# VMTP 2025 Needs Assessment

Regional Needs Profile
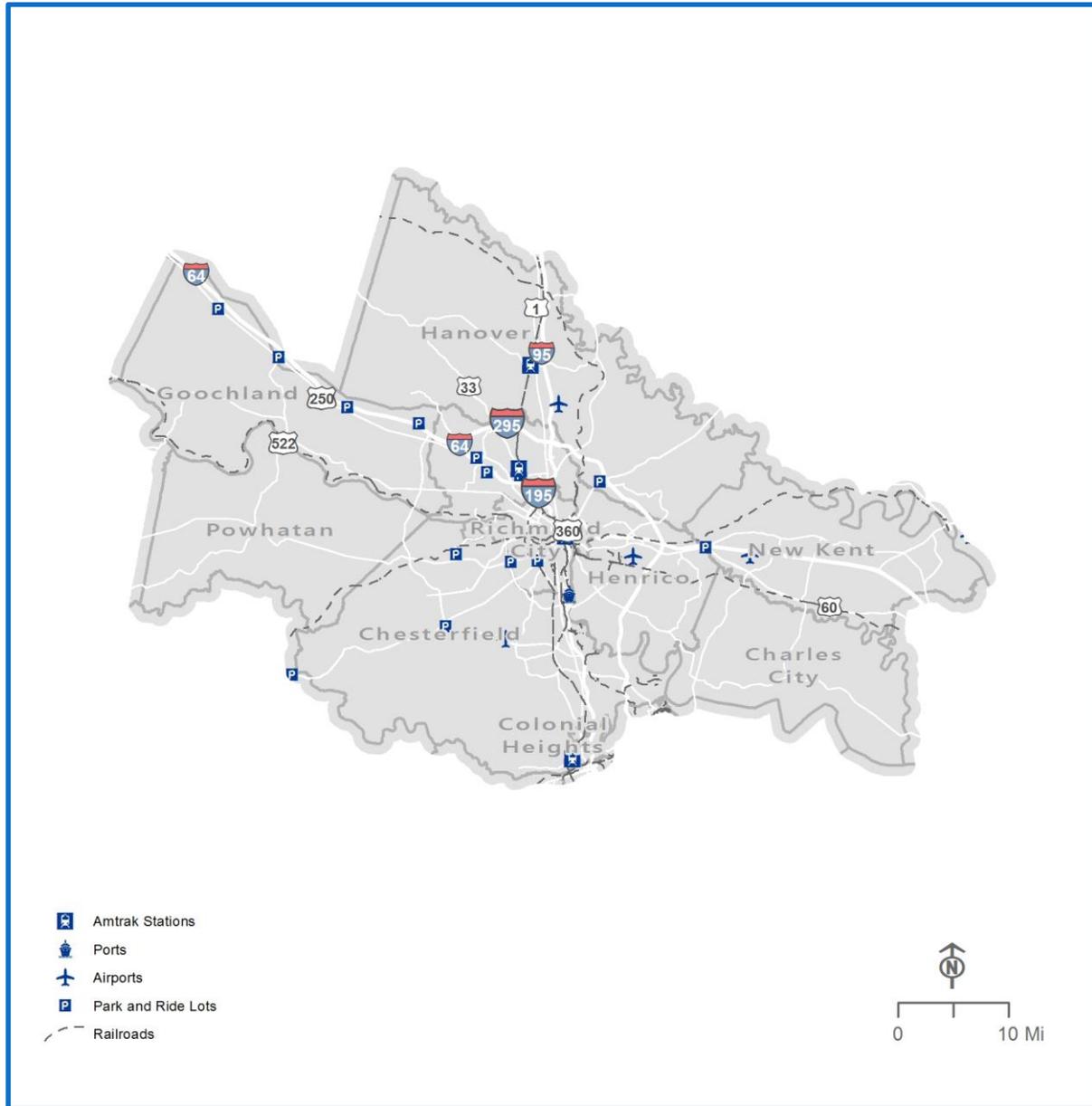
Richmond Region

December 2015

1. NEEDS ASSESSMENT PURPOSE

The VMTP 2025 Needs Assessment is an essential element of the overall VTrans2040 Statewide Transportation Plan for Virginia. 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 Richmond 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 Richmond Regional Network, and that would support regional industries and workforces.

Defining a Regional Network
Transportation needs, as considered in the 2025 Needs Assessment, are defined as the gap between the transportation system in place currently that serves the existing industries in a region, and the future 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 Richmond 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 was developed as part of the outreach process in working with each region, as explained in the Regional Network Needs Assessment Introduction.

The Richmond Region is defined as the City of Richmond, Chesterfield County, Henrico County, Charles City County, Powhatan County, Goochland County, Hanover County, and New Kent County for the needs analysis. However, as shown in the Needs Assessment, below, other areas beyond the immediate needs analysis area were considered in the Needs Assessment as well.

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 Richmond Region's 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

According to the Woods & Poole *2014 State Profile*, 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 Richmond Region. Projections estimate about 200,000 new residents in the region by the year 2025. (Refer to Table 2).

Table 2: Bristol Region Population Projections.

| Current Population (2012)	Weldon Cooper Projection (2025)
1,025,561	1,229,842

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

Table 3: County and City Population Projections.

Jurisdiction	Current Population (2012)	Weldon 2025 Projection	% Change in Population
Charles City County	7,157	8,072	13%
Chesterfield County	323,856	430,226	33%
Goochland County	21,347	24,921	17%
Hanover County	100,668	128,227	27%
Henrico County	314,932	375,491	19%
New Kent County	19,169	22,013	15%
Powhatan County	28,123	33,771	20%
Richmond City	210,309	207,120	-2%

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

According to the Woods & Poole *2014 State Profile*, per-capita income for the region is expected to rise 19% (slightly less than the state average of 21%) from $43,051 to $51,400. Population growth is also projected to be accompanied by a demographic shift, with a higher percentage of the population between 25 and 39.
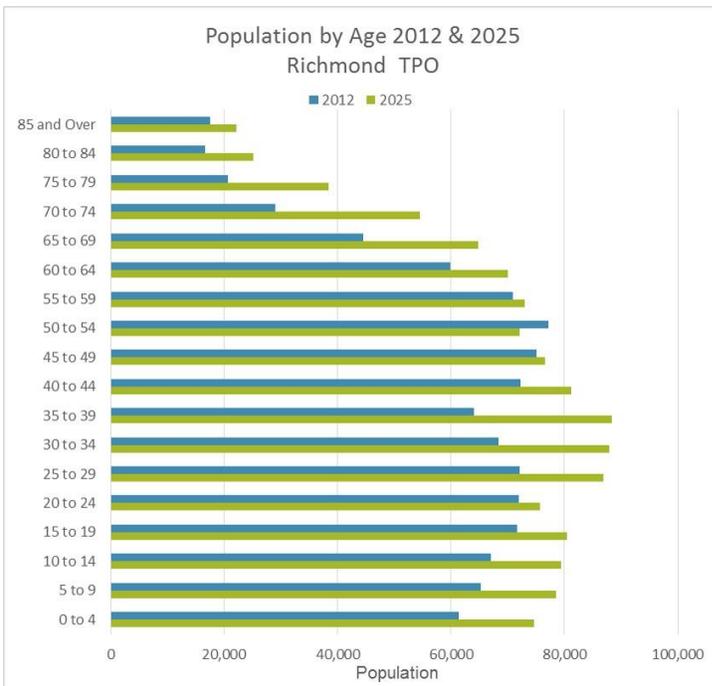
Figure 1: Population of Region 2000 in the years2012 and Projected for the year 2025.

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 Richmond 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 Richmond 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.
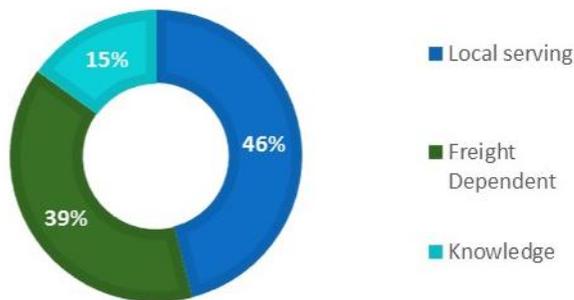
Figure 2: Top Sectors by Output
Source: IHS Global Insight, 2012.

The local services cluster is clearly the strongest in this region. Local services make up 46% of the economic output in the Richmond Region. The knowledge and freight-dependent clusters account for 15% and 39% of economic output, respectively. Each economic sector has different transportation characteristics and needs, as will be discussed below. The local services economic cluster, for example,

is typically characterized by different peak commute times; customer traffic; trip-chaining destinations; and truck deliveries.

Top Industries by Output

Wholesale trade is the strongest industry in the Richmond Region when measured by both economic output and employment. Retail Trade is the second largest industry in the region. Mining, healthcare, and finance and insurance 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	17%
Retail Trade	44 – 45	12%
Mining	21	11%
Healthcare	62	9%
Finance and Insurance	52	9%

Source: IHS Global Insight Data, 2012

Top Industries by Employment

In the Richmond Region, public administration, healthcare, mining, and finance and insurance are the top industries by employment. (Refer to Table 5). As the capital region, the high percentage of Public Administration employment is unsurprising.

Table 5: Current Top Industries by Employment.

Top Industries	NAICS Code	% of Workforce
Public Administration	92	16%
Healthcare	62	12%
Mining	21	10%
Accommodation & Food Services	72	8%
Finance and Insurance	52	7%

Source: IHS Global Insight Data, 2012

The list of top employers in the region shows a diversified economy in the Richmond Region. Capital One and Wells Fargo show that Finance is a critical industry to the Richmond Region, while VCU shows the importance of higher education and healthcare. Altria is representative of the importance of corporate management to the region while Wal-Mart is indicative of the importance of local services such as retail. WellPoint Inc. shows the importance of insurance and corporate management to the regional economy.

Table 6: Current Top Employers.

Employers	Employees
Capital One Financial Corp.	5,000 – 9,999
Virginia Commonwealth University	5,000 – 9,000
Wal – Mart Stores, Inc.	5,000 – 9,999
Altria Group	2,500 – 4,999
WellPoint Inc.	2,500 – 4,999
Wells Fargo & Company	2,500 – 4,999

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 Richmond Region. The industries expressed in Table 7 have the highest LQ scores in the region. The score for corporate management, for example, can be inferred to mean that these services are almost four 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
Corporate Management	55	3.82
Professional Services	54	2.34
Real Estate	53	1.87
Administrative Sector	56	1.58
Other Services	81	1.42

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. Activity centers were first defined in draft form using employment location patterns. A GIS-based spatial analysis was conducted to determine which areas have the greatest relative density of jobs. Activity centers were then developed for these areas using Census block boundaries. Activity centers were revised, refined, or amended after discussing economic conditions with regional stakeholders. Activity centers such as Meadowville were added through coordination with local stakeholders who had a knowledge of the regional significance of the activity in places were existing data sources had little information on employment. Figure 3 below shows the activity centers as blue circles. 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.

Richmond Activity Centers

● Activity Centers

|	
1 Airport and Industrial Park	16 Sandston/RIC
2 Ashland	17 Short Pump
3 Boulevard/Scotts Addition	18 St. Mary's Hospital
4 Broad/Forest	19 Swift Creek
5 Chesterfield	20 VCU
6 Chippenham Hospital/	21 Virginia Center Commons
Stonebridge	22 VSU
7 Dabney Industrial	23 Walthall
8 Downtown Richmond	24 Watkins Center/Westchester
9 DSCR	25 West Creek
10 Hanover Airport	26 Willow Lawn
11 Innsbrook	
12 Meadowbridge	
13 Meadowville	
14 Midlothian	
15 Port	
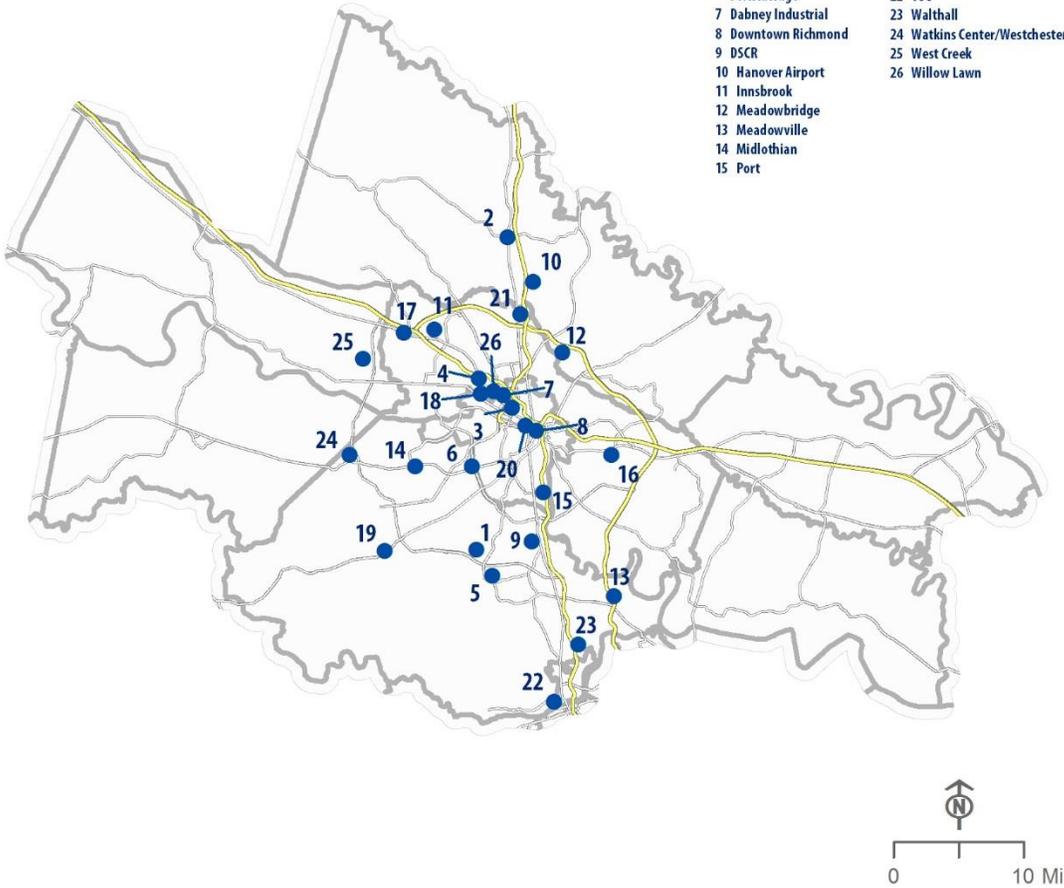
Figure 3: Map of Activity Centers based on Job Density and Stakeholder Input

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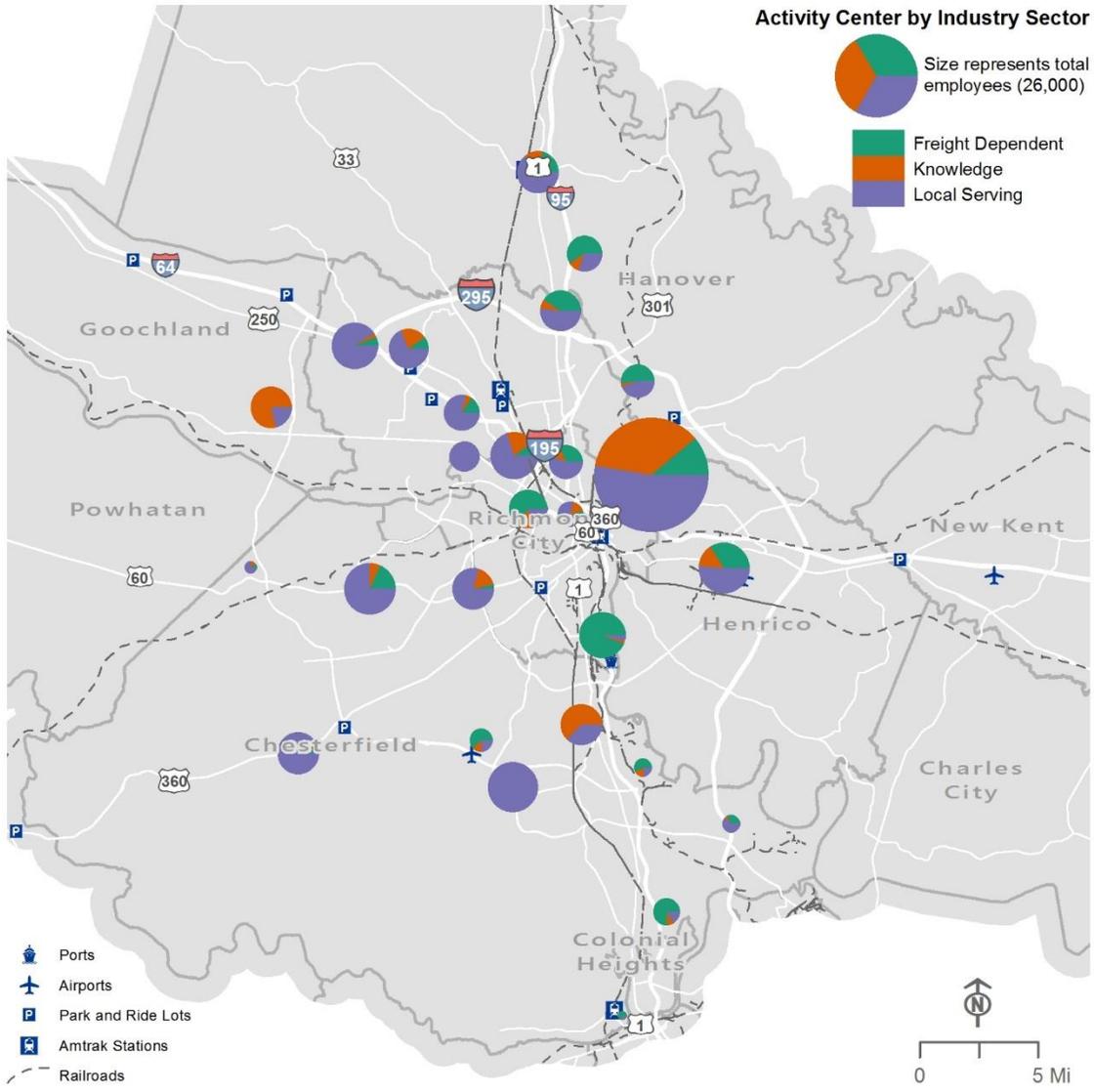
Figure 4: Activity Center Employment by Industry Sector.
Source: IHS Global Insight Data, 2012

E. Forecasted 2025 Industry and Employment Strengths

Through a series of work sessions with the Richmond 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 Richmond 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 Richmond 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

Substantial growth is forecasted for the Richmond Region area by 2025. According to statewide and national datasets used, the corporate management and arts, entertainment, and recreation industries will see the largest growth. Combined, they are expected to produce $5 billion more in 2025 than was produced in 2012.
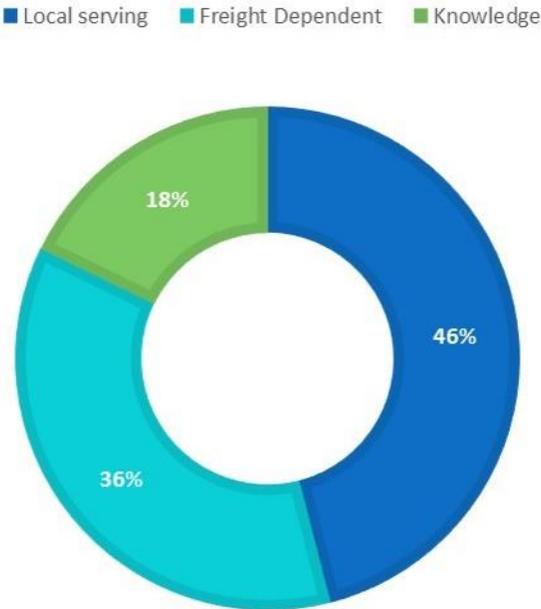
Figure 5: 2025 Industry Sectors by Output.
Source: IHS Global Insight Data, 2012

The local services cluster will remain the strongest sector in this region in 2025. Local services make up 46% of the economic output in the Richmond Region. The knowledge sector is expected to grow from 15% of regional output to 18% in 2025. The share of freight in the regional output is anticipated to decline from 39% to 36% in 2025.
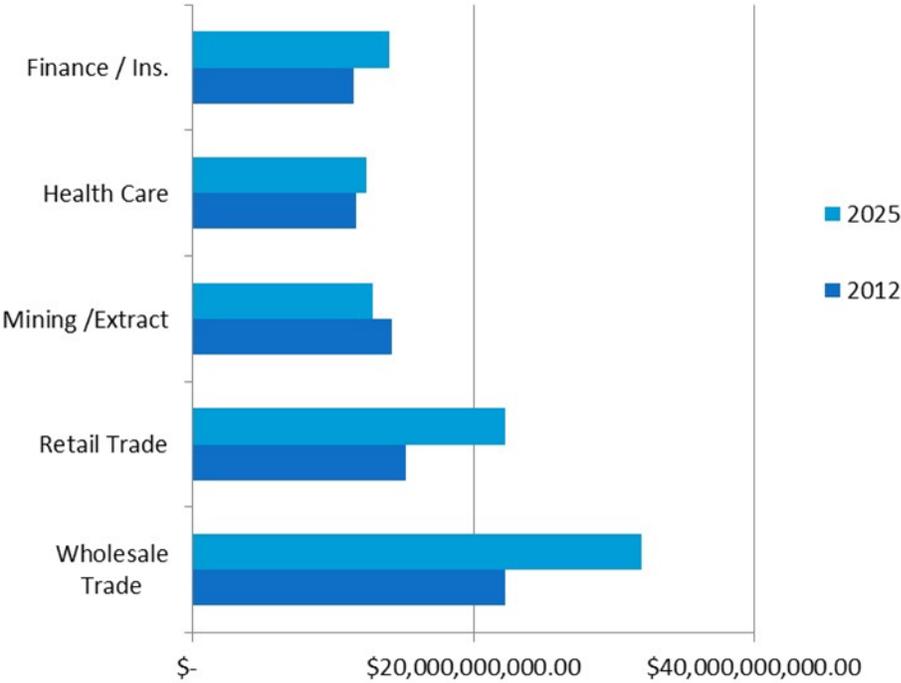
Figure 6: Top Industries by Output
Source: IHS Global Insight Data, 2012

All the top industries by output in the region will continue to grow in 2025, with the exception of mining. The administrative sector is anticipated to grow the most, in terms of employment, and will employ 52% more workers in 2025. In all industries combined, economic output in the Richmond Region is expected to increase by more than $38 billion by 2025. (Refer to Figure 6).

Table 8: Top Industries by Employment.

Top Industries	NAICS Sector Code	% Change in Employment (2012-2025)
Administrative Sector	56	52%
Construction	23	46%
Arts, Entertainment, and Recreation	71	37%
Health Care and Social Assistance	62	20%
Information	51	19%

Source: IHS Global Insight Data, 2012

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 Richmond 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 Richmond Region:

- Commuting Patterns
- Accessibility to Employment
- Roadway Measures
- Freight Measures

B. Commuting Patterns

Regional Commuting Patterns

Commuting patterns in the Richmond Region show that there is a number of workers commuting to the City of Richmond, Henrico County, and Chesterfield County. As represented in Figure 7, the vast majority of workers both live and work within the same jurisdiction or commute to another jurisdiction within the MPO area. The only jurisdiction that stands as the exception is New Kent County, where many workers commute to the Hampton Roads Region.

Commuter Origin/Destination Flow
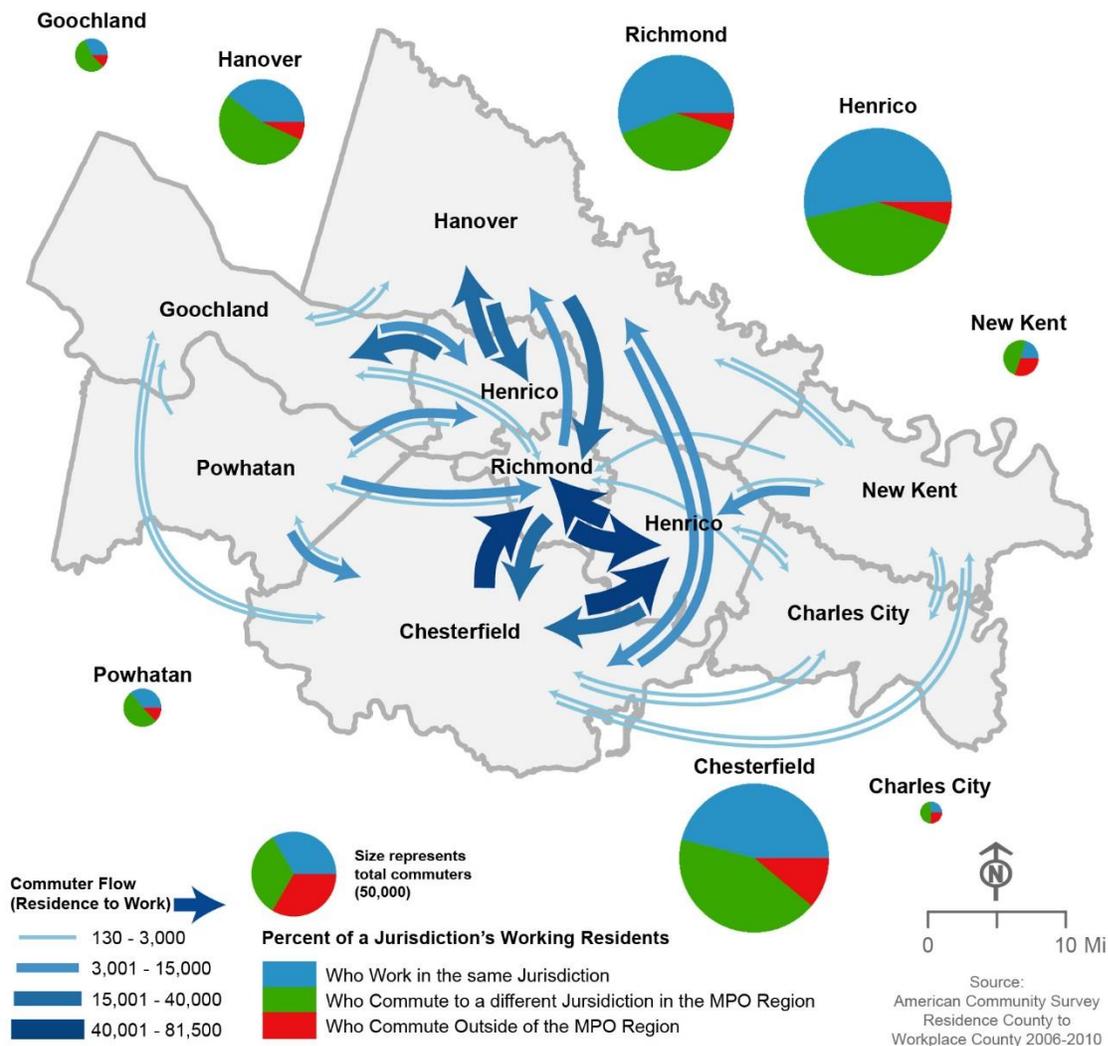
Figure 7: Regional Commuting Patterns.
*Source: Census Commuting Data, 2006-2010*

Activity Center Commuting Patterns

Equally important to the formation of a regional transportation profile for the Richmond Region was the analysis of commuting patterns between activity centers. Figures 8 through 15 below provide insights into the commuting patterns for eleven of the activity centers in the Richmond Region. Block groups are symbolized on a color scale from dark blue to yellow, with the darker shades 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, Downtown Richmond worker origins indicates a strong pattern of commutes from the western neighborhoods of the City of Richmond and western Henrico. Based on these patterns, key corridors for commutes to Downtown Richmond include I-64, West Broad Street, and Patterson Avenue. (Refer to Figure 8).
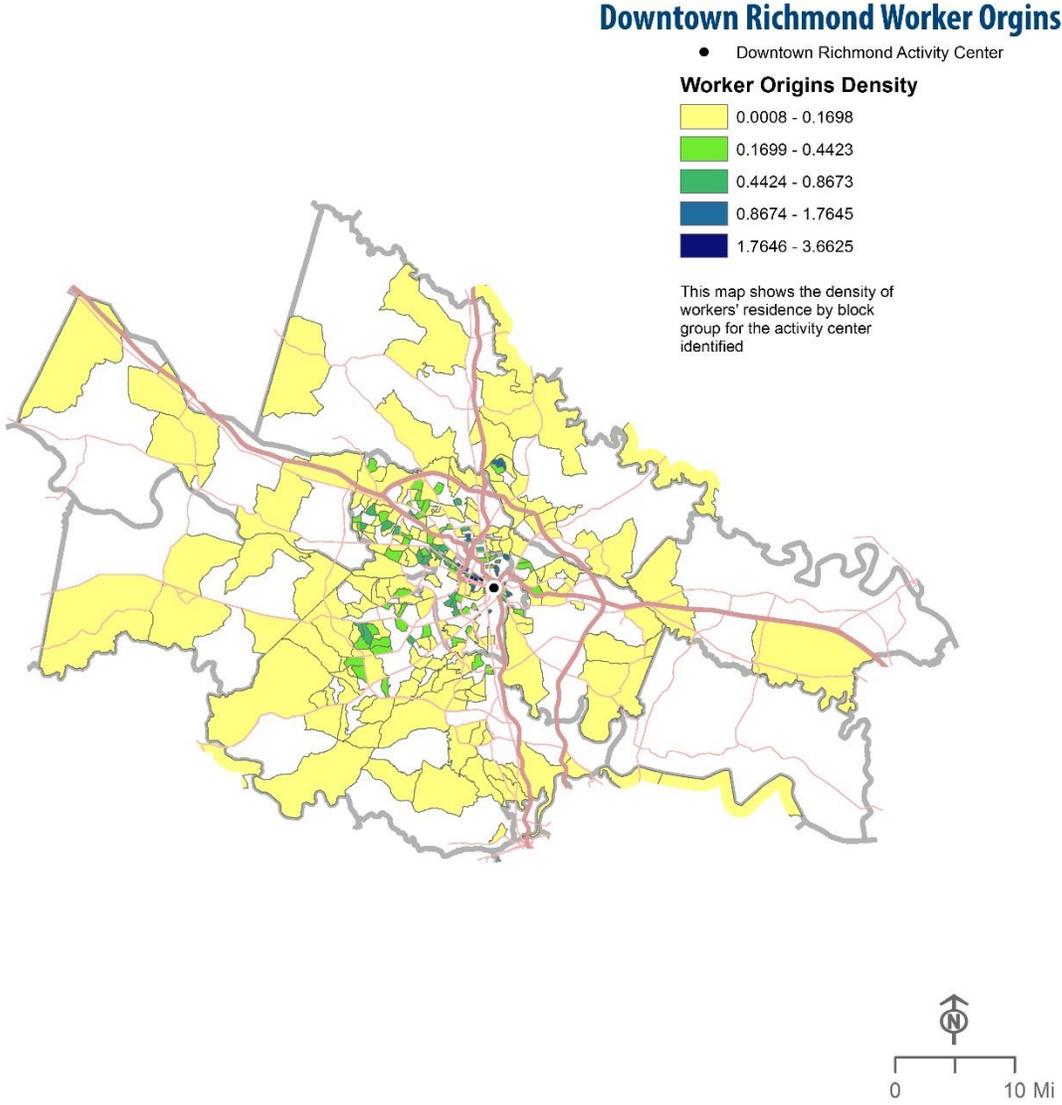
Figure 8: Commuting Patterns to Downtown Richmond Activity Center.
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

Data indicates commutes to the Virginia Commonwealth University (VCU) activity center follow a similar pattern to Downtown Richmond. (Refer to Figure 9). Many commutes originate in the western portions of the City of Richmond and Henrico County, making I-64, West Broad Street, and Patterson Avenue important corridors for work bound trips.

VCU Worker Orgins

● VCU Activity Center

Worker Origins Density

	0.0001 - 0.0381
	0.0382 - 0.1568
	0.1569 - 0.3821
	0.3822 - 0.8988
	0.8989 - 1.9024

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

0   10 Mi
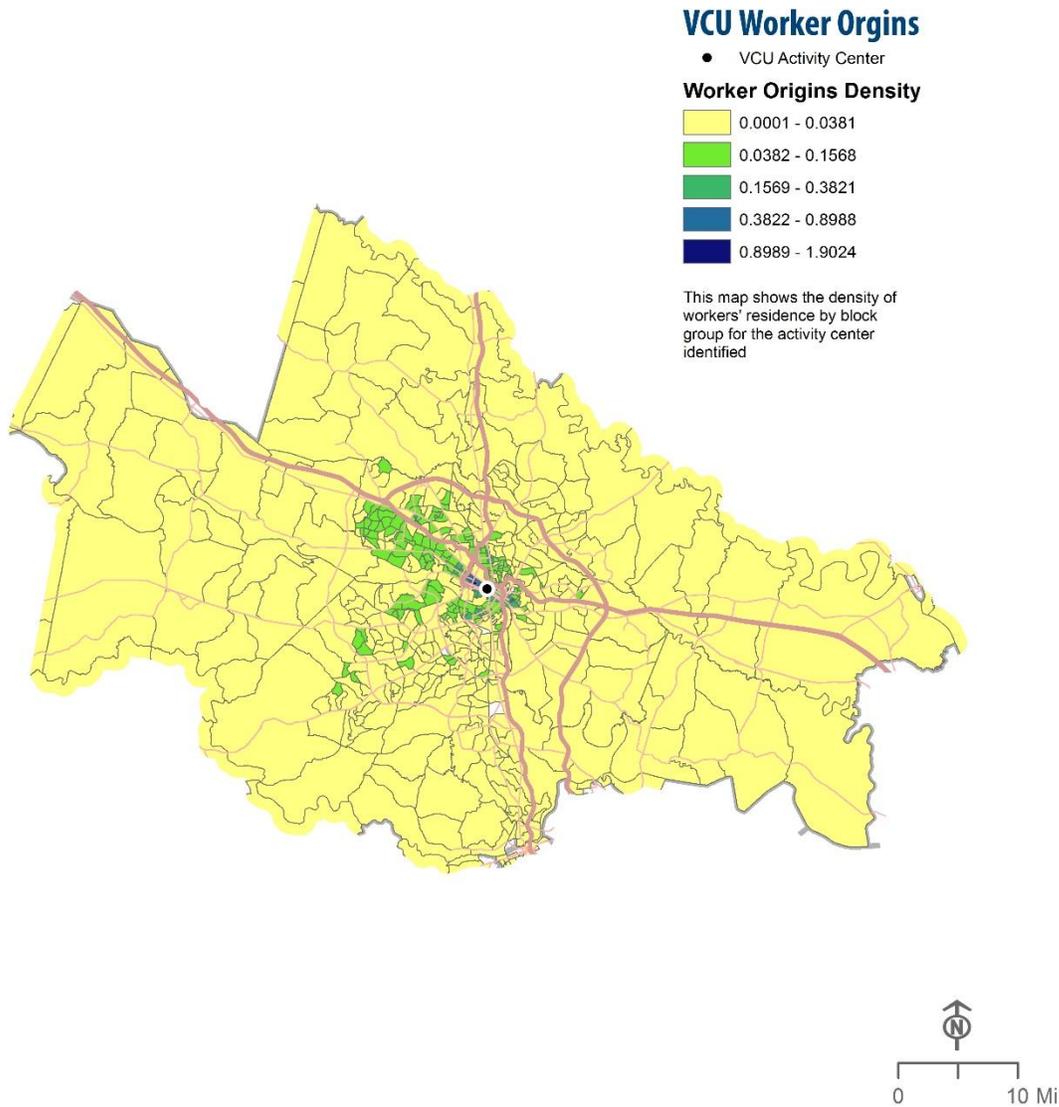
Figure 9: Commuting Patterns to VCU Activity Center.
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

Most commutes to the Midlothian activity center originate in surrounding block groups in Chesterfield County and western Henrico County. (Refer to Figure 10). However, a significant number of commute originate western Henrico County, making reliable river crossing critical for many workers along with I-64 and I-195.
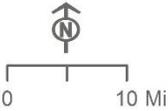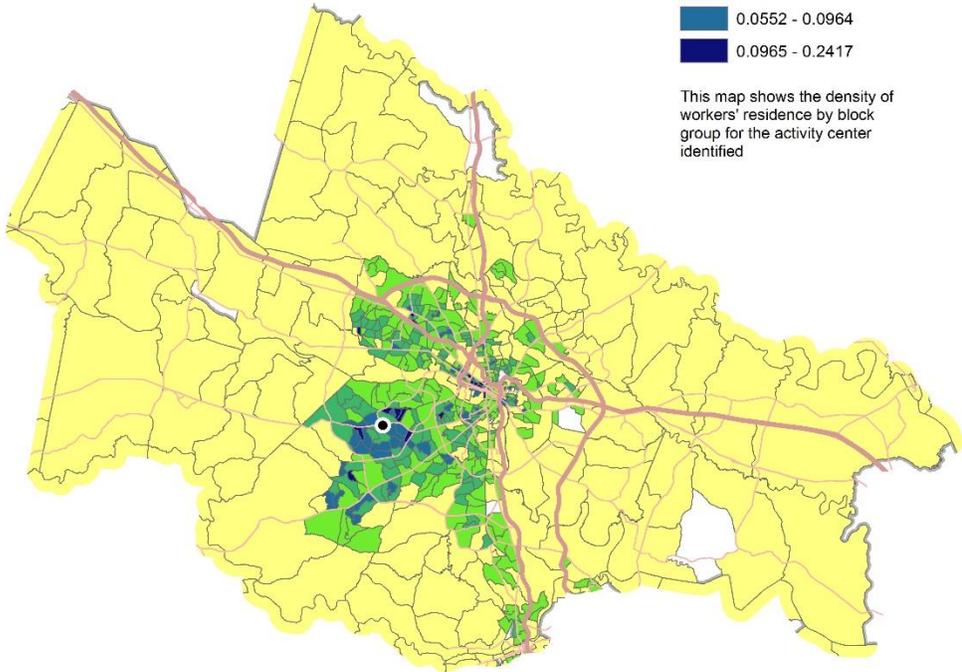
Figure 10: Commuting Patterns to Midlothian Activity Center.
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

Commute origins for the Swift Creek activity center are similar to Midlothian activity center, with most commutes originate in the surrounding block groups in Chesterfield County. As with the Midlothian activity center, a significant number of commute originate western Henrico County, making reliable river crossing critical for many workers.

Swift Creek Worker Orgins

● Swift Creek Activity Center

Worker Origins Density

	0.0001 - 0.0046
	0.0047 - 0.0138
	0.0139 - 0.0319
	0.0320 - 0.0692
	0.0693 - 0.1563

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

N

0   10 Mi
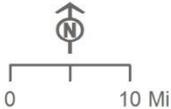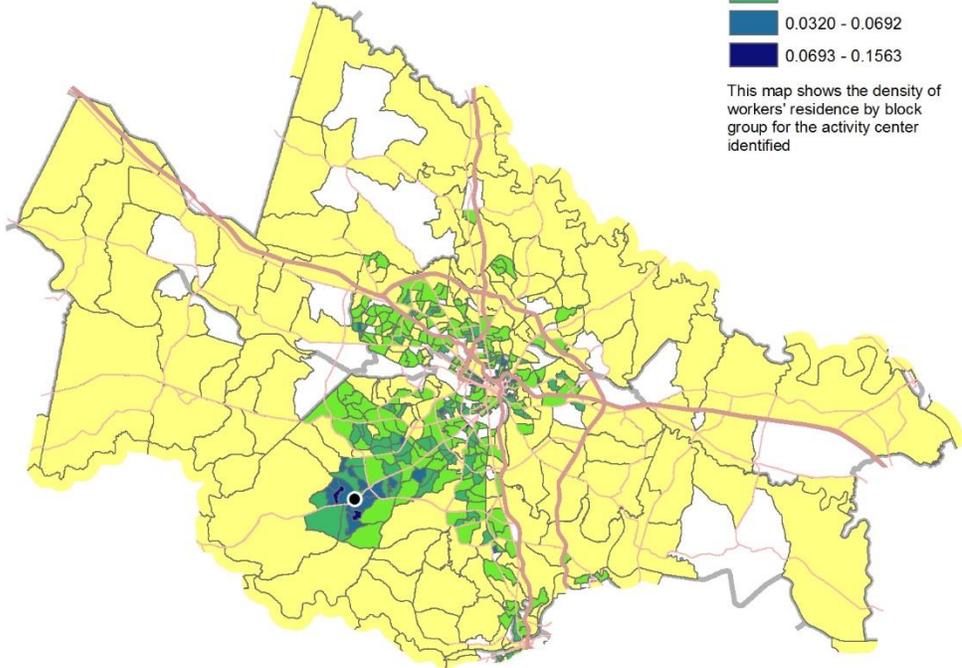
Figure 11: Commuting Patterns to the Swift Creek Activity Center.
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

Most commutes to the Innsbrook activity center originate mostly in western Henrico County in the surrounding block groups and the western neighborhoods in the City of Richmond. There is also a smaller concentration of commutes originating in northern Chesterfield County. This makes the river crossings, West Broad Street, and I-64 important for commuting patterns to the Innsbrook activity center.
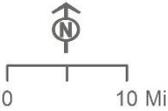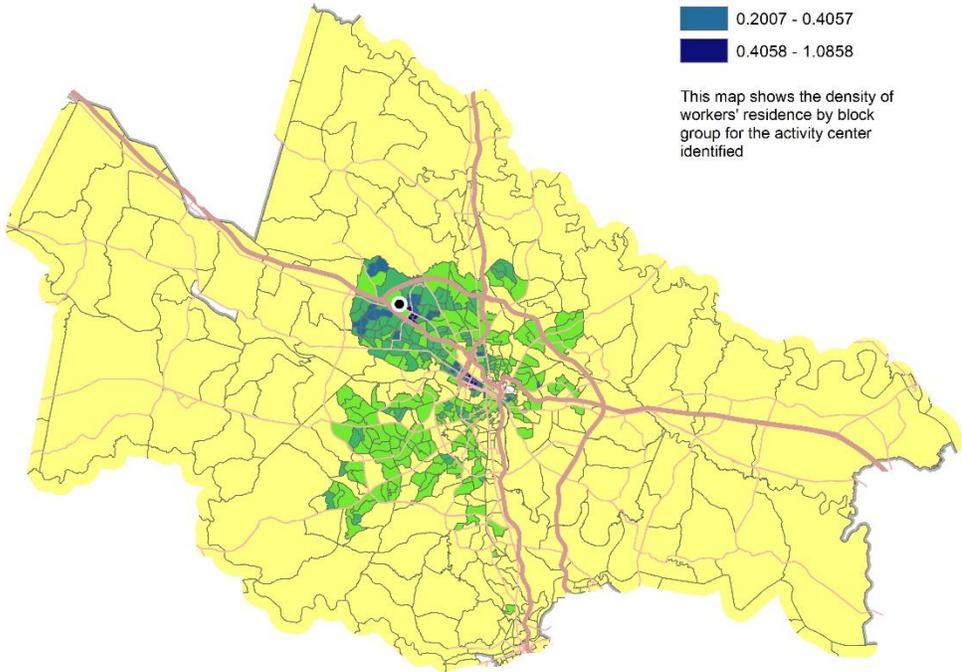
Figure 12: Commuting Patterns to Innsbrook Activity Center.
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

Commuting patterns for the Short Pump activity center are similar to the Innsbrook activity center, with most commutes originating in western Henrico County in the surrounding block groups and the western neighborhoods in the City of Richmond. This makes West Broad Street and I-64 important for commuting patterns to the Innsbrook activity center. However, fewer commutes originate in northern Chesterfield County for this activity center than the Innsbrook activity center. Therefore, the river crossings are less important in commuting patterns to Short Pump.

Short Pump Worker Orgins

- Short Pump Activity Center

Worker Origins Density
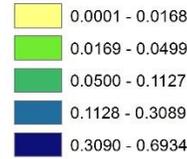
	0.0001 - 0.0168
	0.0169 - 0.0499
	0.0500 - 0.1127
	0.1128 - 0.3089
	0.3090 - 0.6934

This map shows the density of workers' residence by block group for the activity center identified
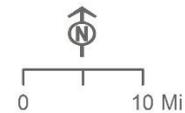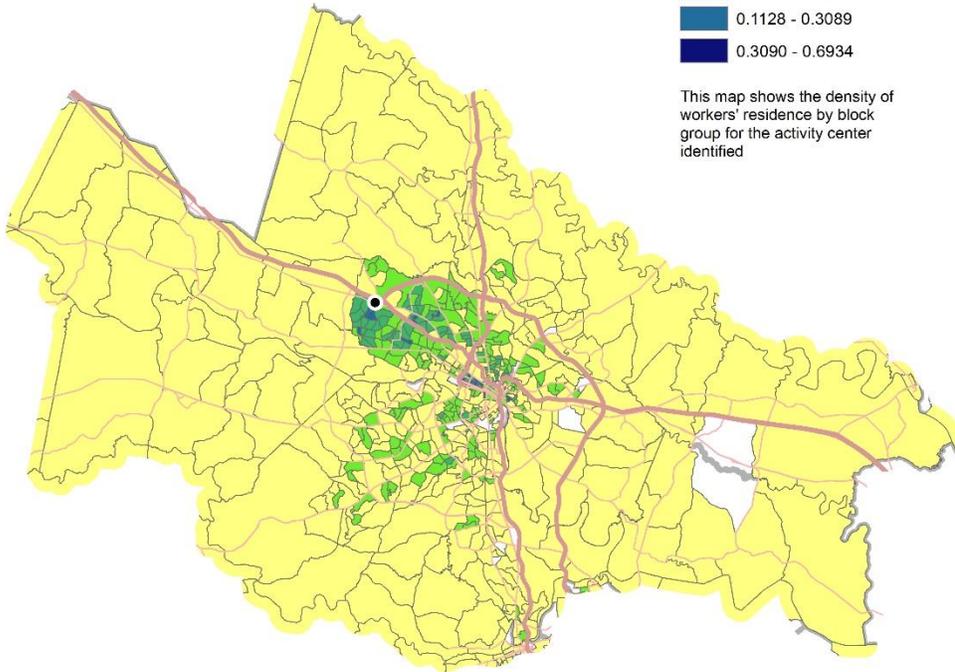
Figure 13: Commuting Patterns to Short Pump Activity Center.
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

Similarly to the nearby activity centers of Innsbrook and Short Pump, commutes to the West Creek activity center originate mostly in western Henrico County in the surrounding block groups the western neighborhoods in the City of Richmond. As with the Innsbrook activity center, there is a smaller concentration of commutes originating in northern Chesterfield County. This makes the river crossings, West Broad Street, and I-64 important for commuting patterns to the Innsbrook activity center.

West Creek Worker Orgins

●   West Creek Activity Center

Worker Origins Density

▢	0.0001 - 0.0089
▢	0.0090 - 0.0259
▢	0.0260 - 0.0564
▢	0.0565 - 0.1328
▢	0.1329 - 0.2774

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

N

0   10 Mi
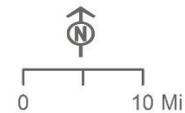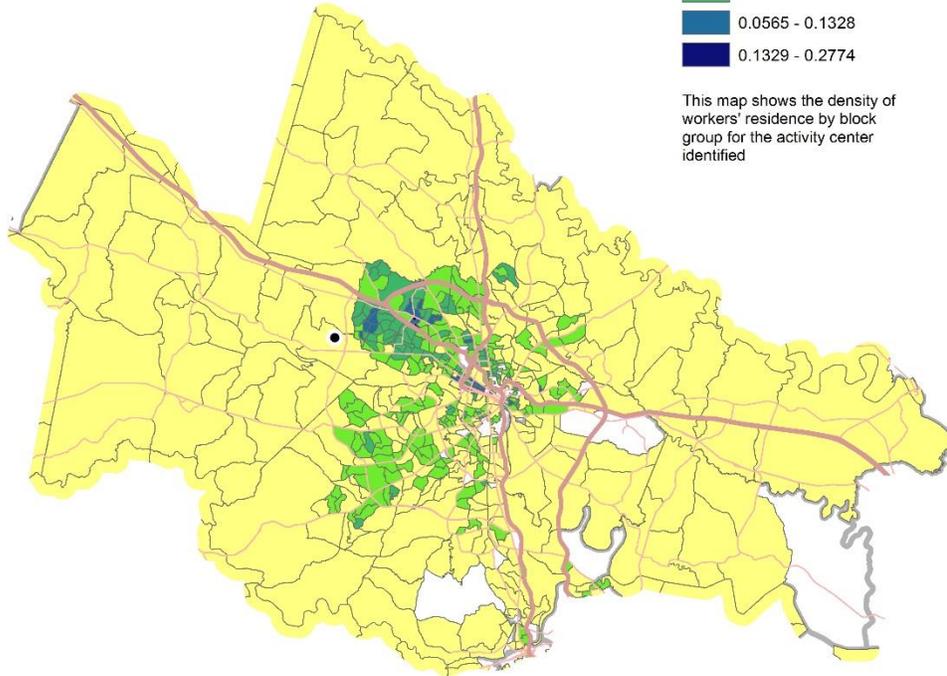
Figure 14: Commuting Patterns to West Creek Activity Center.
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

Commutes to Ashland originate in a variety of places in the region, but are densest in the City of Richmond, Henrico County, and Hanover County. These commuting patterns indicate a reliability on I-95 for workers traveling to Ashland.

Ashland Worker Orgins

● Ashland Activity Center

Worker Orgins Density

☐	0.0001 - 0.0058
☐	0.0059 - 0.0168
☐	0.0169 - 0.0351
☐	0.0352 - 0.0737
☐	0.0738 - 0.1851

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

0   10 Mi
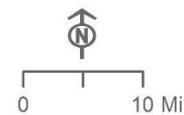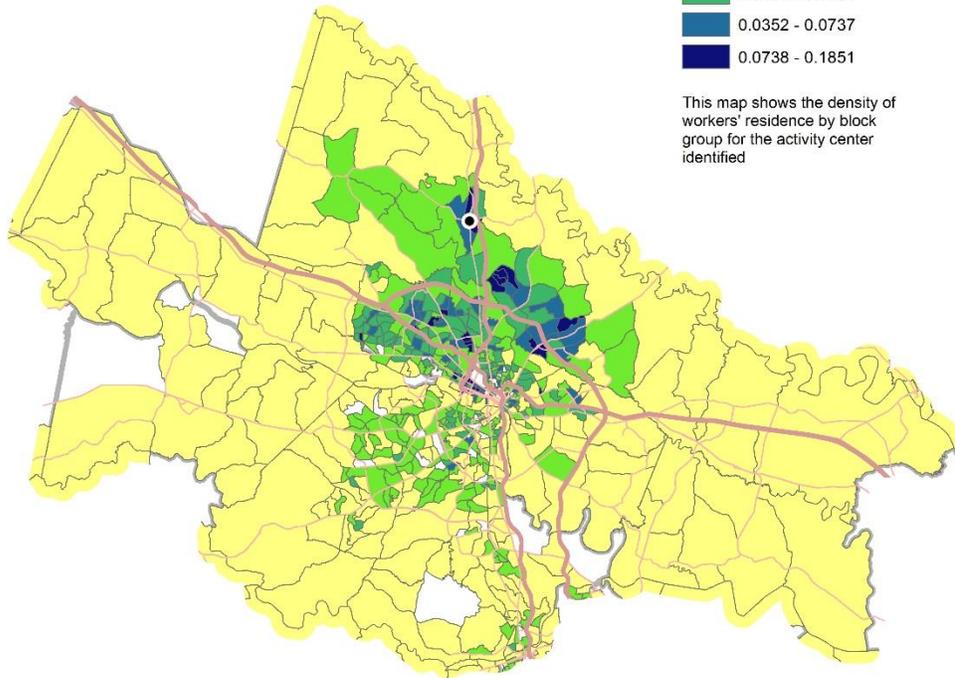
*Figure 15: Commuting Patterns to Ashland Activity Center*
Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011

Mode Choice

In the Richmond Region, the majority of commuters drive alone to work. While there is some variation between jurisdictions, cars are used between 70% and 86% of the time. For all jurisdictions, carpooling is the second most popular option, accounting for 7% to 11% of the mode share. Public transit use is highest in the City of Richmond, which has the most robust transit system in the region. (Refer to Figure 16).
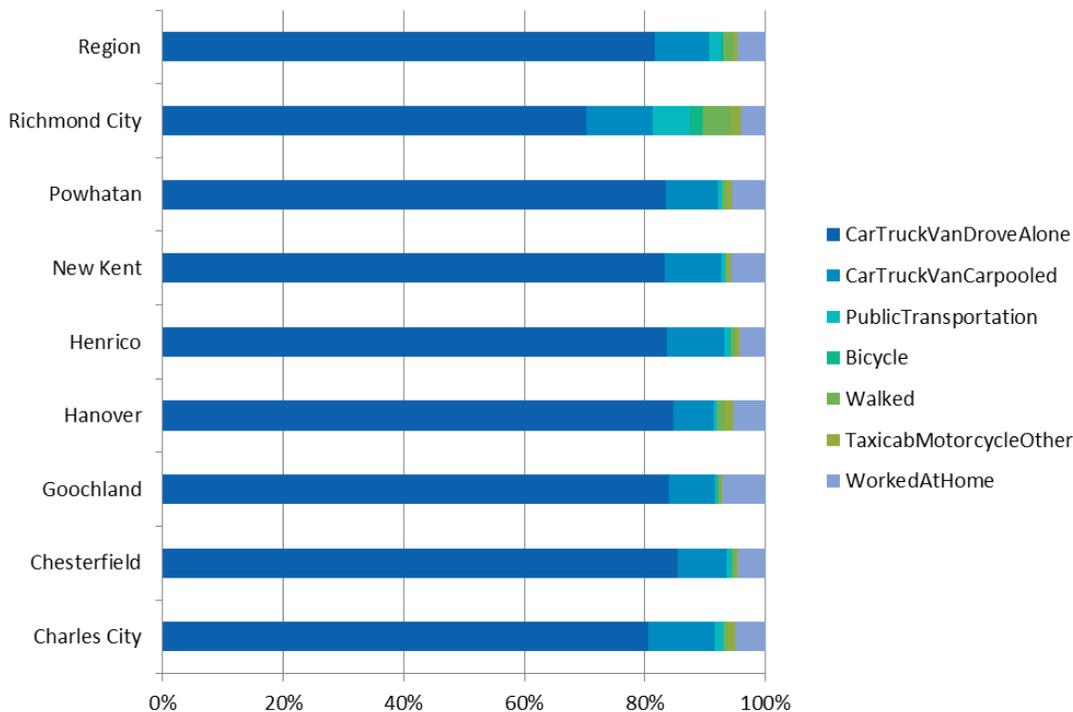
Figure 16: Mode Share Split by Jurisdiction.
Source: ACS 2013 5-Year Estimates

Average Commute Times

In the Richmond Region, average commute times range from 23 to 36 minutes among the various jurisdictions. (Refer to Table 9). Due to its density and proximity to employment centers, the City of Richmond and Henrico County have the shortest average commute, while more rural areas, like Charles City County, have longer commutes on average.

Table 9: Mean Commute Time by Jurisdiction. Source: ACS 2013 5-Year Estimates.

Jurisdiction	Mean Commute Time (Minutes)
Charles City	36.8
Chesterfield	27.0
Goochland	32.4
Hanover	26.6
Henrico	23.3
New Kent	33.4
Powhatan	34.9
Richmond City	23.3

Source: ACS 2013 5-Year Estimates

Commutes of over 45 minutes make up a small percentage of regional commutes, with only 9% of workers reporting a commute longer than 45 minutes. Charles City County has the highest percentage of workers who commute over 45 minutes at nearly 37%, this is three times as high as both the City of Richmond's and Henrico County's rate of long commutes. (Refer to Figure 17).
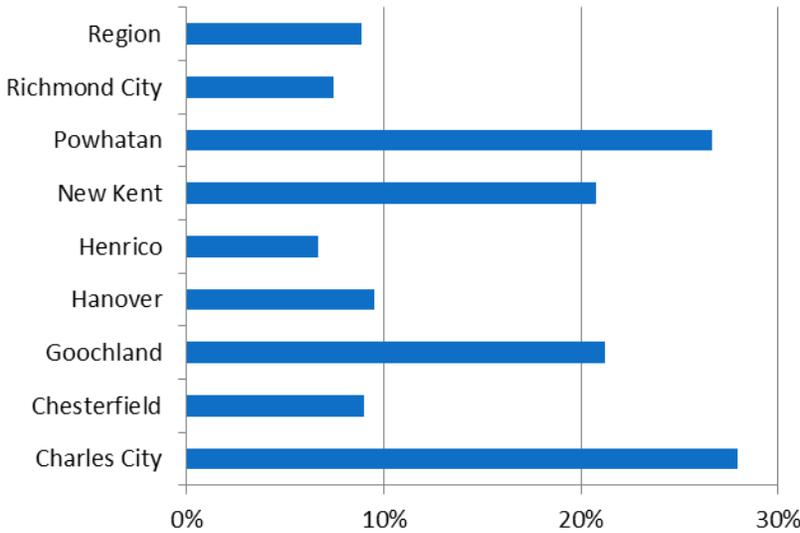
Figure 17: Percent of Commutes Long than 45 Minutes.
Source: ACS 2013 5-Year Estimates

Figure 18 provides a closer look at where longer commutes originate. In the City of Richmond, western Henrico, and northern Chesterfield 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 Goochland, Hanover, New Kent and Charles City counties have commute times that are nearly 150% - 240% longer 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 - 20
- 21 - 25
- 25.5 (Average)
- 26 - 35
- 36 - 61

This map shows the Areas with average commute time above or below regional average. The regional average is 25.5 min. The formula is the Average Time divided by the Regional Average

0   10 Mi

Source:
American Community Survey
2009-2013 5 Year Estimate,
Table B08303
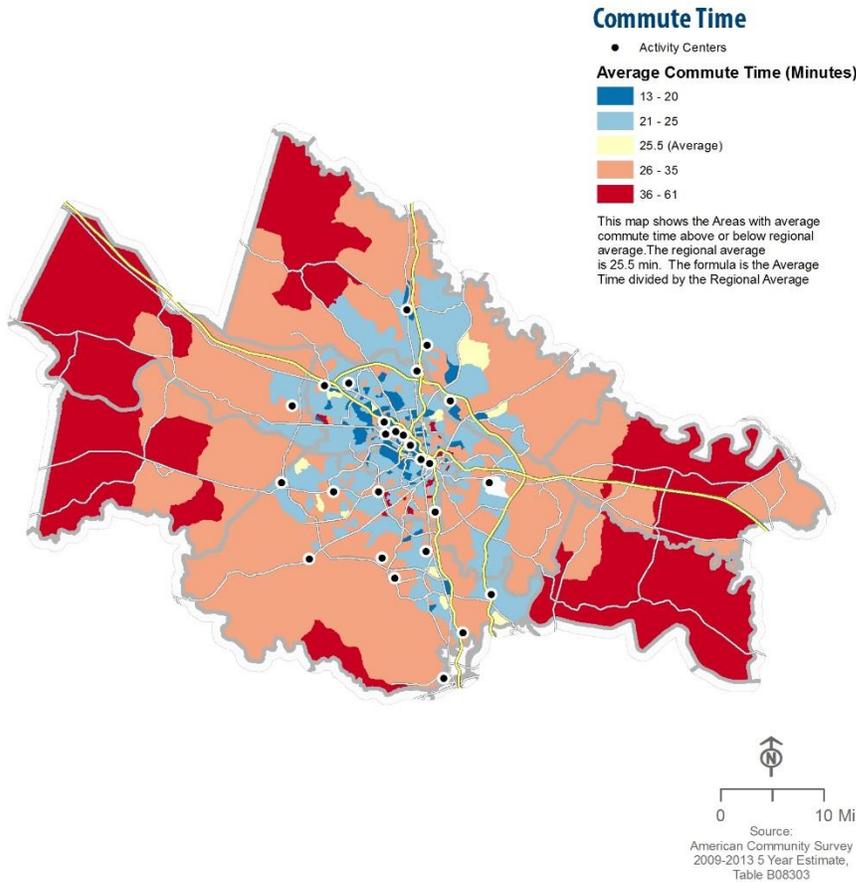
Figure 18: Richmond Commute Times.
Source: ACS 2013 5-Year Estimates

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 Richmond 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 around the City of Richmond, western Henrico, and Chesterfield. 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).
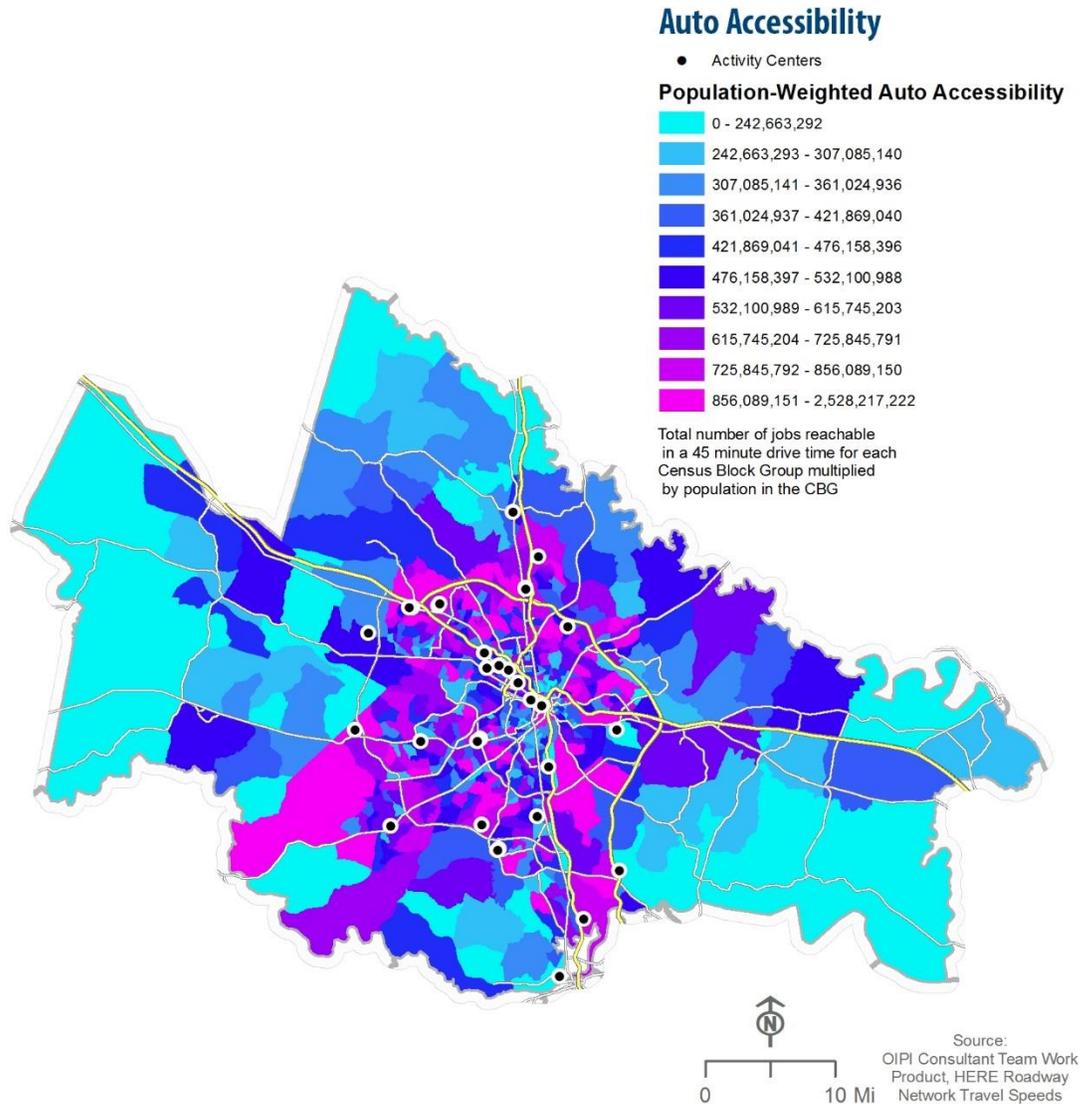
Figure 19: Auto Accessibility

Transit Accessibility

Outside of the City of Richmond, there are few fixed-route transit options in the region. This is reflected not only in the low (fixed route) transit accessibility scores for large parts of the region, but also the low number of jobs accessible from the high scoring areas. Only a few select areas outside the City of Richmond are served by transit, namely northern Chesterfield County and western and northeastern portions of Henrico County. A number of the activity centers have little or no transit accessibility. (Refer to Figure 20).

Transit Accessibility

- Activity Centers

Population-Weighted Transit Accessibility

	0
	1 - 14,992,188
	14,992,189 - 22,436,066
	22,436,067 - 27,587,870
	27,587,871 - 32,213,041
	32,213,042 - 37,910,578
	37,910,579 - 45,566,986
	45,566,987 - 55,417,390
	55,417,391 - 70,708,261
	70,708,262 - 310,939,241

Total number of jobs reachable
in a 45 minute transit time for each
Census Block Group multiplied
by population in the CBG
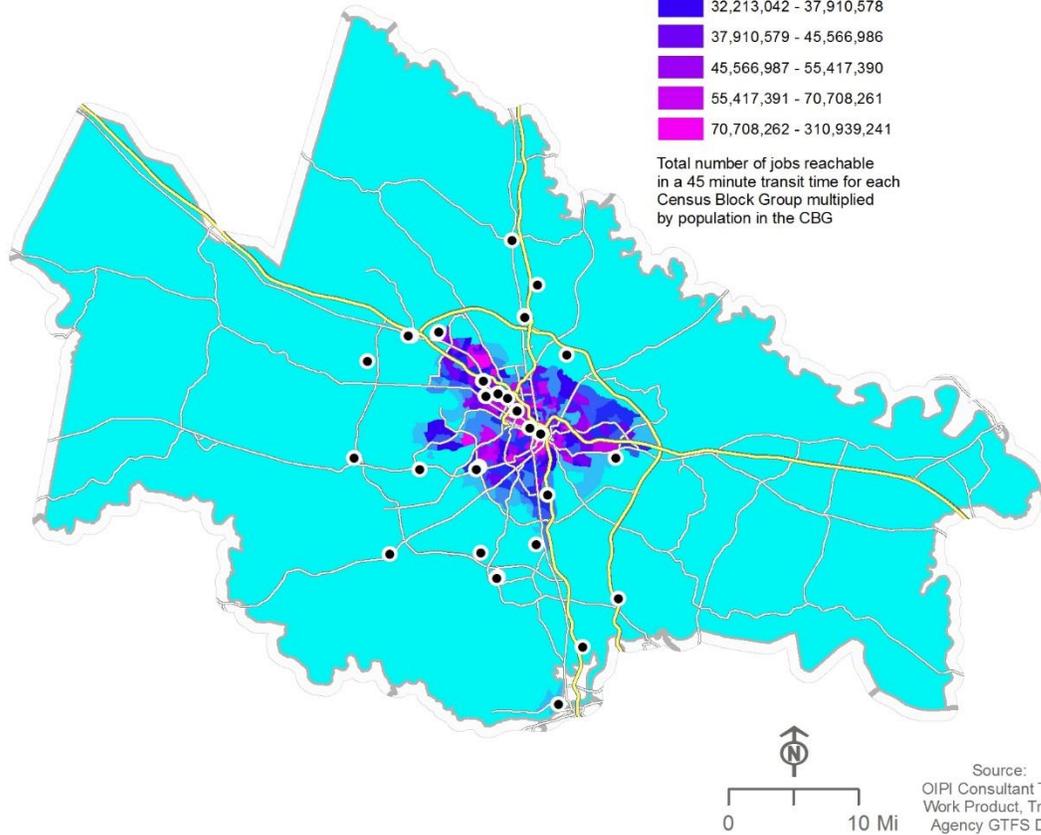
Source:
OIPI Consultant Team
Work Product, Transit
Agency GTFS Data

0   10 Mi

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. Richmond City and areas of the county adjacent to the city scored the highest, as was expected, with the highest scoring areas located within the City of Richmond. 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).

Walk Accessibility

● Activity Centers

Population-Weighted Walk Accessibility

	0
	1 - 203
	204 - 1,568
	1,569 - 5,196
	5,197 - 11,469
	11,470 - 20,672
	20,673 - 36,278
	36,279 - 66,636
	66,637 - 152,072
	152,073 - 20,843,389
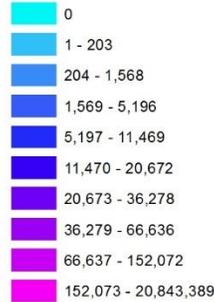
Total number of jobs reachable
in a 45 minute walk time for each
Census Block Group multiplied
by population in the CBG

Source:
OIPI Consultant Team
Work Product

0   10 Mi
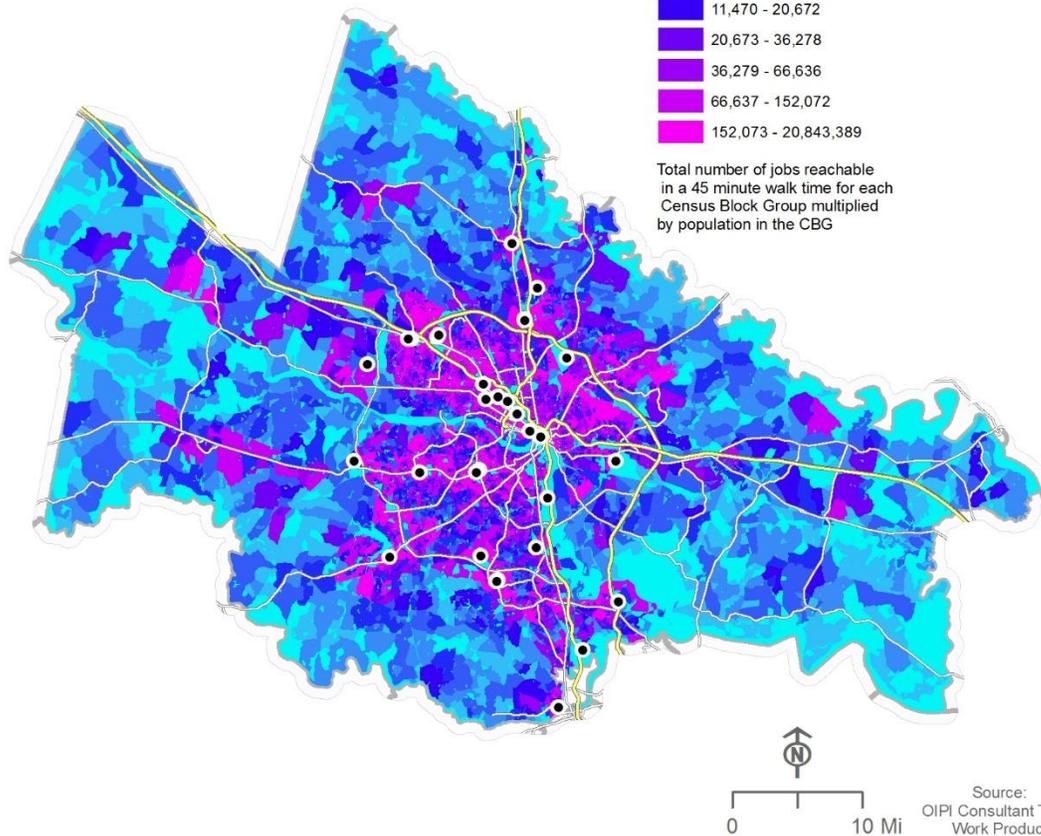
Figure 21: Walk Accessibility

Freight Accessibility

In addition to railways, I-95 and I-64 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 two 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)

- 20.1 - 29.1
- 12.1 - 20.0
- 8.1 - 12.0
- 6.1 - 8.0
- 4.1 - 6.0
- 3.1 - 4.0
- 2.1 - 3.0
- 0.1 - 2.0

0   Source: 10 Mi
OIPI Consultant Team Work Product
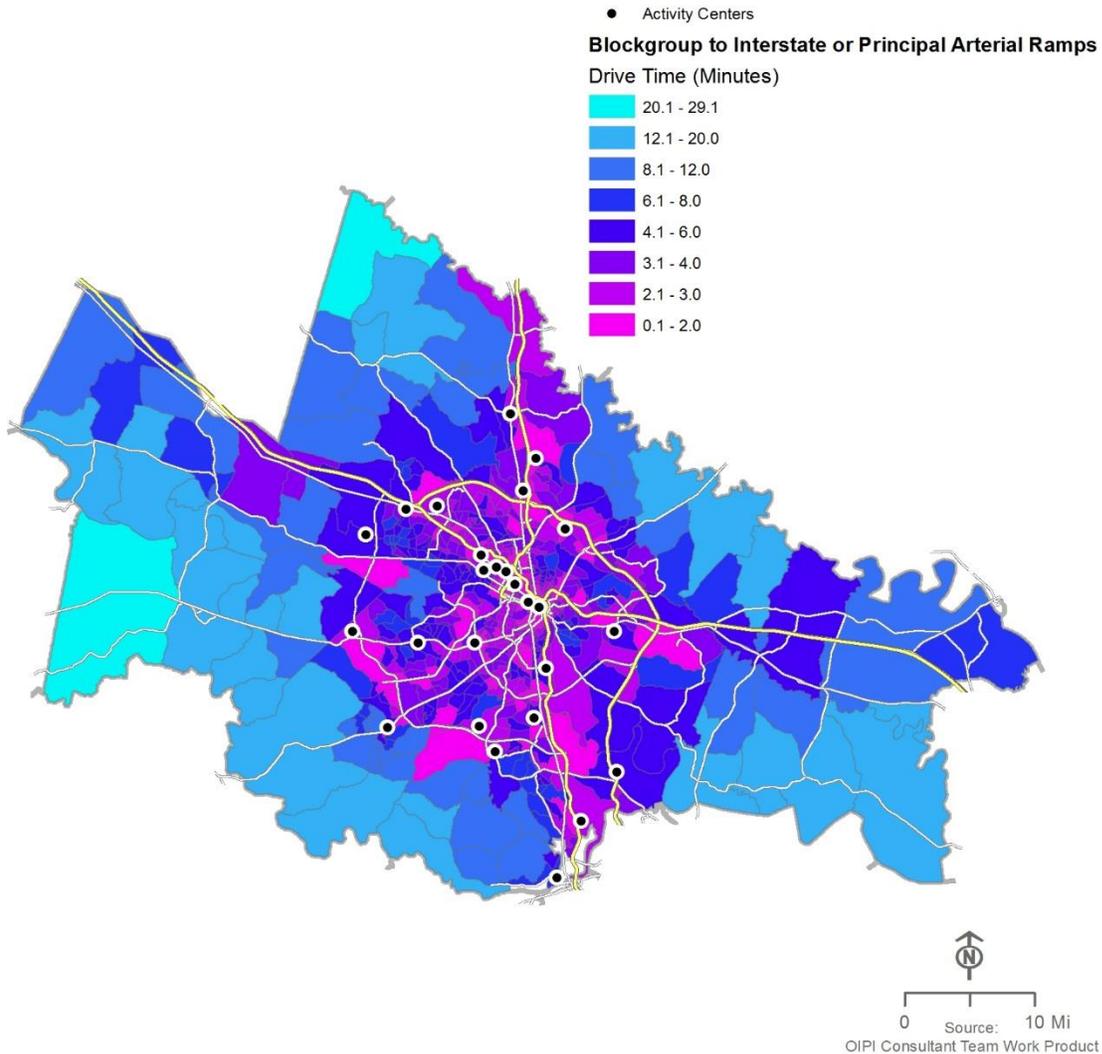
Figure 22: Access to Interstate and Principal Arterial Ramps

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 Richmond Region are clustered around I-95 and I-65 in and around the City of Richmond. Most areas within the City of Richmond, and to the north and south of the city, have access to a warehouse or distribution center within a ten minute drive. (Refer to Figure 23).

Figure 23: Access to Warehouses & Distribution Centers

Both CSX and Norfolk Southern operate freight rail lines that pass through the City of Richmond. CSX rail lines run both north-south and east-west through Chesterfield County, Henrico County, Charles City County, New Kent, and Hanover County in addition to the City of Richmond. Norfolk Southern run east-west in the Richmond Region through New Kent, Henrico County, and Chesterfield County. Richmond International Airport is the closest major airport that handles large quantities of freight. Richmond International Airport, located in eastern Henrico County, is within a 14 minute drive of most activity centers in the region. (Refer to Figure 24).

Access to International Airports

- Activity Centers

Blockgroup to International Airports

Drive Time (Minutes)

- 48.1 - 67.1
- 38.1 - 48.0
- 32.1 - 38.0
- 26.1 - 32.0
- 20.1 - 26.0
- 16.1 - 20.0
- 12.1 - 16.0
- 0.4 - 12.0

0   Source: 10 Mi
OIPI Consultant Team Work Product
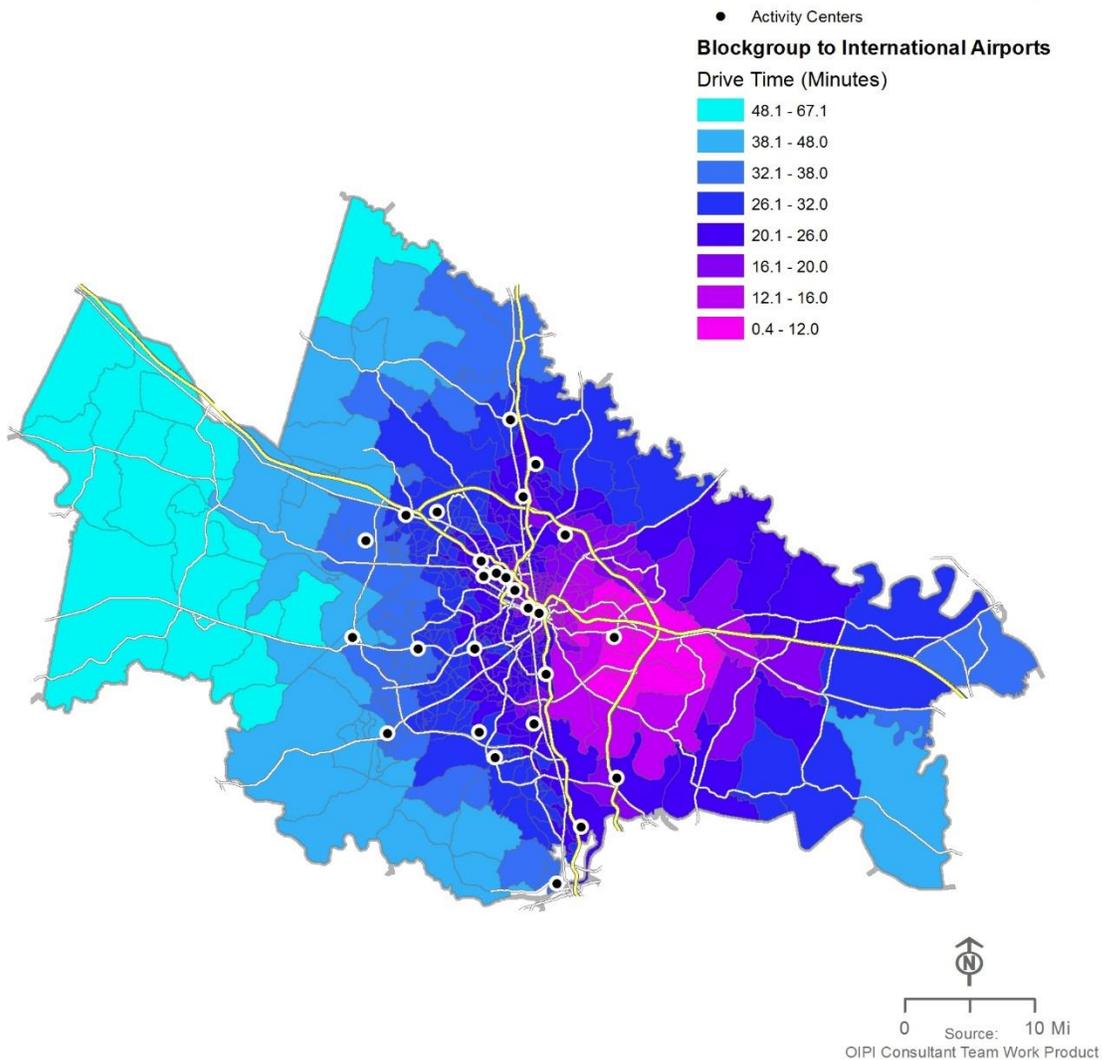
Figure 24: Access to International Airports

D. Roadway Measures

This assessment identified the transportation conditions in the Richmond Region are 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 Richmond Region were available for analysis, as they are the major arterial roadways with heavy commuter traffic. Overall, scores on the travel time reliability index indicated high travel time reliability

for most corridors. The reliability index scores are higher in certain areas of the region, representing slightly lower levels of travel time reliability. These areas include western Henrico County, the central business district of the City of Richmond, and parts of eastern Henrico. There are, however, no areas of significant concern along most corridors in the region. (Refer to Figure 25).

Highway Conditions: PM Reliability Index
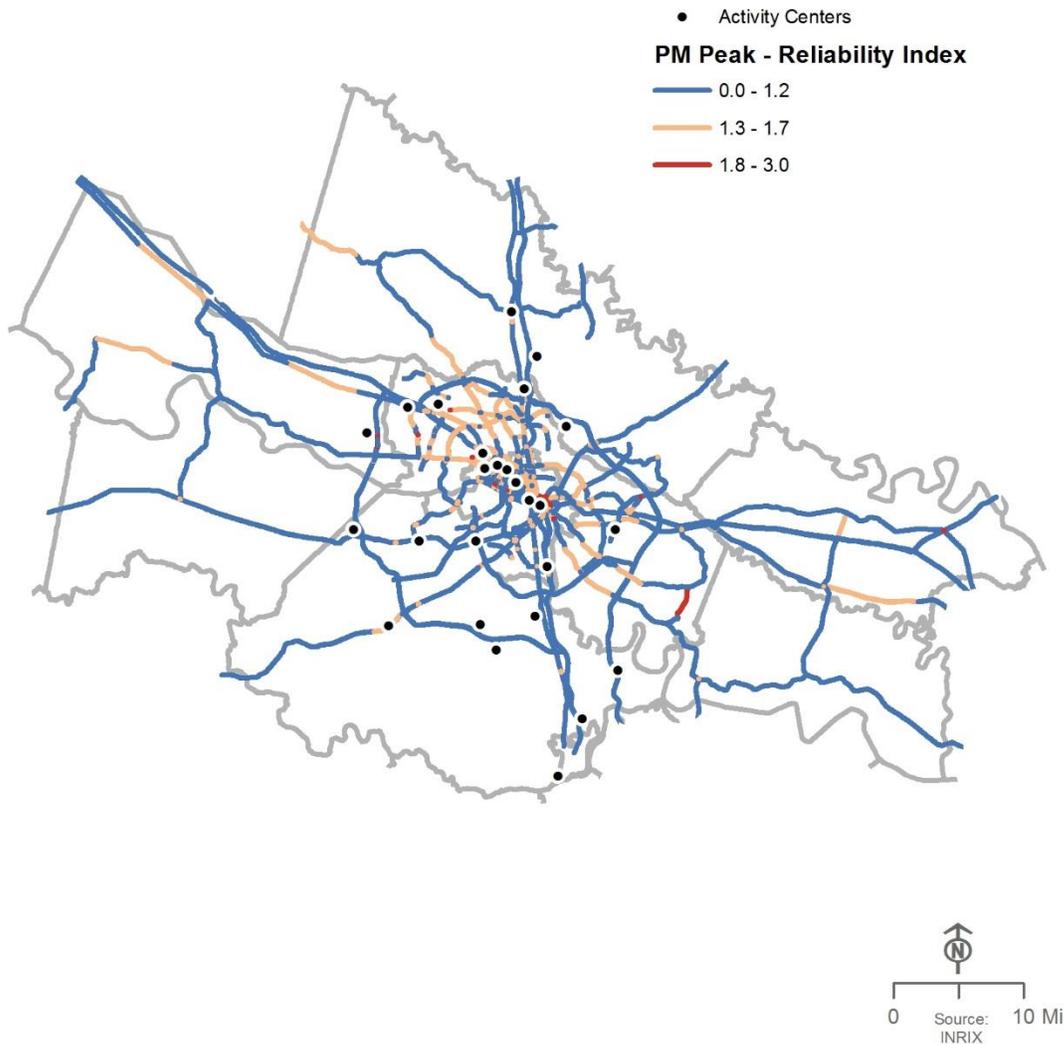
Figure 25: Travel Time Reliability

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 roadway in the Richmond Region. According to the analysis, congestion only occurs in small areas in the Richmond Region. Most roadways analyzed are congested less than 5% of the time. (Refer to Figure 26).

Highway Conditions: PM Percent Time Congested

- Activity Centers

PM Peak - Percent Time Congested

- 0% - 5.5%
- 5.6% - 25.5%
- 25.6% - 100%

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 overnight speed.

0   Source: 10 Mi
     INRIX

Figure 26: Percent of Time Congested

Median Speeds

Median speeds were calculated for major roadways in the region and are represented as the ratio of pm peak hour vehicle speeds and the speed limit for the PM peak period. Speeds greater than 1.0 indicate travel at speeds higher than the speed limit. The ratio of median speed to speed limit shows problems in congested areas along I-64 and I-95 in Richmond and Henrico, congestion at the I-64/I-295 Interchange in eastern Henrico, congestion at the I-95/I-295 Interchange in northern Henrico and other key interchanges around the region. (Refer to Figure 27).

Highway Conditions: PM Peak Median Speed

- Activity Centers

Ratio of Median Speed and Speed Limit
- 0.00 - 0.50
- 0.51 - 0.85
- 0.86 - 1.00
- >1

This map 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.

0   Source: INRIX   10 Mi
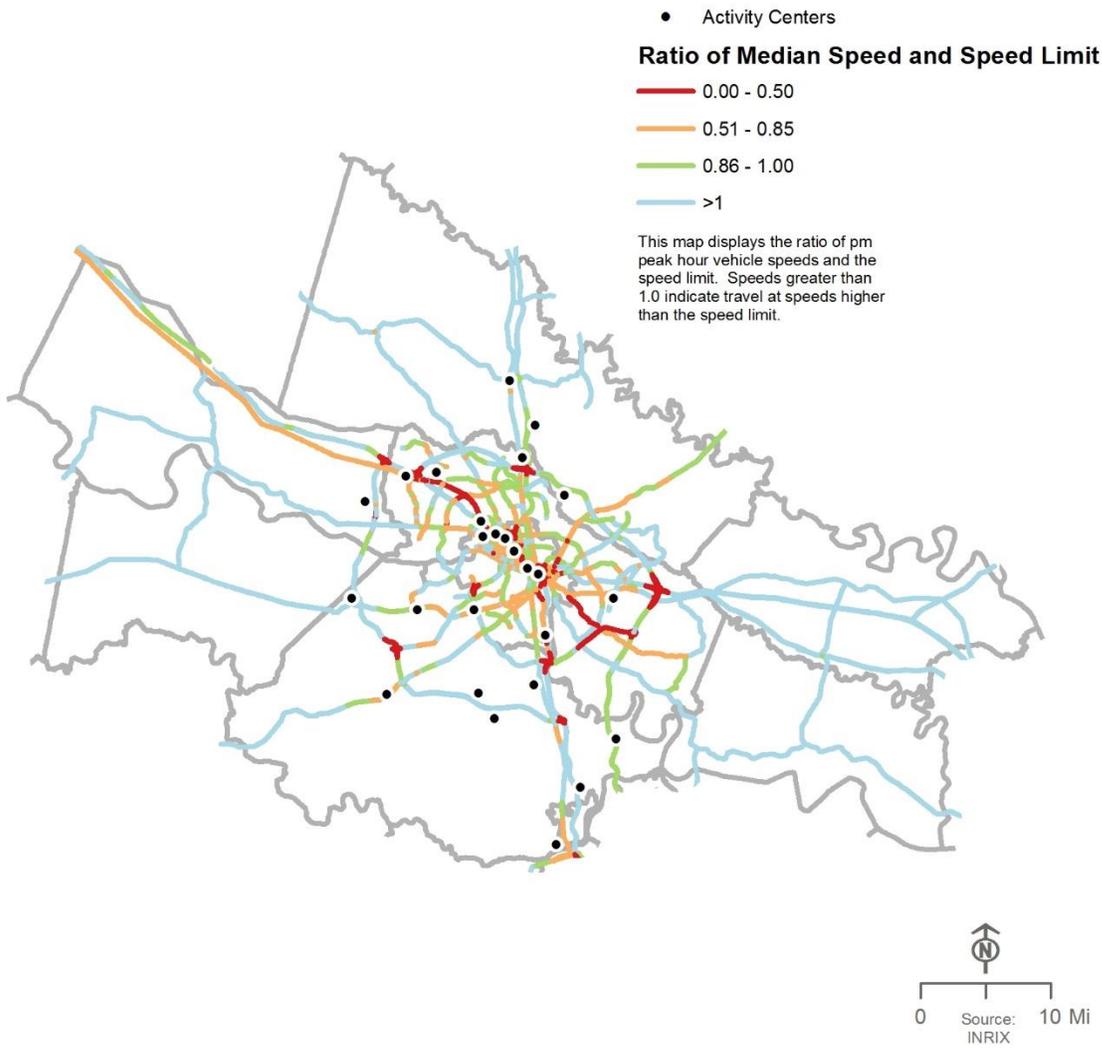
Figure 27: Median Speeds

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 Richmond 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 Richmond Region, an average of 86% of the dollar value of all goods that are moved through the region are moved by truck. Air is the second most important mode, carrying around 6% of the total dollar value of goods. Other modes of goods movement used in the Richmond Region includes rail and water, however trucks remain the dominant mode of freight movement. (Refer to Figure 28).
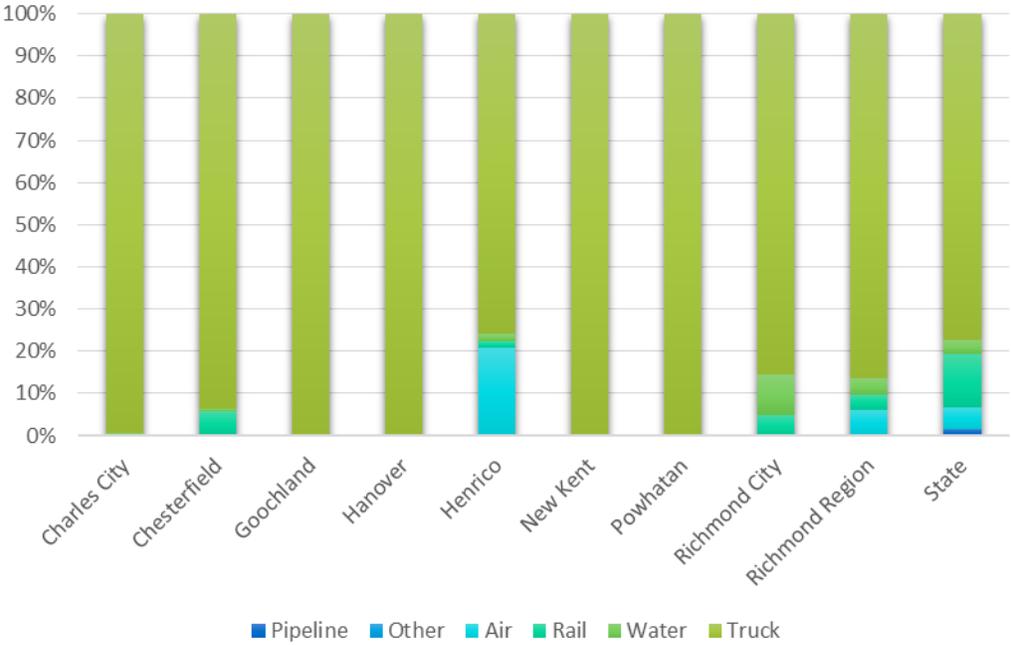
Figure 28: Comparison of Freight Modal Dependence
Source: TranSearch, 2012

Location quotients are used to compare the prominence of freight modes between the Richmond Region, and the state as a whole. The Richmond Region relies on trucks for freight movement 1.12 times more than the does the state as a whole. Water and air transportation for goods are more prevalent in the Richmond Region on average than it is for the rest of the state. This reflects the greater density of freight rail lines in other portions of the state. It also reflects the importance of the Richmond International Airport in freight movement for the region. (Refer to Figure 29).
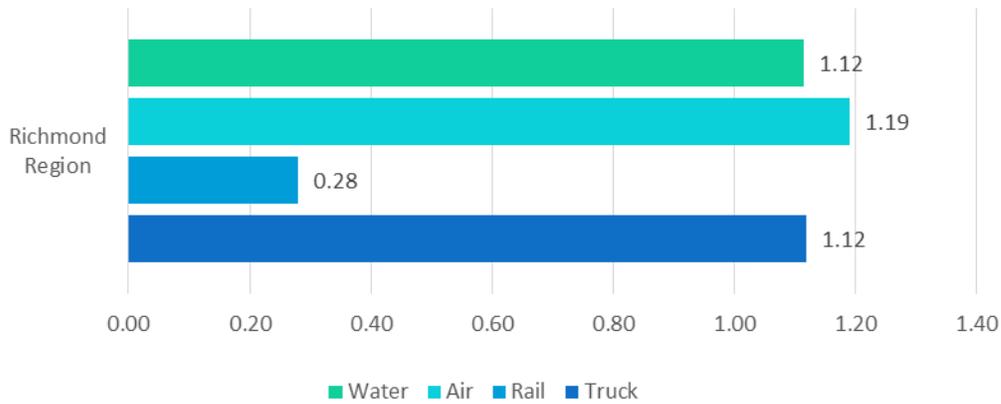
Figure 29: Location Quotient by Mode of Freight Travel
Source: TranSearch, 2012

Top Commodities

While the 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 goods account for most of the total value of freight imported to the Richmond Region, accounting for about half of the total value of freight imported. Other goods also represented the highest dollar amount of goods exported from the region, followed closely by tobacco products. Overall, the Richmond Region imported $26 billion worth of goods and exported $30.7 billion worth of goods, resulting in $4.7 billion of net exports in 2012. (Refer to Figures 30 and 31).

Inbound Commodities, by Value ($M)

Secondary Traffic, $4,725

Chemicals or Allied Products, $3,593

Food or Kindred Products, $2,703

OTHER, $15,381.13

Petroleum or Coal Products, $2,306

Farm Products, $2,040
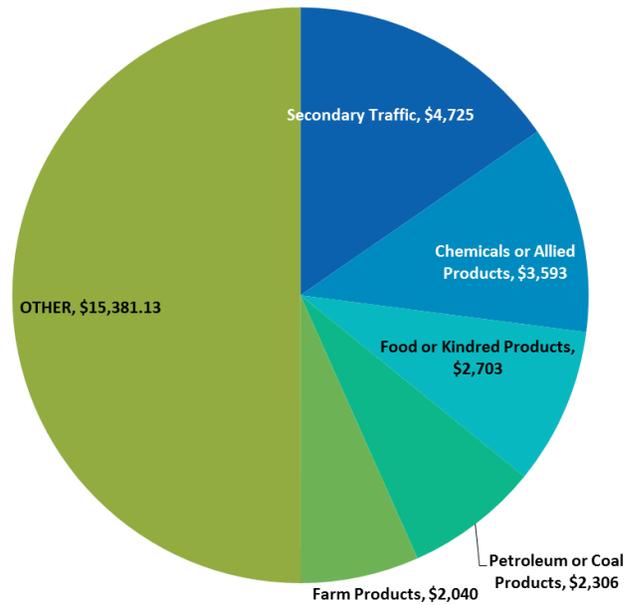
Figure 30: Top Freight Values by Commodities.
Source: TranSearch, 2012

Outbound Commodities, by Value ($M)

OTHER, $7,151

Tobacco Products, $6,553

Secondary Traffic, $5,258

Food or Kindred Products, $1,442

Petroleum or Coal Products, $4,233

Chemicals or Allied Products, $1,696
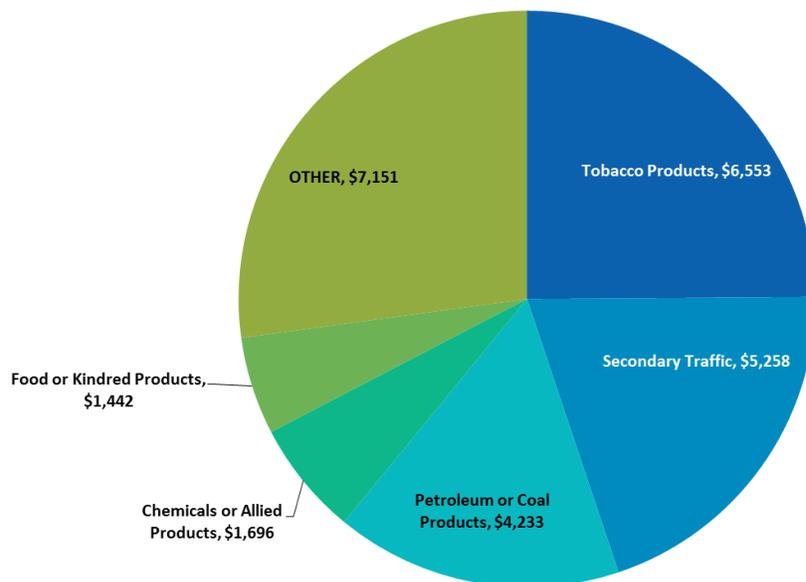
Figure 31: Top Freight Values by Commodities.
Source: TranSearch, 2012

The Southeast Region, as defined by the Bureau of Economic analysis, is the destination for the highest amount of freight by value and total tonnage from the Richmond Region. In 2012, $7.8 billion and over ten million tons of freight was exported to the Southeast Region. The second highest destination for both value and tonnage is the Mideast Region, accounting for almost $6.8 billion and over seven million tons of freight. (Refer to Figure 32).
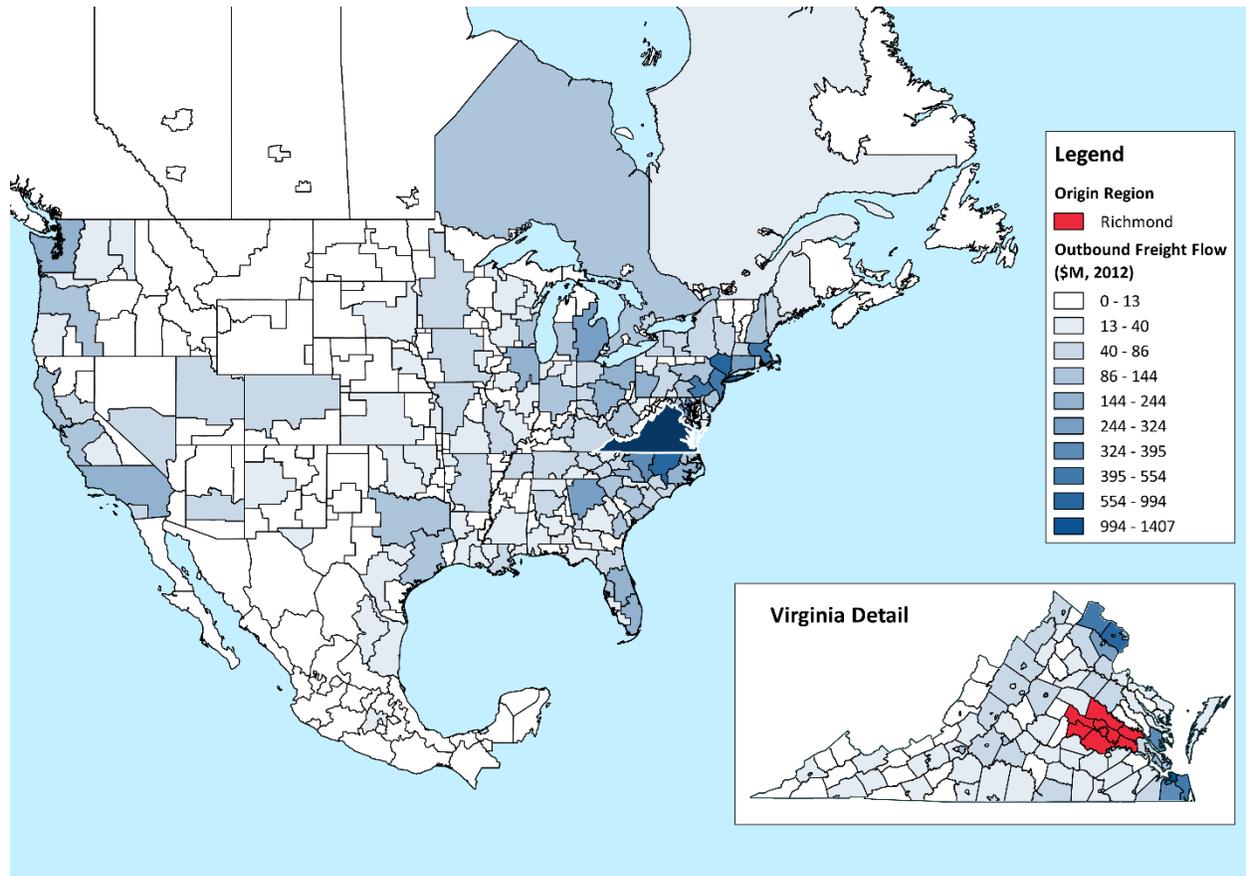
Figure 32: Top Freight Values by Region.
Source: TranSearch, 2012

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, nonmetallic minerals made up the highest weight of freight imported and exported to the Richmond Region. Nonmetallic minerals accounted for half of freight exports and a third of freight imports to the region. (Refer to Figures 33 and 34).

Inbound Commodities, by Weight (000s of tons)

Farm Products, 2,687

OTHER, 11

Petroleum or Coal Products, 3,060

Nonmetallic Minerals, 8,080

Secondary Traffic, 3,396

Waste or Scrap Materials, 3,972
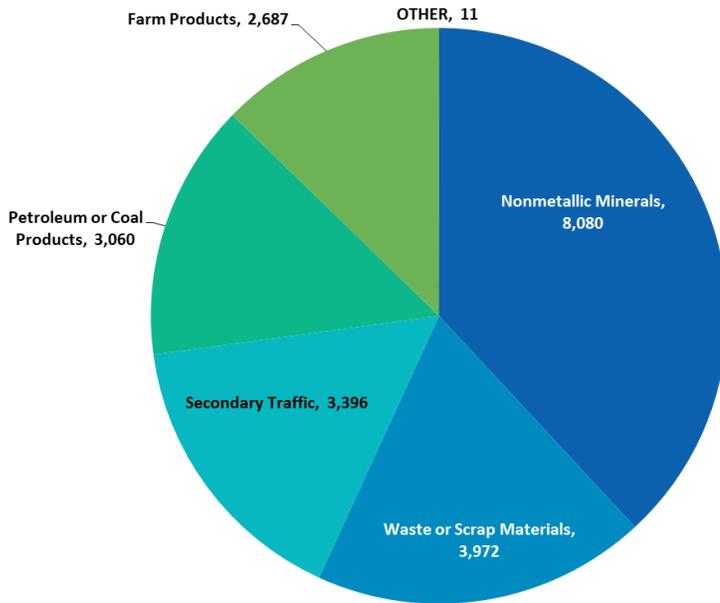
Figure 33: Top Commodities by Weight – Inbound.
Source: TranSearch, 2012

Outbound Commodities, by Weight (000s of tons)

Clay,concrete,glass or Stone, 1,280

OTHER, 4

Waste or Scrap Materials, 1,455

Secondary Traffic, 3,844

Nonmetallic Minerals, 8,721

Petroleum or Coal Products, 4,062
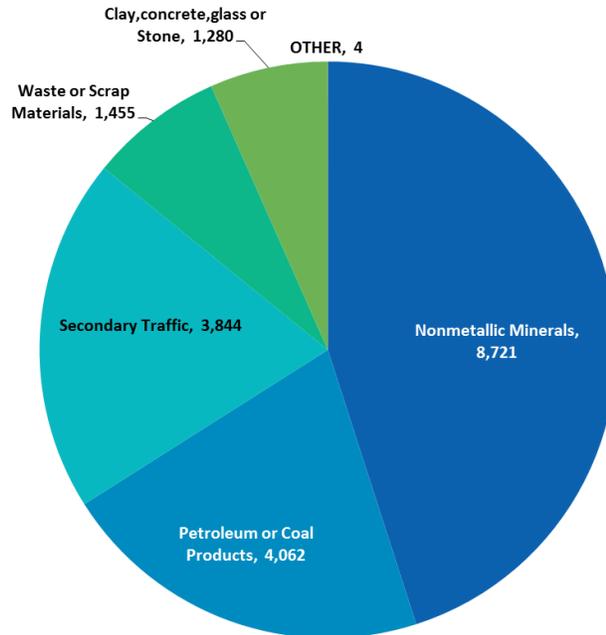
Figure 34: Top Commodities by Weight - Outbound.
Source: TranSearch, 2012

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. 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 the Study 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 Richmond Region, the knowledge-based sector is projected to grow as a share of output (15% to 18%) while the freight-based sector is expected to decline slightly (39% to 36%). Nevertheless, freight-based industries such as Wholesale Trade are expected to see significant increases in output by 2025.

The local input received in the outreach to regional stakeholders and in local plans such as the Comprehensive Economic Development (CEDS) plan for the region indicate a strong desire in the region to continue to support the manufacturing, wholesale and light industrial sectors in the region, particularly with respect to goods movement needs and also to support the expected growth of the knowledge sector and its needs for reliable commuting and additional modal travel options. There is a strong emphasis from stakeholders to supporting the industrial needs of the areas along the I-95 corridor, particularly in the area of the Port and south toward Meadowville Technology Park. In addition there is a strong desire to maintain and expand the knowledge-based sectors that are key to the region's economy.

This translates into transportation needs such as freight accessibility and passenger reliability on the region's prime corridors, such as I-95, I-295, I-64 and the passenger and freight rail corridors that generally parallel the highways. It also indicates the need for addressing any bottlenecks along these prime corridors to further support reliable travel for both commuters and goods movement. In addition, other key corridors that support activity centers in the region, such as VA 288, US 360 and US 60 are important commuter routes and serve economic growth in Downtown, West Creek, Swift Creek, Midlothian, and emerging activity centers such as Watkins Center.

The forecasted growth in the knowledge economic sector for this region brings the potential for additional transportation needs. The Economic and Transportation correlations for the knowledge industry sector particularly point to improving modal choice, transit access and walkable places. The local economic sector also 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. Fixed route transit exists in the region but has limited service to a number of significant local-based and knowledge-based centers. The expansion of knowledge-based and local-based sectors would benefit from both additional fixed route transit in the region. Further support for the knowledge 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.

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.

Figure 35: Summary Needs Map for the Richmond Region

Richmond Region Needs Summary

Needs Map

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*

(A) NEEDS INDICATED BY LETTERS DESCRIBED IN NEEDS TABLE

● Activity Centers

--- Railroads

Needs Table (Page 1)

A. I-95 & 64 Corridor Reliability

The I-95 & 64 Overlap Corridor serves as a major artery for the region, handling commuter and freight traffic as well as connecting the region to other parts of Virginia. There is a need for improved access at many older interchanges and more options for commuters such as transit, passenger rail and transportation demand management, to better connect residents with destinations and ease congestion. The issues for this corridor extend to the interchanges at each end, along the I-95 corridor to the James River and along the I-64 corridor to Mechanicsville Turnpike.

B. Downtown Richmond to West End Mode Choice

The regional activity centers along the US 250 and I-64 Corridors from Downtown Richmond to West Creek are key Knowledge Sector employment centers and Local Service centers. Transit access is limited west of Willow Lawn. Extending and improving transit access along the entire corridor would improve transit accessibility for the region substantially.

C. I-95 Southside Connectivity and Mode Choice

Along the I-95 Corridor from the James River Bridge to VA Route 10 are key Freight activity centers such as the Port of Richmond and Meadowville. Numerous factors such as insufficient vertical clearances and older interchange designs limit the accessibility of trucks and other freight modes to some of these centers. Improving the accessibility of freight to these centers will improve goods movement for many business in these centers.

D. VA 288 Corridor Reliability and TDM

VA 288 is a key corridor connecting activity centers such as Innsbrook and West Creek to major workforce residential areas in Chesterfield and serves as an important bypass around the region. There are some key bottlenecks with reliability issues and limited TDM options currently serving this corridor.

E. US 60 & 360 Connectivity and Mode Choice

The US Route 60 and 360 Corridors are important arteries for the movement of commuters and connects a sizeable portion of the regional workforce with key activity centers. These corridors lack transit access west of Chippenham Parkway, they have limited bike access and suffer from limited network connectivity creating bottlenecks as users have no other option to travel between destinations, even locally.

F. North/South Rail Reliability and Connectivity

The North-South CSX Rail Lines through the region are critical freight and passenger corridors for inter-regional movement and suffer from congestion and unreliability. Passenger rail service is not well connected to the region as the main train station for the region is not well connected to regional multimodal options and is distant from major activity centers.

G. I-95 Corridor Reliability

The I-95 corridor north of I-295 is a major artery for the region, handling commuter and freight traffic as well as connecting the region to other parts of Virginia. Congestion is very unreliable, particularly in the bottleneck between I-295 and Ashland. The corridor would benefit from operational and capacity improvements to reduce the unreliable travel times.

H. I-64 Corridor Reliability

The I-64 Corridor east of I-295 is a major artery for the region, handling commuter and freight traffic as well as connecting the region to other parts of Virginia. Congestion is very unreliable and the corridor would benefit from operational and capacity improvements to reduce the unreliable travel times.

Richmond Region Needs Summary

Needs Map

Needs Table (Page 2)

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

Ⓐ NEEDS INDICATED BY LETTERS DESCRIBED IN NEEDS TABLE

● Activity Centers
Railroads

I. Various Activity Centers - Walkable Places

There are multiple activity centers that have limited pedestrian or bicycle facilities or need improved pedestrian or bicycle environments. Walkable and bikeable places improve the appeal to the future workforce, attraction for knowledge-based industries and reduces the reliance on vehicular travel.

J. Various Activity Centers - TDM, Network Connectivity and Mode Choice

There are multiple activity centers with a knowledge and local service employment focus that need to develop adequate network connectivity, mode choice options and TDM strategies to ensure an efficient transportation system develops as they grow.

K. Network Connectivity and Access for Meadowville

Meadowville Technology Park is expected to be a major office, industrial, warehousing and distribution center and will need to ensure that it has adequate access to both I-95 and I-295 to maintain its economic potential.

L. Regional Need - Modal Choice

To support active transportation, crossings of major barriers such as the James River, Interstates and railroads need to accommodate bicycles and pedestrians. Constraints are widespread and create circuitous trips and sometimes unsurmountable obstacles. One example is that no crossing of the James River has dedicated bicycle lanes.

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Figure 36: VMTP Icon Key

NEEDS ICONS

Corridor Reliability and Congestion

Network Connectivity

Transportation Demand Management

Modal Choices

Walkable/Bikeable Places

ECONOMIC ICONS

Local Service Sector

Freight Based Sector

Knowledge Based Sector

TRANSPORTATION ICONS

Commuting Patterns / Modes

Multimodal Access to Jobs

Highway Network Reliability

Highway Network Bottlenecks

Freight Networks / Commodity Flows

Conditions from Stakeholder Input

## A. I-95/64 Overlap Corridor Reliability

NEED

The I-95 & 64 Overlap Corridor serves as a major artery for the region, handling commuter and freight traffic as well as connecting the region to other parts of Virginia. There is a need for improved access at many older interchanges and more options for commuters such as transit, passenger rail and transportation demand management, to better connect residents with destinations and ease congestion. The issues for this corridor extend to the interchanges at each end, along the I-95 corridor to the James River and along the I-64 corridor to Mechanicsville Turnpike.

ECONOMIC

Supports major regional activity centers throughout the region and particularly Downtown Richmond and VCU. The corridor is an essential and high-priority corridor for activity centers of all types throughout the region and supports tourism. Ensuring adequate access to this corridor is essential for Downtown and VCU activity centers.

TRANSPORT.

Bottlenecks and congestion hinder the reliability of the corridor, modal alternatives are limited and older designs limit access to and from this corridor. Parallel facilities (such as US 1, US 250 and US 360) have bottlenecks and limitations that limit the ability to absorb overflow traffic, particularly during traffic incidents.

B. Downtown Richmond to West End Mode Choice

NEED

The regional activity centers along the US 250 and I-64 Corridors from Downtown Richmond to West Creek are key Knowledge Sector employment centers and Local Service centers. Transit access is limited west of Willow Lawn. Extending and improving transit access along the entire corridor would improve transit accessibility for the region substantially.

ECONOMIC

Supports major local and knowledge-based regional activity centers including Downtown Richmond, VCU, Innsbrook and West Creek, while enhancing access to local centers such as Willow Lawn.

TRANSPORT.

Existing connections between activity centers are not efficient, involving low speeds and many stops. Transit access west of Willow Lawn is limited and somewhat disconnected from the rest of the regional transit system.

C. I-95 Southside Connectivity and Mode Choice

NEED

Along the I-95 Corridor from the James River Bridge to VA Route 10 are key Freight activity centers such as the Port of Richmond and Meadowville. Numerous factors such as insufficient vertical clearances and older interchange designs limit the accessibility of trucks and other freight modes to some of these centers. Improving the accessibility of freight to these centers will improve goods movement for many business in these centers.

ECONOMIC

Connects major freight activity centers for the region and addresses insufficient access issues for multiple modes. The connections are critical to the port and freight movement and to many commuters. Key freight activity centers such as the Port, Meadowville and the UPS/Tranlin area are served by this corridor.

TRANSPORT.

Insufficient vertical clearances and older interchange designs limit the accessibility of trucks and other freight modes in numerous places along this critical corridor including issues with truck access along parallel and connecting primary and secondary routes in the corridor. Parallel facilities (such as US 1) have bottlenecks and limitations that limit the ability to absorb overflow traffic, particularly during traffic incidents.

D. VA 288 Corridor Reliability and TDM

NEED

VA 288 is a key corridor connecting activity centers such as Innsbrook and West Creek to major workforce residential areas in Chesterfield and serves as an important bypass around the region. There are some key bottlenecks with reliability issues and limited TDM options currently serving this corridor.

ECONOMIC

Innsbrook and West Creek are key regional Knowledge focused activity centers and some of the largest employment centers in the region and a sizeable portion of their workforce commutes from Chesterfield County via VA 288. Along VA 288 are key local service activity centers serving the surrounding residential populations.

TRANSPORT.

The major issues along this corridor are the bottlenecks at key interchanges and the lack of TDM or other alternative mode choice options which reduces the efficiency of the corridor and the surrounding transportation system.

E. US 60 & 360 Connectivity and Mode Choice

NEED

The US Route 60 and 360 Corridors are important arteries for the movement of commuters and connect a sizeable portion of the regional workforce with key activity centers. These corridors lack transit access west of Chippenham Parkway, they have limited bike access and suffer from limited network connectivity creating bottlenecks as users have no other option to travel between destinations, even locally.

ECONOMIC

These corridors connect key workforce residential locations with key knowledge and local service activity centers. Providing more modal options and improving the efficiency and quality of these corridors is critical to attracting and retaining the regional workforce.

TRANSPORT.

These corridors do not suffer significant reliability problems but they do have localized bottlenecks due to the lack of continuous parallel roadway network options. These corridors also have limited transit service.

F. North/South Rail Reliability and Connectivity

NEED

The North-South CSX Rail Lines through the region are critical freight and passenger corridors for inter-regional movement and suffer from congestion and unreliability. Passenger rail service is not well connected to the region as the main train station for the region is not well connected to regional multimodal options and is distant from major activity centers.

ECONOMIC

Reliable freight movement along this corridor is critical to certain freight industries in the region. High-quality and reliable inter-city passenger service is critical to knowledge sector industries in the region.

TRANSPORT.

The CSX line from Richmond to DC is identified as a key chokepoint in the freight and passenger rail system in the Virginia Statewide Multimodal Freight Study due to the heavy train traffic and limited capacity.

G. I-95 Corridor Reliability

NEED

The I-95 corridor north of I-295 is a major artery for the region, handling commuter and freight traffic as well as connecting the region to other parts of Virginia. Congestion is very unreliable, particularly in the bottleneck between I-295 and Ashland. The corridor would benefit from operational and capacity improvements to reduce the unreliable travel times.

ECONOMIC

The I-95 corridor connects Richmond to critical markets to the northeast and therefore is a key connecting for freight and knowledge industries. It is also a significant commuter corridor for workforce coming from Hanover County and Ashland and is a major access corridor to reach Virginia Center Commons, Hanover Airport and Ashland activity centers. Highway access is essential for all three, but is particularly critical for freight focused activity centers like Hanover Airport.

TRANSPORT.

The I-95 Corridor in this area has a key bottleneck at the I-295 interchange due to weaving from the adjacent interchange at VA 656 and suffers from significant reliability issues, particularly on weekends. Parallel facilities (such as US 1 and US 301) have bottlenecks and limitations that limit the ability to absorb overflow traffic, particularly during traffic incidents.

H. I-64 Corridor Reliability

NEED

The I-64 Corridor east of I-295 is a major artery for the region, handling commuter and freight traffic as well as connecting the region to other parts of Virginia. Congestion is very unreliable and the corridor would benefit from operational and capacity improvements to reduce the unreliable travel times.

ECONOMIC

The I-64 corridor a key connection for freight industries in the region as it is the most direct route to the Port of Virginia.

TRANSPORT.

The I-64 corridor in this area suffers from significant reliability issues, particularly on weekends. Parallel facilities (such US 60) have bottlenecks and limitations that limit the ability to absorb overflow traffic, particularly during traffic incidents.

I. Various Activity Centers - Bikeable/Walkable Places

NEED

There are multiple activity centers that have limited pedestrian or bicycle facilities or need improved pedestrian or bicycle environments. Walkable and bikeable places improve the appeal to the future workforce, attraction for knowledge-based industries and reduces the reliance on vehicular travel.

ECONOMIC

Knowledge and local serving centers compete for the workforce segment that prioritizes walk and bike commutes and amenities.

TRANSPORT.

In addition to inhibiting transportation mode choice for trips that might otherwise be made by car, this need affects the mobility of non-drivers who desire access to these areas.

J. Various Activity Centers - TDM, Network Connectivity and Mode Choice

NEED

There are multiple activity centers with a knowledge and local service employment focus that need to develop adequate network connectivity, mode choice options and TDM strategies to ensure an efficient transportation system develops as they grow.

ECONOMIC

Fast growing knowledge and local serving centers need to prioritize adquate network connectivity, mode choice options and TDM strategies to compete for a quality workforce and maintain good access to the region's workforce.

TRANSPORT.

This need will help maintain the effeciency of the transportation system as these activity centers grow and expand.

K. Network Connectivity and Access for Meadowville

NEED

Meadowville Technology Park is expected to be a major office, industrial, warehousing and distribution center and will need to ensure that it has adequate access to both I-95 and I-295 to maintain its economic potential.

ECONOMIC

Meadowville Technology Park is expected to be a major office, industrial, warehousing and distribution center and needs adequate highway access to maintain adequate goods movement and workforce access.

TRANSPORT.

This need will help maintain the effeciency of the transportation system and access to this key activity center as this activity centers grows and expands.

L. Regional Need - Modal Choice

NEED

To support active transportation, crossings of major barriers such as the James River, Interstates and railroads need to accommodate bicycles and pedestrians. Constraints are widespread and create circuitous trips and sometimes unsurmountable obstacles. One example is that no crossing of the James River has dedicated bicycle lanes.

ECONOMIC

All activity centers with employees seeking a bicycle commute may be affected by this need. Knowledge and local serving centers appear the most likely to be affected, as they compete for the workforce segment that prioritizes walk and bike commutes and amenities.

TRANSPORT.

In addition to inhibiting transportation mode choice for trips that might otherwise be made by car, this need particularly affects the mobility of non-drivers in the region. It also affects recreational walking and bicycling in the region.