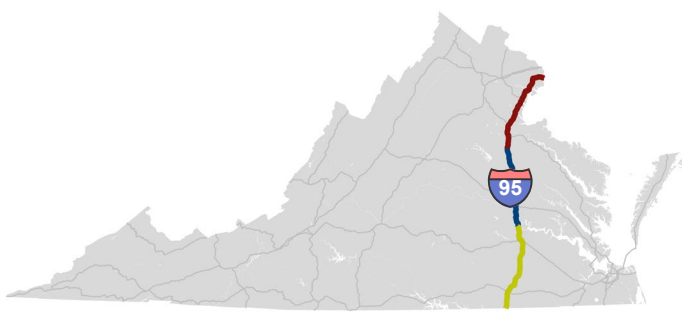
VTrans2040 Multimodal Transportation Plan

Corridors of Statewide Significance Needs Assessment

Washington to North Carolina Corridor (K)



Office of INTERMODAL Planning and Investment

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

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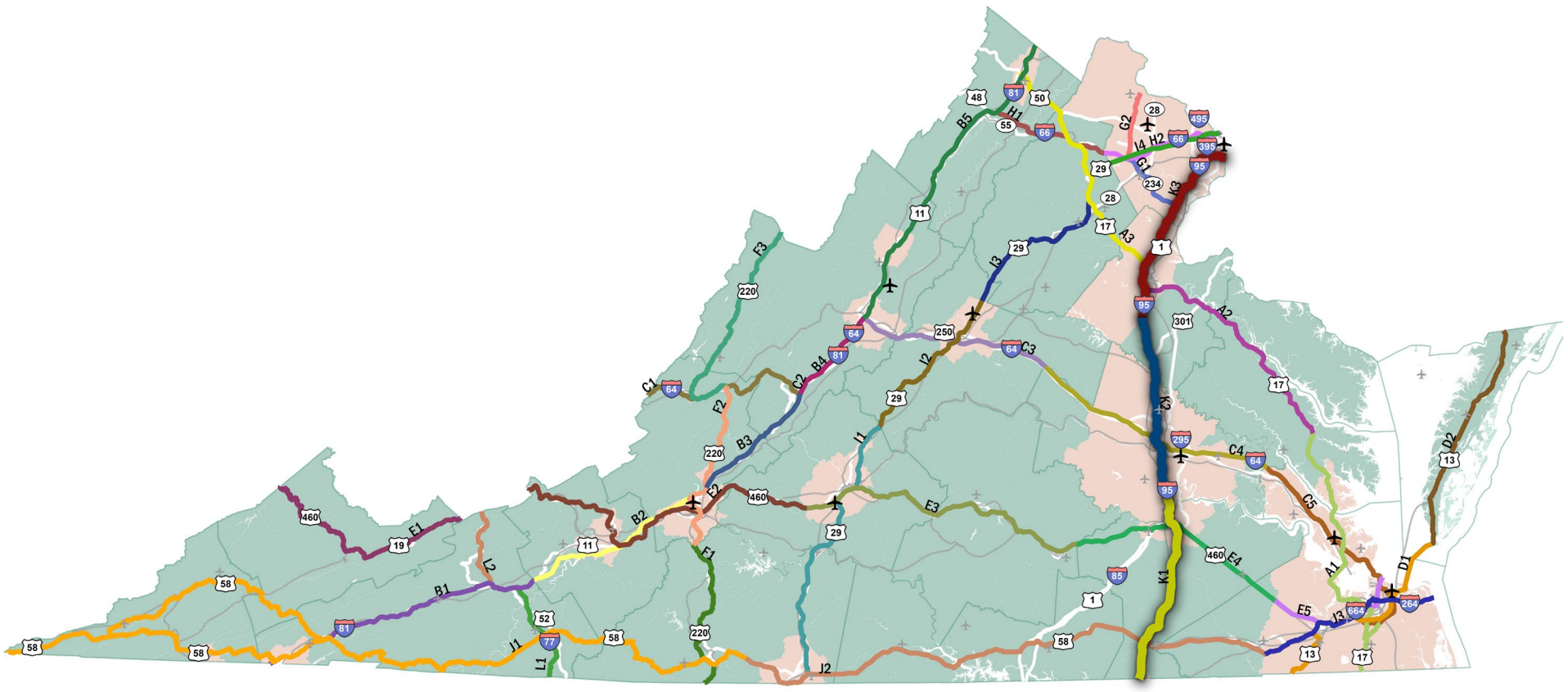


Corridor of Statewide Significance
(color varies by segment)

Railroad

Airport Facility
(grey denotes not a commercial service airport)

Metropolitan Planning Organization Area

The Washington to North Carolina Corridor (Corridor K) is defined primarily by I-95, a multi-lane interstate highway that serves as the primary corridor for the East Coast of the United States, running from Maine to Florida. I-95 is also an important north-south freight corridor in the eastern United States. In the Commonwealth of Virginia, it serves as one of the state's main through corridors for both passengers and freight. I-95 traverses approximately 178 miles of Virginia, between North Carolina in the south and the District of Columbia in the north. The character of I-95 changes from north to south – it is as wide as ten lanes in the Northern Virginia Area and is used primarily for commuting, while it is a four-lane highway south of Petersburg. I-95 includes reversible high-occupancy toll (HOT lanes) between Stafford and Fairfax Counties.

From the northern terminus in the City of Alexandria through the City of Colonial Heights, US 1 parallels I-95 very closely until it diverges in the City of Petersburg to follow I-85 to the North Carolina border. Both I-85 and US 301 are considered to be parallel facilities from Petersburg south. Portions of US 301 and Route 207 between Richmond and Fredericksburg are also considered to be parallel facilities. I-95 runs concurrently with I-64 within the City of Richmond for approximately four miles, and with US 17 for a short section near Fredericksburg. The Washington to North Carolina Corridor includes a number of auxiliary routes:

- I-395 in the Northern Virginia Area, which begins at the interchange with I-495 and travels into the District of Columbia, including reversible high-occupancy vehicle (HOV) lanes;
- I-495 in the Northern Virginia Area, which travels to the west and north from the interchange with I-95 and I-395 and travels into Maryland over the American Legion Bridge, including HOT lanes;
- I-195, which connects to downtown Richmond from I-95; and
- I-295, which is a bypass around Richmond and Petersburg with connections to I-64 east and west of I-95.

Numerous opportunities to use transit exist in Corridor K, mostly in the Northern Virginia. Options for passenger travel include:

- Metrorail's Blue and Yellow Lines, which follow I-395 south from Washington, DC;
- Express bus service, available along I-95 in Northern Virginia provided by the Potomac and Rappahannock Transportation Commission (PRTC);
- Park-and-Ride lots, which are present throughout the corridor (especially concentrated in the Northern Virginia Area) and provide connections in many cases to other transit systems such as the Fairfax Connector and Metrobus;
- Private commuter bus carriers, also operating in the northern portion of this corridor;
- Virginia Railway Express (VRE), which operates commuter trains along the corridor between Fredericksburg and Washington, DC on the CSX National Gateway Corridor;
- An express route, in the Richmond Area, which provides service between Richmond and Petersburg along the Washington to North Carolina Corridor;

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)

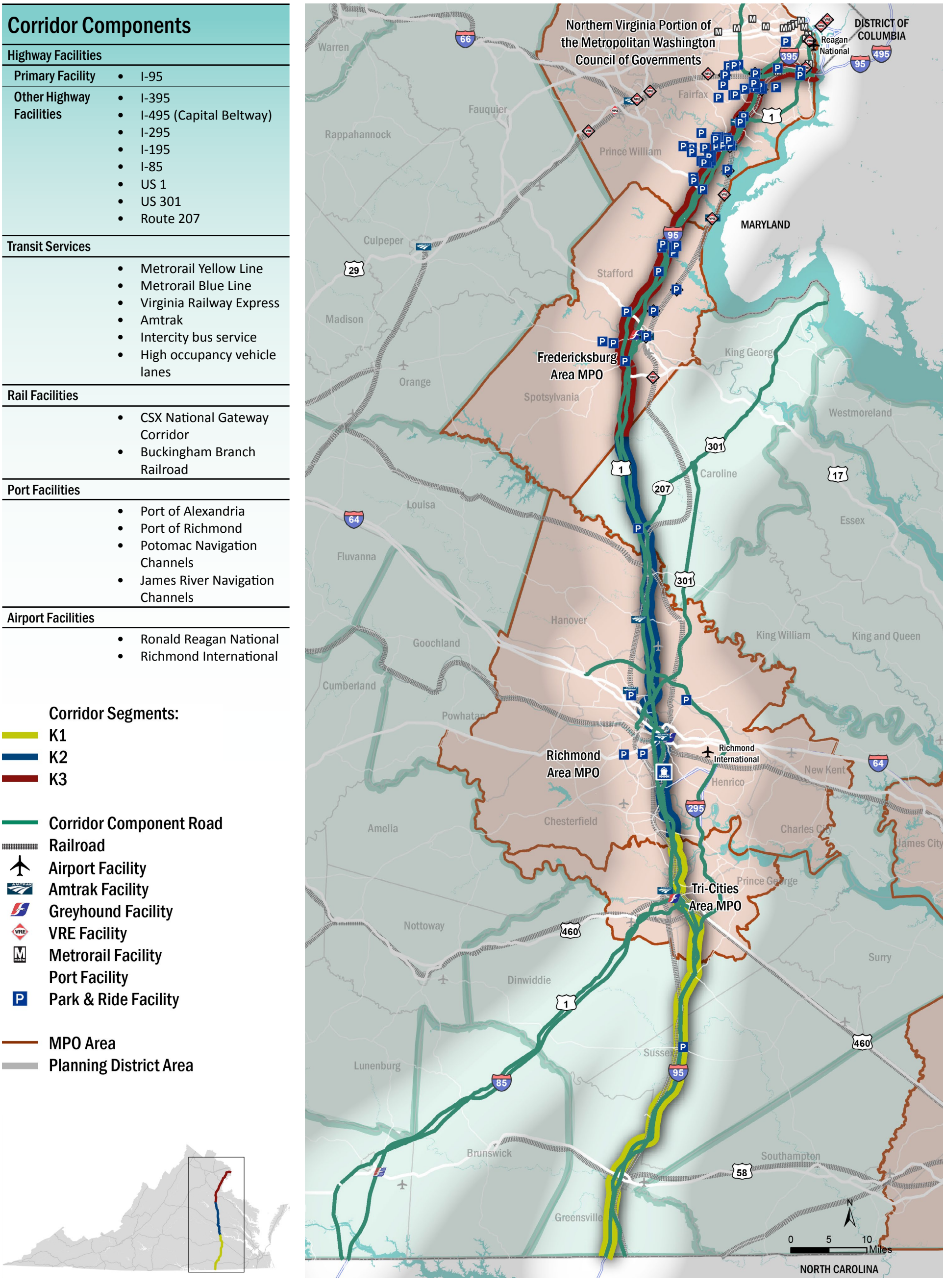
CORRIDOR K OVERVIEW

- Amtrak, which operates stations in Alexandria, Springfield, Lorton, Woodbridge, Fredericksburg, Ashland, near Petersburg (in the Town of Ettrick), and Richmond (two stations). Amtrak routes include the Carolinian Line, the Auto Train (only in Lorton), the Northeast Corridor Regional Route (which provides access between Newport News and Boston), the Silver Star Route, the Palmetto Route, and the Silver Meteor Route;
- Greyhound, which operates long-distance bus service along the corridor, with stops in Petersburg, Richmond, Fredericksburg, Woodbridge, Springfield, and Washington, DC; and
- Access to the two largest airports in Virginia, Dulles International and Ronald Reagan National, which together account for 45 percent of all commercial enplanements in Virginia. Access to Richmond International Airport and numerous general-aviation facilities is also available.

CSX Transportation provides freight rail lines along its National Gateway Corridor, which runs along most of the East Coast of the United States and provides the main connection from the Port of Virginia facilities in the Hampton Roads Area to national markets. Access is also available to Norfolk Southern's Heartland Corridor and Coal Corridor rail lines, which run from the three ports in the Hampton Roads Area through western Virginia and to markets in Ohio, Illinois, and other states. A small portion of the Buckingham Branch Short-Line Railroad, between Clifton Forge and Richmond, operates along the Washington to North Carolina Corridor north of Richmond. The Washington to North Carolina Corridor provides access to two smaller port facilities, the Port of Alexandria and the Port of Richmond. Neither of these ports is operated by the Commonwealth or the Port of Virginia. I-95 accesses the Potomac River and James River navigational channels.

Corridor Components

Highway Facilities	
Primary Facility	• I-95
Other Highway Facilities	• I-395 • I-495 (Capital Beltway) • I-295 • I-195 • I-85 • US 1 • US 301 • Route 207
Transit Services	
	• Metrorail Yellow Line • Metrorail Blue Line • Virginia Railway Express • Amtrak • Intercity bus service • High occupancy vehicle lanes
Rail Facilities	
	• CSX National Gateway Corridor • Buckingham Branch Railroad
Port Facilities	
	• Port of Alexandria • Port of Richmond • Potomac Navigation Channels • James River Navigation Channels
Airport Facilities	
	• Ronald Reagan National • Richmond International



Corridor Segments:

- K1
- K2
- K3

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

- MPO Area
- Planning District Area

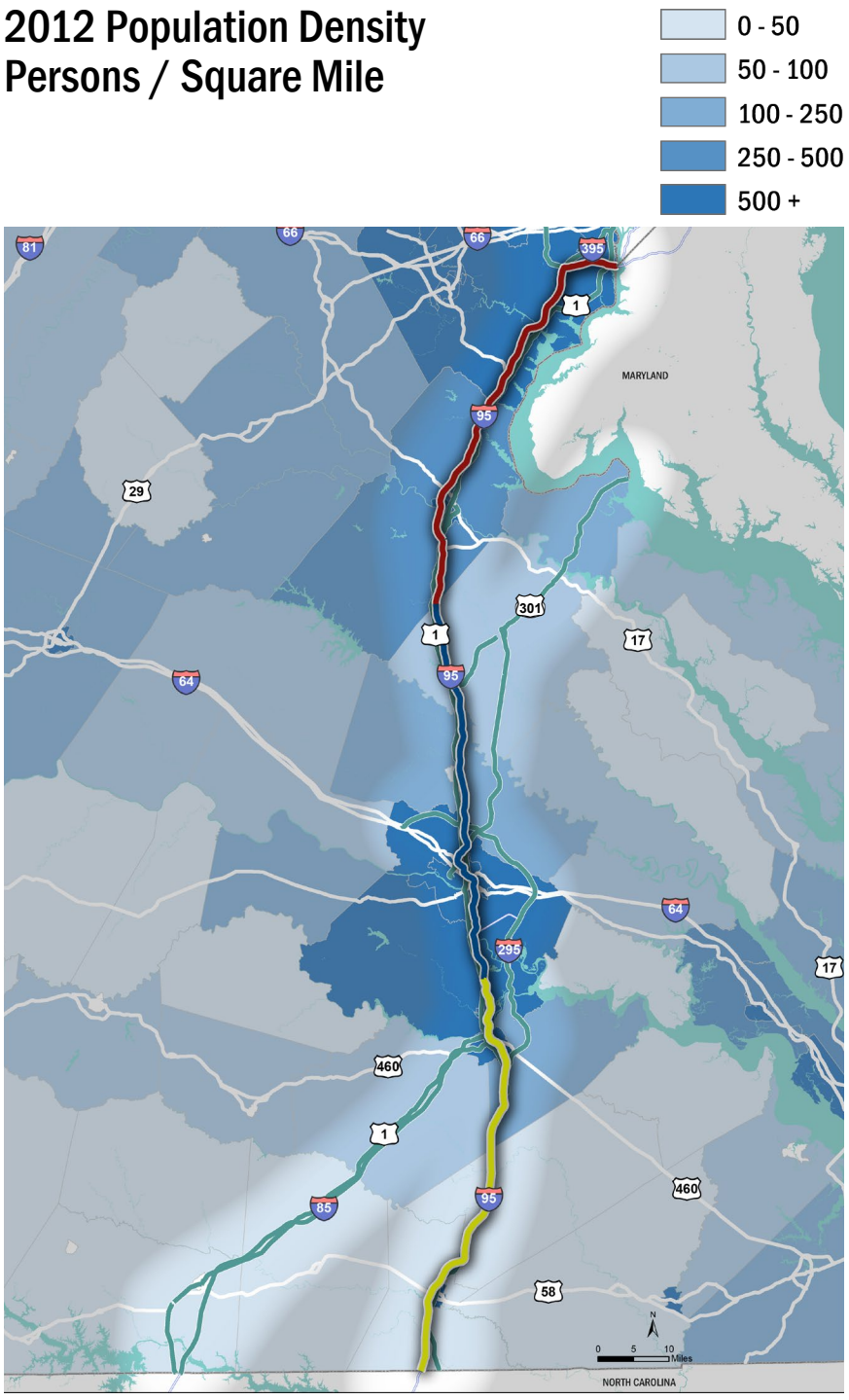
Demographics and Economic Trends

The primary population centers along Corridor K are found in the Northern Virginia Area, the Richmond Area, and the Tri-Cities Area. Along with the Cities of Fredericksburg and Emporia, these are the most densely populated areas along the corridor. As the corridor moves further south, the population density quickly drops off, with most of Segment K1 traveling through some of the least densely populated counties in the state.

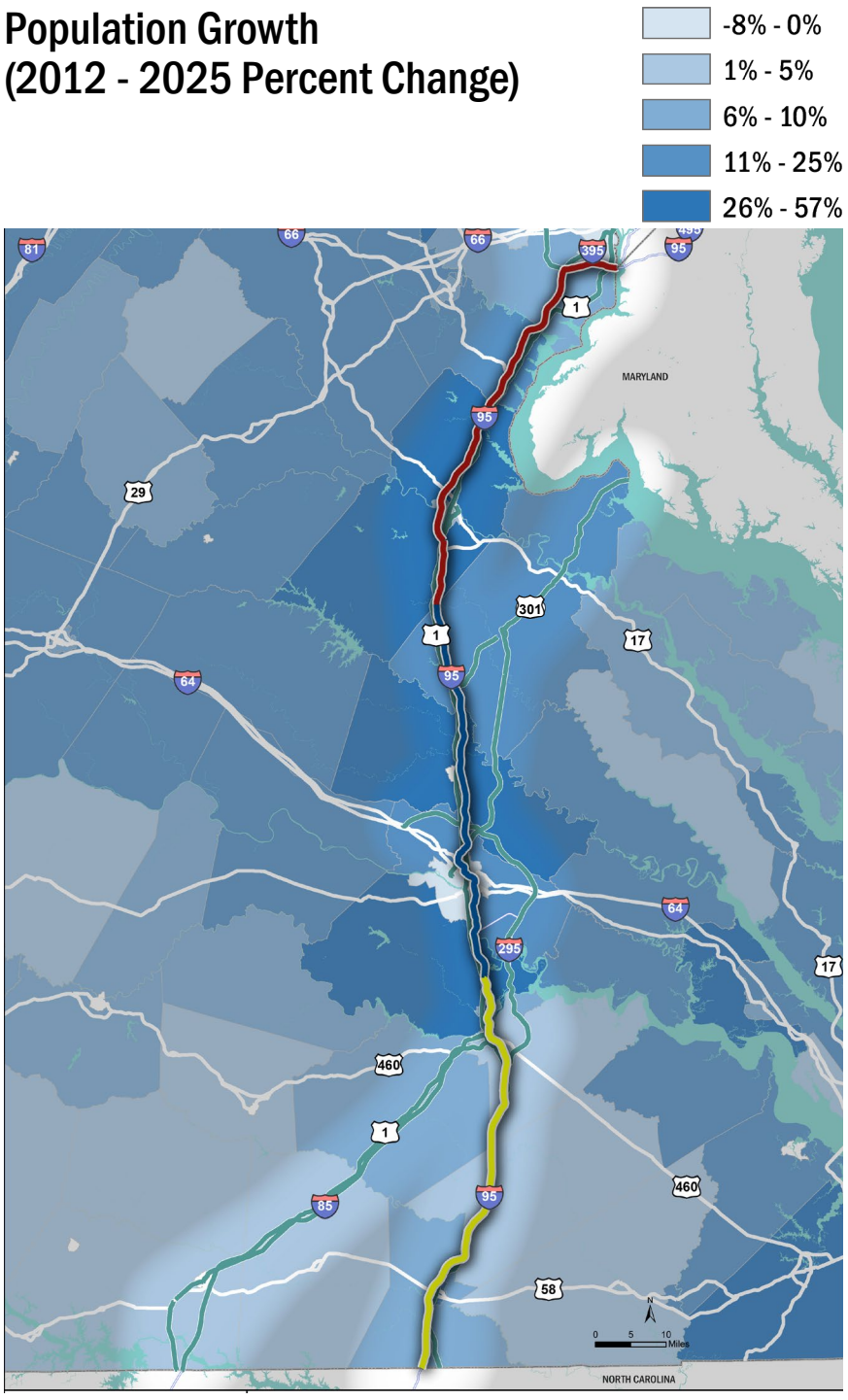
The suburban counties surrounding Fredericksburg and Richmond are expected to see the largest percentage of population growth among jurisdictions along the corridor. Conversely, the Cities of Richmond and Fredericksburg, along with Arlington County and Alexandria, are expected to see a decrease in population by 2025. Overall, suburban areas from the Tri-Cities Area to north of Fredericksburg are anticipated to see substantial population growth while growth in the northern and southern reaches of the corridor will be more modest. Employment growth tracks a similar pattern along the corridor, but with less disparity between the jurisdictions.

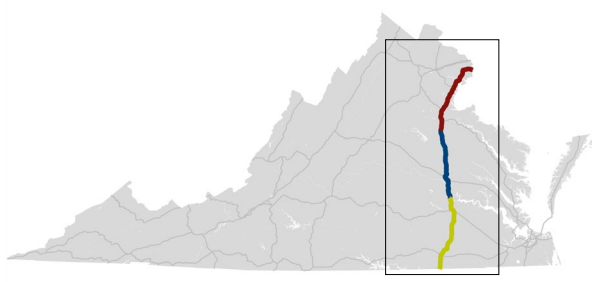
Corridor K passes through four Metropolitan Planning Organization (MPO) areas along its route, each with a different size and focus for its local economy. The Northern Virginia Area has the highest GDP of any of the MPO areas in the corridor. The largest industry sectors in the corridor include professional/scientific/technical services, wholesale trade, and public administration.

2012 Population Density Persons / Square Mile



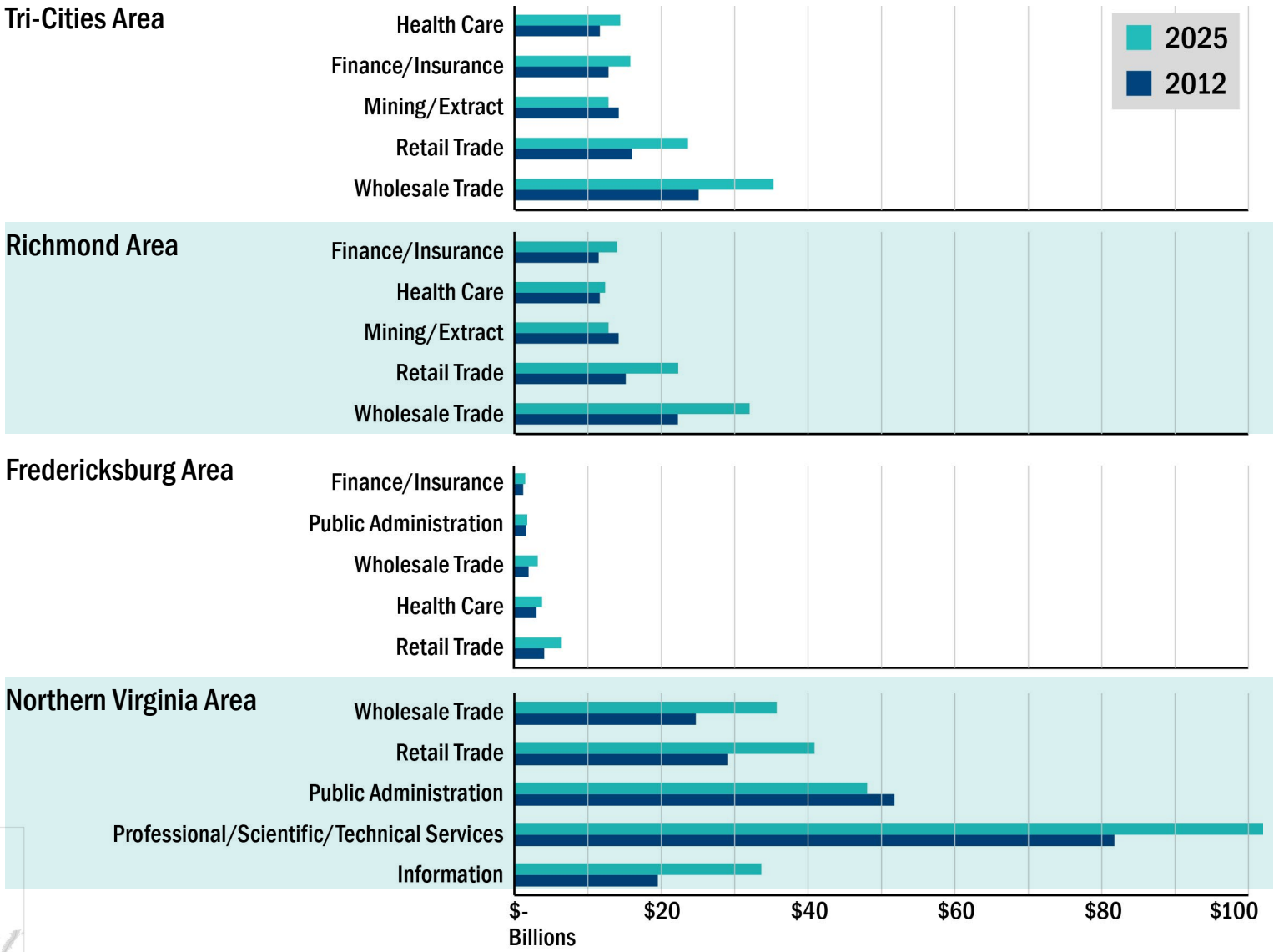
Population Growth (2012 - 2025 Percent Change)

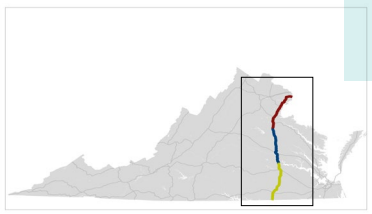




CORRIDOR K OVERVIEW

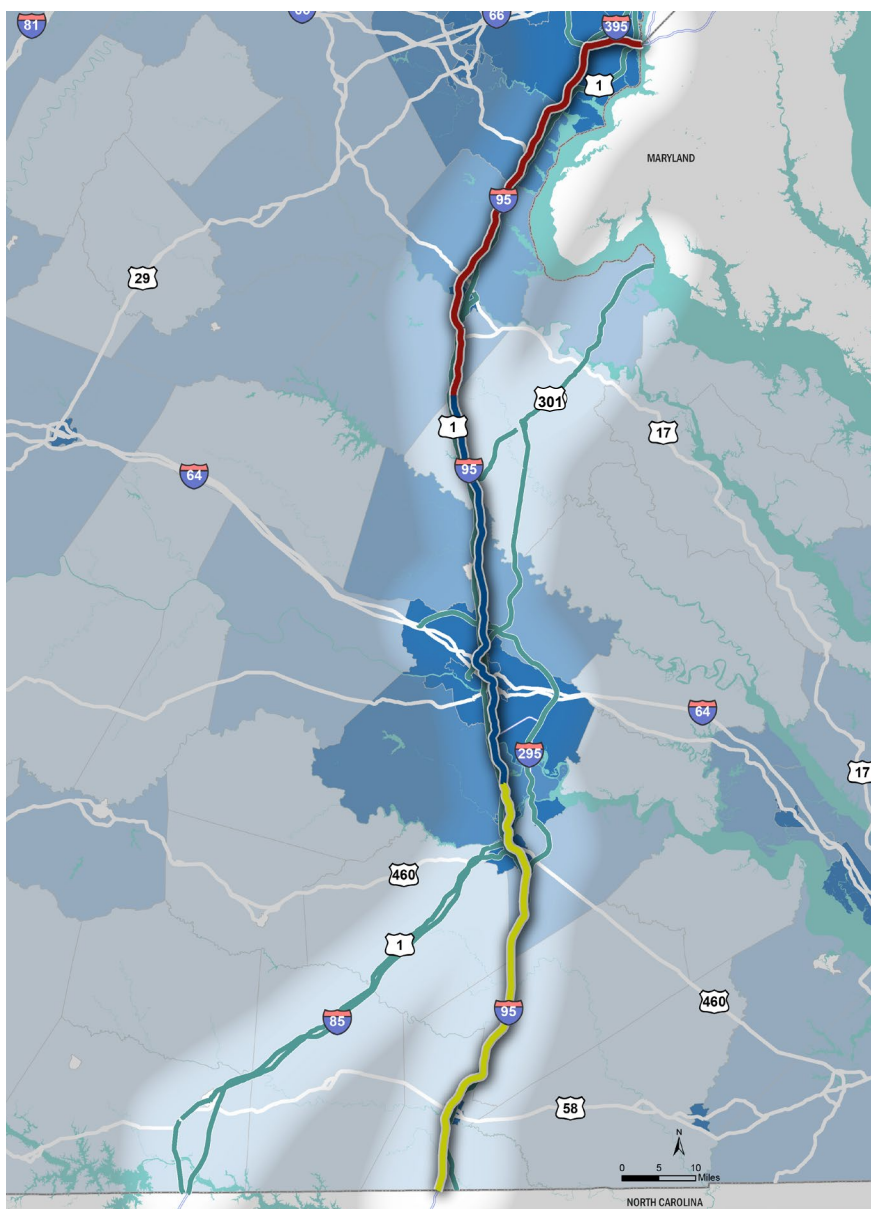
Top Industries (GDP)





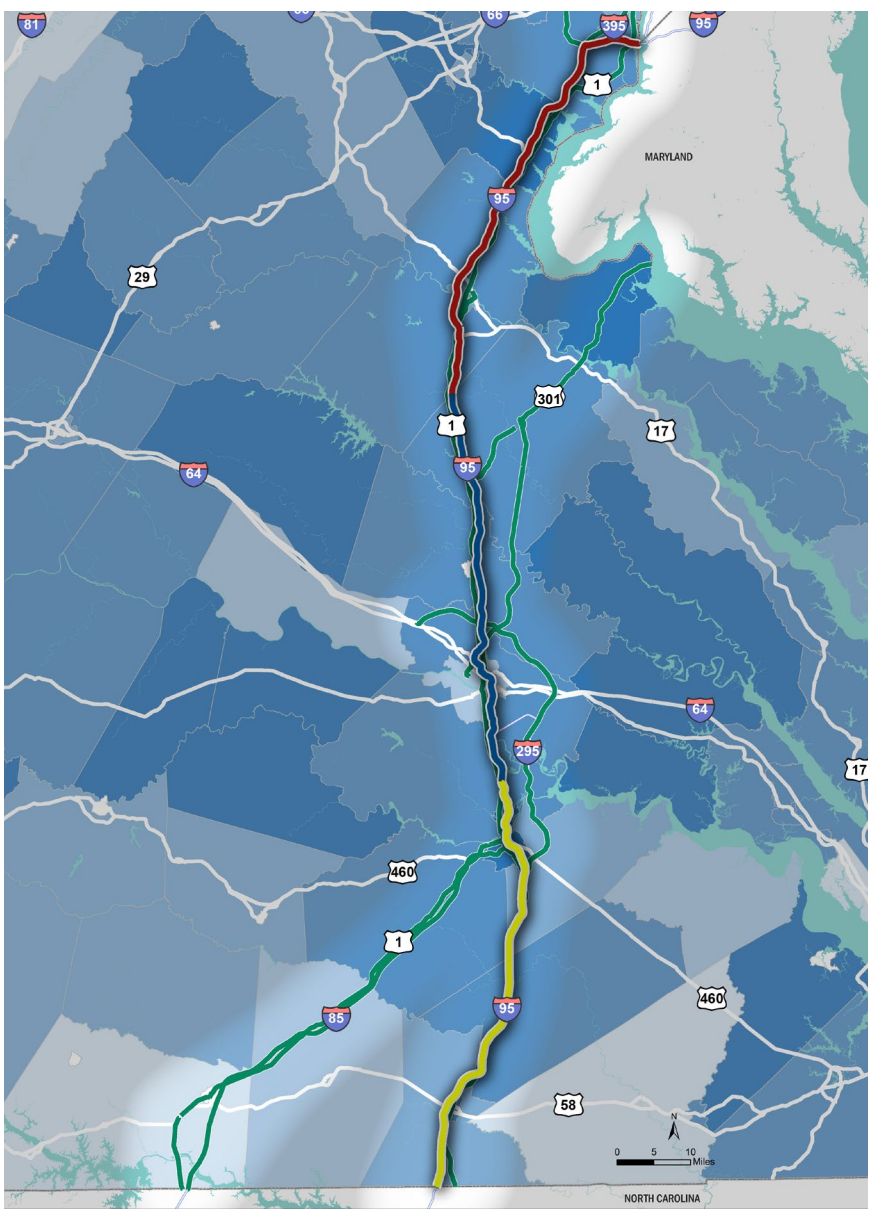
2012 Employment Density
Jobs / Square Mile

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



Employment Growth
(2012 - 2025 Percent Change)

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



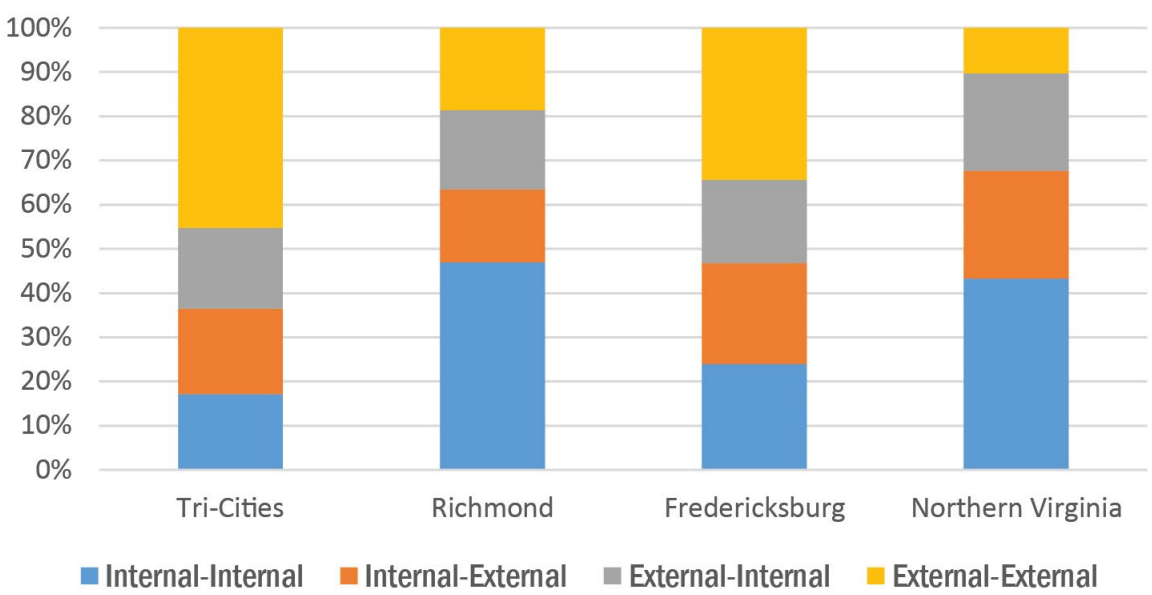
Corridor Travel Patterns

Passenger

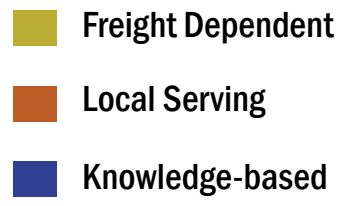
Corridor K connects North Carolina and Maryland and passes through four Metropolitan Planning Organization (MPO) areas along its length: the Tri-Cities Area, the Richmond Area, the Fredericksburg Area, and the Northern Virginia Area. Within the Tri-Cities Area, traffic along Corridor K is dominated by pass-through traffic which accounts for more than 40 percent of the total corridor traffic, but an additional 37 percent of traffic has its trip origin or destination inside the MPO area, due to the large market for travel between the Tri-Cities Area and the Richmond Area. On the interstates, there is a much higher proportion of pass-through traffic than on the parallel facilities. In the Richmond Area, local traffic prevails on Corridor K (47 percent) and a significant portion has only one trip end inside the MPO Area as there are large markets for passenger travel between Richmond and the Tri-Cities and Hampton Roads Areas. Within the Richmond Area, the parallel facilities (non-interstates) are heavily dominated by local traffic (more than 75 percent).

In the Fredericksburg Area, there is a large amount of pass-through traffic; however, the largest proportion of traffic is comprised of trips with only one end inside the MPO Area, due in part to the large number of passenger trips made between the Fredericksburg Area and the Northern Virginia Area. In Northern Virginia, most traffic is related to the area; more than 40 percent of the traffic along Corridor K reflects local internal trips, while an additional 40 percent has at least one trip end in the region (this includes trips originating in or destined for other portions of the Metropolitan Washington Council of Governments (MWCOG) MPO area).

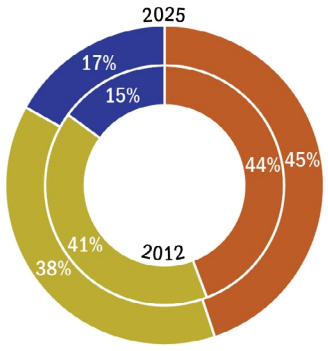
Distribution of Internal and External Travel



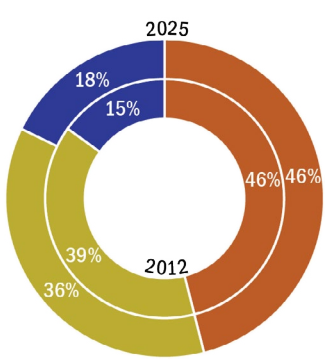
GDP by Sector, 2012 and 2025



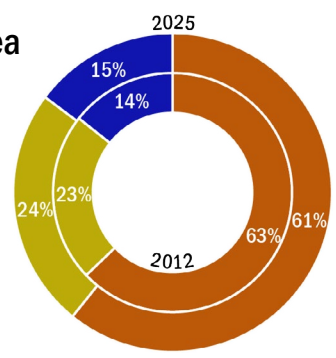
Tri-Cities Area



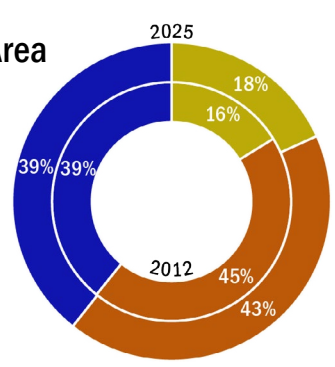
Richmond Area



Fredericksburg Area



Northern Virginia Area



Freight

By truck, Corridor K carried 122 million tons of freight worth $172 billion in 2012, and is estimated to carry 170 million tons of freight worth $252 billion in 2025. A large proportion of truck freight on Corridor K passes through the Commonwealth, representing more than 35 percent of total corridor tonnage and 55 percent of total corridor value. In terms of tonnage, North Carolina is the largest producer and attractor of truck freight traveling along this corridor. In terms of value, Florida is the largest destination for truck freight along the corridor. Corridor K is used heavily by truck freight traffic traveling between locations in the Middle Atlantic and the Southeastern U.S. Within Virginia, the Port of Virginia marine terminal in Norfolk is a major generator of freight traffic on Corridor K, accounting for around five percent of the total truck freight value. Fairfax and Henrico Counties each attract about three percent of the total truck freight value on the corridor, with freight arriving from North Carolina, the Middle Atlantic, and the Port of Virginia.

By rail, Corridor K carried 53 million tons of freight worth $25 billion in 2012, and is estimated to carry 59 million tons of freight worth $32 billion in 2025. Rail freight between Florida and New Jersey accounts for more than 12 percent of the total rail value in Corridor K. The City of Petersburg attracts more than nine percent of the total rail value in Corridor K, where the railroad distribution center processes rail freight arriving from the Midwest for distribution along the Eastern Seaboard. The Port of Virginia facilities in the Hampton Roads Area attracts around four percent of rail tonnage in the corridor.

Truck Freight

	2012	2025
Truck Freight Value	$172 Billion	$252 Billion
Truck Freight Tonnage	122 Million Tons	170 Million Tons
Freight Value per Ton	$1406	$1477
Corridor Tonnage Passing Through	37%	35%

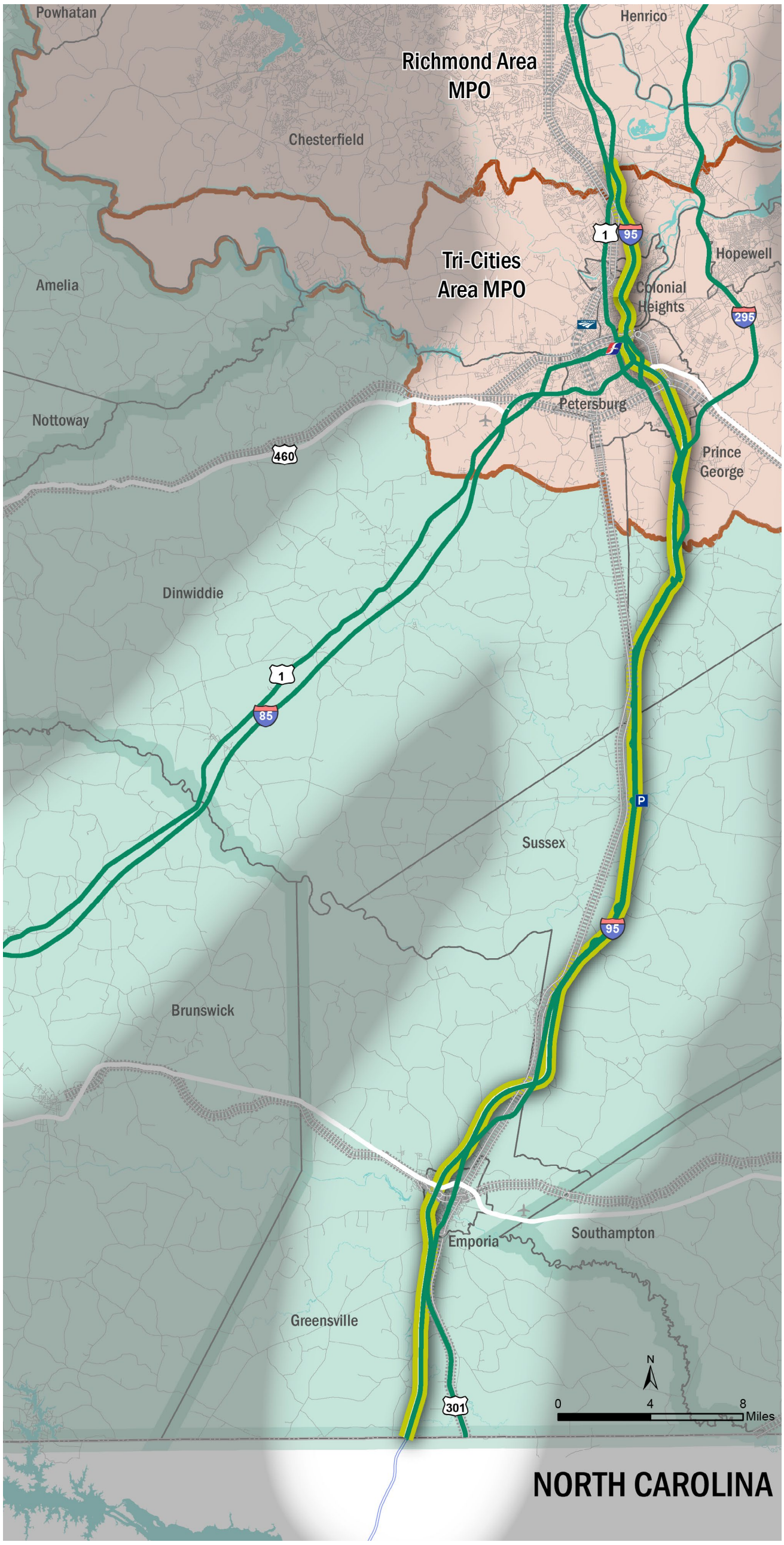
Rail Freight

	2012	2025
Rail Freight Value	$25 Billion	$32 Billion
Rail Freight Tonnage	53 Million Tons	59 Million Tons
Freight Value per Ton	$468	$537
Corridor Tonnage Passing Through	17%	19%

II. Segment K1

Corridor Segment K1 Components

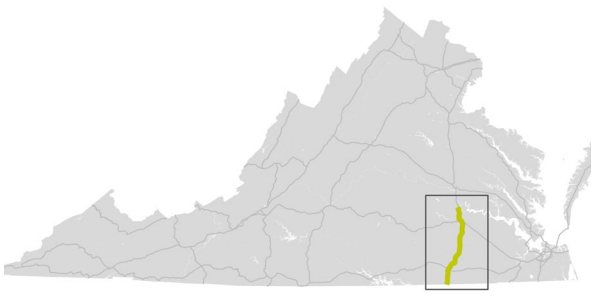
- I-95
- I-85
- I-295
- US 1
- US 301
- CSX National Gateway Corridor
- Intercity bus service



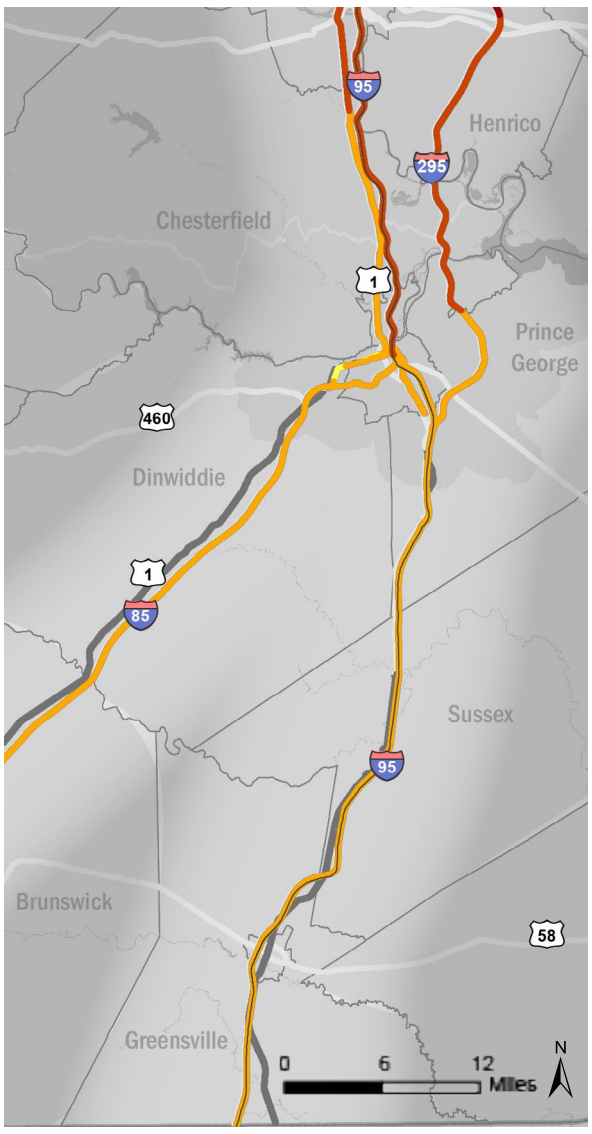
Segment K1

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

MPO Area
Planning District Area



K1 SEGMENT PROFILE



Segment K1 begins at the North Carolina border and progresses north, serving Greensville, Sussex, Prince George, Chesterfield, Mecklenburg, Brunswick, and Dinwiddie Counties, as well as the Cities of Emporia, Petersburg, Hopewell, and Colonial Heights. The segment exists entirely within the Crater Planning District Commission (PDC) boundaries and serves the Tri-Cities MPO Area. Segment K1 is primarily defined by I-95, but also includes the parallel facilities of I-85, I-295, US 1, and US 301. Segment K1 is characterized by through traffic; however, commuter traffic is heavy through the Cities of Colonial Heights and Petersburg and the areas north toward Richmond.

Highway Facilities: I-95 is primarily a four-lane facility south of Colonial Heights. US 1 parallels I-95 through most of Corridor K, but diverges to the west in the City of Petersburg, where it follows I-85 to the North Carolina border. South of Petersburg, US 301 parallels I-95, and all four of these facilities are components of Segment K3. I-295 acts as a bypass around Petersburg and Richmond to the north with four lanes south of Hopewell and six lanes further north.

Transit Services: In this area, the corridor is served by the Greater Richmond Transit Company (GRTC) transit system and the Petersburg Area Transit System (PAT). There are also several Park-and-Ride facilities within the segment. GRTC's Richmond–Petersburg Express provides bus service along the segment. In addition, Greyhound and Amtrak have stations in Petersburg and Ettrick (in Chesterfield County), respectively, and provide service to destinations throughout the country, including Richmond, and Washington, DC.

Rail Facilities: CSX Transportation's National Gateway Corridor is a freight rail line that operates in this segment providing connection between Petersburg and Emporia.

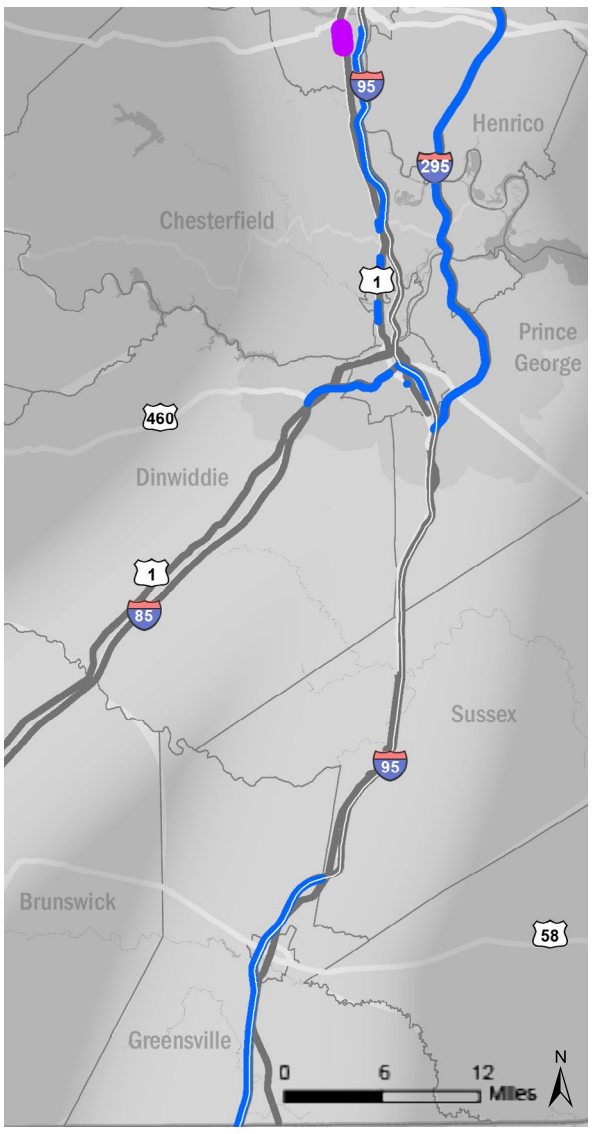
Port Facilities: No port facilities are directly accessible from Segment K1, but connections are available to the Norfolk Southern lines that serve the Port of Virginia terminals in the Hampton Roads Area.

Airport Facilities: There are no commercial airports located within this segment.

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

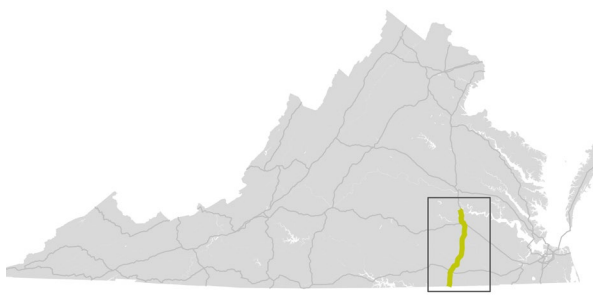
Number of Lanes (both directions)

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



Future Projects

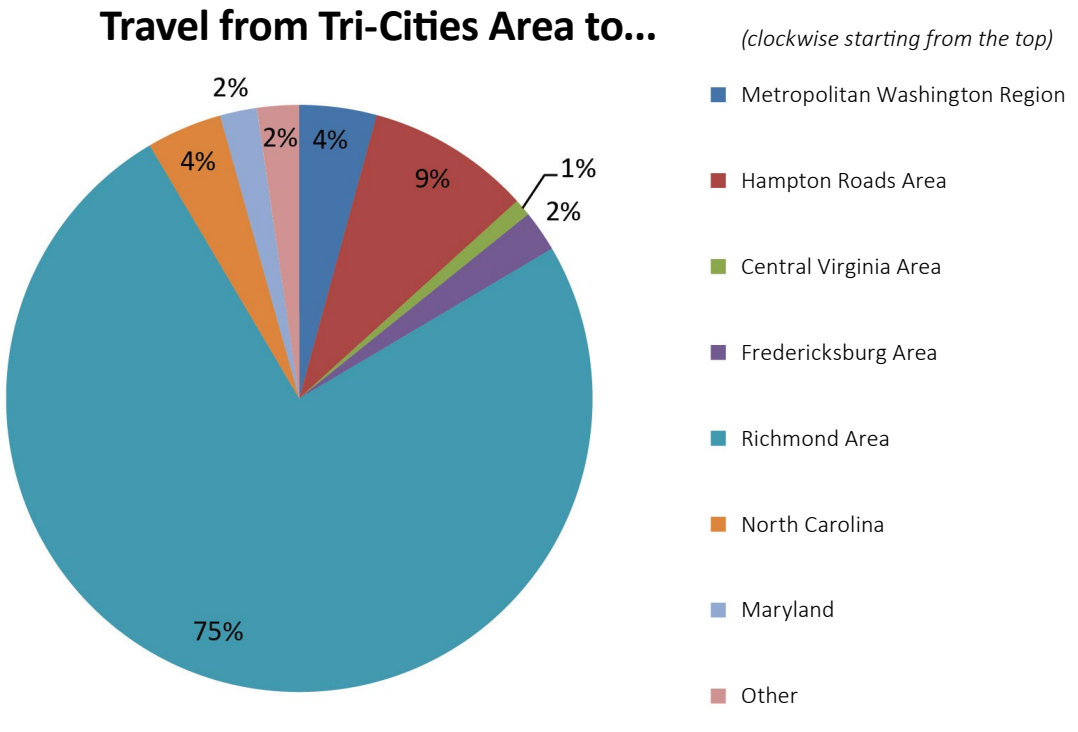
- Reconstruction with added capacity
- Safety improvements
- Primary facility

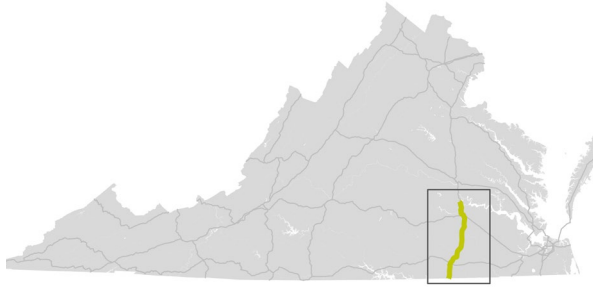


Travel Demand

Passenger Demand

The southernmost Segment of Corridor K connects the Tri-Cities Area to North Carolina, although it does not connect any major cities within Virginia. The vast majority (75 percent) of inter-city passenger travel starting in the Tri-Cities Area is destined for the Richmond Area, located directly adjacent to the north of this segment. Travel between these two adjacent MPO Areas accounts for 11 percent of intercity travel in the Commonwealth. Other major destinations for intercity passenger travel along Corridor K include the Metropolitan Washington Area, the Fredericksburg Area, and other parts of Maryland, which account for a total of nine percent of the travel starting in the Tri-Cities Area. Southbound travel to North Carolina accounts for an additional four percent of passenger travel from the Tri-Cities Area.





K1 SEGMENT PROFILE

Freight Demand

By truck, Segment K1 carried 47 million tons of freight worth $92 billion in 2012, and is estimated to carry 65 million tons of freight worth $135 billion in 2025. A large proportion of truck freight on Corridor K passes through the Commonwealth, representing more than 35 percent of total corridor tonnage and 55 percent of total corridor value. In terms of tonnage, North Carolina is the largest producer and attractor of truck freight traveling along this corridor. In terms of value, Florida is the largest destination for truck freight along the corridor. Corridor K is used heavily by truck freight traffic traveling between locations in the Middle Atlantic and the Southeastern U.S. Within Virginia, the Port of Virginia marine terminal in Norfolk is a major generator of freight traffic on Corridor K, accounting for around five percent of the total truck freight value. Fairfax and Henrico Counties each attract about three percent of the total truck freight value on the corridor, with freight arriving from North Carolina, the Middle Atlantic, and the Port of Virginia facilities in the Hampton Roads Area. Henrico County attracts about three percent of the total truck freight value on the corridor, with freight arriving from North Carolina, the Middle Atlantic, and the Port of Virginia facilities in the Hampton Roads Area. Within Segment K1, more than three percent of corridor truck freight tonnage is destined for Chesterfield County. This freight primarily originates in North Carolina, Maryland, and Pennsylvania. Segment K1 is also used by truck freight traffic traveling between the Port of Virginia facilities in the Hampton Roads Area and locations in the Southeastern U.S.

By rail, Segment K1 carried 12 million tons of freight worth $16 billion in 2012, and is estimated to carry 15 million tons of freight worth $20 billion in 2025. Rail freight between Florida and New Jersey accounts for more than 12 percent of the total rail value in Corridor K. The City of Petersburg attracts more than nine percent of the total rail value in Corridor K, where the railroad distribution center processes rail freight arriving from the Midwest for distribution along the Eastern Seaboard. The Port of Virginia facilities in the Hampton Roads Area attracts around four percent of rail tonnage in the corridor. Dinwiddie County and the City of Hopewell are major freight generators along Segment K1, and the latter accounts for approximately six percent of the total rail freight value in the corridor. There are also significant rail freight movements from Sussex County, in Segment K1, to Mississippi.

Truck Freight

Major Origins (by Tonnage)
1. Virginia (35% / 37%)
2. North Carolina (19% / 17%)
3. Pennsylvania (8% / 9%)
4. Maryland (7% / 7%)
5. Florida (6% / 6%)

Corridor Tonnage Originating in Segment K1:
6% / 7%

Major Origin-Destination Pairs for Freight
North Carolina and Maryland
North Carolina and Pennsylvania
North Carolina and New York
Florida and Pennsylvania
Florida and New York

Percentages represent 2012 / 2025 values.

Major Destinations (by Tonnage)
1. Virginia (39% / 40%)
2. North Carolina (11% / 12%)
3. Maryland (10% / 10%)
4. Pennsylvania (7% / 7%)
5. Florida (7% / 7%)

Corridor Tonnage Destined for Segment K1:
10% / 9%

Rail Freight

Major Origins (by Tonnage)
1. West Virginia (52% / 48%)
2. Virginia (12% / 14%)
3. Pennsylvania (8% / 7%)
4. Kentucky (6% / 5%)
5. Florida (3% / 4%)

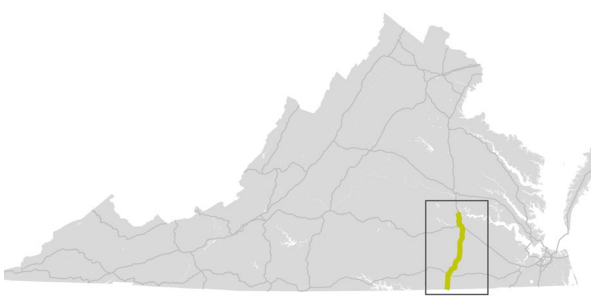
Corridor Tonnage Originating in ment K1:
% / 6%

Major Origin-Destination Pairs for Freight
City of Newport News* and West Virginia
City of Newport News* and Kentucky
Florida and New Jersey
Pennsylvania and South Carolina
Dickenson County and City of Newport News*

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

Major Destinations (by Tonnage)
1. Virginia (77% / 75%)
2. City of Newport News* (60% / 55%)
3. South Carolina (4% / 4%)
4. City of Norfolk* (4% / 4%)
5. North Carolina (3% / 3%)

Corridor Tonnage Destined for Segment K1:
6% / 7%



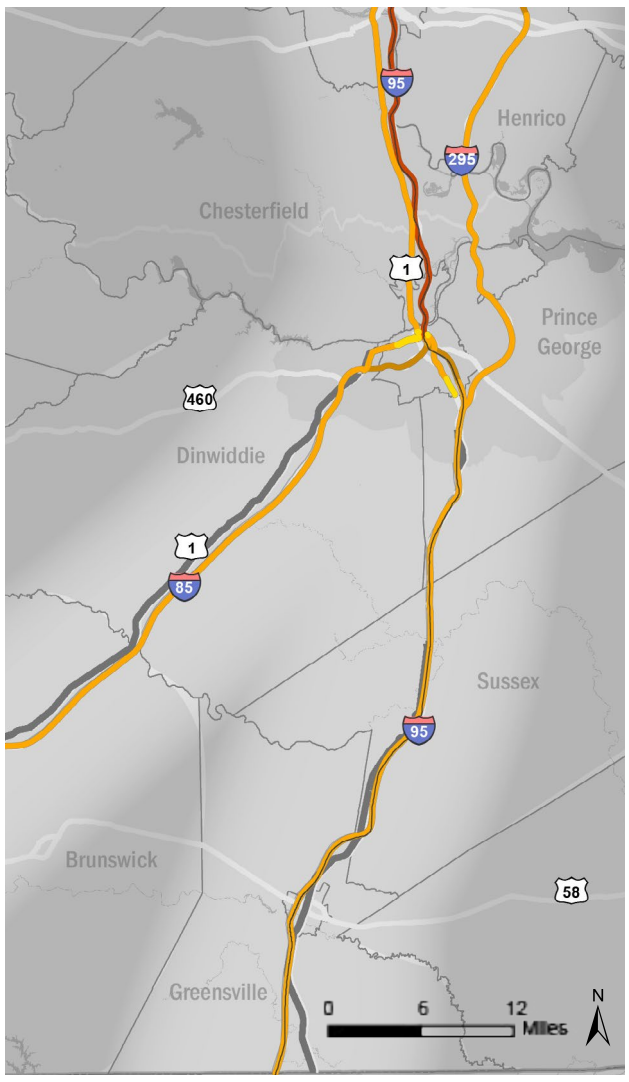
Traffic Conditions

Traffic Volume and AADT

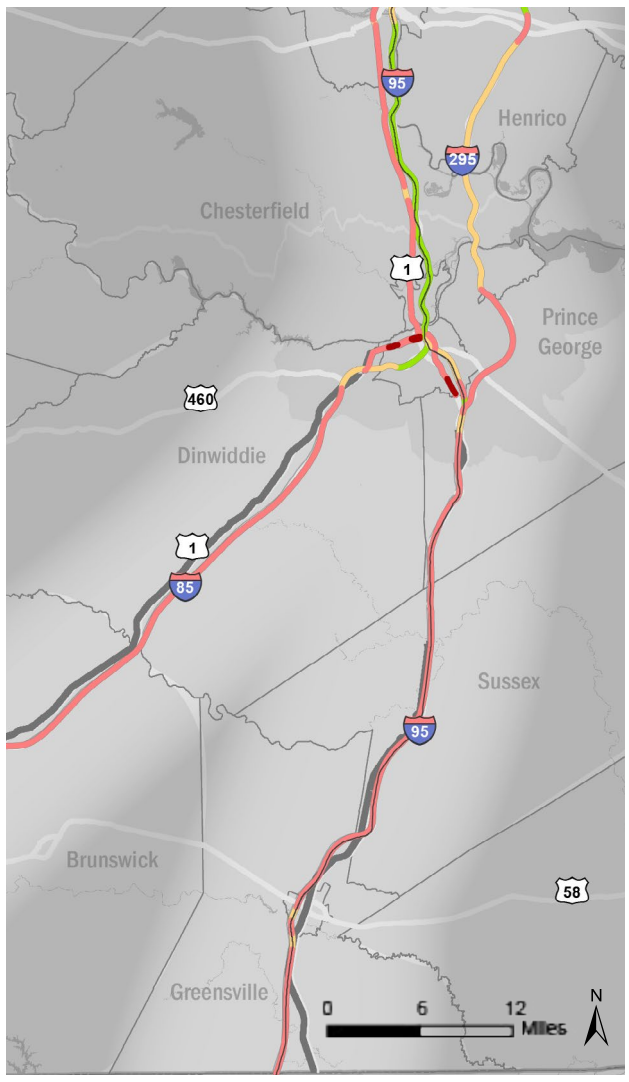
Traffic volume on Segment K1 is generally low in comparison to Corridor K overall. The facility with the highest average daily traffic is the portion of I-95 north of the City of Petersburg, which carries over 95,000 vehicles on an average day. South of Petersburg, traffic volumes are significantly lower, with volumes ranging from 32,000-40,000 vehicles per day on I-95 and between 20,000-26,000 ADT on the alternative I-85. Traffic volumes on Segment K1 are forecast mostly to increase by 2025, with the largest increases on I-95 north of Petersburg. By 2025, the volume on I-95 north of Petersburg is forecast to increase to over 110,000 vehicles. South of Petersburg volumes in 2025 are forecast to increase to 35,000-45,000 on I-95 and 23,000-31,000 on I-85.

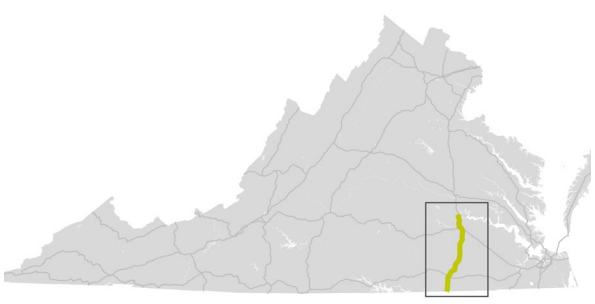
Traffic Volume 2014 (AADT)

Traffic Volume 2025 (AADT)



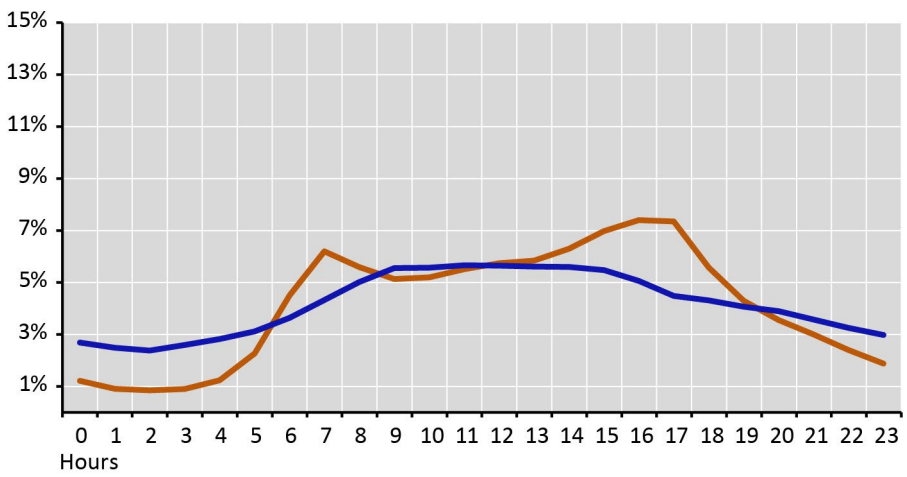
Change in Traffic Volume 2014- 2025 (AADT)



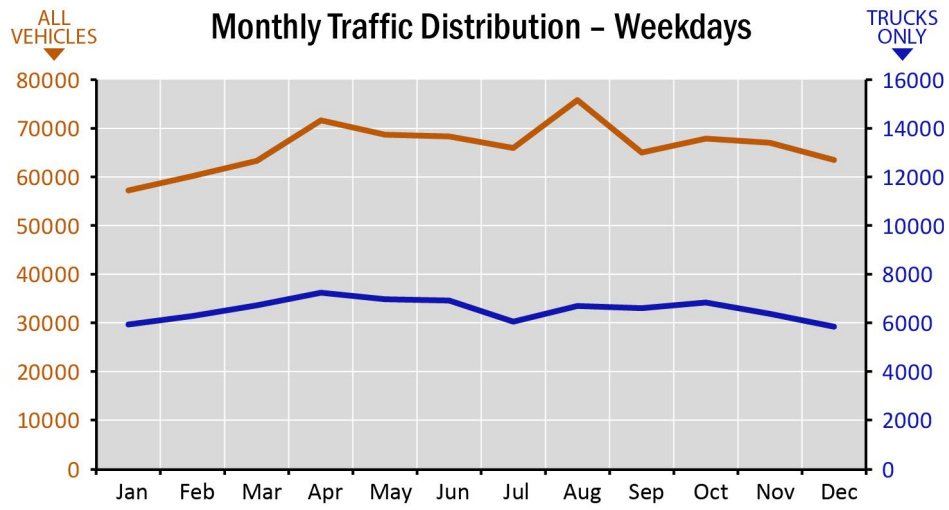


K1 SEGMENT PROFILE

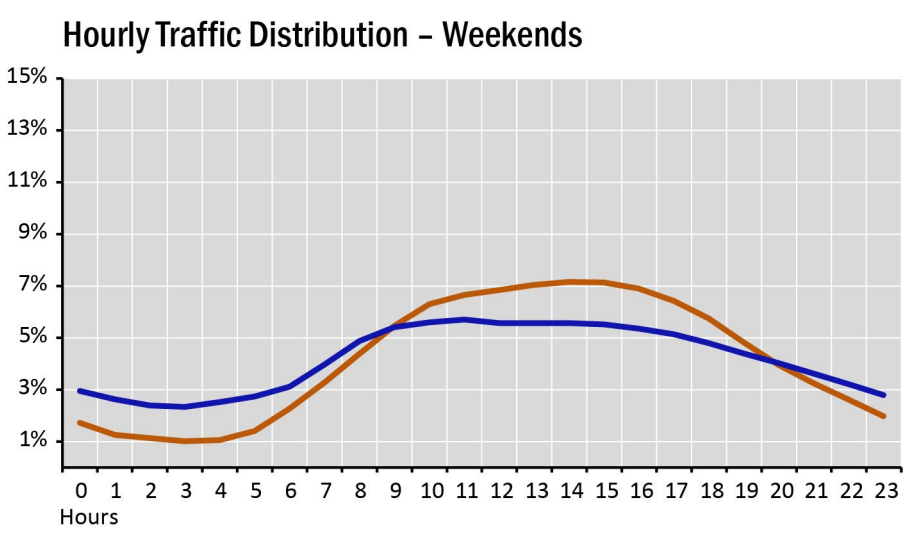
Hourly Traffic Distribution – Weekdays



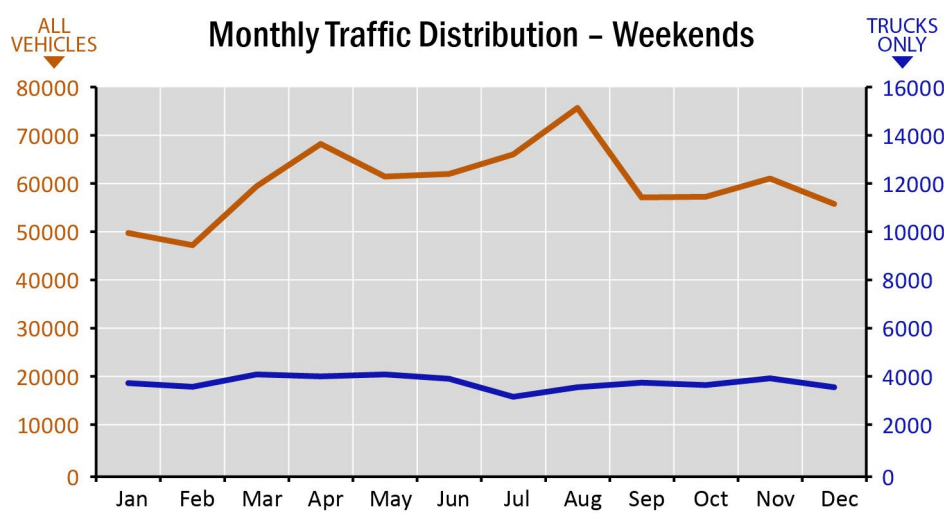
Monthly Traffic Distribution – Weekdays



Hourly Traffic Distribution – Weekends



Monthly Traffic Distribution – Weekends



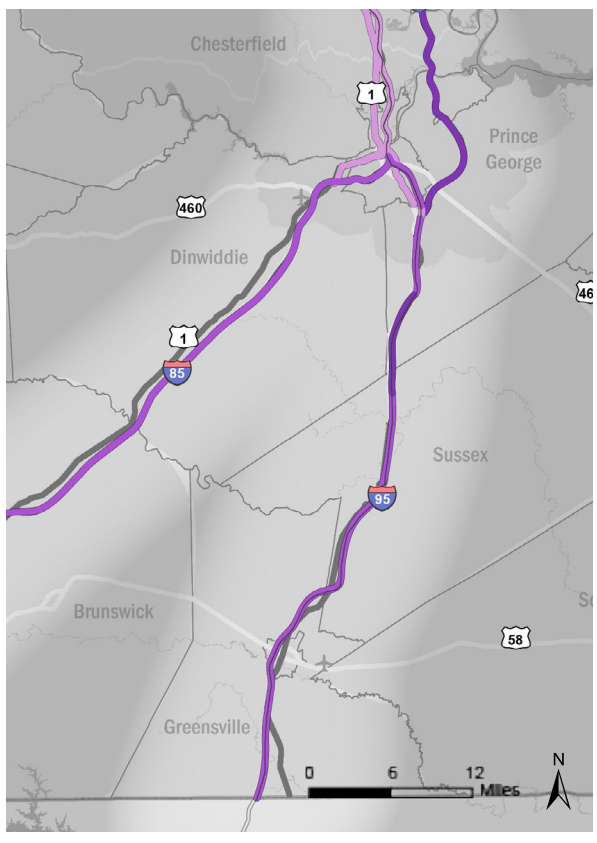
All Vehicles

Trucks

Traffic Distribution

On average, traffic on Segment K1 is distributed throughout the day as shown in the graphs below. Weekday traffic shows two peak periods over the course of the day, with the highest hourly traffic occurring between 4 and 5 p.m. which accounts for 7.4 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 other traffic, with a relatively steady flow of trucks during the midday period between 10 a.m. and 4 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 3 and 4 p.m. (7.1 percent of daily traffic) for all traffic, and 11 a.m. to noon (5.7 percent of daily traffic) for truck traffic.

Weekday traffic volumes on Segment K1 vary by as much as 32 percent throughout the year, with the high point in August (around 76,000 vehicles per day) and the low point in January (around 57,000 vehicles per day). Truck volumes vary less than passenger volumes throughout the year, with the April high (around 7,200 vehicles per day) 24 percent higher than the December low (around 5,800 vehicles per day). Weekend traffic levels also vary over the course of the year, and the highest levels of weekend traffic (August, around 76,000 vehicles per day) are 60 percent higher than February levels (around 47,000 vehicles per day). Weekend truck traffic is marginally more steady than all vehicle traffic, with the March high (around 4,000 vehicles per day) 29 percent higher than the July low (around 3,000 vehicles per day). Since truck volumes account for a relatively small portion of traffic on Segment K1, traffic conditions are much more responsive to variations in automobile traffic than truck traffic.

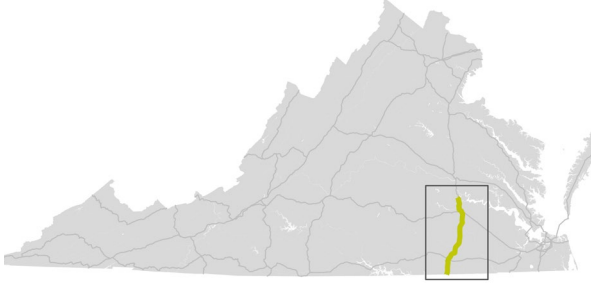


Percent Heavy Trucks

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

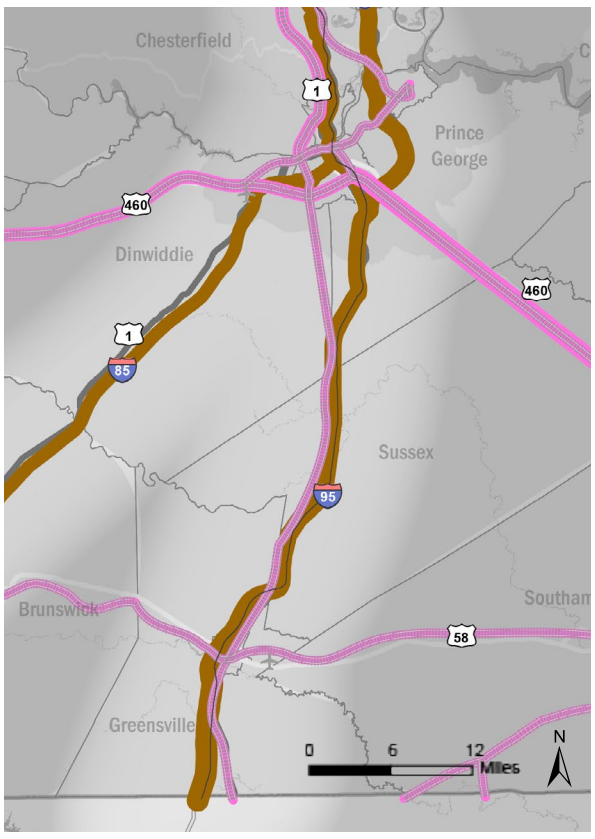
Truck Volume

The percent of average daily traffic comprised of heavy trucks on Segment K1 is generally less than ten percent, although it does vary by location. Heavy trucks account for less than five percent of daily traffic volumes on I-95 and US 1 north of Petersburg (where overall vehicle traffic is highest), but account for approximately 11 percent of vehicle traffic on I-295 in the same area. South of Petersburg, heavy trucks account for between eight and ten percent of ADT on I-95 and I-85.



K1 SEGMENT PROFILE

Annual Freight by Tonnage, 2012

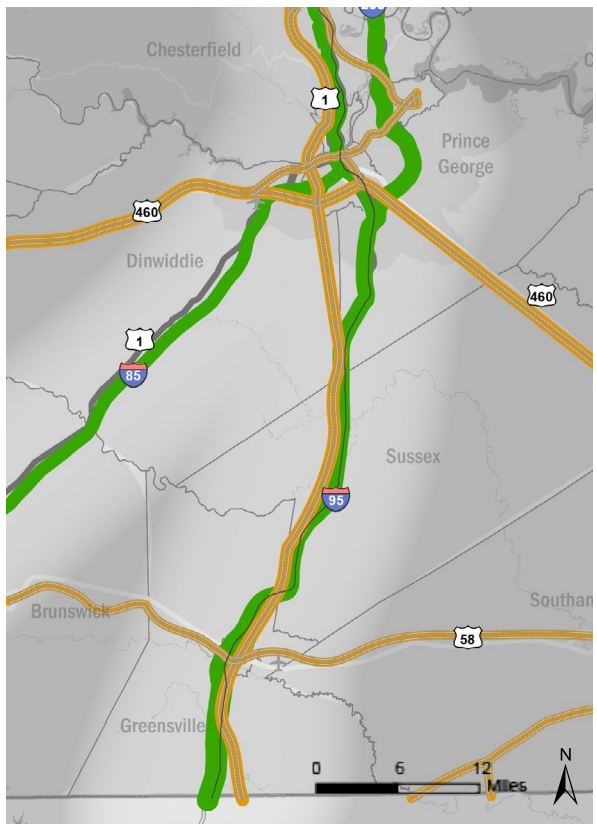


Freight Flows

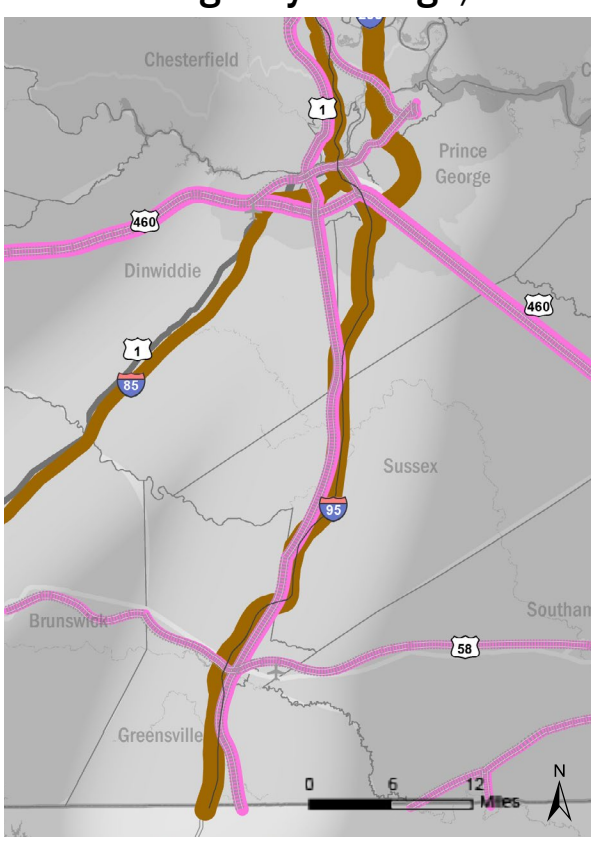
North of Emporia in Greensville County on Segment K1, freight is primarily moved by truck in terms of tonnage and value. In total, 47 million tons (84 percent) of freight is moved through this section of Segment K1 by truck, compared to nine million tons (16 percent) moved by rail. With regard to value, $92 billion (88 percent) of freight travels by truck, while $12 billion (12 percent) of freight travels by rail. On average, a ton of freight moving through this section of Segment K1 by truck and by rail is worth $1,943 and $1,393, respectively. In 2025, truck and rail freight tonnages and value in this area of Segment K1 will likely increase. The percentage of freight moving by truck is expected to increase by tonnage and by value to 86 percent and 90 percent, respectively. It is anticipated that value per ton on trucks will increase to $2,061 and increase to $1,425 for rail.

North of Colonial Heights on Segment K1, freight is moved primarily by truck by tonnage and value. In total, 21 million tons (65 percent) of freight is moved through this section of Segment K1 by truck and 12 million tons (35 percent) by rail. With regard to value, $21 billion (57 percent) of freight travels by truck and $16 billion (43 percent) travels by rail. On average, a ton of freight moving through this section of Segment K1 by truck and by rail is worth $964 and $1,344, respectively. This is one of the few locations in the Commonwealth where rail freight is on average more valuable than truck freight. In 2025, truck freight tonnage and value in this area of Segment K1 are expected to increase. The percentage of freight traveling by truck by tonnage and value will increase to 66 percent and 60 percent, respectively. It is anticipated that value per ton on trucks and rail will increase to $1,087 and $1,379, respectively.

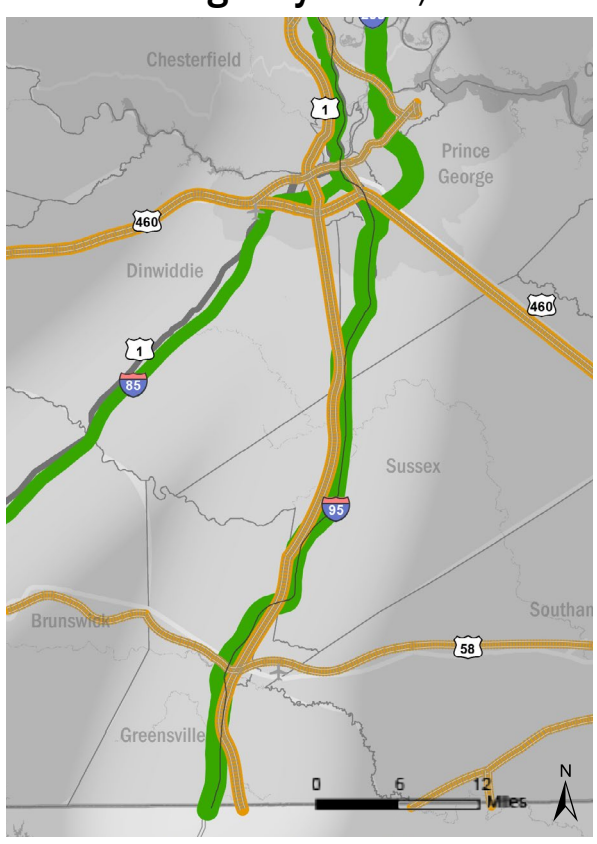
Annual Freight by Value, 2012



Annual Freight by Tonnage, 2025



Annual Freight by Value, 2025



Truck Freight (in tons)

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

Rail Freight (in tons)

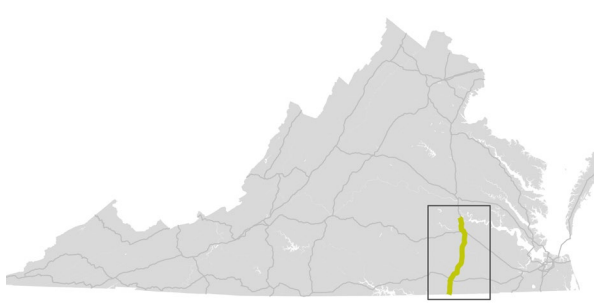
- < 10M
- 10M - 25M
- 25M - 50M
- 50M - 100M
- > 100M
- Primary facility

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

Petersburg to Richmond

Inter-City Bus	*Train*
4 Trips per Day	5 Trips per Day
0:45 Travel Time	0:35 Travel Time
$3.50 Avg Cost	$12 Avg Cost

Auto

Via I-95: 0:25 Travel Time $13 Avg Cost
Via US-1: 0:45 Travel Time $13 Avg Cost

Petersburg to Rocky Mount, NC

Inter-City Bus	*Train*
0 Trips per Day	4 Trips per Day
	1:30 Travel Time
	$18 Avg Cost

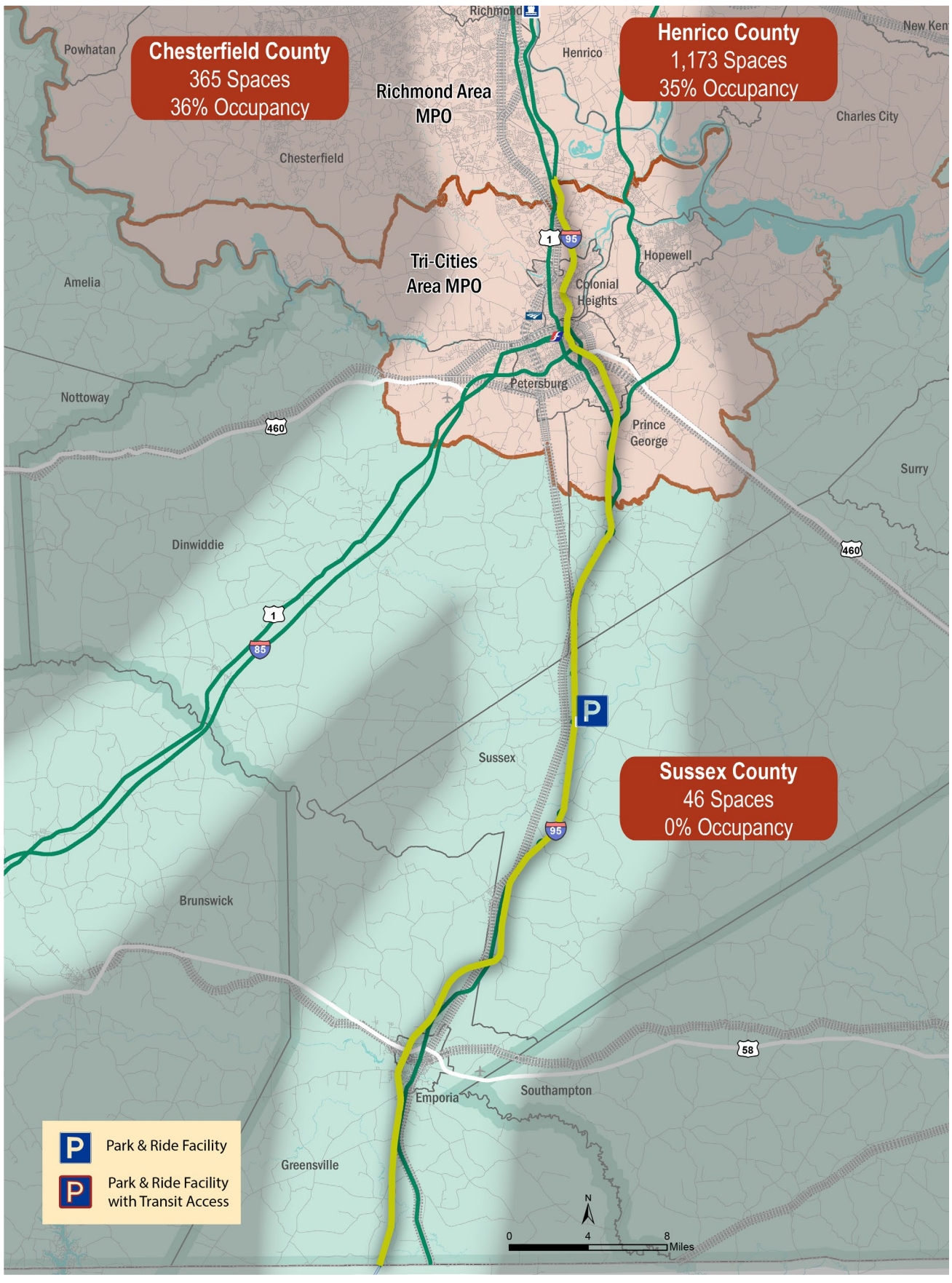
Auto

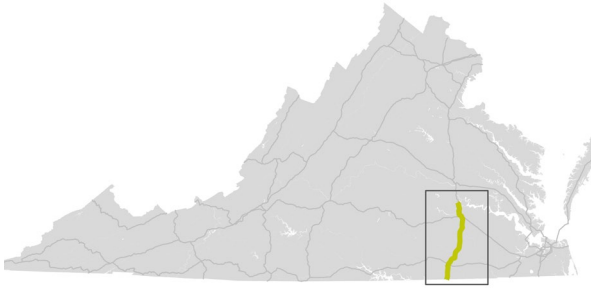
Via I-95: 1:30 Travel Time $58 Avg Cost
Via US-360: 2:05 Travel Time $56 Avg Cost

Passenger trips on Segment K1 of the Washington to North Carolina Corridor have several travel options, both in terms of travel path and mode choice. Interstates I-85, I-295, US 1, and US 301 serve as parallel highway facilities within the segment. The segment is served by a variety of modes with frequent service, including the Richmond-Petersburg Express bus service offered by GRTC. Greyhound and Amtrak each have stations in the Petersburg Area serving the corridor, as well as providing connections to destinations east and west. Automobile travel from Petersburg is typically less expensive than by alternative modes such as rail or bus (based on the 2014 federal standard mileage rate of 56 cents per mile), but is not as competitive in terms of speed or frequency of service.

Park-and-Ride

Within Segment K1, commuters can use one Park-and-Ride location, as well as local and commuter bus services provided by GRTC and PAT. The single Park-and-Ride location in Sussex County, the Stony Creek lot, has little to no usage. Chesterfield County does have more Park-and-Ride locations, as well as higher utilization of these lots; however, these lots do not directly serve Segment K1. No county within the Segment K1 area has a rate higher than the statewide average for Park-and-Ride utilization, which is 76 percent.





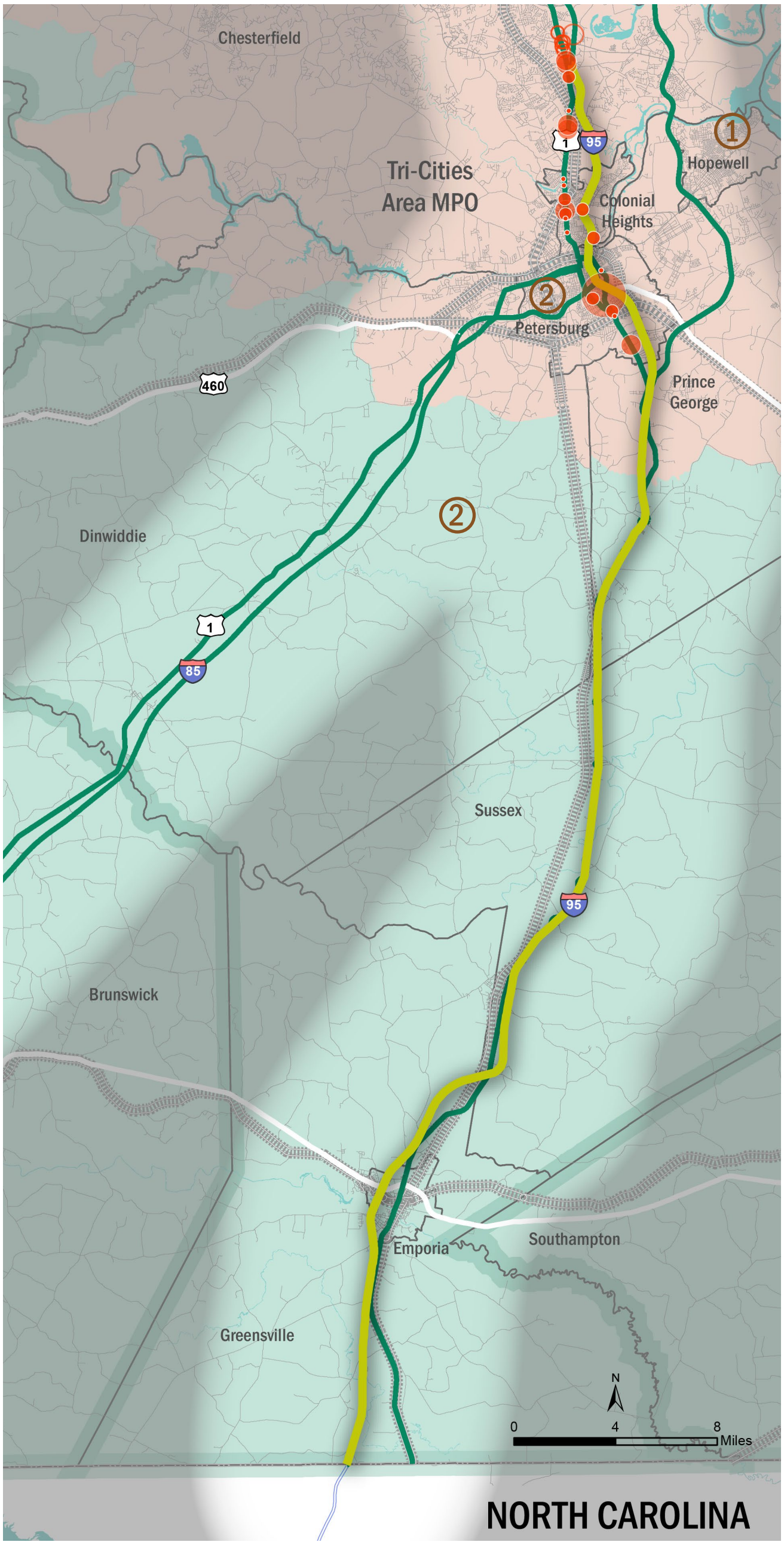
K1 SEGMENT NEEDS

Safety

Performance Metrics:

Number of Severe Crashes	178
Severe Crashes/Million VMT	0.2
Number of Railroad Crashes	5

Between 2010 and 2012, 178 severe crashes occurred on Segment K1. The largest concentration of severe crashes occurred in the northernmost portion of the segment, near Petersburg and Colonial Heights. Most of the collisions occurred along a span of US 1 in Colonial Heights and north of the Appomattox River. A total of 47 incidents took place within a stretch of approximately two miles, with 13 of the crashes in this span occurring at the intersection of US 1 and Route 144. A significant number of collisions (39) also occurred along a 1.4 mile segment of US 301 (South Crater Road) in Petersburg, south of I-95 and north of Roberts Avenue. Of the 39 crashes, 28 happened along a 0.7 mile segment between I-95 and South Boulevard. There is also a concentration of crashes on US 1 further north in Chesterfield County; these crashes are included in the analysis of the southernmost portion of Segment K2.

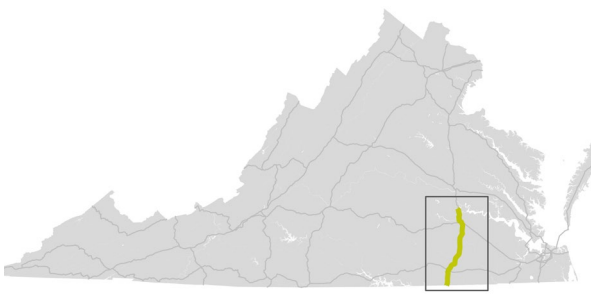


Fatality and Injury Crashes (2010-2012)

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

Railroad Incidents/Accidents per County (2011-2014)

#



K1 SEGMENT NEEDS

Congestion

Performance Metrics:

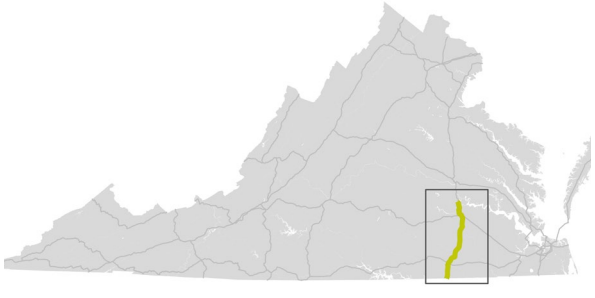
Person Hours of Delay per Mile	4
Freight Ton Hours of Delay per Mile	8.7K

Passenger Delays

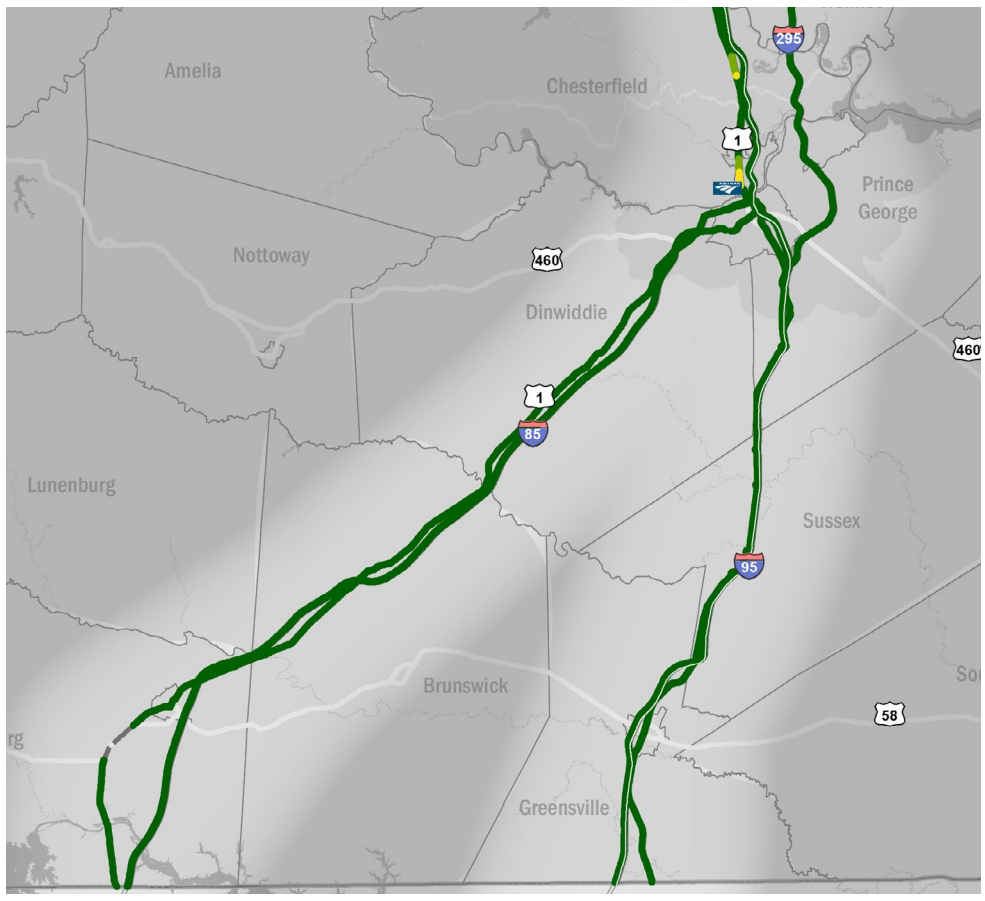
Passenger delays along Segment K1 are quite low, with an average delay of just four person-hours per mile. While the passenger delays are minimal for most of the segment, passenger delays exceed 100 person-hours per mile for a short section of US 1 in Colonial Heights. Approximately 46 percent of the daily passenger delays are experienced in the peak period, which is higher than average for the peak-period share of congestion on CoSS segments.

Freight Delays

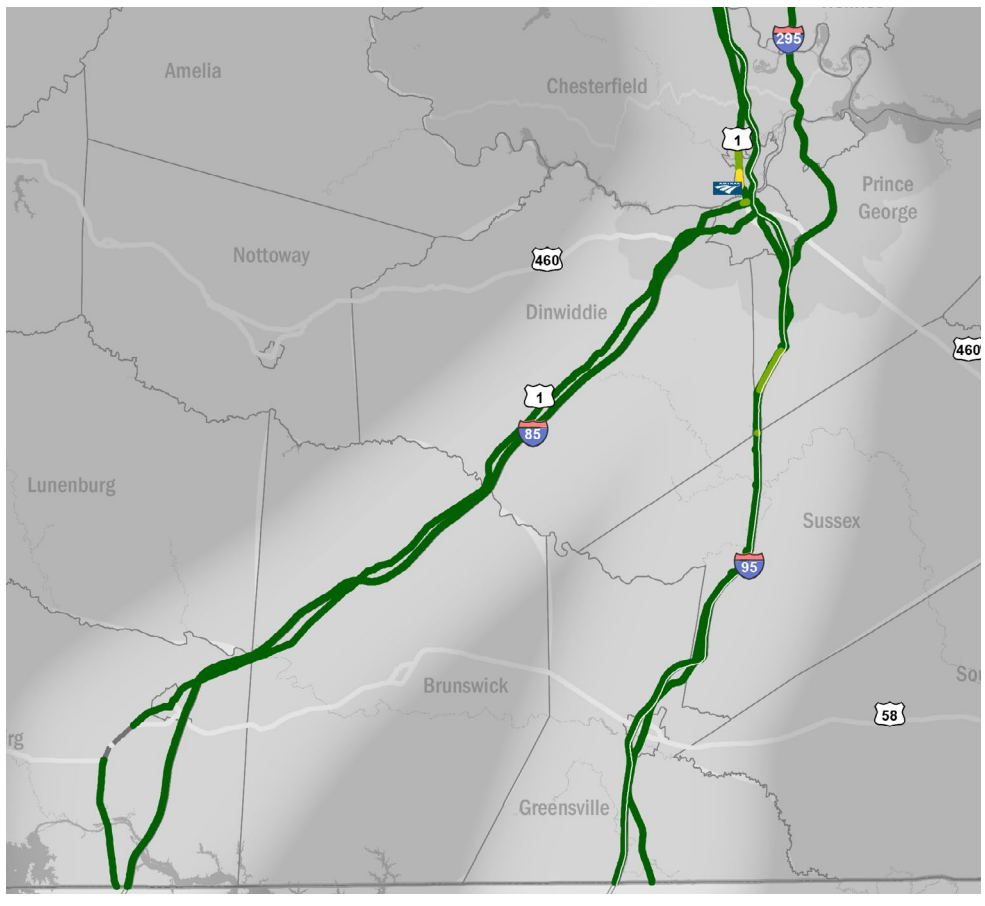
Freight congestion along Segment K1 is the lowest in the corridor, with an average delay of 8,700 ton-hours per mile. Freight delays follow similar patterns to passenger delays, with only minimal freight delays for most of the segment, and significant freight delays (exceeding 250,000 ton-hours per mile) for a short section of US 1 in Colonial Heights. Approximately 38 percent of the daily freight delays are experienced in the peak period, which is slightly higher the average peak periods share of freight delay among CoSS segments statewide.



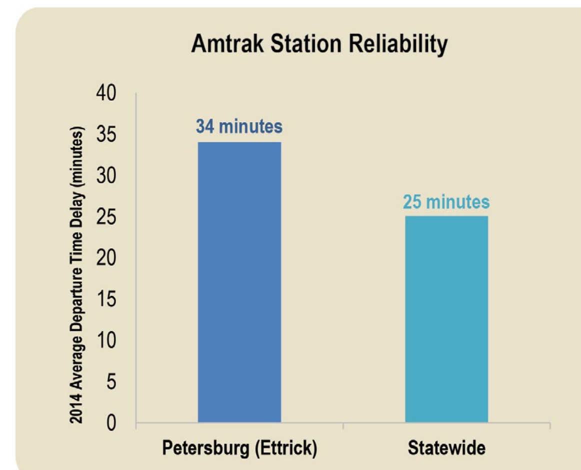
Daily Person Hours of Delay per Mile



Daily Freight Ton Hours of Delay per Mile



Reliability



Weekday Peak

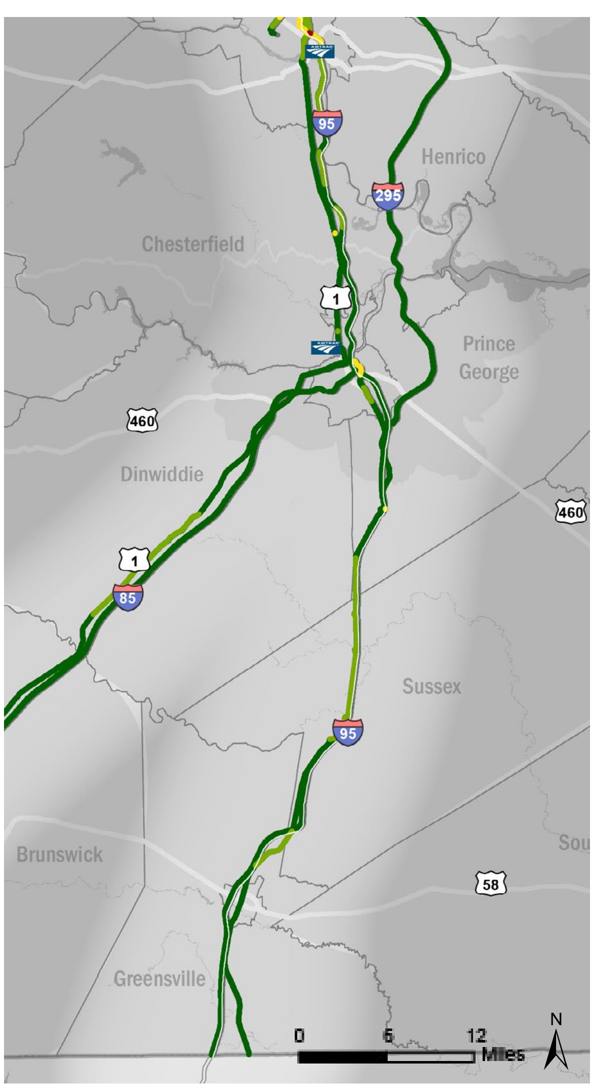
Reliability of travel during the peak period on a typical weekday on Segment K1 ranges from 0.00 to 0.56 in terms of reliability index, with an average value of 0.08. None of the locations along Segment K1 have reliability index values exceeding the statewide threshold.

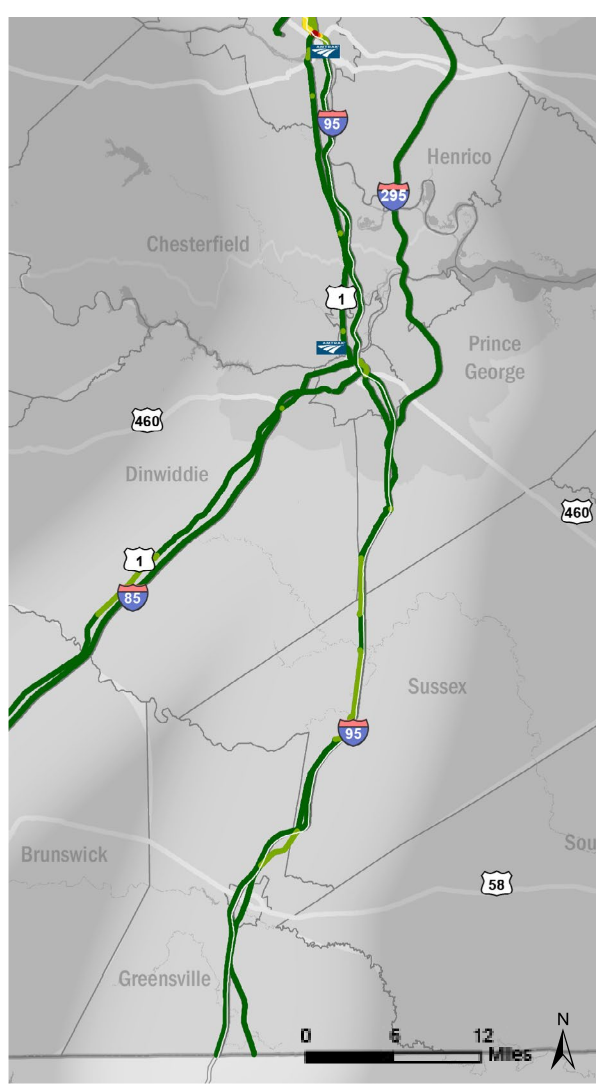
Weekday

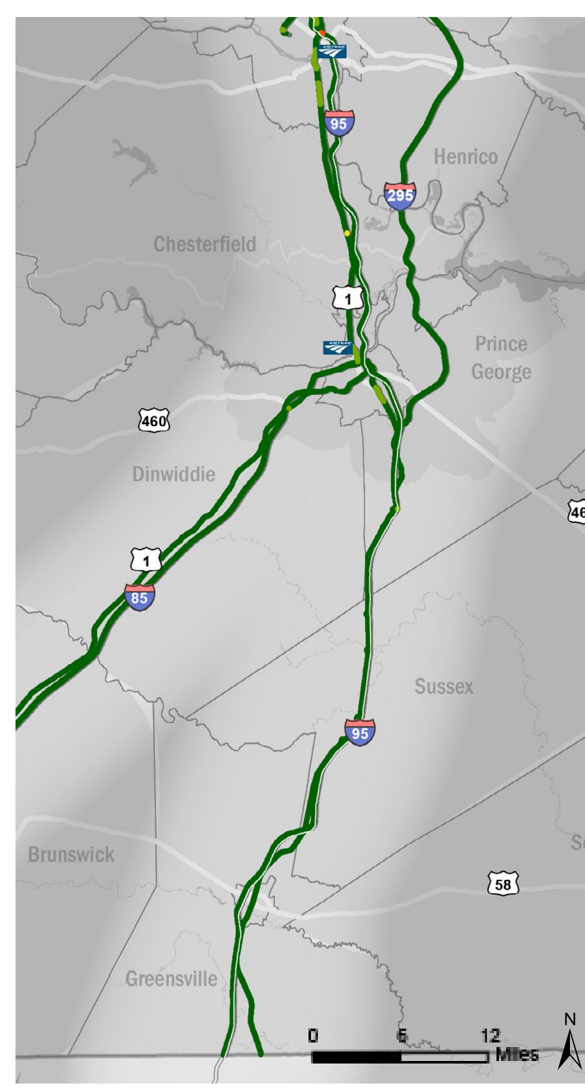
Reliability of travel during a typical weekday ranges from 0.00 to 0.29 in terms of reliability index, with an average value of 0.07. None of the locations along Segment K1 have reliability index values exceeding the statewide threshold.

Weekend

Reliability of travel during a typical weekend ranges from 0.00 to 0.37 in terms of reliability index, with an average value of 0.05. None of the locations along Segment K1 have reliability index values exceeding the statewide threshold.





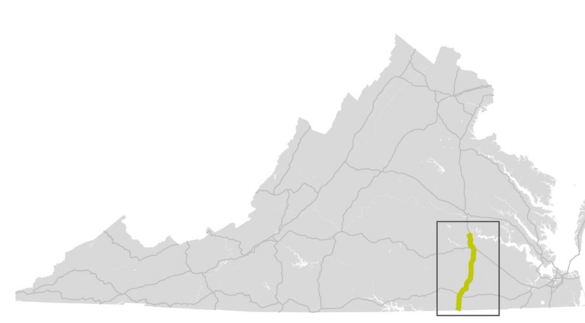


Reliability Index

- < 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 unreliable. 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.

Mode Choice

C

E

Redundancy

F

Safety

B

A

D

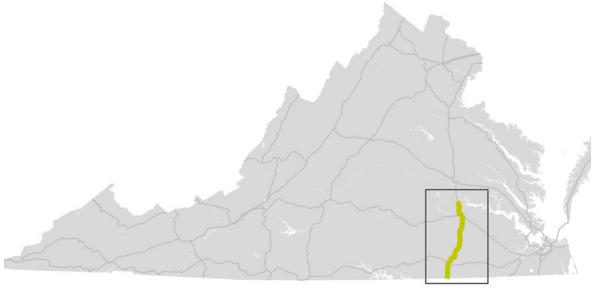
Congestion

H

Bottlenecks

G

Reliability



K1 SEGMENT NEEDS

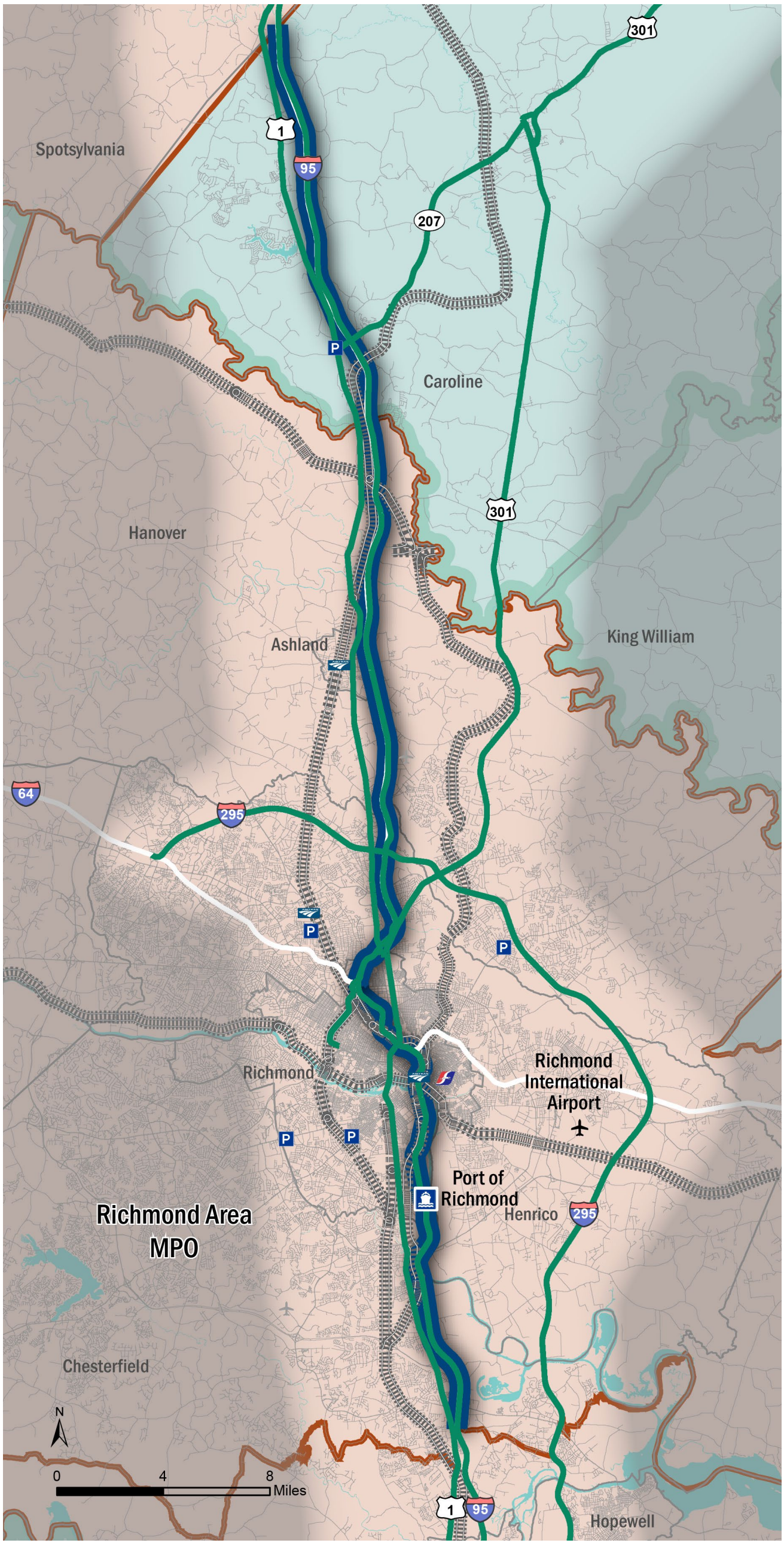
Summary of Needs - K1 Segment

A.		Unsafe interchange at junction of I-95 and I-85
B.		Unsafe ramp at interchange of I-95 and US 460
C.		US 1 in Colonial Heights (near intersection with VA 144/Temple Ave) : Highest number of crashes on the Segment (47)
D.		US 301/South Crater Road in Petersburg: 39 crashes between I-95 and Roberts Avenue
E.		Limited availability of transit options from Petersburg to Metropolitan Washington region (2 buses, 11 rail trips daily)
F.		Unreliable Amtrak service from Petersburg (Ettrick) station. Average departure delay is 34 minutes totaling over 8,200 person-hours of delay from this segment.
G.		Congestion issue at US 1 and VA Route 144 (Temple Avenue) in Colonial Heights
H.		Capacity issues at Truck Plaza on US 1 near I-85 and US 460: truck plaza often full or overflowing, causing congestion issues on surrounding roadways.

III. Segment K2

Corridor Segment K2 Components

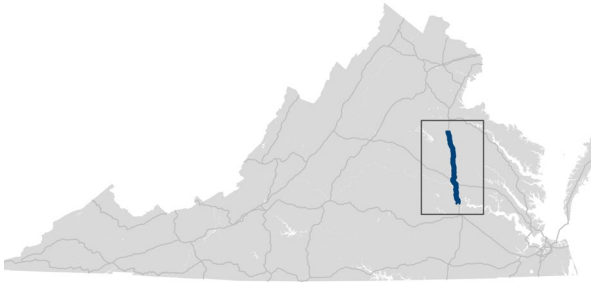
- I-95
- I-195
- I-295
- US 1
- US 301
- Route 207
- CSX National Gateway Corridor
- Port of Richmond
- James River
- Amtrak
- Richmond International Airport
- Intercity bus service



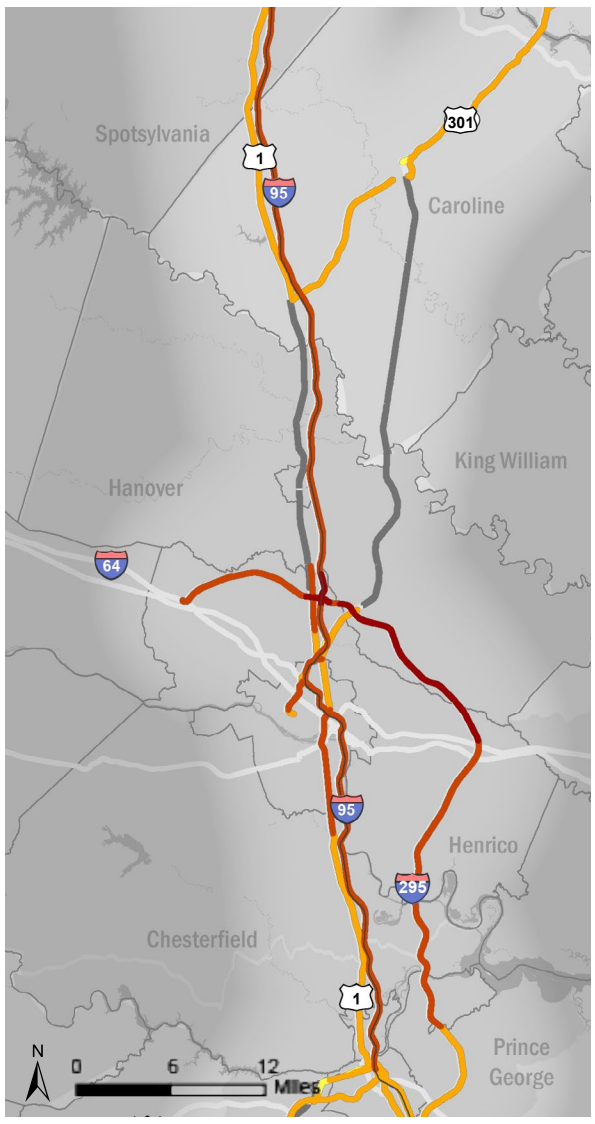
Segment K2

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

MPO Area
Planning District Area

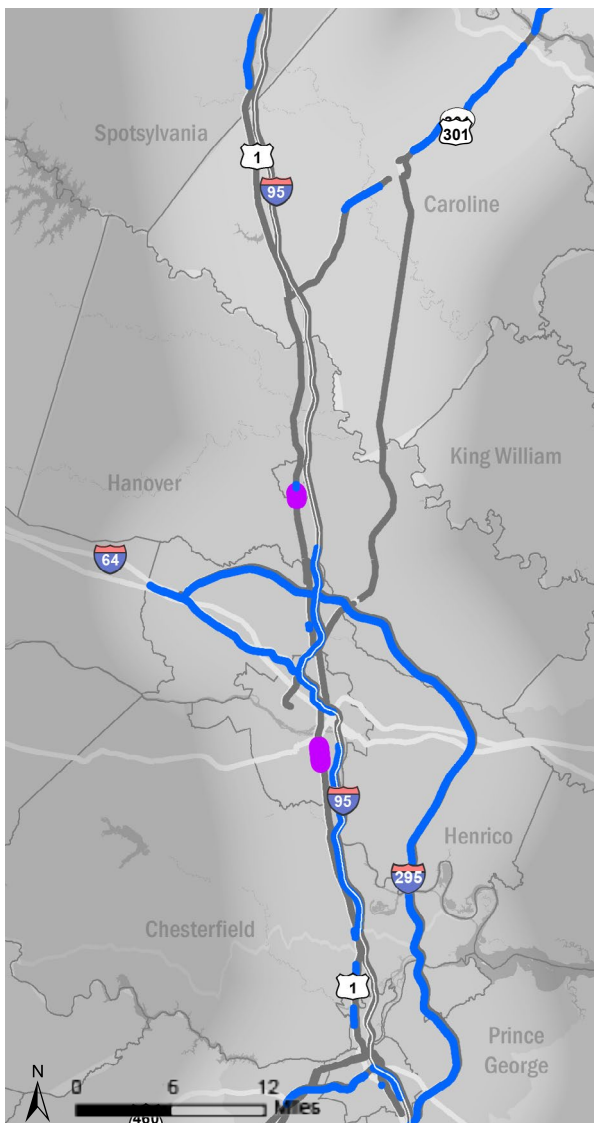


K2 SEGMENT PROFILE



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

Centered on the City of Richmond, Segment K2 stretches from the city's southern suburbs through Chesterfield, Henrico, Hanover, and Caroline Counties to the border of Spotsylvania County. The segment traverses the area covered by the Richmond Area and connects to the Tri-Cities Area to the south and the Fredericksburg Area to the north. Segment K2 is primarily defined by I-95, but it also includes portions of I-195, I-295, US 1, US 301, and Route 207. There is heavy commuter traffic throughout Segment K2.

Highway Facilities: I-95 is primary a four-lane freeway in Segment K2, although there is some variation in cross-section along its length. I-295 acts as a bypass around Richmond, with six to eight lanes in this segment. US 1 is mostly a four-lane roadway that runs parallel to I-95 throughout Segment K2. US 301 branches off eastward to north of Richmond, providing an alternate path to Maryland. I-195 is a short spur which connects to downtown Richmond from I-95. I-95 also runs concurrently with I-64 (Segment C4) for a short distance in the City of Richmond.

Transit Services: The segment is served by the GRTC transit system and PAT, as well as several Park-and-Ride facilities. Amtrak operates one station in Ashland and two stations in Richmond. Richmond is served by Amtrak's Northeast Regional Service, which operates along the corridor from Washington, DC to Richmond, where it travels east toward its termini in Newport News and Norfolk.

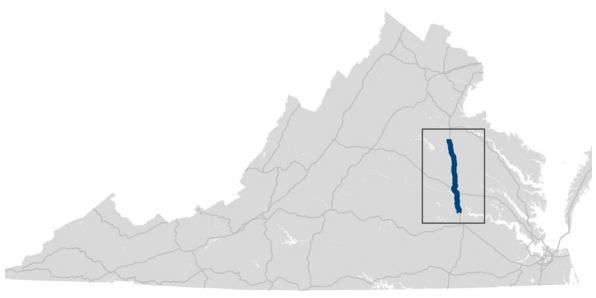
Rail Facilities: The CSX National Gateway Corridor operates over the length of this segment. The Buckingham Ranch Short Line Railroad serves the segment with stations in Richmond and Doswell providing service as far west as Clifton Forge.

Port Facilities: Segment K2 provides access to the James River navigational channels and the Port of Richmond. Rail connections are also available from Segment K2 to the Port of Virginia facilities in the Hampton Roads Area via Norfolk Southern rail lines.

Airport Facilities: Commercial air service in Segment K2 is provided by the Richmond International Airport.

Major planned and future projects include:

- **Chesterfield County:** Widen West Hundred Road from four to six lanes from Jefferson Davis Highway to 0.27 miles east of Old Bermuda Hundred Road;
- **Chesterfield County:** Add center turn lane with raised median on Commerce Road from Bells Road to 0.13 north of Bellemeade Road;
- **Henrico County:** Upgrade existing signs, sign lighting, and ground mounted sign structures on concurrent I-64/I-95 section (between I-195 and southeastern I-64/I-95 split);
- **City of Richmond and Henrico County:** Install overhead message boards, CCTV, and fiber optic lines on the portion of I-95 from mile marker 76.8 (0.08 miles south of Lombardy Street Bridge) to mile marker 88 (Sliding Hill Road); and
- **Hanover County:** Shoulder wedging, milling, and overlay of Ashcake Road, including a portion that goes over I-95.

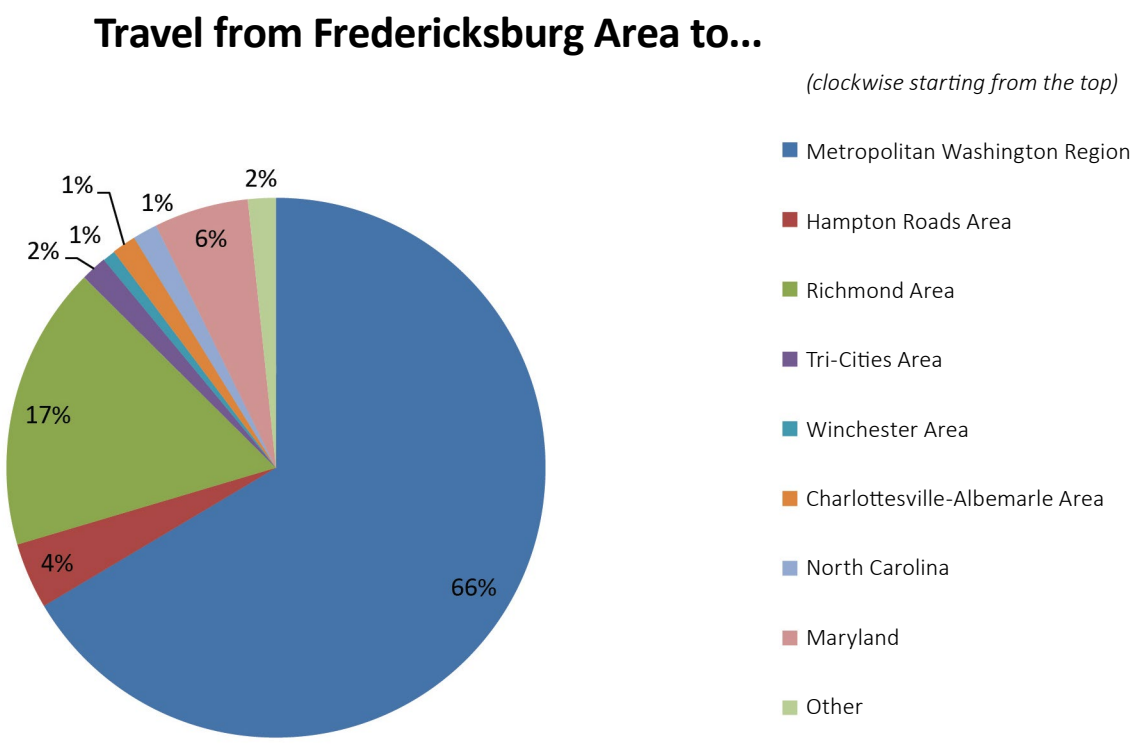


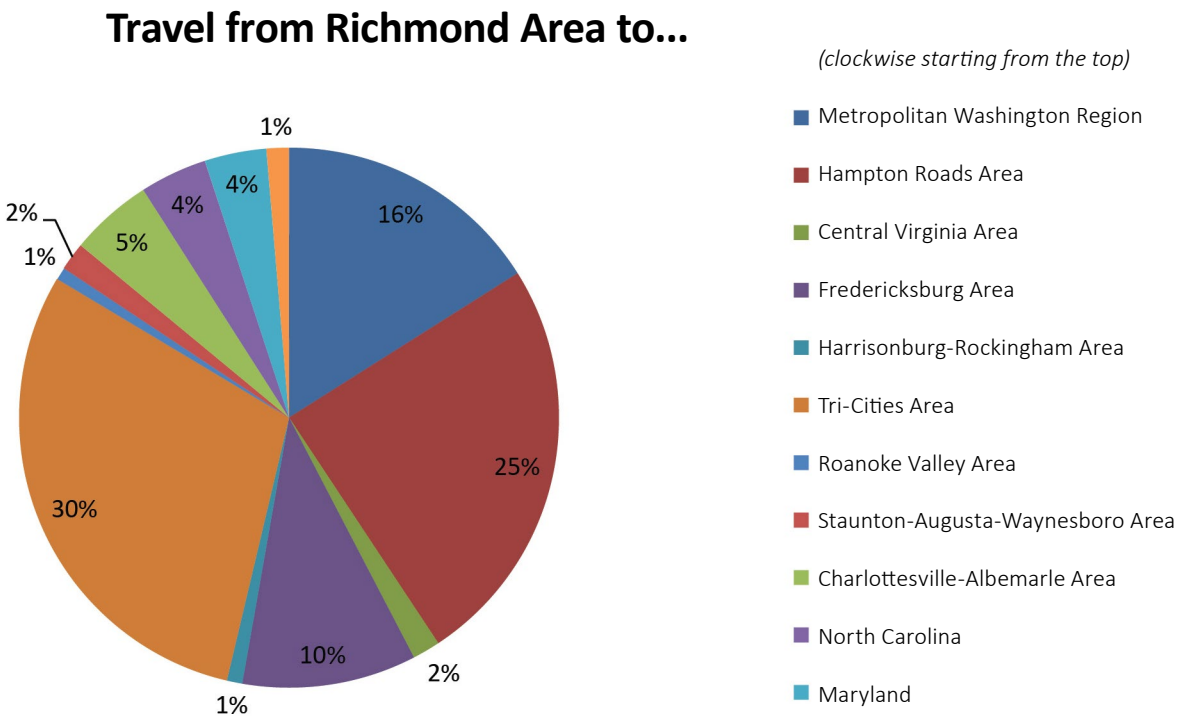
Travel Demand

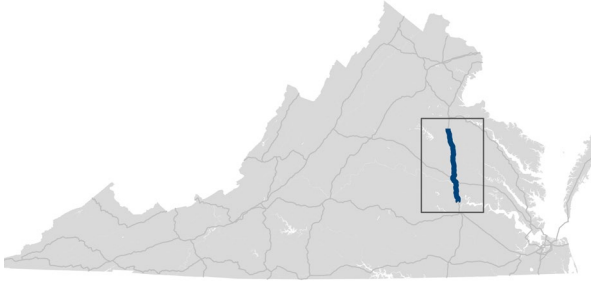
Passenger Demand

This segment of Corridor K connects the Richmond Area and the Fredericksburg Area. All told, a large portion of intercity passenger travel in the Commonwealth occurs on this segment; 11 percent of the statewide total occurs between the Tri-Cities Area and Richmond, an additional four percent occurs between the Richmond Area and the Fredericksburg Area, while travel between the Richmond Area and the Metropolitan Washington Area accounts for another six percent. This accounts for a total of more than 20 percent of the intercity passenger travel in the Commonwealth.

Of the intercity passenger travel originating in the Richmond Area, 30 percent is destined for the Tri-Cities Area located directly to the south along Corridor K. Twenty six percent of intercity travel originating in the Richmond Area is destined for the Fredericksburg Area and the Metropolitan Washington Area, using this segment to access major areas to the north. Significant portions of passenger travel originating in the Fredericksburg Area will also use Segment K2, with approximately 20 percent destined for the Richmond Area, the Tri-Cities Area, and North Carolina.







K2 SEGMENT PROFILE

Truck Freight Demand

By truck, Segment K2 carried 100 million tons of freight worth $154 billion in 2012, and is estimated to carry 138 million tons of freight worth $225 billion in 2025. A large proportion of truck freight on Corridor K passes through the Commonwealth, representing more than 35 percent of total corridor tonnage and 55 percent of total corridor value. In terms of tonnage, North Carolina is the largest producer and attractor of truck freight traveling along this corridor. In terms of value, Florida is the largest destination for truck freight along the corridor. Corridor K is used heavily by truck freight traffic traveling between locations in the Middle Atlantic and the Southeastern U.S. Within Virginia, the Port of Virginia marine terminal in Norfolk is a major generator of freight traffic on Corridor K, accounting for around five percent of the total truck freight value. The jurisdictions adjacent to Segment K2 generate more than 11 percent of and attract more than 13 percent of truck freight traveling on the corridor. Henrico County is the largest attractor of truck freight traffic along the segment, while Hanover County is the largest producer of truck freight traffic along the segment.

By rail, Segment K2 carried 16 million tons of freight worth $18 billion in 2012, and is estimated to carry 19 million tons of freight worth $23 billion in 2025. Rail freight between Florida and New Jersey accounts for more than 12 percent of the total rail value in Corridor K. In terms of tonnage, Segment K2 is dominated by rail freight travel from West Virginia, Kentucky, and Dickenson County, VA to the marine terminal in Newport News (accounting for more than 57 percent of rail freight tonnage on Corridor K). Hanover County is a major generator of rail freight in the corridor, accounting for more than two percent of the total rail freight tonnage in Corridor K. The major destinations of rail freight from Hanover County are North Carolina and the marine terminal at Newport News.

Truck Freight

Major Origins (by Tonnage)
1. Virginia (35% / 37%)
2. North Carolina (19% / 17%)
3. Pennsylvania (8% / 9%)
4. Maryland (7% / 7%)
5. Florida (6% / 6%)

Corridor Tonnage Originating in Segment K2: 13% / 15%

Major Origin-Destination Pairs for Freight
North Carolina and Maryland
North Carolina and Pennsylvania
North Carolina and New York
Florida and Pennsylvania
Florida and New York

Percentages represent 2012 / 2025 values.

Major Destinations (by Tonnage)
1. Virginia (39% / 40%)
2. North Carolina (11% / 12%)
3. Maryland (10% / 10%)
4. Pennsylvania (7% / 7%)
5. Florida (7% / 7%)

Corridor Tonnage Destined for Segment K2: 15% / 13%

Rail Freight

Major Origins (by Tonnage)
1. West Virginia (52% / 48%)
2. Virginia (12% / 14%)
3. Pennsylvania (8% / 7%)
4. Kentucky (6% / 5%)
5. Florida (3% / 4%)

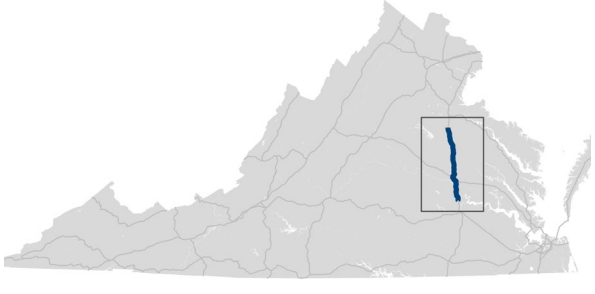
Corridor Tonnage Originating in Segment K2: 4% / 5%

Major Origin-Destination Pairs for Freight
City of Newport News* and West Virginia
City of Newport News* and Kentucky
Florida and New Jersey
Pennsylvania and South Carolina
Dickenson County and City of Newport News*

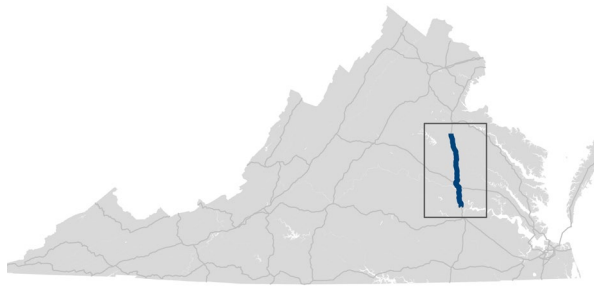
Percentages represent 2012 / 2025 values.
*Includes freight passing through the Port of Virginia.

Major Destinations (by Tonnage)
1. Virginia (77% / 75%)
2. City of Newport News* (60% / 55%)
3. South Carolina (4% / 4%)
4. City of Norfolk* (4% / 4%)
5. North Carolina (3% / 3%)

Corridor Tonnage Destined for Segment K2: 4% / 4%



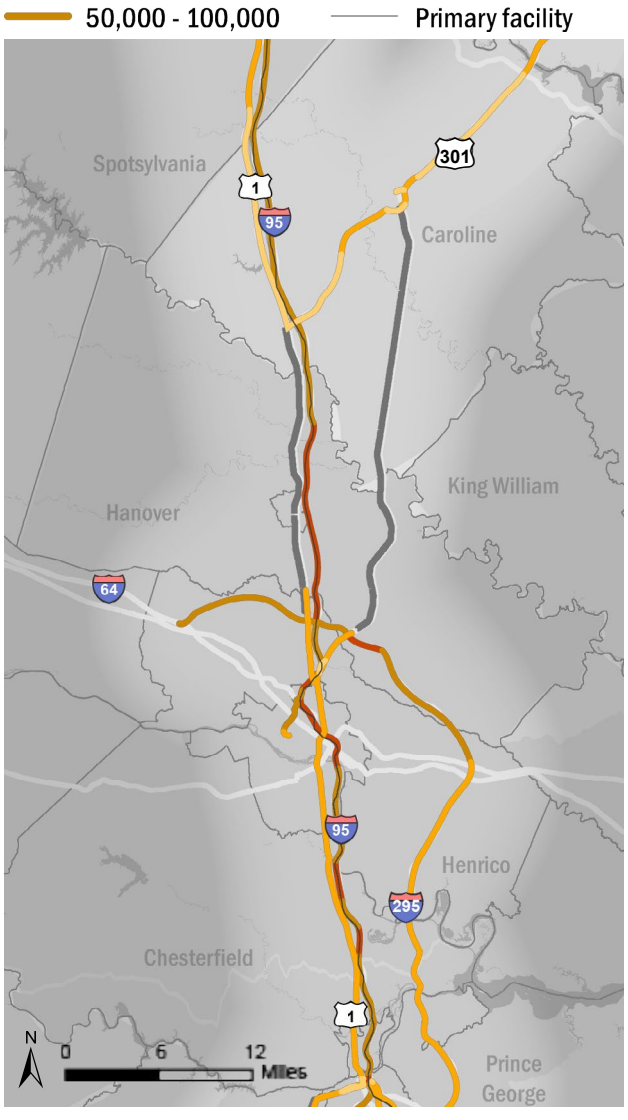
Traffic Conditions



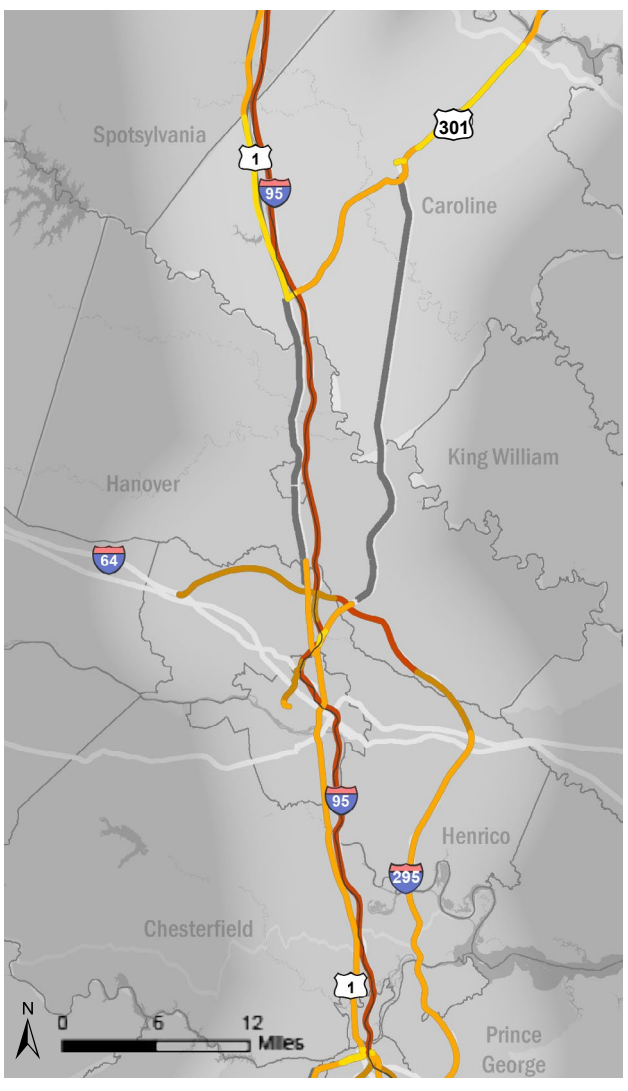
Traffic Volume and AADT

Traffic volumes on Segment K2 vary significantly throughout the segment. The highest traffic volumes in the segment can exceed 130,000 vehicles per day, and occur on the section I-64/I-95 in downtown Richmond and on I-95 north of I-295 near the border of Hanover and Henrico Counties. Average daily volumes on I-95 taper to about 95,000 vehicles per day in the northernmost portions of the segment. South of Richmond, average daily traffic volumes on I-95 range from 92,000 to 110,000 vehicles per day. Average daily traffic on US 1 is much lower, with volumes between 15,000 to 30,000 vehicles per day throughout Segment K2. Substantial traffic growth is expected on Segment K2 by 2025. Growth of more than 20,000 vehicles is projected for portions of I-95 and I-295 in northern Henrico County.

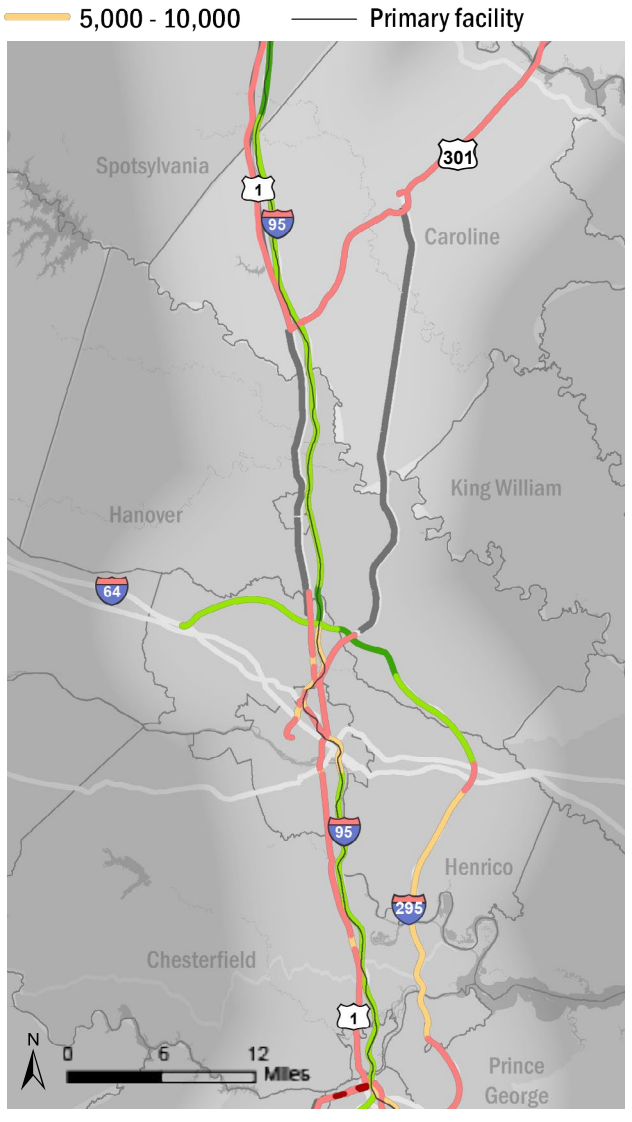
Traffic Volume 2014 (AADT)



Traffic Volume 2025 (AADT)

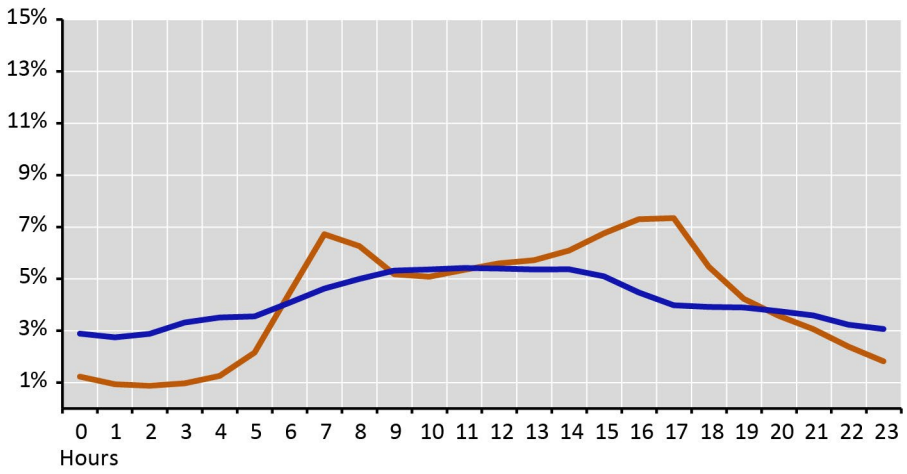


Change in Traffic Volume 2014- 2025 (AADT)

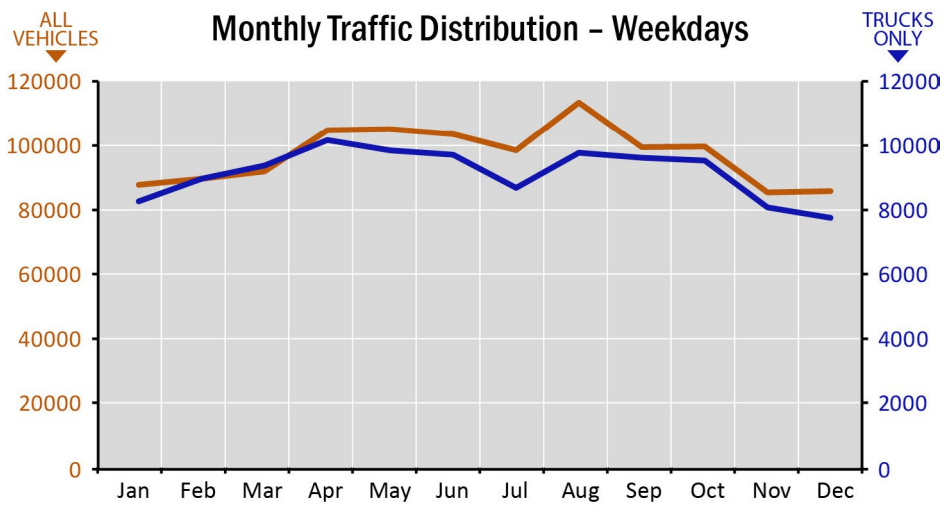


K2 SEGMENT PROFILE

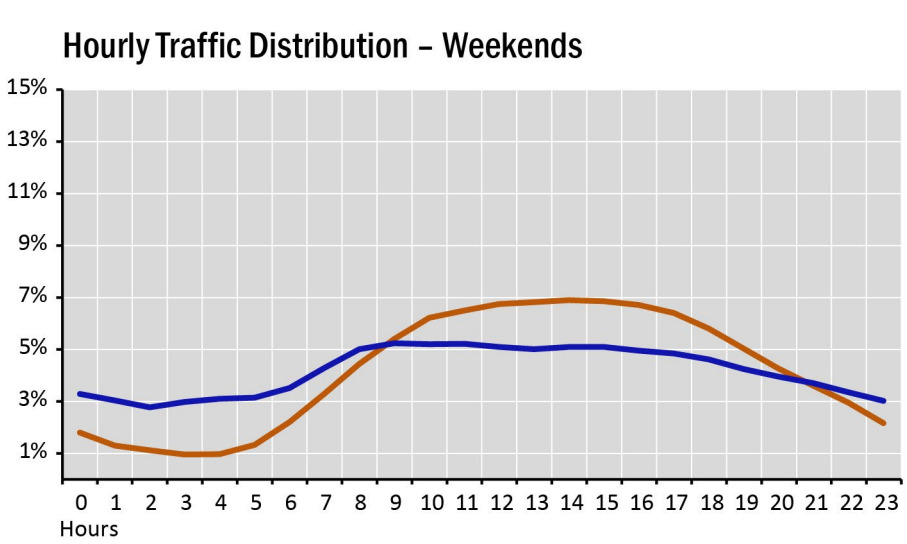
Hourly Traffic Distribution – Weekdays



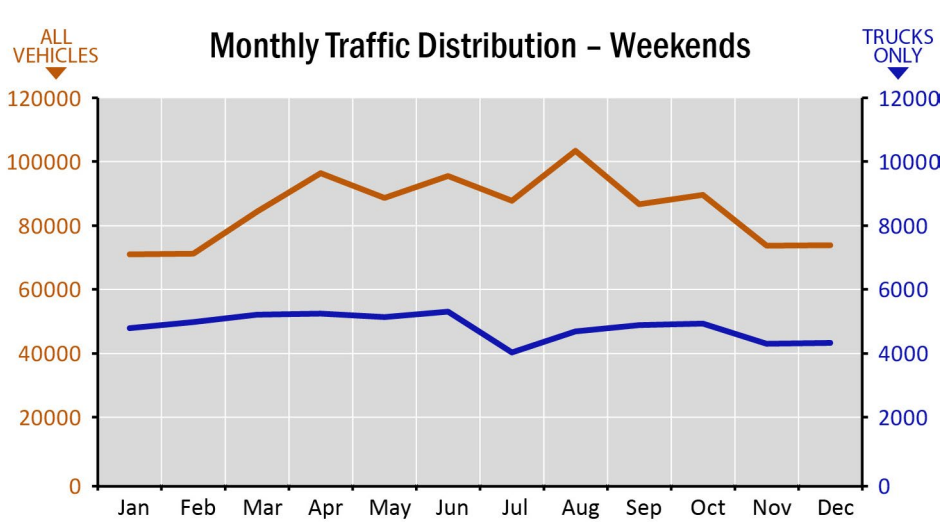
Monthly Traffic Distribution – Weekdays



Hourly Traffic Distribution – Weekends



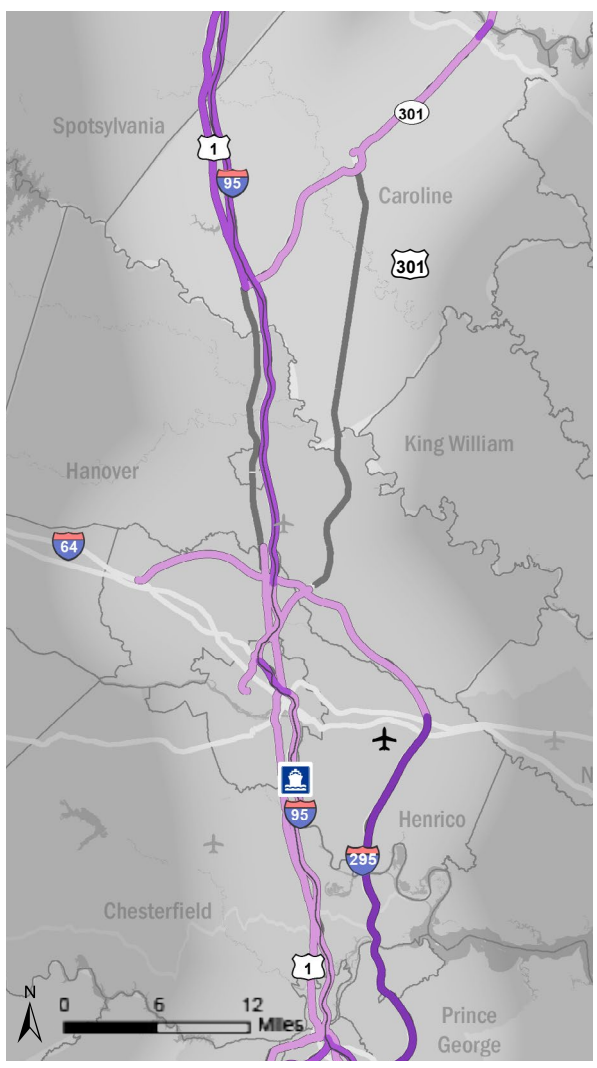
Monthly Traffic Distribution – Weekends



Traffic Distribution

On average, traffic on Segment K2 is distributed throughout the day as shown in the graphs below. Weekday traffic shows two distinct peak periods over the course of the day, with the highest hourly traffic occurring between 4 and 5 p.m. which accounts for 7.3 percent of daily traffic and the morning peak hour between 7 and 8 a.m. accounting for 6.7 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 50 percent of total daily traffic. Peaking patterns for truck traffic are different from commuter traffic, with a relatively steady flow of trucks during the midday period between 10 a.m. and 4 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 2 and 3 p.m. (6.9 percent of daily traffic) for all traffic, and 9 to 10 a.m. (5.2 percent of daily traffic) for truck traffic.

Weekday traffic volumes on Segment K2 vary by as much as 33 percent throughout the year, with the high point in August (around 113,000 vehicles per day) and the low point in November (around 85,000 vehicles per day). Truck volumes vary similarly throughout the year, with the April high (around 10,000 vehicles per day) 31 percent higher than the December low (around 7,700 vehicles per day). Weekend traffic levels also vary over the course of the year, and the highest levels of weekend traffic (August, around 103,000 vehicles per day) are 45 percent higher than January levels (around 71,000 vehicles per day). Weekend truck traffic is steadier than all vehicle traffic, with the June high (around 5,300 vehicles per day) 31 percent higher than the July low (around 4,000 vehicles per day).

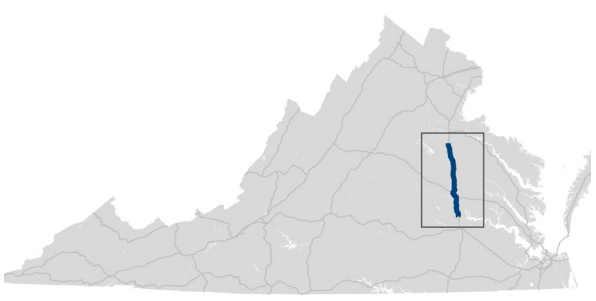


Percent Heavy Trucks

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

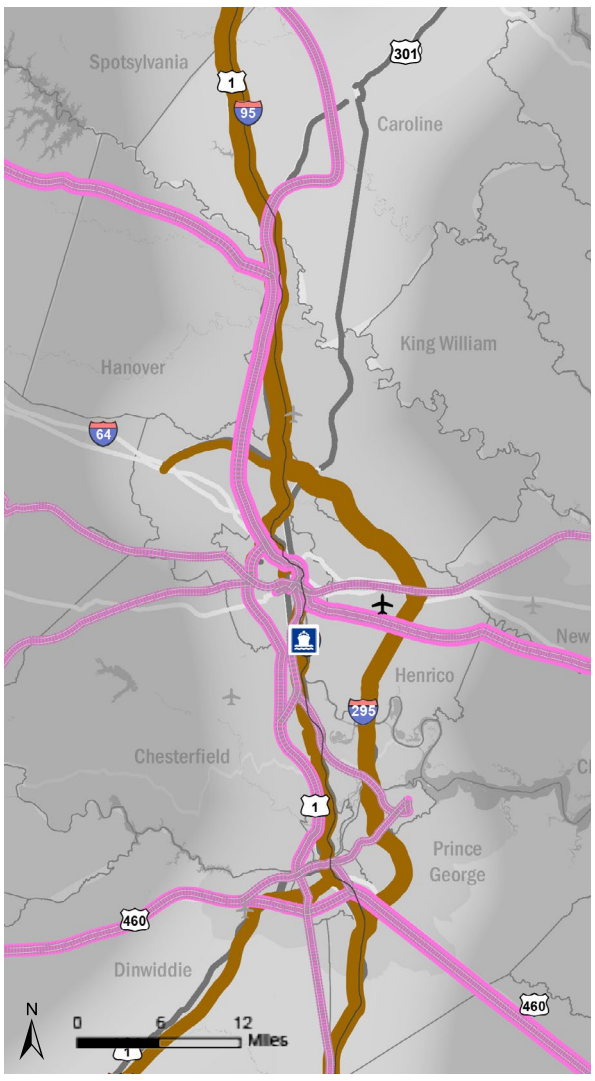
Truck Volume

The percent of daily traffic comprised of heavy trucks on Segment K2 is typically less than five percent in the more urbanized areas in and around Richmond. North of Henrico County, heavy trucks comprise between five and eight percent of daily traffic on I-95, US 1, and US 301. The highest proportion of truck traffic occurs on the southern portion of I-295, where trucks account for 11 percent of daily vehicle traffic as trucks use this facility to bypass congestion through the City of Richmond.

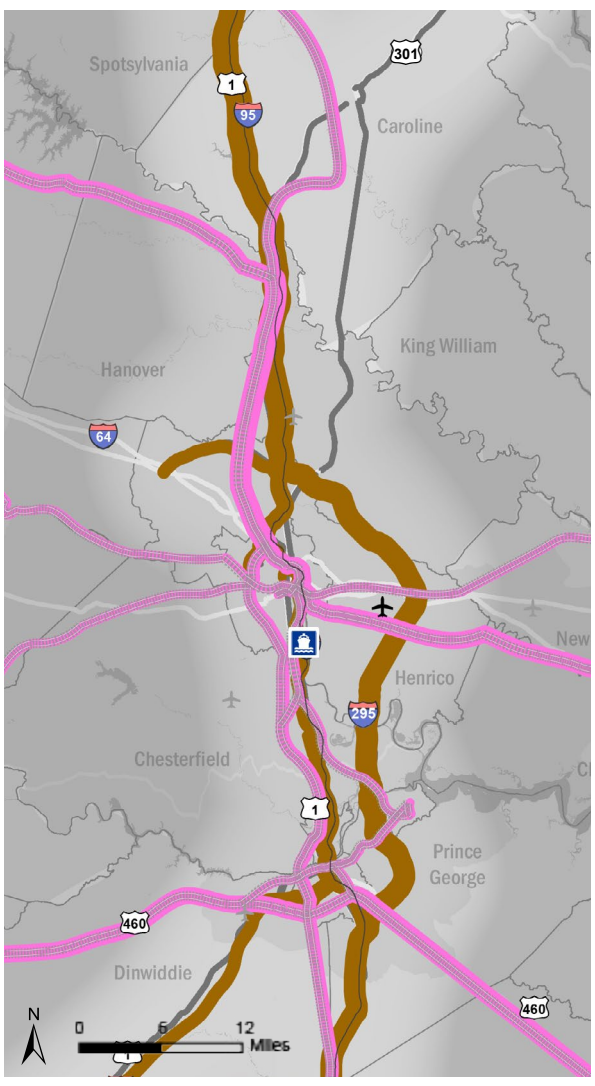


K2 SEGMENT PROFILE

Annual Freight by Tonnage, 2012



Annual Freight by Tonnage, 2025



Truck Freight (in tons)

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

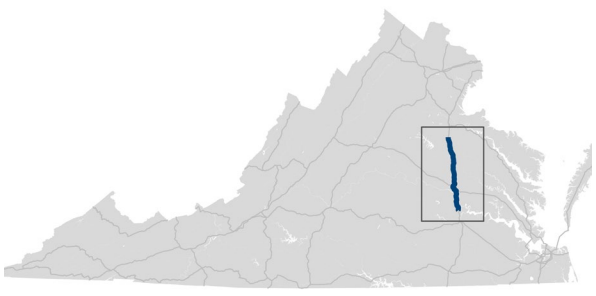
Rail Freight (in tons)

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

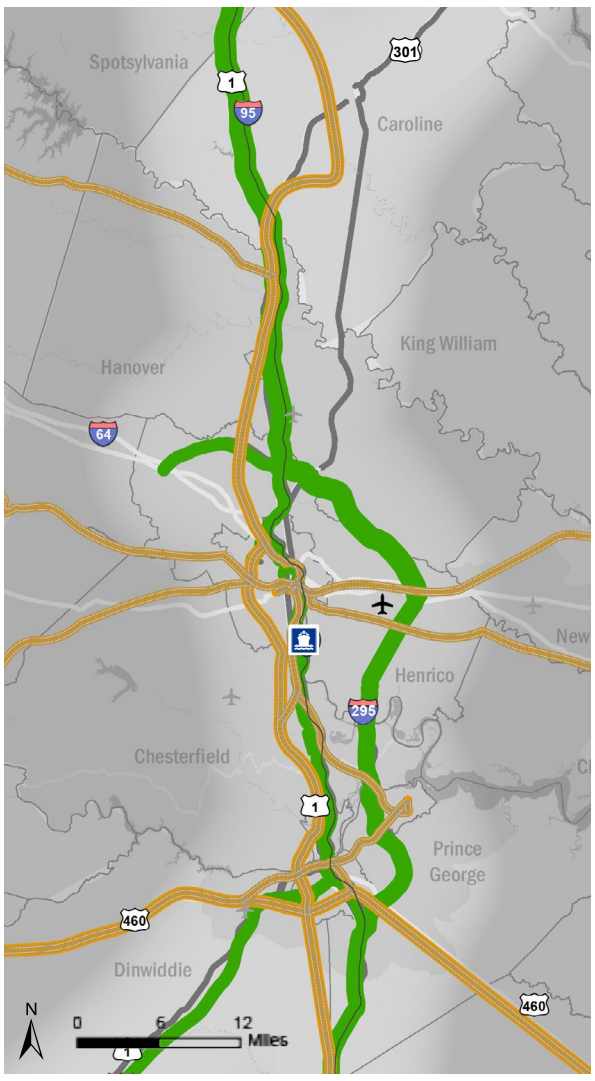
Freight Flows

In the City of Richmond, freight on Segment K2 is primarily moved by truck in terms of tonnage and value. In total, 19 million tons (94 percent) of freight is moved through this section of Segment K2 by truck, compared to just over 1 million tons (6 percent) by rail. With regard to value, $18.5 billion (93 percent) of freight travels by truck, while $1.4 billion (7 percent) of freight travels by rail. On average, a ton of freight traveling through this section of Segment K2 by truck and rail is worth $989 and $1,113, respectively. In 2025, truck and rail freight tonnages and value in this area of Segment K2 will likely increase. The percentage of freight traveling by truck is expected to remain the same by tonnage and increase by value to 94 percent. It is anticipated that value per ton on trucks will increase to $1,133 and decrease to $1,080 for rail.

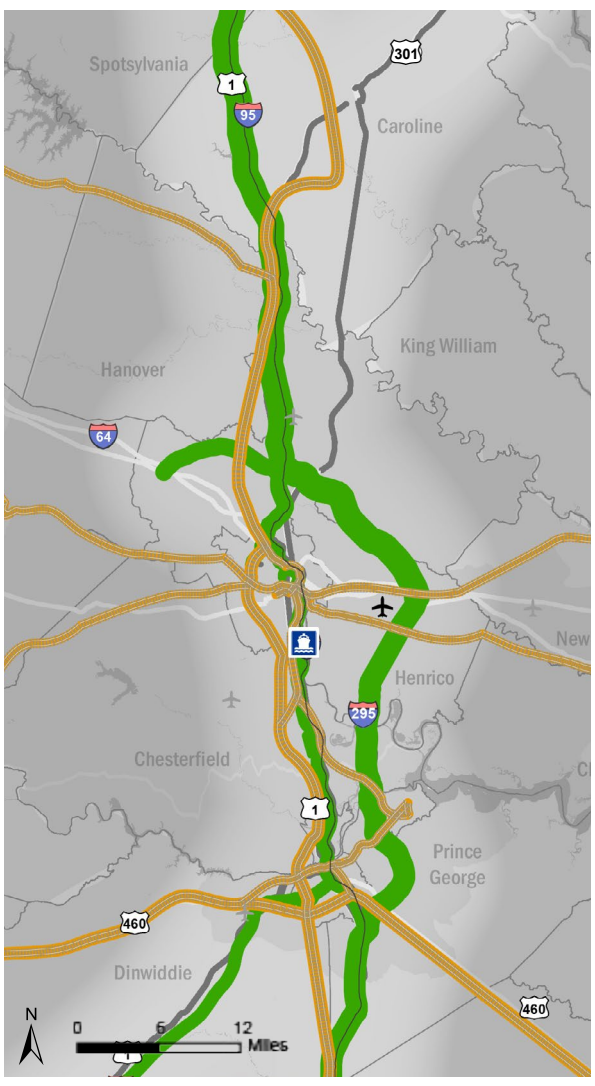
In northern Hanover County, freight on Segment K2 is moved primarily by truck in terms of tonnage and value. In total, 99 million tons (86 percent) of freight is moved through this section of Segment K2 by truck and 16 million tons (14 percent) by rail. With regard to value, $154 billion (90 percent) of freight travels by truck and $18 billion (10 percent) travels by rail. On average, a ton of freight traveling through this section of Segment K2 by truck and by rail is worth $1,552 and $1,129, respectively. In 2025, truck freight tonnage and value in this area of Segment K2 are expected to increase. The percentage of freight traveling by truck will likely increase to 88 percent by tonnage and 91 percent by value. It is anticipated that value per ton on trucks and rail will increase to $1,632 and $1,174, respectively.



Annual Freight by Value, 2012



Annual Freight by Value, 2025



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 & Mode Choice

Passenger trips on Segment K2 of the Washington to North Carolina Corridor have a wide range of travel options, both in terms of travel path and mode choice. Interstate I-295, US 1, and US 301 serve as parallel highway facilities to I-95 in this segment. In addition to trips on the Washington to North Carolina Corridor, Richmond serves as a transfer point for trips heading east and west along the East-West Corridor.

The segment is served by a variety of modes with relatively frequent service, including the Richmond-Petersburg Express bus service offered by the GRTC. Amtrak has two stations in Richmond and one in Ashland. Greyhound and Megabus also serve Richmond. Travel on Segment K2 is typically less expensive using alternative modes such as rail or bus (based on the 2014 federal standard mileage rate of 56 cents per mile). However, these options are not as competitive in terms of speed or frequency of service.

Park-and-Ride

Within Segment K2, commuters can utilize many Park-and-Ride locations, as well as commuter bus service provided by GRTC. Henrico County has the most Park-and-Ride locations and the highest number of spaces, while Hanover County has the highest utilization rate of spaces available in the region. However, no county within Segment K2 area has a rate higher the statewide average for Park-and-Ride utilization, which is 76 percent.

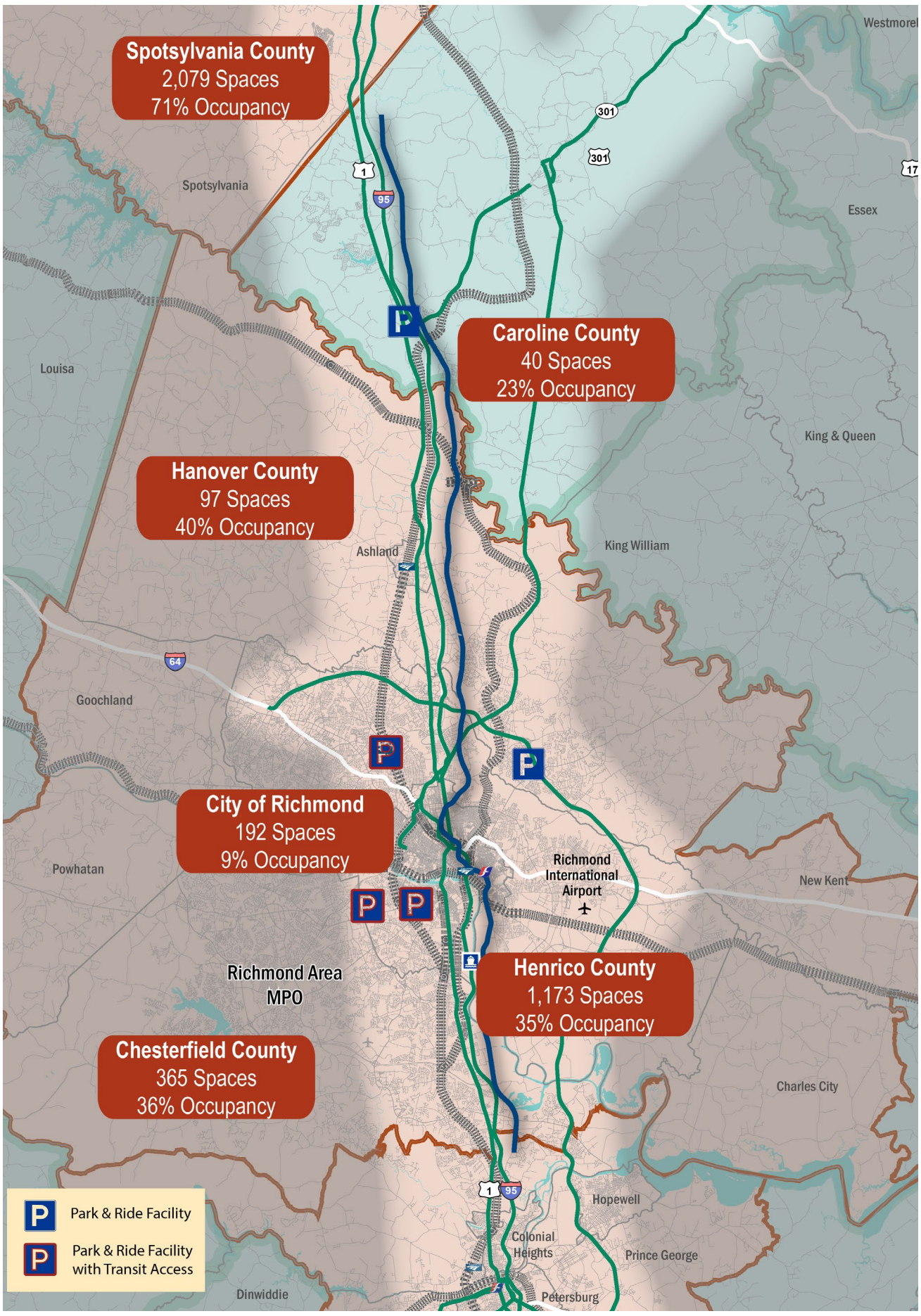
Comparable Travel Options

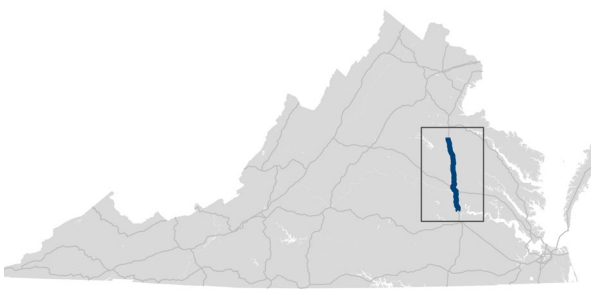
Richmond to Fredericksburg

Inter-City Bus	*Train*
3 Trips per Day	6 Trips per Day
1:00 Travel Time	1:05 Travel Time
$10 Avg Cost	$22 Avg Cost

Auto

Via I-95: 1:00 Travel Time $33 Avg Cost
Via US-1: 1:40 Travel Time $32 Avg Cost



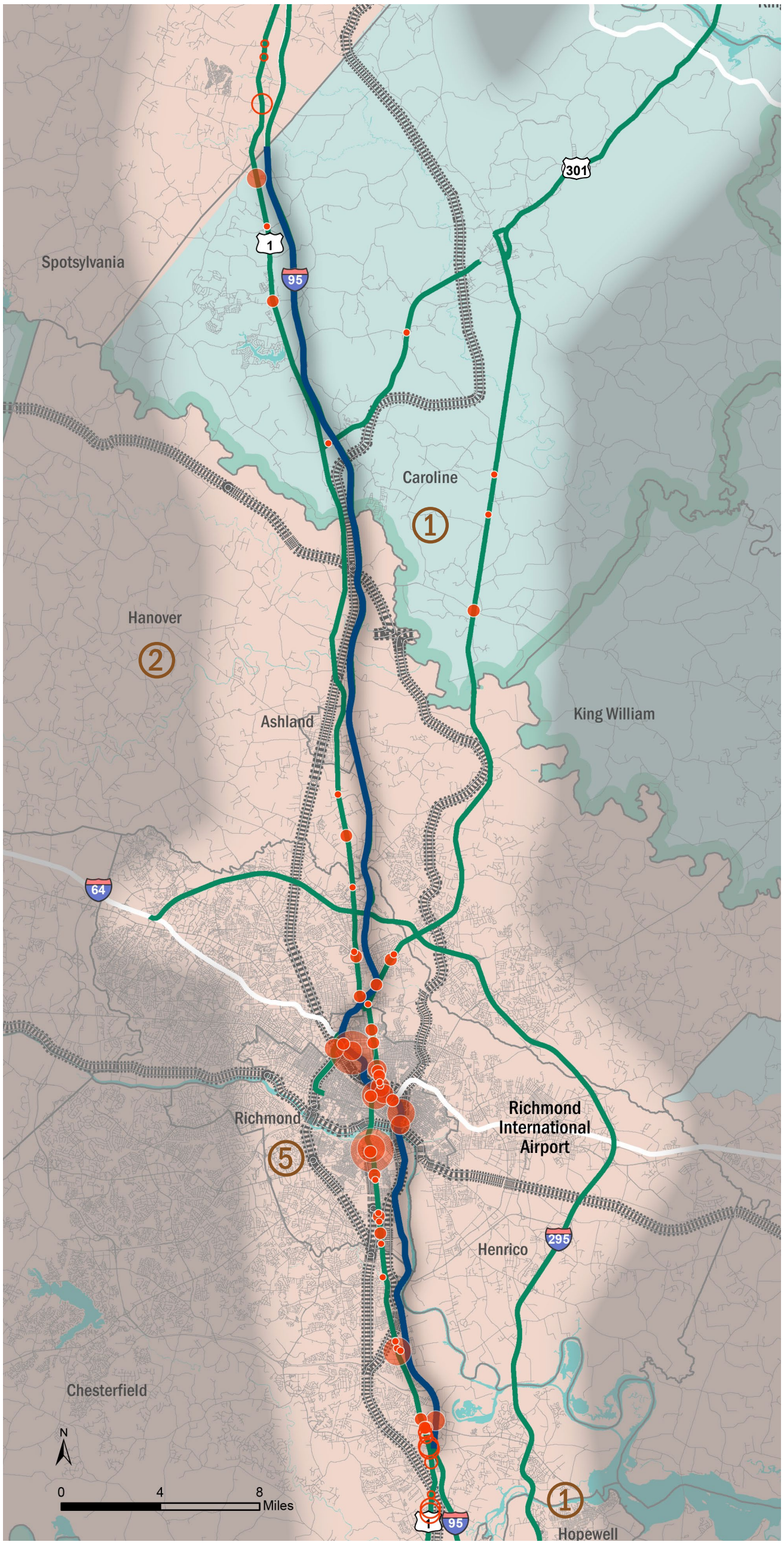


Safety

Performance Metrics:

Number of Severe Crashes	418
Severe Crashes/Million VMT	0.3
Number of Railroad Crashes	9

Between 2010 and 2012, 418 severe crashes occurred on Segment K2, with the largest concentration in the Richmond area. A span of approximately 1.2 miles of US 1 at I-64 /I-95 experienced 68 crashes. Of the 68, 15 took place at the intersection with Overlook Road, 11 occurred at the intersection with Mitchell Street, and 18 were in a 0.2 mile segment between I-95 and US 250 (West Broad Street). Another section of US 1 Richmond had 45 collisions at and near the intersection with US 360. A segment of I-95 in Richmond also experienced a large number of incidents (28) between US 1 and the James River. Outside of Richmond, 62 severe crashes occurred across a 1.9 mile interval in the southernmost portion of Segment K2, along US 1 near Route 10 in Chester.

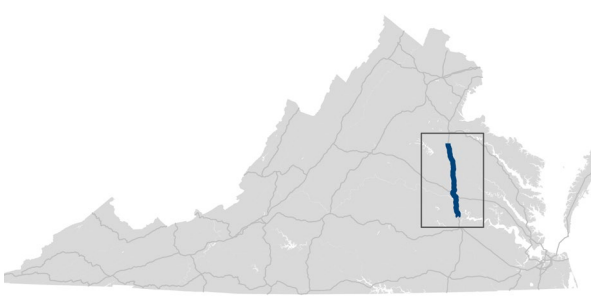


Fatality and Injury Crashes (2010-2012)

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

Railroad Incidents/Accidents per County (2011-2014)

#



Congestion

Performance Metrics:

Person Hours of Delay per Mile	13
Freight Ton Hours of Delay per Mile	37.2K

Passenger Delays

Passenger traffic congestion along Segment K2 is more substantial than K1, with average passenger delays of 13 person-hours per mile along the segment. While there are minimal passenger delays along much of the segment, there are several areas where delays are in excess of 100 person-hours per mile, primarily in the City of Richmond:

- US 1 at Route 10 in Chesterfield County
- US 1 between Route 195 and Brookland Parkway in the City of Richmond;
- Brook Road between US 1 and Lombardy Street in the City of Richmond;
- US 1 in Henrico County south of Parham Road;
- I-95 between US 60 and US 1 in the City of Richmond;
- I-95 in the City of Richmond near the exits for Hermitage Road (exits 80 and 78); and
- I-195 near both the northern and southern termini in the City of Richmond.

Peak period passenger delays account for 62 percent of daily congestion, which gives Segment K2 one of the largest peak period shares of passenger delay among CoSS segments.

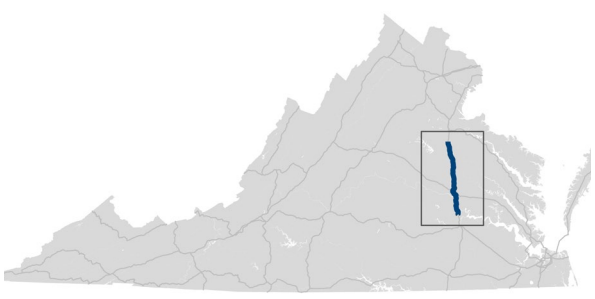
Daily Person Hours of Delay per Mile

Freight Delays

Freight congestion along Segment K2 is far greater than K1, with average freight delays of over 37,000 ton-hours per mile on the segment. Locations with significant levels of freight delay include:

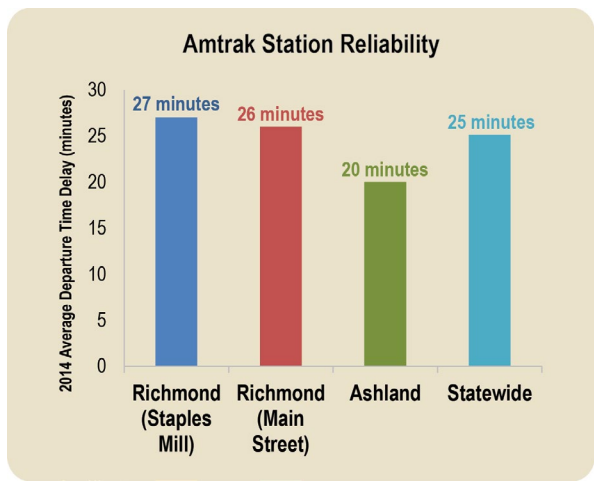
- Many locations on US 1 between Ashland and US 1 in Henrico County and the City of Richmond;
- Locations on I-95 between US 1 and US 60 in the City of Richmond;
- I-195 near the interchange with I-64/I-95 in the City of Richmond;
- Brook Road between US 1 and Lombardy Street in the City of Richmond; and
- Route 297 between US 1 and I-95 in Caroline County.

Peak period freight delays account for 50 percent of daily congestion, which gives Segment K2 one of the largest peak period shares of freight delay among CoSS segments.



Daily Freight Ton Hours of Delay per Mile

Reliability



Weekday Peak

Reliability of travel during the peak period on a typical weekday on Segment K2 ranges from 0.00 to 4.03 in terms of reliability index, with an average value of 0.17. While this segment does have a peak period reliability index much higher than average for the CoSS segments statewide, only two locations have reliability index values over the statewide threshold: Brook Road just south of US 1 in the City of Richmond and near the intersection of US 301 and Route 207 in Bowling Green in Caroline County.

Weekday

Reliability of travel during a typical weekday ranges from 0.00 to 3.39 in terms of reliability index, with an average value of 0.13.

Locations where the weekday reliability index exceeds the statewide threshold include:

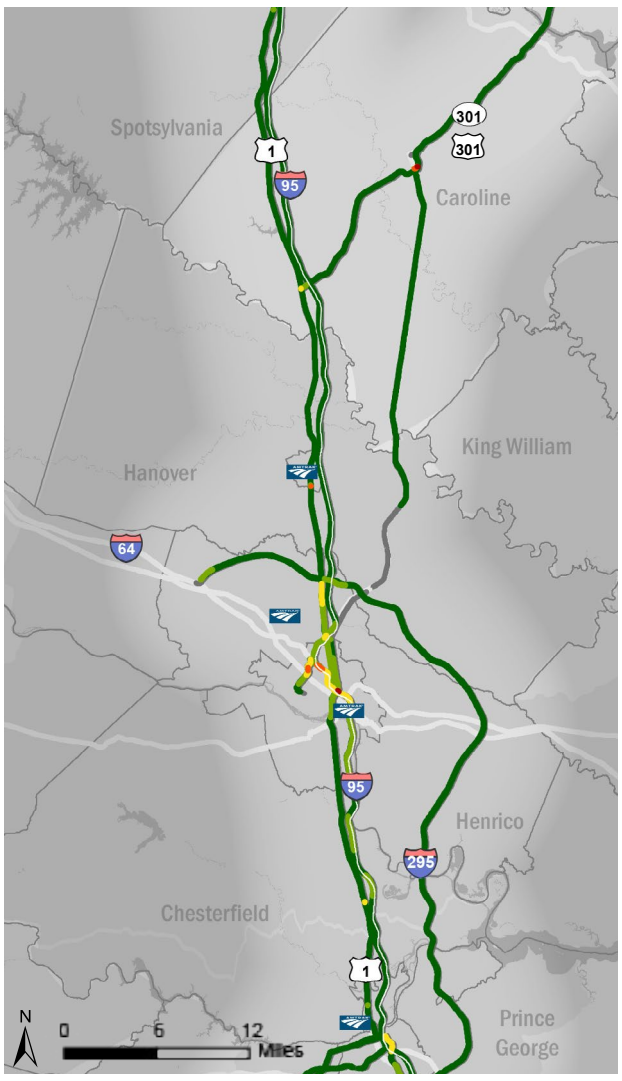
- I-95 where it runs concurrently with I-64 in the City of Richmond;
- Brook Road just south of US 1 in the City of Richmond;
- US 1 near the intersection with Route 657 in the Town of Ashland; and
- Near the intersection of US 301 and Route 207 in Bowling Green in Caroline County.

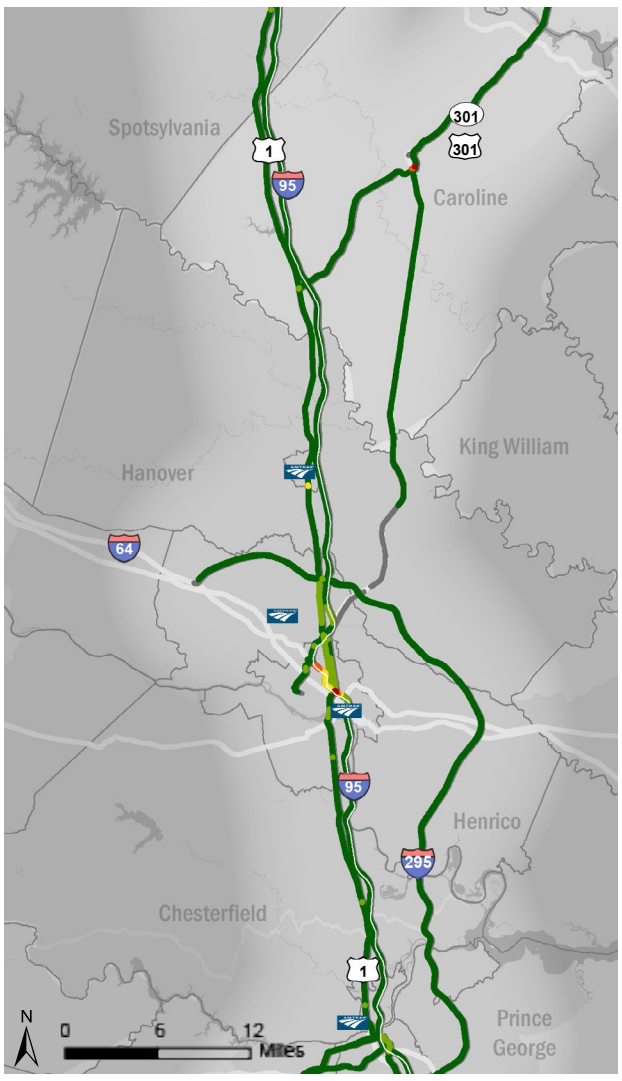
Weekend

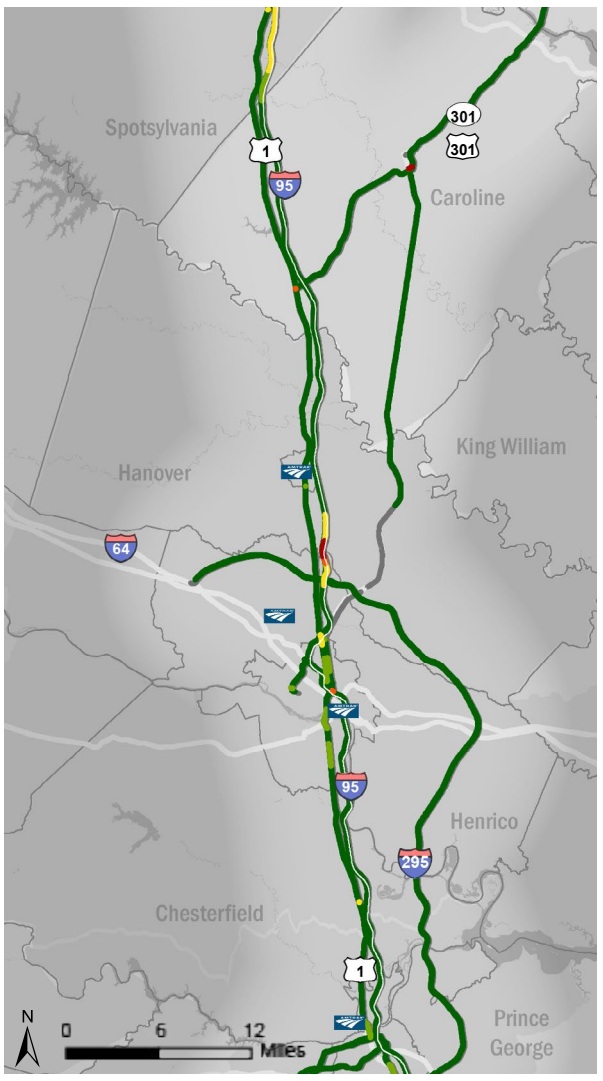
Reliability of travel during a typical weekend ranges from 0.00 to 2.75 in terms of reliability index, with an average value of 0.10.

Locations where the weekend reliability index exceeds the statewide threshold include:

- Brook Road just south of US 1 in the City of Richmond;
- I-95 between the northernmost ramps for Route 656 (exit 86) and the northernmost ramps for I-295 (exit 84);
- US 1 at the intersection with Route 207 in Caroline County; and
- Near the intersection of US 301 and Route 207 in Bowling Green in Caroline County.





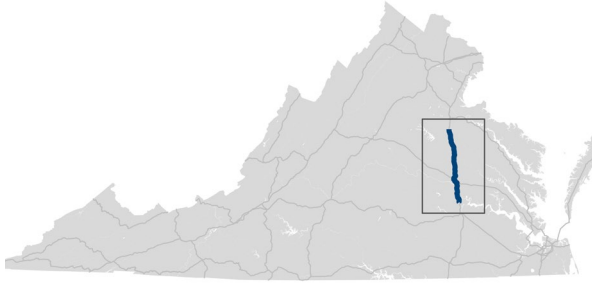


Reliability Index

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

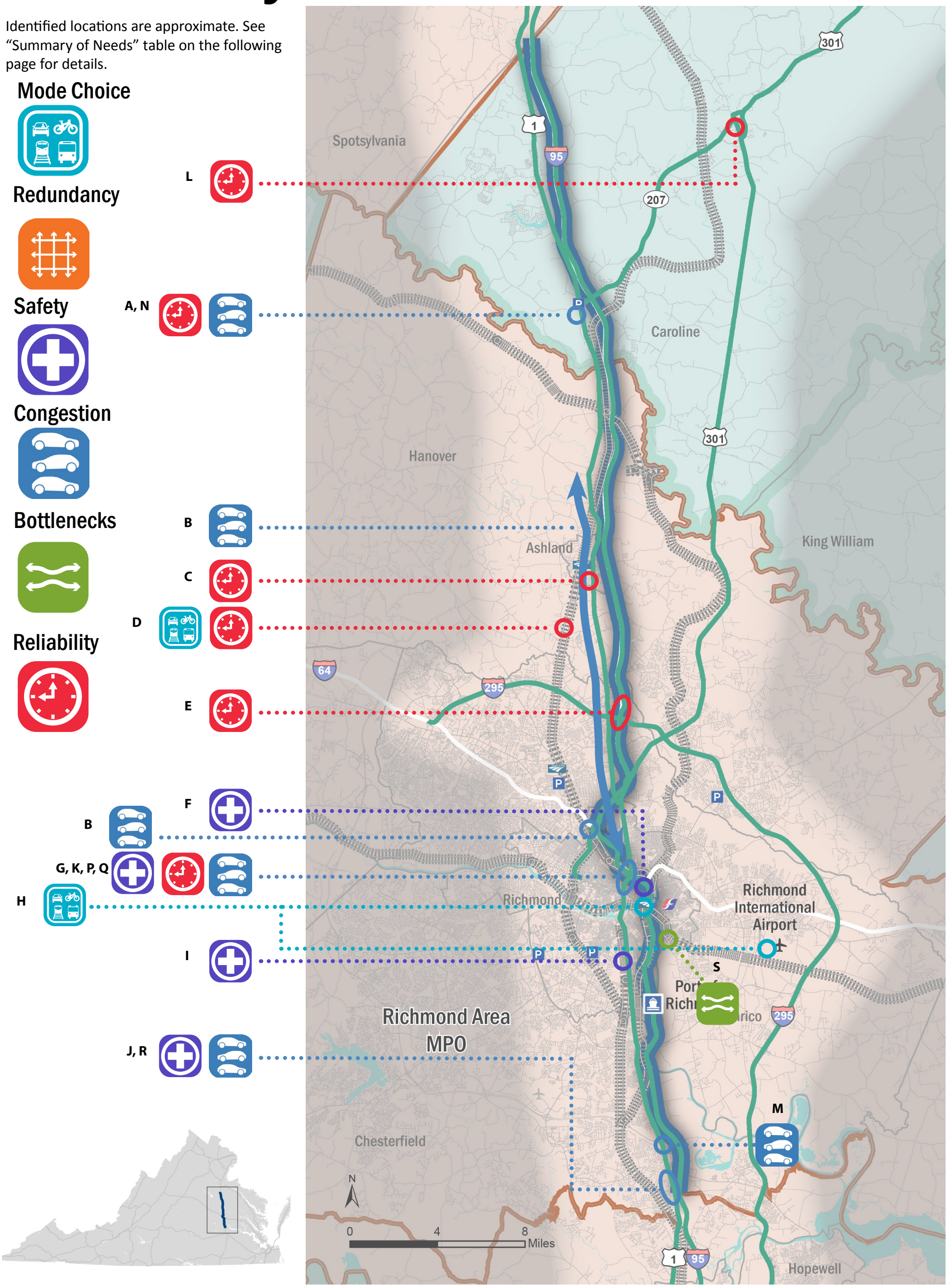
Statewide reliability index thresholds have been set for weekday peak, weekday and weekend travel to assess the reliability of travel on each segment on all corridors of statewide significance. A higher reliability index indicates that travel times are more unreliable. The following are the reliability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

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



Summary of Needs

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



K2 SEGMENT NEEDS

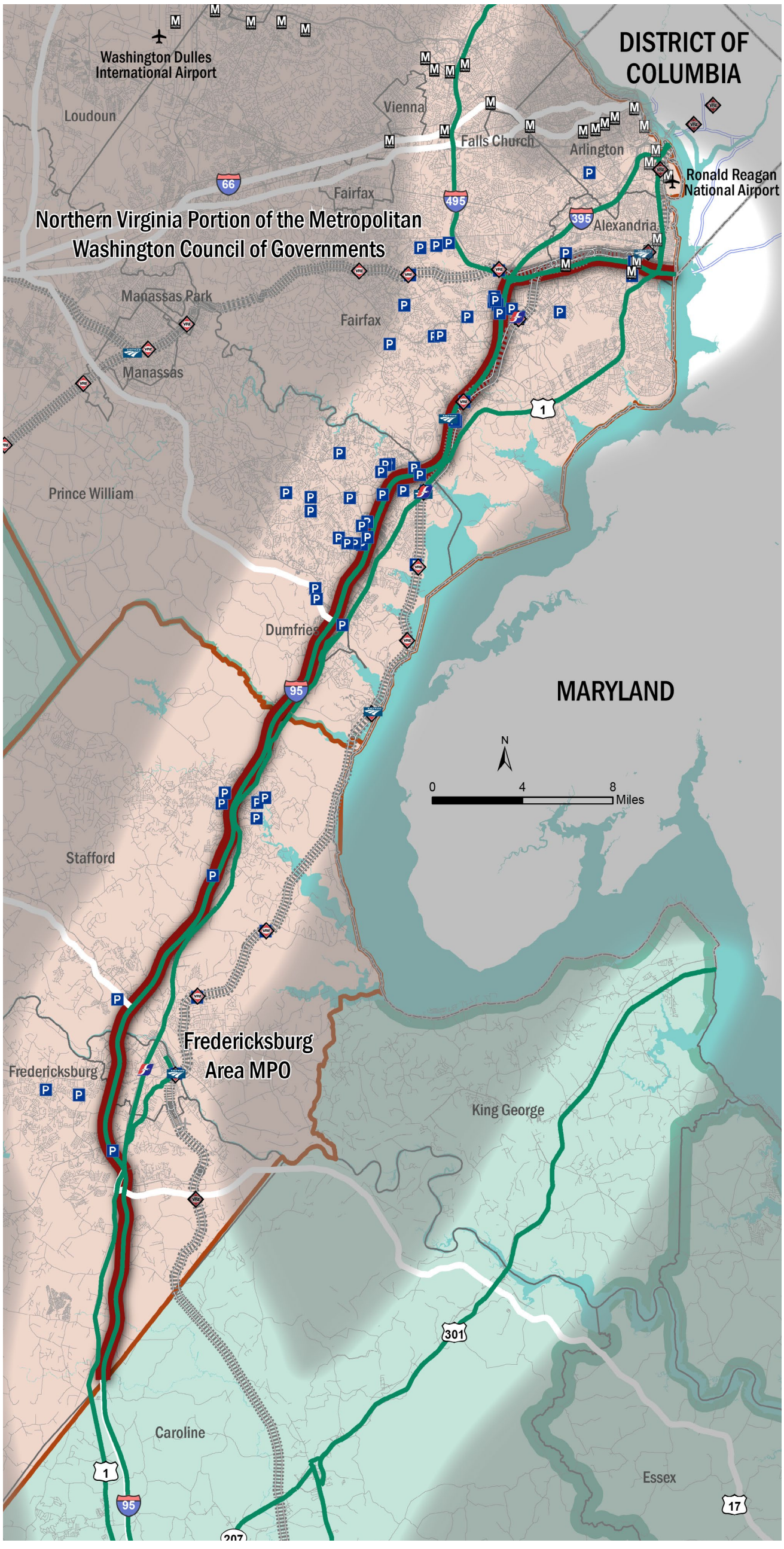
Summary of Needs - K2 Segment

A.		Reliability issue at US 1 and VA Route 207 (Rogers Clark Boulevard) near Ruther Glen
B.		Congestion issue on US 1 from VA Route 54 in Ashland to James River in downtown Richmond
C.		Reliability issue at US 1 and Virginia Route 54 (England Street) in Ashland
D.		Shared tracks lead to unreliable Amtrak service between Richmond and Washington DC. Average departure delays from stations in this segment range from 20 to 27 minutes.
E.		Reliability issue on I-95 at Exit 86 (VA Route 656/Sliding Hill Road) near Poindexters
F.		A segment of I-95 in downtown Richmond also experienced a large number of crash incidents (28) between Route 1 and the James River.
G.		The largest concentration of severe incidents crashes along the K2 segment occurred in the Richmond area. A span of approximately 1.2 miles of Route 1 at I-95/I-64 near the Chamberlayne Industrial Center experienced 68 crashes.
H.		Public transportation does not offer access to Richmond Airport or Amtrak.
I.		Segment along Route 1 in the Richmond area, located south of the James River, had 45 collisions at and near the intersection with Route 360. Capacity improvement projects are planned for this area.
J.		62 severe crashes occurred across a 1.9 mile interval in the southernmost portion of K2, along Route 1 near Route 10 in Chester.
K.		Reliability issue on I-95/I-64 through Richmond between the I-64 and I-95 interchanges
L.		Reliability issue at US 301 and VA Route 207 (Bowling Green Bypass) in Bowling Green
M.		Congestion issue at US 1 and VA Route 10 (West Hundred Road) in Chester
N.		Congestion issue at US 1 and VA Route 207 (Rogers Clark Boulevard) near Ruther Glen
O.		Congestion issue at I-64/I-95/I-195 interchange in west Richmond
P.		Congestion issue at I-64/I-95 interchange in downtown Richmond
Q.		Congestion issue at I-195/VA Route 76/VA Route 195 interchange in Richmond
R.		Congestion issue at US 1 and VA Route 144 (Temple Avenue) in Colonial Heights
S.		Triple bridge in Richmond bottlenecks rail traffic, impacting passenger and freight travel.

IV. Segment K3

Corridor Segment K3 Components

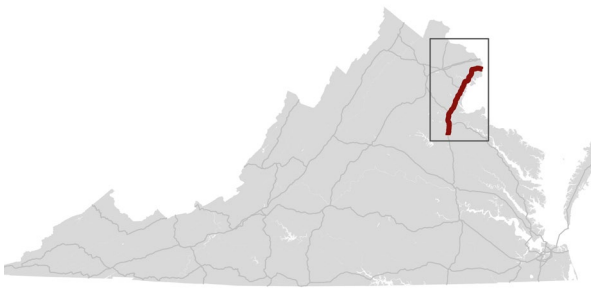
- I-95
- I-395
- I-495
- US 1
- US 301
- Metrorail Blue Line
- Metrorail Yellow Line
- Virginia Railway Express
- CSX National Gateway Corridor
- Port of Alexandria
- Amtrak
- Ronald Reagan National Airport



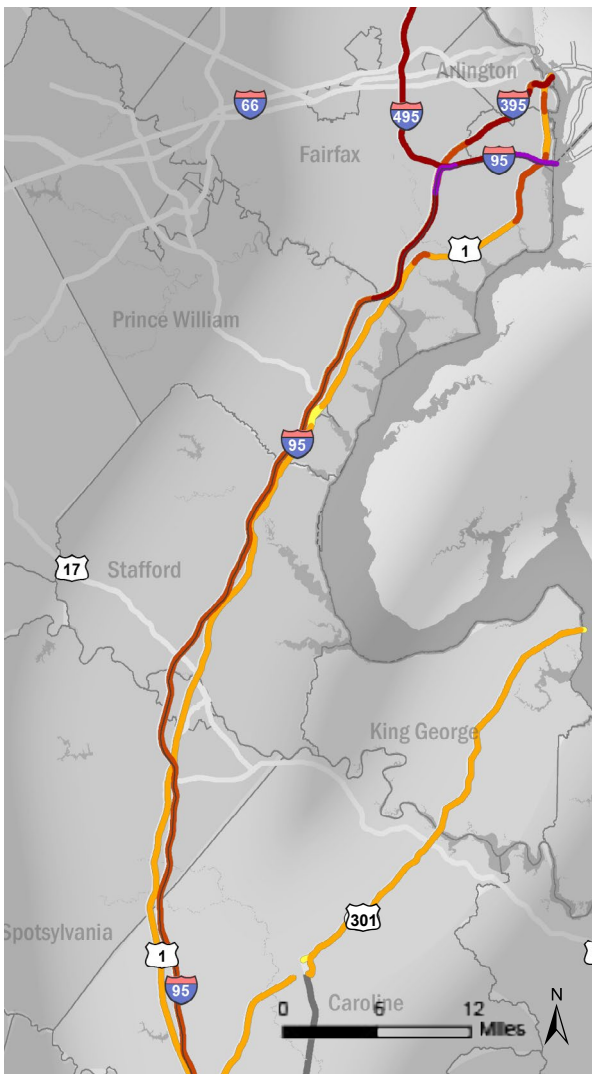
Segment K3

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

MPO Area
Planning District Area

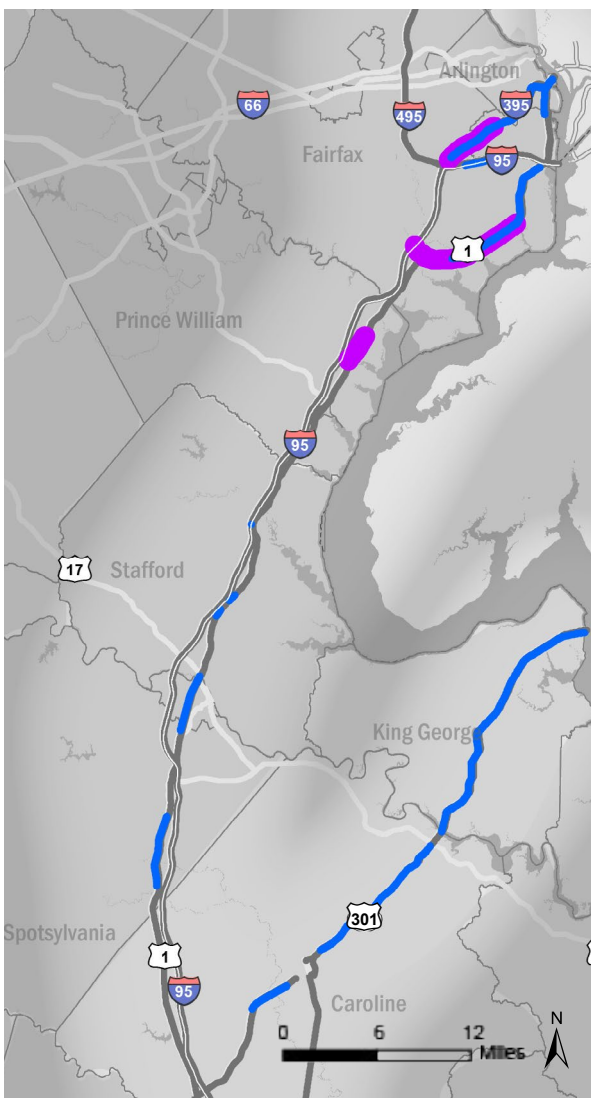


K3 SEGMENT PROFILE



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

The northernmost segment in the North Carolina to Washington Corridor, Segment K3, begins in Spotsylvania County and progresses through Stafford, Prince William, Fairfax, and Arlington Counties as well as the Cities of Fredericksburg and Alexandria. The segment serves a substantial area of the Fredericksburg Area MPO and the Northern Virginia portion of the Metropolitan Washington MPO Area. Each day there are thousands of commuters who navigate through the segment to travel to Washington, DC, Arlington, or Maryland. These commuters travel from residences in Northern Virginia as well as the south, all the way through Spotsylvania County. This segment is both a commuter corridor and an important high-capacity multimodal corridor.

Highway Facilities: I-95 is a six- to ten-lane facility in Segment K3, with reversible HOT lanes between Stafford and Fairfax Counties. A major interchange in Springfield (known as "the mixing bowl") provides access to other corridor components including I-395 and I-495 (the Capital Beltway). I-395 is a six- to eight-lane facility with reversible HOV lanes and I-495 is a six- to ten-lane freeway. US 1 runs parallel to I-95 for the majority of the segment until it diverges eastward near Lorton in Fairfax County. US 301 north of Bowling Green also provides an alternative route into Maryland in Segment K3. Direct or indirect connections to all of the other CoSS in the Northern Virginia Area are available, including Corridors G, I and H.

Transit Service: Segment K3 includes many alternatives to driving, including reversible HOV-3 and HOT lanes, in addition to Metrorail, commuter rail, express, and local bus services. Options include:

- Two reversible HOV-3/HOT lanes on I-95 and I-395 for a total of 30 miles between Stafford County and the Potomac River;
- HOT lanes on I-495;
- Virginia Railway Express (VRE) and Amtrak service provided to downtown Washington, DC and destinations north, with stops along the corridor via the CSX National Gateway Corridor rail line;
- Amtrak, which operates the Auto Train service along CSX tracks, a service that transports vehicles and passengers between Florida and Lorton in Fairfax County;
- Metrorail's Blue and Yellow Lines, which follow I-395 south from Washington, DC serving stations in Arlington County, Alexandria, and Fairfax County, including Ronald Regan National Airport;
- PRTC, which provides the OmniRide and Metro Direct service that travels the segment between Dumfries and Washington, DC. Many of the routes originate at Park-and-Ride locations;
- Metrobus and Fairfax Connector, which provide local transit connections throughout the segment, including Metrobus' Richmond Highway Express (REX) on US 1;
- Private commuter bus carriers that operate in Segment K3;
- Greyhound, which operates long distance bus service along the segment, with stops in Fredericksburg, Woodbridge, Springfield, and Washington, DC; and
- Park-and-Ride facilities which are available at over 15 locations in Fairfax and Arlington Counties. There are over 30 Park-and-Ride facilities in Prince William County, and more than ten Park-and-Ride locations available within the segment in Stafford and Spotsylvania Counties.

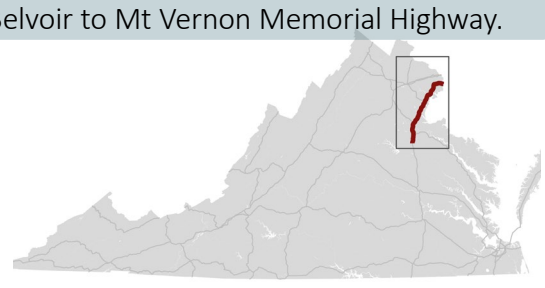
Rail Facilities: CSX Transportation provides freight rail lines along its National Gateway Corridor, which runs along most of the east coast of the United States and provides the main connection from the Port of Virginia facilities in the Hampton Roads Area to national markets.

Port Facilities: The Washington to North Carolina Corridor provides access to the Port of Alexandria.

Airport Facilities: Reagan National Airport operates in Arlington County.

Major planned and future projects include:

- **Spotsylvania County:** Widen Mudd Tavern Road from two to four lanes from 0.51 miles west of the bridge over I-95 to the bridge over I-95 (includes portion of Mudd Tavern Road with I-95 on- and off-ramps);
- **Spotsylvania County and Prince William County:** New VRE stations at Spotsylvania and Potomac Shores in Prince William County;
- **City of Fredericksburg:** Widen Fall Hill Avenue from two to four lanes from 0.12 miles west of Gordon W. Shelton Boulevard to 0.03 miles west of Rappahannock Drive to include reconstructing and widening the bridge over I-95;
- **City of Fredericksburg:** Construct I-95 Southbound collector/distributor lanes and I-95 Southbound Bridge over Rappahannock River from Exit 130 (Route 3) to Exit 133 (US 17). Ramp improvements at Exit 133 for southbound movements;
- **Stafford County:** Reconstruct and add capacity along I-95 between mile markers 143 and 136; and
- **Fairfax County:** Widen US 1 to six lanes from Fort Belvoir to Mt Vernon Memorial Highway.

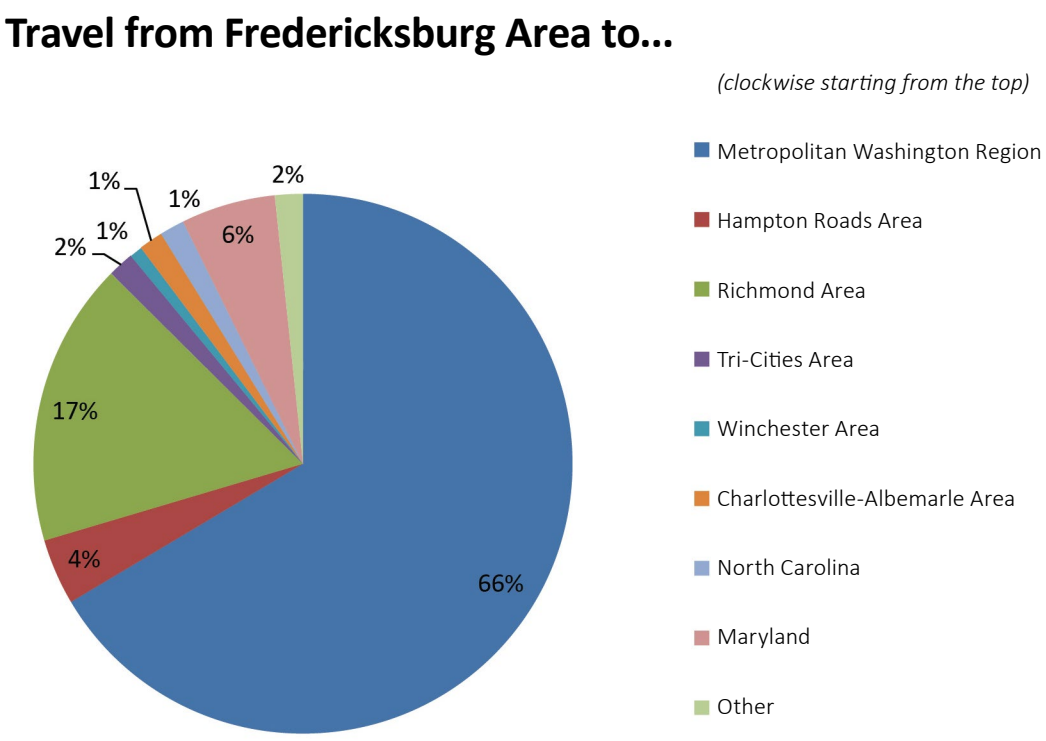


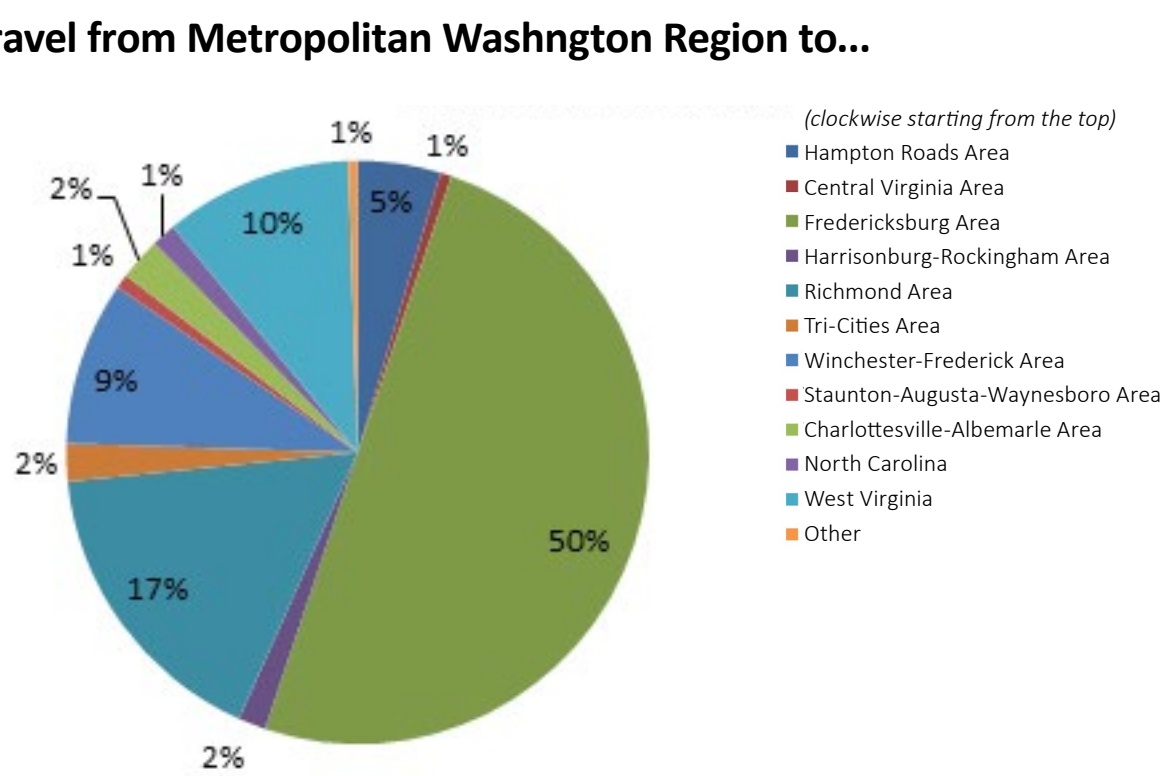
Travel Demand

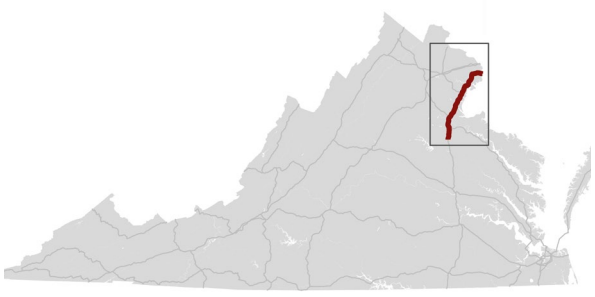
Passenger Demand

Segment K3, the northernmost Segment of Corridor K, covers the Fredericksburg Area and the Northern Virginia Area. It connects Virginia to Maryland and the District of Columbia, and other points further to the north. One quarter of the Commonwealth's intercity passenger travel occurs on this segment including 18 percent between the Fredericksburg Area and the Metropolitan Washington Area and six percent between the Northern Virginia Area and the Richmond Area.

Of intercity passenger travel originating in the Fredericksburg Area, the vast majority (66 percent) is destined for the Metropolitan Washington Area, while an additional six percent is destined for other areas in Maryland. Of intercity passenger travel originating in the Metropolitan Washington Area, half is destined for the Fredericksburg Area. An additional 17 percent of intercity passenger travel originating in the Metropolitan Washington Area is destined for the Richmond Area and five percent, for the Hampton Roads Area; in both cases, Segment K3 will be utilized for portions of the trips.







K3 SEGMENT PROFILE

Freight Demand

By truck, Segment K3 carried 99 million tons of freight worth $155 billion in 2012, and is estimated to carry 137 million tons of freight worth $227 billion in 2025. A large proportion of truck freight on Corridor K passes through the Commonwealth, representing more than 35 percent of total corridor tonnage and 55 percent of total corridor value. In terms of tonnage, North Carolina is the largest producer and attractor of truck freight traveling along this corridor. In terms of value, Florida is the largest destination for truck freight along the corridor. Corridor K is used heavily by truck freight traffic traveling between locations in the Middle Atlantic and the Southeastern U.S. Within Virginia, the Port of Virginia marine terminal in Norfolk is a major generator of freight traffic on Corridor K, accounting for around five percent of the total truck freight value. Fairfax County attracts about three percent of the total truck value on the corridor, with freight arriving from North Carolina, the Middle Atlantic, and the Port of Virginia facilities in Hampton Roads. The jurisdictions adjacent to Segment K3 are not major producers of truck freight on the corridor, accounting for around 1.5 percent of the total truck freight value on Corridor K.

By rail, Segment K3 carried 16 million tons of freight worth $18 billion in 2012, and is estimated to carry 20 million tons of freight worth $23 billion in 2025. Major markets for rail freight include flows between Florida and New Jersey (more than 12 percent of corridor rail value) and flows between Florida and Pennsylvania (six percent of corridor rail value). Within Segment K3, the largest attractor of rail freight, accounting for around one percent of total rail value in the corridor, is the City of Fredericksburg. Segment K3 is a very minor generator of rail freight traffic on Corridor K, accounting for less than one percent of total corridor rail freight tonnage and value.

Truck Freight

Major Origins (by Tonnage)
1. Virginia (35% / 37%)
2. North Carolina (19% / 17%)
3. Pennsylvania (8% / 9%)
4. Maryland (7% / 7%)
5. Florida (6% / 6%)

Corridor Tonnage Originating in Segment K3: 6% / 7%

Major Origin-Destination Pairs for Freight
North Carolina and Maryland
North Carolina and Pennsylvania
North Carolina and New York
Florida and Pennsylvania
Florida and New York

Percentages represent 2012 / 2025 values.

Major Destinations (by Tonnage)
1. Virginia (39% / 40%)
2. North Carolina (11% / 12%)
3. Maryland (10% / 10%)
4. Pennsylvania (7% / 7%)
5. Florida (7% / 7%)

Corridor Tonnage Destined for Segment K3: 8% / 9%

Rail Freight

Major Origins (by Tonnage)
1. West Virginia (52% / 48%)
2. Virginia (12% / 14%)
3. Pennsylvania (8% / 7%)
4. Kentucky (6% / 5%)
5. Florida (3% / 4%)

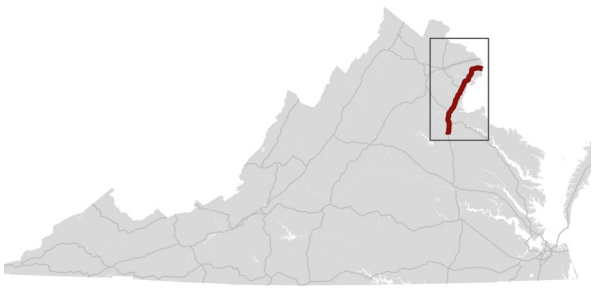
Corridor Tonnage Originating in Segment K3: <1% / <1%

Major Origin-Destination Pairs for Freight
City of Newport News* and West Virginia
City of Newport News* and Kentucky
Florida and New Jersey
Pennsylvania and South Carolina
Dickenson County and City of Newport News*

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

Major Destinations (by Tonnage)
1. Virginia (77% / 75%)
2. City of Newport News* (60% / 55%)
3. South Carolina (4% / 4%)
4. City of Norfolk* (4% / 4%)
5. North Carolina (3% / 3%)

Corridor Tonnage Destined for Segment K3: <1% / <1%



Traffic Conditions

Traffic Volume and AADT

Segment K3 generally has the highest traffic volumes in Corridor K. On I-95, average daily traffic varies along Segment K3 from 95,000 vehicles south of Fredericksburg to 188,000 vehicles in Fairfax County.

Volumes on other components of Segment K3 vary as well, as follows:

- I-395: 144,000 – 166,000 vehicles;
- I-495: 142,000 – 201,000 vehicles;
- US 1, from Route 234 near Dumfries to the Pentagon: 35,000 – 50,000 vehicles; and
- US 1, south of Dumfries: 15,000 to 30,000 vehicles.

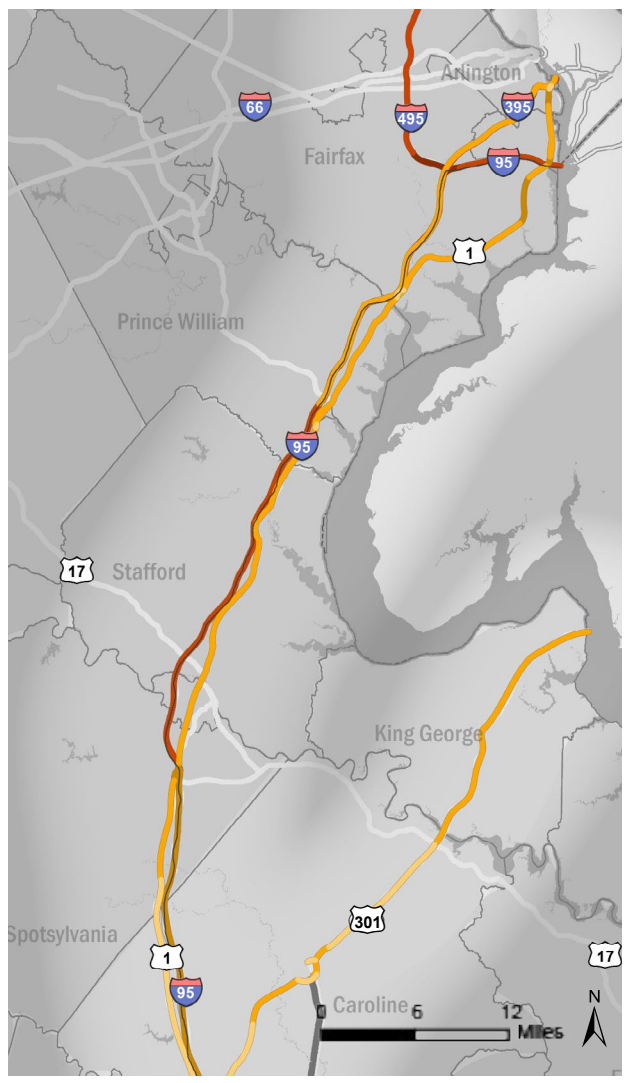
By 2025, daily traffic volumes in Segment K3 are forecasted to increase, as follows:

- Most sections of I-95: 24,000 – 30,000 vehicles;
- I-495, from the Maryland border to the I-95 interchange: 10,000 – 12,000 vehicles;
- I-495, from the I-95 interchange to the DC border: 19,000 – 31,000 vehicles;
- I-395: 14,000 – 16,000 vehicles; and
- US 1, south of I-495: 2,000 – 8,000 vehicles.

The highest daily traffic volumes in 2025 are forecasted to occur in the following locations:

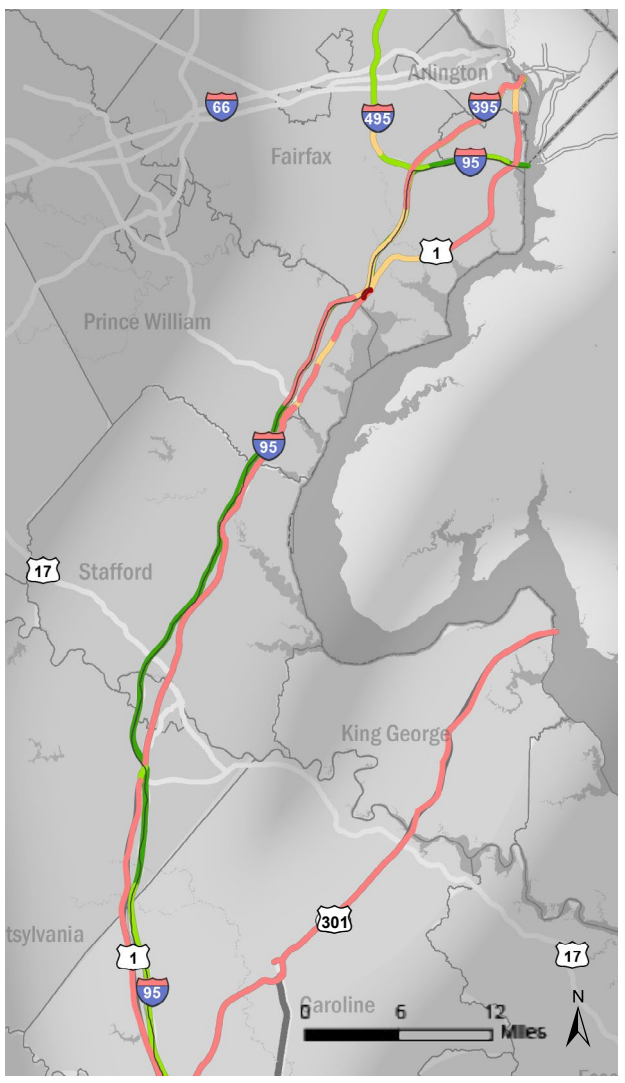
- The intersection of I-95 and Route 123: 202,000 vehicles;
- I-95, south of the I-95/I-495 interchange: 214,000 vehicles;
- I-495, near the I-95/I-495 interchange: 205,000 – 211,000 vehicles; and
- I-495, near the I-66 interchange and from the Dulles Toll Road to the Maryland border: 200,000 – 205,000 vehicles.

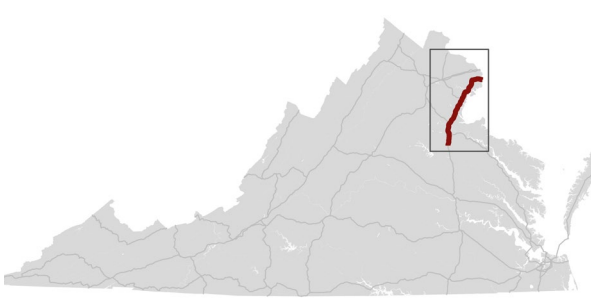
Traffic Volume 2014 (AADT)



Traffic Volume 2025 (AADT)

Change in Traffic Volume 2014- 2025 (AADT)

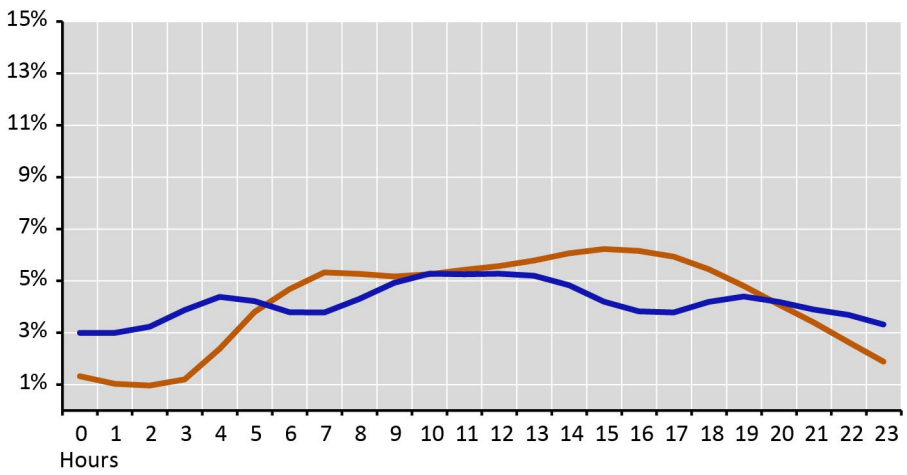




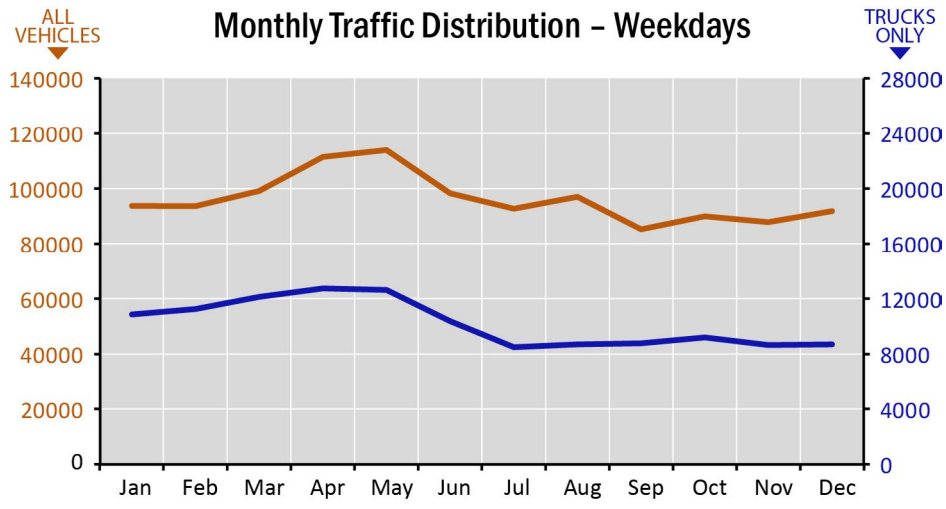
K3 SEGMENT PROFILE

All Vehicles
Trucks

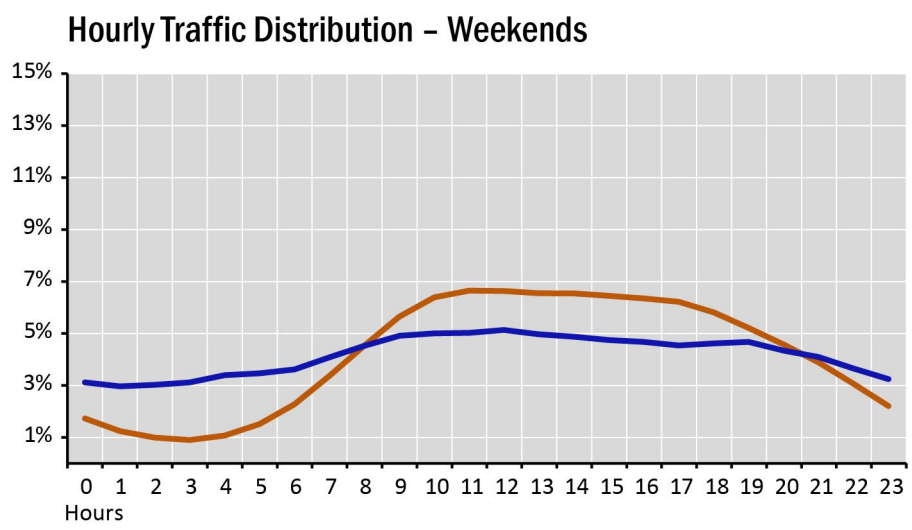
Hourly Traffic Distribution – Weekdays



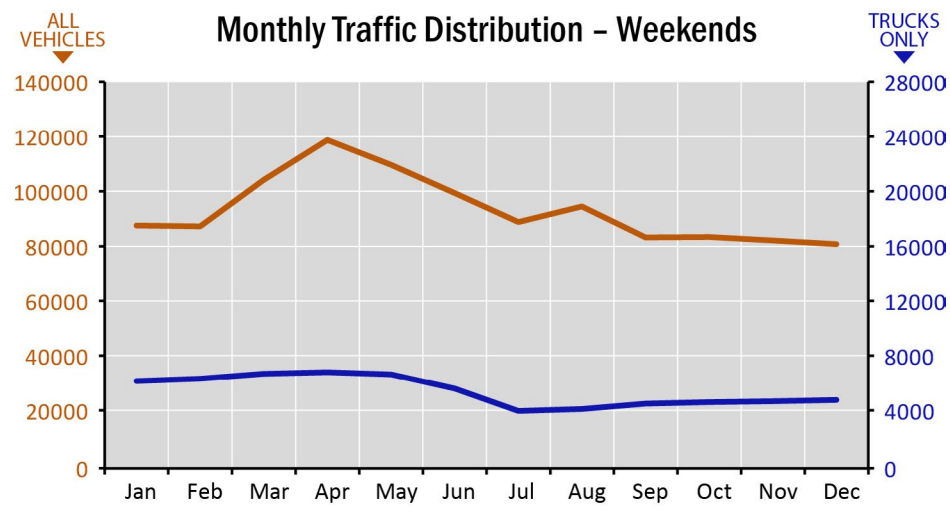
Monthly Traffic Distribution – Weekdays

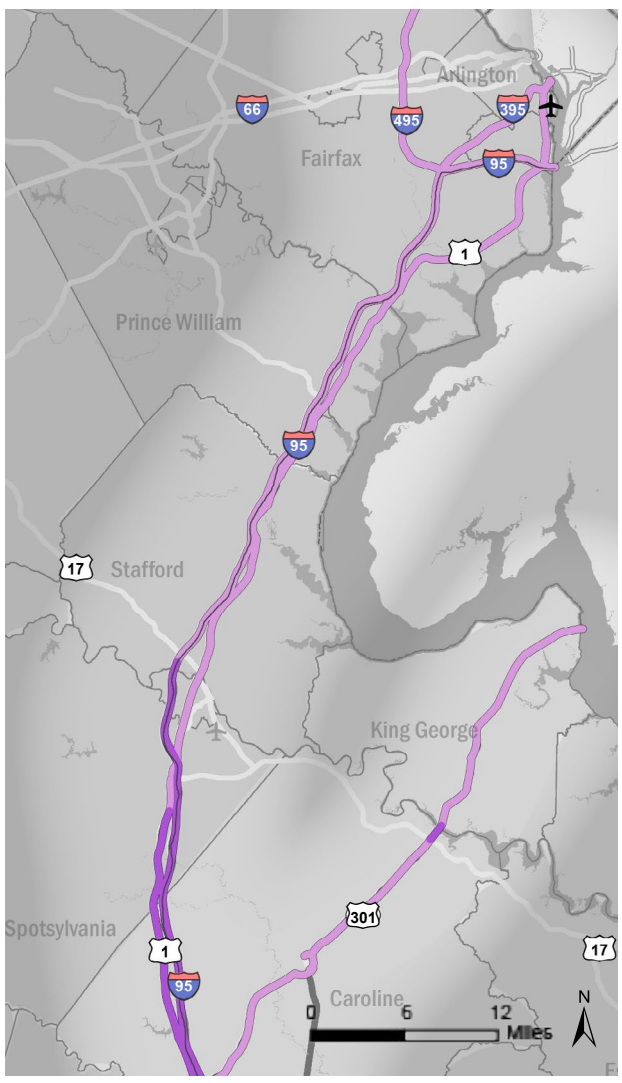


Hourly Traffic Distribution – Weekends



Monthly Traffic Distribution – Weekends





Percent Heavy Trucks

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

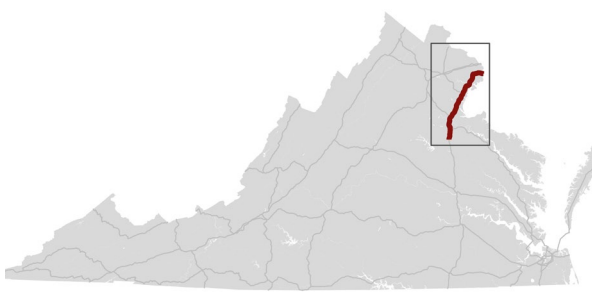
Traffic Distribution

On average, traffic on Segment K3 is distributed throughout the day as shown in the graphs below. Weekday traffic shows a relatively steady flow over the course of the day from 7 a.m. to 7 p.m., which is different from the typical commute patterns. The highest hourly traffic occurs between 3 and 4 p.m. which accounts for 6.2 percent of daily traffic and the less busy morning peak hour between 7 and 8 a.m. accounts for 5.3 percent of daily traffic. The combined weekday traffic from 7 a.m. to 7 p.m. accounts for 68 percent of total daily traffic. Peaking patterns for truck traffic show relatively steady flow with a midday peak, with the highest hourly traffic occurring between 10 and 11 a.m. Weekend traffic patterns are also different from the typical commute patterns, showing an even distribution of traffic during the middle of the day, with the highest percentage of hourly traffic occurring from 11 a.m. to noon (6.7 percent of daily traffic) for all traffic, and noon to 1 p.m. (5.1 percent of daily traffic) for truck traffic.

Weekday traffic volumes on Segment K3 vary by as much as 34 percent throughout the year, with the high point in May (around 114,000 vehicles per day) and the low point in September (around 85,000 vehicles per day). Truck volumes vary more than passenger volumes throughout the year, with the April high (around 12,800 vehicles per day) 50 percent higher than the July low (around 8,500 vehicles per day). Weekend traffic levels also vary over the course of the year, and the highest levels of weekend traffic (April, around 119,000 vehicles per day) are 47 percent higher than December levels (around 81,000 vehicles per day). Weekend truck traffic varies more than all vehicle traffic, with the April high (around 6,800 vehicles per day) 72 percent higher than the July low (around 4,000 vehicles per day). Since truck volumes account for a relatively small portion of traffic on Segment K3, traffic conditions are much more responsive to variations in automobile traffic than truck traffic.

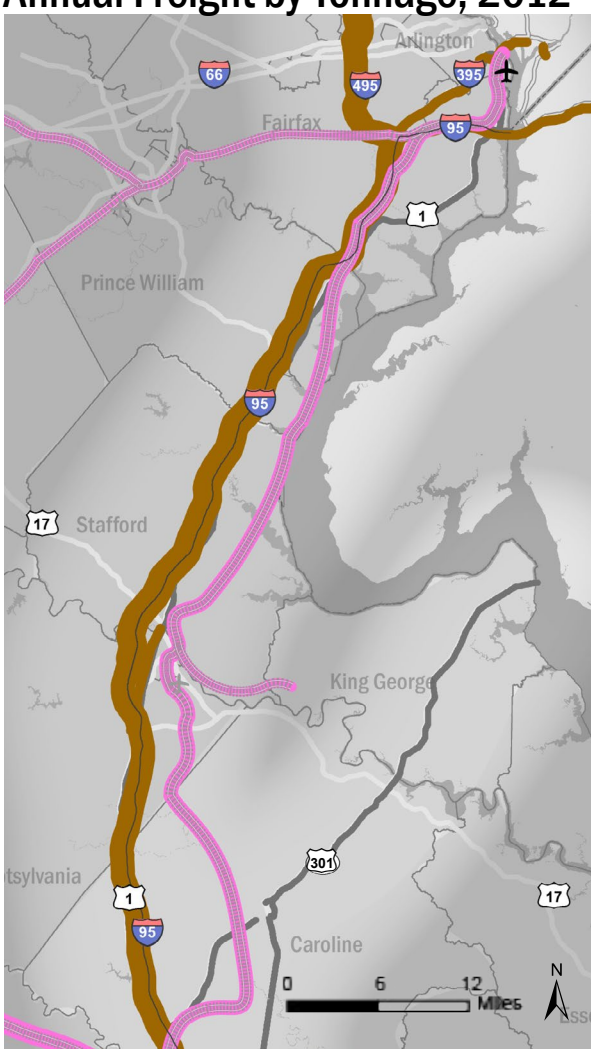
Truck Volume

The percent of daily traffic comprised of heavy trucks on Segment K3 varies across the different segment components, including a high of seven percent on I-95 in Spotsylvania County and Fredericksburg. Ranges for other locations on Segment K3 are lower (below four percent) including some facilities where truck traffic is not a factor at all, such as I-395 north of I-495 where truck prohibitions are in effect.



K3 SEGMENT PROFILE

Annual Freight by Tonnage, 2012

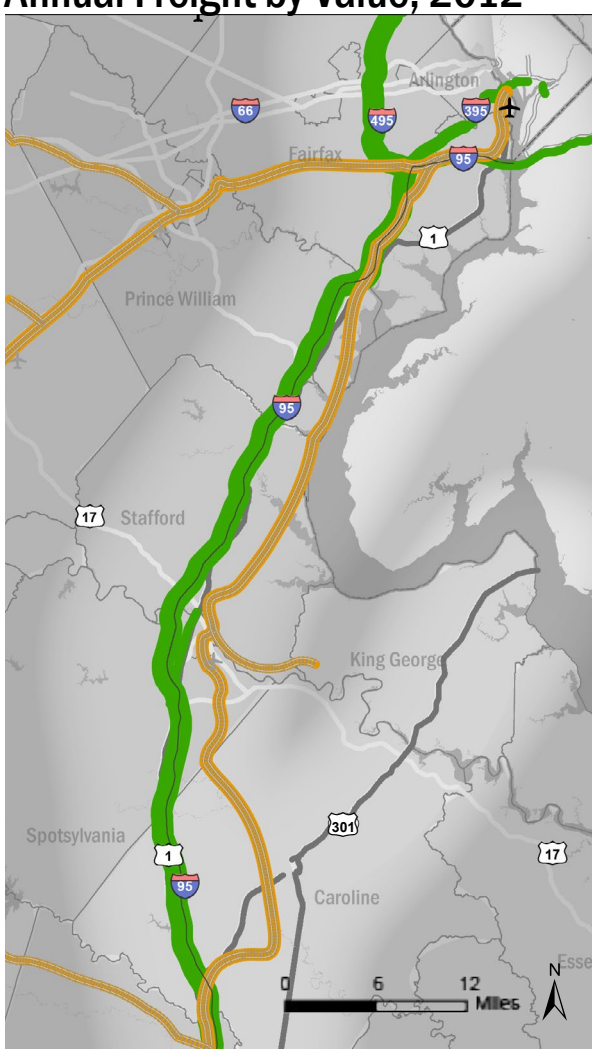


Freight Flows

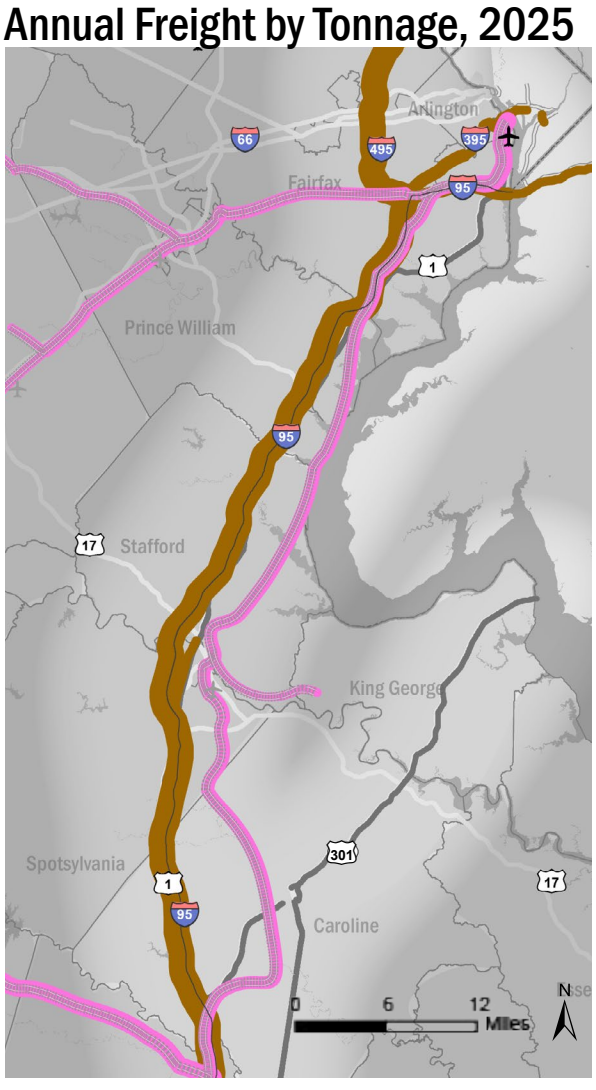
South of US 17 on Segment K3, freight is primarily moved by truck in terms of tonnage and value. In total, 92 million tons (86 percent) of freight is moved through this section of Segment K3 by truck, compared to 15.5 million tons (16 percent) by rail. With regard to value, $153 billion (90 percent) of freight value travels by truck, while $18 billion (10 percent) of freight travels by rail. On average, a ton of freight traveling through this section of Segment K3 by truck and by rail is worth $1,563 and $1,130, respectively. In 2025, truck and rail freight tonnages and value in this area of Segment K3 are expected to increase. The percentage of freight traveling by truck will increase by tonnage and by value to 88 percent and 91 percent, respectively. It is anticipated that value per ton on trucks and rail will increase to $1,648 and $1,175, respectively.

South of I-495 near Springfield on Segment K3, freight is moved primarily by truck by tonnage and value. In total, 99 million tons (86 percent) of freight is moved through this section of Segment K3 by truck and 16 million tons (14 percent) by rail. With regard to value, $155 billion (90 percent) of freight value travels by truck and $18 billion (10 percent) travels by rail. On average, a ton of freight traveling through this section of Segment K3 by truck and by rail is worth $1,568 and $1,109, respectively. In 2025, truck freight tonnages and value in this area of Segment K3 are expected to increase. The percentage of freight moving by truck by tonnage and value will increase to 87 percent and 91 percent, respectively. It is anticipated that value per ton on trucks and rail will increase to $1,651 and $1,147, respectively.

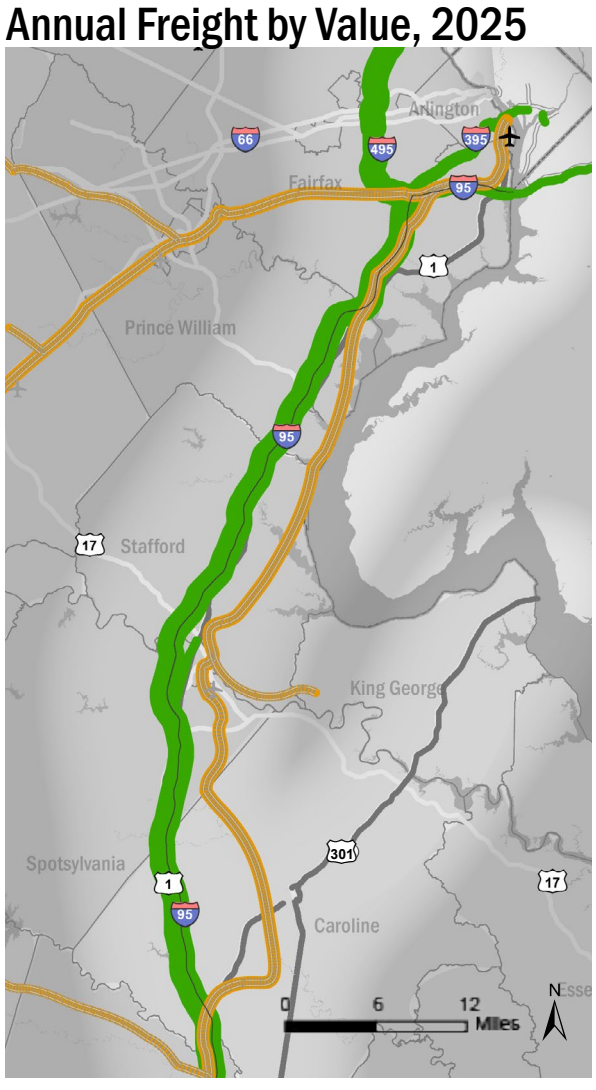
Annual Freight by Value, 2012



Annual Freight by Tonnage, 2025



Annual Freight by Value, 2025

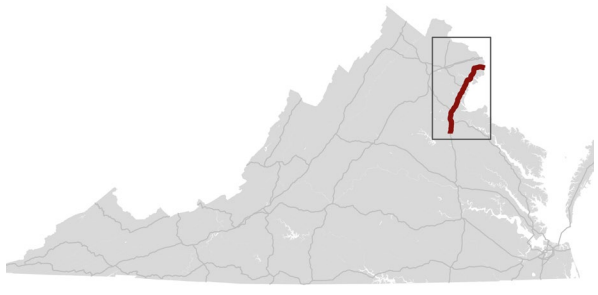


Truck Freight (in tons)

- < 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 & Mode Choice

Passenger trips on Segment K3 of the Washington to North Carolina Corridor have many travel options, both in terms of travel path and mode choice. US 1 and US 301 serve as parallel highway facilities on the segment, while interstates I-395 and I-495 serve as spurs that connect Northern Virginia, Washington, DC, and Maryland to I-95. Based on the 2014 federal standard mileage rate of 56 cents per mile, alternative modes of travel in the segment are typically more cost effective than automobile travel, but not as competitive in terms of speed or frequency of service.

Many transit options are available within Segment K3 that provide access within the Northern Virginia Area in addition to longer distance locations. Options include the following:

- VRE and Amtrak, which provide service to downtown Washington, DC and destinations north, with stops along the corridor via the CSX National Gateway Corridor rail line;
- Amtrak, which operates multiple services in the corridor with stations in Lorton, Fredericksburg, Quantico, Woodbridge, and Alexandria;
- Metrorail's Blue and Yellow Lines, which follow I-395 south from Washington, DC serving stations in Arlington County, Alexandria, and Fairfax County;
- PRTC, which provides the OmniRide and Metro Direct service that travels the segment between Dumfries and Washington, DC;
- Metrobus and Fairfax Connector, which provide local transit connections throughout the segment, including Metrobus' Richmond Highway Express (REX) on US 1; and
- Greyhound, which operates long distance bus service along the segment, with stops in Fredericksburg, Woodbridge, Springfield, and Washington, DC.

Park-and-Ride

Within Segment K3, commuters can utilize many Park-and-Ride locations, many of which are served by transit service. Fairfax County provides the highest number of Park-and-Ride locations and the most parking spaces in the Commonwealth, accounting for nearly half of the Park-and-Ride parking spaces in Virginia. While Arlington County (96 percent) has the highest utilization rate of spaces available in the segment, Fairfax (83 percent) and Prince William (80 percent) Counties also have a rate higher than the statewide average for Park-and-Ride utilization, which is 76 percent.

Comparable Travel Options

Richmond to Washington DC

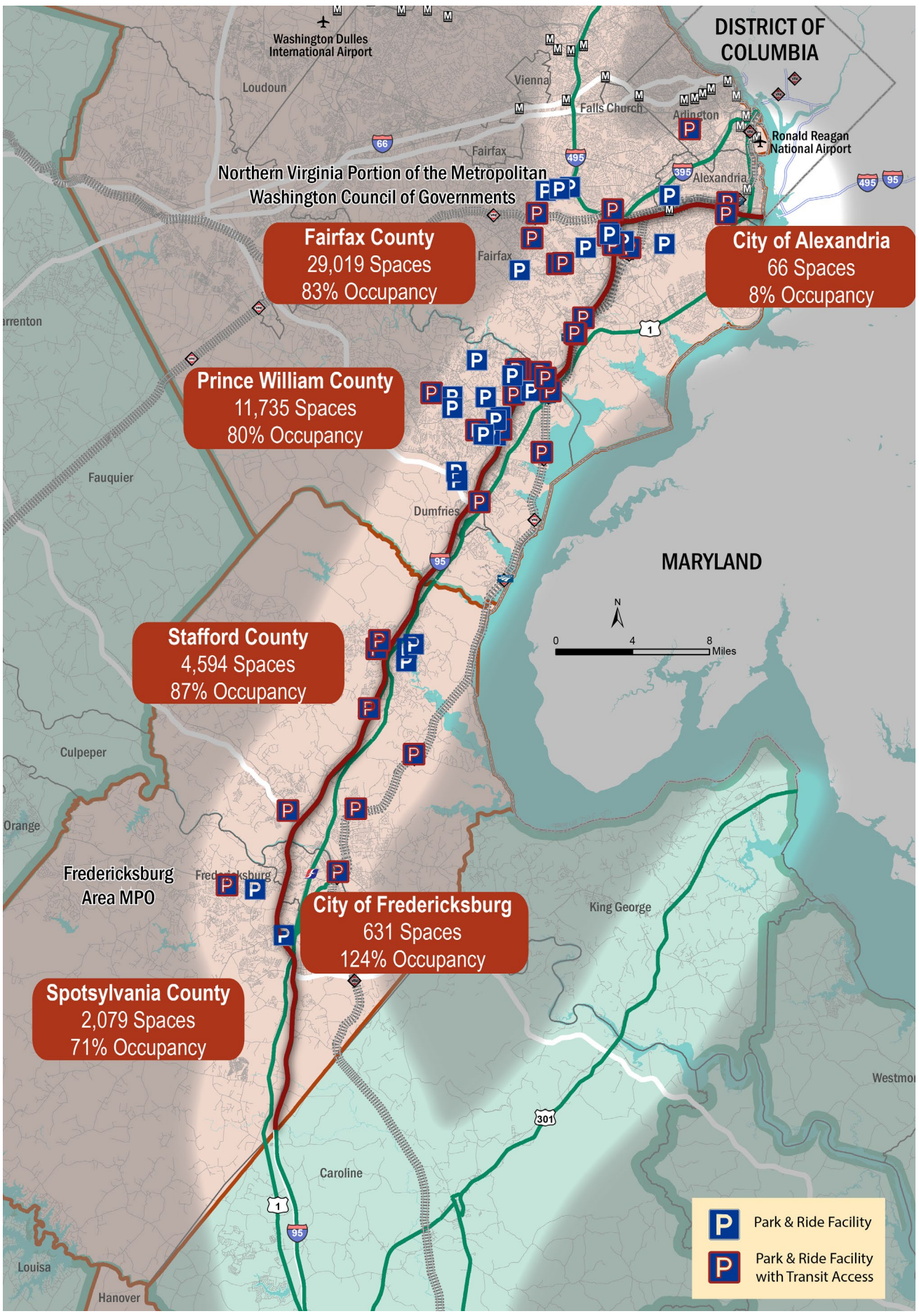
Inter-City Bus	Train	Air
20 Trips per Day	9 Trips per Day	9 Trips per Day
2:20 Travel Time	2:45 Travel Time	0:55 Travel Time
$16 Avg Cost	$26 Avg Cost	$390 Avg Cost

Auto
Via I-95: 1:45 Travel Time $62 Avg Cost
Via US-1: 3:10 Travel Time $61 Avg Cost

Fredericksburg to DC

Inter-City Bus	Train
5 Trips per Day	6 Trips per Day
1:20 Travel Time	1:17 Travel Time
$10 Est. Cost	$20 Est. Cost

Auto
Via I-95: 1:03 Travel Time $30 Est. Cost
Via Rt. 1: 1:49 Travel Time $31 Est. Cost



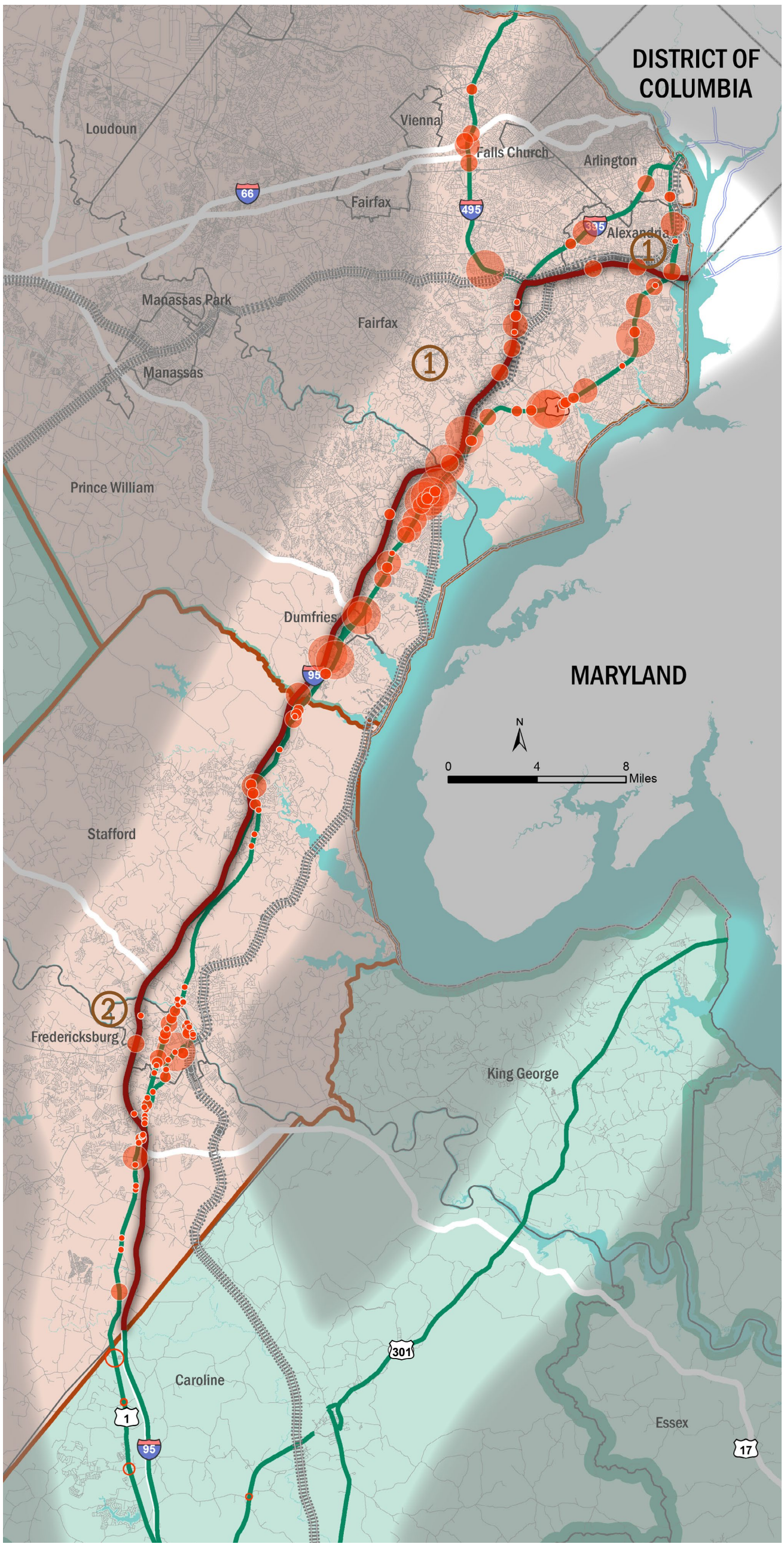
K3 SEGMENT NEEDS

Safety

Performance Metrics:

Number of Severe Crashes	1,108
Severe Crashes/Million VMT	0.3
Number of Railroad Crashes	4

Between 2010 and 2012, over 1,100 severe crashes occurred on Segment K3, the most of any CoSS segment in the Commonwealth. High concentrations of severe crashes occurred near Fredericksburg and between Dumfries and Alexandria. In Woodbridge, along approximately 1.3 miles of US 1 just south of the Woodbridge Amtrak station, there were 136 severe incidents, 98 of which were at intersections. Just north of this area, north of the Occoquan River near Lorton, there were 128 severe collisions within a stretch of approximately three miles along I-95. Along US 1 in Fort Belvoir, on approximately 2.5 miles between Route 235 and Route 286, 94 incidents took place; slightly over half of these occurred at intersections. On US 1 in Fredericksburg, within a span of about two miles directly south of Route 218, 55 crashes transpired. At the intersection of Lafayette Boulevard and Route 3 in Fredericksburg, 35 collisions occurred. Other segments and intersections with high crash numbers were on I-495, with 22 collisions taking place approximately 1.9 miles west of the intersection with I-95, and on Route 21 at the intersection with US 1, just south of I-95.

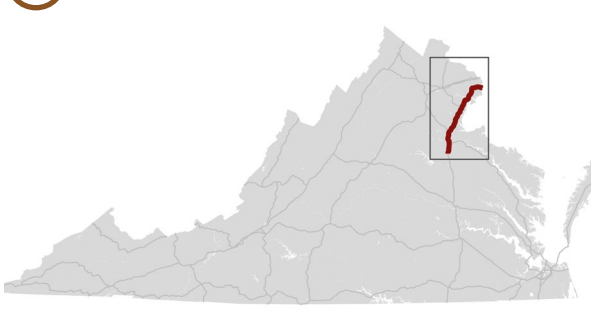


Fatality and Injury Crashes (2010-2012)

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

Railroad Incidents/Accidents per County (2011-2014)

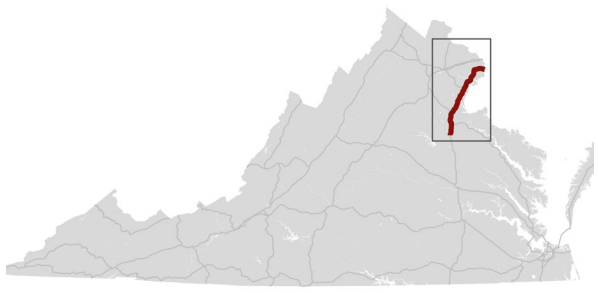
#



Congestion

Performance Metrics:

Person Hours of Delay per Mile	118
Freight Ton Hours of Delay per Mile	892.6K



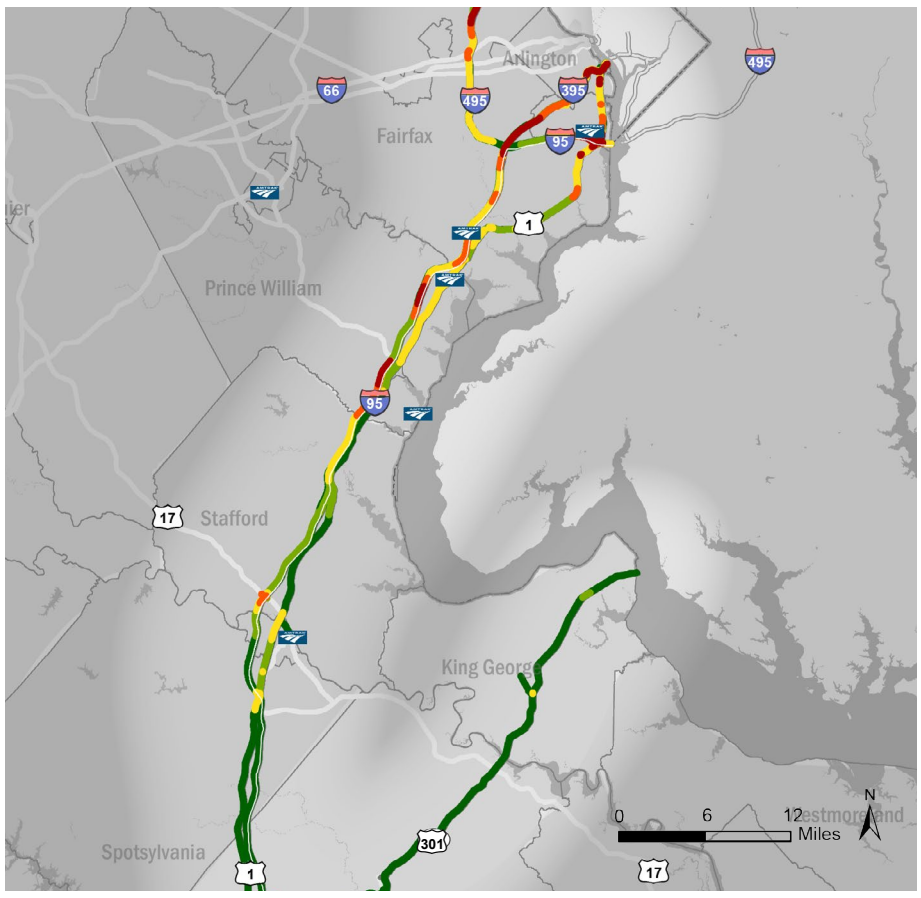
Passenger Delays

Passenger delays along Segment K3 are by far the highest among CoSS segments, with the highest total passenger delay (47,000 person-hours of delay) and one of the highest average delays (118 person-hours per mile). There are significant passenger delays on large portions of Segment K3, including:

- Almost the entire Capital Beltway (I-495) between the American Legion and Wilson Bridges;
- All of I-395 between I-495 and the Potomac River;
- US 301 at Route 3 in King George County;
- US 1 near the interchange with I-95 south of Fredericksburg in Spotsylvania County;
- US 1 between Route 3 and US 17 in the City of Fredericksburg;
- I-95 between US 17 and the Rappahannock River in Spotsylvania County;
- Many locations on US 1 between Route 234 in Prince William County and the Potomac River; and
- Most of I-95 in Prince William and Fairfax Counties.

The highest levels of passenger delay, exceeding 1,800 person-hours per mile of daily, occur on the far northern portions of I-495 north of Tysons Corner. Peak period passenger delays account for 61 percent of daily congestion, which gives Segment K3 one of the largest peak period shares of passenger delay among CoSS segments.

Daily Person Hours of Delay per Mile



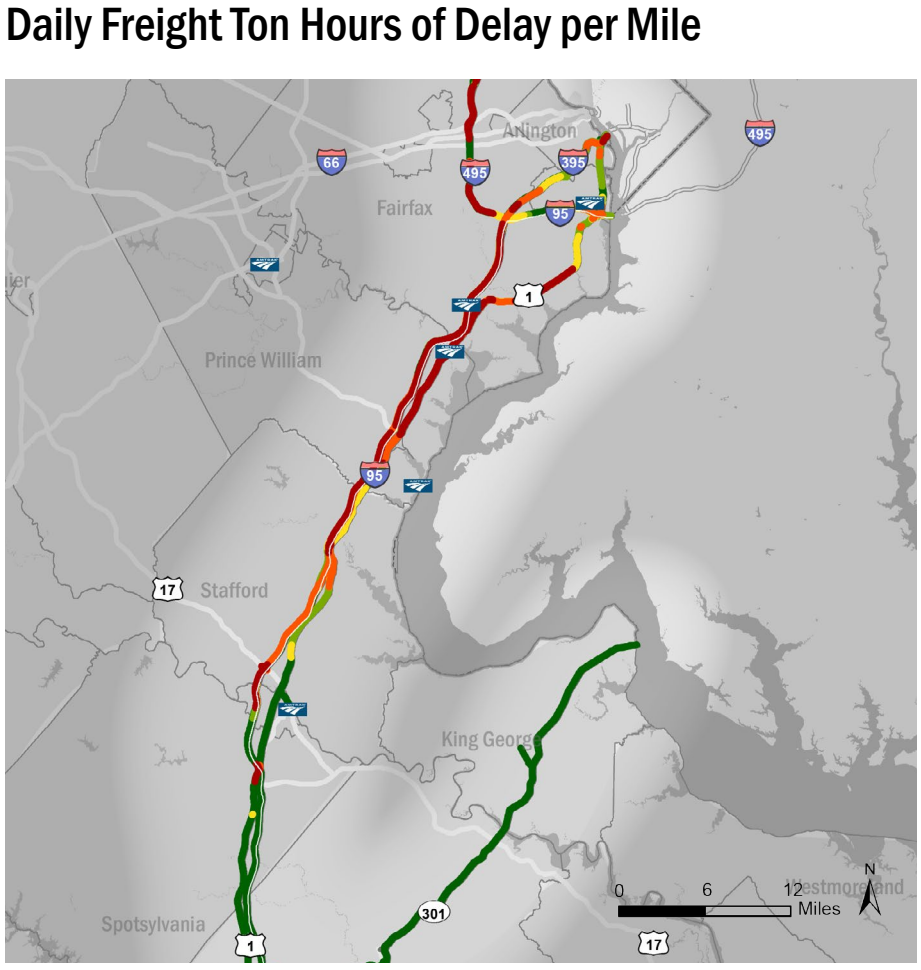
Freight Delays

Freight delays along Segment K3 are by far the highest among CoSS segments, with the highest total passenger delay (357 million ton-hours of delay) and average delays (893,000 ton-hours per mile), exceeding the next most congested CoSS segment by a factor of ten. There are significant freight delays on large portions of Segment K3, including:

- Almost all of I-495 north of the interchange with I-95;
- Most of I-395 between I-495 and the Potomac River;
- US 1 near the interchange with I-95 south of Fredericksburg in Spotsylvania County;
- Most of US 1 between Centreport Parkway in Stafford County and Route 7 in the City of Alexandria;
- US 1 in Crystal City in Arlington County;
- I-95 between Route 3 in the City of Fredericksburg and I-495 in Fairfax County; and
- I-95/I-495 near the interchange with US1 in the City of Alexandria.

The most severe freight congestion occurs on I-495 north of Tysons Corner in Fairfax County, where delay exceeds 10 million ton-hours per mile of delay. Peak period freight delays account for 58 percent of daily congestion, which gives Segment K3 one of the largest peak period shares of freight delay among CoSS segments.

Daily Freight Ton Hours of Delay per Mile



Reliability

Weekday Peak

Reliability of travel during the peak period on a typical weekday on Segment K3 ranges from 0.00 to 4.93 in terms of reliability index, with an average value of 0.38. This segment has the highest peak period reliability index of the CoSS segments statewide, and includes many locations where the reliability index exceeds the statewide threshold:

- I-495 between I-66 and the Dulles Toll Road (Route 267);
- I-495 near US 29 and US 50;
- I-495 near the interchange with I-95;
- I-395 north of Route 27 (Washington Boulevard);
- I-95 between Route 289 near Springfield and Route 611 in Alexandria;
- I-95 between US 1 and Route 642 in Fairfax County;
- I-95 between Route 294 and Dale Boulevard in Woodbridge; and
- I-95 near the interchange with Route 234 in Dumfries.

Weekday

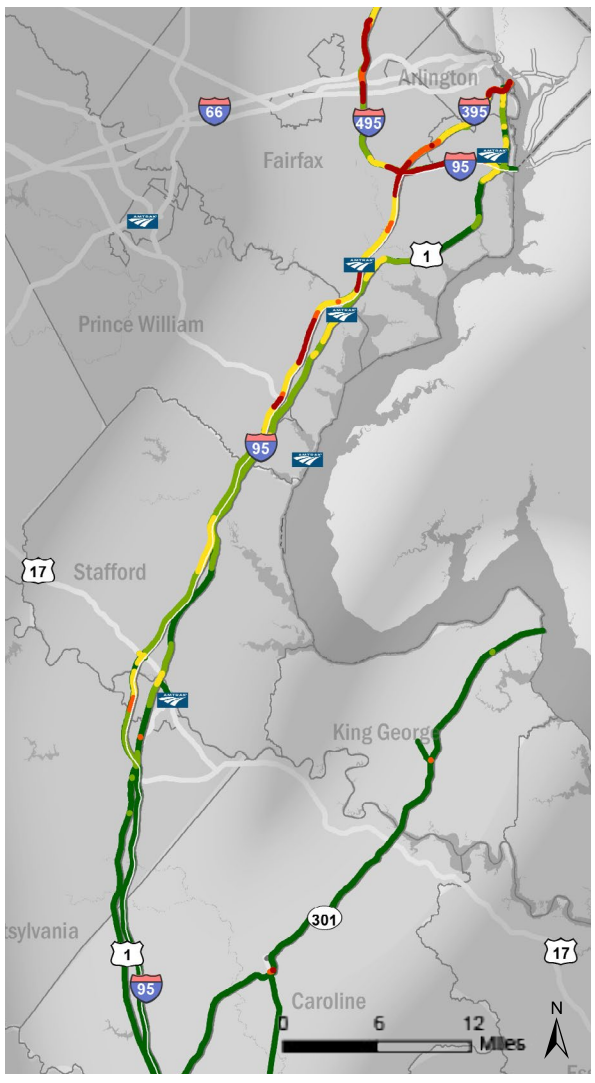
Reliability of travel during a typical weekday ranges from 0.00 to 2.63 in terms of reliability index, with an average value of 0.36. This segment has the highest weekday reliability index of the CoSS segments statewide, and includes many locations where the reliability index exceeds the statewide threshold:

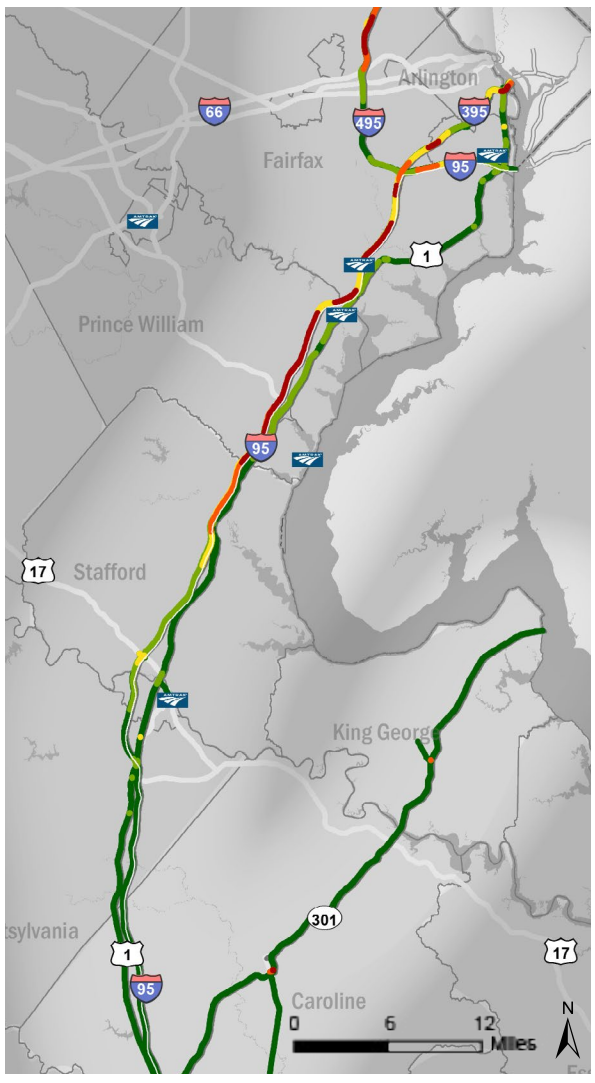
- US 301 at Route 3 in King George County;
- US 1 near Route 620 south of Fredericksburg in Spotsylvania County;
- I-95 near the interchange with US 17 in Stafford County;
- Most of I-95 between Route 628 in Stafford County and Route 611 in the City of Alexandria;
- I-495 north of I-66 in Fairfax County;
- I-395 south of Seminary Road in Fairfax County and the City of Alexandria;
- I-395 north of Route 27 (Washington Boulevard); and
- US 1 near the intersection with East Glebe Road in the City of Alexandria.

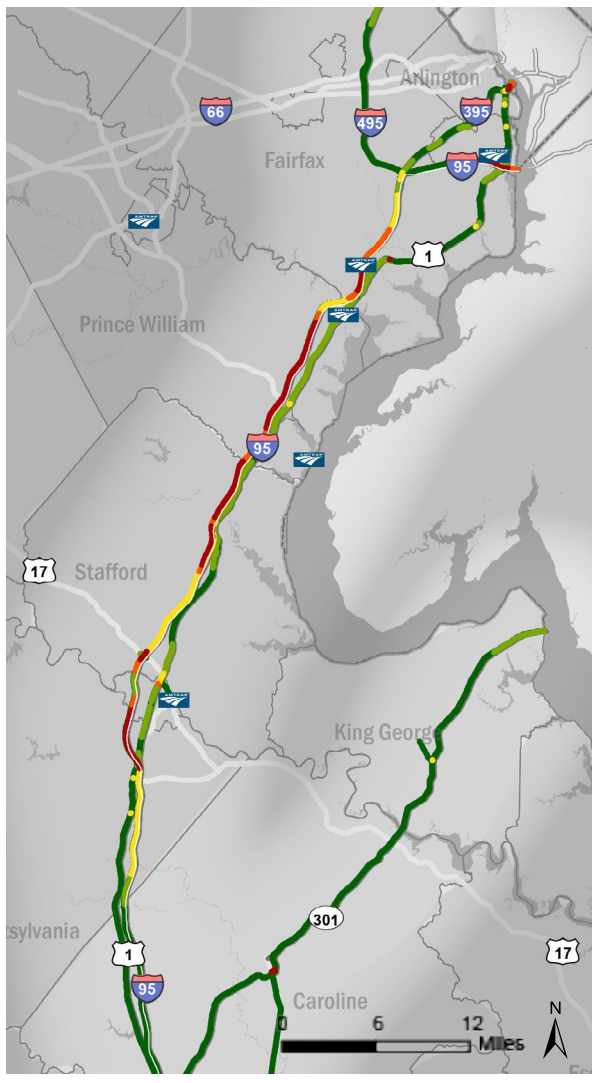
Weekend

Reliability of travel during a typical weekend ranges from 0.00 to 2.58 in terms of reliability index, with an average value of 0.25. This segment has the highest weekend reliability index of the CoSS segments statewide, and includes many locations where the reliability index exceeds the statewide threshold:

- I-95 where it runs concurrently with US 17 in and around the City of Fredericksburg;
- US 1 near US 17 Business in the City of Fredericksburg;
- Most sections of I-95 between Route 628 in Stafford County and Route 286 in Fairfax County;
- US 1 at Route 611 near Lorton in Fairfax County;
- I-95/I-495 between east of Route 611 in the City of Alexandria; and
- I-395/US 1 north of the interchange with US 1.





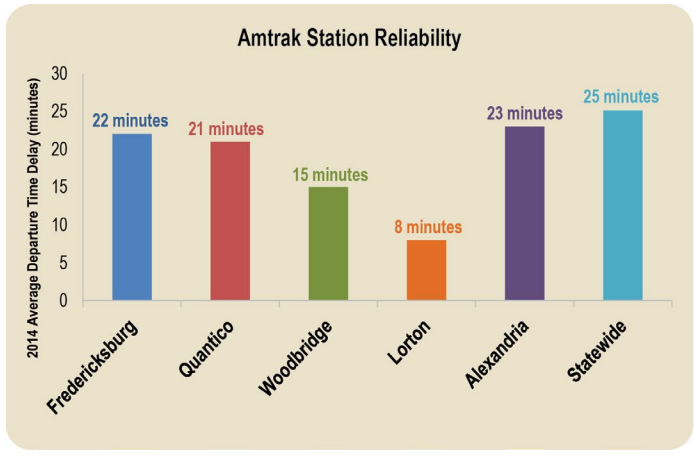


Reliability Index

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

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

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



VRE On-Time Performance

Fredericksburg Line

93%

WMATA On-Time Performance

Blue Line

90%

Yellow Line

94%

K3 SEGMENT NEEDS

Summary of Needs

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

Mode Choice

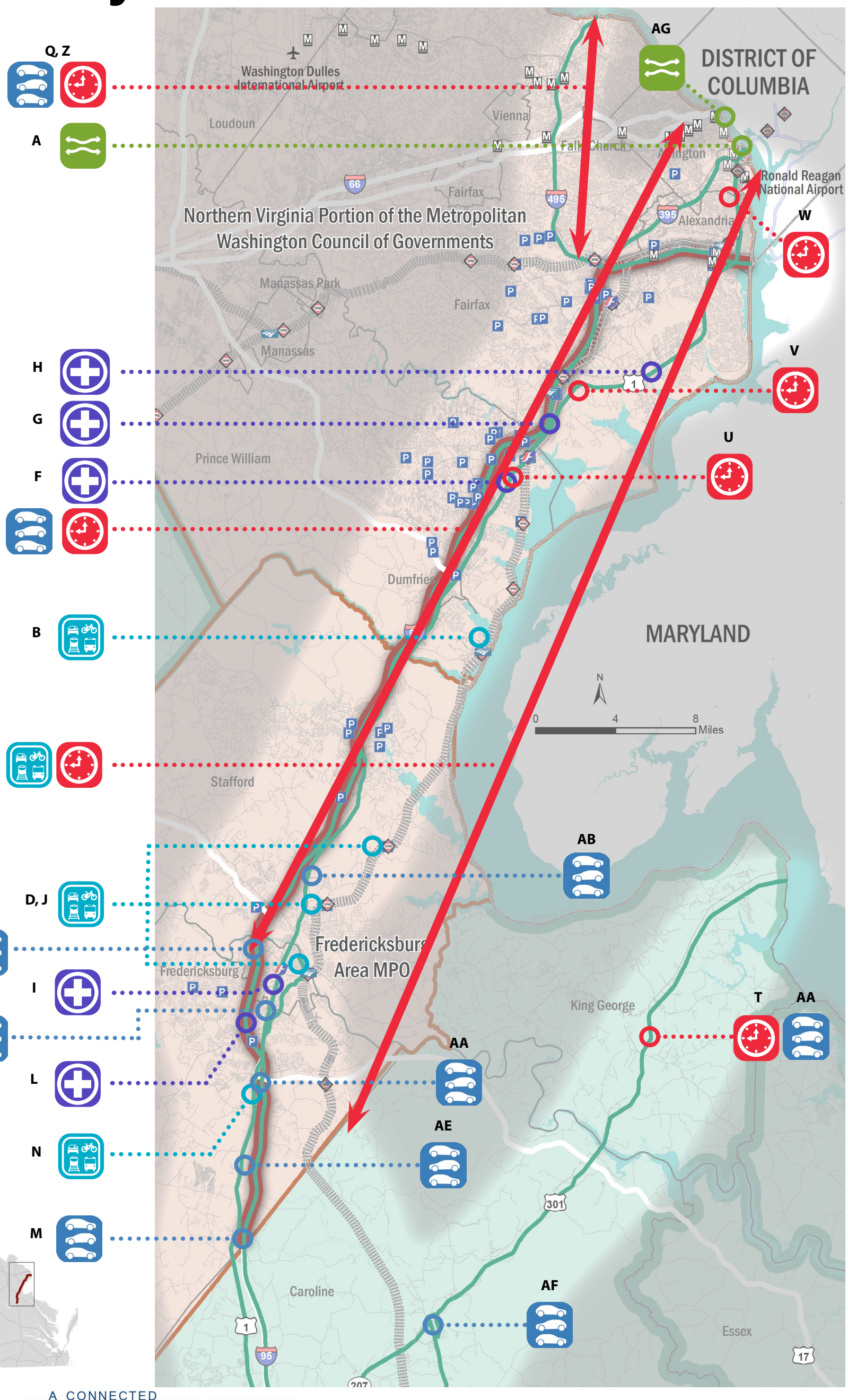
Redundancy

Safety

Congestion

Bottlenecks

Reliability



K3 SEGMENT NEEDS

Summary of Needs - K3 Segment

A.	Long Bridge: Rail bottleneck
B.	Inadequate parking facilities at VRE stations
C.	Congestion along rail lines affects reliability of Passenger Rail services. Over 83,000 passenger hours of delay for Amtrak riders in Segment.
D.	Park-and-ride lots in Fredericksburg area are over-capacity. Large portions of commuters traveling 25+ miles per day, and Frederickburg to DC region accounts for 18 percent of intercity passenger travel in Commonwealth.
E.	Slow speeds and safety concerns at interchange of I-95 and US 3.
F.	US 1 in Woodbridge (south of VRE station) : Highest concentration of crashes on Segment (136)
G.	I-95 north of Occoquan River: 128 severe collisions with a 3-mile stretch
H.	US 1 near Ft. Belvoir: 94 severe crashes in 2.5 miles between VA 235 and Fairfax County Pkwy (VA 286)
I.	US 1 in Fredericksburg: 55 severe crashes in 2 miles south of VA 218
J.	Limited availability/connections to non-auto modes at VRE stations along the Corridor
K.	High-growth commercial area near VA 3 forecast to be congested by 2025.
L.	I-95 at US 3: safety concerns related to interchange design
M.	I-95 at Exit 118: Planned growth in the area may exacerbate congestion issues
N.	Limited availability/connections to transit modes at park-and-ride lots
O.	Reliability issue on I-95 between Exit 126 (US 1/US 17) and Rappahannock River
P.	Reliability issue on I-95/I-395 between Exit 140 (Courthouse Road) and Potomac River

K3 SEGMENT NEEDS

Summary of Needs - K3 Segment

Q.		Reliability issue on I-495 between Exit 51 (VA Route 650/Gallows Road) and Potomac River
R.		Reliability issue at US 1 and Harrison Road in Fredericksburg
S.		Reliability issue at US 1 and VA Route 639 (Fall Hill Avenue) in Fredericksburg
T.		Reliability issue at US 301 and VA Route 3 (Kings Highway) in King George County
U.		Reliability issue at US 1 and VA Route 123 (Gordon Boulevard) in Woodbridge
V.		Reliability issue at US 1 and VA Route 611 (Telegraph Road) in Fairfax County
W.		Reliability issue at US 1 and East Glebe Road in Alexandria
X.		Congestion issue on I-95/I-395 between Rappahannock River and Potomac River
Y.		Congestion issue on US 1 between Courthouse Road in Stafford to Potomac River
Z.		Congestion issue on I-495 between I-95/I-395 and Potomac River in Fairfax County
AA.		Congestion issue on US 1/US 17 at junction with I-95 south of Fredericksburg
AB.		Congestion issue at US 1 and Centerport Parkway in Stafford County
AC.		Congestion issue on US 1 between VA Route 3 and US 17 Business in Fredericksburg
AD.		Congestion issue at US 1 and Harrison Road in Fredericksburg
AE.		Congestion issue at US 1 and Massaponax Church Road south of Fredericksburg
AF.		Congestion issue at US 301 and VA Route 207 (Bowling Green Bypass) in Bowling Green
AG.		Rail bottleneck at Rosslyn tunnel problematic for Metrorail Blue Line.