

US Route 501

Corridor Study

Campbell and Halifax Counties, VA

September 2012

Prepared for:



Prepared by:



Executive Summary

PROJECT BACKGROUND

The Virginia Department of Transportation (VDOT) conducted the Route 501 Corridor Study to develop a prioritization and implementation plan for potential improvements along the state-owned roadway within Campbell and Halifax Counties. US 501 is primarily a north-south arterial in the Lynchburg District. The project study area is bounded by the Town of Rustburg to the north and the Town of Halifax to the south. VDOT had previously established a list of improvements based upon safety and operational concerns that exist along the corridor. The list of improvements was developed from a recently completed Roadway Safety Audit (RSA), previous studies, and collaboration with various VDOT departments and coordination with the Route 501 Coalition. Funding in the amount of approximately \$11.2 million became available and was dedicated for improvements to the Route 501 Corridor.

PROJECT PURPOSE

VDOT conducted the Route 501 Corridor Study to develop a prioritization and implementation plan for potential improvements along the Route 501 corridor in Campbell and Halifax Counties. The findings of this report will be used to validate the various improvements, as well as identify other potential improvements. The goal of the study was to identify four or five projects which could be advanced through design and construction, as well as several additional projects which could be advanced through design to Right-of-Way stage. The priority improvements were identified based upon the overall safety and traffic operation improvements.

PROJECT PROCESS

The current planning study utilized a collaborative process that began with gaining a clearer understanding of the previous efforts that were completed along the corridor, identifying the key concerns of the various key stakeholders, and establishing existing conditions and trends. Based upon this foundation, an analysis of the corridor was completed to identify the various locations with safety and/or operation concerns. These locations were studied at a planning level to identify the benefits of the improvements, as well as potential roadblocks. A key element of this study was the coordination with the public. Two Community Information Meetings were conducted to allow for the public to understand the purpose of the study and provide input to the establishment of the priority project.

Through the planning process, several improvement alternatives were identified and advanced through conceptual plans. These “priority” improvements included a variety of intersection and passing lane alternatives. The identification of the priority projects was established based upon a review of the historical accident data, site observations, site constraints/opportunities and public and key stakeholder input. Detailed cost estimates, preliminary right-of-way impacts and other areas of concern were identified and evaluated to determine the overall prioritization of the improvements.

In addition to the intersection and passing lane priority improvements, several areas were investigated and recommended for shoulder widening. The existing shoulder, along a majority of the study corridor, is 2’ wide, or less. A minimum 10’ shoulder is to be provided in each of these locations. The locations for recommended shoulder widening were established based upon the identification of accident clusters outside of the intersection and passing lane areas already identified as priority.

Finally, the RSA’s recommendation for spot safety/signage improvements was reviewed and three types of improvements were recommended for further study as a part of the specific priority projects.

SUMMARY OF FINDINGS

The following provides an overall listing of the priority improvements for the Route 501 Corridor. These projects have been identified as priority improvements based upon previous studies, including VDOT's Roadway Safety Audit and the various Rural Long Range Transportation Plans, as well as based upon comments provided by the public and local officials during the current planning process. The priority improvements included intersection passing lanes, shoulder widening and general safety/signing improvements. The intersection improvements focused on creating safer conditions through improved sight-distance and alignment, as well as improving operations through the addition of left and/or right turn lanes.

Intersections

The focus of the intersection alternatives is to increase safety and operations through improving sight distances and the addition of left and/or right turn lanes. Within the limits of the proposed improvements, the existing shoulder width would be increased to 8' and all guardrails would be upgraded to meet current standards. A summary of the priority intersection improvements includes:

- Route 24 (eastbound) (Study Alternative A)
 - The project scope consists of modifications to the southbound, Route 501 right turn lane, including improvements to the existing pedestrian facilities to match the new turning lane alignment. The project scope also includes access management improvements to minimize potential points of conflicts.
- Route 607 (Study Alternative E)
 - The project scope consists of vertical alignment improvements, as well as shoulder widening improvements to provide a shoulder width which meets current standards. The project limits will be determined by the extent of the necessary vertical alignment improvements.
- Route 761/Route 652 (Study Alternative 6)
 - The project scope consists of roadway widening improvements to provide a wider two lane roadway section with upgraded shoulders. The proposed scope also includes horizontal alignment adjustments to improve the intersection sight distance. The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address the sight distance concerns, as well as evaluate and implement access management improvements.
- Route 633 (Study Alternatives 12 & 13)
 - The project scope consists of the addition of left and right turn lanes in both the southbound and northbound directions. The improvements include widening of the existing shoulder, access control improvements associated the Foster Fuels property and relocation of existing guiderail.
- Route 40/Route 632 (Study Alternatives 15a & 15b)
 - The project scope consists of intersection improvements to provide more defined right turn lanes in both the northbound and southbound directions. The improvements include widening of the existing shoulder, access control improvements associated with the business located in the northeastern quadrant of the intersection, and relocation of existing guiderail.
- Route 628 (Study Alternative 22)

- The project scope consists of roadway widening improvements to provide a left-turn lane along northbound Route 501 and a right turn lane along southbound Route 501. The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address sight distance concerns, as well as evaluate and implement access control improvements.
- Route 642 (Study Alternative 24)
 - The project scope consists of the addition of left and right turn lanes in both the southbound and northbound directions. The improvements include widening of the existing shoulder and access control improvements associated with the business located in the southeastern quadrant of the intersection.
- Route 360 (Study Alternative 31)
 - The project scope consists of roadway widening improvements to provide a right-turn lane along southbound Route 501, with an upgraded shoulder. The scope of work also includes improvements along the property to the north, between Route 501 and Route 360. These improvements should be focus to better accommodate right turns from Route 360 to northbound Route 501, while providing access control along the property.

Passing Lane Sections

The addition of passing lane sections at strategic locations along Route 501 was found to provide the largest impact to both operation and safety along the corridor; however these improvements also carry the highest price tag. Several locations were identified as priority areas. They included:

- Route 635 to Route 607 (Study Alternative 3)
- Route 970 to 1.6 miles north of Route 970 (Study Alternative 8)
- Route 972 to Route 605 (Study Alternative 11)
- Route 905 to southern intersection of Route 645 (Study Alternative 19)
- Route 628 to Route 907 (Study Alternative 21)
- Route 610 to Route 643 (Study Alternative 27)

Shoulder Widening (From 2' to 10' Shoulder)

Priority locations for shoulder widening have been identified, outside of the limits of the priority intersection and passing lane sections. Costs for the segments of shoulder widening are based upon the approximate earthwork and right-of-way for widening the existing 2' shoulder to 8' paved and 2' graded. The segments to be considered include:

- 0.3 miles, from Route 686 to Merryman Drive, 1.0 miles south of Rustburg
- 0.6 miles, from Rocky Road to Route 607, 3.5 miles south of Rustburg
- 0.4 miles, from Morningside Drive to Route 635, within the Town of Gladys
- 0.6 miles, from Route 910 to Mollies Creek Road, 3.5 miles south of Gladys
- 0.2 miles, from Laughlin Street to 830' north of Laughlin Street, 0.25 miles north of Brookneal
- 1.5 miles from Charles Lane to Davis Lane, 1.5 miles north of the Town of Halifax
- 0.3 miles, from Carters Lane to Route 615, 1.0 miles north of the Town of Halifax

General Safety/Signing Improvements

It is recommended that the following safety/signing improvements be included in the design and implementation of the various intersections, passing lane and shoulder widening projects:

- Install driveway warning signs in advance of segments with high volume of driveways
- Update existing guardrail
- Update existing chevron signs

The following implementation table provides a suggested approach to assist VDOT with moving forward with allocating the available funding towards design and ultimately construction of several of the priority improvements. The suggested implementation plan focuses on the design and construction of as many spot improvements as possible, while completing design and right-of-way for two passing lane projects.

<u>Priority</u>	<u>Project Description</u>	<u>Location</u>	<u>Cost</u>
1	Intersection with Route 24	Rustburg	\$0.20 Million
2	Intersection with Route 642	McKendree	\$1.10 Million
3	Intersection with Route 652/761	Gladys	\$1.02 Million
4	Intersection with Route 40/632	South of Brookneal	\$0.87 Million
5	Intersection with Route 633	North of Brookneal (Foster Fuels)	\$1.98 Million
6	Shoulder Widening, Mollies Creek Road to Route 910	South of Gladys	\$1.35 Million
7	Shoulder Widening, Rocky Road to Route 607	South of Rustburg	\$1.18 Million
8	Intersection with Route 360	Halifax	\$0.50 Million
9	Design & ROW of Passing Lane from Route 970 to 1.6 miles north of Route 970	South of Gladys	\$0.72 Million
10	Design & ROW of Passing Lane from Route 610 to Route 643	North of Halifax	\$1.36 Million
Total:			\$10.28 Million

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Section 1.0 Introduction

The Virginia Department of Transportation (VDOT) conducted the Route 501 Corridor Study to develop a prioritization and implementation plan for potential improvements along the state-owned roadway within Campbell and Halifax Counties. US 501 is primarily a north-south arterial in the Lynchburg District. The project study area is bounded by the Town of Rustburg to the north and the Town of Halifax to the south. VDOT had previously established a list of improvements based upon safety and operational concerns that exist along the corridor. The list of improvements was developed from a recently completed Roadway Safety Audit (RSA), previous studies, and collaboration with various VDOT departments and coordination with the Route 501 Coalition. Funding in the amount of approximately \$11.2 million became available and was dedicated for improvements to the Route 501 Corridor.

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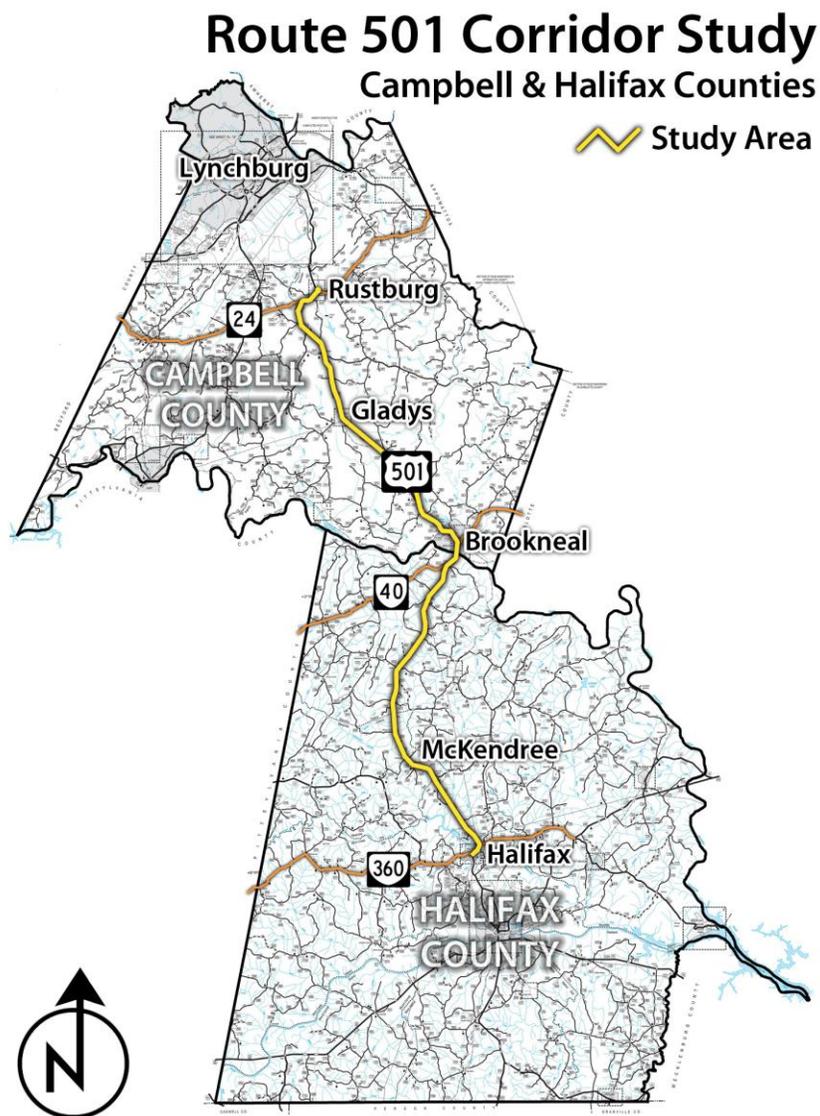
In addition to the intersection and passing lane priority improvements, several areas were investigated and recommended for shoulder widening. The existing shoulder, along a majority of the study corridor, is 2’ wide, or less. A minimum 10’ shoulder is to be provided in each of these locations. The locations for recommended shoulder widening were established based upon the identification of accident clusters outside of the intersection and passing lane areas already identified as priority.

Finally, the RSA’s recommendation for spot safety/signage improvements was reviewed and three types of improvements were recommended for further study as a part of the specific priority projects.

Section 2.0 Existing Conditions

US Route 501 is a primary north-south regional arterial in the Lynchburg District that runs through Campbell and Halifax Counties. Within the study limits of Rustburg to the north and Halifax to the south, Route 501 is a two-lane rural road. Typically, the roadway section, within the study limits, consists of two 11' travel lanes and outside shoulders varying in width from one to three feet. Within urbanized areas, the section of Route 501 varies to include parking lanes, center left turn lanes and right/left turn lanes at intersections.

The existing speed limit varies from 55mph in the rural sections to 25mph in the more urbanized sections of the study corridor. Similarly, the existing land use patterns vary dependent upon the location along the study corridor. Existing land uses include primarily residential and commercial, with a few instances of industrial.



The analysis of existing conditions consisted of the review of existing plans and studies, key person interviews, existing site conditions, review of historic accident data and public input.

EXISTING PLANS & STUDIES

Various studies have previously been conducted which include the section of Route 501 that was analyzed as a part of this study. These studies range from specific corridor studies along Route 501 to Regional Long Range Transportation Plans. The list of previous studies which were reviewed includes the following:

- Route 501 Corridor Study, September 1997
- US Route 501 Roadway Safety Assessment, June 21, 2011
- Southside Planning District Commission's 2035 Regional Long Range Transportation Plan, 2011
- Virginia's Region 2000 Local Government Council's 2035 Rural Long Range Transportation Plan, 2011

In addition to these specific studies, both VDOT and the Route 501 Coalition developed a list of potential improvements to the corridor based upon their understanding of existing Route 501.

As a part of this analysis, key person interviews were conducted with the Route 501 Coalition and the VDOT staff member who prepared the RSA. The meeting with the Coalition provided the project team an opportunity to discuss the issues and concerns with representatives from both Campbell and Halifax Counties, as well as other local officials.

The major findings associated with the review of the previous studies and the key stakeholder interviews included the following points:

- Traffic operations is not a concern as a result of traffic volumes, but instead traffic operations is a concern based upon typical conditions, such as the high number of logging trucks, buses, etc.
- Safety is a major concern, including the minimal shoulder which exists along the study corridor and the high number of driveway entrances along the higher speed sections.
- Intersection improvements should address both operations and safety.
- Signing and guardrail upgrades/improvements should be included as a part of the proposed solutions.

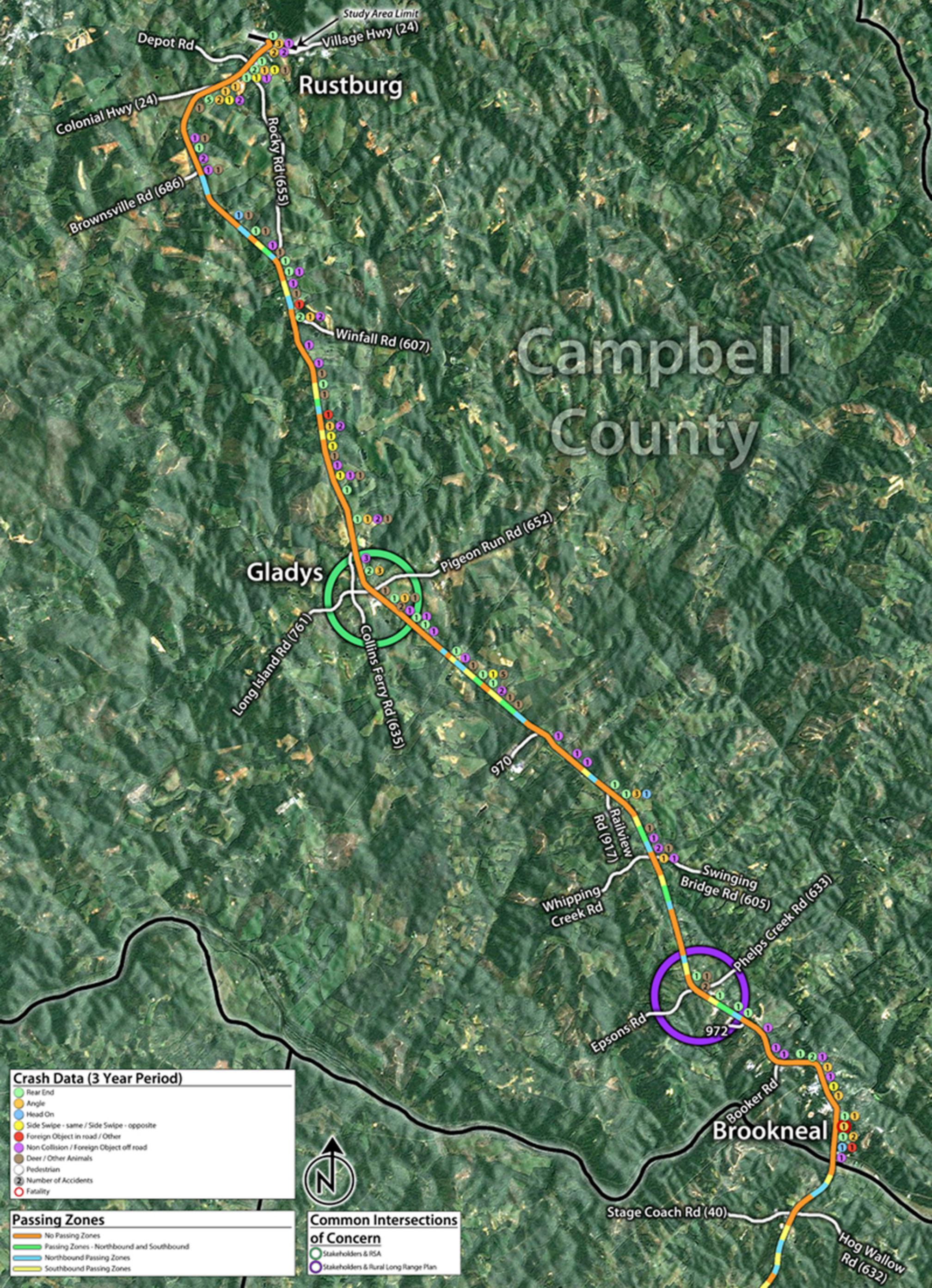
These areas of concern assisted the project team in focusing our efforts to define solutions which best addressed the various issues.

PASSING ZONE

Outside of the urban sections of the project area, the existing Route 501 corridor consists of two travel lanes, one per direction. To provide opportunity for passing of another vehicle, there are several passing zone locations. The passing zones vary from passing allowed in just the northbound or just the southbound direction, to passing allowed in either direction.

The following figures show the passing zone locations along the corridor.

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Crash Data (3 Year Period)

- Rear End
- Angle
- Head On
- Side Swipe - same / Side Swipe - opposite
- Foreign Object in road / Other
- Non Collision / Foreign Object off road
- Deer / Other Animals
- Pedestrian
- 2 Number of Accidents
- Fatality

Passing Zones

- No Passing Zones
- Passing Zones - Northbound and Southbound
- Northbound Passing Zones
- Southbound Passing Zones



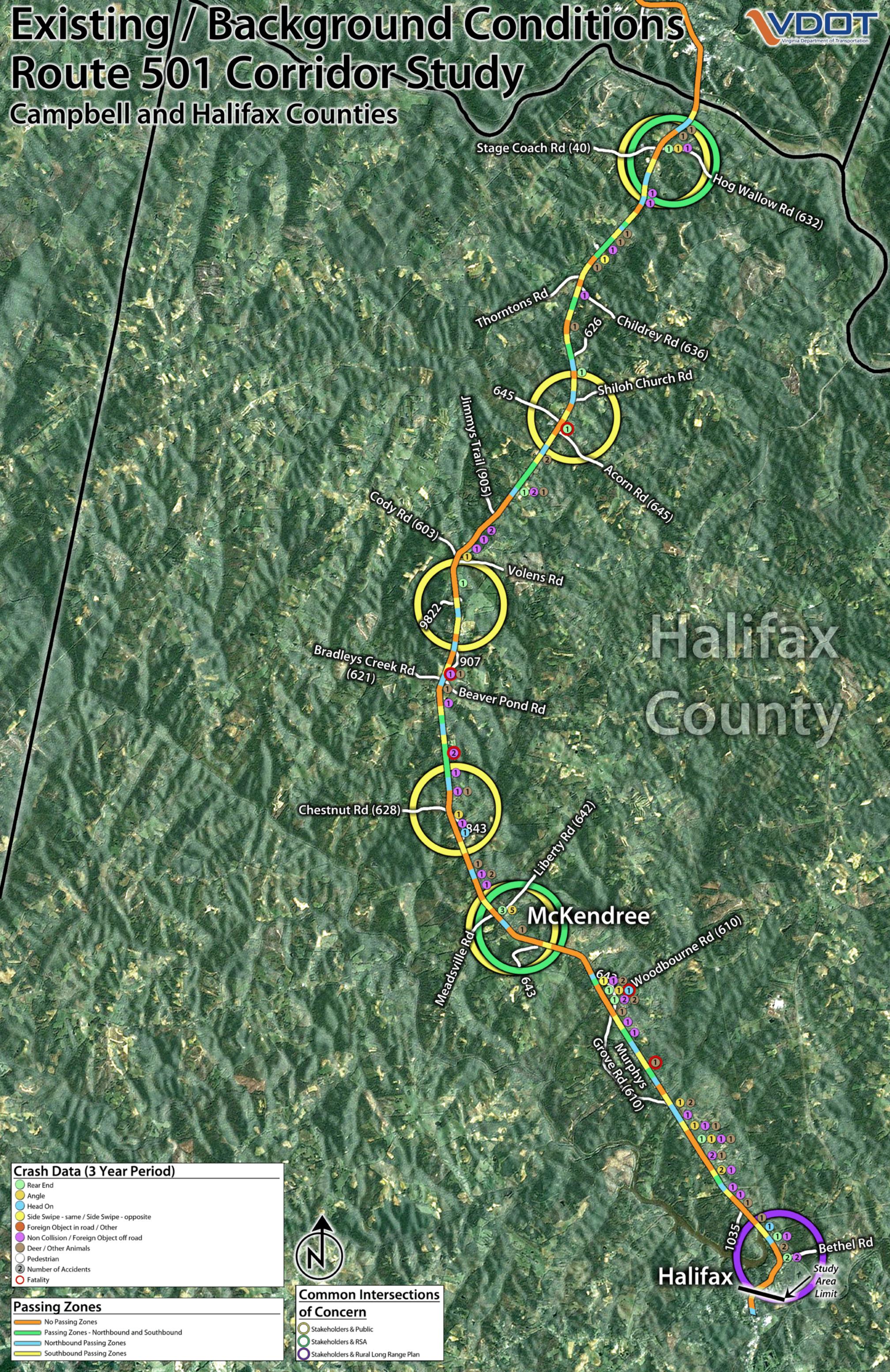
Common Intersections of Concern

- Stakeholders & IISA
- Stakeholders & Rural Long Range Plan

Existing / Background Conditions

Route 501 Corridor Study

Campbell and Halifax Counties



Halifax
County

McKendree

Halifax
Study Area Limit

Crash Data (3 Year Period)

- Rear End
- Angle
- Head On
- Side Swipe - same / Side Swipe - opposite
- Foreign Object in road / Other
- Non Collision / Foreign Object off road
- Deer / Other Animals
- Pedestrian
- Number of Accidents
- Fatality

Passing Zones

- No Passing Zones
- Passing Zones - Northbound and Southbound
- Northbound Passing Zones
- Southbound Passing Zones

Common Intersections of Concern

- Stakeholders & Public
- Stakeholders & RSA
- Stakeholders & Rural Long Range Plan

HISTORIC ACCIDENT DATA

Historic accident data, spanning the two previously reported three-year periods, was reviewed as a part of the existing conditions analysis. The latest available data was mapped and shown on the previous displays.

PUBLIC INVOLVEMENT

The local community was included as a part of the planning process as the issues and solutions were defined for the Route 501 Corridor. Two Citizen's Information Meetings (CIM) were conducted to gather input from and provide information to the local community.

The first CIM was held on December 15, 2011, at the Brookneal Elementary School. The purpose of the meeting was to introduce the project to the public, educate them on the study process and gather their input associated with their specific areas of concerns along the study corridor. A summary of the comments provided during the initial CIM are provided in Appendix A.

The second CIM was held on April 5, 2012, at the Brookneal Elementary School. The priority improvements, including intersection and passing lane improvements, were presented to the public. A summary of the comments provided during the second CIM are provided in Appendix B.

Section 3.0 Analysis of Improvements

At the onset of the corridor study for Route 501, the project team was provided with a list of potential intersection, passing zone, and passing lane improvements focused on providing safety and operation upgrades along the Route 501 corridor. The following provides a general description of the various improvements alternatives:

- **Left Turn Lane** – Additional third lane, typically located within 50 to 100 feet of an intersection which allows for storage of a vehicle attempting a left turn.
- **Right Turn Lane** – Additional third lane, located within a wide shoulder area, which allows for a vehicle making a right turn to slow down and safely maneuver the turn without impacting operations within the main travel lane.
- **Sight Distance Improvements** – Modifications to the horizontal and/or vertical geometry of one or both intersecting roadways to provide additional sight distance.
- **Passing Zone** – Legal passing area along a two lane roadway; depicted by dashed pavement markings.
- **Passing Lanes** – Additional travel lane added in one or both directions. The optimal passing lane length is based upon the “directional demand flow rate” for a roadway. This varies from less than 0.5 miles to between 1.0 and 2.0 miles. Passing lanes have similar characteristics to climbing lanes. In reviewing various references, a minimum length for a climbing lane is 1000 feet. Supporting documentation for this desirable length is located in Appendix C. For the purposes of the Route 501 Study, a minimum length of 0.5 miles was utilized as a target.

The following table provides a summary of the specific improvement projects and general location.

Study Alt.	County	Location	Treatment Type	Description	Rec. source
1	Campbell	0.58 MN of Rte 655	Add Passing Zone	0.58 MN Rte 655 (south intersection), passing zone could be implemented with lowering vertical 4 feet over 800 feet length	TE
2	Campbell	From Rte 655 to Rte 686	Add Passing Lane	Approximately 1.8-mile section for possible passing lane	District L&D, CN, TE
3	Campbell	From Rte 635 to Rte 607	Add Passing Lane	Approximately 2.3-mile section for possible passing lane	District L&D, CN, TE
4	Campbell	Rt. 501 north of Gladys Village	Reduce Vertical Curves	Reduce vertical curves approximately .5 miles north of Gladys Village to create an additional safe passing zone	501 Coalition
5	Campbell	1.22 MN of Rte 635	Add Passing Zone	1.22 MN Rte 635, passing zone could be implemented with lowering vertical 6 feet over 650 feet length	TE
6	Campbell	Intersection of Rte 501, 652, 653	Safety Concerns	Evaluate intersection of Rte 501, 652, 653 in the Village of Gladys; determine potential solutions for safety concerns	501 Coalition
7	Campbell	2.04 MS of Rtes 761/652	Add Passing Zone	2.04 MS Rte 761/652 - Lower vertical curve - ADT: 5500 vpd	TE

Study Alt.	County	Location	Treatment Type	Description	Rec. source
8	Campbell	From Rte 970 to 1.6 mi N Rte 970	Add Passing Lane	Approximately 1.6-mile section for possible passing lane	District L&D, CN, TE
9	Campbell	From Rte 917 to Rte 970	Add Passing Lane	Approximately 1.3-mile section for possible passing lane	District L&D, CN, TE
10	Campbell	Intersection of Rte 501 & Rte 917	Add Northbound Left Turn Lane	Install northbound left turn lane and enhance southbound right turn out lane for safety.	501 Coalition
11	Campbell	From Rte 972 to Rte 605	Add Passing Lane	Approximately 1.9-mile section for possible passing lane	District L&D, CN, TE
12	Campbell	Intersection of Rte 501 & Rte 633	Add Left Turn Lane	Provide southbound turn lane	501 Coalition
13	Campbell	Intersection of Rte 501 & Rte 633	Add Northbound Left Turn Lane	Add northbound left turn lane at Int of Rte 501 & Rte 633	501 Coalition
14	Campbell	Intersection of Rte 501 & Rte 933	Add Northbound Left Turn Lane	Add northbound left turn lane at Int of Rte 501 & Rte 933	501 Coalition
15	Halifax	Intersection of Rte 40 & 632	Add Right Turn Lane	Add southbound right turn lane at Int of Rte 40 & 632	Residency
16	Halifax	From Rte 632 to Rte 636	Add Passing Lane	Add passing lane	501 Coalition
17	Halifax	From Rte 636 to Rte 626	Center Passing Lane	Approximately 1.5-mile section for possible passing lane in direction of steep incline	Residency
18	Halifax	Intersection of Rte 645	Add Left Turn Lane	Add southbound left turn lane at Int of Rte 645	Residency
19	Halifax	From Rte 905 to Rte 645	Add Passing Lane	Approximately 1.7-mile section for possible passing lane	District L&D, CN, TE
20	Halifax	Sydnor Jennings Elem. School	Add/Enhance Right & Left Turn Lanes	Approximately .5 miles south of Volens, construct/enhance southbound right turn/deceleration lane and construct northbound left turn lanes	501 Coalition
21	Halifax	From Rte 628 to Rte 907	Add Passing Lane	Approximately 2.5-mile section for possible passing lane	District L&D, CN, TE
22	Halifax	Intersection of Rte 501 & 628	Add Right and Left Turn Lanes	Install right and left turn lanes @ intersection of Rte 501 & 628	501 Coalition
23	Halifax	0.41 MN of Rte 843	Add Passing Zone	0.41 MS Rte 843, passing zone for northbound traffic could be implemented with lowering vertical 2 feet over 200 feet - this would allow a double passing zone	TE
24	Halifax	Intersection of Rte 501 & 642	Add Right and Left Turn Lanes	Install right and left turn lanes @ intersection of Rte 501 & 642	CN
25	Halifax	From 0.3 MN Rte 643 to 0.5 MN Rte 642	Add Passing Lane	Approximately 2.1-mile section for passing lane	CN
26	Halifax	0.15 MN of Rte 643	Trim overhanging trees	0.15 MN Rte 610 (north intersection) ADT: 4800 vpd	TE
27	Halifax	From Rte 610 to Rte 643	Add Passing Lane	Approximately 2.4-mile section for possible passing lane	District L&D, CN, TE
28	Halifax	0.26 MS of Rte 643 North Int	Add Passing Zone	0.26 MS Rte 643 N Int - Lower vertical curve - ADT: 4800vpd	TE
29	Halifax	North of Rte 610	Extend Passing Zone	Improve horizontal Alignment by cutting grade on south side of intersection and placing fill material on north side of intersection enabling an extension of the existing passing zones	Residency

Study Alt.	County	Location	Treatment Type	Description	Rec. source
30	Halifax	From Rte 1035 to Rte 610	Add Passing Lane	Approximately 2-mile section for possible passing lane	District L&D, CN, TE
31	Halifax	Intersection of Va Rte 360	Add Right Turn Lane	Add southbound right turn lane at Int of Rte 360, possibly roundabout	Residency & 501 Coalition

ADDITIONAL AREAS OF CONCERN

Other areas of concern were also identified through the planning study process. Sources of these specific locations included key stakeholder input, public input, long range plans, and field observations. The following provides a summary of the specific areas of concern:

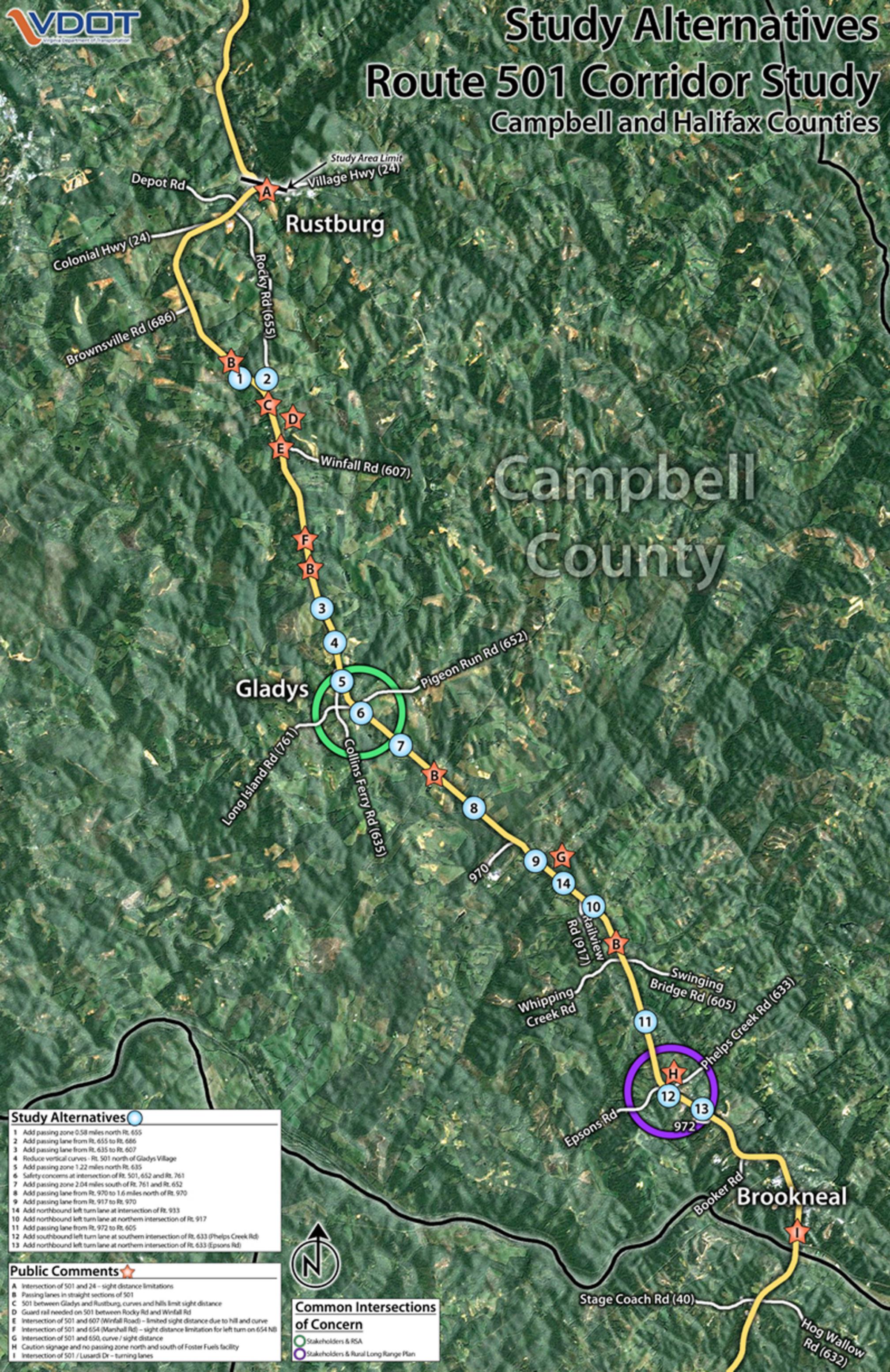
- A. Intersection of Rte 501 and Rte 24, sight distance limitations
- B. Passing lanes in straight sections of Rte 501
- C. Rte 501 between Gladys and Rustburg, curves and hills limit sight distance
- D. Guardrail needed on Rte 501 between Rocky Road and Winfall Road
- E. Intersection of Rte 501 and Rte 607 (Winfall Road), limited sight distance due to hill and curve
- F. Intersection of Rte 501 and Rte 654 (Marshall Road), sight distance limitations for left turn on 654 NB
- G. Intersection of Rte 501 and Rte 650, curve/sight distance
- H. Caution signage and no passing zone north and south of Foster Fuel facility
- I. Intersection of Rte 501 and Lusardi Drive, turning lanes
- J. Intersection of Rte 501 and Rte 40/632, limited sight distance
- K. Intersection of Rte 501 and Rte 636, add center turn lanes
- L. Childrey Creek, 1 mile south, limited sight distance
- M. Intersection(s) of Rte 501 and Rte 645, add turn lanes
- N. Intersection of Rte 501 and Stagecoach Road/Clarkton Road, limited sight distance
- O. Limited sight distance at Volens Recycling Center
- P. Intersection of Rte 501 and Rte 603, sight distance limitations for left turn lane
- Q. 0.3 miles south of Sydnor Jennings School, limited sight distance
- R. Intersection of Rte 501 and Rte 621, add turn lanes
- S. Intersection of Rte 501 and Chestnut Road, limited sight distance
- T. Intersection of Rte 501 and Rte 628, add turn lanes and vertical alignment adjustment south of intersection
- U. Intersection of Rte 501 and Meadville Road, add right turn lane
- V. Intersection of Rte 501 and McKendree Road, make into no passing zone, sight distance limitations
- W. Intersection of Rte 501 and Rte 610, add turn lanes

The following maps show the initial improvement alternatives, as well as the additional areas of concern identified during the study.

Study Alternatives

Route 501 Corridor Study

Campbell and Halifax Counties



Study Alternatives

- 1 Add passing zone 0.58 miles north Rt. 655
- 2 Add passing lane from Rt. 655 to Rt. 686
- 3 Add passing lane from Rt. 635 to Rt. 607
- 4 Reduce vertical curves - Rt. 501 north of Gladys Village
- 5 Add passing zone 1.22 miles north Rt. 635
- 6 Safety concerns at intersection of Rt. 501, 652 and Rt. 761
- 7 Add passing zone 2.04 miles south of Rt. 761 and Rt. 652
- 8 Add passing lane from Rt. 970 to 1.6 miles north of Rt. 970
- 9 Add passing lane from Rt. 917 to Rt. 970
- 14 Add northbound left turn lane at intersection of Rt. 933
- 10 Add northbound left turn lane at northern intersection of Rt. 917
- 11 Add passing lane from Rt. 972 to Rt. 605
- 12 Add southbound left turn lane at southern intersection of Rt. 633 (Phelps Creek Rd)
- 13 Add northbound left turn lane at northern intersection of Rt. 633 (Epsoms Rd)

Public Comments

- A Intersection of 501 and 24 - sight distance limitations
- B Passing lanes in straight sections of 501
- C 501 between Gladys and Rustburg, curves and hills limit sight distance
- D Guard rail needed on 501 between Rocky Rd and Winfall Rd
- E Intersection of 501 and 607 (Winfall Road) - limited sight distance due to hill and curve
- F Intersection of 501 and 654 (Marshall Rd) - sight distance limitation for left turn on 654 NB
- G Intersection of 501 and 650, curve / sight distance
- H Caution signage and no passing zone north and south of Foster Fuels facility
- I Intersection of 501 / Lusardi Dr - turning lanes



Common Intersections of Concern

- Stakeholders & RSA
- Stakeholders & Rural Long Range Plan

Study Alternatives

Route 501 Corridor Study

Campbell and Halifax Counties



Halifax
County

- Study Alternatives**
- 15a Review right turn lanes in both the northbound and southbound directions at the intersection of Rt. 501, 40 and 632
 - 15b Include a review to widen shoulder along northbound lane, north of Rt. 632 and reset guardrail to improve sight distance
 - 16 Add passing lane from Rt. 632 to Rt. 636
 - 17 Add passing lane from Rt. 636 to Rt. 626
 - 18 Add southbound left turn lane at southern intersection of Rt. 645
 - 19 Add passing lane from Rt. 905 to southern intersection of Rt. 645
 - 20 Add entrance right and left turn lanes at Route 9822 (Sydnor Jennings Elem. School)
 - 21 Add passing lane from Rt. 628 to Rt. 907
 - 22 Add southbound right and northbound left turn lanes at intersection of Rt. 628
 - 23 Add passing zone 0.41 miles south of southern intersection of Rt. 843
 - 24 Add right and left turn lanes at intersection of Rt. 642
 - 25 Add passing lane from southern intersection of Rt. 643 to 0.5 miles north Rt. 642
 - 26 Trim overhanging trees to provide additional sight distance for a potential passing zone 0.15 miles north of northern intersection of Rt. 643
 - 27 Add passing lane from southern intersection of Rt. 610 to southern intersection of Rt. 643
 - 28 Add passing zone 0.26 miles south of Rt. 643 (North Intersection)
 - 29 Extend passing zone north of northern intersection of Rt. 610
 - 30 Add passing lane from Rt. 1035 to southern intersection of Rt. 610
 - 31 Add right turn lane and storage lane at intersection of Rt. 360

- Public Comments**
- B Passing lanes in straight sections of 501
 - J Intersection of 501 and 632 and 40 – limited sight distance
 - K Intersection of 501 and 636 – add center turn lanes
 - L Childrey Creek 1 mile south – sight distance limitations
 - M Intersection(s) of 501 and 645 – add turn lanes
 - N Intersection of 501 and Stagecoach Rd, Clarkton Rd – limited sight distance
 - O Limited sight distance at Volens Recycling Center
 - P Intersection of 501 and 603 – sight distance limitations for left turn lane
 - Q 0.3 miles south of Sydnor Jennings School – limited sight distance
 - R Intersections of 501 & 621 – add turn lanes
 - S Intersection of 501 and Chestnut Rd – limited sight distance
 - T Intersection of 501 and 628 – add turn lanes and vertical alignment south of intersection
 - U Intersection of 501 and Meadville Rd – add right turn lane
 - V Intersection of 501 and McKendree Rd – make into no passing zone – sight distance limitations
 - W Intersections of 501 & 610 – add turn lanes

Common Intersections of Concern

- Stakeholders & Public
- Stakeholders & RSA
- Stakeholders & Rural Long Range Plan

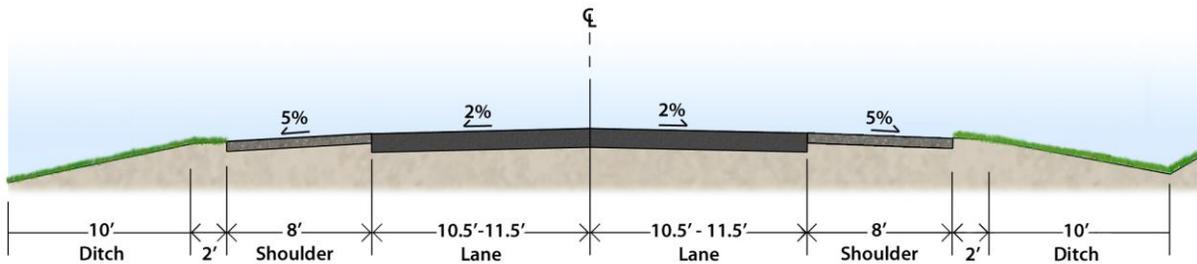


Halifax

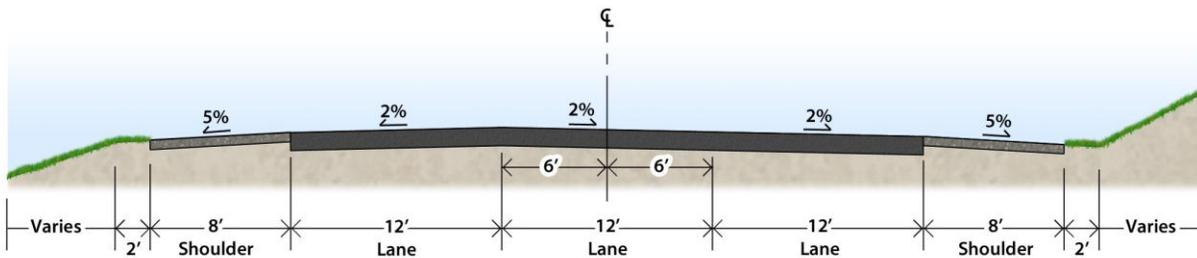
Study Area Limit

TYPICAL SECTIONS

The proposed typical sections for all improvement alternatives were developed based upon VDOT's Geometric Design Standard Rural Minor Arterial (GS-2). Two main typical sections were developed, including an upgraded two-lane roadway and shoulder, and a three-lane roadway for the passing lane sections.



Two-Lane Roadway



Three-Lane Roadway

ALTERNATIVE ANALYSIS

The alternative analysis was conducted in two steps. The initial step was to complete a cursory analysis on each of the alternatives identified during the study. The goal of the initial analysis was to establish a group of 10-15 priority improvements to be further analyzed and prioritized to establish an action plan for VDOT to move ahead with implementation.

Benefit-Cost Analysis

The initial step of conducting the cursory analysis of the various improvement alternatives was through a Benefit-Cost Analysis. This analysis was completed for several of the spot improvements identified within the previously completed RSA. The Benefit to Cost ration provided the project team with an understanding of what safety impacts the spot improvements would have at a given intersection. However, the ration did not provide an understanding of operational enhancements.

The cost aspect of the cost to benefit ratio is based upon the construction/implementation costs associated with a given improvement. Benefits are defined as the reduction in societal costs due to a given project being implemented. For this study, an average value based on collision type of \$83,982 per crash was utilized. A detailed report was completed, including a summary of the various improvements and existing field conditions, as well as the specific details for the Benefit-Cost analysis. The intersection analysis was completed on several of the spot improvements and found that the signage and advance notification improvements provide the best Benefit-Cost ratio at various intersections. This study can be found in Appendix D.

Signage improvements were found to provide a high benefit to cost ratio. The types of improvements identified were the installation of driveway warning signs, updated chevron signs and truck restriction signage.

In addition, a general Benefit-Cost analysis was completed for Route 501, from Rustburg to Brookneal, as well as from Brookneal to Halifax for the addition of a passing lane and the widening of shoulders. The addition of a passing lane was found to provide one of the overall highest benefits, as related to safety. Similarly, the widening of the paved shoulders to equal to or greater than six feet was found to provide large overall safety benefits. As a result of these findings, it was determined that a selection of the passing lane areas, as well as spot locations for shoulder widening would be identified as priority improvements and studied in further detail.

Accident Data Hot Spots

In addition to the benefit-cost analysis, the intersection, passing lane, and shoulder widening improvements were evaluated based upon the intensity of accidents in proximity to an improvement location. The table below highlights the Hot Spot areas for intersection, passing lane and shoulder widening locations.

Study Alt.	County	Location	Treatment Type	Accident Count*
A	Campbell	Rte 501 and Rte 24	Intersection	5
3	Campbell	North of Rte 635 to Rte 607	Passing Lane	19
6	Campbell	Rte 501 and Rte 652/761	Intersection	5
8	Campbell	Rte 970 to 1.6 miles North of Rte 970	Passing Lane	10
12/13	Campbell	1.22 MN of Rte 635	Intersection	5
19	Halifax	Rte 905 to Rte 645	Passing Lane	9 (1 fatality)
24	Halifax	Rte 501 and Rte 642	Intersection	5
27	Halifax	Rte 610 to Rte 907	Passing Lane	17 (2 fatalities)
-	Campbell	Rocky Road to Foxwood Lane	Shoulder Widening	6
-	Campbell	Mollies Creek Road to Rte 910	Shoulder Widening	9

*Accident count based on three-year crash data

VDOT, Route 501 Coalition & Public Input

The final step in the preliminary analysis was to review and compare the input provided by the various VDOT departments, Route 501 Coalition and the general public. Common locations of concern were identified as higher areas of concern. In addition, the various locations were compared to recently completed RSA and Long Range Transportation Plans for the region to identify any common projects. The results of the identification of the common projects are displayed on the previous figures.

Alternative Analysis - Summary of Findings

The critical findings of the initial alternative analysis help to guide the planning efforts with regards to the type of improvements identified for prioritization. The critical findings, as well as the process used to identify the priority improvements are described below.

- ***The addition of passing lanes provides the highest overall benefit.***
 - Although the high cost to implement these improvements results in an average Benefit to Cost ratio of just above 1.0, the overall benefit and public support led the planning team to move forward with identifying priority locations for implementing passing lane segments.
 - The process used to identify the priority improvement locations included reviewing key factors, such as existing passing zones, accident data and existing driveways. The definition of the priorities also included a factor with regards to spacing of the priority passing lane locations.
- ***Signage improvements and upgrading guardrail were found to provide the highest benefit to cost ratio.***
 - During the study process, VDOT implemented signage improvements to address a specific need near Foster Fuels. As intersection and corridor improvements are implemented, it is recommended that the existing signage is evaluated. If additional advanced warning signage is warranted, it is recommended that they are included in the improvements.
 - VDOT is currently in the process of reviewing their existing guardrail and programming improvements to upgrade existing guardrail. It is recommended that this process be coordinated with the identified priority improvements.
- ***Increasing the width of the paved shoulder, to greater than 6', provides a positive impact to the overall safety of the corridor. The average Benefit to Cost ratio was found to be 4.33.***
 - The focus of defining the priority locations for shoulder widening improvements was to identify the accident clusters, outside of the intersection and passing lane locations. The goal was to create manageable solutions, with regards to cost, with termini near or adjacent to intersections along Route 501. If and when these improvements are advanced, the length of the improvements should be further evaluated.
- ***Intersection improvements should focus on safety, while improving operations.***
 - The priority intersections were identified through and analysis of the various studies, plans and evaluations which were previously completed. This analysis combined with a review of the accident data, field observations and input from the public and key stakeholders lead to the identification of the eight priority intersections.

PRIORITY IMPROVEMENTS

Utilizing the information gathered during the initial analysis process, priority improvements were identified for intersection improvements, passing lane improvements and shoulder widening improvements. The following provides an overall listing of the priority improvements for the Route 501 Corridor. These projects have been identified as priority improvements based upon previous studies, including VDOT's Roadway Safety Audit and the various Rural Long Range Transportation Plans, as well as based upon comments provided by the public and local officials during the current planning process.

Intersections

The focus of the intersection alternatives are to increase safety and operations through improving sight distances and the addition of left and/or right turn lanes. Within the limits of the proposed improvements, the existing shoulder width would be increased to 8' and all guardrails would be upgraded to meet current standards. A summary of the priority intersection improvements include:

- Route 24 (eastbound) (Study Alternative A)
 - The project scope consists of modifications to the southbound, Route 501 right turn lane, including improvements to the existing pedestrian facilities to match the new turning lane alignment. The project scope also includes access management improvements to minimize potential points of conflicts.
- Route 607 (Study Alternative E)
 - The project scope consists of vertical alignment improvements, as well as shoulder widening improvements to provide a shoulder width which meets current standards. The project limits will be determined by the extent of the necessary vertical alignment improvements.
- Route 761/Route 652 (Study Alternative 6)
 - The project scope consists of roadway widening improvements to provide a wider two lane roadway section with upgraded shoulders. The proposed scope also includes horizontal alignment adjustments to improve the intersection sight distance. The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address the sight distance concerns, as well as evaluate and implement access management improvements.
- Route 633 (Study Alternatives 12 & 13)
 - The project scope consists of the addition of left and right turn lanes in both the southbound and northbound directions. The improvements include widening of the existing shoulder, access control improvements associated with the Foster Fuels property and relocation of existing guiderail.
- Route 40/Route 632 (Study Alternatives 15a & 15b)
 - The project scope consists of intersection improvements to provide more defined right turn lanes in both the northbound and southbound directions. The improvements include widening of the existing shoulder, access control improvements associated with the business located in the northeastern quadrant of the intersection, and relocation of existing guiderail.
- Route 628 (Study Alternative 22)
 - The project scope consists of roadway widening improvements to provide a left-turn lane along northbound Route 501 and a right turn lane along southbound Route 501. The improvements will also evaluate the existing vertical alignment to

determine if any spot adjustments are required to address sight distance concerns, as well as evaluate and implement access control improvements.

- Route 642 (Study Alternative 24)
 - The project scope consists of the addition of left and right turn lanes in both the southbound and northbound directions. The improvements include widening of the existing shoulder and access control improvements associated with the business located in the southeastern quadrant of the intersection.
- Route 360 (Study Alternative 31)
 - The project scope consists of roadway widening improvements to provide a right-turn lane along southbound Route 501, with an upgraded shoulder. The scope of work also includes improvements along the property to the north, between Route 501 and Route 360. These improvements should be focus to better accommodate right turns from Route 360 to northbound Route 501, while providing access control along the property.

Passing Lane Sections

The addition of passing lane sections at strategic locations along Route 501 was found to provide the largest impact to both operation and safety along the corridor; however these improvements also carry the highest price tag. Several locations were identified as priority areas:

- Route 635 to Route 607 (Study Alternative 3)
- Route 970 to 1.6 miles north of Route 970 (Study Alternative 8)
- Route 972 to Route 605 (Study Alternative 11)
- Route 905 to southern intersection of Route 645 (Study Alternative 19)
- Route 628 to Route 907 (Study Alternative 21)
- Route 610 to Route 643 (Study Alternative 27)

Shoulder Widening (From 2' to 8'/2' Shoulder)

Priority locations for shoulder widening have been identified, outside of the limits of the priority intersection and passing lane sections. Costs for the segments of shoulder widening are based upon the approximate earthwork and right-of-way for widening the existing 2' shoulder to an 8' paved and 2' graded shoulder. The segments to be considered include:

- 0.3 miles, from Route 686 to Merryman Drive, 1.0 miles south of Rustburg
- 0.6 miles, from Rocky Road to Route 607, 3.5 miles south of Rustburg
- 0.4 miles, from Morningside Drive to Route 635, within the Town of Gladys
- 0.6 miles, from Route 910 to Mollies Creek Road, 3.5 miles south of Gladys
- 0.2 miles, from Laughlin Street to 830' north of Laughlin Street, 0.25 miles north of Brookneal
- 1.5 miles from Charles Lane to Davis Lane, 1.5 miles north of the Town of Halifax
- 0.3 miles, from Carters Lane to Route 615, 1.0 miles north of the Town of Halifax

General Safety/Signing Improvements

It is recommended that the following safety/signing improvements be included in the design and implementation of the various intersections, passing lane, and shoulder widening projects.

- Install driveway warning signs in advance of segments with high volume of driveways
- Update existing guardrail
- Update existing chevron signs

The following includes a one page “project sheet” for each of the priority projects, followed by a plan which graphically depicts the proposed intersection and passing lane improvements. It is important to note that the projects were developed as planning level and as preliminary and final design progresses, the exact improvements may need to be refined to provide the best solution for both safety and operations. Examples of this include:

- In locations where guardrail is being removed, due to sight distance concerns, the possibility of grading the slope to avoid the need for guardrail could be evaluated.
- The exact limits of the intersections and shoulder widening improvements could be adjusted to address additional concerns or provide a more convenient terminus.

The priority projects are presented by county, starting with Campbell County and followed by Halifax County.

Priority Projects – *Campbell County*



Study A - Intersection Improvement:

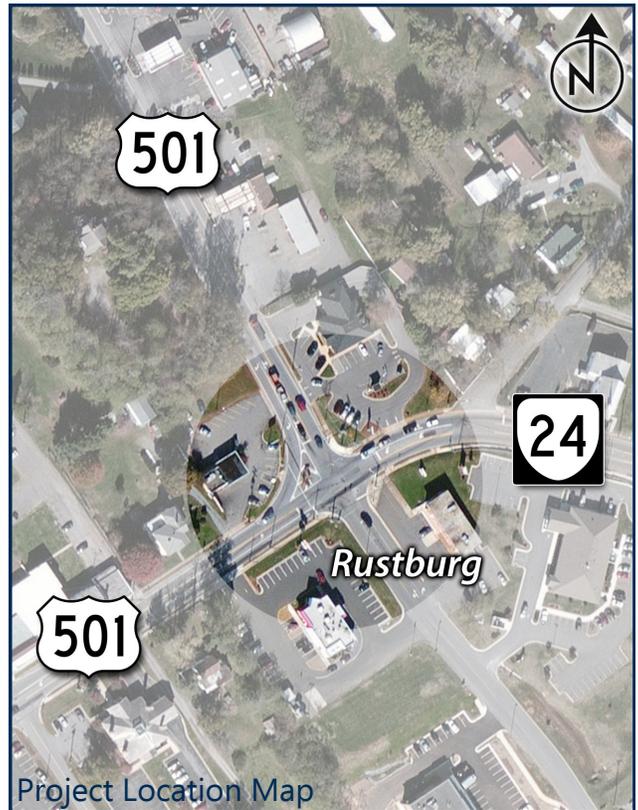
Intersection at Route 24 (Campbell County)

Purpose & Need:

The emphasis of the intersection improvements is to increase safety and operations within the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Typical concerns include sight distance, queuing as a result of left/right turn maneuvers and lack of access management within close proximity to an intersection. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient intersections within the US 501 corridor that meets Virginia Department of Transportation standards. *Specific concerns at the intersection of Route 501 and Route 24 include the orientation of the right turn lane along southbound Route 501, as well as the existing point of conflict associated with the left turn lane along northbound Route 501 and the driveway entrances just south of the intersection.*

Project Scope:

The project scope consist of modifications to the southbound, Route 501 right turn lane, including improvements to the existing pedestrian facilities to match the new turning lane alignment. The project scope also includes access management improvements to minimize potential points of conflicts.



Key Statistics:

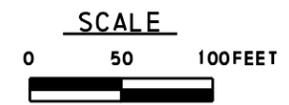
Function Classification: Minor Arterial	<u>Cost</u>
Geometric Standard: GS-2	Design: \$15,700
Design Standards: • Turn Lane Length—Match Existing	ROW \$10,000
• Taper Length—Match Existing	Construction: \$105,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	CM/CI: \$13,000
	Total (2012): \$143,000
	Total (2014): \$152,000

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	ROUTE	STATE PROJECT	SHEET NO.
	VA.	501	ROUTE 501 CORRIDOR STUDY	



RUSTBURG STUDY - INTERSECTION AT RTE. 24
 * PRIORITY INTERSECTION *





Study E - Intersection Improvement:

Intersection at Route 607 (Campbell County)

Purpose & Need:

The emphasis of the intersection improvements is to increase safety and operations within the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Typical concerns include sight distance, queuing as a result of left/right turn maneuvers and lack of access management within close proximity to an intersection. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient intersections within the US 501 corridor that meets Virginia Department of Transportation standards. *Specific concerns at the Route 501 and Route 607 (Winfall Road) intersection include sight distance associated with the existing vertical alignment. Recent three-year crash data show three accidents within the intersection.*

Project Scope:

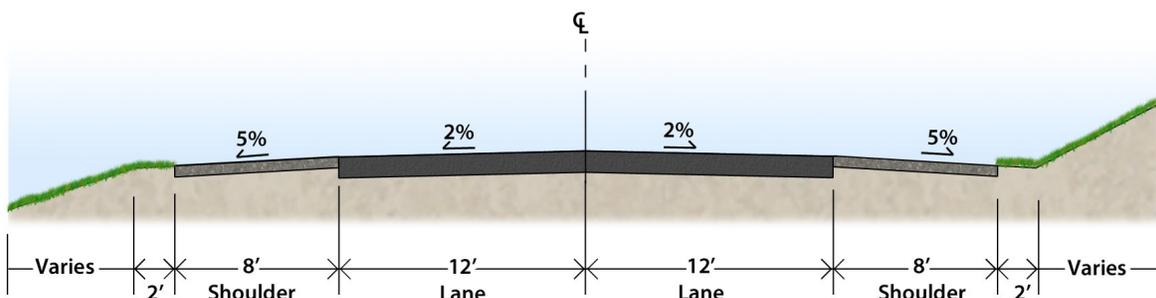
The project scope consists of vertical alignment improvements, as well as shoulder widening improvements to provide a shoulder width which meets current standards. The project limits will be determined by the extent of the necessary vertical alignment improvements



Key Statistics:

Function Classification: Minor Arterial	<u>Cost</u>
Geometric Standard: GS-2	Design: \$79,000
Design Standards: • Turning Lane Length—150'	ROW \$30,000
• Turn Lane Taper Transition—15:1	Construction: \$525,000
• Rate of Lane Shift—Width x Design Speed	CM/CI: \$63,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	Total (2012): \$697,000
	Total (2014): \$740,000

Typical Section



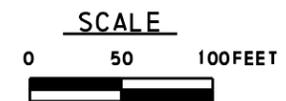
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 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE		SHEET NO.
	ROUTE	PROJECT	
	VA.	501	ROUTE 501 CORRIDOR STUDY



STUDY E - INTERSECTION AT RTE. 607

* PRIORITY INTERSECTION *



PROJECT	SHEET NO.
ROUTE 501	



Study 6 - Intersection Improvement:

Intersection at Route 761/Route 652 (Campbell County)

Purpose & Need:

The emphasis of the intersection improvements is to increase safety and operations within the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Typical concerns include sight distance, queuing as a result of left/right turn maneuvers and lack of access management within close proximity to an intersection. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient intersections within the US 501 corridor that meets Virginia Department of Transportation standards. *Specific Concerns at the intersection of Route 501 and Route 761/652 intersection include intersection sight distance. The combination of minimal shoulder widths, a tight horizontal curve and operations at adjacent properties result in the need for potential sight distance improvements.*

Project Scope:

The project scope consists of roadway widening improvements to provide a wider two lane roadway section with upgraded shoulders. The proposed scope also includes horizontal alignment adjustments to improve the intersection sight distance. The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address the sight distance concerns, as well as evaluate and implement access management improvements.

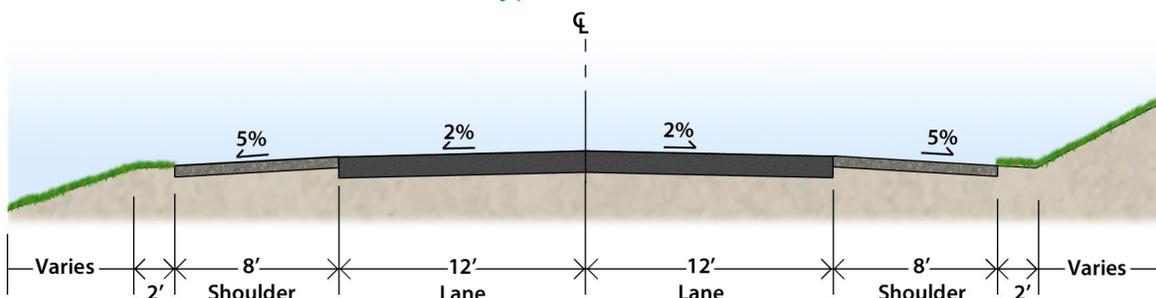


Project Location Map

Key Statistics:

Function Classification: Minor Arterial	<u>Cost</u>
Geometric Standard: GS-2	Design: \$100,000
Design Standards: <ul style="list-style-type: none"> • Turning Lane Length—150' • Turn Lane Taper Transition—15:1 • Rate of Lane Shift—Width x Design Speed 	ROW \$110,000
	Construction: \$670,000
	CM/CI: \$80,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	<i>Total (2012):</i> \$960,000
	<i>Total (2014):</i> \$1,020,000

Typical Section

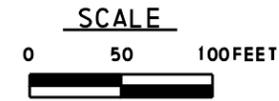


PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	ROUTE	STATE PROJECT	SHEET NO.
	VA.	501	ROUTE 501 CORRIDOR STUDY	



STUDY #6 - INTERSECTION AT RTE. 652 & RTE. 761
 * PRIORITY INTERSECTION *





Study 12 & 13 - Intersection Improvement:

Intersection at Route 633 (Campbell County)

Purpose & Need:

The emphasis of the intersection improvements is to increase safety and operations within the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Typical concerns include sight distance, queuing as a result of left/right turn maneuvers and lack of access management within close proximity to an intersection. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient intersections within the US 501 corridor that meets Virginia Department of Transportation standards. *Specific concerns at this offset intersection are associated with the overall operations of the intersection and the Route 501 corridor. The opportunity to implement left and right turn lanes will assist with both.*

Project Scope:

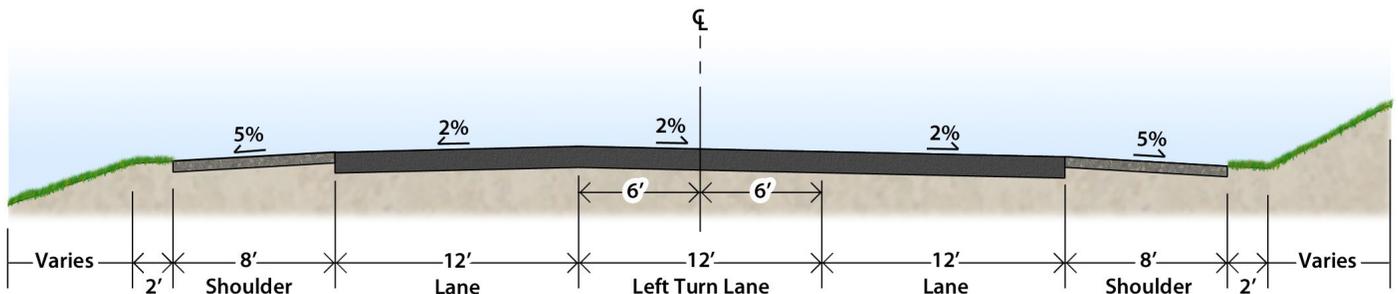
The project scope consists of the addition of left and right turn lanes in both the southbound and northbound directions. The improvements include widening of the existing shoulder, access control improvements associated the Foster Fuels property and relocation of existing guiderail. The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address sight distance concerns.



Key Statistics:

Function Classification: Minor Arterial	<u>Cost</u>
Geometric Standard: GS-2	Design: \$190,000
Design Standards: <ul style="list-style-type: none"> Turning Lane Length—150' Turn Lane Taper Transition—15:1 Rate of Lane Shift—Width x Design Speed 	ROW \$280,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	Construction: \$1,250,000
	CM/CI: \$150,000
	<i>Total (2012):</i> \$1,870,000
	<i>Total (2014):</i> \$1,980,000

Typical Section



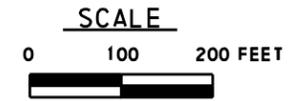
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 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	ROUTE	STATE PROJECT	SHEET NO.
	VA.	501	ROUTE 501 CORRIDOR STUDY	



STUDY #12 & #13 - INTERSECTIONS AT RTE. 633

* PRIORITY INTERSECTIONS *



PROJECT	SHEET NO.
ROUTE 501	



Study 3 - Passing Lane Section:

Rt. 635 to Rt. 607 (Campbell County)

Purpose & Need:

The emphasis for the passing lane section improvements is to increase safety and operations along the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Although not measured, there are existing sections with apparent limited sight distance caused by roadway vertical alignment, as well as, frequent residential areas that have numerous driveways and access road along the route. In addition, the existing Route 501 corridor contains truck and bus traffic, which have an impact on the operations of the corridor. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient roadway corridor that meets Virginia Department of Transportation standards.

Project Scope:

The project scope consists of roadway widening improvements to provide a three lane roadway section with upgraded shoulder. The project limits extend from just north of Route 635 (Collins Ferry Road) to just south of Route 607. The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address sight distance concerns, as well as evaluate and implement access management improvements.

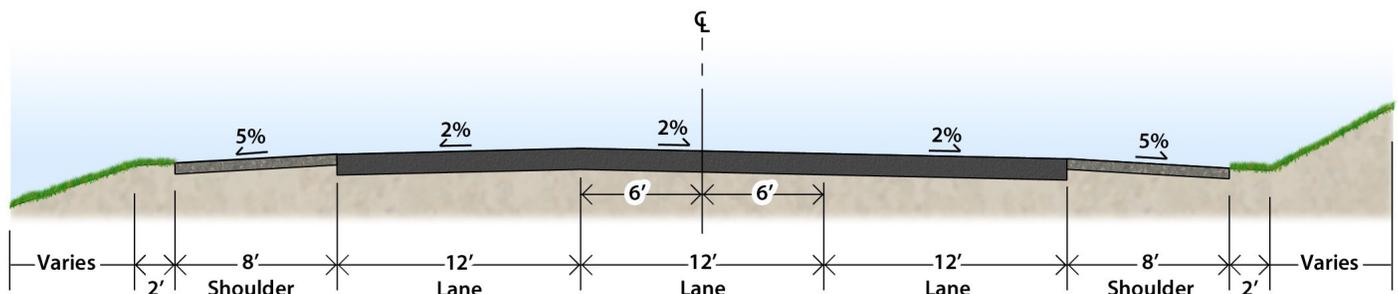


Project Location Map

Key Statistics:

Function Classification: Minor Arterial	Cost
Length: 2.4 Miles (12,700 Feet)	Design: \$1,045,000
Geometric Standard: GS-2	ROW: \$350,000
Design Standards: <ul style="list-style-type: none"> Terrain—Rolling Design Speed—60 MPH Vertical Grade—0.5% to 7.0% Sight Distance (@ lane taper approach)—1,000' Min 	Construction: \$6,960,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	CM/CI: \$835,000
	Total (2012): \$9,190,000
	Total (2014): \$9,750,000

Typical Section



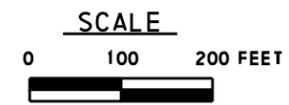
PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	3-1



SEE PLAN SHEET 3-2

STUDY #3 - PASSING LANE FROM RTE. 635 TO RTE. 607
 * PRIORITY PASSING LANE *



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	3-2

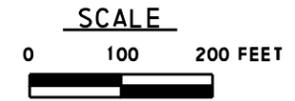
SEE PLAN SHEET 3-1



SEE PLAN SHEET 3-3

STUDY #3 - PASSING LANE FROM RTE. 635 TO RTE. 607

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE		PROJECT	SHEET NO.
	STATE	ROUTE		
	VA.	501	ROUTE 501 CORRIDOR STUDY	3-3

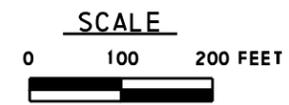


SEE PLAN SHEET 3-2



SEE PLAN SHEET 3-4

STUDY #3 - PASSING LANE FROM RTE. 635 TO RTE. 607
 * PRIORITY PASSING LANE *



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	ROUTE	STATE PROJECT	SHEET NO.
	VA.	501	ROUTE 501 CORRIDOR STUDY	

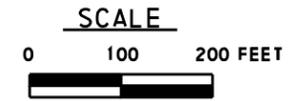


SEE PLAN SHEET 3-3

SEE PLAN SHEET 3-5

STUDY #3 - PASSING LANE FROM RTE. 635 TO RTE. 607

* PRIORITY PASSING LANE *



PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	3-5

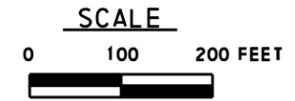
SEE PLAN SHEET 3-4



SEE PLAN SHEET 3-6

STUDY #3 - PASSING LANE FROM RTE. 635 TO RTE. 607

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

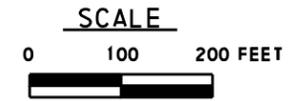
REVISED	STATE	PROJECT		SHEET NO.
	ROUTE			
	VA.	501	ROUTE 501 CORRIDOR STUDY	3-6

SEE PLAN SHEET 3-5



STUDY #3 - PASSING LANE FROM RTE. 635 TO RTE. 607

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	



Study 8 - Passing Lane Section:

Rt. 970 to 1.6 miles north of Rt. 970 (Campbell County)

Purpose & Need:

The emphasis for the passing lane section improvements is to increase safety and operations along the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Although not measured, there are existing sections with apparent limited sight distance caused by roadway vertical alignment, as well as, frequent residential areas that have numerous driveways and access road along the route. In addition, the existing Route 501 corridor contains truck and bus traffic, which have an impact on the operations of the corridor. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient roadway corridor that meets Virginia Department of Transportation standards.

Project Scope:

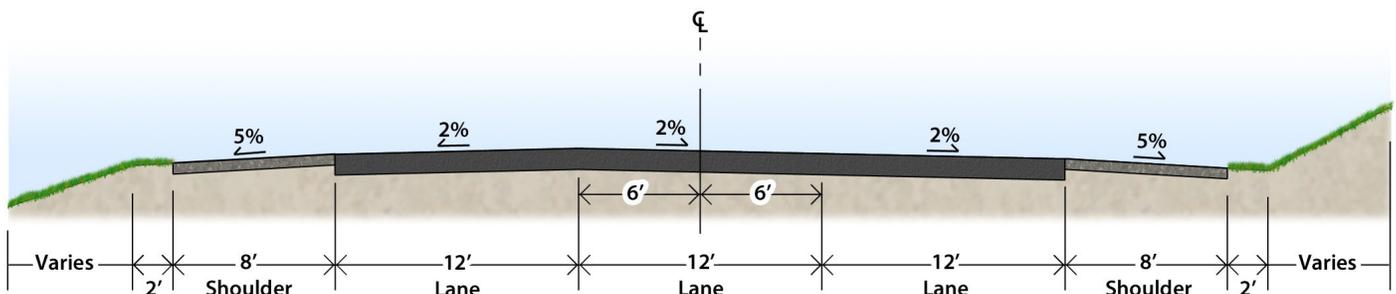
The project scope consists of roadway widening improvements to provide a three lane roadway section with upgraded shoulder. The project limits extend from 1.6 miles north of Route 970 to the just north of the intersection of Route 501 and Route 970. The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address sight distance concerns, as well as evaluate and implement access management improvements.



Key Statistics:

Function Classification: Minor Arterial	<u>Cost</u>
Length: 1.5 Miles (8,000 Feet)	Design: \$545,000
Geometric Standard: GS-2	ROW: \$175,000
Design Standards: <ul style="list-style-type: none"> Terrain—Rolling Design Speed—60 MPH Vertical Grade—0.5% to 7.0% Sight Distance (@ lane taper approach)—1,000' Min 	Construction: \$3,630,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	CM/CI: \$440,000
	<i>Total (2012):</i> \$4,790,000
	<i>Total (2014):</i> \$5,100,000

Typical Section



PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

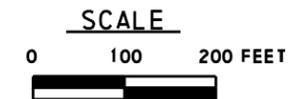
REVISED	STATE	PROJECT		SHEET NO.
	ROUTE			
	VA.	501	ROUTE 501 CORRIDOR STUDY	8-1



SEE PLAN SHEET 8-2

STUDY #8 - PASSING LANE FROM RTE. 970 TO 1.6 MILES NORTH

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	ROUTE	STATE PROJECT	SHEET NO.
	VA.	501	ROUTE 501 CORRIDOR STUDY	

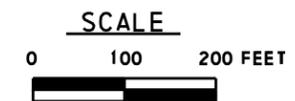
SEE PLAN SHEET 8-1



SEE PLAN SHEET 8-3

STUDY #8 - PASSING LANE FROM RTE. 970 TO 1.6 MILES NORTH

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	8-3

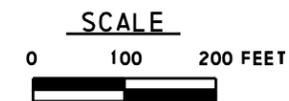
SEE PLAN SHEET 8-2



SEE PLAN SHEET 8-4

STUDY #8 - PASSING LANE FROM RTE. 970 TO 1.6 MILES NORTH

* PRIORITY PASSING LANE *



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

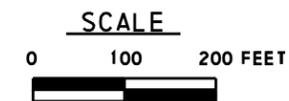
REVISED	STATE	PROJECT		SHEET NO.
	ROUTE			
	VA.	501	ROUTE 501 CORRIDOR STUDY	8-4

SEE PLAN SHEET 8-3



STUDY #8 - PASSING LANE FROM RTE. 970 TO 1.6 MILES NORTH

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	



Study 11 - Passing Lane Section: Rt. 972 to Rt. 605 (Campbell County)

Purpose & Need:

The emphasis for the passing lane section improvements is to increase safety and operations along the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Although not measured, there are existing sections with apparent limited sight distance caused by roadway vertical alignment, as well as, frequent residential areas that have numerous driveways and access road along the route. In addition, the existing Route 501 corridor contains truck and bus traffic, which have an impact on the operations of the corridor. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient roadway corridor that meets Virginia Department of Transportation standards.

Project Scope:

The project scope consists of roadway widening improvements to provide a three lane roadway section with upgraded shoulder. The project limits extend from just south of Route 633 (Phelps Creek Road) to Route 605 (Swinging Bridge Road). The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address sight distance concerns, as well as evaluate and implement access management improvements.

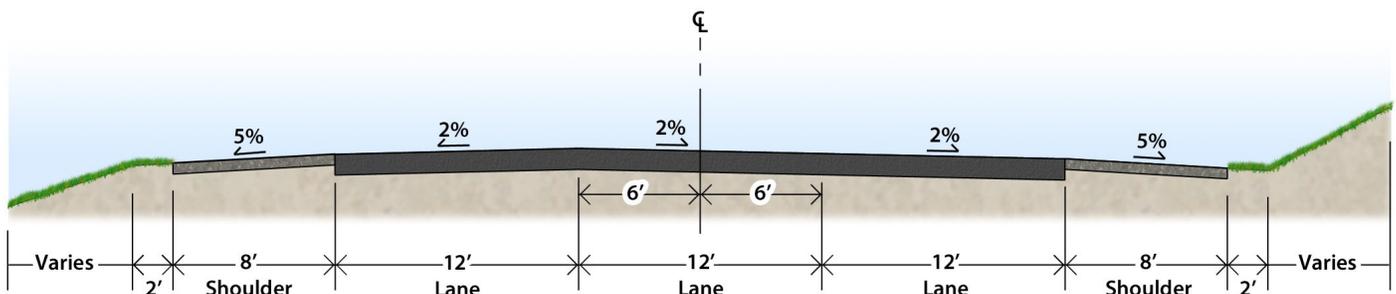


Project Location Map

Key Statistics:

Function Classification: Minor Arterial	<u>Cost</u>
Length: 2.3 Miles (12,200 Feet)	Design: \$955,000
Geometric Standard: GS-2	ROW: \$425,000
Design Standards: <ul style="list-style-type: none"> Terrain—Rolling Design Speed—60 MPH Vertical Grade—0.5% to 7.0% Sight Distance (@ lane taper approach)—1,000' Min 	Construction: \$6,360,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	CM/CI: \$760,000
	Total (2012): \$8,500,000
	Total (2014): 9,020,000

Typical Section



PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

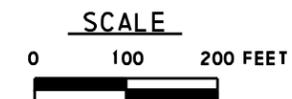
REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	11-1



SEE PLAN SHEET 11-2

STUDY #11 - PASSING LANE FROM RTE. 972 TO RTE. 605

*** PRIORITY PASSING LANE ***



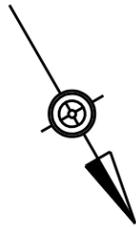
PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	11-2



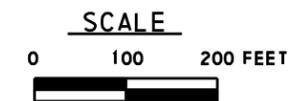
SEE PLAN SHEET 11-1



SEE PLAN SHEET 11-3

STUDY #11 - PASSING LANE FROM RTE. 972 TO RTE. 605

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE		SHEET NO.
	ROUTE	PROJECT	
	VA.	501	11-3

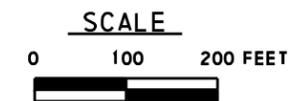


SEE PLAN SHEET 11-2

SEE PLAN SHEET 11-4

STUDY #11 - PASSING LANE FROM RTE. 972 TO RTE. 605

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE		PROJECT	SHEET NO.
	STATE	ROUTE		
	VA.	501	ROUTE 501 CORRIDOR STUDY	11-4



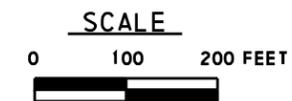
SEE PLAN SHEET 11-3



SEE PLAN SHEET 11-5

STUDY #11 - PASSING LANE FROM RTE. 972 TO RTE. 605

* PRIORITY PASSING LANE *



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

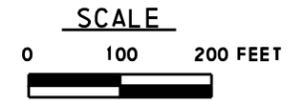
REVISED	STATE		SHEET NO.
	ROUTE	PROJECT	
	VA.	501	11-5

SEE PLAN SHEET 11-4



SEE PLAN SHEET 11-6

STUDY #11 - PASSING LANE FROM RTE. 972 TO RTE. 605
 * PRIORITY PASSING LANE *



PROJECT	SHEET NO.
ROUTE 501	

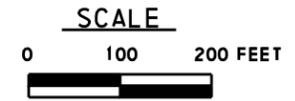
PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	11-6

SEE PLAN SHEET 11-5



STUDY #11 - PASSING LANE FROM RTE. 972 TO RTE. 605
 * PRIORITY PASSING LANE *



PROJECT	SHEET NO.
ROUTE 501	



Shoulder Widening Section:

Route 686 to Merryman Drive (Campbell County)

Purpose & Need:

The emphasis for the shoulder widening improvements is to increase safety and operations along the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Existing paved should widths, on average, range from 1' to 2'. The inclusion of a full paved shoulder (8' minimum) would be beneficial primarily for safety, but would also have some positive affects on operations. The wider shoulder would provide a area of refuge for motorist in an event they encounter unforeseen conditions. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient roadway corridor that meets Virginia Department of Transportation standards.

Project Scope:

The project scope consists widening the existing paved shoulder to a minimum width of 8', with and additional 2' graded should along both the northbound and southbound directions. The improvements will include the necessary grading, grading and driveway improvements associated with the shoulder widening.

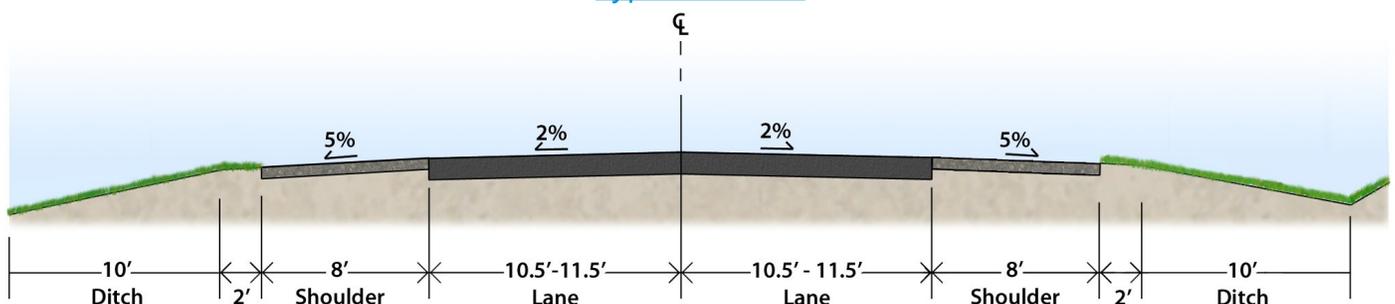


Project Location Map

Key Statistics:

Function Classification: Minor Arterial	Cost
Length: 1,500 Feet	Design: \$70,000
Geometric Standard: GS-2	ROW \$40,000
Design Standards: <ul style="list-style-type: none"> Terrain—Rolling Design Speed—60 MPH 	Construction: \$465,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	CM/CI: \$60,000
	Total (2012): \$635,000
	Total (2014): \$680,000

Typical Section





Shoulder Widening Section:

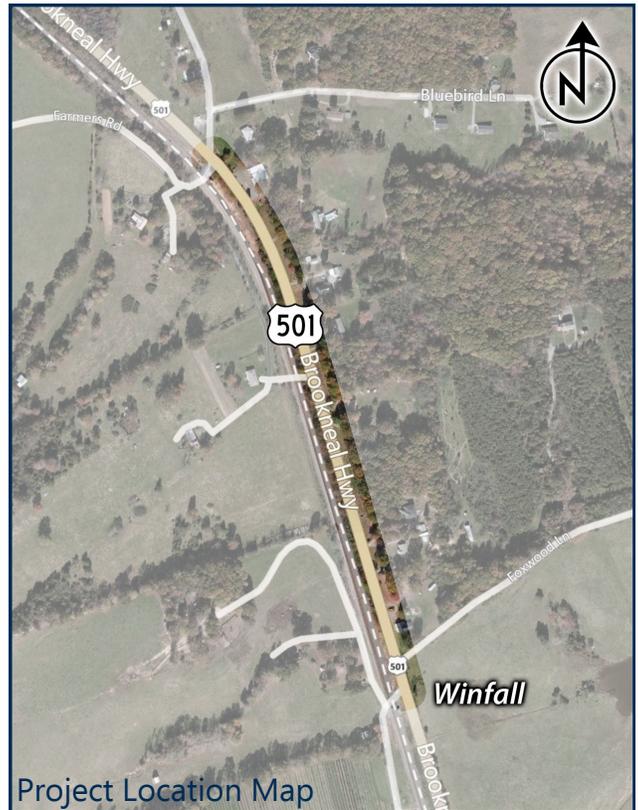
Rocky Road to Route 607 (Campbell County)

Purpose & Need:

The emphasis for the shoulder widening improvements is to increase safety and operations along the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Existing paved should widths, on average, range from 1' to 2'. The inclusion of a full paved shoulder (8' minimum) would be beneficial primarily for safety, but would also have some positive affects on operations. The wider shoulder would provide a area of refuge for motorist in an event they encounter unforeseen conditions. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient roadway corridor that meets Virginia Department of Transportation standards.

Project Scope:

The project scope consists widening the existing paved shoulder to a minimum width of 8', with and additional 2' graded should along both the northbound and southbound directions. The improvements will include the necessary grading, grading and driveway improvements associated with the shoulder widening.

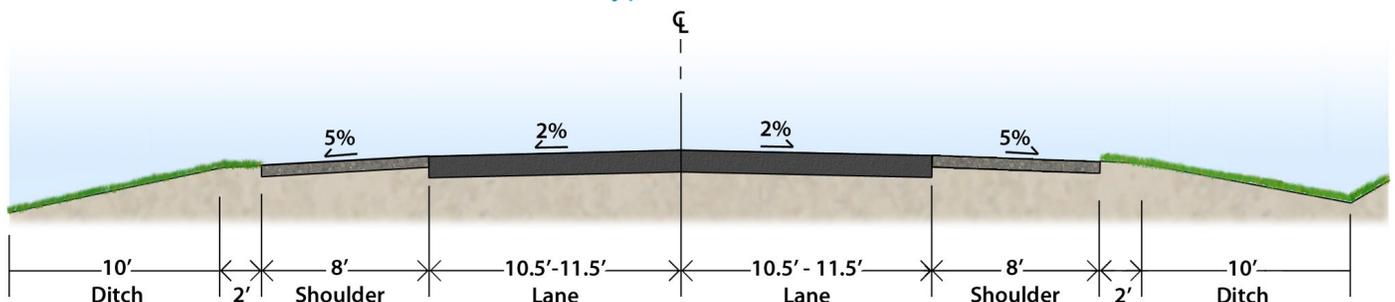


Project Location Map

Key Statistics:

Function Classification: Minor Arterial	<u>Cost</u>
Length: 2,700 Feet	Design: \$120,000
Geometric Standard: GS-2	ROW \$85,000
Design Standards: <ul style="list-style-type: none"> Terrain—Rolling Design Speed—60 MPH 	Construction: \$800,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	CM/CI: \$100,000
	<i>Total (2012):</i> \$1,110,000
	<i>Total (2014):</i> \$1,180,000

Typical Section





Shoulder Widening Section:

Morningside Drive to Route 635 (Campbell County)

Purpose & Need:

The emphasis for the shoulder widening improvements is to increase safety and operations along the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Existing paved should widths, on average, range from 1' to 2'. The inclusion of a full paved shoulder (8' minimum) would be beneficial primarily for safety, but would also have some positive affects on operations. The wider shoulder would provide a area of refuge for motorist in an event they encounter unforeseen conditions. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient roadway corridor that meets Virginia Department of Transportation standards.

Project Scope:

The project scope consists widening the existing paved shoulder to a minimum width of 8', with and additional 2' graded should along both the northbound and southbound directions. The improvements will include the necessary grading, grading and driveway improvements associated with the shoulder widening.

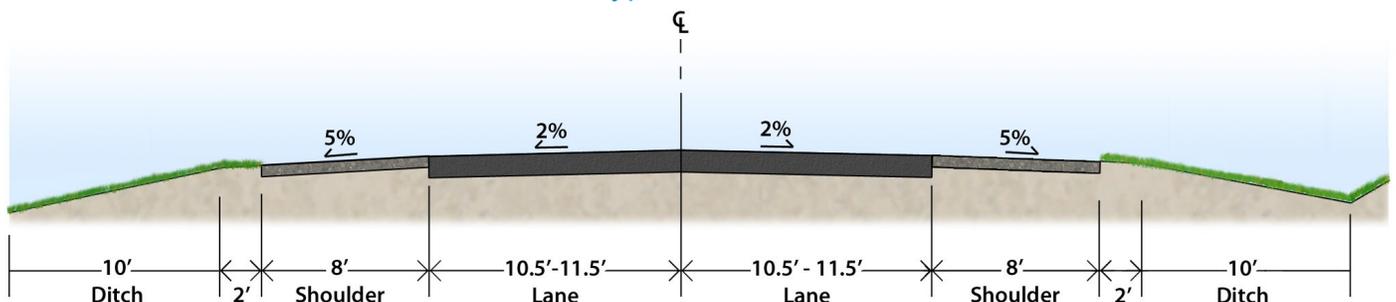


Project Location Map

Key Statistics:

Function Classification: Minor Arterial	<u>Cost</u>
Length: 2,000 Feet	Design: \$75,000
Geometric Standard: GS-2	ROW \$40,000
Design Standards: • Terrain—Rolling • Design Speed—60 MPH	Construction: \$495,000
	CM/CI: \$60,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	<i>Total (2012):</i> \$670,000
	<i>Total (2014):</i> \$710,000

Typical Section





Shoulder Widening Section:

County Road 910 to Mollies Creek Road (Campbell County)

Purpose & Need:

The emphasis for the shoulder widening improvements is to increase safety and operations along the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Existing paved should widths, on average, range from 1' to 2'. The inclusion of a full paved shoulder (8' minimum) would be beneficial primarily for safety, but would also have some positive affects on operations. The wider shoulder would provide a area of refuge for motorist in an event they encounter unforeseen conditions. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient roadway corridor that meets Virginia Department of Transportation standards.

Project Scope:

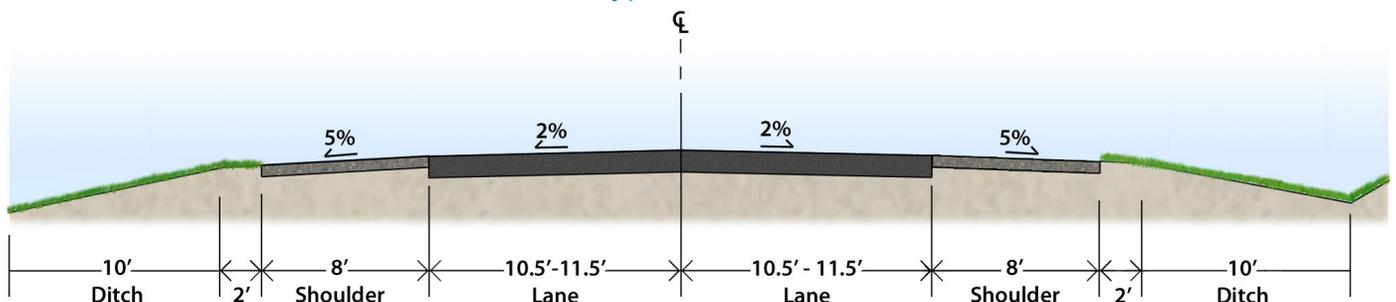
The project scope consists widening the existing paved shoulder to a minimum width of 8', with an additional 2' graded should along both the northbound and southbound directions. The improvements will include the necessary grading, grading and driveway improvements associated with the shoulder widening.



Key Statistics:

Function Classification: Minor Arterial	<u>Cost</u>
Length: 3,500 Feet	Design: \$140,000
Geometric Standard: GS-2	ROW \$85,000
Design Standards: <ul style="list-style-type: none"> • Terrain—Rolling • Design Speed—60 MPH 	Construction: \$910,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	CM/CI: \$110,000
	<i>Total (2012):</i> \$1,250,000
	<i>Total (2014):</i> \$1,350,000

Typical Section





Shoulder Widening Section:

Laughlin Street to 830' north Of Laughlin Street (Campbell County)

Purpose & Need:

The emphasis for the shoulder widening improvements is to increase safety and operations along the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Existing paved should widths, on average, range from 1' to 2'. The inclusion of a full paved shoulder (8' minimum) would be beneficial primarily for safety, but would also have some positive affects on operations. The wider shoulder would provide a area of refuge for motorist in an event they encounter unforeseen conditions. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient roadway corridor that meets Virginia Department of Transportation standards.

Project Scope:

The project scope consists widening the existing paved shoulder to a minimum width of 8', with and additional 2' graded should along both the northbound and southbound directions. The improvements will include the necessary grading, grading and driveway improvements associated with the shoulder widening.

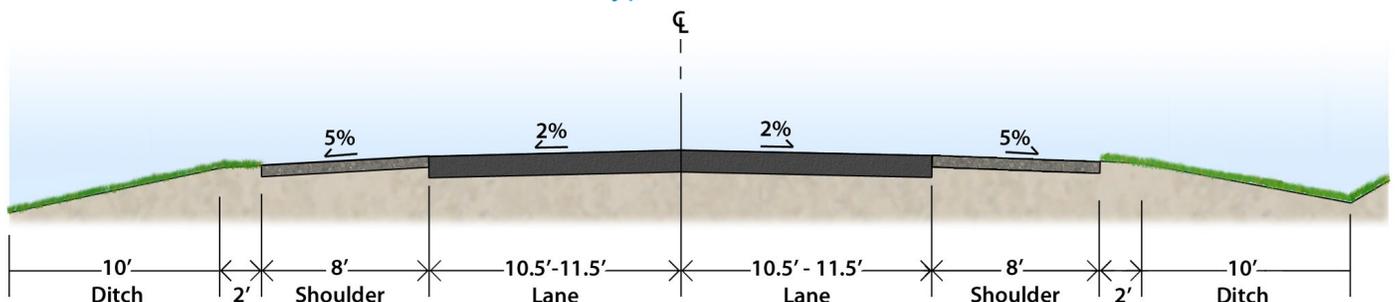


Project Location Map

Key Statistics:

Function Classification: Minor Arterial	<u>Cost</u>
Length: 900 Feet	Design: \$35,000
Geometric Standard: GS-2	ROW \$20,000
Design Standards: • Terrain—Rolling	Construction: \$230,000
• Design Speed—60 MPH	CM/CI: \$30,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	<i>Total (2012):</i> \$320,000
	<i>Total (2014):</i> \$340,000

Typical Section



Priority Projects – *Halifax County*



Study 15 - Intersection Improvement:

Intersection at Route 40/Route 632 (Halifax County)

Purpose & Need:

The emphasis of the intersection improvements is to increase safety and operations within the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Typical concerns include sight distance, queuing as a result of left/right turn maneuvers and lack of access management within close proximity to an intersection. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient intersections within the US 501 corridor that meets Virginia Department of Transportation standards. *The concerns at the Route 501 and Route 40/632 intersection include both safety and operations, as well as access control. The improvements should focus on providing a wider roadway section and establishing more efficient sight lines.*

Project Scope:

The project scope consists of intersection improvements to provide more defined right turn lanes in both the northbound and southbound directions. The improvements include widening of the existing shoulder, access control improvements associated with the business located in the northeastern quadrant of the intersection, and relocation of existing guiderail. The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address sight distance concerns



Key Statistics:

Function Classification: Minor Arterial

Cost

Geometric Standard: GS-2

Design: \$90,000

- Design Standards:
- Turning Lane Length—150'
 - Turn Lane Taper Transition—15:1

ROW \$125,000

Construction: \$550,000

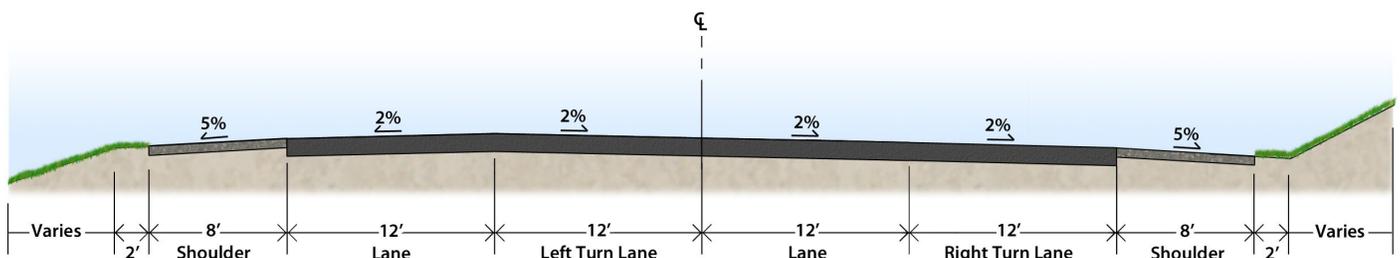
CM/CI: \$65,000

Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .

Total (2012): \$830,000

Total (2014): \$870,000

Typical Section



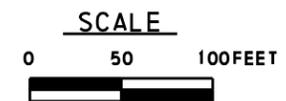
PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	ROUTE	STATE PROJECT	SHEET NO.
	VA.	501	ROUTE 501 CORRIDOR STUDY	



STUDY #15 - INTERSECTION AT RTE. 40 & RTE. 632

*** PRIORITY INTERSECTION ***





Study 22 - Intersection Improvement:

Intersection at Route 628 (Halifax County)

Purpose & Need:

The emphasis of the intersection improvements is to increase safety and operations within the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Typical concerns include sight distance, queuing as a result of left/right turn maneuvers and lack of access management within close proximity to an intersection. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient intersections within the US 501 corridor that meets Virginia Department of Transportation standards. *Specific concerns at the Route 501 and Route 628 intersection are associated with the overall operations of the intersection and the Route 501 corridor. The opportunity to implement a left and right turn lane will assist with both.*

Project Scope:

The project scope consists of roadway widening improvements to provide a left-turn lane along northbound Route 501 and a right turn lane along southbound Route 501. The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address sight distance concerns, as well as evaluate and implement access control improvements.



Key Statistics:

Function Classification: Minor Arterial

Cost

Geometric Standard: GS-2

Design: \$95,000

- Design Standards:
- Turning Lane Length—150'
 - Turn Lane Taper Transition—15:1
 - Rate of Lane Shift—Width x Design Speed

ROW \$150,000

Construction: \$610,000

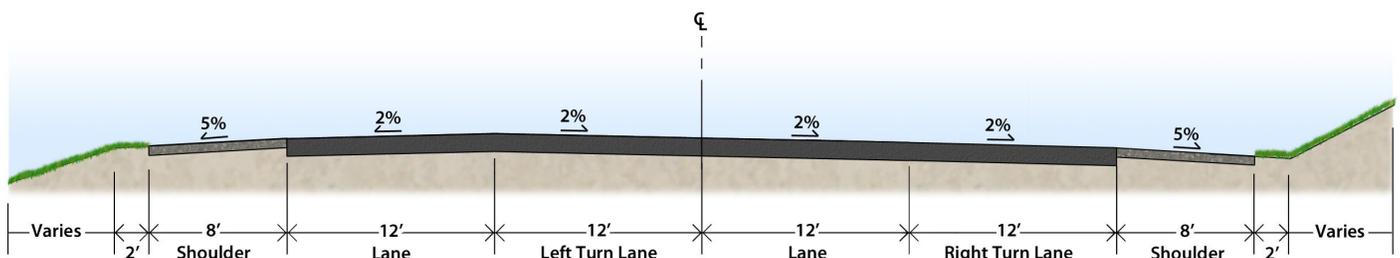
CM/CI: \$75,000

Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .

Total (2012): \$930,000

Total (2014): \$980,000

Typical Section



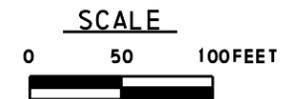
PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	ROUTE	STATE PROJECT	SHEET NO.
	VA.	501	ROUTE 501 CORRIDOR STUDY	



STUDY #22 - INTERSECTION AT RTE. 628

* PRIORITY INTERSECTION *



PROJECT	SHEET NO.
ROUTE 501	



Study 24 - Intersection Improvement:

Intersection at Route 642 (Halifax County)

Purpose & Need:

The emphasis of the intersection improvements is to increase safety and operations within the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Typical concerns include sight distance, queuing as a result of left/right turn maneuvers and lack of access management within close proximity to an intersection. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient intersections within the US 501 corridor that meets Virginia Department of Transportation standards. *Specific concerns at the Route 501 and Route 642 intersection are associated with the overall operations of the intersection and the Route 501 corridor. The opportunity to implement left and right turn lanes, as well as access control improvements will assist with both.*

Project Scope:

The project scope consists of the addition of left and right turn lanes in both the southbound and northbound directions. The improvements include widening of the existing shoulder and access control improvements associated with the business located in the southeastern quadrant of the intersection. The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address sight distance concerns.

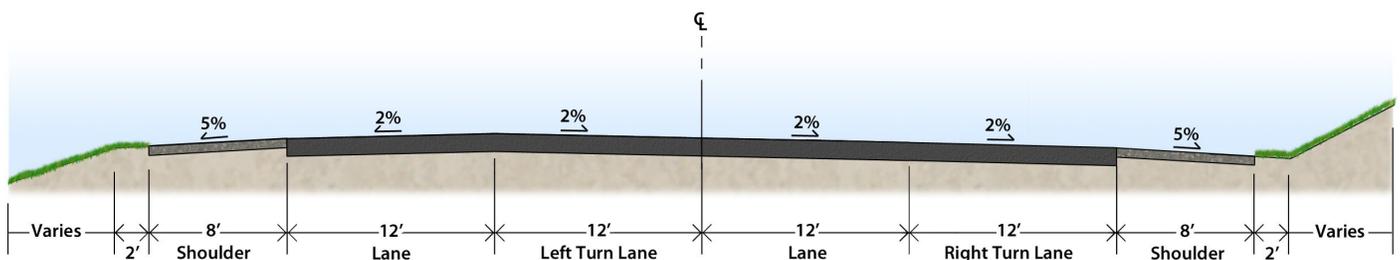


Project Location Map

Key Statistics:

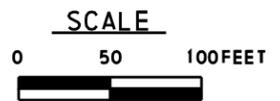
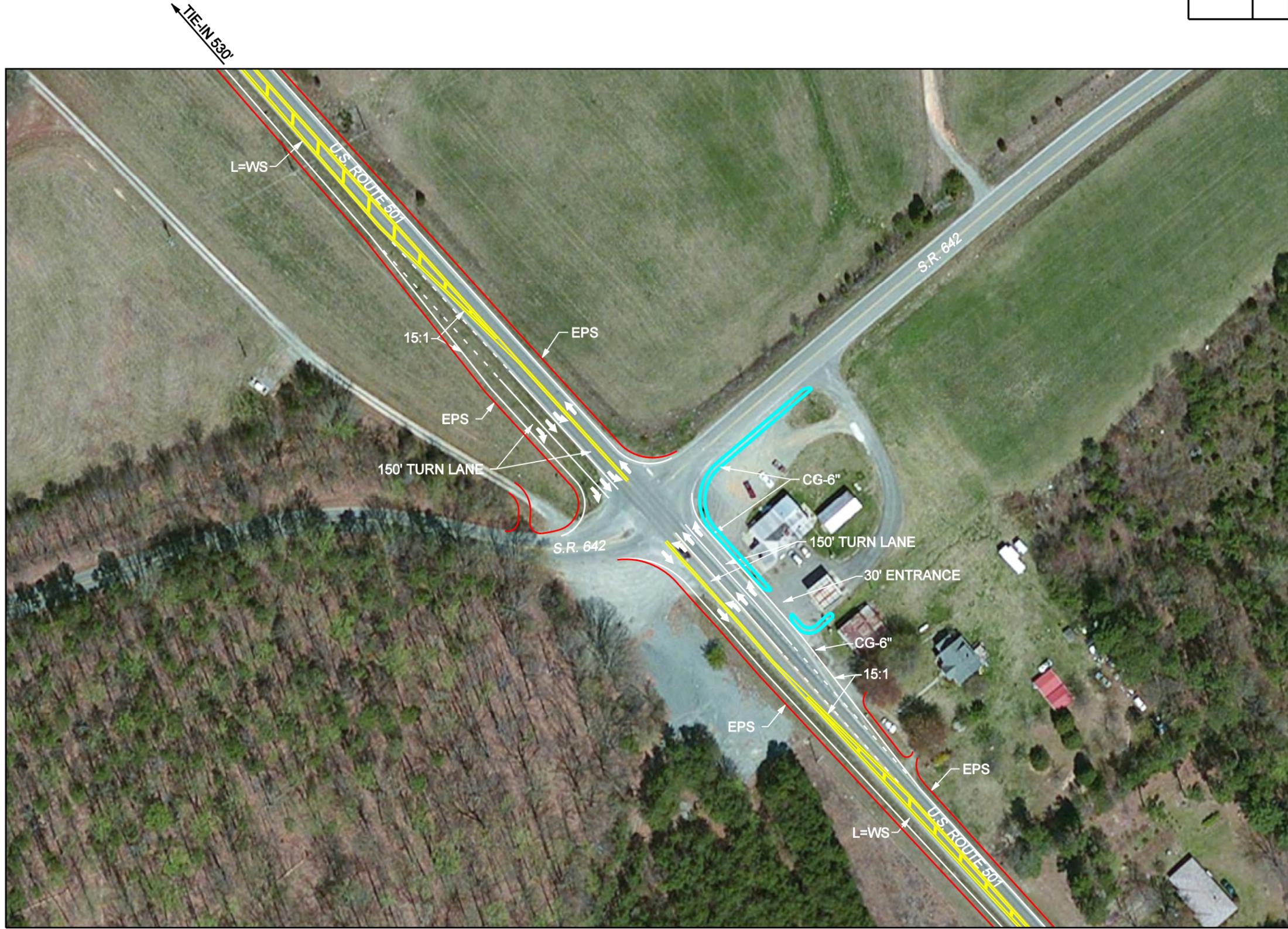
Function Classification: Minor Arterial	<u>Cost</u>
Geometric Standard: GS-2	Design: \$105,000
Design Standards: <ul style="list-style-type: none"> Turning Lane Length—150' Turn Lane Taper Transition—15:1 Rate of Lane Shift—Width x Design Speed 	ROW \$150,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	Construction: \$680,000
	CM/CI: \$85,000
	<i>Total (2012):</i> \$1,020,000
	<i>Total (2014):</i> \$1,080,000

Typical Section



PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	



STUDY #24 - INTERSECTION AT RTE. 642
 * PRIORITY INTERSECTION *

PROJECT	SHEET NO.
ROUTE 501	



Study 31 - Intersection Improvement:

Intersection at Route 360 (Halifax County)

Purpose & Need:

The emphasis of the intersection improvements is to increase safety and operations within the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Typical concerns include sight distance, queuing as a result of left/right turn maneuvers and lack of access management within close proximity to an intersection. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient intersections within the US 501 corridor that meets Virginia Department of Transportation standards. *Specific concerns associated with the Route 501 and Route 360 intersection include operations associated with the stop condition along Route 501. Southbound Route 501 currently is stopped controlled with a shared right/left turn lane.*

Project Scope:

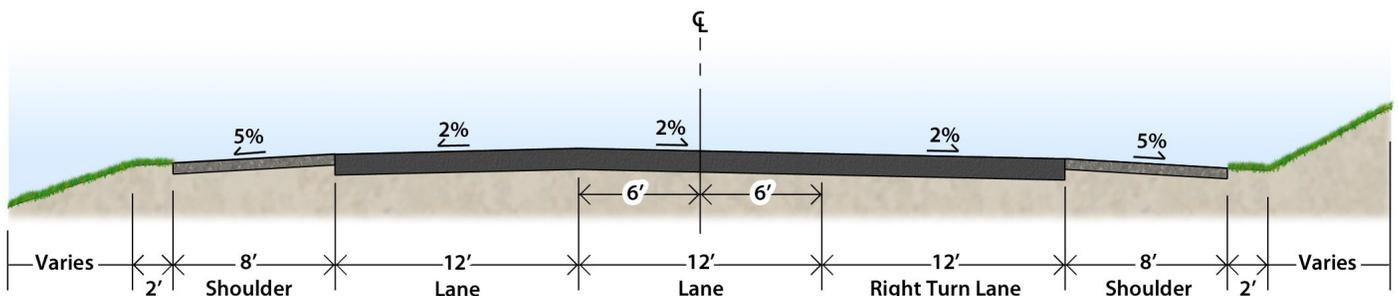
The project scope consists of roadway widening improvements to provide a right-turn lane along southbound Route 501, with a upgraded shoulder. The scope of work also includes improvements along the property to the north, between Route 501 and Route 360. These improvements should be focus to better accommodate right turns from Route 360 to northbound Route 501, while providing access control along the property.



Key Statistics:

Function Classification: Minor Arterial	<u>Cost</u>
Geometric Standard: GS-2	Design: \$55,000
Design Standards: <ul style="list-style-type: none"> Turning Lane Length—150' Turn Lane Taper Transition—15:1 	ROW: \$30,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	Construction: \$340,000
	CM/CI: \$45,000
	<i>Total (2012):</i> \$470,000
	<i>Total (2014):</i> \$500,000

Typical Section



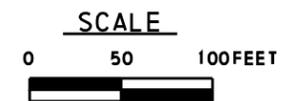
PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	PROJECT		SHEET NO.
	ROUTE			
	VA.	501	ROUTE 501 CORRIDOR STUDY	



STUDY #31 - INTERSECTION AT RTE. 360

* PRIORITY INTERSECTION *



PROJECT	SHEET NO.
ROUTE 501	



Study 19 - Passing Lane Section:

Rt. 905 to southern intersection of Rt. 645 (Halifax County)

Purpose & Need:

The emphasis for the passing lane section improvements is to increase safety and operations along the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Although not measured, there are existing sections with apparent limited sight distance caused by roadway vertical alignment, as well as, frequent residential areas that have numerous driveways and access road along the route. In addition, the existing Route 501 corridor contains truck and bus traffic, which have an impact on the operations of the corridor. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient roadway corridor that meets Virginia Department of Transportation standards.

Project Scope:

The project scope consists of roadway widening improvements to provide a three lane roadway section with upgraded shoulder. The project limits extend from Route 905 (Jimmys Trail) to the southern intersection of Route 645 (Acorn Road). The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address sight distance concerns, as well as evaluate and implement access management improvements.

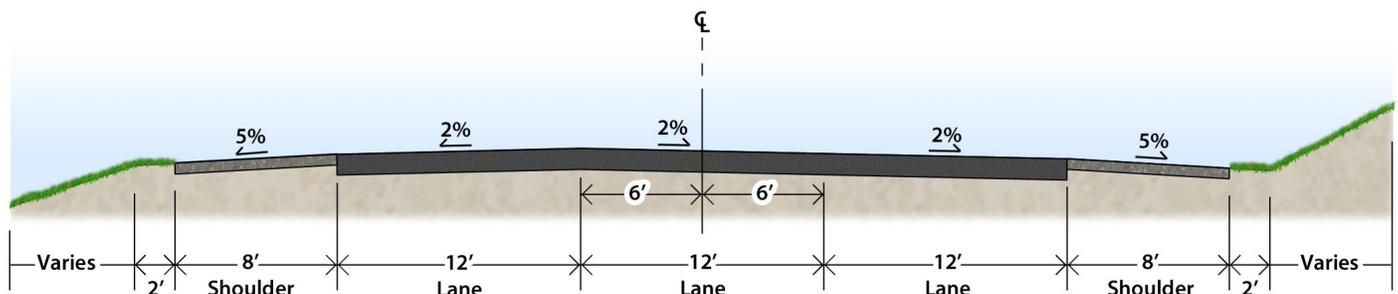


Project Location Map

Key Statistics:

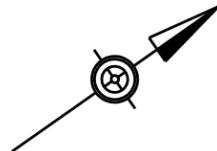
Function Classification: Minor Arterial	<u>Cost</u>
Length: 1.7 Miles (9,000 Feet)	Design: \$800,000
Geometric Standard: GS-2	ROW \$325,000
Design Standards: <ul style="list-style-type: none"> Terrain—Rolling Design Speed—60 MPH Vertical Grade—0.5% to 7.0% Sight Distance (@ lane taper approach)—1,000' Min 	Construction: \$5,310,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	CM/CI: \$635,000
	<i>Total (2012):</i> \$7,070,000
	<i>Total (2014):</i> \$7,490,000

Typical Section



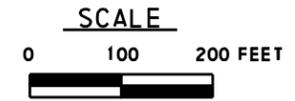
PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	19-1



SEE PLAN SHEET 19-2

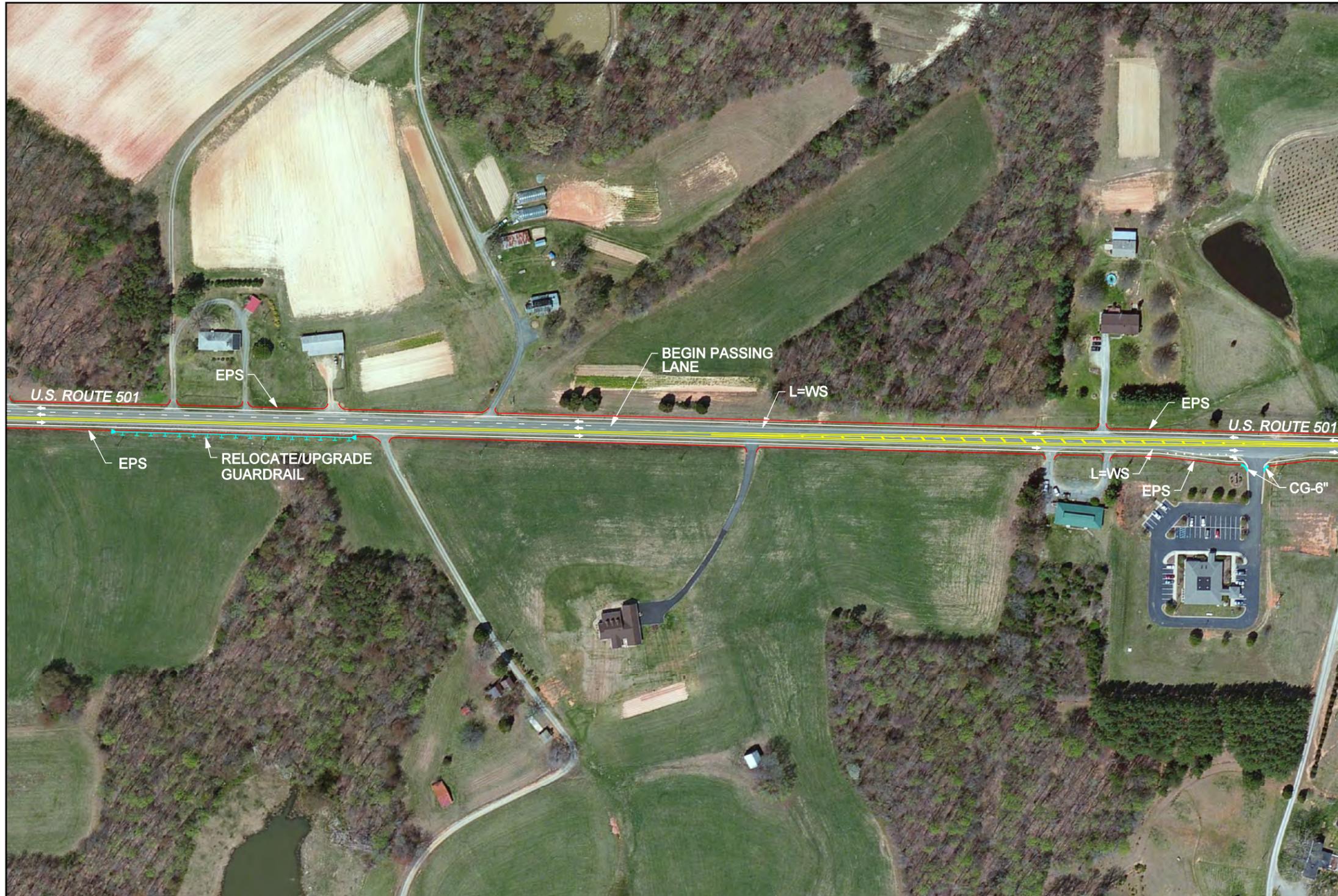
STUDY #19 - PASSING LANE FROM RTE. 905 TO RTE. 645
 * PRIORITY PASSING LANE *



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE		SHEET NO.
	ROUTE	PROJECT	
	VA.	501	19-2
ROUTE 501 CORRIDOR STUDY			



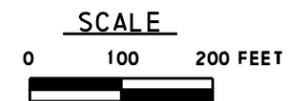
SEE PLAN SHEET 19-1

SEE PLAN SHEET 19-3



STUDY #19 - PASSING LANE FROM RTE. 905 TO RTE. 645

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE		PROJECT	SHEET NO.
	STATE	ROUTE		
	VA.	501	ROUTE 501 CORRIDOR STUDY	19-3

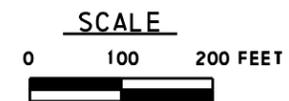


SEE PLAN SHEET 19-2

SEE PLAN SHEET 19-4

STUDY #19 - PASSING LANE FROM RTE. 905 TO RTE. 645

*** PRIORITY PASSING LANE ***

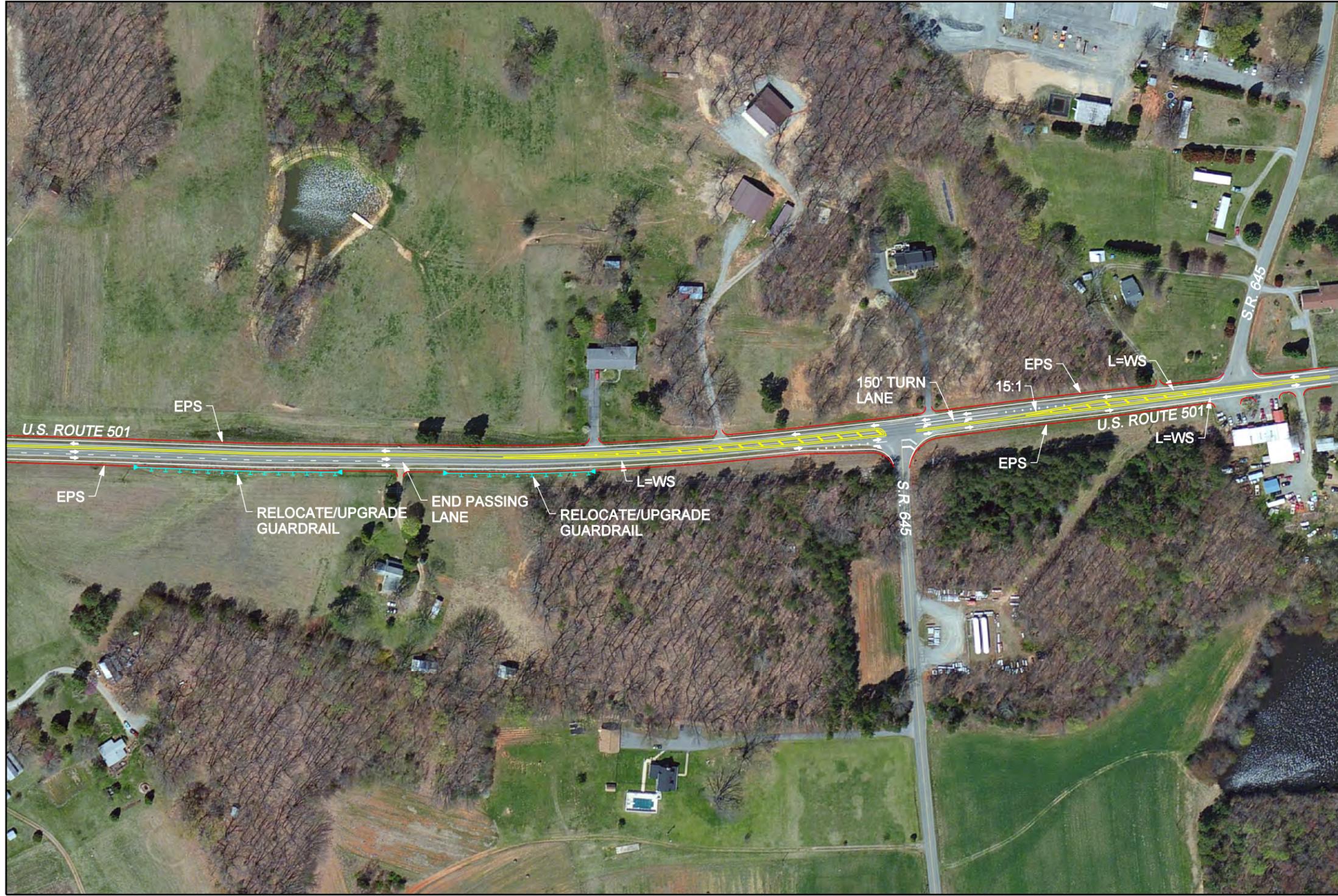


PROJECT	SHEET NO.
ROUTE 501	

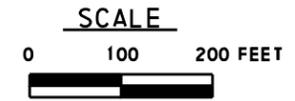
PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE		SHEET NO.
	ROUTE	PROJECT	
	VA.	501	19-4

SEE PLAN SHEET 19-3



STUDY #19 - PASSING LANE FROM RTE. 905 TO RTE. 645
 * PRIORITY PASSING LANE *





Study 21 - Passing Lane Section: Rt. 628 to Rt. 907 (Halifax County)

Purpose & Need:

The emphasis for the passing lane section improvements is to increase safety and operations along the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Although not measured, there are existing sections with apparent limited sight distance caused by roadway vertical alignment, as well as, frequent residential areas that have numerous driveways and access road along the route. In addition, the existing Route 501 corridor contains truck and bus traffic, which have an impact on the operations of the corridor. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient roadway corridor that meets Virginia Department of Transportation standards.

Project Scope:

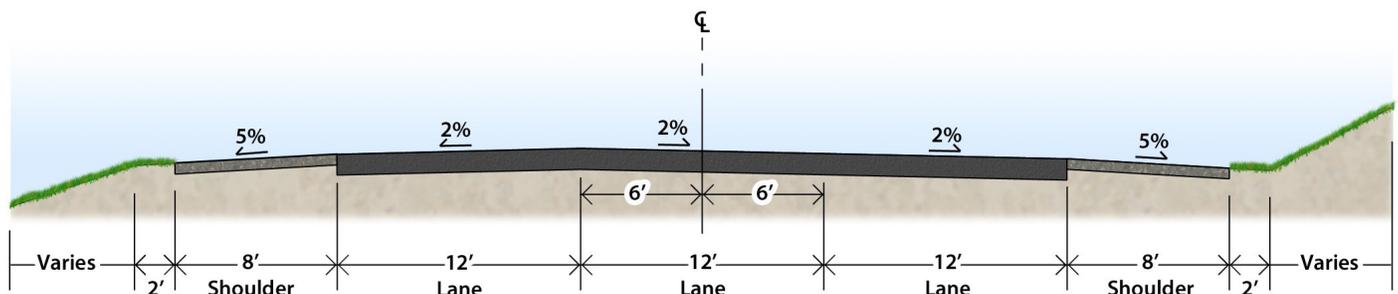
The project scope consists of roadway widening improvements to provide a three lane roadway section with upgraded shoulder. The project limits extend from just north of Route 628 (Chestnut Road) to Route 621 (Bradleys Creek Road). The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address sight distance concerns, as well as evaluate and implement access management improvements.



Key Statistics:

Function Classification: Minor Arterial	<u>Cost</u>
Length: 2.0 Miles (10,600 Feet)	Design: \$810,000
Geometric Standard: GS-2	ROW \$275,000
Design Standards: <ul style="list-style-type: none"> • Terrain—Rolling • Design Speed—60 MPH • Vertical Grade—0.5% to 7.0% • Sight Distance (@ lane taper approach)—1,000' Min 	Construction: \$5,400,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2).	CM/CI: \$645,000
	<i>Total (2012):</i> \$7,130,000
	<i>Total (2014):</i> \$7,570,000

Typical Section



PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

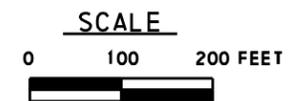
REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	21-1



SEE PLAN SHEET 21-2

STUDY #21 - PASSING LANE FROM RTE. 628 TO RTE. 907

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

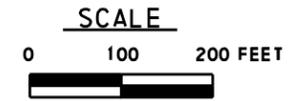
REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	21-2

SEE PLAN SHEET 21-1



SEE PLAN SHEET 21-3

STUDY #21 - PASSING LANE FROM RTE. 628 TO RTE. 907
 * PRIORITY PASSING LANE *



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	21-3

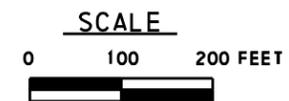
SEE PLAN SHEET 21-2



SEE PLAN SHEET 21-4

STUDY #21 - PASSING LANE FROM RTE. 628 TO RTE. 907

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	21-4

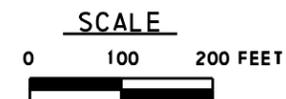
SEE PLAN SHEET 21-3



SEE PLAN SHEET 21-5

STUDY #21 - PASSING LANE FROM RTE. 628 TO RTE. 907

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE		SHEET NO.
	ROUTE	PROJECT	
	VA.	501	21-5

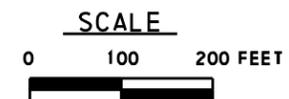


SEE PLAN SHEET 21-4



STUDY #21 - PASSING LANE FROM RTE. 628 TO RTE. 907

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	



Study 27 - Passing Lane Section:

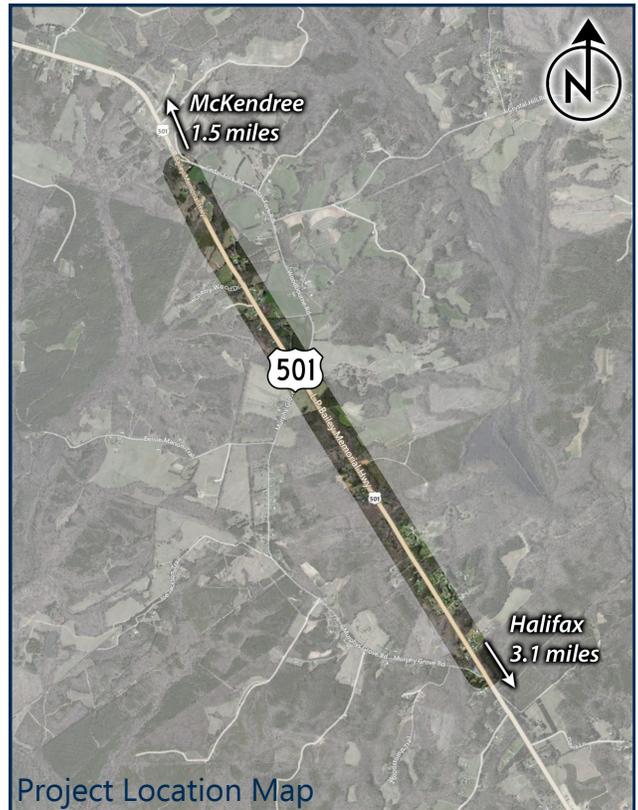
Rt. 610 to southern intersection of Rt. 643 (Halifax County)

Purpose & Need:

The emphasis for the passing lane section improvements is to increase safety and operations along the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Although not measured, there are existing sections with apparent limited sight distance caused by roadway vertical alignment, as well as, frequent residential areas that have numerous driveways and access road along the route. In addition, the existing Route 501 corridor contains truck and bus traffic, which have an impact on the operations of the corridor. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient roadway corridor that meets Virginia Department of Transportation standards.

Project Scope:

The project scope consists of roadway widening improvements to provide a three lane roadway section with upgraded shoulder. The project limits extend from just north of Route 610 (Grove Road) to the southern intersection of Route 501 and Route 643. The improvements will also evaluate the existing vertical alignment to determine if any spot adjustments are required to address sight distance concerns, as well as evaluate and implement access management improvements.

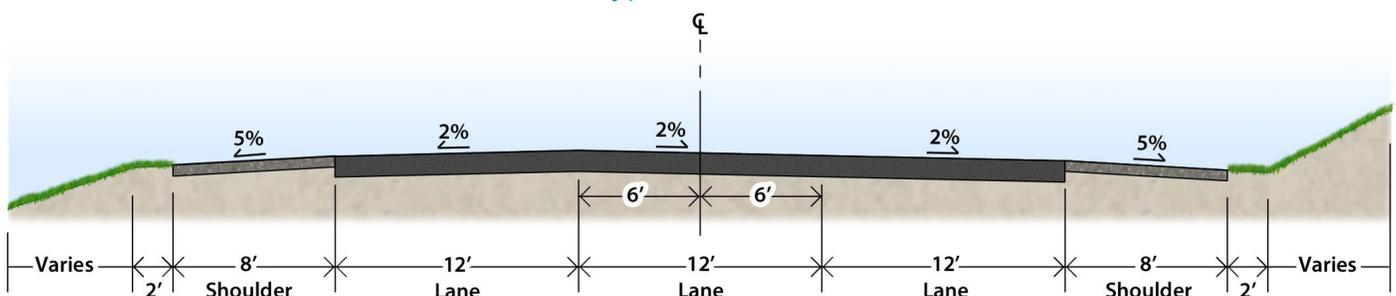


Project Location Map

Key Statistics:

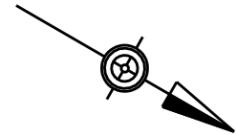
Function Classification: Minor Arterial	<u>Cost</u>
Length: 2.0 Miles (10,560 Feet)	Design: \$980,000
Geometric Standard: GS-2	ROW \$375,000
Design Standards: <ul style="list-style-type: none"> Terrain—Rolling Design Speed—60 MPH Vertical Grade—0.5% to 7.0% Sight Distance (@ lane taper approach)—1,000' Min 	Construction: \$6,510,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2).	CM/CI: \$785,000
	Total (2012): \$8,650,000
	Total (2014): \$9,170,000

Typical Section



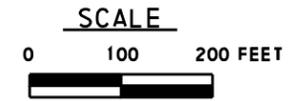
PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	ROUTE	STATE PROJECT	SHEET NO.
	VA.	501	ROUTE 501 CORRIDOR STUDY	



SEE PLAN SHEET 27-2

STUDY #27 - PASSING LANE FROM RTE. 610 TO RTE. 643
 * PRIORITY PASSING LANE *

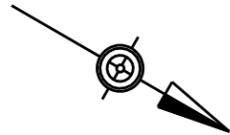


PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	27-2



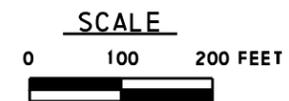
SEE PLAN SHEET 27-1



SEE PLAN SHEET 27-3

STUDY #27 - PASSING LANE FROM RTE. 610 TO RTE. 643

*** PRIORITY PASSING LANE ***

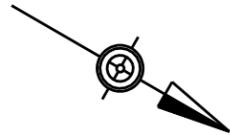


PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	PROJECT		SHEET NO.
	ROUTE			
	VA.	501	ROUTE 501 CORRIDOR STUDY	27-3

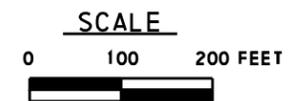
SEE PLAN SHEET 27-2



SEE PLAN SHEET 27-4

STUDY #27 - PASSING LANE FROM RTE. 610 TO RTE. 643

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	27-4

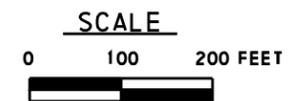


SEE PLAN SHEET 27-3

SEE PLAN SHEET 27-5

STUDY #27 - PASSING LANE FROM RTE. 610 TO RTE. 643

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	

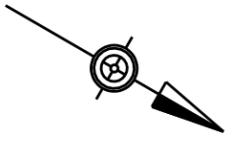
PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	27-5

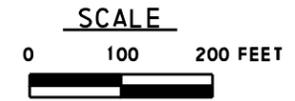


SEE PLAN SHEET 27-4

SEE PLAN SHEET 27-6



STUDY #27 - PASSING LANE FROM RTE. 610 TO RTE. 643
 * PRIORITY PASSING LANE *



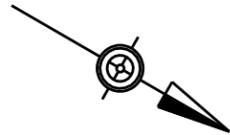
PROJECT	SHEET NO.
ROUTE 501	

PROJECT MANAGER _____
 SURVEYED BY _____
 DESIGN SUPERVISED BY _____
 DESIGNED BY _____

REVISED	STATE	STATE PROJECT		SHEET NO.
	ROUTE	PROJECT		
	VA.	501	ROUTE 501 CORRIDOR STUDY	27-6

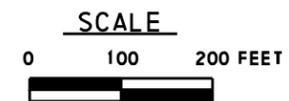


SEE PLAN SHEET 27-5



STUDY #27 - PASSING LANE FROM RTE. 610 TO RTE. 643

*** PRIORITY PASSING LANE ***



PROJECT	SHEET NO.
ROUTE 501	



Shoulder Widening Section:

Davis Lane to Charles Lane (Halifax County)

Purpose & Need:

The emphasis for the shoulder widening improvements is to increase safety and operations along the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Existing paved should widths, on average, range from 1' to 2'. The inclusion of a full paved shoulder (8' minimum) would be beneficial primarily for safety, but would also have some positive affects on operations. The wider shoulder would provide a area of refuge for motorist in an event they encounter unforeseen conditions. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient roadway corridor that meets Virginia Department of Transportation standards.

Project Scope:

The project scope consists widening the existing paved shoulder to a minimum width of 8', with an additional 2' graded should along both the northbound and southbound directions. The improvements will include the necessary grading, grading and driveway improvements associated with the shoulder widening.

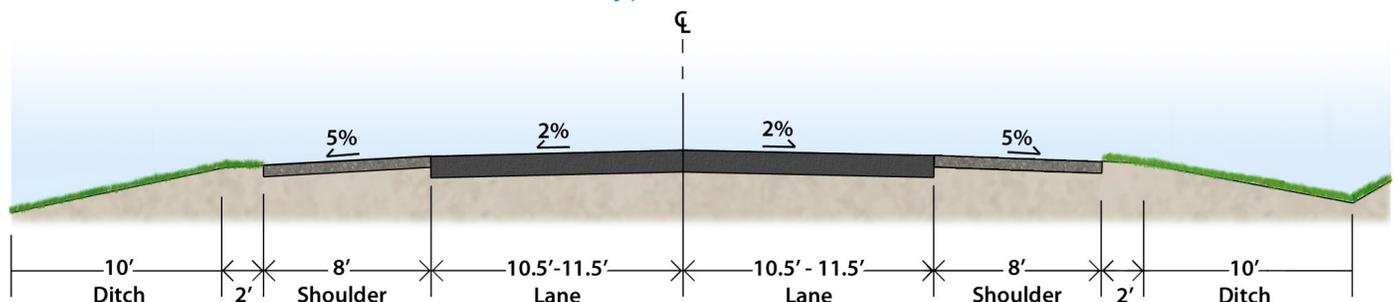


Project Location Map

Key Statistics:

Function Classification: Minor Arterial	<u>Cost</u>
Length: 8,000 Feet	Design: \$245,000
Geometric Standard: GS-2	ROW \$110,000
Design Standards: <ul style="list-style-type: none"> Terrain—Rolling Design Speed—60 MPH 	Construction: \$1,620,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	CM/CI: \$195,000
	<i>Total (2012):</i> \$2,170,000
	<i>Total (2014):</i> \$2,300,000

Typical Section





Shoulder Widening Section: Carters Lane to Route 615 (Halifax County)

Purpose & Need:

The emphasis for the shoulder widening improvements is to increase safety and operations along the US 501 corridor. Route 501 was originally designed as a low-volume rural road and the present roadway features and roadside environment has evolved over the years. Existing paved should widths, on average, range from 1' to 2'. The inclusion of a full paved shoulder (8' minimum) would be beneficial primarily for safety, but would also have some positive affects on operations. The wider shoulder would provide a area of refuge for motorist in an event they encounter unforeseen conditions. By addressing these concerns, the proposed improvements will be focused on providing a safer and more efficient roadway corridor that meets Virginia Department of Transportation standards.

Project Scope:

The project scope consists widening the existing paved shoulder to a minimum width of 8', with an additional 2' graded should along both the northbound and southbound directions. The improvements will include the necessary grading, grading and driveway improvements associated with the shoulder widening.

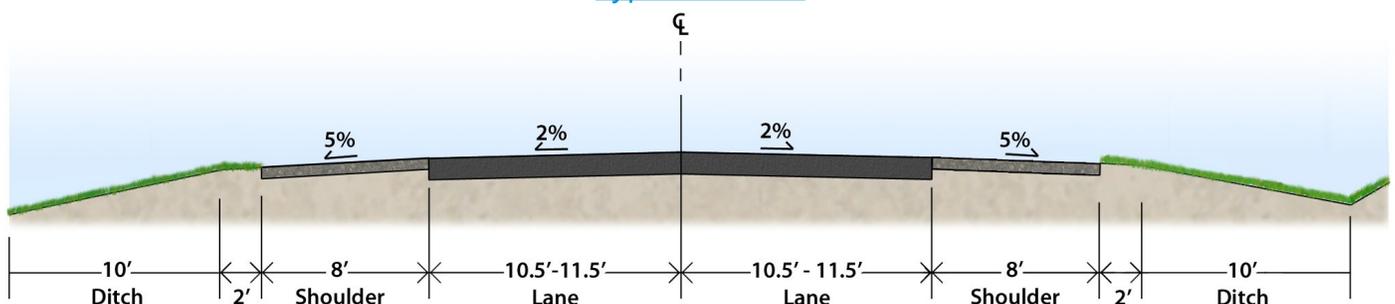


Project Location Map

Key Statistics:

Function Classification: Minor Arterial	<u>Cost</u>
Length: 1,800 Feet	Design: \$75,000
Geometric Standard: GS-2	ROW \$40,000
Design Standards: <ul style="list-style-type: none"> Terrain—Rolling Design Speed—60 MPH 	Construction: \$490,000
Typical Section: The proposed typical section for all improvement alternatives were developed based upon VDOT's GS Rural Minor Arterial (GS-2) .	CM/CI: \$60,000
	<i>Total (2012):</i> \$665,000
	<i>Total (2014):</i> \$710,000

Typical Section



COST ESTIMATES

Planning level cost estimates were completed for each of the priority improvement projects. The estimates were based upon the following assumptions:

- Existing Route 501 travel lanes would be milled to a depth of 1 ½ inches and overlaid with the same depth surface course.
- Widening associated with the intersection, passing lane, and shoulder widening improvements would include full depth reconstruction from the outside edge of each travel lane.
- The Regular Excavation quantity was estimated based upon existing grade outside of the roadway shoulder and required tie-in slopes and distances.
- The cost evaluated the major quantities associated with the proposed construction. A sample of the major quantities which were identified and estimated include the following:
 - Regular Excavation
 - Asphalt Concrete TY. SM-9.5D (Surface)
 - Asphalt Concrete TY. IM-19.0A (Subbase)
 - Asphalt Concrete TY. BM-25.0A (Base)
 - STD. Combination Curb and Gutter (CG-6)
 - Guardrail GR-2
 - TY. B CL VI Pavement Marking Line 4" (Yellow & White)
- Unit prices for the major quantity items were established based upon the statewide averages from July 2009 through August 2011.
- The following categories were estimated based upon a percentage of the major quantity items subtotal cost:
 - Drainage – 8%
 - Erosion & Sediment Control – 3%
 - Utilities – 10%
 - Landscaping – 5%
- A contingency of 30% was added to the estimated construction cost to determine the Total Construction Cost.
- Design/Engineering was estimated to be 15% of the Total Construction Cost.
- Construction Management and Inspection were estimated to be 12% of the Total Construction Cost.
- Right-of-Way costs were estimated based upon the Regular Excavation quantity and subsequent impacts.

The following table provides a summary of the cost for the priority improvement projects. In addition, a copy of the cost estimates for each of the intersection, passing lane, and shoulder widening improvements can be found in Appendix E.

SUMMARY TABLE - PRIORITY IMPROVEMENTS				
	<u>County</u>	<u>Location</u>	<u>Cost (2014 Dollars)</u>	<u>Accident Count*</u>
Intersection Improvements	Campbell	Route 501 & 24	\$200,000	5
	Campbell	Route 501 & 607	\$750,000	3
	Campbell	Route 501 & 652/761	\$1,020,000	5
	Campbell	Route 501 & 633	\$1,980,000	5
	Halifax	Route 501 & 40/632	\$870,000	3
	Halifax	Route 501 & 628	\$980,000	1
	Halifax	Route 501 & 642	\$1,080,000	5
	Halifax	Route 501 & 360	\$500,000	4
Passing Lane Sections	Campbell	North of Rte. 635 to Rte. 607 (2.4 miles)	\$9,750,000	19
	Campbell	Rte. 970 to 1.6 miles north of Rte. 970 (1.5 miles)	\$5,100,000	10
	Campbell	Rte. 972 to Rte. 605 (2.3 miles)	\$9,020,000	5
	Halifax	Rte. 905 to Rte. 645 (1.7 miles)	\$7,490,000	9 (1 fatality)
	Halifax	Rte. 628 to Rte. 907 (2.0 miles)	\$7,570,000	5
	Halifax	Rte. 610 to Rte. 643 (2.0 miles)	\$9,170,000	17 (2 fatalities)
Shoulder Widening	Campbell	Merryman Drive to Rte. 686, 1 mile south of Rustburg (0.3 miles)	\$680,000	3
	Campbell	Rocky Road to Rte. 607, 3.5 miles south of Rustburg (0.5 miles)	\$1,180,000	6
	Campbell	Rte. 635 to Morningside Drive, Gladys (0.4 miles)	\$710,000	3
	Campbell	Mollies Creek Road to Rte. 910, 3.5 miles south of Gladys (0.7 miles)	\$1,350,000	9
	Campbell	830' North of Laughlin Street to Laughlin Street, 0.25 miles north of Brookneal (0.2 miles)	\$340,000	3
	Halifax	Davis Lane to Charles Lane, 1.5 miles north of Halifax (1.5 miles)	\$2,300,000	4
	Halifax	Carters Lane to Rte. 615, 1 mile north of Halifax (0.3 miles)	\$710,000	4

* Accident history based on 3-year crash data

Action Plan

The ultimate goal of the Route 501 Corridor Study was to *identify four or five projects which could be advanced through design and construction, as well as several additional projects which could be advanced through design to Right-of-Way stage*. These projects would utilize the available \$11 million to address specific safety and operation concerns along the Route 501 Corridor, from Rustburg to Halifax.

The following implementation table provides a suggested approach to assist VDOT with moving forward with allocating the available funding towards design and ultimately construction of several of the priority improvements. The suggested implementation plan focuses on the design and construction of as many spot improvements as possible, while completing design and right-of-way for two passing lane projects.

<u>Priority</u>	<u>Project Description</u>	<u>Location</u>	<u>Cost</u>
1	Intersection with Route 24	Rustburg	\$0.20 Million
2	Intersection with Route 642	McKendree	\$1.10 Million
3	Intersection with Route 652/761	Gladys	\$1.02 Million
4	Intersection with Route 40/632	South of Brookneal	\$0.87 Million
5	Intersection with Route 633	North of Brookneal (Foster Fuels)	\$1.98 Million
6	Shoulder Widening, Mollies Creek Road to Route 910	South of Gladys	\$1.35 Million
7	Shoulder Widening, Rocky Road to Route 607	South of Rustburg	\$1.18 Million
8	Intersection with Route 360	Halifax	\$0.50 Million
9	Design & ROW of Passing Lane from Route 970 to 1.6 miles north of Route 970	South of Gladys	\$0.72 Million
10	Design & ROW of Passing Lane from Route 610 to Route 643	North of Halifax	\$1.36 Million
Total:			\$10.28 Million

As with any action plan, the overall program should be constantly monitored and priorities should be flexible to take advantage of other potential funding sources or other unique circumstances to an improvement into an existing planned or programmed project.

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APPENDIX A –
12/15/2011 CIM Summary

Public Comment Summary 12/15/2011 Citizen Information Meeting

A Citizen Information Meeting (CIM) was held on Thursday, December 15, 2011 for the proposed safety improvement along Route 501 in Campbell and Halifax Counties. The focus of the CIM was to introduce the public to the project and gather input pertaining to the development of improvements along the corridor. Input from the public was gathered through the distribution and completion of Comment Sheets. Residents and property owners located along the project corridor received the Comment Sheet through a direct mailing. Copies of the Comment Sheet were also available at the CIM.

The comments received included specific concerns related to both safety and operations. With regards to operations, a majority of the comments were focused on specific intersections and the need for turning (left and/or right) lanes. Several of the respondents also expressed the need for an occasional third lane to provide an opportunity for passing slower vehicles. Finally a few also expressed a desire to make the corridor 4 lanes. Specific to addressing safety concerns, several locations were identified in which poor sight conditions exist. Also, the need for wider shoulders along the corridor, as well as guardrail at two locations, was mentioned as a way to improve safety.

The Comment Sheet consisted of 6 Questions. The following provides list of all responses received for each of the six questions. In addition, six additional responses were provided in the form of either a letter or phone call. These comments are also provided below.

1. What improvements do you feel are needed to improve traffic flow and safety along Route 501 and at intersecting connections?
 - **Any improvement you can do would be a help.**
 - **Study 17-18 does need improvement. It's a bottleneck area. The residents have limited view to enter 501 from their driveways. It's uphill and this area is very curvy. Very limited view for stopping school busses. Unsafe.**
 - **Passing and turning lanes.**
 - **More aggressive enforcement of speed limits and "following too close" guidelines.**
 - **Straighten the curve at 501 and 650 near Georgia Pacific, the only curve from Gladys to Naruna.**
 - **Turning lanes along Lugardi/501 or center turning lanes.**
 - **Prefer 4 lanes.**
 - **Improve conditions to all or more passing zones. Add center turn lanes at intersection of Route 501/636 Halifax. Add turn lanes at both intersection Routes 645 and 501 Halifax.**
 - **More passing zones and turning lanes.**
 - **Turning lanes at 610 north and south, 641, 628, 621, 603, 645, 621, 40, and 628. Passing lanes in straight sections of Route 581.**
 - **Wider Road, passing lanes.**
 - **Occasional third lane for passing slower vehicles, turn off lanes for major road intersections, guard railing where no shoulders present and 10'+ drop offs.**

- **Volens Area – 501 North to turn left onto highway 603, it is hard at night to see when you make the turn if a car is sitting at the stop sign with the lights on (if the part of the highway could be elevated a little).**
 - **Route 607 and 501 – Hill and curve creates blind spot. 654 and 501 – Hill creates hazard for vehicles turning on 654 northbound.**
 - **More passing zones, improved visibility with existing passing zones.**
 - **Turning lanes at some busy intersections, passing lanes, and sight distance improvements in some areas.**
 - **South of Snyder Jennings, 0.3 miles as you proceed up the hill; that area is nothing but a blind spot. Residents can't see how to pull out of driveways no vertical sight. Bus can't let children off at designed stops.**
2. What particular areas have poor sight conditions or turning movements that are difficult or cause you concern? Please describe and provide any suggestions you might have for addressing your concerns.
- **I have met over 100 vehicles from Route 917 north to Route 24 around 2pm and after noon a lot of times. That is a lot of traffic.**
 - **Childrey Creek South 1 mile is very dangerous. I would suggest more lanes to help the traffic flow. In this economy the kind of traffic pattern has changed. More long distance traffic for workers. A lot of trailers pulling scrap iron to Brookneal Recycle for income. More log trucks.**
 - **The curve at 501 and 650, make it very difficult to pull out of driveway and is dangerous to make a left turn into drive due to curve. The school buses will not pick my children up there.**
 - **Brookneal-Lusardi Drive along/between R.R. tracks at 40/501 down to Radio Road. Dangerous, numerous crashes? Center turn lane? Maybe that would help. Too many crashes involving vehicles making left turns.**
 - **In south Brookneal.**
 - **Improve sight distance Route 615 and 501 Halifax County. Add turn lanes intersection Route 628 and 501 Halifax County and improve vertical alignment south of this intersection.**
 - **Really agree that money should be spent on road work that has already been identified.**
 - **Turning or passing lane at 4178 L.P. Bailey highway Halifax. Traffic does not acknowledge vehicle turning into residence. Death of Tyler Hunt.**
 - **L.P. Bailey Hwy., down below 2065 where the Halifax General Store is; if you are at the green boxes you cannot see traffic coming out of Halifax because of a small knoll.**
 - **Right turnoff lane would be helpful southbound (in Halifax County) onto Meadville Road. The store at this intersection is very busy and this turn requires a very slow turn onto Meadville Road.**
 - **610 Murphy Grove Road – 501 – 610 Wilbourne Road. It's hard to see cars coming up the hill from toward Halifax if you are trying to pull out onto highway 501.**
 - **607 – Winfall Road & 654 Marshall Mill. Route 607 and 501 – Hill and curve creates blind spot. 654 and 501 – Hill creates hazard for vehicles turning on 654 northbound**

- **501 beginning at Gladys, all the way to Rustburg. Numerous hills and curves along this section.**
 - **Poor sight condition and turning movements at Liberty Mini Market – intersection of Liberty Road and Meadville Road with 501. There have been numerous accidents in this area. Poor sight conditions and turning movements at Millstone Grocery – intersection of Chestnut Road and 501. There have also been several accident in this area. Poor sight condition at the Volens Recycling Center (old Volens Elementary School), when pulling out into 501. Poor sight conditions at intersection of stagecoach Road and Clarkton Road with 501 (Route 40).**
 - **The area I have mentioned in item 1 (south of Sydnor Jenning, 0.3 miles). I would suggest cutting the hill down and building up the bottom area right below the school.**
3. Which of the following best describes your interest in this corridor? (a few respondents checked more than one)
- 8 I own or work at a business on or near the corridor
- 12 I own or rent residential property on or near the corridor
- 10 I am a frequent commuter or user of the corridor
- 1 Other (please specify)
- School Administrator, Halifax County Schools
 - Town Manager – representing our citizens
4. What specific locations do you feel need to be improved? Where and what do you recommend (i.e., passing lanes, passing zones, wider shoulders, additional signage, turn lanes, sight distance improvements)?
- **All of the above.**
 - **Wider Shoulders**
 - **501/Lusardi Drive**
 - **In Brookneal area.**
 - **See 1 above (Improve conditions to all or more passing zones. Add center turn lanes at intersection of Route 501/636 Halifax. Add turn lanes at both intersection Routes 645 and 501 Halifax.) Also add right turn lane at intersection Route 501 and VA 360, town of Halifax.**
 - **All**
 - **Wider shoulders form Southern end (Route 360) to Liberty/Meadville Roads about 10 miles – Dangerous if icy.**
 - **Area near my mother’s house, 501 near McKendree Road, there is a passing lane near the auto shop. When I put on my right signal light to turn, cars tends to pass instead of slowing down, there is a small knoll and they are taking a chance because in that short**

- distance it could cause an accident if a car was coming over the knoll in the opposite direction (make it a no passing zone).
- List mailed looks reasonable.
 - Halifax County, intersection of 501, 632 and 40, approaches to 501 from 40 and 632 needs to be offset because this is a very dangerous intersection. Campbell County, guard rail needed on eastern side of road between Rocky Road and Winfall Road at Winfall nursery.
 - More passing lanes are needed to prevent traffic back-ups behind slow moving vehicles which lead to dangerous passing attempts. Turning lanes are needed at the intersection noted above and others. Poor sight condition s needs to be improved by widening shoulders or cutting down trees or embankments at the Volens Recycling Center, intersection of Woodbourne Road with 501, etc. Parking areas at some businesses also causes problems at intersections – Crescent Restaurant, Liberty Mini Market, Millstone Grocery.
 - The area South of Snyder Jennings is the worse spot on the highway.
 - Turn lanes in Brookneal. We need a 3rd center lane.
5. As a result of this meeting, do you have a better understanding of the goals of this project and the schedule and plan process? If not, may a representative contact you?
- Please do what you can.
 - Yes, I will help in any way I can.
 - Yes
 - Yes
 - Yes, I have a better understanding. Yes, a representative may cont me if needed but not required.
 - Yes to first part
 - Yes
 - Yes
 - Yes I do! I wish your timeline could be expedited in some way. Thanks for all you do!
 - I understand
6. How did you hear about the meeting? (a few respondents checked more than one)

5 Newspaper

11 Direct Mail

1 VDOT Roadway Signs

2 Other (please specify)

- Variety of meetings I attend
- I am a member of route 501 Coalition

The following are a list of other comments provided in a different form than the standard Comment Sheet:

- *Phone Conversation with J.T. Davis who is on the Halifax County Transportation Safety Board and will be in attendance at our Feb. 23 501 Coalition meeting.*
 - **He stated that Halifax's top priority would be to improve the intersection of Rte. 501, 40 and 632. That intersection was on our list for you to review for turn lanes, northbound and southbound. He, along with the Head Maintenance person, Kenneth Martin, of the VDOT Halifax Residency, agree that this location should be Halifax County's top priority. They feel the sight distance coming off 632 is poor and stated that an accident occurred this year when a car was hit while crossing 501 coming from 632 to Rte. 40. They have made several suggestions how to improve the intersection as follows: Move stop bar on Rte. 632 six feet closer to Rte. 501, widen the shoulders on the right side of 632 to offset guardrail further from the edge of Rte. 632 pavement, decrease the speed limit on 501, install a flashing light to warn motorist of the intersection, and not allow parking close to rte. 501 at the Crescent Restaurant.**

- *Hand written note from local resident.*
 - **In response to 501 Hwy. (spot improvement project); whatever is safe, I am for it. 501 N. Halifax is a bad turn off. Motorists just pass if you are turning into my house. A question is, if they take my property, do you get paid for it?**

- *Email from R. Lewis Francis, date 12/16/11.*
 - **A turning lane is urgently needed at the intersection of US 501 and 607 (Winfall Road) in Campbell County. The "ahead vision" here is very limited for traffic headed south on 501 such that if a south bound vehicle is making a left turn from 501 to Winfall Road, very often the following vehicle cannot stop in time. If you will check the record for this intersection, you will find a large number of rear-ends. Also, there is almost always skid marks in the road there evidencing near misses. More than once while waiting to turn left, I have aborted my turn and accelerated forward to avoid being rear-ended.**

Also, left turning traffic entering 501 from Winfall Road have a very limited view of oncoming south bound traffic and even when no vehicles could be seen when entering 501, very frequently, I find, after entering 501 and with optimum acceleration, there is a vehicle right on my bumper with an irate drive. (I do realize a turning lane will not solve this vision problem.)

- *Letter from John George, Safety Director for Foster Fuels*
 - **Thank you for conducting the Road Improvement Project Citizen Information Meeting at the Brookneal Elementary School on December 15, 2011. I found the meeting to (be) very informative and educational. Your staff did an exceptional presentation of the information.**

I enjoyed speaking with you and Matthew Conner about Foster Fuels safety concerns on entering route 501 at Foster Fuels. Your concern for the public safety was evident during our conversation. Our concern at Foster Fuels is also public safety. Foster Fuels is a family owned business with many ties to the community, all safety issues are major concerns for us, not only to our community family and friends but to our employees. Therefore I would like to list our safety concerns we discussed to be considered by your committee for 501 improvements.

- Caution signs posted north and south of Foster Fuels on route 501 warning drivers of cargo tanks entering the highway containing flammable materials. Foster Fuels has cargo tanks entering route 501 containing gasoline and propane all during the day starting early in the morning.
- Consider changing the passing zone to a no passing zone from route 633 to Grass Street. This would cover the area directly where our vehicles enter route 501.
- Your proposed changes that were posted at the meeting indicated a left turn lane southbound at route 633 (Phelps Creek Rd). We would support this change.

Thank you for your consideration of our concerns regarding improvements to route 501, I look forward to attending your spring meeting.

- *Phone Conversation with Ruth Pillow, Campbell County.*
 - She would like to see all funding for this project put towards building 4 lanes in Halifax County since we are not able to perform four lane work in Campbell County. Also, as additional funds are made available addition 4 lane work should be performed in Halifax County.
- *Letter from George Nester, County Administrator, Halifax County (a copy of the accident report referenced in the letter is included as an attachment to this report).*
 - This letter is written to submit additional evidence of the need to improve the intersection of Routes 40, 501, and 632 here in Halifax County. In the letter to me from Mr. Kenneth Martin, the traffic engineering report indicated that VDOT "will still look to widen the northbound shoulder just north of Route 632 and reset the guard rail to improve sight distance since there is a deficiency in sight distance. We will request that this work be done under the 501 corridor improvement project currently underway, however there is no guarantees there will be funding for this improvement. The other improvements that were to be pursued under the HSIP program were based on the notion that there is a deficiency at the intersection and that the improvement would reduce crashes. Since our most recent 3 years of crash data show there has only been 1 crash at the intersection, the justification is not there for implementing these related improvements at this time."

I would like to present information regarding a three vehicle report that occurred on January 3, 2012, the same date that the VDOT Communication was received. I

would like for this Virginia State Police Accident Investigation Report be added to the evidence of why this intersection needs to receive the improvement and upgrades identified in the HSIP.

There is one other bit of information that is vital related to this request. The crash data does not reflect the near misses that have taken place and continue to plague this intersection. Both the Virginia State Police and the Halifax County Sheriff's Office have continued to maintain a more active patrol of this area that has certainly help curtail a number of accidents from occurring.

The Study of the 501 Corridor offers the right tool at the right time to do the right thing to help enhance safety at this location. Therefore, the Board of Supervisors respectfully requests that this intersection be included for improvement as part of the 501 Corridor Project.

Transportation safety is everyone's responsibility. It is the belief that these improvements are necessary to protect lives and property that are continually at risk at this location.

Let me thank you in advance for your cooperation and assistance. I know that you will do what is right and I hope this information will be helpful. Let me know if you require additional information or assistance.

- *Email from Carl Espy (Town of Halifax), Dated 12/23/2011.*
 - **It was good seeing you and other VDOT staff at the 12-15-11 Public Informational Meeting in Brookneal.**

I am forwarding to you the material and discussion items I had e-mailed to Rob Cary prior to the meeting specifically addressing the intersection of US 501 & VA Scenic Byway 360 in the Town of Halifax (identified as Item #31 in the Study Alternatives List compiled by VDOT).

Additonal to the attachments listed in the original e-mail below, I have included for your file the following:

- 1) 501 Coalition 01-23-2008 Meeting Minutes**
- 2) Town of Halifax VDOT 06-20-2008 Memo (highlighted)**
- 3) Town of Halifax VDOT 01-14-2009 Memo (highlighted)**
- 4) Town of Halifax SYIP US501/VA360 Improvements 11-09-2010 Resolution**

I appreciate VDOT staff's responsiveness to identifying the 501/360 intersection for current and future VDOT funding projects which can in turn create a significant cost-savings opportunities to build upon needed pedestrian/bicycle facilities, the preservation of scenic and historic sites, the promotion of historic transportation structures, the interconnectivity of neighborhoods, commercial and industrial areas and environmental improvements while effectively addressing safety,

congestion and the preservation of Virginia's transportation network along the 501 corridor.

Thank you for your attention on this matter.

http://projectcenter.jmt.com/sites/10/10-1579-007/ProjectFiles/00-JMT/11_12-15 CIM/501-CIM_Meeting Summary.doc

APPENDIX B –
4/5/2012 CIM Summary

Public Comment Summary 4/5/2012 Citizen Information Meeting

A Citizen Information Meeting (CIM) was held on Thursday, April 5, 2012 for the proposed safety improvement along Route 501 in Campbell and Halifax Counties. The focus of the CIM was to present the draft priority projects associated with potential intersection and passing lane improvements. Residents and property owners located along the project corridor received the Comment Sheet through a direct mailing. Copies of the Comment Sheet were also available at the CIM.

The Comment Sheet consisted of 5 Questions. The following provides list of all responses received for each of the five questions. In addition, six additional responses were provided in the form of either a letter or phone call. These comments are also provided below.

1. Which three of the intersection improvements and passing lane locations identified for further study do you feel are the highest priorities and why?
 - **Blind spot on 501 around Girl Home in Rustburg from 24 to 686. Cull school bus stop spot around Clark Auto Repair Shop. Bad spot in to be look at fast and Girl Home too. 1245 Home bad spot to come out and 404 home address too. Look at the hill at too.**
 - **Gladys intersection at 501 need review as no turn lanes at Flynn Street or at Long Island Road. Traffic backs up am and pm.**
 - **Rt 24 & 501 intersection in Rustburg, Rt 633 & 501 Intersection, Rt 607 & 501 Intersection, 635 to 607 Passing Lane, 972 to 605, 970.**
 - **Improve sight distance, widen shoulders. Need improvement on blind spot on 501 south just outside of Rustburg. From your charts 5 accidents have happen on that area. Too many up and down hills. Nothing on charts to help this area.**
 - **Improve sight distance. On the 501 corridor charts the area has the most accidents show in improvements like widen shoulders, because it has the most serious accidents.**
 - **Intersection #24 & #22 has limited visibility and high traffic at times.**
 - **Hwy 642 intersection (Liberty Mini Market), Hwy 628 intersection (Millstone Grocery), Hwy 40 intersection in Halifax County (Crescent Restaurant).**

2. Do you feel that the intersection routes VDOT and their consultants have identified to analyze in further detail are warranted based on information you received from the Citizens Information Meeting? If not, what intersections would you recommend for improvement? Give the reasons(s) for your choice.
 - **Int. 501 & 910 in Campbell County**
 - **Yes**
 - **Yes**
 - **Please more research on these matters on blind spot and hills from the outside of Rustburg Clark Repair Shop.**

- **Nothing mentioned on the charts of happening or what type of accidents, school bus accident on 501 south of Rustburg.**
 - **Yes, I think that the areas identified are the correct ones.**
3. Do you feel that the passing lane sections identified by VDOT and their consultants for further analysis are good choices? If not, please provide your concerns and suggestions.
- **Project #21 – I live with my four children and wife, with animals on this section of proposed passing zone. According to your maps, the added lane is primarily located on my property taking up my front yard. The property across the highway is wooded with fields. Why not take up the other property and not my front yard? I would also suggest splitting the extra passing lane to include south and north bound passing.**
 - **No, look at 24 to 686**
 - **Yes**
 - **Yes**
 - **Are researches because this is a serious problem with more traffic has increase over the years coming into south at Rustburg.**
 - **Look at the accidents between 686 and Rustburg the most, and not what type of accidents (solution/changing speed).**
 - **Yes, Rt 501 from Rt 610 to 1035 should be evaluated for a no passing zone if passing lanes are not scheduled for this section of 501. There is high residential density south of Rt 610.**
 - **Yes**
4. Which of the following best describes your interest in this corridor:
- 3 I own or work at a business on or near the corridor
- 5 I own or rent residential property on or near the corridor
- 3 I am a frequent commuter or user of the corridor
- 2 Other (please specify)
- **By Pass? “Solutions” “Wide Shoulders”.**
 - **Problem with sun shining into your eyes leaving Rustburg going South to Gladys.**
5. Do you feel you have a better understanding about the goals of this project and the schedule and plan process? If not, may a representative contact you?
- **Yes**
 - **Yes**
 - **Yes**
 - **Yes, more traffic.**

- **Widen shoulder, heavy traffic.**
- **Yes**
- **Yes**

The following are a list of other comments provided in a different form than the standard Comment Sheet:

- *Phone Conversation between Renard Yeatts (VDOT) and Ms. Valdelin Marshall:*
 - **Said she was representing herself and the Seymour Jennings Elem. School. Her concern was the blind spot on Rte. 501 approximately ¼ mile south of the school. I informed her that this area was originally on our list in the beginning but did not make the priority list of projects we went to the CIM with. She wanted to know why that area did not make our list we had at the CIM. I told her that this did not mean the area would not be considered in the future. I asked for reasons why the area did not make the list from JMT and have cut and pasted JMT's response below. I stated to her that one of the biggest reasons why it did not make the list was the accident history. She wanted to ensure it was brought to our Traffic section's attention. I provided her with Matt Conner's and Gerry Harter's telephone number.**
- *Phone Conversation between Renard Yeatts (VDOT) and Wayne and Carolyn Smith:*
 - **They voiced their concern with the intersection of Rte. 607, Windfall Road, and Rte. 501. They stated that the site distance on 501 is very poor and they had close calls with being rear ended there many times when traveling south and turning left into Rte. 607. This is a intersection which made our tentative final list.**
- *Phone Conversation between Renard Yeatts (VDOT) and Bernice Williams:*
 - **Her concern was associated with dangers she has experience while traveling north from Halifax and making a left turn into her driveway which is located 5 miles north of the intersection of Rte. 501. She has been involved in an accident where was turning left into her driveway and a vehicle was passing her and others behind her on the left and hit her in the side. She stated that there were 5 driveways in a row at that area. It sounded as if this may be a location where a left turn lane could help the situation greatly.**
- *Phone Conversation between Renard Yeatts (VDOT) and Bernice Williams:*
 - **What happens when and if VDOT needs to appropriate a portion of her property acquisition? She has a letter that says she should contact you with questions. If you would give her a call back it would be greatly appreciated**
- *Hand written note from Mr. Luther Fisher:*
 - **It is my understanding this project is to help speed the traffic flow from Rustburg to Halifax. I hope you can see fit to use all the money available before you cross the river at Halifax. The town has already imposed a burden on people from the**

bridge to 360 with a 35 mph zone. I read in the paper the highway dept. thought 45 was low enough but they won't cooperate with the public. The town manager is attending these meetings getting information spending at the boat dock at the river will not help us.

- *Email from Carl Espy, IV, date 4/16/12:*
 - **Just wanted to confirm your receipt of the printed information I provided you at the meeting along with the material copied on CD I handed you regarding improvements at the intersection of US Hwy 501 and VA Scenic Byway 350 in the Town of Halifax. This includes the surveillance video from the Jiffy Store of the logging truck crash which occurred on 2/15/2008 (still attached). Thank you again for your attention on this matter.**

- *Email from Pamela Blanks, date 4/11/12:*
 - **I live at 4129 LP Bailey Hwy. Halifax. I am not opposed to improvement to 501; however, I am opposed to 501 being in my front yard, or "on my front step". I would not like to have any of my land taken for the road improvement. I have two small children; one with special needs. Yes, I was aware of the road being busy when we moved here in 2005 and yes I was aware that there was "talk" of widening the road: however, we decided we did like the location and purchased the house because "it was not right on the road"! As of right now, the house and yard are far enough off the road for children to play; however, if any of the land is taken, the house would be "right on the road". Thank you for allowing me to express my concern.**

- *Letter from Catherine C. Clark, Residence*
 - **I definitely approve of the road improvement project, to increase safety and traffic flow; will make our highway safer for everyone and cut down on accidents on our highway.**

- *Letter from Marie Mosby*
 - **This correspondence is in reference to the spot road improvements planned for the approximately 42-mile section of Route 501 from routes 24 and 501 in Rustburg, Campbell County to the town of Halifax.**
As a home owner and business owner in the Brookneal area, I submit the following items for consideration and timely responses:
 1. **There was a highway improvement sign placed in front of the River Ridge Apartments which are physically located on Rte. 501 in Brookneal. Will the road improvements specifically affect that property? If so, in what way?**
 2. **Is June 2014 still the expected time frame that the road improvements will actually commence?**
 3. **How far ahead of time from the actual road work, will the Department of Transportation contact home/business owners specifically regarding their property?**

- 4. When can business owners have individual conversations with your office concerning the immediate financial impact of this announcement/road improvement on our business?**
- 5. When will you have available for us to see the proposed new route that the highway will take once finished?**

Again, the items above are the questions/concerns I have as a business and home owner along the impacted route.

Thank you in advance for a prompt response to tis correspondence

http://projectcenter.jmt.com/sites/10/10-1579-007/ProjectFiles/00-JMT/11_12-15 CIM/501-CIM_Meeting Summary.doc

APPENDIX C –

Climbing Lane Length Analysis

Climbing Lanes on Upgrades

Issue:

“Attached is the scope of work for the Rte. 501 Corridor Study. One of the improvements we are evaluating is the use of a three lane section to provide a passing lane for a small segment. What we are seeking to find out is if there is a minimum length allowable for such a passing lane segment.”

A review of the Highway Capacity Manual 2010 (HCM2010) was completed to address the issue. Research was also completed using a limited internet search in order to obtain additional information.

HCM2010 stipulates that “all road segments in mountainous terrain, and all grades of 3% or more that cover a length of 0.6 mi or more must be analyzed as specific grades”. In addition, “a grade of 3% or more may be analyzed as a specific grade if it is 0.25 mi. or longer.

The input data in computing capacity for a two-2 lane road, under uninterrupted conditions includes among other items “percent no-passing zone”, “length of passing zone”, and “heavy vehicle percentage” but does not include the length of the grade. When including passing lanes or climbing lanes, the calculations include the “length of the passing lane”. Grade adjustment factors and passenger car equivalent for truck are included in the calculations, however; the length of grade is not.

Based on the information provided, climbing lane criteria was reviewed. Climbing lanes are typically used on steeper than normal grades where there are trucks or other heavy vehicles that impede traffic flow, possibly creating capacity and/or safety concerns.

Climbing lanes for two lane roads are discussed in detail on beginning on page 15-33 of the HCM2010.

“A climbing lane is, in effect, a passing lane added on an upgrade to allow traffic to pass heavy vehicles whose speeds are reduced. Generally, a lane is added to the right, and all slow-moving vehicles should move to this lane, allowing faster vehicles to pass in the normal lane.

The American Association of State Highway and Transportation Officials (AASHTO) indicates that climbing lanes on two-lane highways are warranted when:

- The directional flow rate on the upgrade exceeds 200 vehicles/hour.

- The directional flow rate for trucks on the upgrade exceeds 20 vehicles per hour; and
- Any of the following conditions apply:
 - A speed reduction of 10 mi/hr or more exists for a typical truck
 - LOS E or F exists on the upgrade without a climbing lane; or
 - Without a climbing lane, the LOS is two or more levels lower on the upgrade than on the approach segment to the grade.”

Based on the above, it is evident that the actual warrants come from A Policy on Geometric Design of Highways and Streets, (PGDHS) from AASHTO. I do not have a current edition of PGDHS. My edition is an older, 1984 edition.

The 1984 PGDHS discusses climbing lanes and refers to the “critical length of grade” as the maximum length of a designated upgrade on which a loaded truck can operate without an unreasonable speed reduction. The critical length of grade can be considered the length of grade that a speed reduction of 10 mi/h or more exists for a typical truck and is identified as such in the 1984 PGDHS. A discussion also exists within the PGDHS regarding how accident rates increase significantly when the truck speed reduction exceeds the 10 mph reduction (i.e. speed differential between trucks and other vehicles).

The critical length of grade is a function of a number of factors:

- Gradient of the road
- Approach speed of the truck
- Weight to power ratio of the truck

Figure III-30 in the 1984 PGDHS provides information concerning the critical grade lengths of design, assuming a typical heavy truck of 300 lb/hp and an entering speed of 55 mph. A copy of this figure is attached.

Based on this Figure, very steep grades can have a critical length of grade of as little as 400 feet (road grade = 9% or more, 55 mph entering speed and truck = 300 lb/hp).

A limited search of the web revealed that a paper exists that discusses truck weight to power ratio. This abstract indicates that differing weight to power ratios for the “typical truck” may be a consideration. The abstract implies that the appropriate truck weight to power ratio may be different than that indicated in the 1984 PGDHS. A copy of this 2004 abstract is attached.

Based on the above, consideration should be given to reviewing the latest edition of the PGDHS for the most current data. The South Dakota Road design document below advises that there is useful information in a more current addition of the PGDHS.

The characteristics/features of a climbing lane include the following:

- Beginning of full width of climbing lane
- End of full width of climbing lane
- Entering Taper
- Exiting Taper

The design criteria for each of these characteristics is not included in HCM2010 and appears to vary by state. Information concerning the criteria used for climbing lanes for these design features is included in the documents listed below for:

- | | |
|--------------------------|-------------|
| • Maine | Page 4-23 |
| • 1270.04 Climbing Lanes | Page 1270-7 |
| • Tennessee | Page 9 |
| • Nebraska | Page 3-38 |
| • South Dakota | Page 6-22 |

The tapers in that are used in Virginia for “lane adds” and “lane drops” would be similar to the entering taper and exiting taper on a climbing lane.

In general, the the minimum location for the beginning of the full width climbing lane is where the truck speed is 10 mph below the posted/design speed. The minimum end of the full width climbing lane is where the truck is 10 mph below the posted speed and is maintaining the speed or accelerating. Consideration must also be given to sight distance and safe merge maneuvers.

Based on the above data, there does not seem to be an absolute minimum full climbing lane length. However, the effectiveness of a climbing lane is a function, at least in part, to the length of the lane. If the lane is extremely short, then few vehicles would have the ability to pass a slow moving vehicle. This should be borne out in the capacity calculations.

Based on my limited web search, several states utilize a minimum full lane length of 1000 feet. The critical length of grade is unique to the conditions, characteristics and operating conditions of a specific road segment. Correspondingly, the length of grade and level of service (existing with and without the lane) also influences this decision. It

would appear that if a climbing lane is warranted, the decision to construct would be an engineering judgment decision considering the cost, impacts, and benefit in safety and level of service.

Several additional documents were found on the web that are of interest. A copy of these are attached for your reference.

Tennessee DOT – Instructional Bulletin 11-13, (August 26, 2011)

This document utilizes similar warrants/criteria that are identified in HCM2010 for climbing lanes. They do add an additional warrant relating to construction costs and construction impacts as a consideration. A Figure is provided (The Figure is from a recent edition of PGDHS) determining the critical length of grade using the following variables:

Design Vehicle: 200 lb/hp truck
Approach speed: 70 mph

The Figure indicates that a 10 mph speed reduction will occur on steep grades (9% or more) in as little as 500 feet.

These guidelines do identify a “minimum full width lane” of **1000 feet** is *desirable* on interstates but does not address other roads.

Arizona – “2003 Climbing Lane Prioritization Update Final Report”, (May 14, 2004)

This is a Report prepared by Lima & Associates for Arizona DOT to preliminary identify candidate locations for climbing lanes.

The warrants/criteria used for this study are the same as those identified in the HCM2010.

The “universe of candidate locations” was identified by selecting road segments having a grade over 2.5% and a length of at least **500 feet**.

The study references the 2000 HCM indicating that “a segment with a grade of 2.5 % can cause a truck to lose 10 mpg speed over a longer grade length and, similarly, a segment with a grade length of 500 feet can cause a typical truck to lose 10 mph over a

steeper grade.” It is indicated that a large number of candidate locations met the criteria and most of them were adjacent sections. Adjacent sections were combined to provide longer road segment candidate.

South Dakota Road Design Document, (Undated)

This document uses the same warrants/criteria that are identified in the HCM2010 And it also references exhibits for identifying heavy truck and RV speed reductions in a more current edition of PGDHS.

This document advises that “climbing lanes should be a **minimum of 0.5 miles** long excluding tapers to be effective”.

Washington State DOT – 1270.04 Climbing lanes, (December 2009)

The warrants/criteria used here for climbing lanes are similar, but not the same as HCM2010.

The document recommends a minimum climbing lane length of **1000 feet**.

232.1 Climbing Lanes, from Engineering Policy Guide, (November 24, 2010)

This document uses the same warrants/criteria as the HCM2010 and also references the PGDHS for additional information.

New Jersey DOT Climbing Lane Document, (undated)

This document although undated, uses the same warrants/criteria as the HCM2010 and references the 2001 PGDHS.

Maine Highway Design Guide –Chapter 4, (December, 2004)

Climbing lane warrants here rely on capacity and LOS and refer to the Capacity Manual and PGDHS. Consideration is also given to costs and impacts of the improvement.

A minimum full width climbing lane length is identified as **1000 feet**.

Nebraska Roadway Design Manual, (July, 2006)

Climbing lane information begins on page 3-38. This document refers to PGDHS and recommends a minimum full climbing lane length of **1000 feet**.

Conclusion

Climbing lanes are warranted based on the criteria identified in the HCM2010.

Based on the above data, there does not seem to be an absolute minimum full climbing lane length. The effectiveness of a climbing lane is a function, at least in part, to the length of the lane. If the lane is extremely short, then few vehicles would have the ability to pass a slow moving vehicle. This should be borne out in the capacity calculations since an input to the calculation is the “length of the passing lane”.

The critical length of grade is unique to the conditions, characteristics and operating conditions of a specific road segment. Correspondingly, the length of grade and level of service (existing with and without the lane) also influences this decision.

Based on the 1984 PGDHS, a critical length of grade of as little as 400 feet can exist as noted above. Such a length could permit a climbing lane that is effective on a relatively short upgrade.

There is no standardization among states as to minimum full width climbing lane length, based on the limited search of documents that was conducted on the web. This seems logical given the unique characteristics within states and the specific road segments. However, several states utilize a minimum full lane length of 1000 feet.

It would appear that if a climbing lane is warranted, the decision to construct would be an engineering judgment decision considering the cost, impacts, and benefit in safety and level of service.

The 1984 PGDHS and other documents (**232.1 Climbing Lanes**, above) indicate safety issues occur when the speed differentials between heavy vehicles and other vehicles exceed 10 mph. This is quantified in the HCM2010 warrants to the extent that one of the warrants addresses speed differential and should be a consideration in determining a means to move slow moving vehicles out of the way to permit faster vehicles to pass safely.

Route 501 - Climbing lanes

Without knowing the details of the road segment in question it should be indicated that a “turnout” might be an alternative as well as a climbing lane. Turnouts are typically shorter than climbing lanes and allow slow moving vehicles to pull out of the through lane so that vehicles following may pass.

Consideration should be given to reviewing the latest edition of the PGDHS for the most current data particularly as it relates to the following:

- Design of the typical heavy truck

- Updated Exhibits/Figures providing critical length of grades

- Application of criteria that is unique to the segment under consideration on Route 501

APPENDIX D – *Benefit-Cost Analysis*

Draft

Route 501 Corridor Improvements

Project: 0501-118-218

UPC: 100556

Prepared for

JMT, Inc

June 20, 2012

Prepared by

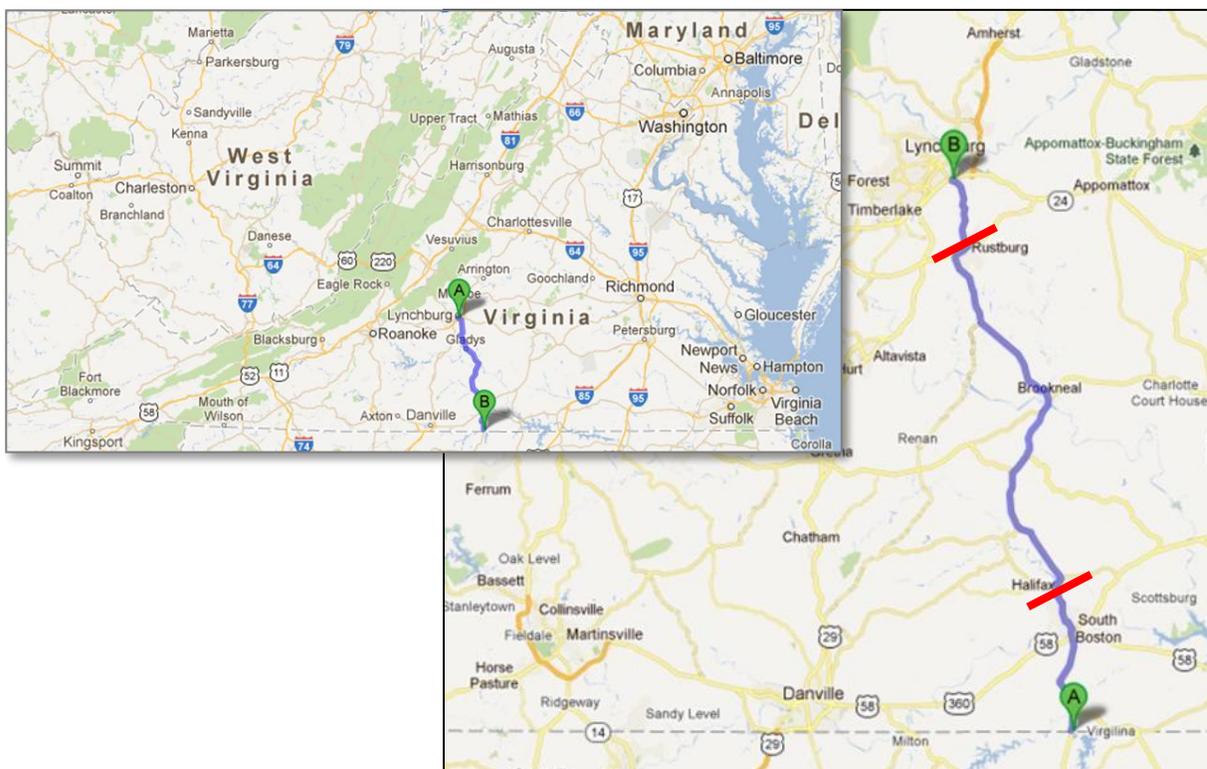
CH2MHILL

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1 Introduction and Background

US Route 501 is a primary north-south regional arterial in the Lynchburg District that runs through Campbell and Halifax counties. Route 501 is a two-lane rural road with divided and undivided roadway sections. Urbanized areas along the corridor have multilane sections to account for parking and signalized intersections. The analysis limits are bounded by the Virginia state line (milepost [MP] 0.0) on the south, and the city of Lynchburg (MP 68.42) on the north. Speed limits in urbanized areas vary from 25 mph to 45 mph and outside of urban areas the speed is 55 mph. The current study has a specific focus on the segment of Route 501 between Rustburg and Halifax.



The study is focused on developing an implementation strategy plan and report, using information from a recently developed Roadway Safety Audit (RSA), previous studies, input from various Virginia Department of Transportation (VDOT) departments, coordination with the Route 501 Coalition, and a field visit. The findings of this report will be used to validate the various improvements, as well as to identify additional potential improvements.

This report contains a summary of each of the recommended improvements, additional observations found during the document review and field visit, and a recommended project prioritization ranking based on a benefit-cost analysis.

2 Data Analysis

2.1 Review of Available Information and Reports

The consultant conducted a cursory review of the US Route 501 RSA report and data furnished by JMT. This review was performed to understand the corridor’s safety, operational, and physical characteristics before the field trip. Additionally, the various improvement recommendations included in the RSA report and in the table with proposed treatments from various stakeholders were reviewed and located on a map in preparation for the field trip.

In the RSA report, the entire corridor has been broken down into five segments. This report uses the same breakdown for analysis and reference purposes. Table 1 depicts the milepost limits of each segment.

Table 1 Corridor Segments Mileposts

Segment Number	From (MP)	To (MP)
1	0.00	10.74
2	10.74	17.80
3	17.80	38.25
4	38.25	60.51
5	60.51	68.42

*Focus Area

Table 2 shows all the intersections with recommended safety improvements, along with milepost information. As shown below, there are two sets of intersection locations where improvements are recommended; the left column are intersection locations included in the RSA report, and the right column are locations included in the stakeholders’ recommendations.

References included in Table 2 will be used in the discussions throughout the remainder of this report.

Table 2 Corridor Intersections Mileposts

Intersections Included in the Route 501 RSA			Intersections Included in the Stakeholders' Recommendations		
Intersection Number	Intersecting Road	Milepost	Intersection Number	Intersecting Road	Milepost
1	Rte 711	10.90	14	US 58	10.74
2	Rte 658	6.30	15	Rte 610	20.74
3	SR 129	14.62	16	Rte 645	33.35
4	Rte 654	15.13	17	Rte 633	42.99
5	SR 360	17.80	18	Rte 933	41.63
6	Rte 642	24.93	19	Rte 917	38.04
7	SR 40	38.25	20	Mitchell's Stretch & Childrey Creek	
8	Rte 605	45.11	21	Rte 628	26.79
9	Rte 652 / Rte 761	49.22	22	Sydnor Jennings Elem. School	30.22
10	Rte 607	55.30	23	Rte 655	56.82
11	SR 24	59.59	24	Rte 643	23.25
12	SR 24 (East)	60.51	-	-	-
13	Rte 670	64.66	-	-	-

*Focus area

Table 3 contains the recommendations included in the RSA, along with the recommended implementation timeframe. Most of the improvements are related to sight distance issues, traffic signing, and guardrail installation.

Table 3 Route 501 RSA Recommended Improvements

Index	Time-span	Major Safety Concern	Project	Location	Crossing Road
1	Short Term	Increase driver awareness	Install warning signs ("Frequent Driveways", "Next X Miles", "Be Prepared to Stop") and reflective poles at driveways	Segments 2, 3, and 4	
2	Short Term	Restrict truck traffic	Consider restricting truck traffic through South Boston US 501 downtown area	Segment 2	
3	Short Term	Replace directional signs	Replace numerous directional signs on US 501 northbound at intersection with US 58	Intersection 14	US 58
4	Short Term	Protect median crossover	Install guardrail or cable on open median	Segment 1 and 5	
5	Short Term	Horizontal curve visualization	Update chevron signs to new MUTCD 2009 standards	Horizontal curves	
6	Short Term	Increase driver awareness	Install advance warning signs "Intersection Ahead" with road name plates	Multiple Intersections along the corridor	Rte 658, Rte 642, SR 40, Rte 605
			Add flashing beacons or LED lights		
			Install single yellow overhead signals on intersection facing both directions of US 501		
			Install real-time supplemental warning systems [to be studied in the Enterprise-pooled fund study (www.enterprise.prog.org) that is working towards developing MUTCD standards.]		

		<i>Sight distance</i>	<p>Replace or install new stop bars and "Stop Ahead" markings, Provide large and/or new sheeting stop signs (potentially double) and reflective tape on posts</p> <p>Relocate signs along US 501 restricting sight from side road vehicle stop position</p> <p>Install dynamic intersection warning systems [to be evaluated by MNDOT and WIDOT through the Cooperative Intersection Collision Avoidance System ITS initiative.]</p>		
7	<i>Short Term</i>	<i>Yield maneuver</i>	Replace "Yield" sign with "Stop" sign and add a stop bar	Intersection 3	SR 129
8	<i>Short Term</i>	<i>Increase driver awareness</i>	Install advance warning signs "Intersection Ahead" with name plate and potentially adding flashing beacons of LED lights	Intersection 10	RT 607
9	<i>Short Term</i>	<i>Sight distance</i>	<p>Replace US 501 southbound (SB) right turn "Yield" sign with "Stop" sign</p> <p>Consider removing SB right turn island, resurface, and provide markings to realign right-turn angle closer to 90 degrees</p> <p>Provide double flashing yellow, or consider operations to provide a protected northbound (NB) left-turn phase</p> <p>Replace "Left turn yield on green" sign by "Left on green arrow only"</p>	Intersection 11	SR 24
10	<i>Intermediate</i>	<i>Roadside hazards (Trees, utility poles, long, steep side slopes)</i>	Update existing guardrails design and length	Segments 1, 3, 4 and 5	
11	<i>Intermediate</i>	<i>Yield maneuver</i>	<p>Further design consideration is recommended.</p> <p>Remove SB right-turn island, resurface, and provide markings to realign right-turn angle closer to 90 degrees</p>	Intersection 3	SR 129
12	<i>Intermediate</i>	<i>Sight distance</i>	<p>Construct roundabout</p> <p>Design a double NB left-turn lane with protected only phases</p> <p>Realign the SB right turn into the signal control with an approach closer to 90 degrees</p> <p>Provide pedestrian crosswalks and signal phases</p>	Intersection 11	SR 24
13	<i>Long Term</i>	<i>Improve roadway features</i>	Add left-turn lanes	Intersection 6	Rte 642
14	<i>Long Term</i>	<i>Improve roadway features</i>	<p>Widen paved shoulders to a minimum of 6 feet</p> <p>Add two-way center left-turn lanes in sections with high presence of driveways</p> <p>Add passing lanes</p> <p>Construct service road parallel to the main roadway to provide driveway access</p>	Segments 3, 4 and 5	

*Focus area

Additionally, a second reference containing a number of safety improvements from other stakeholders (see Table 4, which includes input from the 501 Coalition, District Location &

Design (L&D), Residency, and among others) was provided. This additional reference only provides a list of segments and intersections with the recommended safety countermeasure, and is not associated with a particular crash dataset.

Table 4 Stakeholders' Recommended Improvements

Index	Time-span	Major Safety Concern	Project	Location	Crossing Road
1	Long Term	Improve roadway features	Add passing zone	Segment 3	
2	Long Term	Sight distance	Trim overhanging trees	Segment 3	
3	Long Term	Sight distance	Extend passing zone	Segment 3	
4	Long Term	Improve roadway features	Add passing zone	Segment 4	
5	Long Term	Improve roadway features	Extend third lane	Segment 4	
6	Long Term	Sight distance	Reduce vertical curves	Segment 4	
7	Long Term	Improve roadway features	Center passing lane	Segment 3	
8	Long Term	Sight distance	Add/enhance right turn lanes	Intersection 22	Sydnor Jennings Elem. School
9	Long Term	Sight distance	Add/enhance left turn lanes	Intersection 22	Sydnor Jennings Elem. School
10	Long Term	Improve roadway features	Install NB left-turn lane	Intersection 19	Rte 917
11	Long Term	Improve roadway features	Enhance SB right turnout lane for safety	Intersection 19	Rte 917
12	Long Term	Improve roadway features	Add NB left-turn lane	Intersection 18	Rte 933
13	Long Term	Improve roadway features	Add SB left-turn lane	Intersection 17	Rte 633
14	Long Term	Improve roadway features	Add NB left-turn lane	Intersection 17	Rte 633
15	Long Term	Improve roadway features	Add left-turn lane	Intersection 16	Rte 645
16	Long Term	Improve roadway features	Replace with overhead signs for increased clarity	Intersection 14	US 58
17	Long Term	Improve roadway features	Add right turn lane & storage lane	Intersection 5	SR 360
18	Long Term	Improve roadway features	Add right turn lane	Intersection 7	SR 40

* Focus area

The document review was performed using the information provided above, along with aerial photography from Google Earth, and screen captures from Google Street View. The review included understanding the site safety performance and associated issues, and making sure each improvement addressed the safety concern. The team reviewed the crash

data to determine if the contributing factors indicated specific features or locations of primary concern. These observations were refined based on the field visit, and are summarized in the next section.

2.2 Field Visit to the Corridor

The CH2M HILL team visited the US Route 501 corridor to verify the recommended improvements listed in both the RSA and the stakeholder-proposed treatments table.

The field visit was conducted on January 12 and 13 from 12:00 pm to 8:00 pm and 8:30 am to 1:30 pm, respectively. Weather conditions were rainy and foggy during the first day, and sunny and cold during the second day, with temperatures ranging from 30 to 40 degrees Fahrenheit during the entire field visit. The CH2M HILL team consisted of one roadway design engineer and one highway safety engineer.

The field visit consisted of a windshield survey of the study area, observing the existing roadway geometry and traffic control devices. The team drove through the corridor twice, stopping at the locations listed in the RSA report (Table 3). On the first day, the trip started at the state line, ending in Lynchburg. The second day, the corridor was driven in the opposite direction. During the field visit, the team assessed roadway conditions for both daylight and dark conditions. During the day, the team drove by all the approaches at the various intersection and segment locations in order to confirm the safety issues reported in the RSA, as well as to understand possible contributing factors. Most of the issues listed in the report were verified, particularly the ones related to sight distance, and increasing driver awareness.

Segments 4 and 5 were reviewed at nighttime, with a focus on visibility and retro-reflectivity of signing and pavement markings. Most of the signs were in good condition, and no major issues were identified during the review. Overall, the road marking and signing is in good condition, and no issues were identified during this review in either segment. Examples are provided in Figure 1.

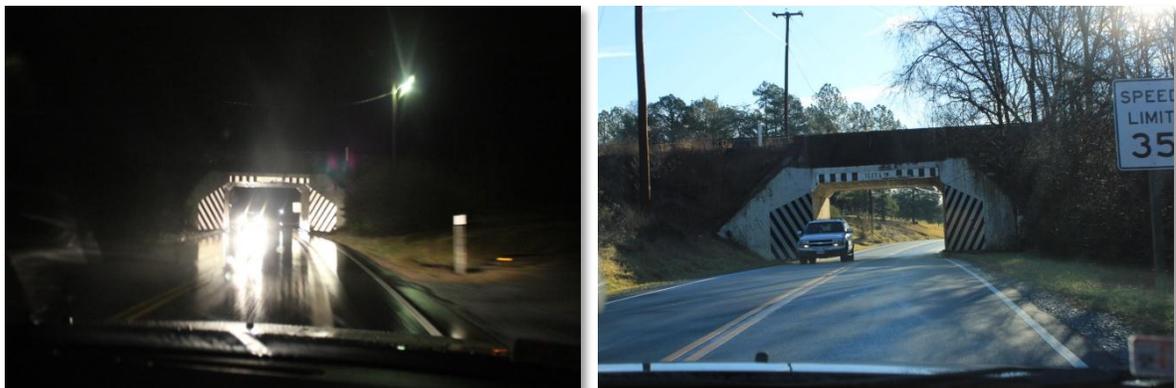


Figure 1: Narrow roadway section under bridge. Good retroreflectivity. Segment 5

Table 5 presents the observations recorded during the field trip, along with some recommendations to the proposed countermeasures.

Table 5 Documentation and Field Visit Observations

Index	Time-span	Major Safety Concern	Project	Location	Crossing Road	Observations / Recommendations	Field Visit Notes
1	Short Term	Increase driver awareness	Install warning signs ("Frequent Driveways", "Next X Miles", "Be Prepared to Stop") and reflective poles at driveways	Segments 2, 3, and 4		The proposed second warning sign "Be Prepared to Stop" to be installed on US 501 may hint that there is a stop sign ahead on the main route at each driveway location. May be useful to add additions to this sign such as " Watch for turning vehicles Be prepared to stop" to clarify the message	
2	Short Term	Restrict truck traffic	Consider restricting truck traffic through South Boston US 501 downtown area	Segment 2		In order to emphasize the use of truck route to restrict US 501 South Boston downtown area, additional signing may be useful to inform drivers of truck route restrictions at US 501 intersection with US 58	
3	Short Term	Sight distance	Relocate signs along US 501 restricting sight from side road vehicle stop position	Intersection 14	US 58		
6	Short Term	Sight distance	Sight Distance	Intersection 2	Rte 658	The vertical alignment (crest vertical curves) of US 51 at the approaches of the intersection on both sides of the roadway and the grade of US 501 NB approach appears to be lower than the grade of the SB approach, and may limit visibility of traffic from the vehicle position at the stop bar on Rte 658. In addition to the short-term recommendations provided in the RSA report, it may help to raise US 501 traffic awareness by adding centerline rumble strips on each side approaching the intersection.	Stopping at the stop bar at the intersection on the US 501 SB side approach, it appears that the crest vertical curve on US 501 on both sides is a major factor for limited visibility and sight distance at the intersection.

Index	Time-span	Major Safety Concern	Project	Location	Crossing Road	Observations / Recommendations	Field Visit Notes
6	Short Term	Sight distance	Sight Distance	Intersection 6	Rte 642	Consider relocating the stop sign at the west approach from the middle of Rte 642 intersection, to the right side of the pavement, and provide stop bar at this location. There is a crest vertical curve on US 501 near the intersection approach that may limit visibility from the vehicle position at the stop bar of the intersecting roadway.	There is a high point (hill) at the back slope of the US 501 roadside ditch causing limited visibility and affecting sight distance to the north for stopped vehicles at the west approach leg. Also, a crest vertical curve on US 501 just south of the intersection which causes limited sight distance for stopped vehicles at the east approach leg.
6	Short Term	Sight distance	Sight Distance	Intersection 7	SR 40	The north leg of US 501 approaching the intersection has a horizontal curve with superelevation, which may cause restrict visibility at the Rte 40 west approach.	
6	Short Term	Sight distance	Sight Distance	Intersection 8	Rte 605	Combination of crest vertical curve with horizontal curve and superelevation on US 501 near the intersection approaches may limit visibility at the stop bar location.	The downhill grade at US 501 south of the intersection, and guardrail alignment along US 501 with the high fill side slope are factors limiting sight distance for vehicles stopping on the west approach leg, looking at traffic approaching from the south.
7	Short Term	Yield maneuver	Replace "Yield" sign with "Stop" sign and add a stop bar	Intersection 3	SR 129	May need to consider adding a "Stop Ahead" sign right before entering the slip ramp, along with replacing the yield sign with a stop sign to make drivers aware of the need to stop as they enter the slip ramp, because the right-turn slip ramp geometry hints allowing this maneuver without stopping. Another option would be a secondary yield sign accompanied by yield pavement markings.	

Index	Time-span	Major Safety Concern	Project	Location	Crossing Road	Observations / Recommendations	Field Visit Notes
8	Short Term	Increase driver awareness	Install advance warning signs "Intersection Ahead" with name plate and potentially adding flashing beacons of LED lights	Intersection 10	RT 607	May need to consider adding a "Watch for stopped or Turning vehicles ahead" sign along with the other proposed short term recommendations. Ensure sign is in compliance with MUTCD.	
9	Short Term	Sight Distance	<p>Replace US 501 SB right turn "yield" sign by "Stop" sign</p> <p>Consider removing SB right-turn island, resurface and provide markings to realign right turn angle closer to 90 degrees</p> <p>Provide double flashing yellow, or consider operations to provide a protected NB left- turn phase</p> <p>Replace "Left turn yield on green" sign by "Left on green arrow only"</p>	Intersection 12	SR 24 East	Along with the proposed recommendations, may need to add warning signs along SR24 westbound (WB) to alert drivers to intersection location on curve, and may be supplemented by cross-stripping to increase rumble for additional awareness.	

*Focus area

Additionally, areas that exhibited safety concerns and were not included in the set of recommendations are documented and included for consideration in the discussion below.

Intersection US 501 and SR 360

The NB approach at this intersection is on a vertical crest, creating a limited visibility issue. To increase driver awareness, it is recommended that warning signs be installed to alert drivers about the upcoming major intersection.



Figure 2: intersections US 501 and SR 360

Intersection US 501 and SR 24

There is a change in speed limit from 55 to 35 mph in a short distance in the northbound direction, north of the intersection. At the north approach leg, the vertical crest approaching the intersection does not allow drivers to see the 35 mph sign. It is recommended that the 35 mph sign be moved to before the crest. Also, consider adding flashing beacons on top of existing “reduced speed ahead” sign.



Figure 3: intersections US 501 and SR 24

Segment 3. MP 17.80 to 38.25

Several segment locations are on school bus routes. During the field review, buses on the road frequently stopped to drop off students. It is recommended that driver awareness of these routes be increased by adding pavement markings or increasing the number of bus route signs.



Figure 4: School Buses along Route 501



Figure 5: School Buses along Route 501

2.3 Project Prioritization Criteria and Evaluation

The ranking of projects presented in the following section is based on the estimate of the benefit-cost ratio for each potential countermeasure. The benefits are defined as the reduction in societal costs due to the project being implemented. The societal cost of crashes by severity level were obtained from the HSM in 2001 dollars and subsequently updated to 2010 dollars, assuming three percent interest (Table 6). For the unknown severity

classification, a weighted average was applied to societal costs based on the ratio of fatal injury, non-fatal injury, and property damage only (PDO) totals. For the entire corridor, an average value based on collision type was \$83,982 per crash.

The reduction in crashes used in the benefit calculation was calculated by way of the countermeasure-specific crash modification factor:

$$3 \text{ yr Crash Reduction} = \text{Existing 3 yr Crash Count} * (1 - \text{CMF})$$

Where,

$$\text{Annual Benefit} = \frac{\sum_{\text{severity}} (3 \text{ yr Crash Reduction} * \text{Societal Cost})_{\text{severity}}}{3 \text{ years}}$$

$$\forall \text{severity} \in \{\text{Fatal, Injury, Property Damage Only}\}$$

Without the breakdown of crashes by year, a simple average was used to annualize the benefits. It was further assumed that the benefits would grow at a rate of 0.5 percent per year. The present worth of the benefits were then computed for a comparison against the present worth of costs associated with the countermeasure.

Table 6
Societal Crash Cost Estimates by Crash Severity

Crash Severity Level	2001\$	2010\$
K ¹ - Fatal Crashes	\$ 4,008,900	\$ 5,230,705
A - Injury Crashes	\$ 216,000	\$ 281,831
B - Injury Crashes	\$ 79,000	\$ 103,077
C - Injury Crashes	\$ 44,900	\$ 58,584
O - Property Damage Only	\$ 7,400	\$ 9,655
All Non-fatal Injuries ²	\$ 82,600	\$ 107,774
Unknown Severity ³	\$ 64,365	\$ 83,982

¹ Table 7-1 of the 2010 HSM

² Table 4-7 of the 2010 HSM

³ Weighted average of the number of crashes by collision type in the VDOT Roadway Safety Assessment report and Table 4-17 of the 2010 HSM

The Crash Modification Factors (CMFs), often linked to a severity level, were obtained from the HSM, FHWA Clearinghouse, and similar studies conducted by CH2M HILL. CMFs with 3-star rating or better were used for this analysis. However, a few countermeasures with less than a 3-star rating were used in the calculations, as follows: (a) Implement truck lane restrictions on 2-lane directional interstate segments (screened), (b) Convert yield control to Stop control, (c) Install flashing beacons as advance warning, (d) Add centerline and stop bar, replace 24 in with 30 in stop signs, and (e) Install dynamic advance intersection warning system. For countermeasures and severity types with unknown CMFs, they were conservatively assumed to have no effect on crashes.

Crash data for years 2006 to 2008 were provided in the RSA report (See Appendix). Of the 466 crashes on the Route 501 corridor, the crashes were separated into intersection and non-intersection crashes and by geographic location (Table 7).

Table 7: Facility type Breakdown for Crash Analysis (VDOT, 2010)

(a) Non-Intersection Locations

Segment	From Milepost	To Milepost	Length (mi)
1	0	10.74	10.74
2	10.74	17.8	7.06
3	17.8	38.25	20.45
4	38.25	60.51	22.26
5	60.51	68.35	7.84

* Focus area

(b) Intersection Locations

Intersection	Intersecting Roadway	Milepost
1	Rte 711	10.9
2	Rte 658	6.3
3	SR 129	14.62
4	Rte 654	15.13
5	SR 360	17.8
6	Rte 642	24.93
7	SR 40	38.25
8	Rte 605	45.11
9	Rte 652 / Rte 761	49.22
10	Rte 607	55.3
11	SR 24	59.59
12	SR 24 (East)	60.51
13	Rte 670	64.66

*Focus area

While certain countermeasures (e.g., guardrails, chevrons) only affect crashes at specific locations along a segment, a ratio of the improvement length to the segment length was applied to the total crashes along the segment. Maps provided in the RSA report showing general crash ranges along the corridor do not provide the level of detail required for a more-precise analysis.

Crash data were further disaggregated at a segment level for roadway departure and general crashes, and an intersection level for intersections associated with a safety recommendation.

For roadway departure crashes, the RSA report broke down the data on a segment-by-segment basis, but further extrapolation was required to break this information down by severity level. For this, it was assumed that the number of fatalities matched the number of fatal crashes (excluding the possibility of multiple fatalities per crash); the number of non-fatal injuries were then calculated by combining the number of persons injured with the

average person per crash for that segment; the remainder of crashes were allocated to the PDO severity level.

The remainder of non-intersection crashes were allocated to the 'general' classification. Segment data were not available, so an extrapolation from the 'All crashes per Mile' maps were applied to distribute these crashes among the various segments. From this analysis, a total number of crashes were assigned to each segment. The general crashes were then computed as the total crashes less the roadway departure and intersection crashes. The breakdown by severity for these general crashes, in lieu of locally derived values, were assumed to be distributed according to the default values used in the HSM for rural two-lane, two-way roads (Tables 10-3 and 10-4 of the HSM).

The intersection crashes were taken from the RSA report collision diagrams, when available.

As a result of these assumptions, the crash totals in Table 8 were obtained.

Table 8: Existing Crash Data by Segment, Crash Category, and Severity Level

(a) Existing Crash Data by Segment and Crash Category

Corridor Location		Number of Crashes by Category			
Segment	Mileposts	Roadway Departure	Intersection	General	Total
1	0.00 - 10.74	17	17	17	51
2	10.74 - 17.80	3	15	81	99
3	17.80 - 38.25	23	15	78	116
4	38.25 - 60.51	35	29	68	132
5	60.51 - 68.35	23	14	31	68
All	0.00 - 68.35	101	90	275	466
*Focus area					

(b) Existing Crash Data by Segment and Severity Level

Corridor Location		Number of Crashes by Severity Level			
Segment	Mileposts	K	A/B/C	O	Total
1	0.00 - 10.74	4	29	18	51
2	10.74 - 17.80	0	34	65	99
3	17.80 - 38.25	4	52	60	116
4	38.25 - 60.51	6	60	66	132
5	60.51 - 68.35	0	42	26	68
All	0.00 - 68.35	14	217	235	466
*Focus area					

The projects costs associated with the list of countermeasures were estimated by analyzing the VDOT 6-year Improvement Program for similar projects and locations, Virginia DOT and Idaho DOT recent bid tabs, FHWA Intersection Safety Case Studies, and a statewide safety planning tool developed for the Illinois DOT Bureau of Safety Engineering. Unit costs from these sources were then applied to the US 501 corridor (typically on a per-mile basis).

These estimates can be further refined with additional detail surrounding the countermeasures (for example, number of signs to be installed, length of left-turn and storage lanes). A sensitivity analysis was conducted for dealing with some unclear cost to provide more confidence on the benefit cost calculation. Typically, it was found that the ratio was not sensitive to small changes in price and quantity.

Non-intersection and intersection projects were then ranked based on the benefit-cost ratio, as presented in the following section.

Stakeholder's recommended improvements

Some of the stakeholder recommendations were not included in the report. Also, recommendations did not have crash data associated with the different segment and intersection locations.

3 Findings and Recommendations

- Overall, most of the selected countermeasures seem reasonable and address the problems at the various locations. The project's cost-effectiveness evaluation determined what countermeasures are most cost effective.
- Recommended countermeasures have been evaluated from a highway safety perspective, and determined its cost effectiveness. However, no traffic operational analysis was found in any of the documents to support some of the improvements. Operational analysis typically provide a better understanding of what results are achieved upon implementation of adding passing lanes or turn lanes. This report provides countermeasure justification based on crash reduction, but not operations.
- As determined by the benefit-cost ratio, the projects in order of prioritization for intersections (Table 9) and non-intersections (Table 10), show 58 cost-effective countermeasures out of 66 proposed projects (separated by segment). The projects with the largest benefit-cost ratios were found to be installing advance warning signs for frequent driveways and installation of overhead warning beacons. The largest overall benefits were determined to be construction of a parallel service road, passing lanes, and a roundabout at the SR 24 (East) intersection.
- Countermeasures with benefit-cost ratios of less than one are not recommended.

Table 9: Prioritization of Non-Intersection Safety Projects

Item	CIP Range	Segment	Project Description	Existing Crashes affected by Severity Level			CMF by Severity Level				Service Life (Yrs)	Benefit	Unit Cost	Unit Type	Quantity	Cost	B/C	Rank
				Fatality	Injury	PDO	Fatal	Injury	PDO	All		2010 (1000\$)				2010 (1000\$)		
13	Short	4	Install driveway warning signs	6	50	49	---	---	---	0.96	10	\$4,328	\$1,800	Sign	10	\$18	240.42	1
6	Short	3	Install driveway warning signs	4	46	54	---	---	---	0.96	10	\$3,068	\$1,800	Sign	16	\$29	106.51	2
7	Short	3	Update chevron signs	1	8	9	0.82	---	---	---	10	\$2,735	\$1,800	Sign	18	\$32	84.41	3
4	Short	2	Sign and enforce truck restrictions	0	28	57	---	---	---	0.95	25	\$1,092	\$1,800	Sign	10	\$18	60.65	4
8	Intermediate	3	Update guardrails	1	8	9	0.9	---	---	---	20	\$2,708	\$25,000	Mile	3.41	\$85	31.76	5
14	Short	4	Update chevron signs	1	10	10	0.82	---	---	---	10	\$2,735	\$1,800	Sign	54	\$97	28.14	6
15	Intermediate	4	Update guardrails	1	9	9	0.9	---	---	---	20	\$2,708	\$25,000	Mile	4.07	\$102	26.61	7
23	Intermediate	5	Update guardrails	0	2	2	---	---	---	0.9	20	\$122	\$25,000	Mile	0.57	\$14	8.53	8
16	Long	4	Widen paved shoulders to ≥ 6 ft.	5	40	40	---	---	---	0.93	15	\$8,877	\$200,000	Mile	17.95	\$1,795	4.95	9
9	Long	3	Widen paved shoulders to ≥ 6 ft.	4	46	54	---	---	---	0.93	15	\$7,596	\$200,000	Mile	20.45	\$2,045	3.71	10
17	Long	4	Construct parallel service road	3	24	23	---	---	---	0.56	15	\$33,460	\$1,647,360	Mile	10.59	\$17,446	1.92	11
10	Long	3	Add TWLTL	3	33	39	---	---	---	0.9	15	\$8,276	\$1,013,760	Mile	14.8	\$4,593	1.8	12
18	Long	4	Add TWLTL	3	24	23	---	---	---	0.91	15	\$6,957	\$1,013,760	Mile	10.57	\$4,593	1.51	13
19	Long	4	Add passing lane	6	50	49	---	---	---	0.75	15	\$38,274	\$55,800,000	Lump Sum	0.47	\$26,084	1.47	14
1	Short	1	Install median barrier	1	9	5	0.71	0.71	---	---	15	\$739	\$125,000	Mile	4.53	\$566	1.31	15
11	Long	3	Construct parallel service road	2	26	30	---	---	---	0.56	15	\$24,512	\$1,647,360	Mile	11.41	\$18,796	1.3	16
12	Long	3	Add passing lane	4	46	54	---	---	---	0.75	15	\$27,130	\$55,800,000	Lump Sum	0.53	\$29,716	0.91	17
24	Long	5	Widen paved shoulders to ≥ 6 ft.	0	8	5	---	---	---	0.93	15	\$262	\$200,000	Mile	1.91	\$382	0.69	18
21	Short	5	Install median barrier	0	17	11	0.71	0.71	---	---	15	\$128	\$125,000	Mile	3.94	\$492	0.26	19
2	Short	1	Update chevron signs	0	1	1	0.82	---	---	---	10	\$ -	\$1,800	Sign	12	\$22	0	20
3	Intermediate	1	Update guardrails	0	0	0	0.9	---	---	---	20	\$ -	\$25,000	Mile	0.06	\$2	0	20
5	Short	2	Update chevron signs	0	0	0	0.82	---	---	---	15	\$ -	\$1,800	Sign	30	\$54	0	20
22	Short	5	Update chevron signs	0	17	11	0.82	---	---	---	10	\$ -	\$1,800	Sign	24	\$43	0	20

*Focus area

Table 10: Prioritization of Intersection Safety Projects

Index	CIP Range	Intersect ion	Project Description	Existing Crashes affected by Severity Level							CMF by Severity Level						Service Life (Yrs)	Benefit 2010 (1000\$)	Unit Cost	Unit Type	Quantity	PW Cost 2010 (1000\$)	B/C	Rank
				Fatal	Injury	PDO	Rear-end Injury	Rear-end PDO	Angle Injury	Angle PDO	Fatal	Injury	PDO	Rear-end	Angle	All								
34	Short	12	Provide new double flashing yellow	0	6	3	4	---	2	1	---	---	---	0.64	0.38	---	20	\$1,526	\$2,000	Flasher	1	\$2	763.09	1
1	Short	2	Install single yellow overhead signals	0	3	2	---	---	3	2	---	---	---	0.64	0.38	---	20	\$1,100	\$2,000	Flasher	1	\$2	549.84	2
2	Short	2	Add flashing beacons or LED lights	0	3	2	---	---	3	2	---	---	---	0.64	0.38	---	20	\$1,100	\$2,000	Flasher	1	\$2	549.84	2
10	Short	6	Install single yellow overhead signals	0	3	3	---	1	3	1	---	---	---	0.64	0.38	---	20	\$1,087	\$2,000	Flasher	1	\$2	543.34	4
11	Short	6	Add flashing beacons or LED lights	0	3	3	---	1	3	1	---	---	---	0.64	0.38	---	20	\$1,087	\$2,000	Flasher	1	\$2	543.34	4
35	Short	12	Replace "Left Turn Yield on Green" sign by "Left on Green Arrow Only"	0	6	3	---	---	---	---	---	---	---	---	0.94	20	\$210	\$600	Sign	1	\$1	349.74	6	
18	Short	7	Relocate signs obstructing on-coming traffic sight	0	4	2	---	---	---	---	---	---	---	---	0.62	10	\$497	\$1,800	Sign	1	\$2	276.2	7	
12	Short	6	Relocate signs obstructing on-coming traffic sight	0	3	3	---	---	---	---	---	---	---	---	0.62	10	\$389	\$1,800	Sign	1	\$2	216.03	8	
3	Short	2	Relocate signs obstructing on-coming traffic sight	0	3	2	---	---	---	---	---	---	---	---	0.62	10	\$378	\$1,800	Sign	1	\$2	210.11	9	
19	Short	7	Install single yellow overhead signals	0	4	2	---	---	1	2	---	---	---	0.64	0.38	---	20	\$408	\$2,000	Flasher	1	\$2	203.94	10
20	Short	7	Add flashing beacons or LED lights	0	4	2	---	---	1	2	---	---	---	0.64	0.38	---	20	\$408	\$2,000	Flasher	1	\$2	203.94	10
25	Short	8	Install single yellow overhead signals	0	1	5	---	---	1	2	---	---	---	0.64	0.38	---	20	\$408	\$2,000	Flasher	1	\$2	203.94	10
26	Short	8	Add flashing beacons or LED lights	0	1	5	---	---	1	2	---	---	---	0.64	0.38	---	20	\$408	\$2,000	Flasher	1	\$2	203.94	10
8	Short	3	Replace Yield sign with Stop sign	0	5	3	---	---	---	---	---	---	---	---	0.71	10	\$478	\$1,600	Leg	2	\$3	149.48	14	
21	Short	7	Replace stop bars, markings, and signs	0	4	2	---	---	---	---	---	---	---	---	0.33	10	\$877	\$1,600	Leg	4	\$6	136.96	15	
32	Short	10	Add flashing beacons or LED lights	0	2	3	1	2	---	---	---	---	0.64	0.38	---	20	\$237	\$2,000	Flasher	1	\$2	118.42	16	
13	Short	6	Replace stop bars, markings, and signs	0	3	3	---	---	---	---	---	---	---	---	0.33	10	\$686	\$1,600	Leg	4	\$6	107.13	17	
4	Short	2	Replace stop bars, markings, and signs	0	3	2	---	---	---	---	---	---	---	---	0.33	10	\$667	\$1,600	Leg	4	\$6	104.19	18	
36	Short	12	Replace Yield sign with Stop sign	0	6	3	---	---	---	---	---	---	---	---	0.71	3	\$186	\$1,800	Sign	1	\$2	103.13	19	
27	Short	8	Relocate signs obstructing on-coming traffic sight	0	1	5	---	---	---	---	---	---	---	---	0.62	10	\$172	\$1,800	Sign	1	\$2	95.69	20	
28	Short	8	Replace stop bars, markings, and signs	0	1	5	---	---	---	---	---	---	---	---	0.33	10	\$304	\$1,600	Leg	4	\$6	47.45	21	
37	Short	12	Resurface and provide markings to realign right turn angle	0	6	3	---	---	---	---	0.44	0.53	0.89	---	---	---	15	\$1,262	\$480,000	Mile	0.1	\$48	26.3	22
38	Intermediate	12	Design double NB left turn lane with protected only phases	0	6	3	---	---	---	---	0.42	0.42	---	---	---	---	15	\$1,542	\$41,400	Lane	2	\$83	18.62	23
22	Short	7	Install dynamic intersection warning system	0	4	2	---	---	---	---	0.38	0.3	0.29	---	---	0.46	10	\$916	\$60,000	VMS	1	\$60	15.27	24
14	Short	6	Install dynamic intersection warning system	0	3	3	---	---	---	---	0.38	0.3	0.29	---	---	0.46	10	\$717	\$60,000	VMS	1	\$60	11.95	25
5	Short	2	Install dynamic intersection warning system	0	3	2	---	---	---	---	0.38	0.3	0.29	---	---	0.46	10	\$697	\$60,000	VMS	1	\$60	11.62	26
23	Short	7	Install real-time supplemental warning system	0	4	2	---	---	---	---	0.56	0.56	---	---	---	---	10	\$551	\$60,000	VMS	1	\$60	9.18	27
39	Short	12	Provide a protected NB left-turn phase	0	6	3	---	---	---	---	---	---	---	---	0.94	20	\$210	\$25,000	Intersection	1	\$25	8.39	28	
6	Short	2	Install real-time supplemental warning system	0	3	2	---	---	---	---	0.56	0.56	---	---	---	---	10	\$413	\$60,000	VMS	1	\$60	6.89	29
15	Short	6	Install real-time supplemental warning system	0	3	3	---	---	---	---	0.56	0.56	---	---	---	---	10	\$413	\$60,000	VMS	1	\$60	6.89	29
16	Long	6	Add left turn lanes	0	3	3	---	---	---	---	0.65	0.65	---	---	---	0.72	15	\$465	\$41,400	Lane	2	\$83	5.62	31
24	Short	7	Install advance intersection warning signs	0	4	2	---	---	---	---	---	---	---	---	0.984	10	\$21	\$4,800	Sign	1	\$5	4.36	32	
29	Short	8	Install dynamic intersection warning system	0	1	5	---	---	---	---	0.38	0.3	0.29	---	---	0.46	10	\$219	\$60,000	VMS	1	\$60	3.65	34
40	Short/Intermediate	12	Remove SB right turn island, resurface, and provide markings to realign angle	0	6	3	---	---	---	---	0.44	0.53	0.89	---	---	---	15	\$1,262	\$370,000	Lump Sum	1	\$370	3.41	35
17	Short	6	Install advance intersection warning signs	0	3	3	---	---	---	---	---	---	---	---	0.984	10	\$16	\$4,800	Sign	1	\$5	3.41	36	
7	Short	2	Install advance intersection warning signs	0	3	2	---	---	---	---	---	---	---	---	0.984	10	\$16	\$4,800	Sign	1	\$5	3.32	37	
41	Intermediate	12	Construct roundabout	0	6	3	---	---	---	---	0.22	0.22	---	---	---	0.52	15	\$2,073	\$725,000	Lump Sum	1	\$725	2.86	38
33	Short	10	Install advance intersection warning signs	0	2	3	---	---	---	---	---	---	---	---	0.984	10	\$11	\$4,800	Sign	1	\$5	2.37	39	
30	Short	8	Install real-time supplemental warning system	0	1	5	---	---	---	---	0.56	0.56	---	---	---	---	10	\$138	\$60,000	VMS	1	\$60	2.3	40
42	Intermediate	12	Provide pedestrian crosswalks and signal phases	0	6	3	---	---	---	---	---	---	---	---	0.63	3	\$237	\$30,000	Leg	4	\$120	1.97	41	
31	Short	8	Install advance intersection warning signs	0	1	5	---	---	---	---	---	---	---	---	0.984	10	\$7	\$4,800	Sign	1	\$5	1.51	42	
9	Intermediate	3	Modify approach angle and signalize right-turns	0	5	3	---	---	---	---	---	---	---	---	0.87	15	\$303	\$395,000	Lump Sum	1	\$395	0.77	43	

Appendix

Table A-1: Number of segment crashes by severity (2006-2008)

Segment	Number of Non-Intersection Crashes (2006-2008) by Severity			
	K	A/B/C	PDO	Total
1	3	21	11	35
2	0	28	57	85
3	4	46	54	104
4	6	50	49	105
5	0	33	21	54
All	13	178	192	383
*Focus area				

Table A-2: Number of intersection crashes by severity (2006 to 2008)

Intersection	Number of Intersection Crashes (2006-2008) by Severity				
	Intersecting Roadway	K	A/B/C	PDO	Total
1	Rte 711	1	0	2	3
2	Rte 658	0	3	2	5
3	SR 129	0	5	3	8
4	Rte 654	0	4	4	8
5	SR 360	0	3	3	6
6	Rte 642	0	3	3	6
7	SR 40	0	4	2	6
8	Rte 605	0	1	5	6
9	Rte 652 / Rte 761	0	4	3	7
10	Rte 607	0	2	3	5
11	SR 24	0	3	6	9
12	SR 24 (East)	0	6	3	9
13	Rte 670	0	3	2	5
*Focus area					

Table A-3: Number of curve-related crashes

Segment	Curve Related Crashes
1	5.88%
2	0.00%
3	17.39%
4	20.00%
5	52.17%

Table A-4: Unknown severity cost calculation

For Unknown Severity Cost Calculation		
Crash Type	Number of Crashes	Cost
		2001\$
Rear End	115	\$ 30,100
Angle	78	\$ 56,100
Head on	10	\$ 375,100
SS	39	\$ 34,000
FO	102	\$ 94,700
Pedestrian	3	\$ 287,900
Other/Undefined	119	\$ 55,100
Total	466	\$ 64,365

Table A-5: Stakeholders recommendations

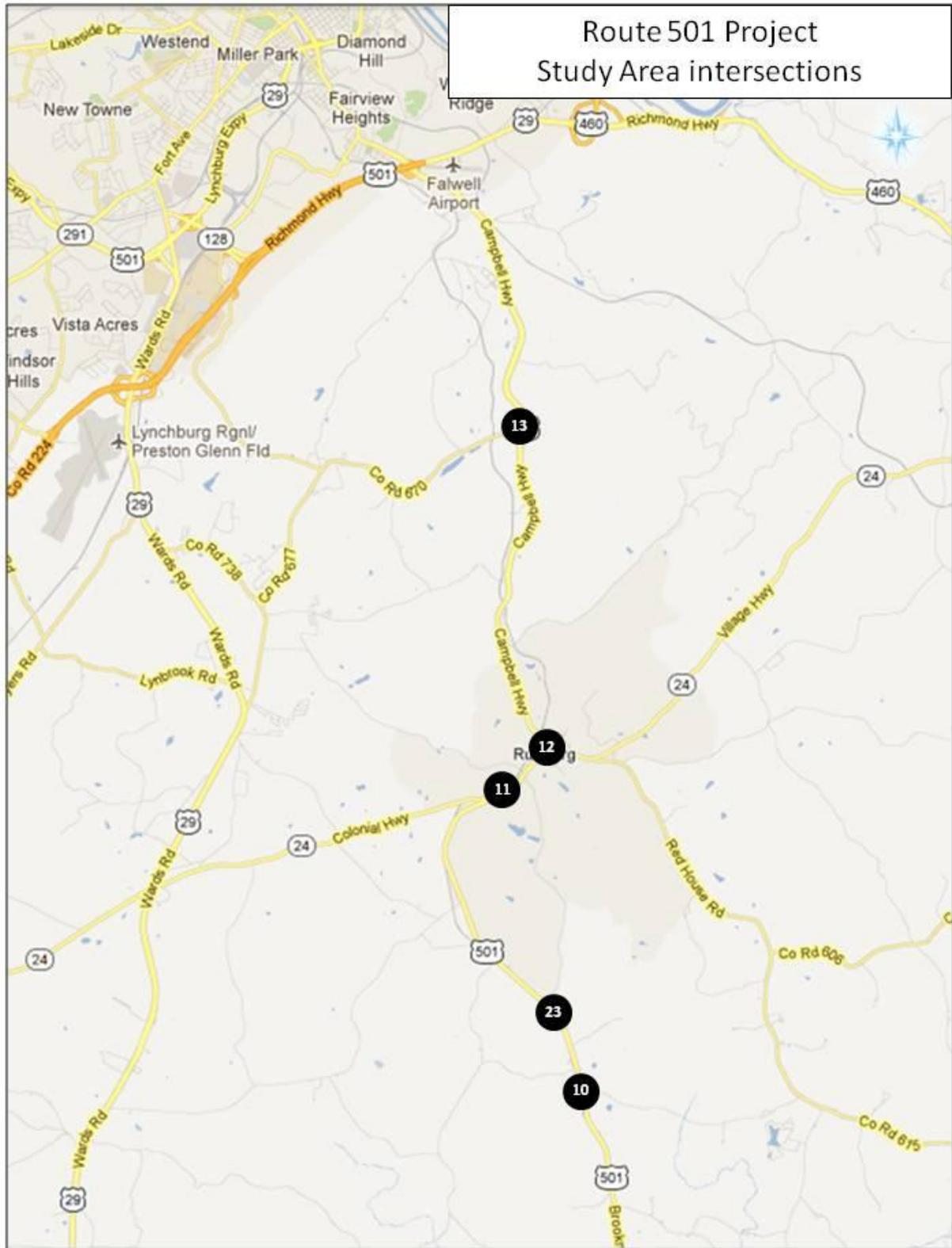
Index	County	Location	Treatment Type	Description	Rec. source
1	Halifax	From Rte 1035 to Rte 610	Add Passing Lane	Approximately 2 mile section for possible passing lane	District L&D, CN, TE
2	Halifax	From Rte 610 to Rte 643	Add Passing Lane	Approximately 2.4 mile section for possible passing lane	District L&D, CN, TE
3	Halifax	From Rte 643 to Rte 642	Add Passing Lane	Approximately 1.4 mile section for possible passing lane	District L&D, CN, TE
4	Halifax	From Rte 628 to Rte 907	Add Passing Lane	Approximately 2.5 mile section for possible passing lane	District L&D, CN, TE
5	Halifax	From Rte 905 to Rte 645	Add Passing Lane	Approximately 1.7 mile section for possible passing lane	District L&D, CN, TE
6	Halifax	From Old Rte 501 to Rte 40	Add Passing Lane	Approximately 3.4 mile section for possible passing lane	District L&D, CN, TE
7	Campbell	From Rte 792 to Rte 605	Add Passing Lane	Approximately 1.9 mile section for possible passing lane	District L&D, CN, TE
8	Campbell	From Rte 917 to Rte 970	Add Passing Lane	Approximately 1.3 mile section for possible passing lane	District L&D, CN, TE
9	Campbell	From Rte 970 to 1.6 mi N Rte 970	Add Passing Lane	Approximately 1.6 mile section for possible passing lane	District L&D, CN, TE
10	Campbell	From Rte 635 to Rte 607	Add Passing Lane	Approximately 2.3 mile section for possible passing lane	District L&D, CN, TE
11	Campbell	From Rte 655 to Rte 686	Add Passing Lane	Approximately 1.8 mile section for possible passing lane	District L&D, CN, TE
12	Halifax	Intersection of Rte 40	Add Right Turn Lane	Add southbound right turn lane at Int of Rte 40	Residency
13	Halifax	Intersection of Va Rte 360	Add Right Turn Lane	Add southbound right turn lane at Int of Rte 360, possibly roundabout	Residency & 501 Coalition
14	Halifax	Intersection of Rte 642	Add Right and Left Turn Lanes	Add left and right turn lanes in north and south bound directions at Int of Rte 642	Residency
15	Halifax	North of Rte 610	Extend Passing Zone	Improve horizontal Alignment by cutting grade on south side of intersection and placing fill material on north side of intersection enabling an extension of the existing passing zones	Residency
16	Halifax	Intersection of Rte 645	Add Left Turn Lane	Add southbound left turn lane at Int of Rte 645	Residency
17	Halifax	From Rte 636 to Rte 626	Center Passing Lane	Approximately 1.5 mile section for possible passing lane in direction of steep incline	Residency
18	Campbell	Rt. 501 north of Gladys Village	Reduce Vertical Curves	Reduce vertical curves approximately .5 miles north of Gladys Village to create an additional safe passing zone	501 coalition
19	Campbell	Intersection of Rte 501 & Rte 633	Add Left Turn Lane	Provide southbound turn lane	501 coalition
20	Campbell	Intersection of Rte 501 & Rte 633	Add Northbound Left Turn Lane	Add northbound left turn lane at Int of Rte 501 & Rte 633	501 coalition
21	Campbell	Intersection of Rte 501 & Rte 933	Add Northbound Left Turn Lane	Add northbound left turn lane at Int of Rte 501 & Rte 933	501 coalition
22	Campbell	South of Depot Road	Extend Third Lane	Extend third lane of three travel lanes in the Village of Rustburg from Depot Road south to the existing three lane improvements to provide a center left turn only lane	501 coalition

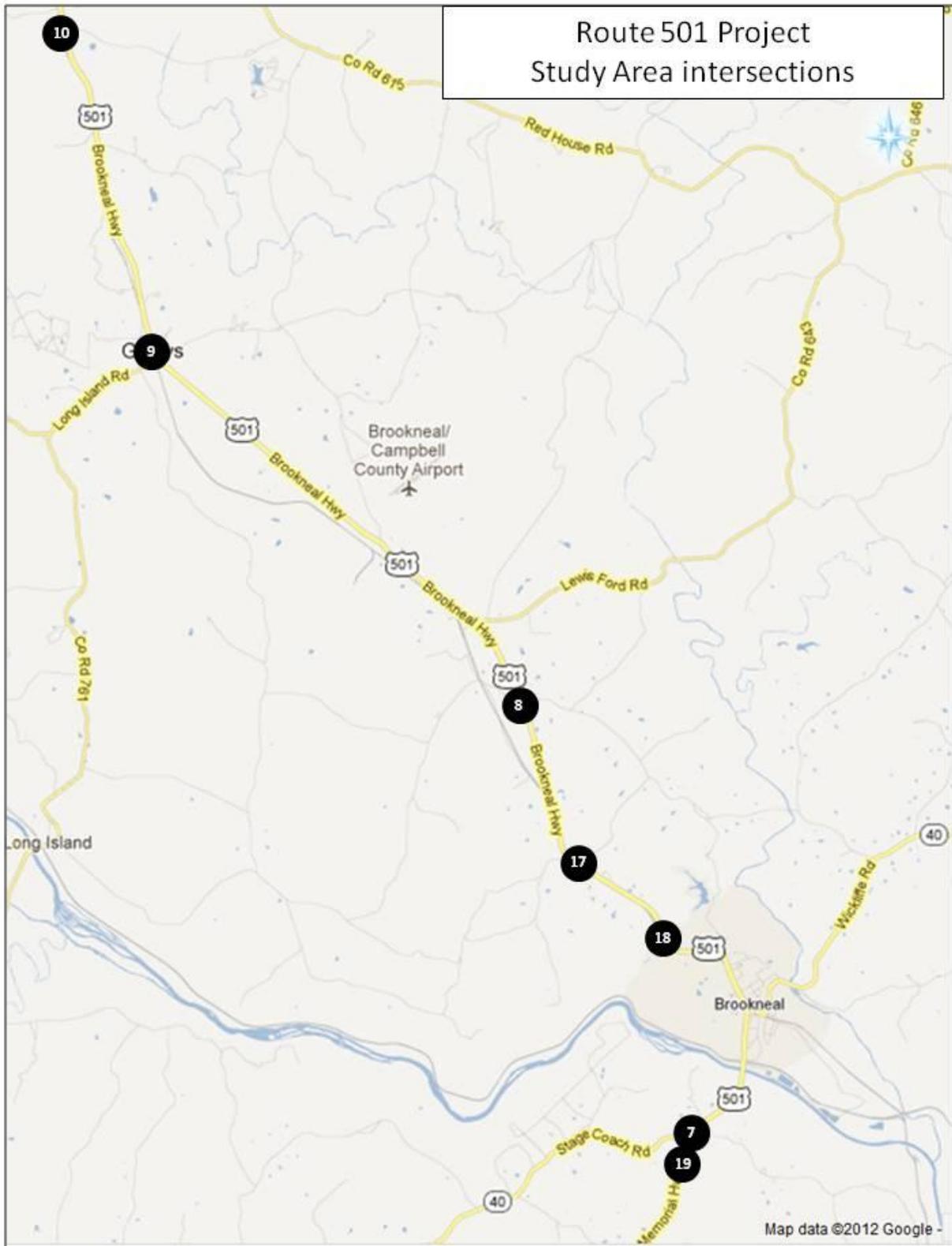
Index	County	Location	Treatment Type	Description	Rec. source
23	Campbell	Intersection of Rte 501, 652, 653	Safety Concerns	Evaluate intersection of Rte 501, 652, 653 in the Village of Gladys; determine potential solutions for safety concerns	501 coalition
24	Campbell	Intersection of Rte 501 & Rte 917	Add Northbound Left Turn Lane	Install northbound left turn lane and enhance southbound right turn out lane for safety.	501 coalition
25	Halifax	Rte 501 @ Mitchell's Stretch & Childrey Creek	Add Passing Lane	Install passing lane @ Mitchell's Stretch & Childrey Creek	501 coalition
26	Halifax	Intersection of Rte 501 & 628	Add Right and Left Turn Lanes	Install right and left turn lanes @ intersection of Rte 501 & 628	501 coalition
27	Halifax	Intersection of Rte 501 & 642	Add Right and Left Turn Lanes	Install right and left turn lanes @ intersection of Rte 501 & 642	501 coalition
28	Halifax	Intersection of Rte 501 & 360	Add Right Turn Lane & Storage Lane	Install right turn lane and storage lane for southbound traffic	501 coalition
29	Halifax	Sydnor Jennings Elem. School	Add/Enhance Right & Left Turn Lanes	Approximately .5 miles south of Volens, construct/enhance southbound right turn/deceleration lane and construct northbound left turn lanes	501 coalition
30	Halifax	From 0.3 MN Rte 643 to 0.5 MN Rte 642	Add Passing Lane	Approximately 2.1 mile section for passing lane	CN
31	Campbell	From 1.0 MN Rte 635 to 0.2MN Rte 778	Add Passing Lane	Approximately 1.5 mile section for possible passing lane	CN
32	Campbell	From Rte 972 to 0.1 MN Rte 917	Add Passing Lane	Approximately 1.9 mile section for possible passing lane	CN
33	Halifax	0.41 MN of Rte 843	Add Passing Zone	0.41 MS Rte 843, passing zone for northbound traffic could be implemented with lowering vertical 2 feet over 200 feet - this would apploy a double passing zone (#1 priority)	TE
34	Campbell	1.22 MN of Rte 635	Add Passing Zone	1.22 MN Rte 635, passing zone could be implemented with lowering vertial 6 feet over 650 feet length (#2 priority)	TE
35	Campbell	0.58 MN of Rte 655	Add Passing Zone	0.58 MN Rte 655 (south intersection), passing zone could be implemented with lowering vertical 4 feet over 800 feet length (#3 priority)	TE
36	Halifax	0.15 MN of Rte 643	Trim overhanging trees	0.15 MN Rte 610 (north intersection) ADT: 4800 vpd	TE
37	Campbell	2.04 MS of Rtes 761/652	Add Passing Zone	2.04 MS Rte 761/652 - Lower vertical curve - ADT: 5500 vpd	TE
38	Campbell	.12 MS of Rte 1028	Add Passing Zone	0.12 MS Rte 1029 - Lower vertical curve - ADT: 6200 vpd	TE
39	Halifax	0.26 MS of Rte 643 North Int	Add Passing Zone	0.26 MS Rte 643 N Int - Lower vertical curve - ADT: 4800vpd	TE

Table A-6: Prioritization of Non-Intersection Safety Projects

Item	CIP Range	Segment	Project Description	CMF Countermeasure	Existing Crashes affected by Severity Level			CMF by Severity Level				CMF Source	Service Life (Yrs)	Benefit 2010 (1000\$)	Unit Cost	Unit Type	Quantity	Comments	Cost Source	Cost 2010 (1000\$)	B/C	Rank
					Fatal	Injury	PDO	Fatal	Injury	PDO	All											
1	Short	1	Install median barrier	Install median barrier	1	9	5	0.71	0.71	---	---	HSM Table 13-23	15	\$739	\$125,000	Mile	4.53	IDOT (MS Effectiveness)	\$566	1.31	15	
2	Short	1	Update chevron signs	Install new fluorescent curve signs or upgrade existing curve signs to fluorescent sheeting	0	1	1	0.82	---	---	---	FHWA Clearinghouse (4 star)	10	\$0	\$1,800	Sign	12	Assumed 2 curves, 3 signs/curve, and 2 directions	Idaho 8 study	\$22	0.00	20
3	Intermediate	1	Update guardrails	Inventory/Improve/Update/Maintain Existing Guardrails, End Treatments, and Attenuation Systems	0	0	0	0.9	---	---	---	IDOT (MS Effectiveness)	20	\$0	\$25,000	Mile	0.06		IDOT (MS Effectiveness)	\$2	0.00	20
4	Short	2	Sign and enforce truck restrictions	Implement truck lane restrictions on 2-lane directional interstate segments (screened)	0	28	57	---	---	---	0.95	FHWA Clearinghouse (2 star)	25	\$1,092	\$1,800	Sign	10	Assumed 5 access points, 2 directions	Idaho 8 study	\$18	60.65	4
5	Short	2	Update chevron signs	Install new fluorescent curve signs or upgrade existing curve signs to fluorescent sheeting	0	0	0	0.82	---	---	---	FHWA Clearinghouse (4 star)	15	\$0	\$1,800	Sign	30	Assumed 5 curves, 3 signs/curve, and 2 directions	Idaho 8 study	\$54	0.00	20
6	Short	3	Install driveway warning signs	Install advanced warning signs at intersecting crossings	4	46	54	---	---	---	0.96	Idaho 8 Study	10	\$3,068	\$1,800	Sign	16	8 segments called out in report, 2 directions	Idaho 8 study	\$29	106.51	2
7	Short	3	Update chevron signs	Install new fluorescent curve signs or upgrade existing curve signs to fluorescent sheeting	1	8	9	0.82	---	---	---	FHWA Clearinghouse (4 star)	10	\$2,735	\$1,800	Sign	18	Assumed 3 curves, 3 signs/curve, and 2 directions	Idaho 8 study	\$32	84.41	3
8	Intermediate	3	Update guardrails	Inventory/Improve/Update/Maintain Existing Guardrails, End Treatments, and Attenuation Systems	1	8	9	0.9	---	---	---	IDOT (MS Effectiveness)	20	\$2,708	\$25,000	Mile	3.41		IDOT (MS Effectiveness)	\$85	31.76	5
9	Long	3	Widen paved shoulders to ≥ 6 ft.	Widen paved shoulder from 3 ft to 6 ft	4	46	54	---	---	---	0.93	FHWA Clearinghouse (3 star)	15	\$7,596	\$200,000	Mile	20.45		IDOT (MS Effectiveness)	\$2,045	3.71	10
10	Long	3	Add TWLTL	Add Center TWLTL on Rural 2-lane	3	33	39	---	---	---	0.9	HSM Equation 10-18	15	\$8,276	\$1,013,760	Mile	14.80	Extrapolated distance from figure in report	Idaho 8 study	\$4,593	1.80	12
11	Long	3	Construct parallel service road	Absence of access points	2	26	30	---	---	---	0.56	FHWA Clearinghouse (3 star)	15	\$24,512	\$1,647,360	Mile	11.41		Idaho 8 study	\$18,796	1.30	16
12	Long	3	Add passing lane	Provide passing lane or climbing lane	4	46	54	---	---	---	0.75	HSM Table 16-7	15	\$27,130	\$55,800,000	Lump Sum	0.53		VDOT 6 Year TIP (9 Passing lanes – Rte 501 Campbell/Halifax)	\$29,716	0.91	17
13	Short	4	Install driveway warning signs	Install advanced warning signs at intersecting crossings	6	50	49	---	---	---	0.96	Idaho 8 Study	10	\$4,328	\$1,800	Sign	10	5 segments called out in report, 2 directions	Idaho 8 study	\$18	240.42	1
14	Short	4	Update chevron signs	Install new fluorescent curve signs or upgrade existing curve signs to fluorescent sheeting	1	10	10	0.82	---	---	---	FHWA Clearinghouse (4 star)	10	\$2,735	\$1,800	Sign	54	Assumed 9 curves, 3 signs/curve, and 2 directions	Idaho 8 study	\$97	28.14	6
15	Intermediate	4	Update guardrails	Inventory/Improve/Update/Maintain Existing Guardrails, End Treatments, and Attenuation Systems	1	9	9	0.9	---	---	---	IDOT (MS Effectiveness)	20	\$2,708	\$25,000	Mile	4.07		IDOT (MS Effectiveness)	\$102	26.61	7
16	Long	4	Widen paved shoulders to ≥ 6 ft.	Widen paved shoulder from 3 ft to 6 ft	5	40	40	---	---	---	0.93	FHWA Clearinghouse (3 star)	15	\$8,877	\$200,000	Mile	17.95		IDOT (MS Effectiveness)	\$1,795	4.95	9
17	Long	4	Construct parallel service road	Absence of access points	3	24	23	---	---	---	0.56	FHWA Clearinghouse (3 star)	15	\$33,460	\$1,647,360	Mile	10.59		Idaho 8 study	\$17,446	1.92	11
18	Long	4	Add TWLTL	Add Center TWLTL on Rural 2-lane	3	24	23	---	---	---	0.91	HSM Equation 10-18	15	\$6,957	\$1,013,760	Mile	10.57	Extrapolated distance from figure in report	Idaho 8 study	\$4,593	1.51	13
19	Long	4	Add passing lane	Provide passing lane or climbing lane	6	50	49	---	---	---	0.75	HSM Table 16-7	15	\$38,274	\$55,800,000	Lump Sum	0.47		VDOT 6 Year TIP (9 Passing lanes – Rte 501 Campbell/Halifax)	\$26,084	1.47	14
20	Intermediate	5	Update guardrails	Inventory/Improve/Update/Maintain Existing Guardrails, End Treatments, and Attenuation Systems	0	2	2	---	---	---	0.9	IDOT (MS Effectiveness)	20	\$122	\$25,000	Mile	0.57		IDOT (MS Effectiveness)	\$14	8.53	8
21	Long	5	Widen paved shoulders to ≥ 6 ft.	Widen paved shoulder from 3 ft to 6 ft	0	8	5	---	---	---	0.93	FHWA Clearinghouse (3 star)	15	\$262	\$200,000	Mile	1.91		IDOT (MS Effectiveness)	\$382	0.69	18
22	Short	5	Install median barrier	Install median barrier	0	17	11	0.71	0.71	---	---	HSM Table 13-23	15	\$128	\$125,000	Mile	3.94		IDOT (MS Effectiveness)	\$492	0.26	19
23	Short	5	Update chevron signs	Install new fluorescent curve signs or upgrade existing curve signs to fluorescent sheeting	0	17	11	0.82	---	---	---	FHWA Clearinghouse (4 star)	10	\$0	\$1,800	Sign	24	Assumed 4 curves, 3 signs/curve, and 2 directions	Idaho 8 study	\$43	0.00	20

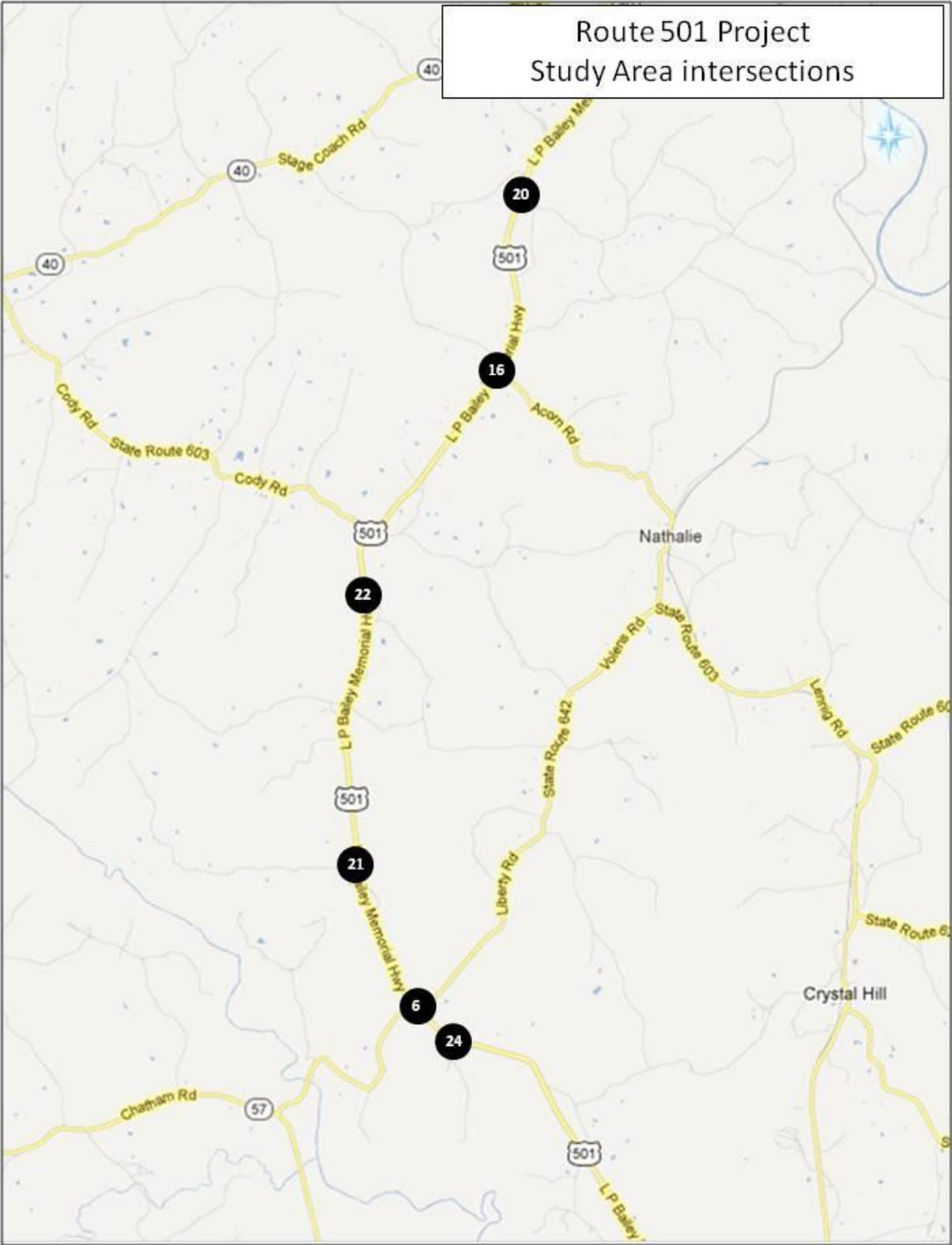
Analysis Area – Intersection Maps

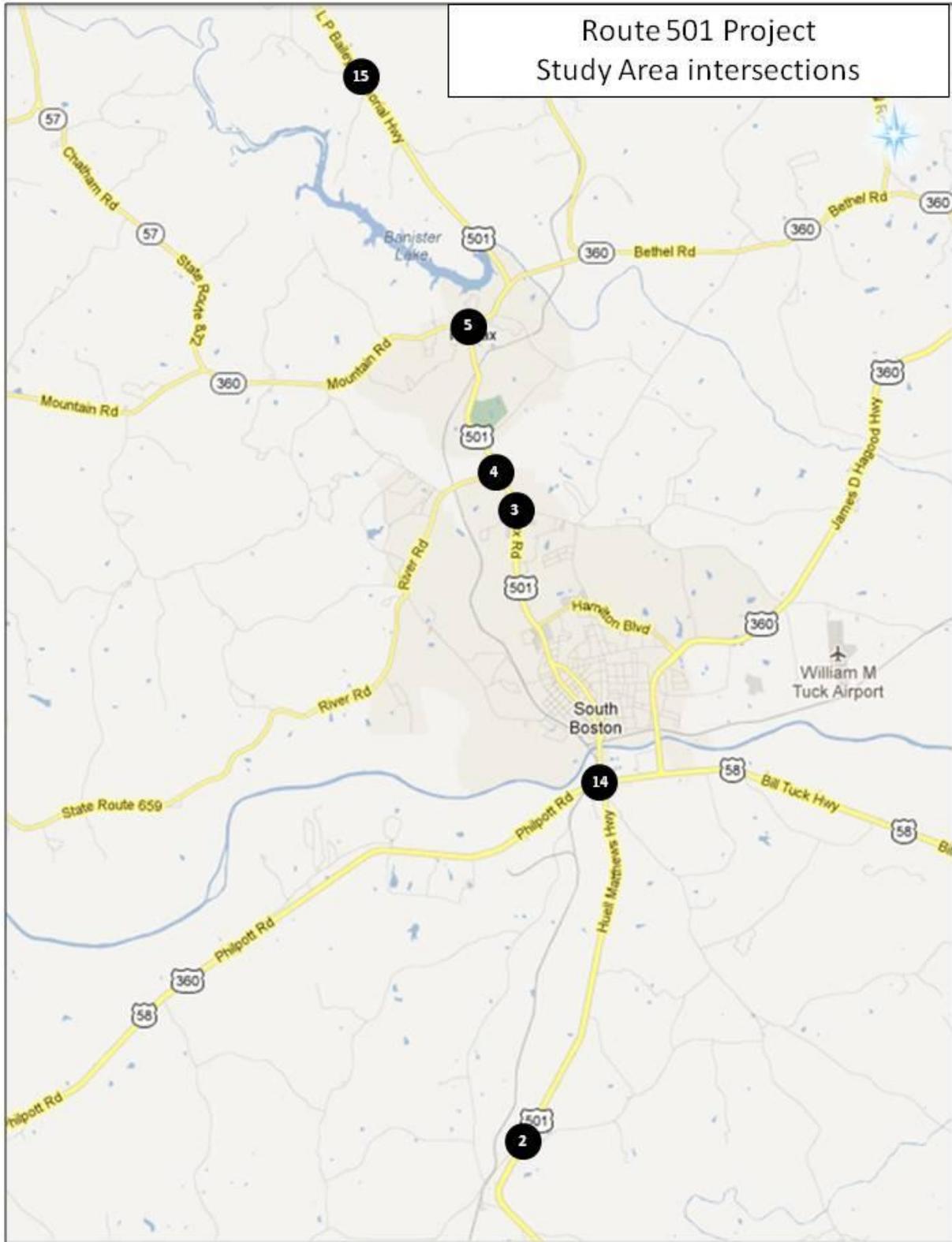




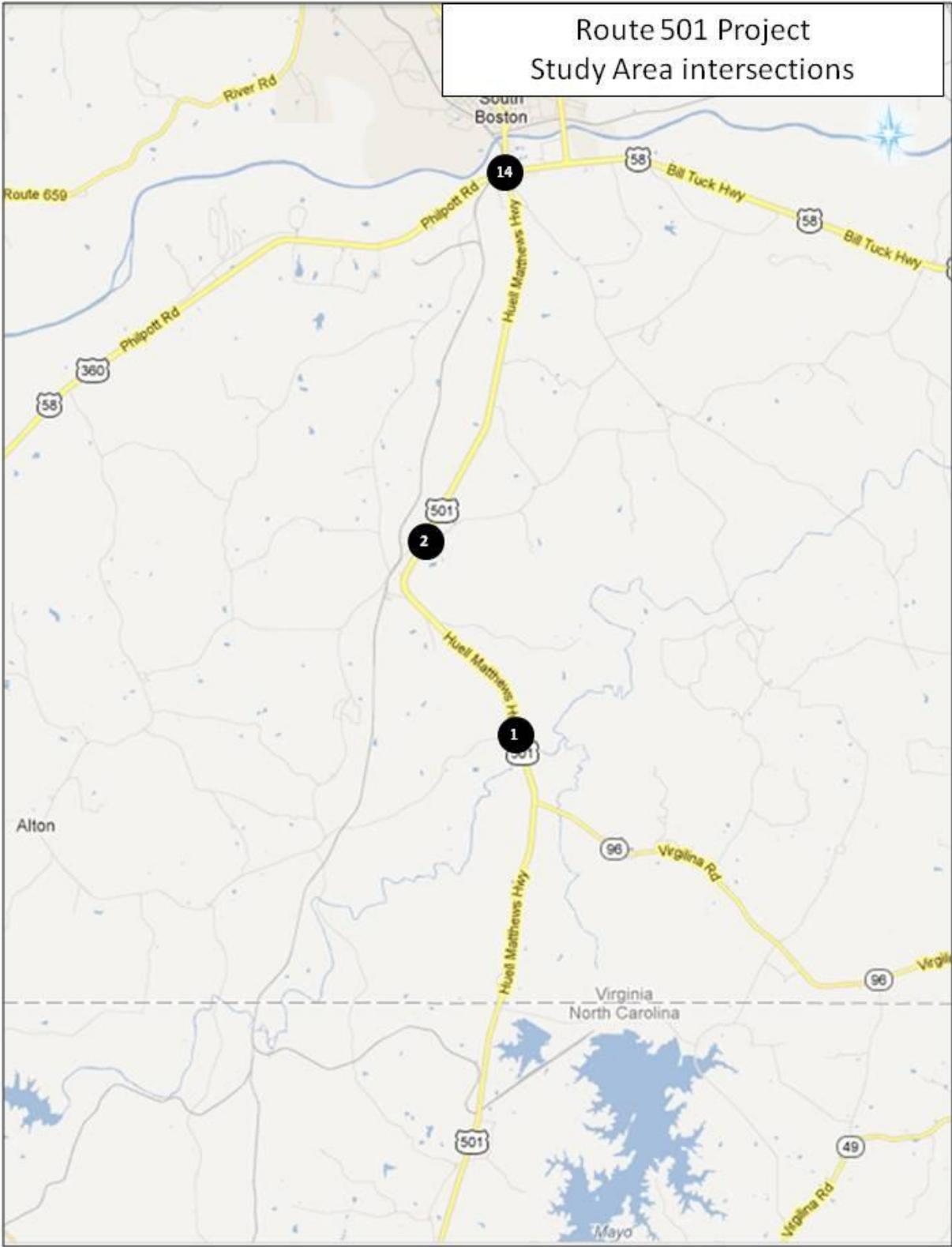
Route 501 Project
Study Area intersections

Route 501 Project
Study Area intersections





Route 501 Project
Study Area intersections



APPENDIX E – *Cost Estimates*

Route 501 Intersection Project Costs (2014 Dollars)

Date: August 1, 2012



STUDY ALTERNATIVE	ESTIMATING PROJECT COST	REPORTED PROJECT COST
<i>ROUTE 501- RUSTBURG STUDY A - INTERSECTION AT RTE 24</i>	\$151,414	\$200,000
<i>ROUTE 501-STUDY E -INTERSECTION AT RTE 607</i>	\$739,180	\$740,000
<i>ROUTE 501-STUDY 6 - INTERSECTION AT RTE 652/761</i>	\$1,013,145	\$1,020,000
<i>ROUTE 501-STUDY 12 & 13_INTERSECTION AT RTE 633</i>	\$1,971,148	\$1,980,000
<i>ROUTE 501-STUDY 15_INTERSECTION AT RTE 40/632</i>	\$869,031	\$870,000
<i>ROUTE 501-STUDY 22_INTERSECTION AT RTE 628</i>	\$976,810	\$980,000
<i>ROUTE 501-STUDY 24_INTERSECTION AT RTE 642</i>	\$1,072,088	\$1,080,000
<i>ROUTE 501-STUDY 31_INTERSECTION AT RTE 360</i>	\$487,344	\$500,000
Total	\$7,280,159	\$7,370,000

**CONSTRUCTION COST ESTIMATE
 ROUTE 501- RUSTBURG STUDY INTERSECTION AT RTE 24**

VDOT CODE	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$25,000.00	1	\$20,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	600	\$7,200.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00		\$0.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00	300	\$5,400.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50	200	\$900.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00	150	\$6,000.00
14414	Curb (CG-2)	LF	\$26.00	450	\$11,700.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50		\$0.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00		\$0.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00		\$0.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	200	\$500.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50		\$0.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50	40	\$220.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50	200	\$100.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00	4	\$380.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	350	\$1,400.00

SUBTOTAL 1 **\$63,800.00**

DRAINAGE (8% OF SUBTOTAL 1) \$5,104.00
 EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1) \$1,914.00
 UTILITIES (10% OF SUBTOTAL 1) \$6,380.00
 LANDSCAPING (5% OF SUBTOTAL 1) \$3,190.00

SUBTOTAL 2 **\$80,388.00**

CONTINGENCY (30% OF SUBTOTAL) \$24,117.00

TOTAL CONSTRUCTION COST **\$104,505.00**

DESIGN/ENGINEERING (15%) \$15,676.00
 CONSTRUCTION INSPECTION (12%) \$12,541.00
 RIGHT-OF-WAY \$10,000.00

TOTAL PROJECT COST (2012 Dollars) **\$142,722.00**

TOTAL PROJECT COST (2013 Dollars) **\$147,003.66**

TOTAL PROJECT COST (2014 Dollars) **\$151,413.77**

**CONSTRUCTION COST ESTIMATE
ROUTE 501-STUDY E INTERSECTION AT RTE 607**

VDOT CODE	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$25,000.00	1	\$25,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	2,400	\$28,800.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	470	\$37,600.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	6,000	\$9,000.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	440	\$30,360.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	2,000	\$168,000.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	1,200	\$3,000.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50	2,500	\$8,750.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	1,700	\$6,800.00

SUBTOTAL 1**\$320,510.00**

DRAINAGE (8% OF SUBTOTAL 1)

\$25,641.00

EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1)

\$9,616.00

UTILITIES (10% OF SUBTOTAL 1)

\$32,051.00

LANDSCAPING (5% OF SUBTOTAL 1)

\$16,026.00

SUBTOTAL 2**\$403,844.00**

CONTINGENCY (30% OF SUBTOTAL)

\$121,154.00

TOTAL CONSTRUCTION COST**\$524,998.00**

DESIGN/ENGINEERING (15%)

\$78,750.00

CONSTRUCTION INSPECTION (12%)

\$63,000.00

RIGHT-OF-WAY

\$30,000.00

TOTAL PROJECT COST (2012 Dollars)

\$696,748.00

TOTAL PROJECT COST (2013 Dollars)

\$717,650.44

TOTAL PROJECT COST (2014 Dollars)**\$739,179.95**

CONSTRUCTION COST ESTIMATE
ROUTE 501-STUDY 6 INTERSECTION AT RTE 652/761

VDOT CODE	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$25,000.00	1	\$25,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	8,300	\$99,600.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	440	\$35,200.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00	850	\$22,100.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	5,300	\$7,950.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	460	\$31,740.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	1,850	\$155,400.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	2,400	\$6,000.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50	2,400	\$8,400.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	1,200	\$4,800.00

SUBTOTAL 1**\$406,190.00**

DRAINAGE (8% OF SUBTOTAL 1)

\$32,496.00

EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1)

\$12,186.00

UTILITIES (10% OF SUBTOTAL 1)

\$40,619.00

LANDSCAPING (5% OF SUBTOTAL 1)

\$20,310.00

SUBTOTAL 2**\$511,801.00**

CONTINGENCY (30% OF SUBTOTAL)

\$153,541.00

TOTAL CONSTRUCTION COST**\$665,342.00**

DESIGN/ENGINEERING (15%)

\$99,802.00

CONSTRUCTION INSPECTION (12%)

\$79,842.00

RIGHT-OF-WAY

\$110,000.00

TOTAL PROJECT COST (2012 Dollars)

\$954,986.00

TOTAL PROJECT COST (2013 Dollars)

\$983,635.58

TOTAL PROJECT COST (2014 Dollars)**\$1,013,144.65**

CONSTRUCTION COST ESTIMATE
ROUTE 501-STUDY 12 & 13 INTERSECTION AT RTE 633

VDOT CODE	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$25,000.00	1	\$25,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	18,000	\$216,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	1,400	\$112,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50	2,000	\$33,000.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	16,000	\$24,000.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	590	\$40,710.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	2,400	\$201,600.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00	2,000	\$2,000.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	9,100	\$22,750.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50	5,000	\$17,500.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50	500	\$2,750.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00	14	\$70.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00	25	\$2,375.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	12,200	\$48,800.00

SUBTOTAL 1**\$758,555.00**

DRAINAGE (8% OF SUBTOTAL 1)

\$60,685.00

EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1)

\$22,757.00

UTILITIES (10% OF SUBTOTAL 1)

\$75,856.00

LANDSCAPING (5% OF SUBTOTAL 1)

\$37,928.00

SUBTOTAL 2**\$955,781.00**

CONTINGENCY (30% OF SUBTOTAL)

\$286,735.00

TOTAL CONSTRUCTION COST**\$1,242,516.00**

DESIGN/ENGINEERING (15%)

\$186,378.00

CONSTRUCTION INSPECTION (12%)

\$149,102.00

RIGHT-OF-WAY

\$280,000.00

TOTAL PROJECT COST (2012 Dollars)

\$1,857,996.00

TOTAL PROJECT COST (2013 Dollars)

\$1,913,735.88

TOTAL PROJECT COST (2014 Dollars)**\$1,971,147.96**

CONSTRUCTION COST ESTIMATE
ROUTE 501-STUDY 15 INTERSECTION AT RTE 40/632

VDOT CODE	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$25,000.00	1	\$25,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	9,400	\$112,800.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	550	\$44,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00	350	\$6,300.00
13320	Guardrail GR-2	LF	\$16.50	950	\$15,675.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00	500	\$13,000.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	6,400	\$9,600.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	150	\$10,350.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	610	\$51,240.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00	700	\$700.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	2,500	\$6,250.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50	1,800	\$6,300.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50	150	\$825.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00	100	\$500.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00	12	\$1,140.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	5,000	\$20,000.00

SUBTOTAL 1**\$333,680.00**

DRAINAGE (8% OF SUBTOTAL 1)

\$26,695.00

EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1)

\$10,011.00

UTILITIES (10% OF SUBTOTAL 1)

\$33,368.00

LANDSCAPING (5% OF SUBTOTAL 1)

\$16,684.00

SUBTOTAL 2**\$420,438.00**

CONTINGENCY (30% OF SUBTOTAL)

\$126,132.00

TOTAL CONSTRUCTION COST**\$546,570.00**

DESIGN/ENGINEERING (15%)

\$81,986.00

CONSTRUCTION INSPECTION (12%)

\$65,589.00

RIGHT-OF-WAY

\$125,000.00

TOTAL PROJECT COST (2012 Dollars)

\$819,145.00

TOTAL PROJECT COST (2013 Dollars)

\$843,719.35

TOTAL PROJECT COST (2014 Dollars)**\$869,030.93**

CONSTRUCTION COST ESTIMATE
ROUTE 501-STUDY 22 INTERSECTION AT RTE 628

VDOT CODE	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$25,000.00	1	\$25,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	11,000	\$132,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	600	\$48,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00	300	\$5,400.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00	600	\$15,600.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	7,100	\$10,650.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	210	\$14,490.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	840	\$70,560.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	3,000	\$7,500.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50	2,300	\$8,050.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50	200	\$1,100.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00	10	\$950.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	5,300	\$21,200.00

SUBTOTAL 1**\$370,500.00**

DRAINAGE (8% OF SUBTOTAL 1)

\$29,640.00

EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1)

\$11,115.00

UTILITIES (10% OF SUBTOTAL 1)

\$37,050.00

LANDSCAPING (5% OF SUBTOTAL 1)

\$18,525.00

SUBTOTAL 2**\$466,830.00**

CONTINGENCY (30% OF SUBTOTAL)

\$140,049.00

TOTAL CONSTRUCTION COST**\$606,879.00**

DESIGN/ENGINEERING (15%)

\$91,032.00

CONSTRUCTION INSPECTION (12%)

\$72,826.00

RIGHT-OF-WAY

\$150,000.00

TOTAL PROJECT COST (2012 Dollars)

\$920,737.00

TOTAL PROJECT COST (2013 Dollars)

\$948,359.11

TOTAL PROJECT COST (2014 Dollars)**\$976,809.88**

CONSTRUCTION COST ESTIMATE
ROUTE 501-STUDY 24 INTERSECTION AT RTE 642

VDOT CODE	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$25,000.00	1	\$25,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	11,000	\$132,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	600	\$48,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00	900	\$16,200.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00	900	\$23,400.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	7,100	\$10,650.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	300	\$20,700.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	1,200	\$100,800.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	4,200	\$10,500.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50	2,100	\$7,350.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50	100	\$550.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00	40	\$200.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00	16	\$1,520.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	1,700	\$6,800.00

SUBTOTAL 1**\$413,670.00**

DRAINAGE (8% OF SUBTOTAL 1)

\$33,094.00

EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1)

\$12,411.00

UTILITIES (10% OF SUBTOTAL 1)

\$41,367.00

LANDSCAPING (5% OF SUBTOTAL 1)

\$20,684.00

SUBTOTAL 2**\$521,226.00**

CONTINGENCY (30% OF SUBTOTAL)

\$156,368.00

TOTAL CONSTRUCTION COST**\$677,594.00**

DESIGN/ENGINEERING (15%)

\$101,640.00

CONSTRUCTION INSPECTION (12%)

\$81,312.00

RIGHT-OF-WAY

\$150,000.00

TOTAL PROJECT COST (2012 Dollars)

\$1,010,546.00

TOTAL PROJECT COST (2013 Dollars)

\$1,040,862.38

TOTAL PROJECT COST (2014 Dollars)**\$1,072,088.25**

**CONSTRUCTION COST ESTIMATE
 ROUTE 501-STUDY 31 INTERSECTION AT RTE 360**

VDOT CODE	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$25,000.00	1	\$25,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	3,000	\$36,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	200	\$16,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00	500	\$9,000.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00	500	\$13,000.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	2,000	\$3,000.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	200	\$13,800.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	850	\$71,400.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	1,200	\$3,000.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50		\$0.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00	2	\$10.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR,	EA	\$95.00	2	\$190.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	1,500	\$6,000.00

SUBTOTAL 1 **\$206,400.00**

DRAINAGE (8% OF SUBTOTAL 1) \$16,512.00
 EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1) \$6,192.00
 UTILITIES (10% OF SUBTOTAL 1) \$20,640.00
 LANDSCAPING (5% OF SUBTOTAL 1) \$10,320.00

SUBTOTAL 2 **\$260,064.00**

CONTINGENCY (30% OF SUBTOTAL) \$78,020.00

TOTAL CONSTRUCTION COST **\$338,084.00**

DESIGN/ENGINEERING (15%) \$50,713.00
 CONSTRUCTION INSPECTION (12%) \$40,571.00
 RIGHT-OF-WAY \$30,000.00

TOTAL PROJECT COST (2012 Dollars) **\$459,368.00**

TOTAL PROJECT COST (2013 Dollars) **\$473,149.04**

TOTAL PROJECT COST (2014 Dollars) **\$487,343.51**

Route 501 Passing Lane Project Costs (2014 Dollars)

Date: August 1, 2012



STUDY ALTERNATIVE	ESTIMATING PROJECT COST	REPORTED PROJECT COST
<i>STUDY 03_ROUTE 635 TO ROUTE 607 (PROJECT LENGTH - 2.4 MILES)</i>	\$9,744,004	\$9,750,000
<i>STUDY 08 ROUTE 970 TO 1.6 MILES NORTH OF ROUTE 970 (PROJECT LENGTH - 1.5 MILES)</i>	\$5,077,801	\$5,100,000
<i>STUDY 11 ROUTE 972 TO ROUTE 605 (PROJECT LENGTH - 2.3 MILES)</i>	\$9,016,162	\$9,020,000
<i>STUDY 19 ROUTE 905 TO ROUTE 645 (PROJECT LENGTH - 1.7 MILES)</i>	\$7,488,797	\$7,490,000
<i>STUDY 21 ROUTE 628 TO ROUTE 907 (PROJECT LENGTH - 2.0 MILES)</i>	\$7,567,173	\$7,570,000
<i>STUDY 27 ROUTE 610 TO ROUTE 643 (PROJECT LENGTH - 2.0 MILES)</i>	\$9,167,588	\$9,170,000
Total	\$48,061,523	\$48,100,000

CONSTRUCTION COST ESTIMATE
ROUTE 501- STUDY 03 ROUTE 635 TO ROUTE 607 (PROJECT LENGTH - 2.4 MILES)

VDOT CODE	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$50,000.00	1	\$50,000.00
00110	Clearing and Grubbing	LS	\$15,000.00	1	\$15,000.00
00120	Regular Excavation	CY	\$12.00	90,000	\$1,080,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	6,600	\$528,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	77,800	\$116,700.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	5,300	\$365,700.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	21,000	\$1,764,000.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	36,000	\$90,000.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50	29,000	\$101,500.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	34,000	\$136,000.00

SUBTOTAL 1 \$4,246,900.00

DRAINAGE (8% OF SUBTOTAL 1) \$339,752.00

EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1) \$127,407.00

UTILITIES (10% OF SUBTOTAL 1) \$424,690.00

LANDSCAPING (5% OF SUBTOTAL 1) \$212,345.00

SUBTOTAL 2 **\$5,351,094.00**

CONTINGENCY (30% OF SUBTOTAL) \$1,605,329.00

TOTAL CONSTRUCTION COST **\$6,956,423.00**

DESIGN/ENGINEERING (15%) \$1,043,464.00

CONSTRUCTION INSPECTION (12%) \$834,771.00

RIGHT-OF-WAY \$350,000.00

TOTAL PROJECT COST (2012 Dollars) **\$9,184,658.00**

TOTAL PROJECT COST (2013 Dollars) **\$9,460,197.74**

TOTAL PROJECT COST (2014 Dollars) **\$9,744,003.67**

CONSTRUCTION COST ESTIMATE
ROUTE 501- STUDY 08 ROUTE 970 TO 1.6 MILES NORTH OF ROUTE 970 (PROJECT LENGTH - 1.5 MILES)

VDOT CODE	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$30,000.00	1	\$30,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	40,000	\$480,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	3,900	\$312,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	46,500	\$69,750.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	2,800	\$193,200.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	11,100	\$932,400.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	18,000	\$45,000.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50	16,100	\$56,350.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	22,000	\$88,000.00

SUBTOTAL 1 **\$2,216,700.00**

DRAINAGE (8% OF SUBTOTAL 1) \$177,336.00

EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1) \$66,501.00

UTILITIES (10% OF SUBTOTAL 1) \$221,670.00

LANDSCAPING (5% OF SUBTOTAL 1) \$110,835.00

SUBTOTAL 2 **\$2,793,042.00**

CONTINGENCY (30% OF SUBTOTAL) \$837,913.00

TOTAL CONSTRUCTION COST **\$3,630,955.00**

DESIGN/ENGINEERING (15%) \$544,644.00

CONSTRUCTION INSPECTION (12%) \$435,715.00

RIGHT-OF-WAY \$175,000.00

TOTAL PROJECT COST (2012 Dollars) **\$4,786,314.00**

TOTAL PROJECT COST (2013 Dollars) **\$4,929,903.42**

TOTAL PROJECT COST (2014 Dollars) **\$5,077,800.52**

CONSTRUCTION COST ESTIMATE
ROUTE 501- STUDY 11 ROUTE 972 TO ROUTE 605 (PROJECT LENGTH - 2.3 MILES)

VDOT CODE	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$48,000.00	1	\$48,000.00
00110	Clearing and Grubbing	LS	\$5,000.00	1	\$5,000.00
00120	Regular Excavation	CY	\$12.00	125,000	\$1,500,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	5,600	\$448,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00	200	\$3,600.00
13320	Guardrail GR-2	LF	\$16.50	7,000	\$115,500.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	66,100	\$99,150.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	3,200	\$220,800.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	13,000	\$1,092,000.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	35,000	\$87,500.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50	32,200	\$112,700.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	37,200	\$148,800.00

SUBTOTAL 1**\$3,881,050.00**

DRAINAGE (8% OF SUBTOTAL 1)

\$310,484.00

EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1)

\$116,432.00

UTILITIES (10% OF SUBTOTAL 1)

\$388,105.00

LANDSCAPING (5% OF SUBTOTAL 1)

\$194,053.00

SUBTOTAL 2**\$4,890,124.00**

CONTINGENCY (30% OF SUBTOTAL)

\$1,467,038.00

TOTAL CONSTRUCTION COST**\$6,357,162.00**

DESIGN/ENGINEERING (15%)

\$953,575.00

CONSTRUCTION INSPECTION (12%)

\$762,860.00

RIGHT-OF-WAY

\$425,000.00

TOTAL PROJECT COST (2012 Dollars)**\$8,498,597.00**

**CONSTRUCTION COST ESTIMATE
 ROUTE 501- STUDY 19 ROUTE 905 TO ROUTE 645 (PROJECT LENGTH - 1.7 MILES)**

VDOT CODE	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$35,000.00	1	\$35,000.00
00110	Clearing and Grubbing	LS	\$5,000.00	1	\$5,000.00
00120	Regular Excavation	CY	\$12.00	95,000	\$1,140,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	4,600	\$368,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50	2,200	\$36,300.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	54,100	\$81,150.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	3,300	\$227,700.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	13,100	\$1,100,400.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	28,000	\$70,000.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50	21,000	\$73,500.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	25,000	\$100,000.00

SUBTOTAL 1 **\$3,237,050.00**

DRAINAGE (8% OF SUBTOTAL 1) \$258,964.00
 EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1) \$97,112.00
 UTILITIES (10% OF SUBTOTAL 1) \$323,705.00
 LANDSCAPING (5% OF SUBTOTAL 1) \$161,853.00

SUBTOTAL 2 **\$4,078,684.00**

CONTINGENCY (30% OF SUBTOTAL) \$1,223,606.00

TOTAL CONSTRUCTION COST **\$5,302,290.00**

DESIGN/ENGINEERING (15%) \$795,344.00
 CONSTRUCTION INSPECTION (12%) \$636,275.00
 RIGHT-OF-WAY \$325,000.00

TOTAL PROJECT COST (2012 Dollars) **\$7,058,909.00**

TOTAL PROJECT COST (2013 Dollars) **\$7,270,676.27**

TOTAL PROJECT COST (2014 Dollars) **\$7,488,796.56**

CONSTRUCTION COST ESTIMATE
ROUTE 501- STUDY 21 ROUTE 628 TO ROUTE 907 (PROJECT LENGTH - 2.0 MILES)

VDOT CODE	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$40,000.00	1	\$40,000.00
00110	Clearing and Grubbing	LS	\$15,000.00	1	\$15,000.00
00120	Regular Excavation	CY	\$12.00	75,000	\$900,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	5,200	\$416,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50	800	\$13,200.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	62,000	\$93,000.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	4,000	\$276,000.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	15,100	\$1,268,400.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	33,000	\$82,500.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50	23,000	\$80,500.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	28,000	\$112,000.00

SUBTOTAL 1**\$3,296,600.00**

DRAINAGE (8% OF SUBTOTAL 1)

\$263,728.00

EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1)

\$98,898.00

UTILITIES (10% OF SUBTOTAL 1)

\$329,660.00

LANDSCAPING (5% OF SUBTOTAL 1)

\$164,830.00

SUBTOTAL 2**\$4,153,716.00**

CONTINGENCY (30% OF SUBTOTAL)

\$1,246,115.00

TOTAL CONSTRUCTION COST**\$5,399,831.00**

DESIGN/ENGINEERING (15%)

\$809,975.00

CONSTRUCTION INSPECTION (12%)

\$647,980.00

RIGHT-OF-WAY

\$275,000.00

TOTAL PROJECT COST (2012 Dollars)

\$7,132,786.00

TOTAL PROJECT COST (2013 Dollars)

\$7,346,769.58

TOTAL PROJECT COST (2014 Dollars)**\$7,567,172.67**

**CONSTRUCTION COST ESTIMATE
 ROUTE 501- STUDY 27 ROUTE 610 TO ROUTE 643 (PROJECT LENGTH - 2.0 MILES)**

VDOT CODE	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$40,000.00	1	\$40,000.00
00110	Clearing and Grubbing	LS	\$15,000.00	1	\$15,000.00
00120	Regular Excavation	CY	\$12.00	105,000	\$1,260,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	5,900	\$472,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50	2,100	\$34,650.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	70,000	\$105,000.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	4,300	\$296,700.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	17,200	\$1,444,800.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	38,000	\$95,000.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50	24,500	\$85,750.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	31,200	\$124,800.00

SUBTOTAL 1 **\$3,973,700.00**

DRAINAGE (8% OF SUBTOTAL 1) \$317,896.00
 EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1) \$119,211.00
 UTILITIES (10% OF SUBTOTAL 1) \$397,370.00
 LANDSCAPING (5% OF SUBTOTAL 1) \$198,685.00

SUBTOTAL 2 **\$5,006,862.00**

CONTINGENCY (30% OF SUBTOTAL) \$1,502,059.00

TOTAL CONSTRUCTION COST **\$6,508,921.00**

DESIGN/ENGINEERING (15%) \$976,339.00

CONSTRUCTION INSPECTION (12%) \$781,071.00

RIGHT-OF-WAY \$375,000.00

TOTAL PROJECT COST (2012 Dollars) **\$8,641,331.00**

TOTAL PROJECT COST (2013 Dollars) **\$8,900,570.93**

TOTAL PROJECT COST (2014 Dollars) **\$9,167,588.06**

Route 501 Shoulder Widening Project Costs (2014 Dollars)

Date: August 1, 2012

STUDY ALTERNATIVE	ESTIMATING PROJECT COST	REPORTED PROJECT COST
<i>ROUTE 501- SECTION A - CARTERS LANE TO S.R. 615 (PROJECT LENGTH - 1,787 FT)</i>	\$697,042	\$710,000
<i>ROUTE 501 - SECTION B - DAVIS LANE TO CHARLES LANE (PROJECT LENGTH - 8000')</i>	\$2,298,160	\$2,300,000
<i>ROUTE 501- SECTION E - LAUGHLIN STREET TO 830' WEST (PROJECT LENGTH - 830')</i>	\$327,368	\$340,000
<i>ROUTE 501- SECTION G -COUNTY ROAD 910 TO MOLLIES CREEK ROAD (PROJECT LENGTH - 3500')</i>	\$1,309,917	\$1,350,000
<i>ROUTE 501- SECTION H -MORNINGSIDE DRIVE TO COUNTY ROAD 635 (PROJECT LENGTH - 2000')</i>	\$704,900	\$710,000
<i>ROUTE 501- SECTION I -COUNTY ROAD 686 TO MERRYMAN DRIVE (PROJECT LENGTH - 1500')</i>	\$663,738	\$680,000
<i>ROUTE 501- SECTION H -MORNINGSIDE DRIVE TO COUNTY ROAD 635 (PROJECT LENGTH - 2000')</i>	\$1,096,781	\$1,180,000
Total	\$3,322,570	\$3,350,000

CONSTRUCTION COST ESTIMATE
ROUTE 501- SECTION A - CARTERS LANE TO ROUTE 615 (PROJECT LENGTH - 1,787 FT)

VDOT CODE	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$20,000.00	1	\$20,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	9,000	\$108,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	270	\$21,600.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	3,200	\$4,800.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	290	\$20,010.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	1,200	\$100,800.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	3,600	\$9,000.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50		\$0.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	600	\$2,400.00

SUBTOTAL 1 \$296,610.00

DRAINAGE (8% OF SUBTOTAL 1) \$23,729.00

EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1) \$8,899.00

UTILITIES (10% OF SUBTOTAL 1) \$29,661.00

LANDSCAPING (5% OF SUBTOTAL 1) \$14,831.00

SUBTOTAL 2 **\$373,730.00**

CONTINGENCY (30% OF SUBTOTAL) \$112,119.00

TOTAL CONSTRUCTION COST **\$485,849.00**

DESIGN/ENGINEERING (15%) \$72,878.00

CONSTRUCTION INSPECTION (12%) \$58,302.00

RIGHT-OF-WAY \$40,000.00

TOTAL PROJECT COST (2012 Dollars) \$657,029.00

TOTAL PROJECT COST (2013 Dollars) \$676,739.87

TOTAL PROJECT COST (2014 Dollars) **\$697,042.07**

**CONSTRUCTION COST ESTIMATE
 ROUTE 501 - SECTION B - DAVIS LANE TO CHARLES LANE (PROJECT LENGTH -7920')**

VDOT CODE	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$20,000.00	1	\$20,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	22,000	\$264,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	1,200	\$96,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	14,100	\$21,150.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	1,300	\$89,700.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	5,200	\$436,800.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	16,000	\$40,000.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50		\$0.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	2,700	\$10,800.00

SUBTOTAL 1 **\$988,450.00**

DRAINAGE (8% OF SUBTOTAL 1) \$79,076.00
 EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1) \$29,654.00
 UTILITIES (10% OF SUBTOTAL 1) \$98,845.00
 LANDSCAPING (5% OF SUBTOTAL 1) \$49,423.00

SUBTOTAL 2 **\$1,245,448.00**

CONTINGENCY (30% OF SUBTOTAL) \$373,635.00

TOTAL CONSTRUCTION COST **\$1,619,083.00**

DESIGN/ENGINEERING (15%) \$242,863.00
 CONSTRUCTION INSPECTION (12%) \$194,290.00
 RIGHT-OF-WAY \$110,000.00

TOTAL PROJECT COST (2012 Dollars) **\$2,166,236.00**

TOTAL PROJECT COST (2013 Dollars) **\$2,231,223.08**

TOTAL PROJECT COST (2014 Dollars) **\$2,298,159.77**

**CONSTRUCTION COST ESTIMATE
 ROUTE 501- SECTION E - LAUGHLIN STREET TO 830' WEST (PROJECT LENGTH - 830')**

VDOT CODE	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$20,000.00	1	\$20,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	3,000	\$36,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	125	\$10,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	1,500	\$2,250.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	140	\$9,660.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	540	\$45,360.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	1,700	\$4,250.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50		\$0.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	300	\$1,200.00

SUBTOTAL 1 **\$138,720.00**

DRAINAGE (8% OF SUBTOTAL 1) \$11,098.00
 EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1) \$4,162.00
 UTILITIES (10% OF SUBTOTAL 1) \$13,872.00
 LANDSCAPING (5% OF SUBTOTAL 1) \$6,936.00

SUBTOTAL 2 **\$174,788.00**

CONTINGENCY (30% OF SUBTOTAL) \$52,437.00

TOTAL CONSTRUCTION COST **\$227,225.00**

DESIGN/ENGINEERING (15%) \$34,084.00
 CONSTRUCTION INSPECTION (12%) \$27,267.00
 RIGHT-OF-WAY \$20,000.00

TOTAL PROJECT COST (2012 Dollars) **\$308,576.00**

TOTAL PROJECT COST (2013 Dollars) **\$317,833.28**

TOTAL PROJECT COST (2014 Dollars) **\$327,368.28**

CONSTRUCTION COST ESTIMATE
ROUTE 501- SECTION G -COUNTY ROAD 910 TO MOLLIES CREEK ROAD (PROJECT LENGTH - 3500')

VDOT CODE	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$20,000.00	1	\$20,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	18,000	\$216,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	530	\$42,400.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	6,300	\$9,450.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	570	\$39,330.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	2,300	\$193,200.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	7,000	\$17,500.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50		\$0.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	1,200	\$4,800.00

SUBTOTAL 1**\$552,680.00**

DRAINAGE (8% OF SUBTOTAL 1)

\$44,215.00

EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1)

\$16,581.00

UTILITIES (10% OF SUBTOTAL 1)

\$55,268.00

LANDSCAPING (5% OF SUBTOTAL 1)

\$27,634.00

SUBTOTAL 2**\$696,378.00**

CONTINGENCY (30% OF SUBTOTAL)

\$208,914.00

TOTAL CONSTRUCTION COST**\$905,292.00**

DESIGN/ENGINEERING (15%)

\$135,794.00

CONSTRUCTION INSPECTION (12%)

\$108,636.00

RIGHT-OF-WAY

\$85,000.00

TOTAL PROJECT COST (2012 Dollars)

\$1,234,722.00

TOTAL PROJECT COST (2013 Dollars)

\$1,271,763.66

TOTAL PROJECT COST (2014 Dollars)**\$1,309,916.57**

**CONSTRUCTION COST ESTIMATE
 ROUTE 501- SECTION H -MORNINGSIDE DRIVE TO COUNTY ROAD 635 (PROJECT LENGTH - 2000')**

VDOT CODE	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$20,000.00	1	\$20,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	8,000	\$96,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	300	\$24,000.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	3,600	\$5,400.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	330	\$22,770.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	1,300	\$109,200.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	4,000	\$10,000.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50		\$0.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	700	\$2,800.00

SUBTOTAL 1 **\$300,170.00**

DRAINAGE (8% OF SUBTOTAL 1) \$24,014.00
 EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1) \$9,006.00
 UTILITIES (10% OF SUBTOTAL 1) \$30,017.00
 LANDSCAPING (5% OF SUBTOTAL 1) \$15,009.00

SUBTOTAL 2 **\$378,216.00**

CONTINGENCY (30% OF SUBTOTAL) \$113,465.00

TOTAL CONSTRUCTION COST **\$491,681.00**

DESIGN/ENGINEERING (15%) \$73,753.00
 CONSTRUCTION INSPECTION (12%) \$59,002.00
 RIGHT-OF-WAY \$40,000.00

TOTAL PROJECT COST (2012 Dollars) **\$664,436.00**

TOTAL PROJECT COST (2013 Dollars) **\$684,369.08**

TOTAL PROJECT COST (2014 Dollars) **\$704,900.15**

CONSTRUCTION COST ESTIMATE
ROUTE 501- SECTION I -COUNTY ROAD 686 TO MERRYMAN DRIVE (PROJECT LENGTH - 1500')

VDOT CODE	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	COST
00100	Mobilization	LS	\$20,000.00	1	\$20,000.00
00110	Clearing and Grubbing	LS	\$10,000.00	1	\$10,000.00
00120	Regular Excavation	CY	\$12.00	10,000	\$120,000.00
10636	Asphalt Concrete TY. SM-9.5D (Surface)	TON	\$80.00	230	\$18,400.00
12600	STD. Combination Curb & Gutter CG-6	LF	\$18.00		\$0.00
13320	Guardrail GR-2	LF	\$16.50		\$0.00
13346	Remove GR-7 Terminal	EA	\$190.00		\$0.00
14100	Removal Of Sidewalk And Entrance	SY	\$5.50		\$0.00
14120	Removal Of Combination Curb And Gutter	LS	\$4.50		\$0.00
14300	Cement Concrete Sidewalk 4"	SY	\$40.00		\$0.00
14414	Curb (CG-2)	LF	\$26.00		\$0.00
14440	Saw Cut Sidewalk	LF	\$1.90		\$0.00
14450	Saw Cut Curb, Gutter And Entrances	LF	\$1.80		\$0.00
16110	Emul. Aspht. Slurry Seal Type A	SY	\$1.50	2,700	\$4,050.00
16365	Asphalt Concrete TY. IM-19.0A (Subbase)	TON	\$69.00	250	\$17,250.00
16390	Asphalt Concrete TY. BM-25.0A (Base)	TON	\$84.00	980	\$82,320.00
24410	Demolition Of Pavement	SY	\$3.50		\$0.00
24600	Remove Existing Guardrail	LF	\$1.00		\$0.00
54032	TY. B CL VI Pavement Line Marking 4" (Yellow & White)	LF	\$2.50	3,000	\$7,500.00
54034	TY. B CL VI Pavement Line Marking 6" (White for Gore)	LF	\$3.50		\$0.00
54037	TY. B CL VI Pavement Line Marking 8" (White for Crosswalk)	LF	\$4.50		\$0.00
54038	TY. B CL VI Pavement Line Marking 12"	LF	\$5.50		\$0.00
54042	TY. B CL VI Pavement Line Marking 24" (White for Stop Line)	LF	\$5.00		\$0.00
54105	ERAD. Of Existing Pavement Markings	LF	\$0.50		\$0.00
54300	Pavement Message Mark Elong Arrow Single (Ty B Class VI) STR, L	EA	\$95.00		\$0.00
68315	Type A Milling (1 1/2" Depth)	SY	\$4.00	500	\$2,000.00

SUBTOTAL 1 **\$281,520.00**

DRAINAGE (8% OF SUBTOTAL 1) \$22,522.00
 EROSION & SEDIMENT CONTROL (3% OF SUBTOTAL 1) \$8,446.00
 UTILITIES (10% OF SUBTOTAL 1) \$28,152.00
 LANDSCAPING (5% OF SUBTOTAL 1) \$14,076.00

SUBTOTAL 2 **\$354,716.00**

CONTINGENCY (30% OF SUBTOTAL) \$106,415.00

TOTAL CONSTRUCTION COST **\$461,131.00**

DESIGN/ENGINEERING (15%) \$69,170.00
 CONSTRUCTION INSPECTION (12%) \$55,336.00
 RIGHT-OF-WAY \$40,000.00

TOTAL PROJECT COST (2012 Dollars) **\$625,637.00**

TOTAL PROJECT COST (2013 Dollars) **\$644,406.11**

TOTAL PROJECT COST (2014 Dollars) **\$663,738.29**



U.S. Route 501 Corridor Study
Campbell and Halifax Counties, VA