



Virginia's Long-Range Multimodal Transportation Plan

Corridors of Statewide Significance: Crescent Corridor

**Prepared for:
Commonwealth Transportation Board**

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Corridor Overview

1.1 Transportation Facilities

The Crescent Corridor runs along the Appalachian Mountains in the western part of Virginia and is generally defined by I-81. I-81 is a multi-lane interstate that stretches from Tennessee to New York, with a large portion paralleling the Appalachian Mountains in Virginia. The southern terminus is at I-40 in Tennessee east of Knoxville in Dandridge, and the northern terminus is at the Canadian border near Fishers Landing, New York. I-81 also passes through major portions of Pennsylvania and Virginia, with short stretches through Maryland and West Virginia. Figure 1 shows a map of the entire I-81 corridor along the east coast.

Nationally, the interstate serves as a major trucking and freight corridor along the east coast and provides an interstate connection between Virginia and cities such as Harrisburg, Pennsylvania and Syracuse, New York. It also serves as a connection to I-40 and the southern United States. I-81 is one of the top eight truck routes in the U.S and also carries tourists, a growing number of intra-valley commuters, and more than a third of all college students in Virginia.

In Virginia, I-81 travels for approximately 325 miles with the southern terminus at the Tennessee border near Bristol, Virginia and the northern terminus at the West Virginia state line north of Winchester, Virginia, making it is the longest interstate in Virginia. I-81 travels over more miles in Virginia than any other state it travels through. Figure 2 illustrates the corridor in Virginia.

I-81 is primarily a rural highway through Virginia, though it provides access to smaller urban areas. It is generally a four-lane highway throughout its length in Virginia, though there are six-lane sections in Montgomery County, Wythe County, and Washington County. It connects Winchester and Harrisonburg to the north with Roanoke, Blacksburg/Christiansburg, and Bristol to the south. It is primarily used as a long distance thoroughway to and from points north and south of Virginia. It is an important east coast trucking and freight corridor and the most important and heavily used trucking corridor in Virginia. It is used somewhat as a commuting corridor, though there are few major metropolitan areas near the interstate in Virginia, with the only substantial local traffic near the larger cities, such as Roanoke and Harrisonburg. The Crescent Corridor provides access to two airports with commercial service and to the Virginia Inland Port. Multiple line-haul transit opportunities and multiple park and ride lots are located within the corridor, and Norfolk Southern operates a rail line along the entire corridor.

Virginia Statewide Multimodal Transportation Plan

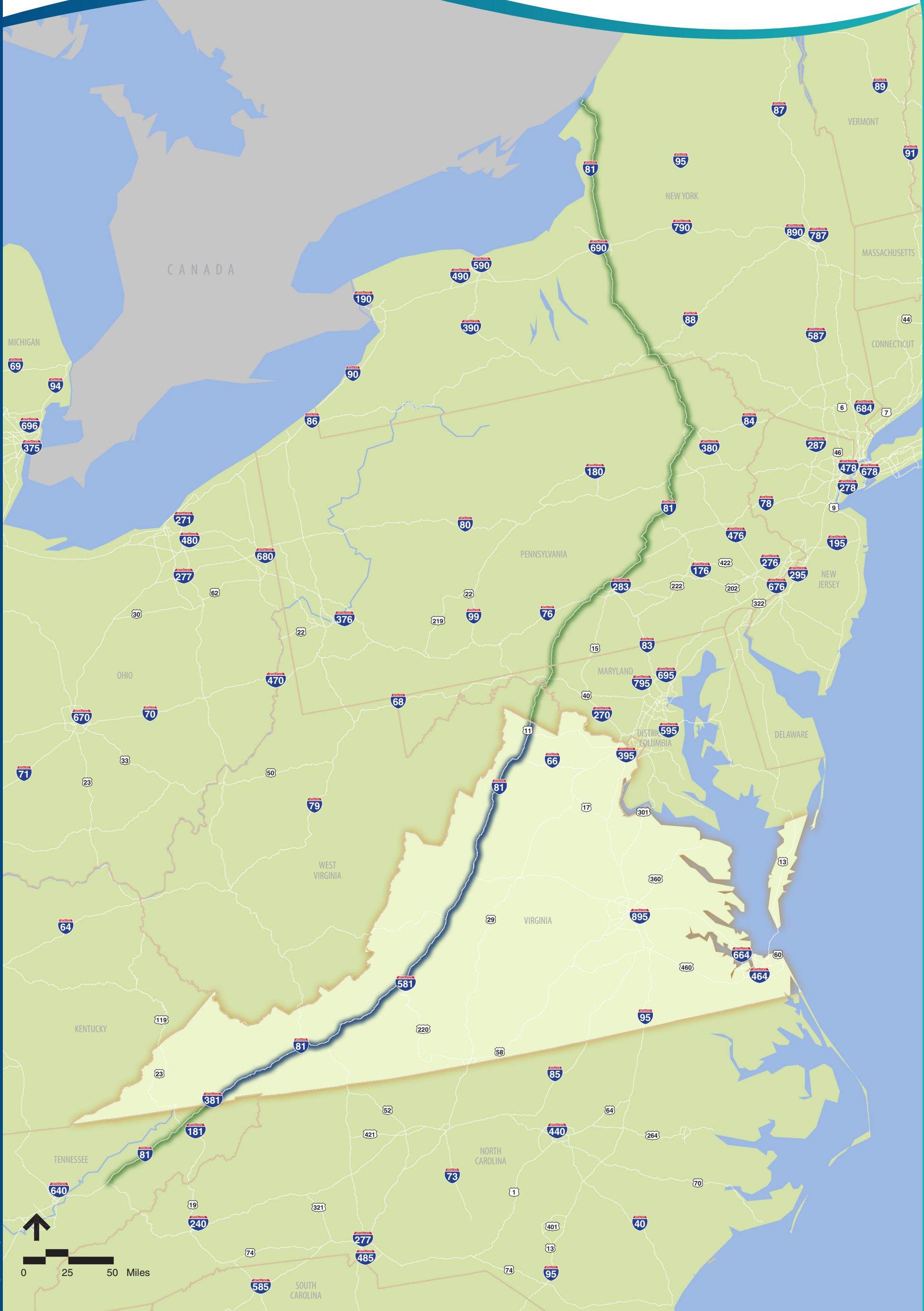


FIGURE 1
Crescent Corridor National Context Map

Virginia Statewide Multimodal Transportation Plan

Legend

- I-81
- Airport
- Railroad
- Greyhound Terminal
- Line-Haul Bus Route
- Amtrak Station
- Park and Ride
- Port
- County Line
- MPO Area
- Planning District

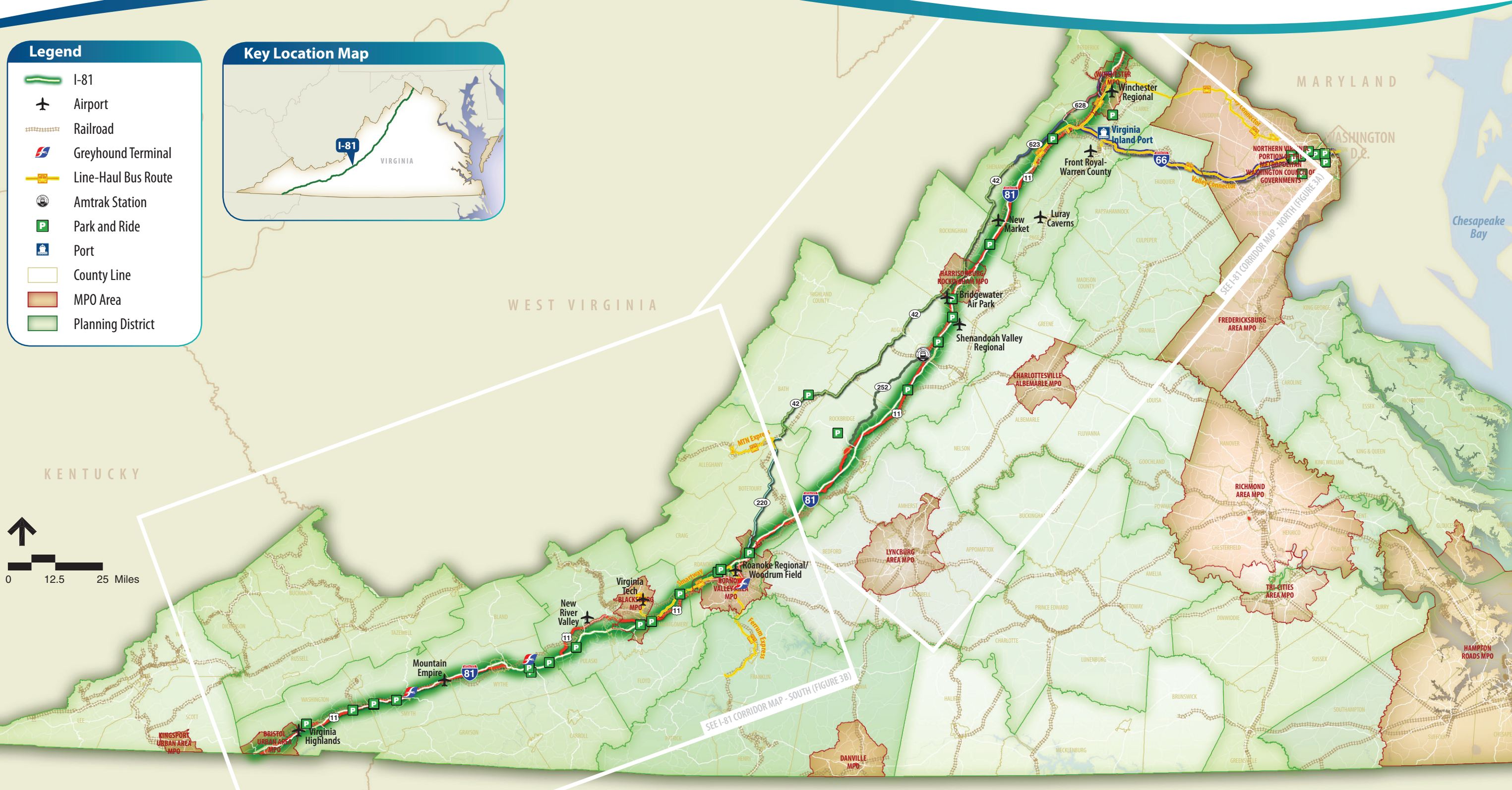


FIGURE 2
Crescent Corridor Map

Passenger travel, much of which is used to access educational facilities and recreational tourist areas, is primarily accomplished along the Crescent Corridor through the highway facilities, including I- 81 and its parallel local route, U.S. 11. There are transit options available, both along the northern section of the corridor near Winchester and along the southern section between Roanoke and Blacksburg. These transit options are typically express bus services connecting larger urban areas, such as the Valley Connector, which offers service to both Washington, D.C. and Dulles Airport; and the Smartway Bus, which offers service between Blacksburg and Roanoke. A major national bike route also runs in the Crescent Corridor, offering another modal option. In addition, there are two airports offering commercial service, and an additional nine general aviation facilities along the Crescent Corridor.

The Crescent Corridor provides access to the Virginia Inland Port. Norfolk Southern rail lines run along the entire corridor, supporting its role as a major freight corridor. Access to Roanoke Regional Airport and Shenandoah Valley Regional Airport, as well as multiple other general aviation facilities, aids in passenger travel as well as freight movement. In addition to I- 81, U.S. 11 provides roadway access along the entire corridor, especially to local areas. Figure 3 illustrates all modal facilities along the northern section of the Crescent Corridor and Figure 4 illustrates the modal facilities for the southern portion of the corridor.

The Crescent Corridor travels through five Planning Districts and five Metropolitan Planning Organizations (MPOs). The five Planning Districts are the Northern Shenandoah Valley Planning District, the Central Shenandoah Planning District, the Roanoke Valley-Alleghany Planning District, the New River Valley Planning District, and the Mount Rogers Planning District. The five MPOs include Winchester, Harrisonburg-Rockingham, Roanoke Valley, Blacksburg, and Bristol. The corridor also travels through 13 counties and five cities.

The Crescent Corridor includes two auxiliary routes for I-81. I-381 is a very short spur into the City of Bristol, and I-581 is a longer spur into the City of Roanoke.

Crescent Corridor Jurisdictions

- Frederick County
- City of Winchester
- Warren County
- Shenandoah County
- Rockingham County
- City of Harrisonburg
- Augusta County
- Rockbridge County
- Botetourt County
- Roanoke County
- City of Roanoke
- City of Salem
- Montgomery County
- Pulaski County
- Wythe County
- Smyth County
- Washington County
- City of Bristol

Virginia Statewide Multimodal Transportation Plan

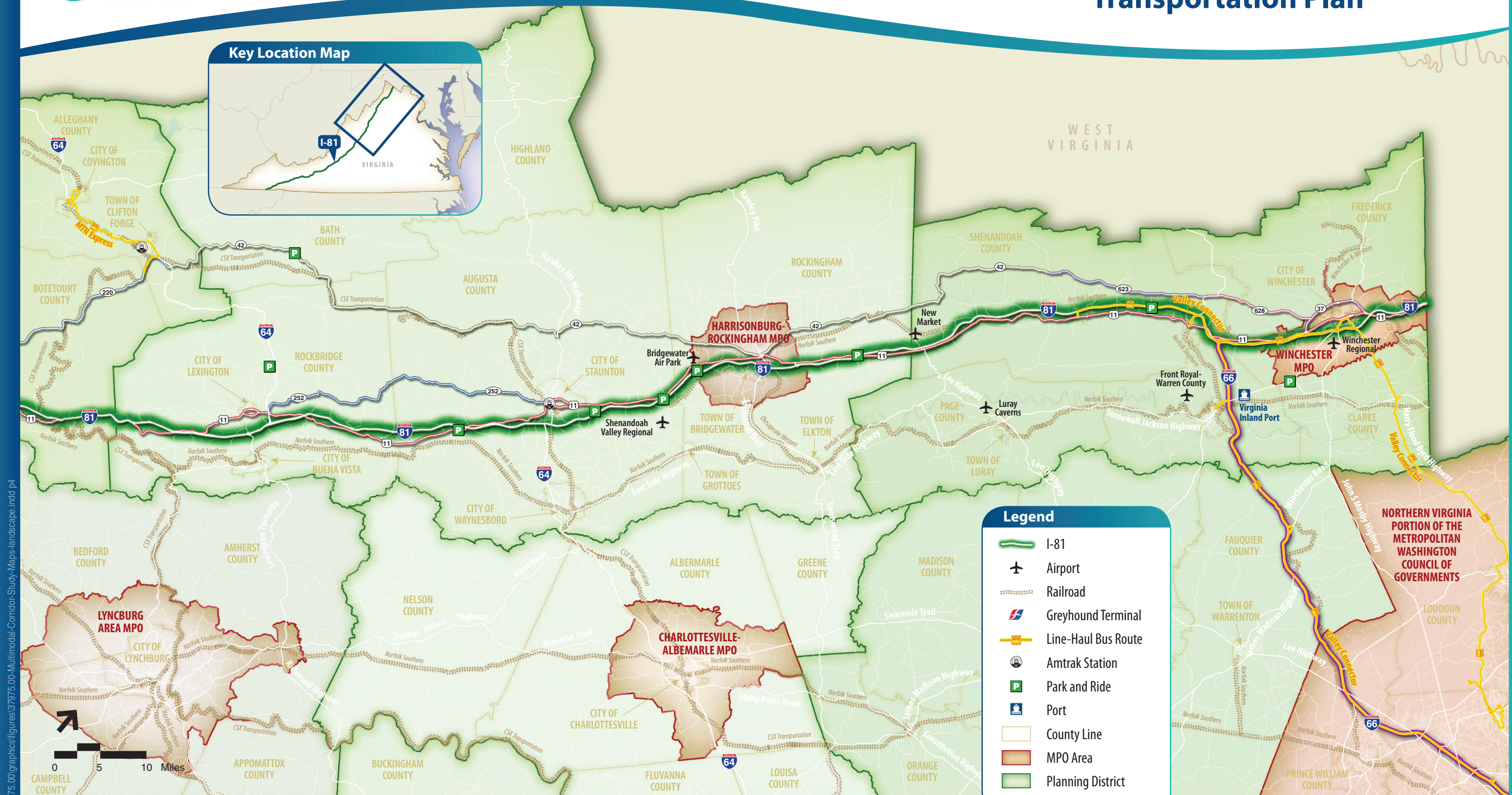


FIGURE 3
Crescent Corridor Map - North

Virginia Statewide Multimodal Transportation Plan



FIGURE 4
Crescent Corridor Map - South

U.S. 11 parallels I-81 for its entire length, though it runs concurrently with I-81 for stretches through Wythe County and a small portion of Pulaski County as well as through Botetourt County and Rockbridge County.

U.S. 11 is primarily used as a local access road throughout the Crescent Corridor and is a two-lane road for the majority of its length. U.S. 11 is labeled Main Street through the City of Harrisonburg and acts as the main corridor through the City. There are multiple exit points along the I-81 corridor directly to U.S. 11 and many more that indirectly access U.S. 11.

I-64, which runs east-to-west through Virginia, runs concurrently with I-81 between Rockbridge County and Augusta County for approximately 30 miles. I-64 corridor is also part of the East-West Corridor, defined as a Corridor of Statewide Significance. I-77, also a part of a Corridor of Statewide Significance, the Western Mountain Corridor, runs concurrent to I-81 for approximately 11 miles in Wythe County.

Other concurrent U.S. highways include U.S. 58, which runs concurrently with I-81 in Lee County and Washington County in the southwest part of the state, U.S. 52, which runs concurrently with I-81 in Wythe County (where I-77 and U.S. 11 are also concurrent along I-81), and U.S. 220, which runs concurrently with I-81 through Roanoke and Botetourt Counties. U.S. 58 and U.S. 220 have all also been defined as elements of Corridors of Statewide Significance.

A line-haul transit option for this corridor is the Valley Connector, operated by S & W Tours, LLC. It provides weekday transit service connecting towns along the Crescent Corridor in the Shenandoah Valley with the Washington metropolitan area. The service operates morning and afternoon trips that accommodate workday schedules.

I-81 Auxiliary, Concurrent, and Parallel Roadway Facilities

Auxiliary:

- I- 381 (Bristol)
- I- 581 (Roanoke)

Concurrent:

- I- 64
- I- 77
- U.S. 58
- U.S. 52
- U.S. 220

Parallel:

- U.S. 11

Crescent Corridor Transit Facilities

- Valley Connector
- Virginia Regional Transit
- Ferrum Express
- Smartway Bus
- Greyhound
- Park and ride lots

Valley Connector provides connections to many different transportation options, such as Metrorail, Amtrak, Dulles Airport, and Reagan National Airport. It also provides connections to a number of park and ride lots, including some along the Crescent Corridor, as well as to other transit systems, including the system in Winchester.

Virginia Regional Transit provides two shuttle bus options, accessing Blue Ridge Community College in Weyers Cave. The northern route travels between Weyers Cave and Harrisonburg, while the southern route travels between Weyers Cave and Staunton. The Ferrum Express operates express bus service on Thursday and Friday between Ferrum and Rocky Mount, and between Ferrum and downtown Roanoke on Saturday. There are a total of four stops during its weekday route, with one additional stop in Roanoke on Saturday. It is operated by Valley Metro and only runs while school is in session at Ferrum College.

The southern portion of the corridor between Christiansburg and Roanoke is connected by another line-haul transit service. The Smartway commuter bus is operated by Valley Metro, the transit provider for the Roanoke Valley. This service provides connections between Blacksburg, home of Virginia Polytechnic and State University, and downtown Roanoke. The service operates Monday through Saturday and provides trips throughout the day.

The Smartway Bus provides connections to two local transit systems and a number of park and ride lots. The route connects with both Blacksburg Transit and Valley Metro. Blacksburg Transit provides local bus service to the Town of Blacksburg, the campus of Virginia Tech, and connections to Christiansburg. Valley Metro provides local bus service to the Roanoke Valley, and two park and ride facilities along I-81 are served by the Smartway Bus.

In addition, there are numerous park and ride facilities up and down the corridor; including at least four north of Bristol; at least 10 between Wytheville and Roanoke, with most of them serving the Blacksburg or Roanoke areas; at least five between Staunton and Harrisonburg; and at least two near Winchester. Greyhound offers bus service along the Crescent Corridor, with stops in Marion in Smyth County and in Wytheville in Wythe County. There are, however, no Greyhound stations north of these two stations.

I-81 provides access to the Virginia Inland Port, which is located five miles from I-81 near the junction with I- 66. The Inland Port receives cargo from the other three state-owned ports (Norfolk International Terminals, Newport News Marine Terminal, and Portsmouth Marine Terminal) five days a week for distribution, in effect bringing the ports in the Hampton Roads area 220 miles closer inland. Norfolk Southern provides rail access to the Inland Port, and I-81 acts as the major truck corridor in Virginia.

Norfolk Southern rail lines run along the Crescent Corridor for its entire length in Virginia as the Shenandoah Line of the Crescent Corridor. This line accesses the Virginia Inland Port as well as multiple junction points to other Norfolk Southern lines. This includes the Heartland Corridor, which runs east-to-west and is the Norfolk Southern’s primary track system connecting the Port of Virginia to national markets. Norfolk Southern’s Coal Corridor runs from Norfolk to the Appalachian coalfields. There is also a junction with CSX’s Coal Corridor, which travels between Newport News through Richmond and Charlottesville to the Appalachian coalfields.

There are three short-line railroads. The Shenandoah Valley Railroad runs between Staunton and Pleasant Valley and is operated by the Durbin and Greenbrier Valley Railroad. The Chesapeake Western Railroad is a small section of railroad between Harrisonburg and Elkton now owned and operated by Norfolk Southern. The Winchester and Western Railroad Company operates between Gore and Winchester and then north to Maryland. It is exclusively a freight line with connections to CSX and Norfolk Southern lines. While Amtrak passenger rail service does not run along the corridor’s major lines, there is a station in Staunton allowing passengers to connect with east-west running rail service along the Cardinal Route, which runs from Chicago to New York City.

There are eleven airport facilities along the corridor. Commercial air service is available at Roanoke Regional Airport, the largest airport within the corridor, which offers over sixty daily passenger flights, including connections to major hubs of five airlines. The airport is located within the City of Roanoke directly adjacent to I-581 less than two miles from its junction with I-81. Some commercial service is also available at Shenandoah Valley Regional Airport. However, neither of these airports has the capacity or volume of larger commercial service facilities in Virginia, such as Dulles International, Reagan Washington National, Norfolk International, or Richmond International. For residents in southwest Virginia, the closest airport with a large volume of commercial service is the Tri-Cities Airport, located near Blountville, Tennessee along the I-81 corridor.

The remaining airport facilities serve general aviation needs. Table 1 details the airport facilities along the Crescent Corridor, their designation by the Virginia Air Transportation System Plan, and their location.

Crescent Corridor Rail and Port Facilities

Port:

- Virginia Inland Port

Freight Rail:

- Norfolk Southern Crescent Corridor

Short Line:

- Shenandoah Valley Railroad
- Chesapeake Western Railroad
- Winchester and Western Railroad

Connections to:

- Norfolk Southern Coal Corridor
- CSX Coal Corridor
- Amtrak Cardinal Route

Table 1 Crescent Corridor Airport Facilities

Airport	Type	Location
Shenandoah Valley Regional	Commercial Service	Augusta County
Roanoke Regional	Commercial Service	Roanoke County
Winchester Regional	General Aviation—Regional	Frederick County
Front Royal Warren County	General Aviation—Community	Warren County
New Market	Local Service	Shenandoah County
Luray Caverns	General Aviation—Community	Page County
Bridgewater Air Park	Local Service	Rockingham County
New River Valley	General Aviation—Regional	Montgomery County
Virginia Tech Montgomery	General Aviation—Community	Montgomery County
Mountain Empire	General Aviation—Community	Smyth County
Virginia Highlands	General Aviation—Regional	Washington County

2

Corridor Functions

2.1 Corridor Functions in Virginia

In Virginia, the Crescent Corridor acts as the major corridor for through freight movement, carrying almost 40 percent of the total interstate truck traffic in Virginia. In Virginia, it has been called the “National Rest Stop” for through travel, as the state is centrally located along the east coast. In addition, freight is moved through freight rail lines operated by Norfolk Southern. The corridor also provides access to almost 30 higher educational institutions, including Virginia Tech and James Madison University.

Functions of Crescent Corridor

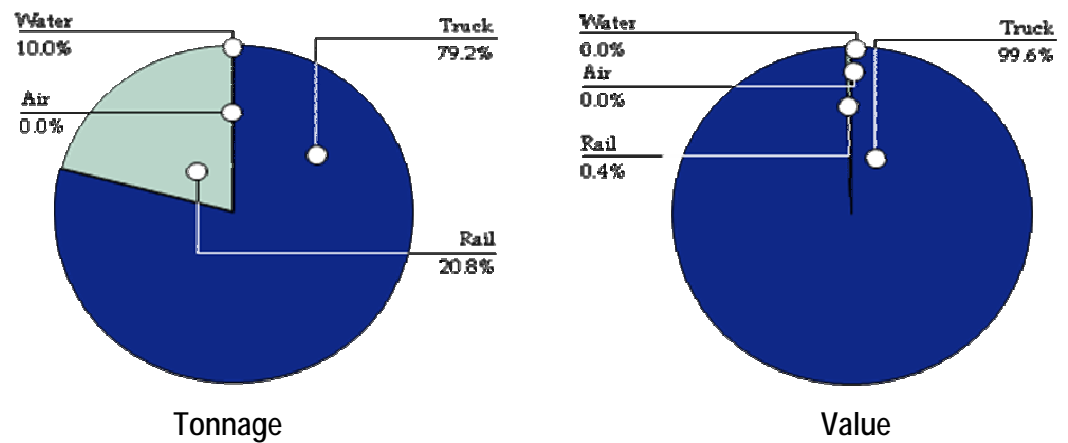
- Freight Corridor
- Passenger Link between Urban Areas
- Through Corridor
- Education
- Tourism

The Crescent Corridor connects smaller urban areas such as Harrisonburg, Blacksburg, and Bristol, and it provides access to multiple natural, historical, and cultural resources. The corridor provides access to state parks, state recreational trails, two national forests, the Blue Ridge Parkway, and the Appalachian Trail; as well as many historic sites, including Civil War battlefields.

2.2 Freight Movement

The Crescent Corridor is an important freight corridor, with most freight movement accomplished via trucking along the highway facilities, though other options exist, including rail and air. Trucking accounts for 80 percent of the freight movement along the corridor. Freight rail accounts for most of the remaining 20 percent of the total freight movement, which is mostly along the western line of Norfolk Southern's Crescent Corridor. Short-line railroads, as discussed in the previous section, also handle some freight movement within the Crescent Corridor. Figure 5 shows the tonnage by mode along the corridor, as well as the freight value by mode.

Figure 5 Crescent Corridor Total Freight Tonnage and Value by Mode

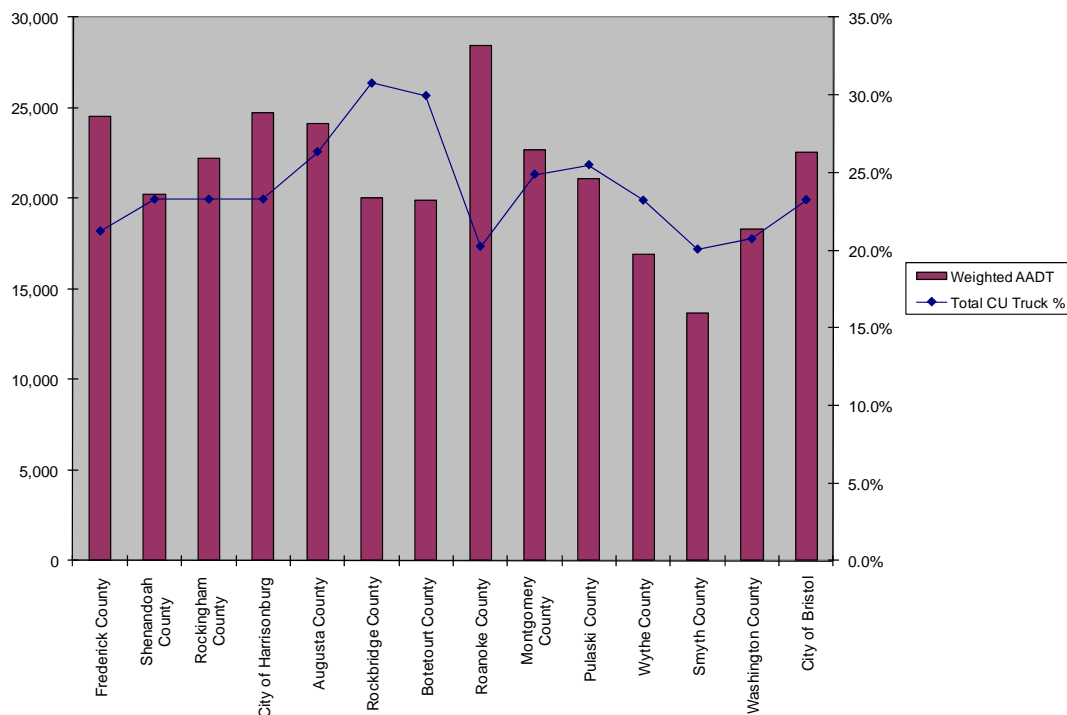


(Source: Statewide Freight Study)

As seen in Figure 5, most freight along the I-81 corridor is handled by truck despite the presence of Norfolk Southern rail lines along the entire corridor.

Figure 6 shows the total average annual daily traffic along different sections of I-81 and shows the total commercial use truck percentage along I-81. According to this information, trucks account for anywhere between 20 and 30 percent of the total traffic along I-81.

Figure 6 Average Annual Daily Traffic (AADT) and Commercial Unit (CU) Truck Percentages

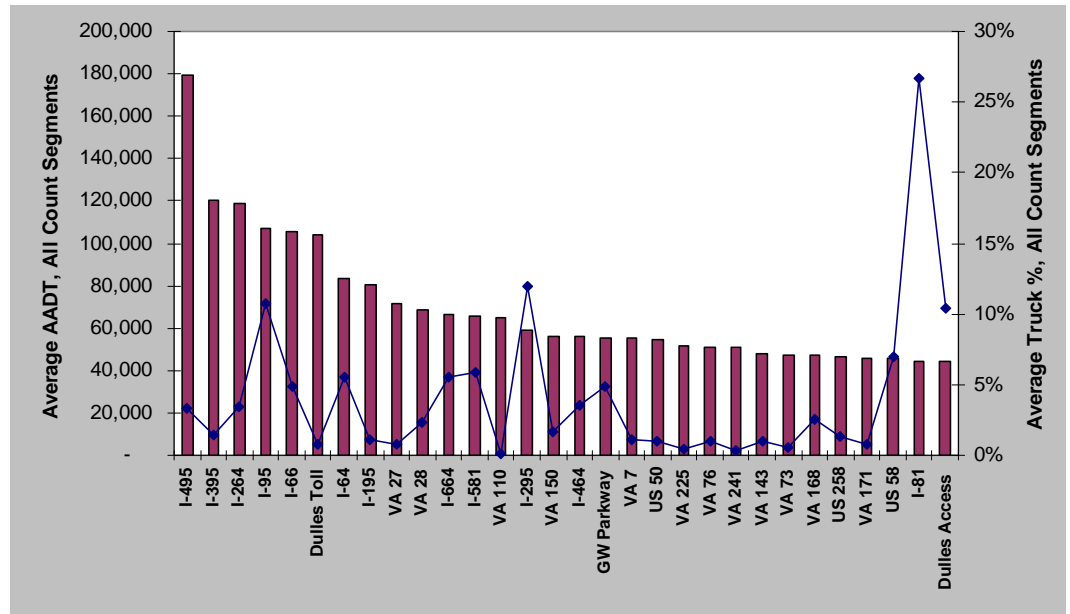


(Source: Statewide Freight Study)

Traffic is heaviest around the urban areas, though truck percentages are highest through Rockbridge and Botetourt Counties. Traffic in general is highest in and around Roanoke. Traffic is also heavy around Winchester in Frederick County, in and around Harrisonburg and Staunton, and in Bristol. While truck percentages are lower in Roanoke County, there are more passenger cars on the roadway.

Figure 7 illustrates the total traffic along major highways in Virginia and illustrates the average truck percentages along the entire roadway through the state. This clearly shows the importance of I-81 as a freight corridor, as the truck percentage is significantly higher than any other corridor, including I-95, though average daily traffic is lower than most major roadways in Virginia.

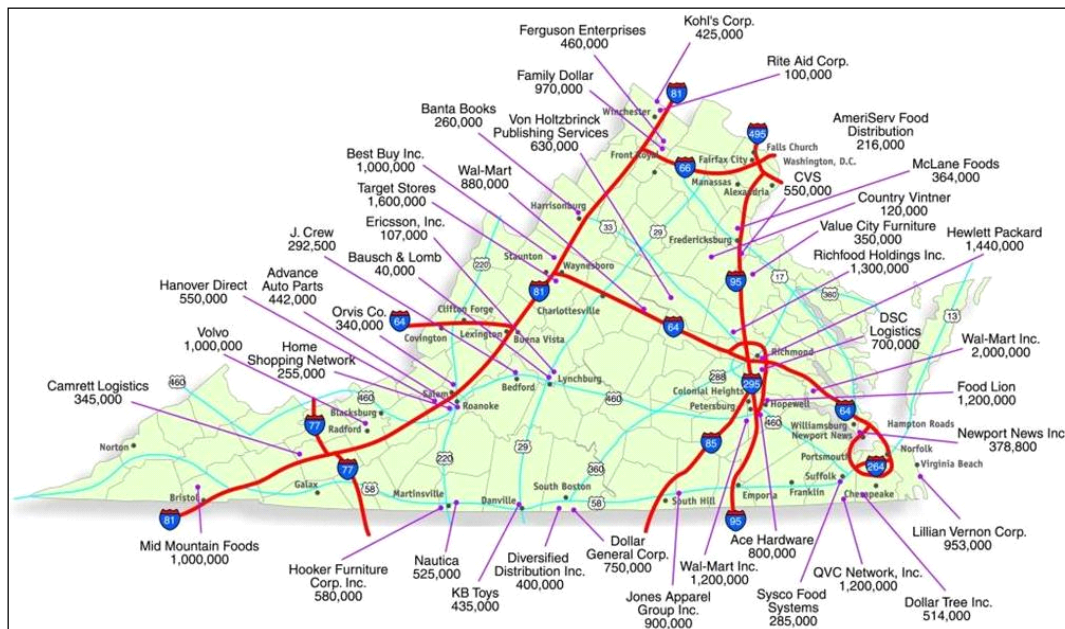
Figure 7 Virginia Highway AADT and Truck Percentages



(Source: Statewide Freight Study)

Figure 8 shows the major distribution centers in Virginia. As seen in the figure, a large percentage of these are located directly along the Crescent Corridor.

Figure 8 Major Virginia Distribution Centers



(Source: Statewide Freight Study)

Table 2 lists the distribution centers located along the Crescent Corridor. In addition, the Virginia Inland Port is located near the junction of I-66 and I-81, making I-81 an even more convenient freight corridor for trucks.

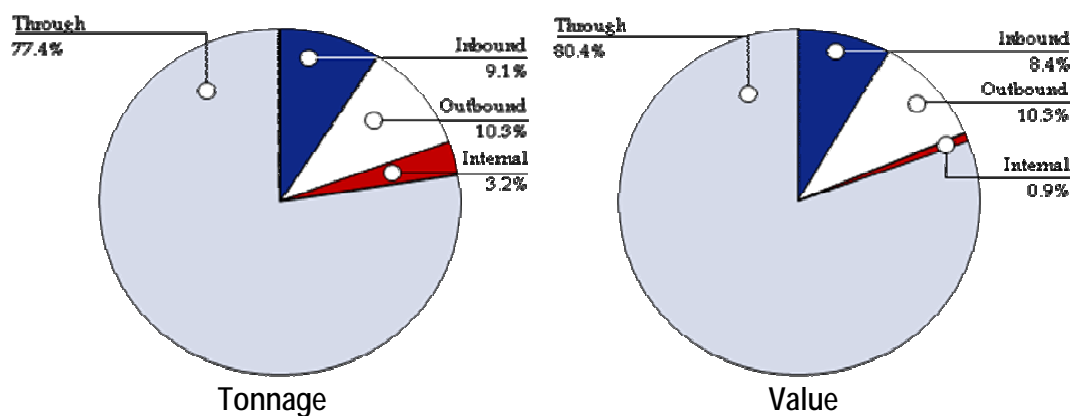
Table 2 Crescent Corridor Warehouse and Distribution Facilities

Store	Location	Area (Square Feet)
Kohl's Corp.	Winchester	425,000
Rite Aid Corp.	Winchester	100,000
Ferguson Enterprises	Front Royal	460,000
Family Dollar	Front Royal	970,000
Banta Books	Harrisonburg	260,000
Best Buy Inc.	Staunton	1,000,000
Target Stores	Waynesboro	1,600,000
Orvis Co.	Roanoke	340,000
Advance Auto Parts	Roanoke	442,000
Hanover Direct	Roanoke	550,000
Home Shopping Network	Roanoke	255,000
Volvo	Radford	1,000,000
Camrett Logistics	Wytheville	345,000
Mid Mountain Foods	Bristol	1,000,000

(Source: Statewide Freight Study)

Figure 9 shows the freight tonnage and value by direction. As seen in this figure, almost half of the freight traffic moved through Virginia is traveling through the state, though a large amount has origins and destinations in Virginia. The Virginia Inland Port is a major origin of freight in the Commonwealth, and the distribution centers represent a large portion of the destinations.

Figure 9 Freight Tonnage and Value by Direction



(Source: Statewide Freight Study)

Freight volumes along the Crescent Corridor will continue to grow and will be influenced by a number of factors leading to increased transportation demand. Population growth along the corridor, while less than the overall population growth in Virginia, will play a major role. In addition, changes in national and global logistics patterns and the corridor's evolving industry structure will lead to increased demand for freight movement along this already heavy freight corridor.

With increases in freight demand, it is important that capacity to carry the expected volumes of freight will exist in the future, not only along the highway facilities but along the rail facilities as well. Norfolk Southern has many planned projects for their Crescent Corridor, half of which runs directly along I-81. These projects include expansion of single-line tracks to double tracks, adding and improving existing passing sidings, realigning curves, improving connections, and adding track signals and systems. These will increase capacity of the freight rail system along the Crescent Corridor. It is important that with these projects, more freight is moved to rail to connect with national markets as well as to the Virginia Inland Port and the distribution centers within and near the corridor. This will add capacity for both freight traffic and passenger traffic along the corridor's highway facilities and improve safety.

2.3 Urban Link and Through Travel

The Crescent Corridor provides a link between various cities and urban centers along its length, including Winchester, Harrisonburg, Roanoke, Christiansburg, Blacksburg, and Bristol. All of these areas have Metropolitan Planning Organizations (MPOs) associated with them. In addition to these major areas, I-81 provides linkage to Staunton and Lexington, both located south of Harrisonburg and north of Roanoke.

The functions of urban linkage and through travel will be impacted by population growth and aging, roadway level of service and roadway safety. As demand for intercity and through travel grows, these functions will become challenged and there will be a need for corridor improvement strategies to maintain this functionality.

2.3.1 Population Projections

The Virginia Transportation Research Council (VTRC) completed a report as part of VTrans2035, detailing population and employment trends and projections to 2035 for these socioeconomic factors. Increases in population will impact the amount of traffic on the roadway, impacting travel between the different urban centers and through travel. It will impact both passenger and freight traffic along the highway.

Figure 10 shows the population projections for each of the five major urban areas listed previously, according to VTRC. As seen in this figure, the highest population is in the Roanoke region; with Christiansburg/Blacksburg second with just over half the population of Roanoke; while Winchester and Harrisonburg have similar

populations and population projections to each other. Bristol is the least populated region. The Winchester region is expected to grow by the greatest percentage between 2010 and 2030, which likely means more traffic along the I-81 corridor in the northern portion, much of which is likely to be commuter traffic to Northern Virginia and Washington, D.C.

Figure 10 Population Projections for Urban Areas

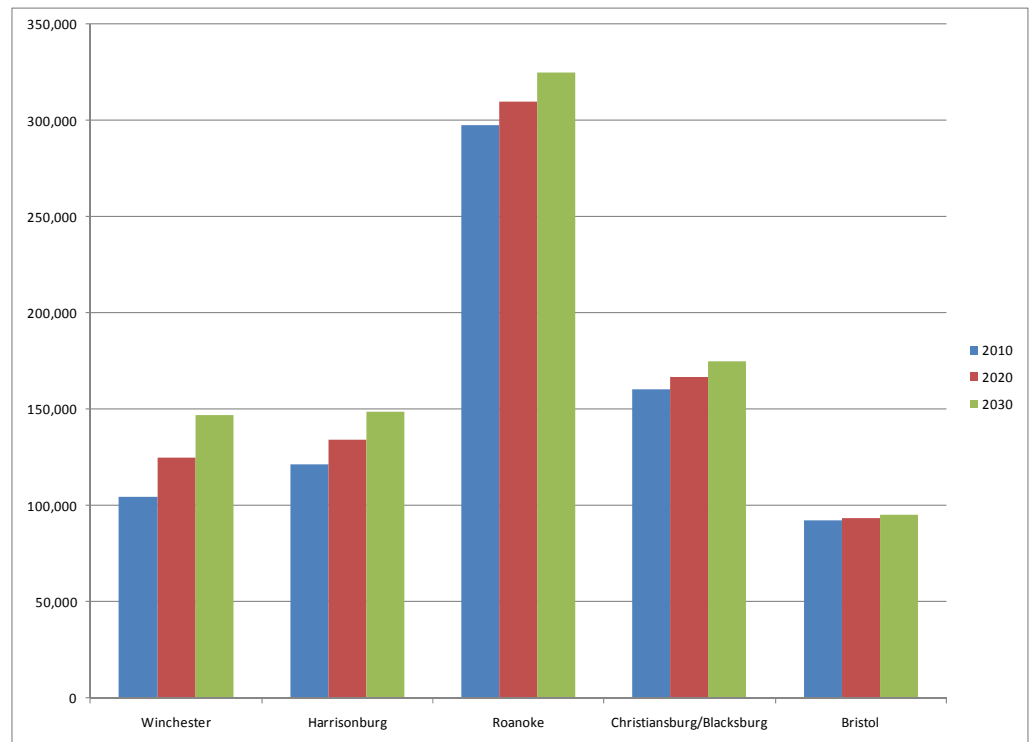


Figure 11 illustrates the population density projections for the year 2010 at the Planning District level along the Crescent Corridor, and Figure 12 illustrates the population density projections for the year 2035 and the increase in population density from 2010 to 2035. Table 3 shows the increases in population projections to 2035 for each Planning District the Crescent Corridor passes through.

Table 3 Population Projections to 2035

PDC	2010 Value		Midpoint 2035 Forecast		Percentage Increase		Annual Effective Growth Rate	
	VEC	NPA	VEC	NPA	VEC	NPA	VEC	NPA
Mount Rogers	189,461	190,050	196,549	204,663	3.7%	7.7%	0.1%	0.3%
New River Valley	175,336	170,200	196,909	199,490	12.3%	17.2%	0.5%	0.6%
Roanoke Valley-Allegheny	267,634	266,590	287,827	287,762	7.5%	7.9%	0.3%	0.3%
Central Shenandoah	281,272	277,850	341,310	330,428	21.3%	18.9%	0.8%	0.7%
Northern Shenandoah Valley	225,501	224,660	324,804	308,542	44.0%	37.3%	1.5%	1.3%
Statewide Totals	8,010,340	8,057,350	10,278,943	10,926,181	28.3%	35.6%	1.0%	1.2%

Source: Virginia Transportation Research Council

The increases in population between 2010 and 2035 for the Mount Rogers Planning District and Roanoke Valley-Allegheny Planning District are significantly less than the other three Planning Districts along the Crescent Corridor. The biggest population increase is expected to take place in the Northern Shenandoah Valley PDC, with a fairly substantial increase in population in the Central Shenandoah PDC as well. According to the VTRC Trends Report, between 76 and 81 percent of the total population increase in Virginia will take place in four Planning Districts: Northern Virginia, Richmond Regional, Hampton Roads, and George Washington. The Crescent Corridor does not pass through any of these Planning Districts. However, the percentage increase in population for the Northern Shenandoah Valley PDC is higher than the statewide average.

2.3.2 Levels of Service and Travel Times

Figures 13 (northern section) and 14 (southern section) show the existing levels of service (LOS) along the Crescent Corridor, with red areas indicating undesirable levels of service (i.e., LOS 'E' or LOS 'F'). All areas not marked in red are where acceptable levels of service (i.e., LOS 'A' through LOS 'D') currently exist. As seen in Figure 13, there are currently no areas of deficiency along the northern section, starting in the Winchester MPO, traveling through the Harrisonburg MPO, and south into Botetourt County. As seen in Figure 14, there are short areas of deficiency around the Roanoke MPO area, including one directly along I- 81. However, south of Roanoke, all areas seem to operate acceptably under existing conditions.

Figures 15 (northern section) and 16 (southern section) show the future levels of service along the Crescent Corridor, with the same color coding. As seen in Figure 15, traffic level of service is expected to degrade in the future, with areas of deficiency throughout the Winchester MPO and to the south, and through the Harrisonburg MPO and to the south through Augusta County and Staunton. Figure 16 shows that southern areas of the corridor will be mostly deficient due to increases in traffic from the Roanoke MPO down through the Blacksburg MPO and into the Bristol MPO, and most points between these areas.

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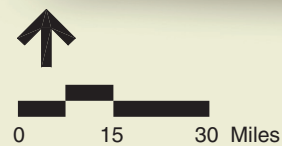
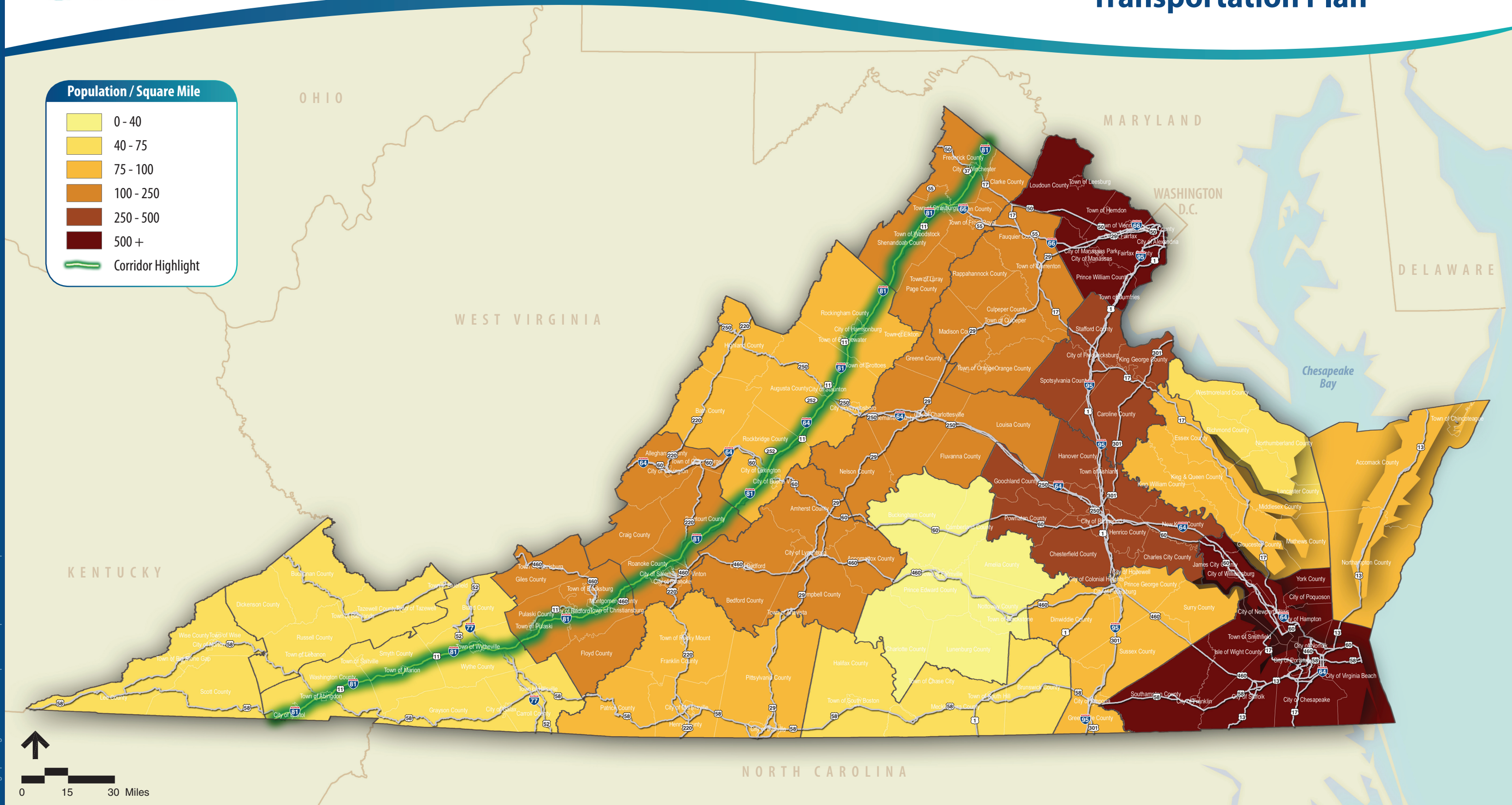


FIGURE 11
Population Density 2010 Projections - Crescent Corridor

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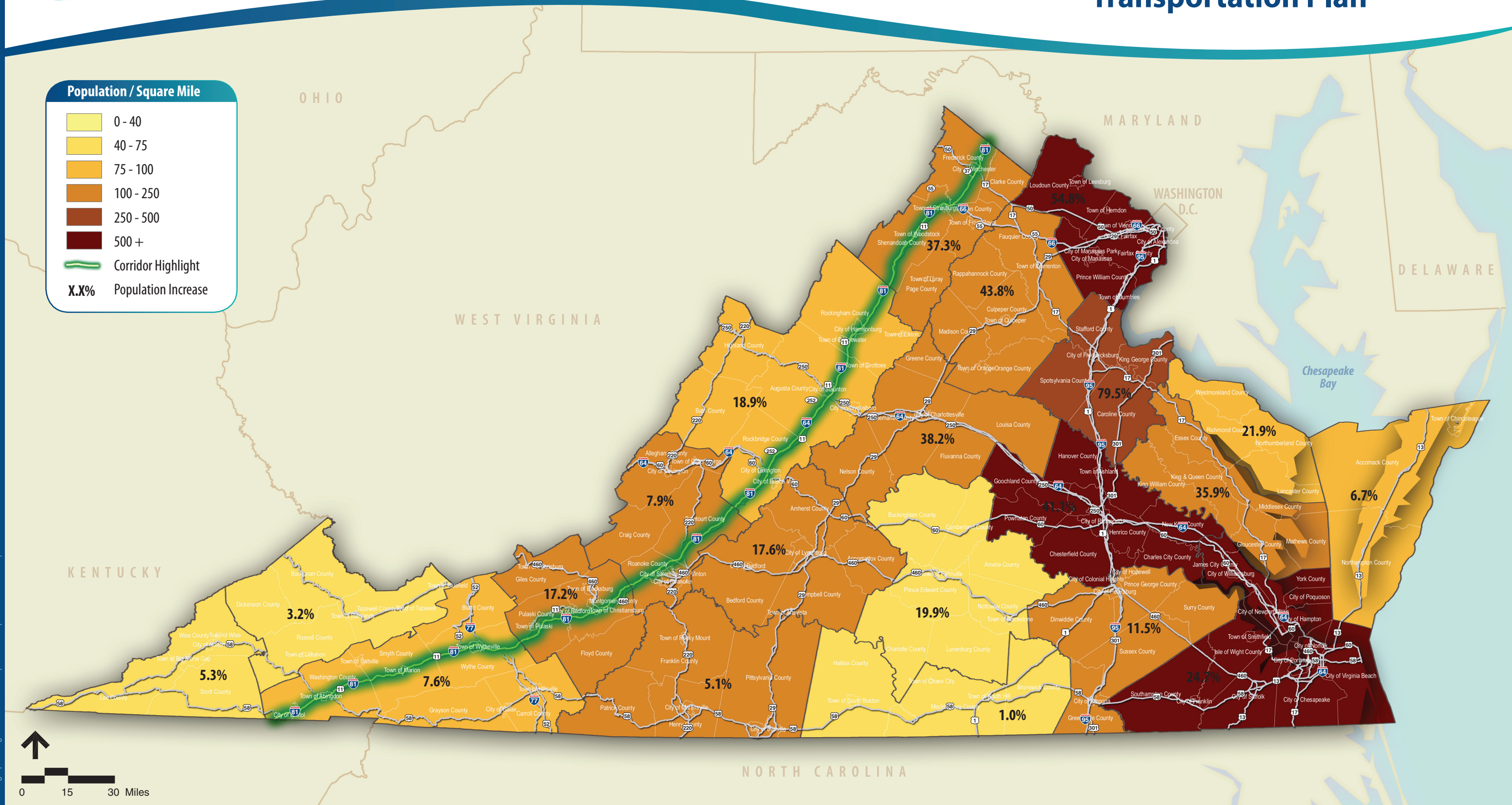


FIGURE 13
Crescent Corridor North Existing Conditions

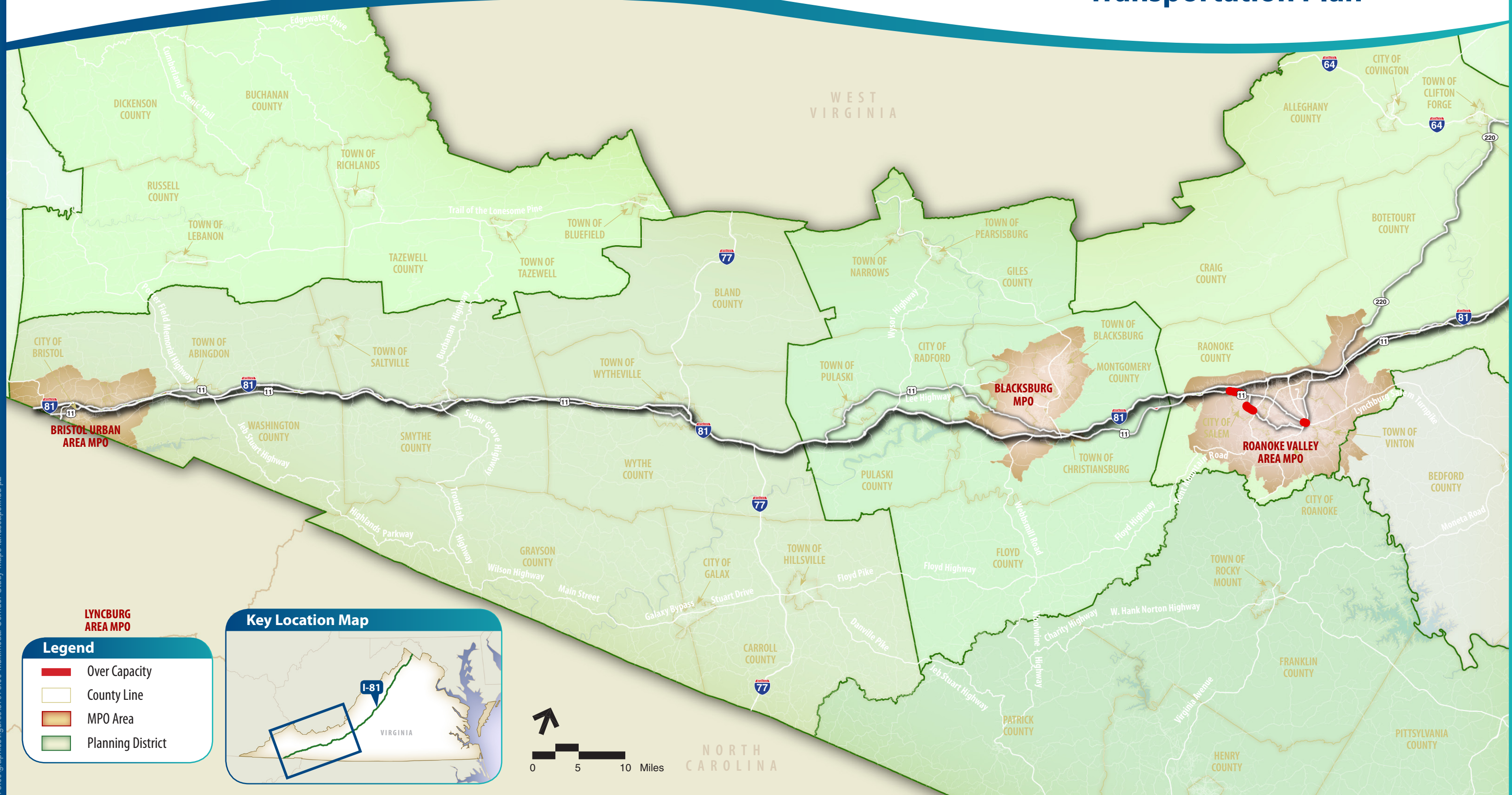


FIGURE 14
Crescent Corridor South Existing Conditions

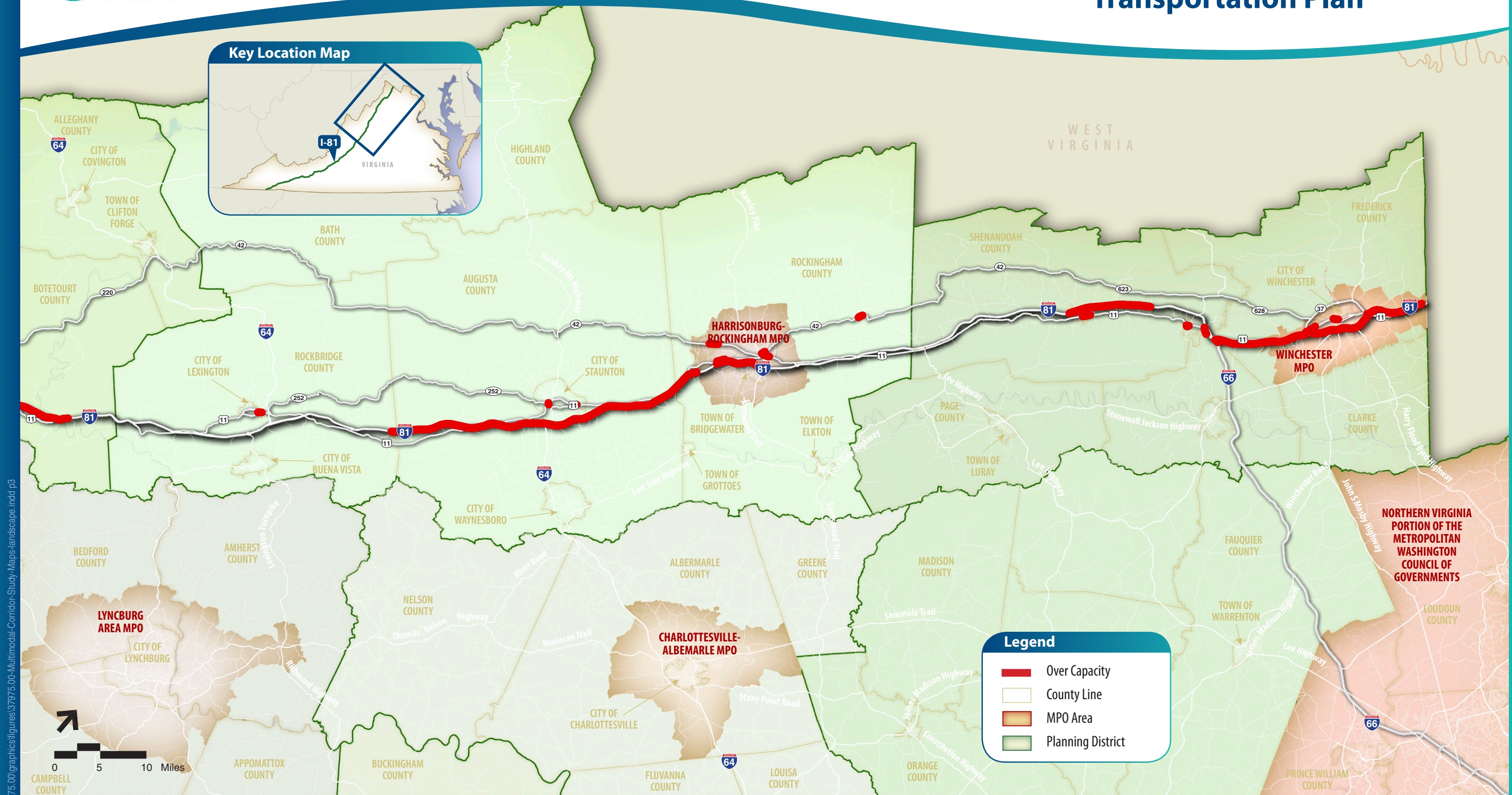
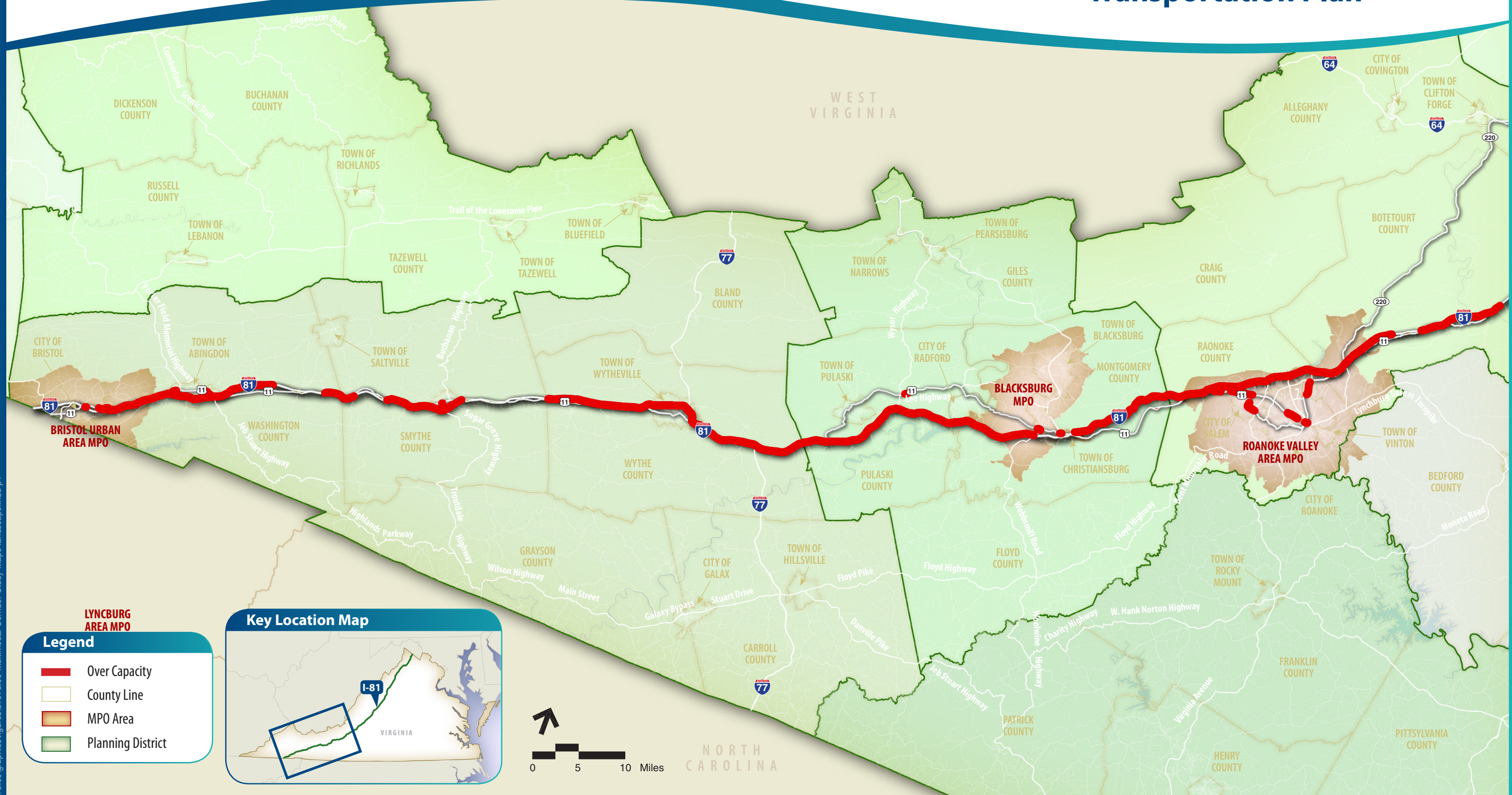


FIGURE 15
Crescent Corridor North Future Conditions

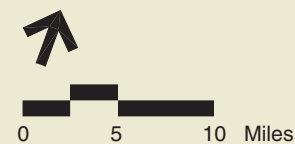
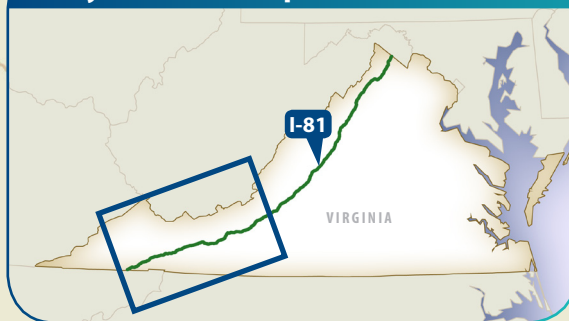


**LYNCBURG
AREA MPO**

Legend

- Over Capacity
- County Line
- MPO Area
- Planning District

Key Location Map



NORTH
CAROLINA

FIGURE 16
Crescent Corridor South Future Conditions

Table 4 details estimates of travel time now and in the future between the urban areas in the Crescent Corridor. Figure 17 shows the percentage increases in travel times between the urban areas.

Table 4 **Travel Times**

Travel Link	Distance (miles)	MPH Existing	MPH Future	Travel Time (min) Existing	Travel Time (min) Future	Increase in Travel Time (min)	Increase in Travel Time (%)
Winchester to Harrisonburg	68	60	52	68	78	10	15%
Harrisonburg to Staunton	27	60	42	27	39	12	43%
Staunton to Lexington	36	60	46	36	47	11	30%
Lexington to Roanoke	54	60	47	54	69	15	28%
Roanoke to Blacksburg	41	60	42	41	59	18	43%
Blacksburg to Bristol	122	60	44	122	166	44	36%

Travel times will increase by over forty percent in the future due to projected increases in traffic volumes and deteriorating levels of service. It is important that capacity be increased along the sections of roadway that will experience capacity issues.

The future levels of service take into account improvement projects along the roadway that are planned by the Virginia Department of Transportation. Even with planned expansions of the roadway and other programmed improvements, the highway facilities of the corridor are expected to significantly degrade by 2035. To combat this, localities, PDCs, and MPOs should identify the worst areas and plan for improvements to these areas. In addition, multimodal coordination should take place to attempt to remove some single-occupancy vehicles from the highway facilities. This could include increased line-haul transit and an increase in the number of park and ride facilities, which could increase carpooling. There have been multiple requests for an increase in park and ride spaces and lots along the corridor.

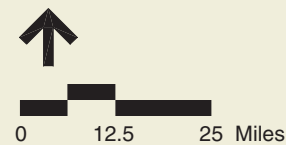
In addition, there is currently no passenger rail service along the corridor despite the presence of rail lines. Many localities have mentioned the need for passenger rail in the western part of Virginia, and with improvements to the existing rail infrastructure, this could be accommodated. The TransDominion Express (TDX) is planned in Virginia to provide passenger service between Bristol and Roanoke. (From there, TDX would connect to Lynchburg, Charlottesville, Richmond, and Washington, D.C.) As the worst areas of deficiency for passenger travel are along the southern portion of the corridor, especially between Roanoke and Bristol, this could assist in alleviating some of the strain. However, passenger rail service along the northern sections should be investigated as well.

Virginia Statewide Multimodal Transportation Plan

Legend

- I-81
- Railroad
- County Line
- MPO Area
- Planning District

Key Location Map



Blacksburg to Bristol

Distance:	122 Miles
Existing Speed:	60 MPH
Future Speed:	44 MPH
Existing Travel Time:	122 Minutes
Future Travel Time:	166 Minutes
Increase in Travel Time:	44 Minutes
Percentage Increase:	36%

Roanoke to Blacksburg

Distance:	41 Miles
Existing Speed:	60 MPH
Future Speed:	42 MPH
Existing Travel Time:	42 Minutes
Future Travel Time:	59 Minutes
Increase in Travel Time:	18 Minutes
Percentage Increase:	43%

Staunton to Lexington

Distance:	36 Miles
Existing Speed:	60 MPH
Future Speed:	46 MPH
Existing Travel Time:	36 Minutes
Future Travel Time:	47 Minutes
Increase in Travel Time:	11 Minutes
Percentage Increase:	30%

Winchester to Harrisonburg

Distance:	68 Miles
Existing Speed:	60 MPH
Future Speed:	52 MPH
Existing Travel Time:	68 Minutes
Future Travel Time:	78 Minutes
Increase in Travel Time:	10 Minutes
Percentage Increase:	15%

Lexington to Roanoke

Distance:	54 Miles
Existing Speed:	60 MPH
Future Speed:	47 MPH
Existing Travel Time:	54 Minutes
Future Travel Time:	69 Minutes
Increase in Travel Time:	15 Minutes
Percentage Increase:	28%

Harrisonburg to Staunton

Distance:	27 Miles
Existing Speed:	60 MPH
Future Speed:	42 MPH
Existing Travel Time:	27 Minutes
Future Travel Time:	39 Minutes
Increase in Travel Time:	12 Minutes
Percentage Increase:	43%

FIGURE 17
Crescent Corridor Percentage Increase in Travel Times

2.3.3 High-Crash Rate Areas

Figures 18 (northern section) and 19 (southern section) illustrate areas along the Crescent Corridor that have been identified as high-crash rate areas, according to Virginia Department of Transportation data. The southern section, south of Blacksburg, has fewer high crash-rate locations, though there are still multiple locations. Safety has been identified as a major issue along the Crescent Corridor by multiple sources, including many counties and the participants in the Regional Planning Forum held in the Spring of 2009. Figures 18 and 19 confirm this information, as there are multiple areas with high-crash rate statistics. Safety improvements should be a major priority along the corridor, as this would assist both through traffic and passengers traveling between the urban centers. In addition, safety improvements would assist freight traffic. As population and traffic increases, the number of crashes will increase unless measures are taken to reduce the crash rate.

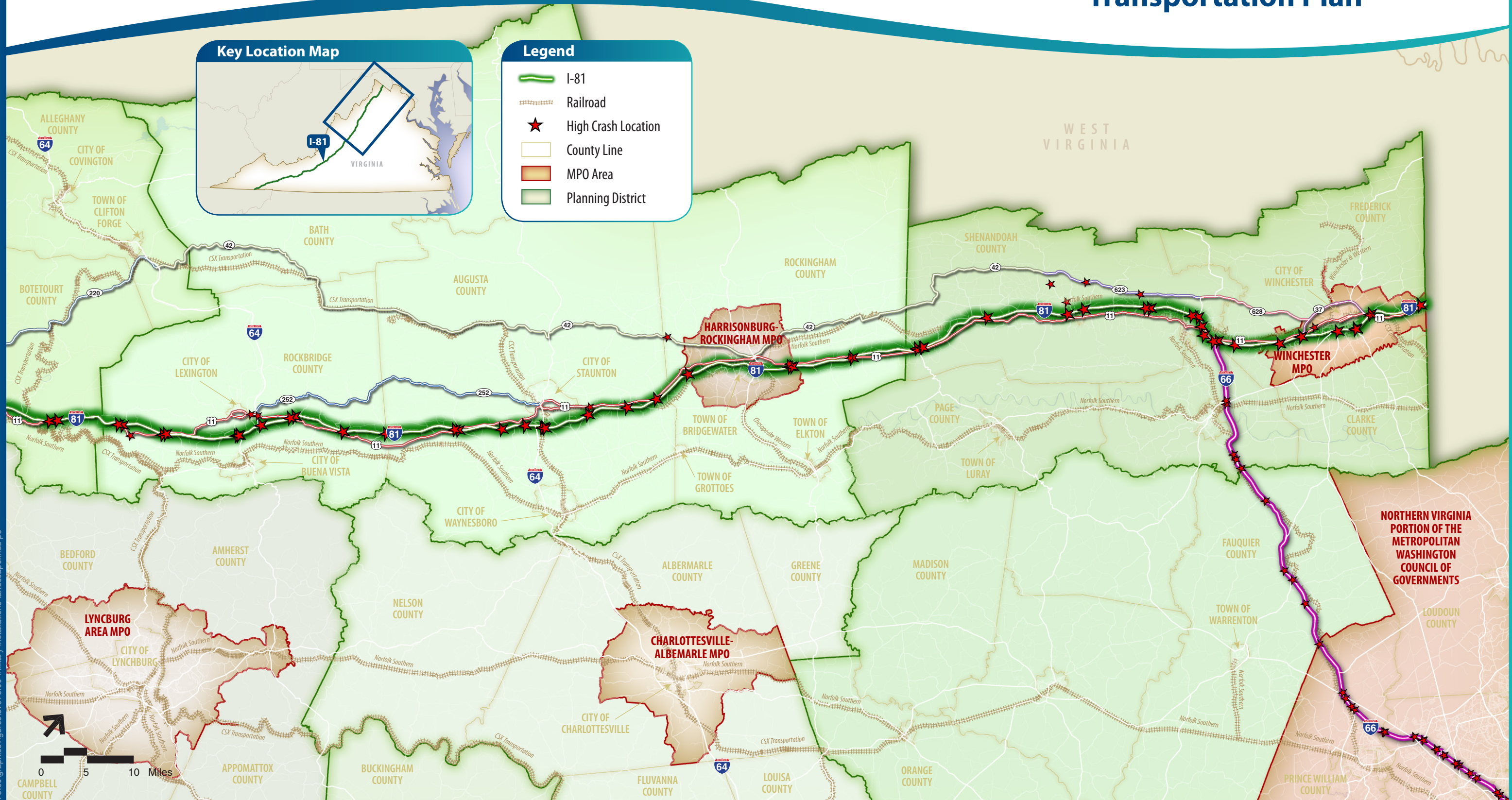


FIGURE 18

Crescent Corridor High-Crash Rate Locations - North

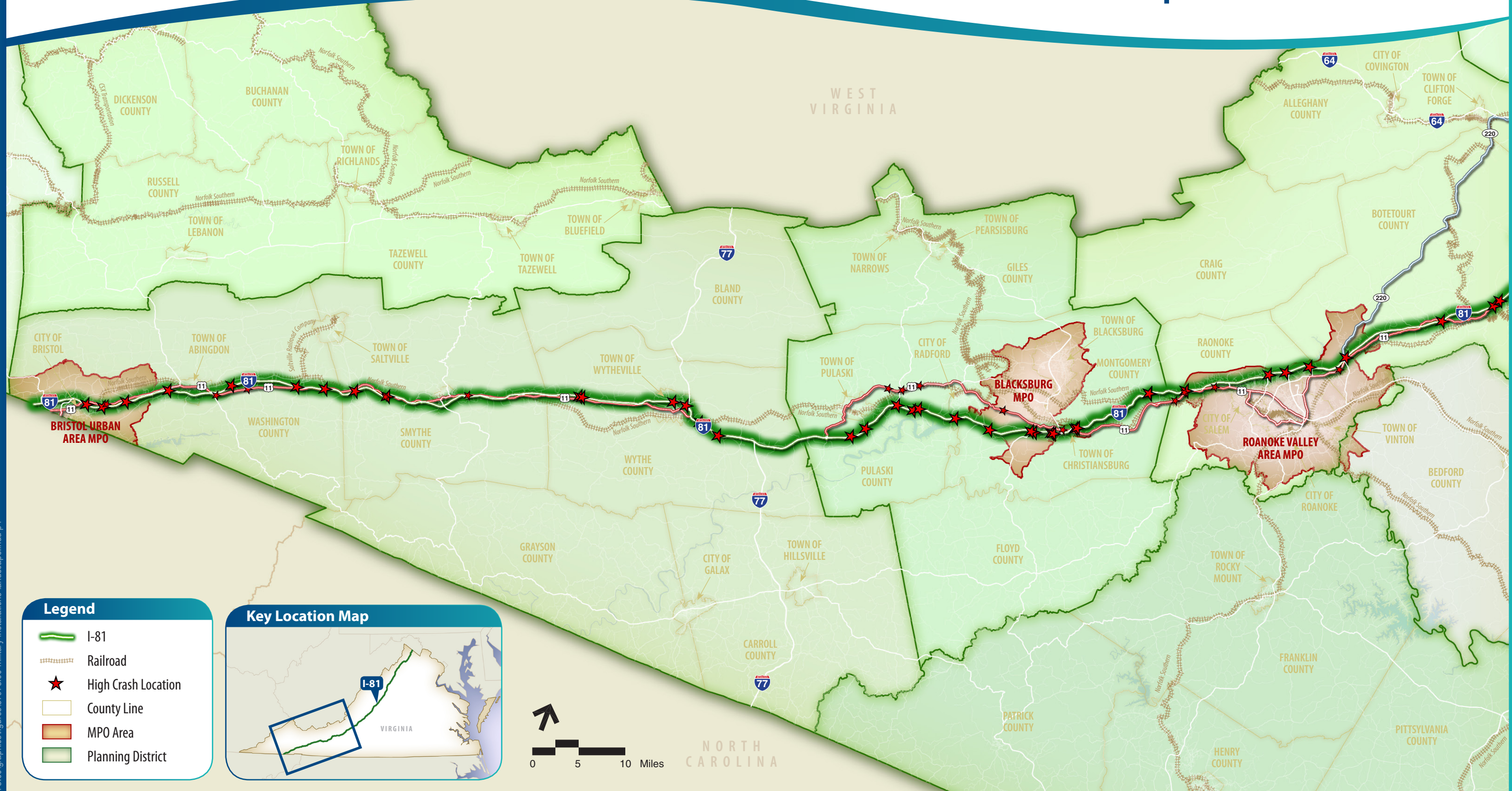


FIGURE 19
Crescent Corridor High-Crash Rate Locations - South

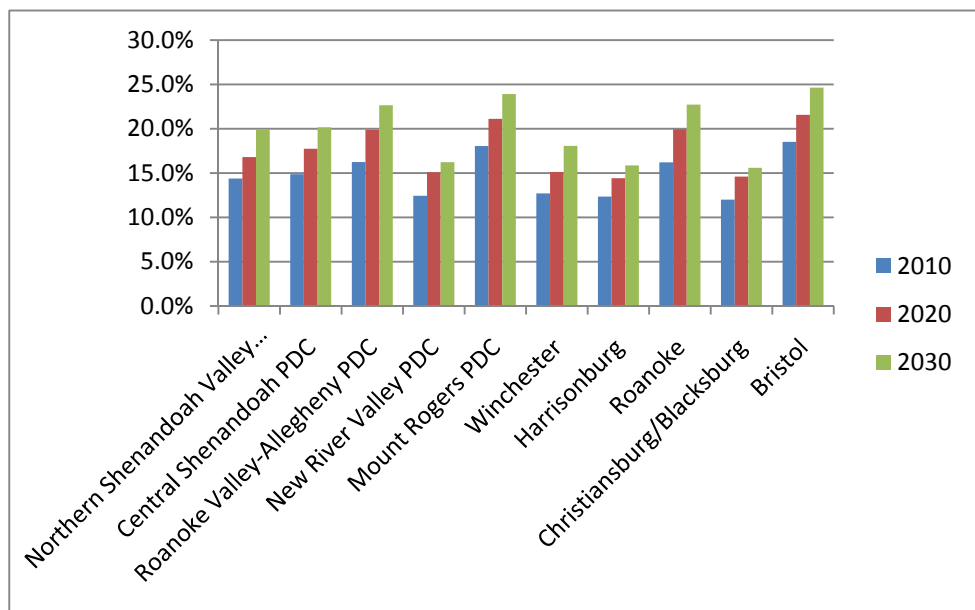
2.3.4 Corridor Mobility for Aging Population

In addition to general population projections, VTRC projected the ages of the population, broken down in five-year increments for a total of 18 categories. The percentage of population that is over age 65 was calculated based on these projections, and this information is available in Figure 20 for the years 2010, 2020, and 2030. The percentages were calculated for each Planning District along the Crescent Corridor, and for each of the five Metropolitan Planning Organizations.

As seen in this figure, the percentage of the population over age 65 is expected to increase in all Planning Districts and MPOs. The highest percentage of the population over age 65 is in the southern-most areas, such as Bristol and in and around Roanoke, where almost one-quarter of the population is expected to be over the 65 by the year 2030.

As the older population increases, it is likely that the population without access to a vehicle will increase as well, leading to a need for other modes of transportation, especially transit. While the larger urban areas, such as Winchester, Harrisonburg, Blacksburg, Roanoke, and Bristol all have local transit systems, this does not allow for residents of these areas to travel beyond the reaches of their individual areas. The Smartway Bus connects Roanoke and Blacksburg; the Valley Connector connects northern portions of the corridor with Northern Virginia and Washington, D.C.; and there is Greyhound service along the corridor, but currently, there are no other transit options other than some express services to various smaller educational institutions. As the population ages, increased demand response transit for the elderly and disabled should be investigated as a strategy to address this growing need.

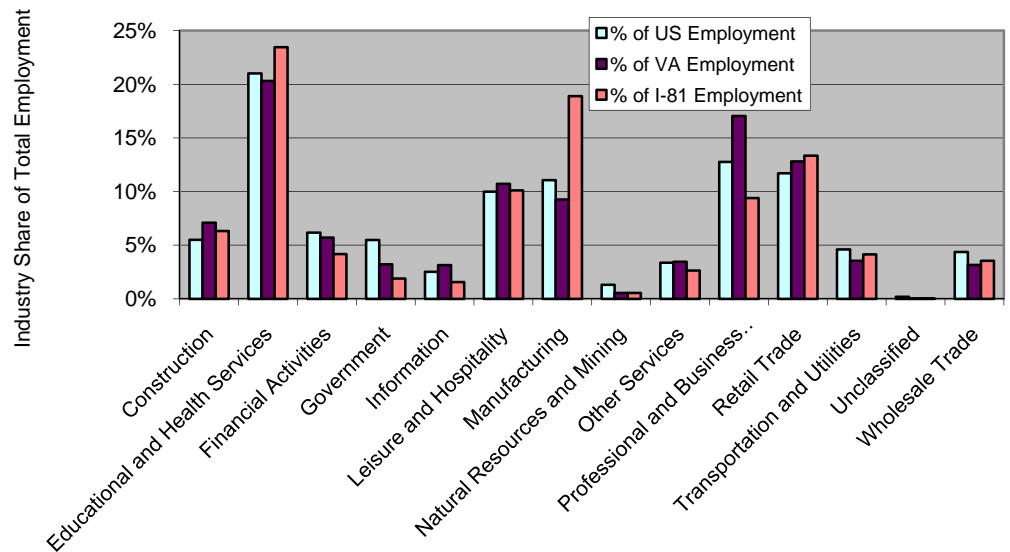
Figure 20 Percentage of Population over Age 65 (Projections)



2.4 Education and Tourism

The Crescent Corridor provides access to a number of educational institutions, including public state universities such as Virginia Polytechnic Institute and State University (Virginia Tech) and James Madison University, as well as many private institutions and community colleges. Figure 21 illustrates the locations of all the educational institutions within the Crescent Corridor. In addition, this figure shows the locations of other educational institutions in Virginia, illustrating that while there are some higher concentrations in Northern Virginia, Richmond, and Hampton Roads, the concentration along the Crescent Corridor is significant. Figure 21 illustrates the economic structure of the Crescent Corridor. Educational and health services represent almost one-quarter of the total employment along the corridor, emphasizing the focus on educational institutions, many of which have medical facilities affiliated with them. The percentage of employment in this sector is higher than the state average and higher than the national average.

Figure 21 Economic Structure of the Crescent Corridor



(Source: Statewide Freight Study)

Virginia Statewide Multimodal Transportation Plan

Legend

- I-81
- School Location
- Railroad
- County Line
- MPO Area
- Planning District

Key Location Map

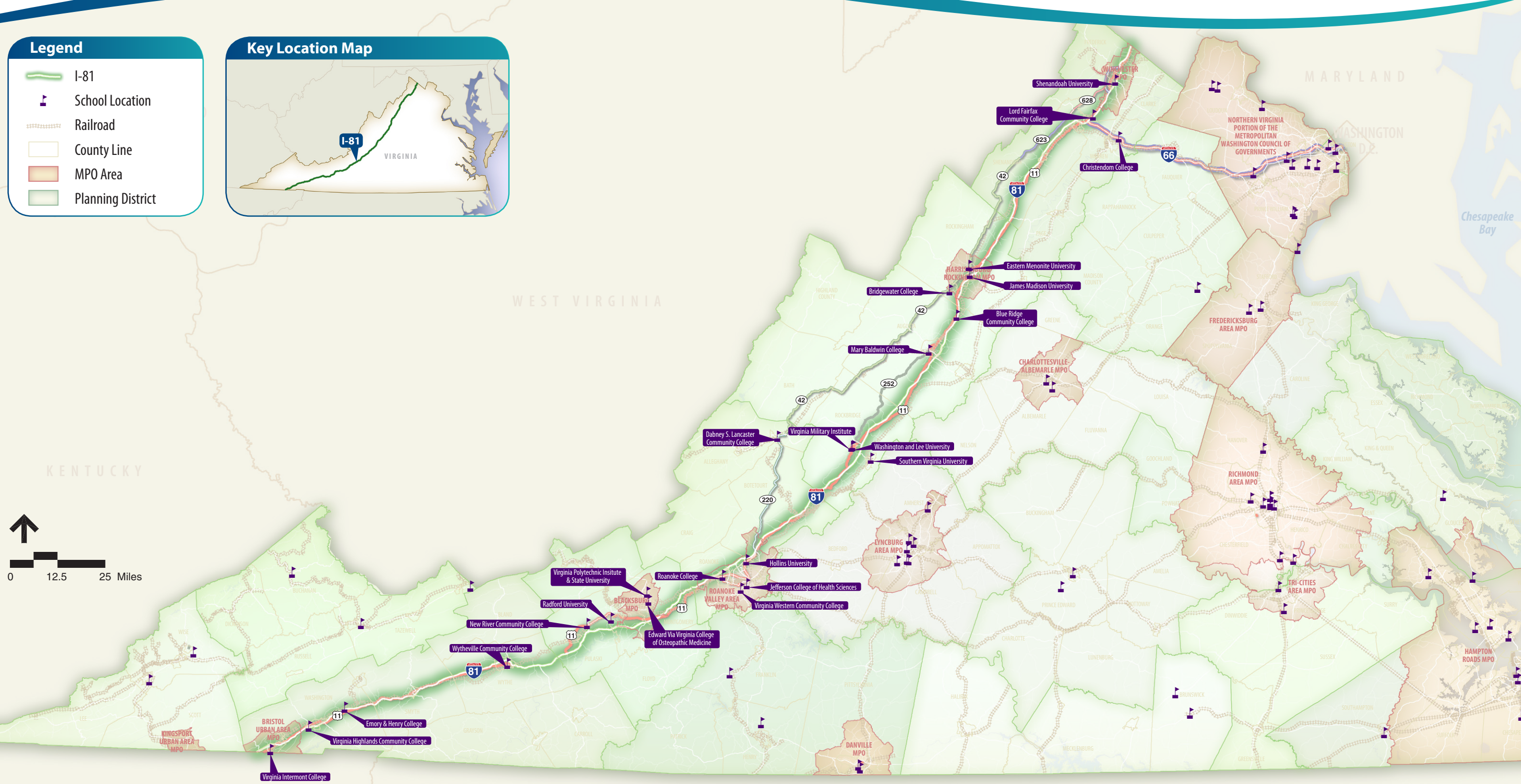


FIGURE 21
Crescent Corridor Educational Institutions

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Table 5 shows the enrollments of the educational institutions along the Crescent Corridor. A study produced by Chmura Economics & Analytics for the State Council of Higher Education for VA titled “Projecting Enrollment Demand for Virginia’s Higher Education Institutions, 2007-2016” produced these enrollment numbers. It also stated that between the years 2006-2016 there would be an increase of 16.4% in systemwide enrollment, including 9.8% at public four-year colleges, 23.2% at public two-year colleges, and 15.8% at private four-year colleges. These percentages were applied to derive enrollment figures for 2016. The institutions listed at the bottom are smaller institutions for which no figures were available. As the population of Virginia and the rest of the United States increases, demand for enrollments at these various educational institutions is likely to rise. Student drivers represent a significant percentage of the traffic along the highway facilities of the corridor. Safety and capacity will be the primary issues for this traffic in the future. Ways to alleviate capacity problems through transit, rail, and highway improvements and improved safety will assist in this function.

Table 5 **Crescent Corridor Educational Institutions**

College/University	Enrollment from CollegeBoard.com	SCHEV 2006 Enrollment	SCHEV 2008 Enrollment	2016 Estimate
Virginia Tech	30380	28470	30739	31260
James Madison University	18454	17393	18454	19097
Radford University	9157	9220	9157	10123
Lord Fairfax Community College	5867	5856	5867	7214
Virginia Western Community College	4665	8365	8532	10305
Blue Ridge Community College	4466	3979	4466	4902
Wytheville Community College	3304	2880	3363	3548
Shenandoah University	3091	3110	3511	3601
New River Community College	2889	4029	4889	4963
Virginia Highlands Community College	2650	2431	2650	2994
Washington and Lee University	2155	2079	2086	2407
Roanoke College	2021	1970	2021	2281
Mary Baldwin College	1738	1755	1738	2032
Bridgewater College	1514	1514	1514	1753
Virginia Military Institute	1428	1377	1428	1511
Eastern Mennonite University	1276	1324	1387	1533
Hollins University	1058	1061	1058	1228
Jefferson College of Health Sciences	995	922	995	1067
Emory & Henry College	978	1048	971	1213
Southern Virginia University	686	749	0	867
Virginia Intermont College	549	899	0	1041
Christendom College	474	451	474	522
Edward Via Virginia College of Osteopathic Medicine	N/A	N/A	N/A	N/A

Most of the corridor is in rural, historic areas, as I-81 travels along the Appalachian Mountains for its entire run through Virginia. There are rich natural resources and a

large agricultural base along most of the corridor, and inexpensive land is a characteristic of the area. Tourism is a major industry along the corridor, as it provides access to multiple state parks and state recreational areas as well as both the Shenandoah National Forest and the Washington National Forest. In addition, there are many historic sites nearby, most of them Civil War sites and battlefields.

Figure 23 illustrates the locations of the National Forests, National Parks, and State Parks, shown in various shades of green for all of Virginia. As seen in the figure, a large majority of these areas are within the Crescent Corridor, and much of the land use is park land and tourist areas. As the population of Virginia increases, it is likely that travel to these tourist facilities from points east, such as Northern Virginia, Richmond, and Charlottesville will increase, further increasing traffic along the corridor. Travel to these locations is likely to take place by car and not by other modes considering natural tourist areas are not readily accessible by transit or other modes. Capacity and safety will be an issue for this function, as it will be for the other major functions of the corridor.

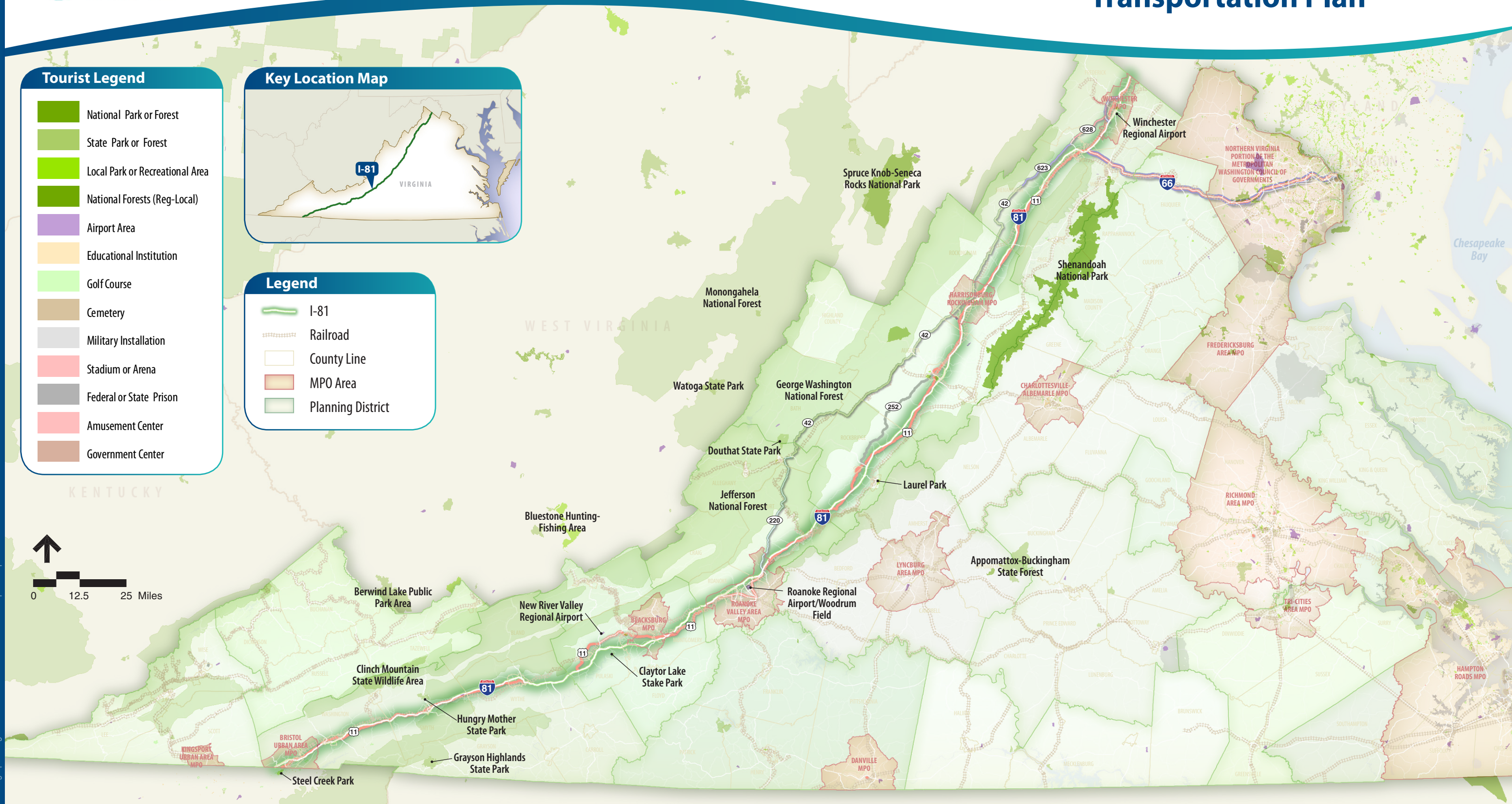


FIGURE 22
Crescent Corridor Tourist Areas Map

3

Corridor Strategies

This section discusses the recommended improvement strategies for the Crescent Corridor to improve safety, mobility, and capacity along the corridor. The functions of the Crescent Corridor are listed below, and Figure 23 presents a matrix that shows how the recommended corridor strategies relate to each corridor function.

Functions of the Crescent Corridor

- *Freight corridor*
- *Passenger link between urban centers*
- *Through travel*
- *Education*
- *Tourism*

- Strategies were formulated based on trends, system performance, issues/challenges, elements of the VDOT Six-Year Program, the Constrained Long-Range Plans for each Metropolitan Planning Organization, visions and plans for the various Planning Districts, and any available Comprehensive Plan visions and strategies for each county and jurisdiction within each corridor. A Regional Planning Forum was held in the spring of 2009 with transportation representatives from across Virginia, including VDOT, Planning Districts and MPOs, transit agencies, the Virginia Airport Authority, the Port of Virginia, and other stakeholders in the Virginia transportation system. Public meetings were held in four locations in June and July of 2009 (Northern Virginia, Richmond, Hampton Roads, and Roanoke). Corridor deficiencies and what could be done to alleviate these deficiencies were discussed, with this information playing a major role in the formulation of these strategies. These strategies are part of a continuing planning process and are designed to be used as a guide for future transportation plans along the corridor within Virginia. They are not the explicit policy of the Commonwealth Transportation Board (CTB), though they are designed to assist the CTB, state and local transportation agencies, and local planning organizations in their planning efforts along the corridor. Specific corridor strategies and improvement recommendations will ultimately be developed as part of subsequent planning analyses at the State and local level.

Figure 23 - Crescent Corridor Strategies vs. Functions Matrix

Strategies	Functions				
	Freight Corridor	Passenger Link	Through Travel	Education	Tourism
Increase capacity for both passengers and freight by expanding freight rail service and adding capacity to allow for passenger rail service.	●	●	○	⊙	⊙
Support expanded freight capacity by expanding intermodal facilities.	●	○	○	⊙	⊙
Increase highway capacity of I-81 in strategic locations by improving interchanges, construction of new interchanges at strategic locations, and/or by roadway widening.	●	●	●	●	●
Improve safety by addressing high-crash rate areas and making necessary improvements.	●	●	●	●	●
Improve safety and increase capacity by adding truck-climbing lanes in strategic locations.	●	●	●	●	●
Increase park and ride capacity by expanding existing lots and adding new facilities at strategic locations.		●		⊙	
Improve transit in rural areas by expanding existing fixed-route services and offering increased demand response services and services for the elderly and disabled.		○			⊙
Improve air passenger service by increasing commercial service where market forces allow at existing airports and improving ground access to air facilities.		○	⊙	⊙	⊙
Implement Intelligent Transportation Systems (ITS) to increase system efficiency and safety.	●	●	●	●	●

● Strong Correlation ○ Medium Correlation ⊙ Some Correlation

3.1 Strategies for Crescent Corridor

Strategy: Increase capacity for both passengers and freight by expanding freight rail service and adding capacity to allow for passenger rail service.

The Virginia Statewide Rail Plan calls for increased capacity and improvements to the Norfolk Southern Crescent Corridor, the western line of which runs along the Crescent Corridor. This would move more freight to rail lines and thereby shift it from trucks along the highway facilities. Improvements include expansion of single tracks to double tracks, adding and expanding passing sidings (allowing longer, modern trains to pass each other), curve realignments to improve speed, connection improvements, additional track switches, and additional signal systems. All of these proposed improvements would add to the freight capacity of the rail system along this corridor.

There is currently no passenger rail service along the Crescent Corridor, despite the presence of Norfolk Southern Crescent Corridor rail lines. Passenger rail service does exist along the eastern line of the Crescent Corridor, which runs along U.S. Route 29 to the east of I-81. Various counties, cities, and MPOs have requested passenger rail service in this corridor, and the Regional Planning Forum also recognized the lack of passenger rail as a deficiency in this corridor.

The TransDominion Express (TDX) is a proposed passenger rail service that will run on existing tracks throughout Virginia. Phase I includes service between Lynchburg and Washington, D.C., and this service started in October 2009. If ridership and revenue goals are met and additional funding is identified, the Commonwealth will advance the next phases of the project. This will include expansion to Roanoke and Bristol, along the Crescent Corridor, as well as necessary rail infrastructure improvements to support this initiative. TDX, if successful, will address some of the need for passenger rail; however, it will need to be determined whether there is demand for passenger rail service between Roanoke and Winchester.

The addition of passenger rail service along the Crescent Corridor will help to alleviate highway traffic congestion, thereby assisting in most of the corridor's functions. The TransDominion Railroad would link Bristol, Blacksburg, and Roanoke and assist with through travel to Richmond and Washington, D.C. Educational facilities and tourist areas would also be served. Additional rail service north of Roanoke would further assist in linking urban areas and offering another modal option to reach educational institutions and tourist areas. If passenger rail in Virginia was linked through Maryland and Tennessee, travel through the entire state for passengers could be accomplished without driving along any of the highway facilities of the corridor.

Strategy: Support expanded freight capacity by expanding intermodal facilities.

With the expansion of freight rail capacity along the Crescent Corridor, intermodal facilities will need to be expanded. These are facilities that transfer freight, usually containers, from one mode to another, such as from rail to truck. The Virginia Inland Port is the largest intermodal facility in Virginia, and there are plans to construct another intermodal facility near Roanoke as part of the rail initiatives along Norfolk Southern's Heartland Corridor. In addition, there are over 50 private intermodal facilities in Virginia, including some along the Crescent Corridor. These facilities will need to be able to handle the amount of freight coming into and out of Virginia and traveling throughout the state on expanded rail facilities.

Strategy: Increase the highway capacity of I-81 in strategic locations by improving interchanges, construction of new interchanges at strategic locations, and/or by roadway widening.

There are plans for roadway expansion near Winchester to help address this strategy, and there are additional plans or visions for new interchanges or interchange improvements along I-81. There are preliminary engineering studies underway for expansion to 8 lanes in various locations, as identified by VDOT in the Six-Year Program. In addition, U.S. 11 has been identified as needing capacity improvements at certain locations, as it provides an alternate route to the interstate. There are some areas where U.S. 11 is only two to three lanes with bridges that need upgrading for truck traffic. Accordingly, trucks cannot re-route to these sections in case of an incident along I-81 due to a lack of adequate truck capacity (i.e., bridges that cannot handle large trucks, geometric difficulties, and pavement issues).

In addition, the overlap area between I-77 and I-81 near Wytheville has been identified as a location with capacity issues. There are multiple options to alleviate this problem, including re-routing I-77 around Wytheville. The I-81 Corridor Improvement Study is currently underway to identify appropriate measures to alleviate the capacity issues at this problem location.

VDOT, as well as the various MPOs and PDCs along the corridor, should continue to identify locations with capacity issues and to propose improvements to alleviate these issues through interchange improvements, additional interchange construction, and possible expansion of the roadway in strategic locations. Many of these locations have already been identified and are part of the various plans and visions for the corridor. Increasing highway capacity assists with freight traffic as well as passenger traffic, such as educational, tourism, and through traffic.

Strategy: Improve safety by addressing high-crash rate areas and making necessary improvements.

County Comprehensive Plans and MPO Plans identify the need to address high-crash rate areas and make safety improvements along the Crescent Corridor. In addition, the Regional Planning Forum identified multiple high crash rate areas along the corridor that need to be addressed. These areas should be further identified, not only along the interstate facility, but along the other roadway facilities, such as U.S. 11, and at the interchange ramps and junction points. Roadway safety audits should be completed for these areas, and improvements should be

recommended and implemented to ensure better safety. Intelligent Transportation Systems (ITS) technologies could also be employed to improve safety for trucks and for all traffic within the Crescent Corridor. Improved safety will enhance travel for both passengers and freight, thereby supporting all functions of the corridor.

Strategy: Improve safety and increase capacity along I-81 by adding truck-climbing lanes in strategic locations.

I-81 travels through mountainous terrain at many points along its length in Virginia. The VDOT Six-Year Program includes two locations for truck climbing lanes already, and other locations where trucks slow the flow of traffic and create safety concerns should be identified and improved with these additional lanes. In addition, the Regional Planning Forum identified a long section of I-81 that would be improved by building these lanes in strategic locations. This strategy will improve passenger traffic at these locations, allowing improved access to the urban centers, educational institutions, and tourist areas, as well as improving the flow of through traffic at these locations.

Strategy: Increase park and ride capacity by expanding existing lots and adding new facilities at strategic locations.

The relative lack of park and ride facilities along the Crescent Corridor has been identified as a weakness of the corridor. While some lots exist along the corridor, especially in the southern portion of the corridor, there is a need for more lot capacity. The Regional Planning Forum identified park and ride demand as a future issue and identified multiple locations where park and ride lots are needed, especially near the Roanoke and Winchester areas. Connections to line-haul transit options, such as the Valley Connector in the north and the Smartway Bus in the south should be provided at any new lots. Coordination between local communities and transit providers should be included in the identification of areas where additional park and ride lots should be constructed, as well as which existing park and ride lots can and should be expanded. Multimodal accessibility to the urban centers would be increased, and transit providers could increase connections to educational and recreational facilities.

Strategy: Improve transit in rural areas by expanding existing fixed-route services and offering increased demand response services and services for the elderly and disabled.

A general weakness in rural areas throughout Virginia is the lack of transit options. While some areas have some demand response services and services to transport elderly and disabled citizens, these services should be expanded to ensure that access to medical centers and to towns and cities are available to everyone who does not drive or own a car. With the over age 65 population of Virginia expected to increase substantially, investment in additional transit in rural areas will be necessary. There are rural areas along the Crescent Corridor and in western Virginia that are currently not served by any transit providers, including demand response providers, and this should be remedied. This would assist these residents in getting to urban areas and to medical and recreational facilities.

Strategy: Improve air passenger service by increasing commercial service where market forces allow at existing airports and improving ground access to air facilities.

A major concern along the Crescent Corridor is the lack of commercial air service in this part of the state, as identified by multiple Comprehensive Plans, as well as at the Regional Planning Forum. The Hampton Roads area, Northern Virginia, and Richmond all have airports with extensive commercial service available. None of these are readily accessible from the Crescent Corridor, except in the northern section, where Dulles Airport can be accessed via the I-66 corridor. The expansion of commercial air service at Roanoke Regional Airport and possibly at Shenandoah Valley Regional Airport should be investigated.

The demand for increased air service in western Virginia appears to exist, and more air travel options for the residents and businesses of these areas should be investigated. However, market forces are what drive increased commercial service. The attractiveness of using Roanoke Regional Airport to connect to larger airports should be upgraded to discourage air passengers from driving long distances to airports in other states (i.e., Tri-Cities Airport in Bristol, TN and Triad Piedmont Airport in Greensboro, NC) or to Dulles International Airport, Reagan National Airport, or Richmond International Airport. This could include better ground access to airport facilities along the corridor, including at Roanoke Regional Airport and Shenandoah Valley Regional Airport and faster access along the major corridors, such as I-81 to the major airports. In addition, ground access to general aviation facilities should be improved.

Strategy: Implement Intelligent Transportation Systems (ITS) to increase system efficiency and improve safety.

Intelligent Transportation Systems would include multiple options, including dynamic message signs along the highway to warn drivers of incidents. When a major accident occurs along I-81, there are typically no warnings for drivers unless ITS is in place. If the crash blocks both lanes going in either direction, traffic could end up being backed up for many miles, and drivers will have no way to avoid the backup and the crash cleanup. Currently, ITS exists along I-81 for incident management and this can direct traffic to U.S. 11 or other roadways many miles ahead of a crash, which saves many hours of time for passengers as well as trucks. However, there are areas that are lacking this ITS infrastructure, and these should be upgraded.

In addition, vehicle detection and CCTV could be employed along I-81. Either of these will aid with faster incident management. Also, in-vehicle detection systems such as IntelliDrive could be employed, especially in large trucks that frequently travel the I-81 corridor, which could help to avoid incidents. There are also initiatives for ITS measures to be taken to assist truckers, directing them toward parking areas, alerting them to weather issues, and directing them toward roadside amenities. Other ITS measures could improve capacity and safety along the corridor, and through travel as well as travel to and from educational institutions, tourist areas, and urban centers could be improved during incidents along the roadway. In

addition to highway ITS, the various air facilities along the I-81 corridor should consider upgrading available navigational aid systems.

3.2 Strategies vs. VTrans2035 Goals

The recommended strategies relate to the seven goals of VTrans2035, and Figure 24 illustrates a matrix showing this relationship.

- **Goal 1: Safety and Security – Provide a safe and secure transportation system.** Many of the strategies relate to the safety and security of the roadway, especially the strategy that deals directly with improving safety throughout the corridor. Increasing rail capacity will lessen the truck load along the Crescent Corridor, which will improve safety, as will improved Intelligent Transportation Systems. More demand response transit service for the elderly and disabled improves their travel safety and security as well.
- **Goal 2: System Maintenance and Preservation – Preserve and maintain the condition of the existing transportation system.** Most of the strategies help to achieve this goal, as the existing transportation system is maintained and preserved, and in many cases, improved. When capacity is increased along the rail lines or along the highway facilities, park and ride lots constructed, safety improved, and access to airports improved, the existing transportation facilities are maintained and preserved along the Crescent Corridor.
- **Goal 3: Mobility, Connectivity, and Accessibility – Facilitate the easy movement of people and goods, improve interconnectivity of regions and activity centers, and provide access to different modes of transportation.** All of the strategies promote increased mobility, connectivity, and accessibility. Any increase in capacity along the roadway, whether it is along the highway facilities, the rail facilities, or an increase in transit capacity assists in achieving this goal. Improved ITS, improved airport access, and an increase in safety all promote this goal.
- **Goal 4: Environmental Stewardship – Protect the environment and improve the quality of life for Virginians.** Increases in rail capacity, which will remove a percentage of large trucks from the roadway, as well as expansion of park and ride lots and increases in transit capacity help to achieve the goal of environmental stewardship. In addition, any increase in roadway capacity that minimizes the amount of time vehicles are on the roadway, leading to fewer emissions, helps to achieve this goal.
- **Goal 5: Economic Vitality – Provide a transportation system that supports economic prosperity.** There is the potential for further economic development along the Crescent Corridor, and an increase in rail service as well as increases in rural transit could potentially spur development in the rural areas of the corridor. The construction of park and ride lots in less developed areas of the corridor also could assist in this goal. Additional freight rail capacity could

potentially lead to an increase in freight movement along the corridor and an increase in distribution centers and warehouses.

- **Goal 6: Coordination of Transportation and Land Use – Facilitate the effective coordination of transportation and land use to promote livable communities.** Widening, interchange modifications, and interchange construction should be accomplished in coordination with land use decisions in the areas they are constructed, especially since a large portion of new development along the Crescent Corridor is expected to take place near interchanges at the request of several counties. In addition, any new park and ride lots constructed should be constructed by coordinating with land use decisions in the area, and any increase in transit, including demand response services, should also be coordinated with land use. Also, local planning efforts should protect airspace and ensure that airports are not compromised by encroachment of incompatible land uses.

Figure 24 - Crescent Corridor Strategies vs. Goals Matrix

Strategies	Goals					
	Safety and Security	System Maintenance and Preservation	Mobility, Connectivity, and Accessibility	Environmental Stewardship	Economic Vitality	Coordination of Transportation and Land Use
Increase capacity for both passengers and freight by expanding freight rail service and adding capacity to allow for passenger rail service.	○	●	●	●	○	⊙
Support expanded freight capacity by expanding intermodal facilities.	○	●	●	●	●	⊙
Increase highway capacity of I-81 in strategic locations by improving interchanges, construction of new interchanges at strategic locations, and/or by roadway widening.	●	●	●	○		⊙
Improve safety by addressing high-crash rate areas and making necessary improvements.	●	●	○			
Improve safety and increase capacity by adding truck-climbing lanes in strategic locations.	●	●	○			
Increase park and ride capacity by expanding existing lots and adding new facilities at strategic locations.	⊙	○	●	●	⊙	○
Improve transit in rural areas by expanding existing fixed-route services and offering increased demand response services and services for the elderly and disabled.	○	○	●	○	⊙	⊙
Improve air passenger service by increasing commercial service where market forces allow at existing airports and improving ground access to air facilities.	⊙	○	●	⊙	●	
Implement Intelligent Transportation Systems (ITS) to increase system efficiency and safety.	●	●	●	○		

● Strong Correlation ○ Medium Correlation ⊙ Some Correlation