VMTP 2025 Needs Assessment
Regional Needs Profile

Legend:
- Airports
- P Park and Ride Lots
- Amtrak Stations
- Railroads

Roanoke Region

December 2015

1. NEEDS ASSESSMENT PURPOSE

The VMTP 2025 Needs Assessment framework is based on two principal objectives underlying transportation policy to enhance economic competitiveness. Based on the VTrans2040 Vision and policy directives from the Governor's office, the VMTP 2025 Needs Assessment is based on two principal objectives of transportation policy with the aim of enhancing economic competitiveness. These are 1) to attract and retain the 21st century workforce, and 2) to support goods movement for Virginia businesses.

This document is one portion of the overall Needs Assessment for regional Networks that deals with the Needs Assessment for the Hampton Roads Region. There is a separate document entitled "VMTP 2025 Needs Assessment: Regional Networks Introduction," that provides an overall introduction into the background and methodology of the Needs Assessments. In this document, details are provided on the 2025 Needs development process, as well as the economic factors shaping regional Transportation Needs. This introductory document provides a foundation for the regional needs described here. The focus of this Transportation Needs Assessment is to identify the Transportation Needs that are part of the Roanoke Regional Network, and that would support regional industries and workforces.

Defining Transportation Needs
Transportation Needs, as considered in the 2025 Needs Assessment, are defined as the gap between the transportation system in place <u>currently</u> that serves the current industries in a region, and the <u>future</u> transportation system needed to serve the desired future economy in the region. The gap between the transportation needs and economic conditions is the basis for the findings in this report. The following sections outline the Roanoke Regional Economic Profile, regional Transportation Profile, and regional Transportation Needs profiles.

Defining a Regional Network

This portion of the VMTP 2025 Needs Assessment is for a <u>Regional Network.</u> For the purposes of the VMTP Needs Assessment, the final determination of Regional Networks will be developed as part of the outreach process in working with each region, as explained in the Regional Network Needs Assessment Introduction.

The Roanoke Region, as defined in the needs analysis, includes Botetourt County, Roanoke County, the City of Roanoke, and the City of Salem.

2. Economic Profile

A. Introduction

The trends analysis conducted as part of the VTrans2040 Vision Plan showed strong indications that future economic success for both states and regions will hinge on attracting and retaining increasingly scarce talented workers, particularly from among the well-educated Millennials. In addition, future goods movements will be critical to supporting Virginia's current and emerging businesses. A key part of understanding emerging transportation needs statewide is understanding the current and future economic conditions in different parts of the state. The Needs Assessment therefore focuses on understanding the major economic dynamics of each region and using that understanding to shape Transportation Needs.

The Study Team used available data from state and national sources, as well as input from the Roanoke Region stakeholders to identify an overall current economic profile for the region. The components of the current economic profiles layers together demographic and economic characteristics of the region. The Regional Profile incorporates the following baseline data for each region:

- Demographic Characteristics
- Top Industries by Employment, Output and Location Quotient
- Workforce Characteristics
- Top Employers
- Activity Centers, characteristics and travel markets (as defined by existing centers of employment as modified by input from stakeholders in each region)

B. Demographics

At a regional level, research regarding basic demographics was analyzed as a foundation for understanding regional economic dynamics. The economic and demographic data analyzed in this report support insights regarding which workforce and/or key age groups are currently present in the region. This information is important to inform potential types of investments to attract and retain the desired workforce.

Statewide Demographics

According to Woods & Poole, the current population in the state of Virginia is 8,185,867. By the year 2025, the Commonwealth of Virginia's population is projected to increase by between 1 million, to 1.5 million people. Statewide per-capita incomes are expected to rise 21%, from $44,765 to $54,226.

Table 1: Statewide Population Projections.

Current Population (2012)	Weldon Cooper Projection (2025)	Woods &Poole Projection (2025)
8,185,867	9,203,977	9,740,553

Sources: Weldon Cooper Center for Public Service, Demographic Research Group, Intercensal Estimates for Virginia, Counties and Cities: 2010-2012, and Woods and Poole Economics, Incorporated, 2014 State Profile District of Columbia, Maryland, and Virginia. Washington DC

Regional Demographics

As evident in Table 2, substantial population growth is projected for the Roanoke Region. Projections range from 25,000 to 40,000 new residents in the region by the year 2025. (Refer to Table 2).

Table 2: Roanoke Region Population Projections.

Current Population (2012)	Weldon Cooper Projection (2025)	Woods &Poole Projection (2025)
332,119	356,341	369,958

Sources: Weldon Cooper Center for Public Service, Demographic Research Group, Intercensal Estimates for Virginia, Counties and Cities: 2010-2012, and Woods and Poole Economics, Incorporated, 2014 State Profile District of Columbia, Maryland, and Virginia. Washington DC

Table 3 provides a closer look at population projections by jurisdiction within the Roanoke Region.

Table 3: County and City Population Projections.

Current Population (2012)	Weldon Cooper Projection (2025)	Woods &Poole Projection (2025)
Botetourt County	33,154	33,154
Roanoke County	92,901	92,901
City of Roanoke	97,469	97,469
City of Salem	24,970	24,970

Source: Weldon Cooper Center for Public Service, Demographic Research Group, Intercensal Estimates for Virginia, Counties and Cities: 2010-2012

According to the Woods and & Poole 2014 State Profile, per-capita income for the region is expected to rise 19% (slightly less than the state average of 21%) from $37,474 to $44,490. Population growth is also projected to be accompanied by a demographic shift, with a higher percentage of the population over the age of 60.
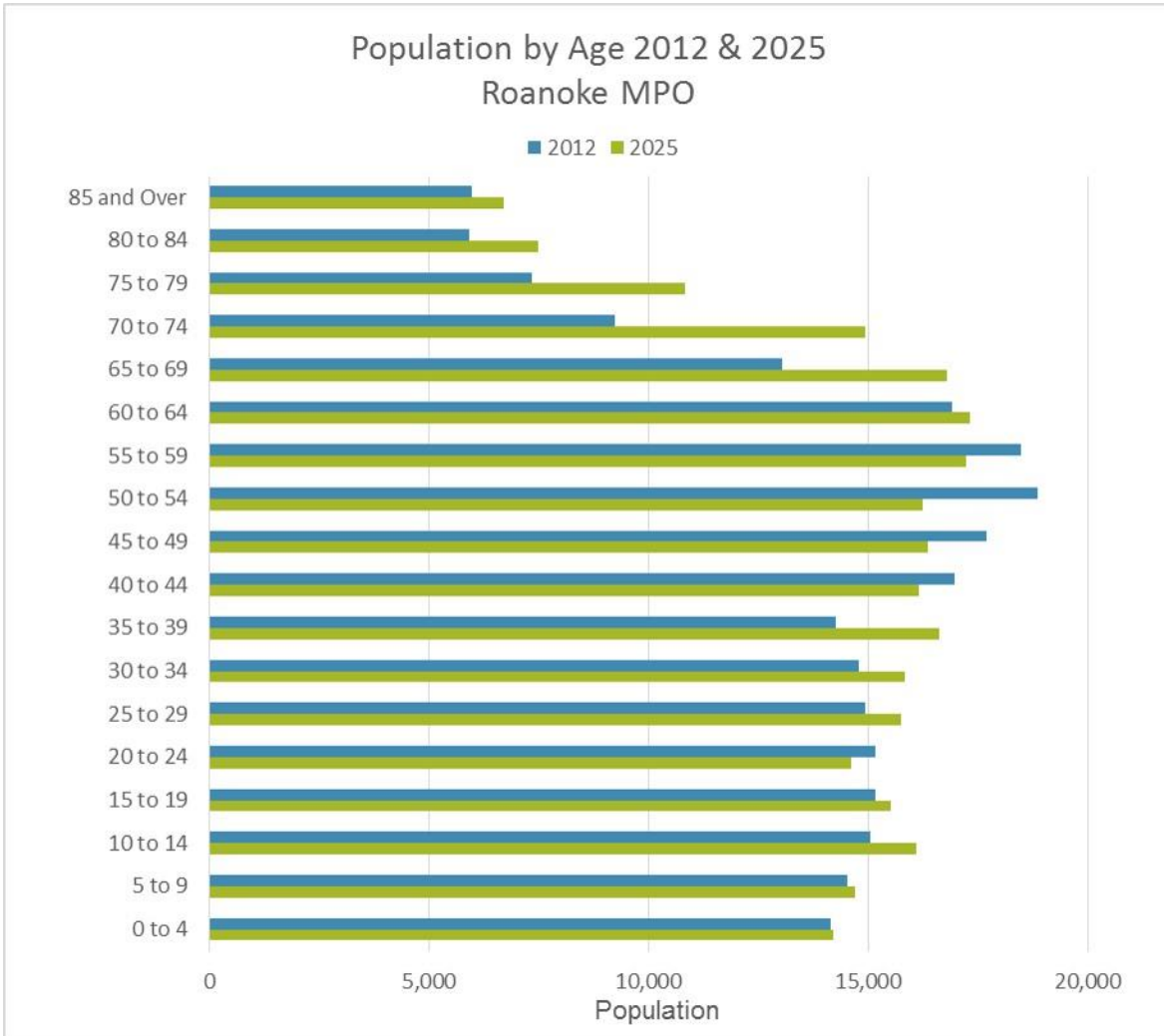
Population by Age 2012 & 2025
Roanoke MPO

Figure 1: Population of Region 2000 in the years 2012 and Projected for the year 2025.
Source: Weldon Cooper Center for Public Service, Demographic Research Group, Intercensal Estimates for Virginia, Counties and Cities: 2010-2012

C. Current Industry Strengths

The following economic measures were used to analyze the strength and characteristics of the current regional economy in the Roanoke Region.

Economic Sectors

The 20 industry sectors, as defined by The North American Industry Classification System (NAICS), have been grouped into three clusters – or broader economic groupings – based on the characteristics that support each industry's growth. These economic clusters are defined as local economic sectors, knowledge-based economic sectors, and freight-based economic sectors. Each economic cluster has different characteristics in terms of land use, commuting patterns, and other aspects of regional accessibility that are essential to attracting and retaining these businesses and their workforce. These different characteristics and each region's mix of economic clusters combine to create unique needs, opportunities and constraints related to transportation and accessibility. For example, a region with

greater economic emphasis on manufacturing or warehousing will have a greater focus on freight intermodal needs than a region with stronger knowledge-type service industries such as financial services, where passenger intermodal needs would be a greater concern.

In addition to the unique characteristics of each cluster, there are also underlying principles with respect to land use density that relate to the different economic sectors and also to the suitability of different transportation modes. These relationships work differently in different regions, and will be applied in context for all 15 of the regional networks. When considering the output of all industries present in the Roanoke Region, Figure 2 provides a summary of the predominance of each economic cluster, as analyzed by a methodology developed by the Study Team and used in all regional analyses throughout the state.
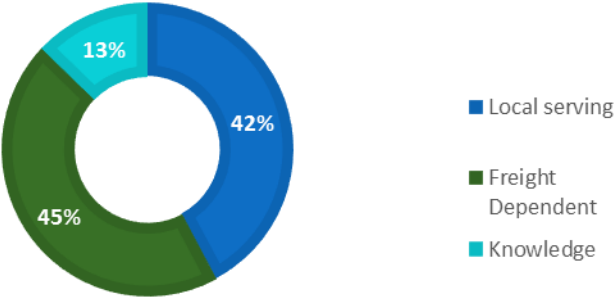
Figure 2: Top Sectors by Output (2012).
Source: IHS Global Insight, 2012.

The freight sector is the strongest in the Roanoke Region, making up 45% of the economic output, with the local serving sector close behind with 42% of the overall economic output. These industry clusters can have a less traditional commute pattern, where freight dependent industries are heavily reliant on goods movement and the local services economic cluster is typically characterized by off-peak commute times; customer traffic; trip-chaining destinations; and truck deliveries. The knowledge sector, which often relies heavily on traditional commuter access during peak travel periods, accounts for only 13% of the economic output for the region.

Top Industries by Output

Wholesale Trade is the strongest industry in the Roanoke Region with 18% of the economic output. Retail trade and manufacturing follow closely behind with 15% and 13% of economic output respectively. These three industry sectors account for slightly less than half of the economic output for the region. This suggests that goods movement is of critical importance to the region. Public administration, and transportation and warehousing round out the top five industries in the region with the greatest economic output. (Refer to Table 4).

Table 4: Current Industries by Output.

Top Industries	NAICS Code	% of Output
Wholesale Trade	42	18%
Retail Trade	44-45	15%
Manufacturing	31-33	13%
Public Administration	92	9%
Transportation and Warehousing	48-49	7%

Source: IHS Global Insight Data, 2012

Top Industries by Employment

Many of the top output industries listed above typically include high value goods, but are not employee intense operations. Conversely, Health Care and Social Assistance, Public Administration, Accommodation and Food Services, and in some cases Retail Trade, are employee intense industries. These industries, in addition to Manufacturing, make up the top five industries by employment in the Roanoke Region, and account for over 50% of the employment in the region. (Refer to Table 5).

Table 5: Current Top Industries by Employment.

Top Industries	NAICS Code	% of Workforce
Health Care and Social Assistance	62	14%
Public Administration	92	13%
Retail Trade	44-45	12%
Manufacturing	31-33	9%
Accommodation and Food Services	72	8%

Source: IHS Global Insight Data, 2012

The top employers in the region have significant overlap with the top industries by both output and employment referenced above. The top employers listed in the table below include companies involved in health care, retail and wholesale trade, manufacturing, and food services. However, companies such as Wells Fargo Bank and Allstate Insurance Company are included in the knowledge based sector, which is a limited portion of the economic output for Roanoke. As a result, these companies could be considered the backbone of the knowledge based sector in Roanoke.

Table 6: Current Top Employers.

Employers	Employees
Carilion Health System	10,000+
Kroger	1,000 - 2,999
Wells Fargo Bank	1,000 – 2,999
Advanced Auto	1,000 – 2,999
MeadWestvaco	1,000 – 2,999
Ply Gem Windows	1,000 – 2,999
HCA Virginia Health System	1,000 – 2,999
Norfolk Southern	1,000 – 2,999
Allstate Insurance Company	1,000 – 2,999

Sources: InfoUSA, supplemented with VEDP, VEC, and local data.

Top Industries by Location Quotient

Location quotient (LQ) is an economic measure, expressed as a ratio, which compares a region to a larger reference region according to some characteristic or asset. It is often used to quantify how concentrated a particular industry, cluster, occupation, or demographic group is in a region, as compared to the nation, and can reveal what makes a particular region unique in comparison to the national average.

Location quotients for 20 different industry categories were calculated for the Roanoke Region. The industries expressed in Table 4 have the highest LQ scores in the region. The score for management of companies and enterprises, for example, can be inferred to mean that these services are more than five times more concentrated in the region than in the entire nation, on average.

Table 7: Current Top Industries by Location Quotient.

Top Industries	NAICS Code	Location Quotient
Management of Companies and Enterprises	55	5.22
Transportation and Warehousing	48-49	1.56
Other Services, except Public Administration	81	1.33
Professional Services	54	1.31

Source: IHS Global Insight Data, 2012

D. Activity Center Analysis

An important part of the Needs Assessment at the regional level has been the identification and evaluation of economic activity centers. For the purposes of this analysis, activity centers are defined as areas of regional importance that have a high density of economic and social activity. The activity centers are a tool in the development of each regional profile and do not have standing in the statewide planning and programming process such as Urban Development Areas; therefore the activity center definitions have no significance other than as a reference tool within the economic profiles.

The activity centers in the Roanoke Region were established in a three step process. First, in a previous effort, the Roanoke MPO established Multimodal Centers for the region. Following the Multimodal Design Guidelines, as produced by the Department of Rail and Public Transportation, Roanoke MPO staff identified multimodal centers based on the activity density – residential and employment density per acre – throughout the region. These centers were further refined through stakeholder outreach lead by MPO staff. Second, the Study Team conducted a GIS-based spatial analysis comparing the existing multimodal centers to the relative density of jobs in the region. This comparison confirmed the multimodal centers as appropriate activity centers for the VMTP needs analysis. Lastly, step three, included revision, refinement and amendment to these activity centers through an OIPI consultant led outreach effort with Roanoke MPO staff and regional stakeholders. Figure 3 below shows the activity centers as blue circles.

Roanoke Activity Centers
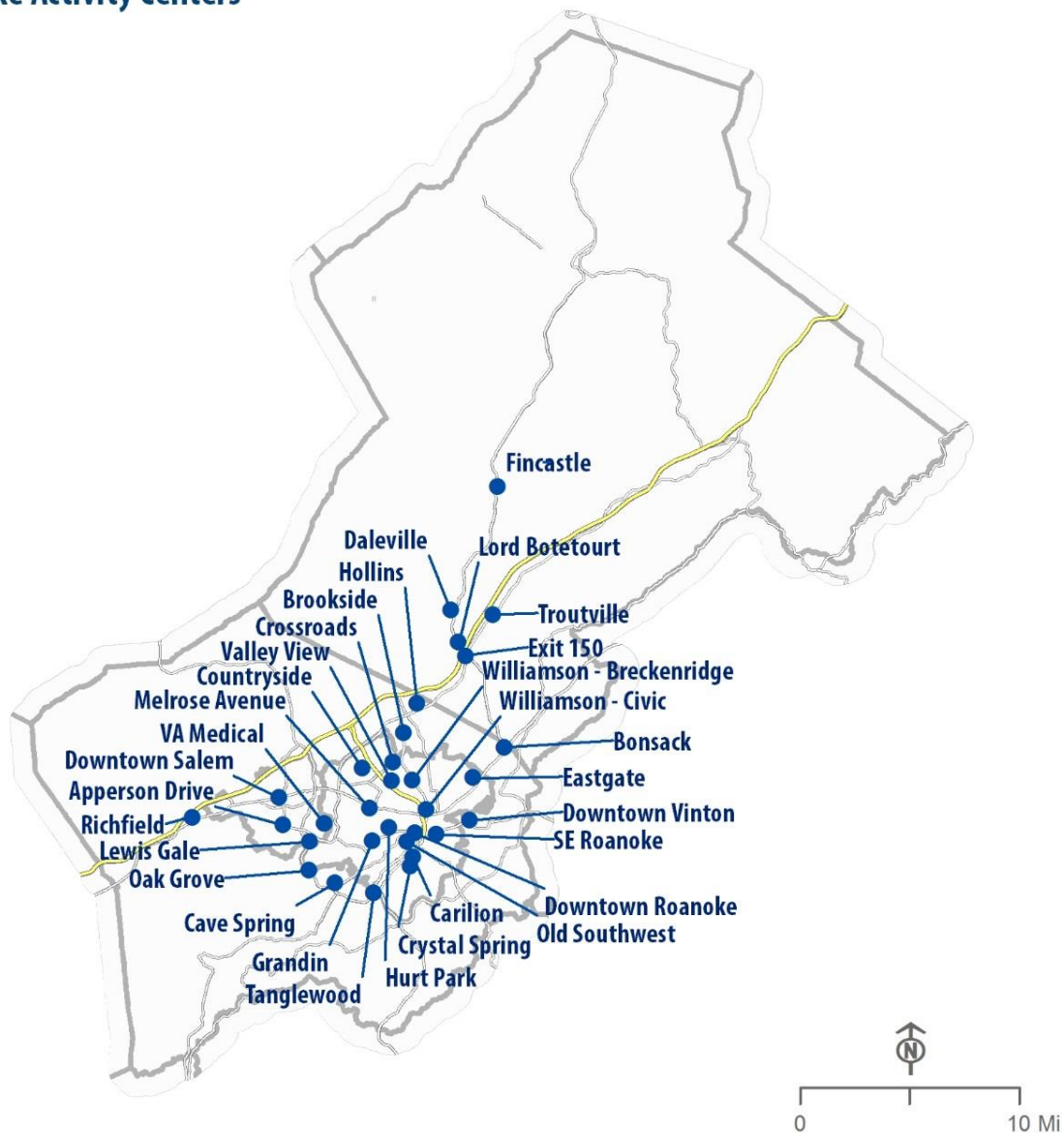
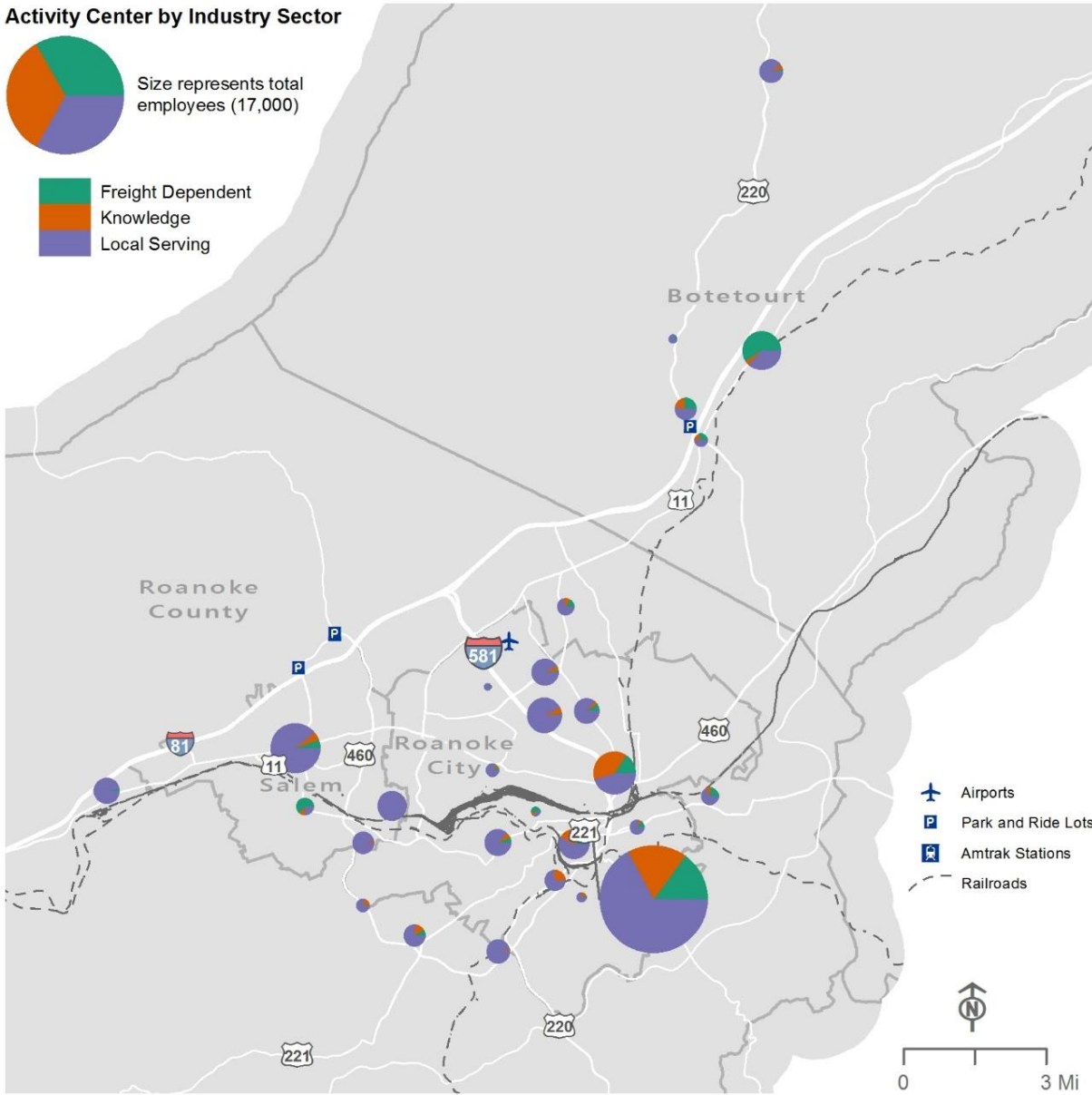*Figure 3: Map of Activity Centers based on Job Density and Stakeholder Input*

Once activity centers were identified, the next step was to analyze the type and scale of economic activity that took place in those locations. Based on the categorization of jobs by NAICS code into the three economic clusters of local, freight, and knowledge economies, analysts developed charts that represented the breakdown of employment by industry sector in each activity center, and scaled those charts based on the number of jobs in each center relative to the other centers in the region. Figure 4 below shows the mapping of each activity center broken down by industry sector, and scaled by relative number of jobs.

Figure 4: Activity Center Employment by Industry Sector.
Source: IHS Global Insight Data, 2012

E. Forecasted 2025 Industry and Employment Strengths

Through a series of work sessions with the Roanoke Region's stakeholders, the Study Team used economic forecasts for 2025 and got input from stakeholders to determine the future desired economic profiles for each region. 2025 economic forecasts for employment by industry from third party data sources were the primary source for the future economic profiles. However, the intent of this process was not to presuppose the Roanoke Region's economic future, but to allow input from stakeholders to affirm or modify these basic economic forecasts according to regional desires.

The future economic profiles were used as the basis for determining future transportation needs to support the future economic vision in the Roanoke Region. The basic economic datasets that were compiled include:

- Current Top Industries by Workforce, Output and Location Quotient
- Future Growth Industries
- Activity Center profiles
- Top Employers and Locations
- Economic Development Priorities

Modest growth is forecasted for the Roanoke Region area by 2025. According to statewide and national datasets used, the transportation and warehousing and wholesale trade industries will see the largest growth. Combined, they are expected to produce $2.5 billion more in 2025 than was produced in 2012.
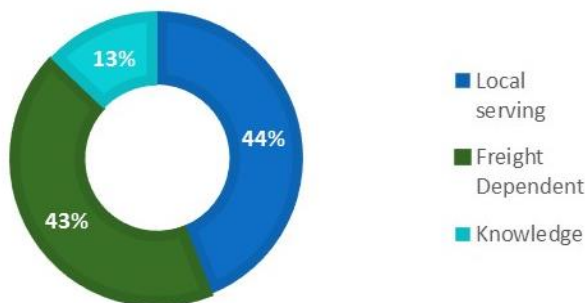

Figure 5: 2025 Industry Sectors by Output.
Source: IHS Global Insight Data, 2012

In 2025, the local services sector will become the largest share of economic output in this region. Local services is estimated to make up 44% of the economic output in the Roanoke Region in 2025. The knowledge and freight-dependent sectors will account for 13% and 43% of economic output, respectively.
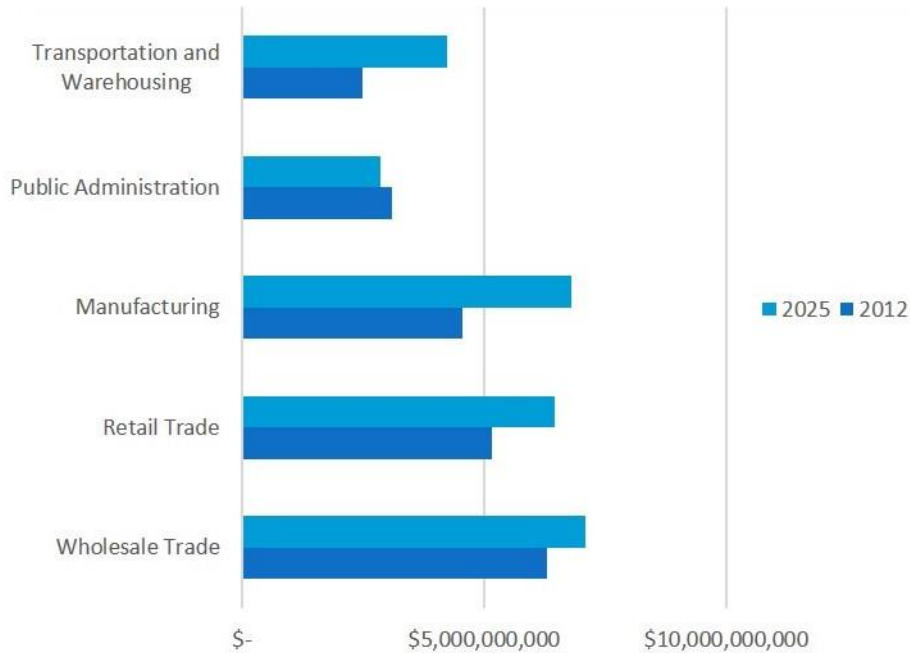
Figure 6: Top Industries by Output
Source: IHS Global Insight Data, 2012

All the top industries by output in the Roanoke Region are expected to grow by 2025, with the exception of public administration. In all industries combined, economic output in the Roanoke Region is expected to increase by $9.7 billion by 2025. (Refer to Figure 6).
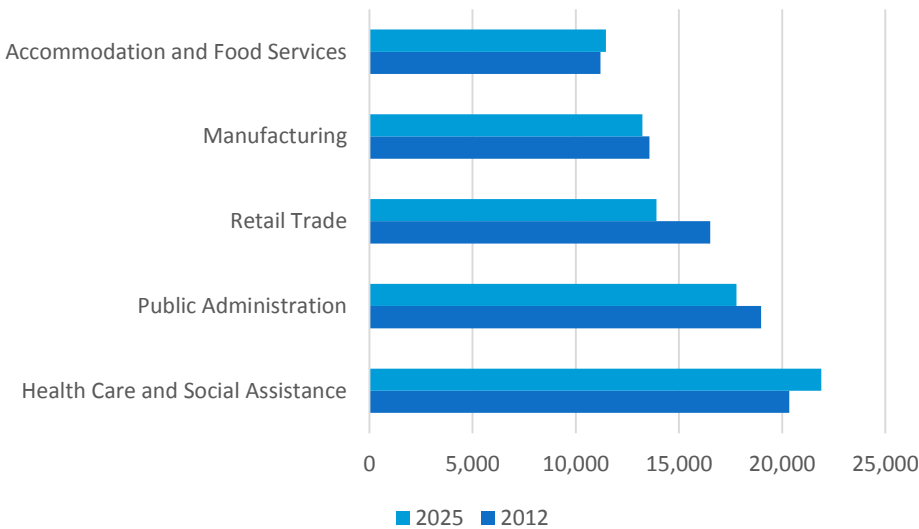
Figure 7: Top Industries by Employment.
Source: IHS Global Insight Data, 2012

The 2025 outlook of the largest employment industries varies. Some industries, such as public administration, retail trade, and manufacturing, are expected to decline in employment by 2025. Conversely, industries such as accommodation and food service and health care and social assistance

will grow in employment. The mining industry anticipated to grow the most in employment by 2025, by 61%. Other major growth industries include corporate management, educational services, retail trade, and finance and insurance. (Refer to Table 8).

Table 8: Top Industries by Employment.

Top Industries	NAICS Code	Location Quotient
Mining	21	61%
Corporate Management	55	33%
Educational Services	61	16%
Retail Trade	44-45	16%
Finance and Insurance	52	12%

Source: IHS Global Insight Data, 2012

The balance of industry types, both in output and employment, remains somewhat constant for the Roanoke Region with the local serving and freight dependent sectors dominating the economic landscape. These industry clusters can have a less traditional commute pattern, where freight dependent industries are heavily reliant on goods movement and the local services economic cluster is typically characterized by off-peak commute times; customer traffic; trip-chaining destinations; and truck deliveries. Therefore, improving transportation choices and options in the region will be key in serving economic sectors that have such varying needs.

3. TRANSPORTATION PROFILE

A. Introduction

The following section describes the transportation and accessibility measures that were developed to capture the workforce needs and the freight needs at a regional scale. This set of measures reflects regional transportation characteristics in the Roanoke Region such as typical commute times and overall travel reliability. The following categories of performance metrics that were used to create a regional transportation profile for the Roanoke Region:
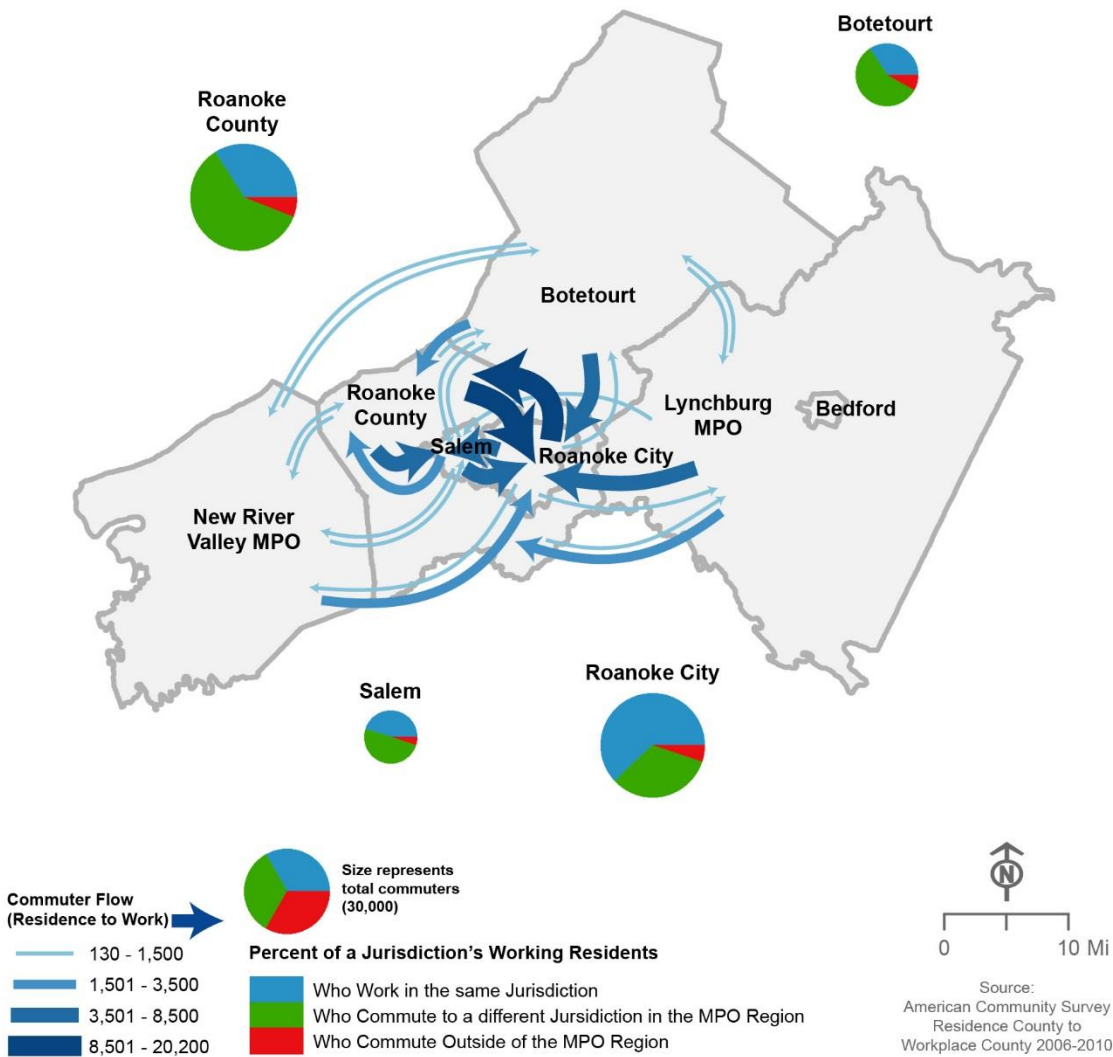
- Commuting Patterns
- Accessibility to Employment
- Roadway Measures
- Freight Measures

B. Commuting Patterns

Regional Commuting Patterns

Commuting patterns in the Roanoke Region show that the City of Roanoke is the destination for workers not only within the Roanoke Region, but for workers in surrounding regions as well. As represented in Figure 8, almost two-third of workers in the City of Roanoke both live and work within the City. The City of Roanoke is a large draw for residents of the other jurisdictions in the Roanoke Region and for residents outside the region as well.

Commuter Origin/Destination Flow

Figure 8: Regional Commuting Patterns.
Source: Census Commuting Data, 2006-2010

Activity Center Commuting Patterns

Equally important to the formation of a regional transportation profile for the Roanoke Region was the analysis of commuting patterns between activity centers. Figures 9 through 15 below provide insights into the commuting patterns for nine of the activity centers in the Roanoke Region. These nine activity centers were chosen to represent the various characteristics of the region, including multiple activity centers in each of the four jurisdictions. The maps indicate, by Census block group, the origin of workers for each activity center. Block groups are symbolized on a color scale from dark blue to yellow, with the darker shades of blue representing the block groups with the largest number of commuters to the activity center analyzed within that map.

The data source used to analyze the origin of workers in activity centers was the LEHD Origin-Destination Employment Statistics (LODES) data from the United States Census Bureau. The data file provided the Census Block of the home and work locations for all persons working in the state of Virginia in 2011 based on Unemployment Insurance earnings data and Quarterly Census of Employment and Wages (QCEW) data. The LODES data is not perfectly accurate as job and home locations can be misreported through the original data sources. In addition, the Census Bureau uses noise infusion and synthetic data methods to ensure confidentiality in the publically released data. For these reasons, the data have been aggregated and reported at the Census Block Group level in the following analysis.

As shown on the map, Troutville sees a significant number of commuters from block groups immediately adjacent to the activity center. Other areas or worker origin include areas of the City of Roanoke, and most of the block groups in Botetourt County. (Refer to Figure 9).
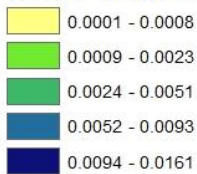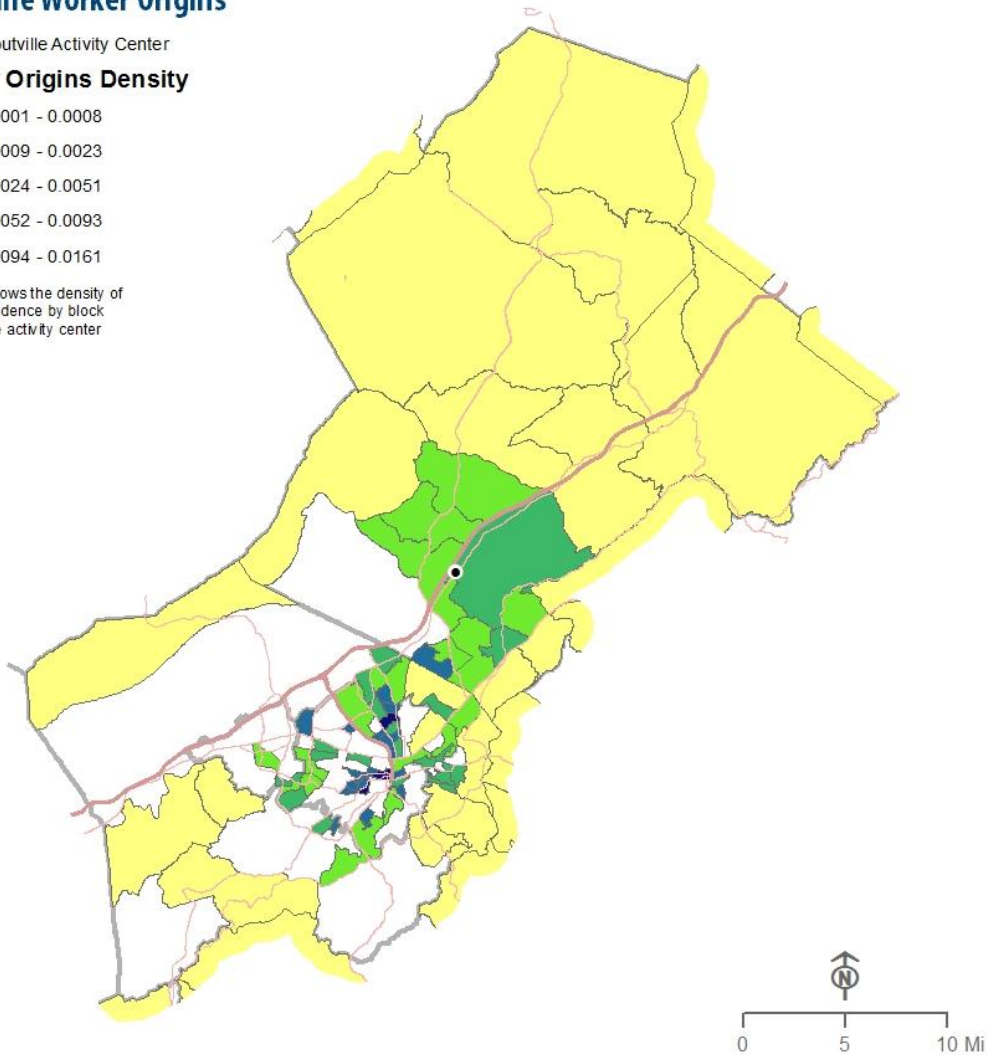
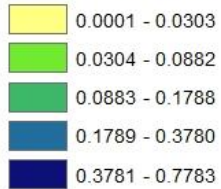**Figure 9: Commuting Patterns to Troutville District Activity Center.**
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

The Downtown Roanoke activity center is a major destination for workers in the Roanoke Region, with commutes originating from every block group in the region. However, a majority of workers origin in the urban core of the region. (Refer to Figure 10).
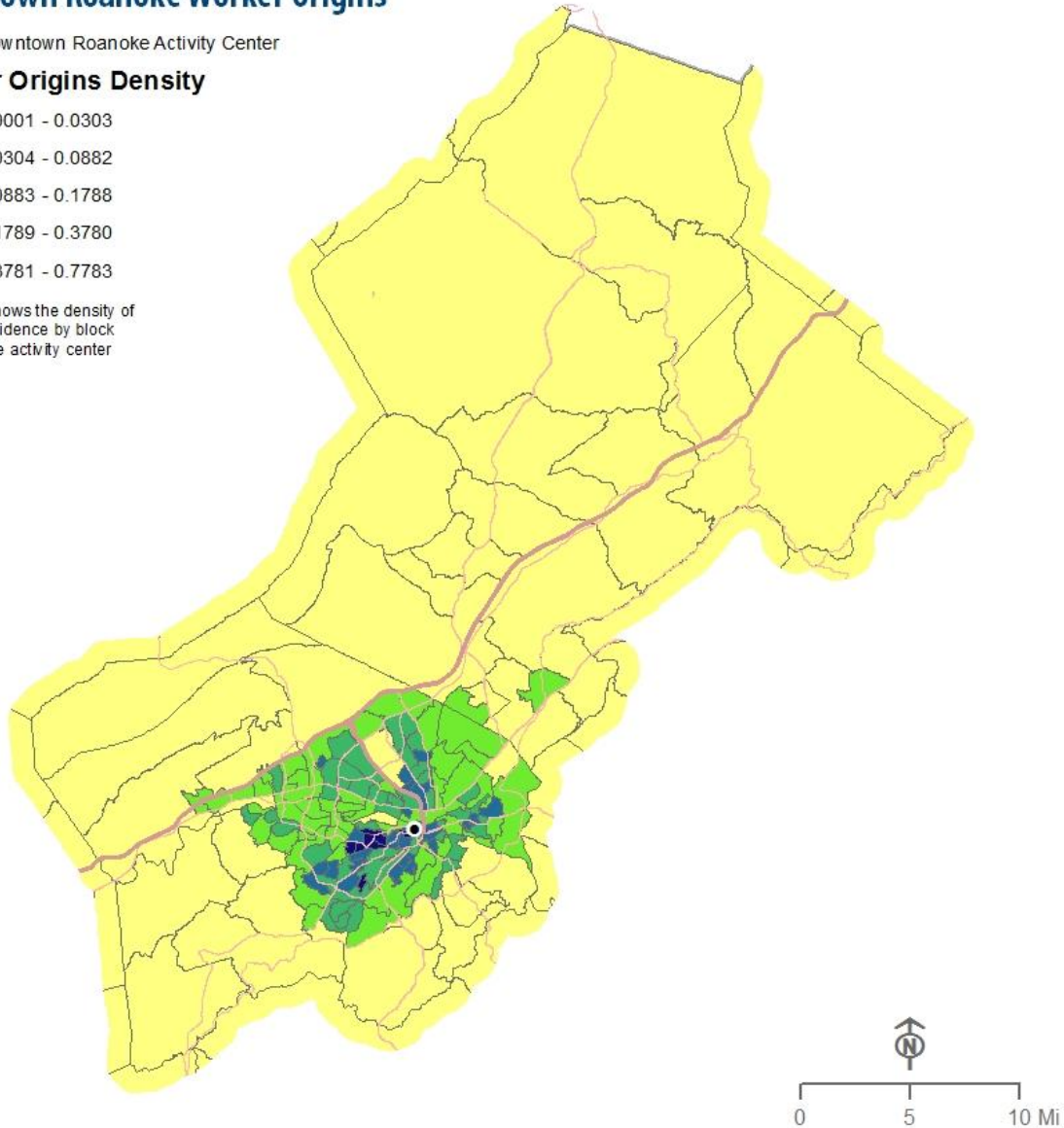
Downtown Roanoke Worker Origins

• Downtown Roanoke Activity Center

Worker Origins Density

	0.0001 - 0.0303
	0.0304 - 0.0882
	0.0883 - 0.1788
	0.1789 - 0.3780
	0.3781 - 0.7783

This map shows the density of workers' residence by block group for the activity center identified

0   5   10 Mi

Figure 10: Commuting Patterns to Downtown Roanoke Activity Center.
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

The Downtown Salem activity center also attracts workers from nearly every corner of the region. The highest levels of commuting are adjacent areas in the Cities of Salem and Roanoke, but low levels from further out towards Roanoke and Botetourt Counties. (Refer to Figure 11).
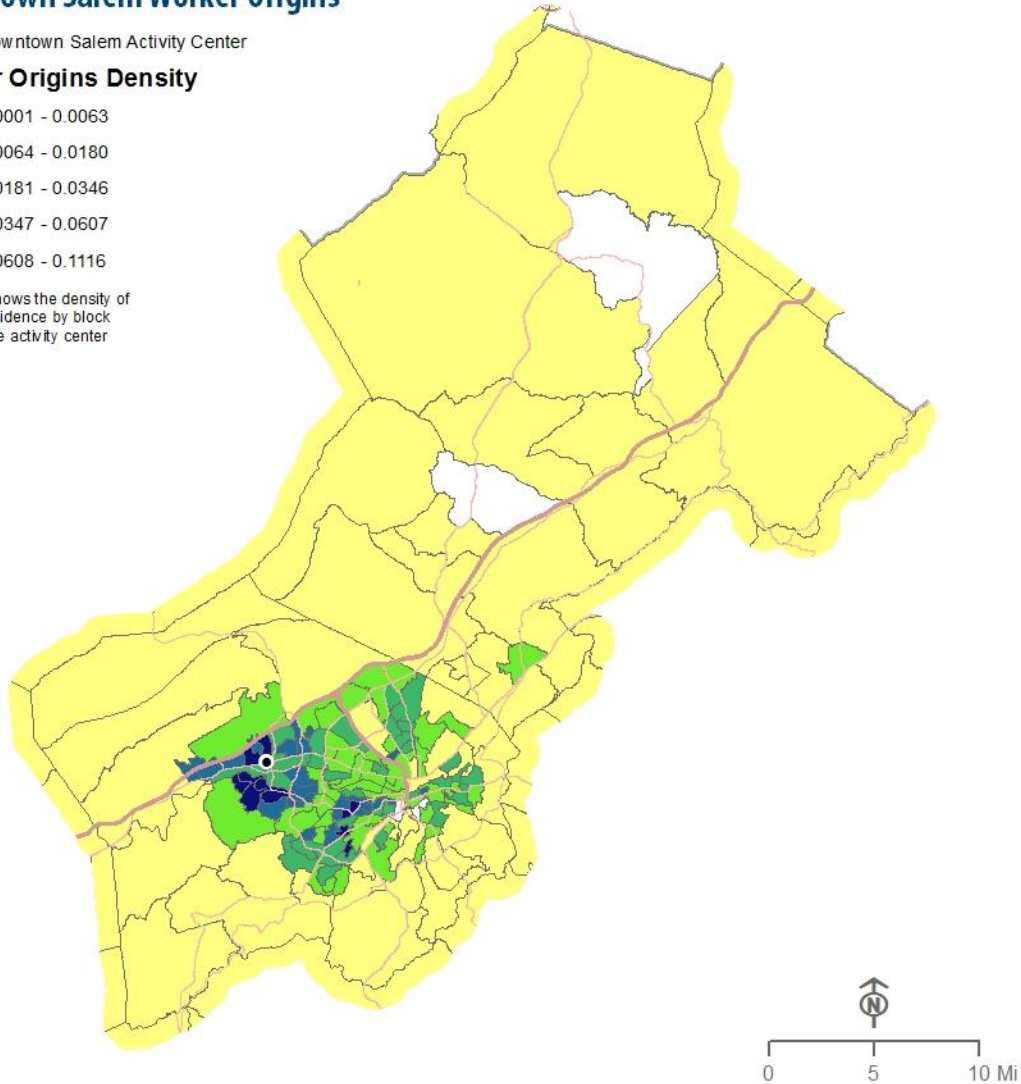
Downtown Salem Worker Origins

- Downtown Salem Activity Center

Worker Origins Density
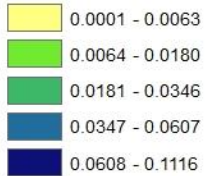
☐	0.0001 - 0.0063
☐	0.0064 - 0.0180
☐	0.0181 - 0.0346
☐	0.0347 - 0.0607
☐	0.0608 - 0.1116

This map shows the density of workers' residence by block group for the activity center identified

Figure 11: Commuting Patterns to Downtown Salem Activity Center.
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

The VA Medical Center is a major destination for workers in the region. Workers are commuting from all block groups in Botetourt and Roanoke Counties and almost all block groups in the Cities of Roanoke and Salem.
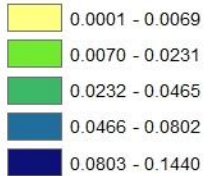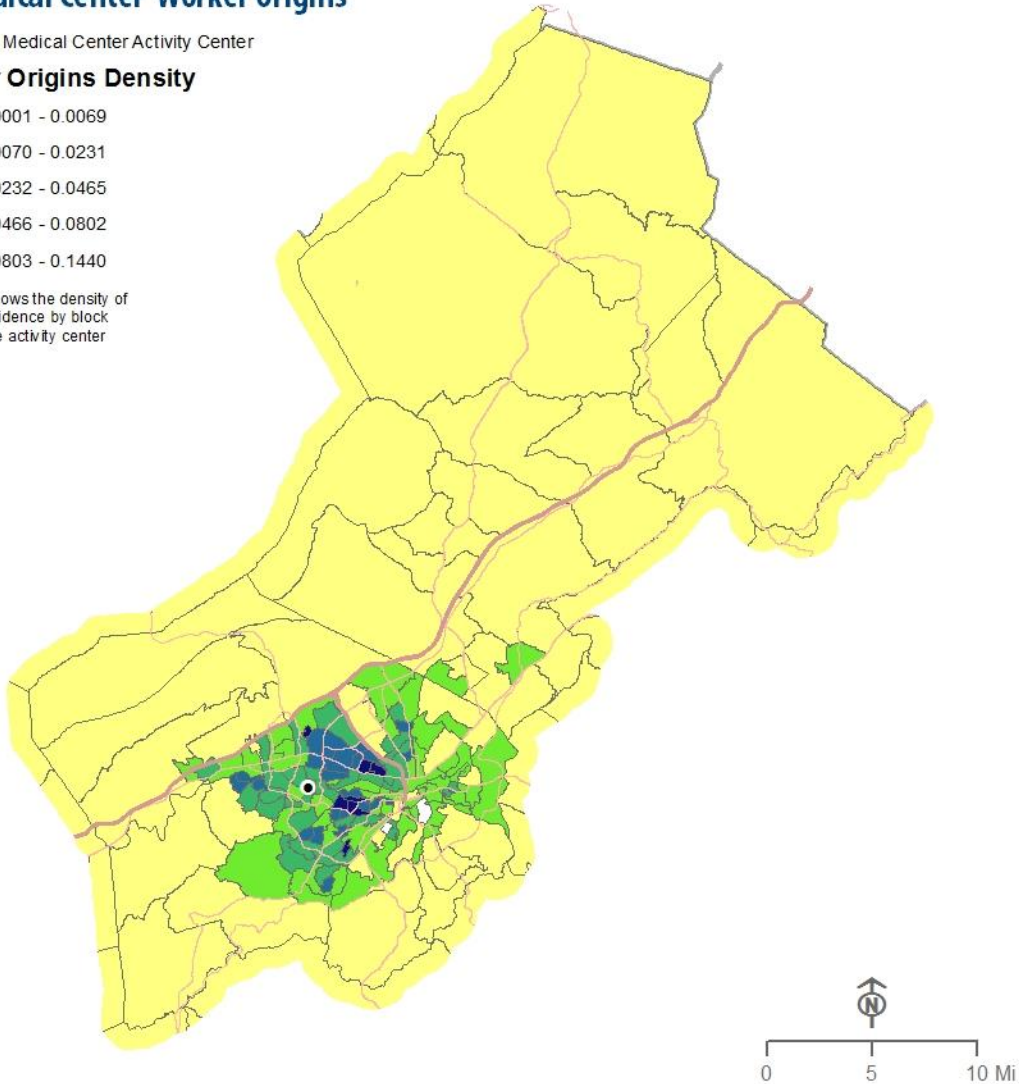

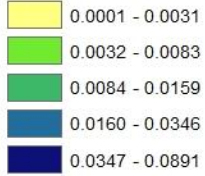**Figure 12: Commuting Patterns to the VA Medical Center.**
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

The Tanglewood activity center attracts workers from fewer origin block groups. Most commutes originate in the City of Roanoke, with a fewer number of commutes originating in the City of Salem and Roanoke County. The fewest number of commutes originate in Botetourt County.
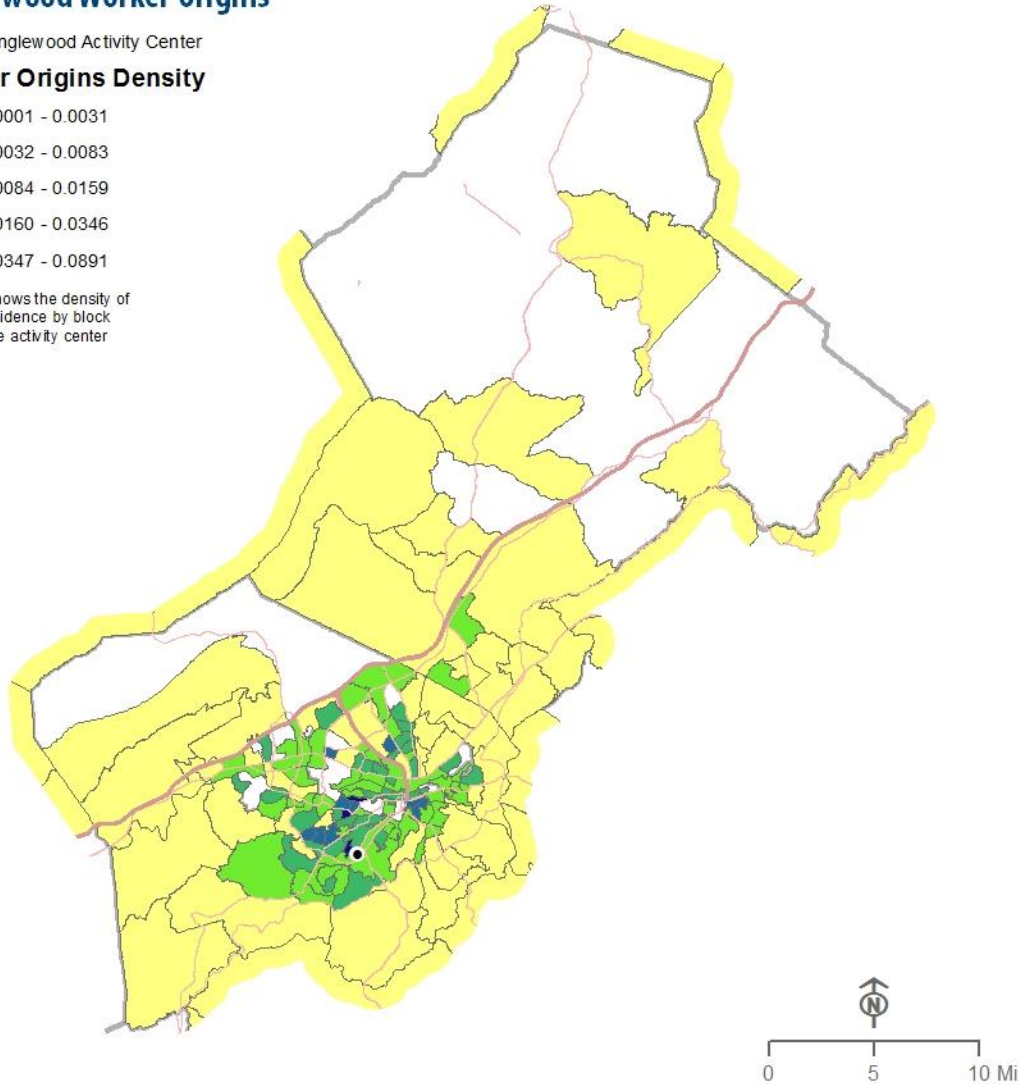

Tanglewood Worker Origins

- Tanglewood Activity Center

Worker Origins Density

	0.0001 - 0.0031
	0.0032 - 0.0083
	0.0084 - 0.0159
	0.0160 - 0.0346
	0.0347 - 0.0891

This map shows the density of workers' residence by block group for the activity center identified

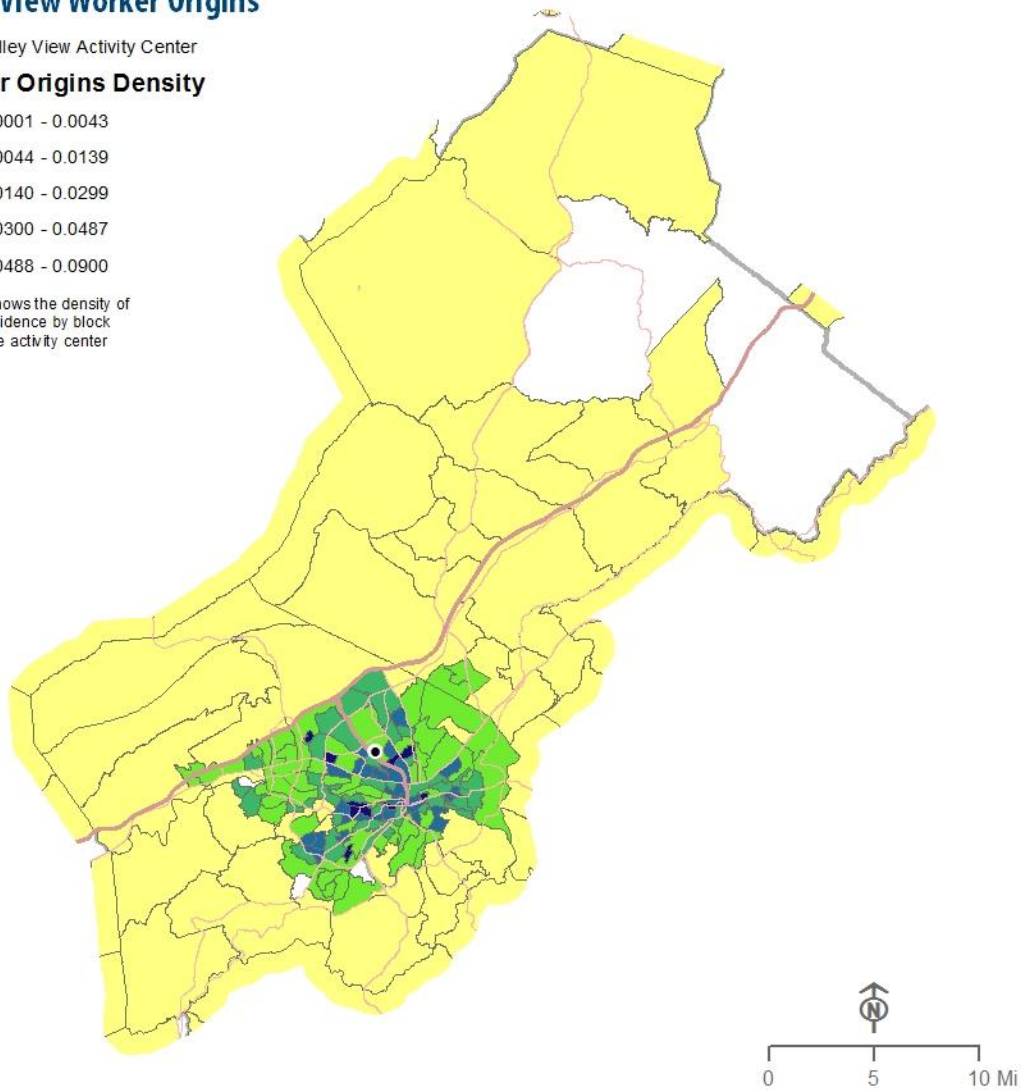*Figure 13: Commuting Patterns to Tanglewood Activity Center*
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

Commutes to the Valley View activity center originate in every jurisdiction in the region, however most commutes originate in the City of Roanoke.

Valley View Worker Origins

● Valley View Activity Center

Worker Origins Density

	0.0001 - 0.0043
	0.0044 - 0.0139
	0.0140 - 0.0299
	0.0300 - 0.0487
	0.0488 - 0.0900

This map shows the density of workers' residence by block group for the activity center identified

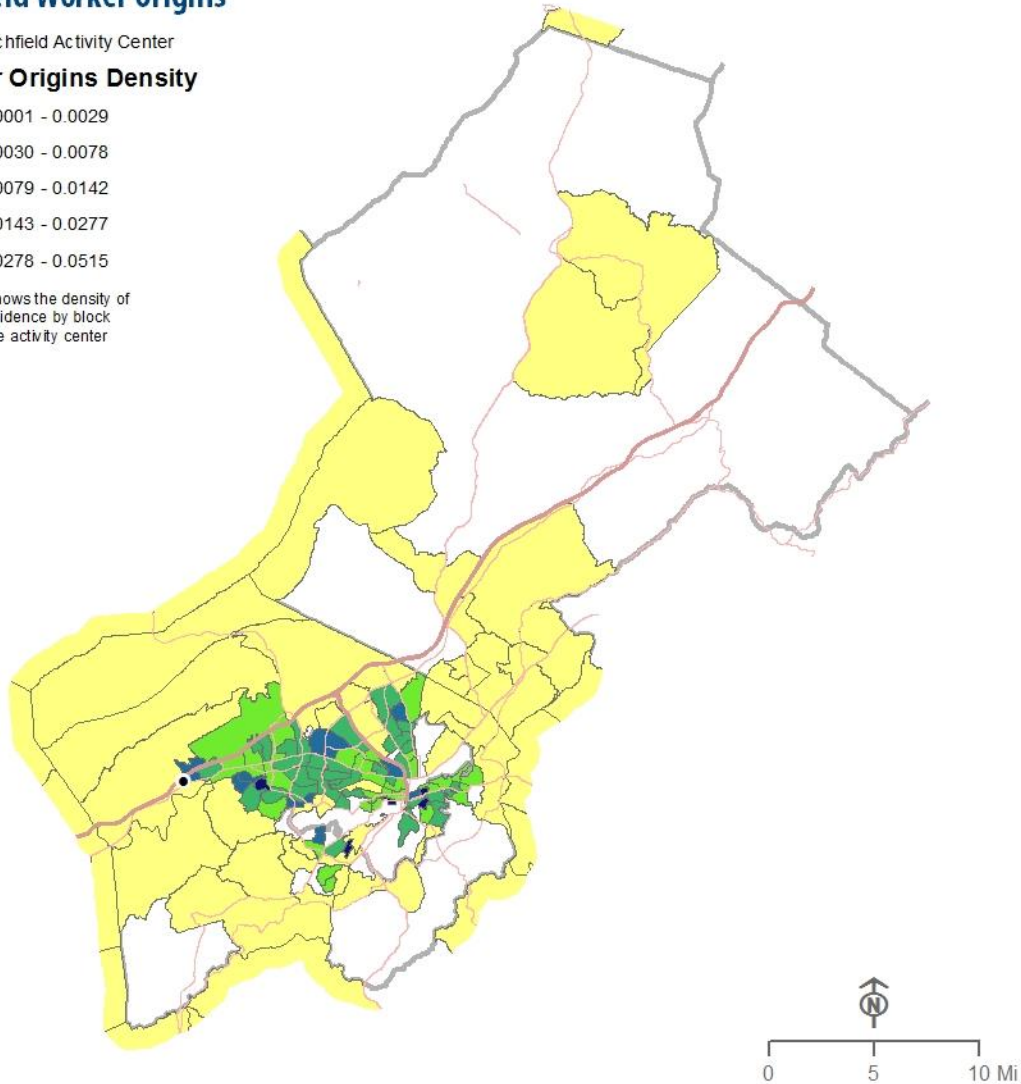*Figure 14: Commuting Patterns to Valley View Activity Center*
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

The Richfield activity center is a more modest draw in regards to worker origins, and there are fewer commutes originating in Botetourt County, the City of Roanoke, and Roanoke County. Most commutes originate in the City of Salem.

Richfield Worker Origins

- Richfield Activity Center

Worker Origins Density

	0.0001 - 0.0029
	0.0030 - 0.0078
	0.0079 - 0.0142
	0.0143 - 0.0277
	0.0278 - 0.0515

This map shows the density of workers' residence by block group for the activity center identified

Figure 15: Commuting to Richfield Activity Center.
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

Mode Choice

In the Roanoke Region, the majority of commuters drive alone to work. While there is some variation between jurisdictions, single occupancy vehicles are used for commuting over 80% of the time. For all jurisdictions, carpooling is the second most prevalent option, accounting for 6% to 9% of the mode share. Public transit use is highest in the City of Roanoke, which has the most robust transit system in the region. (Refer to Figure 16).
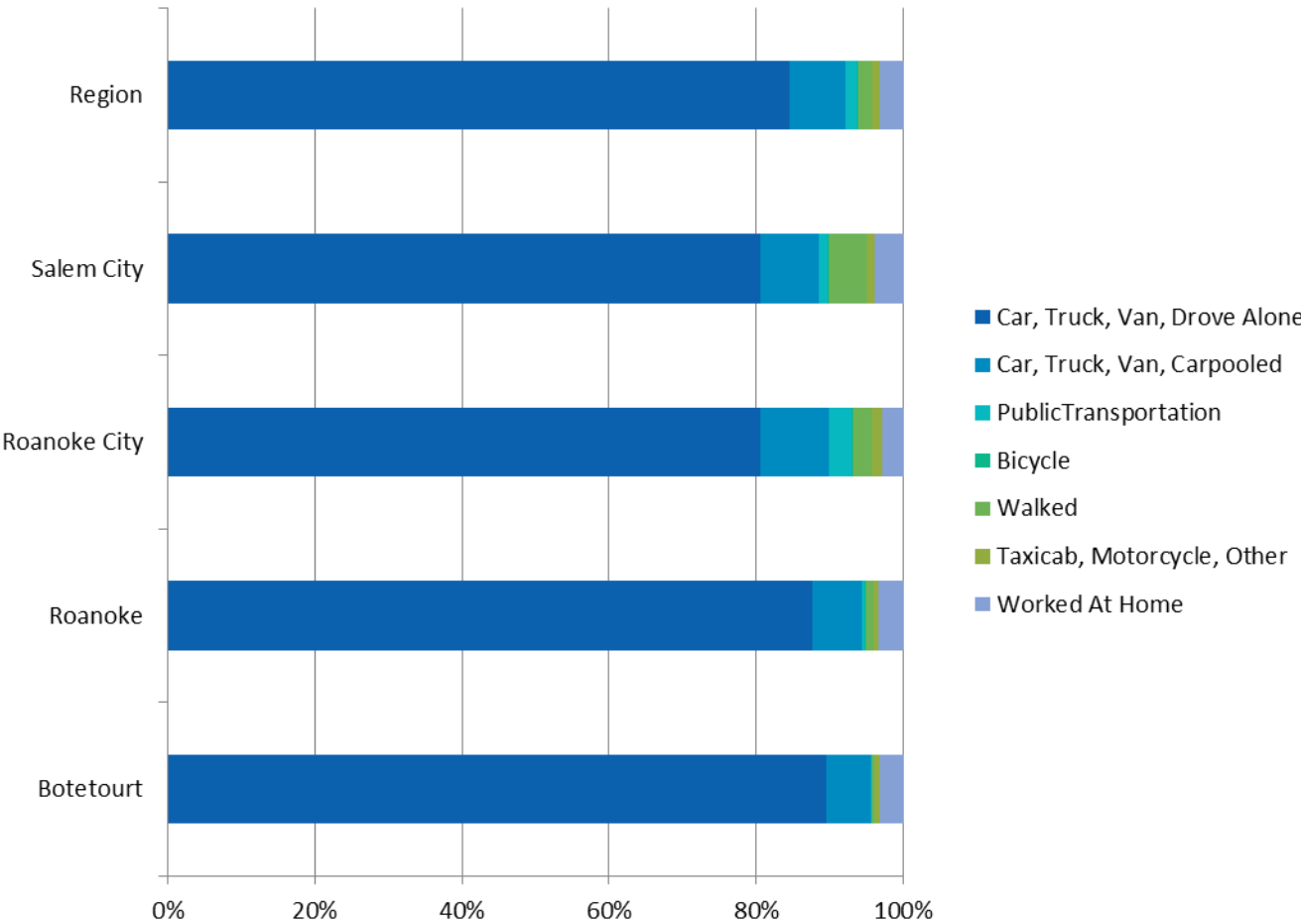

Figure 16: Mode Share Split by Jurisdiction.
Source: ACS 2013 5-Year Estimates
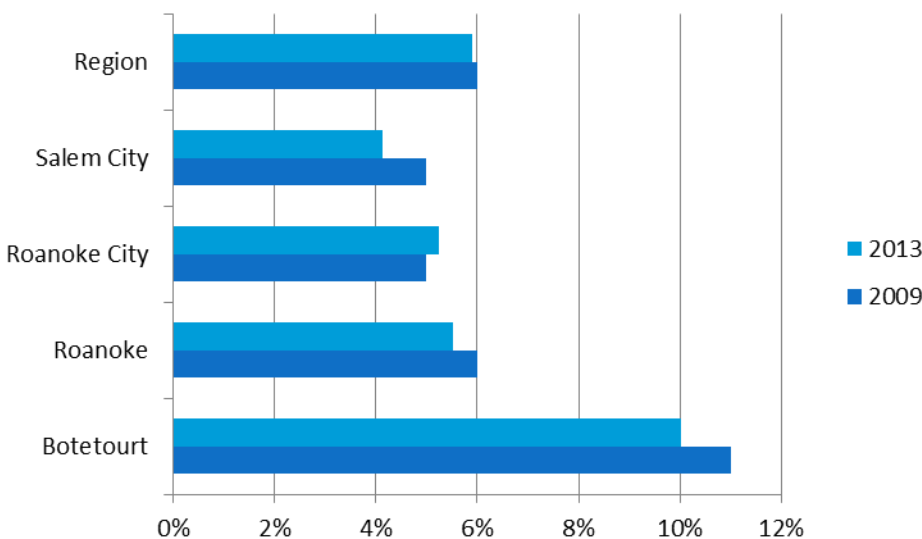
Average Commute Times

In the Roanoke Region, average commute times range from 19 to 28 minutes among the various jurisdictions. (Refer to Table 9). Due to their density and proximity to employment centers, the Cities of Roanoke and Salem have the shortest average commute, while more rural areas, like Botetourt County have longer commutes on average.

Table 9: Mean Commute Time by Jurisdiction.

Jurisdiction	Mean Commute Time (Minutes)
Botetourt County	27.6
Roanoke County	21.8
City of Roanoke	19.9
City of Salem	19.0

Source: ACS 2013 5-Year Estimates

Commutes over 45 minutes in duration are relatively rare in the Roanoke Region. Botetourt County has the highest percentage of workers who commute over 45 minutes at nearly 10%, this is almost twice as high as the regional average of just under 6%. (Refer to Figure 17).

Figure 17: Percent of Commutes Long than 45 Minutes.
Source: ACS 2013 5-Year Estimates

Figure 18 provides a closer look at where longer commutes originate. In much of the Cities of Roanoke and Salem, commute times are well below average for the region as a whole. Block groups on the fringes of the region, and in rural areas of Roanoke and Botetourt Counties have commute times that are greater than the regional average, as these areas have fewer jobs in close proximity, and less access to transportation networks than more developed areas.
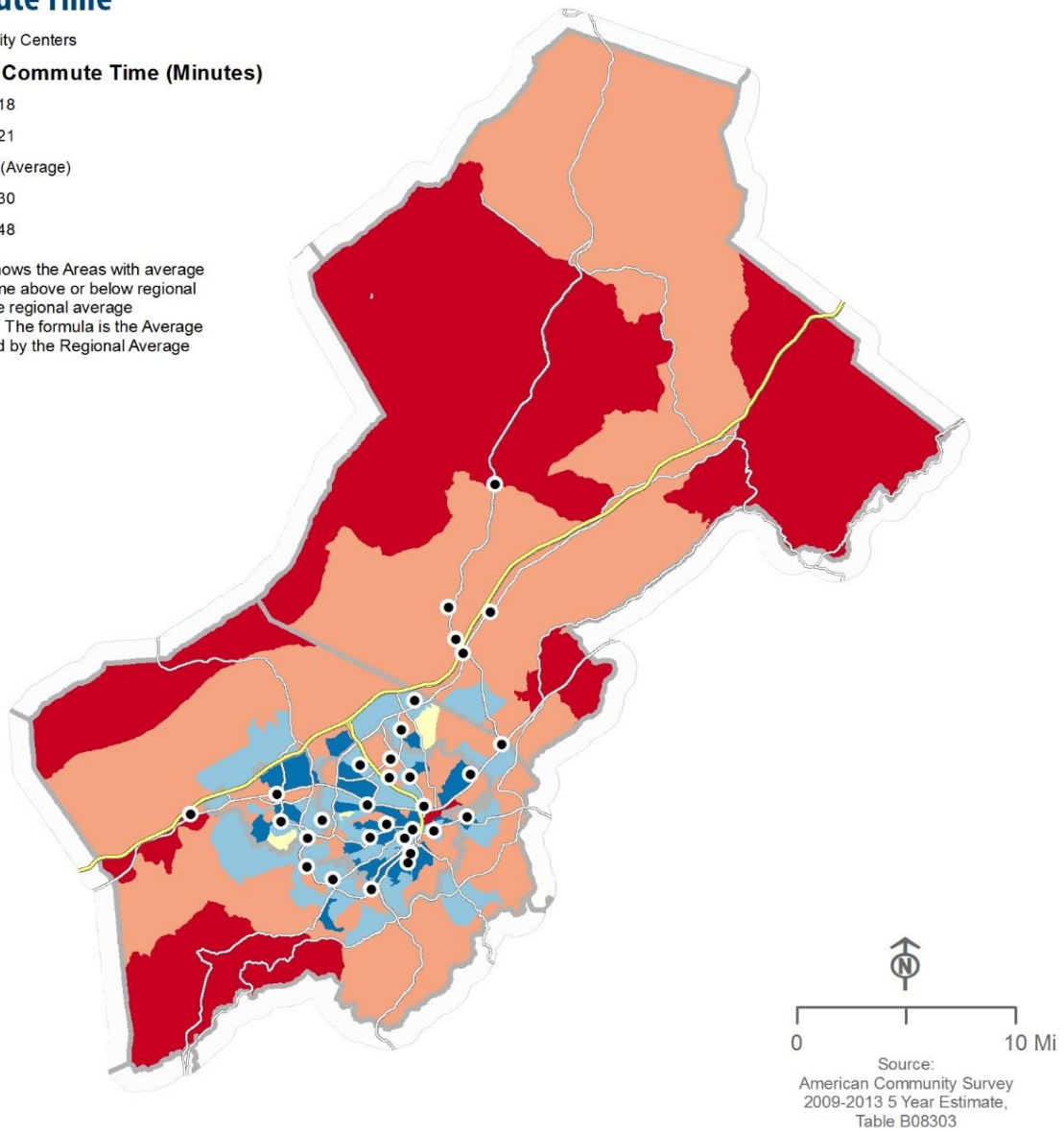
Commute Time

- Activity Centers

Average Commute Time (Minutes)

- 13 - 18
- 19 - 21
- 21.6 (Average)
- 22 - 30
- 31 - 48

This map shows the Areas with average commute time above or below regional average. The regional average is 21.6 min. The formula is the Average Time divided by the Regional Average

Source:
American Community Survey
2009-2013 5 Year Estimate,
Table B08303

Figure 18: Roanoke Region Commute Times.
Source: ACS 2013 5-Year Estimates

C. Accessibility to Employment

As part of the transportation conditions assessment, a set of accessibility performance measures and attributes were developed to assess the workforce and freight accessibility at the general regional scale. This set of performance measures reflects regional characteristics such as travel times and the availability of multimodal transportation between activity centers. The accessibility to employment measure was calculated using an accessibility model developed by the consultant team that measures the number of jobs reachable in a given travel time, using actual travel times on a network, whether highway, transit or pedestrian. The total number of jobs accessible was also "distance decayed," that is the value of each job was decayed by a factor based on how long it took to travel to it. The distance decay factors were developed from traveler surveys that reflect actual preferences for travel to employment based on the length of the trip.

Auto Accessibility

Auto Accessibility in the Roanoke Region is driven by two main factors: distance from activity centers, and distance from major arterial roadways. Accessibility for auto travel is measured as the number of jobs that can be reached within a 45 minute drive. The areas with the highest level of auto accessibility exist in and around the Cities of Roanoke and Salem, and near the outskirts of Lynchburg in the east. The accessibility to jobs is weighted by the population affected to provide further insight into the relative degree of access to employment for residents among areas of the region. (Refer to Figure 19).
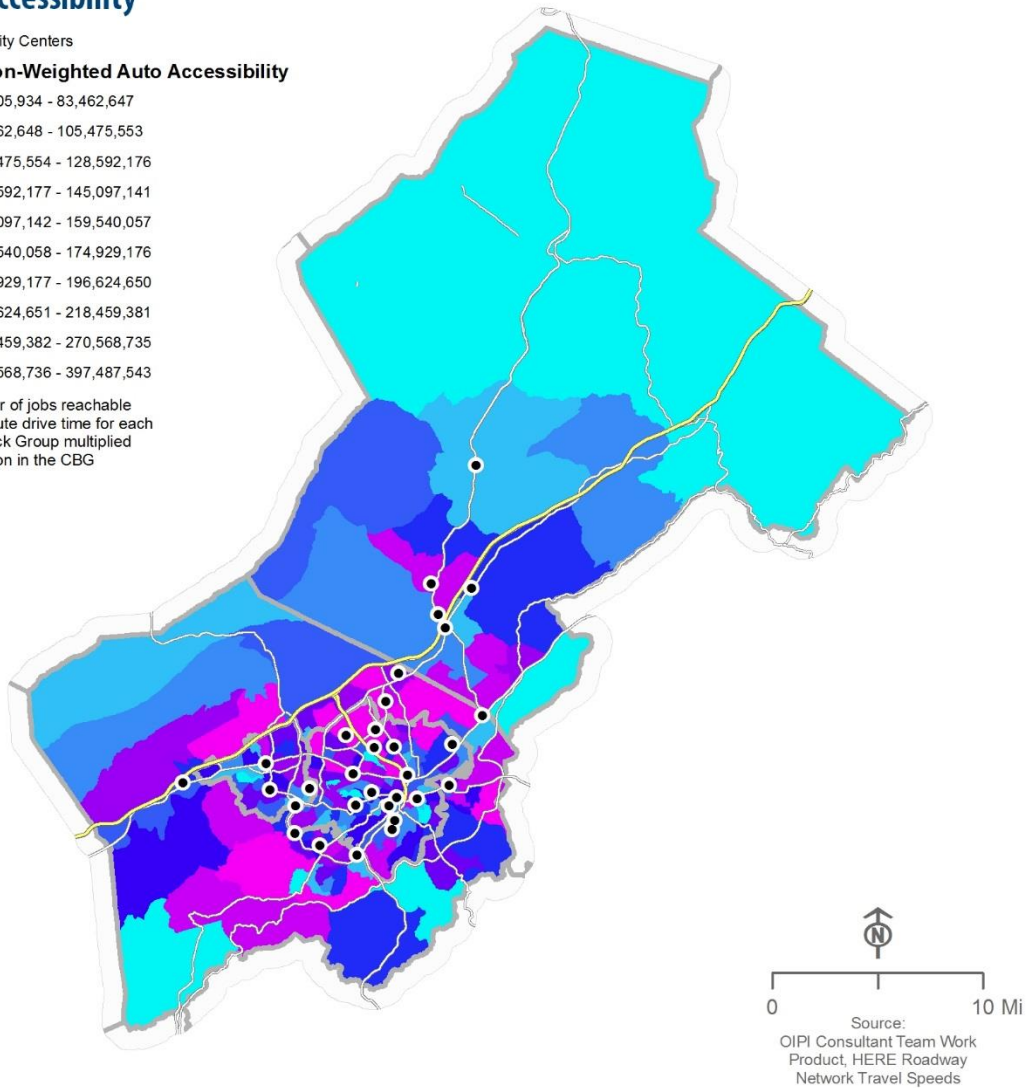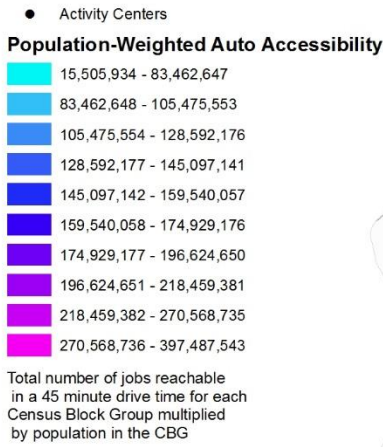
Auto Accessibility

Figure 19: Auto Accessibility

Transit Accessibility

The urban core of the region, including the City of Roanoke and the City of Salem is served by Valley Metro, a hub-and-spoke fixed route transit system. Outside of the urban core, there are few fixed-route transit options in the Roanoke Region. As a result, there is a stark contrast between the transit accessibility in the urban core and the surrounding suburban and rural areas. This is reflected in the low (fixed route) transit accessibility scores for large parts of the region. Also, due to the lack of inter-city transit options in the region (other than demand response services), commuters using transit are restricted in their ability to reach regional jobs. (Refer to Figure 20).
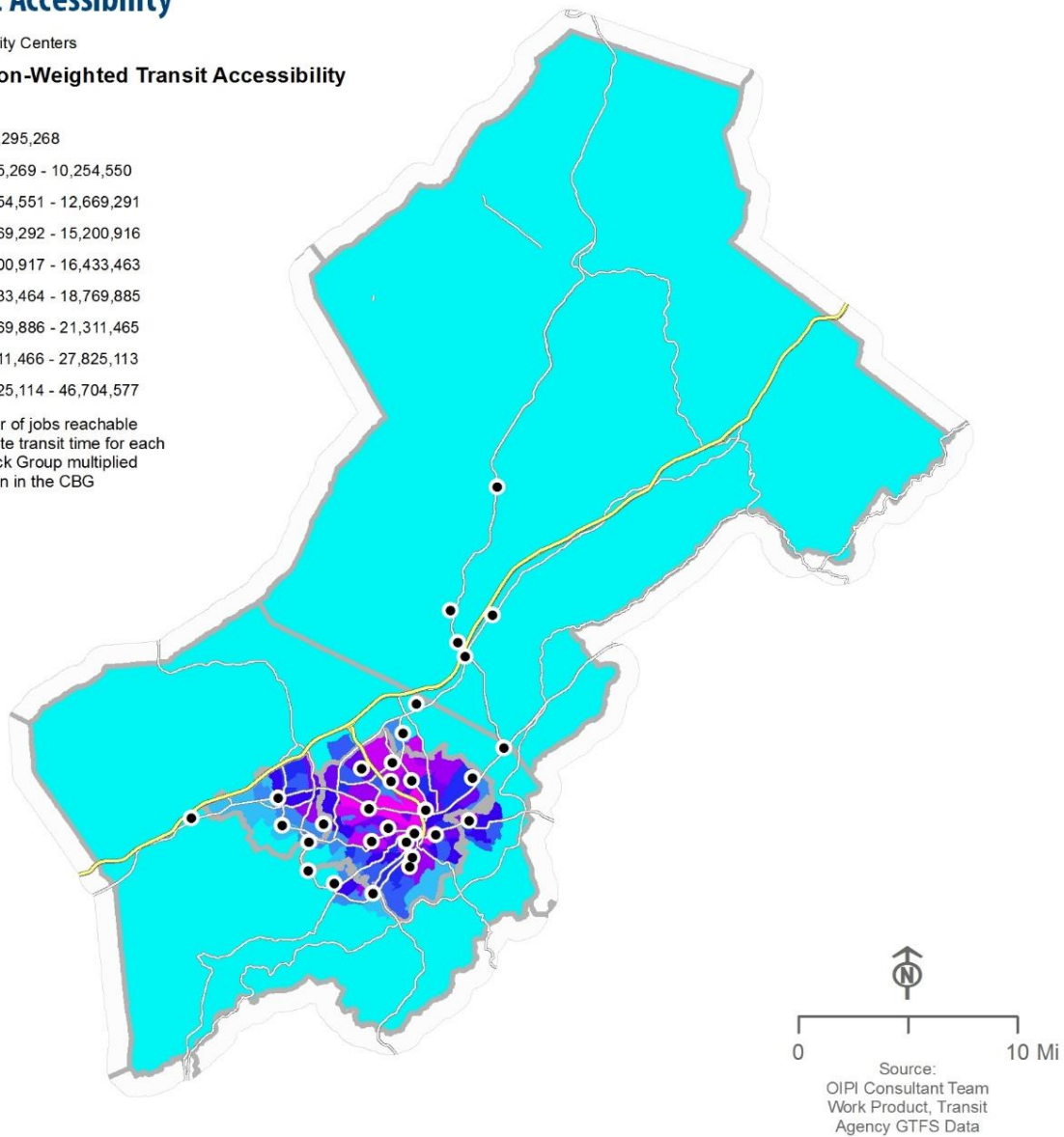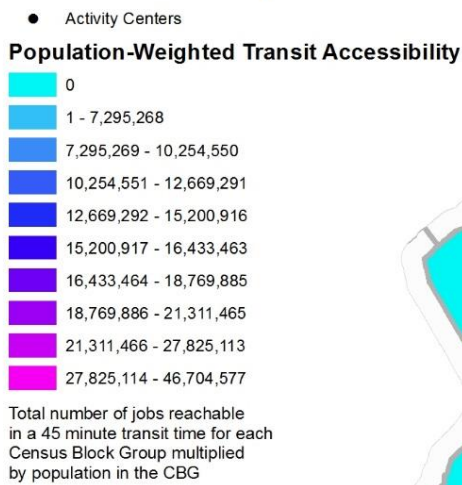
Transit Accessibility

- Activity Centers

Population-Weighted Transit Accessibility

	0
	1 - 7,295,268
	7,295,269 - 10,254,550
	10,254,551 - 12,669,291
	12,669,292 - 15,200,916
	15,200,917 - 16,433,463
	16,433,464 - 18,769,885
	18,769,886 - 21,311,465
	21,311,466 - 27,825,113
	27,825,114 - 46,704,577

Total number of jobs reachable in a 45 minute transit time for each Census Block Group multiplied by population in the CBG

Source:
OIPI Consultant Team
Work Product, Transit
Agency GTFS Data

Figure 20: Transit Accessibility

Walk Accessibility

Walk Accessibility in the area is largely determined by the mix of land use and density of development surrounding the origin of each trip. Areas in and around the Cities of Salem and Roanoke in the Roanoke Region scored the highest, as was expected, with the highest scoring areas located within the City of Roanoke. The high variability within even the highest scoring areas reflects the significance of land use and job density in determining walk accessibility. (Refer to Figure 21).
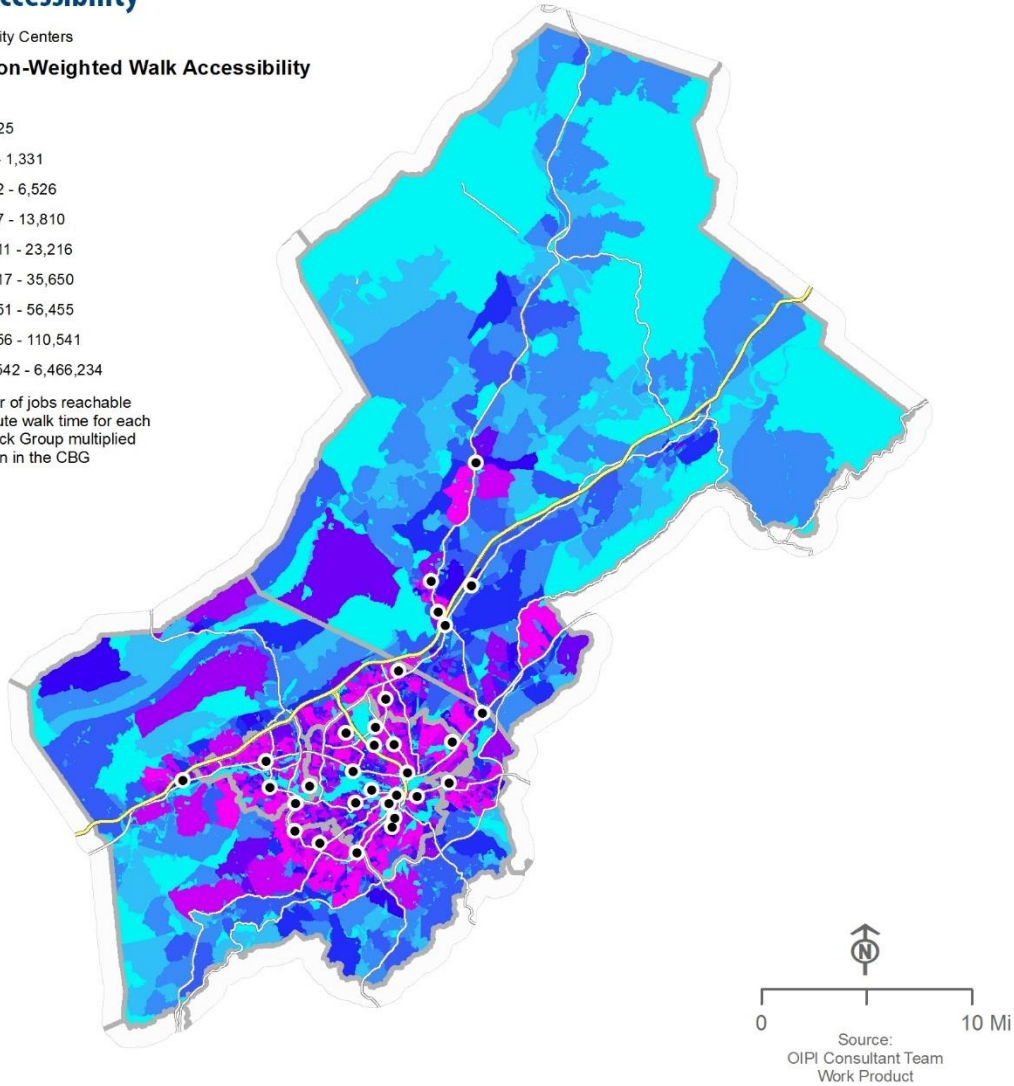

Figure 21: Walk Accessibility

Freight Accessibility

In addition to railways, I-81, US Route 460, and US Route 11 are the major corridors for freight movement throughout the region. Accessibility of freight origins to these roadways is dependent primarily on the proximity of the origin to highway access ramps. Most activity centers in the region are within a six minute drive from a major arterial ramp. (Refer to Figure 22).

Access to Interstate or Principal Arterial Ramps

●   Activity Centers

Blockgroup to Interstate or Principal Arterial Ramps

Drive Time (Minutes)

- 22.1 - 33.0
- 14.1 - 22.0
- 10.1 - 14.0
- 8.1 - 10.0
- 6.1 - 8.0
- 4.1 - 6.0
- 2.1 - 4.0
- 0.8 - 2.0

N

0   Source: 10 Mi
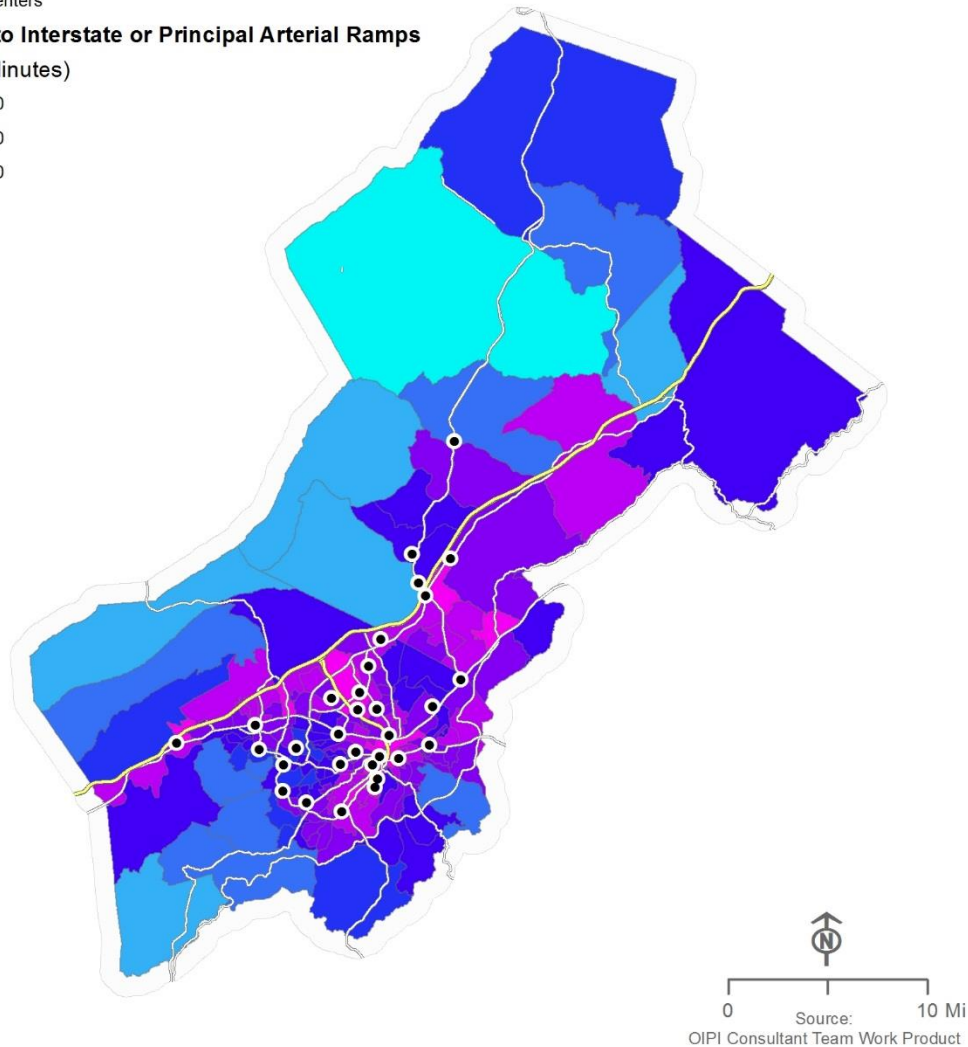OIPI Consultant Team Work Product

Figure 22: Access to Interstate and Principal Arterial Ramps

The location of warehouses and distribution centers is another important factor in the level of freight accessibility for the region. Most warehouses and distribution centers in the Roanoke Region are clustered around US Route 460 in and around the City of Roanoke, and along US Route 11 north of Roanoke City. Most areas within the City of Roanoke, and along I-81 corridor, have access to a warehouse or distribution center within a 20 minute drive. (Refer to Figure 23).
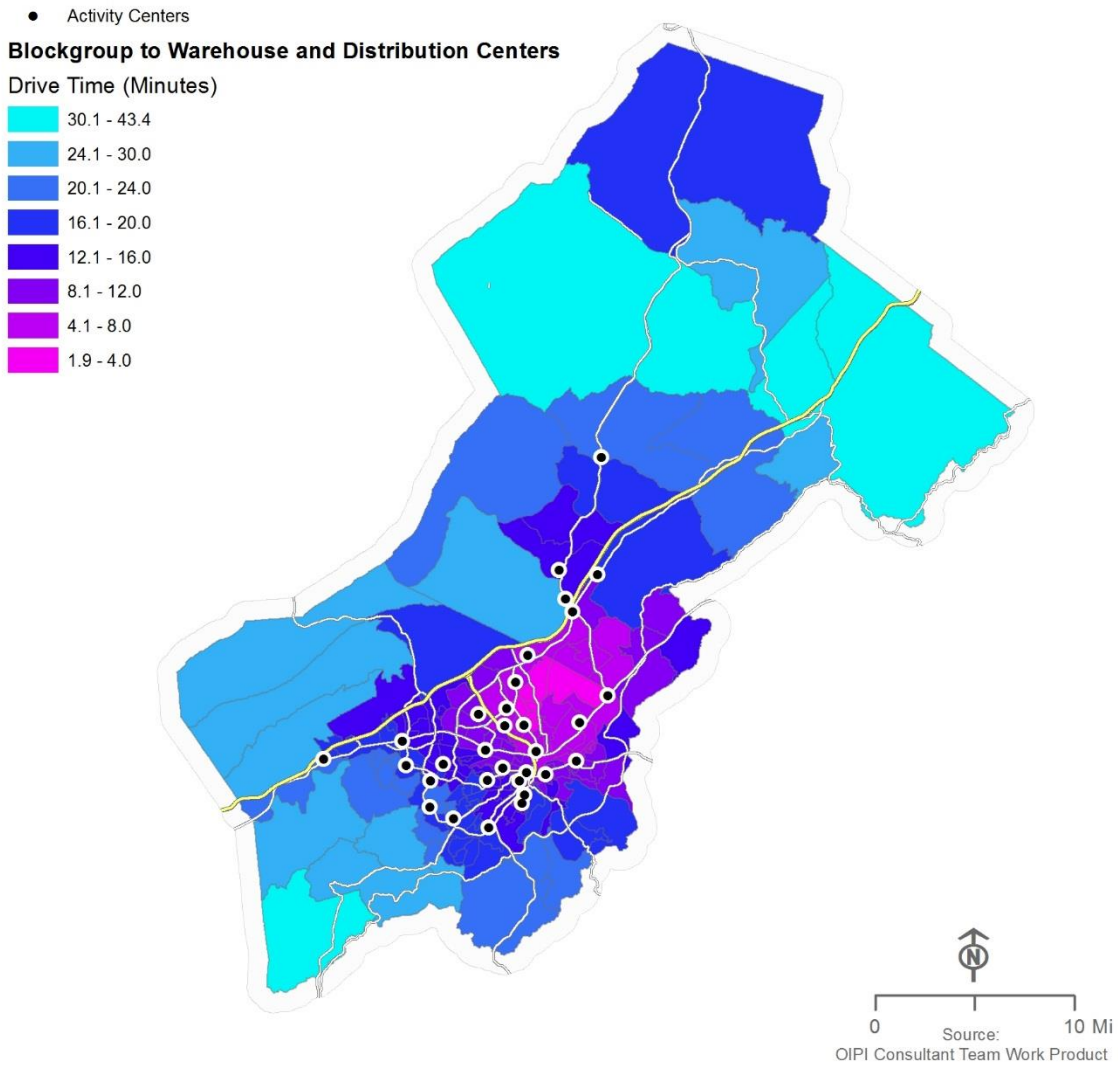
Access to Warehouse and Distribution Centers

- Activity Centers

Blockgroup to Warehouse and Distribution Centers

Drive Time (Minutes)

- 30.1 - 43.4
- 24.1 - 30.0
- 20.1 - 24.0
- 16.1 - 20.0
- 12.1 - 16.0
- 8.1 - 12.0
- 4.1 - 8.0
- 1.9 - 4.0

Source:
OIPI Consultant Team Work Product

Figure 23: Access to Warehouses & Distribution Centers

Norfolk Southern operates freight rail lines that pass through all the jurisdictions in the Roanoke Region. Air freight is accessible within the region at the Roanoke-Blacksburg Regional Airport. Most areas of the region are within a half hour driving distance from a freight airport. (Refer to Figure 24).

Access to Major Air Cargo Airports

- Activity Centers

Blockgroup to Major Air Cargo Airports
Drive Time (Minutes)

- 40.1 - 47.7
- 30.1 - 40.0
- 23.9 - 30.0
- 19.0 - 23.8
- 15.1 - 18.9
- 10.1 - 15.0
- 5.1 - 10.0
- 2.8 - 5.0

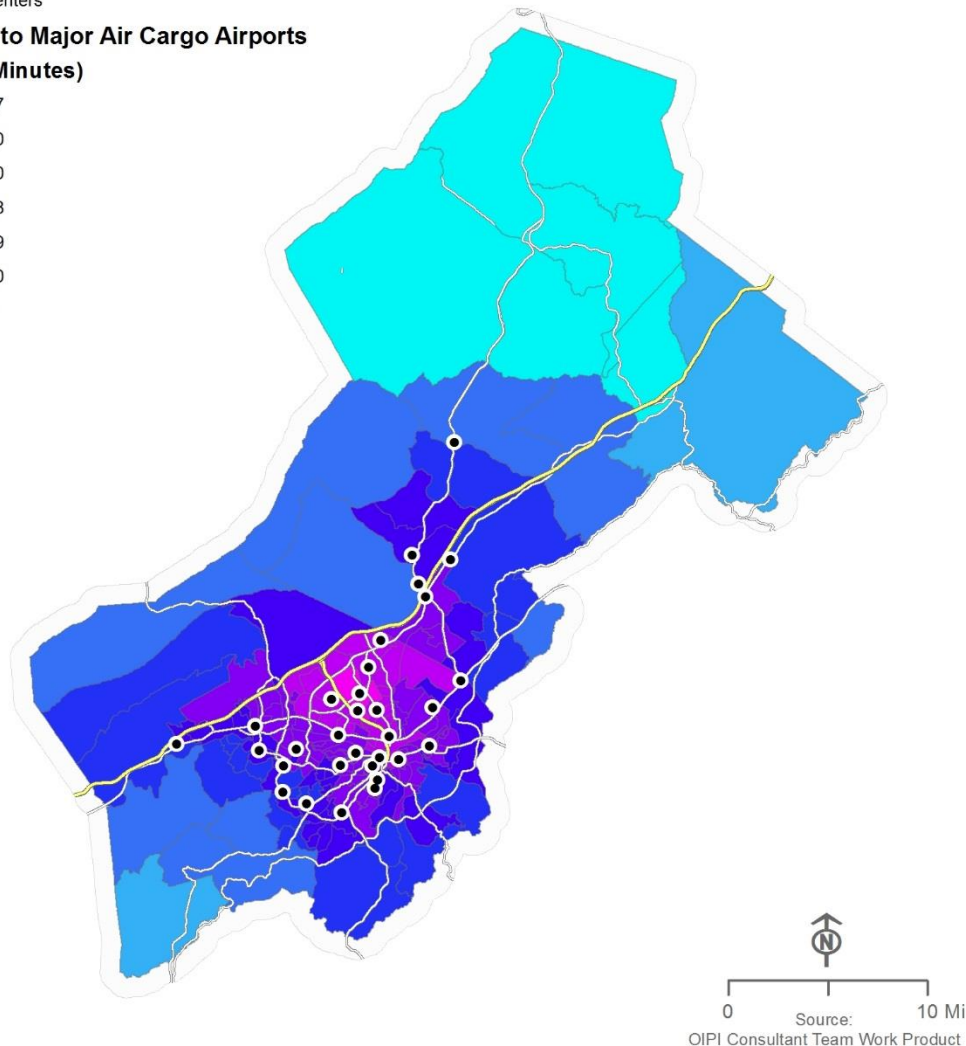Source: OIPI Consultant Team Work Product

Figure 24: Access to International Airports

D. Roadway Measures

This assessment identified the transportation conditions in the Roanoke Region based on a series of quantitative roadway measures. The findings in this section reflect corridor-level measures that are critical to access and mobility for people and freight.

Travel Time Reliability

Travel time reliability measures the frequency by which trips along a specified corridor are significantly delayed. The Reliability Index, as shown in Figure 18 below, is defined as the ratio of the median speed to the 90th percentile speed during the weekday AM peak period. Data for major roadways in the Roanoke Region were available for analysis. Overall, scores on the travel time reliability index indicated high travel time reliability for both corridors. The reliability index scores are higher in several locations within the City of Roanoke and Roanoke County, representing slightly lower levels of travel time reliability. There are, however, no areas of significant concern along any of the corridors. (Refer to Figure 25).
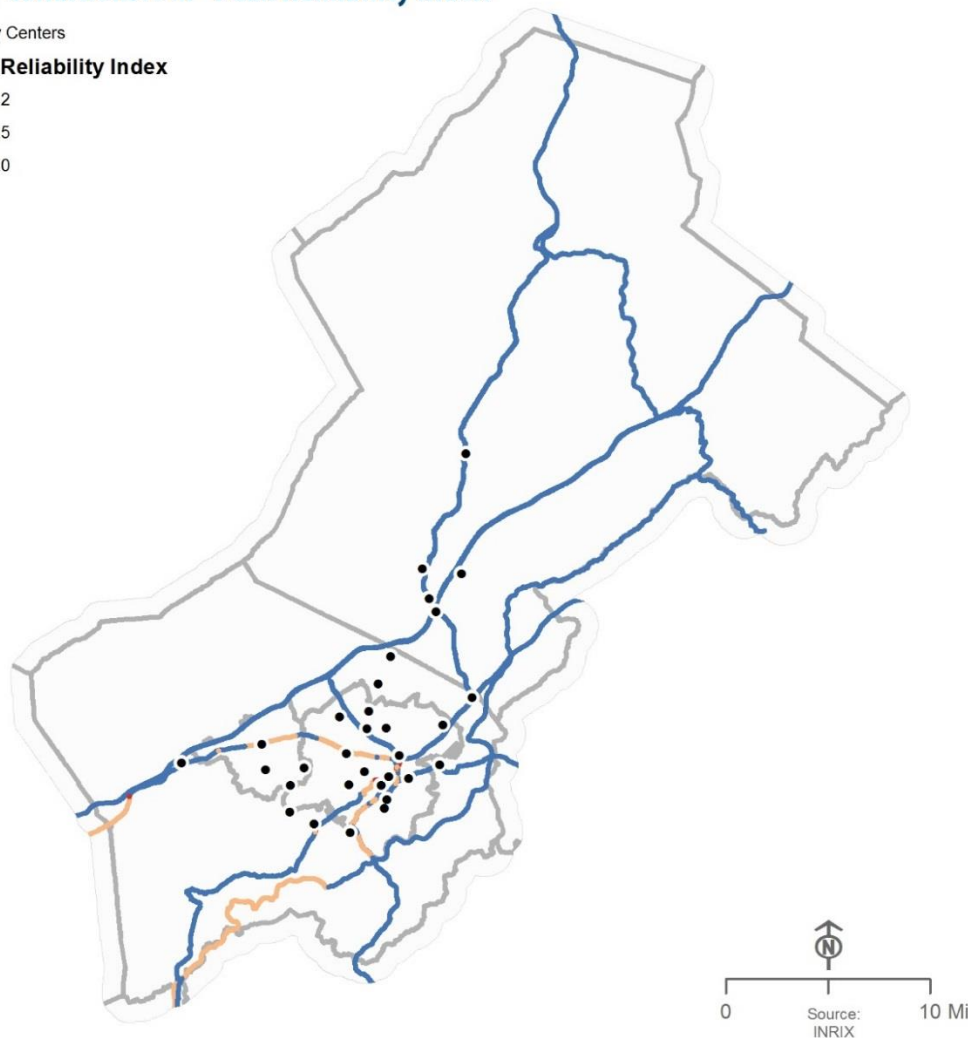

Figure 25: Travel Time Reliability

Note: The Reliability Index is based on a statewide scale which may skew the scores for the Roanoke Region based on the travel time reliability in other regions throughout the state.

Percent of Time Congested

Congestion is an important determinant of roadway level of service. The percentage of time congested was calculated for evening peak times from 2013 to 2014 for major corridors in the region. According to the analysis, the major roadways of the Roanoke Region do not have major congestion problems. The typical roadways analyzed are congested less than 5% of the time. (Refer to Figure 26).

Highway Conditions: PM Peak - Percent Time Congested

- Activity Centers

PM Peak - Percent Time Congested

- 0% - 4.5%
- 4.6% - 12.7%
- 12.8% - 41.3%

PM peak percent time congested. A percentage of the time that a typical vehicle spent in significantly congested conditions in 2014. Significant congestion is defined as operating at speeds below 50% of the free-flow speed. The free-flow speed is measured as the 85th percentile over night speed.
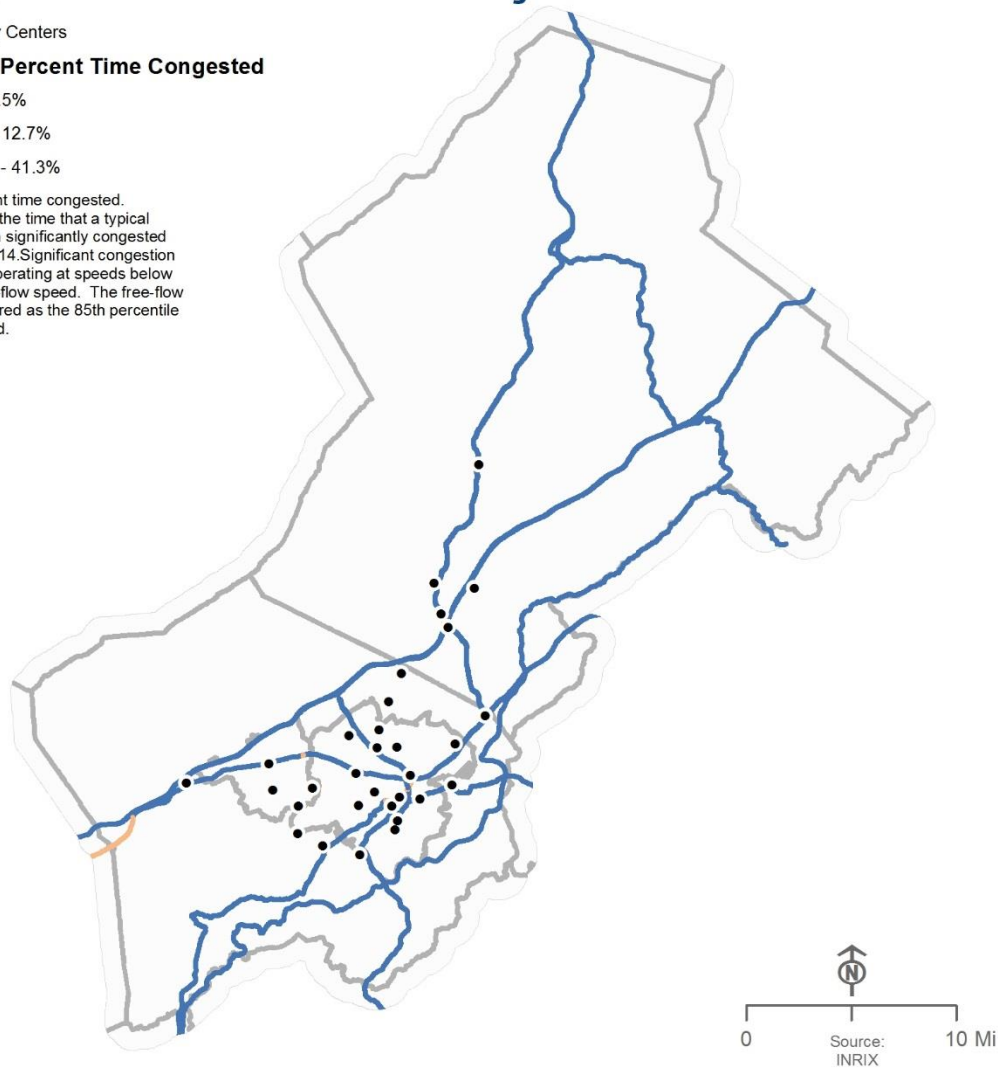
0   Source: INRIX   10 Mi

Figure 26: Percent of Time Congested

Travel Time Delay

Figure 27 displays the total hours of delay per vehicle experienced during the evening peak period on Tuesdays-Thursdays in 2014. A traveler is considered as experiencing delay when travel speeds fall below the posted speed limit. In the Roanoke Region, the greatest delay occurs on the Blue Ridge Parkway and US Route 11. (Refer to Figure 27).

Highway Conditions: AM Peak Delay Hours

- Activity Centers

AM Peak Delay Hours

— 0 - 25
— 26 - 50
— 51 - 80

This map displays the total number of hours of delay per vehicle experienced during the weekday. AM Peak Period during the study year. Delay is measured as the difference between free flow times and AM peak travel times.

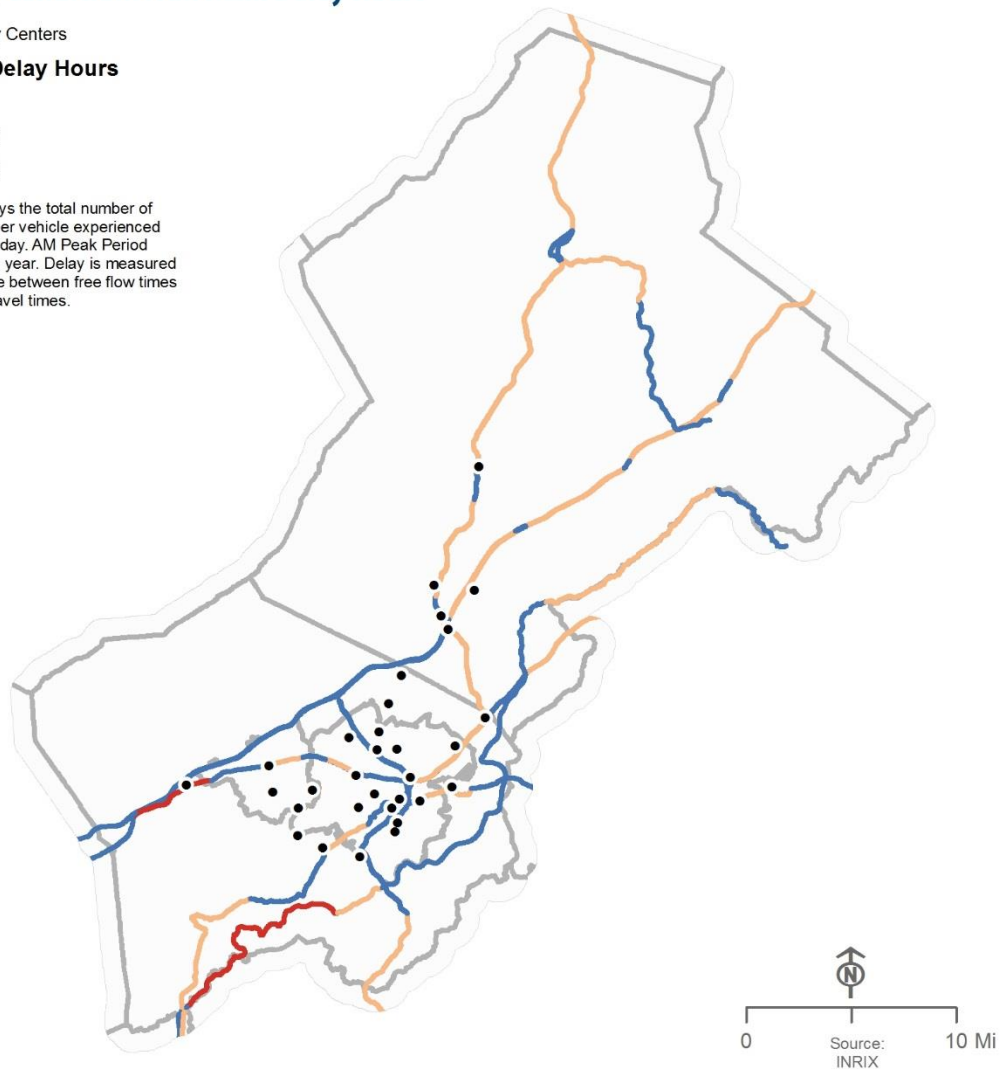0   Source: 10 Mi
         INRIX

Figure 27: Travel Time Delay

Median Speeds

Figure 28 displays the ratio of pm peak hour vehicle speeds and the speed limit. Speeds greater than 1.0 indicate travel at speeds higher than the speed limit. The median speeds were highest on I-81, which operated on a median speed between 61 and 70 mph. The slowest median speeds occurred in the Cities of Roanoke and Salem, which operated at a median speed between 13 and 30 mph. Most major roadways in Botetourt and Roanoke Counties operate between 46 and 60 mph. The exception to this are VA Route 43 in Botetourt County, and US Routes 221 and 11 in Roanoke County, and the Blue Ridge Parkway in both the aforementioned counties. For the most part, the lower median speeds seen in the region are the results of lower speed limits and increased number of traffic lights as these major through routes traverse the urban areas of the region with an increased number of access points. (Refer to Figure 28).
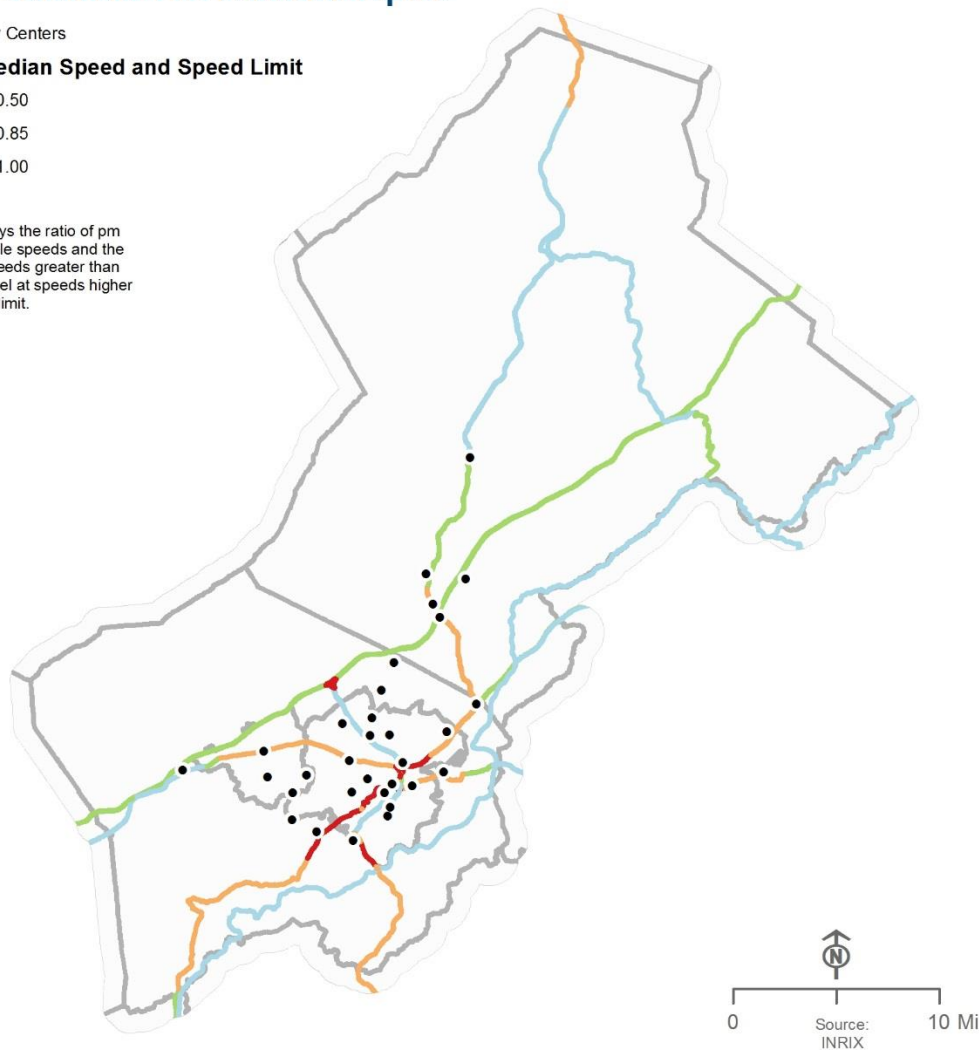

Figure 28: Median Speeds

D. Regional & Local Commodity Flows

Although not strictly an intra-regional issue, an understanding of commodity flows is one important piece of identifying and characterizing how transportation systems support regional businesses. Freight flows within, out of, and to the Hampton Roads Region support local businesses by moving goods to market and allowing business to access key material inputs. The measures below discuss modal dependence of freight commodities, as well as the top commodities in the region by monetary value, geographic destination, and tonnage.

Modal Dependence

The ability of goods and services to flow between industries and customers is the foundation of a functioning economy. Freight delivery is essential to enable input commodities to reach production locations, deliver intermediate goods, and also to deliver finished products to customers. Industry output (sales) in this context can be considered to be "dependent on freight," since transportation is used to move products between buyers and suppliers.

This section assesses the relative reliance of different industries on modes, quantified in terms of dollars of freight-dependent industry output. In the Roanoke Region, an average of 87% of the dollar value of all goods that are moved through the region are moved by truck. Air is the second most important mode, accounting for 7% of dollar value of goods movement. Rail is slightly less prevalent than air movement, accounting for 6% of dollar value of goods movement. (Refer to Figure 29).
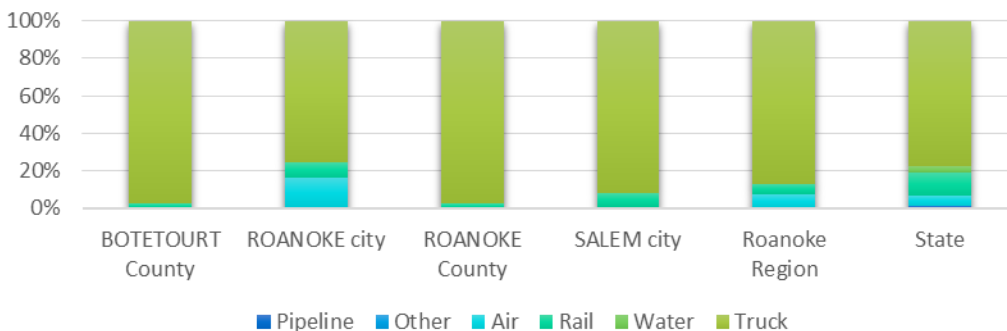
Figure 29: Comparison of Freight Modal Dependence
Source: TranSearch, 2012

Location quotients are used to compare the prominence of freight modes between the Roanoke Region, and the state as a whole. The Roanoke Region relies on trucks for freight movement 1.13 times more than the does the state as a whole. Rail transportation for goods is more common for the state on average than it is for the Roanoke Region. This reflects the greater density of freight rail lines in other portions of the state. Use of air transportation in freight movement is used 1.38 more times in the Roanoke Region than it is in the rest of the state. This indicates that the Roanoke Regional Airport is an important part of freight movement in the region. (Refer to Figure 30).
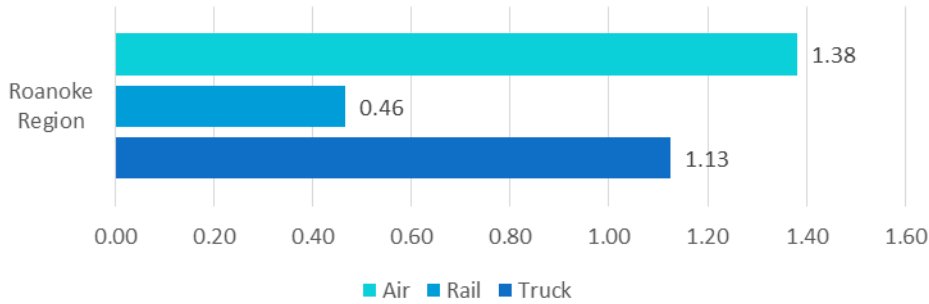
Top Commodities

While to prior section addressed freight modal dependence on the basis of industry output, this section describes commodities shipped into and out of the region, as measured in terms of the dollar value and tonnage of each commodity group. Other freight accounts for the most valuable freight imported to the Roanoke Region. This accounted for almost half of the total value of freight imported to the region. Other freight products also accounted for over two-third of value of freight exported from the freight region. Overall, the Roanoke Region imported almost $8 billion worth of goods and exported $8.4 billion worth of goods, resulting in $300 million of net exports in 2012. (Refer to Figures 31 and 32).
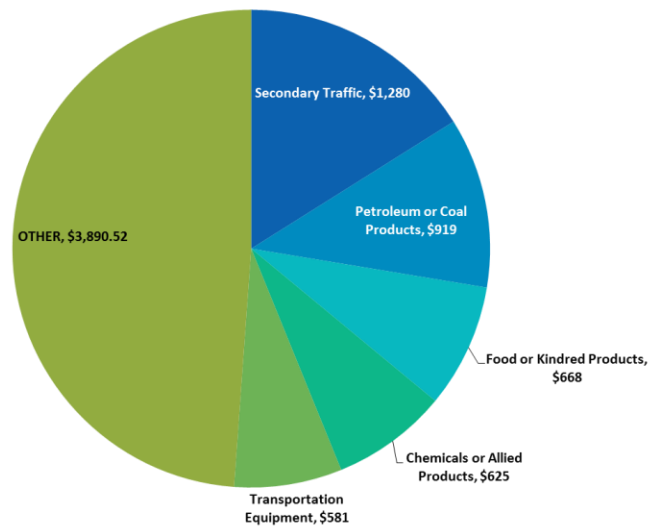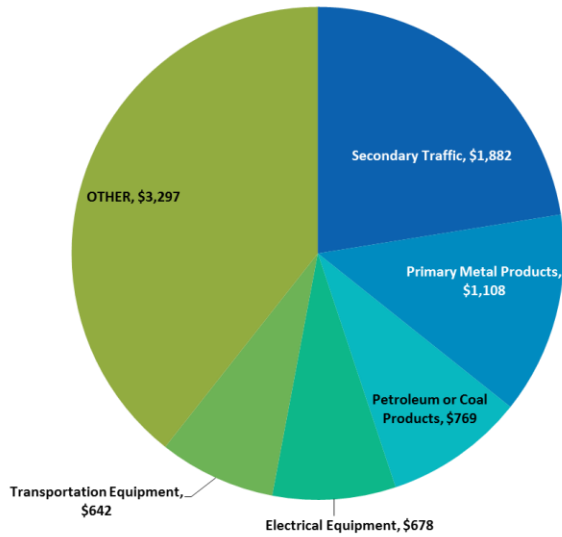

Figure 31: Top Freight Values by Commodities.
Source: TranSearch, 2012

Outbound Commodities, by Value ($M)

Secondary Traffic, $1,882

Primary Metal Products, $1,108

Petroleum or Coal Products, $769

Electrical Equipment, $678

Transportation Equipment, $642

OTHER, $3,297

Figure 32: Top Freight Values by Commodities.
Source: TranSearch, 2012

The Southeast region, as defined by the Bureau of Economic analysis, is the destination for the most freight from the Roanoke Region, based on both value and tonnage. In 2012, $3 billion of freight was exported to the Southeast Region. In total tonnage, over three million tons of freight moved from the Roanoke Region to the Southeast Region. The Mideast Region accounts for the second highest amount of both freight value and tonnage measures. Over $1 billion and almost one and a half million tons of freight moved to the Mideast Region from Roanoke. (Refer to Figure 33).
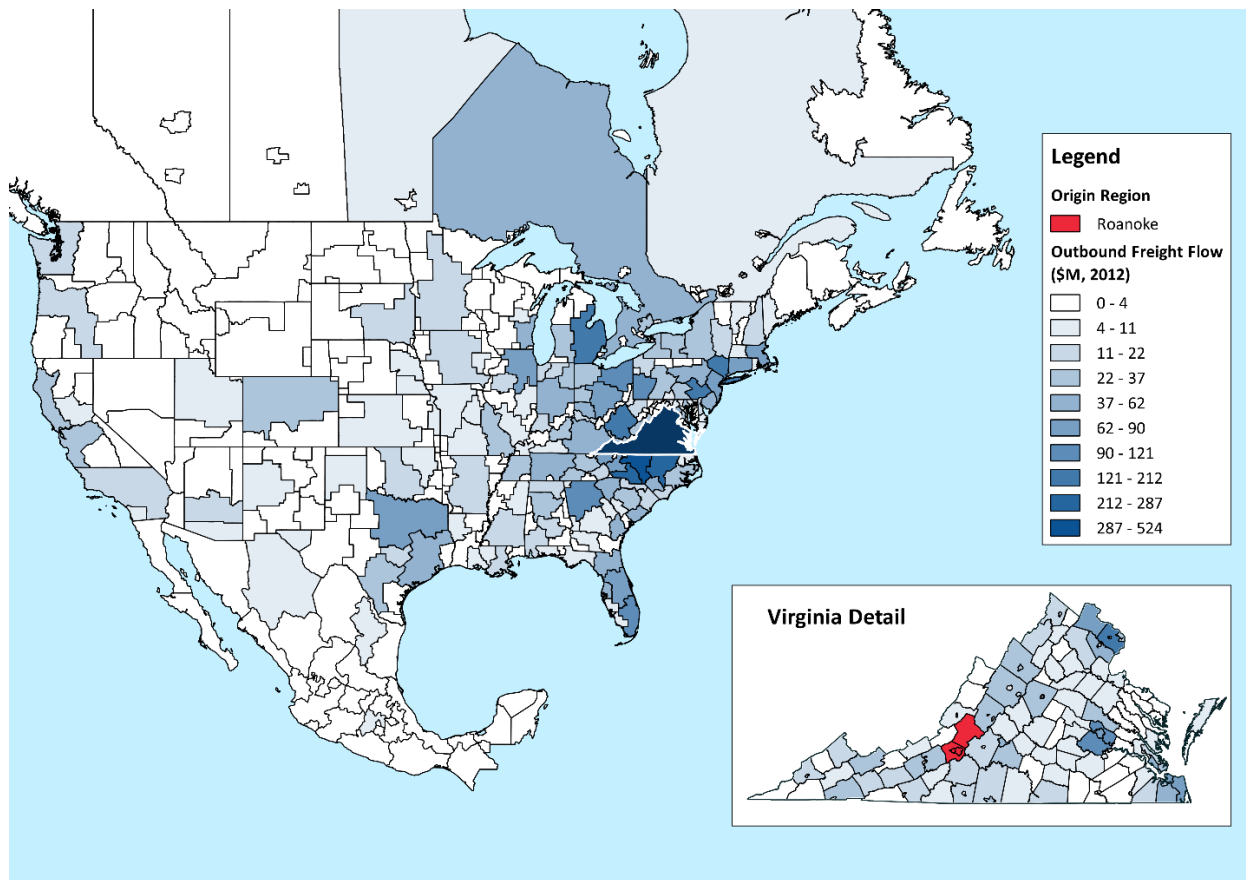
Figure 33: Top Freight Values by Region.
Source: TranSearch, 2012

The next figures present information on top commodities moved to and from the region, based on their tonnage. Considering freight movements both in terms of value and in terms of tonnage provide distinct perspectives for transportation planning. Value most directly relates to economic activity, while tonnage can serve as one indicator of likely wear and tear imposed on the transportation network by freight movement. When freight movements were analyzed by weight, low-value per ton goods came to the top. Nonmetallic minerals and clay, concrete, glass, or stone products account for the largest tonnage of freight exported from the Roanoke Region, while nonmetallic minerals and petroleum and coal products represent the heaviest imports. (Refer to Figures 34 and 35).

Inbound Commodities, by Weight (000s of tons)
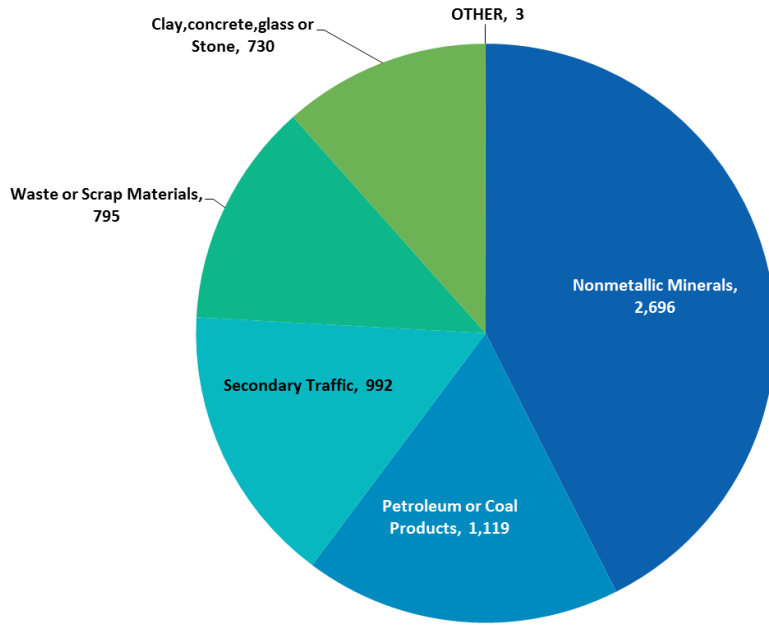
Figure 34: Top Commodities by Weight – Inbound.

Source: TranSearch, 2012

Outbound Commodities, by Weight (000s of tons)
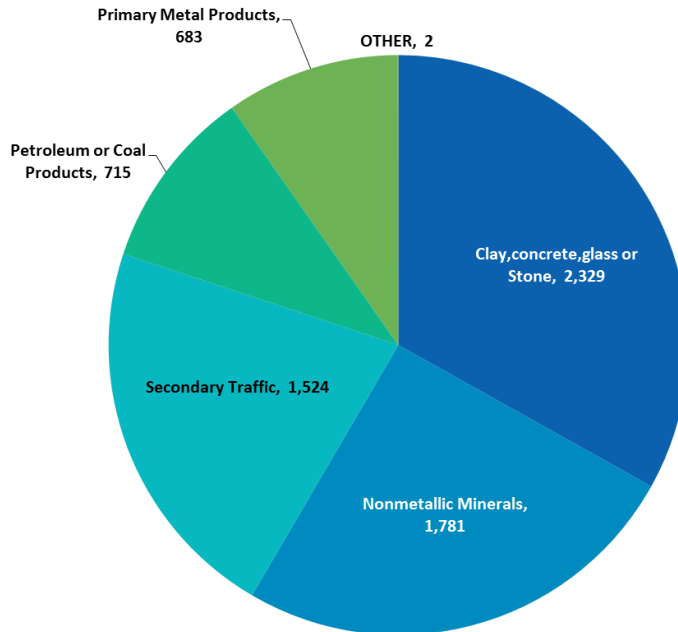
Figure 35: Top Commodities by Weight - Outbound.

Source: TranSearch, 2012

4. NEEDS PROFILE

A. Introduction

Based on the overall approach to the VMTP Needs Assessment, Transportation Needs will be identified as deficiencies or gaps in the transportation conditions that are most critical to each region's key future industries, with an emphasis on attracting and retaining the future workforce and supporting Virginia businesses' goods movement needs. The key economic and transportation conditions have been identified in the Economic and Transportation profiles above. Economic and transportation linkages are discussed at length in the Regional Network Needs Assessment Introduction.

The Needs Assessment relates current transportation conditions and deficiencies to key future industries and economic profiles. The Needs Assessment, however, does not propose specific projects to address the Transportation Needs in each region, since this should be done by MPOs, localities and other nominating entities when they put forward projects for potential funding programs, including those subject to HB2 screening. Instead, the VMTP Transportation Needs Assessment is intended to identify a set of regional Transportation Needs in order to be able to compare proposed projects to Needs. The Needs Assessment also uses a spatial analysis for the Region to provide observations about specific corridors, travel markets, and activity centers in addition to the regional profiles that will provide more detail regarding specific areas within the region around which some of the transportation needs are focused.

Needs have been identified based on both stakeholder input and on the analysis of economic and transportation conditions. In the first round of Regional Forums, held in May, 2015, the transportation and economic conditions were presented to groups of regional stakeholders. Following this, a discussion was held with the stakeholders to connect the transportation conditions to desired economic futures and begin identifying potential Needs.

These Needs were categorized into a series of five very broad types of capacity Needs:

1. Corridor Reliability/Congestion
2. Network Connectivity
3. Transportation Demand management
4. Modal Choice
5. Walkable/Bikeable Places

Non-Capacity Needs (i.e. Safety, Operations and State of Good Repair Needs) were also recorded when they were identified from stakeholder input, although these were not the focus of the Regional Networks Needs Assessments. The potential Needs identified in the first Forum were analyzed by the OIPI teams against the economic and transportation data that was assembled for each region and, where data was found to support the proposed Needs, these Needs were included and documented. In addition, the Study Team analyzed all the overall assembled data for each region in order to identify additional Needs not identified in the Forum, to assemble a more complete picture of potential Transportation Needs in each region, with a particular focus on attracting and retaining the 21st century workforce needed for each region's 2025 economy.

B. Economic and Transportation Needs Correlation

The Study Team conducted a number of research efforts aimed at identifying key correlations between industries and their transportation needs, as described further in the introductory document, VMTP 2025 Needs Assessment: Regional Networks Introduction. These included national research of industry trends in workforce needs and goods movement needs and a national survey of site selection professionals conducted by the Southeastern Institute of Research. Based on the findings of this research, the following table outlines the key correlations between three broad industry sectors (local, knowledge and freight sectors) and their general transportation needs. It should be noted that the table does not reflect that these industry sectors always have these and only these transportation needs. Individual industry types and individual business needs for transportation will vary and the table only represents where there were apparent correlations between industry sectors and basic categories of transportation needs.

Table 10: Economic and Transportation Correlation. Source: Summary correlations based on national research and survey of national Industry Site Selection Professionals conducted by OIPI Consultant Team.

Economic and Transportation Correlation Table			
	Local Sector	**Knowledge Sector**	**Freight Sector**
Highway Access	HIGH	HIGH	HIGH
Passenger Reliability	MED	HIGH	MED
Bottleneck Relief	MED	HIGH	HIGH
Freight Reliability	MED	MED	HIGH
Freight Accessibility	MED	LOW	HIGH
Network Connectivity	HIGH	HIGH	MED
Transportation Demand Management	LOW	MED	MED
Modal Choice	HIGH	HIGH	MED
Transit Access	MED	HIGH	MED
Active Transportation Options	MED	MED	LOW
Walkable Places	MED	HIGH	LOW

The above table of correlations was used to identify potential categories of Transportation Needs in the region by linking prominent regional economic sectors with anticipated Needs and comparing these to the general transportation conditions that currently exist, as described below.

C. General Regional Needs

As discussed in the Economic Profile above, when the 2025 Future Economic Profile was estimated for the Roanoke Region, it showed that nearly 90% of the economic output would be in the Freight and Local economic sectors, which account for 43% and 44% of economic output respectively. This is a shift in proportion, where today the Roanoke Region's economic output is 45% Freight and 42% local. This shift may highlight the need for additional transportation services as outlined in the Economic and Transportation Correlation above.

The forecasted growth in the local economic sector for this region brings the potential for additional transportation needs. The economic and transportation correlations of the local economic sector has important correlations with transit accessibility to support workforce access to these kinds of jobs. Therefore, transportation needs in the region should include expanding transit access, both within the region's economic activity centers, and between the centers. Further, support for the local sector would also come from additional walkable places and modal options for walking and biking in the region.

The above represent general transportation needs for the region based on an analysis of its economic sectors and projected growth. More specific needs from a more detailed spatial analysis of the economic and transportation conditions in the region are described below.

D. Spatial Analysis of Regional Network Needs

Summary of Needs

Potential Needs were also developed by analyzing the economic and transportation data in the region from a spatial standpoint. This analysis included the potential Needs identified by stakeholders in the first Regional Forums, as well as new Needs that emerged from the spatial analysis of the data. These Needs were categorized into a series of very broad types of capacity Needs as described above. The spatial analysis of Needs consists of a Map of Needs, a table of identified Needs, and a Findings of Needs that summarizes the economic and transportation findings to support each identified Need. Each of these is summarized below.

To assist with the understanding of the map and table of needs described below and the relationship of these needs to the Corridors of Statewide Significance and the Urban Development areas, please refer to the following legend of icons.
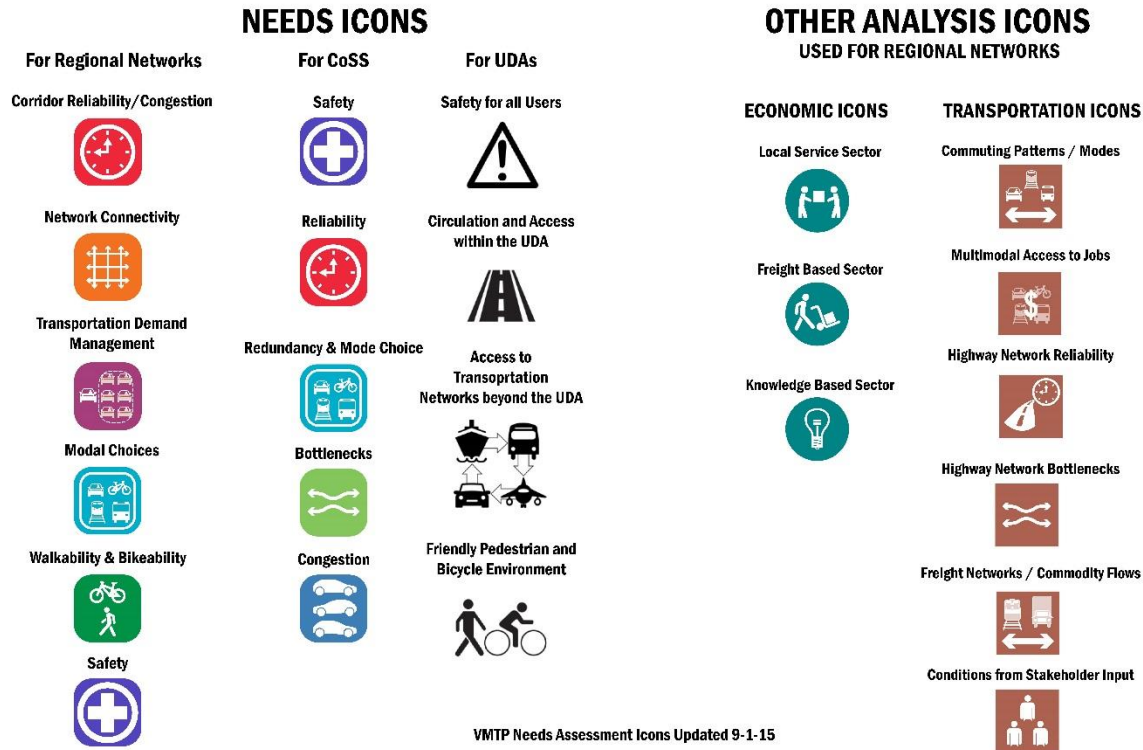
Figure 36. VMTP Needs Icons

Map of Needs

The map below summarizes the regional Transportation Needs according to Activity Centers and corridors. The Needs are summarized and color coded by general category. Each of the Needs is also numbered and keyed to the Finding of Needs table.
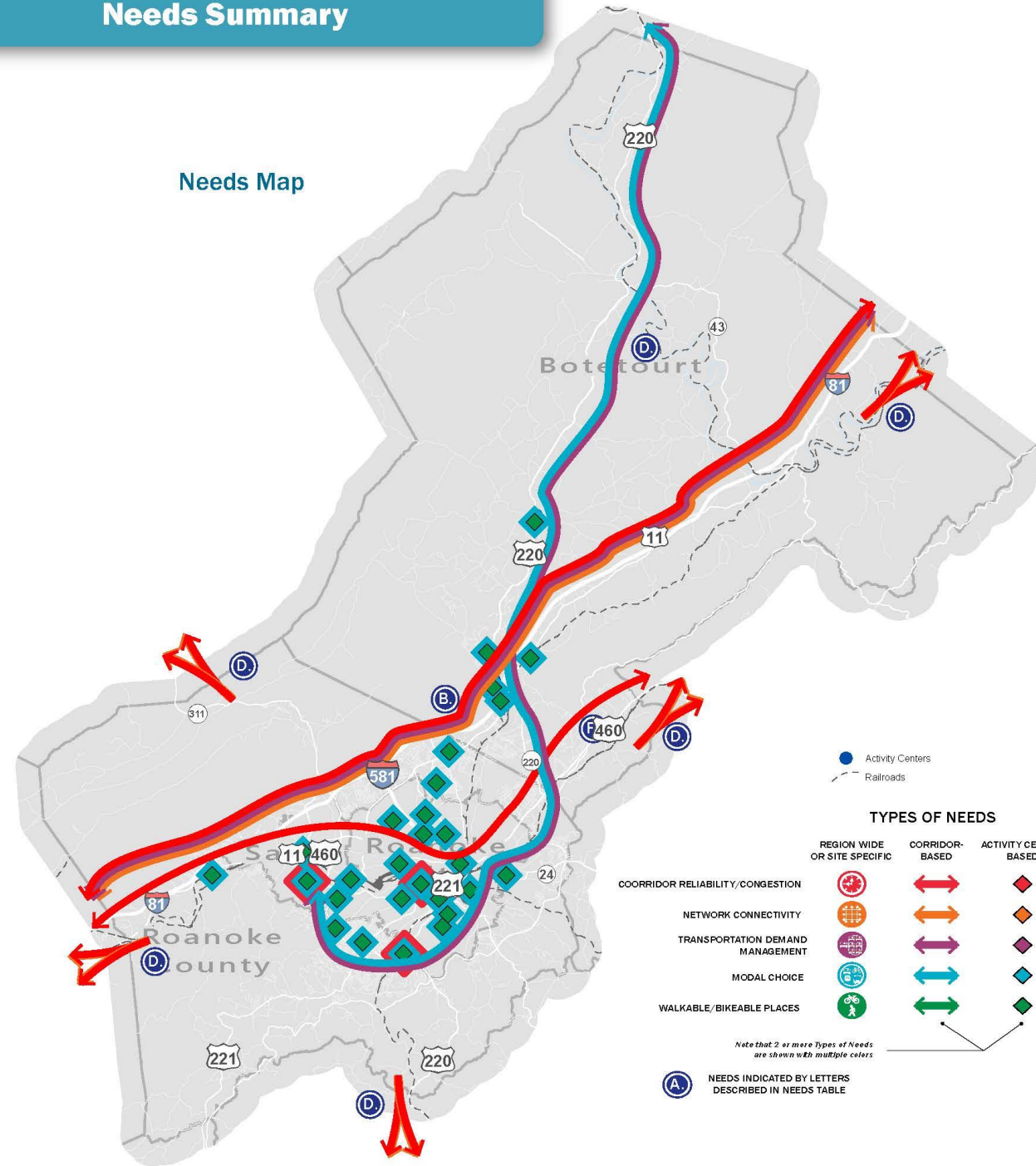
Findings of Needs

The table below lists each of the identified Transportation Needs in the Region, and describes the basis for each Need in terms of economic and transportation findings and data. The analysis of Regional Network Transportation Needs for the region was compiled into a table that identifies the following findings of need:

1. Category of Need
2. General Description of Need
3. Economic findings to support need
4. Transportation findings to support need

The findings to support the determination of need generally came from the statewide datasets of economic and transportation conditions summarized above. However, in cases where the statewide data is not of a fine enough grain or level of detail to accurately determine a Need, it was supplemented by locally obtained data from studies or plans. It is important to note that local plans and studies were not used to identify proposed projects as Needs, but only for supporting data to make an objective determination of need.

Roanoke Region Needs Summary

Needs Map

Needs Table

A. Walkable/Bikeable Places	
	Enhance regional walkability and bikeability at regional activity centers; in particular, focus on completing the regional greenway network and make last mile connections to existing and future greenways.
B. I-81/US 11 Reliability	
	The I-81/US 11 corridor and connected facilities serve as a major artery for regional freight and passenger movement. Ensuring reliability on the corridor is paramount to regional economic success.
C. Regional TDM	
	The Roanoke region includes park-n-ride access and TDM programs and services. However, **multiple activity centers and commuter oriented corridors would benefit from TDM programs** that can help reduce the number of vehicles on the network and the individual burden of a long or congested commute.
D. Inter-Regional Network Connectivity	
	Roanoke's economy, and therefore passenger and freight movement, is closely linked to surrounding regions such as Lynchburg and Blacksburg/Christiansburg. Increasing network connectivity between regions ensures local economic success.
E. Regional Mode Choice	
	Multiple activity centers in the region are underserved by transit. Providing multiple connections between major activity centers provides travel choices and improves regional connectivity. In particular, making multimodal connections with future Amtrak service will be key to the success of the region and to the new passenger rail service.
F. US 460 Reliability and Bottleneck Relief	
	There aren't major congestion issues in Roanoke, in relation to the rest of Virginia. However, bottlenecks do occur where some of the major arteries in the region converge; particularly relating to the US 460 corridor, parrallel rail network, and the downtown and Tanglewood Mall **activity centers. Addressing these bottlenecks is key to regional mobility and network fluidity.**

TYPES OF NEEDS

	REGION WIDE OR SITE SPECIFIC	CORRIDOR-BASED	ACTIVITY CENTER-BASED
COORRIDOR RELIABILITY/CONGESTION			
NETWORK CONNECTIVITY			
TRANSPORTATION DEMAND MANAGEMENT			
MODAL CHOICE			
WALKABLE/BIKEABLE PLACES			

Note that 2 or more Types of Needs are shown with multiple colors

Activity Centers
Railroads

NEEDS INDICATED BY LETTERS DESCRIBED IN NEEDS TABLE

0   5 Mi

Table 11: Findings of Needs

A. Walkable/Bikeable Places

NEED

Enhance regional walkability and bikeability at regional activity centers; in particular, focus on completing the regional greenway network and make last mile connections to existing and future greenways.

ECONOMIC

Greenway facilities serve as placemaking infrastructure that attract the 21st century workforce. The Roanoke River Greenway is located throughout the urban core of the region and includes connectivity to many activity centers that are primarily local and knowledge based industries. Local serving industries rely on foot traffic and tourism more than other industry sectors and would benefit greatly from last mile connectivity with the greenway. Similarly, knowledge based industries rely on transportation infrastructure, such as greenways, that create a lively, healthy and sociable environments that attract a 21st century workforce.

TRANSPORT.

Data analysis on multimodal access to jobs, network congestion, reliability and delay, and commuting patterns suggest that the highest level of network activity, and the greatest access to jobs in the region is within the urban core. Making last mile connections for bikers and walkers will improve access to jobs, provide commuter options and meet local desires for an active lifestyle.

B. I-81/US 11 Reliability

NEED

The I-81/US 11 corridor and connected facilities serve as a major artery for regional freight and passenger movement. Ensuring reliability on the corridor is paramount to regional economic success.

ECONOMIC

Based on nationwide research conducted by the Southeastern Institute of Research, both freight related and knowledge based industries highly value access to reliable highway networks. In order to attract and retain these businesses it is crucial to ensure reliability on I-81 and associated/supporting facilities such as US 11.

TRANSPORT.

The I-81/US 11 corridor handles significant passenger and freight traffic to and through the Roanoke region. Highway reliability data suggests that during significant traffic events, such as crashes, the lack of redundancy in the network to provide relief causes a catastrophic failure of passenger and freight truck movements, sometimes lasting several hours.

C. Regional TDM

NEED

The Roanoke region includes park-n-ride access and TDM programs and services. However, multiple activity centers and commuter oriented corridors would benefit from TDM programs that can help reduce the number of vehicles on the network and the individual burden of a long or congested commute.

ECONOMIC

Research indicates that the retiring baby boom generation and the emerging millennial workforce prefer to live in places that provide multiple travel options.

TRANSPORT.

TDM access exists throughout much of the Roanoke regional network. Several corridors such as the I-81/US 11 corridor includes some of the longer commuter trips in the region and would benefit from carpool and vanpool programs that would consolidate single occupancy vehicles and alleviate stress on the network. The route 419 and 220 corridors also include several activity centers that have limited transportation options; connecting these activity centers and corridors through TDM programs will improve network capacity and provide choices for commuters.

D. Inter-Regional Network Connectivity

NEED

Roanoke's economy, and therefore passenger and freight movement, is closely linked to surrounding regions such as Lynchburg and Blacksburg/Christiansburg. Increasing network connectivity between regions ensures local economic success.

ECONOMIC

Roanoke is the largest urban area outside of Virginia's 'urban crescent' and therefore serves as a major hub for the greater region. Roanoke's largest businesses, such as banking and healthcare, serve as regional centers that draw customers and resources from within as well as outside the region. Roanoke also serves as a major freight hub, including regional headquarters for multiple freight/shipping companies. Ensuring connectivity between internal and external resources will ensure success of these major business hubs.

TRANSPORT.

Based on commuter flow mapping analysis, there is significant cross commuting between Roanoke and the New River Valley and between Roanoke and Lynchburg. In addition, some of the major routes between these regions such as US 460 and 220 have the most significant reliability and congestion issues. FHWA data indicates that, during weekday PM peak periods, multiple sections along US 460 and 220 have slower median speeds and travelers spend a higher percentage of time in congestion.

E. Regional Mode Choice

NEED

Multiple activity centers in the region are underserved by transit. Providing multiple connections between major activity centers provides travel choices and improves regional connectivity. In particular, making multimodal connections with future Amtrak service will be key to the success of the region and to the new passenger rail service.

ECONOMIC

Research indicates that the retiring baby boom generation and the emerging millennial workforce prefer to live in places that provide multiple travel options.

TRANSPORT.

Transit access exists throughout much of the urban core within the Roanoke regional network. Several activity centers, such as Fincastle, Troutville, and others in Botetourt County, have no access to transit and would benefit from connector services to the urban core. Likewise the Route 419 corridor would benefit from improved transit service as it currently includes multiple activity centers, but only limited transit access.

F. US 460 Reliability and Bottleneck Relief

NEED

There aren't major congestion issues in Roanoke, in relation to the rest of Virginia. However, bottlenecks do occur where some of the major arteries in the region converge; particularly relating to the US 460 corridor, parrallel rail network, and the downtown and Tanglewood Mall activity centers. Addressing these bottlenecks is key to regional mobility and network fluidity.

ECONOMIC

The 460 corridor, including the parallel rail network, Tanglewood Mall and downtown Roanoke handles a nexus of all types of economic activity. In particular, with the introduction of passenger rail to this corridor, the region can expect improved economic growth. There is a need to balance passenger, freight and local traffic to successful serve all businesses in the region.

TRANSPORT.

Some reliability issue exist along the 460 corridor, especially in downtown Roanoke and the more urbanized areas of the corridor. Tanglewood Mall and the nexus of many major regional routes is also a chokepoint for the region. These ares handle many types of users, including passengers, freight, commuters, local trips and longer haul movements; ensuring reliability is key to the success of the region.