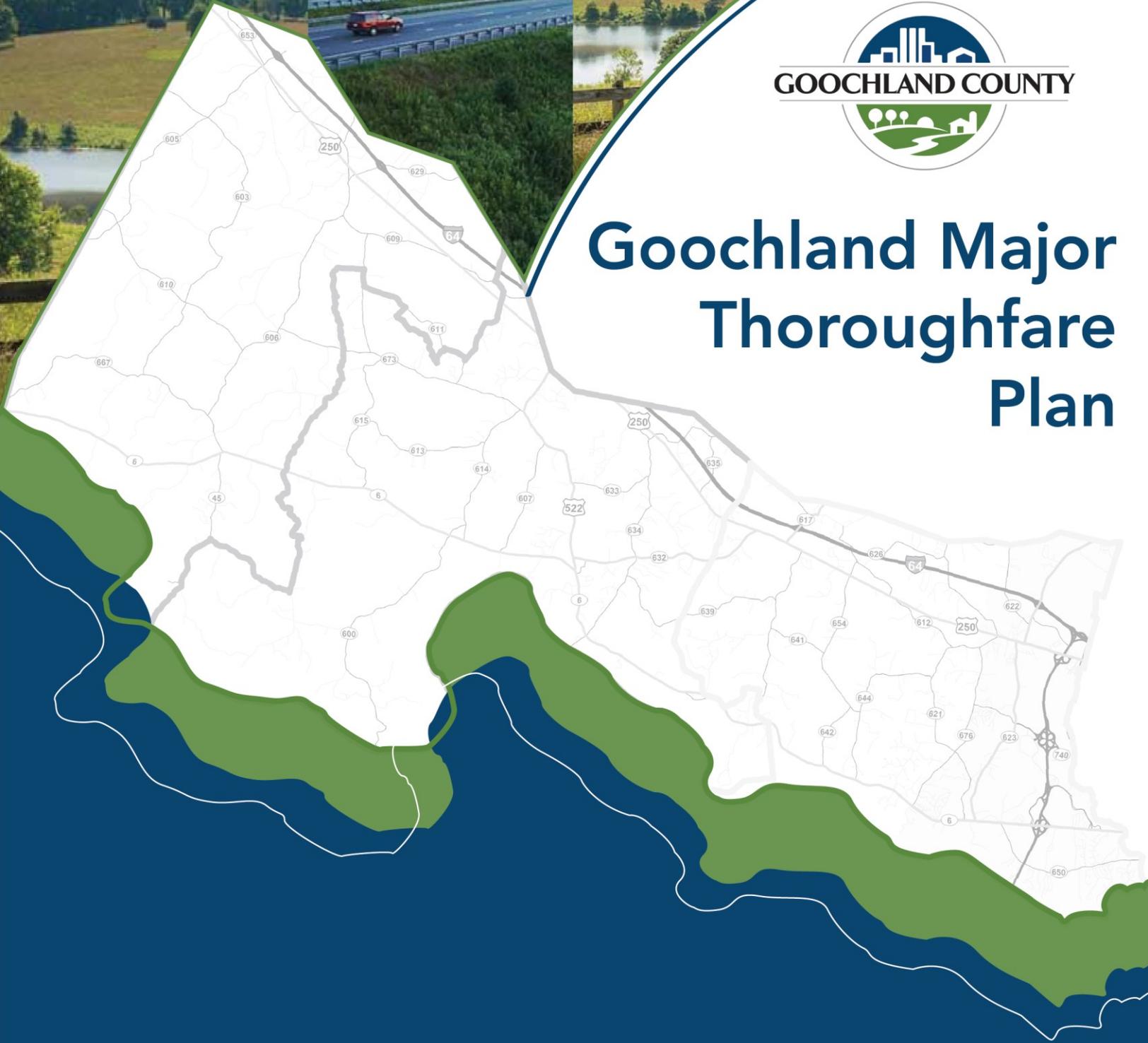




GOOCHLAND COUNTY

# Goochland Major Thoroughfare Plan



August 2018 DRAFT

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August 2018 ■ Draft

# TABLE OF CONTENTS

<b>1</b>	<b>Introduction .....</b>	<b>3</b>
1.1	What is a Major Thoroughfare Plan? .....	3
1.2	Why is a Major Thoroughfare Plan Important? .....	3
1.3	Why update the Major Thoroughfare Plan? .....	3
1.4	Study Area .....	3
1.4.1	<i>Service Areas</i> .....	5
1.4.2	<i>Major Village, Rural Crossroad, and Community Areas</i> .....	6
1.5	MTP Process .....	6
1.6	Guiding Principles .....	7
1.6.1	<i>Safety</i> .....	7
1.6.2	<i>Designated Growth Area and Rural Character</i> .....	7
1.6.3	<i>Connectivity</i> .....	7
1.6.4	<i>Level of Service</i> .....	8
1.6.5	<i>Economic Development</i> .....	8
1.6.6	<i>Multi-modal</i> .....	8
1.7	Public Engagement Overview .....	8
1.7.1	<i>Public Meeting #1 – March 27, 2018</i> .....	8
1.7.2	<i>Public Meeting #2 – August 9, 2018</i> .....	9
<b>2</b>	<b>Background Information .....</b>	<b>10</b>
2.1	County Demographics .....	10
2.2	Transportation .....	10
2.2.1	<i>Richmond Tri-Cities Travel Demand Model</i> .....	10
2.2.2	<i>Functional Classification</i> .....	10
2.2.3	<i>Annual Average Daily Traffic</i> .....	16
2.2.4	<i>Operational Analysis</i> .....	18
2.2.5	<i>Crash History</i> .....	22
2.2.6	<i>Pedestrian and Bicycle Network</i> .....	25
2.2.7	<i>Transit Network</i> .....	25
2.3	Review of Previous Plans .....	25
2.3.1	<i>Review of Previous Plans</i> .....	25
<b>3</b>	<b>Plan Development .....</b>	<b>26</b>
3.1	Methodology .....	26

3.1.1	<i>Projected Traffic Volumes</i> .....	27
3.1.2	<i>Future Growth with No Transportation Improvements (“No Build” Analysis)</i> .....	27
3.1.3	<i>Road Network</i> .....	31
3.1.4	<i>Amended Functional Classifications</i> .....	31
3.1.5	<i>Typical Cross-Sections</i> .....	31
3.1.6	<i>Access Management</i> .....	40
<b>4</b>	<b>2040 MTP Recommendations</b> .....	<b>42</b>
4.1	Justification .....	42
4.2	Level of Service Guidelines .....	45
4.3	Roadways and New Connections.....	46
4.4	Intersections and Interchanges.....	46
4.5	Pedestrian and Bicycle .....	46
4.6	Transit .....	55
4.7	Transportation Improvement Analysis (“Build” Analysis) .....	55
<b>5</b>	<b>Action Plan and Implementation</b> .....	<b>60</b>
5.1	Opinion of Probable Cost.....	60
5.2	Funding Sources.....	60
5.2.1	<i>Private Investment</i> .....	60
5.2.2	<i>SMART SCALE</i> .....	60
5.2.3	<i>Revenue Sharing</i> .....	60
5.2.4	<i>Regional Surface Transportation Program (RSTP)</i> .....	60
5.2.5	<i>Secondary Six-Year Plan (SSYP)</i> .....	60
5.2.6	<i>Highway Safety Improvement Program (HSIP)</i> .....	60
5.2.7	<i>Transportation Alternatives Program (TAP)</i> .....	60
5.3	Timeframe and Prioritization .....	61
	<b>Appendix A: Glossary of Terms</b> .....	<b>67</b>
	<b>Appendix B: Capital Impact Study</b> .....	<b>67</b>
	<b>Appendix C: Standardized Cross-Sections</b> .....	<b>67</b>
	<b>Appendix D: Project Information Sheets</b> .....	<b>67</b>

# 1 INTRODUCTION

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## 1.1 What is a Major Thoroughfare Plan?

The *Goochland County Major Thoroughfare Plan update* (MTP) provides for the orderly development of the roadway network as land development occurs. The MTP identifies the transportation assets and needs for motorists, bicyclists, pedestrians, and transit. This MTP establishes the long-term vision of the Goochland County community and identifies the incremental steps to achieve the vision. The MTP will serve as a living document – one that the County can revisit as goals and projects are implemented. When adopted, the MTP will become a part of the *Goochland County 2035 Comprehensive Plan*. Refer to **Appendix A** for a glossary of terms used throughout the document.

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## 1.2 Why is a Major Thoroughfare Plan Important?

Having an established plan provides guidance to County leaders when making transportation-related decisions. With an MTP in place, each decision will work toward achieving the goals and objectives established by the community. The MTP improves the County's chances of being awarded regional, state, and federal, funds for transportation improvements. Obtaining funding is highly competitive, as Goochland County must compete with other municipalities and transportation agencies in the region and state. The MTP provides the County a competitive advantage by demonstrating that the County has identified projects that are high priority and forecast a clear vision of future needs.

In addition, the MTP helps provide direction for allocating County funds for transportation improvements in the Capital Improvement Program (CIP) and helps provide guidance to facilitate private sector investment in roadway infrastructure to address the impacts of new development.

Lastly, the MTP provides guidance for preparing regional transportation plans and for carrying out regional transportation studies and traffic analysis.

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## 1.3 Why update the Major Thoroughfare Plan?

Goochland County's previous MTP was completed in 2005 and defined the County's vision, goals, strategies; however, much has changed in Goochland since that time. There has been an increase in employment and new development within the County and in neighboring counties driving the need for the County to update the vision, goals, and strategies.

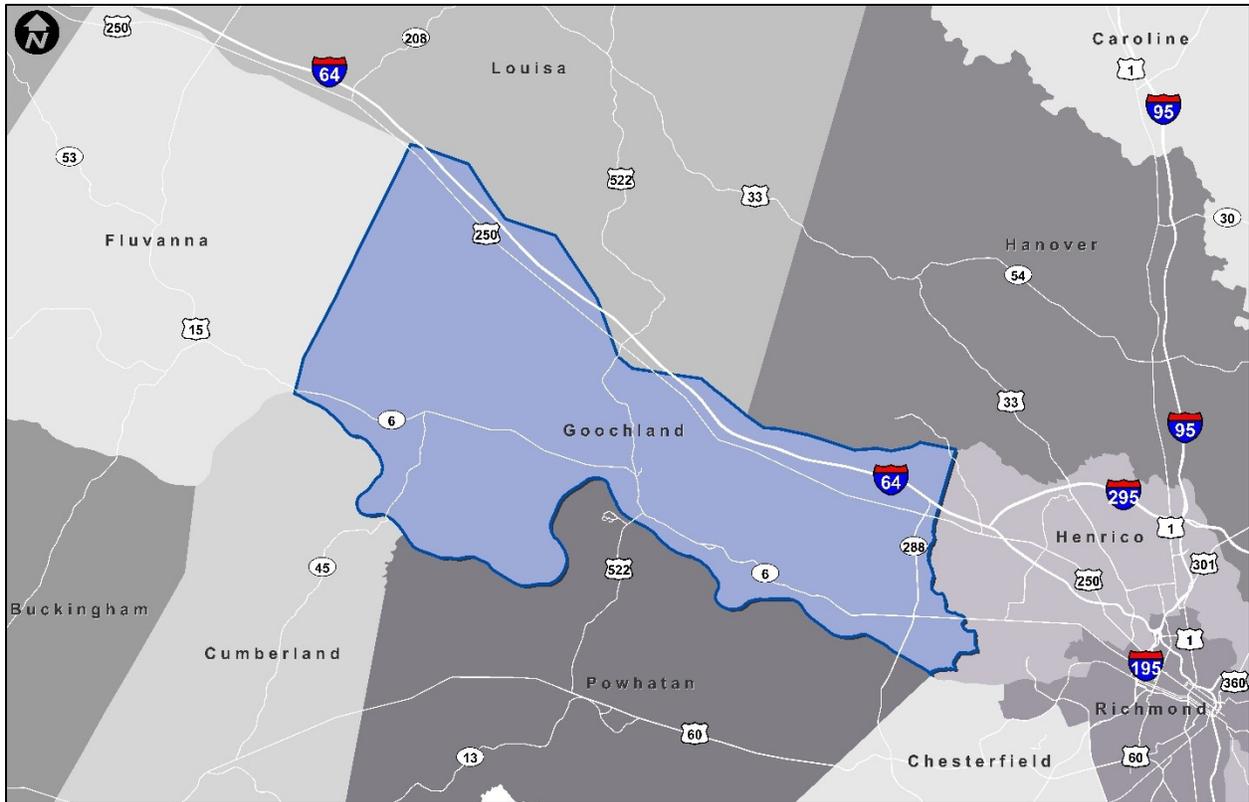
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## 1.4 Study Area

As part of its focus on long-term solutions, the MTP provides guidance for the entire County which is comprised of 289 square miles of rural/exurban land in central Virginia with an approximate population of 23,000 people. Goochland County is located west of the City of Richmond, between the counties of Hanover, Henrico, Powhatan, Louisa, Fluvanna, and Cumberland.

Displayed in **Figure 1-1**, regionally significant roadways traversing Goochland County include Interstate 64 (I-64), World War II Veterans Memorial Highway (Route 288), and Broad Street (US 250), River Road West (Route 6), and Sandy Hook Road (Route 522). I-64 is a major artery in Virginia providing access to urban and rural areas across the state. Route 288 terminates in Goochland County at the I-64 interchange from its commencement near Interstate 95 (I-95), south of Richmond. US 250 and Route 6 traverse multiple counties between the Charlottesville area, to the west, and Richmond, to the east. Route 522 runs from US 60 in Powhatan County, to the south, to Culpepper, to the northwest.

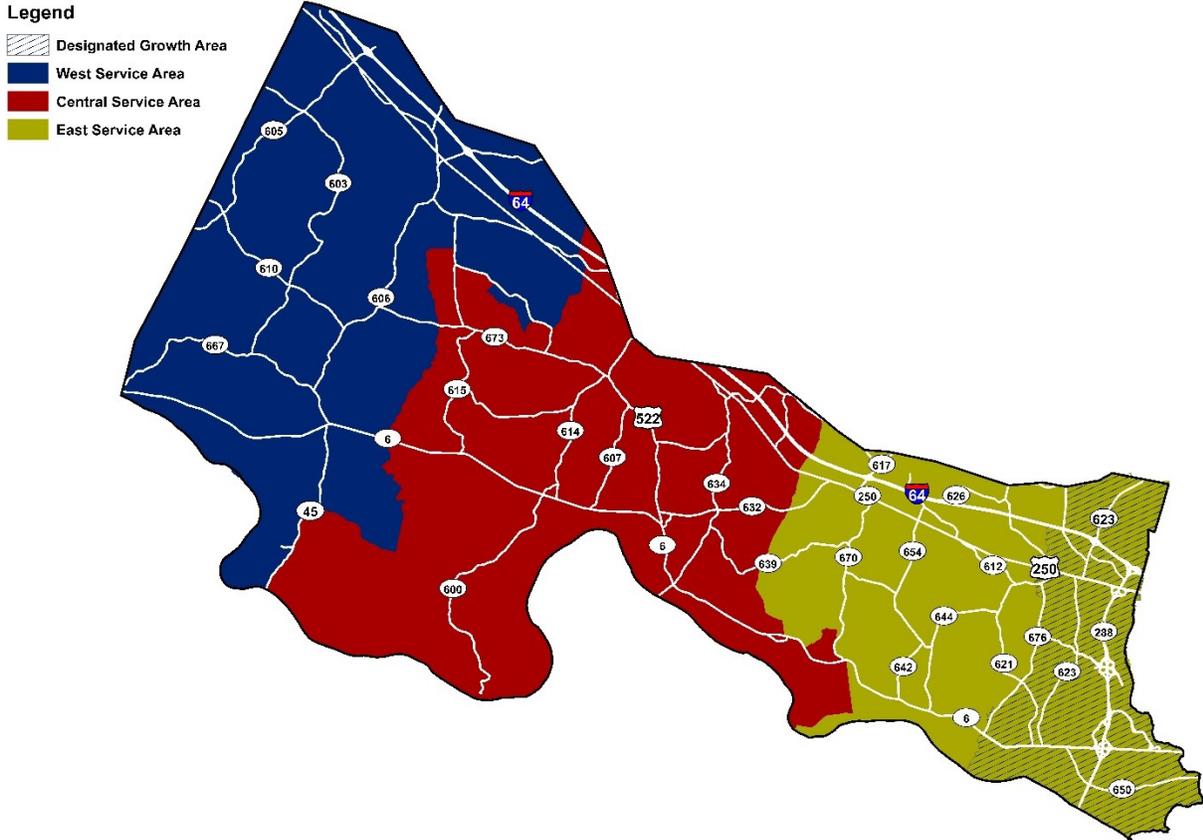
**Figure 1-1: Study Area**



### 1.4.1 Service Areas

For infrastructure funding purposes, Goochland County was divided into three service areas, as shown in **Figure 1-2**, consistent with the *Capital Impacts Study* completed in February 2018 by TischlerBise. These service areas were established based on distinct growth patterns and land use characteristics. The West Service Area has been experiencing more limited growth. The Central Service Area holds many of the County’s facilities (i.e., administration and school buildings) and possesses some public utility infrastructure. The East Service Area is anticipated to have the highest growth and contains the Designated Growth Area where development will be concentrated. Refer to **Appendix B** for the *Goochland County Capital Impacts Study*.

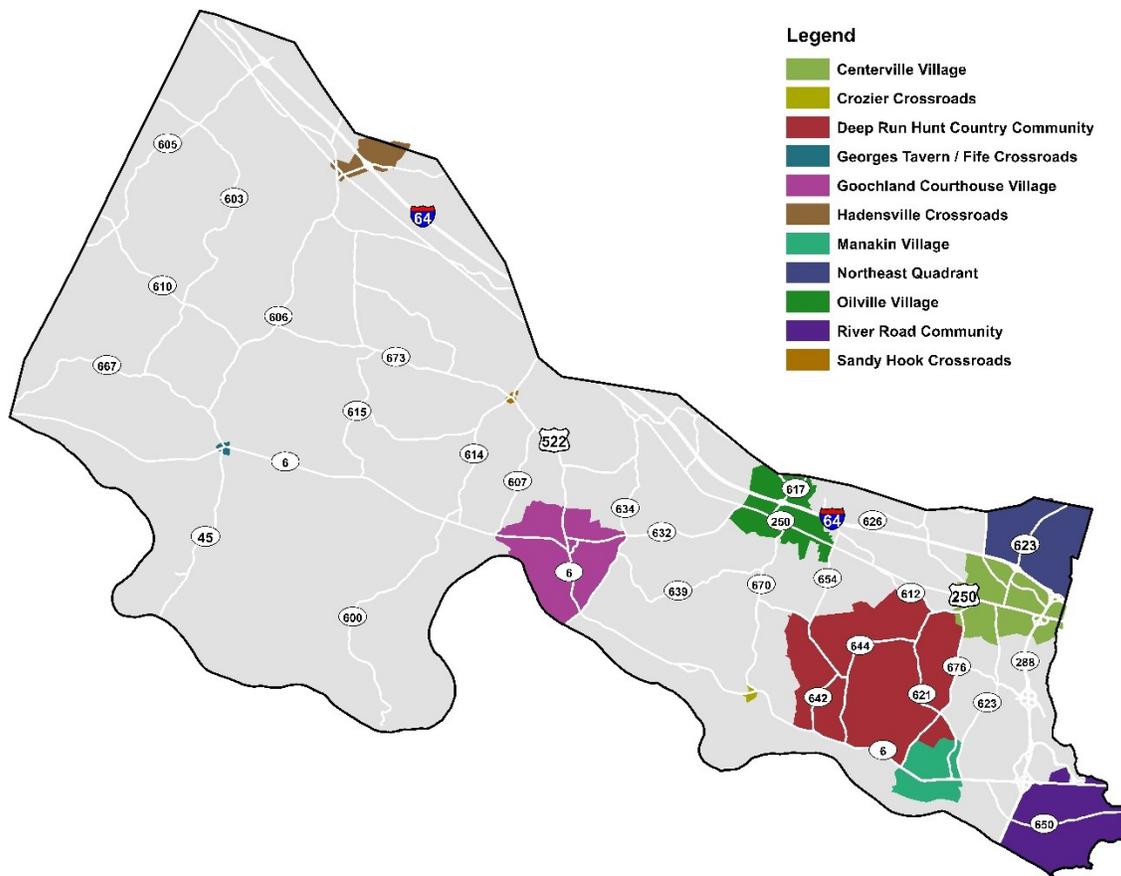
Figure 1-2: Service Areas



### 1.4.2 Major Village, Rural Crossroad, and Community Areas

As part of the *Goochland County 2035 Comprehensive Plan*, the County established major villages, rural crossroads, and identifiable community areas, as shown in **Figure 1-3**. Major villages consist of more populated areas of residential and commercial land uses as well as function as geographic focal points throughout the County. The rural crossroads function as a specific area to contain the necessary goods and services for a surrounding community. Two unique communities are identified within the County: River Road and Deep Run. Both communities allow for growth but development must conform to the established community character. Growth is encouraged and concentrated in the villages and designated growth area. However, all areas were taken into consideration for identification of future development during the MTP development process. Additional information related to the major villages, rural crossroads, and community areas can be found in the *Goochland County 2035 Comprehensive Plan*.

**Figure 1-3: Major Village, Rural Crossroad, and Community Areas**



### 1.5 MTP Process

The MTP represents a collaborative effort of citizens, consultants, County staff, County Planning Commission, and County Board of Supervisors to establish a vision for the County’s transportation network. The plan identifies existing issues for congestion, safety, access, and connectivity and anticipates future concerns.

The update process begins with an explanation of socioeconomic conditions (e.g., population, households, employment), a review of existing transportation plans and policies, and an assessment of the current transportation network. A set of guiding principles is developed to provide guidance for creating a coordinated set of future recommendations. The MTP characterizes current and future transportation needs, and documents multi-modal transportation strategies to address needs through the year 2040. The planning process is outlined below:

1. Develop Guiding Principles
2. Compile and Analyze Existing Transportation Studies and Information
3. Analyze Existing Traffic Conditions
4. Utilize the Comprehensive Plan to Project Future Traffic Volumes
5. Analyze Future Traffic Conditions
6. Develop Recommendations

---

## 1.6 Guiding Principles

The guiding principles represent six interrelated goals and objectives. The guiding principles reflect the County's needs and expectations for the future the County transportation system. These principles provide direction for the MTP process and serve as a tool for prioritizing recommendations – a crucial step to balance competing interests with limited transportation dollars. Each principle consists of a goal and associated objectives for achieving the goal.

### 1.6.1 Safety

***Improve travel safety for all transportation user types.***

- Reduce the total number of crashes and the number of injuries and fatalities.
- Improve safety for all user types at intersections.
- Minimize and mitigate potential conflicts points.
- Reduce the number of high crash locations.
- Increase bicycle and pedestrian safety.
- Enhance safety by refining access management policies.

### 1.6.2 Designated Growth Area and Rural Character

***Recognize importance of the different County areas while preserving each independently.***

- Minimize development impacts in rural areas, particularly those of cultural and historical significance.
- Reduce development impacts on environmentally sensitive areas.
- Preserve natural, cultural, and historic resources.
- Promote and foster growth and development of the designated growth areas.
- Provide for continued population growth in the designated growth areas by coordinating transportation strategies with land use initiatives to foster a vibrant and livable community.

### 1.6.3 Connectivity

***Make travel more efficient by creating better connections between and within key areas.***

- Provide additional critical links in transportation network where connectivity is lacking.
- Provide more than one route option for major corridors to disperse and minimize traffic.
- Connect people to jobs and services through coordinated transportation and land use investment decisions.

- Expand and maintain a network of bicycle, pedestrian, and transit/park-and-ride facilities that connect homes, activity centers, designated growth areas, and complementary amenities.
- Encourage stub street connections in residential and commercial areas to provide opportunities for interconnectivity.

#### 1.6.4 Level of Service

***Develop a roadway transportation system that achieves a level of service (LOS) C or better.***

- Preserve the current roadway network that is achieving a LOS C or better.
- Enhance areas of the roadway network to improve the LOS to C or better for current and future conditions.
- As redevelopment and new development occurs, avoid degradation of the network below LOS C and ensure improvements yield a LOS C or better.

#### 1.6.5 Economic Development

***Promote high quality economic development through targeted transportation investments.***

- Improve access to key economic sites, designated growth areas, and areas of planned development.
- Support transportation investments and policies that work to create jobs and improve access to people, places, and goods.
- Leverage gateways and aesthetics to create an atmosphere that fosters economic investment.
- Focus transportation system improvements to support and promote tourism.

#### 1.6.6 Multi-modal

***Provide a balanced transportation system that incorporates sidewalks, trails, bikeways, and park and ride lots.***

- Provide connectivity for the pedestrian system.
- Provide sidewalks and/or paved pedestrian trails in designated growth areas
- Promote development designs that are supportive of safe multi-modal transportation.

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## 1.7 Public Engagement Overview

Public outreach is an important part of a successful transportation plan. Two primary goals of engagement for the MTP are to inform and engage the public.

**Informing the public** requires the thoughtful translation of engineering and planning vernacular into common English. The initial step of informing the public is to communicate the purpose of the MTP and how it affects them.

**Engaging the public** necessitates empowering them to speak up combined with listening to their thoughts and opinions. Those who have the most to gain or lose from investments in the transportation system have perspectives that must be considered when developing project, policy, and program recommendations.

The MTP included two opportunities (i.e. public meetings) for public engagement to capture feedback from a cross-section of those who live, work, or recreate within Goochland.

### 1.7.1 Public Meeting #1 – March 27, 2018

The objective of the first public meeting was to introduce and educate the public about the existing MTP, the goals for the update, and to obtain citizen input on their priorities, goals, and

recommendations. This meeting provided the citizens an opportunity to highlight any/all transportation related issues that they have in their neighborhood, their roads, or throughout the County, and to gather their comments on the preliminary, high-level analysis. Comments from the public were compiled, synthesized, and applied to the future recommendations, as deemed applicable.

In general, issues were associated with the 2005 MTP recommendations, specifically the Hockett Road Corridor, Centerville Village, and some of the County's other major roads (i.e. Broad Street); right-of-way widths; interconnectivity and safety.

### **1.7.2 Public Meeting #2 – August 9, 2018**

The second public meeting was to provide the public with results on the analysis results for the 2040 traffic projections and to address feedback from the first community meeting. The analysis and recommendations were displayed and discussed with the public. Overall, there was positive public feedback, however, there were still concerns with the Hockett Road Corridor recommendations. Additional feedback was provided from the public. As with the first community meeting, this meeting was a platform for the public to provide written or verbal comment on the recommendations.

## 2 BACKGROUND INFORMATION

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### 2.1 County Demographics

Prior to the completion of the MTP, Goochland County, in conjunction with TischlerBise, completed the *Goochland County Capital Impacts Study* (February 2018) detailing 2017 County demographics (e.g., populations, employment, households, etc.) and trends. For more information regarding County demographics, refer to the *Goochland County Capital Impacts Study* or the *Goochland County 2035 Comprehensive Plan*.

To be most effective, the MTP must look at present traffic congestion and concerns, while also anticipating future impacts. The *Goochland County Capital Impacts Study* in conjunction with the *Goochland County 2035 Comprehensive Plan* were utilized to project future (2040) traffic growth.

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### 2.2 Transportation

#### 2.2.1 Richmond Tri-Cities Travel Demand Model

The Richmond Tri-Cities Travel Demand Model (RTTDM) was used to analyze the major Goochland County roadways. The RTTDM is maintained by the Richmond Regional Transportation Planning Organization (RRTPO) and is utilized to calibrate traffic forecasting in the region. The base (2012) model was used to analyze existing conditions for the following measures of effectiveness (MOEs):

- Functional Classification
- Traffic Volume
- Level of Service (LOS)
- Volume-to-Capacity (V/C)

The following sections detail the results of the existing conditions analysis.

#### 2.2.2 Functional Classification

##### ***Federal Requirement for Functional Classification***

The purpose of functional classification, which began with the passage of the Federal Aid Act of 1921, was to establish uniformity among states hindered federal efforts to determine national needs. To address this issue, Congress passed the Federal Aid Highway Act of 1973, which mandated the realignment of federal aid roads based in a standardized functional classification system. This process remains in effect today. As part of the process established by the Federal Highway Act of 1973, the Act also requires states to classify roadways eligible for federal aid into standardized functional classifications. In the Commonwealth of Virginia, VDOT's Mobility Planning Division (TMPD) is responsible for functional classification.

The Federal Highway Administration (FHWA) provides funding to states, territories, and other entities for roadway construction and improvement projects through various programs and related adjustment accounts. Total miles of each functional classification should fall within established percentage ranges defined by the FHWA. Interstates, urban freeways and expressways, and principal arterials generally received the highest levels of funding. Minor roads—minor arterials, major collectors and minor collectors—typically received the lowest levels of funding. In addition to tracking funding for highway

construction and improvement projects, FHWA also collects data on highway characteristics and usage, including information on the length of the nation’s highways.

The roadway network was developed as part of the MTP, is in accordance with the Virginia Department of Transportation’s (VDOT’s) *Functional Classification Comprehensive Guide*. As defined, “functional classification” is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide. Functional classification outlines how travel can be channelized within the network in a logical and efficient manner by defining the part that a road or street should play in carrying the flow of trips through a highway network. Functional classification may impact design standards such as driveway, median break, and signal spacing and sidewalk and bike facility design.

**Functional Classification Components**

The main components of the “functional usage” of a roadway are mobility and accessibility. Travel can be logically related to the roadway’s ability to access land versus providing mobility through an area.

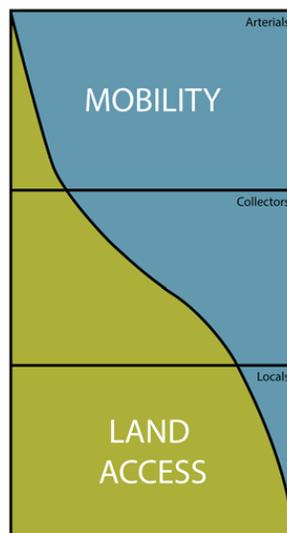
**Figure 2-1** illustrates the relationship between traffic mobility and land access. For example, local facilities (i.e., subdivision road) emphasize the *land-access* function. Arterials (e.g., US 250) emphasize an elevated level of mobility for through movements while collectors (e.g., Hockett Road) offer a balance between access and mobility.

**Mobility** is measured in respect to ability of traffic to pass through a defined area in a reasonable amount of time. Common elements of mobility include:

- Operating speed (Speed)
- Level of service (Efficiency)
- Riding comfort (Visibility)

**Accessibility** is measured in terms of the capability to provide access to and between land use activities within a defined area.

**Figure 2-1: Traffic Mobility and Land Accessibility Relationship**



As part of the MTP, this land utilization and street hierarchy will serve as guides to define the transportation network. **Table 2-1** provides a description and graphical presentation of the functional classifications that are within Goochland County. Functional classifications for rural areas were applied for Goochland County given the rural nature of the county roadways. **Figure 2-2** displays the existing functional classifications from the 2012 RTTDM.

Table 2-1: Functional Classification Description for Rural Areas

Functional Classification	Description	Local Examples	Graphical Representation
Interstate/Limited Access	<ul style="list-style-type: none"> <li>▪ Provides the most mobility and the least amount of access to land with access only available at interchanges or ramps</li> <li>▪ Serves longer distance travel</li> <li>▪ Supports regional mobility</li> </ul>	<ul style="list-style-type: none"> <li>▪ Interstate 64</li> <li>▪ Route 288 <i>(Pictured)</i></li> </ul>	
Principal Arterial	<ul style="list-style-type: none"> <li>▪ Serves medium to long distances of travel</li> <li>▪ Integrated network without stub connections (dead ends)</li> <li>▪ Links cities, towns, and higher density areas with other major traffic generators</li> <li>▪ Typically connects minor arterials and collectors to interstate/limited access facilities</li> <li>▪ Tightly controlled access and few (if any) individual site driveways</li> </ul>	<ul style="list-style-type: none"> <li>▪ None</li> </ul>	<p style="text-align: center;">Not Applicable</p>
Minor Arterial	<ul style="list-style-type: none"> <li>▪ Serves moderate trip lengths</li> <li>▪ Primarily intended to serve travel demand within the local area</li> <li>▪ Provides a higher level of access to adjacent land uses</li> </ul>	<ul style="list-style-type: none"> <li>▪ Sandy Hook Road</li> <li>▪ Broad Street <i>(Pictured)</i></li> </ul>	

Table 2-1 Continued: Functional Classification Description for Rural Areas

Functional Classification	Description	Local Examples	Graphical Representation
Major Collector	<ul style="list-style-type: none"> <li>▪ Serves shorter trip lengths</li> <li>▪ Provides service to any County area not on an arterial system</li> <li>▪ Serves as the most important intra-county travel corridors</li> <li>▪ Distributes traffic from arterials to their ultimate destination</li> <li>▪ Collects traffic from local streets and channels it to the arterial system</li> </ul>	<ul style="list-style-type: none"> <li>▪ River Road West</li> <li>▪ Fairground Road</li> <li>▪ Hockett Road <i>(Pictured)</i></li> </ul>	
Minor Collector	<ul style="list-style-type: none"> <li>▪ Wide range of physical characteristics, some of which can be attributed to the neighborhoods in which they exist</li> <li>▪ Provides good connectivity</li> <li>▪ Collects traffic from local road and bring all developed areas within a reasonable distance of a collector road</li> <li>▪ Service to smaller communities</li> <li>▪ Links local traffic generators with their rural hinterland</li> </ul>	<ul style="list-style-type: none"> <li>▪ Hadensville-Fife Road</li> <li>▪ Rockville Road</li> <li>▪ Oilville Road <i>(Pictured)</i></li> </ul>	
Local	<ul style="list-style-type: none"> <li>▪ Account for largest percentage of all roadways in terms of mileage</li> <li>▪ Provides greater access, especially to adjacent land uses, and the least amount of mobility</li> <li>▪ Typically connect to one another or to collector streets</li> <li>▪ Serves short distances of travel</li> </ul>	<ul style="list-style-type: none"> <li>▪ Hickory Hill Road</li> <li>▪ Greenbriar Branch Drive <i>(Pictured)</i></li> </ul>	

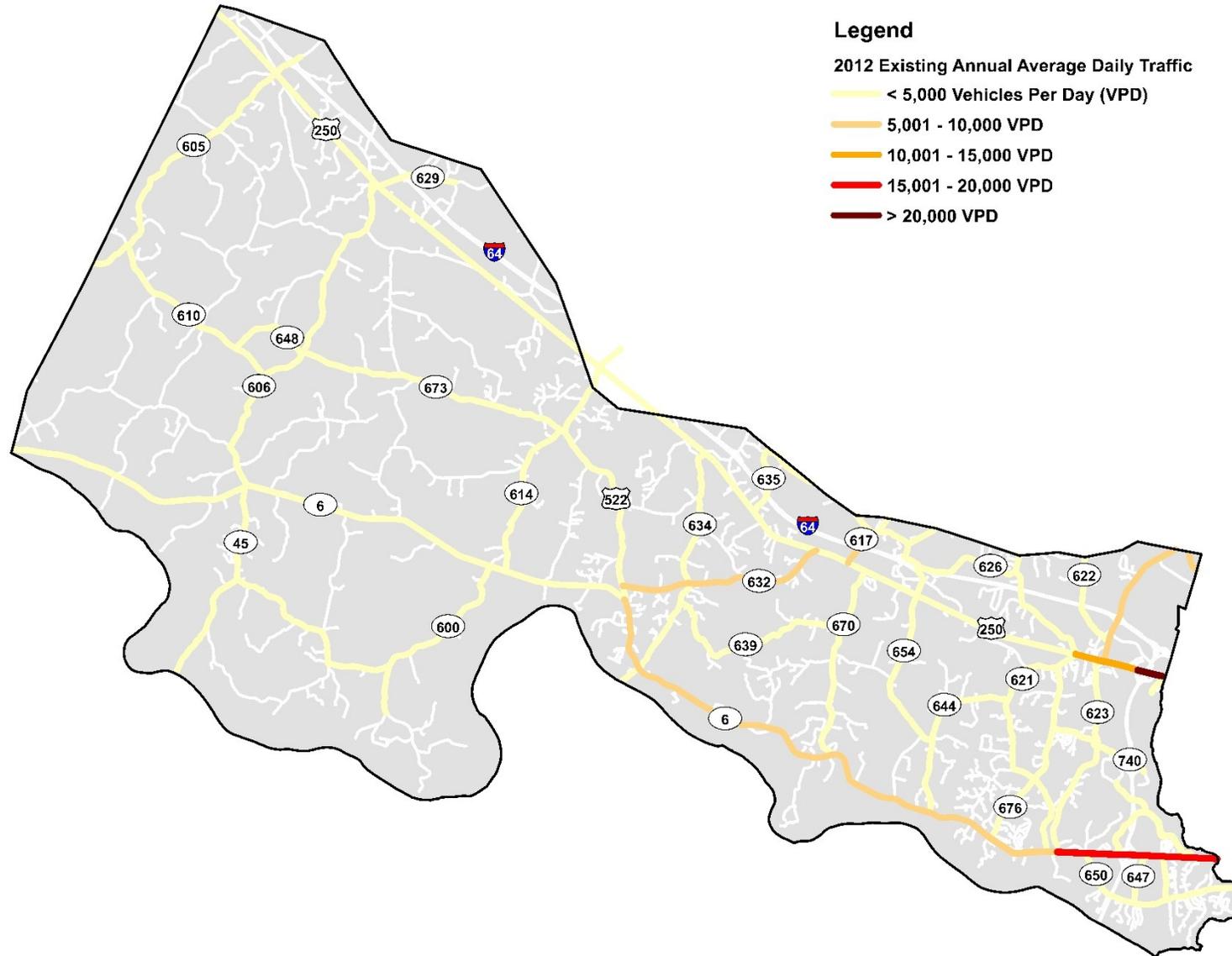


### 2.2.3 Annual Average Daily Traffic

Annual Average Daily Traffic (AADT) represents an estimate on the annual daily, two-way traffic volumes on an average weekday. This data is typically derived from years of traffic count data collected at various times of the year. Traffic volumes typically correlate with roadway's design and location as well as used to define the functional classification.

For this MTP, the existing volumes from the 2012 RTTDM (regional model) were analyzed. The *National Cooperative Highway Research Program (NCHRP) Report 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design* methodology was used to adjust travel model volumes based on collected traffic data. **Figure 2-3** displays the existing AADT volumes for the major roads in Goochland County. I-64 and Route 288 were not included in the operational analysis because they are limited access VDOT roadways.

Figure 2-3: Existing AADT Map



## 2.2.4 Operational Analysis

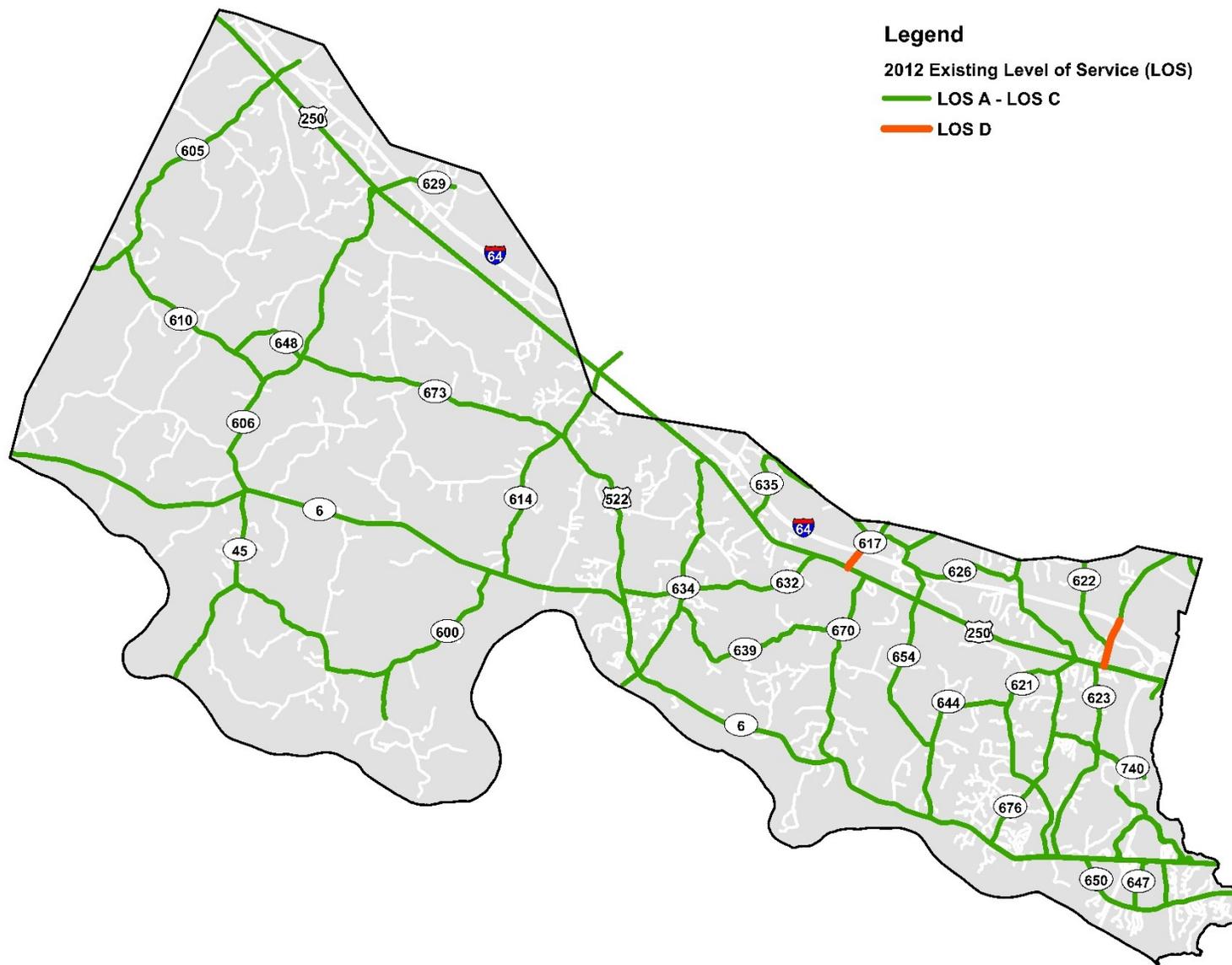
### Level of Service

Level of service (LOS), analyzed for the daily traffic volumes, characterizes the operating conditions on the road in terms of traffic performance measures related to speed and travel time, freedom to maneuver, traffic interruptions, and convenience. The LOS range from LOS A (least congested) to LOS F (most congested). **Table 2-2** provides the general operating conditions represented by this LOS. The specific definitions of LOS differ by facility type. The Highway Capacity Manual (HCM) presents a more thorough discussion of the LOS concept and provides greater detail based on facility type. **Figure 2-4** illustrates the existing LOS for the major Goochland County roadways based on the adjusted travel model volumes. The operational analysis excluded I-64 or Route 288, which are not a part of the MTP. Based on the existing analysis, the majority of the Goochland County roadways experience LOS C or better operations under existing conditions except for Oilville Road and Ashland Road which experience LOS D.

Table 2-2: Level of Service (LOS) Description

Level of Service (LOS)	General Operating Conditions	Graphical Representation
A	Free Flow	
B	Reasonably Free Flow	
C	Stable Flow	
D	Approaching Unstable Flow	
E	Unstable Flow	
F	Forced or Breakdown Flow	

Figure 2-4: Existing LOS Map



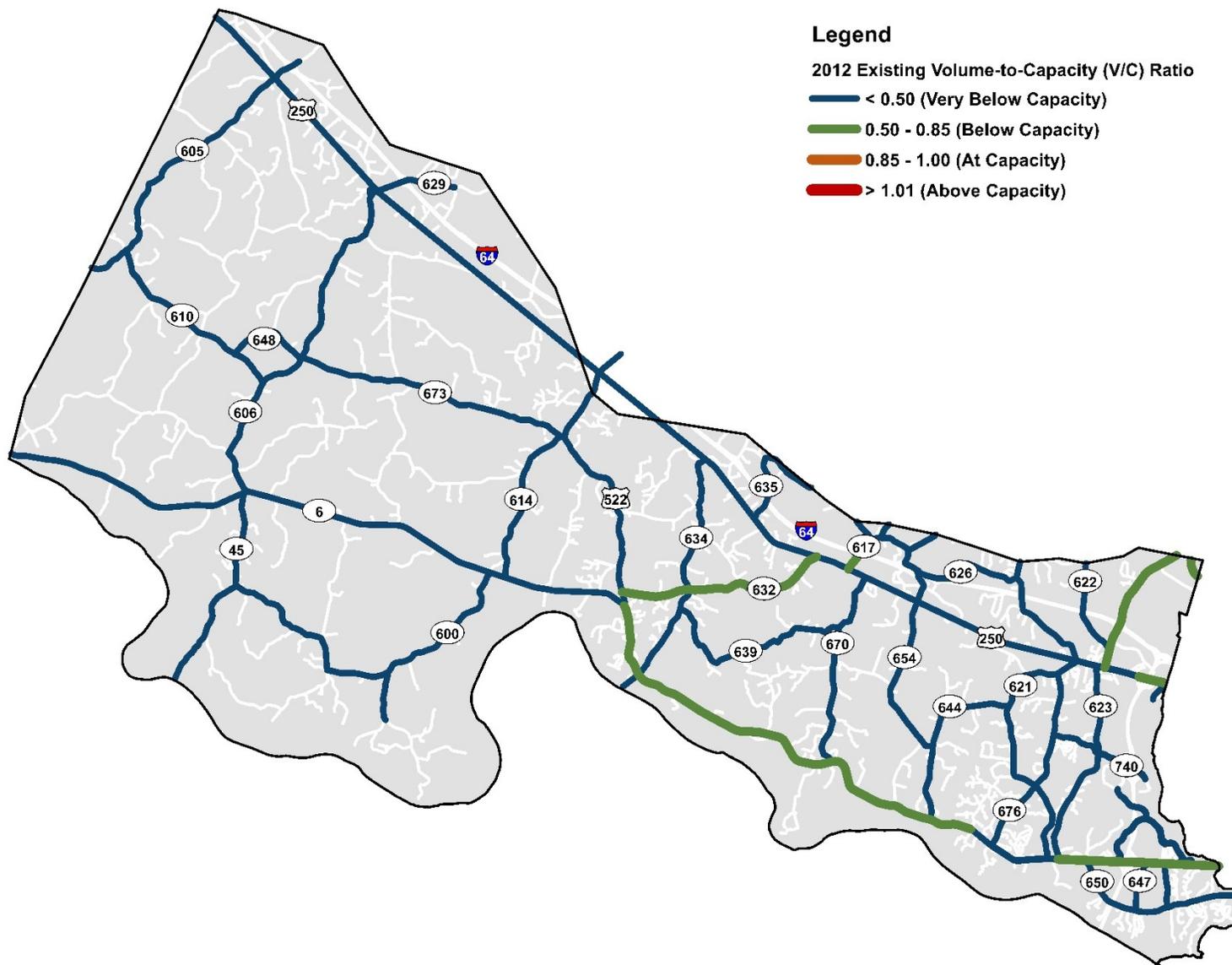
### **Volume-to-Capacity**

Volume-to-Capacity (V/C) compares roadway demand (vehicle volumes) with roadway supply (carrying capacity). The volume is defined as the actual number of vehicles known to occur over a given duration of time (typically daily). Capacity is defined as the maximum rate (number of lanes and speed) at which vehicles can pass through a given point under prevailing conditions. The ratio of the two elements is shown in **Table 2-3** with the associated condition. **Figure 2-5** illustrates the existing V/C ratios for the major Goochland County roadways based on the adjusted travel demand model volumes. All the Goochland County roadways are below capacity under existing conditions.

**Table 2-3: Volume-to-Capacity Description**

<b>Category</b>	<b>Description</b>
<b>Very Below Capacity</b> V/C < 0.50	A roadway with a V/C less than 0.50 typically operates with free-flowing conditions and is underutilizing available roadway capacity.
<b>Below Capacity</b> V/C = 0.50 to 0.85	A roadway with a V/C between 0.50 to 0.85 typically operates with efficiency and is not considered congested.
<b>At Capacity</b> V/C = 0.85 to 1.00	As the V/C nears 1.00, the roadway is becoming more congestion. A roadway approaching congestion may operate effectively during non-peak hours but be congested during peak travel periods.
<b>Above Capacity</b> V/C > 1.01	Roadways operating at capacity or slightly above capacity are heavily congested during peak periods and moderately congested during non-peak periods. A change in capacity due to incidents greatly impacts the travel flow on corridors operations with this V/C range.

Figure 2-5: Existing V/C Map



### 2.2.5 Crash History

Crash data from the statewide database was extracted from 2011 through 2017. The crash data excluded I-64 or Route 288, which are not a part of the MTP. During this seven-year period, there were a total of 2,159 crashes in Goochland County. **Figure 2-6** displays the number of crashes over this period. **Figure 2-7** illustrates the crash severity breakdown over the seven-year period. **Figure 2-8** the severity of crashes per year for this period.

Figure 2-6: Number Crashes by Year

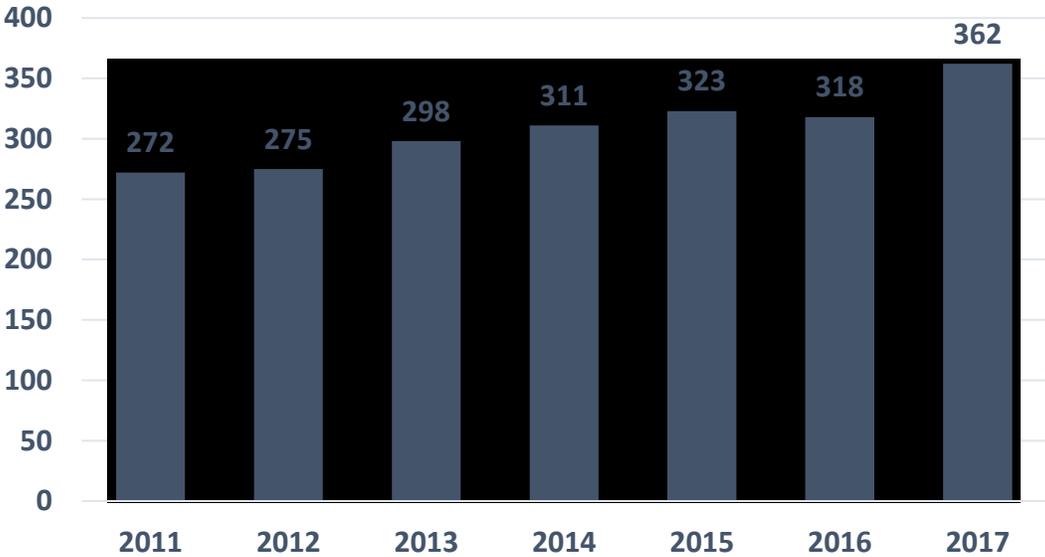


Figure 2-7: Severity of Crashes

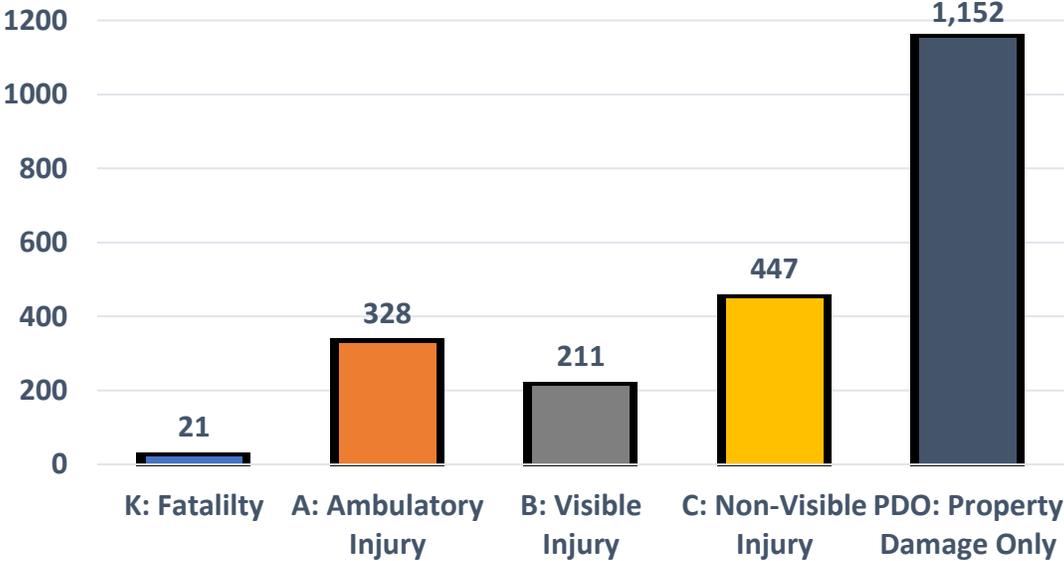
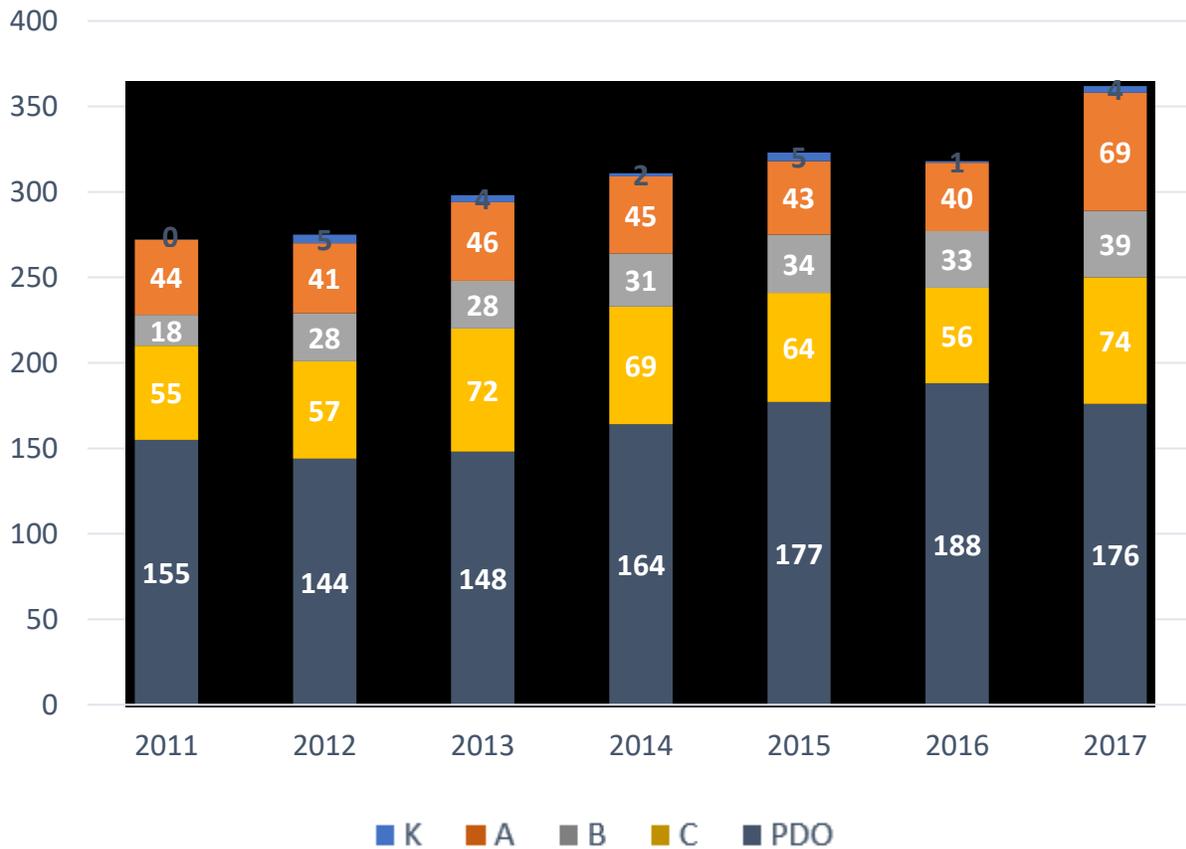


Figure 2-8: Severity of Crashes by Year



In examining the crash data, a heat map was used to identify “hot spots” in the County. The list below shows those roadway and intersections that were identified as locations with a higher number or density of crashes. The hot spots are not relative to statewide data. **Figure 2-9** provides a graphical heat map of the crash density and reveals these hot spot locations.

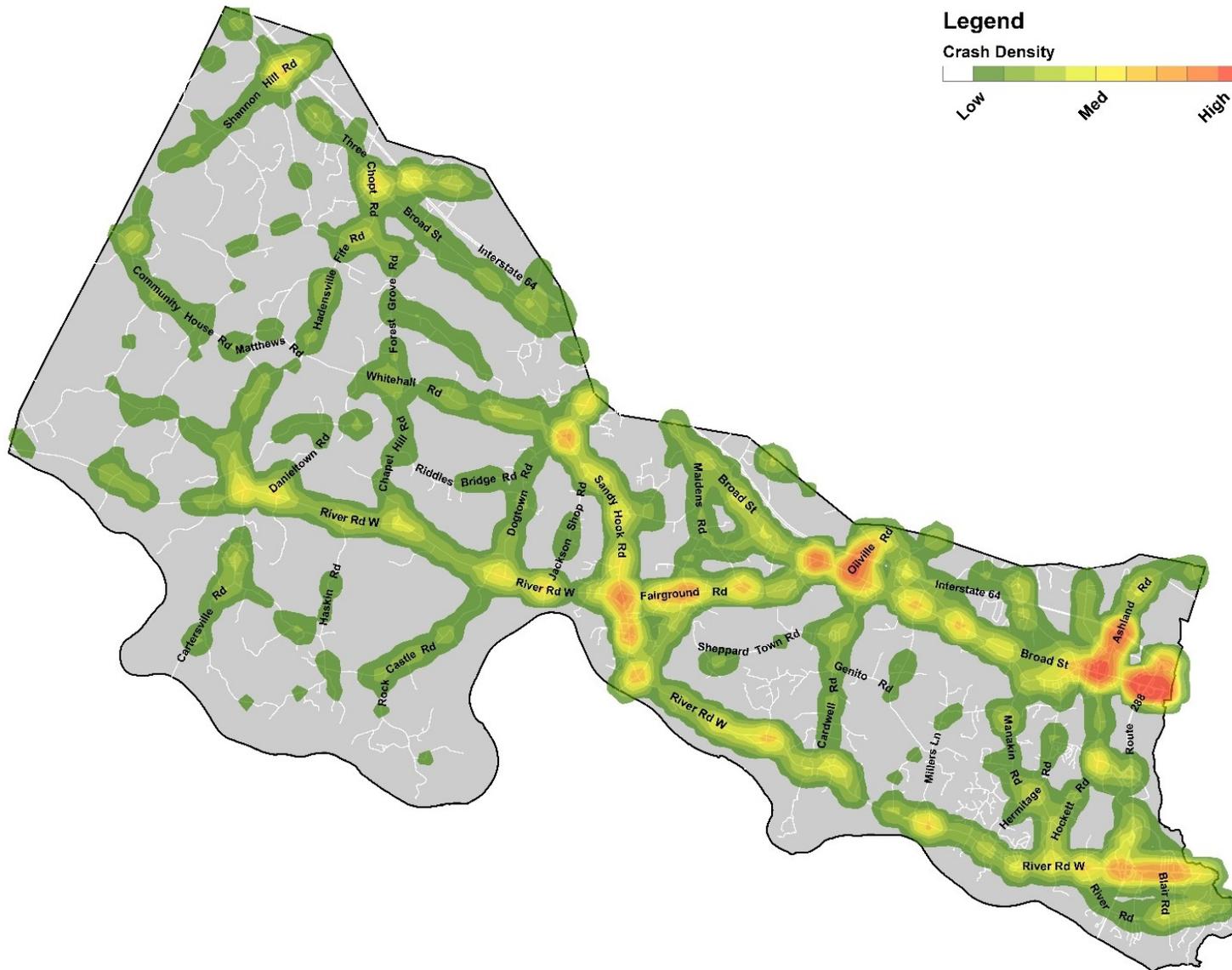
**Roadway Hot Spot Locations**

- Broad Street – between Manakin Road and Wilkes Ridge Parkway
- Broad Street – between Fairground Road and Oilville Road
- Ashland Road – between I-64 and Broad Street
- Patterson Avenue – between River Road and Blair Road
- Fairground Road – between Sandy Hook Road and Broad Street

**Intersections/Interchanges Hot Spot Locations**

- Fairground Road at Sandy Hook Road
- Fairground Road at Broad Street
- Ashland Road at Broad Street
- Broad Street at Route 288
- Oilville Road at I-64
- Oilville Road at Broad Street
- Sandy Hook at Whitehall Road

Figure 2-9: 2011 through 2017 Crash Density Map



## 2.2.6 Pedestrian and Bicycle Network

As included in the *Goochland County 2035 Comprehensive Plan*, “a complete local transportation system includes bikeways, sidewalks, and other pathways.” The County features many roads with minimal or no shoulders. There are limited dedicated bicycle lanes but pedestrian treatments (e.g., sidewalk) are provided in select locations throughout the County.

## 2.2.7 Transit Network

Transit operations are currently not available in Goochland County. However, VDOT has several Park and Ride lots situated throughout the County at the following locations:

- Hickory Haven (Lot #280) – Located on Ashland Road, north of I-64
- Oilville (Lot #281) – Located on Oilville Road, south of I-64
- Hadensville (Lot #75) – Located on Old Fredericksburg Road, south of Broad Street

## 2.3 Review of Previous Plans

The MTP will build on previous planning efforts completed for the County. The section below outlines major planning efforts throughout the County. This outline is by no means all-inclusive but captures the most recent and more major studies.

### 2.3.1 Review of Previous Plans

The following comprehensive set of available data (e.g., mapping, previous studies, plans, conceptual plans, etc.) on the transportation network was reviewed:

- Arterial Management & Interstate Access US Route 250 and State Route 623 (AMP Study)
- Draft 2010 Major Thoroughfare Plan Update
- Draft 2010 Centerville Village Plan
- Proposed Strategically Targeted Affordable Roadway Solutions (STARS) studies
- 2005 Major Thoroughfare Plan
- RRTPO 2038 Major Thoroughfare Plan
- County Cash Proffer Alternatives Study
- Goochland County FY2018-22 Capital Improvement Program
- RRPDC Rural Transportation Plan
- Traffic Impact Analysis
- Fairground Road/Sandy Hook Road Alternatives Analysis
- US 250 Operation and Safety Study – Cardwell Road to Fairground Road
- Access Management Plan of the Goochland County Subdivision Ordinance
- Conceptual diagrams of planned / proposed private roadway improvements
- Tuckahoe Creek Service District
- Alternative transportation – sidewalk / bike lanes / multi-use paths (non-recreation)/ park-and-ride lots, bus/commuter
- All relevant GIS mapping data files (land use, major utilities, infrastructure, etc.) as well as GIS data from 2035 Comprehensive Plan
- Major anticipated land development sites/projects within MTP time horizon
- Significant development plans located within the County (CAD or GIS if available)
- Recent vehicular, pedestrian, or bicycle traffic counts

- Applicable transportation/land use/water resources plans and studies (zoning maps, comprehensive plans, land use plans, small area plans, capital improvement projects, transit system improvements/expansion plans and bike/pedestrian plans for study area, and any other relevant studies)
- Land use/zoning regulations and other applicable policies, guidelines, and ordinances
- Planned/committed roadway improvements (CAD or GIS files)
- Demographic data

## 3 PLAN DEVELOPMENT

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### 3.1 Methodology

Planners and engineers develop elements of the roadway network with specific travel objectives in mind. These objectives range from serving long-distance passenger and freight needs to serving local travel from residential areas to nearby commercial centers. Multi-modal transportation planning adds sidewalks, bicycle ways, trails, transit, etc. to provide the traveling public transportation mode choice.

Traffic volumes on existing roadways provided a baseline to evaluate congestion levels, identify capacity deficiencies, and the basis to calculate future traffic volumes. Traffic projections were utilized to forecast likely future capacity and operational deficiencies.

The “functional classification” of roadways defines the role each element of the roadway network plays in serving the travel objectives. Functional classification has come to assume significance beyond its original purpose and carries with it expectations regarding roadway design, including speed, capacity, and relationship to existing and future land use development.

Roadway capacity is the maximum number of vehicles per hour that can pass a point on a roadway. Capacity is determined by the functional classification, number of lanes, roadway geometry (access management, lane widths, curvature, etc.), speed, and the type of area (urban versus rural). Roadway capacity was used to determine operational efficiency of the roadway network by comparing traffic volumes with the roadway capacity, V/C ratio. This ratio was used to measure level of service (LOS) of a roadway.

Analysis of existing traffic volumes and capacities identified and highlighted current traffic conditions; typically, with an emphasis on deficiencies. Traffic projections were utilized to identify and anticipate future capacity and operational conditions, with an emphasis on identifying deficiencies.

The MTP provided analysis demonstrating the decrease, sometimes significant, in LOS with no road improvements (often called a “no build” scenario). At the end of this section are a series of recommended policy and road improvements (the recommendation) aimed at maintaining the County road networks at a LOS C or better.

### 3.1.1 Projected Traffic Volumes

As part of the *Capital Impacts Study*, County demographics were projected to determine population and employment data for 2040. For the purposes of the MTP, this demographic data was coded into the future (2040) RTTDM to project future volumes and analyze future conditions, as shown in **Table 3-1**.

**Table 3-1: Demographic Data**

Service Area	Population	Employment
West	4,925	1,472
Central	9,164	4,598
East	29,319	22,420
<b>Total</b>	<b>43,660*</b>	<b>28,490</b>

### 3.1.2 Future Growth with No Transportation Improvements (“No Build” Analysis)

In order to identify the areas of congestion throughout the County under future conditions, the 2040 RTTDM was coded with the aforementioned future demographics on the existing County roadway network as the No Build scenario. No Build volume, LOS, and V/C results are shown in **Figure 3-1**, **Figure 3-2**, and **Figure 3-3**, respectively.

From the No Build analysis, the following areas were identified with poor operations:

#### **LOS D**

- Sandy Hook Road (US 522) from Louisa County Line to River Road West (Route 6)
- Fairground Road (Route 632) from River Road West (Route 6) to Broad Street (US 250)
- Hockett Road (Route 623) from Snead Road to River Road West (Route 6)
- Maidens Road (Route 632) from River Road West (Route 6) to Powhatan County Line
- Broad Street (US 250) from Manakin Road (Route 621) to Route 288
- Pouncey Tract Road (Route 271) from Hanover County Line to Henrico County Line

#### **LOS E and F**

- Oilville Road (Route 617) from Broad Street (US 250) to I-64
- Ashland Road (Route 623) from Broad Street (US 250) to I-64
- Broad Street (US 250) from Route 288 to Henrico County Line
- Manakin Road (Route 621) from/to Hermitage Road
- Tuckahoe Creek Parkway (Route 740) from Hermitage Road to Hockett Road
- Patterson Avenue (Route 6) from Hockett Road (Route 623) to Henrico County Line
- River Road (Route 650) from Patterson Avenue (Route 6) to Henrico County Line

Figure 3-1: No Build Volume Map

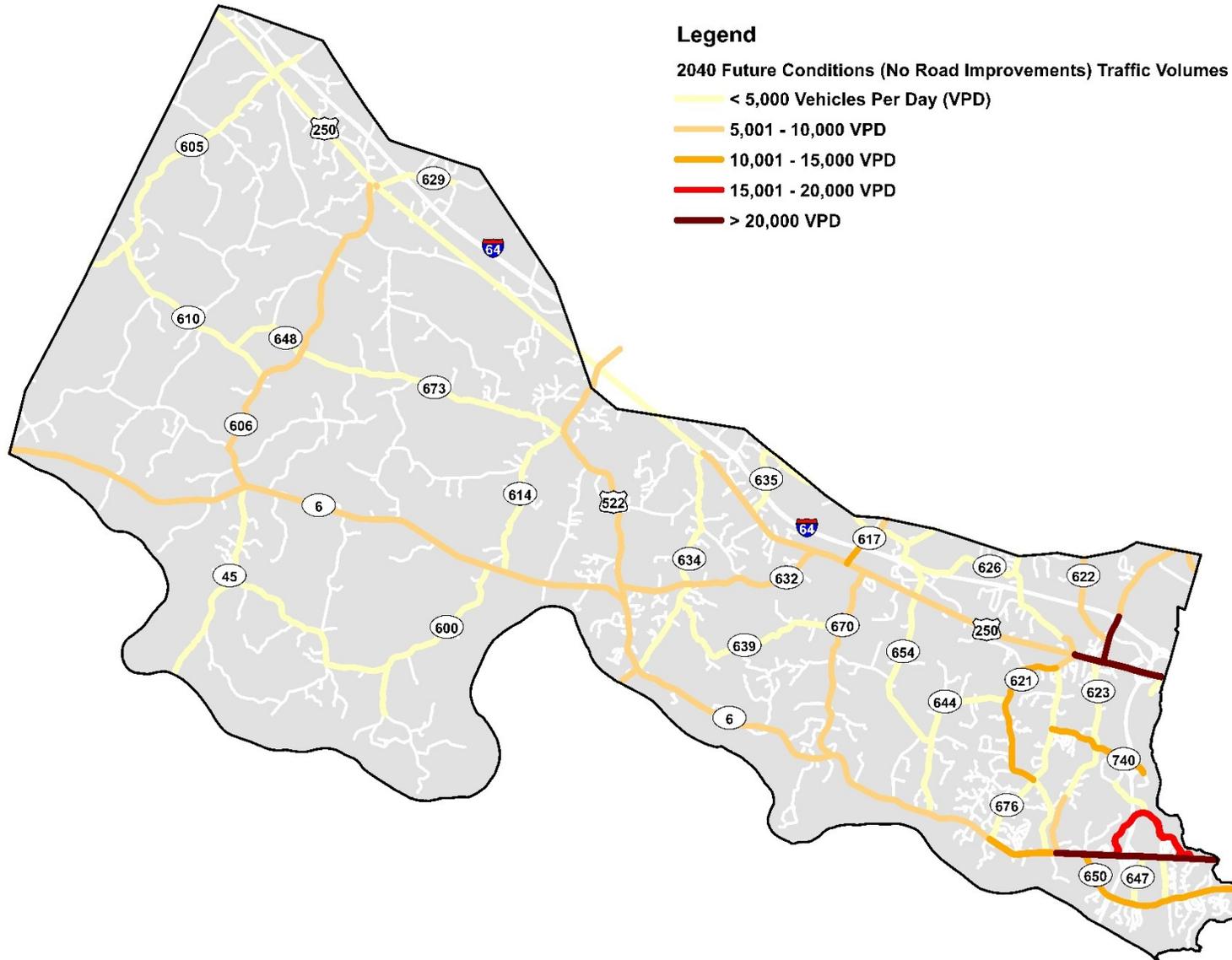


Figure 3-2: No Build LOS Map

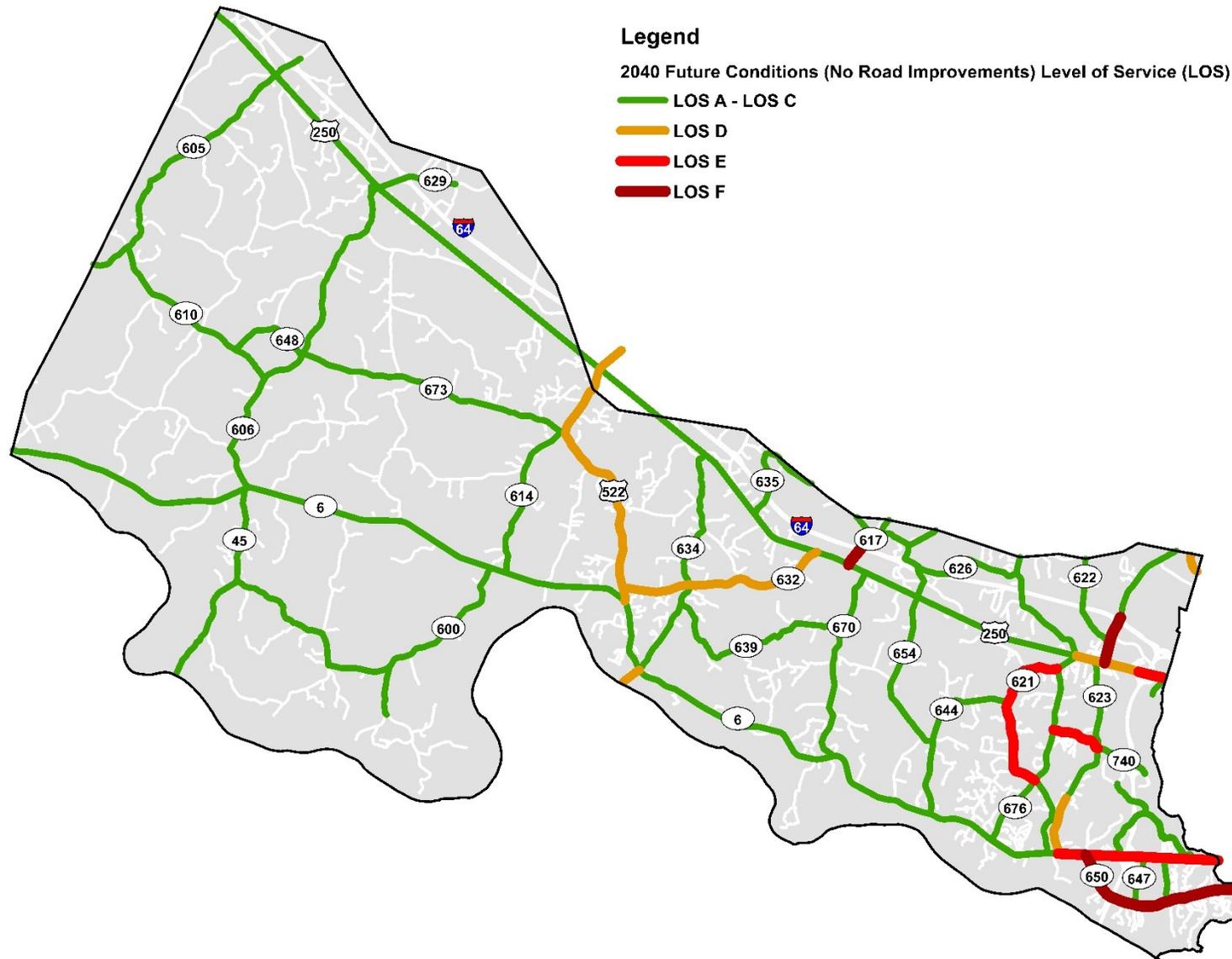
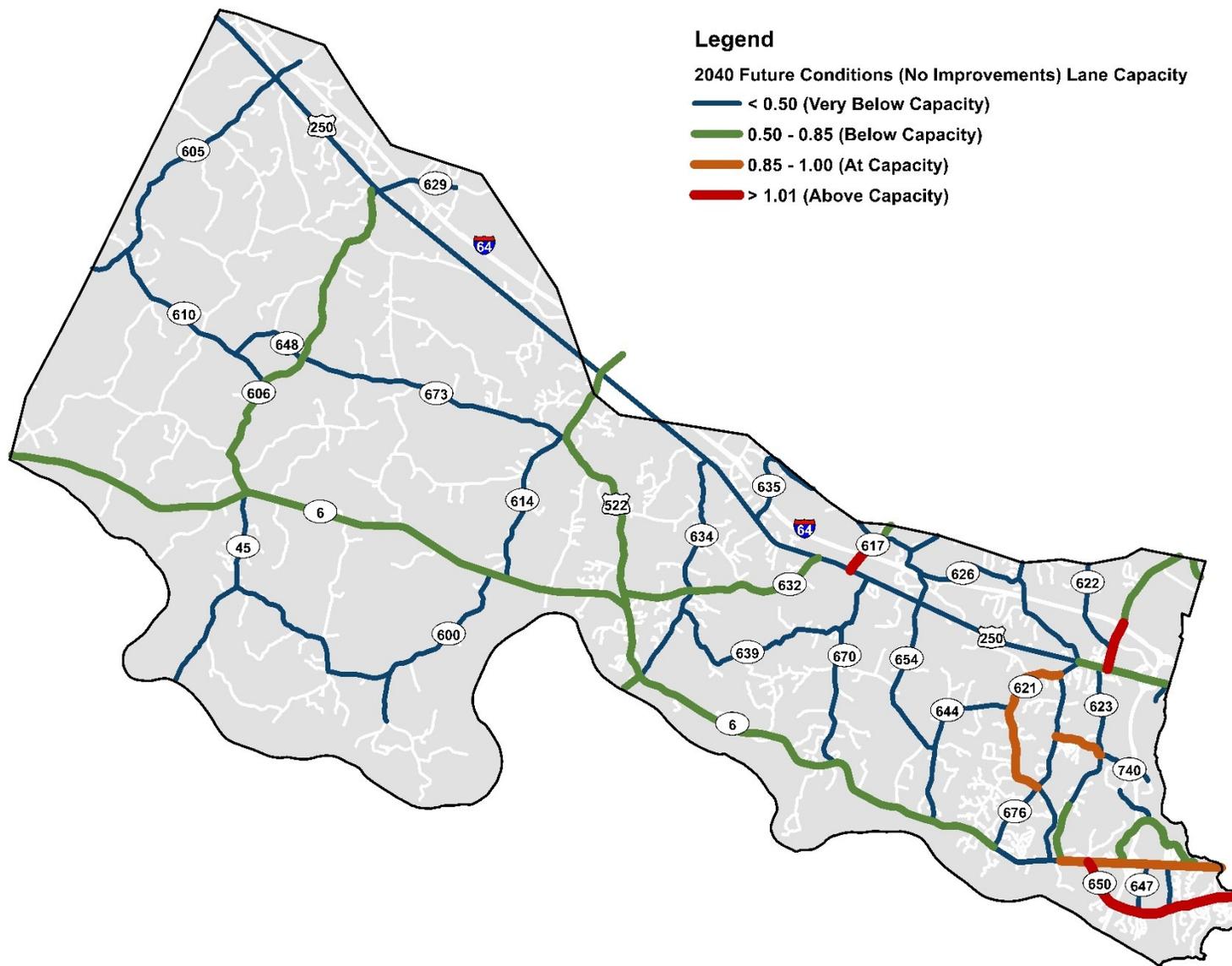


Figure 3-3: No Build V/C Map



### 3.1.3 Road Network

Per the previous functional classification information, an effective roadway network must manage two competing demands:

- Offering mobility between centers
- Providing access to specific destinations

These two demands are inherently adversarial (e.g., increasing access typically limits mobility along the same corridor). Therefore, it is helpful to instill diversity into the network by providing easy access on some roads and protecting the mobility on others. Balancing access and mobility creates roadways that respond to the unique context and user groups along specific corridors. Functional classification categorizes roadways based on characteristics such as speeds, vehicular capacities, and relationships with adjacent land use. Functional classification will continue to be necessary and should be consistently updated.

Goochland County's street hierarchy consists of:

- Interstate/Limited Access
- Principal Arterials
- Minor Arterials
- Major Collectors
- Minor Collectors
- Local Streets

### 3.1.4 Amended Functional Classifications

A review of the current functional classifications was done to validate their current classification or to reconsider their existing function or future function. As a result, some of the classifications were changed to better reflect existing and future functionality of the roadway as well as the VDOT functional classifications developed in 2014. Refer to **Section 3.2** for the amended functional classification.

### 3.1.5 Typical Cross-Sections

Based on the future traffic volumes and the amended functional classification, typical sections were developed for the various functional classifications, as previously defined. The design criteria used in the development of the typical sections, is consistent with the most recent version of the VDOT Road Design Manual.

The primary design criteria and associated description used in development of the typical sections is shown in **Table 3-2**.

Table 3-2: Primary Design Criteria

Design Criteria	Description
Lane Width	Typically shown as a minimum width
Shoulder Width	
Paved (PS)	Shoulder area that is stable and paved. Typically shown as minimum width and may vary based on: if road section was in a cut or fill, with or without guardrail, as well as laneage and volumes
Graded (GS)	Shoulder area that is stable and graded
Median Width	If ditch section, it will vary but typically 16' or greater depending on clear zone. If the median has curbing, the minimum width should be 16' to allow left turn lanes to be constructed, where needed.
Landscape Verge (LV)	Areas between the edge of road, sidewalks, multi-use path that allows for landscaping, grass, brick pavers, etc. Minimum width for grass and/or vegetation should be 2'
Pedestrian Accommodations	Area for pedestrians to walk, minimum should be 5'. May be combined with a multi-use path. ADA requirements apply to widths, surface, grade, ramps, etc.
Bike Accommodations	Area for bicycles. The area may be in a dedicated path/trail, shared with pedestrians in a multi-use path or shared in the travel lane or shoulder with motorized vehicles
Ditch	
Front Slope	Ditch slopes vary based on width
Back Ditch	Ditch slopes vary based on width

The typical sections provide a description of the functional classification, the applicable geometric design standards, and the associated daily and hourly level of service thresholds, as shown in **Figure 3-4** through **Figure 3-8**. Note that each typical section has a defining code, the legend and typical section codes are shown in **Table 3-3** and **Table 3-4**, respectively.

Table 3-3: Typical Section Legend

Code	Description <i>(Amended Functional Classification Example)</i>
P	Principal Arterial <i>(Patterson Avenue)</i>
A	Minor Arterial <i>(Broad Street)</i>
C	Major Collector <i>(Hockett Road)</i>
M	Minor Collector <i>(Shallow Well Road)</i>
L	Local <i>(Greenbriar Branch Drive)</i>
#	Number of Travel Lanes
U	Undivided
D	Divided
DI	Ditch Section – Rural Areas
CG	Curb & Gutter – Suburban/Village Areas
P	Pedestrian Accommodations
B	Bicycle Accommodations
T	Multi-Use Path
O	On-Street parking
XX'	Right-of-Way (ROW) Width

Table 3-4: Typical Section Codes

Code*	Functional Classification	Laneage	Median	Section Type	Pedestrian Accommodations	Bicycle Accommodations	On-Street Parking	Right-of-Way Width
P4D-130	Principal Arterial	4 - 12' lanes	Divided	DI	No	No	No	130' - 150'
P4DP-130	Principal Arterial	4 - 12' lanes	Divided	CG	Yes	No	No	90'
A4D-115	Minor Arterial	4 - 12' lanes	Divided	DI	No	No	No	115' - 125'
A4DP-100	Minor Arterial	4 - 12' lanes	Divided	CG	Yes	No	No	100'
ADPB-100	Minor Arterial	4 - 12' lanes	Divided	CG	Sidewalk & multi-use path	Yes - 1 side multi-use path	No	100'
C2UB-70	Major Collector	2 - 12' lanes	Undivided	DI	No	8' shoulder	No	70'
C4DB-115	Major Collector	4 - 12' lanes	Divided	DI	No	6' - 8' shoulder	No	115' - 125'
C4DP-90	Major Collector	4 - 12' lanes	Divided	CG	Yes	No	No	90'
C5UP-90	Major Collector	4- 12' lanes; 1 -15' Two-Way Left-Turn Lane (TWLTL)	Undivided	CG	Yes	No	No	90'
M2UP-50	Minor Collector	2 - 12' lanes	Undivided	DI	Yes - 1 side	5' shoulder	No	50'
M2UT-55	Minor Collector	2 - 12' lanes	Undivided	DI	Yes - 1 side multi-use path	Yes - 1 side multi-use path	No	55'
M2UPB-55	Minor Collector	2 - 15' lanes	Undivided	CG	Yes	Shared	No	55'
M2UPB-55-2	Minor Collector	2 - 12' lanes	Undivided	CG	Sidewalk & multi-use path	Yes - 1 side multi-use path	No	55'
L2U-40	Local Street	2 - 11' lanes	Undivided	DI	No	No	No	40'
L2UB-50	Local Street	2 - 11' lanes	Undivided	DI	No	5' shoulder	No	50'
L2UB-40	Local Street	2 lanes	Undivided	CG	No	Shared	No	40'
L2UO-50	Local Street	2 - 11' lanes	Undivided	CG	No	No	Yes	50'
L2UPB-50	Local Street	2 - 14' lanes	Undivided	CG	Yes - both sides	Yes - both sides	No	50'

\*For example, Code P4D-130 refers to a roadway classified as a Principal Arterial with a 4-lane, divided median, and 130-foot right-of-way typical section.

Figure 3-4: Principal Arterial Information

## Description

The classification of Principal Arterial differs based on whether the facility is located in an urban or rural area. In rural areas, Principal Arterials serve corridor movements of substantial statewide or interstate travel and provides an integrated network without stub connections (dead ends). This network connects all or nearly all Urbanized Areas and a large majority of Urban Clusters with populations of 25,000 and over.

Principal arterials in urban areas serve the major activity centers of a metropolitan area and the highest traffic volume corridors. These facilities carry a high proportion of total urban travel on the minimum amount of mileage and provide continuity for major rural corridors to accommodate trips entering and leaving an urban area. Lastly, Principal Arterials carry a significant amount of intra-area travel, and serve demand between the central business district and outlying residential areas of a metropolitan area.

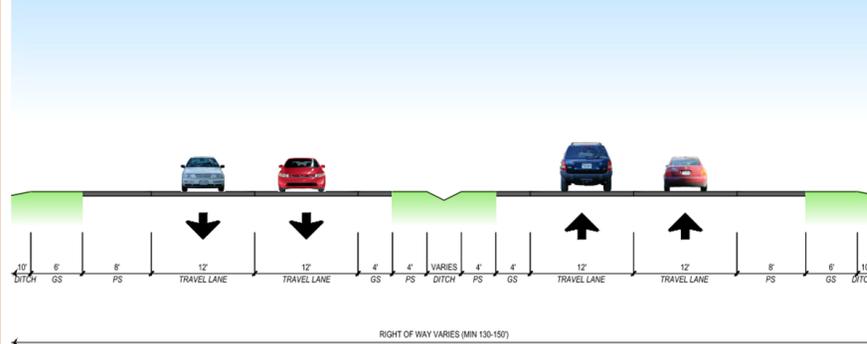
## Geometric Standards

Section Type	Speed	Lane Width	Right Shoulder	Left Shoulder	Bike Lane	Sidewalk	Median Width	Curb & Gutter	Front Slope Width	ROW Requirement
Open Ditches	40 - 70 MPH	12'	8' paved; up to 8' graded	4' paved	NA or provided behind shoulder	5' if provided behind shoulder	Varies	NA	10'	90'
With Curb & Gutter	30 - 60 MPH	12'	NA	NA	NA or provided behind curb & gutter	5'	16'	2.5'	NA	130' - 150'

Functional Classification	Number of Lanes	Speed Threshold	Daily Volume Threshold (VPD)			Hourly Volume Threshold (VPH)		
			LOS A - C	LOS D	LOS E - F	LOS A - C	LOS D	LOS E - F
Principal Arterial	4	40 - 70 MPH	< 32,600	38,200	> 40,200	< 1,955	2,290	> 2,410

## Typical Sections

Principal Arterial without Curb & Gutter (P4D-130)



Principal Arterial with Curb & Gutter (P4DP-130)

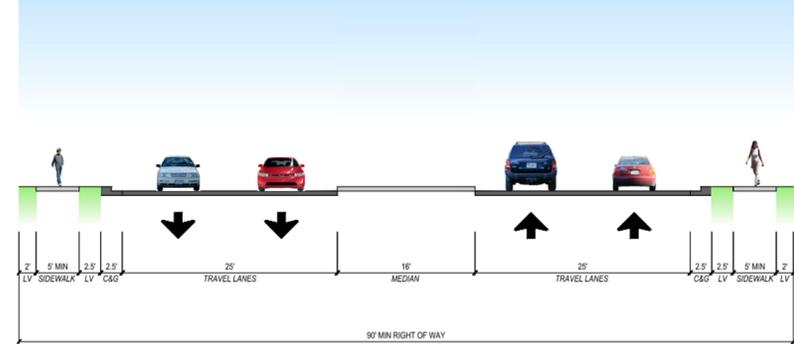


Figure 3-5: Minor Arterial Information

## Description

Minor Arterials provide service for trips of moderate length, serve geographic areas that are smaller than their higher Arterial counterparts and offer connectivity to the higher Arterial system. Classification is based on whether the facility is in an urban or rural area.

In rural areas, Minor Arterials link cities and large towns, along with other major traffic generators, and form an integrated network providing interstate and inter-county service. The design in rural areas typically provides for relatively high overall speeds, with minimum interference to the through movement. Minor Arterials are spaced at intervals, consistent with population density, so that all developed areas within the state are within a reasonable distance of an arterial roadway. They also provide service to corridors with trip lengths and travel density greater than those served by rural collectors or local systems.

In urban areas, Minor Arterials interconnect with principal arterials, augment the urban principal arterial system, and provide service to trips of moderate length at a lower level of travel mobility than principal arterials. Minor Arterials include all arterials not classified as principal arterials and contain facilities that place more emphasis on land access. These facilities provide more land access than Principal Arterials without penetrating identifiable neighborhoods. Minor Arterials serve trips of moderate length at a somewhat lower level of travel mobility than Principal Arterials and distribute traffic to smaller geographic areas than those served by higher-level Arterials.

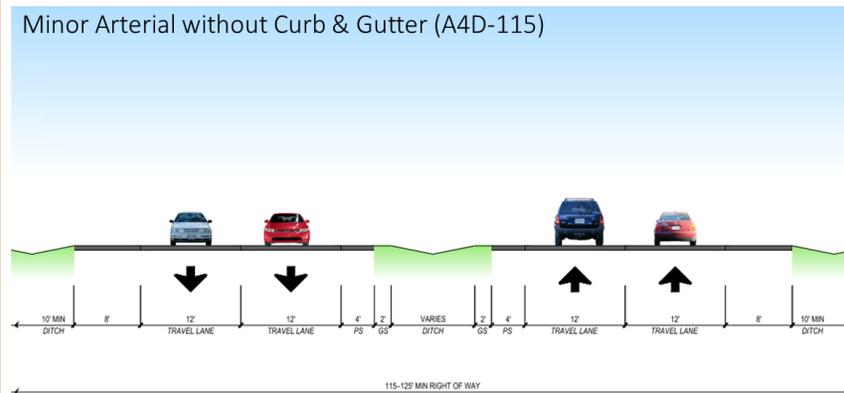
## Geometric Standards

Section Type	Speed	Lane Width	Right Shoulder	Left Shoulder	Bike Lane	Sidewalk	Median Width	Curb & Gutter	Front Slope Width	ROW Requirement
Open Ditches	30 - 60 MPH	12'	8' paved; up to 6' graded	4' paved	NA or provided behind shoulder	5' if provided behind shoulder	Varies	NA	10'	115' - 125'
With Curb & Gutter	30 - 60 MPH	12'	NA	NA	NA or provided behind curb & gutter	5'	16'	2.5'	NA	100'

Functional Classification	Number of Lanes	Speed Threshold	Daily Volume Threshold (VPD)			Hourly Volume Threshold (VPH)		
			LOS A - C	LOS D	LOS E - F	LOS A - C	LOS D	LOS E - F
Minor Arterial	2	30 - 60 MPH	< 11,000	15,100	> 16,000	< 660	905	> 960
Minor Arterial	4	30 - 60 MPH	< 24,300	30,400	> 32,000	< 1,460	1,825	> 1,920

## Typical Sections

Minor Arterial without Curb & Gutter (A4D-115)



Minor Arterial with Curb & Gutter (A4DP-100/A4DPN-100)

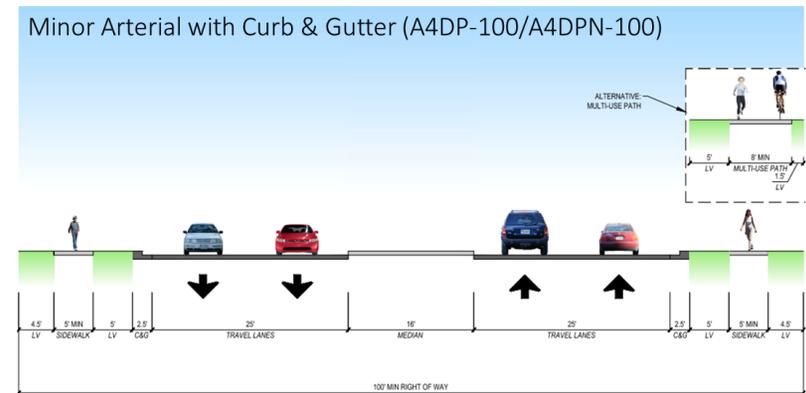


Figure 3-6: Major Collector Information

## Description

Major Collector routes are longer in length; have lower connecting driveway densities; have higher speed limits; are spaced at greater intervals; have higher annual average traffic volumes; and may have more travel lanes than minor collectors may. In rural areas, Major Collectors provide service to any county seat not on an arterial system, to larger towns not directly served by higher systems. Major Collectors also link these places to nearby larger towns and cities or with arterial routes and serve the most important intra-county travel corridor.

Major Collectors in Urban Areas provide land access and traffic circulation within residential neighborhoods, commercial, and industrial areas. These collectors distribute trips from the arterials through the aforementioned areas to their ultimate destination, collect traffic from local streets, and channel it to the arterial system.

## Geometric Standards

Section Type	Speed	Lane Width	Right Shoulder	Left Shoulder	Bike Lane	Sidewalk	Median Width	Curb & Gutter	Front Slope Width	ROW Requirement
Open Ditches	30 - 60 MPH	12'	6' - 8' paved	4' paved	NA or provided behind shoulder	5' if provided behind shoulder	Varies	NA	10'	70' - 125'
With Curb & Gutter	30 - 50 MPH	12'	NA	NA	NA or provided behind curb & gutter	5'	16'	2.5'	NA	90'

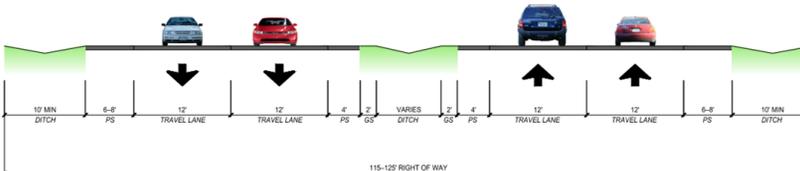
Functional Classification	Number of Lanes	Speed Threshold	Daily Volume Threshold (VPD)			Hourly Volume Threshold (VPH)		
			LOS A - C	LOS D	LOS E - F	LOS A - C	LOS D	LOS E - F
Major Collector	2	30 - 50 MPH	< 9,700	14,600	> 15,500	< 580	875	> 930
Major Collector	4	30 - 50 MPH	< 21,600	29,500	> 31,200	< 1,295	1,770	> 1,870

## Typical Sections

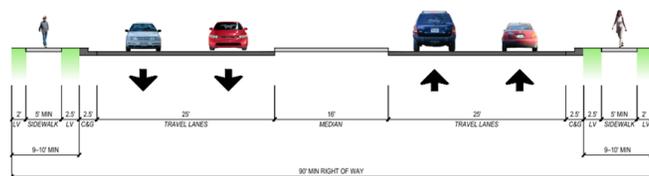
Major Collector without Curb & Gutter (C2UB-70)



Major Collector without Curb & Gutter (C4DB-115)



Major Collector with Curb & Gutter (C4DP-90)



Major Collector with Curb & Gutter (C5UP-90)

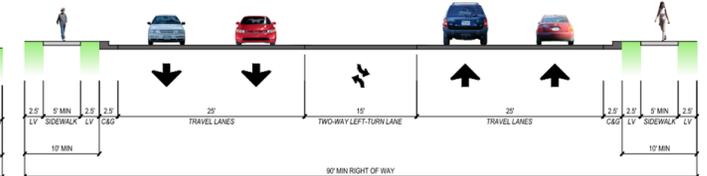


Figure 3-7: Minor Collector Information

## Description

In rural areas, Minor Collectors are spaced at intervals, consistent with population density. Minor Collectors collect traffic from local roads and bring all developed areas within a reasonable distance of a collector road. Minor Collector facilities provide service to the remaining smaller communities and link local traffic generators with their rural hinterland.

In urban areas, Minor Collectors serve both land access and traffic circulation in lower density residential and commercial/industrial areas. Typical operating characteristics of Minor Collectors include lower speeds and fewer signalized intersections. Minor Collectors penetrate residential neighborhoods, but only for a short distance.

## Geometric Standards

Section Type	Speed	Lane Width	Right Shoulder	Left Shoulder	Bike Lane	Sidewalk	Curb & Gutter	Front Slope Width	ROW Requirement
Open Ditches	30 - 50 MPH	12'	5' paved	NA	Shared shoulder	5' if provided behind shoulder	NA	10'	50' - 55'
With Curb & Gutter	30 - 50 MPH	12'	NA	NA	5'	5'	2.5'	NA	55'

Functional Classification	Number of Lanes	Speed Threshold	Daily Volume Threshold (VPD)			Hourly Volume Threshold (VPH)		
			LOS A - C	LOS D	LOS E - F	LOS A - C	LOS D	LOS E - F
Minor Collector	2	30 - 50 MPH	< 7,200	11,200	> 11,900	< 430	670	> 715
Minor Collector	4	30 - 50 MPH	< 16,200	22,700	> 23,900	< 970	1,360	> 1,435

## Typical Sections

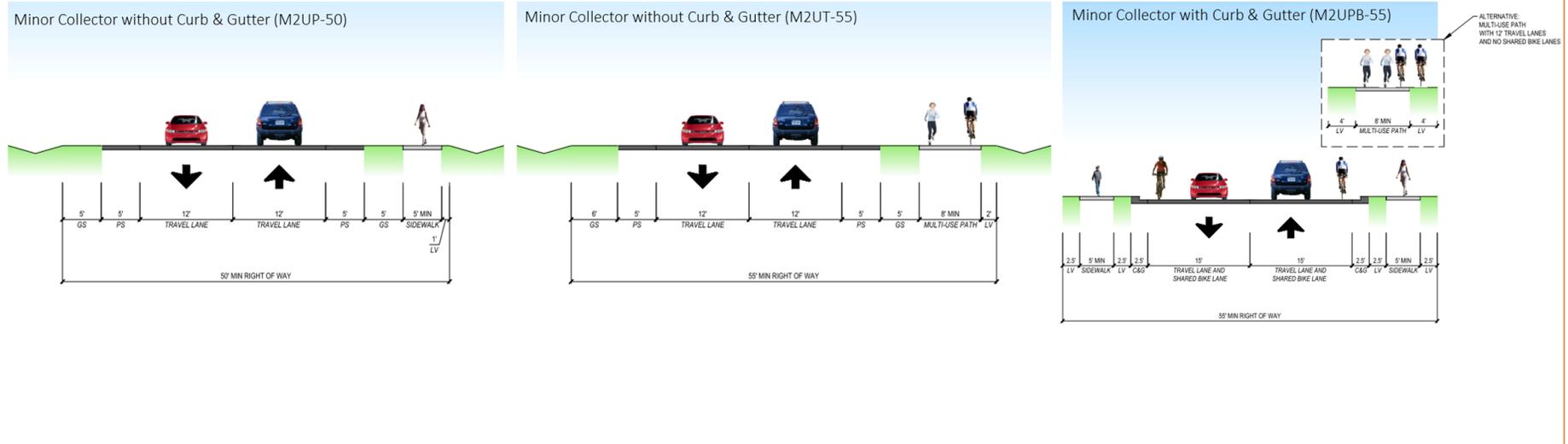


Figure 3-8: Local Information

## Description

Locally classified roads account for the largest percentage of all roadways in terms of mileage. They are not intended for use in long distance travel, except at the origin or destination end of the trip, due to their provision of direct access to abutting land. Bus routes generally do not run on Local Roads.

In rural areas, local roads serve primarily to provide direct access to adjacent land. Local Roads provide service to travel over relatively short distance as compared to collectors or other higher systems. All facilities not classified on one of the higher systems in rural areas are classified as Local Roads.

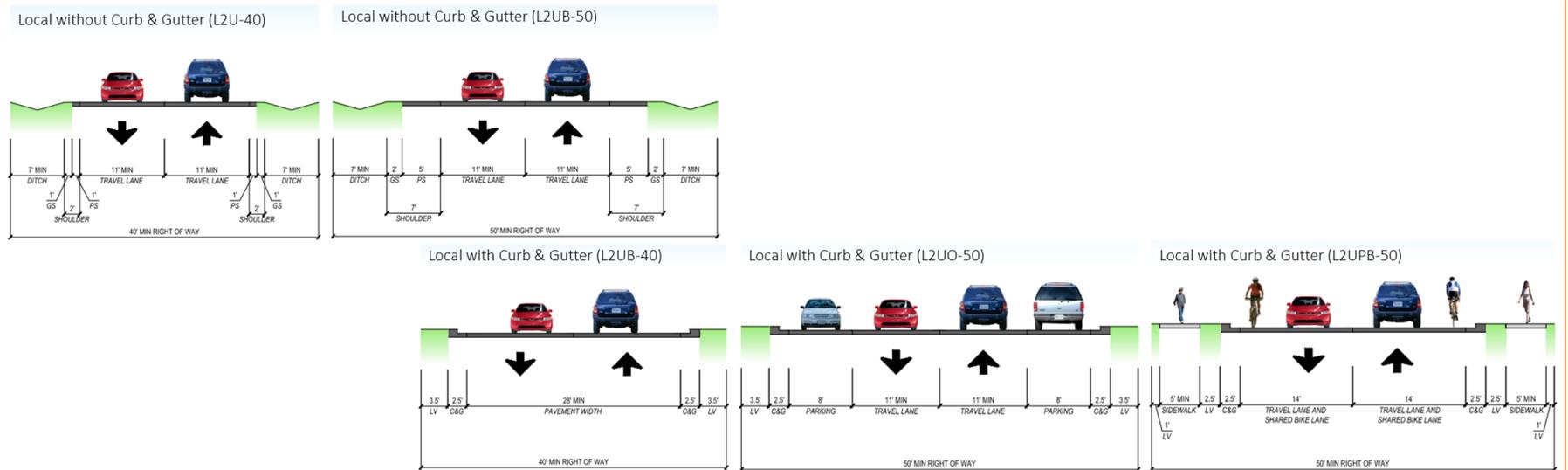
In urban areas, Local Roads serve primarily as direct access to abutting land. Local Roads provide access to higher order systems and all facilities not on one of the higher systems. Through traffic movement is deliberately discouraged for Local Roads in urban areas.

## Geometric Standards

Section Type	Speed	Lane Width	Right Shoulder	Left Shoulder	Bike Lane	Sidewalk	Curb & Gutter	Front Slope Width	ROW Requirement
Open Ditches	20 - 30 MPH	11'	5' paved, 1' graded	NA	Shared shoulder	5' if provided behind shoulder	NA	4'	40' - 50'
With Curb & Gutter	20 - 30 MPH	11'	NA	NA	5'	5'	2.5'	NA	40' - 50'

Functional Classification	Number of Lanes	Speed Threshold	Daily Volume Threshold (VPD)			Hourly Volume Threshold (VPH)		
			LOS A - C	LOS D	LOS E - F	LOS A - C	LOS D	LOS E - F
Local	2	20 - 30 MPH	< 2,400	8,100	> 11,100	< 145	485	> 665

## Typical Sections



### 3.1.6 Access Management

Access management focuses on the location, spacing, and design of entrances, street intersections, median openings, and traffic signals. Each of these creates conflict points where vehicles have to stop or slow down, disrupting the flow of traffic. As the number of conflict points increase, so does traffic congestion and crashes. Management of roadway access is critical to reducing the number of conflict points and their adverse impact on highway operation and public safety. Roads are a public resource and constitute a major investment of public money. Proper access management can maximize this investment.

FHWA defines access management as “the process that provides access to land development while simultaneously preserving the flow of traffic on the surrounding system in terms of safety, capacity, and speed.” According to the VDOT *Access Management Manual*, access management results from a cooperative effort between state and local agencies and private land owners to systematically control the “location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway.” Poor access management directly affects the livability and economic vitality of commercial corridors, discouraging potential customers from entering the area. Corridors with poor access management often have higher crash rates, greater congestion, and more spillover cut-through traffic on adjacent residential streets. Overall, poor access management increases commute times, creates unsafe conditions, lowers fuel efficiency, and increases vehicle emissions.

#### ***Access Management Techniques***

Access management is not a one-size fits all solution to corridor congestion, and a diversity of techniques have already been and should continue to be considered. The following section provides a general overview of various strategies available to manage congestion and its negative effects. A comprehensive access management program includes evaluation methods and supports the efficient and safe use of the corridors for all transportation modes. The access management solutions outlined in this section can be divided into four major categories: site access treatments, corridor median treatments, intersection and minor street treatments, and intelligent transportation systems solutions. An overview of these four major categories is included here.

#### **SITE ACCESS TREATMENTS**

Improvements that reduce the total number of vehicle conflict points should be a key consideration during the approval of development and redevelopment plans. Site access treatments include the following:

- Improved On-Site Traffic Circulation
- Number of Driveways
- Driveway Placement/Relocation
- Cross Access to Adjacent Sites

#### **CORRIDOR MEDIAN TREATMENTS**

Segments of a corridor with sufficient cross access, backdoor access, and onsite circulation may be candidates for median treatments. A median-divided roadway improves traffic flow, reduces congestion, and increases traffic safety – all important goals of access management. While medians restrict some left-turn movements, overall traffic delays are reduced by removing conflicting vehicles from the

mainline. Landscaping and gateway features incorporated into median treatments improve the aesthetics of the corridor. Median Treatments include the following:

- Non-Traversable Median
- Median U-Turn Treatment
- Directional Cross (Left-Over Crossing)
- Left-Turn Storage Bays
- Offset Left-Turn Treatment

#### INTERSECTION AND MINOR STREET TREATMENTS

The operation of signalized intersections can be improved by reducing driver confusion, establishing proper curb radii, and ensuring adequate laneage of minor street approaches. Intersection and Minor Street Treatments include the following:

- Skip Marks (Dotted Line Markings)
- Intersection and Driveway Curb Radii
- Minor Street Approach Improvements (e.g., right-turn storage bays)

#### INTELLIGENT TRANSPORTATION SYSTEM SOLUTIONS

Intelligent Transportation System (ITS) solutions have many potential benefits when implemented in concert with an overall transportation management strategy. ITS solutions use communications and computer technology to manage traffic flow in an effort to reduce crashes, mitigate environmental impacts such as fuel consumption and emissions, and reduce congestion from normal and unexpected delays. Successful systems include a variety of solutions that provide surveillance capabilities, remote control of signal systems components, seamless sharing of traveler information with the public, and even allow emergency vehicles to have priority to proceed safely through signalized intersections.

Intelligent Transportation System components include the following:

- Signalization
- Progressive-Controlled Signal System
- Dynamic Message Signs (DMS)
- Closed Circuit Television Traffic Monitoring
- Emergency Vehicle Preemption

## 4 2040 MTP RECOMMENDATIONS

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### 4.1 Justification

Recommendations for the MTP update were identified based on the following items:

- Adherence to the guiding principles
- Previous Transportation Plans and Traffic Studies recommendations
- Comprehensive Plan recommendations
- Public comment
- Planning Commission and Board of Supervisor comments
- Empirical analysis from an engineering firm

In addition, the recommendations were identified by the deficiencies of the existing operational and safety data as well as the deficiencies identified as part of the future conditions without road improvements analysis. Justification of each recommendation was important to verify the need for the improvement based on safety, operational, connectivity, roadway character, and multi-modal criteria.

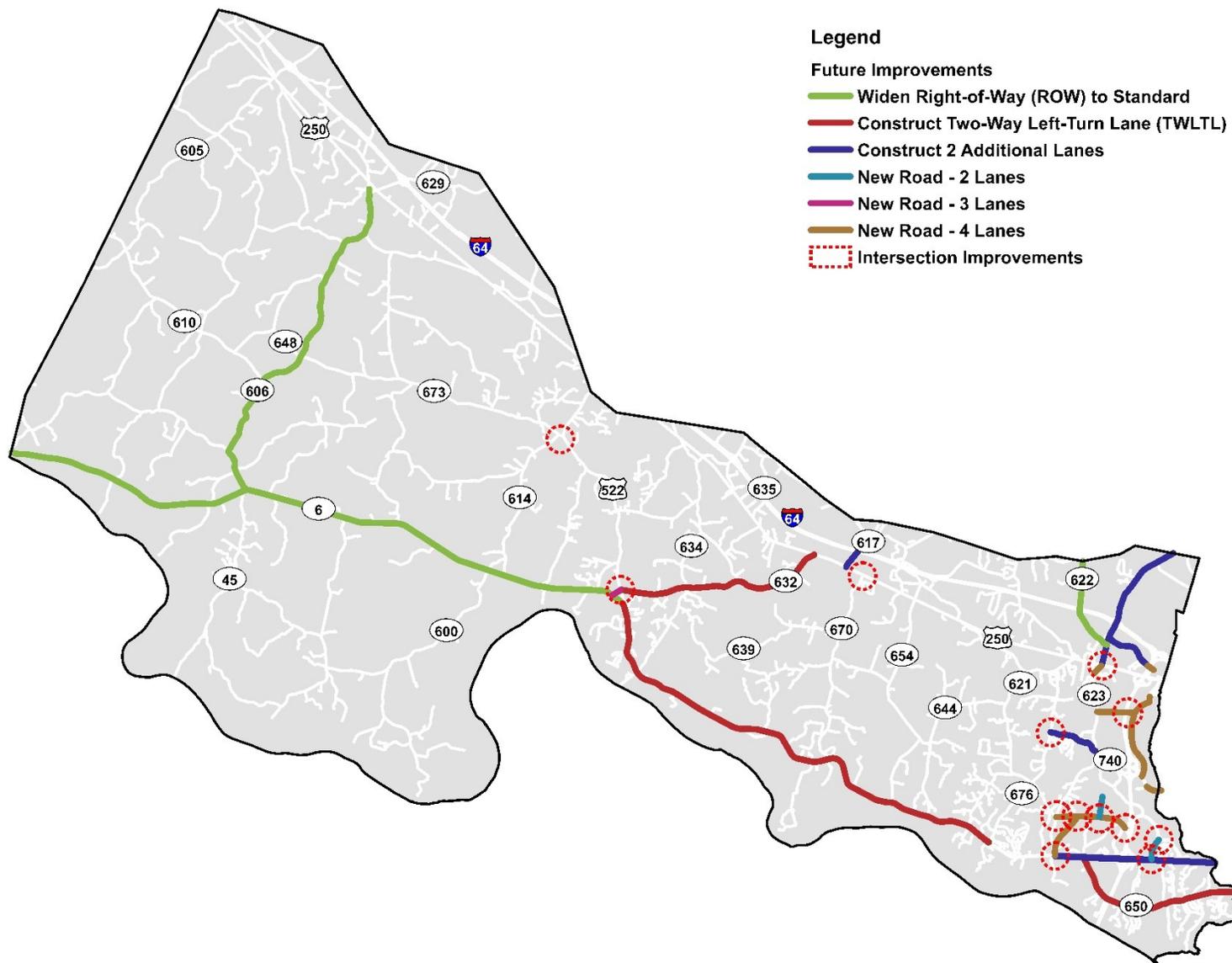
The recommendations described in this section are intended to address one or more of the justification criteria listed in **Table 4-1**. It should also be noted that local connections described in the *Goochland County 2035 Comprehensive Plan* (e.g., Courthouse Land Use Plan Future Transportation links) or additional studies are not precluded from this MTP update. The focus of this MTP update is on the major roadways throughout the County. Refer to **Appendix D** for individual project sheets for each recommendation.

**Table 4-1: Justification Criteria**

Criteria	Icon	Description
Safety		Enhancing travel safety is an important outcome. These segments or locations were identified as hot spot areas from the crash analysis.
Operational		Benefits of less congestion include improved travel time, improved safety, less air pollution, and improved emergency response times. Operational improvements were identified based on operational analysis results to achieve LOS C or higher.
Connectivity		Benefits of connectivity include improved emergency response time, natural disbursement of traffic, options to avoid congested roads and areas, and reduced reliance on major routes. Connections were identified from previous plans, new connections to activity centers, closing gaps in existing network, and improving traffic flow and operations.
Roadway Character		Roadway character improvements refer to changes in functional classification. Functional classification was revised to match the character of the roadway and VDOT guidelines.
Multi-Modal		The option to bike, walk, or take transit is one key to a comprehensive transportation network. A network conducive to multi-modal travel improves physical activity, reduces vehicle usage, reduces air pollution, and improves quality of life. Multi-modal improvements were identified for areas that are appropriate for multi-modal components.

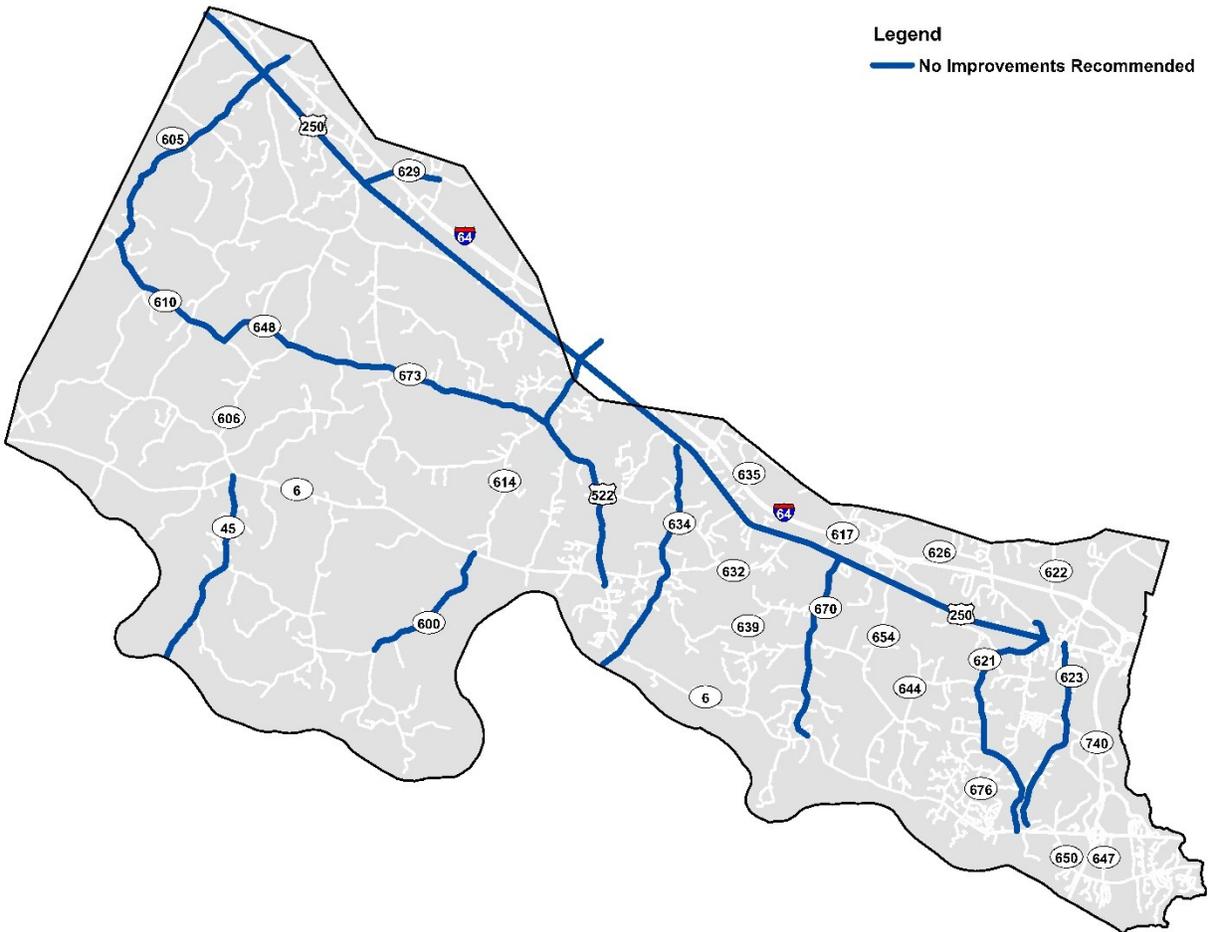
Recommendations were divided into several types: roadways and new connections, intersections, pedestrian and bicycle, and transit improvements. The recommendations are described in the subsequent sections and illustrated **Figure 4-1**.

Figure 4-1: Recommendations Map



**Figure 4-2** provides a graphical representation of projects that were previously identified in the 2005 MTP, that given the change in Goochland County’s economic climate have been removed from this update. The removal of these projects is due to some of the projects have either been completed, funded for construction, or don’t meet the MTP update justification criteria.

**Figure 4-2: Comparison of 2005 MTP to 2040 MTP Update**



## 4.2 Level of Service Guidelines

Preliminary research was conducted into a requirement or an industry standard for “level of service (LOS).” It was revealed that there is not a requirement for LOS thresholds, only guidelines. The FHWA design standards recommend that highway agencies strive to provide the highest LOS practical “as may be fitting to the conditions”. The level of service for Goochland County, given its character, should strive for a level of service C or better.

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### 4.3 Roadways and New Connections

The recommendations in this section are intended to address the operational, safety, and connectivity issues by adding capacity through roadway widening. **Table 4-2** and

Table 4-3: Recommended New Connections list improvements to the thoroughfare network and new connections, respectively. The roadway extensions and connections identified need an additional level of study, as development occurs, to better understand the potential impacts of improvement.

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#### 4.4 Intersections and Interchanges

Recommendations for the future system include improvements to critical intersections and interchanges. These locations were identified from the previous MTP due to operational deficiencies and safety concerns. **Table 4-4** includes the list of intersection and interchange improvements.

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#### 4.5 Pedestrian and Bicycle

As mentioned in the *Goochland County 2035 Comprehensive Plan*, pedestrian treatments are provided in select areas of the County and providing dedicated bicycle lanes for many roads in the County is not feasible due to the rural nature of the roads. However, on a project-by-project basis, the County will incorporate pedestrian and bicycle facilities into project plans where appropriate. Pedestrian and bicycle facility types include; but are not limited to, the following facilities outlined in **Table 4-5**.

To support bicycle ridership in the County, it is recommended that River Road West (Route 6) include a bicycle facility as part of the proposed widening of River Road West from Fluvanna County to Henrico County.

**Table 4-2: Recommended Thoroughfare Improvements**

Roadway	Extents	Improvement	Justification
Blair Road (Route 649)	Patterson Avenue (Route 6) to River Road (Route 650)	<ul style="list-style-type: none"> <li>Update to Major Collector</li> </ul>	 
Pagebrook Road (Route 647)	Patterson Avenue (Route 6) to River Road (Route 650)	<ul style="list-style-type: none"> <li>Update to Minor Collector</li> </ul>	 
Hanover Road (Route 620)	Oilville Road (Route 617) to Hanover County Line	<ul style="list-style-type: none"> <li>Update to Major Collector</li> </ul>	 
Old Fredericksburg Road (Route 629)	Hadensville-Fife Road (Route 606) to Louisa County Line	<ul style="list-style-type: none"> <li>Update to Major Collector</li> </ul>	 
Cardwell Road (Route 670)	Broad Street (US 250) to River Road West (Route 6)	<ul style="list-style-type: none"> <li>Update to Major Collector</li> </ul>	 
Broad Street (US 250)	Route 288 to Henrico County Line	<ul style="list-style-type: none"> <li>Update to Principal Arterial</li> </ul>	  
Perkinsville Road (Route 635)	Louisa County Line to Broad Street (US 250)	<ul style="list-style-type: none"> <li>Update to Minor Collector</li> </ul>	 
Sheppard Town Road (Route 639)	Maidens Road (Route 634) to Cardwell Road (Route 670)	<ul style="list-style-type: none"> <li>Update to Minor Collector</li> </ul>	 
Millers Lane (Route 644)	River Road West (Route 6) to Manakin Road (Route 621)	<ul style="list-style-type: none"> <li>Update to Minor Collector</li> </ul>	
River Road West (Route 6)	Fluvanna County Line to Sandy Hook Road (US 522)	<ul style="list-style-type: none"> <li>Update to Minor Arterial</li> <li>Widen ROW to standard to accommodate wider shoulders</li> <li>Construct multi-modal facility</li> </ul>	     
River Road West (Route 6)	Sandy Hook Road (US 522) to Hermitage Road (Route 676)	<ul style="list-style-type: none"> <li>Update to Minor Arterial</li> <li>Widen to 3-lane roadway (2-lanes with a two-way left-turn lane)</li> <li>Construct multi-modal facility</li> </ul>	    

Table 4-2 Continued: Recommended Thoroughfare Improvements

Roadway	Extents	Improvement	Justification
River Road West (Route 6)	Hermitage Road (Route 676) to Hockett Road (Route 623)	<ul style="list-style-type: none"> <li>Update to Minor Arterial</li> <li>Construct multi-modal facility</li> </ul>	
Patterson Avenue (Route 6)	Hockett Road (Route 623) to Henrico County Line	<ul style="list-style-type: none"> <li>Update to Principal Arterial</li> <li>Widen to 6-lane, divided roadway</li> <li>Construct multi-modal facility</li> </ul>	
Hadensville-Fife Road (Route 606)	Broad Street (US 250) to River Road West (Route 6)	<ul style="list-style-type: none"> <li>Update to Major Collector</li> <li>Widen ROW to standard to accommodate wider shoulders</li> </ul>	
Oilville Road (Route 617)	Broad Street (US 250) to I-64	<ul style="list-style-type: none"> <li>Update to Major Collector</li> <li>Widen to 4-lane, undivided roadway</li> </ul>	
Rockville Road (Route 622)	Hanover County Line to Ashland Road (Route 623)	<ul style="list-style-type: none"> <li>Update to Major Collector</li> <li>Widen ROW to standard to accommodate wider shoulders</li> <li>Construct multi-modal facility</li> </ul>	
Ashland Road (Route 623)	Broad Street (US 250) to I-64	<ul style="list-style-type: none"> <li>Update to Minor Arterial</li> <li>Widen to 4-lane, divided roadway</li> <li>Construct multi-modal facility</li> </ul>	
Ashland Road (Route 623)	I-64 to Hanover County Line	<ul style="list-style-type: none"> <li>Update to Minor Arterial</li> <li>Widen to 4-lane, divided roadway</li> </ul>	
Fairground Road (Route 632)	Broad Street (US 250) to Sandy Hook Road (US 522)	<ul style="list-style-type: none"> <li>Update to Minor Arterial</li> <li>Widen to 3-lane roadway (2-lanes with a two-way left-turn lane)</li> </ul>	
River Road (Route 650)	River Road West (Route 6) to Henrico County Line	<ul style="list-style-type: none"> <li>Widen to 3-lane roadway (2-lanes with a two-way left-turn lane)</li> <li>Construct multi-modal facility</li> </ul>	

Table 4-2 Continued: Recommended Thoroughfare Improvements

Roadway	Extents	Improvement	Justification
Tuckahoe Creek Parkway (Route 740)	Hockett Road (Route 623) to Hermitage Road (Route 676)	<ul style="list-style-type: none"> <li>▪ Widen to 4-lane, divided roadway</li> <li>▪ Construct multi-modal facility</li> </ul>	

Table 4-3: Recommended New Connections

Roadway	Extents	Improvement	Justification
Fairground Road Extension (Route 632)	Sandy Hook Road (US 522) to River Road West (Route 6)	<ul style="list-style-type: none"> <li>Proposed Minor Arterial</li> <li>Construct 3-lane roadway (2-lanes with a two-way left-turn lane)</li> </ul>	
Three Chopt Road and Reconnection	Ashland Road (Route 623) to East of Route 288	<ul style="list-style-type: none"> <li>Proposed Major Collector</li> <li>Construct 4-lane, undivided roadway</li> <li>Connect under Route 288 to Little Tuckahoe Court</li> <li>Construct multi-modal facility</li> </ul>	
Tuckahoe Creek Parkway (Route 740) Extension and Bridge	Route 288 to Ridgefield Parkway (Henrico County)	<ul style="list-style-type: none"> <li>Proposed Major Collector</li> <li>Construct 4-lane, divided roadway</li> </ul>	
Wilkes Ridge Parkway	Existing portion of Wilkes Ridge Parkway to Tuckahoe Creek Parkway Extension (Route 740)	<ul style="list-style-type: none"> <li>Proposed Major Collector</li> <li>Construct 4-lane, divided roadway</li> <li>Construct multi-modal facility</li> </ul>	
West Creek Connection	Patterson Avenue (Route 6) to West Creek Parkway (Route 1250)	<ul style="list-style-type: none"> <li>Proposed Major Collector</li> <li>Construct 2-lane, undivided roadway</li> </ul>	
E-W Connector	Hockett Road (Route 623) to West Creek Parkway (Route 1250)	<ul style="list-style-type: none"> <li>Proposed Major Collector</li> <li>Construct 2-lane, undivided roadway</li> <li>Reserve ROW for 4-lane, divided roadway to accommodate future traffic growth</li> </ul>	
Patterson Avenue Connection	E-W Connector to Patterson Avenue (Route 6)	<ul style="list-style-type: none"> <li>Proposed Major Collector</li> <li>Construct 2-lane, undivided roadway</li> <li>Reserve ROW for 4-lane, divided roadway to accommodate future traffic growth</li> </ul>	

**Table 4-3 Continued: Recommended New Connections**

Roadway	Extents	Improvement	Justification
Future N-S Connector	E-W Connector to Potential Development Roadway	<ul style="list-style-type: none"> <li>Proposed Major Collector</li> <li>Construct 2-lane, undivided roadway</li> </ul>	
Hockett Road Realignment	Hockett Road to Broad Street	<ul style="list-style-type: none"> <li>Construct south leg of Broad Street and Ashland Road intersection</li> <li>Construct multi-modal facility</li> </ul>	
Hockett Road Extension	Hockett Road to Future Wilkes Ridge Parkway Extension	<ul style="list-style-type: none"> <li>Proposed Major Collector</li> <li>Construct south leg of intersection as 4-lane, divided roadway</li> </ul>	

**Table 4-4: Recommended Intersection and Interchange Improvements**

Intersection/Interchange	Improvement	Justification
Whitehall Road at Sandy Hook Road (US 522)	<ul style="list-style-type: none"> <li>Potential location for one-lane roundabout or other improvements</li> <li>Relocate curve in Sandy Hook Road as part of intersection improvements</li> </ul>	
Fairground Road (Route 632) at Sandy Hook Road (US 522)	<ul style="list-style-type: none"> <li>Construct a 1-lane roundabout</li> <li>Construct multi-modal facility</li> </ul>	
Broad Street (US 250) at Cardwell Road (Route 670)	<ul style="list-style-type: none"> <li>Convert intersection to a T-intersection by reconfiguring Cardwell Road (Route 670)</li> </ul>	
Broad Street (US 250) at Hockett Road (Route 623)	<ul style="list-style-type: none"> <li>Construct new connection to Broad Street (US 250) from existing Hockett Road (Route 623) alignment</li> <li>Construct multi-modal facility</li> </ul>	
Hockett Road (Route 623) at River Road West (Route 6)	<ul style="list-style-type: none"> <li>Further analysis of intersection is needed based on construction of new alignment</li> </ul>	
Hermitage Road (Route 676) at Tuckahoe Creek Parkway (Route 740)	<ul style="list-style-type: none"> <li>Construct turn lanes based on widening</li> <li>Construct multi-modal facility</li> </ul>	
Hockett Road (Route 623) at Snead Road/E-W Connector	<ul style="list-style-type: none"> <li>Construct a westbound approach to this intersection as the E-W Connection is constructed</li> </ul>	
E-W Connector at Patterson Avenue Connection	<ul style="list-style-type: none"> <li>Construct a T-intersection as the E-W Connector and Patterson Avenue are constructed</li> </ul>	
E-W Connector at Future N-S Connector	<ul style="list-style-type: none"> <li>Construct a T-intersection as the E-W Connector and N-S Minor Connector are constructed</li> </ul>	

**Table 4-4 Continued: Recommended Intersection and Interchange Improvements**

Intersection	Improvement	Justification
E-W Connector at West Creek Parkway (Route 1250)	<ul style="list-style-type: none"> <li>Construct an eastbound approach to this intersection as the E-W Connector is constructed</li> </ul>	
West Creek Parkway Connection at West Creek Parkway (Route 1250)	<ul style="list-style-type: none"> <li>Construct an eastbound approach to this intersection as the West Creek Parkway Connection is constructed</li> </ul>	
West Creek Parkway Connection at Patterson Avenue (Route 6)	<ul style="list-style-type: none"> <li>Construct a southbound approach to this intersection as the West Creek Parkway Connection is constructed</li> </ul>	
New Route 288 Interchange	<ul style="list-style-type: none"> <li>Conduct study on new interchange on Route 288 between Broad Street and Tuckahoe Creek Parkway</li> </ul>	

Table 4-5: Multi-Modal Facility Types

Facility Type (Example)	Description	Graphical Representation
<p>Shared-Use Path (East End Trail)</p>	<ul style="list-style-type: none"> <li>Fully separated, two-way path</li> <li>Open to pedestrians, bicyclists, and other non-motorized users</li> <li>Typically paved</li> <li>May be parallel to a roadway or along a separate alignment</li> <li>Best used on streets with high motor vehicle traffic speeds or volumes</li> </ul>	
<p>Bicycle Lane (Patterson Avenue)</p>	<ul style="list-style-type: none"> <li>On-road bicyclist facility with roadway space dedicated to bicyclists designated by bike lane pavement markings</li> <li>Generally located to the right of and in the same direction of the motor vehicle travel lane</li> <li>May be placed on one-way streets</li> <li>Best used on streets with low to medium motor vehicle traffic volumes</li> </ul>	
<p>Sidewalk (Ashland Road)</p>	<ul style="list-style-type: none"> <li>Paved walkway for pedestrians</li> <li>Normally separated from vehicular traffic</li> <li>Can be placed on one or both sides of a roadway</li> </ul>	
<p>Paved Shoulder (River Road West)</p>	<ul style="list-style-type: none"> <li>Paved roadway outside edge line available for bicyclist or pedestrian travel</li> <li>Lack of bicycle markings differentiates it from a bike lane</li> <li>Best used on roads with medium motor vehicle traffic volumes where sidewalks are not present</li> </ul>	

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## 4.6 Transit

Based on the *Goochland County 2035 Comprehensive Plan*, bus service to the County should be explored including the expansion of Greater Richmond Transit Company (GRTC) service to West Creek Business Park and Centerville Village. In addition, the County should continue to support the development or expansion of the existing Park and Ride lots.

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## 4.7 Transportation Improvement Analysis (“Build” Analysis)

The aforementioned improvements were modeled using the 2040 RTTDM to identify the effectiveness of the improvements. It is important to note that the improvements being completed or fully built. The most benefit and effectiveness is gained from complete improvements rather than partial improvements. Should only partial improvements (e.g., incomplete links in connectivity, limited widening, etc.) be implemented, then the operational results will be less than proposed or expected.

Similar to **Section 3.1.2**, the improvements were analyzed to identify the future traffic volumes as well as operational results (i.e., LOS and V/C) to determine the viability of the improvement. **Figure 4-3** illustrates the future functional classification. Build volume, LOS, and V/C results are shown in **Figure 4-4**, **Figure 4-5**, and **Figure 4-6**, respectively.

From the Build analysis, the following roadways experience an improvement in operations:

- Fairground Road (Route 632) from River Road West (Route 6) to Broad Street (US 250)
- Hockett Road (Route 623) from Snead Road to River Road West (Route 6)
- Broad Street (US 250) from Manakin Road (Route 621) to Henrico County Line
- Oilville Road (Route 617) from Broad Street (US 250) to Hanover County Line
- Ashland Road (Route 623) from I-64 to Broad Street (US 250)
- Manakin Road (Route 621) from Hermitage Road (Route 676) to Snead Road
- Patterson Avenue (Route 6) from Hockett Road (Route 623) to Henrico County Line
- River Road (Route 650) from Patterson Avenue (Route 6) to Henrico County Line

Figure 4-3: Build Functional Classification Map

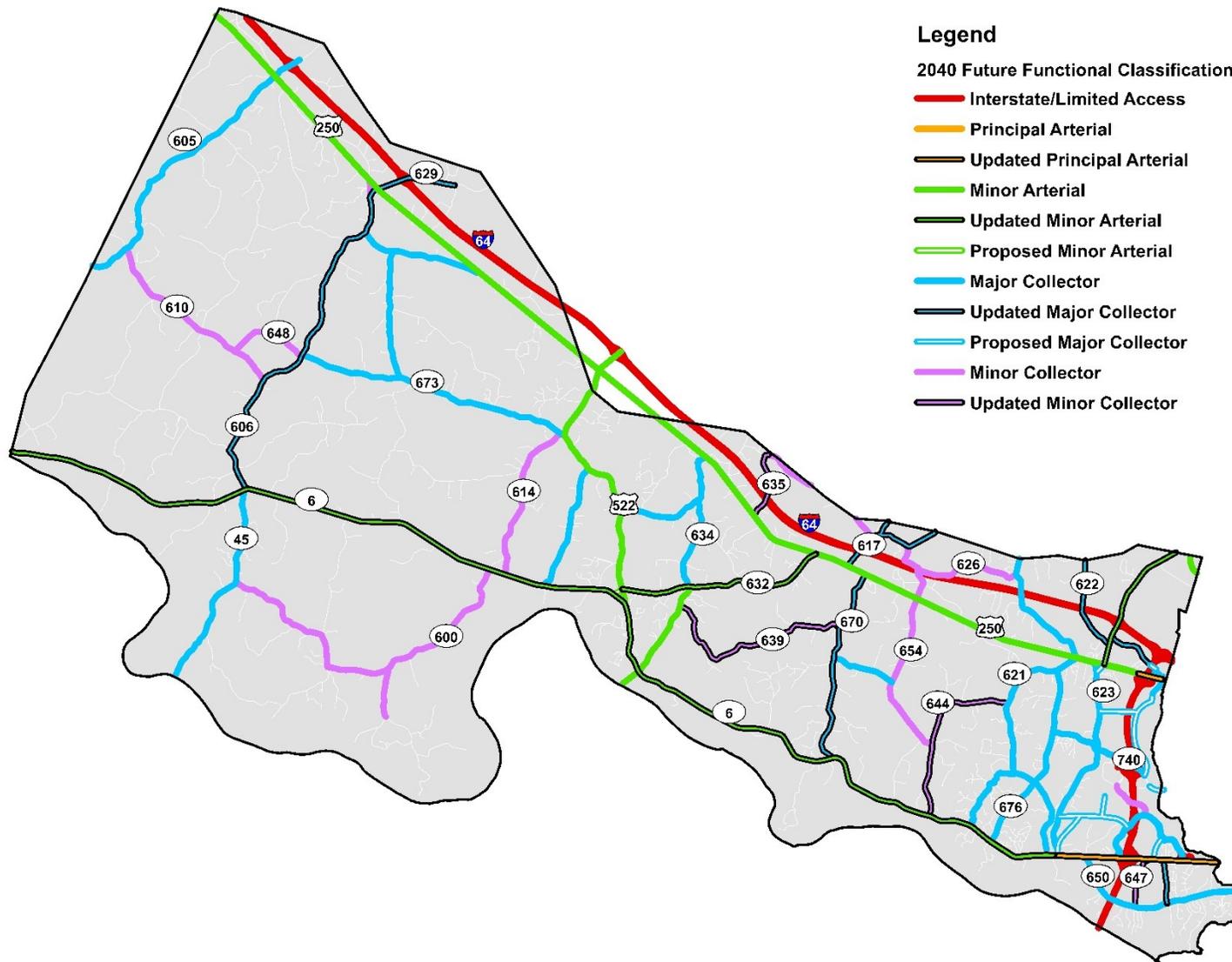


Figure 4-4: Build AADT Map

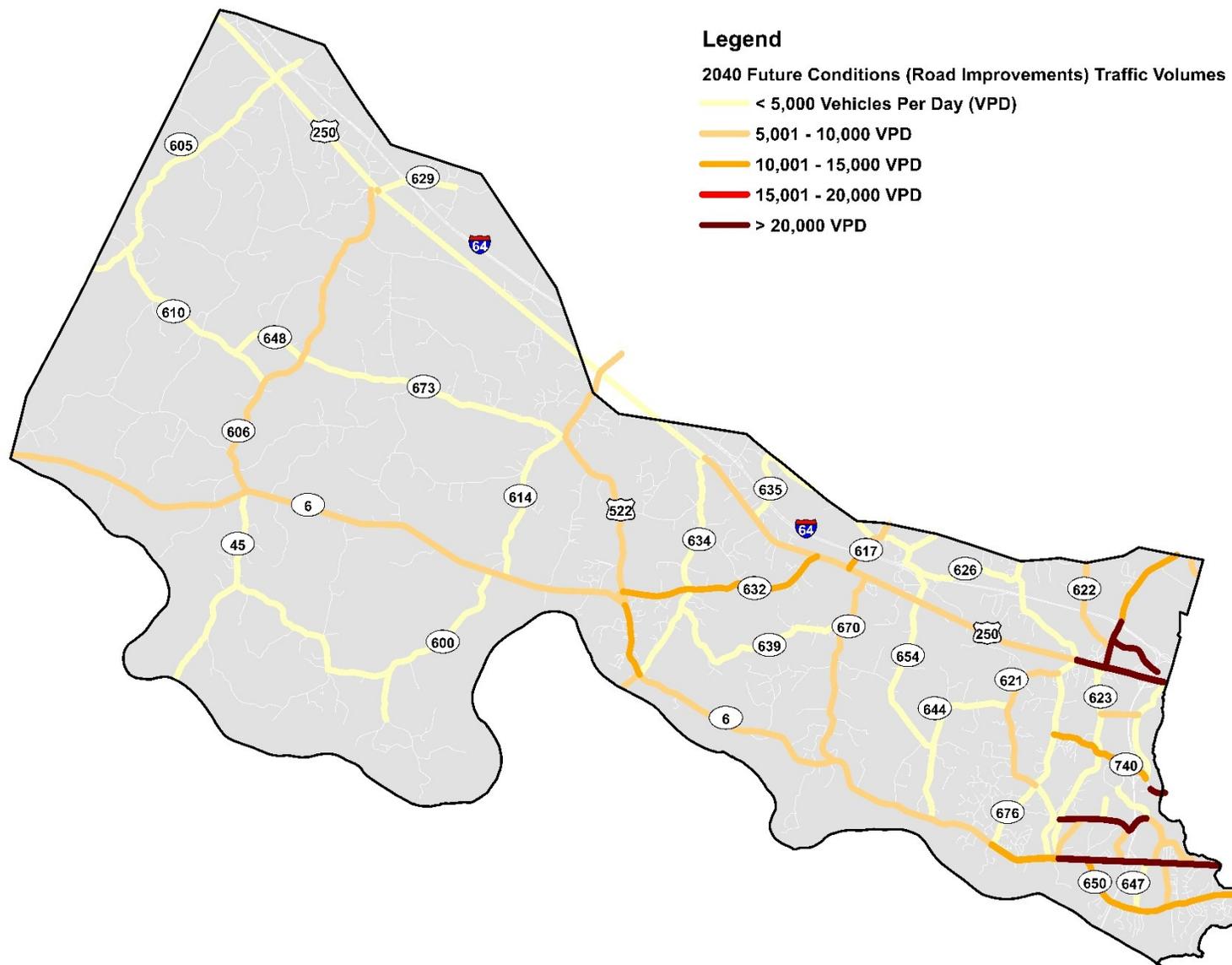


Figure 4-5: Build LOS Map

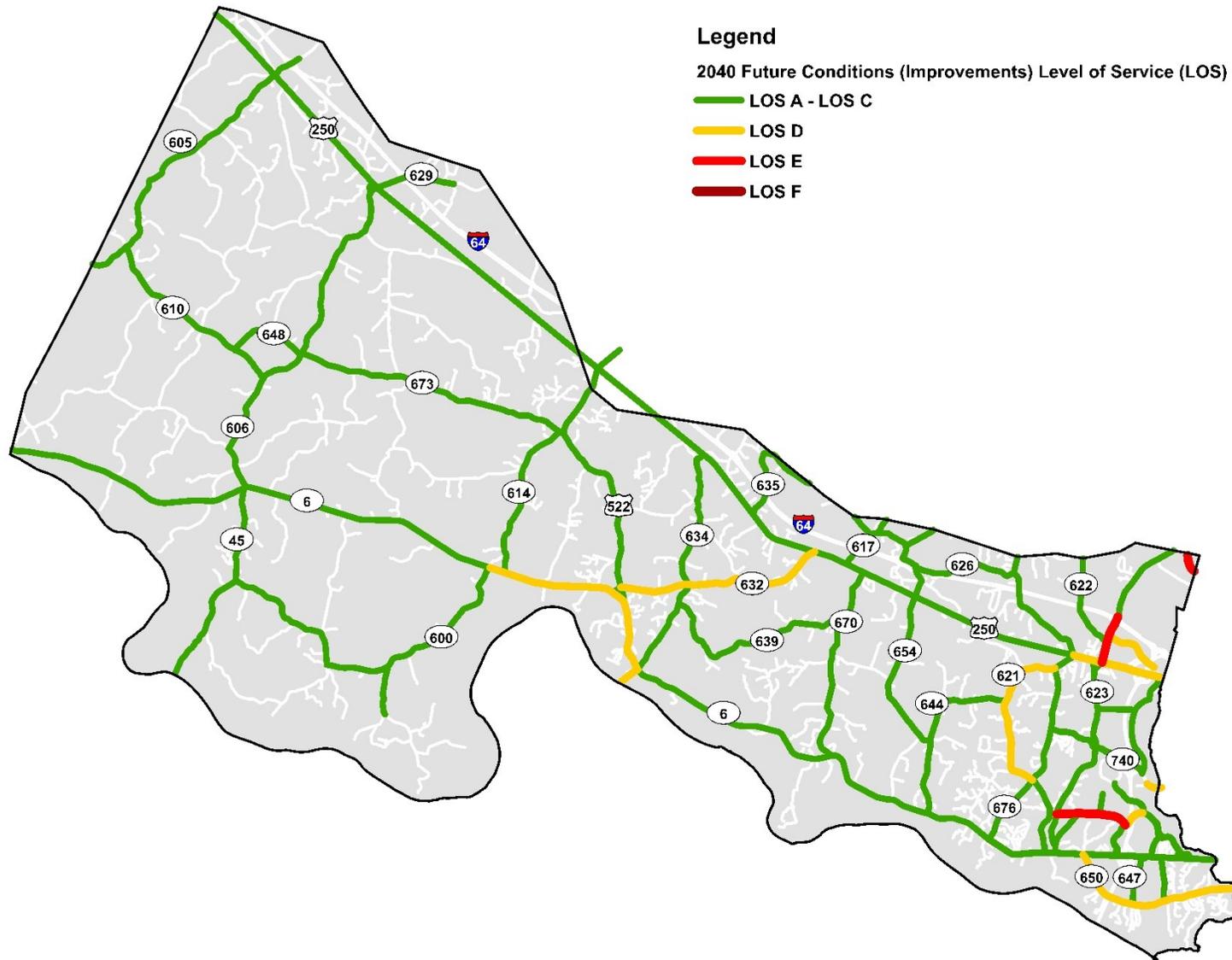
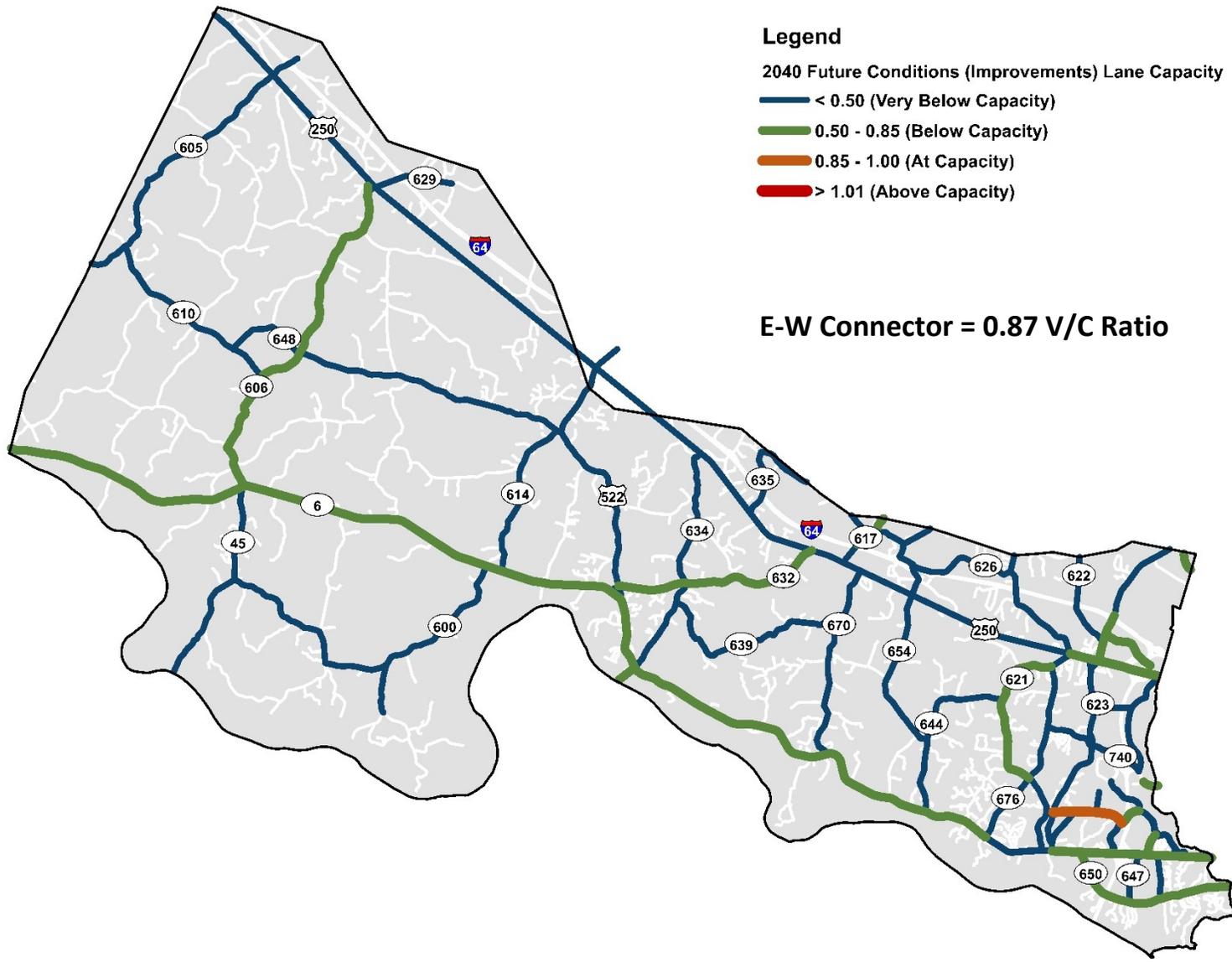


Figure 4-6: Build V/C Map



## 5 ACTION PLAN AND IMPLEMENTATION

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### 5.1 Opinion of Probable Cost

This section will be completed prior to the final report.

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### 5.2 Funding Sources

The funding to implement the recommendations in the MTP update will likely come from a combination of local, state, and federal programs as well as through receipt of development contributions or improvements in lieu of contributions. The following funding sources should be considered for improvement projects identified in this study.

#### 5.2.1 Private Investment

Developer contributions to the funding, construction, and implementation of transportation infrastructure can be utilized to accommodate new or infill growth from their respective properties. This plan serves as a tool for the County to clearly communicate with developers and identify improvements needed to accommodate their future growth.

#### 5.2.2 SMART SCALE

SMART SCALE is a competitive application process to allocate State transportation funds. SMART SCALE allocates funding from the construction District Grants Program (DGP) and High-Priority Projects Program (HPPP) to transportation projects based on a scoring process. The scoring process evaluates, scores and ranks projects based on congestion mitigation, economic development, accessibility, safety, environmental quality, and land use factors. The location of the project determines the weight of each of these scoring factors in the calculation of the total score. For Goochland County, the scoring factors with the highest weight are economic development (25%), accessibility (25%), and safety (25%).

#### 5.2.3 Revenue Sharing

Revenue sharing is a program that provides a dollar for dollar state match to local funds for transportation projects (i.e., Revenue Share funds one-half the cost of a project). Projects eligible for Revenue Sharing funds include construction, reconstruction, improvement, and maintenance projects.

#### 5.2.4 Regional Surface Transportation Program (RSTP)

RSTP provides federal transportation funds are allocated to the regional RRTPO partnership to allocate throughout the region. These funds can be used for a wide variety of highway and transit projects.

#### 5.2.5 Secondary Six-Year Plan (SSYP)

Each locality develops a SSYP for non-competitive direct State allocation. However, this funding has been significantly reduced in recent years.

#### 5.2.6 Highway Safety Improvement Program (HSIP)

HSIP provides funding for improvements that correct or improve safety on a section of roadway or intersection with a high incidence of crashes.

#### 5.2.7 Transportation Alternatives Program (TAP)

The Transportation Alternative Program is intended to help local sponsors fund community-based projects that expand travel choices and enhance the transportation experience by improving the

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cultural, historical, and environmental aspects of the transportation infrastructure. It focuses on providing for pedestrian and bicycle facilities, community improvements, and mitigating negative impacts of the highway system.

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### 5.3 Timeframe and Prioritization

This section will be completed prior to the final report.

Improvements were categorized by timeframe to help determine the high priority projects. Short-term improvements include those projects and studies that are currently undergoing, as shown in **Table 5-1**. Mid-term improvements include those projects and studies that have been allocated funds but have not been started, as shown in *\*It should be noted that these are projects that are either fully funded, partially funded, or privately funded.*

Table 5-2. Lastly, long-term improvements include those recommended as part of this MTP update. Furthermore, the long-term improvements have been prioritized based on the following criteria and are listed in **Table 5-3**.

- Crash analysis – areas that have existing safety concerns
- Existing analysis – existing congestion levels on each facility
- Future analysis – the improvement of congestion levels between 2012 and 2040

Table 5-1: Short-Term Improvements\*

Roadway, Intersection, or Interchange	Estimated Cost	Improvement	Status
Patterson Avenue at West Creek Pkwy	\$900,000	New traffic signal	SMART SCALE – fully funded (ROW)
Broad Street at Route 288 Interchange	\$4,800,000	Major interchange improvements	SMART SCALE – fully funded (ROW)
Fairground Road at Sandy Hook Road	\$3,600,000	Roundabout	SSYP – fully funded (PE)
Fairground Road Extension	\$3,900,000	New road segment	Revenue Share/Local – fully funded
Patterson Avenue at River Road West	\$500,000	Northbound right turn lane	SSYP – Fully funded (PE)
Soldiers Lodge Road	\$35,000	Pave unpaved road	SSYP – Fully funded (PE)
Pink Dogwood Road	\$49,000	Pave unpaved road	SSYP – Fully funded (PE)
Lee Road	\$80,000	Pave unpaved road	SSYP – Fully funded (PE)
Martin Road Extension	\$10,000	Pave unpaved road	SSYP – Fully funded (PE)
Three Chopt Road	\$30,000	Pave unpaved road	SSYP – Fully funded (PE)
Youngstown Road	\$50,000	Pave unpaved road	SSYP – Fully funded (PE)
Maidens Road Bridge	TBD	Bridge deck rehabilitation	SSYP/State – Partially funded
Hockett Road Realignment	TBD	New road segment	RSTP – Partially funded
Wilkes Ridge Parkway Extension	Private	New road segment	Private investment
Four Rings Drive	Private	New road segment	Private investment

*\*It should be noted that these are projects that are either fully funded, partially funded, or privately funded.*

Table 5-2: Mid-Term Improvements

Roadway, Intersection, or Interchange	Estimated Cost	Improvement	Status
I-64 at Ashland Road Interchange	~\$30,00,000	Reconstruct interchange	Proposed SMART SCALE Application
Three Chopt Road Reconnection under Route 288	~\$10,000,000	New bridge/new road segment	Proposed SMART SCALE Application
Route 288 (James River Bridge to Route 6)	~\$15,000,000	New hard shoulder running lane	Proposed SMART SCALE Application
Route 288 (Broad Street to Tuckahoe Creek Parkway)	~\$13,000,000	New lane	Proposed SMART SCALE Application
I-64 at Oilville Road Interchange	~\$2,400,000	New roundabout	Proposed SMART SCALE Application
Route 288 – New Interchange (West Creek Area)	TBD	New interchange	RSTP

Table 5-3: Long-Term Improvements

Roadway	Extents	Priority	Cost
Blair Road (Route 649)	Patterson Avenue (Route 6) to River Road (Route 650)		
Pagebrook Road (Route 647)	Patterson Avenue (Route 6) to River Road (Route 650)		
Hanover Road (Route 620)	Oilville Road (Route 617) to Hanover County Line		
Old Fredericksburg Road (Route 629)	Hadensville-Fife Road (Route 606) to Louisa County Line		
Cardwell Road (Route 670)	Broad Street (US 250) to River Road West (Route 6)		
Broad Street (US 250)	Route 288 to Henrico County Line		
Perkinsville Road (Route 635)	Louisa County Line to Broad Street (US 250)		
Sheppard Town Road (Route 639)	Maidens Road (Route 634) to Cardwell Road (Route 670)		
Millers Lane (Route 644)	River Road West (Route 6) to Manakin Road (Route 621)		
River Road West (Route 6)	Fluvanna County Line to Sandy Hook Road (US 522)		
River Road West (Route 6)	Sandy Hook Road (US 522) to Hermitage Road (Route 676)		
River Road West (Route 6)	Hermitage Road (Route 676) to Hockett Road (Route 623)		
Patterson Avenue (Route 6)	Hockett Road (Route 623) to Henrico County Line		
Hadensville-Fife Road (Route 606)	Broad Street (US 250) to River Road West (Route 6)		
Oilville Road (Route 617)	Broad Street (US 250) to I-64		
Rockville Road (Route 622)	Hanover County Line to Ashland Road (Route 623)		
Ashland Road (Route 623)	Broad Street (US 250) to I-64		

Table 5-3 Continued: Long-Term Improvements

Roadway	Extents	Priority	Cost
Fairground Road (Route 632)	Broad Street (US 250) to Sandy Hook Road (US 522)		
River Road (Route 650)	River Road West (Route 6) to Henrico County Line		
Tuckahoe Creek Parkway (Route 740)	Hockett Road (Route 623) to Hermitage Road (Route 676)		
Fairground Road Extension (Route 632)	Sandy Hook Road (US 522) to River Road West (Route 6)		
Three Chopt Road and Reconnection	Ashland Road (Route 623) to East of Route 288		
Tuckahoe Creek Parkway (Route 740) Extension and Bridge	Route 288 to Ridgefield Parkway (Henrico County)		
Wilkes Ridge Parkway	Existing portion of Wilkes Ridge Parkway to Tuckahoe Creek Parkway Extension (Route 740)		
West Creek Connection	Patterson Avenue (Route 6) to West Creek Parkway (Route 1250)		
E-W Connector	Hockett Road (Route 623) to West Creek Parkway (Route 1250)		
Future N-S Connector	E-W Connector to Potential Development Roadway		
Hockett Road Realignment	Hockett Road to Broad Street		
Hockett Road Extension	Hockett Road to Future Wilkes Ridge Parkway Extension		

**Table 5-3 Continued: Long-Term Improvements**

Intersection/Interchange	Priority	Cost
Whitehall Road at Sandy Hook Road (US 522)		
Fairground Road (Route 632) at Sandy Hook Road (US 522)		
Broad Street (US 250) at Cardwell Road (Route 670)		
Broad Street (US 250) at Hockett Road (Route 623)		
Hockett Road (Route 623) at River Road West (Route 6)		
Hermitage Road (Route 676) at Tuckahoe Creek Parkway (Route 740)		
Hockett Road (Route 623) at Snead Road/E-W Connector		
E-W Connector at Patterson Avenue Connection		
E-W Connector at Future N-S Connector		
E-W Connector at West Creek Parkway (Route 1250)		
West Creek Parkway Connection at West Creek Parkway (Route 1250)		
West Creek Parkway Connection at Patterson Avenue (Route 6)		
New Route 288 Interchange		

## **APPENDIX A: GLOSSARY OF TERMS**

## **APPENDIX B: CAPITAL IMPACT STUDY**

## **APPENDIX C: STANDARDIZED CROSS-SECTIONS**

## **APPENDIX D: PROJECT INFORMATION SHEETS**

All appendices will be completed prior to the final report.