GOOCHLAND COUNTY

Goochland 2040 Major Thoroughfare Plan

November 2018

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1 INTRODUCTION

1.1 What is a Major Thoroughfare Plan?

The *Goochland County 2040 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.

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 localities 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 transportation studies and traffic analysis.

1.3 Why update the Major Thoroughfare Plan?

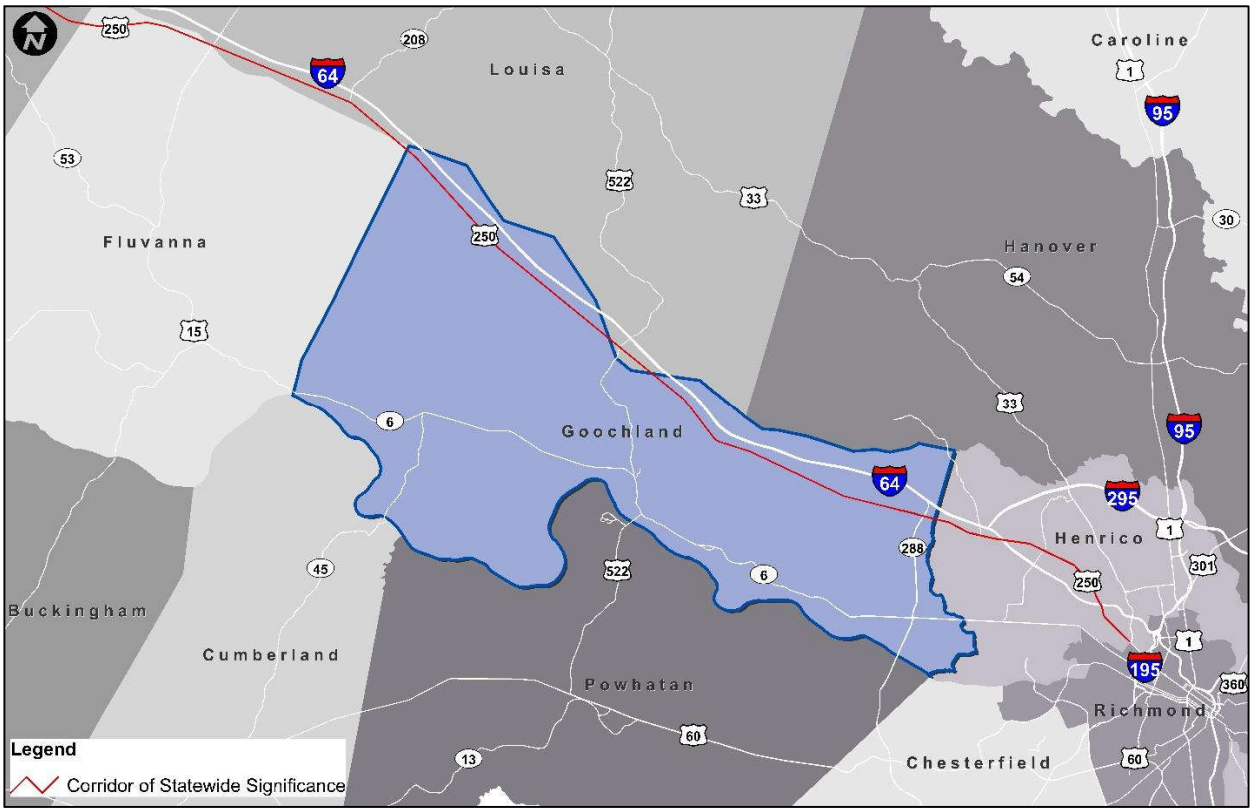
Goochland County's previous MTP was completed in 2005 and defined the County's vision, goals, strategies; however, much has changed in Goochland since that time. There has been an increase in employment and new development within the County and in neighboring counties driving the need for the County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

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 Road (US 250), Patterson Avenue/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.

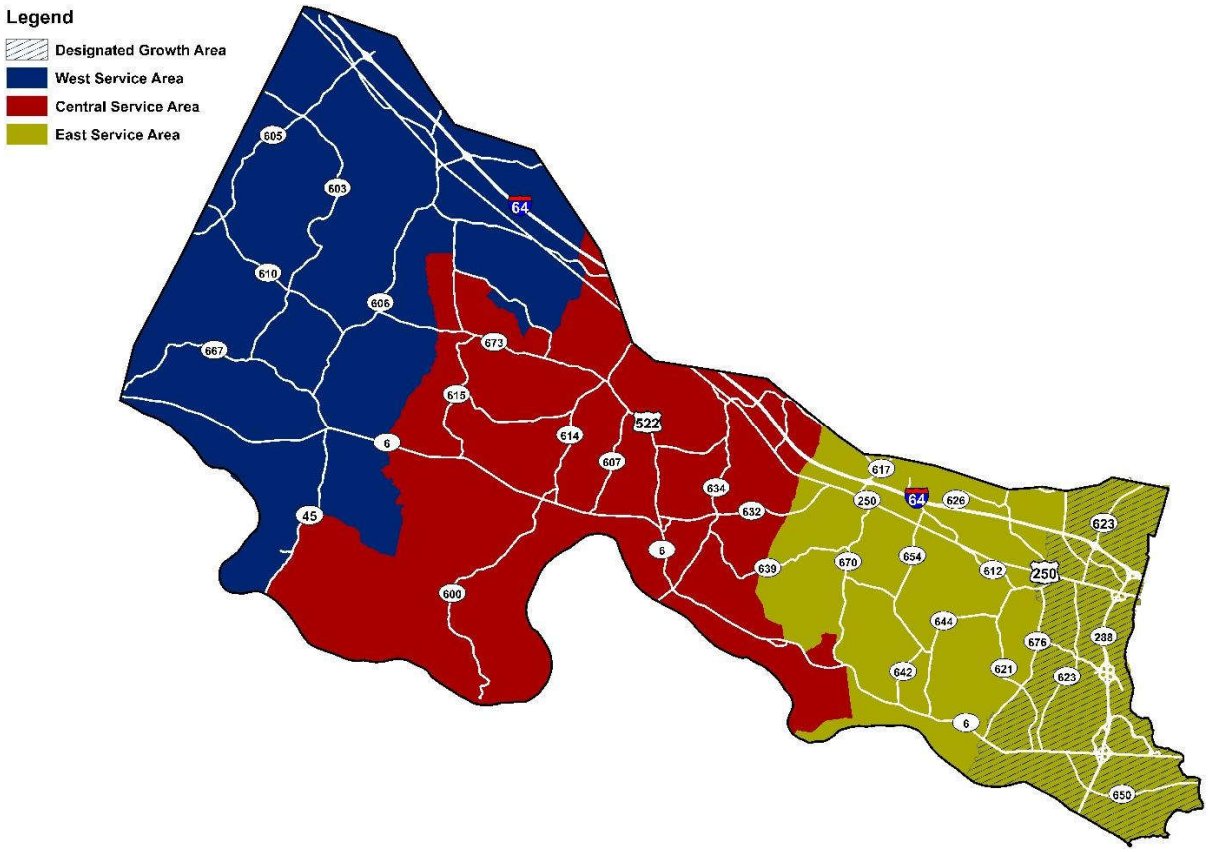
Figure 1-1: Study Area



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.

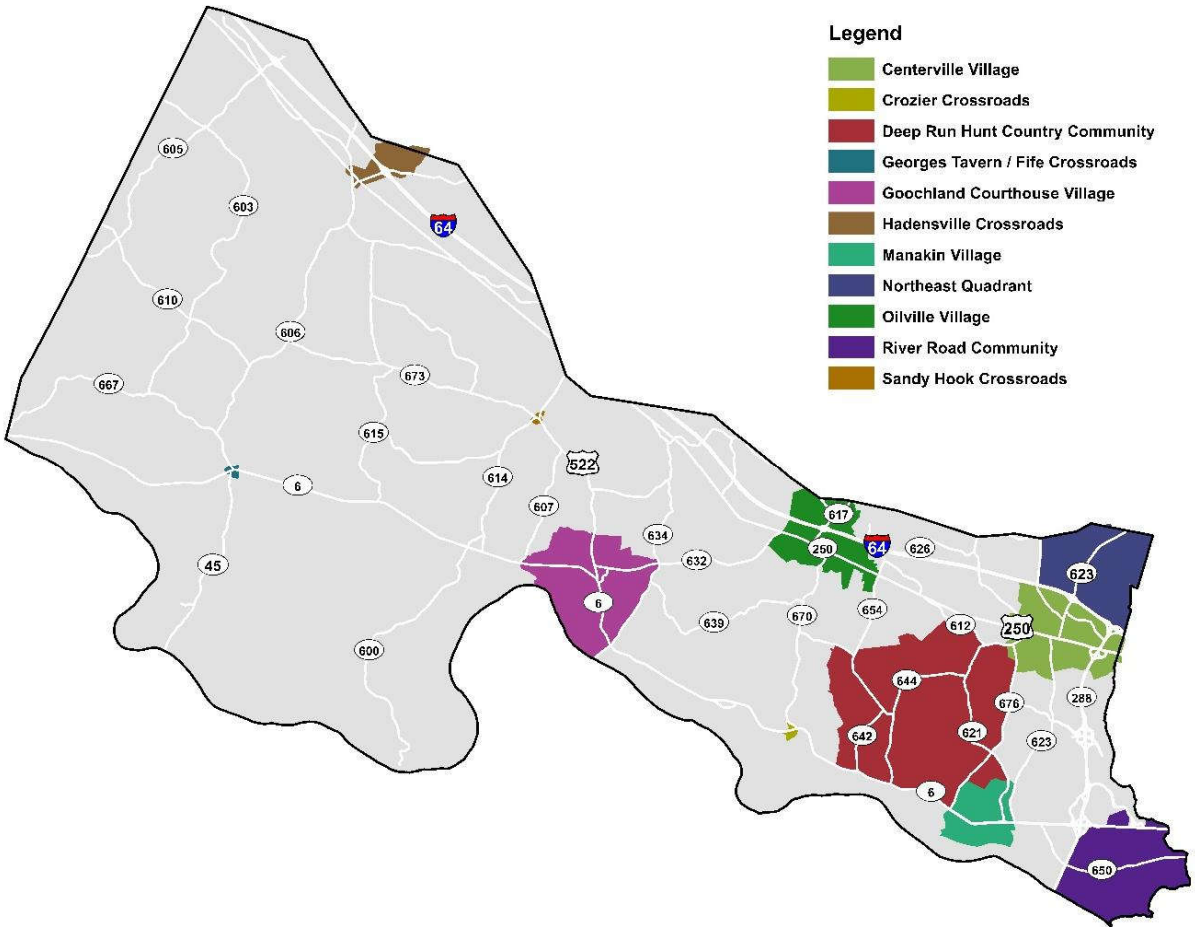
Figure 1-2: Service Areas



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. 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 Hunt Country. Both communities allow for limited growth but development must conform to the established community character. Growth is encouraged and concentrated in the Major 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 Summary

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 MTP characterizes current and future transportation needs, and

documents multi-modal transportation strategies to address needs through the year 2040. For the Goochland County MTP, the following process was conducted:

1. Develop Guiding Principles
2. Public Engagement
3. Compile Existing Conditions Information
4. Analyze Existing Conditions
5. Project Future Traffic Volumes
6. Analyze Future Growth with No Transportation Improvements Conditions
7. Develop Transportation Improvements
8. Analyze Future Growth with Transportation Improvements Conditions
9. Develop Action Plan and Implementation

The update process began with development of a set of guiding principles to provide guidance for creating a coordinated set of future transportation improvements. From the beginning to the end of the MTP process, the public was engaged at key points to provide input and comment on plan components. The next step included an analysis of socioeconomic conditions (e.g., population, households, employment), a review of existing transportation plans and policies, and an assessment of the current transportation network. After the analysis of the existing conditions, future traffic volumes were projected for 2040 utilizing the land use assumptions from the *Goochland County 2035 Comprehensive Plan*. Future traffic volumes were analyzed without transportation improvements to identify deficiencies in the transportation network throughout the County. Utilizing deficiencies in the transportation network determined from the existing and future conditions analysis, transportation improvements for roadways, new connections, intersections, pedestrian/bicycle facilities, and transit facilities were determined. These transportation improvements were analyzed under future conditions to verify the need for the improvement based on safety, operational, connectivity, roadway character, and multi-modal criteria. Lastly, cost estimations and typical sections were developed for each of the transportation improvements to supplement the development of the action plan. Each of the MTP processes are discussed in greater detail in the subsequent sections.

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 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
- Provide pedestrian facilities with new development
- Promote development designs that are supportive of safe multi-modal transportation.

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.

The MTP included two formal opportunities (i.e. public meetings) for public engagement to capture feedback from a cross-section of those who live, work, or recreate within Goochland as well as to listen to their concerns and incorporate their vision for County roadways into the MTP. Additional opportunities for public engagement included the Board of Supervisor and Planning Commission meetings.

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 Road); 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

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. **Table 2-1** displays the socioeconomic data under 2017 conditions from the *Goochland County Capital Impacts Study* for each Service Area.

Table 2-1 shows that the East Service Area contains the highest population and employment throughout the County. Development efforts are anticipated to be focused in the East Service Area but will also occur within the designated Village and Communities throughout the County.

Table 2-1: Goochland County 2017 Socioeconomic Data

2017 Socioeconomic Data	
Population	
West Service Area	4,038
Central Service Area	7,184
East Service Area	11,235
Total	***22,457***
Employment	
West Service Area	704
Central Service Area	1,795
East Service Area	13,115
Total	***15,614***

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. The future (2040) traffic growth projections are detailed in **Section 3.1.1**.

2.2 Components of Transportation Analysis

2.2.1 Richmond Tri-Cities Travel Demand Model

Future traffic conditions were projected and evaluated at the countywide level utilizing the Richmond Tri-Cities Travel Demand Model (RTTDM). 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)

Under the base (2012) model conditions, functional classification was determined by the RRTPO and traffic volumes were from the 2012 collected traffic data. The functional classification and traffic volumes were used to determine the daily LOS and V/C ratio for each of the MTP roadways throughout Goochland County.

It should be noted that the RTTDM will be updated as part of the update of the regional transportation plan (*plan2040*) scheduled for completion in 2021.

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

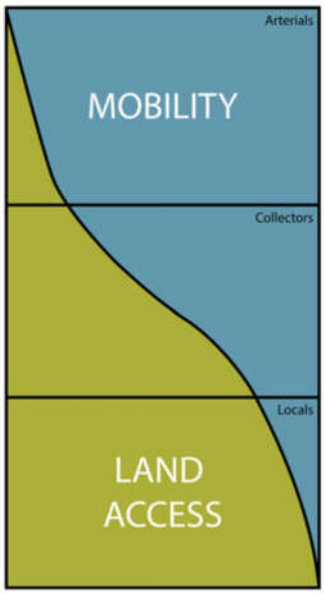
The main components of the "functional usage" of a roadway are mobility and accessibility. Travel can be logically related to the roadway's ability to access land versus providing mobility through an area. **Figure 2-1** illustrates the relationship between traffic mobility and land access. For example, 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 2-2** 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.

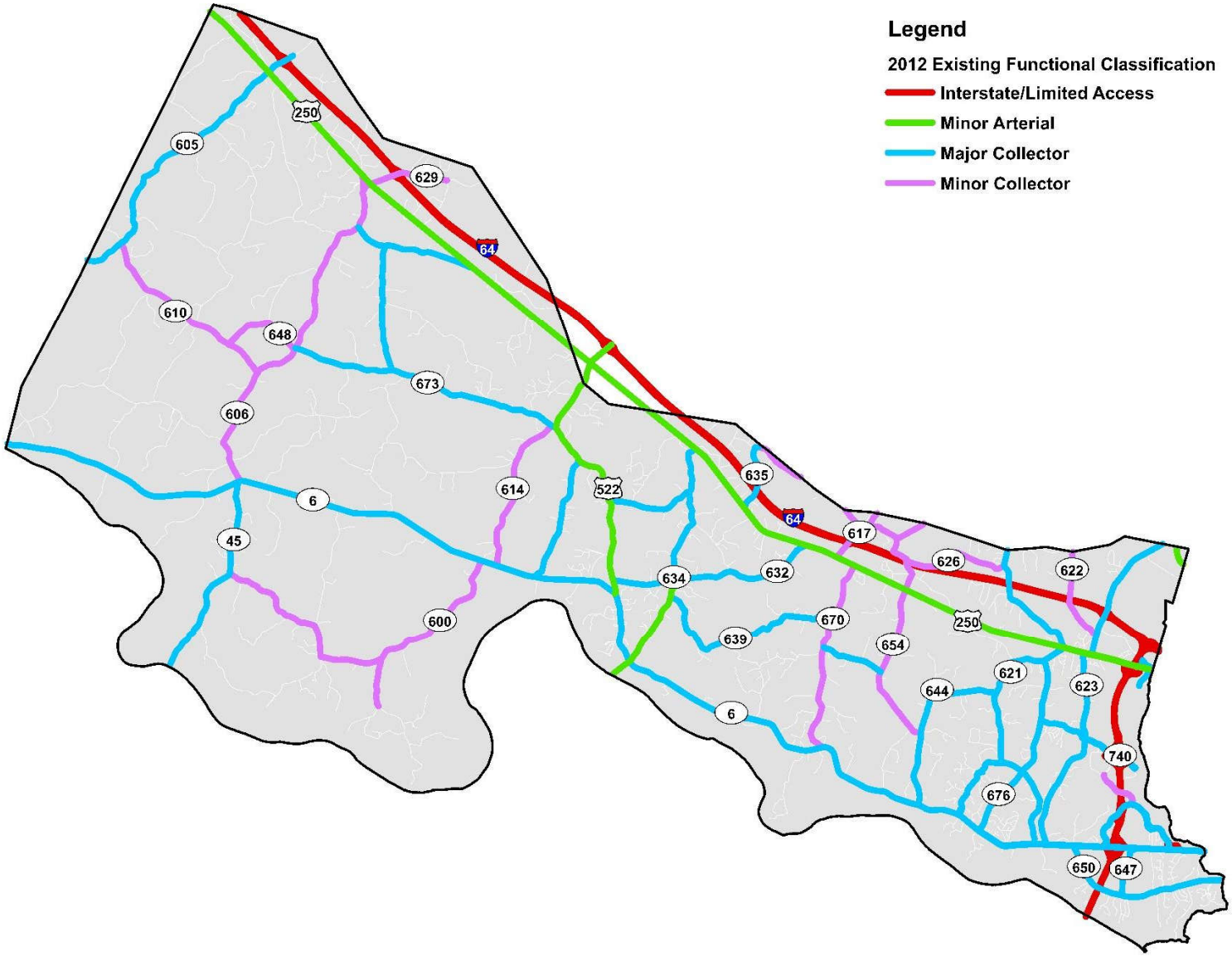
Table 2-2: Functional Classification Description for Rural Areas

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

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

Functional Classification	Description	Local Examples	Graphical Representation
Major Collector	▪ Serves shorter trip lengths ▪ Provides service to any County area not on an arterial system ▪ Serves as the most important intra-county travel corridors ▪ Distributes traffic from arterials to their ultimate destination ▪ Collects traffic from local streets and channels it to the arterial system	▪ River Road West ▪ Fairground Road ▪ Hockett Road *(Pictured)*	
Minor Collector	▪ Wide range of physical characteristics, some of which can be attributed to the neighborhoods in which they exist ▪ Provides good connectivity ▪ Collects traffic from local road and bring all developed areas within a reasonable distance of a collector road ▪ Service to smaller communities ▪ Links local traffic generators with their rural surroundings	▪ Hadensville-Fife Road ▪ Rockville Road ▪ Oilville Road *(Pictured)*	
Local	▪ Account for largest percentage of all roadways in terms of mileage ▪ Provides greater access, especially to adjacent land uses, and the least amount of mobility ▪ Typically connect to one another or to collector streets ▪ Serves short distances of travel	▪ Hickory Hill Road ▪ Greenbriar Branch Drive *(Pictured)*	

Figure 2-2: Existing Functional Classification Map



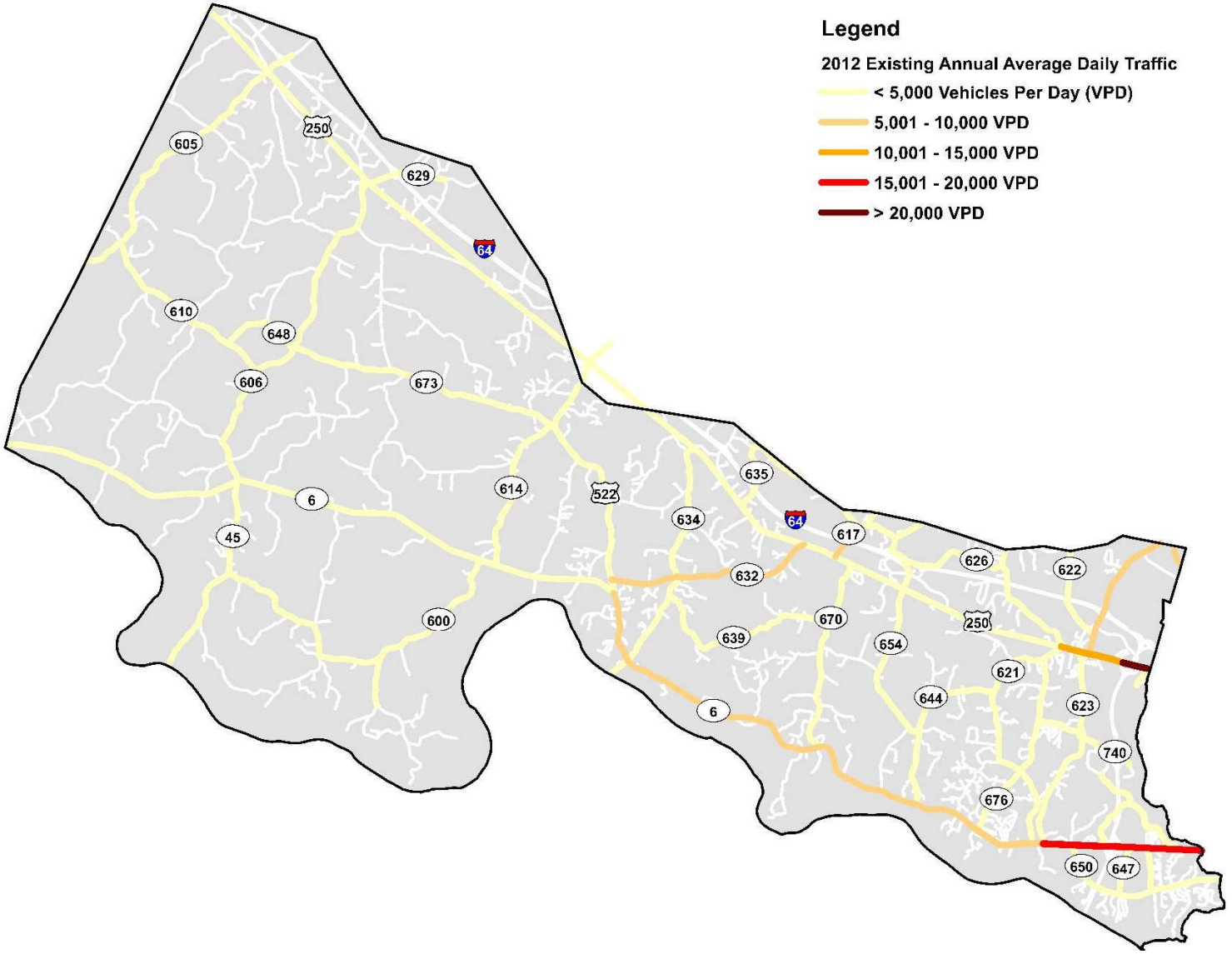
2.2.3 Annual Average Daily Traffic

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 2012 traffic data from VDOT. For example, the 2012 VDOT traffic volume for Rockville Road was 2,200; however, the 2012 RTTDM traffic volume output was 1,900. This identifies that the RTTDM underestimated traffic volumes on Rockville Road. Therefore, 2012 VDOT traffic volumes were used to perform the existing (2012) conditions analyses.

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. In 2012, Goochland County experienced approximately 194,000 vehicles per day (vpd) throughout the entire County.

Figure 2-3: Existing AADT Map



2.2.4 Operational Analysis

Level of Service

Level of service (LOS) 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 MTP analyzes LOS based on daily traffic volumes. However, LOS analysis is often provided at the project level with a Traffic Impact Analysis which typically focuses on peak hour traffic only.

The LOS range from LOS A (least congested) to LOS F (most congested). **Table 2-3** 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 2-3: Level of Service (LOS) Description

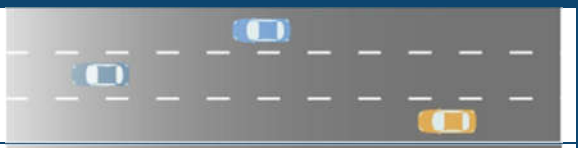
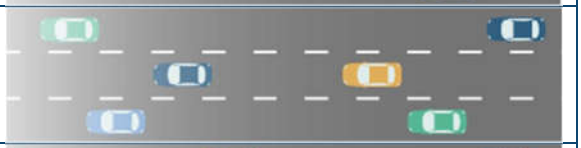
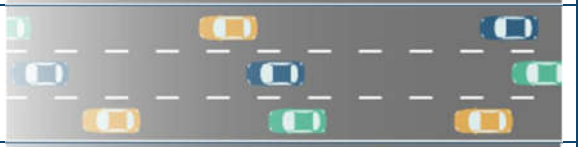
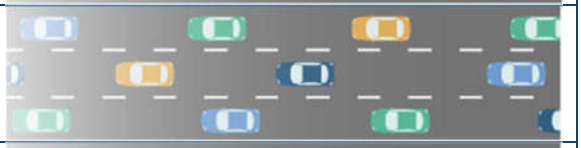
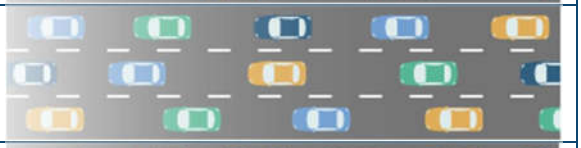
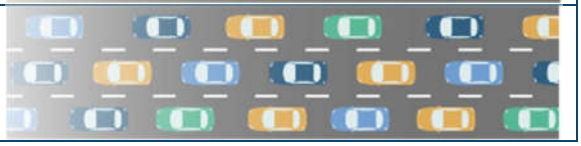
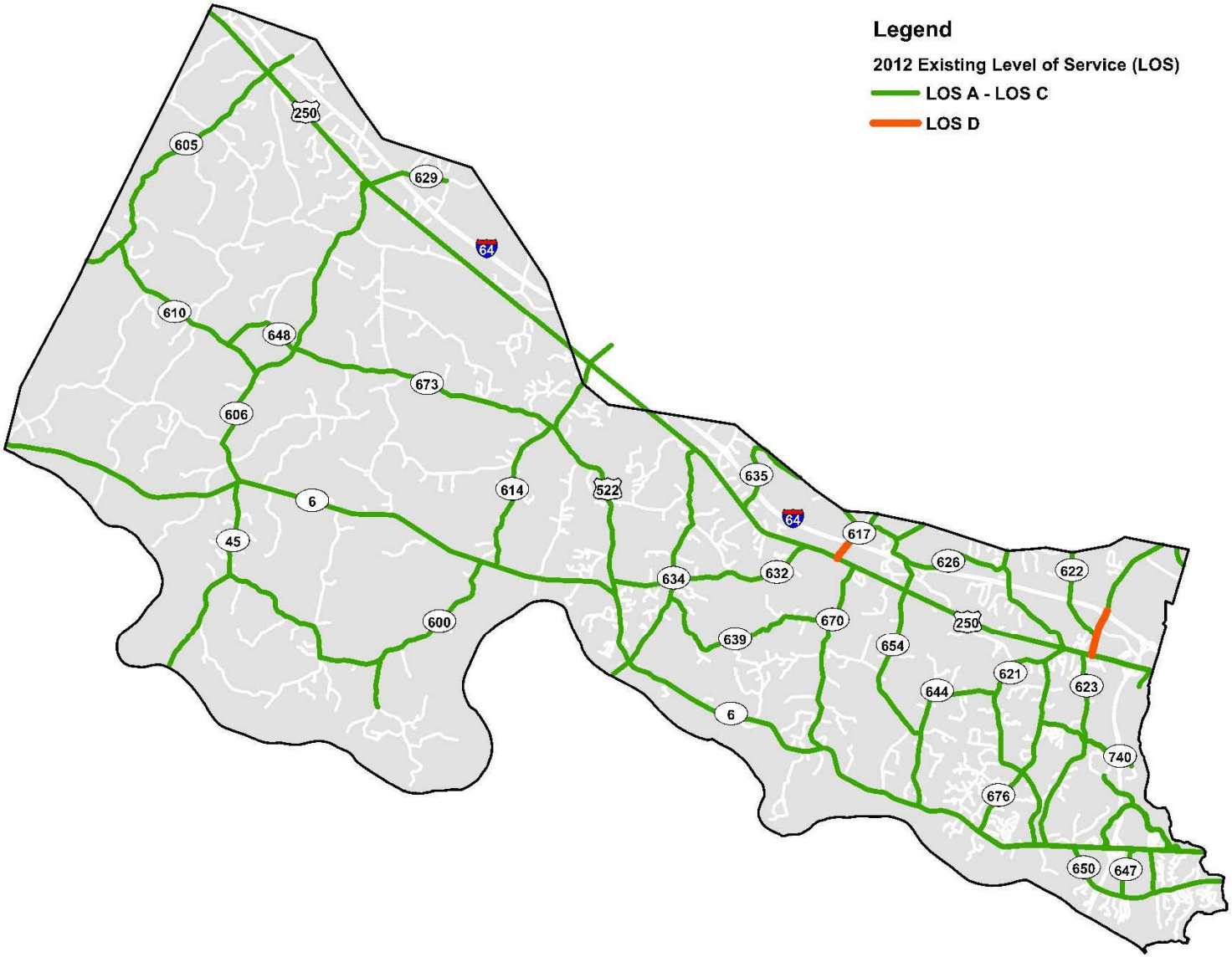
Level of Service (LOS)	General Operating Conditions	Graphical Representation
A	Free Flow	
B	Reasonably Free Flow	
C	Stable Flow	
D	Approaching Unstable Flow	
E	Unstable Flow	
F	Forced or Breakdown Flow	

Figure 2-4: Existing LOS Map



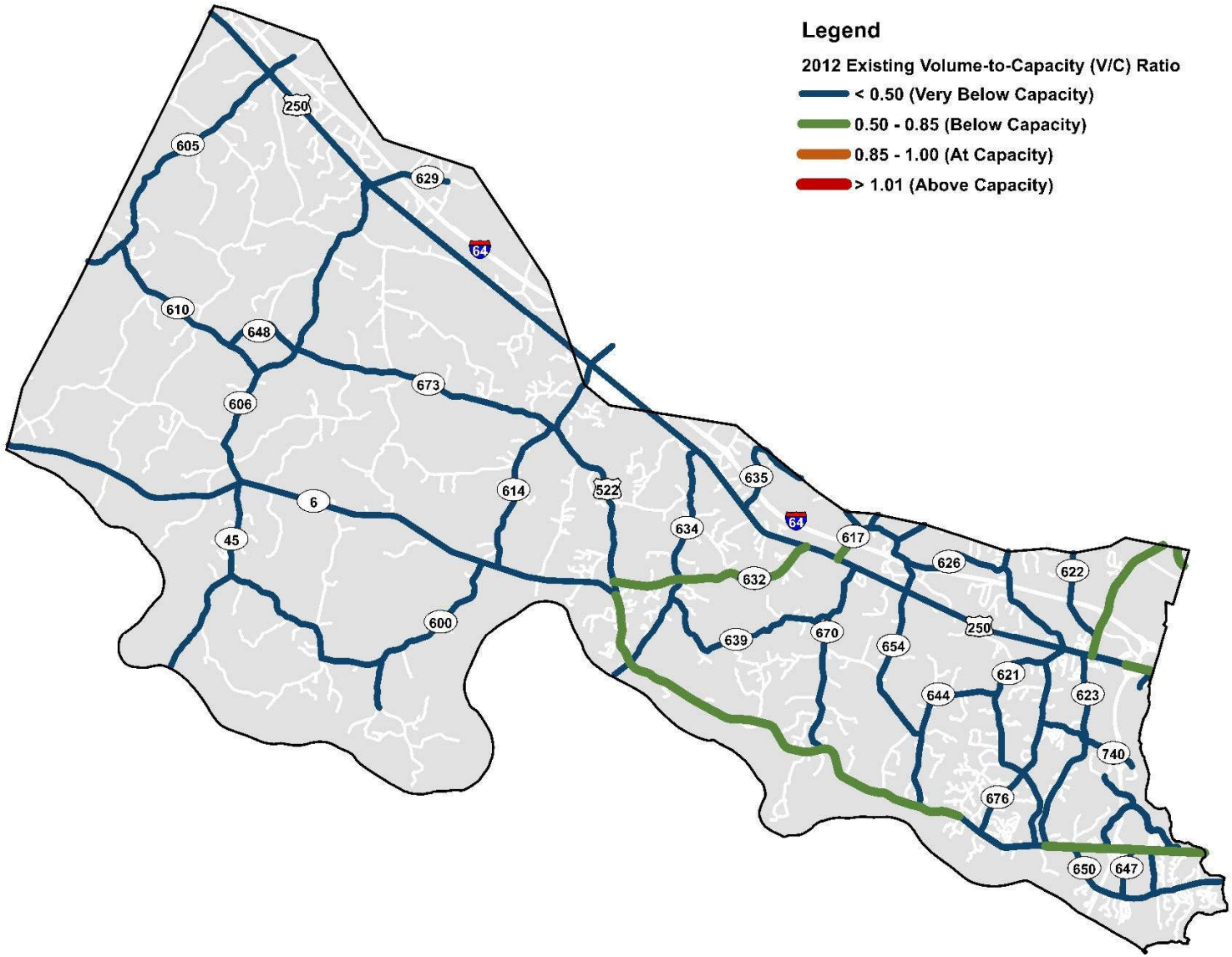
Volume-to-Capacity

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 2-4** 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 2-4: Volume-to-Capacity Description

Category	Description
Very Below Capacity V/C < 0.50	A roadway with a V/C less than 0.50 typical operates with free-flowing conditions and is underutilizing available roadway capacity.
Below Capacity 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.
At Capacity 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.
Above Capacity 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 maintained by the Department of Motor Vehicles (DMV) 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

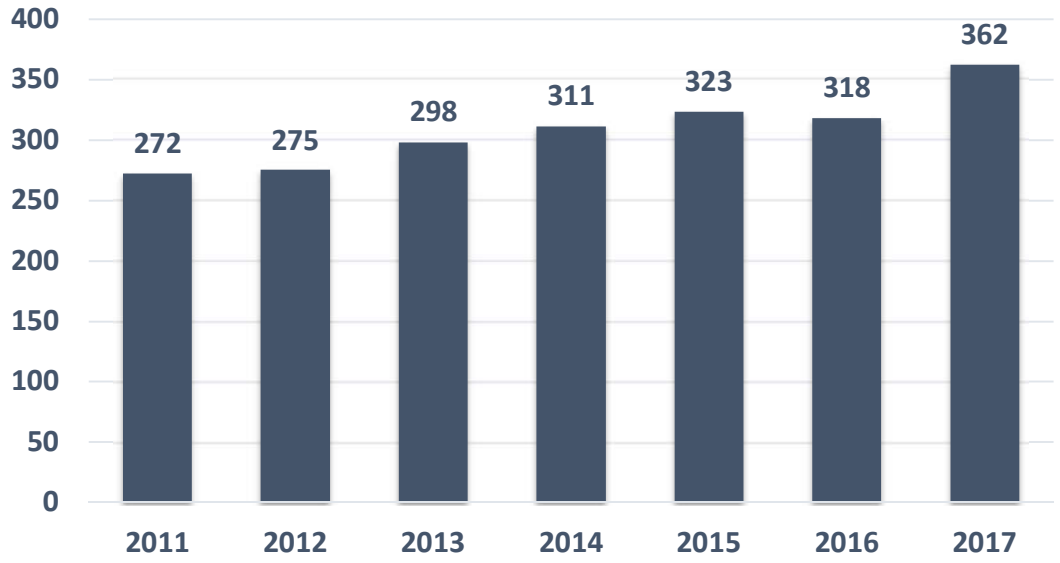


Figure 2-7: Severity of Crashes

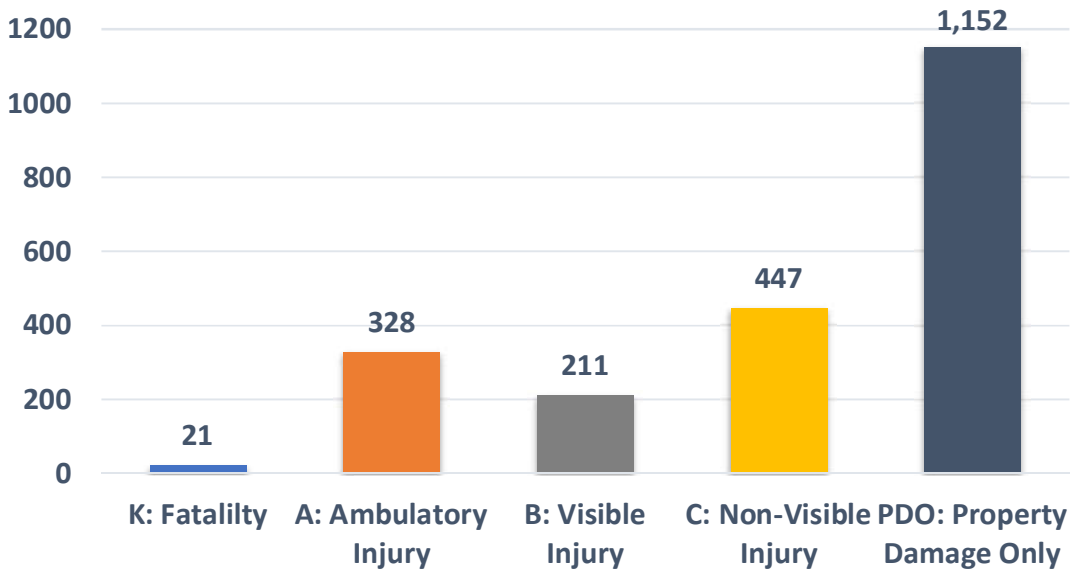
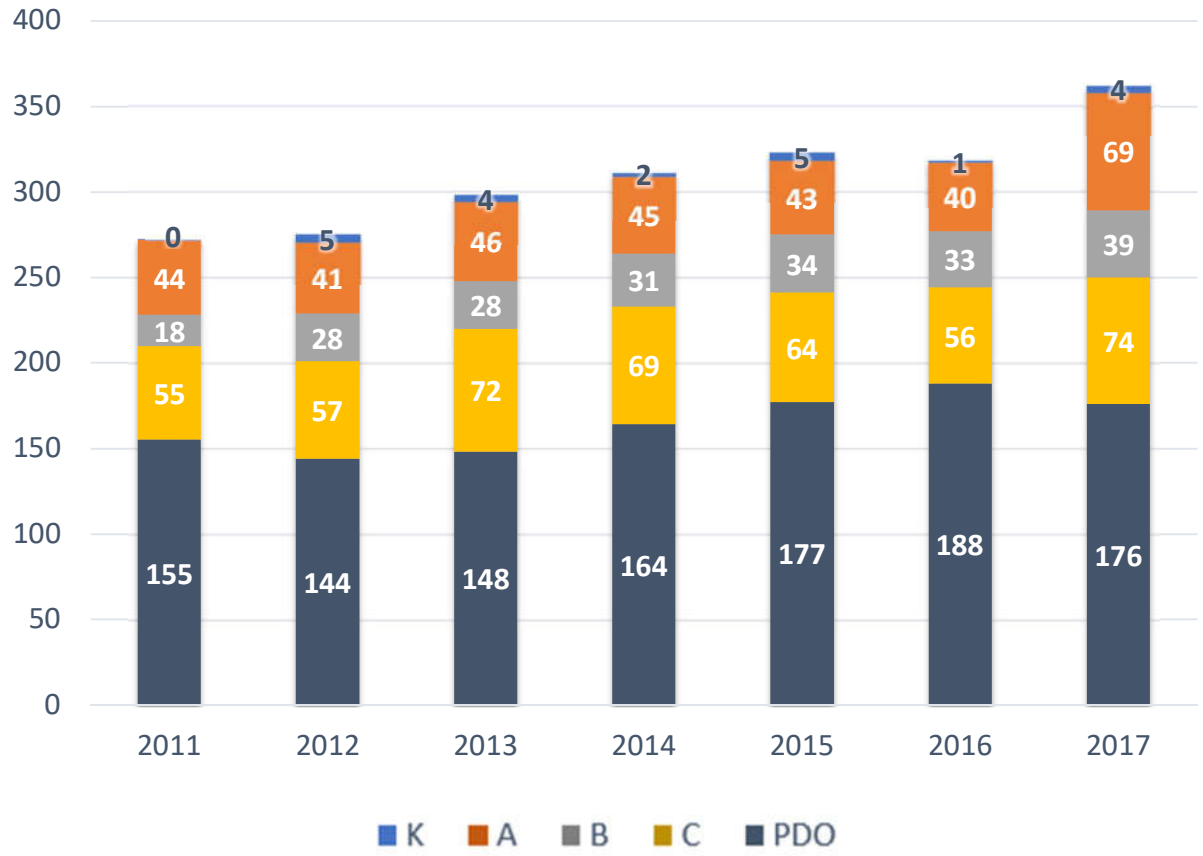


Figure 2-8: Severity of Crashes by Year



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. **Figure 2-9** provides a graphical heat map of the crash density and reveals these hot spot locations.

Roadway Hot Spot Locations

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

Intersections/Interchanges Hot Spot Locations

- Fairground Road at Sandy Hook Road
- Fairground Road at Broad Street Road
- Ashland Road at Broad Street Road
- Broad Street Road at Route 288
- Oilville Road at I-64
- Oilville Road at Broad Street Road
- 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." Providing multi-modal facilities such as sidewalks, shared-use paths, and bikeways is consistent with one of the Guiding Principles. The County features many roads with minimal or no shoulders. There are limited dedicated bicycle lanes but pedestrian facilities (e.g., sidewalk) are provided in select locations throughout the County. However, pedestrian and bicycle facilities are an important component of the existing Villages and Communities. In addition, state law in Virginia considers bicycles a vehicle and allows bicycles to utilize the roadway network.

The option to walk or bike is a key element to any healthy community's transportation system. When an environment is conducive to walking and/or biking, these modes offer a practical transportation choice that provides benefits for both individual and their communities. The benefits for having pedestrian and bicycle facilities include the following:

- **Health** – Regular physical activity helps prevent or reduce the risk of a variety of health issues (e.g., obesity).
- **Transportation** – Many streets carry more traffic than they were designed to handle, resulting in congestion, wasted time, pollution, and driver frustration. Many of the trips that Americans make every day are short enough to be accomplished on foot or bike, and longer trips made by bus reduce the number of single occupancy vehicles.
- **Environmental** – Motor vehicles create substantial air pollution. According to the Environmental Protection Agency, mobile transportation sources (cars, trucks, buses, and off-road equipment such as marine engines and construction equipment) are responsible for nearly 80% of carbon monoxide emissions in the U.S.
- **Economic** – Car ownership consumes a major portion of many family incomes. When safe facilities are provided to walk, bike, and take transit, more people can rely on active travel and spend less on transportation, putting more money back into local economies.
- **Quality of life** – The availability of active travel in a community is an indicator of its livability, which helps attract businesses and grow tourism-related activity. Providing bicycle, pedestrian, and transit facilities contribute to a healthy sense of identity and place.
- **Social Justice** – For those without the option to drive, such as adolescents, elderly, those unable to afford a car, and people with certain disabilities, these facilities provide travel choice and break down barriers to accessing jobs, health care, education, and recreation.

It is not only important to provide pedestrian and bicycle facilities but also provide safe facilities. Providing safe facilities means identifying facilities that are the appropriate type, size, and in the best location as well as providing accessibility features (e.g., curb ramps) and buffers between vehicular traffic and pedestrian/bicycle traffic.

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 Road

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.

The following comprehensive set of available data (e.g., mapping, previous studies, plans, conceptual plans, etc.) on the transportation network was reviewed while some were considered as part of the MTP analyses:

- Capital Impacts Study
- 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 Analyses
- Fairground Road/Sandy Hook Road Alternatives Analysis
- US 250 Operation and Safety Study – Cardwell Road to Fairground Road
- 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
- Planned/committed roadway improvements

3 PLAN DEVELOPMENT

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). The MTP provides 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 proposes of the MTP, this demographic data was coded into the future (2040) RTTDM to project future volumes and analyze future conditions, as shown by Service Area in **Table 3-1**. Total population and employment are anticipated to grow by approximately 82%-94% in the year 2040.

Table 3-1: Goochland County Socioeconomic Data

Socioeconomic Data	2017	2040	Percent Change
Population			
West Service Area	4,038	4,925	22%
Central Service Area	7,184	9,164	28%
East Service Area	11,235	29,571	163%
Total	***22,457***	***43,660***	***94%***
Employment			
West Service Area	704	1,472	109%
Central Service Area	1,795	4,598	156%
East Service Area	13,115	22,420	71%
Total	***15,614***	***28,490***	***82%***

Similar to the existing (2012) traffic volume adjustment, the future (2040) traffic volumes were adjusted to account for the RTTDM either over or underestimating traffic volumes. **Table 3-2** builds upon the 2012 traffic volume adjustment example for Rockville Road, discussed in **Section 2.2.3**. Based on the comparison of the 2012 RTTDM and VDOT traffic data, the difference and ratio were calculated to apply to the future (2040) traffic volumes.

Table 3-2: Rockville Road Adjusted Model Volume Example

2012 Traffic Volumes				2040 Traffic Volumes			
VDOT (vpd)	RTTDM (vpd)	Δ	Ratio	RTTDM (vpd)	Δ	Ratio	Revised RTTDM (vpd)
2,200	1,900	-300	0.86	3,900	4,200	4,516	4,360

The projected increase in the socioeconomic data and adjustments to the traffic model output are anticipated to result in total of approximately 478,000 trips per day throughout Goochland County which is an increase of 146% (284,000 trips) compared to the existing (2012) conditions. The future (2040) traffic volumes were used as part of the future (2040) analysis.

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 Road (US 250)
- Hockett Road (Route 623) from Snead Road to River Road West (Route 6)
- Maidens Road (Route 634) from River Road West (Route 6) to Powhatan County Line
- Broad Street Road (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 Road (US 250) to I-64
- Ashland Road (Route 623) from Broad Street Road (US 250) to I-64
- Broad Street Road (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

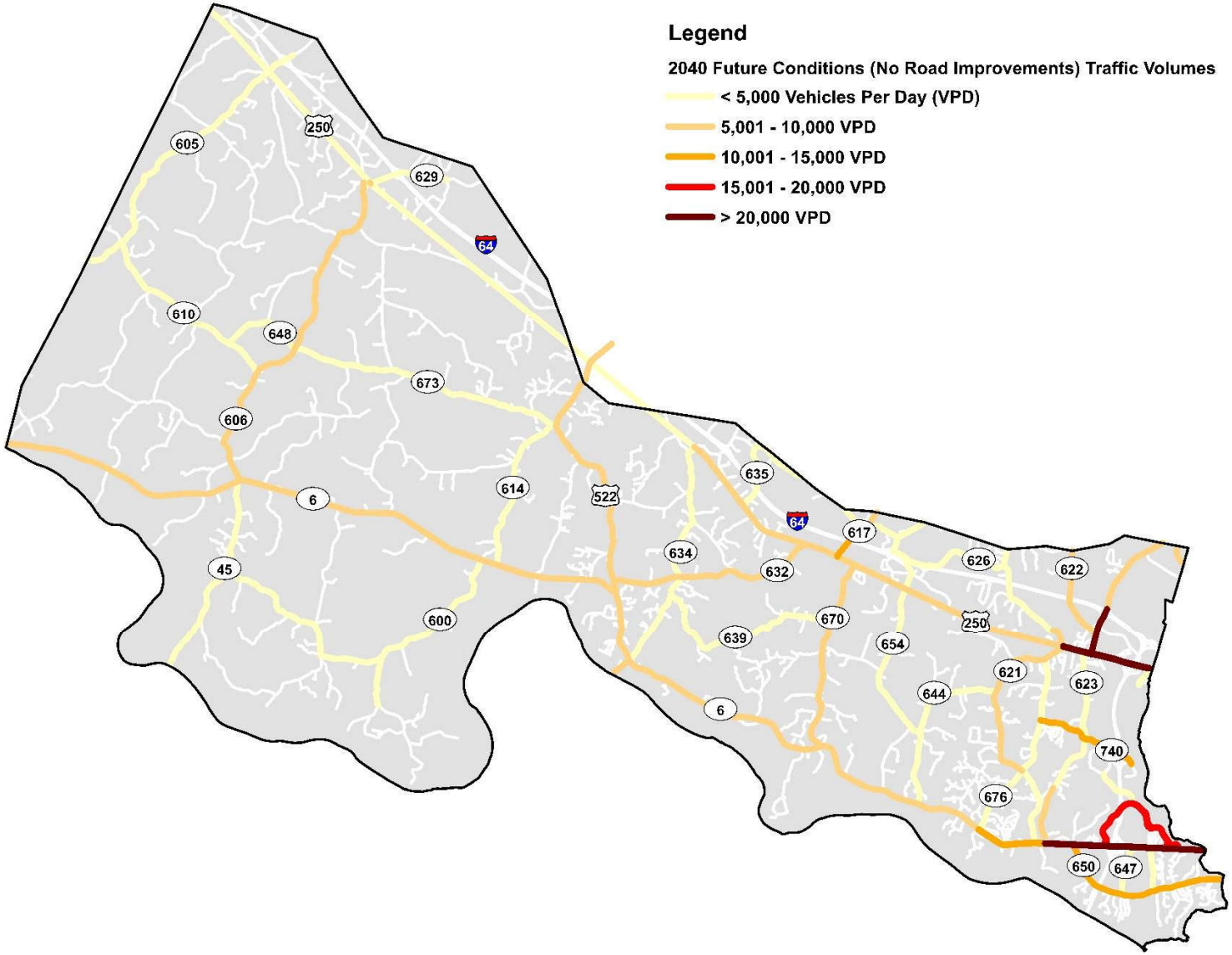


Figure 3-2: No Build LOS Map

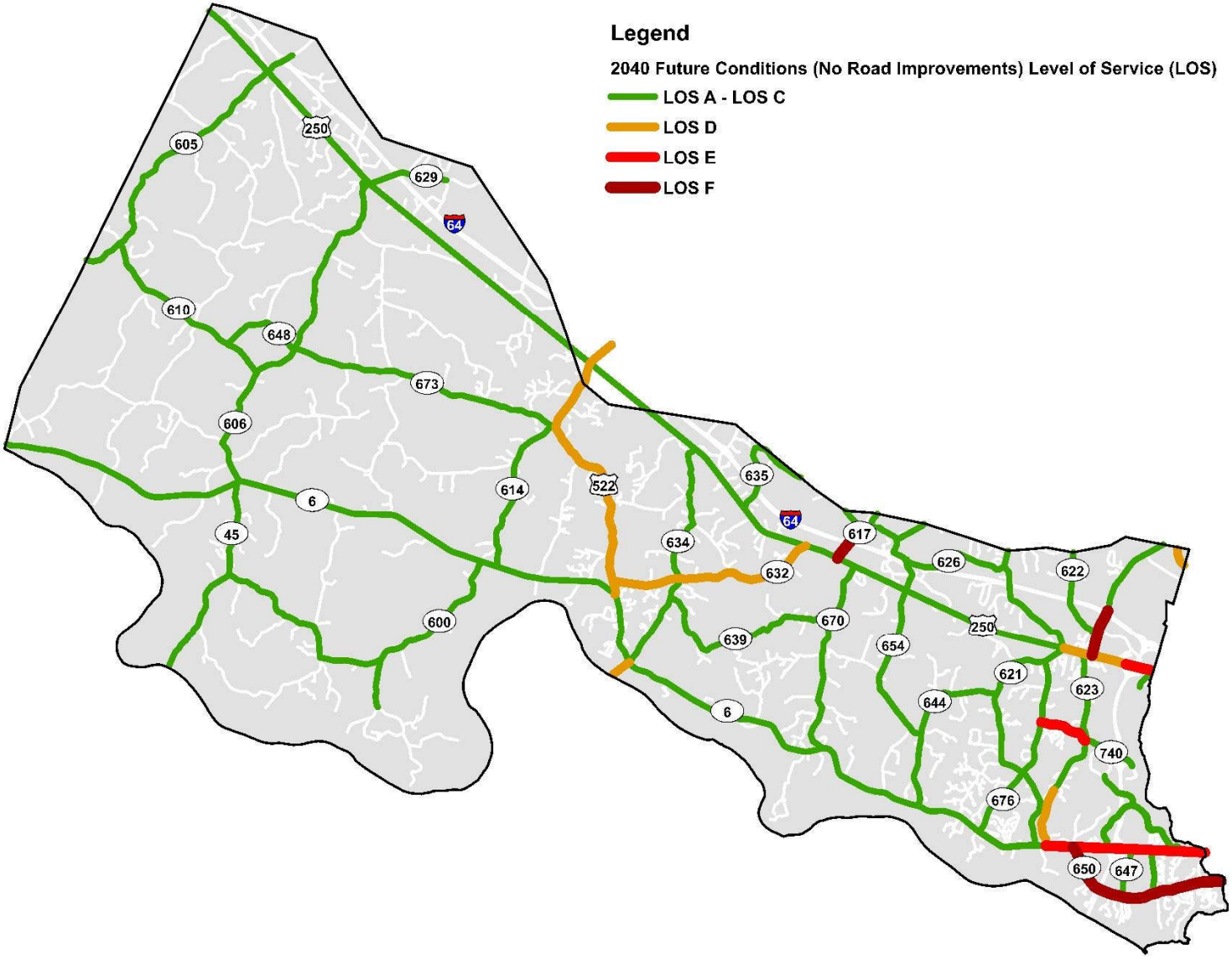
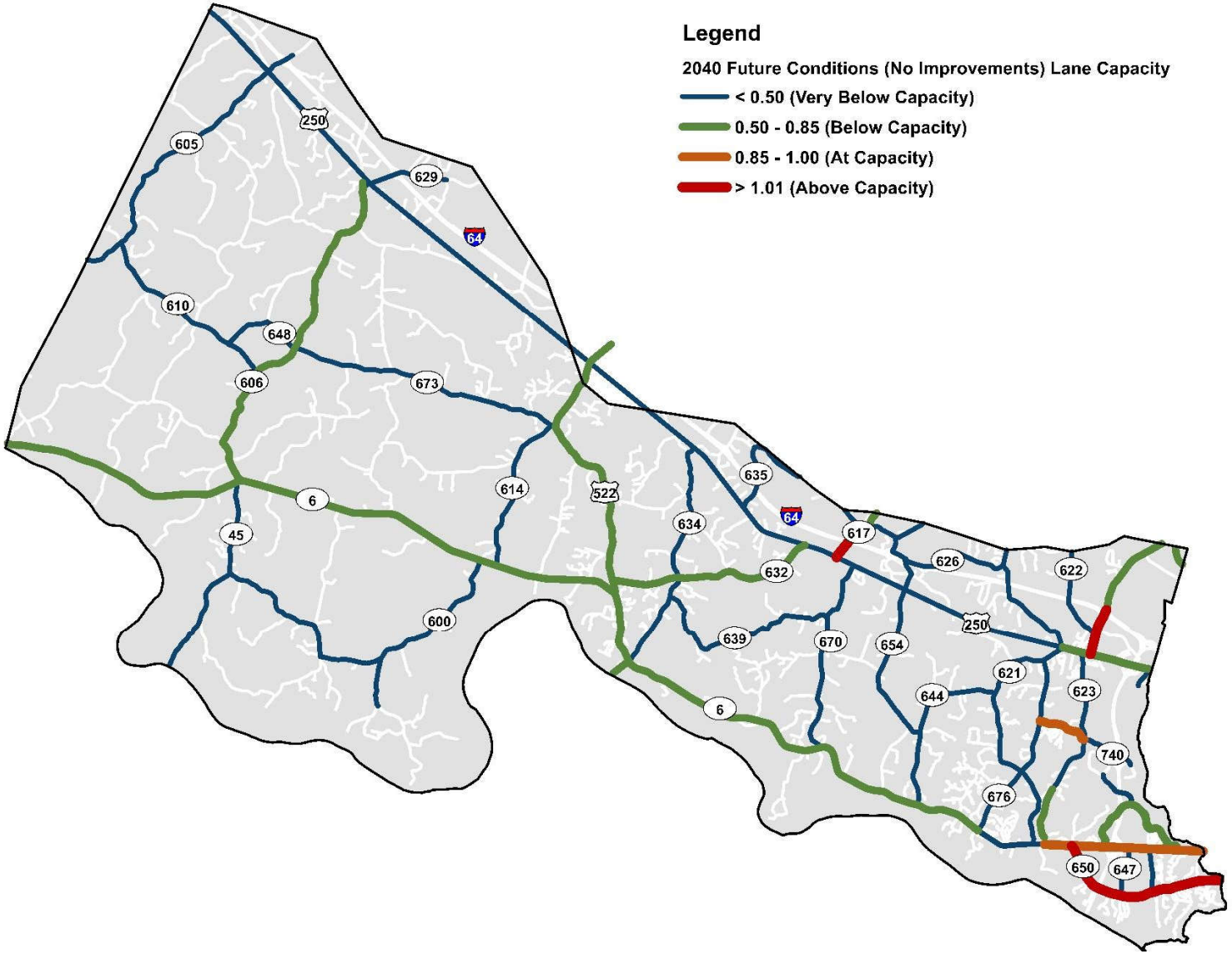


Figure 3-3: No Build V/C Map



3.1.3 Road Network

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

- Mobility
- Access

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.

With approval of MTP recommendations, 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 are recommended to be changed to better reflect existing and future functionality of the roadway as well as the VDOT functional classifications developed in 2014.

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 3-3**.

Table 3-3: 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 3-4** and **Table 3-5**, respectively.

Table 3-4: Typical Section Legend

Code	Description *(Amended Functional Classification Example)*
P	Principal Arterial *(Patterson Avenue)*
A	Minor Arterial *(Broad Street Road)*
C	Major Collector *(Hockett Road)*
M	Minor Collector *(Shallow Well Road)*
L	Local *(Greenbriar Branch Drive)*
#	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 3-5: 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.

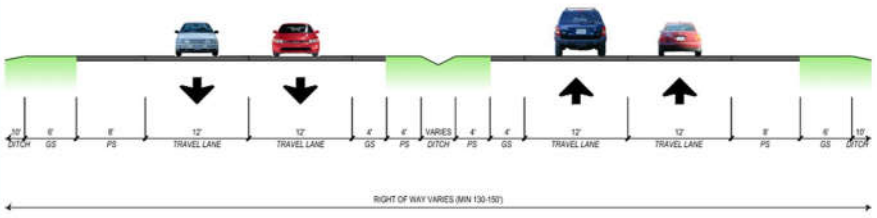
Geometric Standards

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)

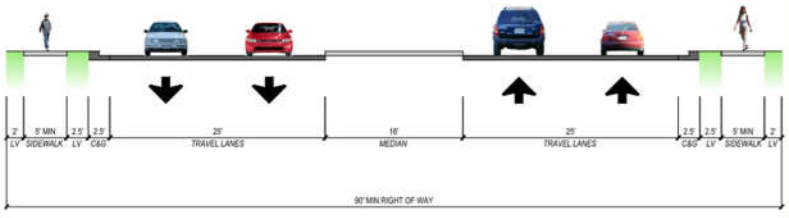


Figure 3-5: Minor Arterial Information

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

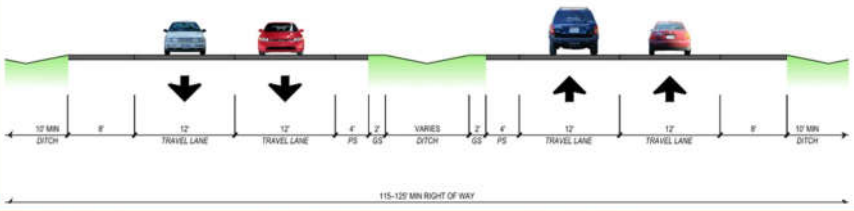
Section Type	Speed	Lane Width	Right Shoulder	Left Shoulder	Bike Lane	Sidewalk	Median Width	Curb & Gutter	Front Slope Width	ROW Requirement
Open Ditches	30 - 60 MPH	12'	8' paved; up to 6' graded	4' paved	NA or provided behind shoulder	5' if provided behind shoulder	Varies	NA	10'	115' - 125'
With Curb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

** For the graphical representation of a two-lane, typical section, see Figure 3-7: Minor Collector Information.*

Typical Sections

Minor Arterial without Curb & Gutter (A4D-115)



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

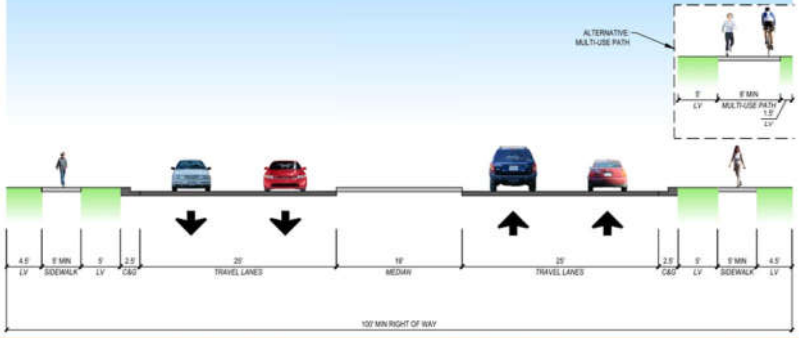


Figure 3-6: Major Collector Information

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.

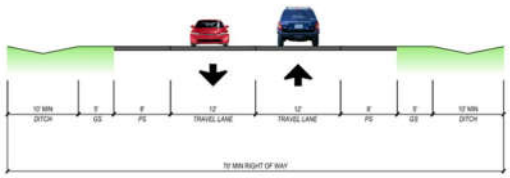
Geometric Standards

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'

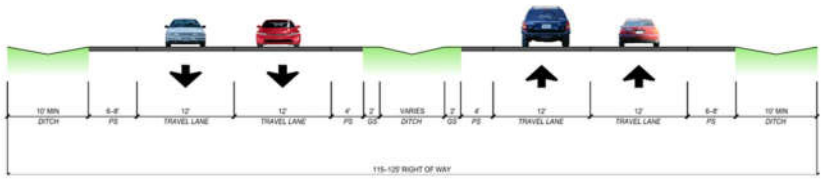
Functional Classification	Number of Lanes	Speed Threshold	Daily Volume Threshold (VPD)			Hourly Volume Threshold (VPH)		
			LOS A - C	LOS D	LOS E - F	LOS A - C	LOS D	LOS E - F
Major Collector	2	30 - 50 MPH	< 9,700	14,600	> 15,500	< 580	875	> 930
Major Collector	4	30 - 50 MPH	< 21,600	29,500	> 31,200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

Typical Sections

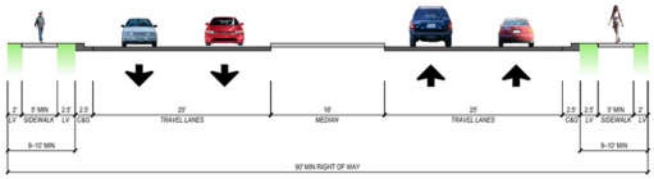
Major Collector without Curb & Gutter (C2UB-70)



Major Collector without Curb & Gutter (C4DB-115)



Major Collector with Curb & Gutter (C4DP-90)



Major Collector with Curb & Gutter (C5UP-90)

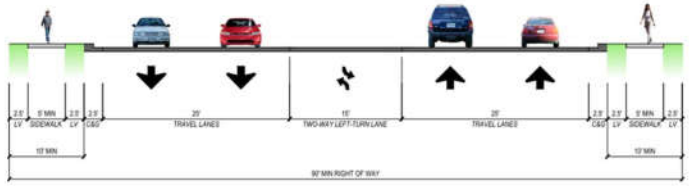


Figure 3-7: Minor Collector Information

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

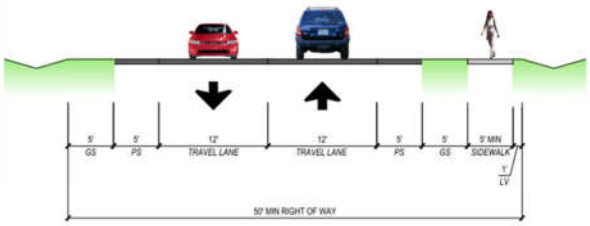
Section Type	Speed	Lane Width	Right Shoulder	Left Shoulder	Bike Lane	Sidewalk	Curb & Gutter	Front Slope Width	ROW Requirement
Open Ditches	30 - 50 MPH	12'	5' paved	NA	Shared shoulder	5' if provided behind shoulder	NA	10'	50' - 55'
With Curb & Gutter	30 - 50 MPH	12'	NA	NA	5'	5'	2.5'	NA	55'

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

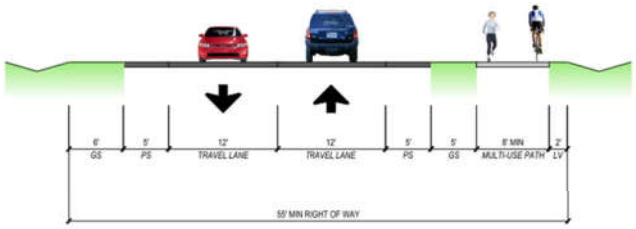
** For the graphical representation of a four-lane, typical section, see Figure 3-5: Minor Arterial Information.*

Typical Sections

Minor Collector without Curb & Gutter (M2UP-50)



Minor Collector without Curb & Gutter (M2UT-55)



Minor Collector with Curb & Gutter (M2UPB-55)

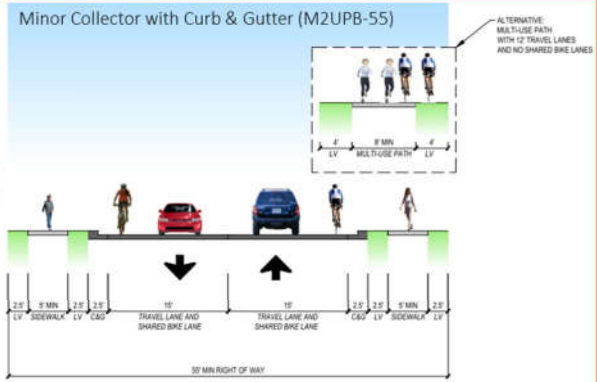


Figure 3-8: Local Information

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.

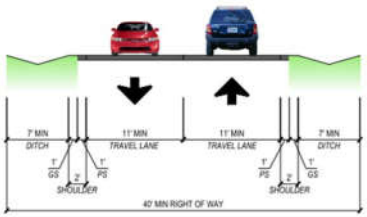
Geometric Standards

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'

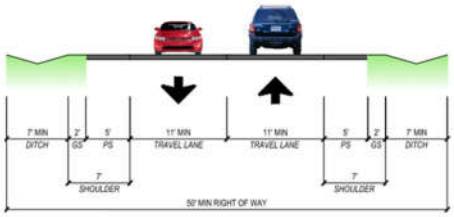
Functional Classification	Number of Lanes	Speed Threshold	Daily Volume Threshold (VPD)			Hourly Volume Threshold (VPH)		
			LOS A - C	LOS D	LOS E - F	LOS A - C	LOS D	LOS E - F
Local	2	20 - 30 MPH	< 2,400	8,100	> 11,100	< 145	485	> 665

Typical Sections

Local without Curb & Gutter (L2U-40)

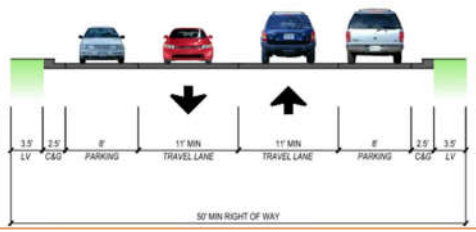


Local without Curb & Gutter (L2UB-50)

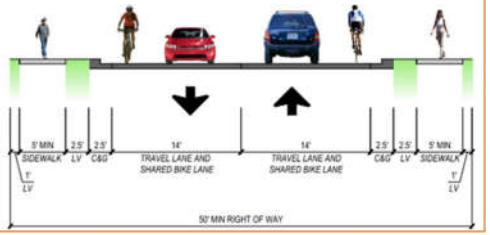


Local with Curb & Gutter (L2UB-40)

Local with Curb & Gutter (L2UO-50)



Local with Curb & Gutter (L2UPB-50)



3.1.6 Access Management

Providing adequate, reliable, safe, and multi-modal transportation is important for the public's mobility. Land use and the transportation system must be considered together and should never be exclusive to one another. The transportation system consists of multiple aspects and influences. One aspect that has a significant influence in the transportation and its operations is access, or the intersecting driveways or roadways.

As public agencies plan, program, design and operate their facilities, focus on access management is important. 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 to 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.

While VDOT has access management requirements, Goochland County also has access management requirements, detailed in the Subdivision Ordinance. It is noted that the Goochland County access management requirements are more stringent that VDOT. It is recommended that the County continues to apply access management techniques to each of its roadways while new projects are being planned and designed. Due to some of the changes in proposed functional classification and cross sections, it is recommended that Table 1 Goochland County Roadway Classification of the Subdivision Ordinance be revised as necessary to reflect the changes as a result of the updated MTP.

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

4.1 Justification

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

- Empirical analysis provided by Kimley-Horn
- Adherence to the guiding principles
- Previous Transportation Plans and Traffic Studies recommendations
- Comprehensive Plan recommendations
- Public comment
- Planning Commission and Board of Supervisor comments

In addition, the recommendations were identified by the deficiencies of the following:

- Existing operational and safety data
- Future conditions without road improvements ("No Build") 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 B** for individual project information 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**. As shown in **Figure 4-1**, a portion of the Designated Growth Area generally bound by Route 288, Tuckahoe Creek Parkway (Route 740), Hockett Road (Route 623), and Patterson Avenue (Route 6) is highlighted. The traffic analysis results in this area identified the need for additional network connections and potential improvements to the surrounding roadways (e.g., Patterson Avenue, River Road). These needs will be identified as part of supplemental traffic studies as development occurs in this area.

Figure 4-1: Recommendations Map

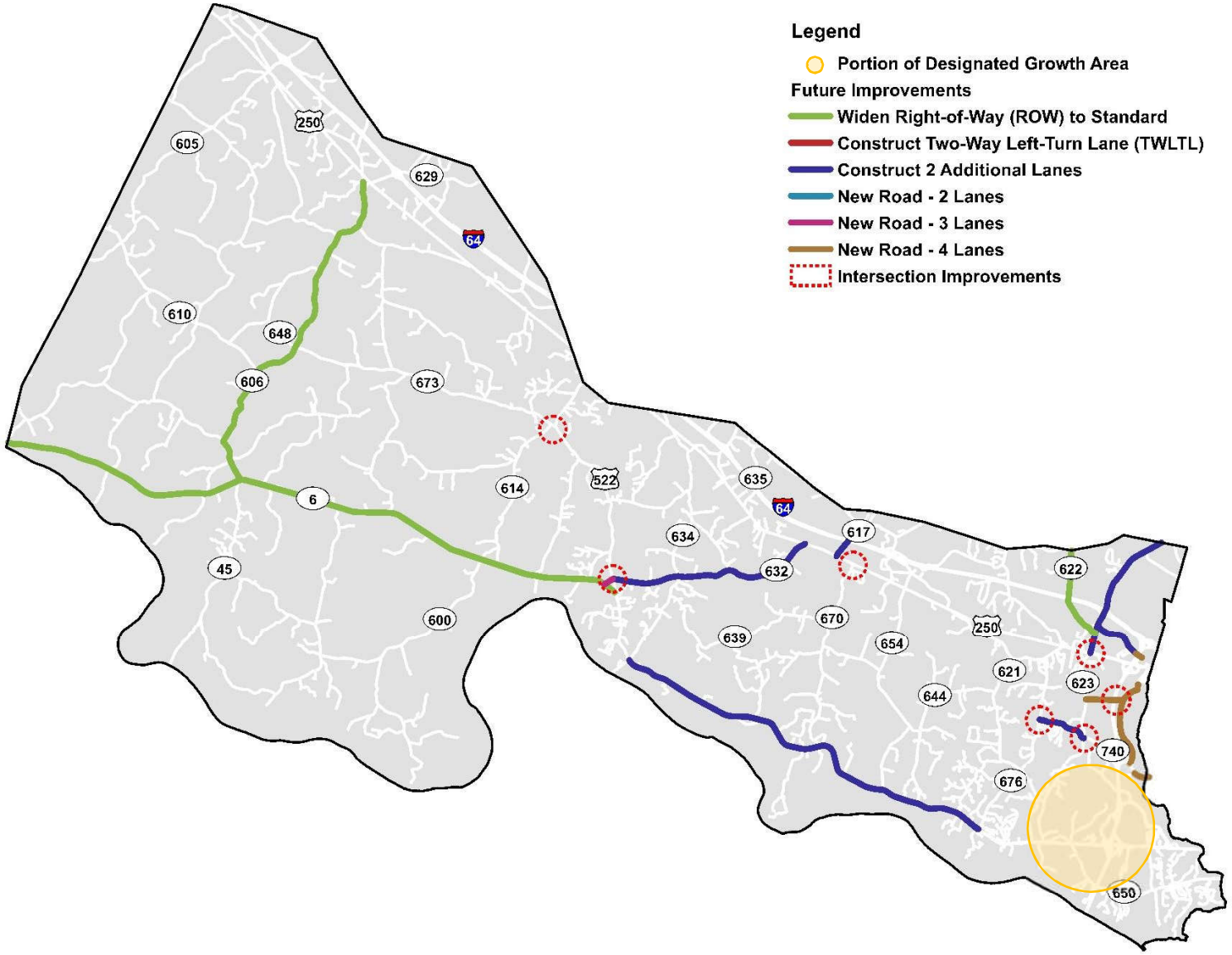
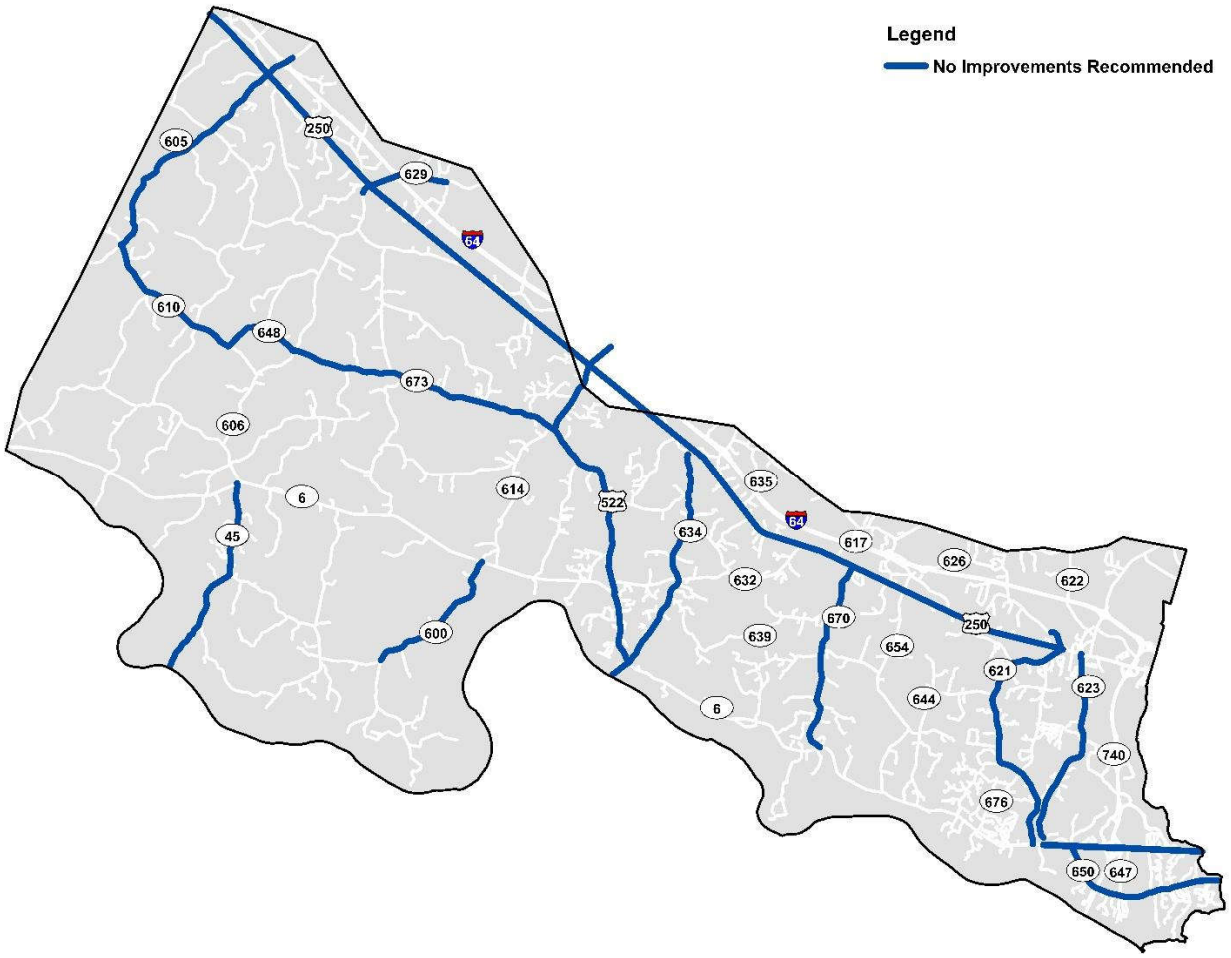


Figure 4-2 provides a graphical representation of projects that were previously identified in the 2005 MTP. However, as there has been an increase in employment and new development within the County and in neighboring counties, several of those improvements are now not necessary because they do not meet the MTP update justification criteria or some of the projects have either been completed or funded for construction.

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



4.2 Level of Service 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 maintain a LOS C or better. It is important for Goochland County to maintain a LOS C or better for County roadways in order to provide a reliable, environmentally friendly, safe, economically viable, and multi-modal transportation system.

LOS C provides a more balanced system of traffic operations that don't overburden particular roadways and intersections. Maintaining LOS C also protects the investment in roadways that were planned, designed, and constructed with the intent to operate at this acceptable level of service. The process for achievement of LOS C included the assessment of existing and future traffic conditions to determine the

necessary functional classification changes, roadway typical sections, roadway connections, intersection improvements, and multi-model network components.

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** 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.

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.

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)	▪ Update to Major Collector	
Pagebrook Road (Route 647)	Patterson Avenue (Route 6) to River Road (Route 650)	▪ Update to Minor Collector	
Hanover Road (Route 620)	Oilville Road (Route 617) to Hanover County Line	▪ Update to Major Collector	
Old Fredericksburg Road (Route 629)	Hadensville-Fife Road (Route 606) to Louisa County Line	▪ Update to Major Collector	
Cardwell Road (Route 670)	Broad Street Road (US 250) to River Road West (Route 6)	▪ Update to Major Collector	
Broad Street Road (US 250)	Route 288 to Henrico County Line	▪ Update to Principal Arterial	
Perkinsville Road (Route 635)	Louisa County Line to Broad Street Road (US 250)	▪ Update to Minor Collector	
Sheppard Town Road (Route 639)	Maidens Road (Route 634) to Cardwell Road (Route 670)	▪ Update to Minor Collector	
Millers Lane (Route 644)	River Road West (Route 6) to Manakin Road (Route 621)	▪ Update to Minor Collector	
River Road West (Route 6)	Fluvanna County Line to Sandy Hook Road (US 522)	▪ Update to Minor Arterial ▪ Widen ROW to standard to accommodate wider shoulders ▪ Construct multi-modal facility	
River Road West (Route 6)	Maidens Road (Route 634) to Hermitage Road (Route 676)	▪ Update to Minor Arterial ▪ Widen to 4-lane, undivided roadway ▪ Construct multi-modal facility	

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)	▪ Update to Minor Arterial ▪ Construct multi-modal facility	
River Road (Route 650)	River Road West (Route 6) to Henrico County Line	▪ Construct multi-modal facility	
Hadensville-Fife Road (Route 606)	Broad Street Road (US 250) to River Road West (Route 6)	▪ Update to Major Collector ▪ Widen ROW to standard to accommodate wider shoulders	
Oilville Road (Route 617)	Broad Street Road (US 250) to I-64	▪ Update to Major Collector ▪ Widen to 4-lane, undivided roadway	
Rockville Road (Route 622)	Hanover County Line to Ashland Road (Route 623)	▪ Update to Major Collector ▪ Widen ROW to standard to accommodate wider shoulders ▪ Construct multi-modal facility	
Ashland Road (Route 623)	Broad Street Road (US 250) to I-64	▪ Update to Minor Arterial ▪ Widen to 4-lane, divided roadway ▪ Construct multi-modal facility	
Ashland Road (Route 623)	I-64 to Hanover County Line	▪ Update to Minor Arterial ▪ Widen to 4-lane, divided roadway	
Fairground Road (Route 632)	Broad Street Road (US 250) to Sandy Hook Road (US 522)	▪ Update to Minor Arterial ▪ Widen to 4-lane, undivided roadway	
Tuckahoe Creek Parkway (Route 740)	Hockett Road (Route 623) to Hermitage Road (Route 676)	▪ Widen to 4-lane, divided roadway ▪ Construct multi-modal facility	

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)	▪ Proposed Minor Arterial ▪ Construct 3-lane roadway (2-lanes with a two-way left-turn lane)	
Three Chopt Road and Reconnection	Ashland Road (Route 623) to East of Route 288	▪ Proposed Major Collector ▪ Construct 4-lane, undivided roadway ▪ Connect under Route 288 to Little Tuckahoe Court ▪ Construct multi-modal facility	
Hockett Road Realignment	Broad Street Road (US 250) to Existing Hockett Road	▪ Construct south leg of intersection ▪ Construct multi-modal facility	
Tuckahoe Creek Parkway (Route 740) Extension and Bridge	Route 288 to Ridgefield Parkway (Henrico County)	▪ Proposed Major Collector ▪ Construct 4-lane, divided roadway	
Wilkes Ridge Parkway	Existing portion of Wilkes Ridge Parkway to Tuckahoe Creek Parkway Extension (Route 740)	▪ Proposed Major Collector ▪ Construct 4-lane, divided roadway ▪ Construct multi-modal facility	
Hockett Road to Wilkes Ridge Parkway Extension	Hockett Road to Future Wilkes Ridge Parkway Extension	▪ Proposed Major Collector ▪ Construct south leg of intersection as 4-lane, divided roadway	

Table 4-4: Recommended Intersection and Interchange Improvements

Intersection/Interchange	Improvement	Justification
Whitehall Road at Sandy Hook Road (US 522)	▪ Potential location for one-lane roundabout or other improvements ▪ Relocate curve in Sandy Hook Road as part of intersection improvements	
Fairground Road (Route 632) at Sandy Hook Road (US 522)	▪ Construct a 1-lane roundabout ▪ Construct multi-modal facility	
Broad Street Road (US 250) at Cardwell Road (Route 670)	▪ Convert intersection to a T-intersection by reconfiguring Cardwell Road (Route 670)	
Broad Street Road (US 250) at Hockett Road (Route 623)	▪ Construct new connection to Broad Street Road (US 250) from existing Hockett Road (Route 623) alignment ▪ Construct multi-modal facility	
Hockett Road (Route 623) at River Road West (Route 6)	▪ Further analysis of intersection is needed based on construction of new alignment	
Hermitage Road (Route 676) at Tuckahoe Creek Parkway (Route 740)	▪ Construct turn lanes based on widening ▪ Construct multi-modal facility	
New Route 288 Interchange	▪ Conduct study on new interchange on Route 288 between Broad Street Road and Tuckahoe Creek Parkway	
Oilville Interchange	▪ Conduct study of interchange ▪ Consider new roundabout	

Table 4-5: Multi-Modal Facility Types

Facility Type *(Example)*	Description	Graphical Representation
Shared-Use Path *(East End Trail)*	▪ Fully separated, two-way path ▪ Open to pedestrians, bicyclists, and other non-motorized users ▪ Typically paved ▪ May be parallel to a roadway or along a separate alignment ▪ Best used on streets with high motor vehicle traffic speeds or volumes ▪ **Could be implemented in Village areas**	
Bicycle Lane *(Patterson Avenue)*	▪ On-road bicyclist facility with roadway space dedicated to bicyclists designated by bike lane pavement markings ▪ Generally located to the right of and in the same direction of the motor vehicle travel lane ▪ May be placed on one-way streets ▪ Best used on streets with low to medium motor vehicle traffic volumes	
Sidewalk *(Ashland Road)*	▪ Paved walkway for pedestrians ▪ Normally separated from vehicular traffic ▪ Can be placed on one or both sides of a roadway ▪ **Could be implemented in Village areas**	
Paved Shoulder *(River Road West)*	▪ Paved roadway outside edge line available for bicyclist or pedestrian travel ▪ Lack of bicycle markings differentiates it from a bike lane ▪ Best used on roads with medium motor vehicle traffic volumes where sidewalks are not present ▪ **Could be implemented in Rural areas**	

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.

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

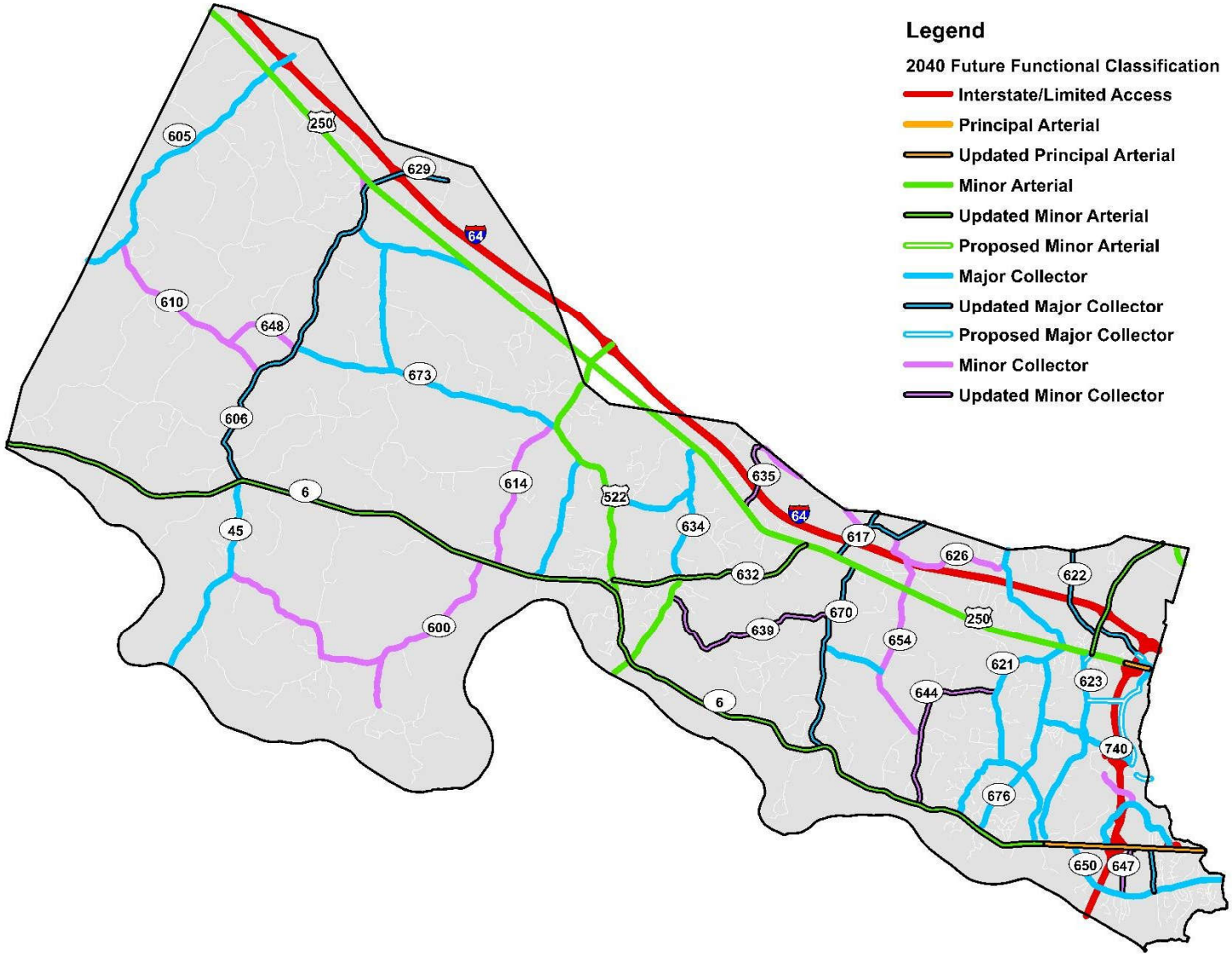


Figure 4-4: Build AADT Map

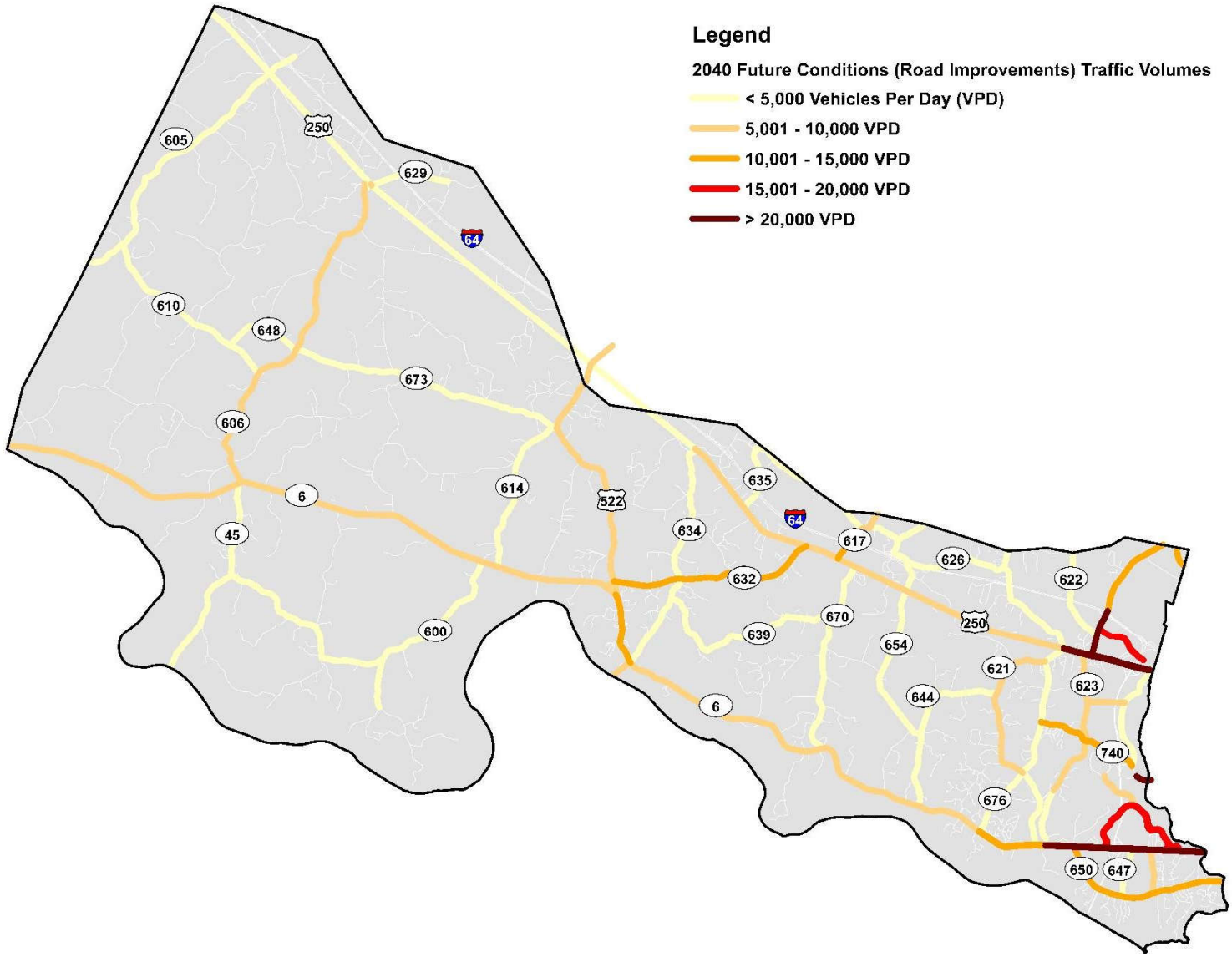


Figure 4-5: Build LOS Map

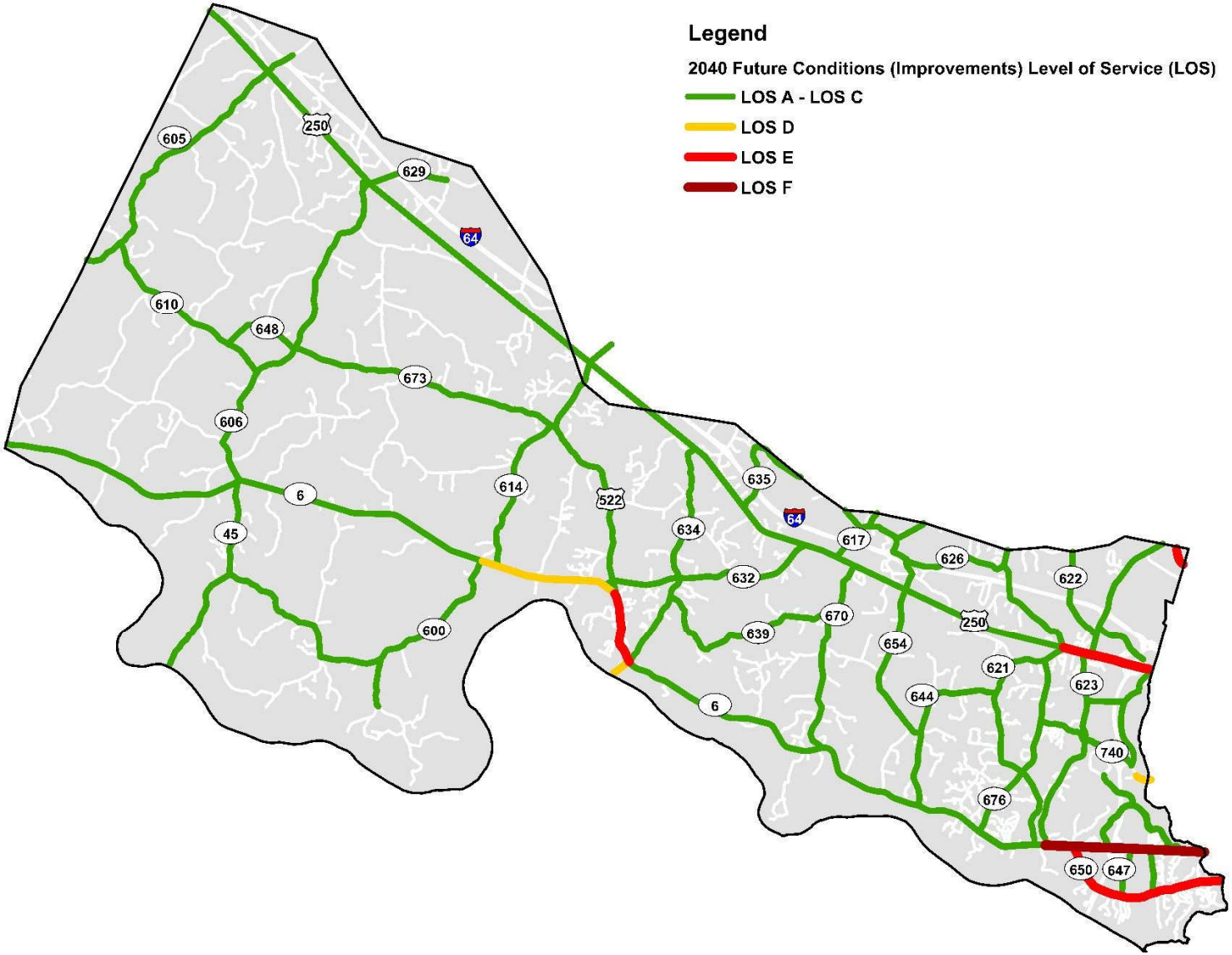
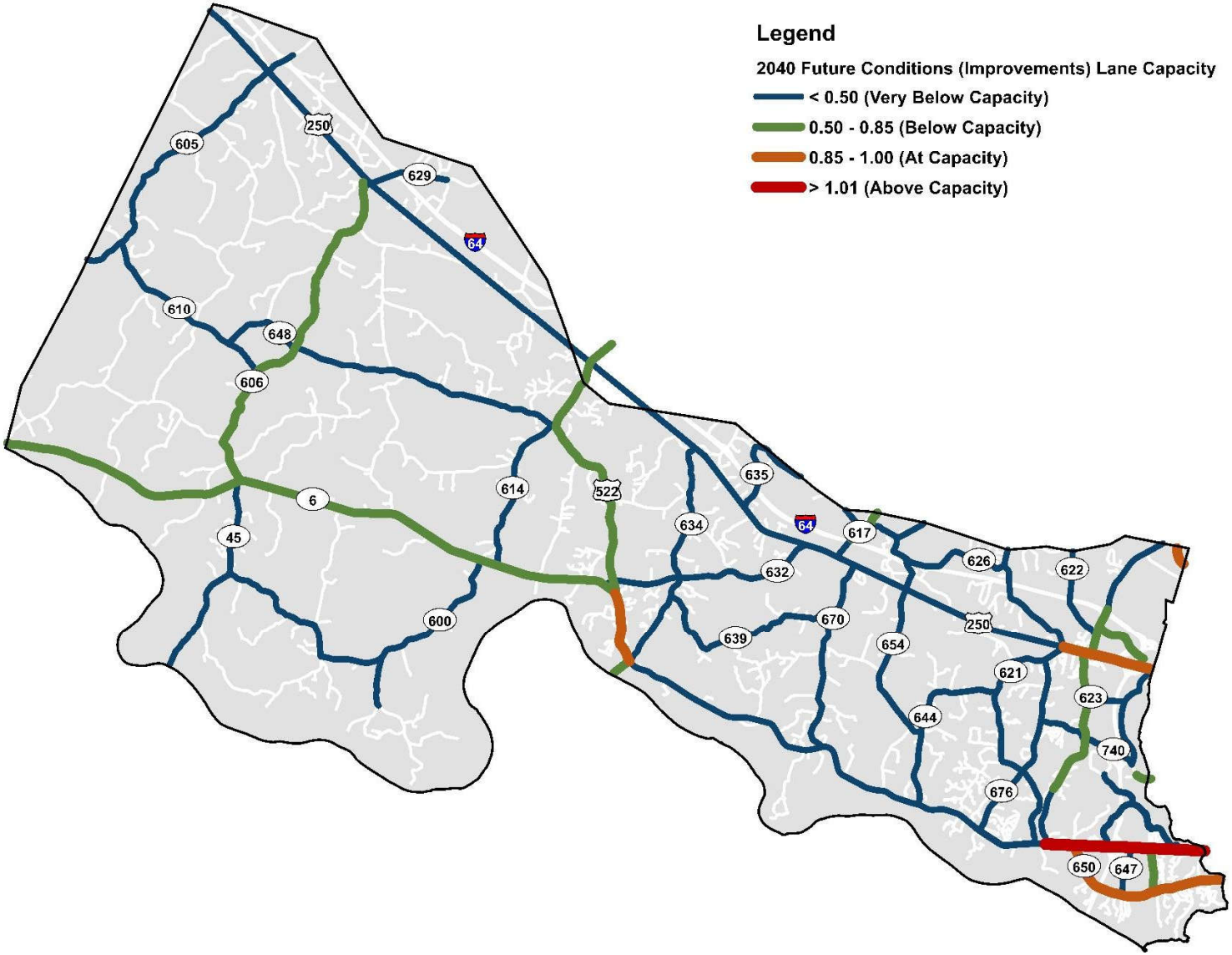


Figure 4-6: Build V/C Map



4.8 Designated Growth Area Criteria

As part of the MTP, the following guidelines apply to the portion of the Goochland County Designated Growth Area generally bound by Route 288, Tuckahoe Creek Parkway (Route 740), Hockett Road (Route 623), and River Road (Route 650).

- Proposed development will require detailed traffic analyses that include proposed transportation solutions if the operational analyses result in degradation of the existing/current operations
- Hockett Road Route (623) will remain a two-lane, undivided roadway
- Intersection improvements may require additional lanes and/or right-of-way
- Ultimately, Patterson Avenue (Route 6) may be a six-lane roadway to accommodate potential future growth and to be consistent with Henrico County's proposed roadway improvements
- Future roadways should avoid existing residential and recreational developments
- LOS C is the minimum standard
- Proposed road improvements should strive to improve the LOS and shall not degrade the LOS on Patterson Avenue (Route 6) and River Road (Route 650)

4.9 New Policies

In addition to the roadway, new connection, intersection and interchange, pedestrian and bicycle, and transit improvements, the following new policies should be enacted as part of the MTP:

- Construction of turn lanes on two-lane roadways is recommended with regard to the development of new subdivisions.
- Stub roads to adjacent properties are encouraged with all new development to promote interconnectivity.
- New developments shall demonstrate traffic impacts and shall not reduce operations to any external roadway to less than a LOS C.
- New development shall incorporate recommendations set forth in this MTP and *Goochland County 2035 Comprehensive Plan*.

5 Action Plan and Implementation

5.1 Planning Level Cost Estimates

Planning level cost estimates were developed for each of the recommendations using the VDOT Transportation and Mobility Planning Division (TMPD) Statewide Planning Level Cost Estimates. The estimates for each recommendation have been prepared in a project information sheet format using an Excel spreadsheet, which will allow the County to easily update, add, or delete projects, as needed. The project information sheets include the planning level cost estimates with information about the project description, a project location map, proposed cross section of the roadway, existing and future traffic data, inputs into the cost calculations, general and specific assumptions, and a placeholder for funding sources. Key general assumptions included the following:

- Minimum roadway standards shall be in accordance with the most recent version of the VDOT Road Design Manual standards
- Cost in 2018 dollars
- Annual inflation rate is 3.0% annually

- No lighting, streetscape, signalization, storm water management, or utility betterments are included in the cost estimations

Project lengths and other quantities were estimated from aerial imagery, as needed. Planning level construction costs include 25% for preliminary engineering (PE) and construction contingencies. However, an additional contingency of 10% was added to each project. Utility and right-of-way impact costs were each estimated as 25% of the construction cost. In addition, 15% of the planning level costs was added for construction engineering and inspection (CEI). Planning level cost estimates are provided for each improvement in **Section 5.3**. However, a more detailed breakdown of the each of the planning level cost estimates is provided on the associated project information sheet in **Appendix B**.

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 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.

5.3 Timeframe

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 **Table 5-2**. Lastly, long-term improvements include those recommended as part of this MTP update. The West, Central, and East Service Area long-term improvements and their associated costs are displayed in **Table 5-3**, **Table 5-4**, and **Table 5-5**, respectively.

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 Road 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 Road 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: West Service Area Long-Term Improvements

West Service Area								
Project Name	Project Limits		Roadway & Bridge Costs	Additional Contingency	Utilities	Right-of-Way	CEI	Total Cost
	From	To						
River Road West (Route 6)	Fluvanna County Line	Sandy Hook Road	$ 21,561,800	$ 2,156,180	$ 5,390,450	$ 5,390,450	$ 3,234,270	$ 37,733,150
Hadensville-Fife Road (Route 606)	River Road West	Broad Street Road	$ 15,789,300	$ 1,578,930	$ 3,947,325	$ 3,947,325	$ 2,368,395	$ 27,631,275
						Total West Service Area =		$ 65,364,425

Table 5-4: Central Service Area Long-Term Improvements

Central Service Area								
Project Name	Project Limits		Roadway & Bridge Costs	Additional Contingency	Utilities	Right-of-Way	CEI	Total Cost
	From	To						
Whitehall Road at Sandy Hook Road	Intersection		$ 3,751,500	$ 375,150	$ 937,875	$ 937,875	$ 562,725	$ 6,565,125
Fairground Road (Route 632) Intersection and Extension	Fairground Road	River Road West	$ 4,940,900	$ 494,090	$ 1,235,225	$ 1,235,225	$ 741,135	$ 8,646,575
Fairground Road (Route 632)	Broad Street Road	Sandy Hook Road	$ 30,141,000	$ 3,014,100	$ 7,535,250	$ 7,535,250	$ 4,521,150	$ 52,746,750
Oilville Road (Route 617)	Broad Street Road	I-64	$ 11,408,100	$ 1,140,810	$ 2,852,025	$ 2,852,025	$ 1,711,215	$ 19,964,175
Broad Street Road at Cardwell Road	Intersection		$ 2,149,100	$ 214,910	$ 537,275	$ 537,275	$ 322,365	$ 3,760,925
River Road West (Route 6)	Maidens Road	Hermitage Road	$ 49,366,000	$ 4,936,600	$ 12,341,500	$ 12,341,500	$ 7,404,900	$ 86,390,500
							Total Central Service Area =	$ 178,074,050

Table 5-5: East Service Area Long-Term Improvements

East Service Area								
Project Name	Project Limits		Roadway & Bridge Costs	Additional Contingency	Utilities	Right-of-Way	CEI	Total Cost
	From	To						
Tuckahoe Creek Parkway (Route 740) and Intersection	Hermitage Road	Hockett Road	$ 8,165,000	$ 816,500	$ 2,041,250	$ 2,041,250	$ 1,224,750	$ 14,288,750
Rockville Road (Route 622)	Hanover County Line	Ashland Road	$ 4,074,700	$ 407,470	$ 1,018,675	$ 1,018,675	$ 611,205	$ 7,130,725
Ashland Road (Route 623)	Broad Street Road	I-64	$ 13,688,000	$ 1,368,800	$ 3,422,000	$ 3,422,000	$ 2,053,200	$ 23,954,000
Ashland Road (Route 623)	I-64	Hanover County Line	$ 11,086,000	$ 1,108,600	$ 2,771,500	$ 2,771,500	$ 1,662,900	$ 19,400,500
Hockett Road Realignment	Hockett Road	Broad Street Road	$ 1,915,100	$ 191,510	$ 478,775	$ 478,775	$ 287,265	$ 3,351,425
Three Chopt Road Extension	Ashland Road	East of Route 288	$ 33,895,800	$ 3,389,580	$ 8,473,950	$ 8,473,950	$ 5,084,370	$ 59,317,650
Hockett Road to Future Wilkes Ridge Parkway Extension and New Route 288 Interchange	Hockett Road	Future Wilkes Ridge Parkway	$ 8,820,000	$ 882,000	$ 2,205,000	$ 2,205,000	$ 1,323,000	$ 15,435,000
Wilkes Ridge Parkway Extension	Wilkes Ridge Parkway (Existing)	Tuckahoe Creek Parkway	$ 15,435,000	$ 1,543,500	$ 3,858,750	$ -	$ 2,315,250	$ 23,152,500
Tuckahoe Creek Parkway (Route 740) Extension and Bridge	Tuckahoe Creek Parkway (Existing)	Ridgefield Parkway (Henrico County)	$ 14,725,900	$ 1,472,590	$ 3,681,475	$ 3,681,475	$ 2,208,885	$ 25,770,325
River Road West (Route 6)	Hermitage Road	Hockett Road	$ 4,678,700	$ 467,870	$ 1,169,675	$ 1,169,675	$ 701,805	$ 8,187,725
						Total East Service Area =		$ 199,988,600
						Total All Service Areas =		$ 443,427,075

5.3.2 Long-Term Improvement Prioritization

The long-term improvements were further prioritized based on a combination of projected traffic volumes, V/C ratios, and safety conditions. It is noted that some projects under long-term (i.e. Fairground Intersection and Extension, Hockett Realignment, etc.) were included for cost estimating purposes, however they are currently underway. Therefore, there are approximately fifteen (15) long-term improvement projects to consider for prioritization. When examining the projected traffic volumes, v/c ratios and safety issues, it was determined that approximately seven (7) long-term improvements are of top priority. The remaining are currently on a relatively level basis to one another. It should be further noted that these are long-term improvements and their priority can change over time. Traffic demands may vary from those originally anticipated should there be including changes in development patterns, employment numbers, population projections, etc.

1. Oilville Road (Route 617) from Broad Street Road to I-64 (Central Service Area)
2. Ashland Road (Route 623) from Broad Street Road to I-64 (East Service Area)
3. Fairground Road (Route 632) from Broad Street Road to Sandy Hook Road (Central Service Area)
4. Tuckahoe Creek Parkway (Route 740) and Intersection from Hermitage Road to Hockett Road (East Service Area)
5. Three Chopt Road Extension from Ashland Road to East of Route 288 (East Service Area)
6. Ashland Road (Route 623) from I-64 to Hanover County Line (East Service Area)
7. River Road West (Route 6) from Maidens Road to Hermitage Road (Central Service Area)

APPENDIX A: GLOSSARY OF TERMS

Acronym	Acronym Definition	Definition
AADT	Annual Average Daily Traffic	The total volume of traffic on a roadway segment for one year, divided by the number of days in the year.
CIP	Capital Improvement Program	A CIP details the infrastructure improvements (e.g., roadways, water and sewer facilities, police and fire stations, etc.) that the County will need to meet the needs of growth.
DGP	District Grant Program	VDOT funding mechanism that provides funds to each construction district based on a priority ranking system. These funds are only open to localities.
DMV	Department of Motor Vehicles	DMV's responsibilities include vehicle titling and registration, driver licensing and maintenance of driver and vehicle records. The agency also collects Virginia's fuel tax, monitors the state's trucking industry and serves as Virginia's Highway Safety Office.
FHWA	Federal Highway Administration	FHWA develops regulations, policies and guidelines to achieve safety, economic development, and other goals of FHWA programs through the construction and improvement of the nation's transportation infrastructure and highway system.
GRTC	Greater Richmond Transit Company	GRTC provides and maintains the public transit service within the Richmond area.
HCM	Highway Capacity Manual	Published by the Transportation Research Board that contains concepts, guidelines, and computational procedures for computing capacity and quality of service for various roadway facilities.
HSIP	Highway Safety Improvements Program	Provides funding for improvements that correct or improve safety on a section of roadway or intersection with a high incidence of crashes.
HPPP	High-Priority Project Program	VDOT funding mechanism that provides funds for state wise transportation projects based on a priority ranking system.
LOS	Level of Service	LOS 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
MOE	Measures-of-effectiveness	Measures used to quantify the results of the traffic analysis.
MTP	Major Thoroughfare Plan	The MTP identifies the transportation assets and needs for motorists, bicyclists, pedestrians, and transit. It establishes the long-term vision of the County and identifies the incremental steps to achieve the vision.
NCHRP	National Cooperative Highway Research Program	A forum for coordinate and collaborative research that addresses various transportation issues.
plan2040	2040 Metropolitan Transportation Plan	A regional, multi-modal transportation planning document that takes into account future needs for roads, bicycle and pedestrian facilities, transit, freight and passenger rail, ports and marine facilities, and air travel.

Acronym	Acronym Definition	Definition
RRTPO	Richmond Regional Transportation Planning Organization	Part of the Richmond Regional Planning District Commission that serves as a forum for cooperative transportation decision-making to assure excellence in mobility and safety.
RSTP	Regional Surface transportation Program	Provides federal transportation funds allocated to the regional RRTPO partnership to distribute. These funds can be used for a wide variety of highway and transit projects.
RTTDM	Richmond Tri-Cities Travel Demand Model	The RTTDM is a state of the practice travel demand model developed and maintained by the RRTPO. The RTTDM is used to plan transportation investments in the Richmond area.
SSYP	Secondary Six-Year Plan	Each locality develops a plan for non-competitive direct State allocation.
TAP	Transportation Alternatives Program	TAP is intended to help local sponsors fund community-based projects to expand travel choices and enhance the transportation experience by improving the cultural, historical, and environmental aspects of the transportation infrastructure.
TMPD	Transportation and Mobility Planning Division	VDOT Department that oversees statewide planning and mobility projects to promote a safe and efficient transportation network.
V/C	Volume-to-Capacity	A ratio of volume to capacity: A ratio >1 indicates the roadway facility is carrying more traffic than it can handle and improvements may be needed.
VDOT	Virginia Department of Transportation	VDOT is the agency responsible for construction, operation, and maintenance of the State's multi-modal transportation system.
VPD	Vehicles per day	The total number of vehicles that pass a particular point on the road during a period of 24 consecutive hours.

APPENDIX B: PROJECT INFORMATION SHEETS

West Service Area Project Information Sheets

Project Description

Project Name:	River Road West (Route 6)	**Date:**	September 2018
Project Limits From:	Fluvanna County Line	**To:**	Sandy Hook Road
MTP Functional Classification:	Minor Arterial	**Length (mi.):**	12.70
Existing Lanes / Proposed Lanes:	2 lanes / 2 lanes	**Divided:**	No
Recommendations:	2-lane, undivided roadway Widen ROW to accommodate wider shoulders Provides guidance for developers / Planning tool for future growth / No eminent domain	**Justification Criteria:**	Operational, Connectivity, Multi-Modal, Safety

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	5,000	0.43	B
2040 No-Build (w/o Improvements)	8,000	0.7	C
2040 Build (w/ Improvements)	8,500	0.74	C

Planning Level Costs

Description	Costs
Roadway Typical Section GS-2	$0
Shoulders - Paved (8' both sides)	$21,561,778
Multi-modal Facility - Paved (4' both sides)	$0
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$0
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$21,561,800*
Additional Contingency (10%)	$2,156,180
Utilities (25%)	$5,390,450
Right-of-Way (25%)	$5,390,450
CEI (15%)	$3,234,270
Grand Total	*$37,733,150*

Cost Inputs

Project Length (Miles)	12.70		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	Bridge #1 Width (Feet)	0
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

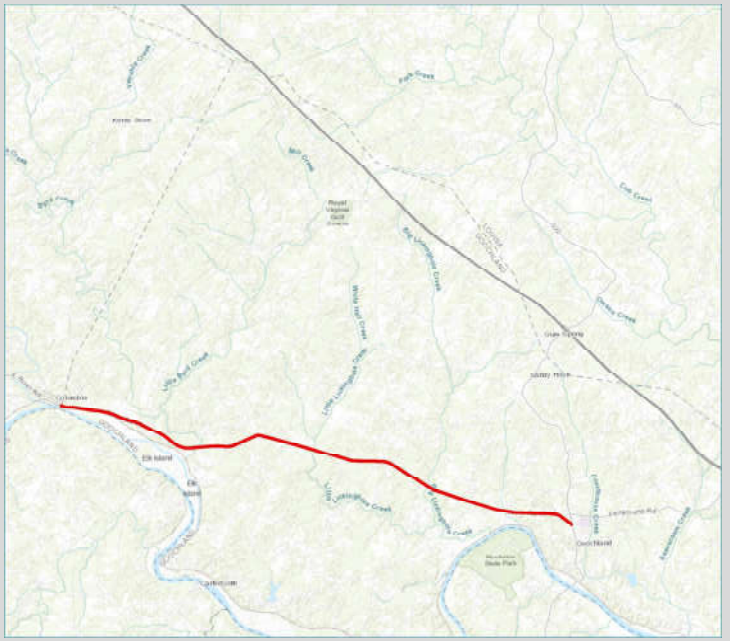
Specific Assumptions

- No cost availbe for 8' shoulder so the unit cost per mile was derived from the using an average cost of a 18' lane prorated to a 16' lane (8' widening on each side)

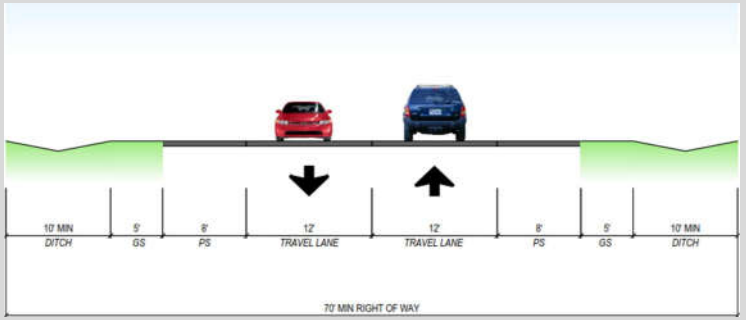
General Assumptions

- Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards
- Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates
- Cost in 2018 dollars
- Costs include 25% for PE & Construction Contingencies
- Annual inflation rate is 3.0% annually
- No lighting, streetscape, signalization, storm water management or utility betterments are included

Project Location Map



Proposed Cross Section



Project Description

Project Name:	Hadensville-Fife Road (Route 606)	**Date:**	September 2018
Project Limits From:	River Road West	**To:**	Broad Street Road
MTP Functional Classification:	Major Collector	**Length (mi.):**	9.30
Existing Lanes / Proposed Lanes:	2 lanes / 2 lanes	**Divided:**	No
Recommendations:	2-lane, undivided roadway Widen ROW to accommodate wider shoulders Provides guidance for developers / Planning tool for future growth / No eminent domain	**Justification Criteria:**	Safety, Operational

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	1,300	0.11	A
2040 No-Build (w/o Improvements)	7,700	0.67	C
2040 Build (w/ Improvements)	7,700	0.67	C

Planning Level Costs

Description	Costs
Roadway Typical Section GS-3	$0
Shoulders - Paved (8' both sides)	$15,789,333
Multi-modal Facility - Paved (4' both sides)	$0
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$0
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$15,789,300*
Additional Contingency (10%)	$1,578,930
Utilities (25%)	$3,947,325
Right-of-Way (25%)	$3,947,325
CEI (15%)	$2,368,395
Grand Total	*$27,631,275*

Cost Inputs

Project Length (Miles)	9.30		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	Bridge #1 Width (Feet)	0
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

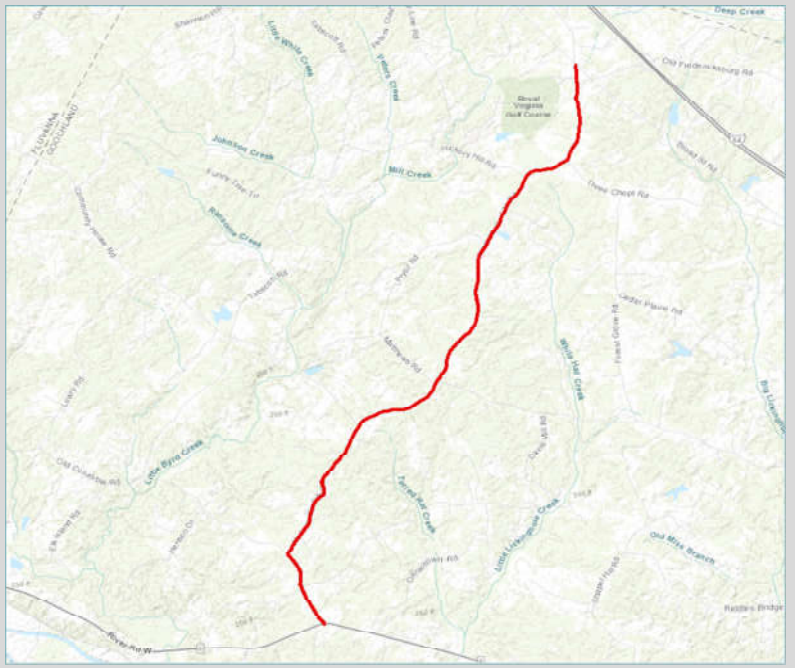
Specific Assumptions

- No cost available for 8' shoulder so the unit cost per mile was derived from the using an average cost of a 18' lane prorated to a 16' lane (8' widening on each side)

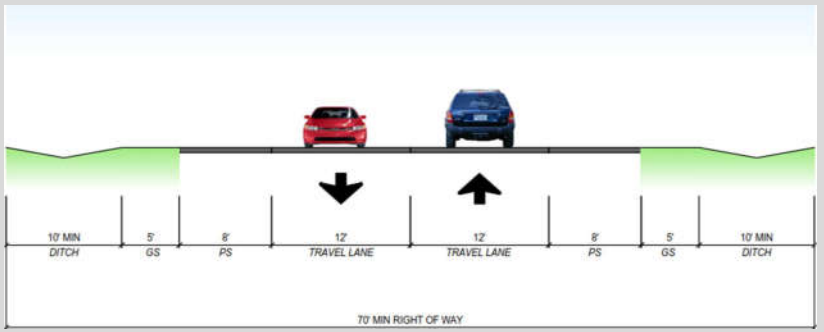
General Assumptions

- Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards
- Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates
- Cost in 2018 dollars
- Costs include 25% for PE & Construction Contingencies
- Annual inflation rate is 3.0% annually
- No lighting, streetscape, signalization, storm water management or utility betterments are included

Project Location Map



Proposed Cross Section



Central Service Area Project Information Sheets

Project Description

Project Name:	Whitehall Road at Sandy Hook Road	**Date:**	September 2018
Project Limits From:	Intersection	**To:**	NA
MTP Functional Classification:	NA	**Length (mi.):**	NA
Existing Lanes / Proposed Lanes:	2 lanes / 2 lanes	**Divided:**	NA
Recommendations:	Potential location for one-lane roundabout or other improvements Relocate curve in Sandy Hook Road as part of intersection improvements	**Justification Criteria:**	Safety

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	-	-	-
2040 No-Build (w/o Improvements)	-	-	-
2040 Build (w/ Improvements)	-	-	-

Planning Level Costs

Description	Costs
One lane Roundabout with approaches	$2,600,000
Curve Flattening ~1600' GS-3	$1,151,515
Multi-modal Facility - Paved (4' both sides)	$0
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$0
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$3,751,500*
Additional Contingency (10%)	$375,150
Utilities (25%)	$937,875
Right-of-Way (25%)	$937,875
CEI (15%)	$562,725
Grand Total	*$6,565,125*

Potential of greater ROW impacts than shown

Cost Inputs

Project Length (Miles)	0.00		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	Bridge #1 Width (Feet)	0
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

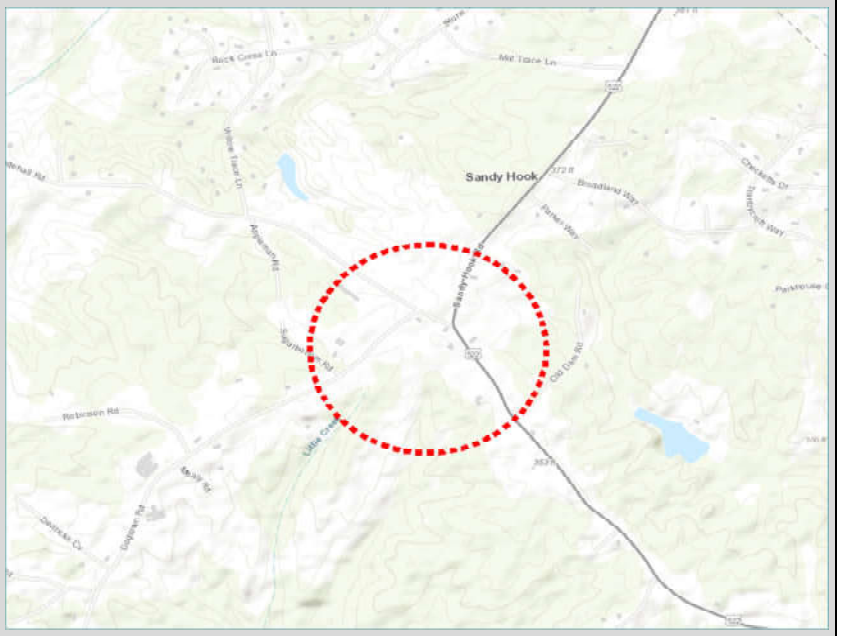
Specific Assumptions

- *Used High cost for roundabout*
- *Used High cost for curve flattening*

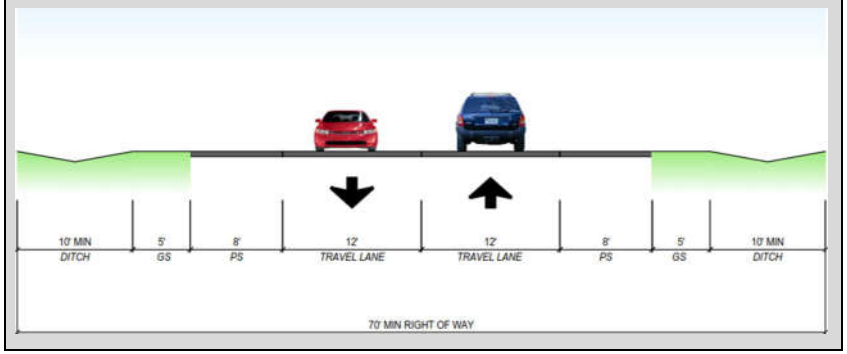
General Assumptions

- *Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards*
- *Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates*
- *Cost in 2018 dollars*
- *Costs include 25% for PE & Construction Contingencies*
- *Annual inflation rate is 3.0% annually*
- *No lighting, streetscape, signalization, storm water management or utility betterments are included*

Project Location Map



Proposed Cross Section



Project Description

Project Name:	Fairground Road (Route 632) Intersection and Extension	**Date:**	September 2018
Project Limits From:	Fairground Road	**To:**	River Road West
MTP Functional Classification:	Minor Arterial	**Length (mi.):**	0.28
Existing Lanes / Proposed Lanes:	2 lanes / 3 lanes	**Divided:**	No
Recommendations:	3-lane, undivided roadway One lane roundabout at intersection Construct multi-modal facility	**Justification Criteria:**	Operational, Connectivity, Multi-Modal

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	-	-	-
2040 No-Build (w/o Improvements)	-	-	-
2040 Build (w/ Improvements)	5,200	0.37	B

Planning Level Costs

Description	Costs
Roadway Typical Section GS-2	$1,590,909
One lane Roundabout with approaches	$1,850,000
Right-turn Lane on River Road	$270,000
Left-turn Lane on River Road	$1,230,000
Bridge #1	$0
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$4,940,900*
Additional Contingency (10%)	$494,090
Utilities (25%)	$1,235,225
Right-of-Way (25%)	$1,235,225
CEI (15%)	$741,135
Grand Total	*$8,646,575*

Cost Inputs

Project Length (Miles)	0.28		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	Bridge #1 Width (Feet)	0
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

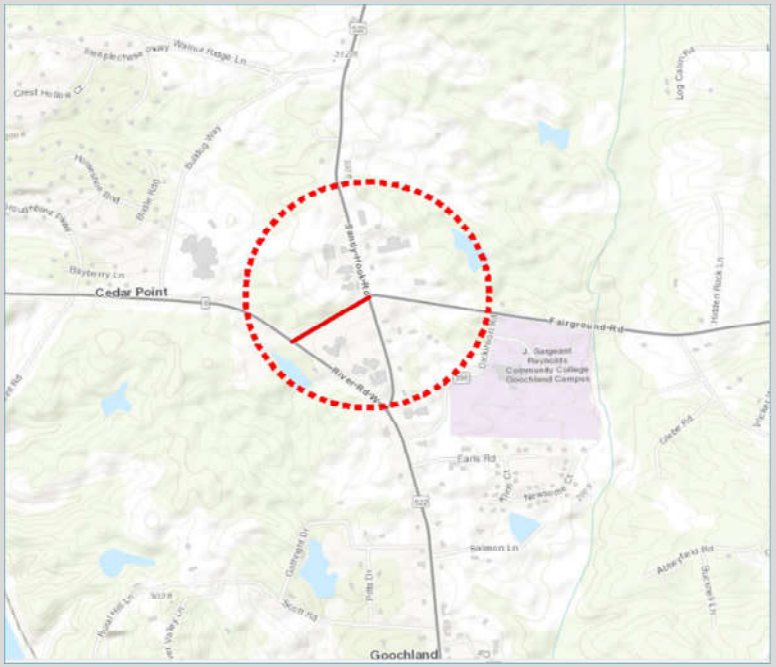
Specific Assumptions

- *Used Low cost for 3-lane section*
- *Used Low cost for roundabout*
- *Added right and left-turn lanes along River Road at the new intersection*

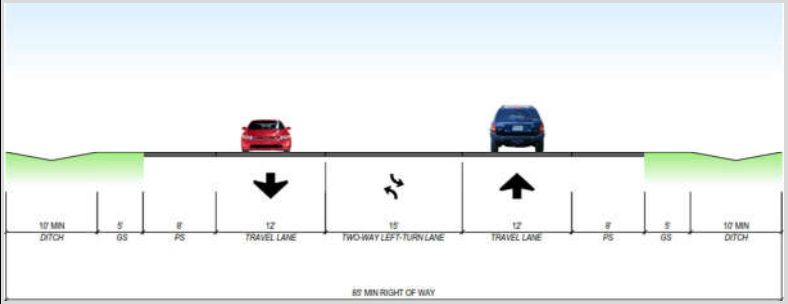
General Assumptions

- *Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards*
- *Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates*
- *Cost in 2018 dollars*
- *Costs include 25% for PE & Construction Contingencies*
- *Annual inflation rate is 3.0% annually*
- *No lighting, streetscape, signalization, storm water management or utility betterments are included*

Project Location Map



Proposed Cross Section



Project Description

Project Name:	Fairground Road (Route 632)	**Date:**	September 2018
Project Limits From:	Broad Street Road	**To:**	Sandy Hook Road
MTP Functional Classification:	Minor Arterial	**Length (mi.):**	5.10
Existing Lanes / Proposed Lanes:	2 lanes / 4 lanes	**Divided:**	No
Recommendations:	4-lane, undivided	**Justification Criteria:**	Safety, Operational

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	7,100	0.62	C
2040 No-Build (w/o Improvements)	9,200	0.8	D
2040 Build (w/ Improvements)	11,600	0.39	B

Planning Level Costs

Description	Costs
Roadway Typical Section GS-2	$30,141,000
Shoulders - Paved (4' both sides)	$0
Multi-modal Facility - Paved (4' both sides)	$0
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$0
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$30,141,000*
Additional Contingency (10%)	$3,014,100
Utilities (25%)	$7,535,250
Additional Contingency (25%)	$7,535,250
Utilities (15%)	$4,521,150
Grand Total	*$52,746,750*

Cost Inputs

Project Length (Miles)	5.10		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	Bridge #1 Width (Feet)	0
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

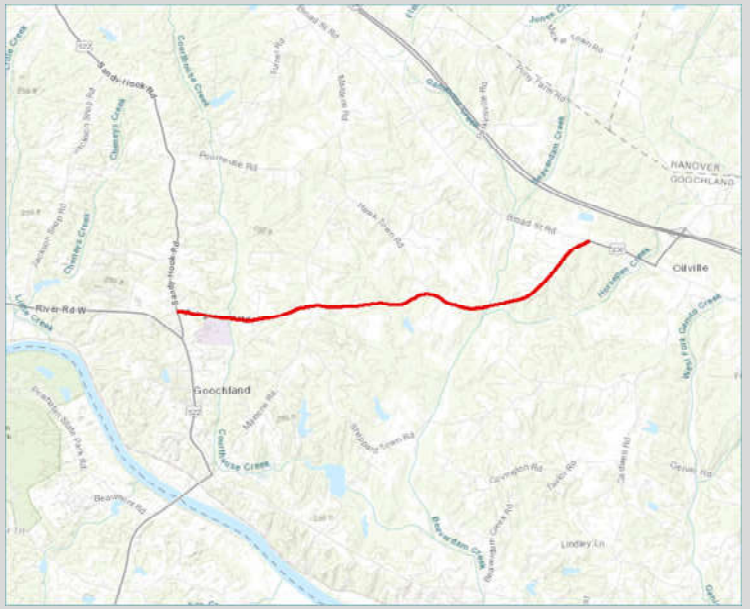
Specific Assumptions

- For 4-lane section: Used High cost for a 4-lane facility that adds two new lanes and repaves the existing lanes. High cost used due to topography of exisitng road.

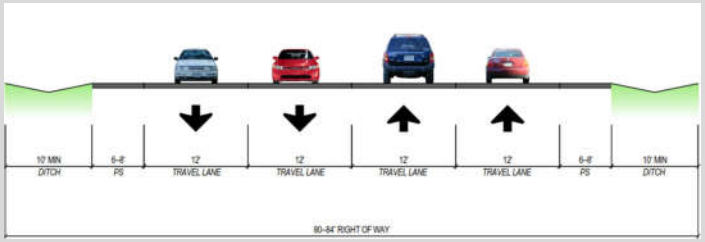
General Assumptions

- Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards
- Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates
- Cost in 2018 dollars
- Costs include 25% for PE & Construction Contingencies
- Annual inflation rate is 3.0% annually
- No lighting, streetscape, signalization, storm water management or utility betterments are included

Project Location Map



Proposed Cross Sections



Project Description

Project Name:	Oilville Road (Route 617)	**Date:**	September 2018
Project Limits From:	Broad Street Road	**To:**	I-64
MTP Functional Classification:	Major Collector	**Length (mi.):**	0.66
Existing Lanes / Proposed Lanes:	2 lanes / 4 lanes	**Divided:**	No
Recommendations:	4-lane, undivided roadway Note: 2018 SMART SCALE application completed for an interchange modification	**Justification Criteria:**	Operational Connectivity

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	8,700	0.76	D
2040 No-Build (w/o Improvements)	12,000	> 1.00	F
2040 Build (w/ Improvements)	14,700	0.5	B

Planning Level Costs

Description	Costs
Roadway Typical Section GS-3	$4,408,144
Shoulders - Paved (4' both sides)	$0
Multi-modal Facility - Paved (4' both sides)	$0
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$7,000,000
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$11,408,100*
Additional Contingency (10%)	$1,140,810
Utilities (25%)	$2,852,025
Right-of-Way (25%)	$2,852,025
CEI (15%)	$1,711,215
Grand Total	*$19,964,175*

Cost Inputs

Project Length (Miles)	0.66		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	400	Bridge #1 Width (Feet)	70
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

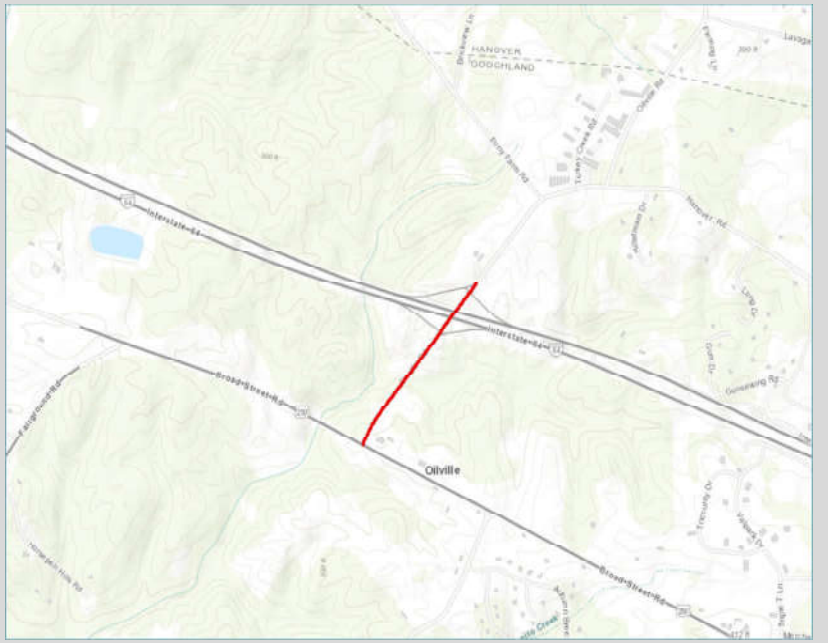
Specific Assumptions

- *Used High cost for 4-lane section due to topography*
- *Bridge unit cost per square foot was increased to $250/ft2 due to work over I-64*
- *Costs DO NOT include any interchange ramp work*

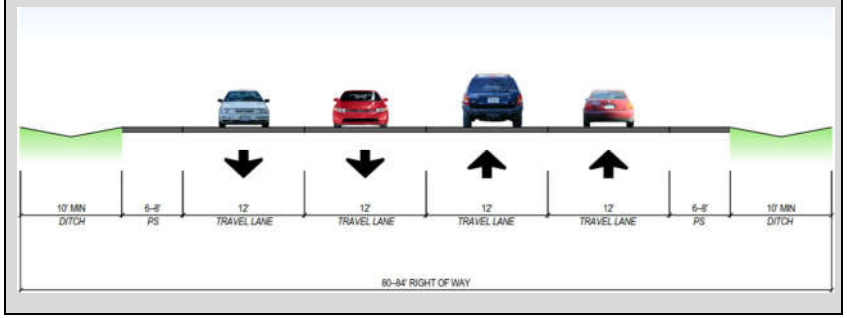
General Assumptions

- *Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards*
- *Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates*
- *Cost in 2018 dollars*
- *Costs include 25% for PE & Construction Contingencies*
- *Annual inflation rate is 3.0% annually*
- *No lighting, streetscape, signalization, storm water management or utility betterments are included*

Project Location Map



Proposed Cross Section



Project Description

Project Name:	Broad Street Road at Cardwell Road	**Date:**	September 2018
Project Limits From:	Intersection	**To:**	NA
MTP Functional Classification:	NA	**Length (mi.):**	NA
Existing Lanes / Proposed Lanes:	NA	**Divided:**	NA
Recommendations:	Convert intersection to a T-intersection configuration Recommendation from Fairground to Cardwell Road Safety Study (2017)	**Justification Criteria:**	Safety, Operational

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	-	-	-
2040 No-Build (w/o Improvements)	-	-	-
2040 Build (w/ Improvements)	-	-	-

Planning Level Costs

Description	Costs
Intersection Reconstruction	$239,110
Left-turn lane on Broad Street	$1,910,000
Multi-modal Facility - Paved (4' both sides)	$0
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$0
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$2,149,100*
Additional Contingency (10%)	$214,910
Utilities (25%)	$537,275
Right-of-Way (25%)	$537,275
CEI (15%)	$322,365
Grand Total	*$3,760,925*

Assumes left-turn lane is warranted

Cost Inputs

Project Length (Miles)	0.00		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	Bridge #1 Width (Feet)	0
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

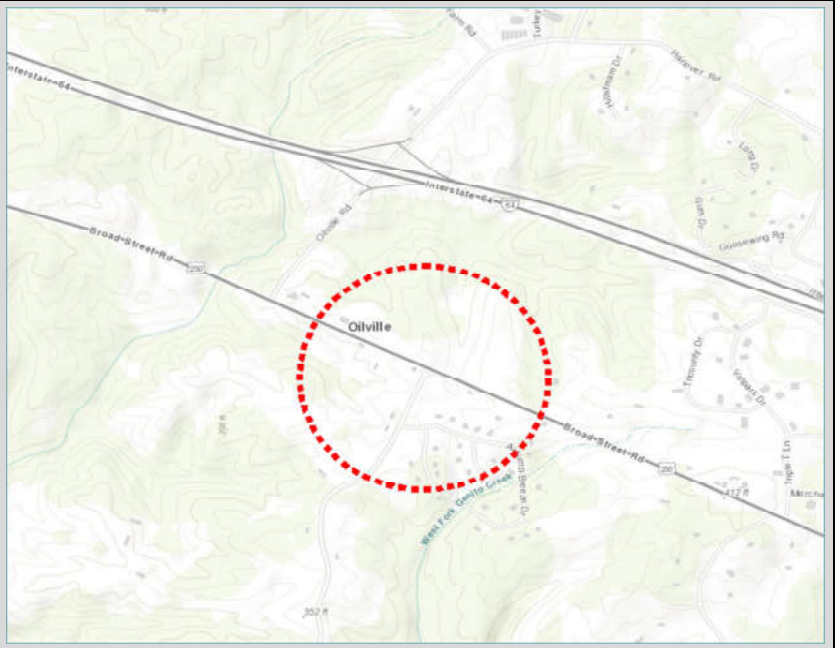
Specific Assumptions

- *Used average cost for a short 2-lane section of Cardwell Road*
- *Used High cost for a westbounbd left-turn lane along Broad Street, which assumes it may be warranted*

General Assumptions

- *Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards*
- *Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates*
- *Cost in 2018 dollars*
- *Costs include 25% for PE & Construction Contingencies*
- *Annual inflation rate is 3.0% annually*
- *No lighting, streetscape, signalization, storm water management or utility betterments are included*

Project Location Map



Proposed Cross Section

Project Description

Project Name:	River Road West (Route 6)	**Date:**	September 2018
Project Limits From:	Maidens Road	**To:**	Hermitage Road
MTP Functional Classification:	Minor Arterial	**Length (mi.):**	10.00
Existing Lanes / Proposed Lanes:	2 lanes / 4 lanes	**Divided:**	No
Recommendations:	4-lane, undivided roadway Construct multi-modal facility to be consistent with Comprehensive Plan Ends at Hermitage Road because that is where the road is an existing 4 lanes	**Justification Criteria:**	Operational Connectivity Multi-Modal

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	6,600	0.57	C
2040 No-Build (w/o Improvements)	6,000	0.52	C
2040 Build (w/ Improvements)	8,300	0.28	A

Planning Level Costs

Description	Costs
Roadway Typical Section GS-2	$43,380,000
Roadway Typical Section GS-2	$5,650,000
New Traffic Signal @ River Rd & Rte 522	$336,000
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$0
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$49,366,000*
Additional Contingency (10%)	$4,936,600
Utilities (25%)	$12,341,500
Right-of-Way (25%)	$12,341,500
CEI (15%)	$7,404,900
Grand Total	*$86,390,500*

Cost Inputs

Project Length (Miles)	10.00		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	Bridge #1 Width (Feet)	0
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

Specific Assumptions

- Aproximately 1 mile of this section of River Road West has curb and gutter section. Therefore two different raodway sections were estimated.

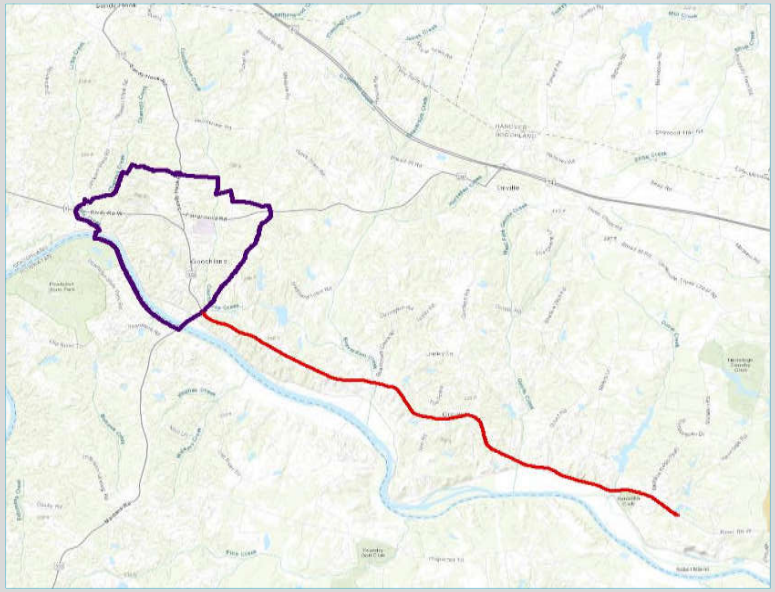
- For the rural section w/o curb and gutter an average cost for a 4-lane facility that adds two new lanes and repaves the existing lanes was estimated.

- For the urban section w/ curb and gutter the High cost was used to widen the existing 36' 2-lane section to a 48' 4-lane section.

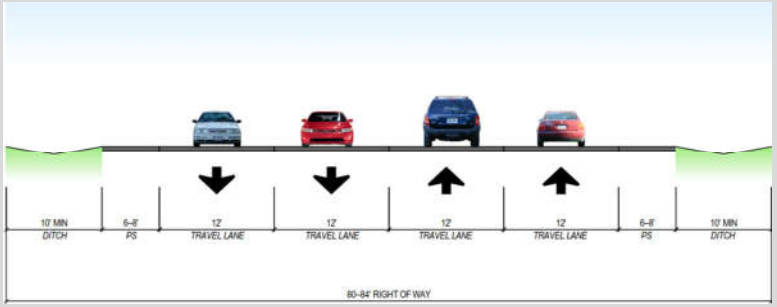
General Assumptions

- Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards
- Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates
- Cost in 2018 dollars
- Costs include 25% for PE & Construction Contingencies
- Annual inflation rate is 3.0% annually
- No lighting, streetscape, signalization, storm water management or utility betterments are included

Project Location Map



Proposed Cross Section



East Service Area Project Information Sheets

Project Description

Project Name:	Tuckahoe Creek Parkway (Route 740) and Intersection	**Date:**	September 2018
Project Limits From:	Hermitage Road	**To:**	Hockett Road
MTP Functional Classification:	Major Collector	**Length (mi.):**	1.30
Existing Lanes / Proposed Lanes:	2 lanes/ 4 lanes	**Divided:**	Yes
Recommendations:	4-lane, divided roadway Add left-turn and right-turn lanes at intersection based on widening Construct multi-modal facility	**Justification Criteria:**	Safety, Operational, Connectivity, Multi-Modal

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	1,800	0.16	A
2040 No-Build (w/o Improvements)	10,600	0.92	E
2040 Build (w/ Improvements)	14,300	0.43	B

Planning Level Costs

Description	Costs
Roadway Typical Section GS-3	$7,345,000
Turn Lanes	$820,000
Multi-modal Facility - Paved (4' both sides)	$0
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$0
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$8,165,000*
Additional Contingency (10%)	$816,500
Utilities (25%)	$2,041,250
Right-of-Way (25%)	$2,041,250
CEI (15%)	$1,224,750
Grand Total	*$14,288,750*

Cost Inputs

Project Length (Miles)	1.30		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	Bridge #1 Width (Feet)	0
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

Specific Assumptions

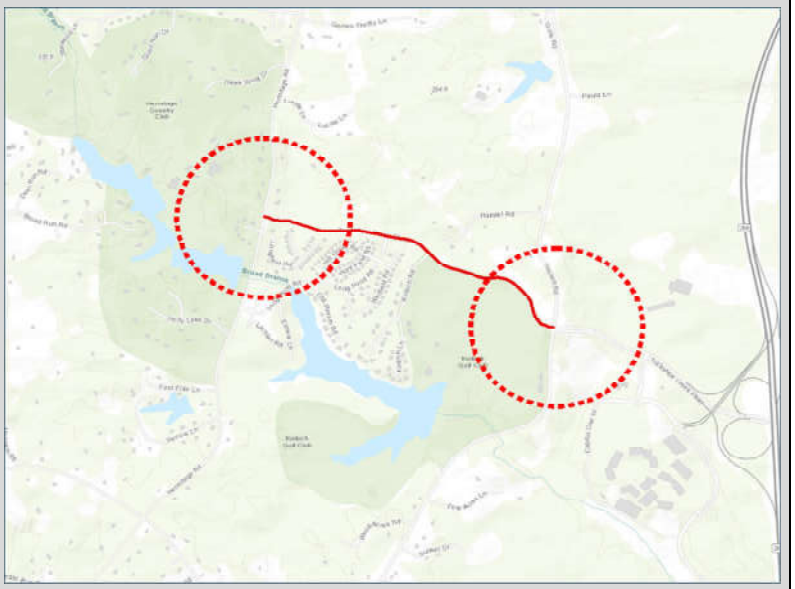
- Used High cost for a 4-lane facility that adds two new lanes and repaves the existing lanes. High cost used due to topography of exisitng road.

- Added right and left-turn lanes to each end of roadway.

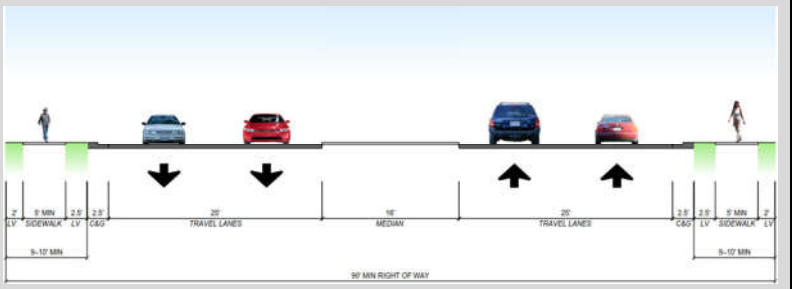
General Assumptions

- Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards
- Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates
- Cost in 2018 dollars
- Costs include 25% for PE & Construction Contingencies
- Annual inflation rate is 3.0% annually
- No lighting, streetscape, signalization, storm water management or utility betterments are included

Project Location Map



Proposed Cross Section



Project Description

Project Name:	Rockville Road (Route 622)	**Date:**	September 2018
Project Limits From:	Hanover County Line	**To:**	Ashland Road
MTP Functional Classification:	Major Collector	**Length (mi.):**	2.40
Existing Lanes / Proposed Lanes:	2 lanes / 2 lanes	**Divided:**	No
Recommendations:	2-lane, undivided roadway Widen ROW to accommodate wider shoulders Construct multi-modal facility	**Justification Criteria:**	Safety, Multi-Modal

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	2,200	0.19	A
2040 No-Build (w/o Improvements)	5,200	0.45	B
2040 Build (w/ Improvements)	4,700	0.38	B

Planning Level Costs

Description	Costs
Roadway Typical Section GS-3	$0
Shoulders - Paved (8' both sides)	$4,074,667
Multi-modal Facility - Paved (4' both sides)	$0
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$0
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$4,074,700*
Additional Contingency (10%)	$407,470
Utilities (25%)	$1,018,675
Right-of-Way (25%)	$1,018,675
CEI (15%)	$611,205
Grand Total	*$7,130,725*

Cost Inputs

Project Length (Miles)	2.40		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	Bridge #1 Width (Feet)	0
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

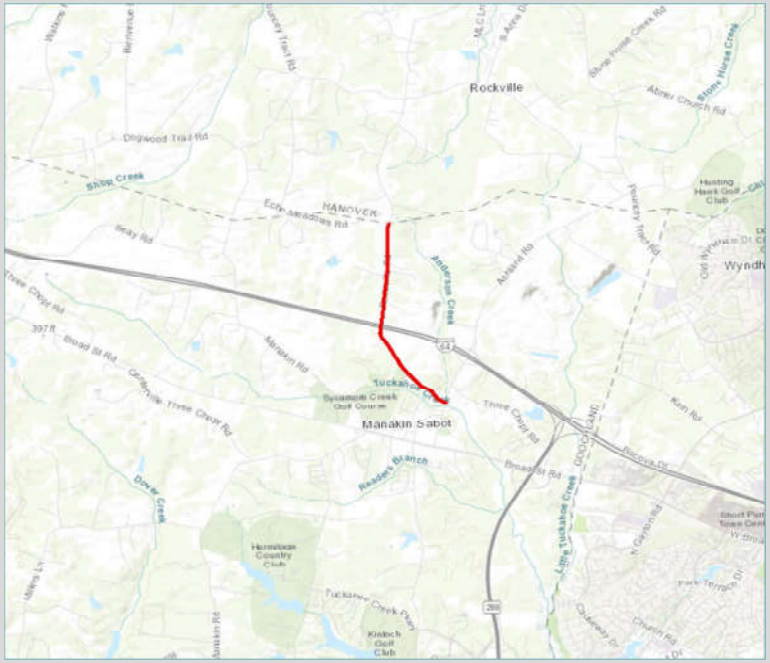
Specific Assumptions

- No cost available for 8' shoulder so the unit cost per mile was derived from the using an average cost of a 18' lane prorated to a 16' lane (8' widening on each side)

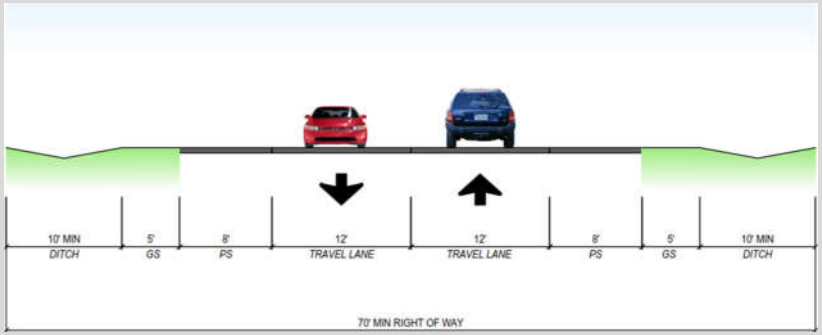
General Assumptions

- Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards
- Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates
- Cost in 2018 dollars
- Costs include 25% for PE & Construction Contingencies
- Annual inflation rate is 3.0% annually
- No lighting, streetscape, signalization, storm water management or utility betterments are included

Project Location Map



Proposed Cross Section



Project Description

Project Name:	Ashland Road (Route 623)	**Date:**	September 2018
Project Limits From:	Broad Street Road	**To:**	I-64
MTP Functional Classification:	Minor Arterial	**Length (mi.):**	1.20
Existing Lanes / Proposed Lanes:	2 lanes / 4 lanes	**Divided:**	Yes
Recommendations:	4-lane, divided roadway Note: 2018 SMART SCALE application for interchange modification Note: New Park & Ride to be added as part of interchange project	**Justification Criteria:**	Safety Operational Multi-Modal

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	9,300	0.81	D
2040 No-Build (w/o Improvements)	25,000	> 1.00	F
2040 Build (w/ Improvements)	25,000	0.58	C

Planning Level Costs

Description	Costs
Roadway Typical Section GS-2	$6,351,970
New traffic signal @ Westbound I-64 Ramp	$336,000
Multi-modal Facility - Paved (4' both sides)	$0
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$7,000,000
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$13,688,000*
Additional Contingency (10%)	$1,368,800
Utilities (25%)	$3,422,000
Right-of-Way (25%)	$3,422,000
CEI (15%)	$2,053,200
Grand Total	*$23,954,000*

Cost Inputs

Project Length (Miles)	1.20		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	400	Bridge #1 Width (Feet)	70
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

Specific Assumptions

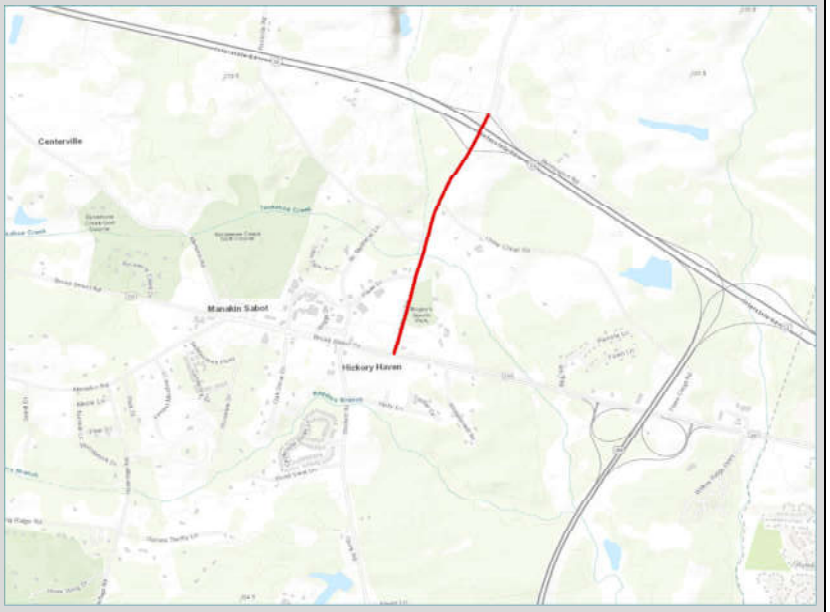
- Used High cost for 4-lane section due to potential amenities needed such as lighting, landscaping, etc.

- Bridge unit cost per square foot was increased to $250/ft2 due to work over I-64

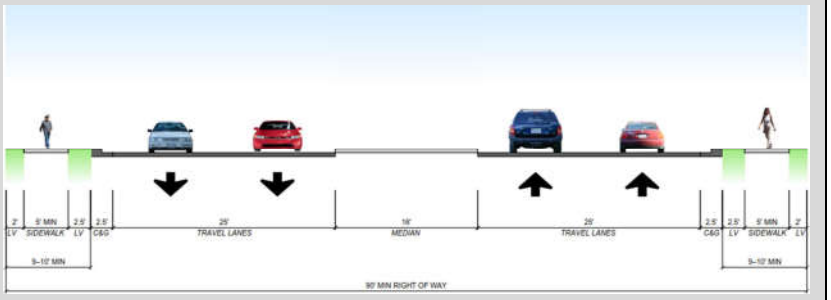
General Assumptions

- Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards
- Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates
- Cost in 2018 dollars
- Costs include 25% for PE & Construction Contingencies
- Annual inflation rate is 3.0% annually
- No lighting, streetscape, signalization, storm water management or utility betterments are included

Project Location Map



Proposed Cross Section



Project Description

Project Name:	Ashland Road (Route 623)	**Date:**	September 2018
Project Limits From:	I-64	**To:**	Hanover County Line
MTP Functional Classification:	Minor Arterial	**Length (mi.):**	2.30
Existing Lanes / Proposed Lanes:	2 lanes / 4 lanes	**Divided:**	No
Recommendations:	4-lane, undivided roadway	**Justification Criteria:**	Safety, Operational

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	6,200	0.54	C
2040 No-Build (w/o Improvements)	8,100	0.71	C
2040 Build (w/ Improvements)	14,400	0.49	B

Planning Level Costs

Description	Costs
Roadway Typical Section GS-2	$11,086,000
Shoulders - Paved (4' both sides)	$0
Multi-modal Facility - Paved (4' both sides)	$0
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$0
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$11,086,000*
Additional Contingency (10%)	$1,108,600
Utilities (25%)	$2,771,500
Right-of-Way (25%)	$2,771,500
CEI (15%)	$1,662,900
Grand Total	*$19,400,500*

Cost Inputs

Project Length (Miles)	2.30		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	Bridge #1 Width (Feet)	0
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

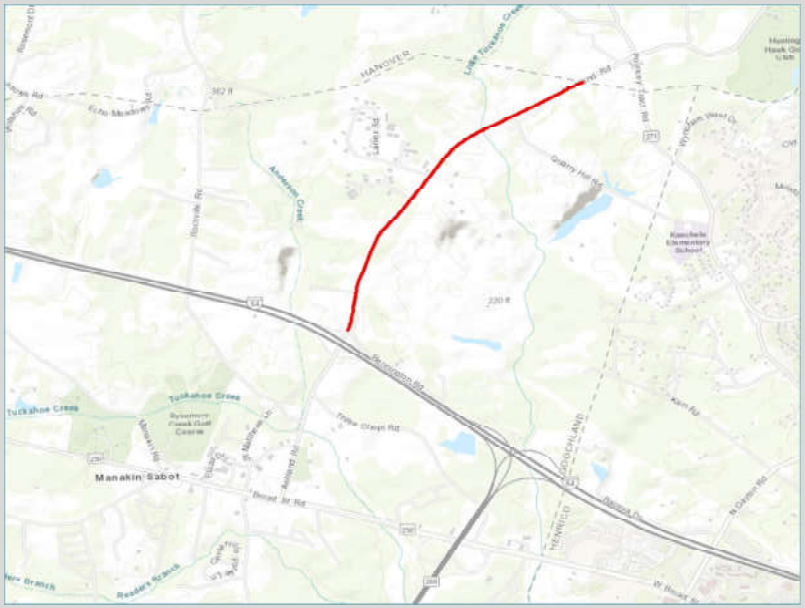
Specific Assumptions

- Used average cost for a 4-lane facility that adds two new lanes and repaves the existing lanes.

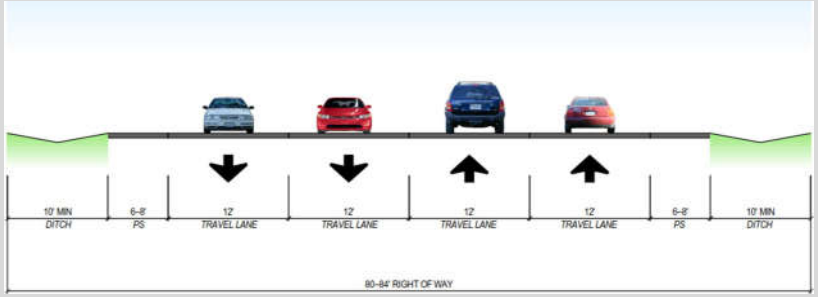
General Assumptions

- Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards
- Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates
- Cost in 2018 dollars
- Costs include 25% for PE & Construction Contingencies
- Annual inflation rate is 3.0% annually
- No lighting, streetscape, signalization, storm water management or utility betterments are included

Project Location Map



Proposed Cross Section



Project Description

Project Name:	Hockett Road Realignment	**Date:**	September 2018
Project Limits From:	Hockett Road	**To:**	Broad Street Road
MTP Functional Classification:	Major Collector	**Length (mi.):**	0.28
Existing Lanes / Proposed Lanes:	New Road / 3 lanes (needs to be further analyzed)	**Divided:**	No
Recommendations:	Construct south leg of intersection Construct multi-modal facility No specific alignment or cross section determined yet. However, for estimating purposes a 3-lane section was used. Note: Partially funded (2014) - $1.5M (TPO funding but still need $400K)	**Justification Criteria:**	Safety, Operational, Multi-Modal

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	-	-	-
2040 No-Build (w/o Improvements)	-	-	-
2040 Build (w/ Improvements)	1,600	0.11	A

Planning Level Costs

Description	Costs
Roadway Typical Section GS-3	$1,389,205
Westbound Left-Turn Lane	$235,000
Signal Modification	$142,000
5' Sidewalk Each Side	$148,864
Bridge #1	$0
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$1,915,100*
Additional Contingency (10%)	$191,510
Utilities (25%)	$478,775
Right-of-Way (25%)	$478,775
CEI (15%)	$287,265
Grand Total	*$3,351,425*

Cost Inputs

Project Length (Miles)	0.28		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	Bridge #1 Width (Feet)	0
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

Specific Assumptions

- Assumed a three-lane section, estimated with the High cost due to the short distance and intersection tie ins.

- Added west left-turn lane in the median at the average cost.

- Added one additional mast arm and pole as part of the signal modification.

General Assumptions

- Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards

- Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates

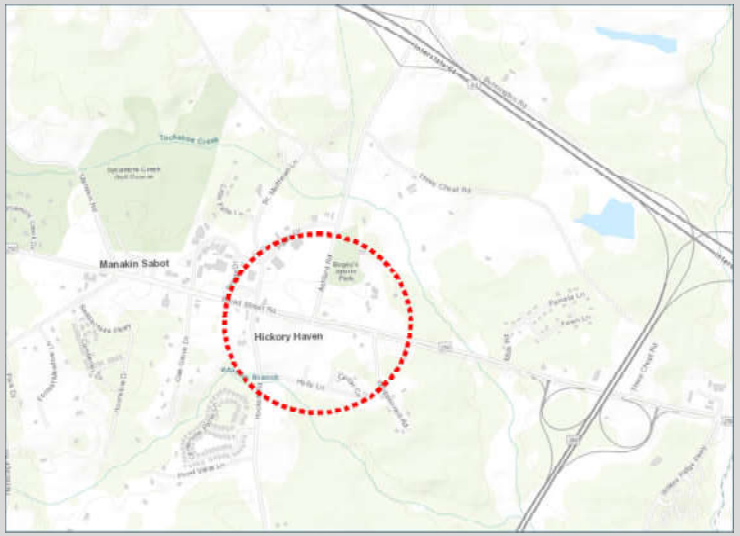
- Cost in 2018 dollars

- Costs include 25% for PE & Construction Contingencies

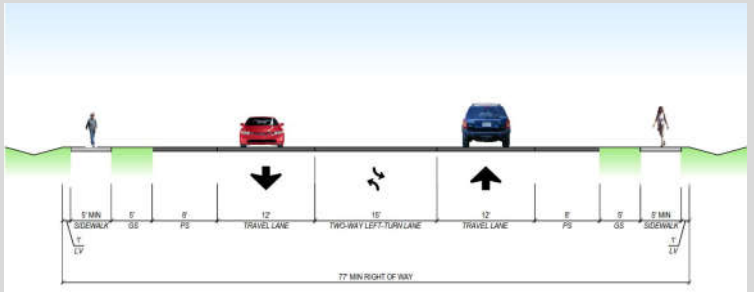
- Annual inflation rate is 3.0% annually

- No lighting, streetscape, signalization, storm water management or utility betterments are included

Project Location Map



Proposed Cross Section



Project Description

Project Name:	Three Chopt Road Extension	**Date:**	September 2018
Project Limits From:	Ashland Road	**To:**	East of Route 288
MTP Functional Classification:	Major Collector	**Length (mi.):**	1.45
Existing Lanes / Proposed Lanes:	Minor narrow 2 way road / 4 lanes	**Divided:**	Yes
Recommendations:	4-lane, divided roadway Construct multi-modal facility Extend under Route 288 Note: Part of AMP Study & 2018 SMART SCALE application	**Justification Criteria:**	Operational, Connectivity, Multi-Modal

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	-	-	-
2040 No-Build (w/o Improvements)	-	-	-
2040 Build (w/ Improvements)	18,300	0.55	C

Planning Level Costs

Description	Costs
Roadway Typical Section GS-3	$9,359,750
Drainage system	$5,000,000
Traffic Signal @ Ashland Rd & Three Chopt	$336,000
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$9,600,000
Bridge #2	$9,600,000
Bridge #3	$0
Roadway & Bridge Subtotal	*$33,895,800*
Additional Contingency (10%)	$3,389,580
Utilities (25%)	$8,473,950
Right-of-Way (25%)	$8,473,950
CEI (15%)	$5,084,370
Grand Total	*$59,317,650*

Cost Inputs

Project Length (Miles)	1.45		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	400	Bridge #1 Width (Feet)	80
Bridge #2 Length (Feet)	400	Bridge #2 Width (Feet)	80
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

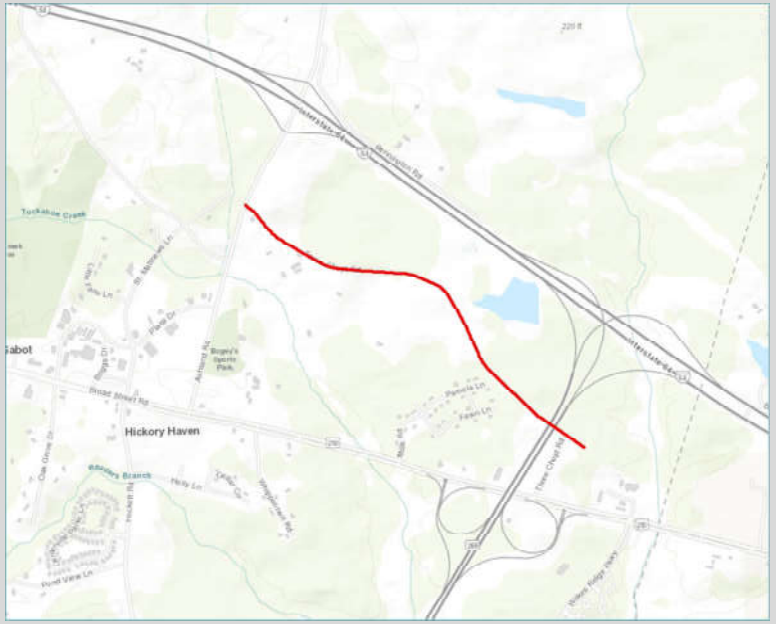
Specific Assumptions

- *Used average cost for 4-lane section*
- *Added drainage cost as the roadway elevation will need to be cut to go under Route 288*
- *Assumed that building 2 bridge structures on Route 288 to span the new Route 288 was a logical solution as opposed to boring under*

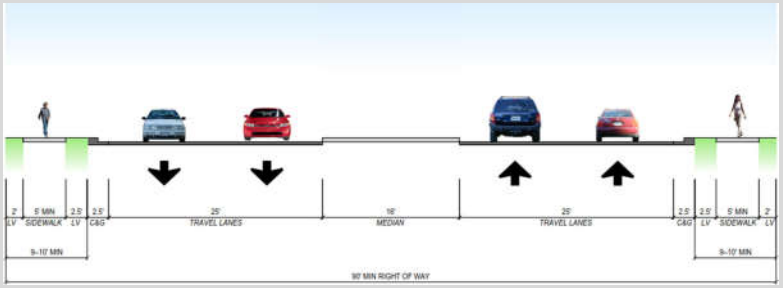
General Assumptions

- *Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards*
- *Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates*
- *Cost in 2018 dollars*
- *Costs include 25% for PE & Construction Contingencies*
- *Annual inflation rate is 3.0% annually*
- *No lighting, streetscape, signalization, storm water management or utility betterments are included*

Project Location Map



Proposed Cross Section



Project Description

Project Name:	Hockett Road to Future Wilkes Ridge Parkway Extension and New Route 288 Interchange	**Date:**	September 2018
Project Limits From:	Hockett Road	**To:**	Future Wilkes Ridge Parkway
MTP Functional Classification:	Major Collector	**Length (mi.):**	1.20
Existing Lanes / Proposed Lanes:	New Road / 4 lanes	**Divided:**	Yes
Recommendations:	4-lane, divided roadway Conduct study on new interchange on Route 288 (Interchange Justification Report) Note: Pursuing TPO funding for study	**Justification Criteria:**	Operational, Connectivity

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	-	-	-
2040 No-Build (w/o Improvements)	-	-	-
2040 Build (w/ Improvements)	5,100	0.15	A

Planning Level Costs

Description	Costs
Roadway Typical Section GS-3	$8,820,000
Interchange	TBD upon study of configuration
Multi-modal Facility - Paved (4' both sides)	$0
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$0
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$8,820,000*
Additional Contingency (10%)	$882,000
Utilities (25%)	$2,205,000
Right-of-Way (25%)	$2,205,000
CEI (15%)	$1,323,000
Grand Total	*$15,435,000*

Cost Inputs

Project Length (Miles)	1.20		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	Bridge #1 Width (Feet)	0
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

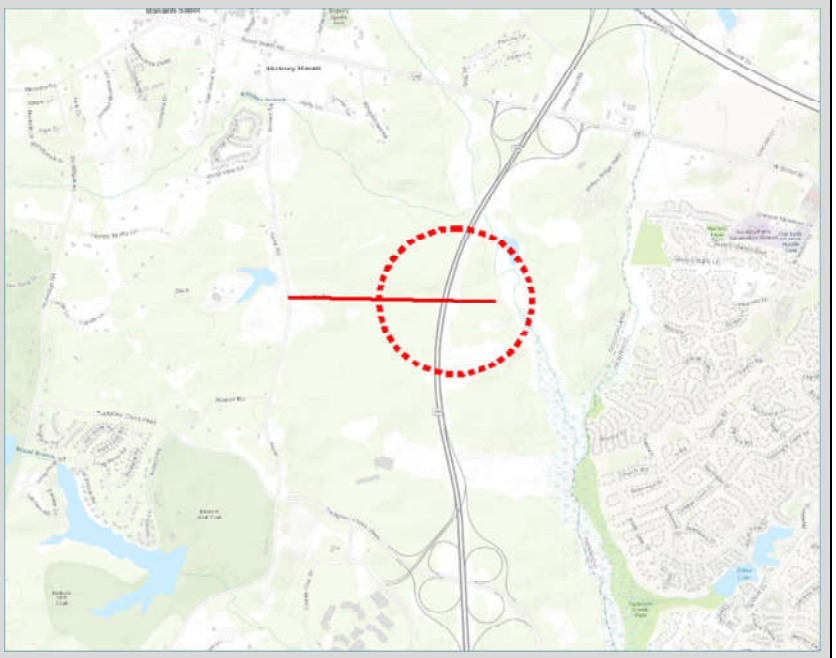
Specific Assumptions

- A rural section was used to estimate the cost based on the undeveloped nature of the area and also due to the seemingly high cost of an urban section

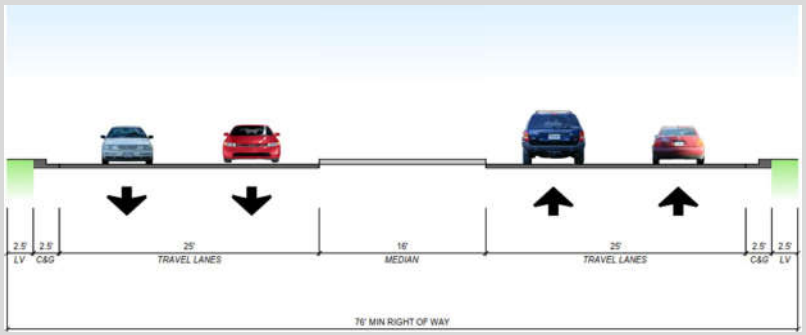
General Assumptions

- Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards
- Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates
- Cost in 2018 dollars
- Costs include 25% for PE & Construction Contingencies
- Annual inflation rate is 3.0% annually
- No lighting, streetscape, signalization, storm water management or utility betterments are included

Project Location Map



Proposed Cross Section



Project Description

Project Name:	Wilkes Ridge Parkway Extension	**Date:**	September 2018
Project Limits From:	Wilkes Ridge Parkway (Existing)	**To:**	Tuckahoe Creek Parkway
MTP Functional Classification:	Major Collector	**Length (mi.):**	2.10
Existing Lanes / Proposed Lanes:	New Road / 4 lanes	**Divided:**	Yes
Recommendations:	4-lane, divided roadway Construct multi-modal facility	**Justification Criteria:**	Operational, Connectivity, Multi-Modal

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	-	-	-
2040 No-Build (w/o Improvements)	-	-	-
2040 Build (w/ Improvements)	1,100	0.03	A

Planning Level Costs

Description	Costs	
Roadway Typical Section GS-3	$15,435,000	
Shoulders - Paved (4' both sides)	$0	
Multi-modal Facility - Paved (4' both sides)	$0	
Shared Use Path - Paved (10' one side)	$0	
Bridge #1	$0	
Bridge #2	$0	
Bridge #3	$0	
Roadway & Bridge Subtotal	***$15,435,000***	
Additional Contingency (10%)	$1,543,500	
Utilities (25%)	$3,858,750	
Right-of-Way (25%)	$0	*No ROW assumed*
CEI (15%)	$2,315,250	
Grand Total	***$23,152,500***	

Cost Inputs

Project Length (Miles)	2.10		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	**Bridge #1 Width (Feet)**	0
Bridge #2 Length (Feet)	0	**Bridge #2 Width (Feet)**	0
Bridge #3 Length (Feet)	0	**Bridge #3 Width (Feet)**	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

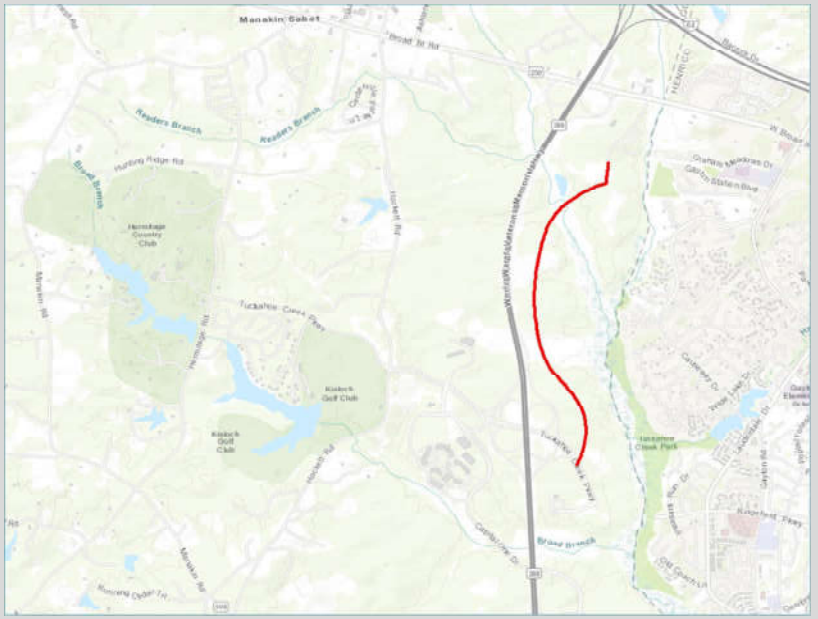
Specific Assumptions

- A rural section was used to estimate the cost based on the undeveloped nature of the area and also due to the seemingly high cost of an urban section

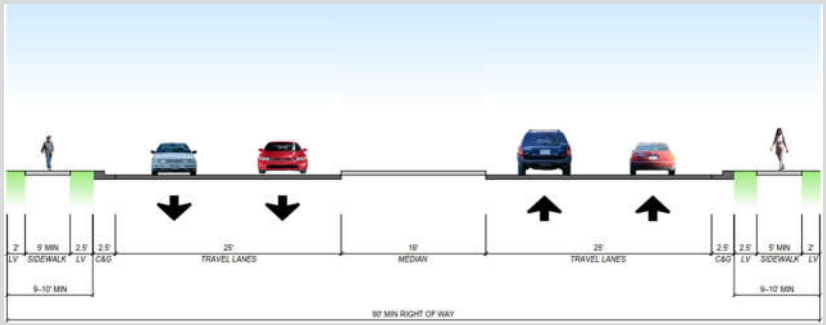
General Assumptions

- Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards
- Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates
- Cost in 2018 dollars
- Costs include 25% for PE & Construction Contingencies
- Annual inflation rate is 3.0% annually
- No lighting, streetscape, signalization, storm water management or utility betterments are included

Project Location Map



Proposed Cross Section



Project Description

Project Name:	Tuckahoe Creek Parkway (Route 740) Extension and Bridge	**Date:**	September 2018
Project Limits From:	Tuckahoe Creek Parkway (Existing)	**To:**	Ridgefield Parkway (Henrico County)
MTP Functional Classification:	Major Collector	**Length (mi.):**	0.41
Existing Lanes / Proposed Lanes:	New Road / 4 lanes	**Divided:**	Yes
Recommendations:	4-lane, divided roadway	**Justification Criteria:**	Operational, Connectivity

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	-	-	-
2040 No-Build (w/o Improvements)	-	-	-
2040 Build (w/ Improvements)	25,400		D

Planning Level Costs

Description	Costs
Roadway Typical Section GS-3	$1,600,852
Shoulders - Paved (4' both sides)	$0
Multi-modal Facility - Paved (4' both sides)	$0
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$13,125,000
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$14,725,900*
Additional Contingency (10%)	$1,472,590
Utilities (25%)	$3,681,475
Right-of-Way (25%)	$3,681,475
CEI (15%)	$2,208,885
Grand Total	*$25,770,325*

Cost Inputs

Project Length (Miles)	0.22		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	1000	Bridge #1 Width (Feet)	70
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

Specific Assumptions

- A rural section was used to estimate the cost based on the undeveloped nature of the area and also due to the seemingly high cost of an urban section

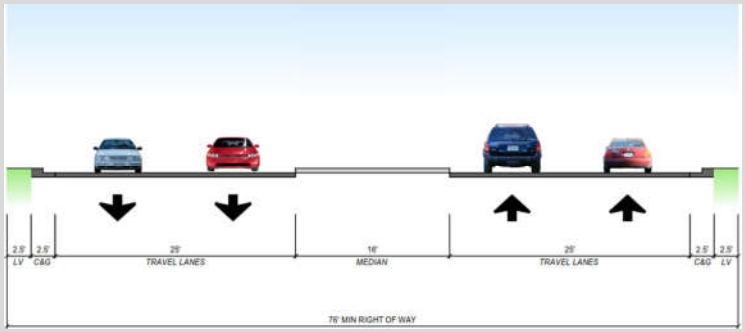
- The bridge cost was estiamted based on a 1000' long structure to span the potential floodplan of the creek

General Assumptions

- Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards
- Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates
- Cost in 2018 dollars
- Costs include 25% for PE & Construction Contingencies
- Annual inflation rate is 3.0% annually
- No lighting, streetscape, signalization, storm water management or utility betterments are included

Project Location Map

Proposed Cross Section



Project Description

Project Name:	River Road West (Route 6)	**Date:**	September 2018
Project Limits From:	Hermitage Road	**To:**	Hockett Road
MTP Functional Classification:	Minor Arterial	**Length (mi.):**	1.73
Existing Lanes / Proposed Lanes:	4 lanes / 4 lanes	**Divided:**	Yes
Recommendations:	Construct multi-modal facility	**Justification Criteria:**	Connectivity, Multi-Modal

Traffic Data

	AADT	Volume/Capacity (V/C) Ratio	Level of Service (LOS)
Existing	5,400	0.16	A
2040 No-Build (w/o Improvements)	10,000	0.34	B
2040 Build (w/ Improvements)	11,300	0.39	B

Planning Level Costs

Description	Costs
Outside Shoulders - Paved (8' both sides)	$3,398,489
Inside Shoulders - Paved (4' both sides)	$1,280,200
Multi-modal Facility - Paved (4' both sides)	$0
Shared Use Path - Paved (10' one side)	$0
Bridge #1	$0
Bridge #2	$0
Bridge #3	$0
Roadway & Bridge Subtotal	*$4,678,700*
Additional Contingency (10%)	$467,870
Utilities (25%)	$1,169,675
Right-of-Way (25%)	$1,169,675
CEI (15%)	$701,805
Grand Total	*$8,187,725*

Cost Inputs

Project Length (Miles)	1.73		
Shoulder Length (Miles)	0.00		
Multi-modal Facility (Miles)	0.00		
Shared Path Length (Miles)	0.00		
Bridge #1 Length (Feet)	0	Bridge #1 Width (Feet)	0
Bridge #2 Length (Feet)	0	Bridge #2 Width (Feet)	0
Bridge #3 Length (Feet)	0	Bridge #3 Width (Feet)	0

Funding

SMART SCALE	
Revenue Sharing	
RSTP	
SSYP	
HSIP	
TAP	
Private Investment	

Specific Assumptions

- No cost available for 8' shoulder so the unit cost per mile was derived from the using an average cost of a 18' lane prorated to a 16' lane (8' widening on each side)

- High costs for the inside shoulders was used due to likely drainage adjustments required.

General Assumptions

- Minimum roadway standards shall be in accordance with the VDOT Road Design Manual standards

- Costs are based on VDOT's TMPD Statewide Planning Level Cost Estimates

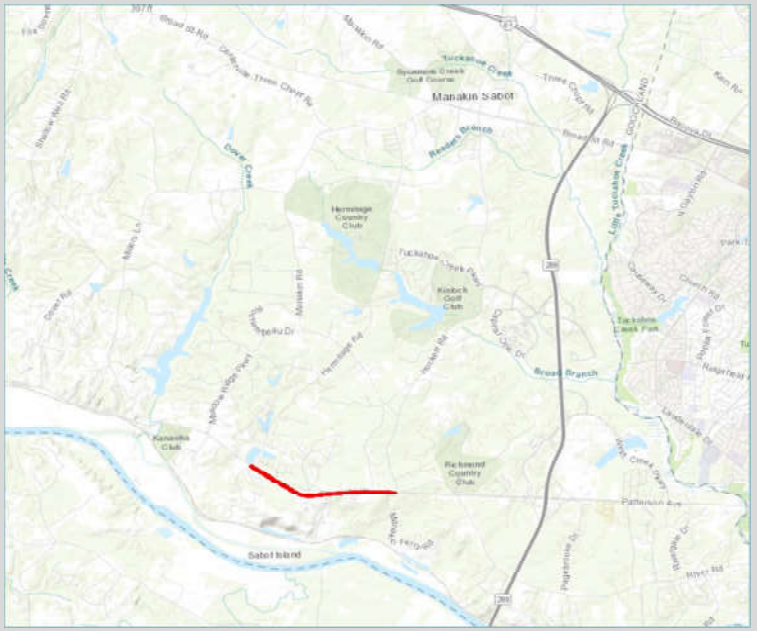
- Cost in 2018 dollars

- Costs include 25% for PE & Construction Contingencies

- Annual inflation rate is 3.0% annually

- No lighting, streetscape, signalization, storm water management or utility betterments are included

Project Location Map



Proposed Cross Section