and City of Norfolk*
Ohio and North Carolina
Illinois and North Carolina

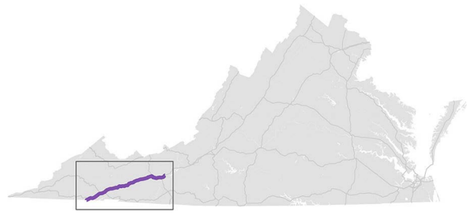
Percentages represent 2012 / 2025 values.
*Includes freight passing through the Port of Virginia.

Major Destinations (by Tonnage)
1. Virginia (38% / 37%)
2. North Carolina (35% / 35%)
3. City of Norfolk* (20% / 17%)
4. Tennessee (4% / 3%)
5. Georgia (3% / 3%)

Corridor Tonnage Originating in Segment B1: <1% / <1%

Corridor Tonnage Destined for Segment B1: <1% / 1%

Traffic Conditions



Traffic Volume and AADT

Traffic volume on Segment B1 is generally less compared other segments of Corridor B. Average daily traffic volumes vary somewhat by section, with daily volumes on I-81 ranging from 25,000 to 50,000 vehicles, and the highest volumes near Bristol and the shared I-77/I-81 section in Wythe County. Volumes on US 11 are lower throughout the corridor, and are less than 20,000 vehicles per day except for a few short portions in Abingdon. By 2025, the greatest traffic volume increases in Segment B1 are forecasted to occur on I-81 on the I-77/I-81 shared section in Wythe County, with a projected increase of 10,000 vehicles by 2025. Little to no increase in traffic is forecast for US 11 in Segment B1. By 2025, daily traffic volumes on I-81 are forecasted to be over 50,000 vehicles between Bristol and Abingdon and 60,000 vehicles on the I-77/I-81 shared section. In other sections along I-81 between Abingdon and I-77, daily traffic volumes are forecasted to range from 25,000 to 40,000 vehicles by 2025.

Traffic Volume 2014 (AADT)

- < 10,000
- 10,000 - 50,000
- 50,000 - 100,000
- 100,000 - 200,000
- > 200,000
- Primary facility

Traffic Volume 2025 (AADT)

- < 10,000
- 10,000 - 50,000
- 50,000 - 100,000
- 100,000 - 200,000
- > 200,000
- Primary facility

Change in Traffic Volume 2014- 2025 (AADT)

- Decreased
- 0 - 5,000
- 5,000 - 10,000
- 10,000 - 20,000
- > 20,000
- Primary facility

B1 SEGMENT PROFILE

Traffic Distribution

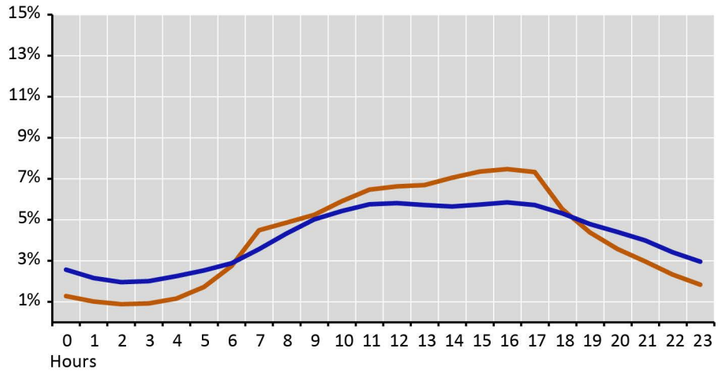
On average, traffic on Segment B1 is distributed throughout the day as shown in the graphs below. Weekday traffic shows steady increase in the flow from 8 a.m. to 5 p.m., indicating that traffic levels on this segment are not controlled by the standard commute patterns typical in many areas. The highest hourly traffic occurs between 4 and 5 p.m. which accounts for 7.4 percent of daily traffic. The combined weekday traffic in this period (from 8 a.m. to 5 p.m.) accounts for 70 percent of total daily traffic. Peaking patterns for truck traffic show a fairly steady peak that lasts from 9 a.m. to 6 p.m. 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 1 p.m. and 2 p.m. (7.8 percent of daily traffic) for all traffic, and 2 p.m. to 3 p.m. (6.4 percent of daily traffic) for truck traffic.

Weekday traffic volumes on Segment B1 vary by as much as 43 percent throughout the year, with the highpoint in July (around 25,000 vehicles per day) and the low point in January (around 17,000 vehicles per day). Truck volumes vary less than passenger volumes throughout the year, with the October high (around 5,700 trucks per day) 18 percent higher than the January low (around 4,800 vehicles per day). Weekend traffic levels also show a distinct peak in the summer months; volumes in July (around 26,000 vehicles per day) are 77 percent higher than February levels (around 14,000 vehicles per day). Weekend truck traffic is steadier than all vehicle traffic, with the June high (around 4,500 vehicles per day) only 14 percent higher than the May low (around 4,000 vehicles per day). Truck volumes account for a significant portion of traffic on Segment B1 (25 percent of overall daily traffic for weekdays and 21 percent for weekends); as a result truck traffic has a significant impact on overall traffic conditions.

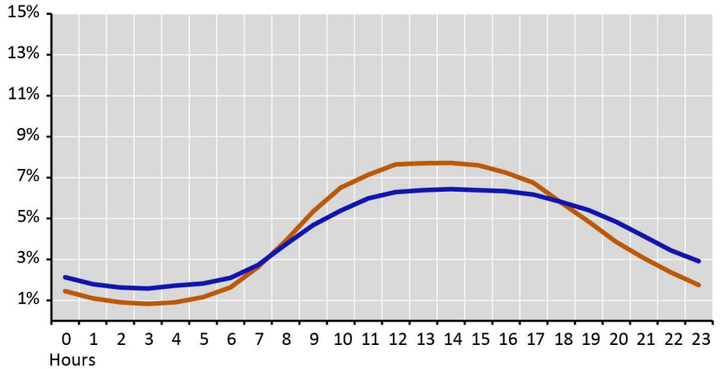
Truck Volume

The percent of average daily traffic comprised of heavy trucks on Segment B1 is lower compared to most other segments throughout Corridor B. On I-81 throughout Segment B1, heavy trucks comprise 10 to 13 percent of daily traffic, with the highest levels west of I-77 in Wytheville and Wythe County. Heavy trucks comprise a much smaller portion of daily traffic on US 11 - less than two percent - in Segment B1.

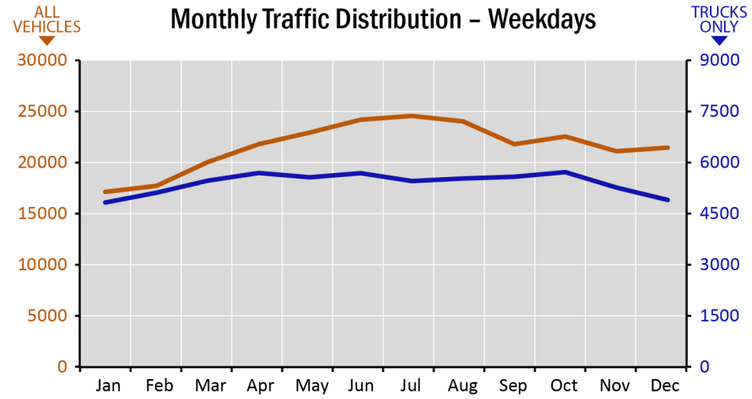
Hourly Traffic Distribution – Weekdays



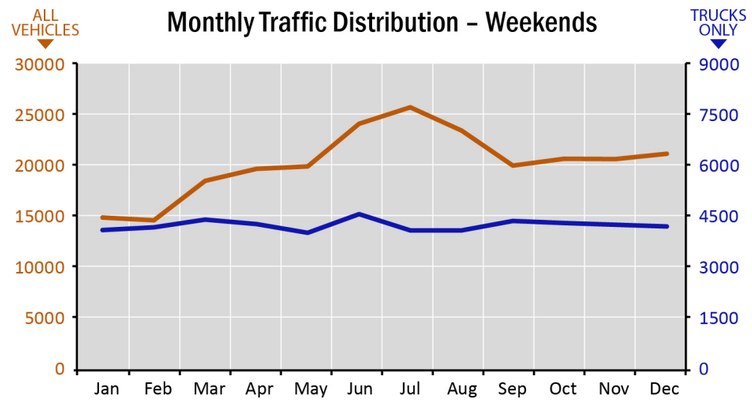
Hourly Traffic Distribution – Weekends



Monthly Traffic Distribution – Weekdays



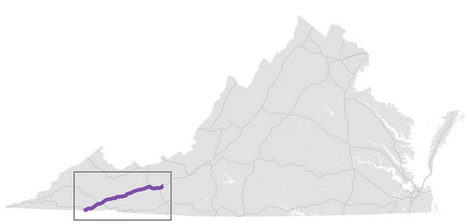
Monthly Traffic Distribution – Weekends



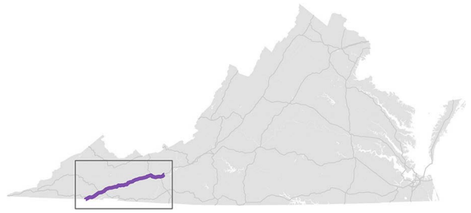
All Vehicles
Trucks

Percent Heavy Trucks

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



B1 SEGMENT PROFILE



Freight Flows

Near Abingdon, freight is moved primarily by truck, in terms of both tonnage and value. In total, 55 million tons (90 percent) of freight is moved through Segment B1 of the Crescent Corridor by truck, compared to 6 million tons by rail. By value, the difference is the same, with $107 billion (90 percent) of freight value traveling by truck, compared to $11 billion by rail. On average, a ton of freight traveling through Segment B1 by truck is worth $1,966 while a ton of freight traveling by rail is worth $1,939. In 2025, both rail and truck freight tonnages and total values are expected to increase, but the percentages of tonnage and value moved by truck are expected to remain nearly the same. Values per ton of freight on trucks are expected to increase to $2,209 in 2025, while rail values per ton will remain nearly the same, at $1,949.

Truck Freight (in tons)

- < 10M
- 10M - 25M
- 25M - 50M
- 50M - 100M
- > 100M
- Primary facility

Rail Freight (in tons)

- < 10M
- 10M - 25M
- 25M - 50M
- 50M - 100M
- > 100M
- Primary facility

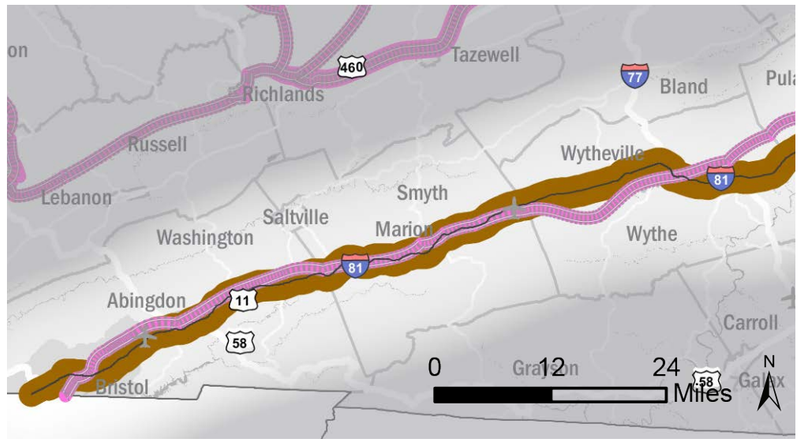
Truck Freight

- < $10B
- $10B - $50B
- $50B - $100B
- $100B - $200B
- > $200B
- Primary facility

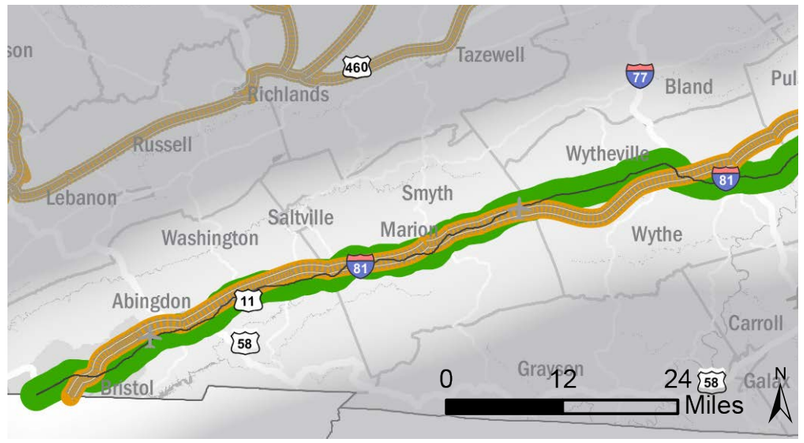
Rail Freight

- < $10B
- $10B - $50B
- $50B - $100B
- $100B - $200B
- > $200B
- Primary facility

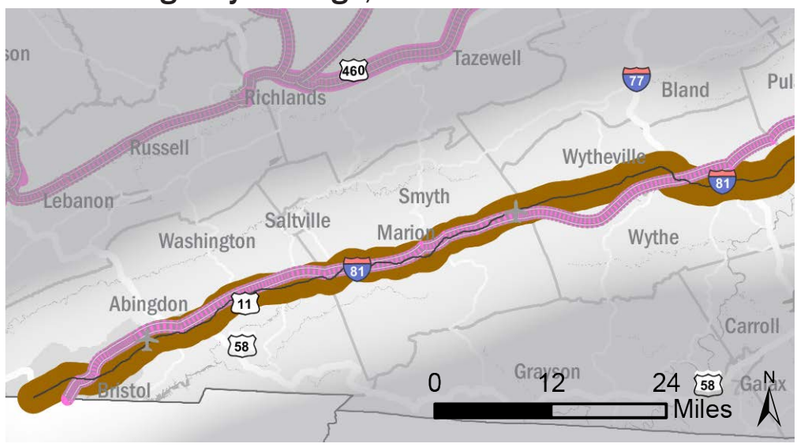
Annual Freight by Tonnage, 2012



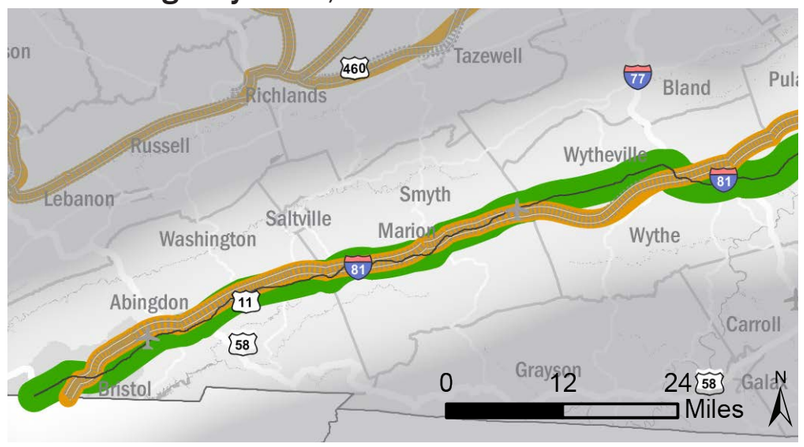
Annual Freight by Value, 2012



Annual Freight by Tonnage, 2025

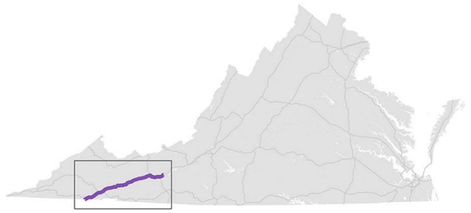


Annual Freight by Value, 2025



Redundancy and Mode Choice

Passenger trips on Segment B1 of the Crescent 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 for local access and for bypassing incidents causing congestion on sections of I-81. Greyhound service is offered at Wytheville and Fort Chiswell, but no alternate mode choices are available for trips along the corridor.



Park-and-Ride

Within Segment B1, commuters can utilize several Park-and-Ride locations. Washington County provides the highest number of Park-and-Ride spaces and the highest utilization rate of spaces available in the region, while Wythe County has the most Park-and-Ride locations. Washington County matches the 76 percent statewide average for Park-and-Ride utilization.

Comparable Travel Options

Bristol to Roanoke

Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 2:24 Travel Time $81 Est. Cost

Bristol to Harrisonburg

Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 3:59 Travel Time $136 Est. Cost

Bristol to Blacksburg / Christiansburg

Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

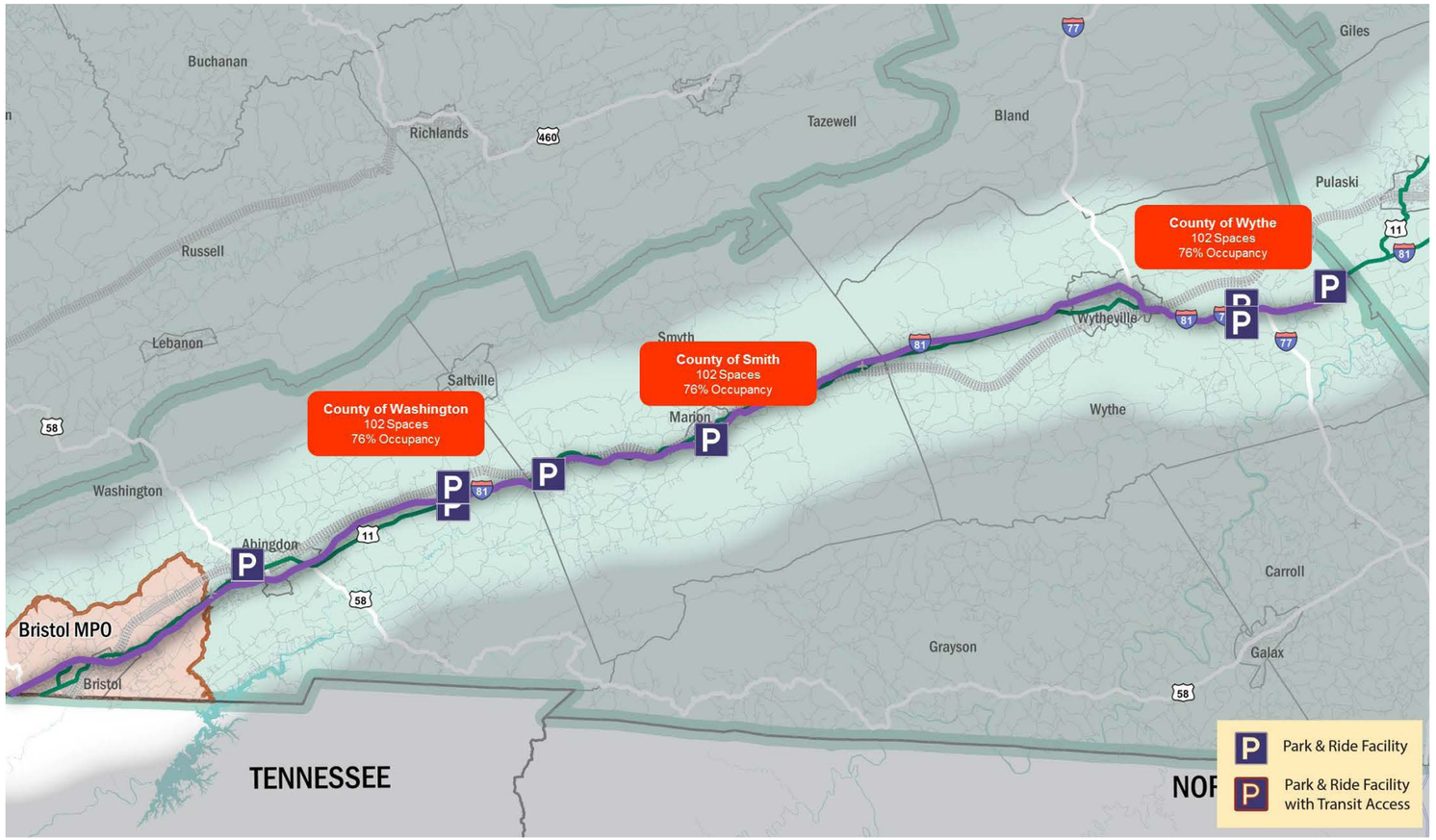
Via I-81: 1:50 Travel Time $70 Est. Cost

Bristol to Winchester

Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

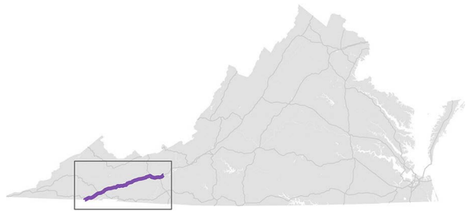
Via I-81: 4:30 Travel Time $176 Est. Cost



B1 SEGMENT NEEDS

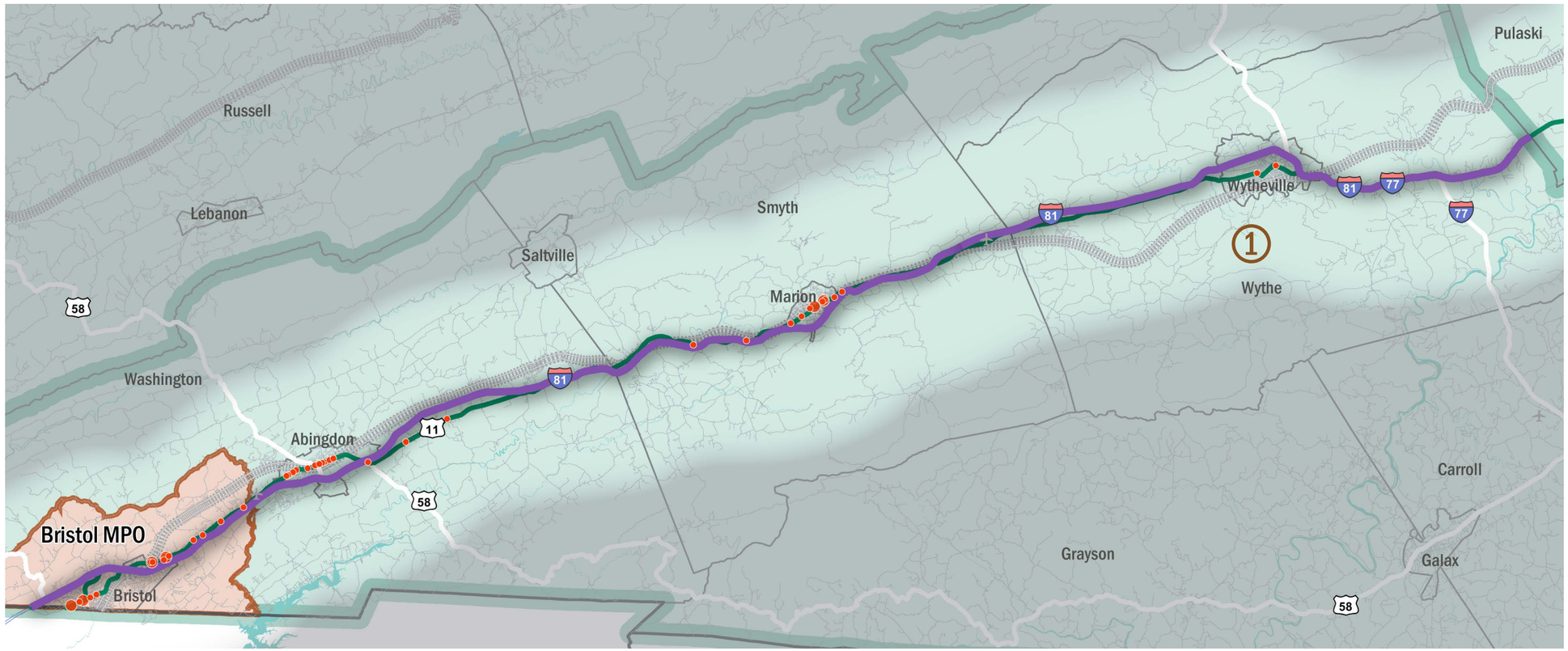
Safety

Between 2010 and 2012, 180 severe crashes occurred on Segment B1, the second highest total on the Crescent Corridor. There are several areas along Segment B1 which have experienced high concentrations of severe crashes. In the southernmost portion of Segment B1, a 1.9 mile portion of US 11 (Euclid Avenue) had 28 collisions between Chester Street and West State Street in Bristol. An approximately 1.3-mile stretch of US 11 (Lee Highway) in Bristol, between Underpass Road and Resting Tree Drive, experienced 31 crashes. Along US 11 (Main Street) in Abingdon, there were 39 incidents that occurred along a span of approximately 2.8 miles between Virginia Highlands Community College and Trigg Street. In Marion, along US 11 (Main Street), 38 collisions occurred over a distance of about 3.5 miles between Washington Avenue and Rifton Drive; of the 38 collisions, eight occurred at the intersection with Route 16 (Park Boulevard). No large concentrations of crashes were recorded along I-81 in Segment B1.



Performance Metrics

Number of Severe Crashes	180
Severe Crashes/Million VMT	0.4
Number of Railroad Crashes	1



Fatality and Injury Crashes (2010 - 2012)

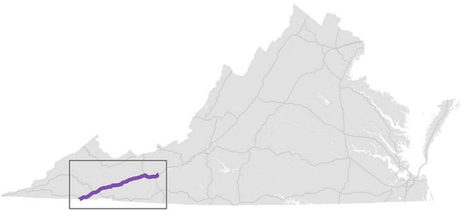
- < 5
- 5 - 10
- 11 - 15
- 16 - 20
- > 20

Railroad Incidents/Accidents per County (2011-2014)

#

B1 SEGMENT NEEDS

Congestion



Performance Metrics

Person Hours of Delay per Mile	4
Freight Ton Hours of Delay per Mile	30K

Passenger Delays

Passenger delays along Segment B1 are generally quite minimal, with approximately 750 person-hours of delay for the entire segment. Areas experiencing significant levels of congestion for passengers include I-381 in the City of Bristol and on US 11 near Abingdon. Peak-period passenger delays account for 44 percent of daily congestion, which is close to the average for the peak-period share of congestion on other CoSS segments.

Freight Delays

Unlike for passenger traffic, there is significant freight delay along Segment B2 with nearly 6.5 million ton-hours of delay experienced on the segment, although delays per mile are lower than average for CoSS segments. The majority of the corridor segment has minimal freight delays, but significant delays occur along several portions of US 11 between Bristol and Abingdon. In particular, freight delays approach 1,390,000 ton-hours per mile at the intersection of US 11 and Route 659 in Bristol. Peak-period freight delays account for about 38 percent of daily congestion, which is just about average for the peak-period share of congestion on 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

Reliability

Weekday Peak

Reliability of travel during the peak period on a typical weekday on Segment B1 ranges from 0.00 to 0.39 in terms of reliability index, with an average value of 0.05. None of the locations along Segment B1 have reliability index values exceeding the statewide threshold.

Weekday

Reliability of travel during a typical weekday ranges from 0.00 to 0.49 in terms of reliability index, with an average value of 0.05. A short stretch of US 11 in Bristol (less than one-tenth of a mile) has a reliability index value exceeding the statewide threshold.

Weekend

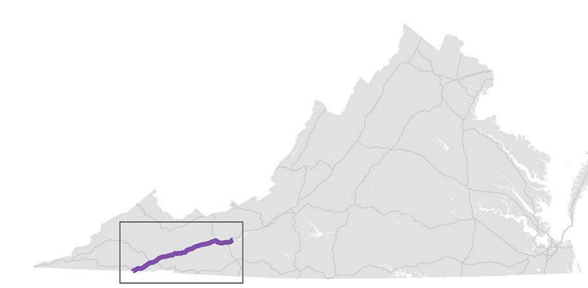
Reliability of travel during a typical weekend ranges from 0.00 to 0.56 in terms of reliability index, with an average value of 0.05. None of the locations along Segment B1 have reliability index values exceeding the statewide threshold.

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 unreliabile. The following are the reliability index thresholds:

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



Summary of Needs

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

Redundancy

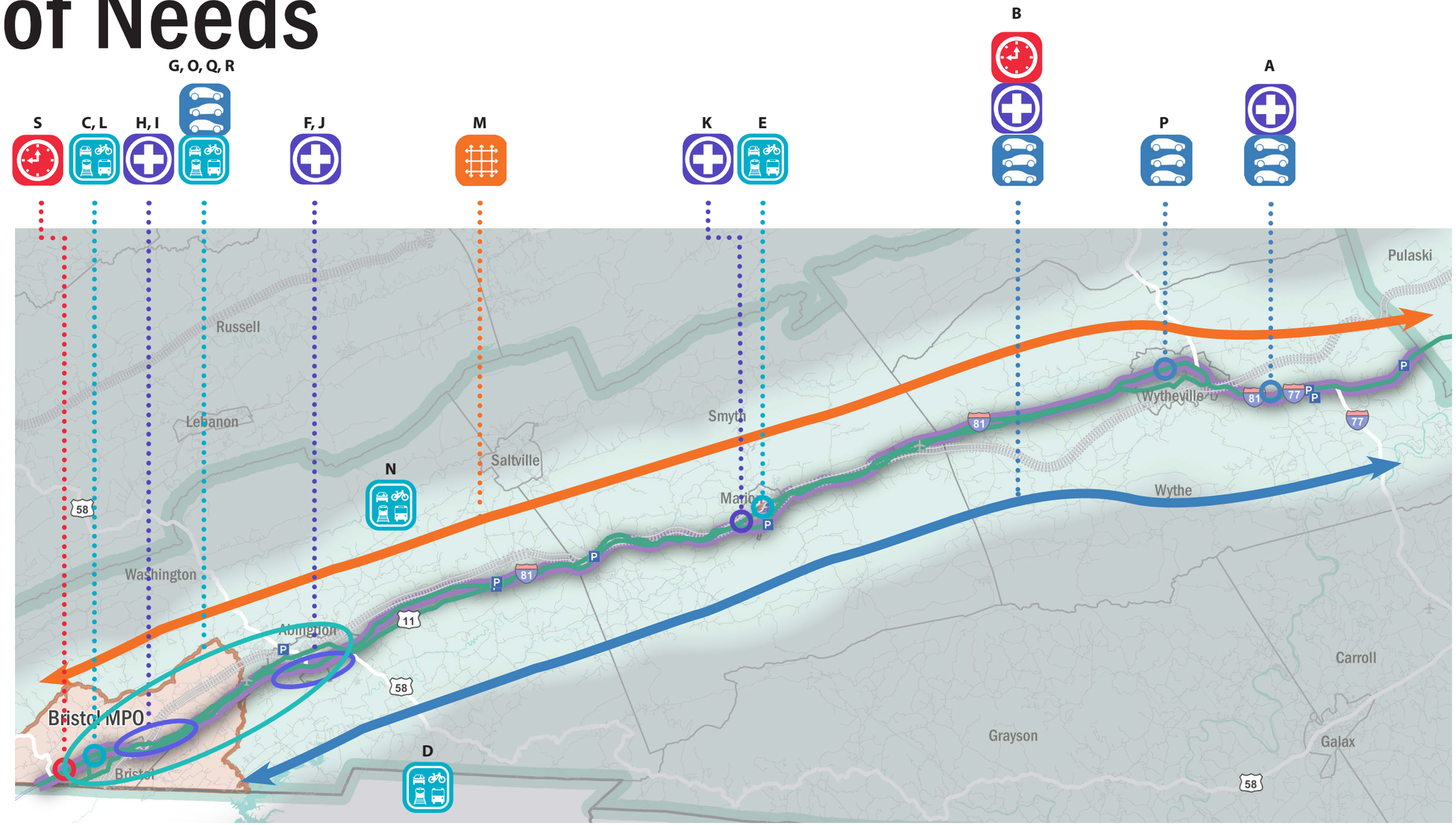
Mode Choice

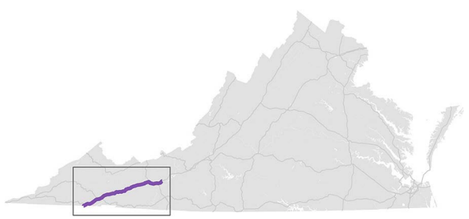
Safety

Congestion

Bottlenecks

Reliability



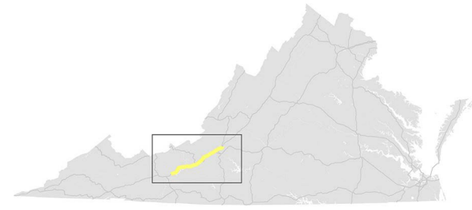


B1 SEGMENT NEEDS

Summary of Needs - B1 Segment

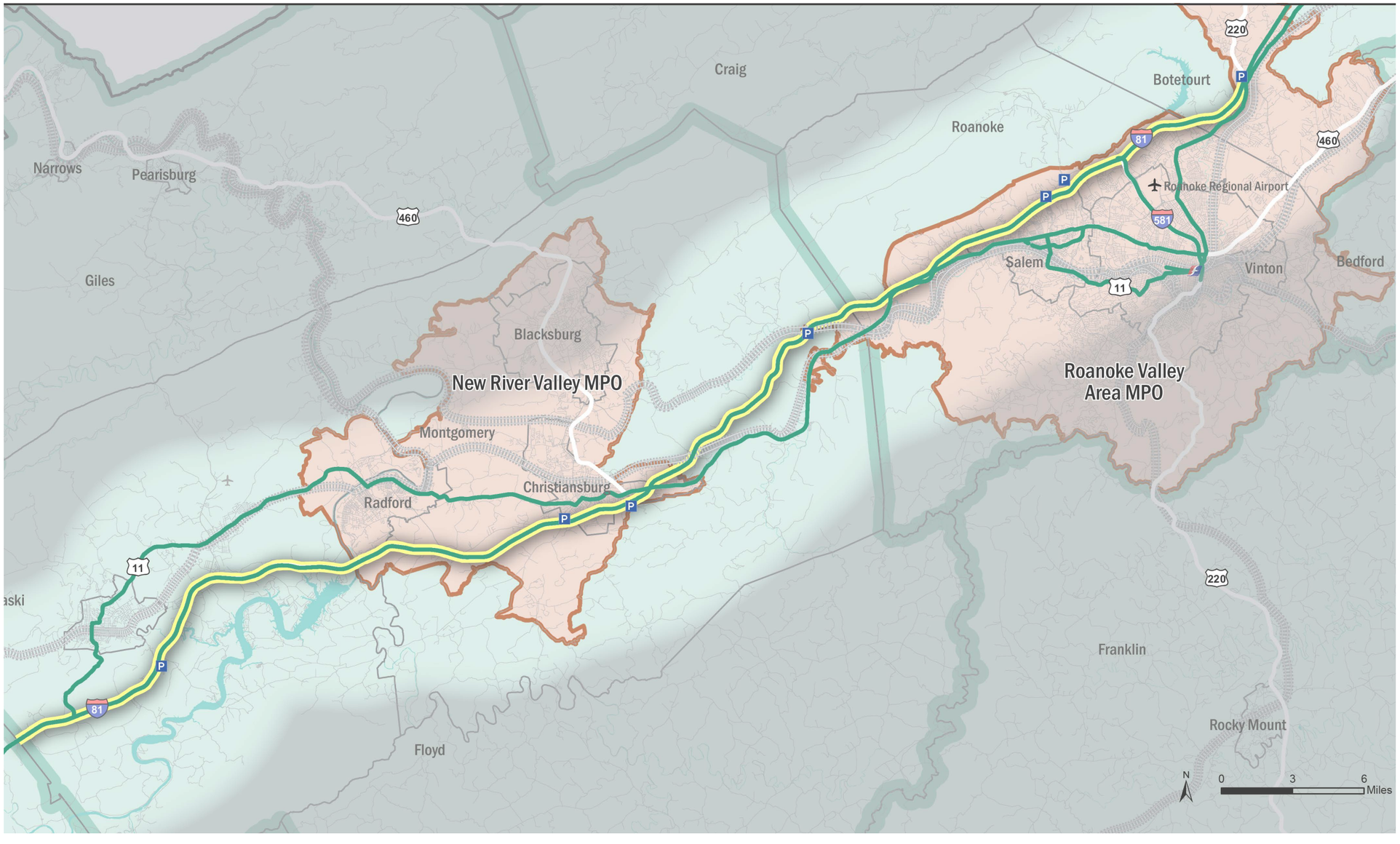
A.	Inadequate climbing lanes for trucks on I-81 through Wytheville can cause backups
B.	High levels of truck traffic can cause congestion, safety, and reliability concerns along entire segment. No intermodal freight facilities located in this area make rail freight less comparable as a mode choice.
C.	No passenger rail connections north (to Roanoke) or south (to Atlanta) from Bristol
D.	Tri-Cities Airport (in Tennessee) is the commercial airport for the entire region but has few flight options
E.	Transit in the region has limited range and limited operating hours.
F.	Safety concerns on I-81 at Exits 14-19 in Abingdon
G.	Lack of commuter park-and-ride lots in both VA and TN near Bristol and Abingdon.
H.	US 11 between Chester Street and West State Street in Bristol: 28 severe crashes
I.	US 11 between Underpass Road and Resting Tree Drive in Bristol: 31 severe crashes
J.	US 11 in Abingdon: 39 severe crashes
K.	US 11 in Marion: 38 severe crashes, especially between Washington Avenue and Rifton Drive
L.	No bus or rail service available from Bristol to other cities in the corridor
M.	Ability for US 11 to serve as a parallel highway facility limited by speed and capacity
N.	Park and Ride locations in Washington County match statewide average for utilization
O.	Congestion issue on US 11 between I-81 in Bristol and Abingdon
P.	Congestion issue at I-81 Exit 70 (US 52/US 21)
Q.	Congestion issue at I-81 Exit 14 (Old Jonesboro Road)
R.	Congestion issue at US 11 and VA Route 381 (Commonwealth Avenue) in Bristol
S.	Reliability issue at US 11 and Clear Creek Road/Old Airport Road in Bristol

III. Segment B2



Corridor Segment B2 Components

- I-81
- US 11
- US 11 Alt
- I-581
- Norfolk Southern Crescent Corridor
- Roanoke Regional Airport



Segment B2

Corridor Component Road
Railroad
Airport Facility
Amtrak Facility
Greyhound Facility
VRE Facility
Metrorail Facility
Port Facility
Park & Ride Facility

MPO Area
Planning District Area

B2 SEGMENT PROFILE

Segment B2 begins at the boundary of Wythe County and progresses north through the Cities of Radford, Salem, and Roanoke, and Pulaski, Montgomery, and Roanoke Counties, and ends in Botetourt County at the interchange with US 220. The segment travels through the Roanoke Valley Area and the New River Valley Area. The segment includes and overlaps with portions of Route 100, US 11, US 11-Alt, US 220, and US 460. Segment B2 acts as a major corridor for through freight travel in Virginia and also connects smaller urban areas, such as Radford, Christiansburg, Salem, and Roanoke, as well as multiple natural, historical, and cultural resources.

Highway Facilities: I-81 is primarily a four-lane rural highway in Segment B2. I-581, a spur of I-81, serves the City of Roanoke with a six-lane cross section. When not running concurrently with I-81 for short distances, US 11 runs parallel to I-81 throughout the corridor as a two or four lane roadway.

Transit Services: The Smartway Bus provides transit service between Blacksburg and Roanoke. Greyhound offers service from Roanoke and Megabus offers service from Christiansburg. Several Park-and-Ride locations are in close proximity to I-81, with multiple locations near Christiansburg and Roanoke.

Rail Facilities: Norfolk Southern rail lines pass through Segment B2 connecting locations south and west of the Virginia Inland Port, near Corridor B south of Winchester. Several short line railroads also provide service to Segment B2.

Port Facilities: No port facilities are located directly adjacent to Segment B2, but the Crescent Corridor does provide direct access to the Virginia Inland Port south of Winchester.

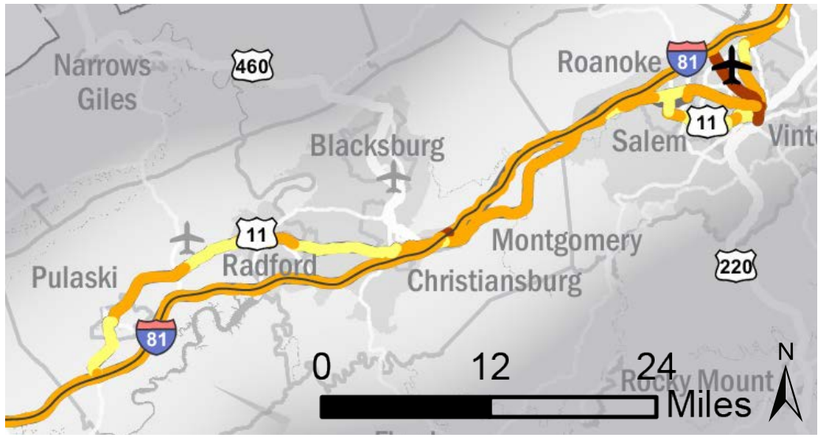
Airport Facilities: Commercial air service is available at the Roanoke Regional Airport. Two general aviation facilities are also present near Segment B2.

Major planned and future projects include:

- Widening Route 603 (North Fork Rd) between I-81 and Route 11/460 (which runs south of the segment) to improve connectivity.

Number of Lanes (both directions)

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



Future Projects

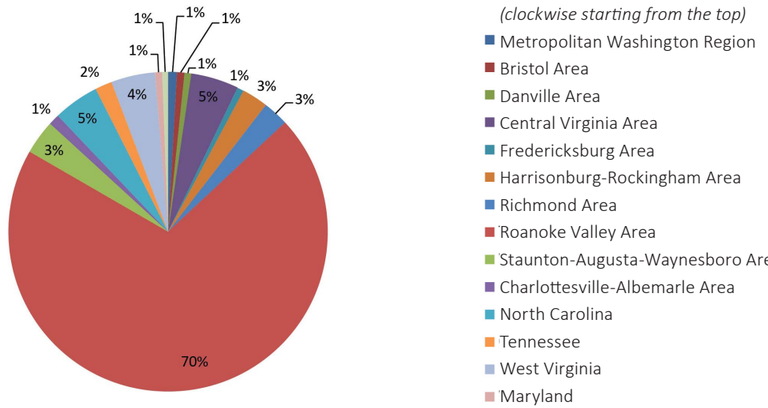
Reconstruction with added capacity
Safety improvements
Primary facility

Travel Demand

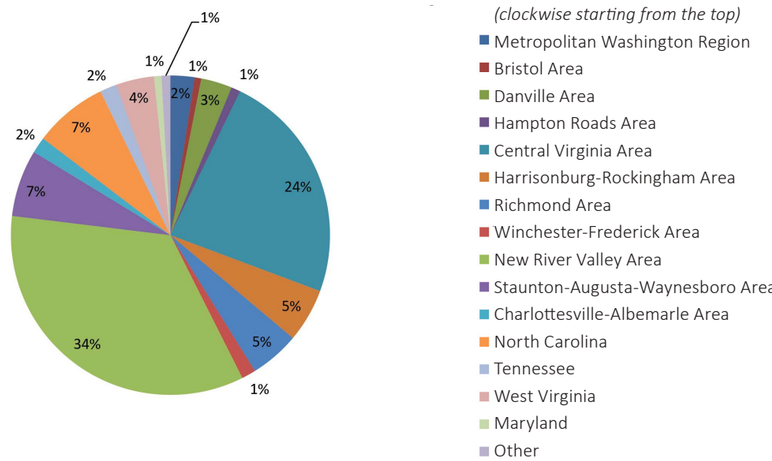
Passenger Demand

Segment B2 connects the New River Valley and Roanoke Valley Areas. Travel between these MPO Areas accounts for approximately two percent of intercity travel in the state and the majority of intercity travel originating in both of these MPO Areas. As shown, travel from the New River Valley Area to the Roanoke Area accounts for 70 percent of New River Valley's intercity travel, while Lynchburg accounts for another five percent. Similarly, 34 percent of the intercity traffic originating in the Roanoke Area is destined for the New River Valley Area.

Travel from New River Valley Area to...



Travel from Roanoke Valley Area to...



B2 SEGMENT PROFILE

Freight Demand

By truck, Segment B2 carried 79 million tons of freight worth $151 billion in 2012, and is estimated to carry 105 million tons of freight worth $226 billion in 2025. The major truck freight flows in Corridor B are interstate through-traffic, accounting for approximately 60 percent of truck freight tonnage in the corridor and over 75 percent of the total truck freight value. There is significant truck freight traffic along Corridor B between North Carolina and Ohio, accounting for four percent of the total truck corridor freight tonnage and value. By tonnage, Pennsylvania and Tennessee are also significant generators of truck freight along Corridor B. Around eight percent of the total truck freight on Corridor B, by value, is destined for New York, while another six to eight percent of truck freight heads to non-U.S. North American destinations. In terms of tonnage, between five and six percent of the total truck freight on Corridor B either originates from or is destined for jurisdictions adjacent to Segment B2. Freight traveling from North Carolina to Pulaski County accounts for nearly one percent of the total truck freight tonnage in the corridor The City of Roanoke, also located adjacent to Segment B2, attracts one percent of the total truck freight value on Corridor B, with a large proportion of that truck freight arriving from Pennsylvania and Ohio.

By rail, Segment B2 carried 51 million tons of freight worth $40 billion in 2012, and is estimated to carry 57 million tons of freight worth $53 billion in 2025. In terms of tonnage, the largest rail freight flows in Corridor B consist of low-value freight traveling from West Virginia to North Carolina, accounting for between 18 and 22 percent of the total rail freight corridor tonnage in 2012 and 2025, respectively. The City of Norfolk and its port facility is a major destination of rail freight in Corridor B, accounting for between 18 and 20 percent of the total corridor tonnage, with major rail freight flows originating in West Virginia, Wise County, and Buchanan County. In terms of value, rail freight flows between Illinois and the Cities of Norfolk and Portsmouth (and their port facilities) are the largest in Corridor B, accounting for more than 20 percent of the total rail freight value in the corridor. The City of Roanoke is a major attractor of rail freight in Segment B2, accounting for one percent of the total corridor value.

Truck Freight

Major Origins (by Tonnage)
1. Virginia (25% / 23%)
2. North Carolina (13% / 12%)
3. Pennsylvania (8% / 8%)
4. Ohio (6% / 7%)
5. Tennessee (6% / 6%)

Corridor Tonnage Originating in Segment B2: 5% / 5%

Major Origin-Destination Pairs for Freight
North Carolina and Ohio
North Carolina and Pennsylvania
North Carolina and West Virginia
Ohio and Florida
North Carolina and Indiana

Percentages represent 2012 / 2025 values.

Major Destinations (by Tonnage)
1. Virginia (22% / 22%)
2. North Carolina (14% / 15%)
3. Pennsylvania (8% / 8%)
4. New York (6% / 6%)
5. Tennessee (4% / 5%)

Corridor Tonnage Destined for Segment B2: 5% / 6%

Rail Freight

Major Origins (by Tonnage)
1. Virginia (31% / 28%)
2. West Virginia (30% / 26%)
3. Wise County (12% / 10%)
4. Illinois (8% / 10%)
5. Ohio (6% / 8%)

Corridor Tonnage Originating in Segment B2: 1% / 2%

Major Origin-Destination Pairs for Freight
West Virginia and North Carolina
City of Norfolk* and West Virginia
Wise County and City of Norfolk*
Ohio and North Carolina
Illinois and North Carolina

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

Major Destinations (by Tonnage)
1. Virginia (38% / 37%)
2. North Carolina (35% / 35%)
3. City of Norfolk* (20% / 17%)
4. Tennessee (4% / 3%)
5. Georgia (3% / 3%)

Corridor Tonnage Destined for Segment B2: 2% / 2%

Traffic Conditions

Traffic Volume and AADT

Some of the highest traffic volumes in Corridor B are in sections of Segment B2 along I-81 and I-581 in Roanoke. In Roanoke County along I-81, average daily traffic volumes range from 48,000 to 67,000 vehicles while volumes on I-81 in Pulaski and Montgomery Counties range from 37,000 to 48,000 vehicles. In the City of Roanoke along I-581, average daily traffic volumes range from 46,000 to 77,000 vehicles, with the sections with the highest volumes located near the I-581/US 11 interchange. Average daily volumes on US 11/US 460 in Roanoke and Roanoke County typically range from 12,000 to 18,000 vehicles, and are typically between 7,000 and 16,000 vehicles on US 11 in Pulaski and Montgomery Counties. Traffic volumes on Segment B2 are forecasted to increase by 2025, with the largest increases in average daily traffic volumes occurring along I-81 near Roanoke. By 2025, almost all sections of I-81 in Montgomery and Roanoke Counties are forecasted to carry more than 50,000 vehicles per day. By 2025, the section of I-81 just south of the I-81/I-581 interchange is forecasted to have an average daily traffic volume of 80,000 vehicles.

Traffic Volume 2014 (AADT)

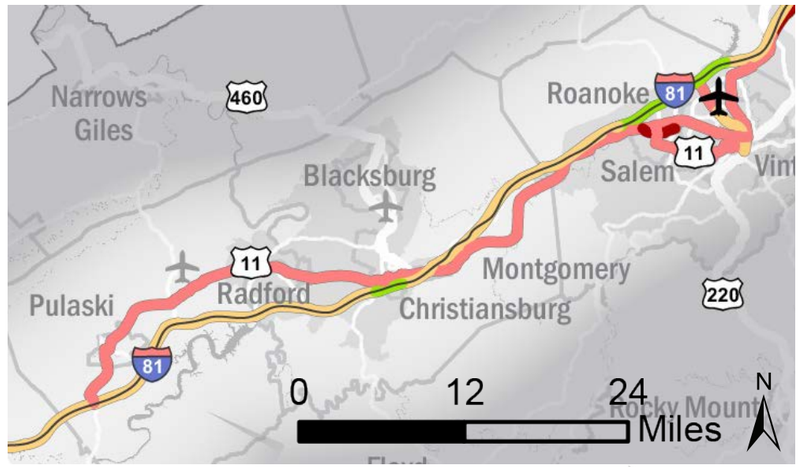
- < 10,000
- 10,000 - 50,000
- 50,000 - 100,000
- 100,000 - 200,000
- > 200,000
- Primary facility

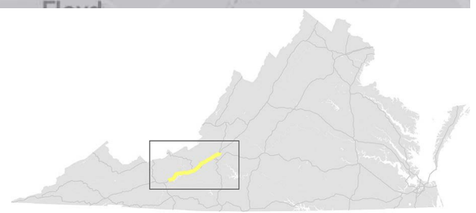
Traffic Volume 2025 (AADT)

- < 10,000
- 10,000 - 50,000
- 50,000 - 100,000
- 100,000 - 200,000
- > 200,000
- Primary facility

Change in Traffic Volume 2014- 2025 (AADT)

- Decreased
- 0 - 5,000
- 5,000 - 10,000
- 10,000 - 20,000
- > 20,000
- Primary facility





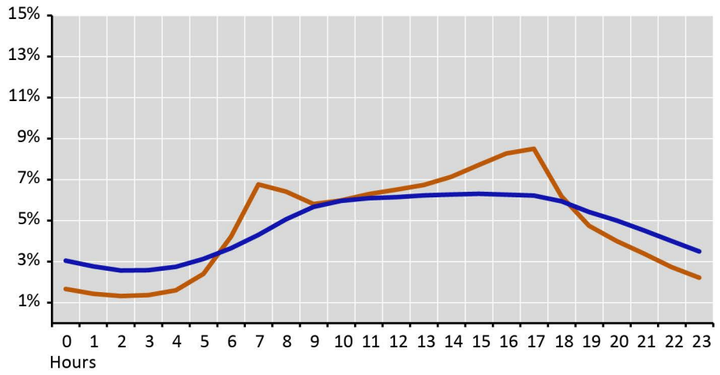
B2 SEGMENT PROFILE

Traffic Distribution

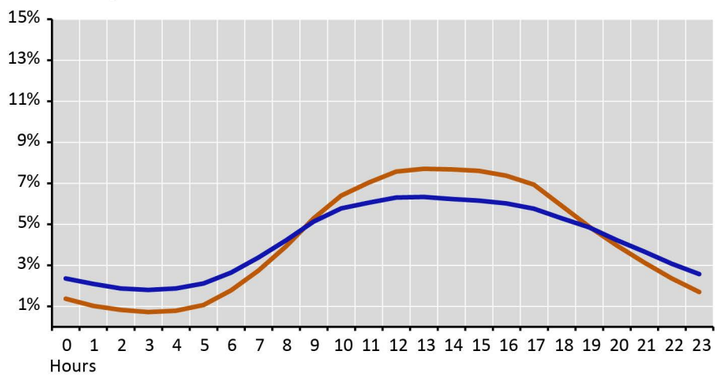
On average, traffic on Segment B2 is distributed throughout the day as shown in the graphs below. Weekday traffic shows two peak periods over the course of the day, with the highest hourly traffic occurring between 5 and 6 p.m. which accounts for 7.9 percent of daily traffic. The morning peak hour is less busy, with the 7 to 8 a.m. hour accounting for 6.2 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 49 percent of total daily traffic. Peaking patterns for truck traffic are different from general traffic, with a relatively steady flow of trucks during the midday period between 9 a.m. and 6 p.m. Weekend traffic patterns are also different from the typical commute patterns, showing a single midday peak between 11 a.m. and 6 p.m., with the highest percentage of hourly traffic occurring between noon and 1 p.m. (7.7 percent of daily traffic) for all traffic, and noon to 2 p.m. (6.3 percent of daily traffic per hour) for truck traffic.

Weekday traffic volumes on Segment B2 vary by as much as 32 percent throughout the year, with the highpoint in August (around 65,000 vehicles per day) and the low point in January (around 49,000 vehicles per day). Truck volumes vary less than passenger volumes throughout the year, with the June high (around 12,400 vehicles per day) being 19 percent higher than the January low (around 10,400 vehicles per day). Weekend traffic levels also vary over the course of the year, with a marked decrease during the winter months (41 percent lower in February than August). Weekend truck traffic is marginally more steady than all vehicle traffic, and includes a marked dip during July. Truck volumes account for a significant portion of traffic on Segment B2 (20 percent of overall daily traffic for weekdays and 17 percent of overall daily traffic for weekends); as a result, truck traffic has a significant impact on overall traffic conditions.

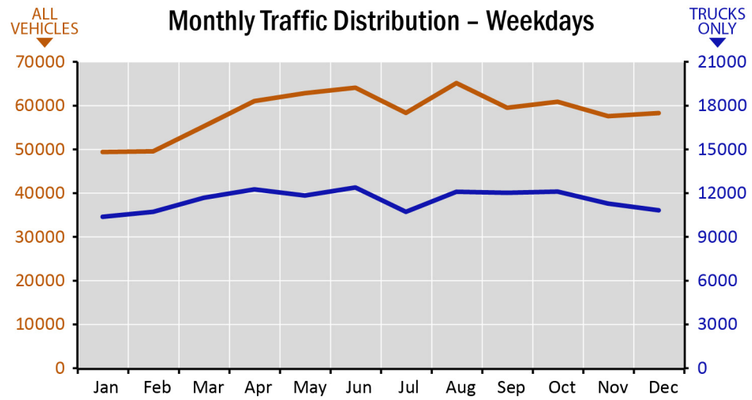
Hourly Traffic Distribution – Weekdays



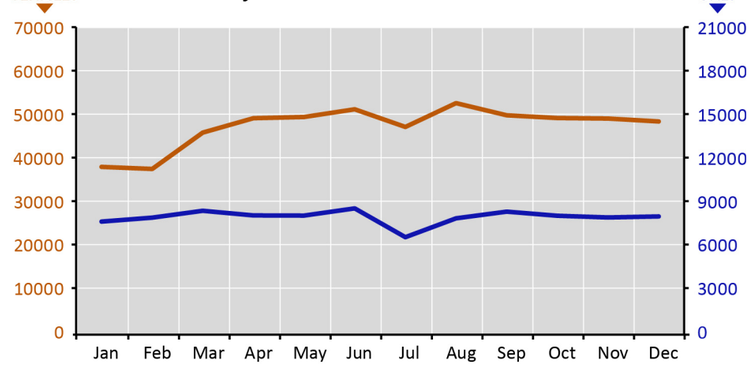
Hourly Traffic Distribution – Weekends



Monthly Traffic Distribution – Weekdays



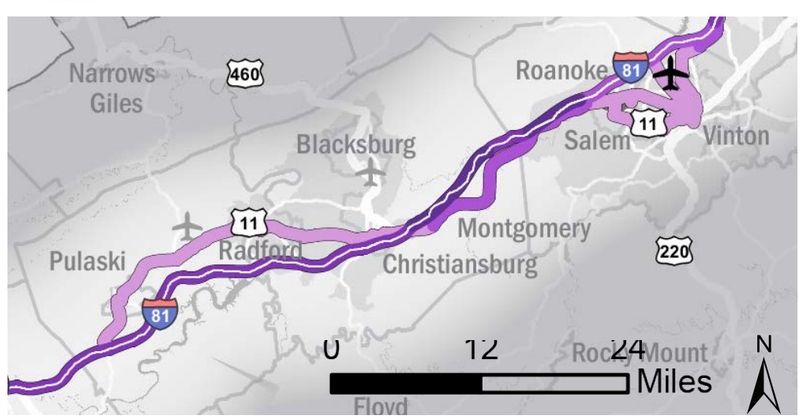
Monthly Traffic Distribution – Weekends



All Vehicles
Trucks

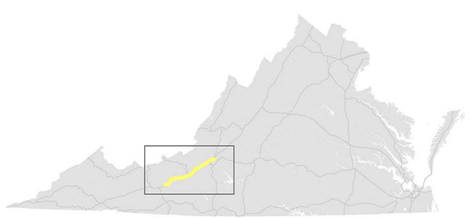
Truck Volume

The percent of average daily traffic comprised of heavy trucks on Segment B2 is high relative to other segments in Corridor B and in the Commonwealth as a whole. Heavy trucks comprise 9 to 18 percent of total vehicle traffic on I-81, with the highest truck percentages occurring between Christiansburg and Salem. Trucks comprise less than nine percent of daily traffic on US 11, with the highest percentage occurring on US 11 in Botetourt County.



Percent Heavy Trucks

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

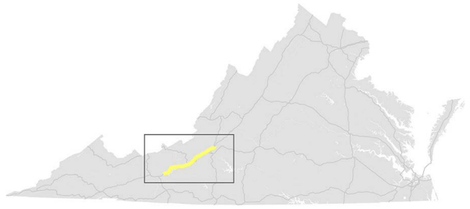


B2 SEGMENT PROFILE

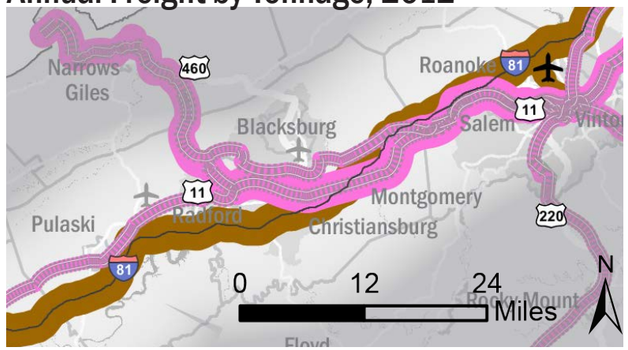
Freight Flows

Near Christiansburg, the majority of freight moves by truck, in terms of both tonnage and value. In total, 75 million tons (60 percent) of freight travel through the Christiansburg section of Segment B2 by truck, compared to 51 million tons by rail. By value, the difference is even starker, with $146 billion (78 percent) of freight value traveling by truck, compared to $40 million by rail. On average, a ton of freight traveling through this section of Segment B2 by truck is worth $1,949 while a ton of freight traveling by rail is worth $793. In 2025, both rail and truck freight tonnages and total values in the Christiansburg area are expected to increase, and the percentage of the freight that travels by truck is expected to increase slightly to 64 percent by tonnage and 81 percent by value. Value per ton on both trucks and rail is expected to grow by 2025, with an average of $2,174 per ton on trucks and $935 on rail.

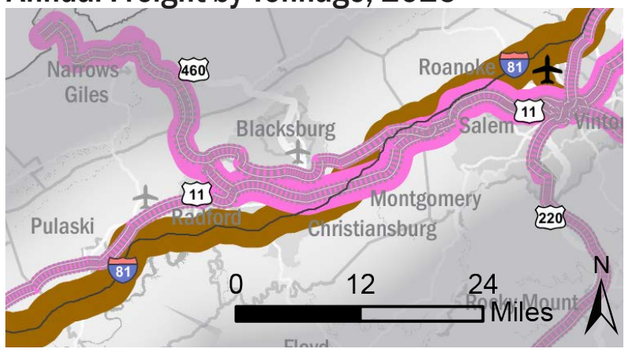
At the northern end of Segment B2, north of Roanoke, freight is also moved primarily by truck, in terms of both tonnage and value. In total, 78.5 million tons (96 percent) of freight is moved through this section of Segment B2 by truck, compared to four million tons by rail. By value, the difference is the same, with $151 billion (96 percent) of freight value traveling by truck, compared to $7 billion by rail. On average, a ton of freight traveling through this section of Segment B2 by truck is worth $1,926 while a ton of freight traveling by rail is worth $1,923. In 2025, both rail and truck freight tonnages and total values in the northern end of Segment B2 are expected to increase, but the percentages of tonnage and value moved by truck are expected to remain nearly the same. Values per ton of freight on trucks are expected to increase to $2,139 in 2025, while rail values per ton will drop slightly to $1,867.



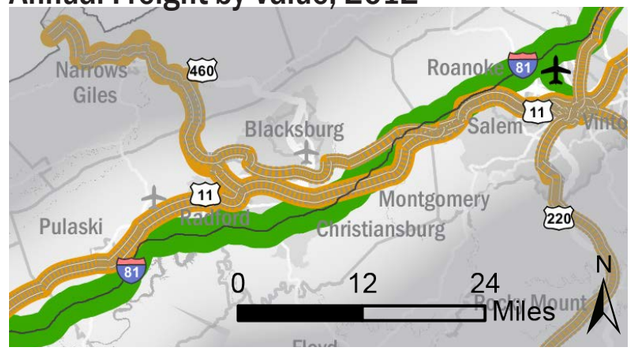
Annual Freight by Tonnage, 2012



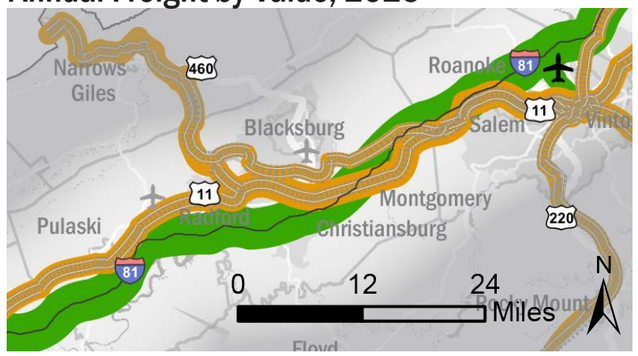
Annual Freight by Tonnage, 2025



Annual Freight by Value, 2012



Annual Freight by Value, 2025



Truck Freight (in tons)

- < 10M
- 10M - 25M
- 25M - 50M
- 50M - 100M
- > 100M
- Primary facility

Rail Freight (in tons)

- < 10M
- 10M - 25M
- 25M - 50M
- 50M - 100M
- > 100M
- Primary facility

Truck Freight

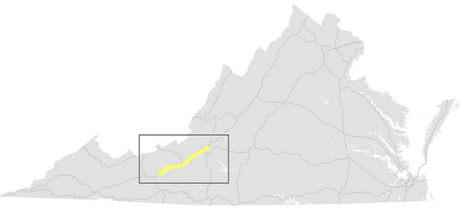
- < $10B
- $10B - $50B
- $50B - $100B
- $100B - $200B
- > $200B
- Primary facility

Rail Freight

- < $10B
- $10B - $50B
- $50B - $100B
- $100B - $200B
- > $200B
- Primary facility

B2 SEGMENT NEEDS

Redundancy and Mode Choice



Passenger trips on Segment B2 of the Crescent 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 for local access and bypassing incidents causing congestion on sections of I-81. Greyhound offers service from Roanoke and Megabus offers service from Christiansburg. The Smartway Bus provides transit service between Blacksburg and Roanoke, although it takes 67 percent longer than driving (in uncongested conditions).

Comparable Travel Options

Roanoke to Harrisonburg

Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 1:53 Travel Time $61 Est. Cost

Blacksburg / Christiansburg to Roanoke

Inter-City Bus	*Train*
13 Trips per Day 1:15 Travel Time $4 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 0:45 Travel Time $24 Est. Cost

Roanoke to Staunton

Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 1:20 Travel Time $49 Est. Cost

Bristol to Roanoke

Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 2:24 Travel Time $81 Est. Cost

Blacksburg / Christiansburg to Staunton

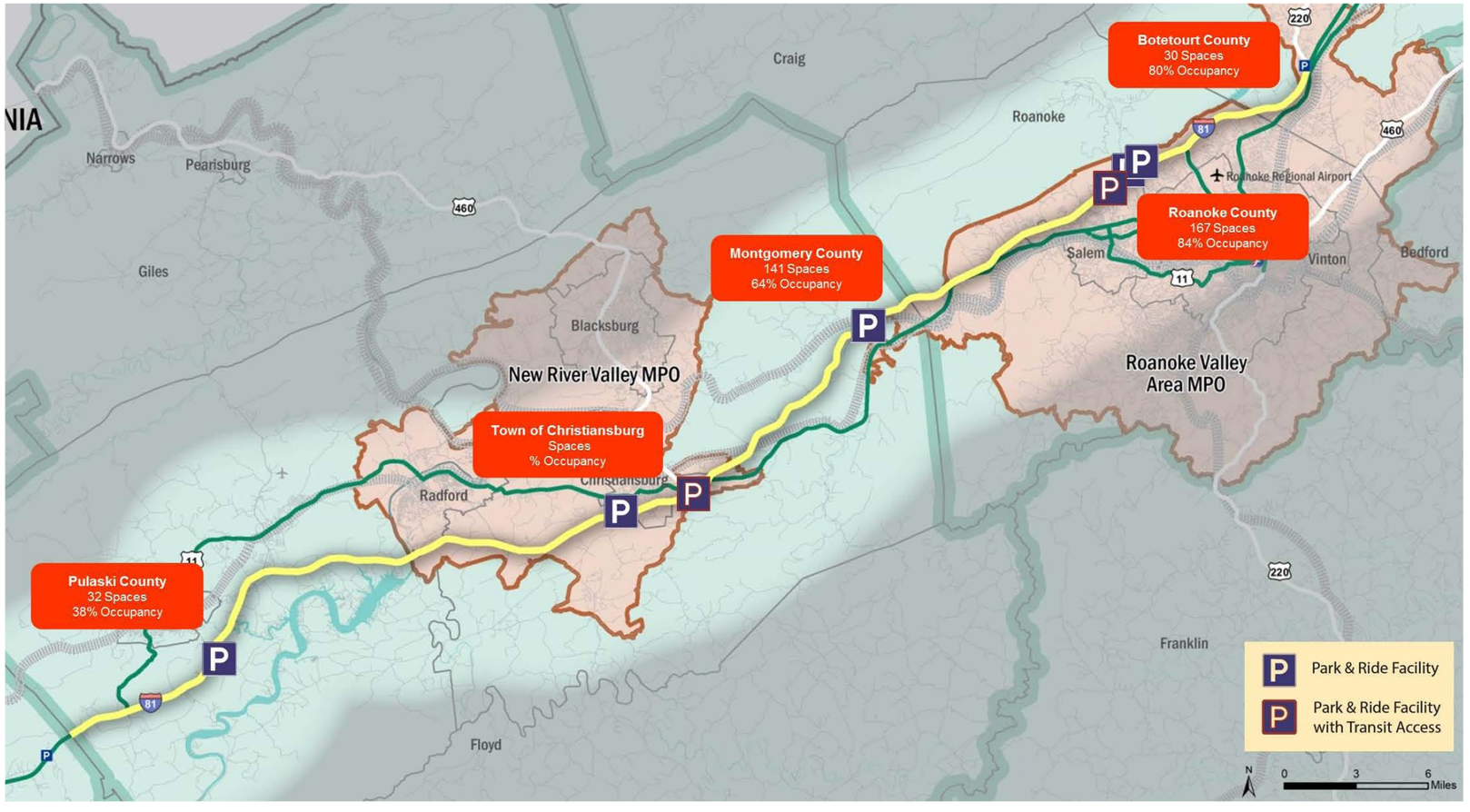
Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 2:05 Travel Time $66 Est. Cost

Park-and-Ride

Within Segment B2, commuters can utilize several Park-and-Ride locations. Roanoke County provides the highest number of Park-and-Ride spaces and the highest utilization rate of spaces in the region, while Montgomery County has the most Park-and Ride-locations. Roanoke County and Botetourt County both have higher utilization rates (84 percent and 80 percent, respectively) than the statewide average of 76 percent for Park-and-Ride utilization.



B2 SEGMENT NEEDS

Safety

Segment B2 experienced the highest number of severe crashes (293) between 2010 and 2014 resulting in the highest crash rate along the Coastal Corridor. In Radford, along US 11, 36 collisions took place within approximately 2.9 miles between Route 114 and Burlington Street, with 15 of these occurring at the intersection of US 11 (Lee Highway) and Route 114 (Peppers Ferry Boulevard). Along US 11/US 460 in Salem, 72 crashes occurred along a 1.6 mile stretch between Texas Hollow Road and Green Street (as noted for Segment E2). Of the 72 crashes, 12 crashes happened at the intersection with Route112 and 12 crashes occurred at the intersection with Mill Lane. Along US 11 in the City of Roanoke, 56 collisions took place along about 2.9 miles between Hawthorne Road NW and Pocahontas Avenue NE.

Performance Metrics

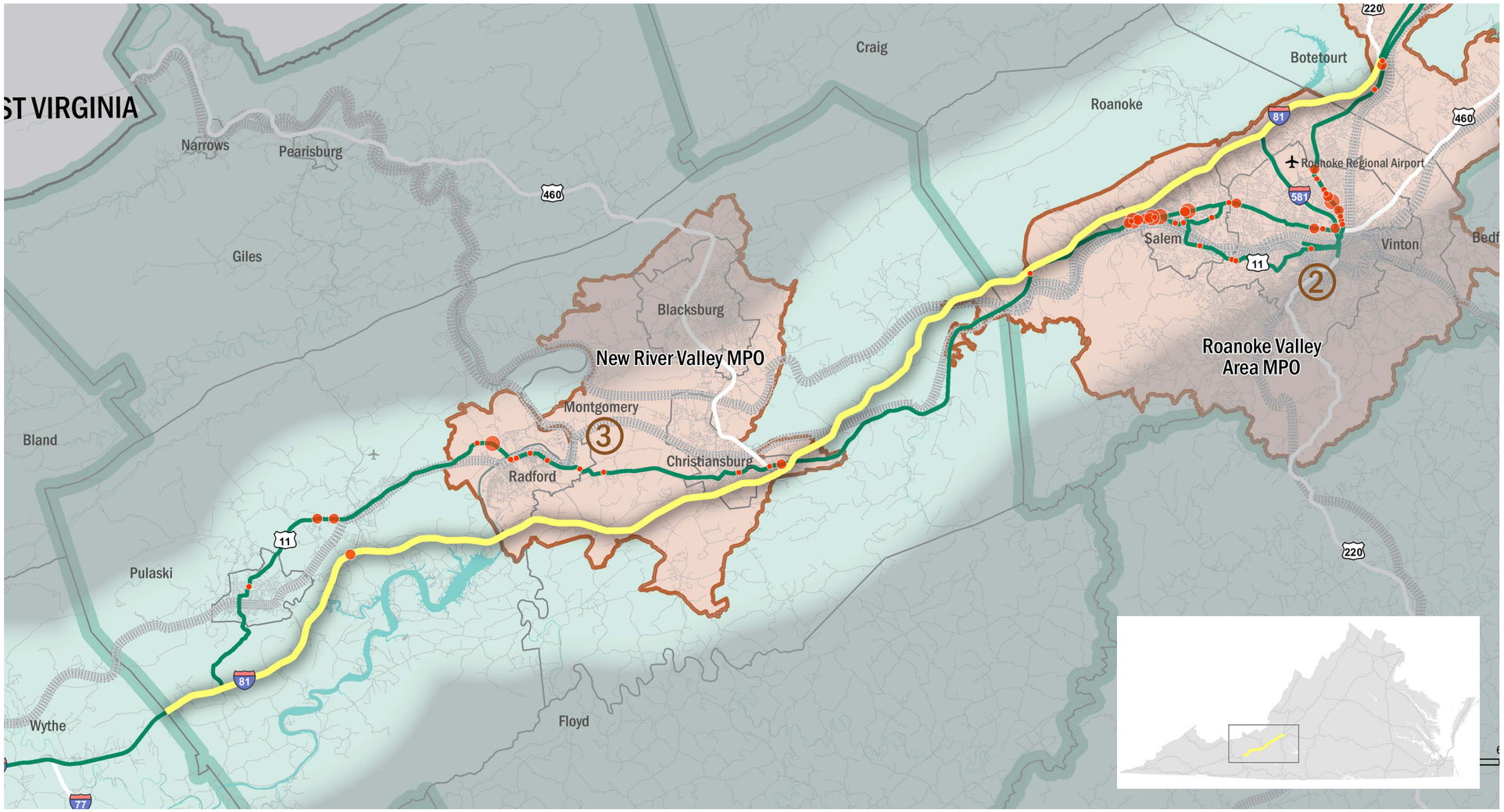
Number of Severe Crashes	293
Severe Crashes/Million VMT	0.6
Number of Railroad Crashes	5

Fatality and Injury Crashes (2010 - 2012)

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

Railroad Incidents/Accidents per County (2011-2014)

#



Congestion

Performance Metrics

Person Hours of Delay per Mile	9
Freight Ton Hours of Delay per Mile	68K

Passenger Delays

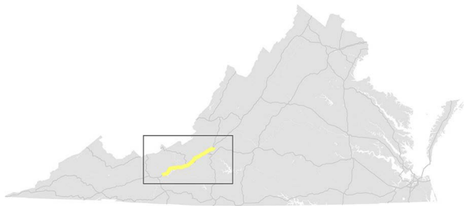
Segment B2 experiences the most passenger traffic congestion of any segment in the Crescent Corridor, with over 1,800 person-hours of passenger delay. However, congestion is not severe compared with other segments on other CoSS. Significant person-hours of delay per mile occur on portions of US 11 and US 11-Alt near downtown Roanoke, and on US 11 in the City of Salem. Peak-period passenger delays account for a little more than half of daily congestion, considerably more than the average peak-period share of congestion on other CoSS segments.

Freight Delays

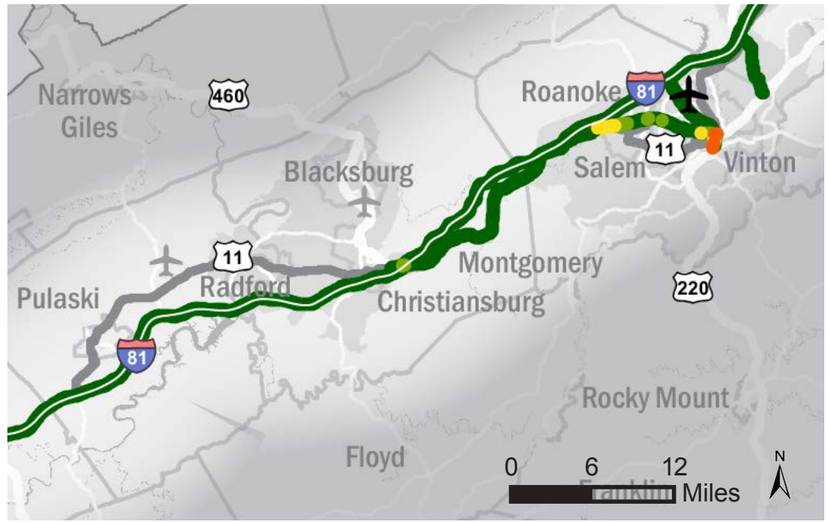
As with passenger congestion, Segment B2 experiences the most freight traffic congestion of all Corridor B segments, with over 13.8 million ton-hours. On a per-mile basis, the segment ranks third among all CoSS segments with congestion averaging nearly 68,000 ton-hours per mile. Areas with significant levels of freight delay include:

- US 11 between Christiansburg and Shawsville in Montgomery County;
- US 11 in Roanoke County west of Salem;
- On US 11 in the City of Salem, where freight delays approach 1,110,000 ton-hours per mile near downtown; and
- Portions of US 11 and US 11-Alt near downtown Roanoke.

Peak-period freight delays account for about 39 percent of daily congestion, close to the average for the peak-period share of congestion on other CoSS segments.

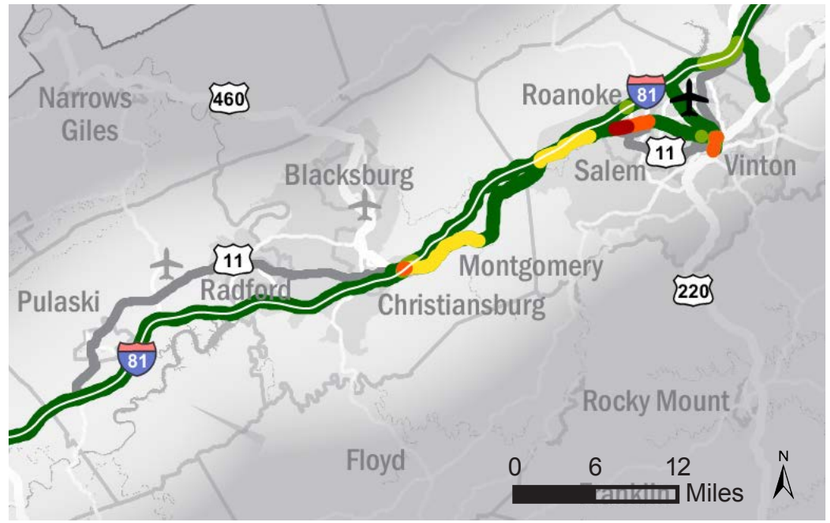


Daily Person Hours of Delay per Mile



< 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

Reliability

Weekday Peak

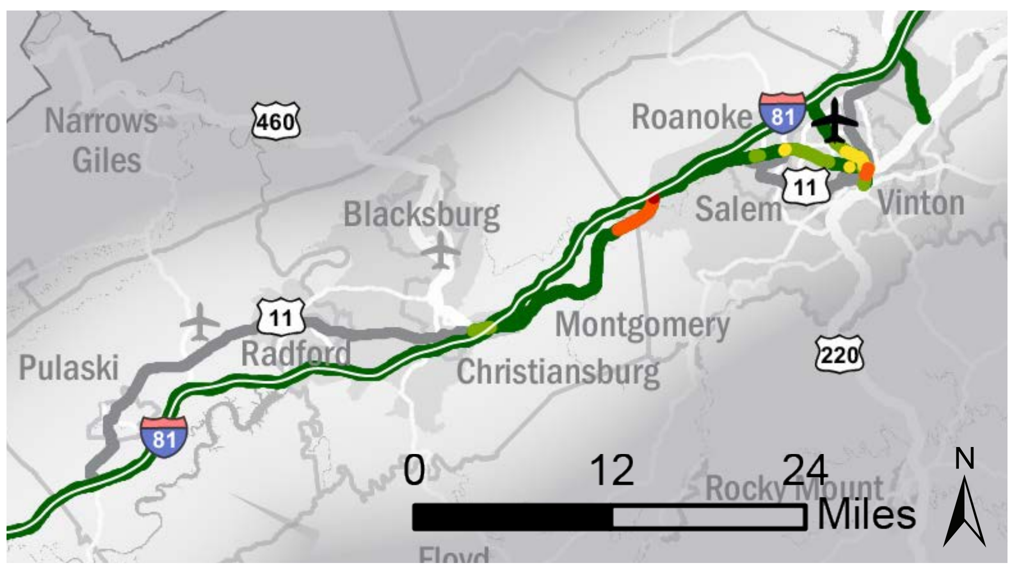
Reliability of travel during the peak period on a typical weekday on Segment B2 ranges from 0.00 to 1.0 in terms of reliability index, with an average value of 0.12. The reliability along Segment B2 is the worst among Corridor B segments. While the average weekday peak reliability index for this segment is approximately average for the state, only a short segment on US 11 at the intersection with Route 647 in Roanoke County has a reliability index value exceeding the statewide threshold.

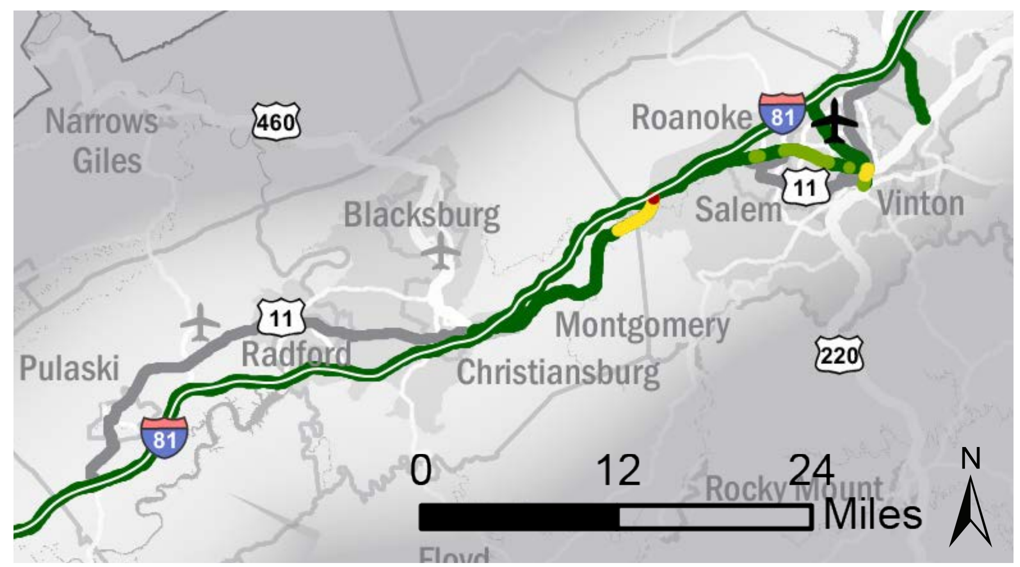
Weekday

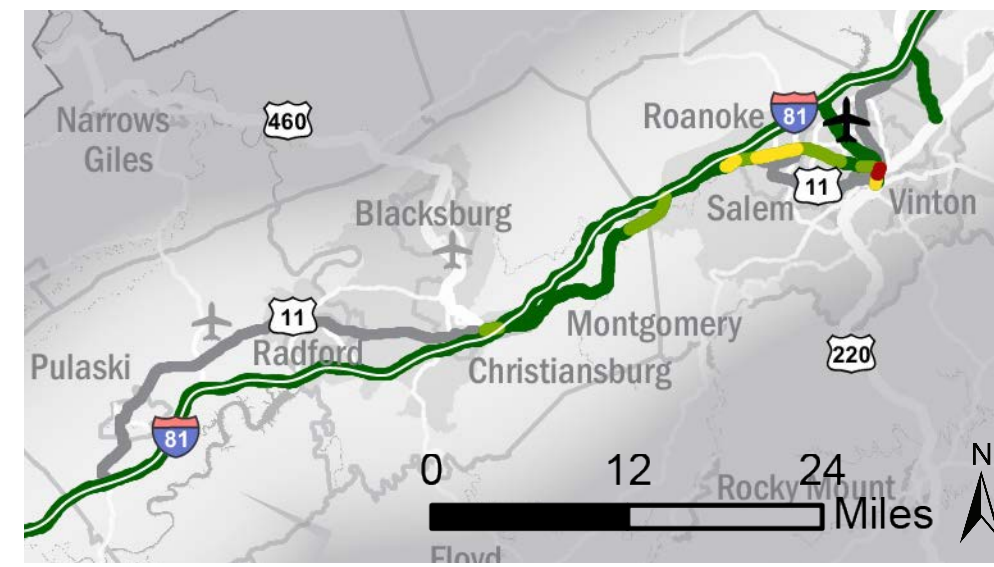
Reliability of travel during a typical weekday ranges from 0.01 to 0.89 in terms of reliability index, with an average value of 0.09. Locations where the weekday reliability index exceeds the statewide threshold include a portion of US 11 between Route 647 and Route 603 in Roanoke and Montgomery Counties and a segment on US 11 near I-581 in the City of Roanoke.

Weekend

Reliability of travel during a typical weekend ranges from 0.00 to 0.95 in terms of reliability index, with an average value of 0.10. While this segment does have a weekday reliability index higher than average for the CoSS segments statewide, only one location has a weekend reliability index over the statewide threshold: a short segment on US 11 near I-581 in the City of Roanoke.





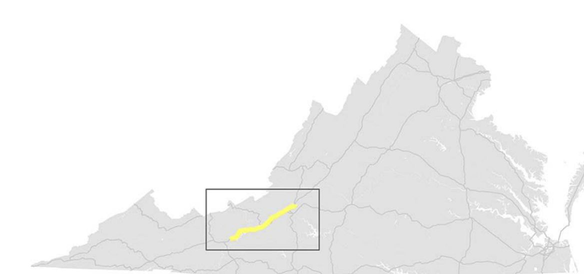


Reliability Index

- < 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 unreliabile. The following are the reliability index thresholds:

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

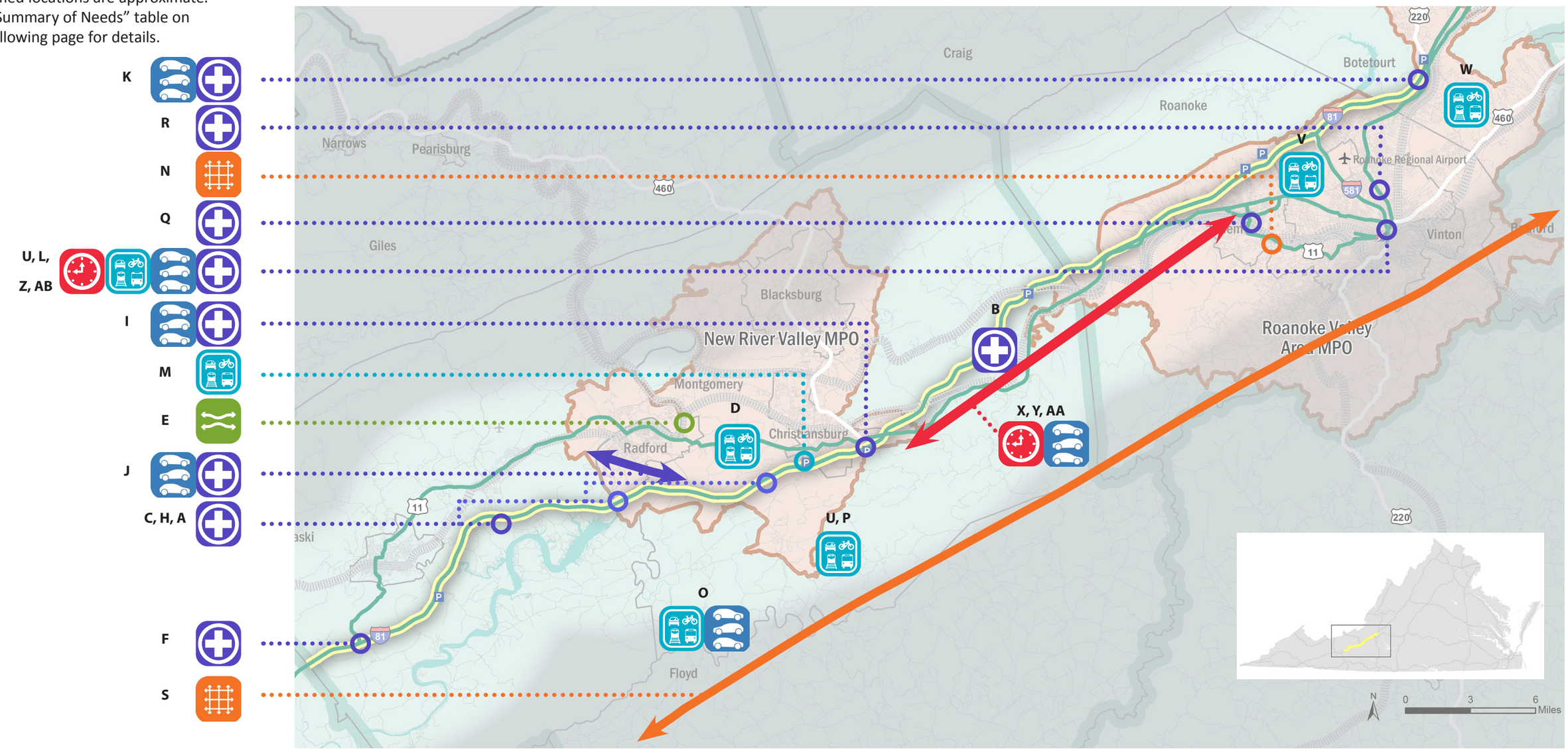


B2 SEGMENT NEEDS

Summary of Needs

Mode Choice | Redundancy | Safety | Congestion | Bottlenecks | Reliability

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



B2 SEGMENT NEEDS

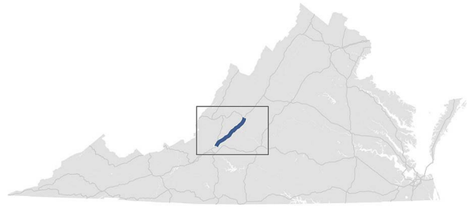
Summary of Needs - B2 Segment

A.	Inadequate climbing lanes for trucks on I-81 Northbound
B.	Inadequate climbing lanes for trucks on I-81 Northbound
C.	Poor acceleration/decceleration lanes on I-81 near exit 98 results in slow traffic and safety conflicts with trucks
D.	Lack of year-round transit options between Pulaski/Dublin and Radford
E.	Rail capacity (single track) at intersection of NS Heartland and Crescent corridors will be insufficient to accommodate future demand
F.	Poor acceleration/decceleration lanes on I-81 near exit 89 (US 11) results in slow traffic and safety conflicts with trucks
G.	Poor acceleration/decceleration lanes on I-81 near exit 94 results in slow traffic and safety conflicts with trucks
H.	Poor acceleration/decceleration lanes on I-81 bridge near exit 105 results in slow traffic and safety conflicts with trucks
I.	Poor acceleration/decceleration lanes on I-81 near exit 114 results in slow traffic and safety conflicts
J.	US 11 through Radford: Frequent driveways and access points result in slow moving traffic; 36 severe crashes between Route 114 and Burlington St
K.	I-81 between Exits 146 and 150: Poor acceleration/decceleration lanes near truck weigh station; significant freight ton-hours of delay
L.	I-581 at Orange Avenue: Structurally deficient bridges on I-581, congestion related to weaving movements from ramps to Elm Avenue
M.	Informal park-and-ride on VA 8 near I-81 indicates need for additional park-and-ride facility in this location
N.	Travelers using US 11 as an alternative to I-81 can cause congestion issues on Main Street in Salem

Summary of Needs - B2 Segment

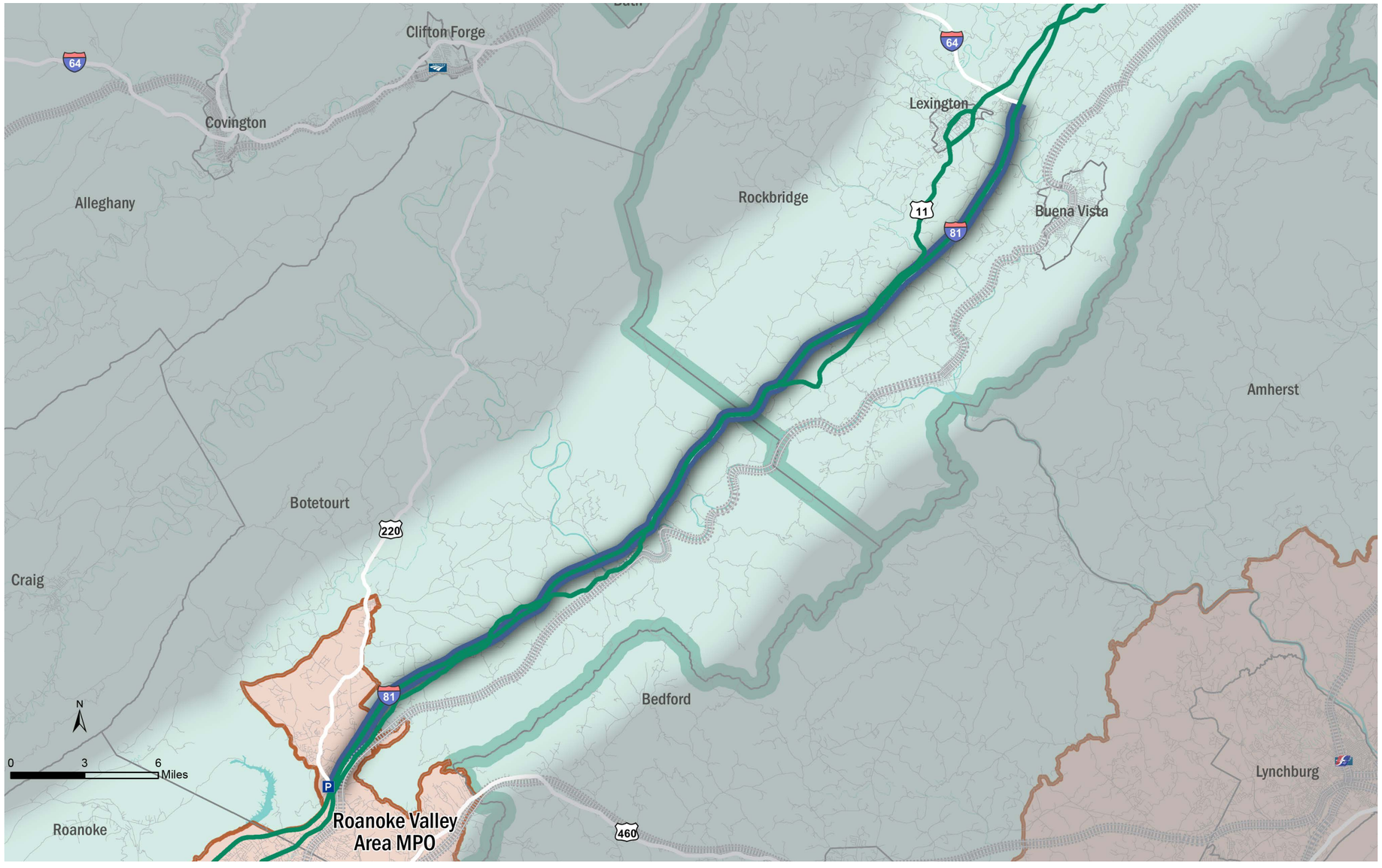
O.	Heavy truck traffic along I-81; no intermodal transfer facility available in Montgomery County to transfer freight from truck to rail.
P.	No passenger rail connection from Blacksburg/Christiansburg
Q.	US 11/460 in Salem between Texas Hollow Rd and Green St: 72 severe crashes
R.	US 11 in Roanoke between Hawthorne Road NW and Pocahantas Ave NE: 56 severe crashes
S.	Ability for US 11 to serve as a parallel highway facility limited by speed and capacity
T.	No passenger rail service from Roanoke to other cities in the corridor, bus service between cities in corridor is limited to Roanoke and Blacksburg/Christiansburg
U.	No passenger rail service from Blacksburg/Christiansburg to other cities in the corridor, bus service between cities in corridor is limited to Roanoke and Blacksburg/Christiansburg
V.	Park and Ride lots in Roanoke County have higher utilization rates than statewide average
W.	Park and Ride lots in Botetourt County have higher utilization rates than statewide average
X.	Congestion issue on US 11/US 460 between Dow Hollow Road (VA Route 647) and South Electric Road (US 11-Alt) in Salem
Y.	Congestion issue on US 11 /US 460 between I-81 in Christiansburg and Alleghany Spring Road in Shawsville
Z.	Congestion issue on VA Route 116 between I-581/US 220 and US 11-Alt in Roanoke
AA.	Reliability issue on US 11/US 460 between North Fork Road (VA Route 603) and Dow Hollow Road (VA Route 647)
AB.	Reliability issue on VA Route 116 between I-581/US 220 and US 11-Alt in Roanoke

IV. Segment B3



Corridor Segment B3 Components

- I-81
- US 11
- Norfolk Southern Crescent Corridor



Segment B3

Corridor Component Road
Railroad
Airport Facility
Amtrak Facility
Greyhound Facility
VRE Facility
Metrorail Facility
Port Facility
Park & Ride Facility

MPO Area
Planning District Area

B3 SEGMENT PROFILE

Segment B3 begins at the junction of I-81 and US 220 and progresses north to the junction of I-64/I-81 in Rockbridge County. This segment serves Botetourt and Rockbridge Counties, as well as the City of Lexington. The segment travels through some of the area covered by the Roanoke Valley Area MPO. Segment B3 acts as a major corridor for through freight travel in Virginia and also connects smaller urban areas, such as Roanoke and Lexington, as well as multiple natural, historical, and cultural resources.

Highway Facilities: I-81 is primarily a rural highway with four lanes in Segment B3. When not running concurrently with I-81 for short distances, US 11 runs parallel to I-81 throughout the corridor.

Transit Services: There are no line-haul transit services or Park-and-Ride facilities within Segment B3.

Rail Facilities: Norfolk Southern rail lines pass through Segment B3 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 B3, but the Crescent Corridor does provide direct access to the Virginia Inland Port south of Winchester.

Airport Facilities: The Roanoke-Blacksburg Regional Airport provides commercial air service in Segment B3.

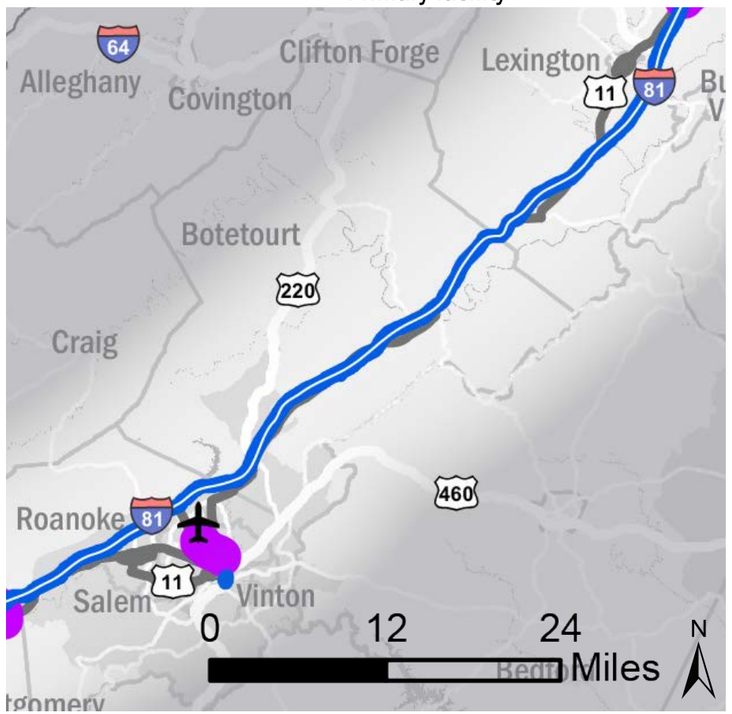
Major planned and future projects include: There are no major planned projects to improve safety or increase capacity at this time.

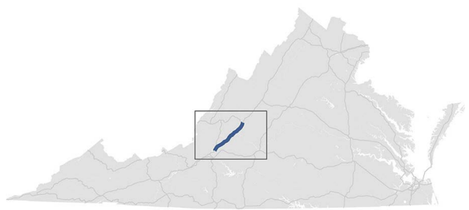
Number of Lanes (both directions)

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

Future Projects

- Reconstruction with added capacity
- Safety improvements
- Primary facility



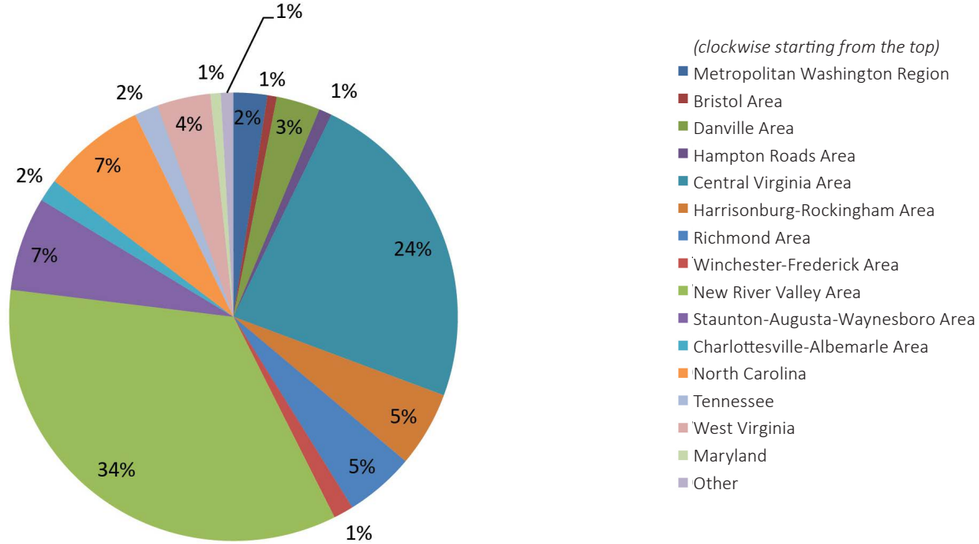


Travel Demand

Passenger Demand

Segment B3 runs from the northern edge of the Roanoke Valley Area towards the Cities of Lexington and Buena Vista. Of the intercity travel originating in Roanoke, several notable markets use Segment B3, including Staunton (seven percent), Harrisonburg (five percent), and points farther north including Winchester, the Metropolitan Washington region, and destinations in Maryland.

Travel from Roanoke Valley Area to...



B3 SEGMENT PROFILE

Freight Demand

By truck, Segment B3 carried 74 million tons of freight worth $147 billion in 2012, and is estimated to carry 99 million tons of freight worth $220 billion in 2025. The major truck freight flows in Corridor B are interstate through-traffic, with approximately 60 percent of truck freight tonnage in the corridor and more than 75 percent of the total truck freight value passing through Virginia. There is significant truck freight traffic along Corridor B between North Carolina and Ohio, accounting for four percent of the total truck freight tonnage and value on the corridor. In terms of tonnage, Pennsylvania and Tennessee are also significant generators of truck freight along Corridor B. Around eight percent of the total corridor truck freight, by value, is destined for New York, while another six to eight percent of truck freight on the corridor heads to non-US North American destinations. Three percent of the total corridor truck freight tonnage originates in the jurisdictions adjacent to Segment B3. The largest generator of truck freight along Segment B3 is Botetourt County, with the majority of this freight destined for North Carolina and Pennsylvania.

By rail, Segment B3 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. In terms of tonnage, the largest rail freight flows in Corridor B consist of low-value freight traveling from West Virginia to North Carolina, accounting for between 18 and 22 percent of the total rail freight corridor tonnage in 2012 and 2025. The City of Norfolk (and its port facility) is a major destination for rail freight on Corridor B, accounting for between 18 and 20 percent of the total corridor rail freight tonnage, with major rail freight flows originating from West Virginia, Wise County, and Buchanan County. In terms of value, the largest rail freight flows on Corridor B are between Illinois and the Cities of Norfolk and Portsmouth (and their port facilities), accounting for more than 20 percent of the total rail freight value. The jurisdictions adjacent to Segment B3 are not major generators of rail freight trips. There is a minor movement of low-value rail freight between North Carolina and Botetourt County, located along Segment B3, accounting for one percent of the total rail freight corridor tonnage.

Truck Freight

Major Origins (by Tonnage)
1. Virginia (25% / 23%)
2. North Carolina (13% / 12%)
3. Pennsylvania (8% / 8%)
4. Ohio (6% / 7%)
5. Tennessee (6% / 6%)

Major Origin-Destination Pairs for Freight
North Carolina and Ohio
North Carolina and Pennsylvania
North Carolina and West Virginia
Ohio and Florida
North Carolina and Indiana

Percentages represent 2012 / 2025 values.

Major Destinations (by Tonnage)
1. Virginia (22% / 22%)
2. North Carolina (14% / 15%)
3. Pennsylvania (8% / 8%)
4. New York (6% / 6%)
5. Tennessee (4% / 5%)

Corridor Tonnage Originating in Segment B3: 3% / 3%

Corridor Tonnage Destined for Segment B3: 3% / 3%

Rail Freight

Major Origins (by Tonnage)
1. Virginia (31% / 28%)
2. West Virginia (30% / 26%)
3. Wise County (12% / 10%)
4. Illinois (8% / 10%)
5. Ohio (6% / 8%)

Major Origin-Destination Pairs for Freight
West Virginia and North Carolina
City of Norfolk* and West Virginia
Wise County and City of Norfolk*
Ohio and North Carolina
Illinois and North Carolina

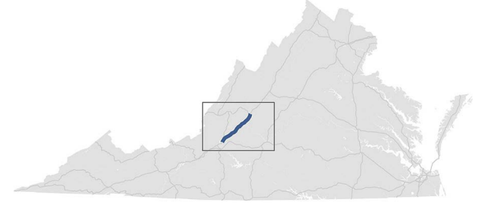
Percentages represent 2012 / 2025 values.
*Includes freight passing through the Port of Virginia.

Major Destinations (by Tonnage)
1. Virginia (38% / 37%)
2. North Carolina (35% / 35%)
3. City of Norfolk* (20% / 17%)
4. Tennessee (4% / 3%)
5. Georgia (3% / 3%)

Corridor Tonnage Originating in Segment B3: 1% / 2%

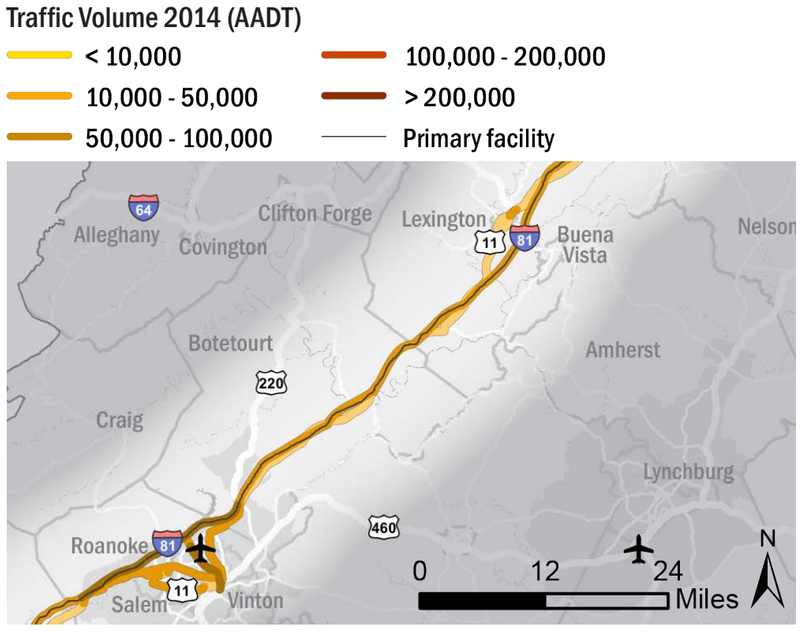
Corridor Tonnage Destined for Segment B3: 1% / 1%

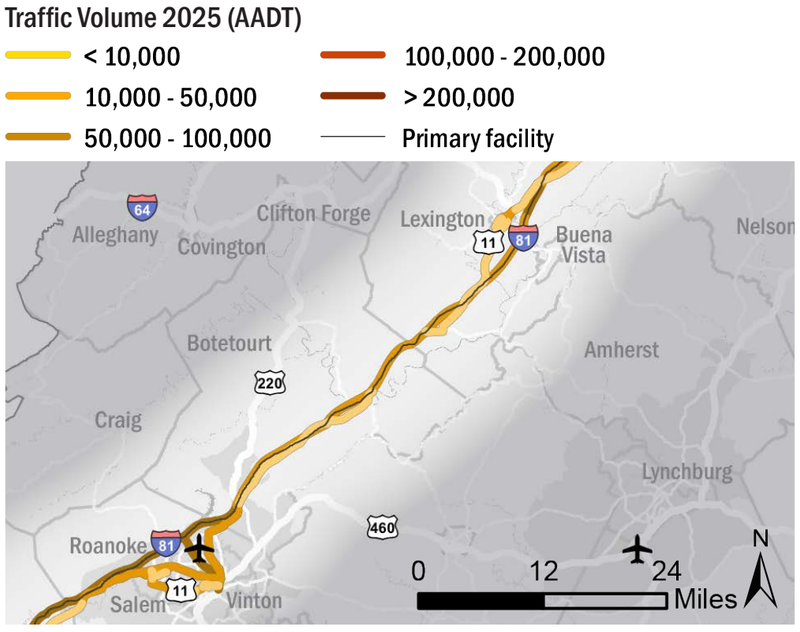
Traffic Conditions

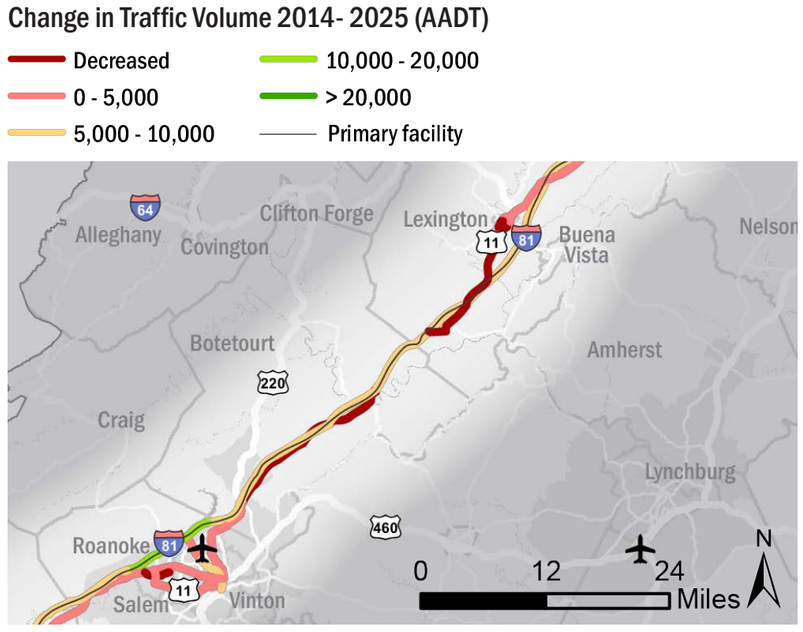


Traffic Volume and AADT

Traffic volume on Segment B3 is generally less than traffic volumes on most sections of Corridor B. I-81 carries between 32,000 to 40,000 vehicles per day on average. Traffic levels on US 11 are significantly lower, and average between 8,000 and 22,000 vehicles per day in the City of Lexington, and less than 7,000 vehicles per day elsewhere in the segment. By 2025, average daily traffic volumes along I-81 in Segment B3 are forecasted to increase by approximately 6,000 vehicles, for average daily traffic volumes between 41,000 and 46,000 vehicles per day. Traffic growth on US 11 is only forecast in and around the City of Lexington, with 2025 traffic volumes increasing by as much as 3,000 vehicles per day.







B3 SEGMENT PROFILE

Traffic Distribution

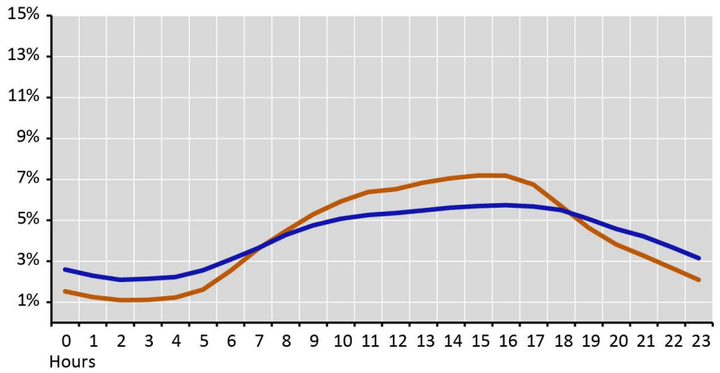
On average, traffic on Segment B3 is distributed throughout the day as shown in the graphs below. Weekday traffic shows a single midday peak between 10 a.m. and 7 p.m. The highest hourly traffic occurs between 4 and 5 p.m. which accounts for 7.2 percent of daily traffic. Peaking patterns for truck traffic show the same relatively steady flow of trucks during the midday period between 10 a.m. and 7 p.m., with a peak hourly flow of 5.6 percent from 5 p.m. to 6 p.m. Weekend traffic patterns are also different from the typical commute patterns, showing even distribution of traffic during the middle of the day between 11 a.m. and 5 p.m.

Weekday traffic volumes on Segment B3 vary by as much as 71 percent throughout the year, with the highpoint in August (around 40,000 vehicles per day) and the low point in February (around 24,000 vehicles per day). Truck volumes vary less than passenger volumes throughout the year, with the October high (around 12,000 vehicles per day) being 33 percent higher than the January low (around 9,000 vehicles per day). Weekend traffic levels also vary over the course of the year, with a marked decrease during the winter months (81 percent lower in February than in August). Weekend truck traffic is more steady than all vehicle traffic, with the June high (around 8,500 vehicles per day) 33 percent higher than the July low (around 6,400 vehicles per day). Truck volumes account for a significant portion of traffic on Segment B3 (32 percent of overall daily traffic for weekdays and 23 percent of overall daily traffic for weekends); as a result truck traffic has a significant impact on overall traffic conditions.

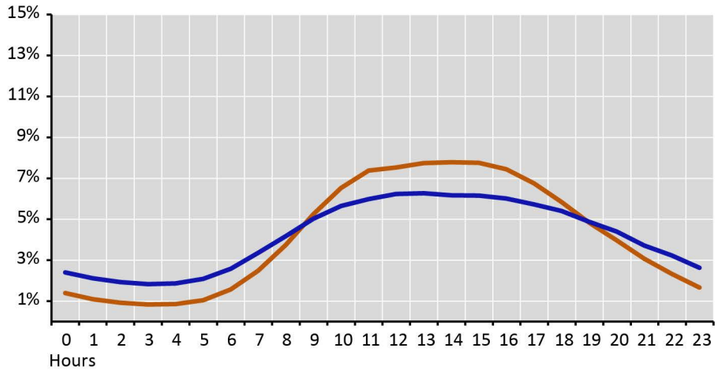
Truck Volume

The percent of daily traffic comprised of heavy trucks on Segment B3 is higher relative to most other segments in Corridor B. On I-81, trucks comprise 15 to 16 percent of total traffic. US 11 shows fewer heavy trucks, comprising less than two percent of daily traffic.

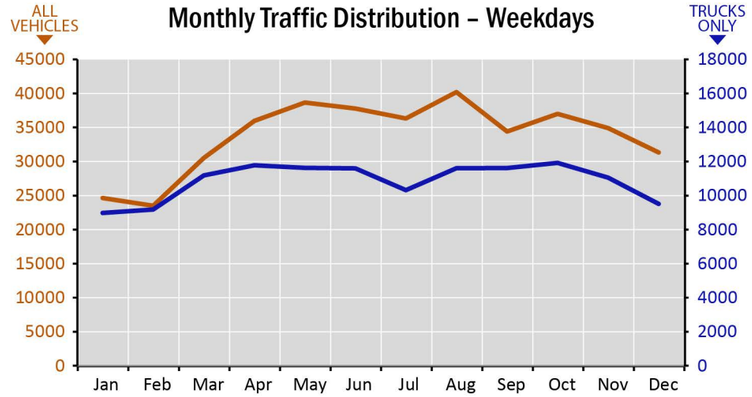
Hourly Traffic Distribution – Weekdays



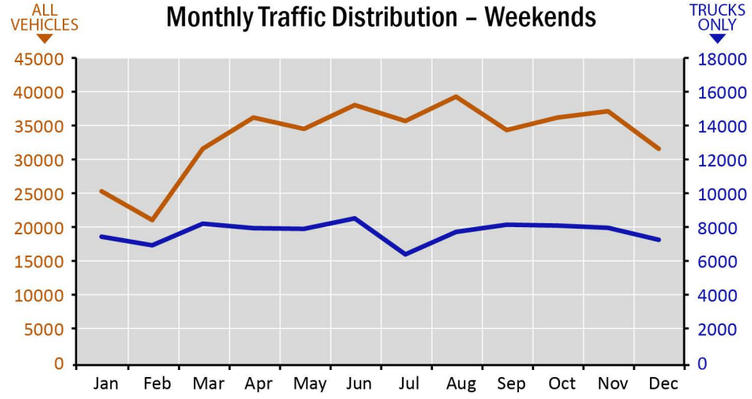
Hourly Traffic Distribution – Weekends



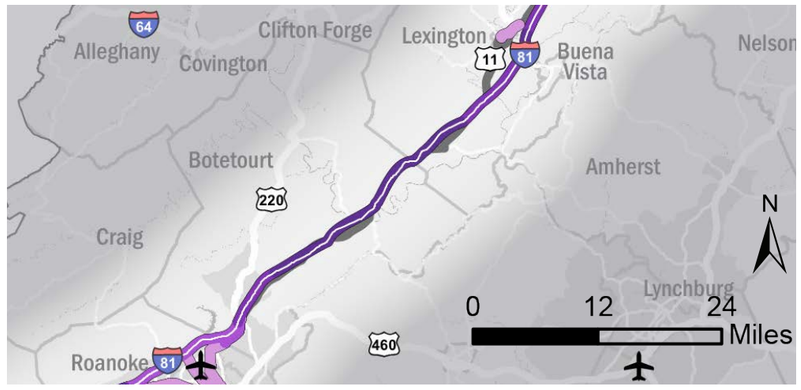
Monthly Traffic Distribution – Weekdays



Monthly Traffic Distribution – Weekends

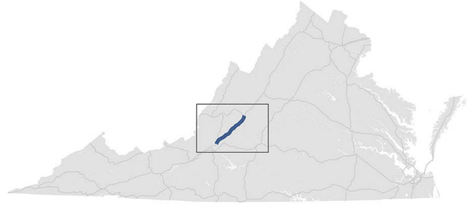


All Vehicles
Trucks



Percent Heavy Trucks

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

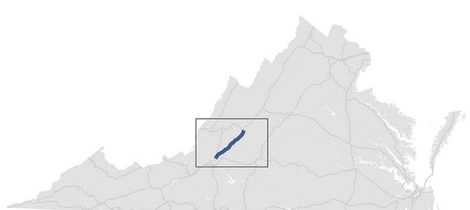


B3 SEGMENT PROFILE

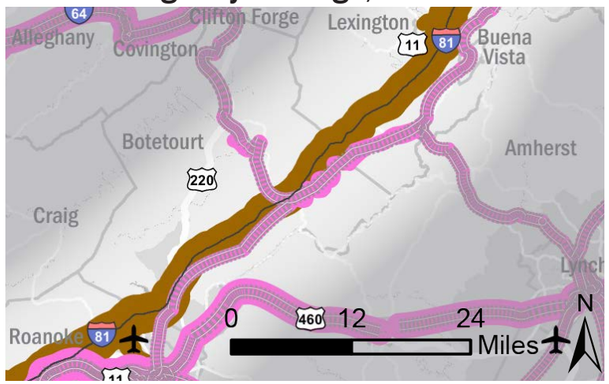
Freight Flows

At the southern end of Segment B3, south of Buchanan, freight is moved primarily by truck in terms of both tonnage and value. In total, 72.5 million tons (95 percent) of freight is moved through this section of Segment B3 by truck, compared to four million tons by rail. By value, the difference is the same, with $147 billion (95 percent) of freight traveling by truck, compared to $7 billion by rail. On average, a ton of freight traveling by truck through this section of Segment B2 is worth $2,021 while a ton of freight traveling by rail is worth $1,923. In 2025, both rail and truck freight tonnages and total values in the southern end of Segment B3 are expected to increase, but the percentages of tonnage and value moved by truck are expected to remain nearly the same. Values per ton of freight on trucks are expected to increase to $2,246 in 2025, while rail values per ton will drop slightly to $1,867.

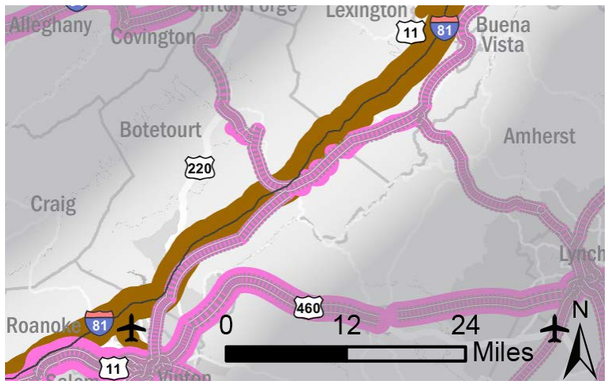
At the northern end of Segment B3, south of Lexington, freight is also moved primarily by truck in terms of both tonnage and value. In total, 74 million tons (92 percent) of freight is moved through this section of Segment B3 by truck, compared to 6 million tons by rail. By value, trucks are favored 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 by truck through this section of Segment B3 is worth $1,992 while a ton of freight traveling by rail is worth $1,221. In 2025, both rail and truck freight tonnages and total values in the northern end of Segment B3 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 $1,396 on rail.



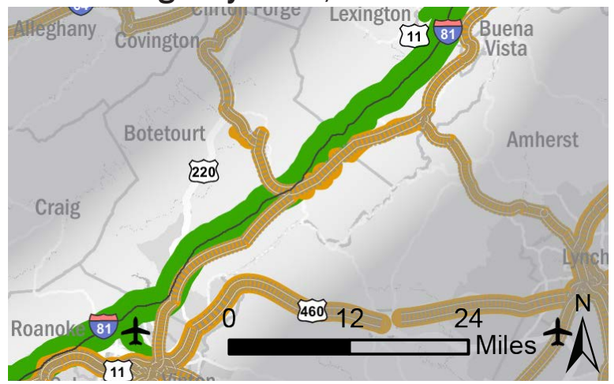
Annual Freight by Tonnage, 2012



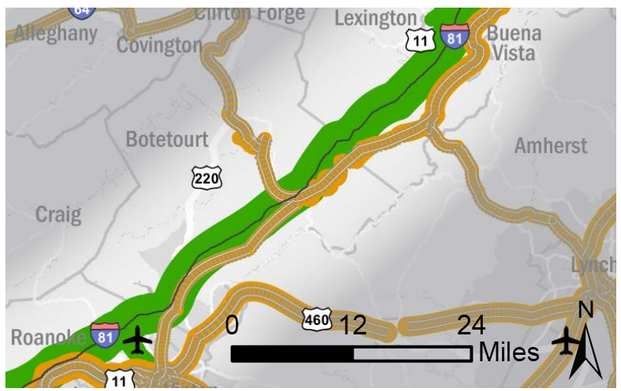
Annual Freight by Tonnage, 2025



Annual Freight by Value, 2012



Annual Freight by Value, 2025



Truck Freight (in tons)

- < 10M
- 10M - 25M
- 25M - 50M
- 50M - 100M
- > 100M
- Primary facility

Rail Freight (in tons)

- < 10M
- 10M - 25M
- 25M - 50M
- 50M - 100M
- > 100M
- Primary facility

Truck Freight

- < $10B
- $10B - $50B
- $50B - $100B
- $100B - $200B
- > $200B
- Primary facility

Rail Freight

- < $10B
- $10B - $50B
- $50B - $100B
- $100B - $200B
- > $200B
- Primary facility

Redundancy and Mode Choice

Passenger trips on Segment B3 of the Crescent 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 for local access and for bypassing incidents causing congestion on sections of I-81. No alternate modes are available along Segment B3.

Comparable Travel Options

Roanoke to Staunton

Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 1:20 Travel Time $49 Est. Cost

Blacksburg / Christiansburg to Staunton

Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 2:05 Travel Time $66 Est. Cost

Roanoke to Harrisonburg

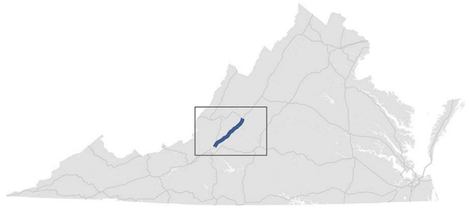
Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

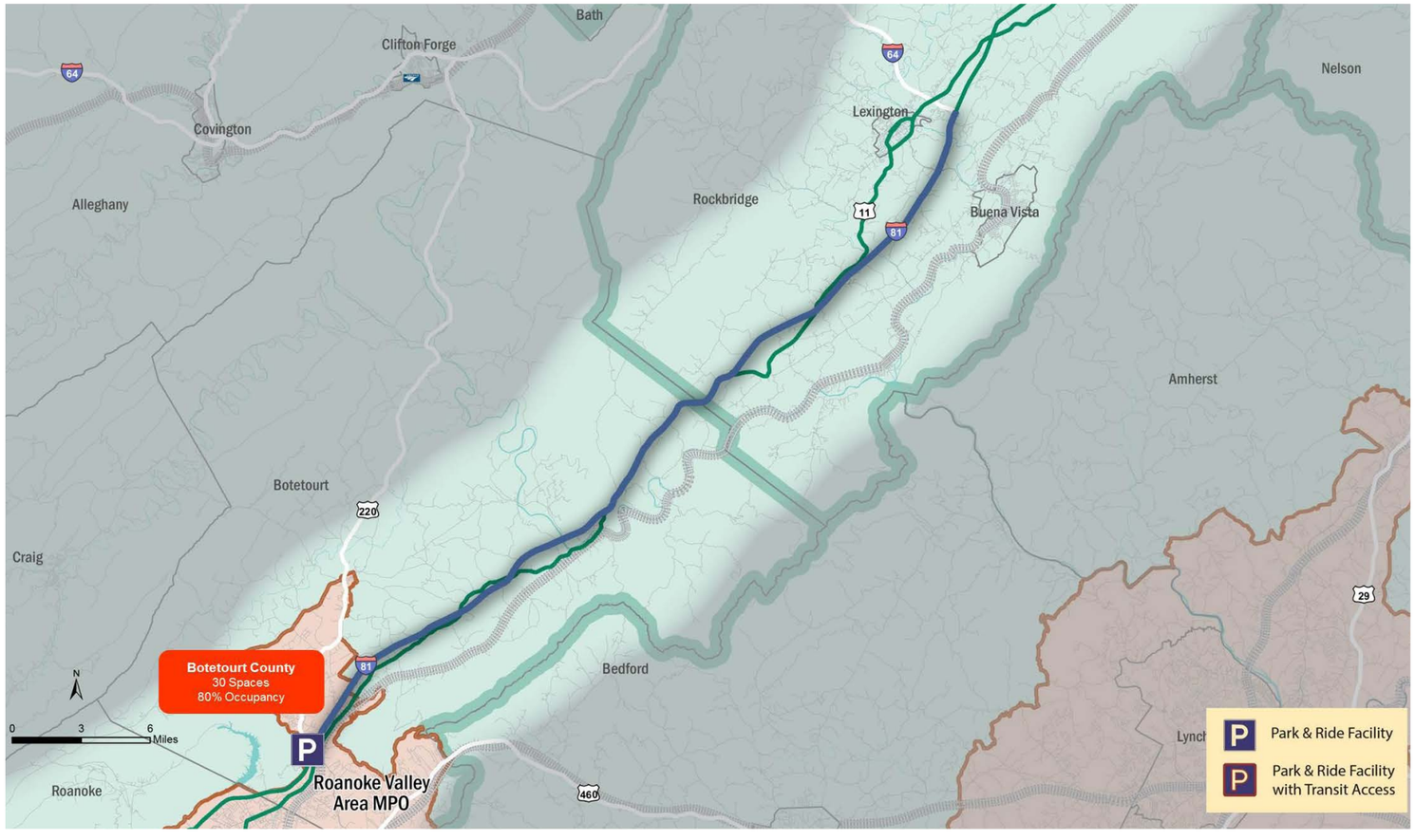
Auto

Via I-81: 1:53 Travel Time $61 Est. Cost

Park-and-Ride

Within Segment B3, commuters do not have direct access to Park-and-Ride locations; however, two Park-and-Ride locations are available in Botetourt County with a utilization rate of 80 percent, which is higher than the statewide average of 76 percent.





B3 SEGMENT NEEDS

Safety

Performance Metrics:

Number of Severe Crashes	21
Severe Crashes/Million VMT	0.3
Number of Railroad Crashes	1

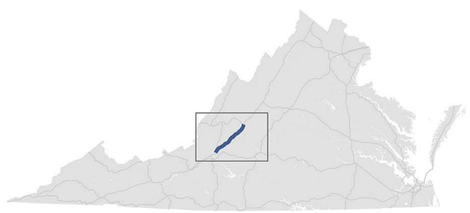
Between 2010 and 2012, only 21 severe crashes were recorded in Segment B3, one of the lowest totals for any CoSS segment. Along I-81, ten crashes occurred near mile marker 167 in Buchanan and seven crashes happened near Lexington around exit 188. On US 11 in Lexington, four incidents occurred approximately 0.5 miles south of I-64.

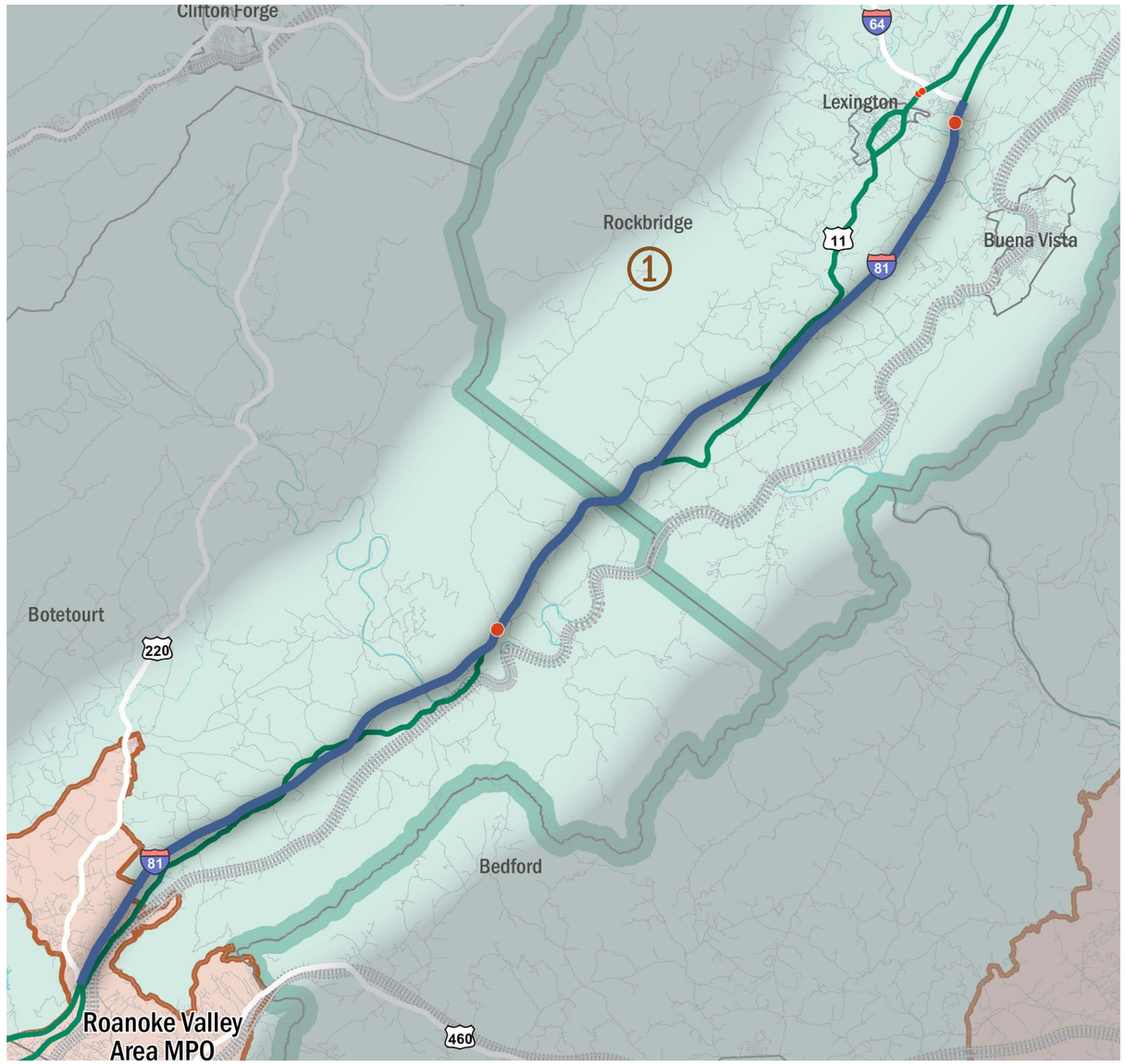
Fatality and Injury Crashes (2010 - 2012)

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

Railroad Incidents/Accidents per County (2011-2014)

#

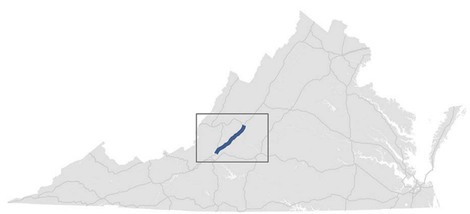




Congestion

Performance Metrics:

Person Hours of Delay per Mile	0
Freight Ton Hours of Delay per Mile	1.3K



Passenger Delays

Segment B3 experiences some of the lowest passenger traffic congestion in the state with only negligible daily passenger delays. As such, there are no locations of significant passenger delay along Segment B3.

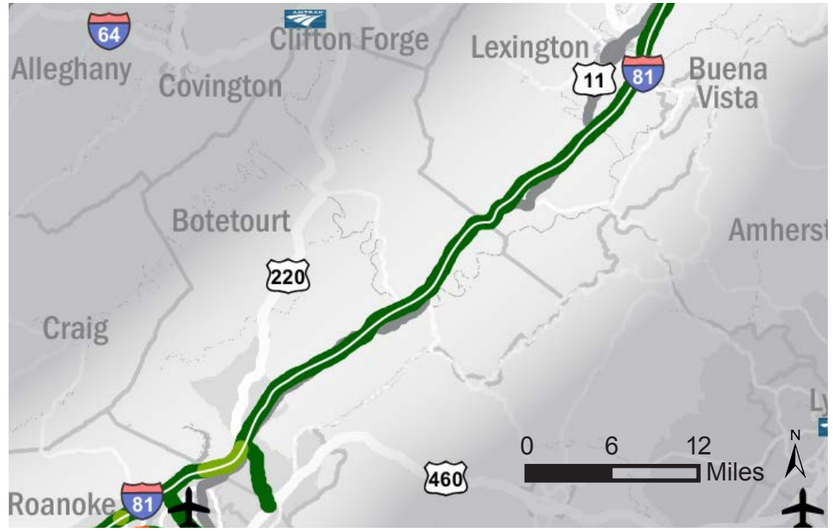
Freight Delays

As with passenger congestion, Segment B3 experiences some of the lowest freight delays in the state, with only 110,000 ton-hours of delay. On a per-mile basis, Segment B3 experiences just two percent of the delays present along Segment B2. There are no locations of freight delay exceeding 250,000 ton-hours per mile along Segment B3. Peak-period freight delays account for only six percent of daily congestion.

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

Reliability

Weekday Peak

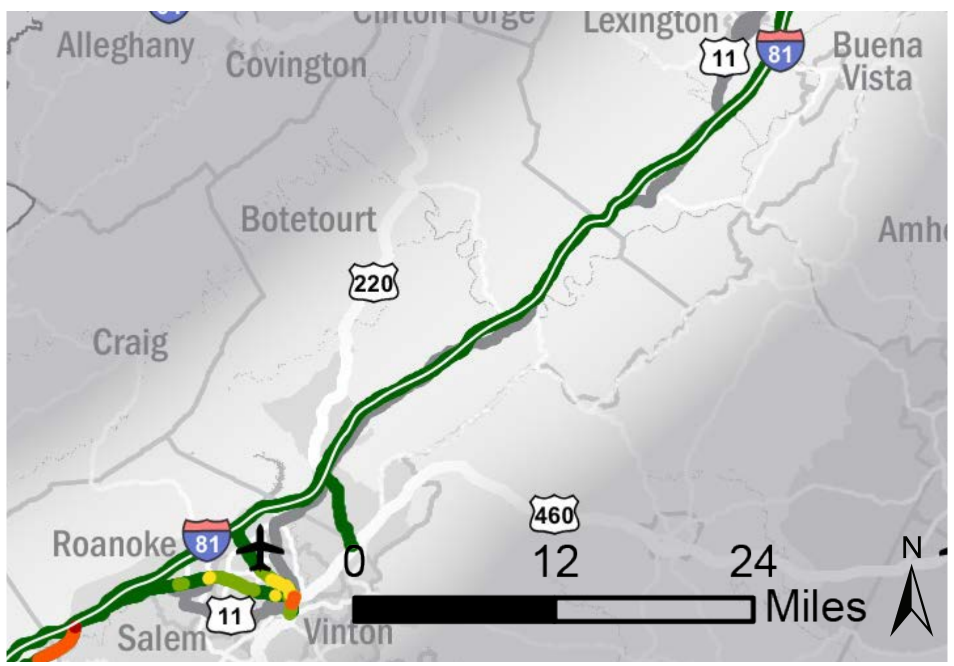
Reliability of travel during the peak period on a typical weekday on Segment B3 ranges from 0.00 to 0.04 in terms of reliability index, with an average value of 0.02. This segment has a peak period reliability index much lower than average for the CoSS segments statewide, and none of the locations along Segment B3 have reliability index values exceeding the statewide threshold.

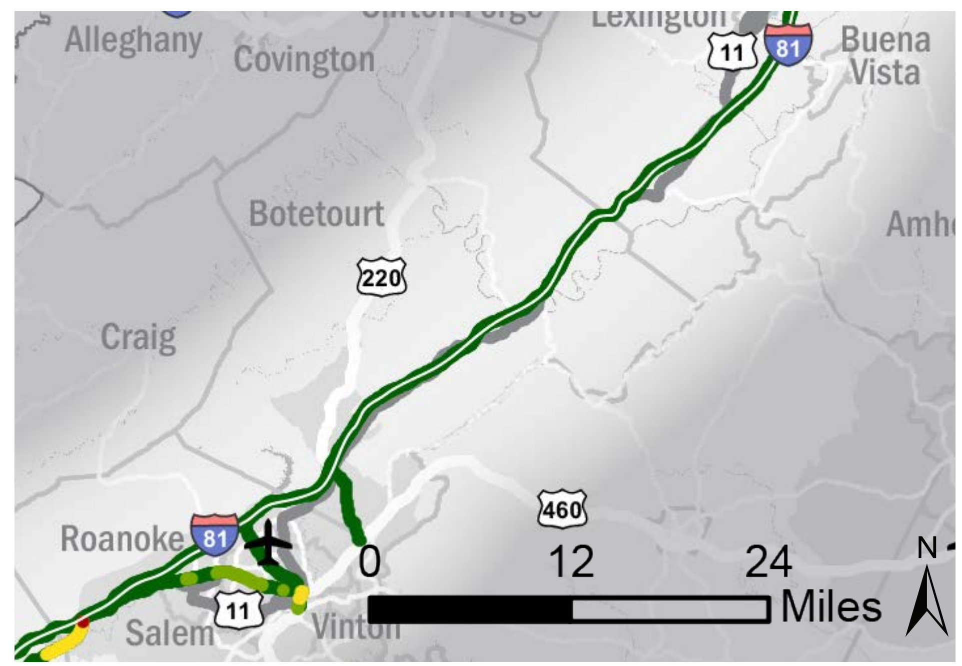
Weekday

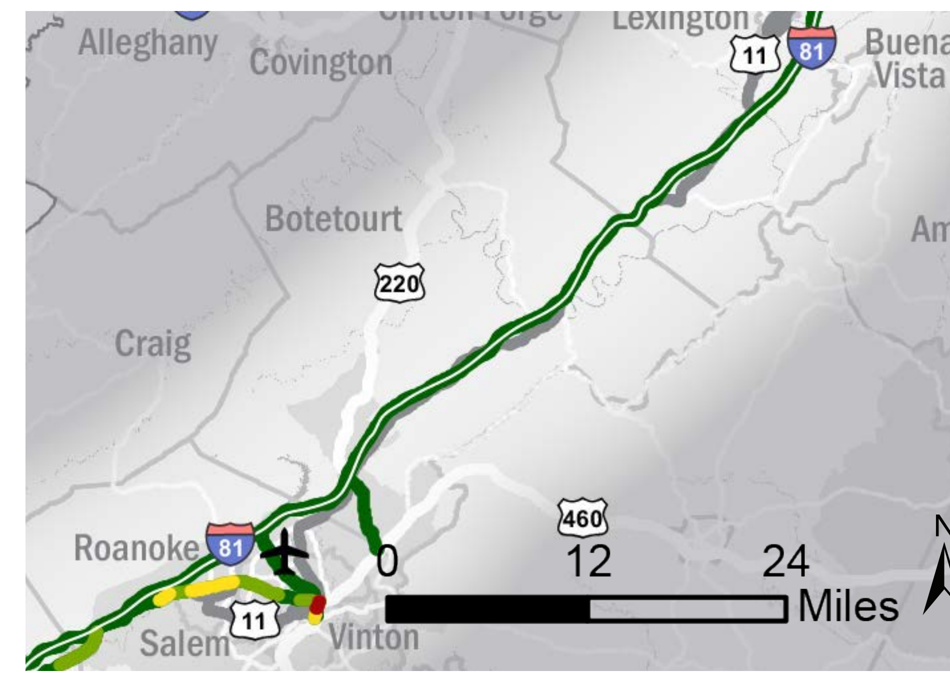
Reliability of travel during a typical weekday ranges from 0.01 to 0.04 in terms of reliability index, with an average value of 0.02. This segment has a weekday reliability index much lower than average for the CoSS segments statewide, and none of the locations along Segment B3 have reliability index values exceeding the statewide threshold.

Weekend

Reliability of travel during a typical weekend ranges from 0.00 to 0.05 in terms of reliability index, with an average value of 0.02. This segment has a weekend reliability index much lower than average for the CoSS segments statewide, and. none of the locations along Segment B3 have reliability index values exceeding the statewide threshold.





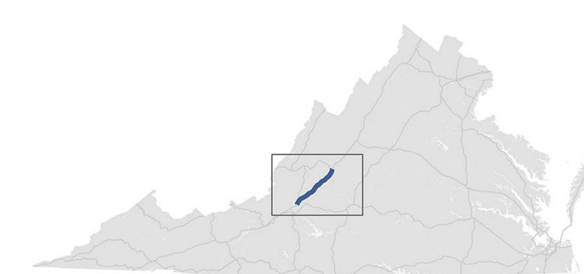


Reliability Index

- < 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 unreliabile. The following are the reliability index thresholds:

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

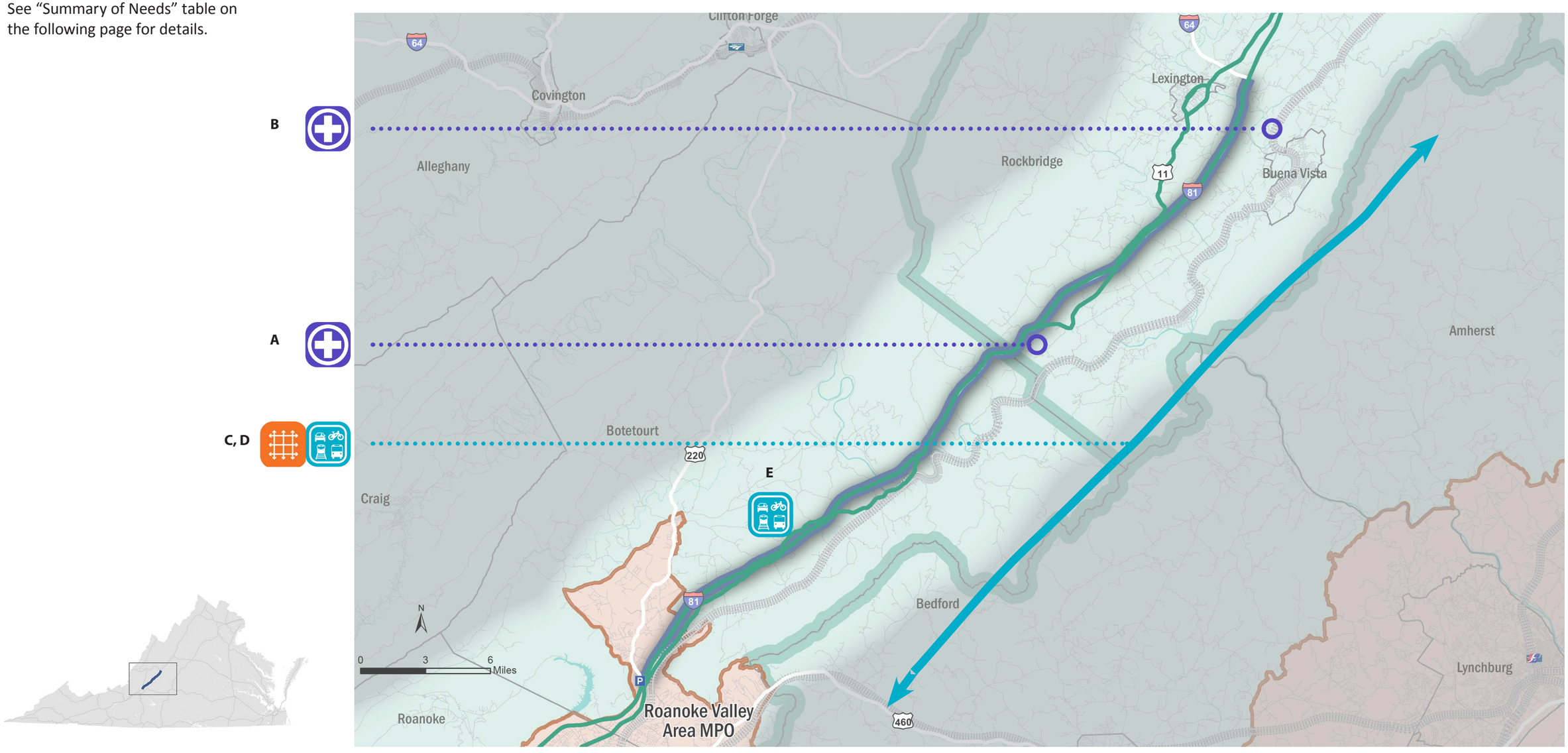


B3 SEGMENT NEEDS

Summary of Needs

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

Mode Choice | Redundancy | Safety | Congestion | Bottlenecks | Reliability



B3 SEGMENT NEEDS

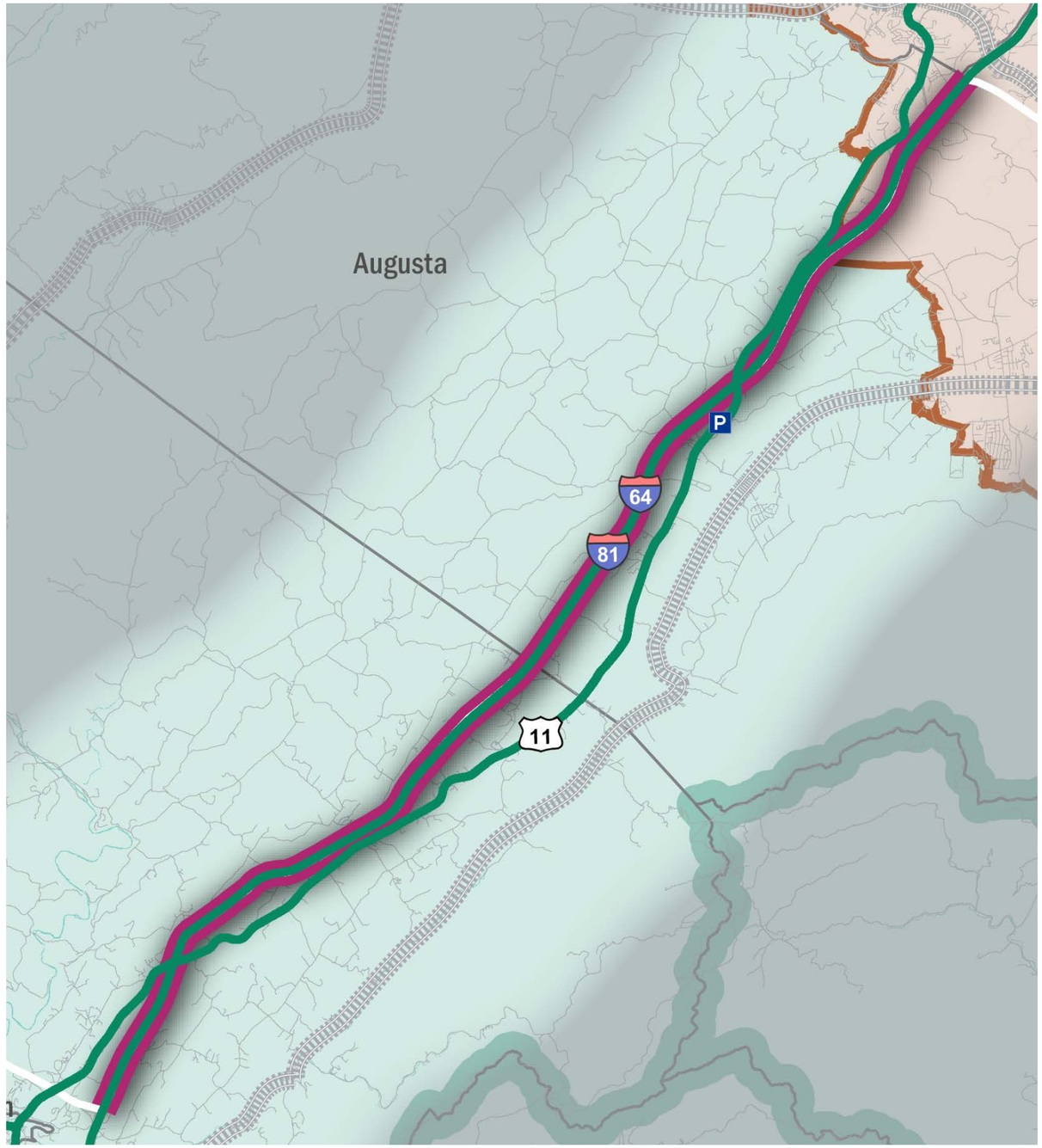
Summary of Needs - B3 Segment

A.		Safety concerns on I-81 at mile marker 167 related to S-curve geometry: 10 severe crashes
B.		I-81 around Exit 188 near Lexington: seven severe crashes
C.		Ability for US 11 to serve as a parallel highway facility limited by speed and capacity
D.		No bus or rail service is available in the segment
E.		Park and Ride lots in Botetourt County have higher utilization rates than statewide average

V. Segment B4

Corridor Segment B4 Components

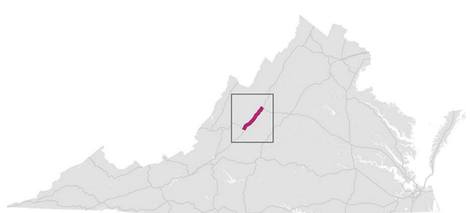
- I-81
- US 11
- Norfolk Southern Crescent Corridor



Segment B4

Corridor Component Road
Railroad
Airport Facility
Amtrak Facility
Greyhound Facility
VRE Facility
Metrorail Facility
Port Facility
Park & Ride Facility

MPO Area
Planning District Area



B4 SEGMENT PROFILE

Segment B4 begins at the junction of I-64/I-81 north of Lexington and progresses north to the junction of I-64/I-81 near Staunton. This segment serves Rockbridge and Augusta Counties and a portion of the Staunton-Augusta-Waynesboro MPO Area. I-64 runs concurrently with I-81 through the entire segment (as Segment C2). The segment also includes US 11. Segment B4 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-81 is primarily a rural highway with four lanes in Segment B4. US 11 runs parallel to I-81 throughout the segment.

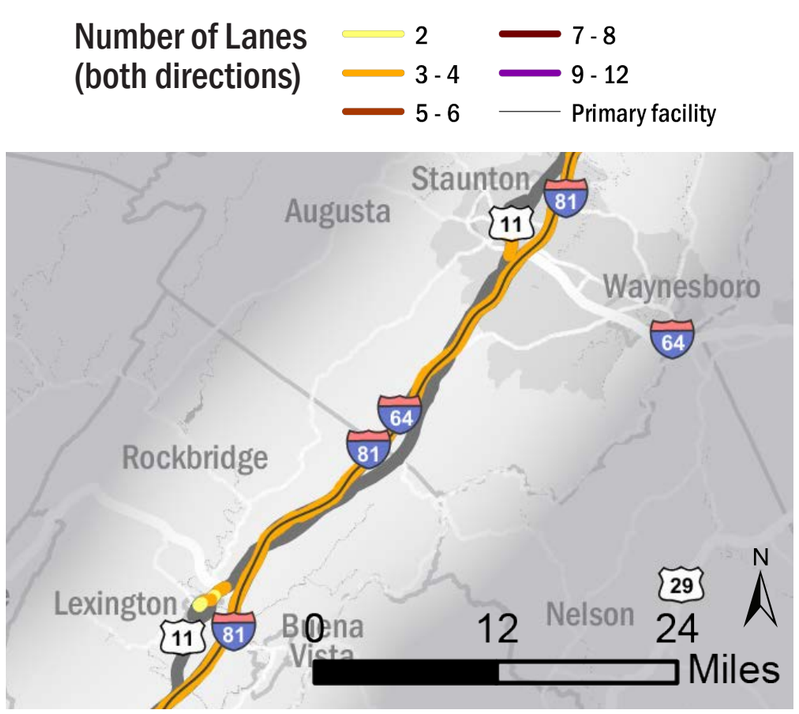
Transit Services: There is no line-haul transit service within Segment B4. There is one Park-and-Ride facility near I-81 in Greenville.

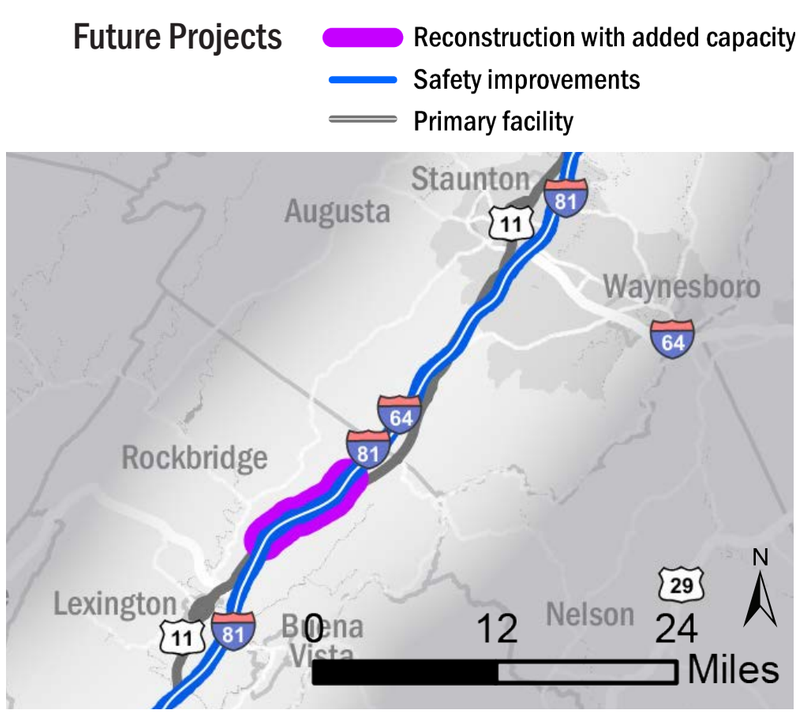
Rail Facilities: Norfolk Southern rail lines pass through Segment B4 connecting locations south and west of the Virginia Inland Port, near Corridor B south of Winchester.

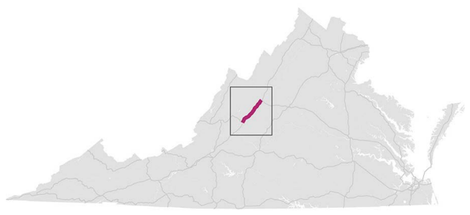
Port Facilities: No port facilities are located directly adjacent to Segment B4, but the Crescent Corridor does provide direct access to the Virginia Inland Port south of Winchester.

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 increase capacity at this time.





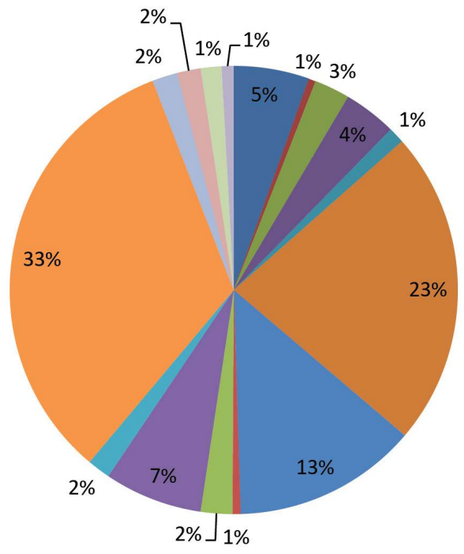


Travel Demand

Passenger Demand

Segment B4 is concurrent with Segment C2 and connects the two discrete sections of I-64 between Lexington and Staunton. Intercity travel from the Staunton-Augusta-Waynesboro MPO Area is distributed to a large number of regions in the state, mostly regions to the north and east that do not require the use of Segment B4. 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...



(clockwise starting from the top)

- Metropolitan Washington Region
- Danville Area
- Hampton Roads Area
- Central Virginia Area
- Fredericksburg Area
- Harrisonburg-Rockingham Area
- Richmond Area
- Tri-Cities Area
- Winchester-Frederick Area
- Roanoake Valley Area
- New River Valley Area
- Charlottesville-Albemarle Area
- North Carolina
- West Virginia
- Maryland
- Other

B4 SEGMENT PROFILE

Freight Demand

By truck, Segment B4 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. The major truck freight flows in Corridor B are interstate through-traffic, with approximately 60 percent of truck freight tonnage in the corridor and more than 75 percent of the total truck freight value, passing through Virginia. There is significant truck freight traffic along Corridor B between North Carolina and Ohio, accounting for four percent of the total corridor freight tonnage and value. Pennsylvania and Tennessee are also significant generators of truck freight tonnage along Corridor B. Around eight percent of the total truck freight on Corridor B, by value, is destined for New York, while another six to eight percent of truck freight on Corridor B is destined for non-US North American destinations. The area adjacent to Segment B4 is not a major generator or attractor of truck freight on Corridor B. Less than one percent of the total corridor truck freight value originates or is destined for this segment.

By rail, Segment B4 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. In terms of tonnage, the largest rail freight flows in Corridor B consist of low-value freight traveling from West Virginia to North Carolina, accounting for between 18 and 22 percent of the total rail freight corridor tonnage in 2012 and 2025, respectively. The City of Norfolk and its port facility is a major destination of rail freight in Corridor B, accounting for between 18 and 20 percent of the total corridor tonnage, with major rail freight flows originating in West Virginia, Wise County, and Buchanan County. In terms of value, rail freight flows between Illinois and the Cities of Norfolk and Portsmouth (and their port facilities) are the largest in Corridor B, accounting for more than 20 percent of the total rail freight value in the corridor. The jurisdictions adjacent to Segment B4 are not major generators or attractors of rail freight, accounting for less than one percent of both total corridor value and tonnage in 2012 and 2025.

Truck Freight

Major Origins (by Tonnage)
1. Virginia (25% / 23%)
2. North Carolina (13% / 12%)
3. Pennsylvania (8% / 8%)
4. Ohio (6% / 7%)
5. Tennessee (6% / 6%)

Corridor Tonnage Originating in Segment B4: 1% / 1%

Major Origin-Destination Pairs for Freight
North Carolina and Ohio
North Carolina and Pennsylvania
North Carolina and West Virginia
Ohio and Florida
North Carolina and Indiana

Percentages represent 2012 / 2025 values.

Major Destinations (by Tonnage)
1. Virginia (22% / 22%)
2. North Carolina (14% / 15%)
3. Pennsylvania (8% / 8%)
4. New York (6% / 6%)
5. Tennessee (4% / 5%)

Corridor Tonnage Destined for Segment B4: 1% / 1%

Rail Freight

Major Origins (by Tonnage)
1. Virginia (31% / 28%)
2. West Virginia (30% / 26%)
3. Wise County (12% / 10%)
4. Illinois (8% / 10%)
5. Ohio (6% / 8%)

Corridor Tonnage Originating in Segment B4: <1% / <1%

Major Origin-Destination Pairs for Freight
West Virginia and North Carolina
City of Norfolk* and West Virginia
Wise County and City of Norfolk*
Ohio and North Carolina
Illinois and North Carolina

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

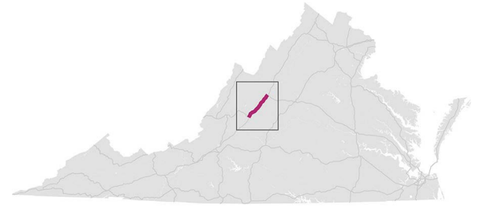
Major Destinations (by Tonnage)
1. Virginia (38% / 37%)
2. North Carolina (35% / 35%)
3. City of Norfolk* (20% / 17%)
4. Tennessee (4% / 3%)
5. Georgia (3% / 3%)

Corridor Tonnage Destined for Segment B4: <1% / <1%

Traffic Conditions

Traffic Volume and AADT

Traffic volume on Segment B4 is moderate relative to traffic volume on other segments in Corridor B. On I-81, 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-81 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.



B4 SEGMENT PROFILE

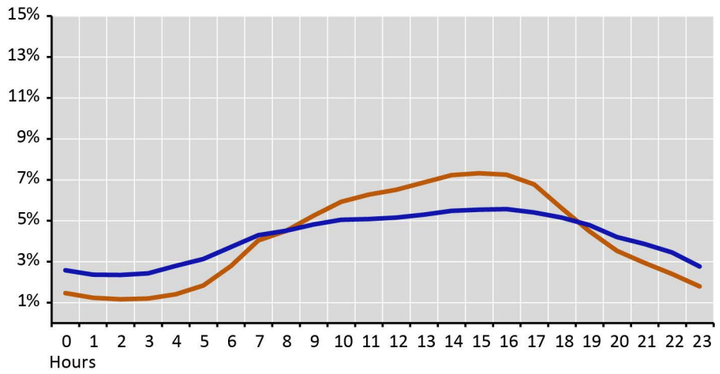
Traffic Distribution

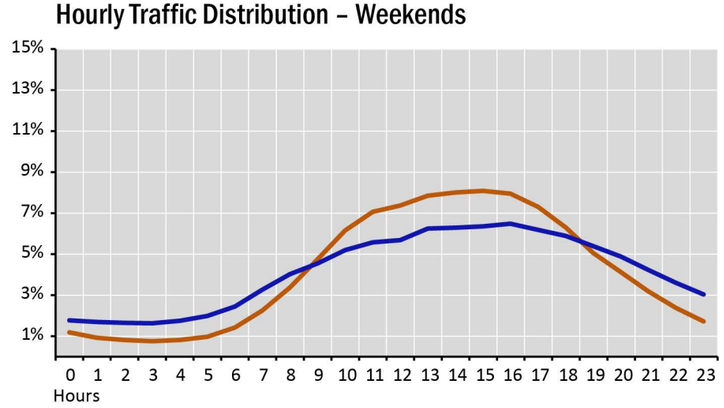
On average, traffic on Segment B4 is distributed throughout the day as shown in the graphs below. Weekday traffic shows steady increase in the flow from 7 a.m. to 5 p.m., with the peak hour starting at 3 p.m. and accounting for 7.3 percent of daily traffic. Peaking patterns for truck traffic show a relatively steady flow of trucks during the midday period between 10 a.m. and 7 p.m., and a peak hour flow of 5.5 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 between 11 a.m. and 6 p.m., with the highest percentage of hourly traffic occurring between 3 and 4 p.m. (8.1 percent of daily traffic) for all traffic, and 4 to 5 p.m. (6.5 percent of daily traffic) for truck traffic.

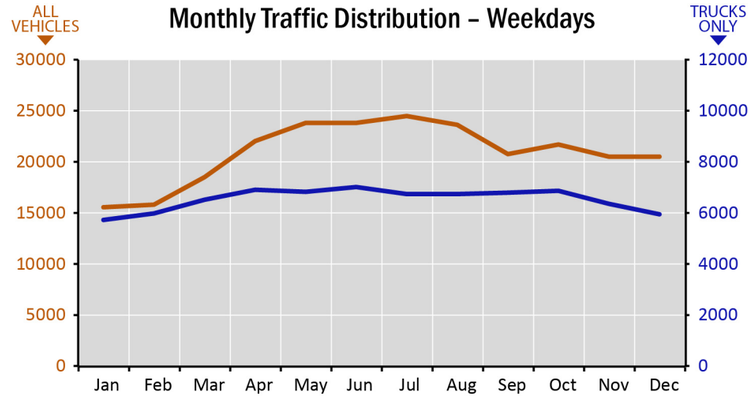
Weekday traffic volumes on Segment B4 vary by as much as 57 percent throughout the year, with the highpoint in July (around 24,000 vehicles per day) and the low point in January (around 15,000 vehicles per day). Truck volumes vary less than passenger volumes throughout the year, with the June high (around 7,000 vehicles per day) being 23 percent higher than the January low (around 5,700 vehicles per day). Weekend traffic levels also vary over the course of the year, and the highest levels of weekend traffic (July, around 27,000 vehicles per day) are 84 percent higher than February levels (around 15,000 vehicles per day), showing a distinct seasonal peak during the spring and summer months. Weekend truck traffic is marginally steadier than all vehicle traffic, with the June high (around 5,200 vehicles per day) only 17 percent higher than the May low (around 4,500 vehicles per day). Truck volumes account for a significant portion of traffic on Segment B4 (32 percent of overall daily traffic for weekdays and 22 percent of overall daily traffic for weekends); as a result truck traffic has a significant impact on overall traffic conditions.

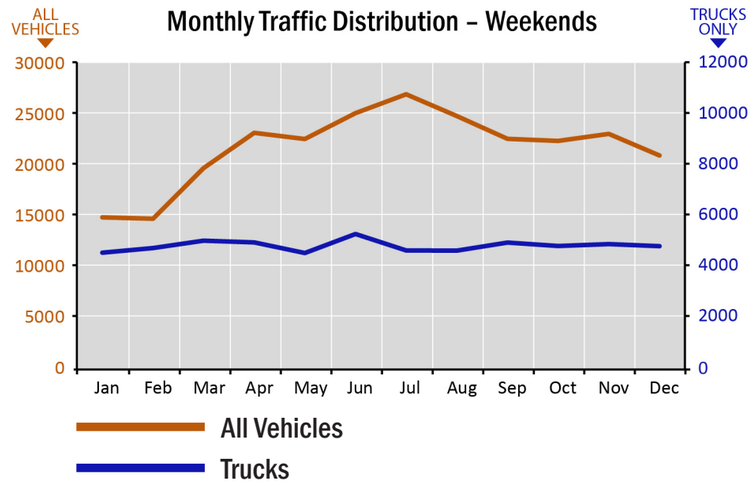
Truck Volume

Daily traffic on Segment B4 is comprised of 14 percent heavy trucks. This is high relative to most other segments in the Commonwealth.



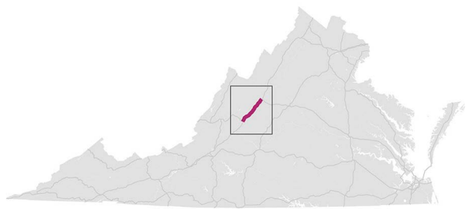






Percent Heavy Trucks

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

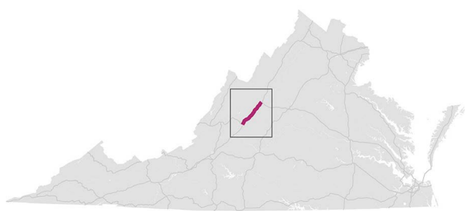


B4 SEGMENT PROFILE

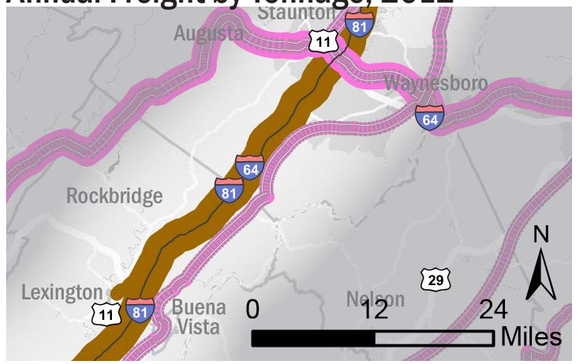
Freight Flows

At the southern end of Segment B4, 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 B4 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 by truck through this section of Segment B4 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 B4 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 B4, 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 B4 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 by truck through this section of Segment B4 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 B4 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.

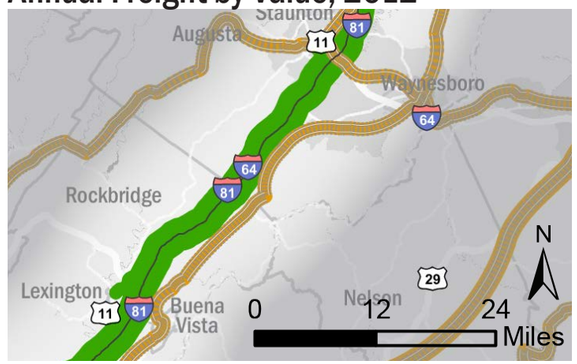


Annual Freight by Tonnage, 2012



Annual Freight by Tonnage, 2025

Annual Freight by Value, 2012



Annual Freight by Value, 2025

Truck Freight (in tons)

- < 10M
- 10M - 25M
- 25M - 50M
- 50M - 100M
- > 100M
- Primary facility

Rail Freight (in tons)

- < 10M
- 10M - 25M
- 25M - 50M
- 50M - 100M
- > 100M
- Primary facility

Truck Freight

- < $10B
- $10B - $50B
- $50B - $100B
- $100B - $200B
- > $200B
- Primary facility

Rail Freight

- < $10B
- $10B - $50B
- $50B - $100B
- $100B - $200B
- > $200B
- Primary facility

Redundancy and Mode Choice

Passenger trips on Segment B4 of the Crescent 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 for local access and for bypassing incidents causing congestion on sections of I-81. No alternate modes are available along Segment B4.

Park-and-Ride

Within Segment B4, 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

Bristol to Winchester

Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 4:30 Travel Time $176 Est. Cost

Roanoke to Staunton

Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 1:20 Travel Time $49 Est. Cost

Blacksburg / Christiansburg to Staunton

Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

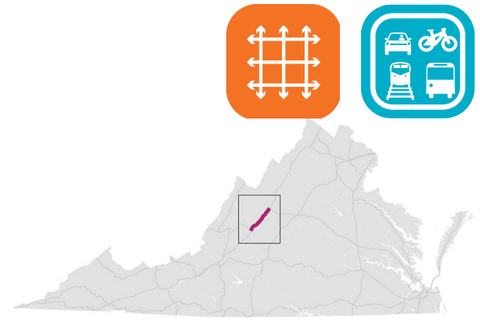
Via I-81: 2:05 Travel Time $66 Est. Cost

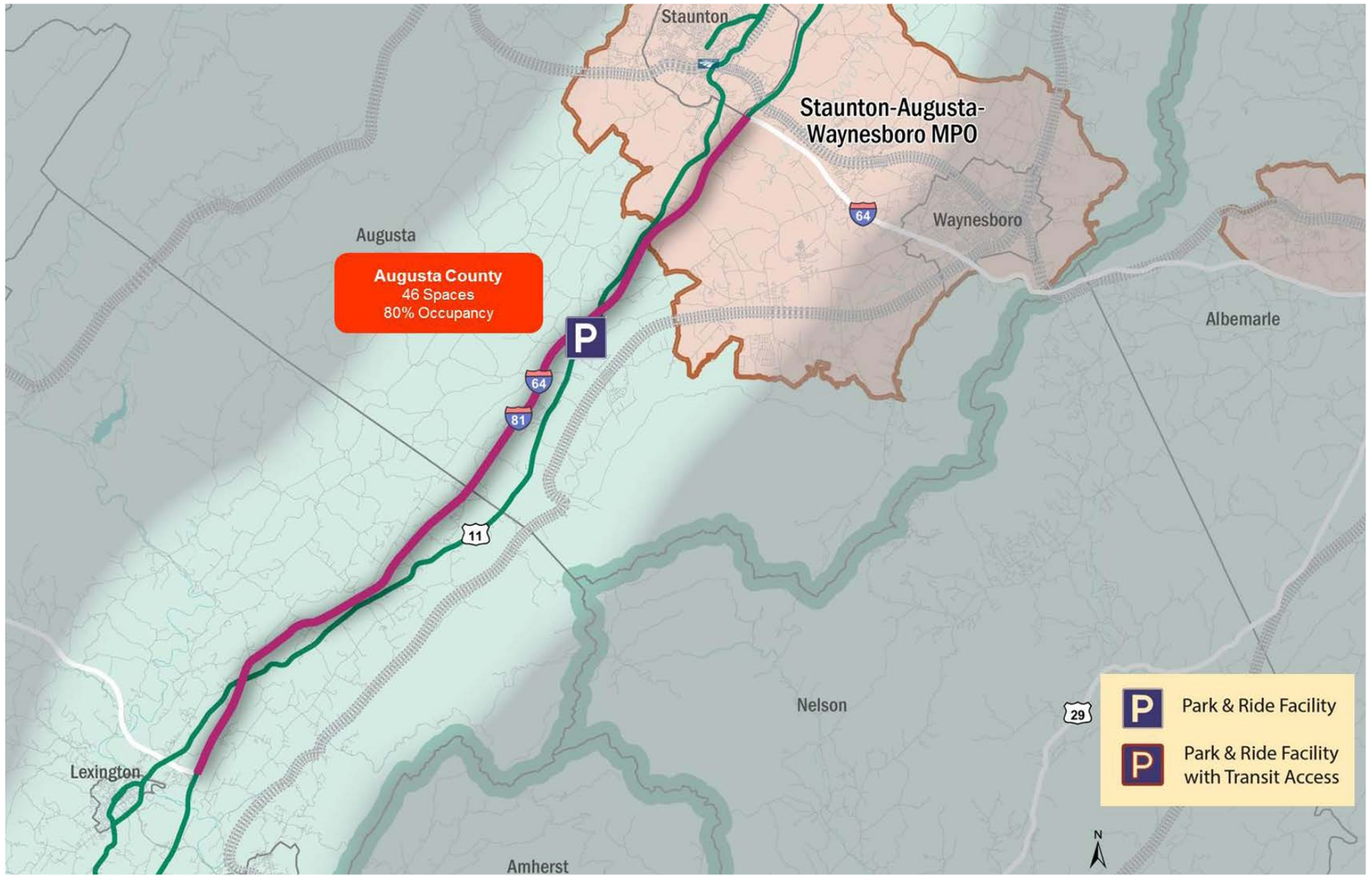
Roanoke to Harrisonburg

Inter-City Bus	*Train*
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 1:53 Travel Time $61 Est. Cost





Safety

Performance Metrics:

Number of Severe Crashes	4
Severe Crashes/Million VMT	0.1
Number of Railroad Crashes	2

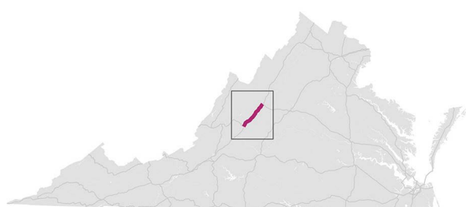
Only four severe crashes occurred on Segment B4 between 2010 and 2012, resulting in one of the lowest accident rates on CoSS segments statewide. All of these crashes occurred over a 1.4 mile stretch of US 11 (Lee Highway) between Fairfield and Vesuvius, approximately 2.6 miles south of Route 56 (Raphine Road).

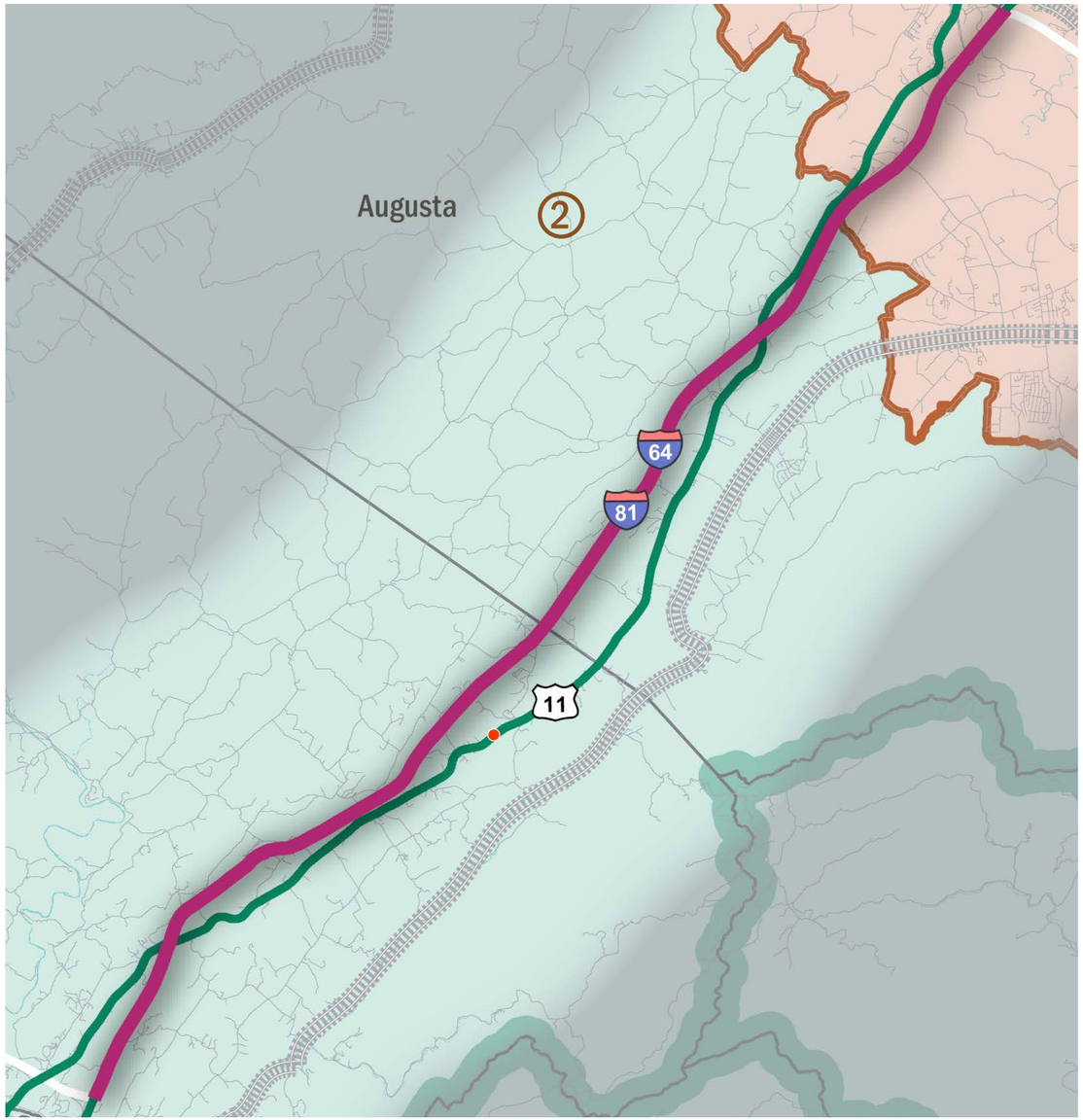
Fatality and Injury Crashes (2010 - 2012)

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

Railroad Incidents/Accidents per County (2011-2014)

#



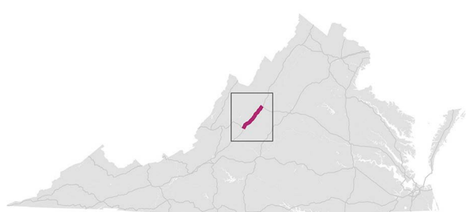


B4 SEGMENT NEEDS

Congestion

Performance Metrics:

Person Hours of Delay per Mile	0
Freight Ton Hours of Delay per Mile	7



Passenger Delays

Segment B4 experiences almost no passenger delays. Overlapping with Segment C2, 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.

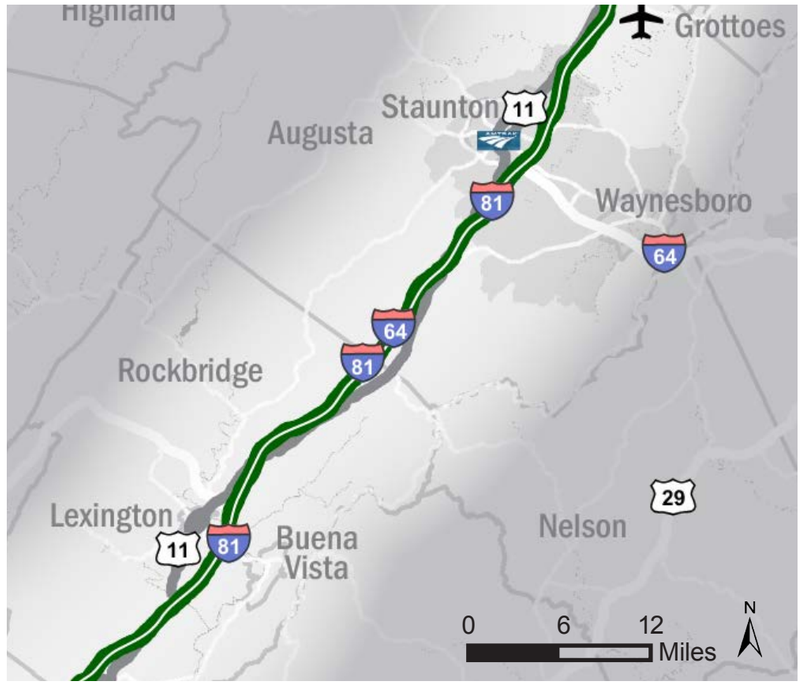
Daily Person Hours of Delay per Mile

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

Freight Delays

As with passenger congestion, Segment B4 experiences the lowest freight delays among CoSS segments, with only 400 ton-hours of delay daily. As such, there are no locations along Segment B4 where the freight delays exceed 250,000 ton-hours per mile.

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

B4 SEGMENT NEEDS

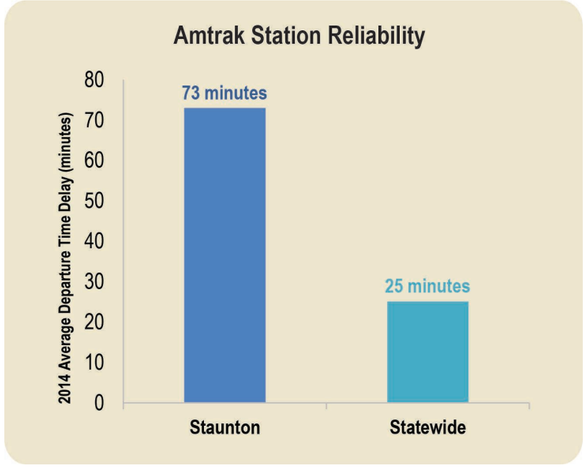
Reliability

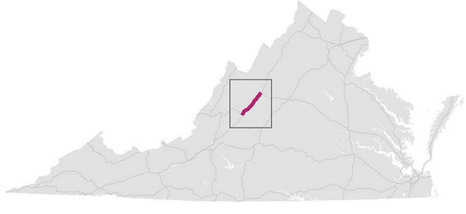
Reliability Index

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

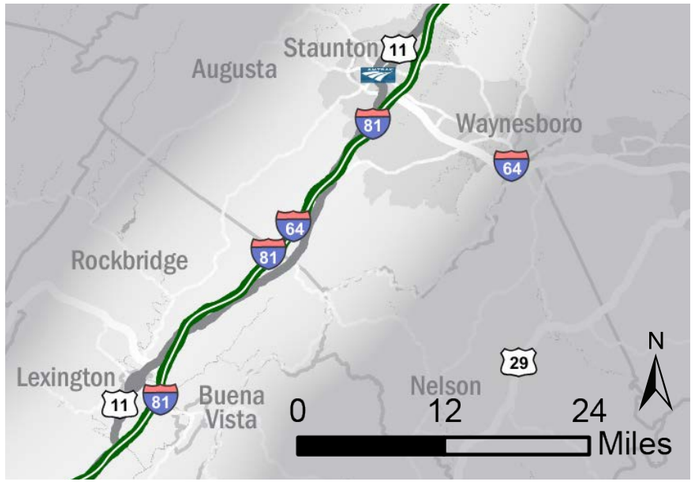
Statewide reliability index thresholds have been set for weekday peak, weekday and weekend travel to assess the reliability of travel on each segment on all corridors of statewide significance. A higher reliability index indicates that travel times are more unreliabile. The following are the reliability 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 B4 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 B4 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 B4 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 B4 have reliability index values exceeding the statewide threshold.

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

B4 SEGMENT NEEDS

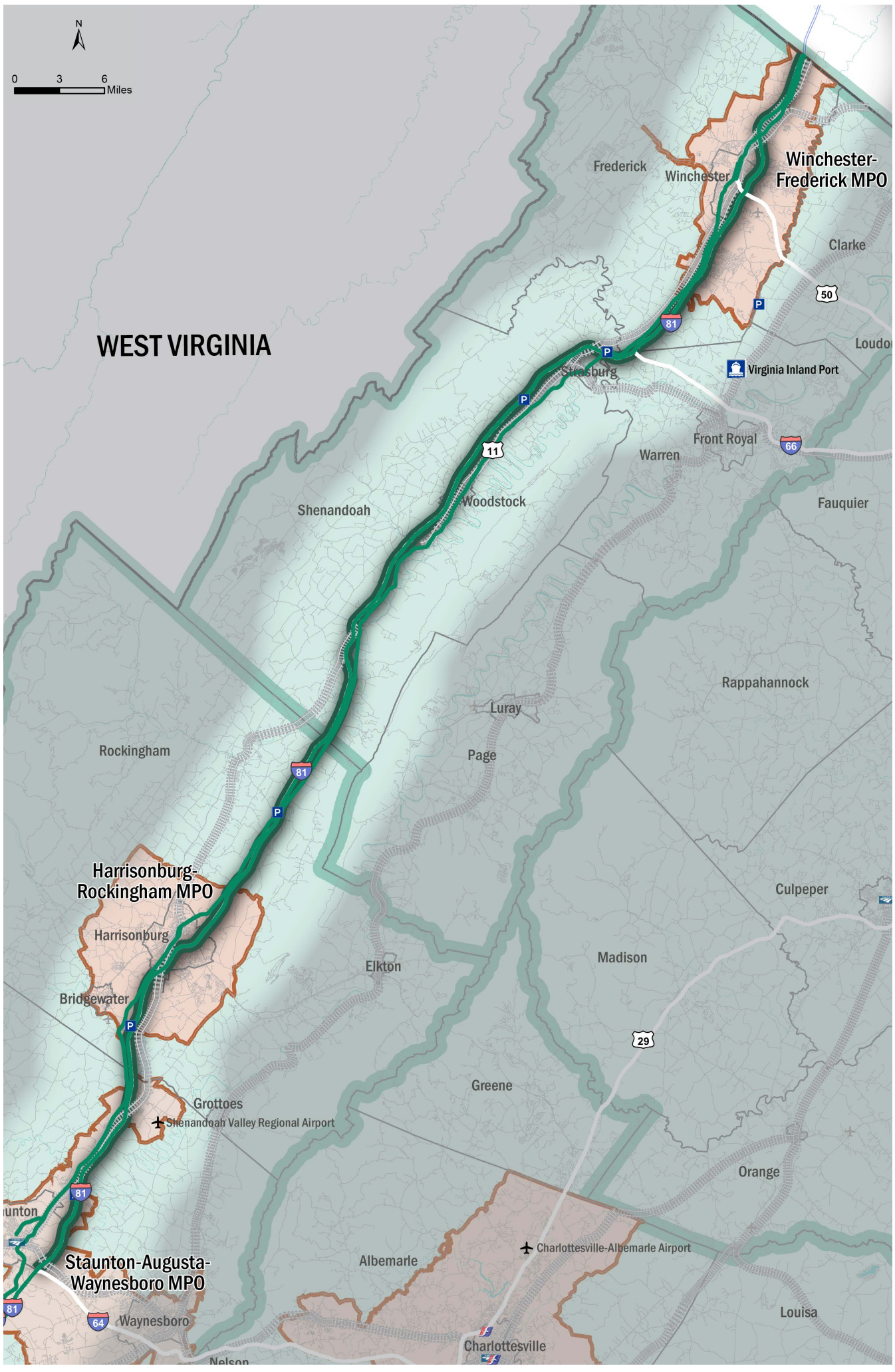
Summary of Needs - B4 Segment

A.	Redundancy issues along Corridor B: US 11 not able to handle overflow when incident occurs on I-81 resulting in signifcant delays
B.	US 11 south of Raphine Rd in Rockbridge County: 4 severe crashes
C.	No bus or rail service is available in the segment

VI. Segment B5

Corridor Segment B5 Components

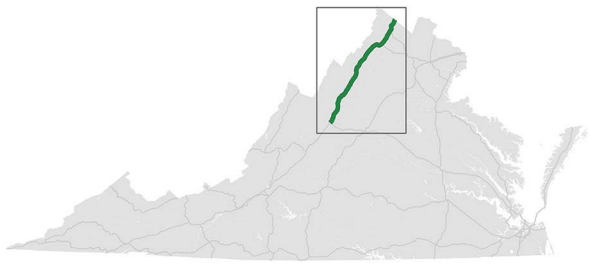
- I-81
- US 11
- Virginia Inland Port
- Norfolk Southern Crescent Corridor
- Shenandoah Valley Regional Airport



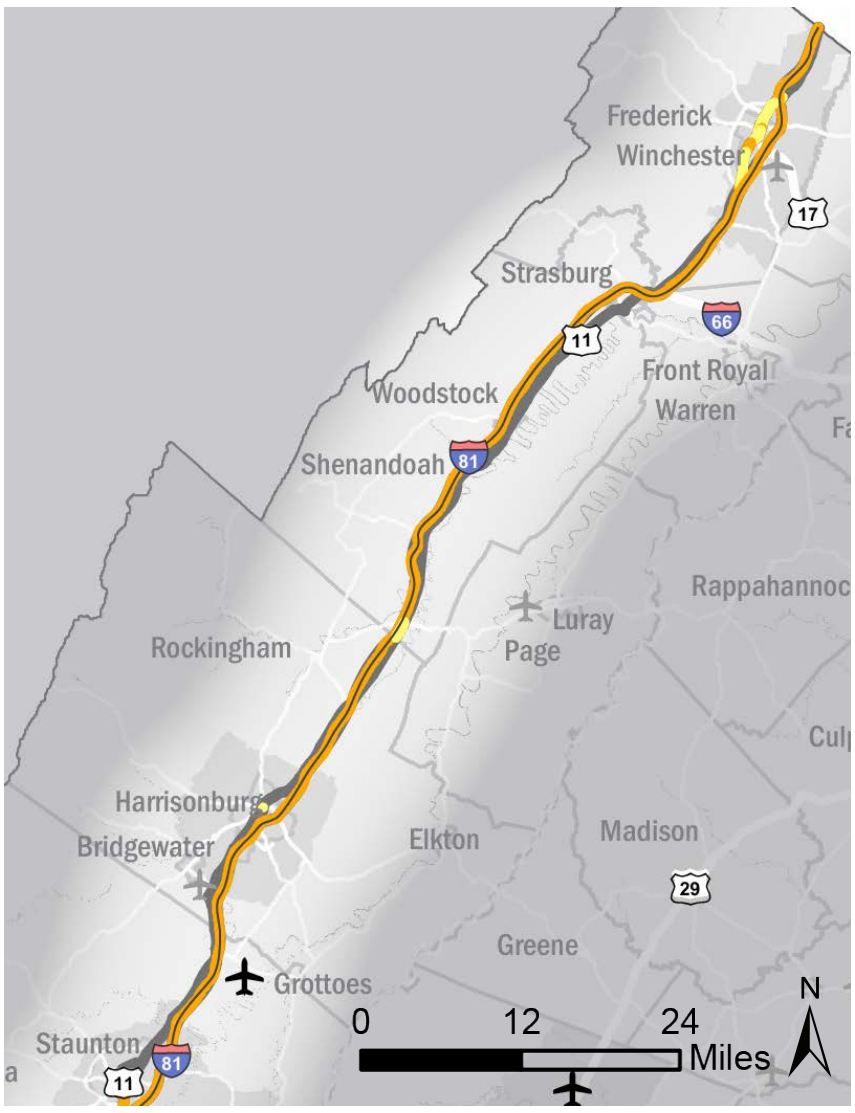
Segment B5

Corridor Component Road
Railroad
Airport Facility
Amtrak Facility
Greyhound Facility
VRE Facility
Metrorail Facility
Port Facility
Park & Ride Facility

MPO Area
Planning District Area



B5 SEGMENT PROFILE



Number of Lanes (both directions)

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

Segment B5 begins at the junction of I-64/I-81 near Staunton and progresses north to the West Virginia border. This segment serves Augusta, Rockingham, Shenandoah, and Frederick Counties, as well as the Cities of Staunton, Harrisonburg, and Winchester. The segment travels through the areas covered by the Staunton-Augusta-Waynesboro MPO, the Harrisonburg-Rockingham MPO and the Winchester-Frederick MPO. The segment also includes US 11. Segment B5 acts as a major corridor for through freight travel in Virginia and also connects smaller urban areas, such as Staunton, Harrisonburg, and Winchester, as well as multiple natural, historical, and cultural resources.

Highway Facilities: I-81 is primarily a rural highway with four lanes in Segment B5. US 11 runs parallel to I-81 throughout the corridor.

Transit Services: Amtrak service is available at Staunton, serving the east-west Cardinal Route. Shuttle buses connect Blue Ridge Community College in Weyers Cave to Staunton and Harrisonburg. There are five Park-and-Ride facilities near I-81.

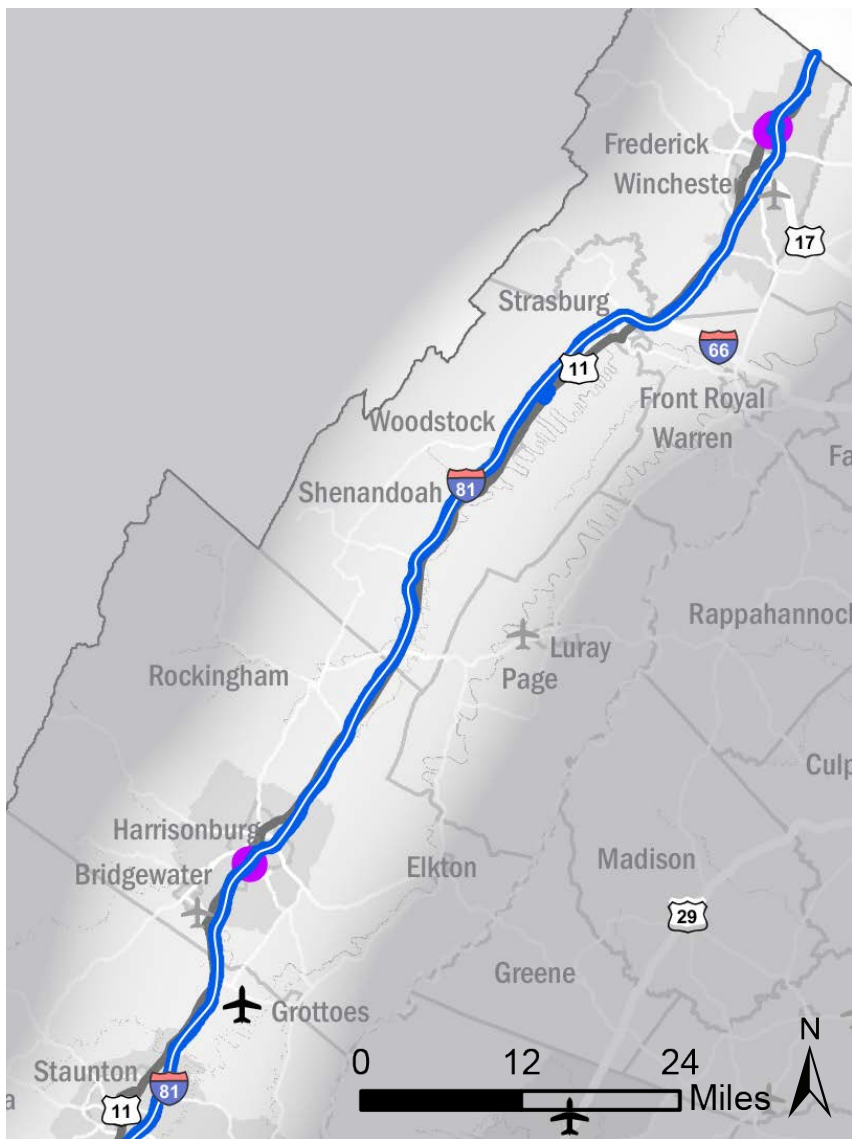
Rail Facilities: Norfolk Southern's Crescent Corridor rail lines pass through Segment B5 and also connect to the Virginia Inland Port. Several short line railroads also provide service to Segment B5.

Port Facilities: I-81 provides access to the Virginia Inland Port, which is located near Winchester. This port receives cargo from state-owned ports in the Hampton Roads Area.

Airport Facilities: The Shenandoah Valley Regional Airport is the only commercial airport in this segment.

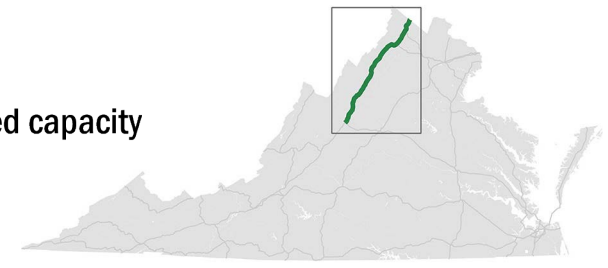
Major planned and future projects include:

- Widening of Route 277 (Fairfax Pike) to five lanes between the northbound I-81 ramps and Double Church Road
- Adding a left turn lane and increasing capacity on Martinsburg Pike just east of the interchange with I-81



Future Projects

- Reconstruction with added capacity
- Safety improvements
- Primary facility



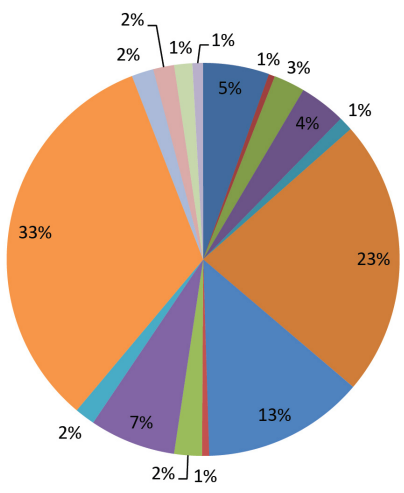
Travel Demand

Passenger Demand

The northernmost segment of Corridor B is a long segment that connects three MPO Areas—Staunton-Augusta-Waynesboro, Harrisonburg-Rockingham, and Winchester-Frederick—before entering West Virginia in the far north. Traffic between the Staunton-Augusta-Waynesboro Area and the two MPO areas to the north accounts for approximately 1.5 percent of the total intercity passenger travel in the state.

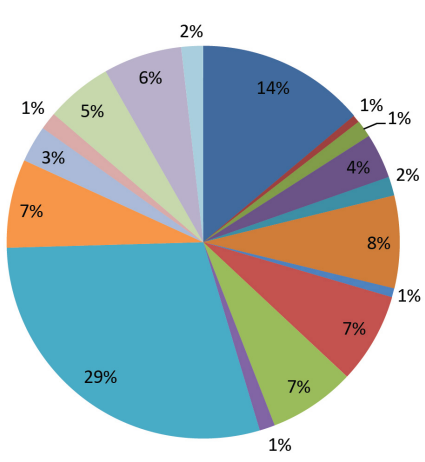
Of the intercity passenger traffic originating in the Staunton area, 23 percent is destined for the Harrisonburg-Rockingham Area farther north in Segment B5. An additional five percent is destined for the Metropolitan Washington region and may use this segment as well. Almost all intercity travel originating in the Harrisonburg-Rockingham Area is likely to use Segment B5 because of the Area's geographic location near its center. Of this travel, 29 percent is destined for the Staunton-Augusta-Waynesboro Area, while another 14 percent is destined for the Washington Metropolitan area. Other notable destinations for intercity travel from Harrisonburg include Richmond (eight percent), Winchester (seven percent), Roanoke (seven percent), and Charlottesville (seven percent). The Winchester-Frederick Area is also located such that a large portion of intercity travel originating in the region is likely to use Segment B5. More than half of the intercity traffic originating in Winchester is destined for the Washington Metropolitan area, for which several potential paths exist. An additional 14 percent of intercity traffic is destined for neighboring West Virginia, while nine percent is ultimately destined for the State of Maryland.

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



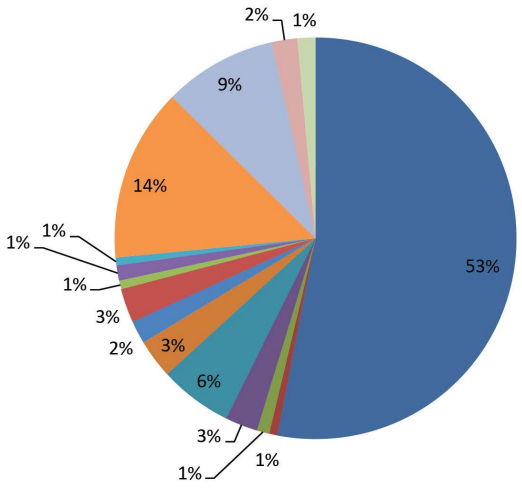
(clockwise starting from the top)
- Metropolitan Washington Region
- Danville Area
- Hampton Roads Area
- Central Virginia Area
- Fredericksburg Area
- Harrisonburg-Rockingham Area
- Richmond Area
- Tri-Cities Area
- Winchester-Frederick Area
- Roanoake Valley Area
- New River Valley Area
- Charlottesville-Albemarle Area
- North Carolina
- West Virginia
- Maryland
- Other

Travel from Harrisonburg-Rockingham Area to...



(clockwise starting from the top)
- Metropolitan Washington Region
- Danville Area
- Hampton Roads Area
- Central Virginia Area
- Fredericksburg Area
- Richmond Area
- Tri-Cities Area
- Winchester-Frederick Area
- Roanoake Valley Area
- New River Valley Area
- Staunton-Augusta-Waynesboro Area
- Charlottesville-Albemarle Area
- North Carolina
- Tennessee
- West Virginia
- Maryland
- Pennsylvania

Travel from Winchester-Frederick Area to...



(clockwise starting from the top)
- Metropolitan Washington Region
- Hampton Roads Area
- Central Virginia Area
- Fredericksburg Area
- Harrisonburg-Rockingham Area
- Richmond Area
- Roanoake Valley Area
- Staunton-Augusta-Waynesboro Area
- Charlottesville-Albemarle Area
- North Carolina
- Tennessee
- West Virginia
- Maryland
- Pennsylvania
- Other

B5 SEGMENT PROFILE

Freight Demand

By truck, Segment B5 carried 71 million tons of freight worth $138 billion in 2012, and is estimated to carry 96 million tons of freight worth $205 billion in 2025. The major truck freight flows in Corridor B are interstate through-traffic, with approximately 60 percent of truck freight tonnage in the corridor and more than 75 percent of the total truck freight value, passing through Virginia. There is significant truck freight traffic along Corridor B between North Carolina and Ohio, accounting for four percent of the total corridor freight tonnage and value. Pennsylvania and Tennessee are also significant generators of truck freight tonnage along Corridor B. Around eight percent of the total truck freight on Corridor B, by value, is destined for New York, while another six to eight percent of truck freight on Corridor B is destined for non-US North American destinations. Frederick and Rockingham Counties are both significant generators of truck freight along Segment B5, each accounting for between one and two percent of freight tonnage, with most of the truck freight destined for the Middle Atlantic region. Rockingham and Shenandoah Counties, along with Harrisonburg, are significant attractors of truck freight along Segment B5, with major truck freight movements originating from North Carolina and Pennsylvania.

By rail, Segment B5 carried 1.1 million tons of freight worth $380 million in 2012, and is estimated to carry 1.6 million tons of freight worth $520 million in 2025. In terms of tonnage, the largest rail freight flows in Corridor B consist of low-value freight traveling from West Virginia to North Carolina, accounting for between 18 and 22 percent of the total rail freight corridor tonnage in 2012 and 2025, respectively. The City of Norfolk and its port facility is a major destination of rail freight in Corridor B, accounting for between 18 and 20 percent of the total corridor tonnage, with major rail freight flows originating in West Virginia, Wise County, and Buchanan County. In terms of value, rail freight flows between Illinois and the Cities of Norfolk and Portsmouth (and their port facilities) are the largest in Corridor B, accounting for more than 20 percent of the total rail freight value in the corridor. There is a major rail freight movement from the Port of Virginia to the Virginia Inland Port in Warren County, adjacent to Segment B5, accounting for two percent of the total rail freight value in the corridor.

Truck Freight

Major Origins (by Tonnage)
1. Virginia (25% / 23%)
2. North Carolina (13% / 12%)
3. Pennsylvania (8% / 8%)
4. Ohio (6% / 7%)
5. Tennessee (6% / 6%)

Corridor Tonnage Originating in Segment B5: 7% / 6%

Major Origin-Destination Pairs for Freight
North Carolina and Ohio
North Carolina and Pennsylvania
North Carolina and West Virginia
Ohio and Florida
North Carolina and Indiana

Percentages represent 2012 / 2025 values.

Major Destinations (by Tonnage)
1. Virginia (22% / 22%)
2. North Carolina (14% / 15%)
3. Pennsylvania (8% / 8%)
4. New York (6% / 6%)
5. Tennessee (4% / 5%)

Corridor Tonnage Destined for Segment B5: 4% / 4%

Rail Freight

Major Origins (by Tonnage)
1. Virginia (31% / 28%)
2. West Virginia (30% / 26%)
3. Wise County (12% / 10%)
4. Illinois (8% / 10%)
5. Ohio (6% / 8%)

Corridor Tonnage Originating in Segment B5: 1% / 2%

Major Origin-Destination Pairs for Freight
West Virginia and North Carolina
City of Norfolk* and West Virginia
Wise County and City of Norfolk*
Ohio and North Carolina
Illinois and North Carolina

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

Major Destinations (by Tonnage)
1. Virginia (38% / 37%)
2. North Carolina (35% / 35%)
3. City of Norfolk* (20% / 17%)
4. Tennessee (4% / 3%)
5. Georgia (3% / 3%)

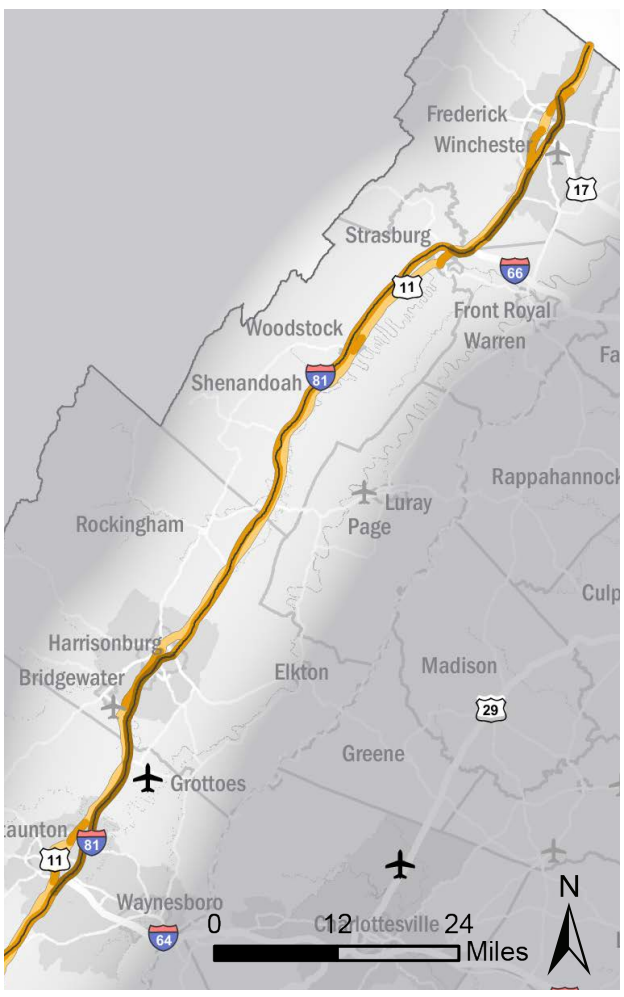
Corridor Tonnage Destined for Segment B5: 3% / 4%

Traffic Conditions

Traffic Volume and AADT

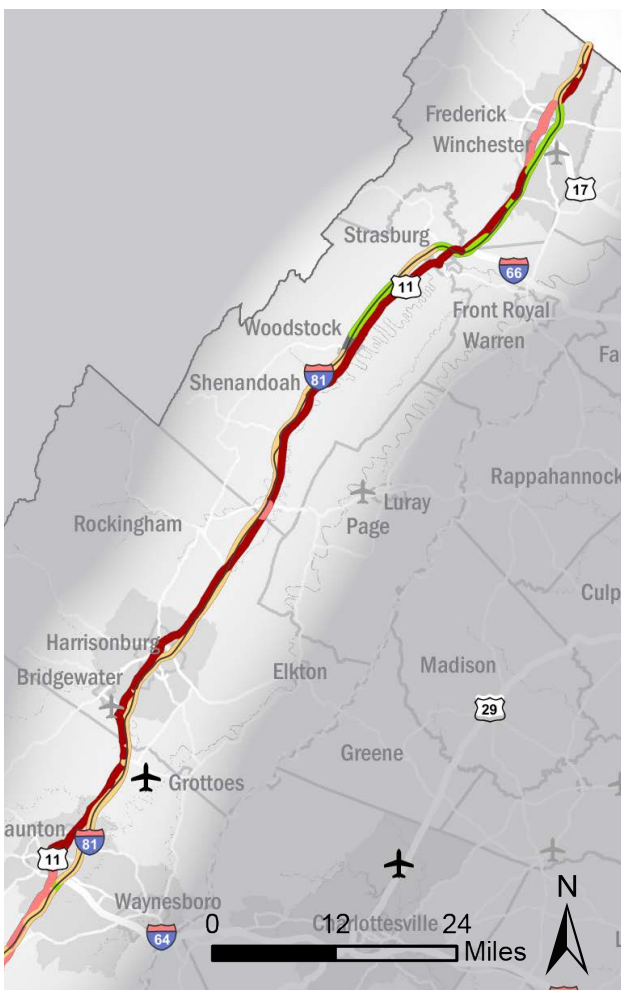
Segment B5 contains some of the heaviest trafficked sections of highway in Corridor B. From Staunton to Harrisonburg along I-81, average daily traffic volumes range from 50,000 to 56,000 vehicles. North of Harrisonburg on I-81, average daily traffic volumes range from 37,000 to 50,000 vehicles. The highest traffic levels occur in and around the City of Winchester, with average daily traffic greater than 60,000 vehicles per day in some locations. Traffic volumes along I-81 are projected to increase by 2025 throughout Segment B5 by 6,000 to 13,000 vehicles per day, with sections along I-81 east of Winchester forecasted to experience the greatest volume increases. By 2025, traffic volumes between Staunton and Harrisonburg are projected to average about 60,000 vehicles per day, and volumes along I-81 in Frederick County and Winchester are projected to range from 51,000 to 75,000 vehicles per day, with the most trafficked sections along I-81 just east of Winchester. Traffic volumes on US 11 are generally much lower than on I-81 although through the Cities of Winchester and Harrisonburg, traffic levels reach 40,000 and 20,000 vehicles per day, respectively. Traffic on US 11 outside of the urbanized areas is generally less than 14,000 vehicle per day. Little growth in traffic is projected for most of US 11 by 2025.

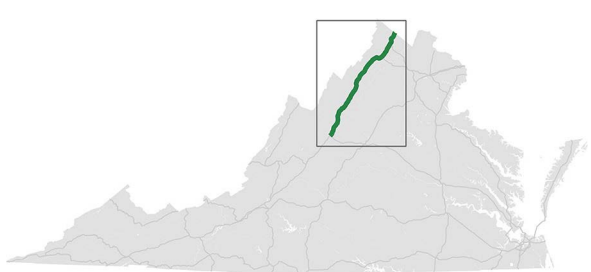
Traffic Volume 2014 (AADT)



Traffic Volume 2025 (AADT)

Change in Traffic Volume 2014- 2025 (AADT)

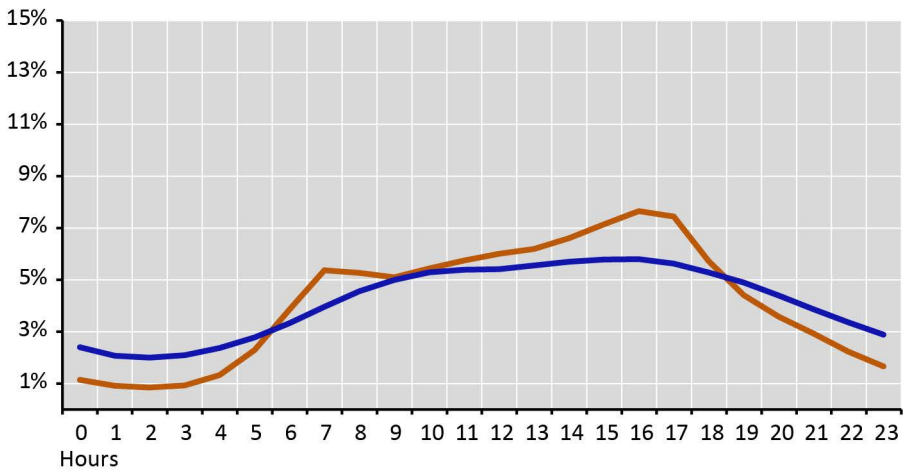




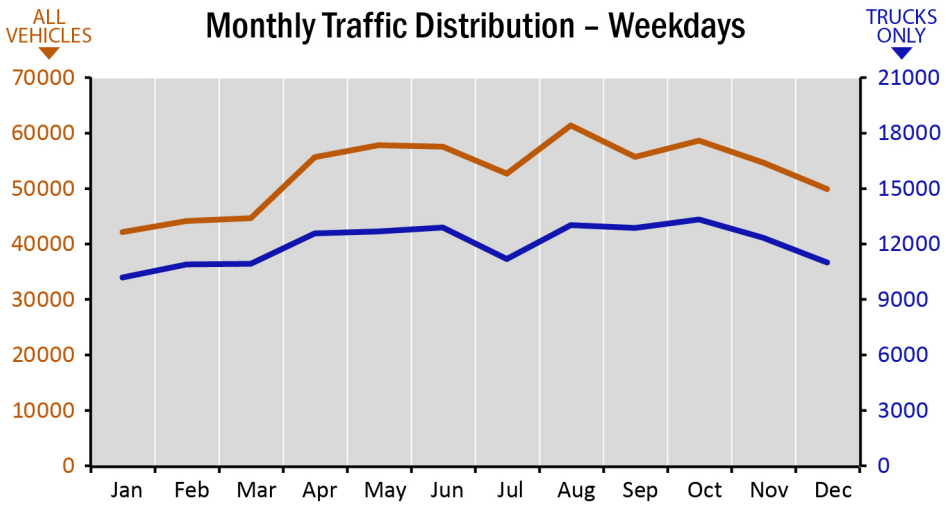
B5 SEGMENT PROFILE

All Vehicles
Trucks

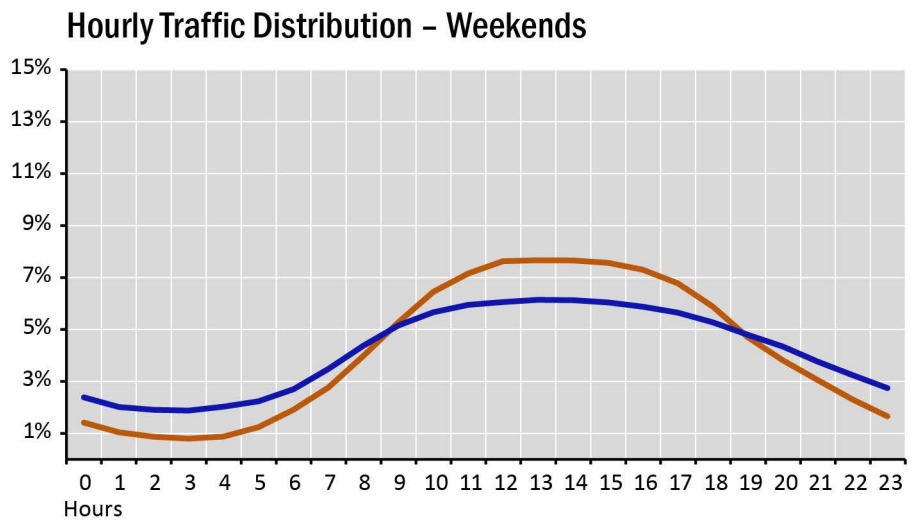
Hourly Traffic Distribution – Weekdays



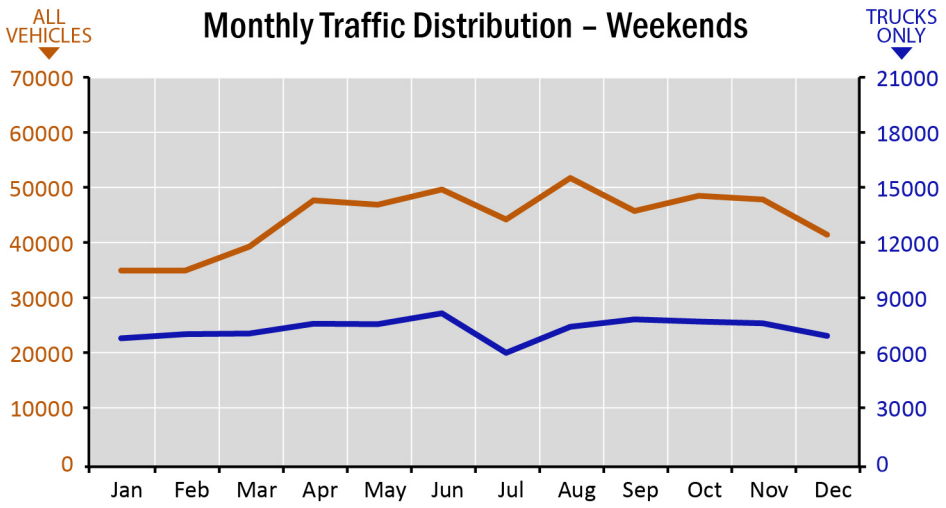
Monthly Traffic Distribution – Weekdays

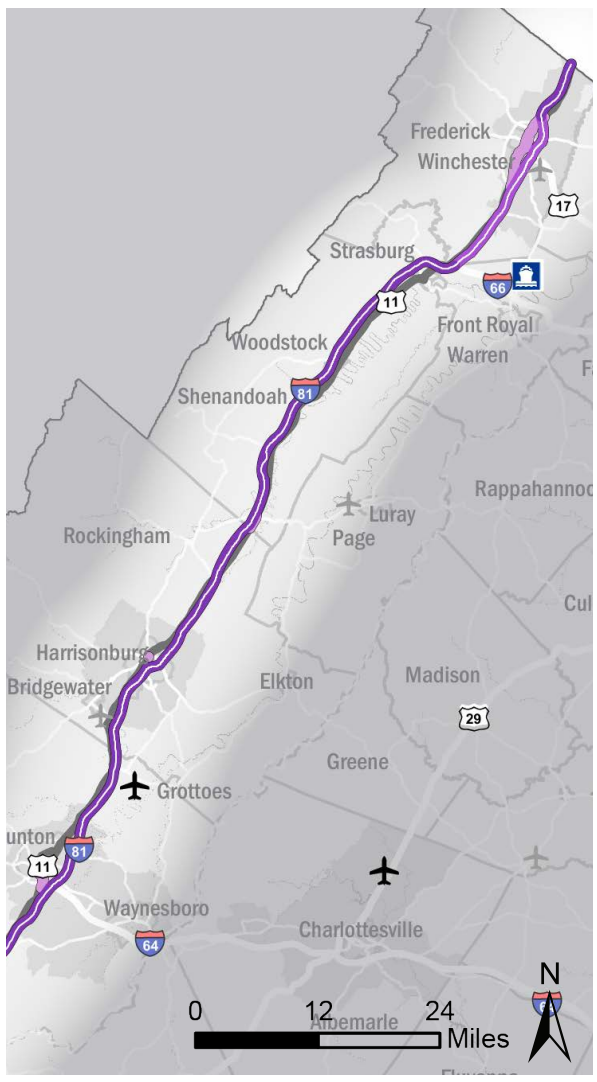


Hourly Traffic Distribution – Weekends



Monthly Traffic Distribution – Weekends





Percent Heavy Trucks

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

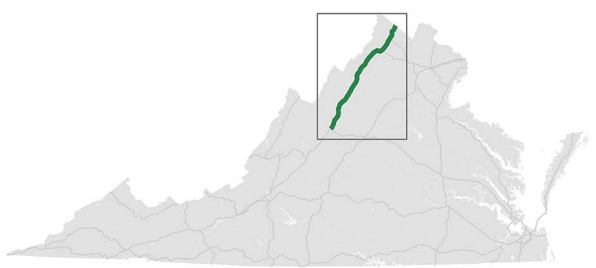
Traffic Distribution

On average, traffic on Segment B5 is distributed throughout the day as shown in the graphs below. Weekday traffic shows the typical morning and evening peak periods. The highest hourly traffic occurs between 4 and 5 p.m., which accounts for 7.6 percent of daily traffic, and a less busy morning peak hour from 7 to 8 a.m., accounting for 5.4 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 48 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 6 p.m. Weekend traffic patterns are 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 noon and 1 p.m. (7.6 percent of daily traffic) for all traffic, and 2 to 3 p.m. (6.1 percent of daily traffic) for truck traffic.

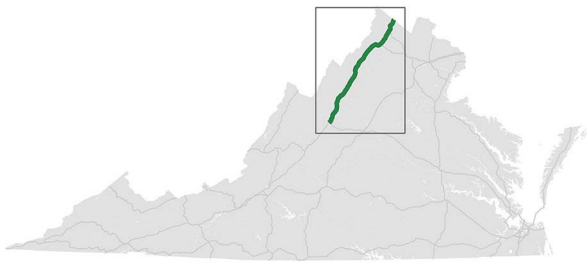
Weekday traffic volumes on Segment B5 vary by as much as 46 percent throughout the year, with the highpoint in August (around 61,000 vehicles per day) and the low point in January (around 42,000 vehicles per day). Truck volumes vary less than passenger volumes throughout the year, with the October high (around 13,000 vehicles per day) 31 percent higher than the January low (around 10,000 vehicles per day). Weekend traffic levels also vary over the course of the year, with a significant decrease during the winter months; August volumes are 48 percent higher than January volumes. Weekend truck traffic is somewhat more steady than all vehicle traffic, with the June high (around 8,000 vehicles per day) 36 percent higher than the July low (around 6,000 vehicles per day). Truck volumes account for a significant portion of traffic on Segment B5 (23 percent of overall daily traffic for weekdays and 16 percent of overall daily traffic for weekends); as a result, truck traffic has a significant impact on overall traffic conditions.

Truck Volume

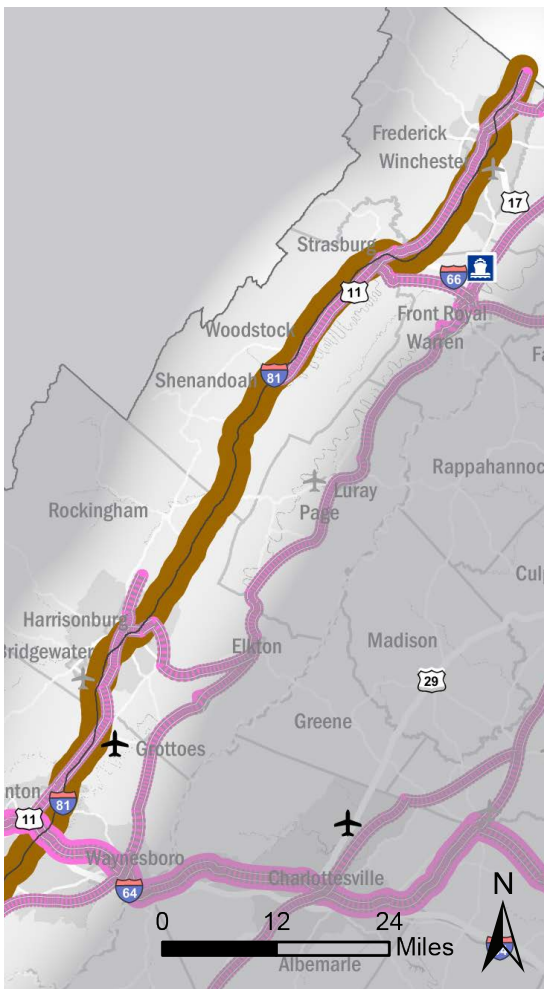
The percent of daily traffic comprised of heavy trucks on Segment B5 is lower relative to most other segments in Corridor B. On I-81, trucks comprise between 10 and 13 percent of daily traffic. On US 11, trucks make up a much smaller portion of traffic, accounting for four percent or less in the urbanized areas along the segment.



B5 SEGMENT PROFILE



Annual Freight by Tonnage, 2012

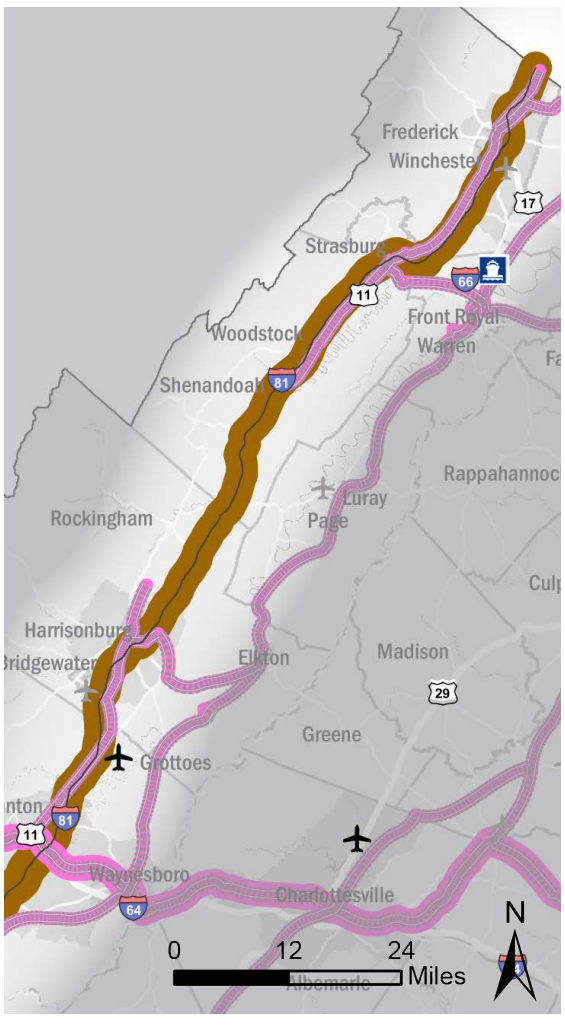


Freight Flows

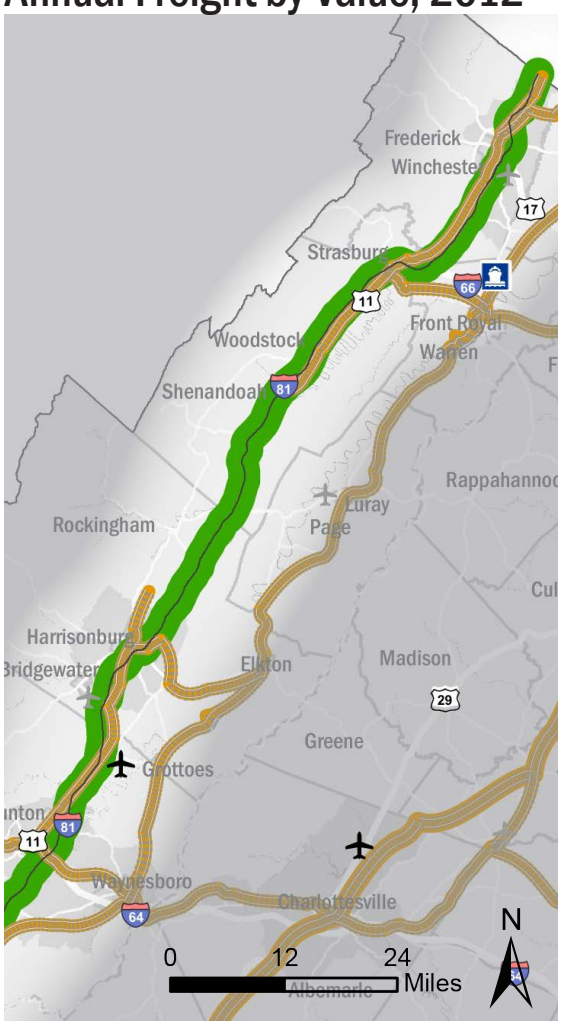
At the southern end of Segment B5, south of Harrisonburg, freight is moved primarily by truck, in terms of both tonnage and value. In total, 71 million tons (99 percent) of freight is moved through this section of Segment B5 by truck, compared to 839,000 tons by rail. By value, trucks are favored even more, with $138 billion (99.8 percent) of freight value traveling by truck, compared to $386 million by rail. On average, a ton of freight traveling by truck through this section of Segment B5 is worth $1,936 while a ton of freight traveling by rail is worth $460. In 2025, both rail and truck freight tonnages and total values in the southern end of Segment B5 are expected to increase, but the percentages of tonnage and value moved by truck are expected to remain nearly the same. Values per ton of freight on trucks are expected to increase to $2,124 in 2025, while rail values per ton will remain nearly the same, at $458.

At the northern end of Segment B5, north of Winchester, freight is also moved primarily by truck, in terms of both tonnage and value. In total, 71 million tons (98 percent) of freight is moved through this section of Segment B5 by truck, compared to 1 million tons by rail. By value, trucks are favored even more, with $132 billion (99.7 percent) of freight value traveling by truck, compared to $379 million by rail. On average, a ton of freight traveling by truck through this section of Segment B5 is worth $1,864 while a ton of freight traveling by rail is worth $334. In 2025, both rail and truck freight tonnages and total values in the northern end of Segment B5 are expected to increase, but the percentages of tonnage and value moved by truck are expected to remain nearly the same. Values per ton of freight on trucks are expected to increase to $2,053 in 2025, while rail values per ton will remain nearly the same, at $330.

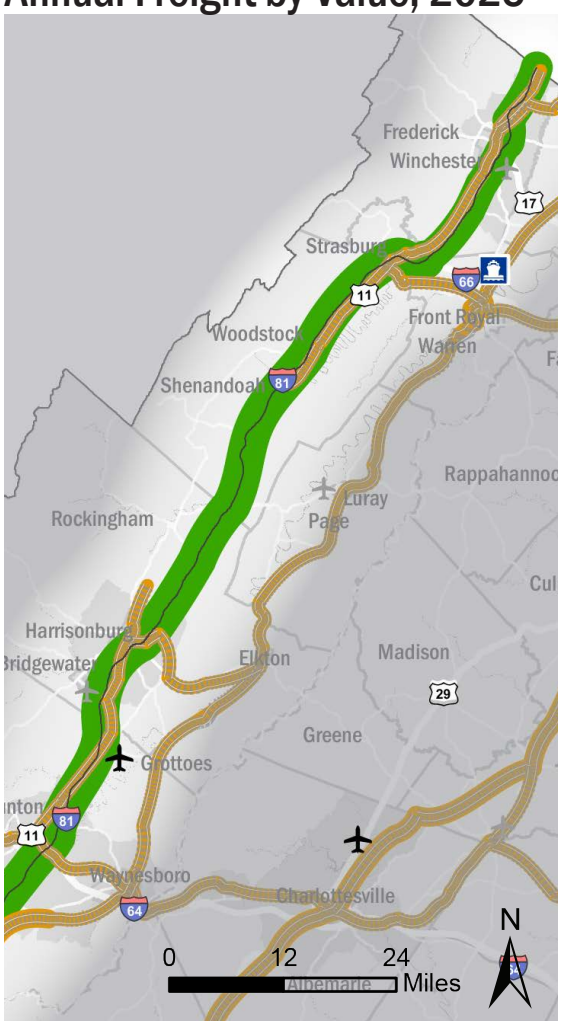
Annual Freight by Tonnage, 2025



Annual Freight by Value, 2012



Annual Freight by Value, 2025



Truck Freight (in tons)

- < 10M
- 10M - 25M
- 25M - 50M
- 50M - 100M
- > 100M
- Primary facility

Rail Freight (in tons)

- < 10M
- 10M - 25M
- 25M - 50M
- 50M - 100M
- > 100M
- Primary facility

Truck Freight

- < $10B
- $10B - $50B
- $50B - $100B
- $100B - $200B
- > $200B
- Primary facility

Rail Freight

- < $10B
- $10B - $50B
- $50B - $100B
- $100B - $200B
- > $200B
- Primary facility

Redundancy and Mode Choice

Comparable Travel Options

Staunton to Harrisonburg

Inter-City Bus	Train
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 0:35 Travel Time $16 Est. Cost

Roanoke to Harrisonburg

Inter-City Bus	Train
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 1:53 Travel Time $61 Est. Cost

Staunton to Winchester

Inter-City Bus	Train
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 1:37 Travel Time $54 Est. Cost

Staunton to DC

Inter-City Bus	Train
0 Trips per Day 0:00 Travel Time $0 Est. Cost	2 Trips per Day 3:56 Travel Time $26 Est. Cost

Auto

Via I-81: 2:41 Travel Time $88 Est. Cost

Harrisonburg to Richmond

Inter-City Bus	Train
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

Auto

Via I-81: 2:28 Travel Time $75 Est. Cost

Harrisonburg to Charlottesville

Inter-City Bus	Train
0 Trips per Day 0:00 Travel Time $0 Est. Cost	0 Trips per Day 0:00 Travel Time $0 Est. Cost

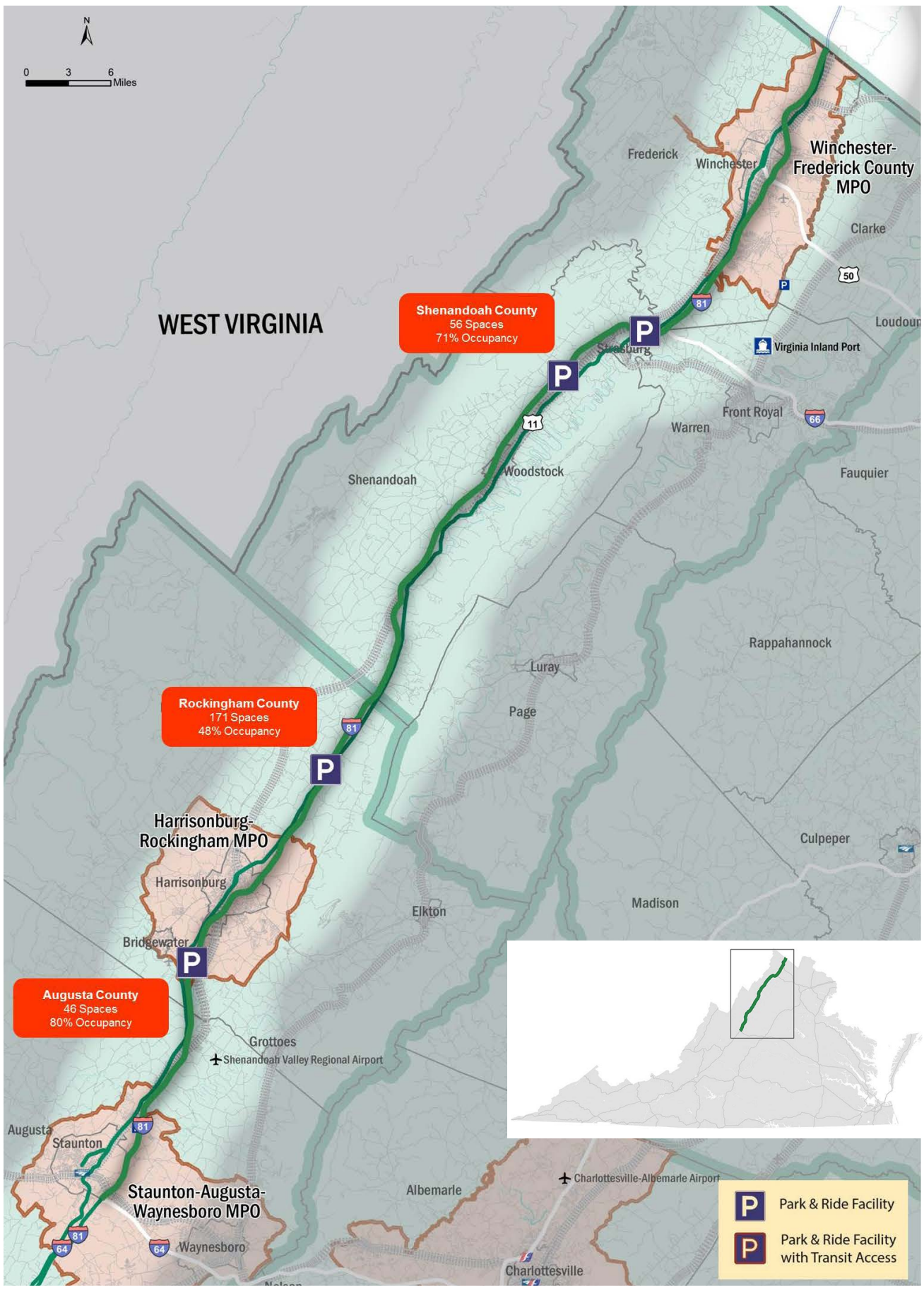
Auto

Via I-81: 1:05 Travel Time $35 Est. Cost

Passenger trips on Segment B5 of the Crescent 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 for local access and for bypassing incidents causing congestion on sections of I-81. Amtrak service is available at Staunton, but it does not provide a connection to any other locations in the corridor. Shuttle buses connect Blue Ridge Community College in Weyers Cave to Staunton and Harrisonburg.

Park-and-Ride

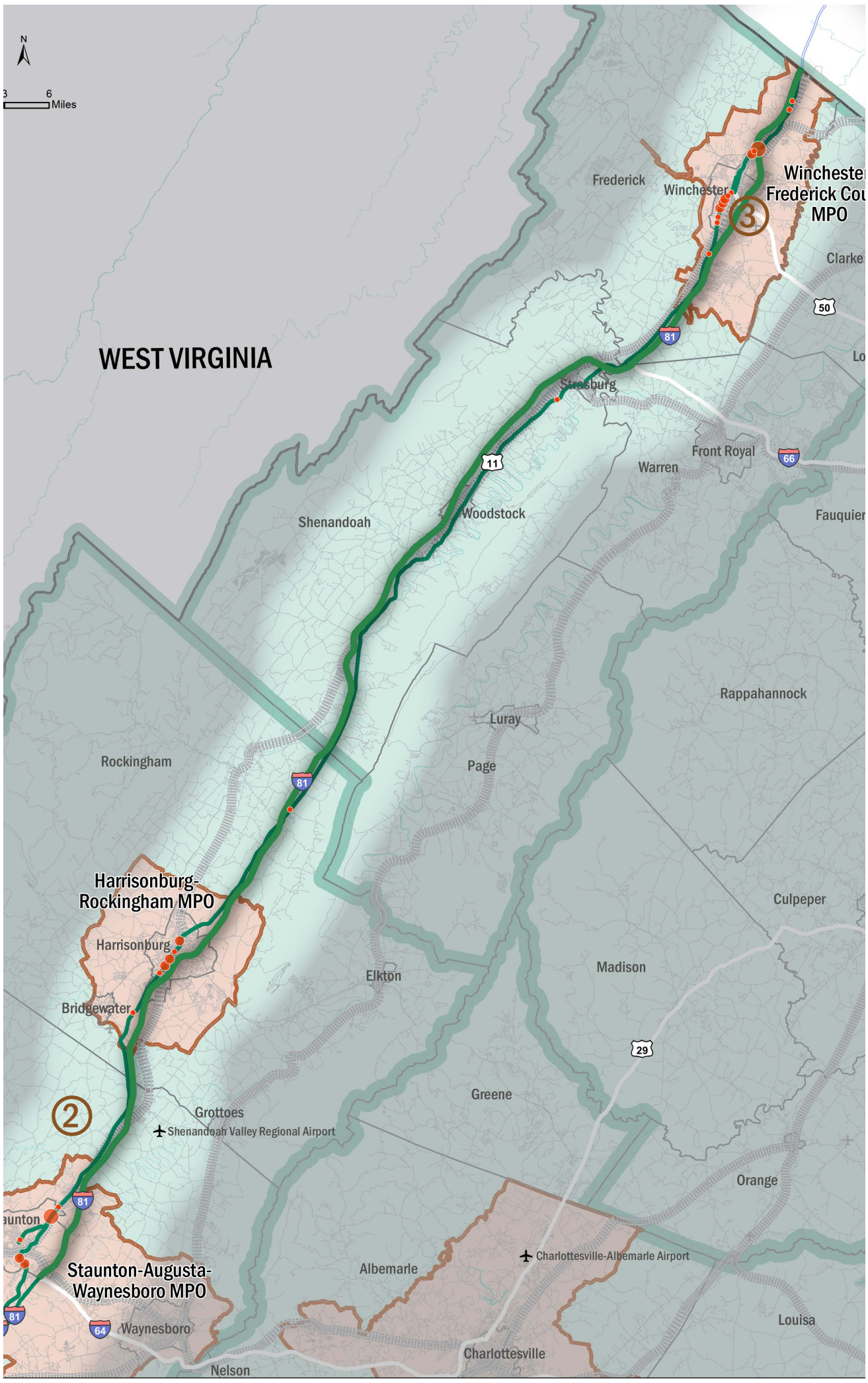
Within Segment B5, commuters can utilize several Park-and-Ride locations. Rockingham County provides the highest number of Park-and-Ride spaces and locations, while Augusta County has the highest utilization rate of spaces available in the region. Augusta and Botetourt Counties both have a utilization rate of 80 percent, which is higher than the statewide average of 76 percent for Park-and-Ride utilization.



B5 SEGMENT NEEDS

Safety

Between 2010 and 2012, 145 severe crashes occurred on Segment B5, and several areas along the segment have high concentrations of severe collisions. In Staunton along US 11, there were 16 crashes within approximately one mile between West Village Drive and Mary Gray Lane (as noted for C2), and there were 11 crashes at the intersection of US 11 and Route 262. In Harrisonburg, along US 11, 30 incidents occurred over 2.6 miles between Pointe Drive and West Market Street, with ten of the 30 incidents occurring at the intersection of South Liberty Street and West Market Street and nine occurring at South Main Street and Pleasant Hill Road. In Winchester, along US 11, there were 37 crashes that took place over a 2.3 mile span between Armour Dale and West Bond Street with the highest number (nine) occurring at the intersection of Middle Road and Valley Avenue outside of the Ward Plaza Shopping Center. Another concentrated area of crashes in Winchester is around the interchange of I-81 and US 11. Along US 11, there were 24 collisions that took place over a distance of 0.6 miles between the US 11 intersections with Route 37 and Redbud Road.



Performance Metrics:

Number of Severe Crashes 145

Severe Crashes/ Million VMT 0.2

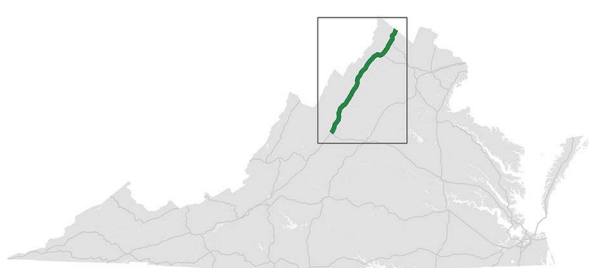
Number of Railroad Crashes 5

Fatality and Injury Crashes (2010 - 2012)

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

Railroad Incidents/Accidents per County (2011-2014)

#



Congestion

Performance Metrics:

Person Hours of Delay per Mile	0
Freight Ton Hours of Delay per Mile	5.3K

Passenger Delays

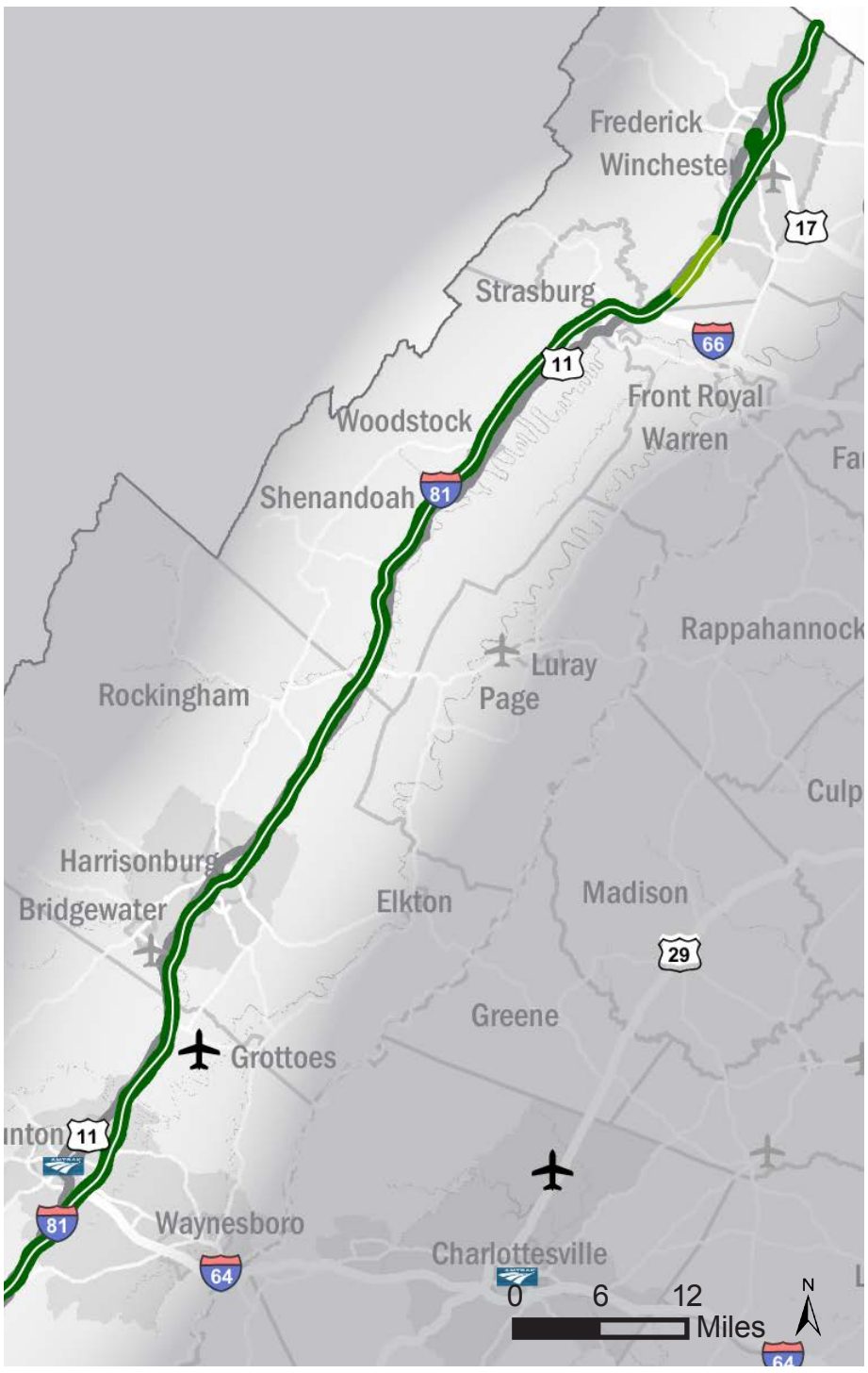
Segment B5 experiences some of the lowest passenger traffic congestion delays in the state, with only 100 person-hours delay daily. As such, there are no locations along the segment where passenger delays exceed 100 person-hours per mile. The peak-period passenger delay percentage is slightly above the average on other CoSS segments, although the total passenger delay is minimal for this corridor segment.

Freight Delays

As with passenger congestion, Segment B5 experiences minimal freight delays with daily delays totaling around 1.1 million ton-hours. The location with the highest level of freight congestion corresponds with trucks accessing the Inland Port from I-81 south of Winchester, but there are no locations along the corridor segment that exceed 250,000 ton-hours per mile of freight delay. The peak-period freight delay accounts for only five percent of the total freight delay on the segment - well below the average on other CoSS segments - suggesting that freight traffic is not concentrated during peak hours.

Daily Person Hours of Delay per Mile

Daily Freight Ton Hours of Delay per Mile



B5 SEGMENT NEEDS

Reliability

Weekday Peak

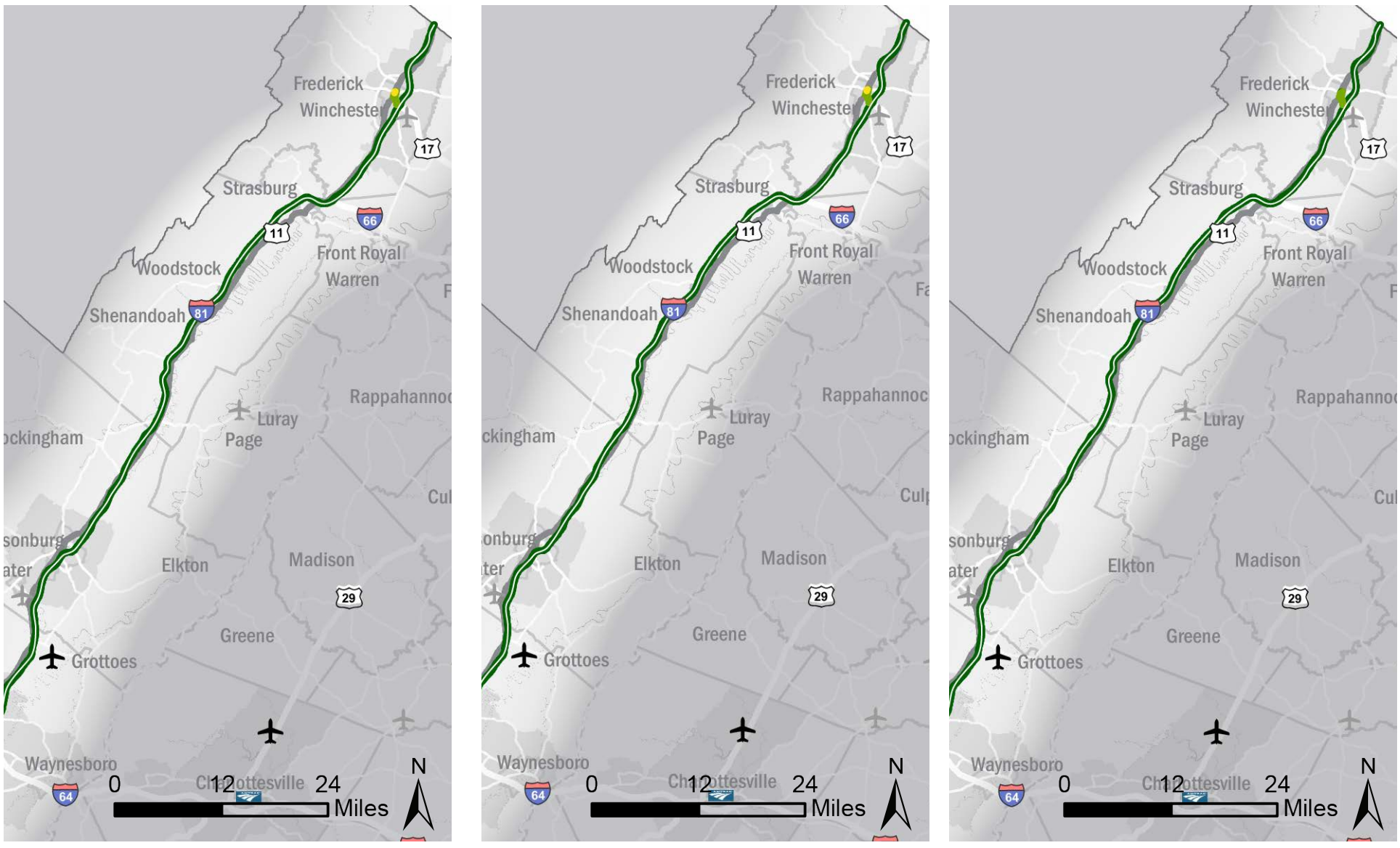
Reliability of travel during the peak period on a typical weekday on Segment B5 ranges from 0.00 to 0.43 in terms of reliability index, with an average value of 0.03. This segment has a peak period reliability index much lower than average for the CoSS segments statewide, and none of the locations along Segment B5 have reliability index values exceeding the statewide threshold.

Weekday

Reliability of travel during a typical weekday ranges from 0.01 to 0.43 in terms of reliability index, with an average value of 0.03. While the average weekday reliability index for this segment is well below the average for CoSS segments statewide, a short segment of US 11, near US 50 in downtown Winchester, has a reliability index value exceeding the statewide threshold.

Weekend

Reliability of travel during a typical weekend ranges from 0.00 to 0.31 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 B5 have reliability index values exceeding the statewide threshold.

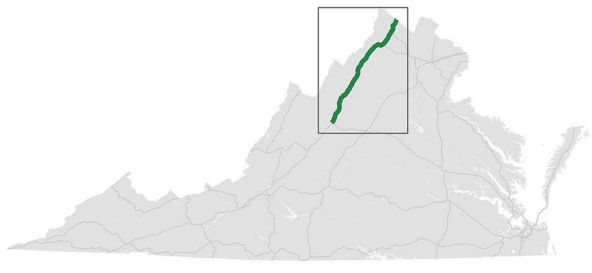


Reliability Index

- < 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 unreliabile. The following are the reliability index thresholds:

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

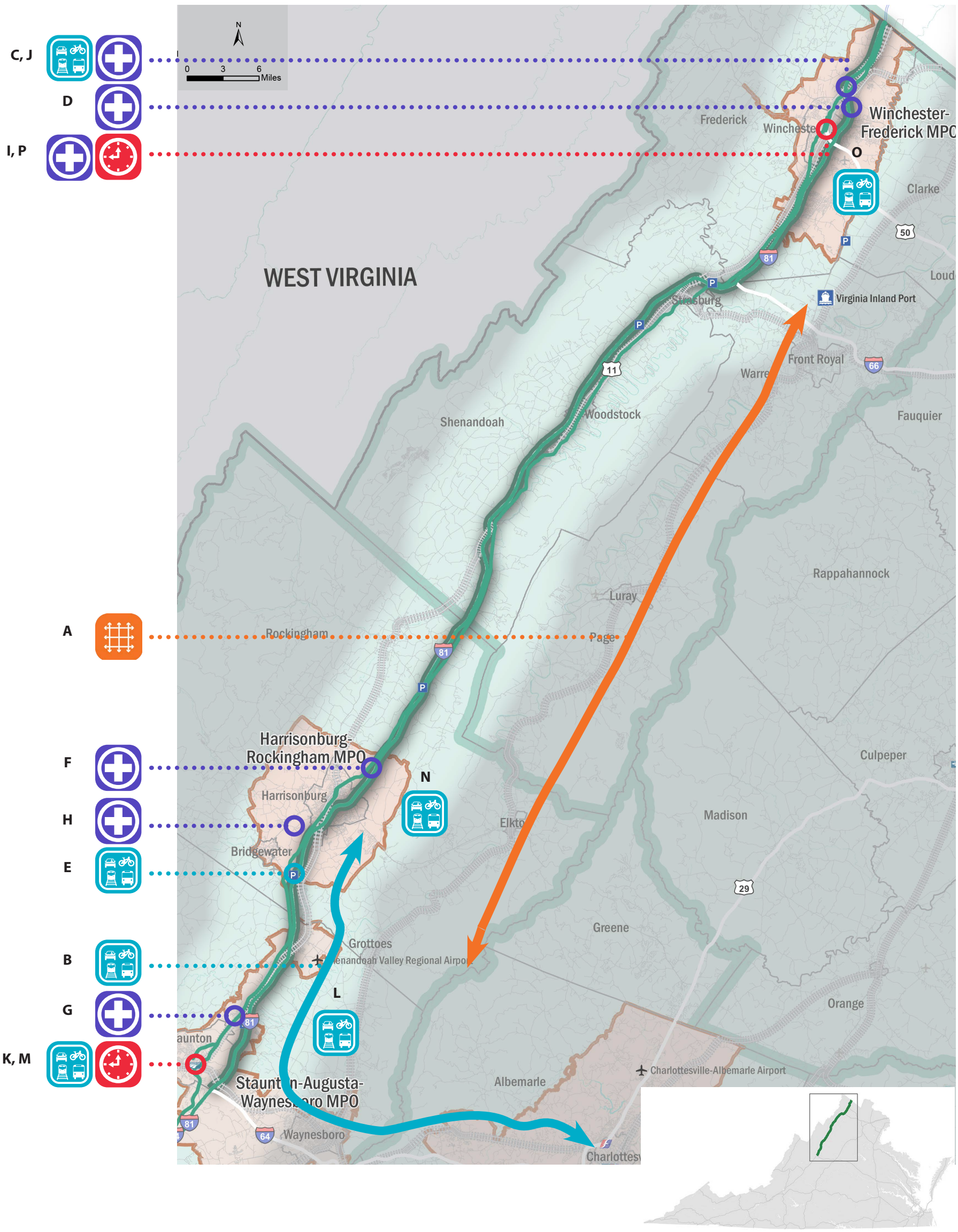


B5 SEGMENT NEEDS

Summary of Needs

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

Mode Choice | Redundancy | Safety | Congestion | Bottlenecks | Reliability



B5 SEGMENT NEEDS

Summary of Needs - B5 Segment

A.	US 11 not able to handle overflow when incident occurs on I-81 resulting in signifcant delays
B.	Lack of intercity transit service between Staunton, Waynesboro, Charlottesville, and Harrisonburg
C.	Park-and-Ride facilities at capacity
D.	Safety concerns on I-81 Bridge at Exit 313 (US 50) related to structural condition and ability to handle amount of heavy truck traffic
E.	Park-and-Ride facilities at capacity
F.	Safety concerns along I-81 between Exits 243-251
G.	US 11 in Staunton between West Village Dr and VA 262: 27 severe crashes
H.	US 11 in Harrisonburg between Pointe Drive and West Market Street: 30 severe crashes
I.	US 11 between Armour Dale and West Bond Street in Winchester: 37 crashes
J.	US 11 near northern interchange with I-81 north of Winchester: 24 severe crashes
K.	Unreliable Amtrak service from Staunton. Average departure delay is 73 minutes totaling over 4,100 person-hours of delay from this segment.
L.	Park and Ride lots in Augusta County have a higher utilization rate than the statewide average
M.	No bus or rail service is available from Staunton to cities on the corridor
N.	No bus or rail service is available from Harrisonburg to cities on the corridor
O.	No bus or rail service is available from Winchester to cities on the corridor
P.	Reliability issue at US 11 and South Braddock Street in Winchester