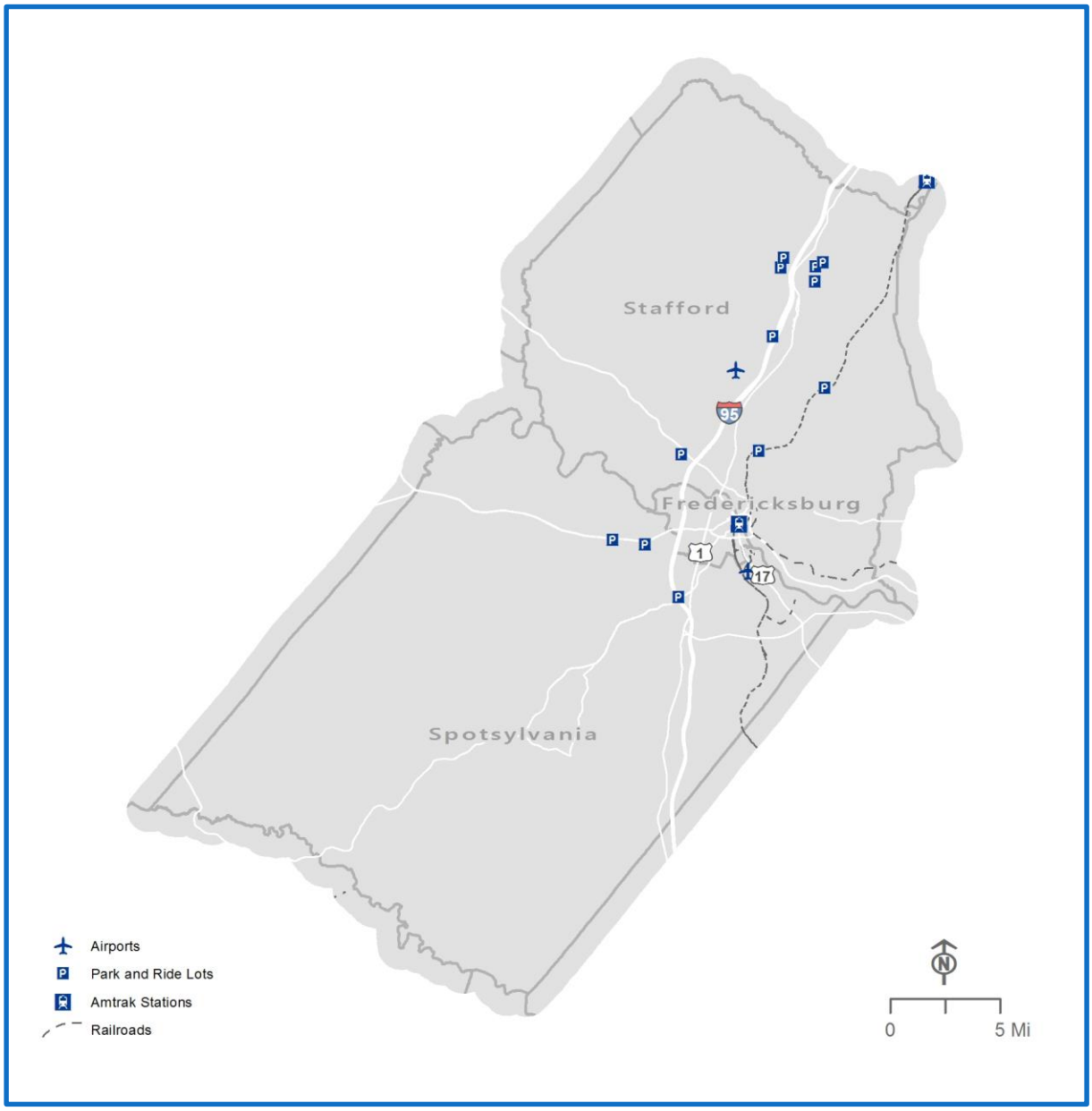
# VMTP 2025 Needs Assessment

## Regional Needs Profile




## Fredericksburg 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 Fredericksburg 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 Fredericksburg 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 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 Fredericksburg 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 Regional Network. 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.

In the Fredericksburg Region, the Needs Analysis area includes the City of Fredericksburg, Stafford County, and Spotsylvania County.

# 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 Fredericksburg 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 the Woods & Poole *2014 State Profile*, 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 Fredericksburg Region. Projections estimate about 150,000 new residents in the region by the year 2025. (Refer to Table 2).

*Table 2: Fredericksburg Region Population Projections. Sources: Woods & Poole, Weldon Cooper.*

| Current Population (2012) | Weldon Cooper Projection (2025) |
|---|---|
| 287,343 | 432,724 |

*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 Fredericksburg Region.

*Table 3: County and City Population Projections. Sources: Woods & Poole, Weldon Cooper.*

| Jurisdiction | Current Population (2012) | Weldon Cooper Projection (2025) | % Change |
|---|---|---|---|
| City of Fredericksburg | 27,307 | 27,442 | 0% |
| Spotsylvania County | 125,684 | 194,560 | 55% |
| Stafford County | 134,352 | 210,721 | 57% |

*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 15% (slightly less than the state average of 21%) from $38,862 to $44,833. Population growth is also projected to be across age demographics, with a higher percentage of the population under the age of 19.

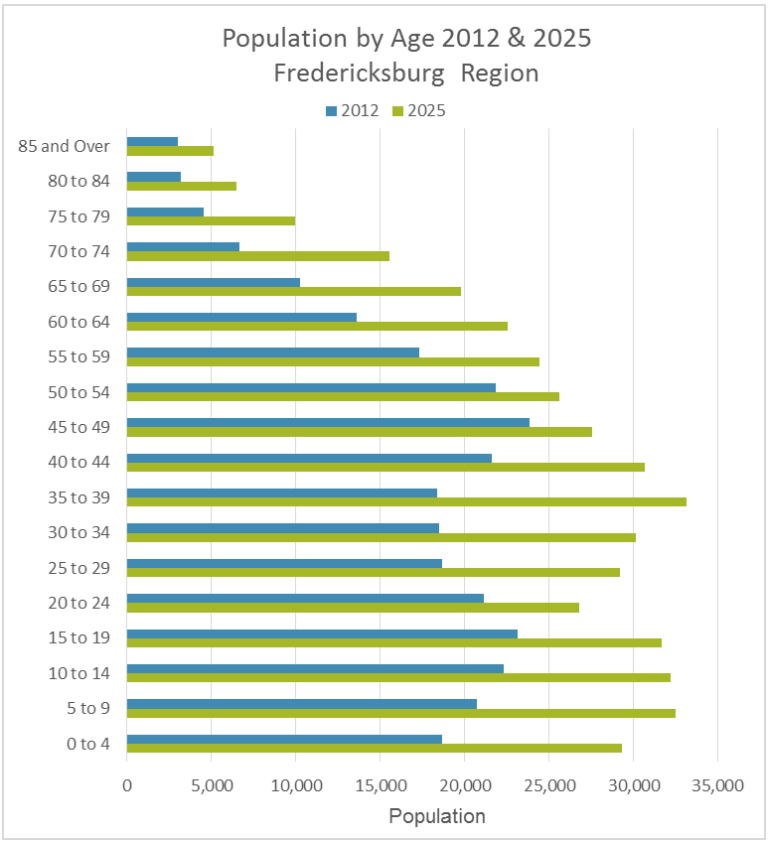



*Figure 1: Population of Region 2000 in the years2012 and Projected for the year 2025.*

*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 Fredericksburg 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 Fredericksburg Region, Figure 3 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.

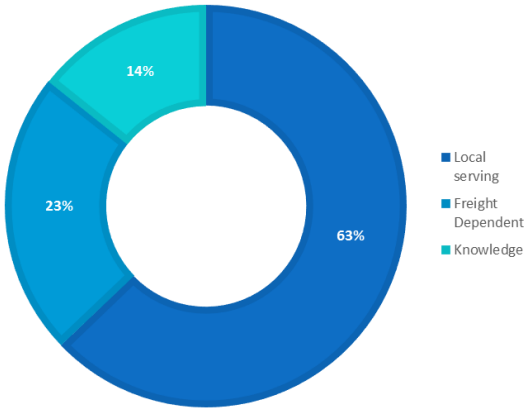



*Figure 3 – Top Sectors by Output (2012).*
*Source: IHS Global Insight, 2012.*

The local services cluster is clearly the strongest in this region. Local services make up 63% of the economic output in the Fredericksburg Region. Since a high percentage of persons in the region commute outside the region for work, the employment within the region tends to skew towards local

service based industries. This commuting pattern and occupational pattern is discussed in more detail below. Conversely, the knowledge and freight-dependent clusters account for 14% and 23% 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

Retail trade is the strongest industry in the Fredericksburg Region when measured by employment. The health care industry comes in a close second, reflecting the number of large health care facilities in the region. Wholesale trade, public administration, and finance/insurance round out the top five industries in the region with the greatest economic output. (Refer to Table 5). Again, with the large number of persons commuting out of the region, the top industries in the region by output tend to be in the locally serving sector of the economy.

*Table 4: Current Industries by Output.*

| Top Industries | NAICS Code | % of Output |
|---|---|---|
| Retail Trade | 44-45 | 22% |
| Health Care | 62 | 16% |
| Wholesale Trade | 42 | 11% |
| Public Admin. | 92 | 9% |
| Finance / Insurance | 52 | 7% |

*Source: IHS Global Insight, 2012.*

## Top Industries by Employment

In the Fredericksburg Region, public administration, retail trade, health care, accommodation/food services, and professional services are the top industries by employment. (Refer to Table 6). Again, with the large number of persons commuting out of the region, the four of the top five industries in the region by employment are in the locally serving sector of the economy.

*Table 5: Current Top Industries by Employment.*

| Top Industries | NAICS Code | % of Workforce |
|---|---|---|
| Public Administration | 92 | 20% |
| Retail Trade | 44-45 | 17% |
| Health Care | 62 | 13% |
| Accommodation / Food Service | 72 | 11% |
| Professional Services | 54 | 7% |

*Source: IHS Global Insight, 2012.*

Top employers in the region include Marine Corps Base – Quanitco, GEICO Insurance and Mary Washington Hospital and College. Marine Corps Base employment is not fully captured in the analysis of industries above due to the difficulty of capturing military and federal employment in national employment statistics. GEICO and Mary Washington are major employers who by NAICS industry code would fall into local serving employment category. In the case of Mary Washington, though, it is likely more appropriate to consider them a knowledge-focused employer.

*Table 6: Current Top Employers. Source: InfoUSA, supplemented with VEDP, VEC, and local data.*

| Employers | Employees |
|---|---|
| Marine Corps Base - Quantico | 10,000 + |
| GEICO Insurance | 2,500 – 4,999 |
| Mary Washington Hospital | 1,500 – 2,499 |
| Mary Washington College | 1,000 – 1,499 |

*Source: IHS Global Insight, 2012.*

## 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 Fredericksburg Region. The industries expressed in Table 4 have the highest LQ scores in the region. The score for professional services, for example, can be inferred to mean that these services are more than two times more concentrated in the region than in the entire nation, on average.

*Table 7: Current Top Industries by Location Quotient. Source: IHS Global Insight Data, 2012*

| Top Industries | NAICS Code | Location Quotient |
|---|---|---|
| Professional Services | 54 | 2.41 |
| Accommodation / Food Service | 72 | 1.52 |
| Retail Trade | 44-45 | 1.51 |
| Other Services | 81 | 1.41 |
| Real Estate | 53 | 1.29 |

*Source: IHS Global Insight, 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 revised, refined, or amended after discussing economic conditions with regional stakeholders. Activity centers such as Spotsylvania Courthouse 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 2 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.

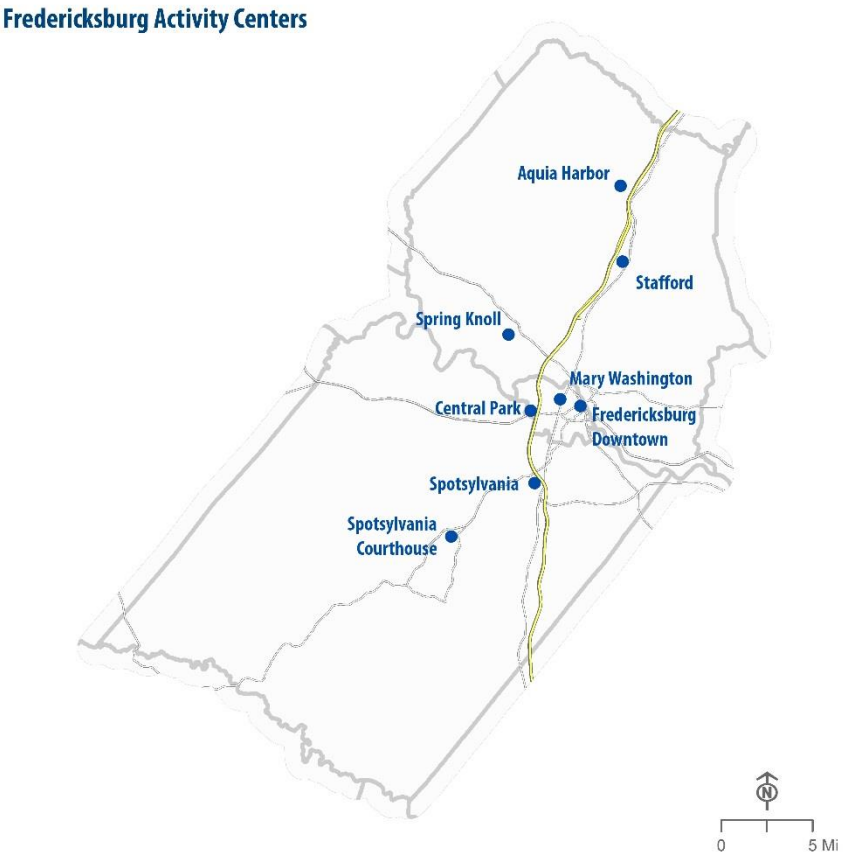



*Figure 2: Map of Activity Centers based on Job Density and Stakeholder Input*

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 3 below shows the mapping of each activity center broken down by industry sector, and scaled by relative number of jobs.

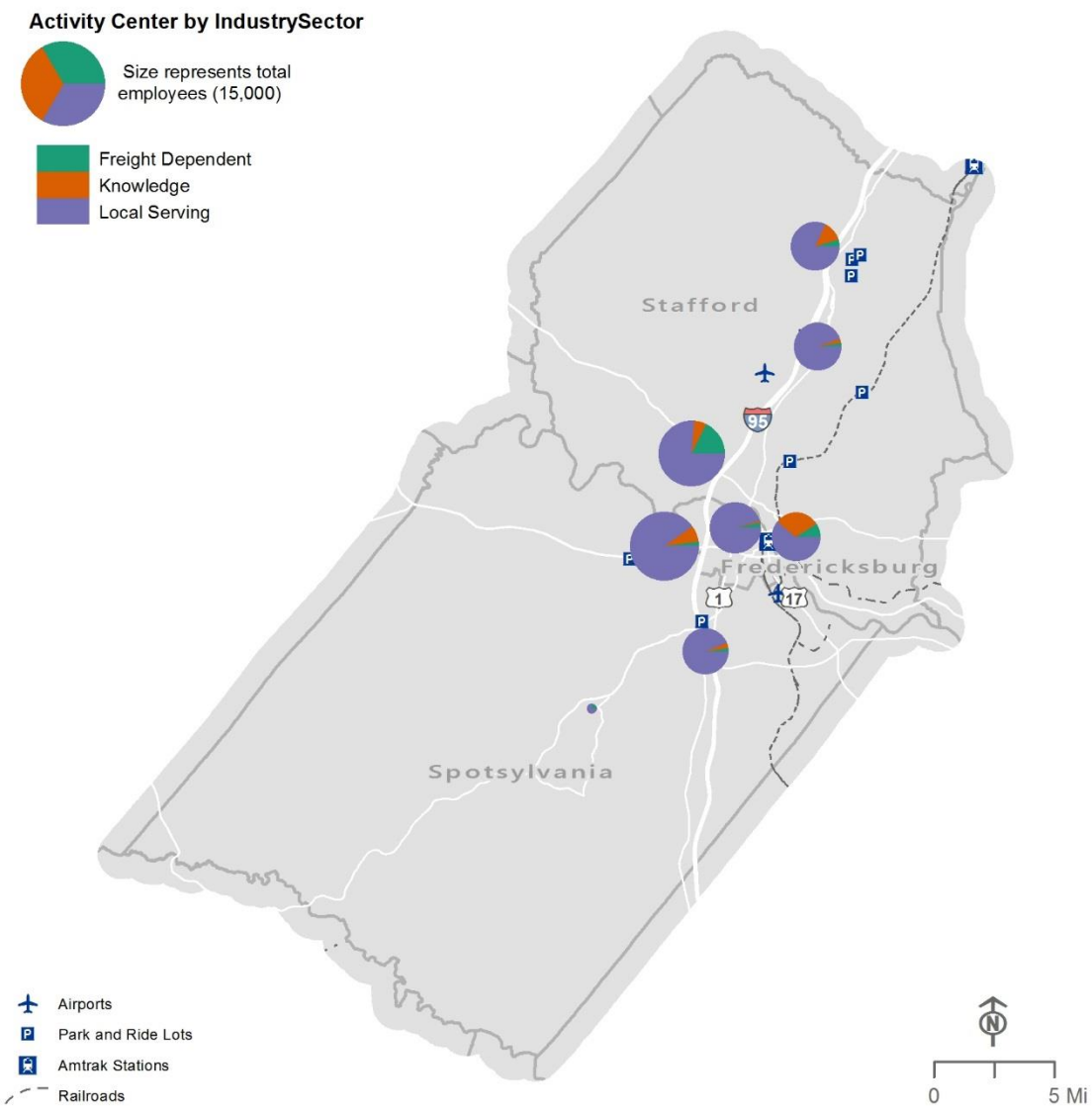



*Figure 3: Activity Center Employment by Industry Sector.*
*Source: IHS Global Insight, 2012.*

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# E. Forecasted 2025 Industry and Employment Strengths

Through a series of work sessions with the Fredericksburg Region 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 Fredericksburg 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 Fredericksburg 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 Fredericksburg Region area by 2025. According to statewide and national datasets used, the administrative services and wholesale trade will see the largest growth. Combined, they are expected to produce $1.5 billion more in 2025 than was produced in 2012.

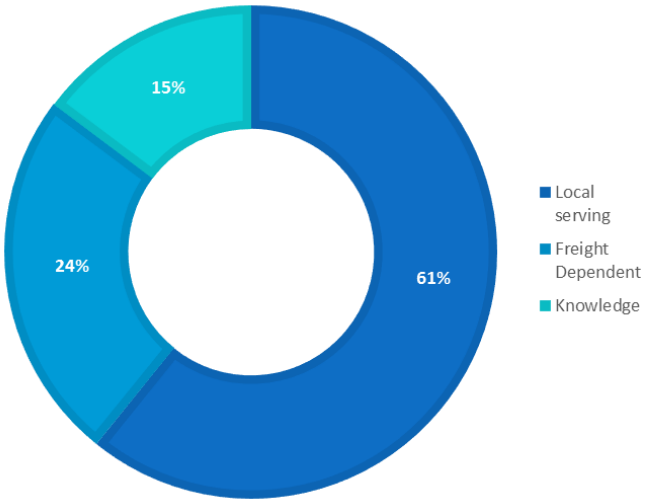



*Figure 4: 2025 Industry Sectors by Output.*
*Source: IHS Global Insight, 2012.*

The local services cluster will remain the dominant industry sector in 2025, however it is anticipated to be a slightly smaller share. Between 2012 and 2025, the local serving sector share of the regional industry will drop by 2%, making up 61% of the regional output. The knowledge and freight-dependent

clusters account for 15% and 25% of economic output, respectively. There are not any major changes in the regional economy that would influence the future transportation needs.

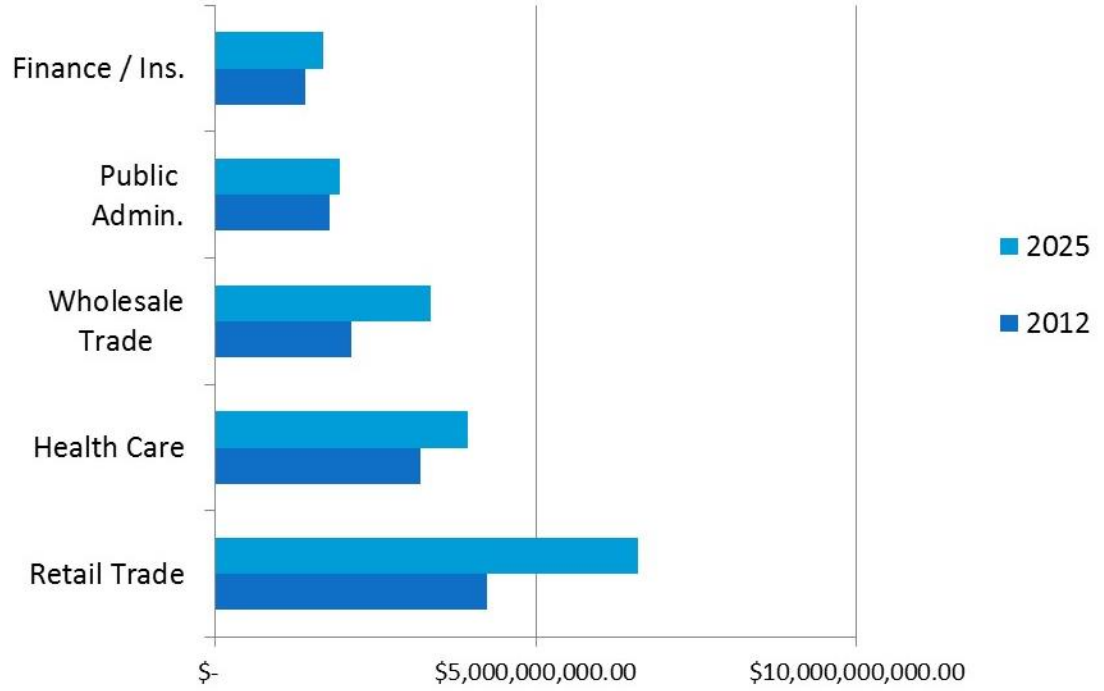



*Figure 5: Top Industries by Output –*
*Source: IHS Global Insight, 2012.*

Output for the major industries will continue to grow in 2025, with the industry with the largest output, retail trade, growing by 56%. In all industries combined, economic output in the Fredericksburg Region is expected to increase by $7 billion by 2025. (Refer to Figure 4).

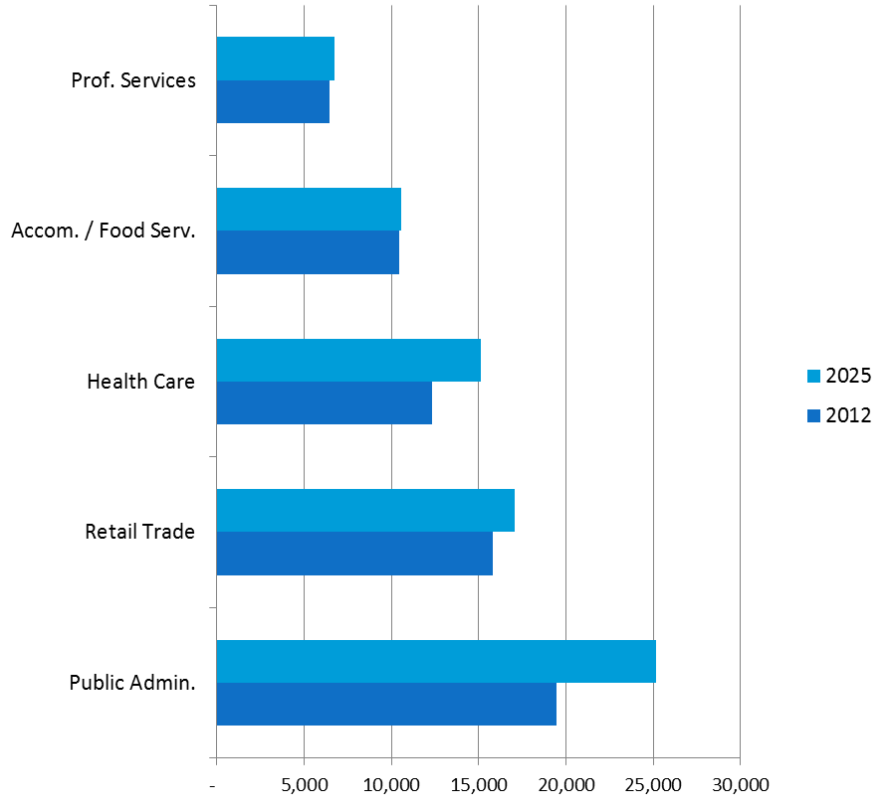



*Figure 6: Top Industries by Employment.*
*Source: IHS Global Insight, 2012.*

The highest growing industry by employment in the region is administrative sector, which will grow by 70% between 2012 and 2025. Other growth industries include wholesale trade, retail trade, transportation and warehousing, and mining. Many of the region's highest employment industries will continue to grow in 2025, especially in public administration and health care.

*Table 8: Top Industries by Employment.*

| Top Industries | NAICS Code | % Change in Employment (2012-2025) |
|---|---|---|
| Administrative Sector | 56 | 50% |
| Construction | 23 | 42% |
| Transportation and Warehousing | 48-49 | 34% |
| Public Administration | 92 | 30% |
| Wholesale Trade | 42 | 25% |

*Source: IHS Global Insight, 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 Fredericksburg 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 Fredericksburg Region:

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

## B. Commuting Patterns

### Regional Commuting Patterns

Commuting patterns in the Fredericksburg Region show that a large number of workers commute outside the region. Figure 7 shows the breakdown of residential occupations versus worker occupations in the region, showing a significant gap in Administrative Support, Protective Services, Management Professionals, and Engineering and Computer Science occupations.

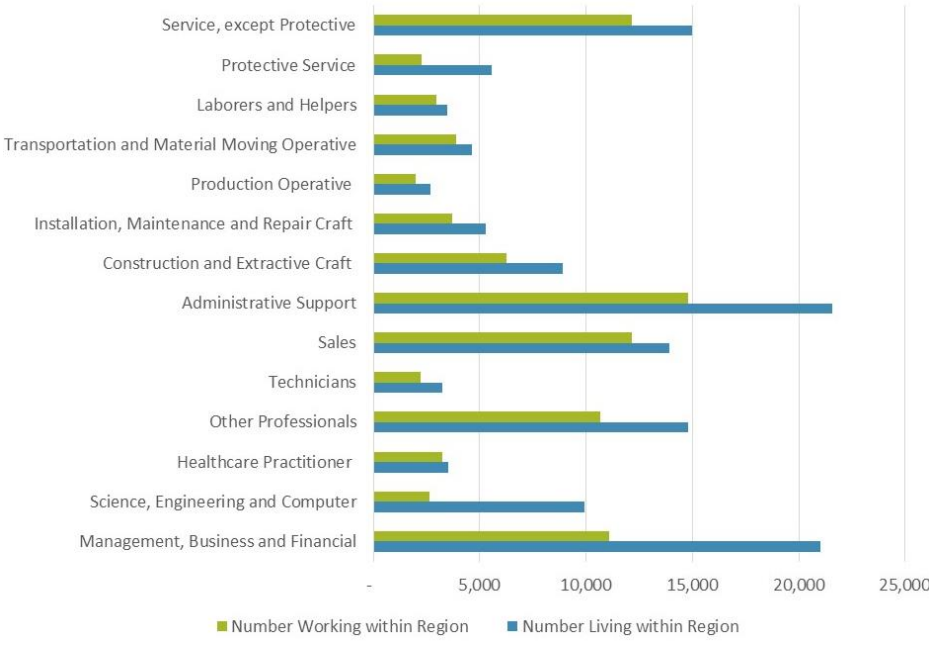



*Figure 7: Comparison of Resident and Worker Occupations*
*Source: US Census Bureau, EEO Tabulations 2006-2010 (5 Yr ACS)*

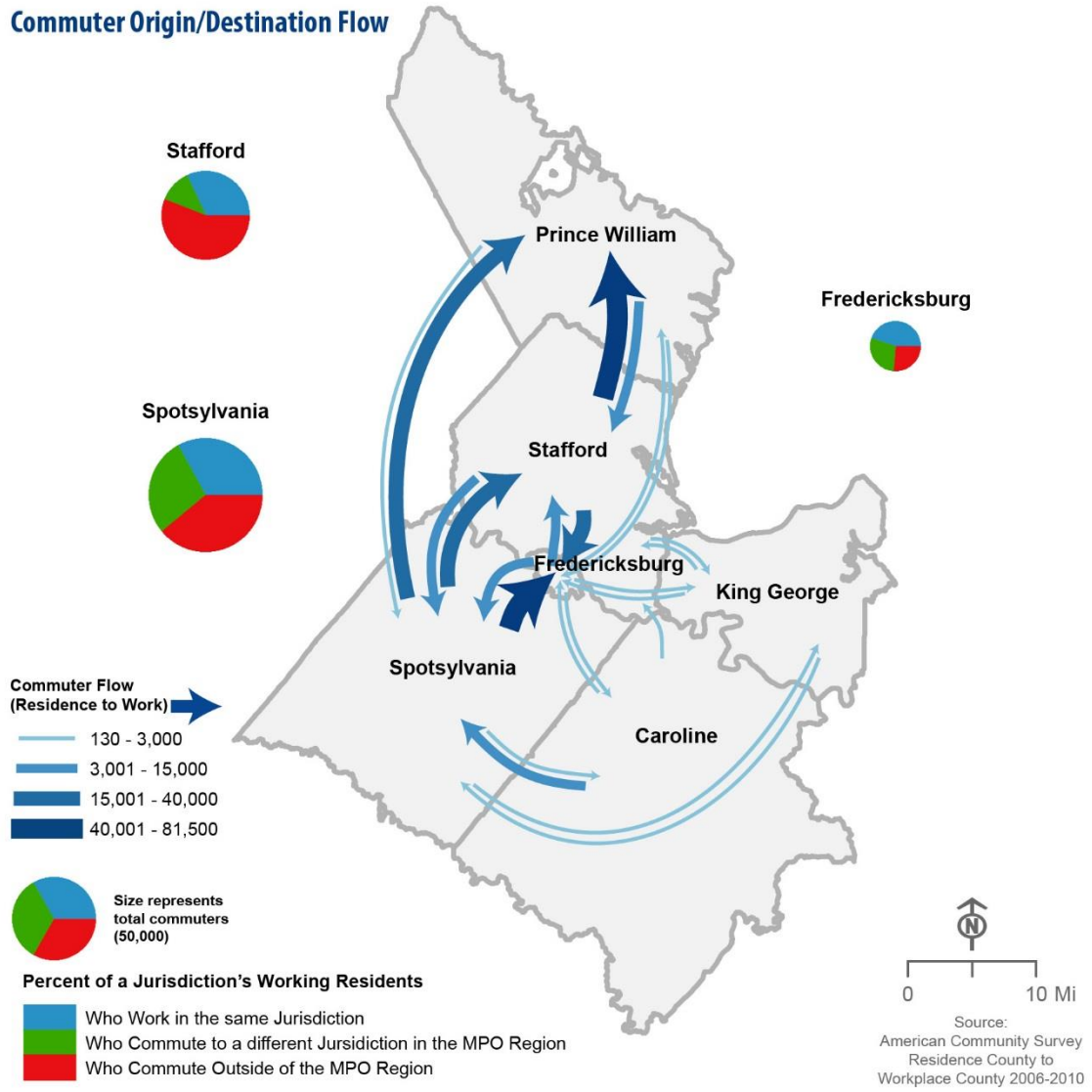



*Figure 8: Regional Commuting Patterns.*
*Source: Census Commuting Data, 2006-2010*

As represented in Figure 8, a third of Spotsylvania workers commute outside the Fredericksburg Region. More than half of Stafford workers commute outside the region. However, in the City of Fredericksburg a third of workers commute outside the region. Conversely to the rest of the region, almost half of workers in the City of Fredericksburg work in the same jurisdiction.

## Activity Center Commuting Patterns

Equally important to the formation of a regional transportation profile for Fredericksburg Region was the analysis of commuting patterns between activity centers. Figures 9 through 14 below provide insights into the commuting patterns for three of the activity centers in the Fredericksburg 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 in Figure 9, Fredericksburg Downtown has a tight commuter shed, with most commutes originating in areas in and around the City of Fredericksburg. For these patterns, VA Routes 2 and 3 are important for workers commuting to Fredericksburg Downtown.

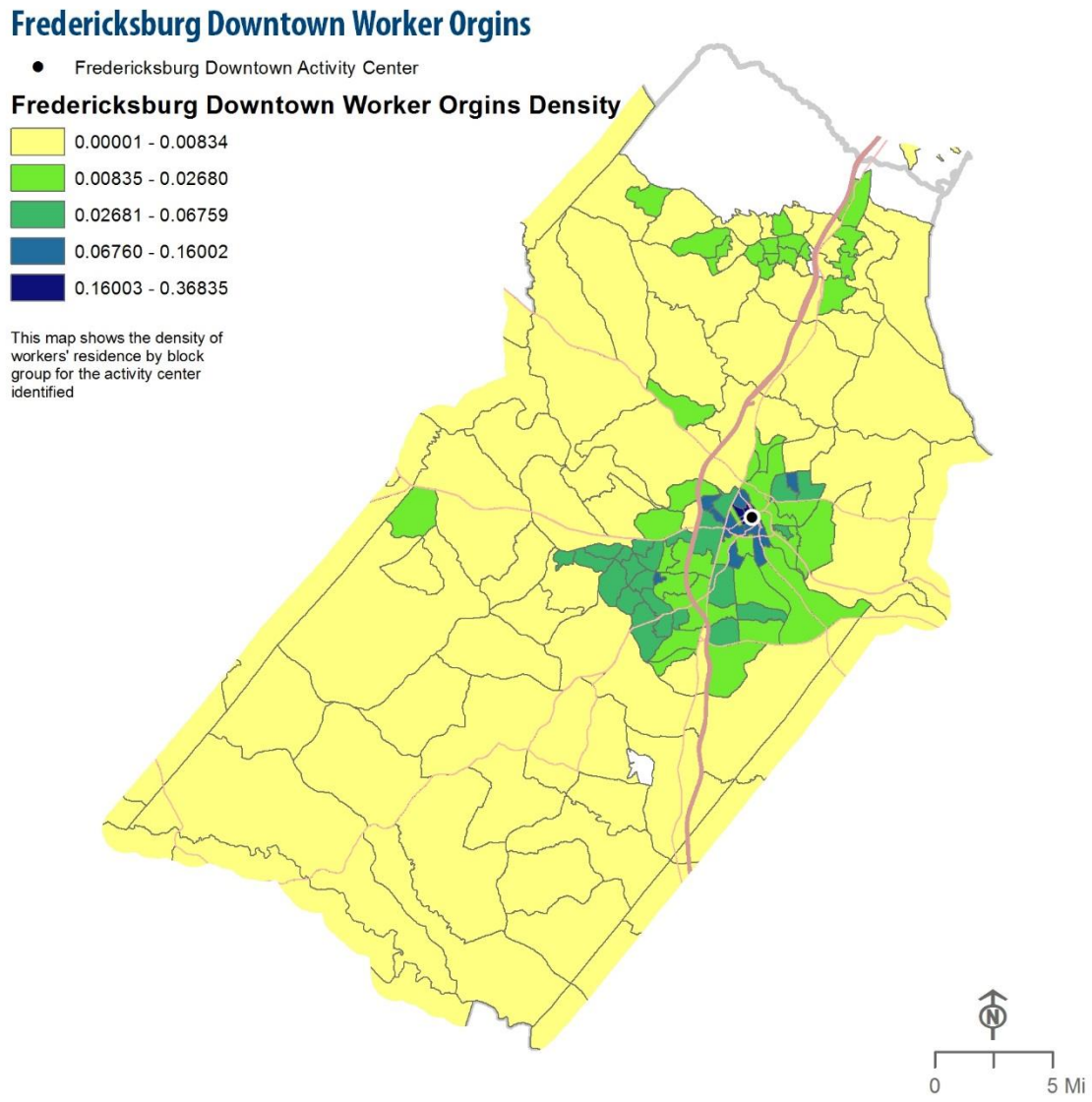



*Figure 9: Commuting Patterns to Fredericksburg Downtown Activity Center.*
*Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011*

As with Fredericksburg Downtown, the Garrisonville activity centers see most commutes originate in and around the activity center, with a modest portion of commutes originating from the City of Fredericksburg and Spotsylvania County. (Refer to Figure 10). Corridors important for this commuting pattern are I-95 and VA Route 610.

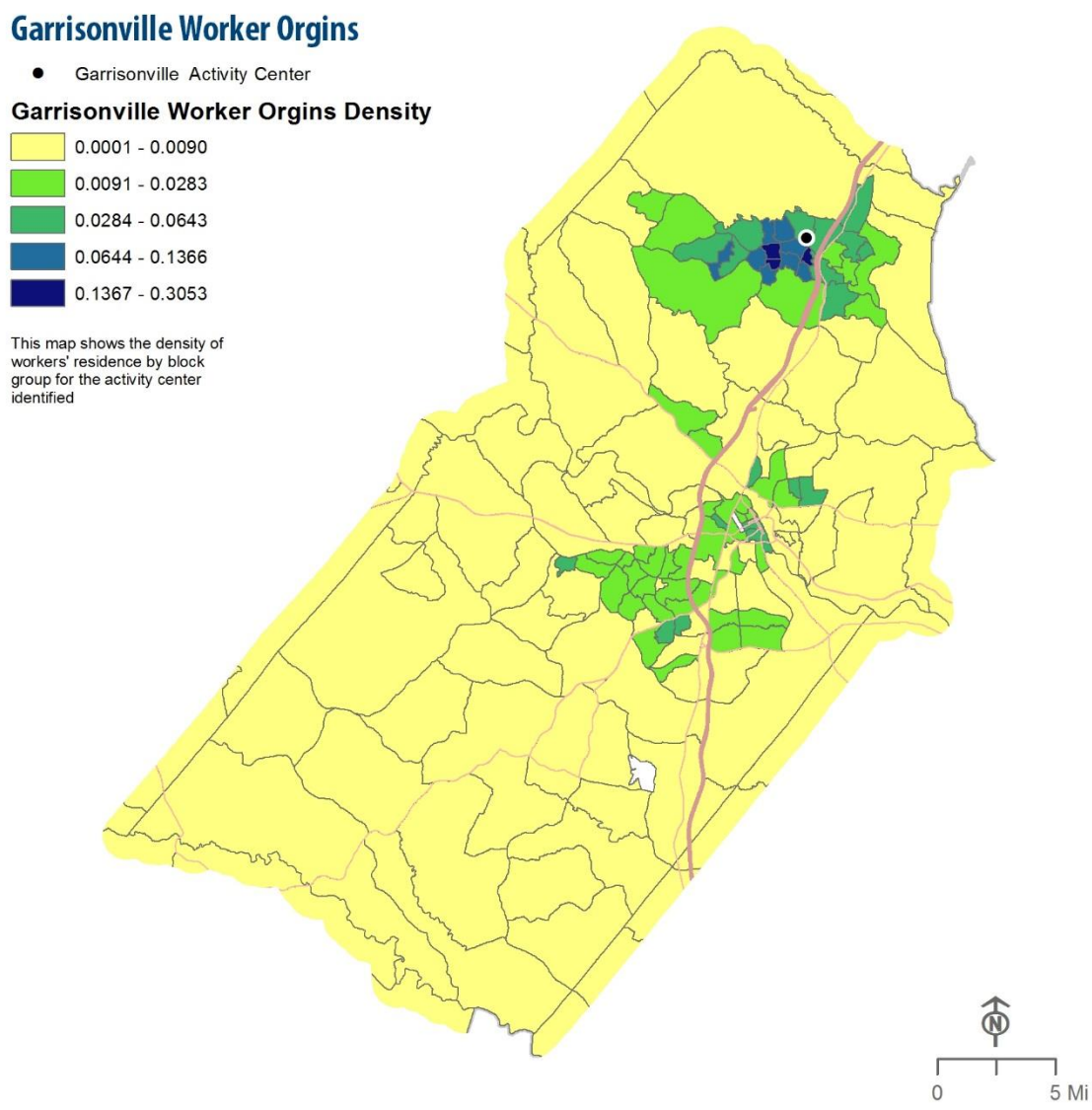



*Figure 10: Commuting Patterns to Garrisonville Activity Center.*
*Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011*

Commutes to the Mary Washington activity center mostly originate in the block groups surrounding the activity center, with a modest number of commutes originating in Stafford County. For these commuting patterns, I-95, VA Route 3, and US Route 1 are important of daily commutes to this activity center. (Refer to Figure 11).

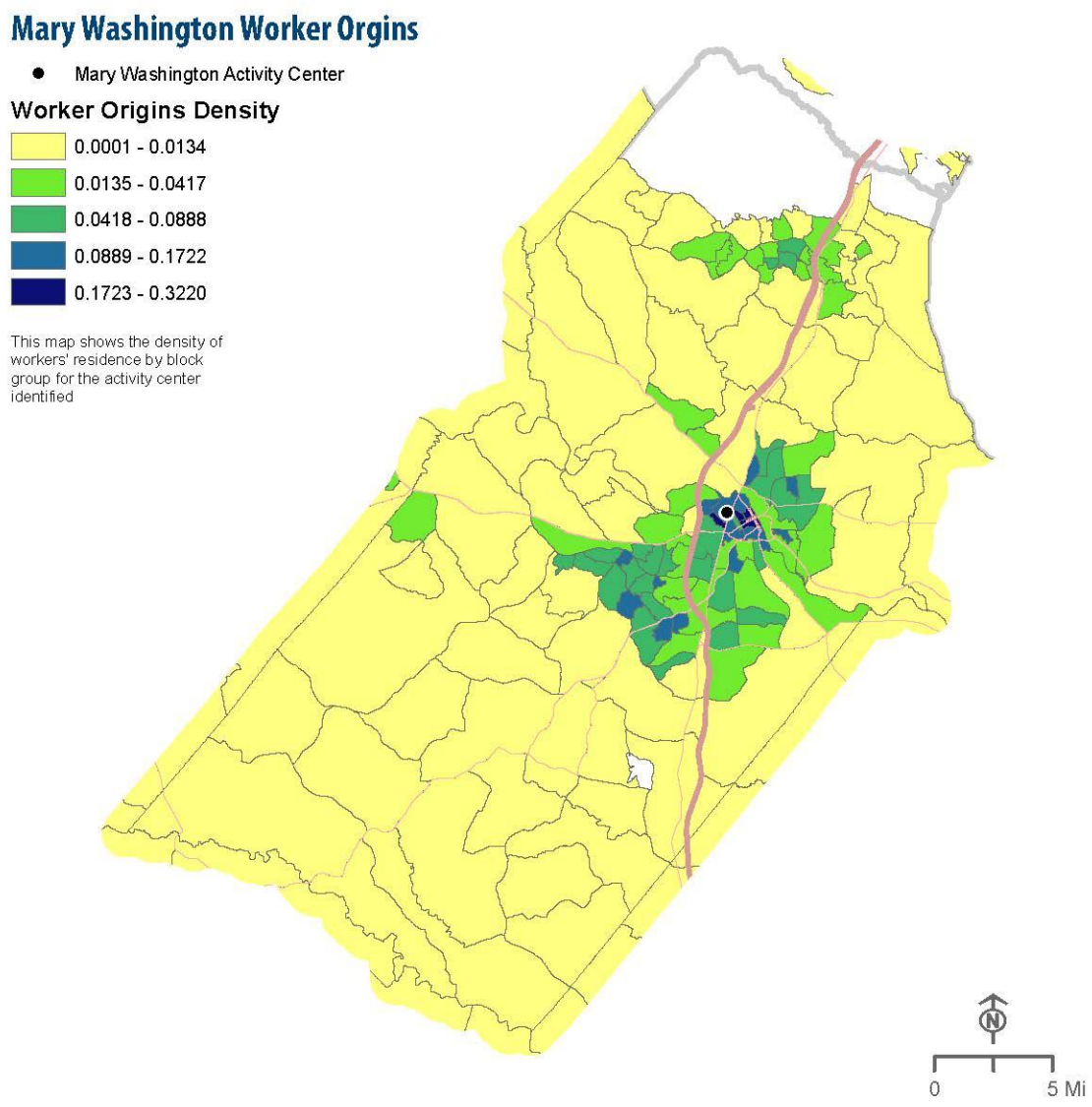



*Figure 11: Commuting Patterns to Mary Washington Activity Center.*
*Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011*

The commuter shed for Spotsylvania County is tight, with most commutes originating in the surrounding block groups. A number of commutes originate in northern Stafford County. Important corridors for the Spotsylvania activity center are I-95 and US Route 1. (Refer to Figure 12).

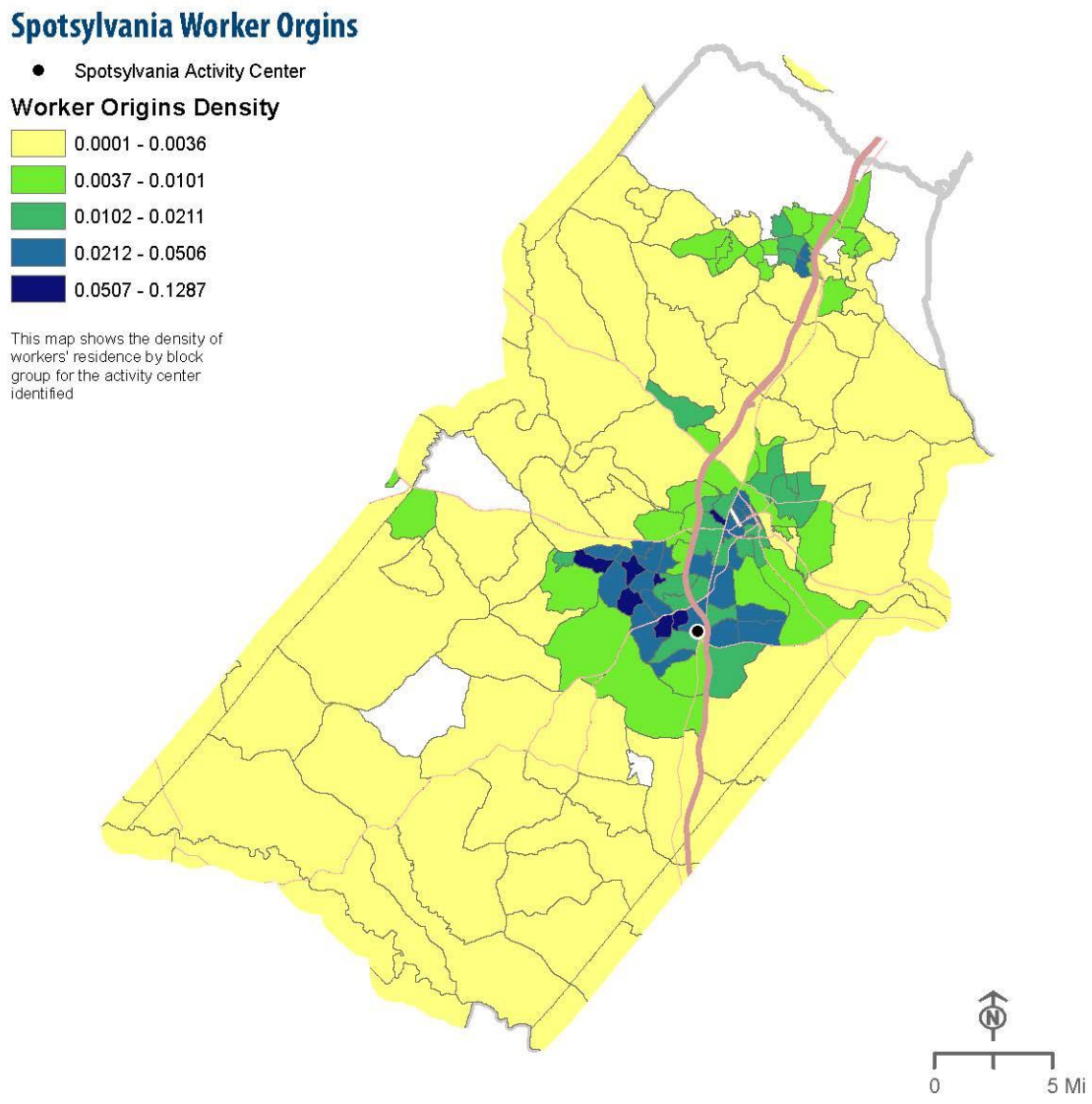



*Figure 12: Commuting Patterns to Spotsylvania Activity Center.*
*Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011*

Commutes to the Spring Knoll activity center originate throughout the region, but are densest along the I-95 corridor.

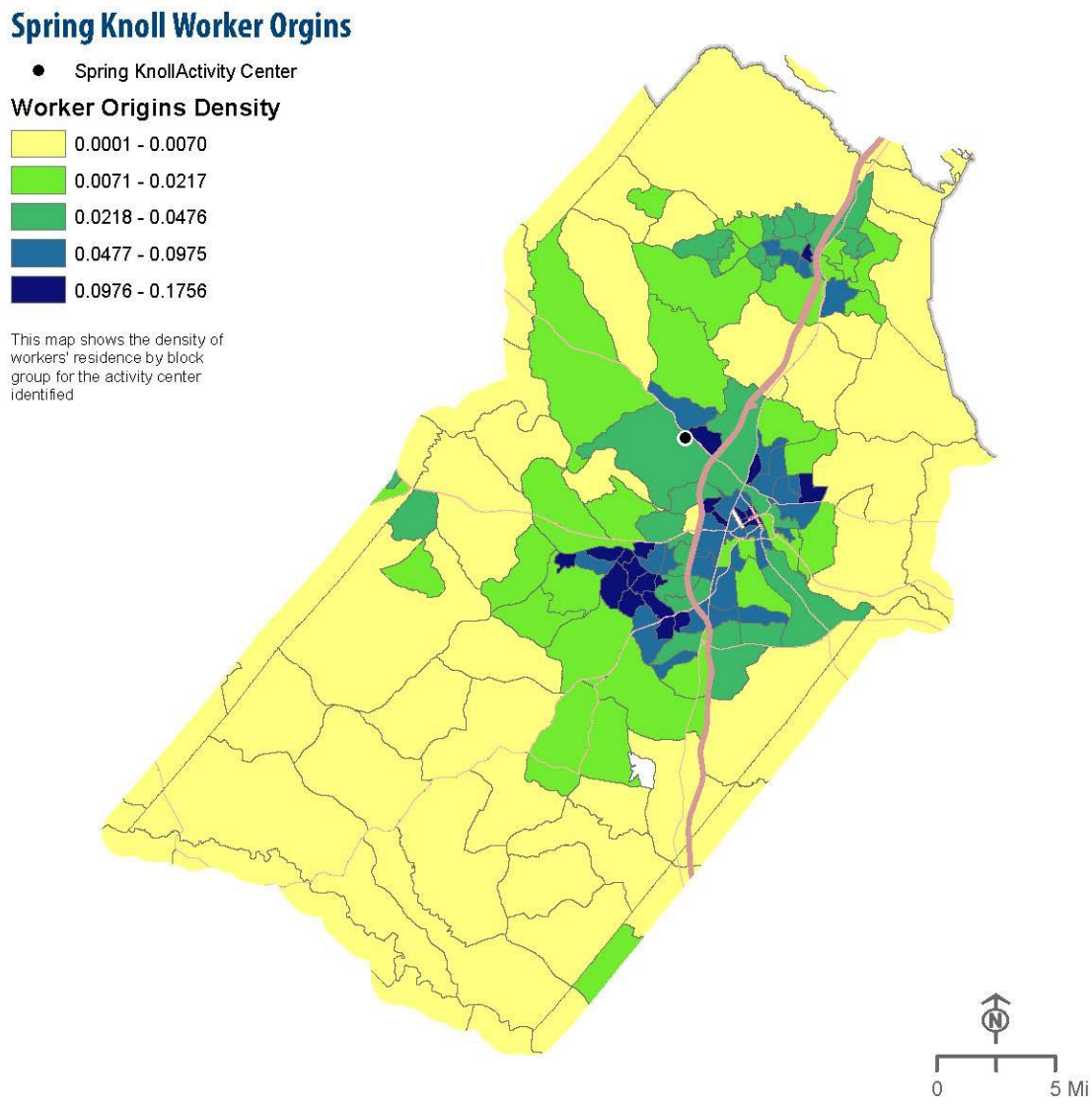



*Figure 13: Commuting Patterns to Spring Knoll Activity Center.*
*Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011*

The Stafford activity center has a similar commuter shed to the Spring Knoll activity center, however it covers a smaller part of the region. Commutes originate in all three jurisdictions in the region, but are densest in Stafford County, and is centered on the I-95 corridor.

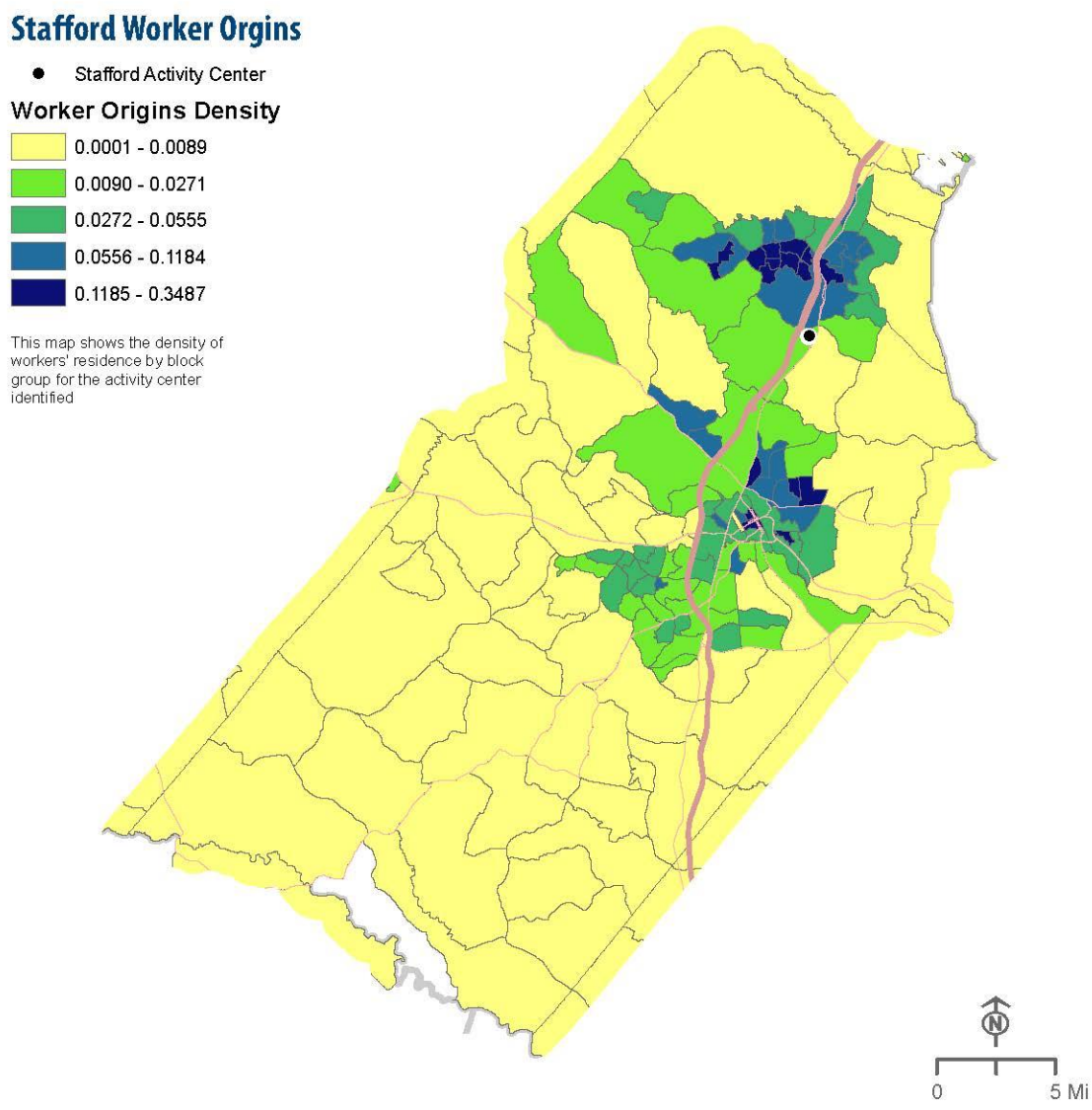



*Figure 14: Commuting Patterns to Stafford Activity Center.*
*Source: US Census, LEHD Origin-Destination Employment Statistics (LODES), 2011*

## Mode Choice

In the Fredericksburg Region, the majority of commuters drive alone to work. While there is some variation between jurisdictions, single occupancy vehicles are used for 71-79% of commutes in the region. For all jurisdictions, carpooling is the second most popular option, accounting for 12% to 15% of the mode share. The prevalence of carpooling is most likely due to the high number of workers commuting long distances outside the region. Public transit use is low in the Fredericksburg Region, accounting for only 3% of regional commutes. (Refer to Figure 15).

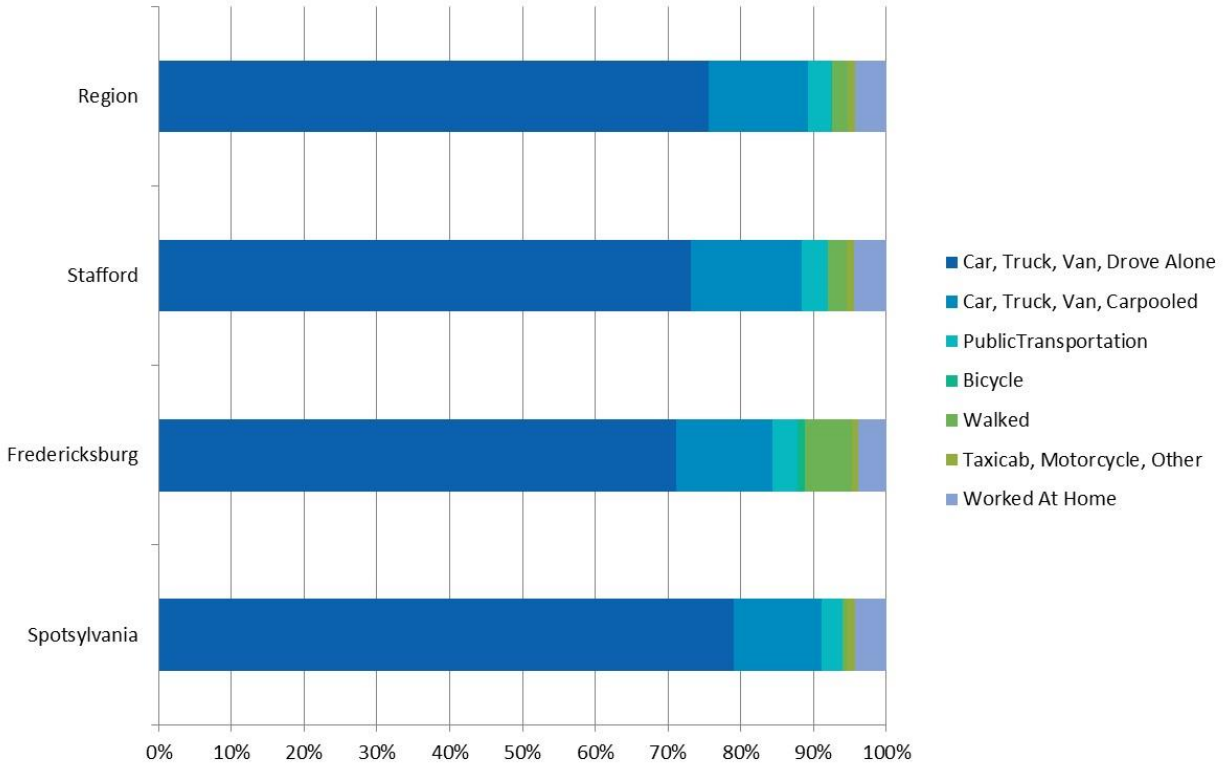



*Figure 15: Mode Share Split by Jurisdiction.*
*Source: ACS 2013 5-Year Estimates*

## Average Commute Times

In the Fredericksburg Region, average commute times range from 27 to 41 minutes among the various jurisdictions. (Refer to Table 9). Due to its density and proximity to employment centers, the City of Fredericksburg has the shortest average commute, while the surrounding counties of Spotsylvania and Stafford have significantly longer commute times. This is most likely due to the high number of workers that commute outside the region.

*Table 9: Mean Commute Time by Jurisdiction.*

| Jurisdiction | Mean Commute Time (Minutes) |
|---|---|
| City of Fredericksburg | 27.2 |
| Spotsylvania County | 39.4 |
| Stafford County | 41.1 |

*Source: ACS 2013 5-Year Estimates*

Commutes of over 45 minutes are common in the Fredericksburg Region. Stafford County has the highest percentage of workers who commute over 45 minutes at nearly 39%, this is twice as high as the City of Fredericksburg's rate of long commutes. (Refer to Figure 16).

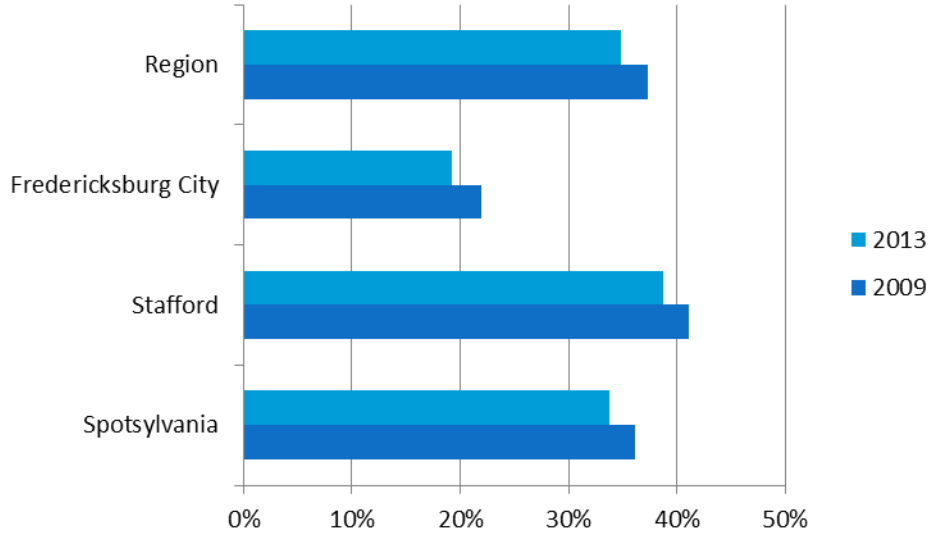



*Figure 16: Percent of Commutes Long than 45 Minutes.*
*Source: ACS 2013 5-Year Estimates*

Figure 17 provides a closer look at where longer commutes originate. In the City of Fredericksburg and areas in the northern areas of Stafford County, 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 Stafford and Spotsylvania Counties have commute times that are nearly 150% longer than the regional average, as these areas have fewer jobs in close proximity, and less access to transportation networks than more developed areas.

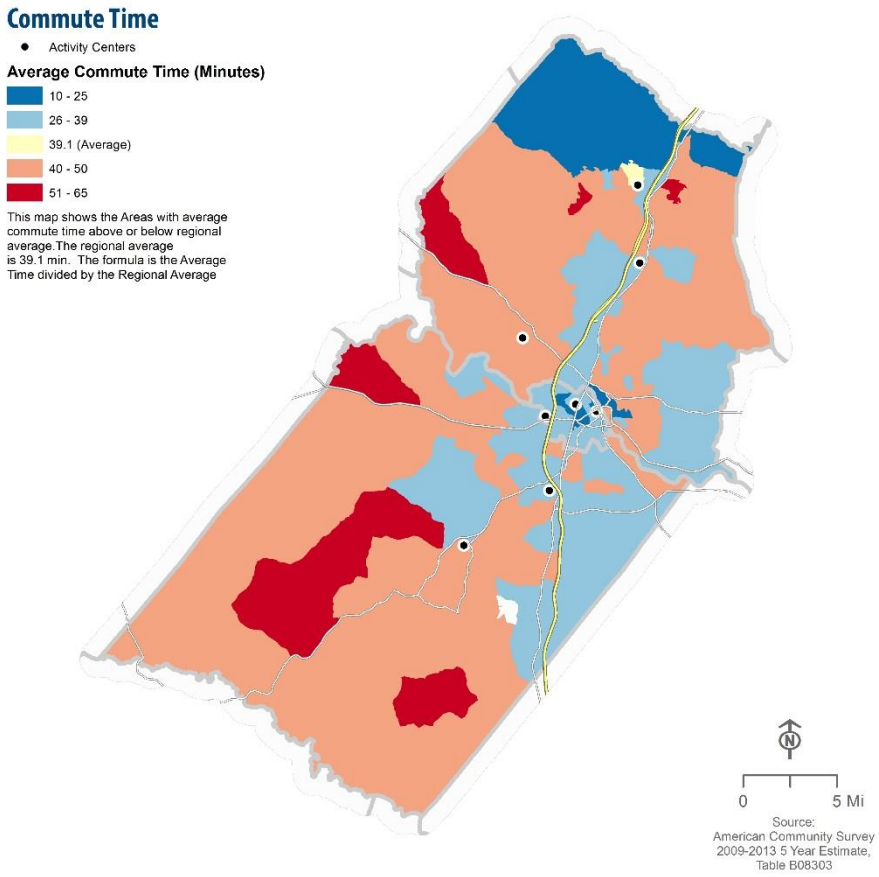



*Figure 17: Fredericksburg Region Commute Times.*
*Source: ACS 2013 5-Year Estimates*

# C. Accessibility to Employment

As part of the transportation conditions assessment, a set of accessibility performance measures and attributes were employed to address the workforce and freight needs at the general regional scale. This set of performance measures/attributes reflects regional characteristics such as commute times and the availability of multimodal transportation between activity centers.

## Auto Accessibility

Auto Accessibility in the Fredericksburg Region area 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 Fredericksburg, and areas adjacent to the I-95 corridor. The auto accessibility scores of activity centers without a large number of employment opportunities like Spotsylvania were boosted by their proximity to major roadways, allowing commuters to reach more

destinations within 45 minutes than commuters who start their trips further from major roadways. (Refer to Figure 18).

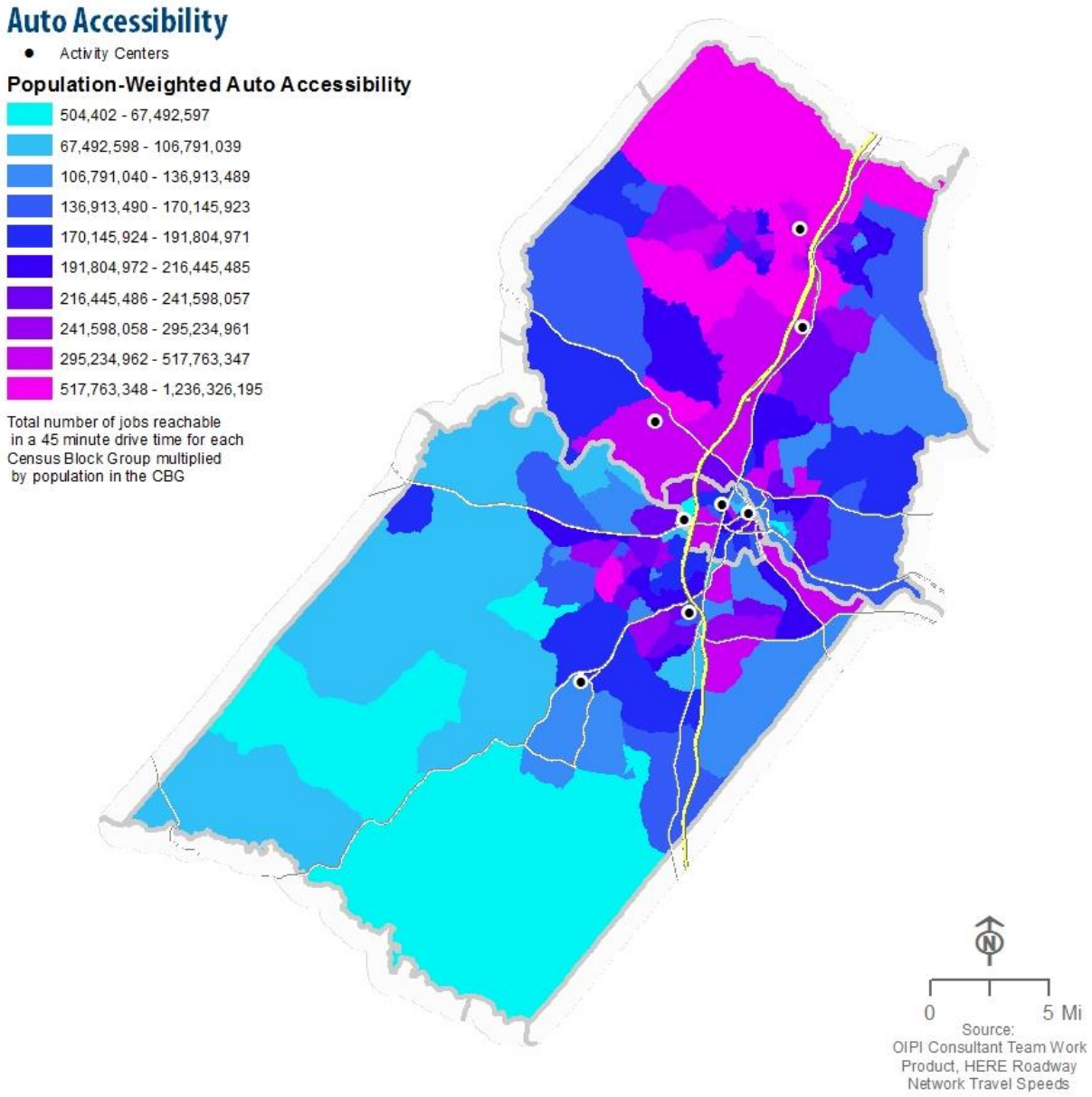



*Figure 18: Auto Accessibility*

## Transit Accessibility

Outside of the US Route 1 corridor, there are few fixed-route transit options in the Fredericksburg 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. Due to the lack of inter-jurisdictional 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 19).

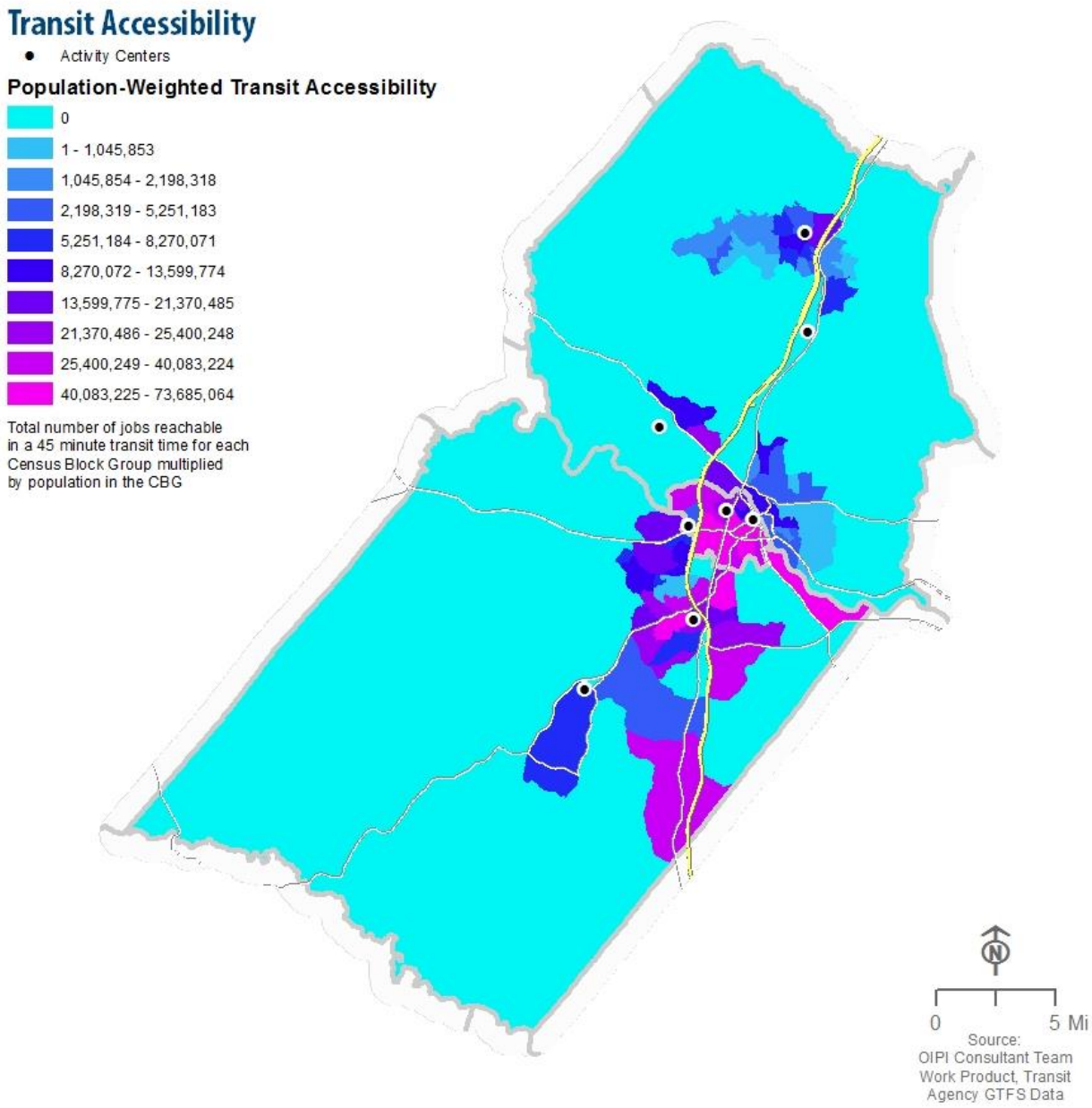



*Figure 19: Transit Accessibility*

## 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. The City of Fredericksburg and areas surrounding major corridors scored the highest. 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 20).

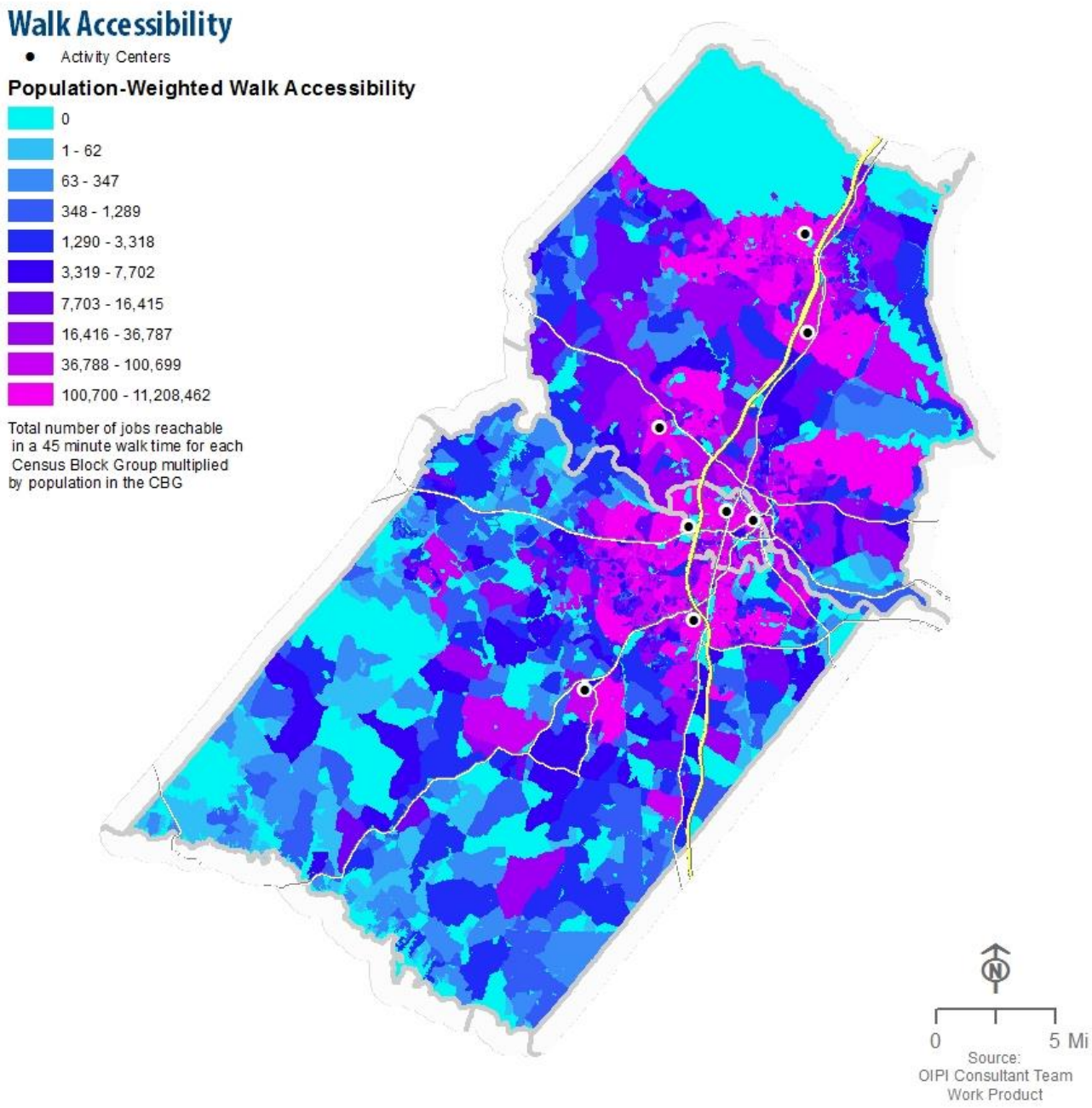



*Figure 20: Walk Accessibility*

## Freight Accessibility

In addition to railways, US Route 1/I-95 corridor is the major corridor 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 an eight minute drive from a major arterial ramp. (Refer to Figure 21).

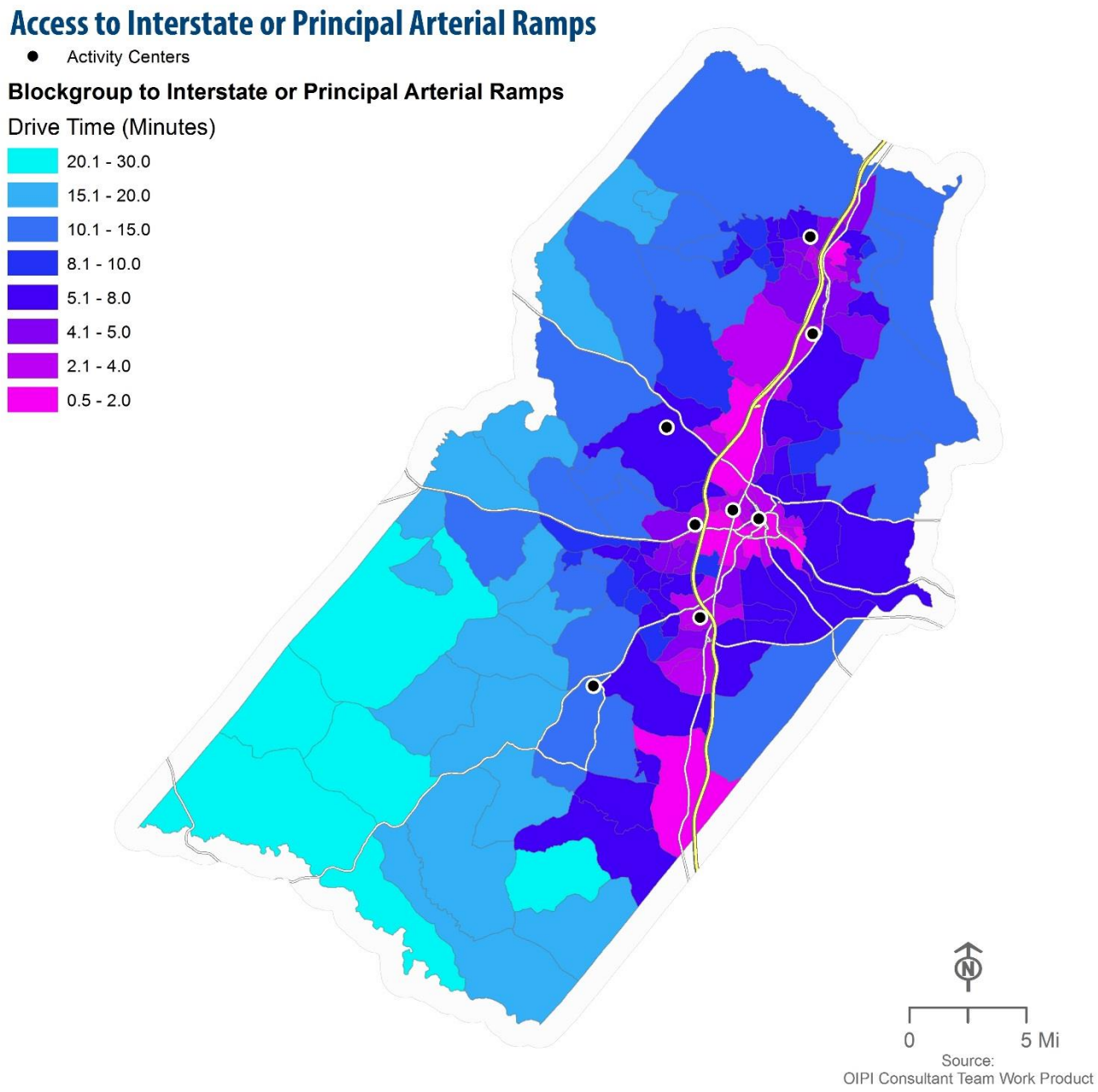



*Figure 21: Access to Interstate and Principal Arterial Ramps*

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 Fredericksburg Region are clustered around the I-95/US Route 1 corridor in and around the City of Fredericksburg. Most areas adjacent to the I-95/US Route 1 corridor are within a 22 minute drive to warehouses and distribution centers. (Refer to Figure 22).

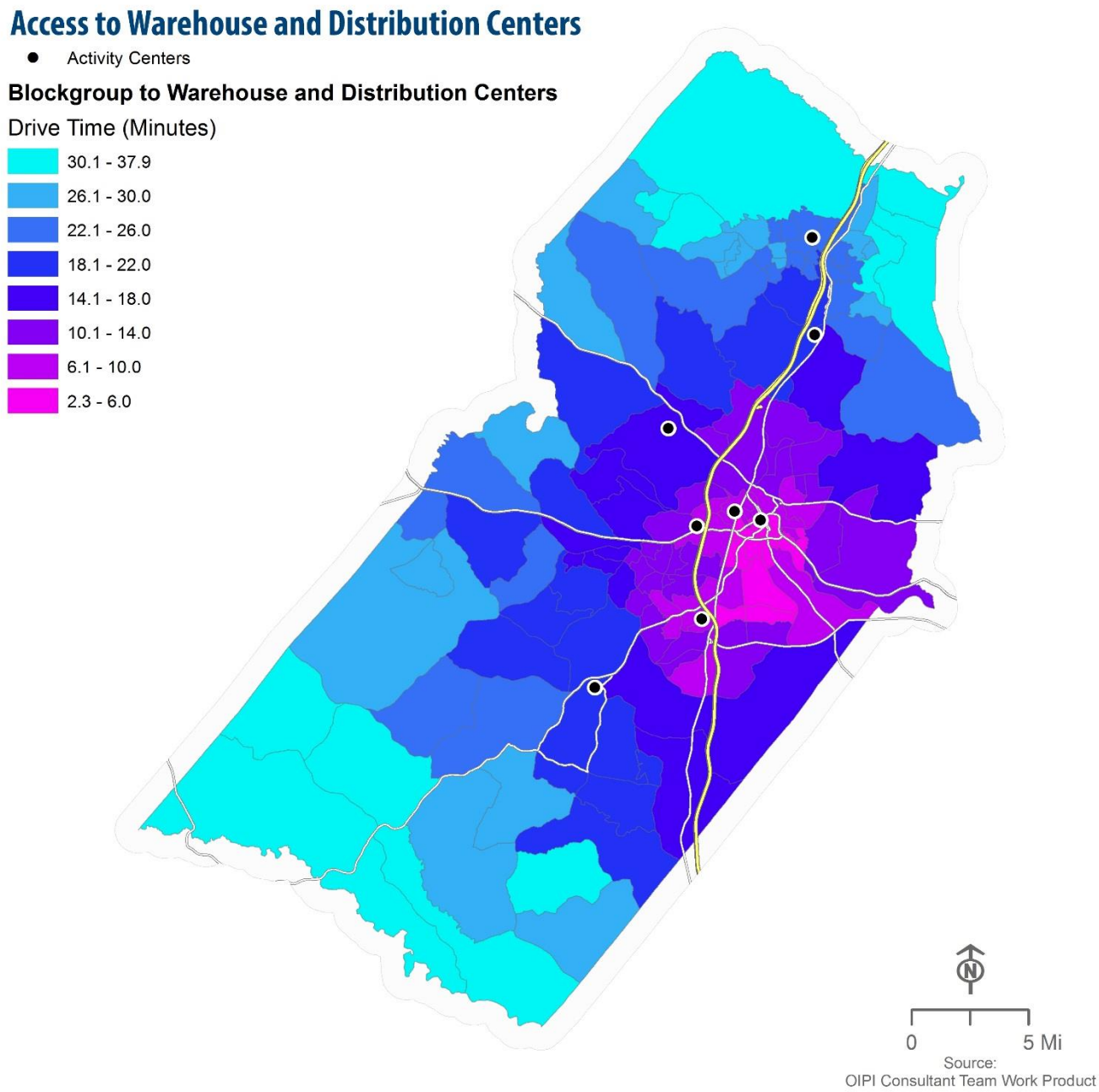



*Figure 22: Access to Warehouses & Distribution Centers*

CSX operates freight rail lines that pass through the City of Fredericksburg, Spotsylvania County, and Stafford County. The Fredericksburg Region is located within a one hour drive to three freight airports, Richmond International, Reagan National, and Dulles International. (Refer to Figure 23).

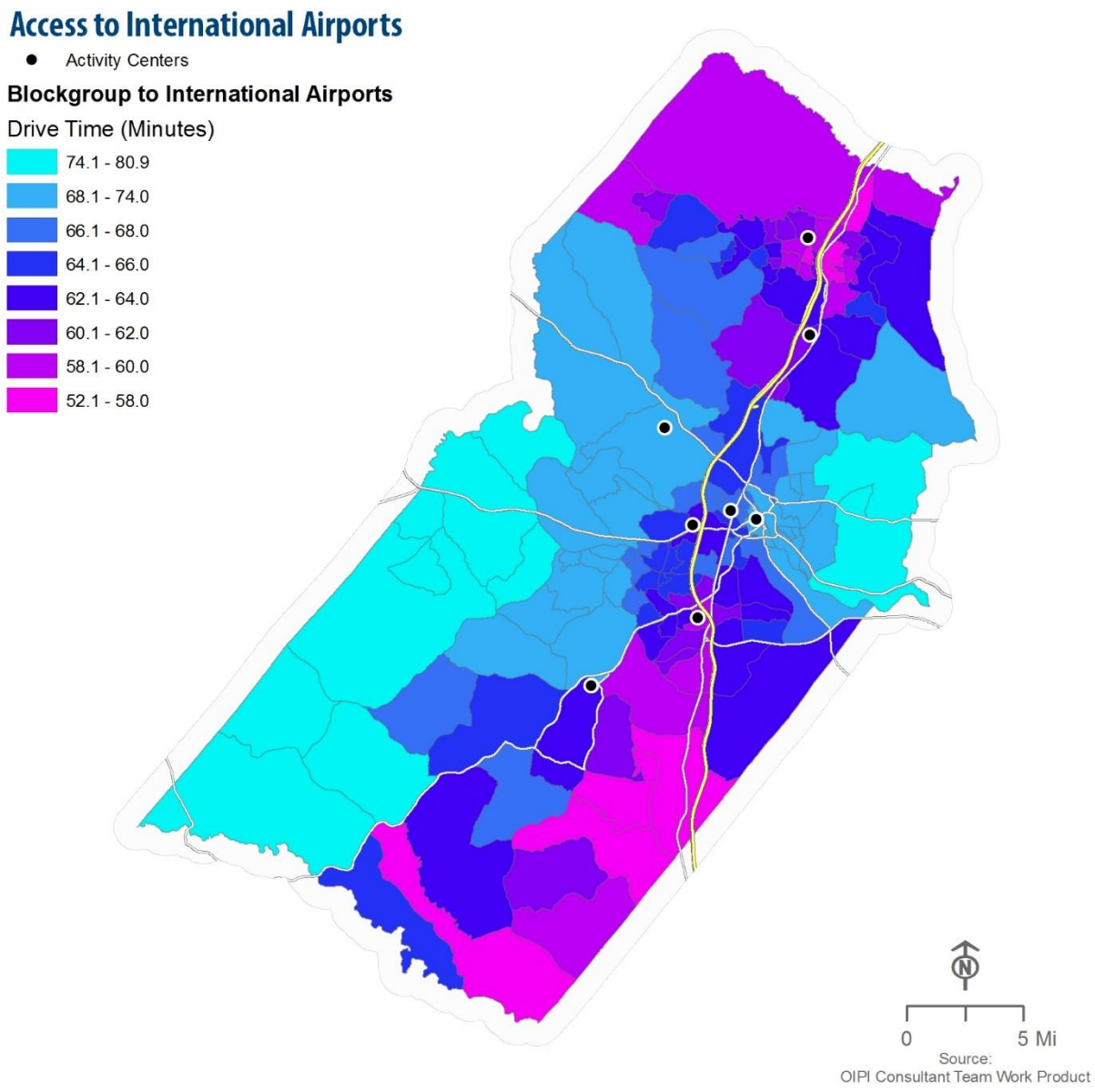



*Figure 23: Access to International Airports*

# D. Roadway Measures

This assessment identified the transportation conditions in Fredericksburg 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 24 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 were available for analysis in the Fredericksburg Region. The reliability index analysis shows poor reliability on I-95, particularly north of VA 3. Other routes have moderated reliability problems in certain areas, such as US 1 near Quantico, US 17 near I-95 and VA 3 near I-95. However, other major roadways in the region, namely I-95 south of US 1, US 17 east of I-95, VA 3 east of Fredericksburg, VA Route 208, and VA Route 2 have high reliability. These patterns reflect the large number of workers commuting to the Northern Virginia Region via I-95. (Refer to Figure 24).

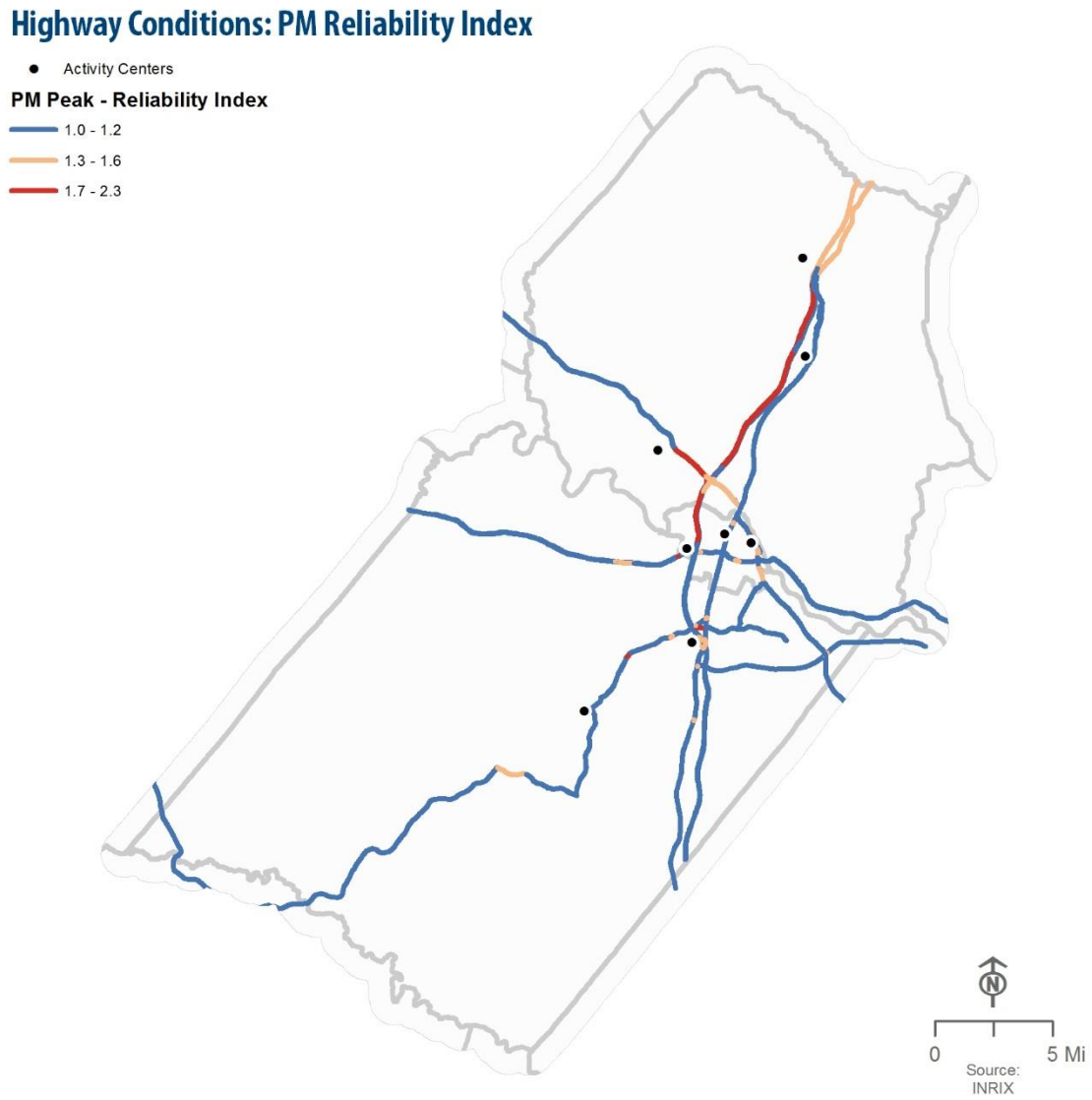



*Figure 24: Travel Time Reliability*

## 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 corridors in the Fredericksburg

Region. According to the analysis, major areas of congestion are the VA Route 3 corridor in Spotsylvania County and the City of Fredericksburg. This portion of I-95 is congested 5% – 19% of the time. The portion of roadway with the highest congestion score is US Route 17 adjacent to I-95. This area of US Route 17 is congested 19 – 42.3% of the time. The rest of the roadways analyzed are congested less than 5% of the time. (Refer to Figure 25).

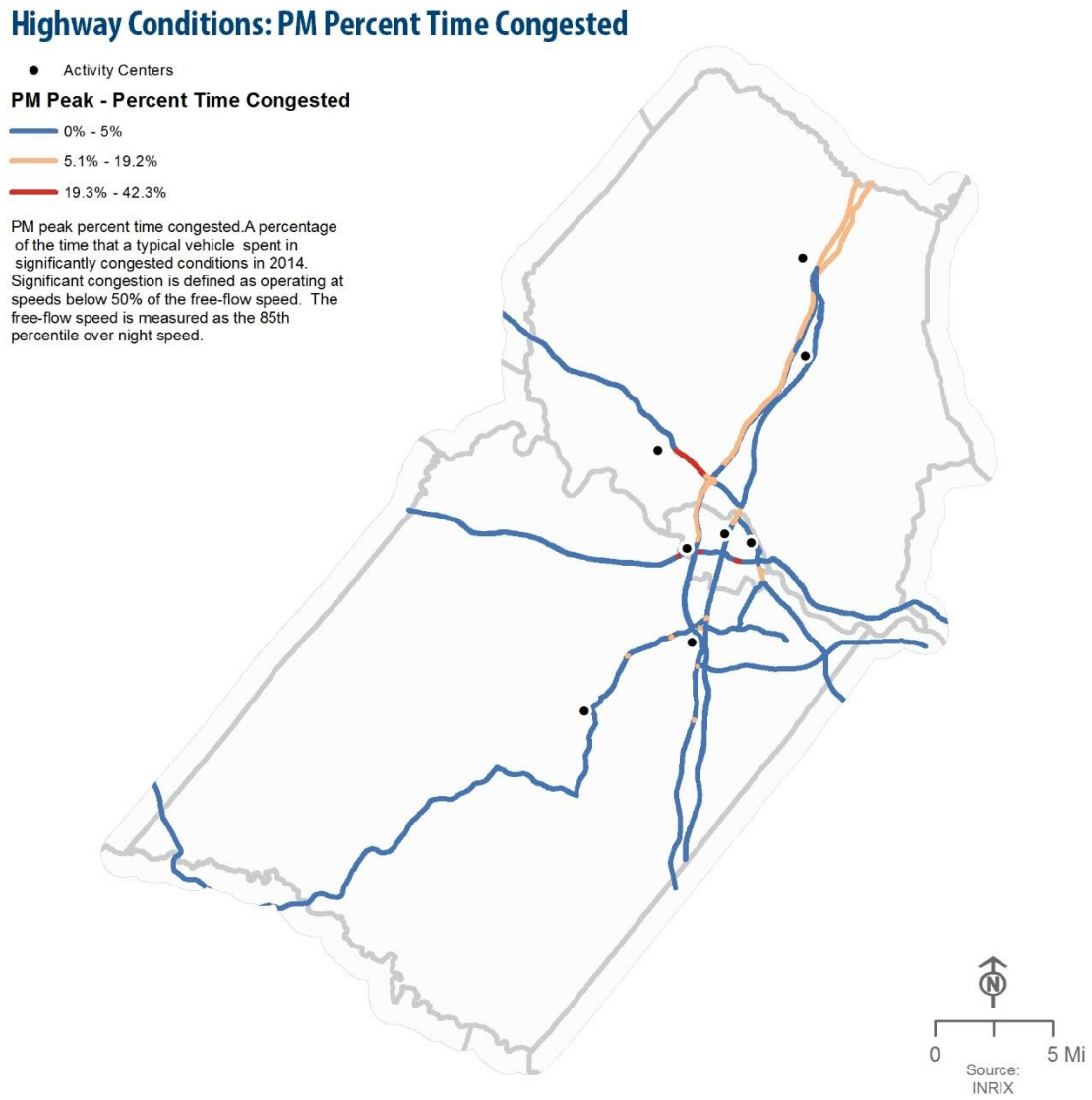



*Figure 25: Percent of Time Congested*

## 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 around the I-95/US 17 Interchange in Stafford, along I-95 at the Rappahannock Bridge

and generally north of Exit 126. Other areas with somewhat lower ratios include US 17 between VA 2 and US 1, VA 3 near the I-95 Interchange and US 1 in northern Stafford. (Refer to Figure 26).

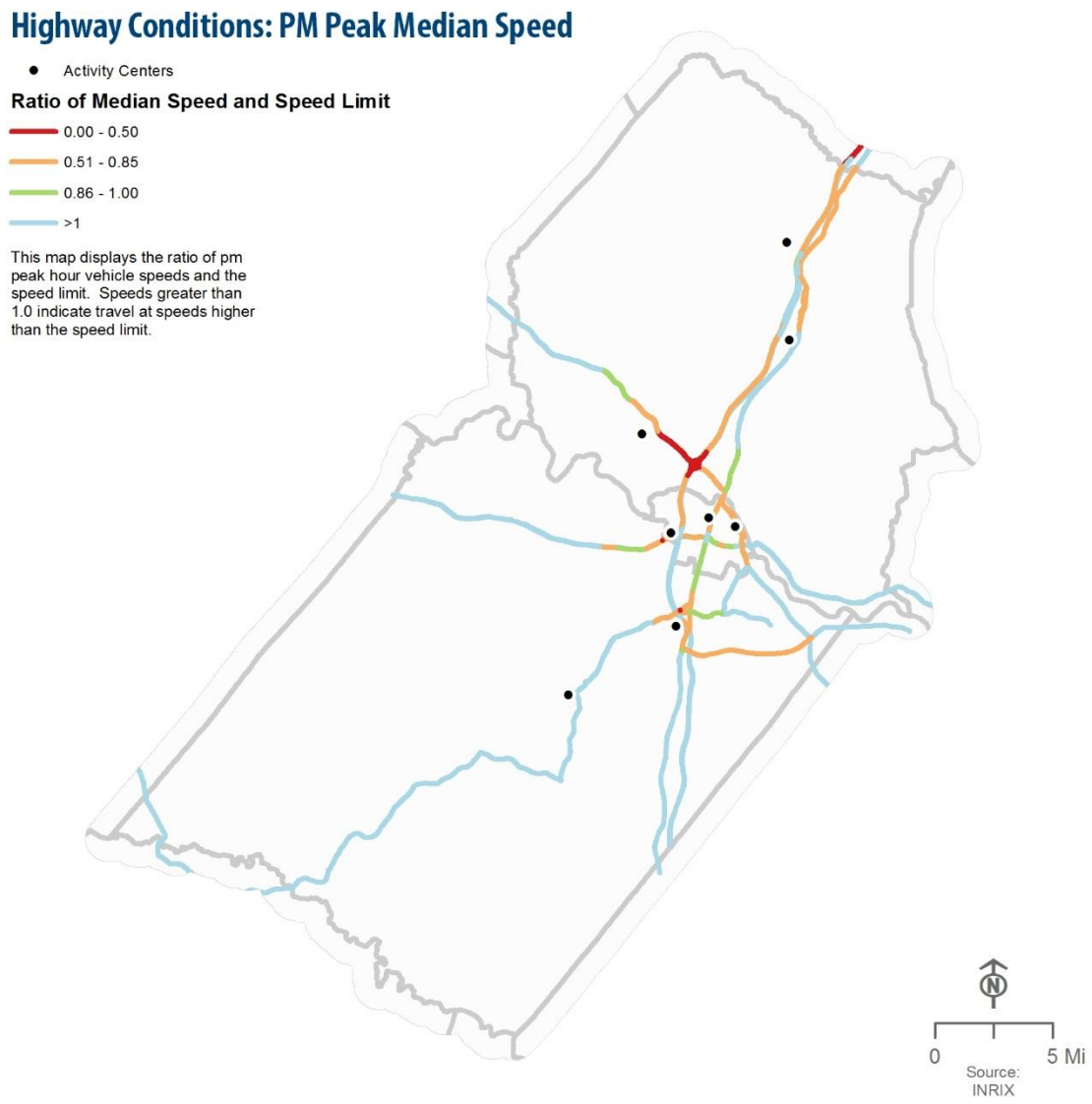



*Figure 26: Median Speeds*

# D. Regional & Local Commodity Flows

Another set of measures vital to the regional transportation profile are specific to the regional and local commodity flows via the various freight corridors in the region. 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

In the Fredericksburg Region, an average of 98% of the dollar value of all goods that are moved through the region are moved by truck. Rail is used to move goods in the region, but only carry around 1% of the

total dollar value of goods. Overall, throughout all jurisdictions in the region, trucks are the primary means of moving goods. (Refer to Figure 27).

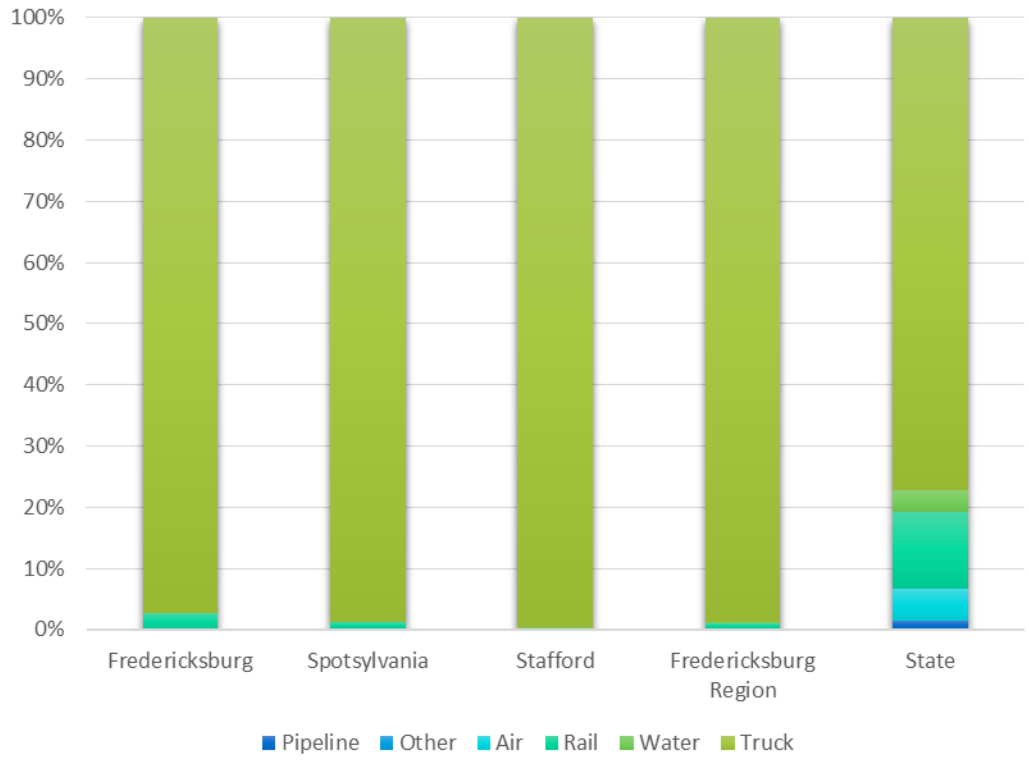



*Figure 27: Comparison of Freight Modal Dependence*
*Source: TranSearch, 2012*

Location Quotients are used to compare the prominence of freight modes between the Fredericksburg Region, and the state as a whole. The Fredericksburg Region relies on trucks for freight movement 1.3 times more than the state as a whole. Rail and air transportation for goods is more common for the state on average than it is for the Fredericksburg Region. This reflects the greater density of freight rail lines in other portions of the state. It also reflects the relative distance – over an hour drive – to Richmond International Airport and Dulles International airport from the Fredericksburg Region. (Refer to Figure 28).

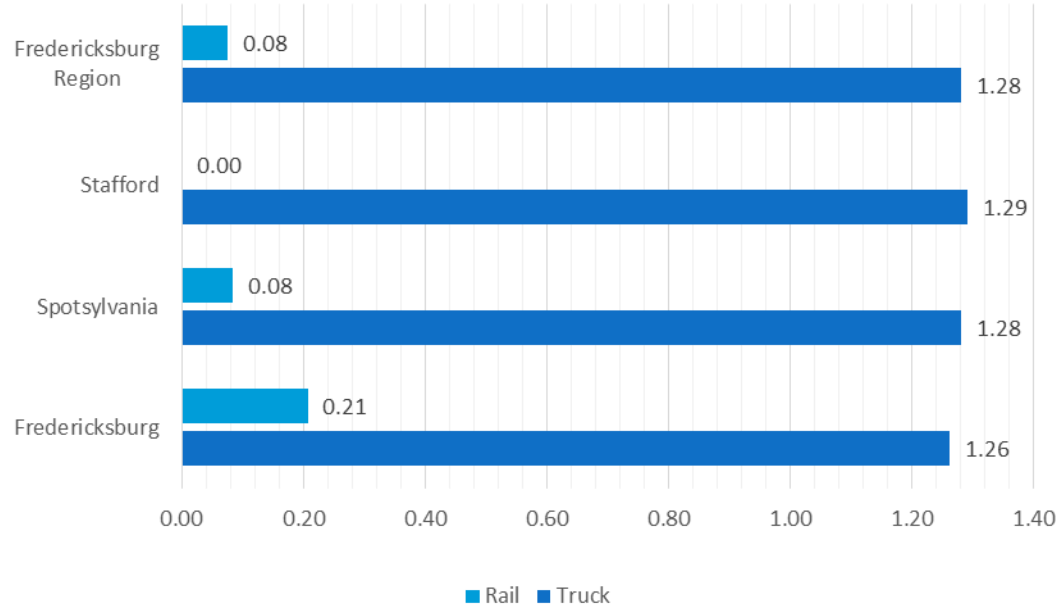



*Figure 28: Location Quotient by Mode of Freight Travel*
*Source: TranSearch, 2012*

## Top Commodities

Secondary Traffic (i.e. freight that is made up of goods being transferred between warehouses or retail centers) accounts for the most valuable freight moving both to and from the Fredericksburg Region. Other goods are the next most valuable export from the Fredericksburg Region. Overall, the Fredericksburg Region imported $3.3 billion worth of goods and exported $1.8 billion worth of goods, resulting in $1.5 billion of net imports in 2012. (Refer to Figures 29 and 30).

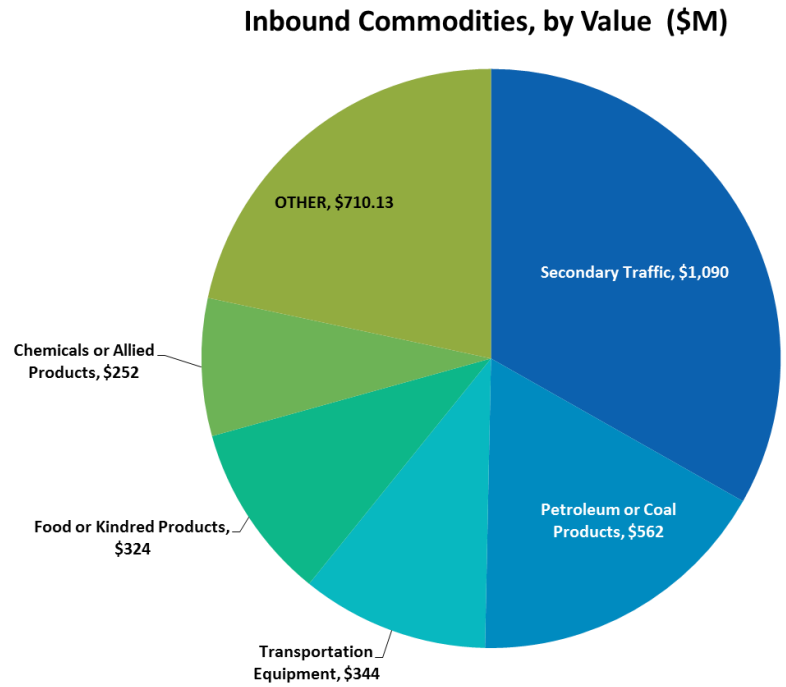



*Figure 29: Top Freight Values by Commodities - Inbound.*
*Source: TranSearch, 2012*

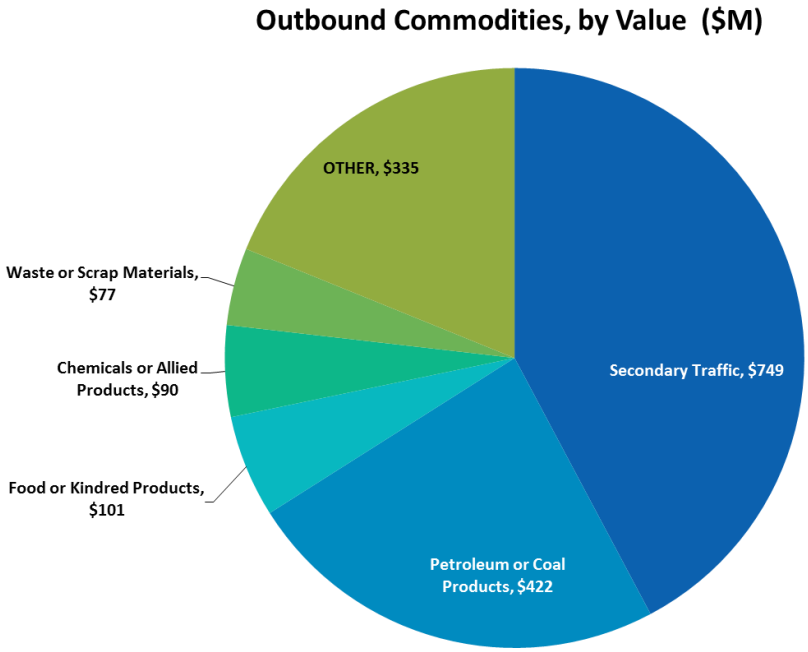



*Figure 30: Top Freight Values by Commodities - Outbound.*
*Source: TranSearch, 2012*

The Mideast Region, as defined by the Bureau of Economic analysis, is the most important destination for freight from the Fredericksburg Region. In 2012, $535 million of freight was exported to the Mideast Region. Freight movements to the Southeast and Hampton Roads Regions are the next most valuable freight export $199 million and $189 million respectively. (Refer to Figure 31).

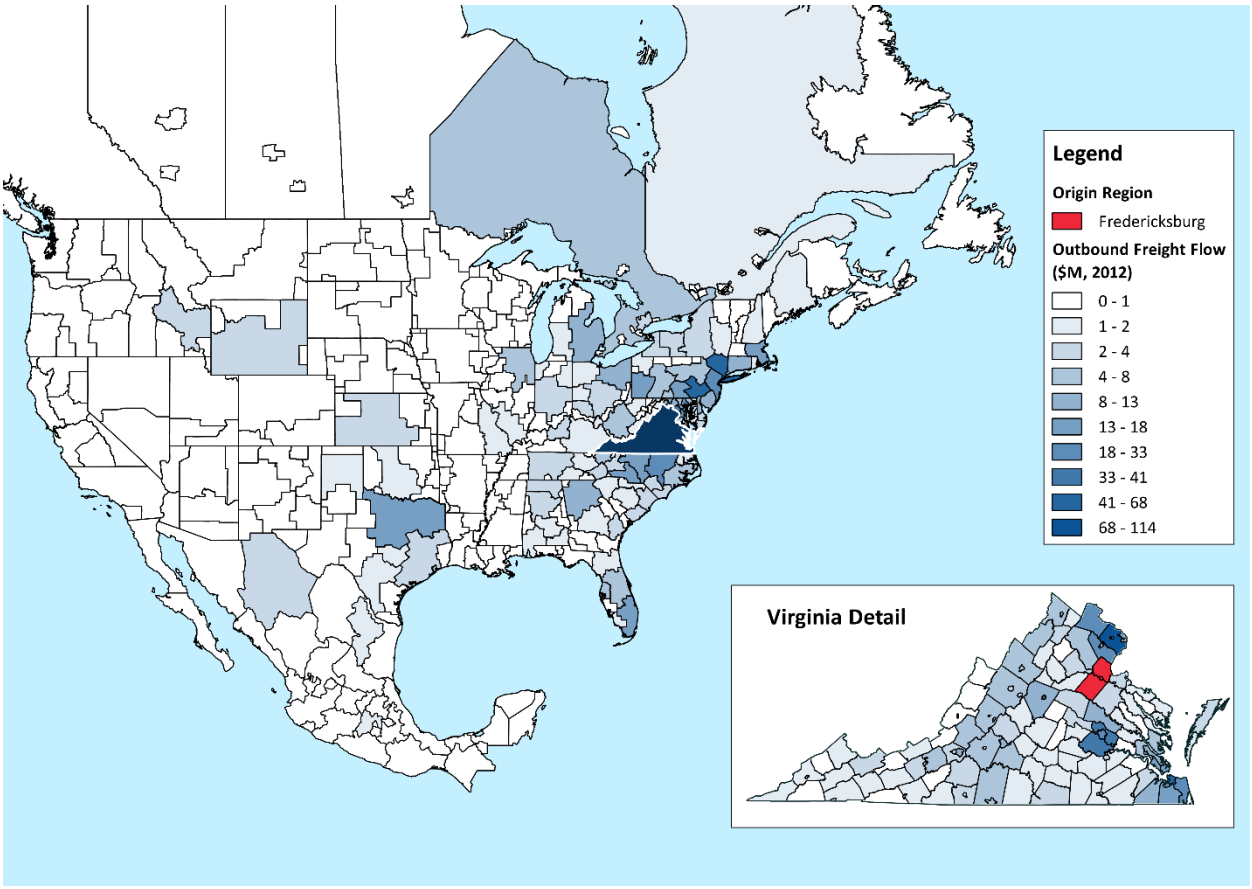



*Figure 31: Top Freight Values by Region.*
*Source: TranSearch, 2012*

When freight movements were analyzed by weight, nonmetallic minerals account for the largest tonnage of freight exported from the Fredericksburg Region. Overall, nonmetallic minerals account for a third of inbound commodities and two-third of outbound commodities. Other high tonnage commodities include secondary traffic and petroleum or coal products. (Refer to Figures 32 and 33).

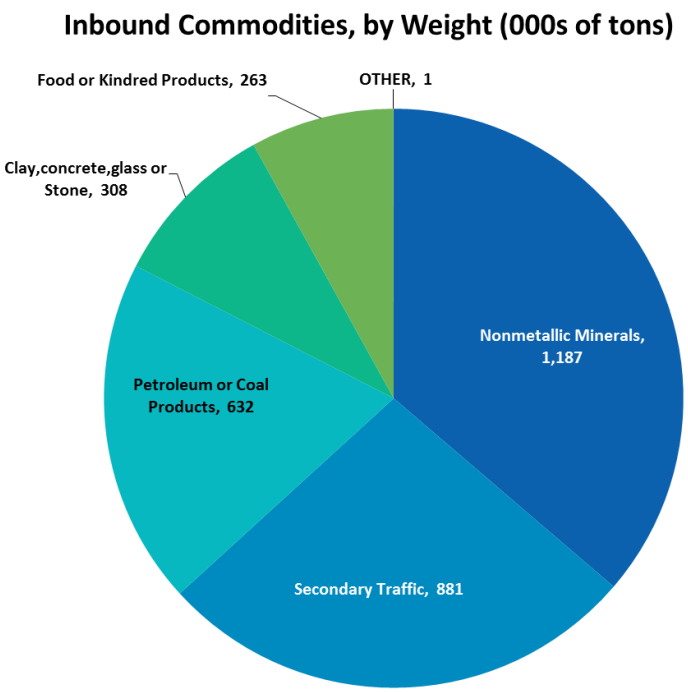



*Figure 32: Top Commodities by Weight – Inbound.*
*Source: TranSearch, 2012*

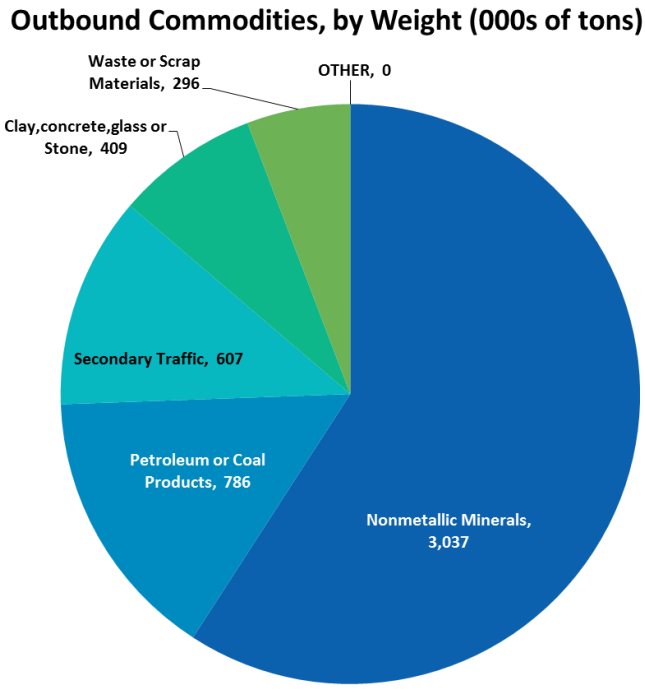



*Figure 33: Top Commodities by Weight - Outbound.*
*Source: TranSearch, 2012*

# 4. NEEDS PROFILE

## A. Introduction

Based on the overall approach to the VMTP Needs Assessment, Transportation Needs are 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 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 Fredericksburg Region, it showed a continuation of the relatively local-serving heavy focus of the for the regional economy. Similarly, the output and employment forecasts show the highest growth in local serving industries such as retail trade, public administration and health care.

In addition, 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 try to expand the knowledge-focused sector of the economy and encourage the shifting of employment toward the Fredericksburg region. In addition, it is recognized that this transition is not likely to dramatically alter the commuting patterns for the region in the next 10 years. These desires and forecasts translates into transportation needs such as passenger reliability, mode choice and TDM needs on the region's prime corridors, such as I-95 and the VRE rail corridor to manage the high level of commuting into the Northern Virginia region.

The desire to capture some of the knowledge-focused sector jobs within the Fredericksburg 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 primarily in and around the City of Fredericksburg and on the north-south axis of the I-95 and US 1 corridors. However, the expansion of knowledge-based and local-based sectors would benefit from both additional fixed route transit in the region and additional demand-response rural transit to provide better workforce access. 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:

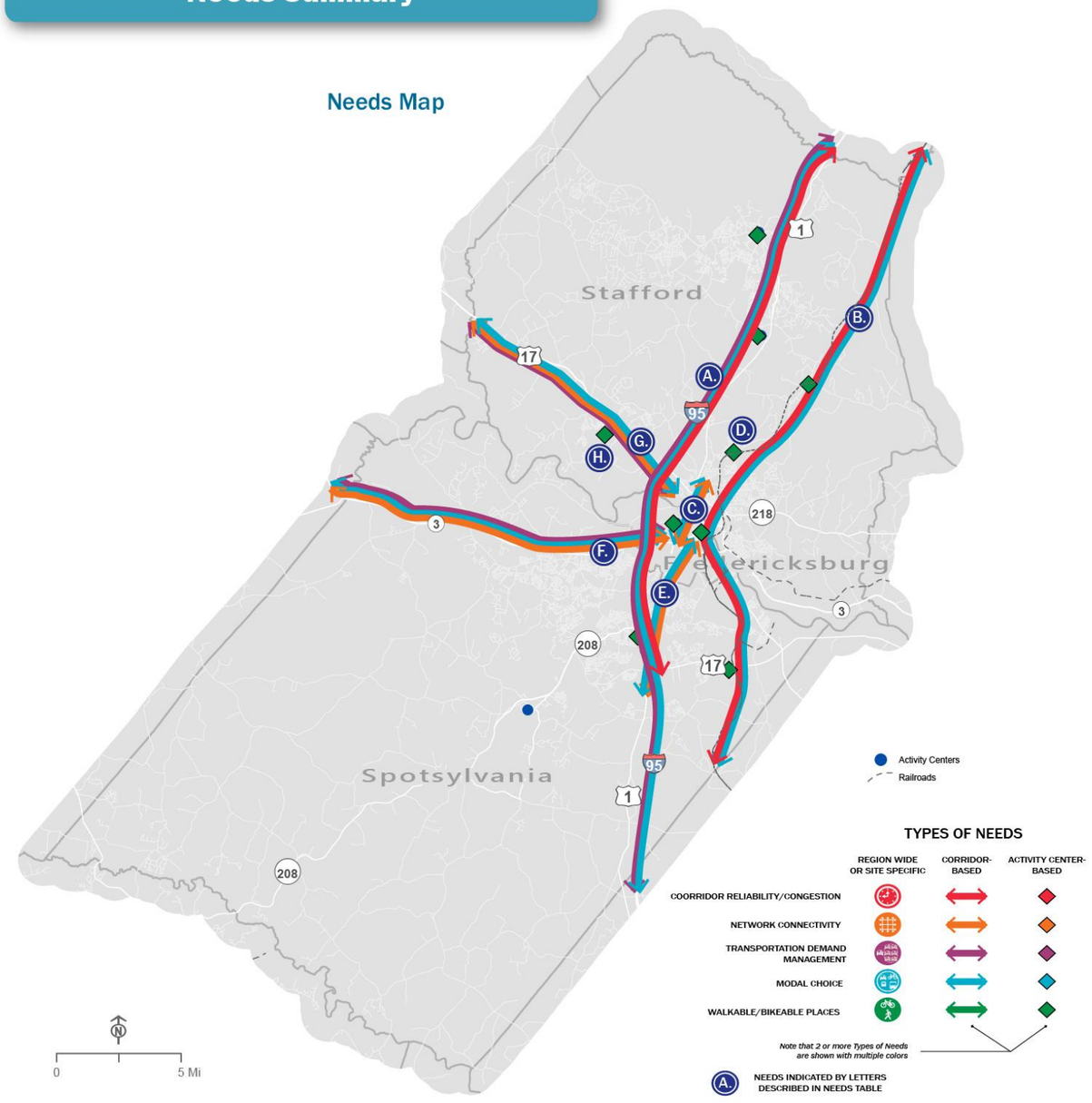
1. Category of Need
2. General Description of Need
3. Economic findings to support need
4. Transportation findings to support need

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 34: Summary Needs Map for Fredericksburg Region*

## Fredericksburg Region Needs Summary

### Needs Map




### Needs Table

**A. I-95 Corridor Reliability**

The I-95 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, particularly connecting the workforce in Fredericksburg to Northern Virginia. Highway capacity and operational improvements, enhanced TDM and additional mode choice options are needed to maintain reasonable mobility and access along this corridor.

**B. North/South Rail Reliability**

The North-South CSX Rail Line through the region is a critical freight and passenger corridors for inter-regional movement and it suffers from congestion and unreliable travel times. Inter-city and commuter passenger rail service is critical to connecting the workforce in Fredericksburg to Northern Virginia. Improved commuter service would be valuable for reverse commute trips to help serve employment centers in Fredericksburg. Capacity and operational improvements to address reliable freight, commuter and inter-city passenger rail travel are needed.

**C. Rappahannock River Crossings**

The Rappahannock River is a major asset to the region and a significant transportation barrier that funnels traffic to a few bridges, particularly the I-95 Bridge. Limited crossings and the limited mode choice at those crossings adds excess local traffic to I-95 and is a barrier to active transportation between points north and south of the river.

**D. VRE Connectivity and Mode Choice**

The VRE stations in the region are critical connections in the regional multimodal system but many are disconnected from nearby activity centers and surrounding residential areas and have limited mode choice options. Improved mode choice options and bike and walk connectivity are needed to maximize the value of the region's commuter rail system.

**E. Fredericksburg to Spotsylvania Connectivity and Mode Choice**

The US Route 1 and Lafayette Boulevard Corridors connect Fredericksburg and Spotsylvania activity centers as well as the adjacent commercial and residential areas. These corridors have limited mode choice for active transportation and have limited network connectivity. Better local network connectivity and active transportation options would enhance the attraction of these areas to businesses and workforce and connect key Knowledge activity centers to the surrounding residential areas and local service needs.

**F. Route 3 Corridor Connectivity, TDM and Mode Choice**

The Route 3 Corridor is a critical corridor connecting the workforce in Spotsylvania County with activity centers in the region and beyond. The corridor currently has limited local network connectivity or active transportation options. Providing additional travel options is critical to maximizing efficiency of this corridor and attracting a strong workforce to this region.

**G. Route 17 Corridor Connectivity, TDM and Mode Choice**

The Route 17 Corridor is a critical corridor connecting the workforce in Stafford County with activity centers in the region and beyond. The corridor currently has limited local network connectivity or active transportation options. Providing additional travel options is critical to maximizing efficiency of this corridor and attracting a strong workforce to this region.

**H. Various Activity Centers - Walkable Places**

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

**I. Regional Need - TDM**

A large portion of the regional workforce commutes to Northern Virginia and encouraging additional TDM measures across the region, such as park-and-ride, vanpools, slugging and telework is essential to maximizing the efficiency of the transportation system given the relatively long commutes of residents in the region.

*Figure 35: 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**

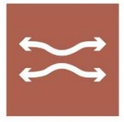
**TRANSPORTATION ICONS**

**Commuting Patterns / Modes**

**Multimodal Access to Jobs**

**Highway Network Reliability**

**Highway Network Bottlenecks**



**Freight Networks / Commodity Flows**

**Conditions from Stakeholder Input**

*Table 11: Findings of Needs*

## A. I-95 Corridor Reliability

| | |
|---|---|
| NEED | **The I-95 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, particularly connecting the workforce in Fredericksburg to Northern Virginia. Highway capacity and operational improvements, enhanced TDM and additional mode choice options are needed to maintain reasonable mobility and access along this corridor.** |
| ECONOMIC | Supports major regional activity centers throughout the region and ensures a reasonable commute for the workforce commuting to Northern Virginia. The corridor is also an essential and high-priority corridor for the regional and statewide freight movement. |
| TRANSPORT. | Bottlenecks and congestion hinder the reliability of the corridor, particularly north of Exit 126 (US 1). Additional TDM and mode choice is needed to connect the workforce to jobs throughout the corridor. |

## B. North/South Rail Reliability

| | |
|---|---|
| NEED | **The North-South CSX Rail Line through the region is a critical freight and passenger corridor for inter-regional movement and it suffers from congestion and unreliable travel times. Inter-city and commuter passenger rail service is critical to connecting the workforce in Fredericksburg to Northern Virginia. Improved commuter service would be valuable for reverse commute trips to help serve employment centers in Fredericksburg. Capacity and operational improvements to address reliable freight, commuter and inter-city passenger rail travel are needed.** |
| ECONOMIC | Supports knowledge-based regional activity centers including downtown Fredericksburg and Mary Washington with more reliable commuter and inter-city service. Provides multi-modal alternatives to commuters using I-95 to reach Northern Virginia and for reverse commute trips trying to reach the Fredericksburg region. Addresses critical freight sector needs for the region and the state. |
| TRANSPORT. | Rail traffic on the corridor is congested and suffers from delays that affect passenger and freight traffic. Existing VRE Stations have inadequate platforms and resulting delays affect passenger and freight trains. |

## C. Rappahannock River Crossings

| | |
|---|---|
| NEED | **The Rappahannock River is a major asset to the region and a significant transportation barrier that funnels traffic to a few bridges, particularly the I-95 Bridge. Limited crossings and the limited mode choice at those crossings adds excess local traffic to I-95 and is a barrier to active transportation between points north and south of the river.** |
| ECONOMIC | Crossing the Rappahannock River is critical to reaching many regional activity centers. The connections are critical to freight movement, to tourism, and to many commuters. |
| TRANSPORT. | The region's worst reliability hot spot and bottleneck is the I-95 crossing of the Rappahannock. With no local alternative west of I-95 and limited local transit access between Spotsylvania and Stafford, many trips within the region must mix with inter-regional trips on I-95. |

## D. VRE Connectivity and Mode Choice

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|---|---|
| NEED | **The VRE stations in the region are critical connections in the regional multimodal system but many are disconnected from nearby activity centers and surrounding residential areas and have limited mode choice options. Improved mode choice options and bike and walk connectivity are needed to maximize the value of the region's commuter rail system.** |
| ECONOMIC | High-quality walkable and bikeable access to transit stations is key to attracting a knowledge sector workforce and it would improve access to local service activity centers near VRE stations. |
| TRANSPORT. | The major issues in this busy area of the region are modal conflicts for freight, local congestion, and lack of multimodal access for passengers. |

## E. Fredericksburg to Spotsylvania Connectivity and Mode Choice

| | |
|---|---|
| NEED | **The US Route 1 and Lafayette Boulevard Corridors connect Fredericksburg and Spotsylvania activity centers as well as the adjacent commercial and residential areas. These corridors have limited mode choice for active transportation and have limited network connectivity. Better local network connectivity and active transportation options would enhance the attraction of these areas to businesses and workforce and connect key Knowledge activity centers to the surrounding residential areas and local service needs.** |
| ECONOMIC | Downtown Fredericksburg and Mary Washington are key knowledge sector activity centers and much of the workforce for these centers comes from west and south of Fredericksburg. Better connectivity and active transportation options will support the workforce for these centers. |
| TRANSPORT. | These corridors have limited mode choice for active transportation and have limited network connectivity via parallel routes. |

## F. Route 3 Corridor Connectivity, TDM and Mode Choice

| | |
|---|---|
| NEED | **The Route 3 Corridor is a critical corridor connecting the workforce in Spotsylvania County with activity centers in the region and beyond. The corridor currently has limited local network connectivity or active transportation options. Providing additional travel options is critical to maximizing efficiency of this corridor and attracting a strong workforce to this region.** |
| ECONOMIC | Better access for local service destinations would support local centers such as Central Park. Improved TDM would increase the attractiveness of the area to knowledge sector workers. |
| TRANSPORT. | The corridor currently has limited local network connectivity via parallel routes or active transportation options. |

## G. Route 17 Corridor Connectivity, TDM and Mode Choice

NEED

**The Route 17 Corridor is a critical corridor connecting the workforce in Stafford County with activity centers in the region and beyond. The corridor currently has limited local network connectivity or active transportation options. Providing additional travel options is critical to maximizing efficiency of this corridor and attracting a strong workforce to this region.**

ECONOMIC

Better access for local service destinations would support local centers such as Spring Knoll. Improved TDM would increase the attractiveness of the area to knowledge sector workers.

TRANSPORT.

The corridor currently has limited local network connectivity via parallel routes or active transportation options.

## H. Various Activity Centers - Walkable/Bikeable Places

NEED

**There are multiple activity centers that have limited pedestrian or bicycle facilities or that could benefit from walkable and bikeable place improvements. Walkable and bikeable places improves the appeal of a place 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. The Fredericksburg Region has a strong workforce in this area, but additional amenities, particularly at the employment sites, would help attract businesses that employ these workers.

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.

## I. Regional Need - TDM

NEED

**A large portion of the regional workforce commutes to Northern Virginia and encouraging additional TDM measures across the region, such as park-and-ride, vanpools, slugging and telework is essential to maximizing the efficiency of the transportation system given the relatively long commutes of residents in the region.**

ECONOMIC

Regional TDM strategies can reduce commuting time and stress for the workforce, making the area more attractive to a talented workforce.

TRANSPORT.

By reducing demand on the transportation system from unnecessary trips, TDM strategies can affect congestion and access to jobs across the region.