Route 8

CORRIDOR STUDY

November 2013

Prepared For:

VDOT

Prepared By:

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and Associates, Inc.

Route 8 Corridor Study

Montgomery County, Virginia

November 2013

Route 8:

I-81 Interchange (Exit 114) to Route 863/River Lane NW

Prepared for:

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TABLE OF CONTENTS

1. Introduction 1
1.1 Background 1
1.2 Purpose 1
1.3 Study Area 1
1.4 Project Team Members 1
2. Data Collection and Inventory 6
2.1 General Description of the Corridor 6
2.2 Physical Environment 7
2.3 Supplemental Field Data Collection 8
2.4 Planned Development 12
2.5 Other Relevant Planning Efforts 12
3. Existing Conditions (2012) 14
3.1 2012 Traffic Volumes 14
3.2 Level of Service 14
3.3 Queue Lengths 19
3.4 Crash Analysis 21
3.5 Transit 23
3.6 Bicycles and Pedestrians 23
4. Future Conditions 25
4.1 Future Traffic Growth Rate 25
4.2 Growth Rate Methodology 25
4.3 Future Traffic Volume Calculation 25
4.4 Future Roadway Network 25
4.5 Future 2035 Baseline and Proposed Conditions – Levels of Service 27
4.6 Queue Lengths 31
5. Recommendations 34
5.1 Short-Term Recommendations 34
5.2 Mid-Term Recommendations 37
5.3 Long-Term Recommendations 39
6. Planning Level Cost Analysis 45
6.1 Potential Funding Sources 45
6.2 Planning Level Costs 45
7. Public Involvement 48
7.1 Summary of Public Feedback from Citizen Information Meeting #1 48
7.2 Summary of Public Feedback from Citizen Information Meeting #2 51

TABLE OF FIGURES

Figure 1.1 – Study Area Map 2
Figure 1.2 – Corridor Location Map (1 of 3) 3
Figure 1.3 – Corridor Location Map (2 of 3) 4
Figure 1.4 – Corridor Location Map (3 of 3) 5
Figure 2.1 – Existing Zoning Map (1 of 3) 9
Figure 2.2 – Existing Zoning Map (2 of 3) 10
Figure 2.3 – Existing Zoning Map (3 of 3) 11
Figure 3.1 - 2012 Traffic Volumes 15
Figure 3.2 – 2012 Intersection LOS 18
Figure 3.3 – Corridor Crash Summary: Time of Day 21
Figure 3.4 – Corridor Crash Summary: Severity 22
Figure 3.5 – Route 8 Crash Histogram 24
Figure 4.1 – Future 2035 Traffic Volumes 26
Figure 4.2 – Future 2035 Baseline and Proposed LOS 30
Figure 5.1 – Existing Access Points in Riner 37
Figure 5.2 – Proposed Route 8 Cross Section 39
Figure 5.3 – Route 8 Proposed Recommendations (1 of 3) 42
Figure 5.4 – Route 8 Proposed Recommendations (2 of 3) 43
Figure 5.5 – Route 8 Proposed Recommendations (3 of 3) 44
Figure 7.1 – Areas of Congestion and Safety Concerns 48
Figure 7.2 – Questionnaire Respondents Interest in the Corridor 49
Figure 7.3 – Condition of Corridor Signage and Wayfinding 50
Figure 7.4 – Condition of Sidewalks, Pedestrian Accommodations, and Bicycle Accommodations 50
Figure 7.5 – Condition of Corridor Safety 50

Figure 7.6 – Desired Improvements along the Corridor 50
Figure 7.7 – Greatest Concern for the Future of the Corridor 50
Figure 7.8 – Public Opinion of Proposed Short-Term Recommendations 51
Figure 7.9 – Public Opinion of Proposed Mid-Term Recommendations 51
Figure 7.10 – Public Opinion of Proposed Long-Term Recommendations 52

TABLE OF TABLES

Table 2.1 – Study Corridor Speed Limits 6
Table 2.2 – Ball Bank Limiting Angle Criteria 7
Table 2.3 – Study Corridor Locations with Ball Bank Readings above 10° 7
Table 2.4 – Zoning Classification Key 7
Table 3.1 – Level of Service Definitions 14
Table 3.2 – Unsignalized Intersection Level of Service Criteria 16
Table 3.3 – Route 8 at Life Drive Existing Approach LOS Summary 16
Table 3.4 – Route 8 at Smith Creek Road Existing Approach LOS Summary 16
Table 3.5 – Route 8 at Childress Road Existing Approach LOS Summary 17
Table 3.6 – Route 8 at Meadow Creek Road Existing Approach LOS Summary 17
Table 3.7 – Route 8 at Dairy Road Existing Approach LOS Summary 17
Table 3.8 – Route 8 at Camp Carysbrook Road Existing Approach LOS Summary 17
Table 3.9 – HCM Two Lane Highway LOS Criteria 19
Table 3.10 – Existing Arterial Level of Service (Class I Two-Lane Highways) 19
Table 3.11 – Existing Arterial Level of Service (Class III Two-Lane Highways) 19
Table 3.12 – Route 8 at Life Drive Existing 95th Percentile Queue Lengths 20
Table 3.13 – Route 8 at Smith Creek Road Existing 95th Percentile Queue Lengths 20
Table 3.14 – Route 8 at Childress Road Existing 95th Percentile Queue Lengths 20
Table 3.15 – Route 8 at Meadow Creek Road 95th Percentile Queue Lengths 20
Table 3.16 – Route 8 at Dairy Road 95th Percentile Queue Lengths 20
Table 3.17 – Route 8 at Camp Carysbrook Road Existing 95th Percentile Queue Lengths 20
Table 3.18 – Crash Summary: Type of Crash 21
Table 4.1 – Turn Lane Warrant Analysis Summary 27
Table 4.2 – Route 8 at Life Drive Future 2035 Approach LOS Summary 28
Table 4.3 – Route 8 at Smith Creek Road Future 2035 Approach LOS Summary 28
Table 4.4 – Route 8 at Childress Road Future 2035 Approach LOS Summary 28
Table 4.5 – Route 8 at Meadow Creek Road Future 2035 Approach LOS Summary 29
Table 4.6 – Route 8 at Dairy Road Future 2035 Approach LOS Summary 29
Table 4.7 – Route 8 at Camp Carysbrook Road Future 2035 Approach LOS Summary 29
Table 4.8 – Route 8 at Meadow Creek Rd/Dairy Rd Future 2035 Proposed Realignment Approach LOS Summary 29
Table 4.9 – Future 2035 Arterial Level of Service (Class I Two-Lane Highways) 31
Table 4.10 – Future 2035 Arterial Level of Service (Class III Two-Lane Highways) 31
Table 4.11 – Route 8 at Life Drive Future 2035 95th Percentile Queue Lengths 32
Table 4.12 – Route 8 at Smith Creek Road Future 2035 95th Percentile Queue Lengths 32
Table 4.13 – Route 8 at Childress Road Future 2035 95th Percentile Queue Lengths 32
Table 4.14 – Route 8 at Meadow Creek Road Future 2035 95th Percentile Queue Lengths 33
Table 4.15 – Route 8 at Dairy Road Future 2035 95th Percentile Queue Lengths 33
Table 4.16 – Route 8 at Camp Carysbrook Road Future 2035 95th Percentile Queue Lengths 33
Table 4.17 – Route 8 at Meadow Creek Rd/Dairy Rd Future 2035 Realignment 95th Percentile Queue Lengths 33
Table 6.1 – Route 8 Proposed Recommendation Matrix 46

APPENDICES

Appendix A: Field Data A-1
Appendix B: Background Study Excerpts B-1
Appendix C: Turning Movement Count Data C-1
Appendix D: Synchro, SimTraffic, and HCS Outputs D-1
Appendix E: Collision Diagrams E-1
Appendix F: Mile Marker Maps F-1
Appendix G: Turn Lane Warrants G-1
Appendix H: Public Involvement H-1

1. INTRODUCTION

1.1 Background

Virginia Department of Transportation (VDOT) in conjunction with Montgomery County and Town of Christiansburg identified the need to develop a corridor study for Route 8. This report, the Route 8 Corridor Study, documents the findings of the project team and presents the following information: data collection and inventory summaries; existing conditions analyses; future conditions analyses; development/analysis of the proposed improvements; and the final recommendations with the plan of action for the corridor. The Route 8 Corridor Study serves as a technical document which identifies future conditions and potential projects. The study will focus primarily on operations, access management, and safety. Capacity and congestion issues occur during traffic incidents on adjacent travel corridors (i.e. I-81); however, this study will focus on typical weekday operations.

1.2 Purpose

The purpose of this study is to examine the existing and future conditions along an approximately nine-mile section of Route 8 in Montgomery County, Virginia. The study identifies potential transportation improvement solutions along the corridor as well as assists VDOT, Montgomery County, Town of Christiansburg, New River Valley Planning District Commission (NRVPDC), and New River Valley Area Metropolitan Planning Organization (NRVMPO) staff in their discussions with property owners and developers as they convey future plans and projects for the corridor. The study will be used as a planning tool to manage growth and assess transportation network impacts created by regional influences internally and externally to the study corridor. The study links the issues of existing and future traffic demand, land use along the corridor, and the roadway network together, allowing the local planning agencies to make informed land use, transportation and economic development decisions. This study also provides an assessment of potential future transportation improvements, which helps identify the need for funding to support future anticipated growth along the corridor by both public and private funding streams. The study will describe the future vision for the corridor, supported by improvements to ensure the vision is achieved. Specifically, the intended outcomes of the study were to:

- Determine the safety and integrity of existing transportation infrastructure, including vehicular, bicycle, and pedestrian infrastructure
- Establish a long-term vision for the corridor
- Provide consensus-based future recommended improvements with prioritization and phasing to realize the vision

1.3 Study Area

The limits of the Route 8 corridor study are from the I-81 interchange (Exit 114) to the bridge over the Little River at the Montgomery/Floyd County line in Virginia. The section of Route 8 in the study area is an approximately nine-mile long, two-lane, undivided section of roadway with a general north/south orientation. In the study area, Route 8 is also referred to as Riner Road.

The following five intersections along Route 8 were identified as the study area intersections and analyzed herein. All of the study area intersections are unsignalized.

1. Route 8 at Life Drive (Route 1295)
2. Route 8 at Smith Creek Road (Route 675)
3. Route 8 at Childress Road (Route 693)
4. Route 8 at Meadow Creek Road (Route 658) & Dairy Road (Route 670)
5. Route 8 at Camp Carysbrook Road (Route 673)

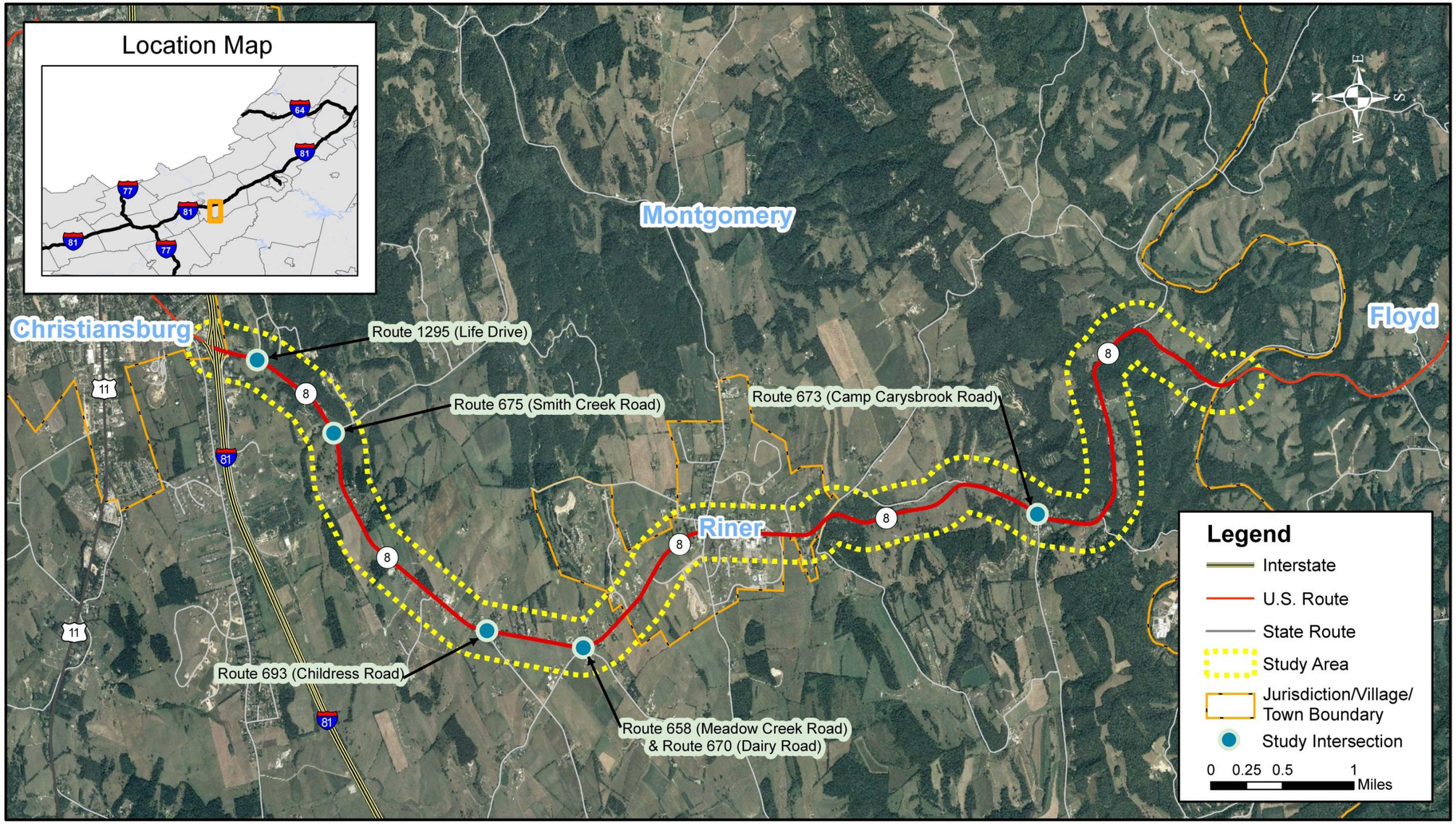
The study area boundary is shown in **Figure 1.1**. More detailed study area maps are provided in **Figure 1.2** through **Figure 1.4**. The Route 8 at Union Valley Road/Fairview Church Road intersection and Route 8 at the Auburn School entrances were not included as study area intersections as these intersections were studied as part of the Auburn School redevelopment project. The project developed detailed recommendations for these intersections, which are included in Section 2.4 and have been integrated into the recommended improvements of this report.

1.4 Project Team Members

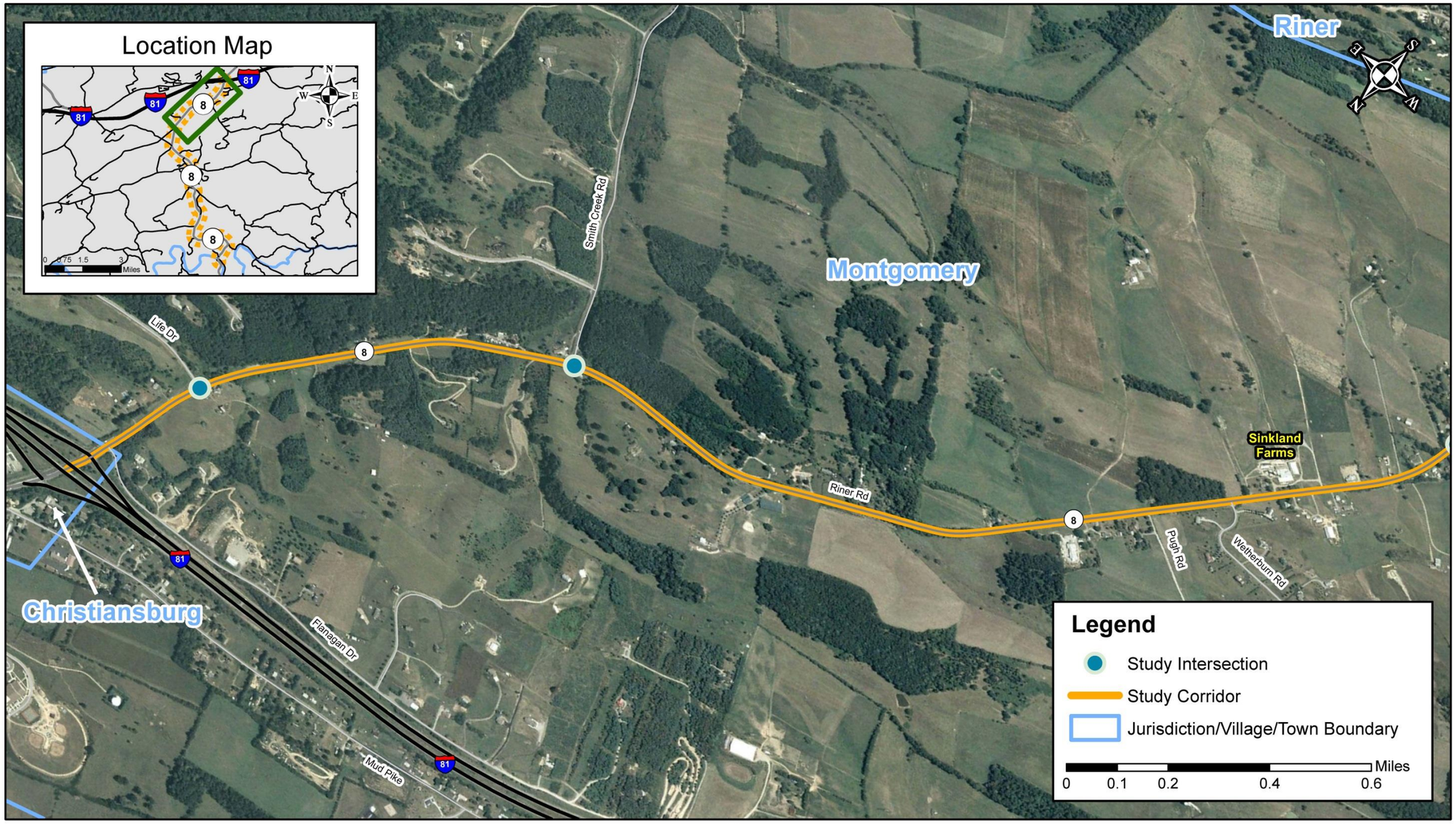
The Route 8 Corridor Study project team includes the following members:

- VDOT
- Montgomery County
- Town of Christiansburg
- NRVPDC
- NRVMPO
- Kimley-Horn and Associates

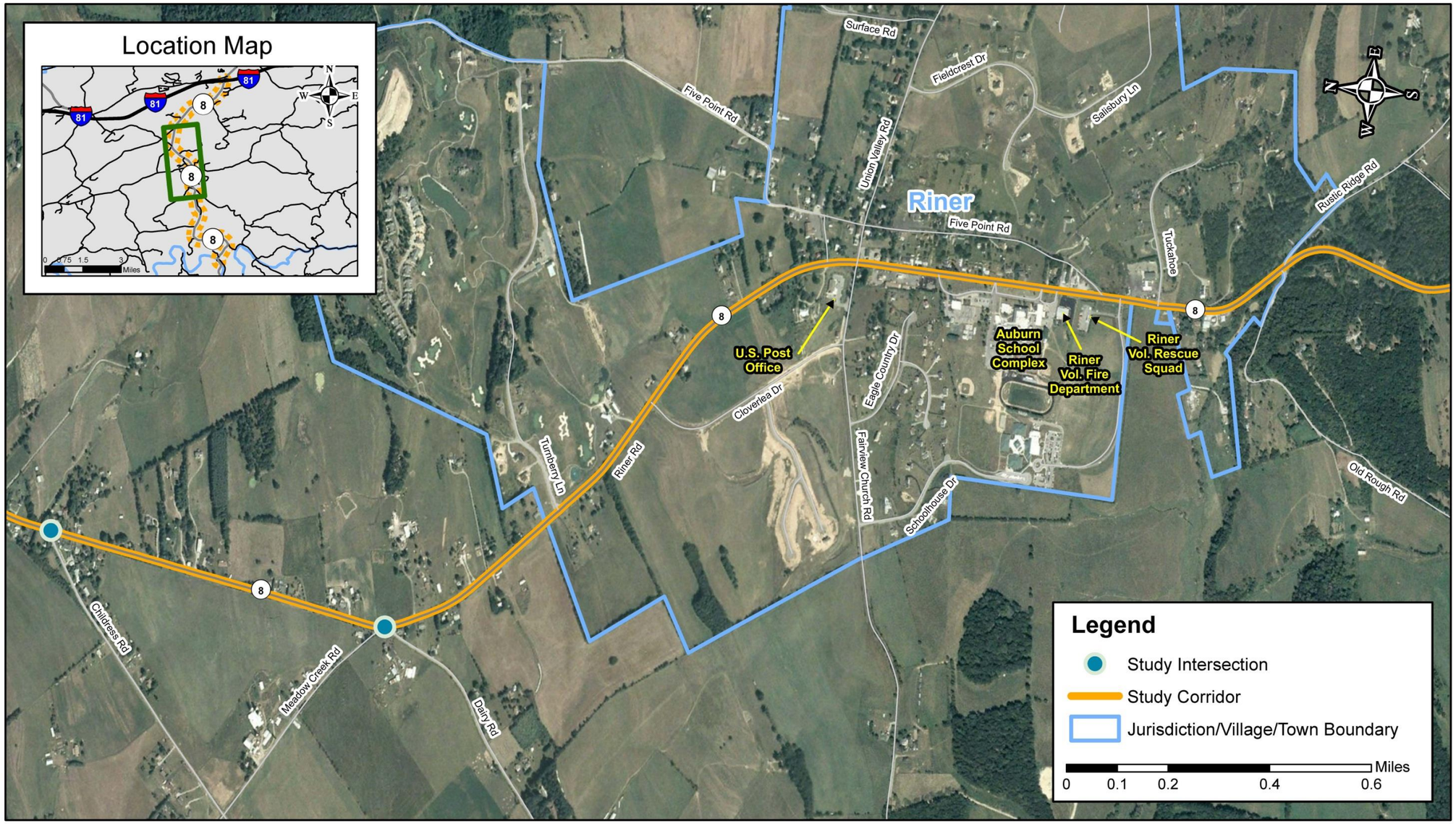
These individuals are referred to herein as the “Study Team”.



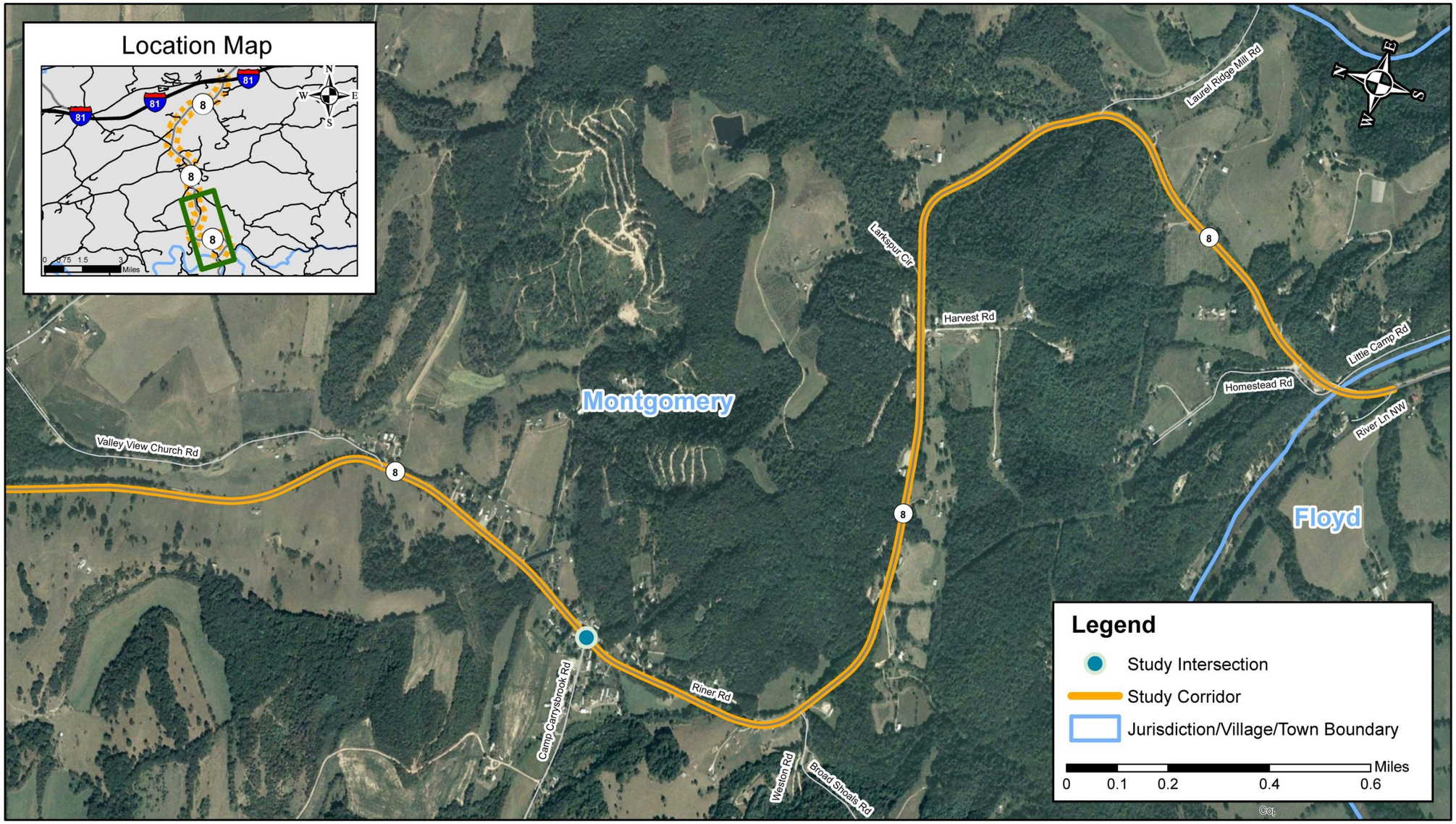
Route 8 Corridor Study	Study Area Map	Figure 1.1



Route 8 Corridor Study	Corridor Location Map	Figure 1.2



Route 8 Corridor Study	Corridor Location Map	Figure 1.3



Route 8 Corridor Study	Corridor Location Map	Figure 1.4

2. DATA COLLECTION AND INVENTORY

An inventory of existing roadway conditions was prepared along the study corridor and at the study area intersections based on a field review conducted on October 1, 2012. Traffic, crash, and Geographic Information System (GIS) data was provided by VDOT and Montgomery County and utilized to document existing conditions.

2.1 General Description of the Corridor

The study corridor is located within the jurisdiction of Montgomery County, adjacent to the Town of Christiansburg, and is generally oriented in a north/south direction. Observations from field reconnaissance of existing physical and operational conditions for the Route 8 corridor revealed that the corridor is a two-lane, undivided roadway in a rural setting with rolling terrain. Route 8 is classified as a Rural Minor Arterial according to VDOT's Montgomery County 2005 Functional Classification map.

All access points along the Route 8 study corridor are unsignalized. Exclusive turn lanes are not present at any of the five study area intersections but do exist at non-study area intersections within the Route 8 study corridor. Pedestrian facilities are relatively minimal to non-existent along the study corridor.

2.1.1 Roadway Section

Within the study area, Route 8 is a two-lane, undivided roadway. **Photograph 2.1** through **Photograph 2.4** show typical roadway sections at locations along the study corridor. Spot field measurements indicate lane width varying from 11 feet to 12 feet and paved shoulder width varying from zero to four feet.

Photograph 2.1 – Typical roadway section at Smith Creek Road (Southbound Direction)

Photograph 2.2 – Typical roadway section at Childress Road (Southbound Direction)

Photograph 2.3 – Typical roadway section at Dairy Road (Northbound Direction)

Photograph 2.4 – Typical roadway section at Camp Carysbrook Road (Northbound Direction)

2.1.2 Corridor Speed

The speed limit ranges from 45 miles per hour (MPH) to 55 MPH within the study corridor. **Table 2.1** provides further details on the speed limit changes. There is one school zone with a speed limit of 25 MPH when flashing for the Auburn School Complex, which contains the Auburn Elementary, Middle, and High School. The school zone extends from Fairview Church Road to Tuckahoe Drive. In addition, the Route 8 study corridor contains several horizontal curves with posted advisory speeds ranging from 35 MPH to 45 MPH.

Table 2.1 – Study Corridor Speed Limits

From	To	Speed Limit (MPH)
Northern Limit of Study Corridor	Auburn Baptist Church (South of Cloverlea Drive)	55
Auburn Baptist Church (South of Cloverlea Drive)	Old Rough Road (Route 616)	45
Old Rough Road	Southern Limit of Study Corridor	55

Spot speeds were collected along Route 8 at the intersection with Childress Road on October 1, 2012 for the 15-minute period from 4:35 PM to 4:50 PM. At this location the posted speed limit is 55 MPH in both the northbound and southbound travel directions. In the northbound direction, the average speed was 53 MPH and the 85th percentile speed was 55 MPH. In the southbound direction, the average speed was 50 MPH and the 85th percentile speed was 53 MPH. Refer to the **Appendix** for the complete spot speed data.

2.1.3 Ball Bank Readings

During the field review, the horizontal curves along the study corridor were investigated using a ball bank indicator. The VDOT standard ball bank limiting angle criteria based on the posted speed is summarized in **Table 2.2**. Locations along the study corridor with ball bank readings greater than ten degrees are documented in **Table 2.3**. On Route 8, the curve near Larkspur Circle and the curve near Laurel Ridge Mill Road exceed the ball bank limiting angle criteria when traveling in the southbound and northbound directions, respectively.

Table 2.2 – Ball Bank Limiting Angle Criteria

Posted Speed (MPH)	Ball Bank Limiting Angle (degrees)
0-24	16
25-34	14
35-49	12
50+	10

Source: VDOT Traffic Engineering Division Memorandum (TE-363)

Table 2.3 – Study Corridor Locations with Ball Bank Readings above 10°

Curve Location	Inventory of Existing Curve Warning Signs w/Advisory Speed Plaques	Ball Bank Reading	Below Ball Bank Limiting Angle
Route 8 Southbound			
Near Old Rough Road	W1-4 Curve Warning Sign w/ 45 MPH Advisory Speed	11°-13°	Yes
Near Larkspur Circle	W1-5 Curve Warning Sign w/ 35 MPH Advisory Speed	14°-16°	No
Near Laurel Ridge Mill Road	W1-2 Curve Warning Sign w/ 35 MPH Advisory Speed	13°-15°	Yes
Route 8 Northbound			
Near Laurel Ridge Mill Road	W1-2 Curve Warning Sign w/ 35 MPH Advisory Speed	16°-18°	No
Near Larkspur Circle	Chevrons Along Curve - No Advisory Speed Posted	13°-15°	N/A
Near Valley View Church Road	W1-5 Curve Warning Sign w/ 45 MPH Advisory Speed	11°-13°	Yes

2.2 Physical Environment

A comprehensive review of available data pertaining to the existing and planned physical environment along the Route 8 corridor was conducted; where possible, the data was obtained in ESRI-compatible format. The obtained published and electronic data and reports were used to document existing and planned conditions in the study area. This review included the following information which was provided by VDOT and Montgomery County:

1. Digital aerial photography
2. GIS data
   - Montgomery County GIS data included property lines, zoning boundaries, and comprehensive plan land use
   - VDOT GIS data included roads, jurisdiction boundaries, and bodies of water
3. Local transportation planning studies

Zoning and parcel information is included in **Figure 2.1** through **Figure 2.3**. A zoning classification key is provided in **Table 2.4**.

Along Route 8 the predominant land use is agricultural. There is an area with a concentration of residential and commercial properties in Riner. In addition, Auburn Elementary, Middle, and High Schools and Riner Volunteer Fire Department and Rescue Squads are located in the study area south of the Route 8 and Fairview Church Road/Union Valley Road (Route 669) intersection. Sinkland Farms is located just north of Childress Road and occasionally holds events throughout the year with a capacity of more than 300 guests. CrossPointe Conference Center is located on Life Drive and holds conferences, seminars, retreats, and weddings with a capacity of approximately 200 guests.

Table 2.4 – Zoning Classification Key

ZONE	DESCRIPTION
Town of Christiansburg	
A	Agricultural
B1	Limited Business
B2	Central Business
B3	General Business
I1	Limited Industrial
I2	General Industrial
MU-1	Mixed Use: Residential-Limited Business
MU-2	Mixed Use: Residential-Limited, Business-Limited Industrial
R-1A	Rural Residential
R1	Single Family Residential
R2	Two-Family Residential
R3	Multi-Family Residential
Montgomery County	
A1	Agricultural
C1	Conservation
CB	Community Business
GB	General Business
M1	Manufacturing
ML	Manufacturing Light
PIN	Planned Industrial
PMR	Planned Mobile Home Residential
PUDCOM	Planned Unit Development Commercial
PUDRES	Planned Unit Development Residential
R1	Residential
R2	Residential
R3	Residential
R3C	Residential (Compact)
RM1	Multi-Family Residential
RR	Rural Residential
RRC	Rural Residential (Compact)

2.3 Supplemental Field Data Collection

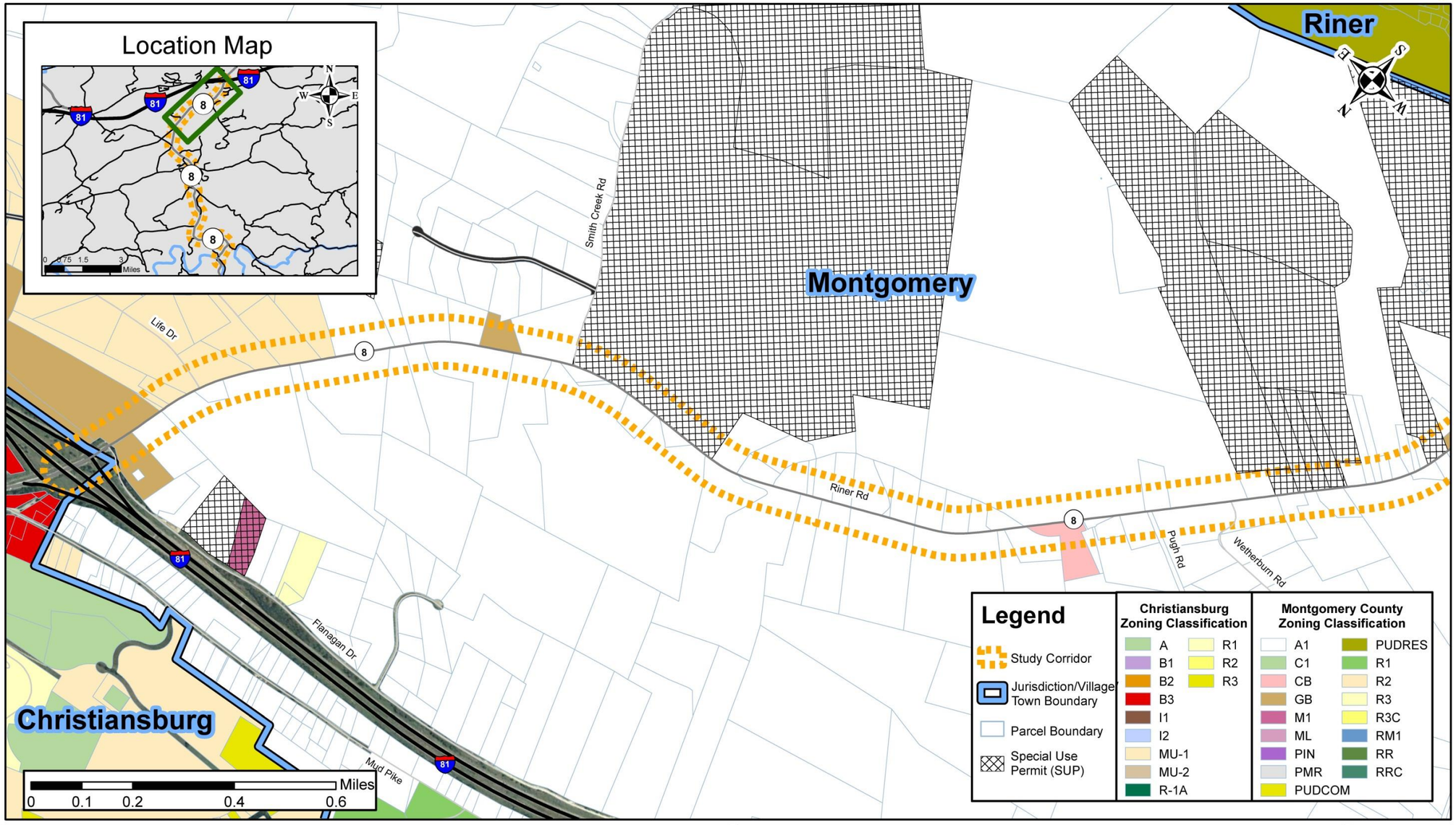
A field inventory of the corridor was conducted in October 2012 to augment and verify some of the aforementioned data. This review was limited to visual verification of the following information:

- Intersection traffic control and roadway geometry (including signs)
- Street cross section (number of lanes, lane width, edge treatment, median treatment, presence of turn lanes, surface)
- Sidewalks, bikeways, medians, and crosswalks
- Bridges
- Curb and gutter/shoulder treatment
- Turn lanes (length and location)
- Lighting
- Guardrail
- Current land use and development
- Business names

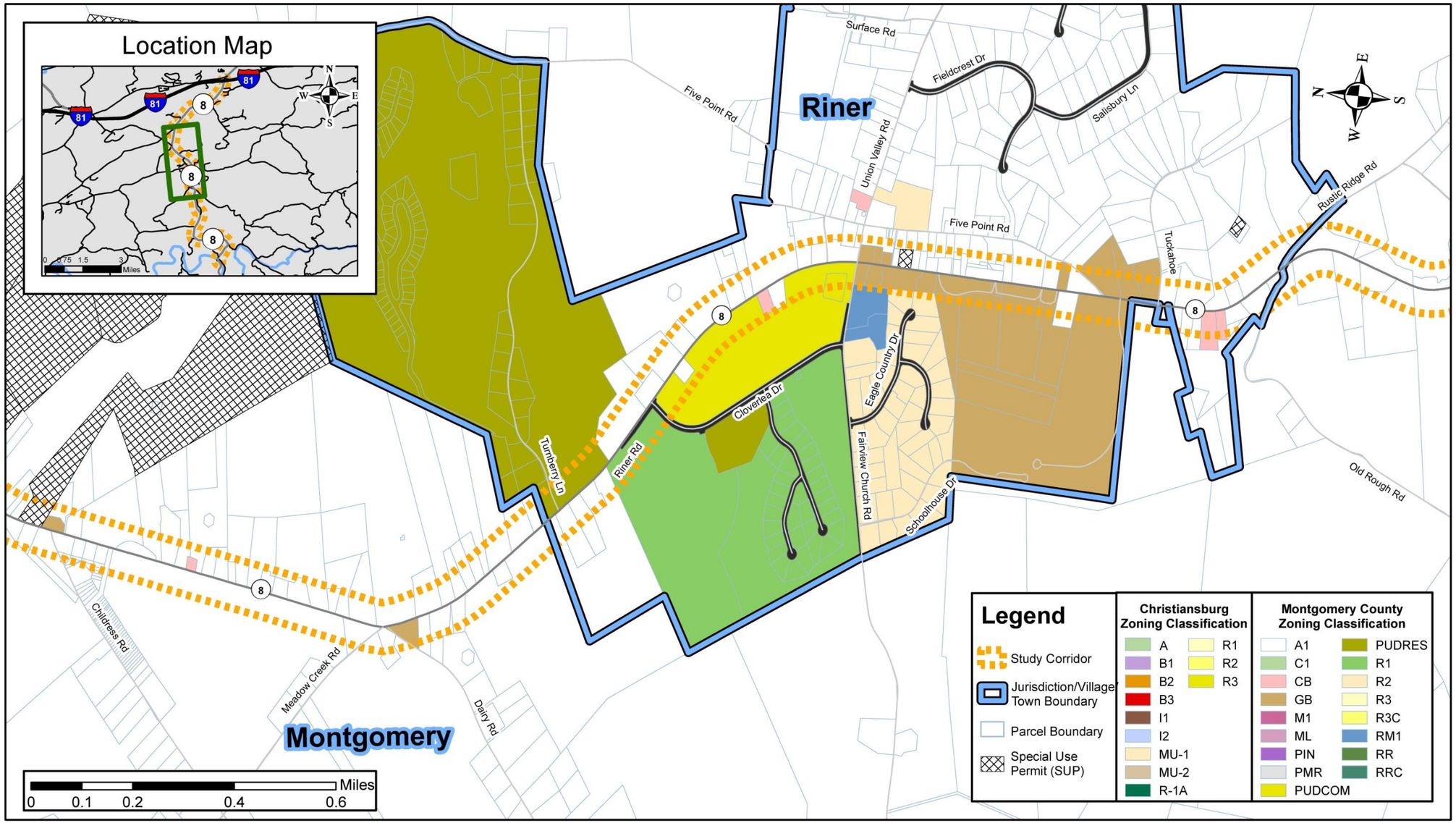
During the field inventory, visual observations were noted regarding the operations of automobile, pedestrian and bicycle traffic. Field data related to cross-sections and roadway geometry at the study area intersections is summarized in the **Appendix**.

2.3.1 Corridor Signing

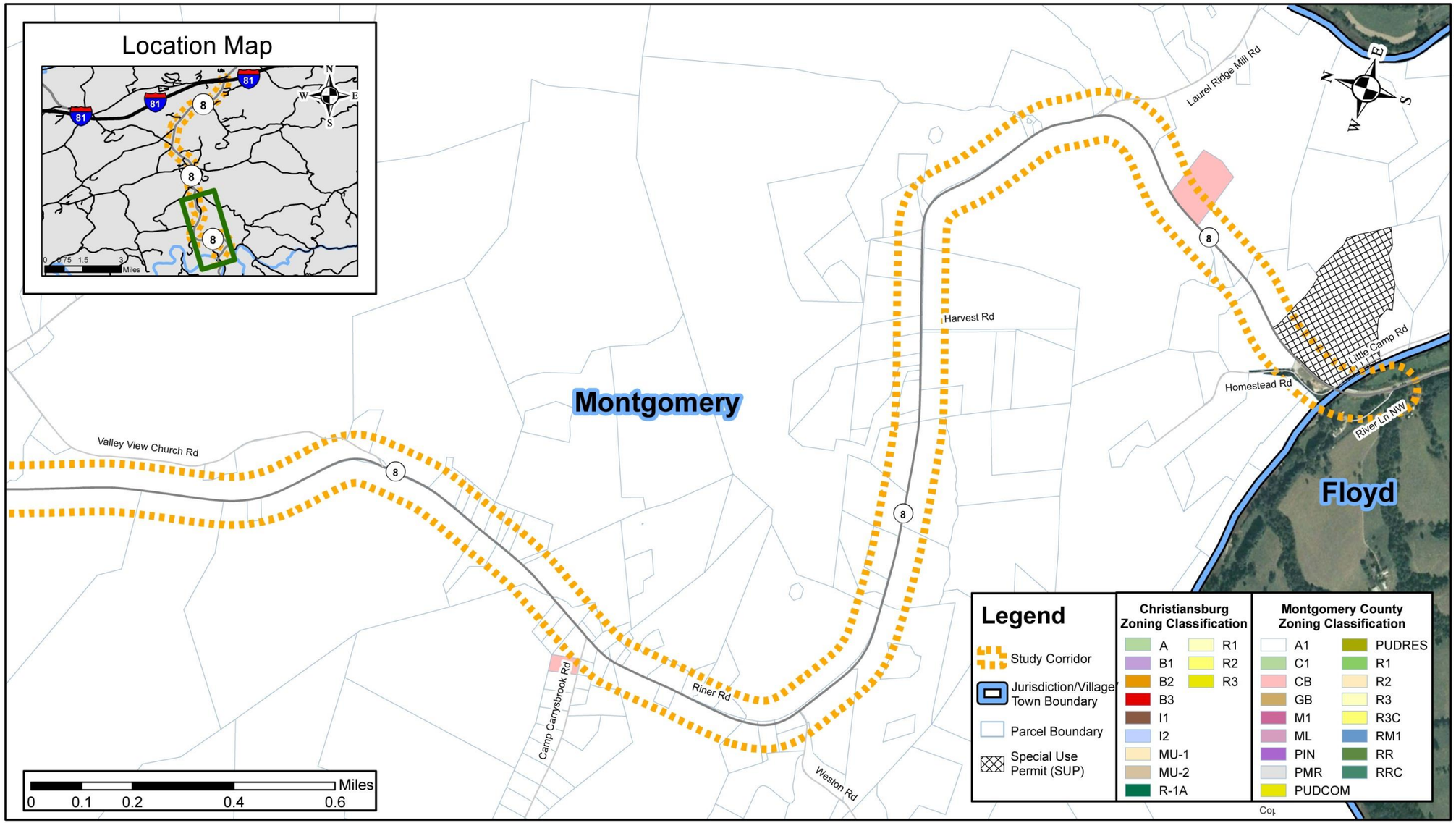
A speed limit change, multiple advisory speed zones, and several warning signs exist throughout the southern half of the corridor (south of Cloverlea Drive, approximately 5 miles). For this reason, an inventory of speed limit and warning signs was conducted on the subject section of the corridor. The multiple warning signs have caused this section of the corridor to become cluttered which can result in signs to be ignored by travelers. Maps showing the approximate location of the existing warning signs and speed limit signs within this section of Route 8 are included in the Appendix.



Route 8 Corridor Study	Existing Zoning Map	Figure 2.1



Route 8 Corridor Study	Existing Zoning Map	Figure 2.2



Route 8 Corridor Study

Existing Zoning Map

Figure 2.3

2.4 Planned Development

Based on discussions with the Project Team, the following two approved but unbuilt developments were identified within the vicinity of the study area:

- Auburn School Complex
- Cloverlea Subdivision

The following sections provide a brief overview of the approved but unbuilt development and identify associated roadway improvements with each development.

2.4.1 Auburn School Complex

The Auburn school complex includes the Elementary, Middle, and High Schools along with associated athletic facilities. Based on a review of the Auburn Area Schools Traffic Impact Analysis (prepared by Anderson & Associates, Inc., dated May 13, 2011), a new high school will be constructed, the existing high school will be remodeled/expanded to serve as the middle school, and the existing middle school will be demolished. The redevelopment is expected to be completed in 2013. The new high school opened in August 2013. The traffic impact analysis recommends the following access to the redeveloped Auburn school complex:

- Abandon the existing full movement access to the middle school (approximately 850' south of the Route 8 and Fairview Church Road/Union Valley Road intersection)
- Existing full movement access to the middle school and high school is proposed to service the future middle school (approximately 1,450' south of the Route 8 and Fairview Church Road/Union Valley Road intersection)
- Abandon the existing full movement access to the high school (approximately 1,900' south of the Route 8 and Fairview Church Road/Union Valley Road intersection)
- Abandon the existing full movement access to the high school (approximately 2,050' south of the Route 8 and Fairview Church Road/Union Valley Road intersection)
- Existing full movement access to the elementary school will service the future high school and existing elementary school

The traffic impact analysis recommends the following roadway improvements.

- Route 8 at Fairview Church Road/Union Valley Road
  - Left-turn lanes on the northbound and southbound Route 8 approaches (as part of a VDOT Six-Year Improvement Project)
- Route 8 at Proposed Middle School Access
  - Left-turn lane on northbound Route 8
  - Right-turn lane on southbound Route 8
- Route 8 at Existing Elementary/Proposed High School Access
  - Left-turn lane on northbound Route 8
  - Maintain existing right-turn lane on southbound Route 8
  - Monitor intersection to determine if additional traffic control is justified

2.4.2 Cloverlea Subdivision – Phase 2

The Cloverlea Subdivision is located west of Cloverlea Drive and north of Fairview Church Road with a total of about 95 acres. The subject property is zoned Planned Unit Development Residential (PUD-R) and is permitted to have a total of 100 dwelling units, split between three phases. The first phase has been platted for a total of 31 lots. The parcel east of Cloverlea Drive, north of Fairview Church Road, and west of Route 8 is zoned Planned Unit Development –Commercial (PUD-Com). This parcel does not have a specific approved but unbuilt development at this time.

2.5 Other Relevant Planning Efforts

Several relevant planning efforts were previously completed within the vicinity of the study corridor. A brief summary of these efforts and how they relate to the Route 8 corridor study are offered below.

2.5.1 Riner Village Plan

The Riner Village Plan – Montgomery County (2025) was adopted on June 25, 2007. The purpose of this plan is to guide development in the village while maintaining the village's distinct identity. Based on the Riner Village Survey, the following primary issues were identified: transportation growth, school related issues, and the lack of community amenities, activities and entertainment. The Route 8 traffic concerns included the level of traffic in the morning, the difficultly of turning onto Route 8, the Fairview Church/Union Valley intersection, and the Dairy Road intersection. The plan assumes Riner will continue to grow over the next 25 years at just over 1% per year annually. Although Riner has experienced growth, the growth has been controlled through good planning and management and has maintained a sense of a rural village feel. The plan developed several policies to guide future planning and preserve Riner in accordance with the Riner Village Plan Policies. Policies applicable to the Route 8 corridor and transportation in general are included in the Appendix and have been taken into account throughout the development of this plan.

2.5.2 Village Transportation Links Plan

The Village Transportation Links Plan: Final Report – Montgomery County was adopted on June 25, 2007. The purpose of this plan is to develop a comprehensive Bicycle, Pedestrian, and Greenways Master Plan for each village identified in the Montgomery County Comprehensive Plan. The goals of the plan include: connecting activities/spaces within villages, strengthening a sense of place in each village, improving connections to schools, connecting to regional trails, resources, and intermodal facilities, and leveraging public/private funding opportunities. The study points out much of the undeveloped land in Riner is platted for subdivision lots and once developed will triple the size of the community. A few of the main issues identified in the plan include: safe crossings on Route 8, pedestrian and bicycle improvements, sidewalks within the Historic District, and connectivity to food store, subdivision, schools, etc. The plans concept primarily focuses on incorporating bicycle and pedestrian accommodations along Route 8 with sidewalks and paved shoulders. The plan also recommends constructing a roundabout at the Route 8 and Union Valley Road/Fairview Church Road intersection along with bicycle and

pedestrian accommodations as a traffic calming measure on Route 8. Excerpts from the Village Transportation Links Plan are included in the Appendix and include specific recommendations for Riner which have been taken into account throughout the development of this corridor study.

2.5.3 The Virginia School Travel Plan – Auburn Campus

The Virginia School Travel Plan – Auburn Campus, dated November 16, 2012 was developed as a safe routes to school plan for the Auburn Elementary and Auburn Middle Schools located on the Auburn school campus. The purpose of the plan is to ensure all students can utilize "physically active transportation," such as biking or walking, for a safe and enjoyable trip to school. Through the plans public input process, it is shown that nearly all students transport to and from school via school bus or family vehicle. Auburn Elementary School has a currently policy that strongly recommends students do not walk or bike to school due to existing safety concerns and a lack of proper facilities. The plan lists the following high priority barriers to walking and biking to school: drop off and pick up congestion, insufficient sidewalks difficult/dangerous intersections, major roadway dividing residents and school, and dangerous driving and speeding vehicles. The primary goal of the plan is to improve the safety of biking and walking students, while also increasing the number of students biking and walking to school. The plan uses education, encouragement, enforcement, evaluation, and engineering strategies to address the existing barriers. An excerpt map of the proposed infrastructure improvements along with an Action Plan are included in the Appendix and have been taken into account throughout the development of this corridor study. As a result of the safe routes to school plan, a grant application was submitted in January 2013, to fund the construction of bicycle and pedestrian improvements.

2.5.4 VDOT Six-Year Improvement Program

Through a review of the VDOT Six-Year Improvement Program (SYIP), the following roadway improvements were identified within the study area:

- Route 8 – construct left-turn lanes at Route 669 (Union Valley Road/Fairview Church Road) – UPC 96069. This project has a current advertisement date scheduled for August 2015, with an estimated cost of $1.77 million.

3. EXISTING CONDITIONS (2012)

A thorough understanding of the 2012 Existing Conditions (referred to herein as "Existing Conditions") in the Route 8 corridor required that detailed field observations be completed in the early stages of the project, prior to completing the analyses. The existing conditions analyses were developed using the data collection discussed in the previous chapter of this report, as well as visual observations of the operational characteristics. This chapter of the report describes the analysis of the existing traffic, transit, and pedestrian/bicycle conditions within the corridor. The intent of the quantitative and qualitative analyses was to provide a starting point for improvements with more of an emphasis placed on future conditions analysis and mitigation strategies.

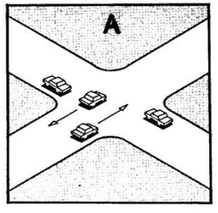
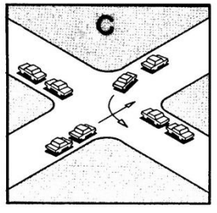
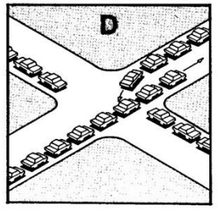
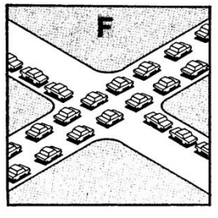
3.1 2012 Traffic Volumes

Collection of existing Turning Movement Count (TMC) data was conducted between the hours of 6:30 AM to 8:30 AM and 3:00 PM to 6:00 PM on Tuesday, May 22, 2012 at the five study area intersections. The 2012 AM and PM peak hour volumes at the study area intersections are summarized in **Figure 3.1**. The AM and PM peak hours of each study area intersection are also displayed on the figure. Complete TMC data is included in the **Appendix**. Based on the 2011 VDOT published traffic volume data, the approximate annual average daily traffic (AADT) volume on Route 8 is 9,600 vehicles per day (VPD) north of Meadow Creek Road and 8,700 VPD south of Meadow Creak Road.

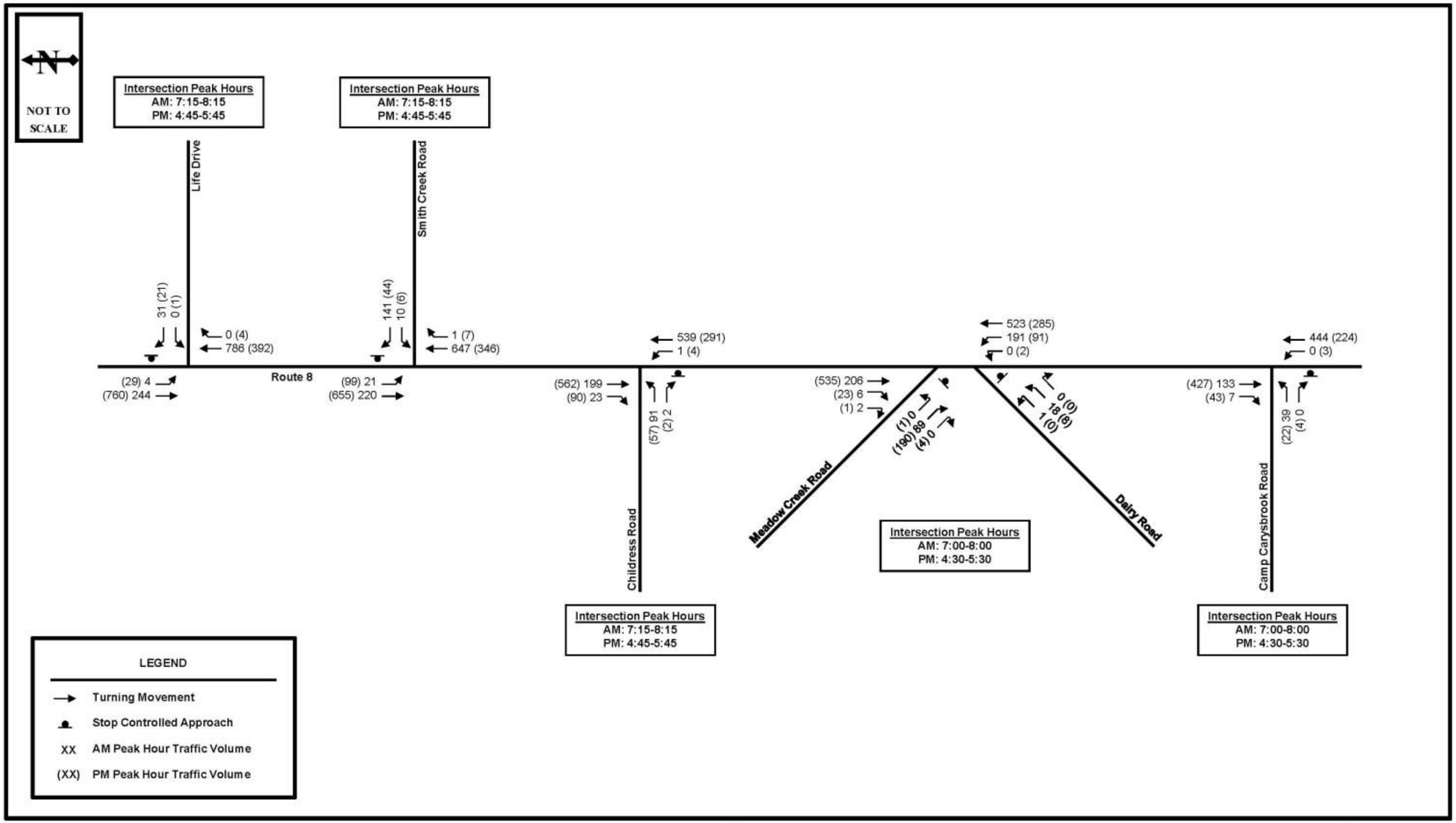
3.2 Level of Service

Capacity analyses allow traffic engineers to assess the operational conditions and identify the impacts of traffic on the surrounding roadway network. The Transportation Research Board's (TRB) *Highway Capacity Manual* (HCM) methodologies govern the methodology for evaluating capacity and the quality of service provided to road users traveling through a roadway network. There are six letter grades for Levels of Service (LOS) ranging from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. **Table 3.1** shows in detail how each of these levels of service are interpreted.

Table 3.1 – Level of Service Definitions

LOS	Roadway Segments or Controlled Access Highways	
A	Free flow, low traffic density	
B	Delay is not unreasonable, stable traffic flow	
C	Stable condtion, movements somewhat restricted due to higher volumes, but not objectionable for motorists	
D	Movements more restricted queues and delays may occur during short peaks, but lower demands occur often enough to permit clearing, thus preventing excessive backups.	
E	Actual capacity of the roadway involves delay to all motorists due to congestion.	
F	Forced flow with demand volumes greater than capacity resulting in complete congestion. Volumes drop to zero in extreme cases.	

Source: A Policy on Design of Urban Highways and Arterial Streets – AASHTO, 1973 based upon material published in Highway Capacity Manual, National Academy of Sciences, 1965



Route 8 Corridor Study | Existing (2012) Traffic Volumes | Figure 3.1

3.2.1 Intersection Level of Service

Intersection level of service is defined in terms of delay (seconds per vehicle), a measure of driver discomfort, frustration, fuel consumption, and lost travel time. **Table 3.2** summarizes the delay associated with each unsignalized intersection LOS category.

Table 3.2 – Unsignalized Intersection Level of Service Criteria

LOS	Intersection Delay (sec/veh)
	Unsignalized
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 – 35
E	>35 – 50
F	>50

Source: Transportation Research Board, Highway Capacity Manual 2000

The five study area intersections, all unsignalized, were anlyzed using SYNCHRO Version 7 based on methodologies in the HCM 2000. Intersection TMC data was used in conjunction with existing geometric data to determine the existing LOS. For the analysis, the following assumptions were made:

- 12- foot lane widths
- No bus stops
- No conflicting pedestrian or bicycle traffic
- Heavy vehicle percentages from TMC data with the following adjustments:
  - Minimum 2% heavy vehicle percentage for all approaches
- Peak hour factor (PHF) from TMC data with the following adjustments:
  - Minimum Peak Hour Factor (PHF) of 0.85 for all approaches

Table 3.3 through **Table 3.8** summarize the delay and associated approach LOS for each of the study area intersections. Due to the nontraditional configuration of the Meadow Creek Road and Dairy Road intersection with Route 8 and the limitations of SYNCHRO, it was necessary to analyze this intersection as two separate intersections. For that reason, the analysis results are presented in separate tables for Meadow Creek Road and Dairy Road. For movements without conflicting volumes, such as the major street's through and right turn movements at a two-way, stop-controlled intersection, an assocaited delay or LOS is not reported by SYNCHRO. **Figure 3.2** shows the LOS of each individual lane group as well as the overall approach LOS for all study area intersections. The corresponding SYNCHRO output sheets are included in the **Appendix**.

As shown in **Figure 3.2**, all of the study area intersection lane groups and overall approaches operate at a LOS C or better during the AM and PM peak hours. In addition, mainline Route 8 (lane group and overall approaches) operates at a LOS A during the AM and PM peak hours at all study area intersections. LOS A through LOS D are generally considered satisfactory based on standard traffic enginnering practice.

Table 3.3 – Route 8 at Life Drive Existing Approach LOS Summary

Peak Hour	Approach	Delay (sec/veh)	LOS
Intersection: Route 8 and Life Drive			
AM	Westbound - Life Drive	17.4	C
	Northbound - Route 8	†	†
	Southbound - Route 8	0.2	A
PM	Westbound - Life Drive	11.5	B
	Northbound - Route 8	†	†
	Southbound - Route 8	0.7	A

† SYNCHRO does not provide level of service or delay for movements with no conflicting volumes.

Table 3.4 – Route 8 at Smith Creek Road Existing Approach LOS Summary

Peak Hour	Approach	Delay (sec/veh)	LOS
Intersection: Route 8 and Smith Creek Road			
AM	Westbound - Smith Creek Road	21.4	C
	Northbound - Route 8	†	†
	Southbound - Route 8	1.1	A
PM	Westbound - Smith Creek Road	12.9	B
	Northbound - Route 8	†	†
	Southbound - Route 8	2.1	A

† SYNCHRO does not provide level of service or delay for movements with no conflicting volumes.

Table 3.5 – Route 8 at Childress Road Existing Approach LOS Summary

Peak Hour	Approach	Delay (sec/veh)	LOS
Intersection: Route 8 and Childress Road			
AM	Eastbound - Childress Road	21.6	C
	Northbound - Route 8	0.0	A
	Southbound - Route 8	†	†
PM	Eastbound - Childress Road	20.8	C
	Northbound - Route 8	0.2	A
	Southbound - Route 8	†	†

† SYNCHRO does not provide level of service or delay for movements with no conflicting volumes.

Table 3.6 – Route 8 at Meadow Creek Road Existing Approach LOS Summary

Peak Hour	Approach	Delay (sec/veh)	LOS
Intersection: Route 8 and Meadow Creek Road			
AM	Southeastbound - Meadow Creek Road	10.3	B
	Northbound - Route 8	3.9	A
	Southbound - Route 8	†	†
PM	Southeastbound - Meadow Creek Road	17.2	C
	Northbound - Route 8	3.0	A
	Southbound - Route 8	†	†

† SYNCHRO does not provide level of service or delay for movements with no conflicting volumes.

Table 3.7 – Route 8 at Dairy Road Existing Approach LOS Summary

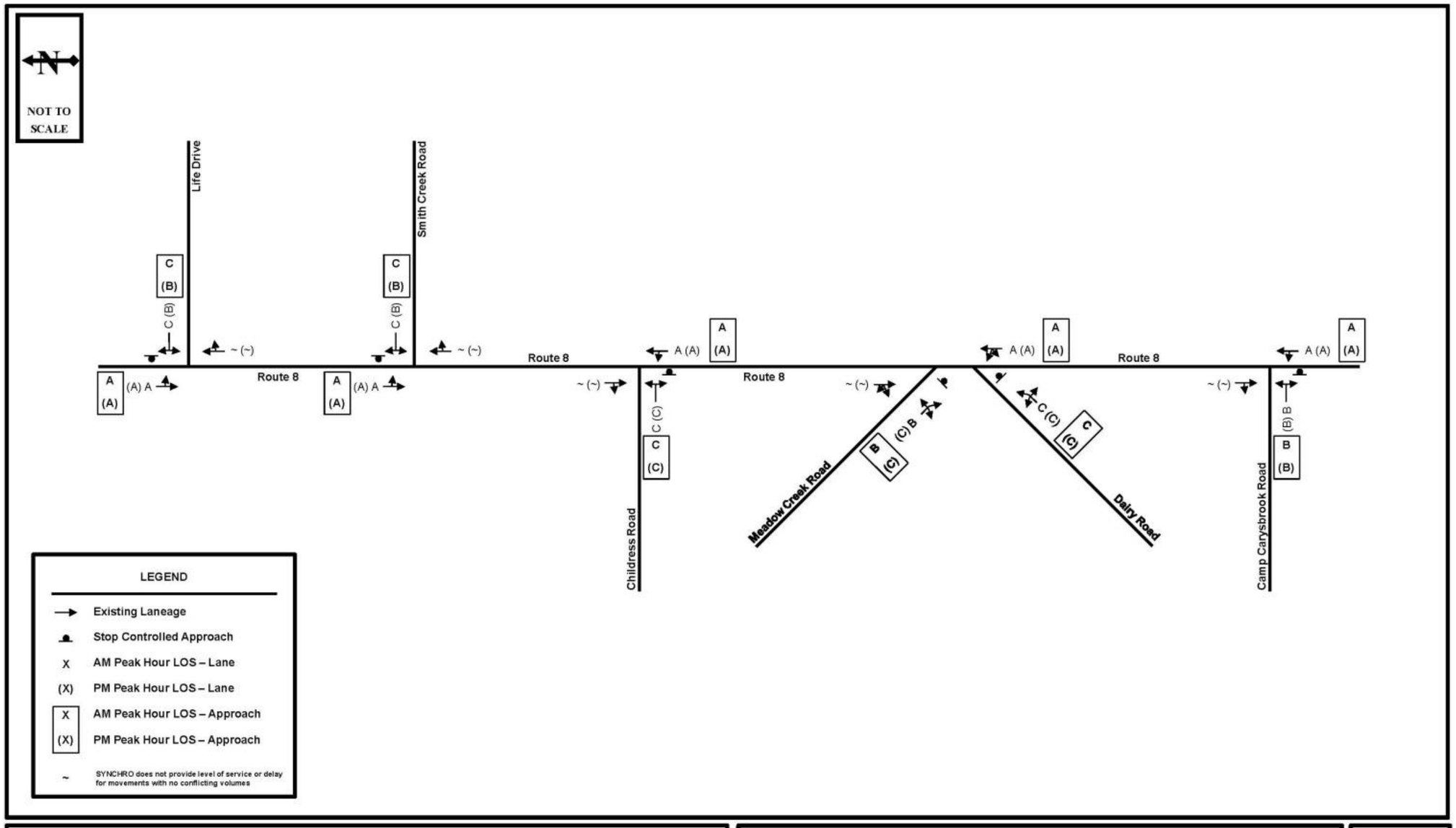
Peak Hour	Approach	Delay (sec/veh)	LOS
Intersection: Route 8 and Dairy Road			
AM	Northeastbound - Dairy Road	24.5	C
	Northbound - Route 8	0.0	A
	Southbound - Route 8	†	†
PM	Northeastbound - Dairy Road	23.2	C
	Northbound - Route 8	0.1	A
	Southbound - Route 8	†	†

† SYNCHRO does not provide level of service or delay for movements with no conflicting volumes.

Table 3.8 – Route 8 at Camp Carysbrook Road Existing Approach LOS Summary

Peak Hour	Approach	Delay (sec/veh)	LOS
Intersection: Route 8 and Camp Carysbrook Road			
AM	Eastbound - Camp Carysbrook Road	14.8	B
	Northbound - Route 8	0.0	A
	Southbound - Route 8	†	†
PM	Eastbound - Camp Carysbrook Road	14.5	B
	Northbound - Route 8	0.1	A
	Southbound - Route 8	†	†

† SYNCHRO does not provide level of service or delay for movements with no conflicting volumes.



Route 8 Corridor Study | Existing (2012) Intersection LOS | Figure 3.2

3.2.2 Arterial Link Levels of Service

For two-lane highways, LOS is defined by the HCM in terms of percent time spent following (the average percent of total travel time that vehicles must travel in platoons behind slower vehicles due to the inability to pass on a two-lane highway) and average travel speed. The HCM defines three classes of two-lane highways based on driver expectations, functional classification, length of trip (long or short), purpose of trip (commuting or sight-seeing/recreation), and development of the surrounding area.

Class I two-lane highways generally serve commuter traffic that travel long distances at high speeds. For Class I two-lane highways, LOS is determined for both average travel speed (ATS) and percent of time spent following (PTSF). The overall LOS for a Class I two-lane highway is taken as the worse of the two LOS values.

Class II two-lane highways largely function as sight-seeing or recreational routes. Drivers on Class II two-lane highways typically are traveling at lower speeds and for shorter distances than those on Class I two-lane highways. LOS for Class II two-lane highways is only based on the PTSF.

Class III two-lane highways can have characteristics of both Class I and Class II two-lane highways but are located in more developed areas with higher traffic volumes and more frequent access points. The LOS on a Class III two-lane highway is dependent on the percent of free flow speed (PFFS).

LOS ranges from A to F, where LOS A indicates a condition of little or no congestion and LOS F indicates a condition of severe congestion, unstable traffic flow, and stop-and-go conditions. LOS A through LOS D are generally considered satisfactory based on standard traffic engineering practice. **Table 3.9** summarizes the LOS criteria for all three two-lane highway classifications.

Table 3.9 – HCM Two Lane Highway LOS Criteria

LOS	Class I Highways		Class II Highways	Class III Highways
	ATS (mi/h)	PTSF (%)	PTSF (%)	PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50-55	>35-50	>40-55	>83.3-91.7
C	>45-50	>50-65	>55-70	>75.0-83.3
D	>40-45	>65-80	>70-85	>66.7-75.0
E	≤40	>80	>85	≤40
F	Volume to capacity ratio (v/c) ≥1.0			

Source: Transportation Research Board, *Highway Capacity Manual 2010*

The following three locations along the Route 8 study corridor were analyzed for arterial LOS:

1. Half-mile roadway segment centered on Life Drive intersection (Class I)
2. One-mile roadway segment from Cloverlea Drive to Tuckahoe Drive through the town of Riner (Class III)
3. Half-mile roadway segment centered on Camp Carysbrook Road (Class I)

Highway Capacity Software (HCS) 2010, a traffic analysis tool based on the theory of the HCM, was used to analyze two-lane arterial LOS at the three locations along the study corridor. Inputs to HCS came from data collected in the field and TMC data. In addition, a rolling terrain was assumed for all three locations. The analysis direction was taken as the travel direction with the higher volume. At all three analysis locations, the analysis direction for the AM peak hour was northbound and the analysis direction for the PM peak hour was southbound. The arterial link LOS during the AM and PM peak hours are summarized in **Table 3.10** and **Table 3.11** for Class I and Class III segments, respectively. Arterial analysis for Route 8 indicates that the corridor operates at a LOS D or better at all of the analyzed segment locations except for the roadway segment centered around Life Drive, which operates at a LOS E during both the AM and PM peak hours.

Table 3.10 – Existing Arterial Level of Service (Class I Two-Lane Highways)

Time of Day	Analysis Direction	Volume to Capacity Ratio	Average Travel Speed (mi/h)	Percent Time Spent Following (%)	LOS
Life Drive Area					
AM	Northbound	0.57	45.7	92.6	E
PM	Southbound	0.49	46.7	84.9	E
Camp Carysbrook Road Area					
AM	Northbound	0.33	48.8	72.1	D
PM	Southbound	0.30	48.7	71.4	D

Table 3.11 – Existing Arterial Level of Service (Class III Two-Lane Highways)

Time of Day	Analysis Direction	Volume to Capacity Ratio	Average Travel Speed (mi/h)	Percent Free-Flow Speed (%)	LOS
Cloverlea Drive to Tuckahoe Drive					
AM	Northbound	0.51	34.3	73.3	D
PM	Southbound	0.46	34.7	74.2	D

3.3 Queue Lengths

Queue lengths, or the distance at which stopped vehicles accumulate at an intersection were calculated. Queue length is another performance indicator of the intersection's operational characteristics. Large or lengthy queues may be indicative of capacity or operational issues such as needed turn lane, which helps in the identification of potential solutions. A 95th percentile queuing analysis was completed for the study area intersections under both AM and PM peak hour existing conditions. SYNCHRO plus SimTraffic Version 7 was used to perform a 60-minute simulation for the analyses. The 95th percentile queue length, measured in feet, represents the queue length with a five percent probability of being exceeded during the analysis time period. A summary of the 95th percentile queue lengths for each of the study area intersection lane groups is presented in **Table 3.12** through **Table 3.17**. As previously discussed, Meadow Creek Road and Dairy Road were analyzed as two separate intersections due to the limitations of SYNCHRO. The 95th percentile queue lengths reported on northbound and southbound Route 8 at Meadow Creek Road and Dairy Road are the sum of the Meadow Creek Road and Dairy Road queue lengths as a result of the closely spaced intersections. For movements without conflicting volumes, no queue length is reported by SimTraffic. Exclusive turn lanes are not provided at any of the five study area intersections. Based on the existing 95th percentile queue lengths, queues do not exceed 125 feet (or approximately five vehicles) with the exception of the following approaches:

- Meadow Creek Road approach to Route 8 during the PM peak hour (227 foot queue)
- Dairy Road approach to Route 8 during the AM peak hour (196 foot queue)
- Northbound Route 8 approach to Dairy Road during the AM peak hour (227 foot queue)
- Northbound Route 8 approach to Dairy Road during the PM peak hour (164 foot queue)

All queues greater than five vehicles in length occur at the closely spaced intersections of Meadow Creek Road and Dairy Road. The supporting SimTraffic output sheets are included in the **Appendix**.

Table 3.12 – Route 8 at Life Drive Existing 95th Percentile Queue Lengths

Lane Group	95th Percentile Queue Length (Ft)	
	AM Peak Hour	PM Peak Hour
Intersection: Route 8 and Life Drive		
WBLR	52	48
NBTR	~	~
SBLT	8	50

~SimTraffic does not report Queue Length on movements with no conflict.

Table 3.13 – Route 8 at Smith Creek Road Existing 95th Percentile Queue Lengths

Lane Group	95th Percentile Queue Length (Ft)	
	AM Peak Hour	PM Peak Hour
Intersection: Route 8 and Smith Creek Road		
WBLR	87	44
NBTR	~	~
SBLT	49	116

~SimTraffic does not report Queue Length on movements with no conflict.

Table 3.14 – Route 8 at Childress Road Existing 95th Percentile Queue Lengths

Lane Group	95th Percentile Queue Length (Ft)	
	AM Peak Hour	PM Peak Hour
Intersection: Route 8 and Childress Road		
EBLR	58	49
NBLT	~	~
SBTR	~	~

~SimTraffic does not report Queue Length on movements with no conflict.

Table 3.15 – Route 8 at Meadow Creek Road 95th Percentile Queue Lengths

Lane Group	95th Percentile Queue Length (Ft)	
	AM Peak Hour	PM Peak Hour
Intersection: Route 8 and Meadow Creek Road		
SEBLR	83	227
NBLT	See NBLT at Dairy Road	
SBTR	7	28

Table 3.16 – Route 8 at Dairy Road 95th Percentile Queue Lengths

Lane Group	95th Percentile Queue Length (Ft)	
	AM Peak Hour	PM Peak Hour
Intersection: Route 8 and Dairy Road		
NEBLR	196	29
NBLT	227	164
SBTR	See SBTR at Meadow Creek Road	

Table 3.17 – Route 8 at Camp Carysbrook Road Existing 95th Percentile Queue Lengths

Lane Group	95th Percentile Queue Length (Ft)	
	AM Peak Hour	PM Peak Hour
Intersection: Route 8 and Camp Carysbrook Road		
EBLR	44	36
NBLT	~	~
SBTR	~	~

~SimTraffic does not report Queue Length on movements with no conflict.

3.4 Crash Analysis

Crash analysis for the study corridor was conducted using the latest three years of available crash data. Crash reports dating from January 1, 2009 to December 31, 2011 were obtained from VDOT. Over the three year time period, 150 total crashes were reported in the study area.

- In 2009 there were **46** reported crashes along the study corridor.
- In 2010 there were **56** reported crashes along the study corridor.
- In 2011 there were **48** reported crashes along the study corridor.

3.4.1 Corridor-Wide Crash Trends

Crash Type

The most predominant crash types in the study corridor are rear-end, fixed object – off road, angle, and deer crashes. A summary of the corridor crashes by type is provided in **Table 3.18**.

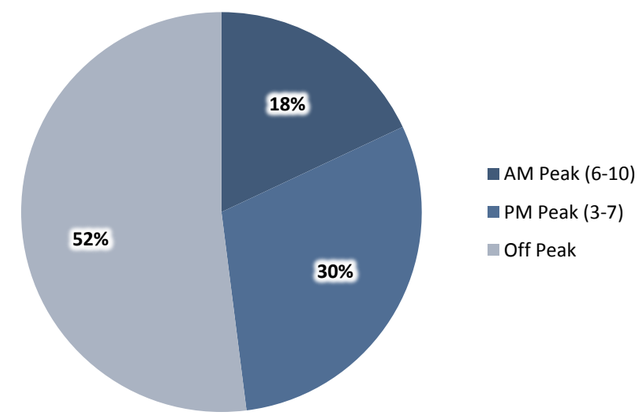
Table 3.18 – Crash Summary: Type of Crash

Crash Type	Number of Crashes
Rear End	39 (26%)
Fixed Object - Off Road	34 (23%)
Angle	26 (17%)
Deer	25 (17%)
Head On	6 (4%)
Sideswipe - Opposite Direction	5 (3%)
Other Animal	4 (3%)
Other	4 (3%)
Sideswipe - Same Direction	3 (2%)
Non-Collision	2 (1%)
Object - In Road	1 (1%)
Pedestrian	1 (1%)

Time of Day

Within the limits of the study corridor, 72 crashes or approximately half of the total crashes occurred during the AM and PM peak periods. The majority of the peak period crashes (approximately 63 percent of peak hour crashes) occurred during the PM peak period. A summary of the corridor crashes by time of day is provided in **Figure 3.3**.

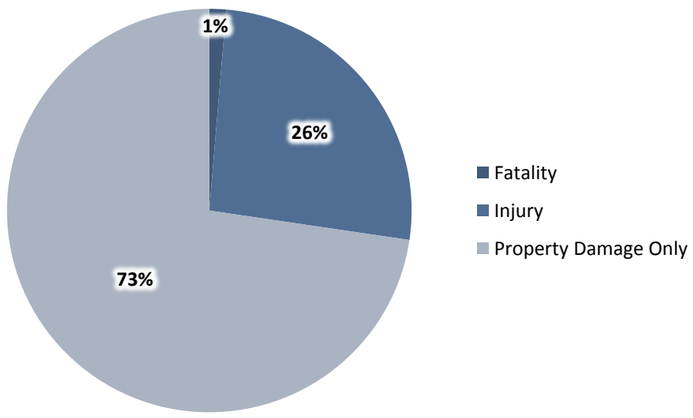
Figure 3.3 – Corridor Crash Summary: Time of Day



Severity

Within the limits of the study corridor, fatal (2) and injury (39) crashes accounted for approximately 27 percent of the reported crashes. The remaining 73 percent of the crashes were property damage only (PDO). A summary of crashes by severity is shown in **Figure 3.4**.

Figure 3.4 – Corridor Crash Summary: Severity



There were two fatal crashes reported along the study corridor. The first fatal crash on Route 8 occurred in 2010 at 5:50 PM at the Camp Carysbrook intersection. The crash was a rear-end collision involving a pick-up truck and a motorcycle. The pick-up truck was stopped, waiting to make a left turn onto Camp Carysbrook Road. The driver of the motorcycle lost control and struck the pick-up truck in the rear. The crash occurred in clear weather, on a dry roadway surface, and in daylight.

The second fatal crash occurred in 2010 at 11:58 AM at the intersection of Route 8 and Union Valley Road. The crash was an angle collision involving two vehicles. A vehicle traveling west on Union Valley Road ran through a stop sign and struck the driver's side of the vehicle traveling southbound on Route 8. The crash occurred in clear weather, on a dry roadway surface, and in daylight.

3.4.2 Study Area Intersection Crashes

At each of the five study area intersections, collision diagrams were prepared to document crashes occurring between January 1, 2009, and December 31, 2011. The following list provides the total number of crashes that occurred at each study area intersection during the three year period. The collision diagrams containing detailed crash information can be found in the Appendix.

- Route 8 at Life Drive – 11 total crashes with the following recurring crash patterns and safety issues:
  - Five crashes (45%) were rear-end crashes on the southbound approach. Based on field observations, vehicles traveling southbound on Route 8 at Life Drive are traveling at high speeds after exiting I-81 and continuing to travel at a high rate of speed. Sufficient sight distance is provided at the subject intersection. One of the rear-end crashes was identified as an injury crash.
  - Five crashes (45%) were animal in roadway crashes (all five animal in roadway crashes were collisions with deer and occurred within a two year period). According to the VDOT Traffic Engineering Memorandum TE-369.0 (dated 12/1/2011), Deer Crossing Warning (W11-3) signs should be installed when there are five or more deer crashes over two years in a mile long segment when the speed limit is greater than 45 MPH. The Deer Crossing Warning sign criterion is met at the subject intersection and should be considered for installation.
- Route 8 at Smith Creek Road – 7 total crashes with the following recurring crash patterns and safety issues:
  - Although this intersection has limited sight distance, no recurring crash patterns were identified.
  - Two crashes were angle crashes with vehicles turning in/out of Smith Creek Road., One of these crashes resulted with an injury. With limited sight distance at the subject intersection, crash patterns should be monitored to determine if a pattern of crashes develops for which mitigation measures are warranted.
- Route 8 at Childress Road – 5 total crashes with the following recurring crash patterns and safety issues:
  - Three crashes (60%) were rear-end crashes. One of these crashes resulted in an injury. Although sufficient sight distance is provided at this intersection, the commercial property directly across Route 8 from Childress Road has a continuous, undefined wipe-down access across the frontage of the property. This condition can lead to confusion with drivers being unaware at which point vehicles will turn in/out of the site.
  - Two crashes (40%) were angle crashes involving vehicles turning in/out of Childress Road.
- Route 8 at Meadow Creek Road & Dairy Road – 0 total crashes
- Route 8 at Camp Carysbrook Road – 8 total crashes with the following recurring crash patterns and safety issues:
  - Three crashes (38%) were animal in roadway crashes.
  - Two crashes (25%) were out of control crashes with one vehicle striking a house and the other striking a tree. Two crashes (25%) were vehicles that ran off the road and struck a sign north of Camp Carysbrook Road.
  - As stated previously, one fatal crash occurred at the subject intersection.
  - The subject intersection has limited sight distance and is located just north of an existing horizontal and vertical curve on Route 8. This location should be monitored to determine if a pattern of crashes develops for which mitigation measures are warranted.

3.4.3 Crash Hot Spots

Crash activity by half-mile segments of roadway, or crash density, along the Route 8 study corridor is shown in **Figure 3.5**. A critical crash density, defined as the average crash density plus two standard deviations, was determined to be 18.4 crashes per half-mile. Segments with more crashes than the critical crash density were considered to be crash "hot spots." One hot spot was identified along the study corridor.

Hot Spot 1 – Route 8 (Mile Marker 45.6 to 46.1)

The hot spot is located at the northern end of the study corridor. The segment extends from I-81 to approximately a quarter-mile south of Life Drive. There were 24 reported crashes over the three year analysis period in this half-mile segment. The 24 reported crashes are summarized in the following list:

- Crash Type
  - Eight angle, seven rear end, five deer, one other animal, one fixed object-off road, one fixed object – in road, and one "other"
- Severity
  - Four crashes were injury crashes with the remaining 20 crashes being property damage only
- Location
  - Four of the crashes were located within the immediate vicinity of the I-81/Route 8 On- and Off-Ramps
  - Remaining 20 crashes were located south of the I-81 frontage road Flanagan Drive
- Year and Time of Day
  - Ten crashes occurred in 2009, nine crashes in 2010, and five crashes in 2011
  - Twelve crashes occurred during the AM and PM peak hours

See Section 3.4.2 for additional information regarding the crashes that occurred at the Route 8 and Life Drive intersection.

3.4.4 Other Crash Locations

Crash activity was analyzed at other identified locations along the Route 8 study corridor to determine if the predominate crash type could be attributed to existing roadway conditions (horizontal and vertical curves and high density of access). Maps with mile marker information are provided in the Appendix.

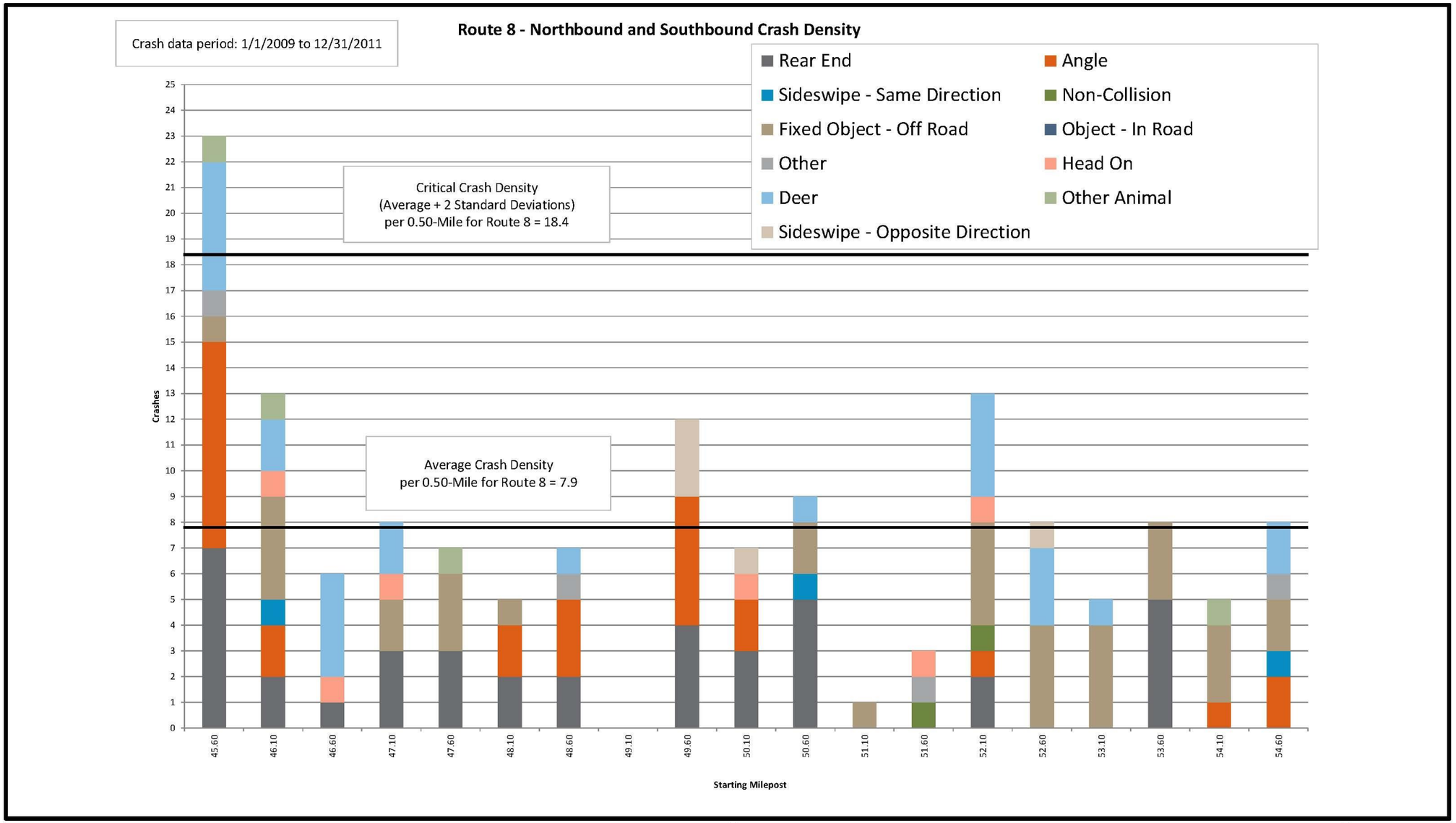
- Curve at Broad Shoals Road (Mile Marker 52.7 – 52.9)
  - Five crashes occurred within this horizontal and vertical curve section, two of which can be attributed to the roadway alignment. One was a fixed object – off road crash, and one was a sideswipe – opposite direction crash.
  - The remaining three (60%) crashes were animal in roadway, all of which were deer,
  - No injuries were associated with the five crashes at this location.
- Curve at Larkspur Circle (Mile Marker 53.6 – 53.8))
  - Five crashes occurred within this horizontal and vertical curve section, four (80%) of which can be attributed to the roadway alignment. All four were fixed object – off road crashes.
  - The remaining one crash was a rear-end.
  - Two (40%) of the five crashes resulted in injuries.
- Curve at Laurel Ridge Mill Road (Mile Marker 54.0 – 54.2)
  - Five crashes occurred within this horizontal and vertical curve section, one that can be attributed to the roadway alignment. One crash was a fixed object – off road.
  - Three (60%) of the five crashes were rear-end and one was an animal in roadway.
  - Two (40%) of the five crashes resulted in injuries.
- Route 8 through Riner (Mile Marker 49.8 – 50.6)
  - 18 crashes occurred within this high density of access section, all of which can be attributed to a dense area of access. Of the 18 crashes, seven (39%) were angle, seven (39%) were rear-end, three (17%) were sideswipe – opposite direction, and one was a head on collision.
  - Angle and head on collisions are typically more severe in nature, which holds true for this section with five injury and one fatal crash.

3.5 Transit

No transit service currently exists in the study area; therefore, an existing conditions analysis of transit operations was not performed as part of this study.

3.6 Bicycles and Pedestrians

No bicycle or pedestrian accommodations currently exist in the study area. Other than a random individual or bicyclist observed along the corridor, there were no patterns of these user types being often or predominant. The facility serves almost exclusively motorized vehicles.



Route 8 Corridor Study	Bidirectional Crash Density	Figure 3.5

4. FUTURE CONDITIONS

The Route 8 Corridor Study included the collection of existing roadway geometry, existing intersection geometry, traffic volume data (existing and future), crash data, and public input. This information was examined to analyze future conditions and develop recommended improvements. The recommended short-, mid-, and long-term multimodal improvements identified in the following chapter of this study are intended to provide the Project Team with a long-term vision for the corridor that can be supported on a regional basis. The study will assist these agencies in continuing to manage planned growth along the corridor, quantify the associated transportation impacts, update existing area plans (i.e., Riner Village Plan, etc.), and strategically implement the necessary improvements along and adjacent to the Route 8 corridor. This chapter provides a summary of two future analyses scenarios, one taking into account no roadway improvements (Future 2035 Baseline) and one taking into account recommended roadway improvements (Future 2035 Proposed), each being analyzed with projected 2035 traffic volumes. The two analysis scenarios were conducted to establish a baseline condition to compare with the Route 8 roadway improvement recommendations (presented in Chapter 5).

4.1 Future Traffic Growth Rate

When planning ahead to address the future needs of a transportation network, it is important to project the level of traffic that is anticipated during the horizon planning years. Historical traffic growth trends (as identified in VDOT's Statewide Planning System (SPS)), traffic from planned and/or approved development(s), and population growth rates as extracted from studies performed in the vicinity of the study area all play key roles in the development of traffic volume projections. The purpose of developing annualized traffic growth is to accurately project the increase in traffic volumes due to usage increases and non-specific growth throughout the area. For example, an increase in socio-economic activity generally equates to an increase in the use of transportation facilities, which results in more vehicles (e.g., personal vehicles, commercial vehicles, trucks and/or transit vehicles) on the surrounding roadway network.

The annualized growth rates were then applied to existing turning movement traffic volumes to develop future traffic volume projections that were generally consistent with existing traffic patterns while taking into account anticipated future traffic conditions. The traffic volume projection effort and the associated future conditions analysis provides the basis for determining necessary future corridor and intersection improvements. This section of the report outlines the process and methodology used to develop future traffic volume projections within the Route 8 corridor study area.

4.2 Growth Rate Methodology

Various traffic-related data resources were referenced and compared to develop annualized growth rates for future traffic projections. For this study, the following resources were used.

- Historic traffic volumes as obtained from VDOT's Statewide Planning System (SPS)
    - Based on a review of historic traffic volumes, the Route 8 corridor has grown at approximately 1.6 to 2.0% over the last 20 years. However, over the last couple years the traffic growth on Route 8 has been relatively flat, likely due in part to the economy.
- Projected traffic and population growth rates as identified in the following studies:
    - Riner Village Plan – the Riner Village Plan anticipates the population growth over the next 25 years will continue at slightly more than 1%.
    - Auburn Schools Traffic Impact Analysis – a background growth rate of 0.5% was used in the analysis

Based on a review of the traffic related data resources identified above, discussions with the Project Team, and engineering judgment, an annualized growth rate of 1.0% was selected for mainline Route 8. An annualized growth rate of 0.5% was selected for the side streets at each study area intersection as the side streets are anticipated to develop (build out) at a slower rate than mainline Route 8 which provides a connection between Floyd County and I-81. These growth rates provide a conservative approach to developing future traffic volume projections.

4.3 Future Traffic Volume Calculation

The growth rates developed were applied to Existing 2012 turning movement counts to develop future traffic volume projections for detailed analysis of the study corridor. Mainline Route 8 through traffic volumes (northbound and southbound) were grown at 1.0% compounded annually for 23 years to develop 2035 future traffic volumes. A 1.0% growth rate compounded annually results in a total increase of approximately 26% over the defined 23 year period (2012 to 2035). Side street turning movement volumes to/from Route 8 were grown at 0.5% compounded annually for 23 years to develop 2035 future traffic volumes. A 0.5% growth rate compounded annually results in a total increase of approximately 12% over the defined 23 year period (2012 to 2035). Projected future 2035 AM and PM peak hour traffic volumes at the study area intersections are summarized in **Figure 4.1**. Future AADT volumes were projected based on the 2011 VDOT published traffic volume data using a 1% growth rate compounded annually as identified above. Future 2035 Route 8 AADT volumes are projected to be 12,200 VPD north of Meadow Creek Road and 11,000 VPD south of Meadow Creek Road.

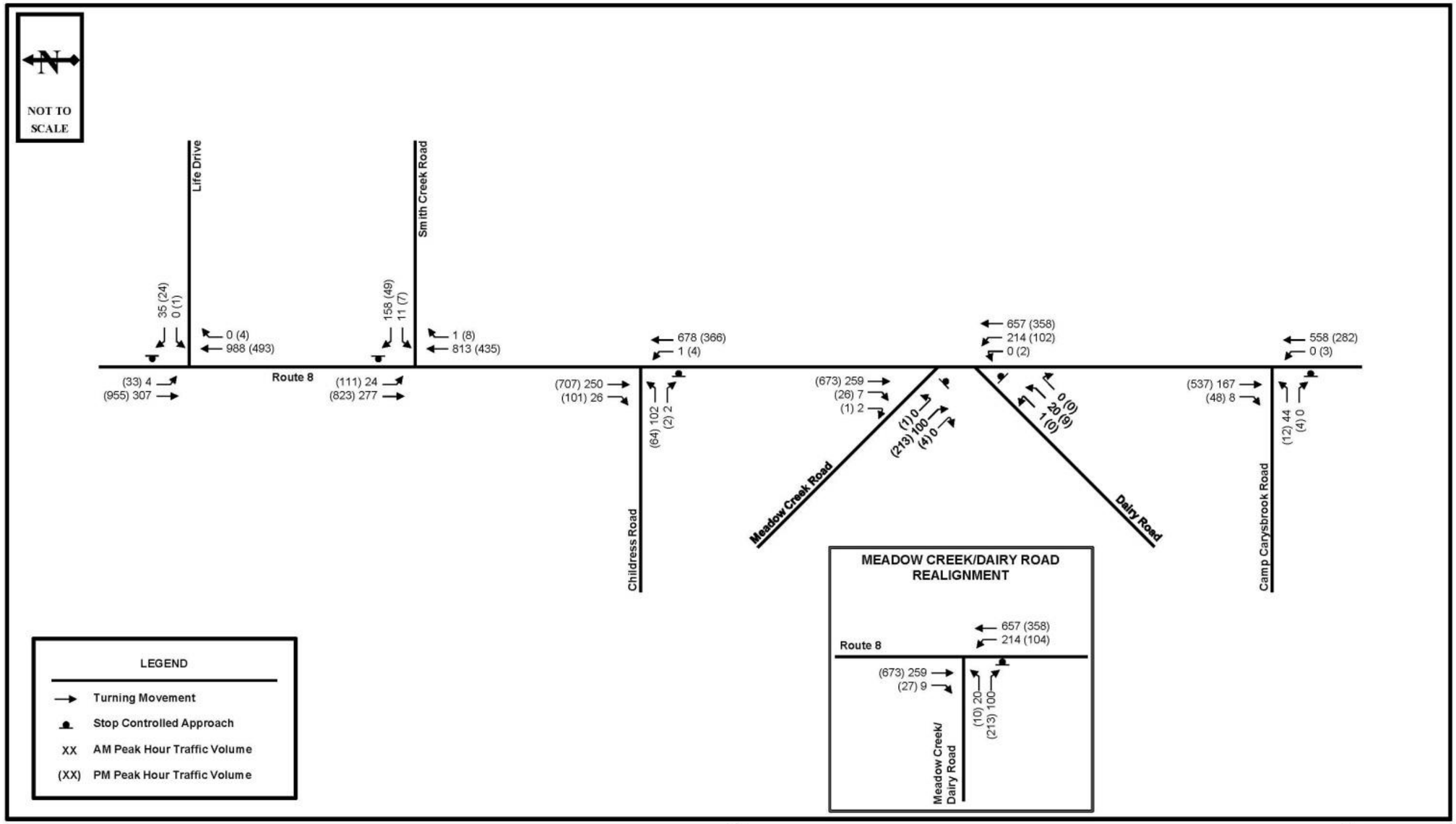
4.4 Future Roadway Network

4.4.1 Future 2035 Baseline Conditions

To evaluate 2035 Baseline traffic conditions, future 2035 traffic volumes were used along with existing roadway geometric conditions. Based on a review of the planning documents identified in Section 2.4, no planned or programmed roadway improvements were identified at the study area intersections. As a result, existing roadway geometric conditions were used to analyzed future 2035 Baseline traffic conditions.

4.4.2 Future 2035 Proposed Conditions

To evaluate 2035 Proposed traffic conditions, future 2035 traffic volumes were used along with proposed roadway improvements. The 2035 Proposed roadway geometric conditions include the geometric roadway recommendations made as a result of this corridor study, which include right- and left-turn lanes and a widened shoulder on both sides of Route 8. The proposed right- and left-turn lanes included in the 2035 Proposed network are identified in Section 4.4.3.



Route 8 Corridor Study | Future 2035 Traffic Volumes | Figure 4.1

4.4.3 Turn Lane Warrant Analysis

Right and left-turn lane warrant analyses were performed at the study area intersections under 2012 and 2035 traffic volume conditions in accordance with warrant requirements contained in the VDOT Road Design Manual (see Appendix). The results of the turn lane warrant analyses are summarized in **Table 4.1**. Under 2035 traffic volume conditions, the following turn lanes meet the warrant threshold:

- Route 8 at Life Drive
  - Southbound Left-Turn Lane
- Route 8 at Smith Creek Road
  - Southbound Left-Turn Lane
- Route 8 at Childress Road
  - Northbound Left-Turn Lane
  - Southbound Right-Turn Lane
- Route 8 at Meadow Creek Road & Dairy Road
  - Northbound Left-Turn Lane
  - Southbound Right Turn Taper
- Route 8 at Camp Carysbrook Road
  - Northbound Left-Turn Lane
  - Southbound Right-Turn Lane

The need for side street turn lanes was based on the 2035 Baseline capacity analysis contained in Section 4.5. Based on a review of this information, no side street turn lanes were identified at the study area intersections.

Turn lane warrant worksheets are included in the Appendix.

Table 4.1 – Turn Lane Warrant Analysis Summary

Turn Lane Warrant Analysis Summary					
Intersection with Route 8	Direction	Existing 2012		Future 2035	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Life Drive	NB Right-Turn	Not Met	Not Met	Not Met	Not Met
	SB Left-Turn	Met – Full (200’ x 200’)	Met – Full (200’ x 200’)	Met – Full (200’ x 200’)	Met – Full (200’ x 200’)
Smith Creek Road	NB Right-Turn	Not Met	Not Met	Not Met	Not Met
	SB Left-Turn	Met – Full (200’ x 200’)	Met – Full (200’ x 200’)	Met – Full (200’ x 200’)	Met – Full (200’ x 200’)
Childress Road	SB Right-Turn	Not Met	Met – Full (200’ x 200’)	Not Met	Met – Full (200’ x 200’)
	NB Left-Turn	Met – Full (200’ x 200’)	Met – Full (200’ x 200’)	Met – Full (200’ x 200’)	Met – Full (200’ x 200’)
Meadow Creek Road/Dairy Road	SB Right-Turn	Not Met	Met – Taper (200’)	Not Met	Met – Taper (200’)
	NB Left-Turn	Met – Full (200’ x 200’)	Met – Full (200’ x 200’)	Met – Full (200’ x 200’)	Met – Full (200’ x 200’)
Camp Carysbrook Road	SB Right-Turn	Not Met	Met – Taper (200’)	Not Met	Met – Full (200’ x 200’)
	NB Left-Turn	Not Met	Not Met	Met – Full (200’ x 200’)	Not Met

*200’ x 200’ = 200 feet of storage and 200 feet of taper length

4.5 Future 2035 Baseline and Proposed Conditions – Levels of Service

Future intersection capacity analyses, consistent with the HCM and methodology described in Chapter 2.4, were performed for the AM and PM peak hours at the following study area intersections:

- Route 8 at Life Drive
- Route 8 at Smith Creek Road
- Route 8 at Childress Road
- Route 8 at Meadow Creek Road & Dairy Road
- Route 8 at Camp Carysbrook Road

Analyses were performed for Existing 2012, Future 2035 Baseline, and Future 2035 Proposed scenarios. The Future 2035 Baseline conditions represent no changes to the roadway network when compared to existing conditions. Future 2035 Proposed conditions represents proposed changes to the roadway network as identified in Section 4.4.

Table 4.2 through **Table 4.8 s**ummarize the delay and associated approach LOS for each of the study area intersections. As previously discussed, Meadow Creek Road and Dairy Road were analyzed as two separate intersections due to the limitations of SYNCHRO. For movements without conflicting volumes, such as the major street's through and right turn movements at a two-way, stop-controlled intersection, an assocaited delay is not reported by SYNCHRO. **Figure 4.2** shows the LOS of each individual lane group as well as the overall approach LOS for all study area intersections. The corresponding SYNCHRO output sheets are included in the **Appendix**.

Under Future 2035 Baseline conditions, as shown in **Figure 4.2**, all of the study area intersection lane groups and overall approaches operate at a LOS D or better during the AM and PM peak hours with the exception of Smith Creek Road and Dairy Road. The sidestreet approach at both Smith Creek Road and Dairy Road operate at an overall approach LOS E during the AM peak hour. Mainline Route 8 (lane group and overall approaches) operates at a LOS A during the AM and PM peak hours at all study area intersections. When compared to Existing Conditions, Smith Creek Road and Dairy Road degradate two LOS categories from LOS C to LOS E during the AM peak hour with an increased delay of 16.0 seconds per vehicle and 10.6 seconds per vehicle respectively. With no change in roadway geometry, this decrease in LOS is a result of traffic volume growth. The traffic volume growth causes side street, stop-controlled vehicles to have more difficultly finding enough gaps of suitable size to allow the side street demand to safely cross through traffic on Route 8.

Under Future 2035 Proposed conditions, the addition of mainline Route 8 left- and right-turn lanes has a minimal improvement on intersection capacity with the exception of Meadow Creek Road and Dairy Road. An approximate 10 second per vehicle and 15 second per vehicle improvement occurs at Meadow Creek Road and Dairy Road, respectively as a result of the addition of turn lanes. The results are skewed for these two subject intersections due to the nontraditional configuration of the closely spaced intersections. However, this intersection was analyzed under a second Future 2035 Proposed condition to model the operations if the Meadow Creek Road and Dairy Road approaches were combined into a single approach. This improvement would require the realingment of either Meadow Creek Road or Dairy Road to intersect each other west of Route 8. The results of this analysis is provided in **Table 4.8**. The realinged intersection is projected to operate at LOS C and LOS D under Future 2035 Proposed AM and PM peak hours, respectively.

In addition to an improvement to intersection capacity, turn lanes also offer a safety benefit. As defined in the HCM, intersection turn lanes are desirable on two-lane highways to reduce delay to through vehicles caused by turning vehicles, and to reduce crashes related to turning. Left-turn lanes provide a protected location for turning vehicles to wait for a gap in opposing traffic. Reducing the potential for rear-end crashes, left-turn lanes also encourage drivers to wait for an adequate gap in opposing traffic.

According to VDOT's Highway Safety Improvement Program (HSIP), the Highway Safety Program (HSP) Proposed Safety Improvements form identifies the associated safety benefit for different improvement types through the use of Crash Reduction Factors (CRF). As defined by the Federal Highway Administration, a CRF "is the percentage crash reduction that might be expected after implementing a given countermeasure at a specific site." Based on VDOT's Proposed Safety Improvements form, the addition of a left-turn lane can expect a 43% reduction in all rear-end, left-turn, and overturn crashes while the addition of a right-turn lane can expect a 21% reduction in all rear-end and right-turn crashes.

Table 4.2 – Route 8 at Life Drive Future 2035 Approach LOS Summary

Peak Hour	Approach	Future 2035 Baseline		Future 2035 Proposed	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Intersection: Route 8 and Life Drive					
AM	Westbound - Life Drive	23.3	C	23.3	C
	Northbound - Route 8	†	†	†	†
	Southbound - Route 8	0.3	A	0.1	A
PM	Westbound - Life Drive	12.8	B	12.8	B
	Northbound - Route 8	†	†	†	†
	Southbound - Route 8	0.9	A	0.3	A

† SYNCHRO does not provide level of service or delay for movements with no conflicting volumes.

Table 4.3 – Route 8 at Smith Creek Road Future 2035 Approach LOS Summary

Peak Hour	Approach	Future 2035 Baseline		Future 2035 Proposed	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Intersection: Route 8 and Smith Creek Road					
AM	Westbound - Smith Creek Road	37.4	E	37.4	E
	Northbound - Route 8	†	†	†	†
	Southbound - Route 8	1.3	A	0.8	A
PM	Westbound - Smith Creek Road	15.6	C	15.6	C
	Northbound - Route 8	†	†	†	†
	Southbound - Route 8	2.6	A	1.0	A

† SYNCHRO does not provide level of service or delay for movements with no conflicting volumes.

Table 4.4 – Route 8 at Childress Road Future 2035 Approach LOS Summary

Peak Hour	Approach	Future 2035 Baseline		Future 2035 Proposed	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Intersection: Route 8 and Childress Road					
AM	Eastbound - Childress Road	34.6	D	33.4	D
	Northbound - Route 8	0.0	A	0.0	A
	Southbound - Route 8	†	†	†	†
PM	Eastbound - Childress Road	30.6	D	28.0	D
	Northbound - Route 8	0.2	A	0.1	A
	Southbound - Route 8	†	†	†	†

† SYNCHRO does not provide level of service or delay for movements with no conflicting volumes.

Table 4.5 – Route 8 at Meadow Creek Road Future 2035 Approach LOS Summary

Peak Hour	Approach	Future 2035 Baseline		Future 2035 Proposed	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Intersection: Route 8 and Meadow Creek Road					
AM	Southeastbound - Meadow Creek Road	11.0	B	9.9	A
	Northbound - Route 8	4.6	A	2.1	A
	Southbound - Route 8	†	†	†	†
PM	Southeastbound - Meadow Creek Road	24.5	C	14.4	B
	Northbound - Route 8	3.4	A	2.1	A
	Southbound - Route 8	†	†	†	†

† SYNCHRO does not provide level of service or delay for movements with no conflicting volumes.

Table 4.6 – Route 8 at Dairy Road Future 2035 Approach LOS Summary

Peak Hour	Approach	Future 2035 Baseline		Future 2035 Proposed	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Intersection: Route 8 and Dairy Road					
AM	Northeastbound - Dairy Road	35.1	E	20.0	C
	Northbound - Route 8	0.0	A	0.0	A
	Southbound - Route 8	†	†	†	†
PM	Northeastbound - Dairy Road	31.9	D	26.2	D
	Northbound - Route 8	0.1	A	0.1	A
	Southbound - Route 8	†	†	†	†

† SYNCHRO does not provide level of service or delay for movements with no conflicting volumes.

Table 4.7 – Route 8 at Camp Carysbrook Road Future 2035 Approach LOS Summary

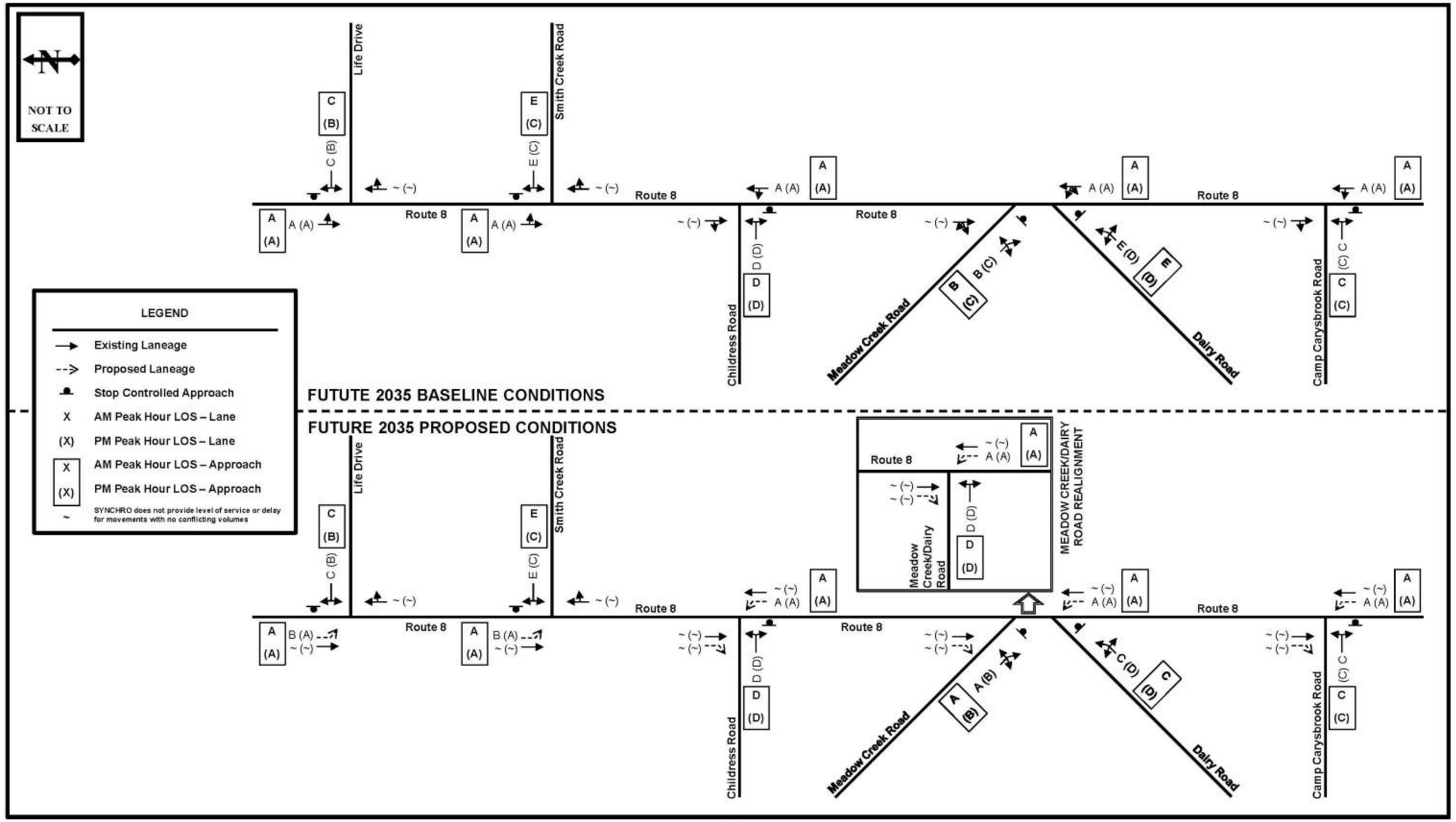
Peak Hour	Approach	Future 2035 Baseline		Future 2035 Proposed	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Intersection: Route 8 and Camp Carysbrook Road					
AM	Eastbound - Camp Carysbrook Road	18.0	C	17.9	C
	Northbound - Route 8	0.0	A	0.0	A
	Southbound - Route 8	†	†	†	†
PM	Eastbound - Camp Carysbrook Road	16.5	C	16.0	C
	Northbound - Route 8	0.1	A	0.1	A
	Southbound - Route 8	†	†	†	†

† SYNCHRO does not provide level of service or delay for movements with no conflicting volumes.

Table 4.8 – Route 8 at Meadow Creek Road/Dairy Road Future 2035 Proposed Realignment Approach LOS Summary

Peak Hour	Approach	Delay (sec/veh)	LOS
Intersection: Route 8 and Realigned Meadow Creek Road/Dairy Road			
AM	Eastbound - Realigned Meadow Creek Road/Dairy Road	22.4	C
	Northbound - Route 8	2.1	A
	Southbound - Route 8	†	†
PM	Eastbound - Realigned Meadow Creek Road/Dairy Road	26.6	D
	Northbound - Route 8	2.2	A
	Southbound - Route 8	†	†

† SYNCHRO does not provide level of service or delay for movements with no conflicting volumes.



Route 8 Corridor Study | Future 2035 Baseline and Proposed LOS | Figure 4.2

4.5.1 Future 2035 Baseline and Proposed Arterial Link Levels of Service

Future 2035 Baseline and Proposed arterial link analyses were conducted at the following same three locations analyzed under Existing Conditions:

1. Half-mile roadway segment centered on Life Drive intersection (Class I)
2. One-mile roadway segment from Cloverlea Drive to Tuckahoe Drive through the town of Riner (Class III)
3. Half-mile roadway segment centered on Camp Carysbrook Road (Class I)

Under Future 2035 Baseline and Proposed scenario conditions, the highway class remains unchanged from Existing Conditions. The methodologies used to analyze Existing Conditions were used to analyze Future 2035 Baseline and Proposed conditions. The analysis direction was taken as the travel direction with the higher volume. At all three analysis locations, the analysis direction for the AM peak hour was northbound and the analysis direction for the PM peak hour was southbound. The arterial link LOS during the AM and PM peak hours are summarized in **Table 4.9** and **Table 4.10** for Class I and Class III segments, respectively. Under Future 2035 Baseline conditions, the arterial analysis for Route 8 indicates that the corridor operates at a LOS D or better at all of the analyzed segment locations except for the roadway segment centered around Life Drive, which operates at a LOS E during both the AM and PM peak hours. Under Future 2035 Proposed conditions, the increased shoulder width has a minimal improvement on the arterial link operations. Although the LOS remains unchanged from Future 2035 Baseline to Future 2035 Proposed conditions, an improvement in average travel speed occurs. Each segment analyzed has an approximately 2.5-3 MPH increase in average travel speed as a result of the increased shoulder width. In addition to an increase in average travel speed, a safety benefit can be associated with widened shoulders. Based on VDOT's Proposed Safety Improvements form, shoulder widening has the following CRFs.

- Widen from 0 feet to 2 feet – 13% reduction in all crashes
- Widen from 2 feet to 4 feet – 12% reduction in all crashes
- Widen from 4 feet to 6 feet – 13% reduction in all crashes
- Widen from 6 feet to 8 feet – 13% reduction in all crashes

The existing shoulder width along Route 8 ranges from zero feet to four feet wide. The Future 2035 Baseline condition was analyzed with a 3 foot shoulder along Route 8. The Future 2035 Proposed condition was analyzed with an 8 foot shoulder along Route 8.

Table 4.9 – Future 2035 Arterial Level of Service (Class I Two-Lane Highways)

Scenario	Time of Day	Analysis Direction	Volume to Capacity Ratio	Average Travel Speed (mi/h)	Percent Time Spent Following (%)	LOS
Life Drive Area						
Future 2035 Baseline	AM	Northbound	0.71	43.6	95.2	E
	PM	Southbound	0.60	45.3	89.4	E
Future 2035 Proposed	AM	Northbound	0.71	46.7	95.2	E
	PM	Southbound	0.60	48	89.4	E
Camp Carysbrook Road Area						
Future 2035 Baseline	AM	Northbound	0.40	47.7	79.2	D
	PM	Southbound	0.36	47.6	76.1	D
Future 2035 Proposed	AM	Northbound	0.40	50.3	79.2	D
	PM	Southbound	0.36	50.3	76.1	D

Table 4.10 – Future 2035 Arterial Level of Service (Class III Two-Lane Highways)

Scenario	Time of Day	Analysis Direction	Volume to Capacity Ratio	Average Travel Speed (mi/h)	Percent Free-Flow Speed (%)	LOS
Cloverlea Drive to Tuckahoe Drive						
Future 2035 Baseline	AM	Northbound	0.57	33.2	71.0	D
	PM	Southbound	0.56	33.2	71.0	D
Future 2035 Proposed	AM	Northbound	0.57	35.8	72.5	D
	PM	Southbound	0.56	35.8	72.5	D

4.6 Queue Lengths

Queue lengths, or the distance at which stopped vehicles accumulate at an intersection were calculated. Queue length is another performance indicator of the intersection's operational characteristics. A 95th percentile queuing analysis was completed for the study area intersections under both Future 2035 Baseline and Future 2035 Proposed AM and PM peak hour conditions. SYNCHRO plus SimTraffic Version 7 was used to perform a 60-minute simulation for the analyses. A summary of the 95th percentile queue lengths for each of the study area intersection lane groups is presented in **Table 4.11** through **Table 4.17**. As previously discussed, Meadow Creek Road and Dairy Road were analyzed as two separate intersections due to the limitations of SYNCHRO. The 95th percentile queue lengths reported on northbound and southbound Route 8 at Meadow Creek Road and Dairy Road are the sum of the Meadow Creek Road and Dairy Road queue lengths as a result of the closely spaced intersections. For movements without conflicting volumes, no queue length is reported by SYNCHRO. Under Future 2035 Proposed conditions, 95th percentile queue lengths were compared with proposed turn lane storage lengths to determine if sufficient capacity is provided. Based on the Future 2035 Baseline 95th percentile queue lengths, queues do not exceed 200 feet (or approximately eight vehicles) with the exception of the following approaches:

- Meadow Creek Road approach to Route 8 during the PM peak hour (1442 foot queue)
- Northbound Route 8 approach to Dairy Road during the AM peak hour (520 foot queue)
- Northbound Route 8 approach to Dairy Road during the PM peak hour (313 foot queue)

All queues greater than eight vehicles in length occur at the closely spaced intersections of Meadow Creek Road and Dairy Road. Based on the Future 2035 Proposed 95th percentile queue lengths, queues do not exceed the storage capacity of the proposed right- and left-turn lanes. Under Future 2035 Baseline conditions, vehicles waiting to turn left off of Route 8 stop in the through lane while waiting for a sufficient gap in opposing traffic. As a result, through vehicles attempting to advance through the intersection in the same direction as the left-turning vehicles are forced to queue behind and wait until the left-turning vehicle clears. The proposed left-turn lanes provide a protected location for turning vehicles to wait for a gap in opposing traffic and allow advancing vehicles to continue through the intersection. Therefore, the mainline queue is eliminated and the left-turning queue is able to be stored in the proposed left-turn lane. As mentioned previously, all proposed turn lanes provide sufficient storage for the projected queues.

A 95th percentile queue analysis was also performed under a second Future 2035 Proposed condition to model the operations for the realigned Meadow Creek Road/Dairy Road condition where the two approaches were combined into a single approach. The results of this analysis is provided in **Table 4.17**. The realinged intersection is projected to operate with a maximum 95th percentile queue of 127 feet on the eastbound approach and 77 feet within the northbound left-turn lane, both maximum queues occur during the PM peak hour. Under the realigned scenario, the maximum queues are reduced when compared to Future 2035 Baseline and Future 2035 Proposed conditions.

The supporting SimTraffic output sheets are included in the **Appendix**.

Table 4.11 – Route 8 at Life Drive Future 2035 95th Percentile Queue Lengths

Future 2035 Baseline			Future 2035 Proposed				
Lane Group	95th Percentile Queue Length (Ft)		Lane Group	Storage (Ft)	Taper (Ft)	95th Percentile Queue Length (Ft)	
	AM Peak Hour	PM Peak Hour				AM Peak Hour	PM Peak Hour
Intersection: Route 8 and Life Drive							
WBLR	50	37	WBLR	-	-	44	46
NBTR	~	~	NBTR	-	-	~	~
SBLT	8	94	SBL	200	200	14	24
			SBT	-	-	~	~

~SimTraffic does not report Queue Length on movements with no conflict.

Table 4.12 – Route 8 at Smith Creek Road Future 2035 95th Percentile Queue Lengths

Future 2035 Baseline			Future 2035 Proposed				
Lane Group	95th Percentile Queue Length (Ft)		Lane Group	Storage (Ft)	Taper (Ft)	95th Percentile Queue Length (Ft)	
	AM Peak Hour	PM Peak Hour				AM Peak Hour	PM Peak Hour
Intersection: Route 8 and Smith Creek Road							
WBLR	173	57	WBLR	-	-	118	54
NBTR	~	~	NBTR	-	-	~	~
SBLT	63	192	SBL	200	200	38	44
			SBT	-	-	~	~

~SimTraffic does not report Queue Length on movements with no conflict.

Table 4.13 – Route 8 at Childress Road Future 2035 95th Percentile Queue Lengths

Future 2035 Baseline			Future 2035 Proposed				
Lane Group	95th Percentile Queue Length (Ft)		Lane Group	Storage (Ft)	Taper (Ft)	95th Percentile Queue Length (Ft)	
	AM Peak Hour	PM Peak Hour				AM Peak Hour	PM Peak Hour
Intersection: Route 8 and Childress Road							
EBLR	74	58	EBLR	-	-	73	59
NBLT	~	28	NBL	200	200	~	9
SBTR	~	~	NBT	-	-	~	~
			SBT	-	-	~	~
			SBR	200	200	~	~

~SimTraffic does not report Queue Length on movements with no conflict.

Table 4.14 – Route 8 at Meadow Creek Road Future 2035 95th Percentile Queue Lengths

Future 2035 Baseline			Future 2035 Proposed				
Lane Group	95th Percentile Queue Length (Ft)		Lane Group	Storage (Ft)	Taper (Ft)	95th Percentile Queue Length (Ft)	
	AM Peak Hour	PM Peak Hour				AM Peak Hour	PM Peak Hour
Intersection: Route 8 and Meadow Creek Road							
SEBLR	92	1442	SEBLR	-	-	73	425
NBLT	See NBLT at Dairy Road		NBL	200	200	See NBL at Dairy Road	
SBTR	24	39	NBT	-	-	See NBT at Dairy Road	
			SBT	-	-	18	154
			SBR	200	200	12	17

Table 4.15 – Route 8 at Dairy Road Future 2035 95th Percentile Queue Lengths

Future 2035 Baseline			Future 2035 Proposed				
Lane Group	95th Percentile Queue Length (Ft)		Lane Group	Storage (Ft)	Taper (Ft)	95th Percentile Queue Length (Ft)	
	AM Peak Hour	PM Peak Hour				AM Peak Hour	PM Peak Hour
Intersection: Route 8 and Dairy Road							
NEBLR	108	33	NEBLR	-	-	43	26
NBLT	520	313	NBL	200	200	78	107
SBTR	See SBTR at Meadow Creek Road		NBT	-	-	~	~
			SBT	-	-	See SBTR at Meadow Creek Road	
			SBR	200	200	See SBTR at Meadow Creek Road	

Table 4.16 – Route 8 at Camp Carysbrook Road Future 2035 95th Percentile Queue Lengths

Future 2035 Baseline			Future 2035 Proposed				
Lane Group	95th Percentile Queue Length (Ft)		Lane Group	Storage (Ft)	Taper (Ft)	95th Percentile Queue Length (Ft)	
	AM Peak Hour	PM Peak Hour				AM Peak Hour	PM Peak Hour
Intersection: Route 8 and Camp Carysbrook Road							
EBLR	46	31	EBLR	-	-	54	38
NBLT	~	~	NBL	200	200	~	8
SBTR	~	~	NBT	-	-	~	~
			SBT	-	-	~	~
			SBR	200	200	~	~

~SimTraffic does not report Queue Length on movements with no conflict.

Table 4.17 – Route 8 at Meadow Creek Road/Dairy Road Future 2035 Proposed Realignment 95th Percentile Queue Lengths

Lane Group	95th Percentile Queue Length (Ft)	
	AM Peak Hour	PM Peak Hour
Intersection: Route 8 and Realigned Meadow Creek Road/Dairy Road		
EBLR	76	127
NBL	49	77
NBT	~	~
SBT	~	~
SBR	~	~

~SimTraffic does not report Queue Length on movements with no conflict.

5. RECOMMENDATIONS

Based on the results of the Future 2035 Baseline and Proposed conditions, field observations, review of input received from the public involvement process, alignment with project goals, and feedback from the Project Team members, recommendations for transportation improvements throughout the study corridor were developed. The recommendations were developed to accommodate anticipated growth in pedestrian, bicycle, and automobile traffic volumes expected in the study area by 2035. The recommendations can be implemented in phases in conjunction with growth and funding availability. Therefore, the recommendations were categorized as short-, mid-, and long-term improvements to assist VDOT, Montgomery County, Town of Christiansburg, NRVPDC, and NRVMPO in the phasing and programming of these improvements.

Short-term recommendations are projects that can be completed within a year, typically at minimal expense and little to no right-of-way impacts. Mid-term recommendations could require preliminary engineering or design, right-of-way acquisition, and/or minor disturbance to operations (i.e. roadway and/or maintenance of traffic plans). These mid-term improvements would come with a higher price tag and could take between one and five+ years to implement. Long-term recommendations are the most expensive improvements and could require extensive design, right-of-way acquisition, utility relocation, and permitting. These long-term improvements could take between five and twenty+ years to plan, design, approve, and construct. With limited right-of-way along the Route 8 study corridor and the likely impacts associated with each proposed recommendation, the timeframe for implementation can be longer than typically expected. The recommendations documented herein are not listed in any particular priority order. The short-, mid-, and long-term labels were used to categorize improvements were based on scale, cost, and timeframe for implementation. Figure 5.3 through Figure 5.5 show the approximate location of each proposed short-, mid-, and long-term recommendation. A summary table containing all recommendations along with planning level costs is included in Chapter 6.

5.1 Short-Term Recommendations

5.1.1 Sight Distance

- **S1.** Cut back vegetation to improve sight distance at the following locations:
  - Smith Creek Road

    Location meets required intersection sight distance of 610 feet per the VDOT road design manual. However, due to the downhill grade along the northbound approach, vehicles frequently travel above the posted speed limit of 55 MPH. For this reason, vegetation should be trimmed back to maximize sight distance from Smith Creek Road looking south and from Route 8 looking south (Photograph 5.1). Skid marks were present during the field visit indicating sight distance issues exist (Photograph 5.2).

Photograph 5.1 – Sight Distance Left at Smith Creek Road (Looking South)

Photograph 5.2 – Skid Marks on Southbound Approach to Smith Creek Road

- Camp Carysbrook Road

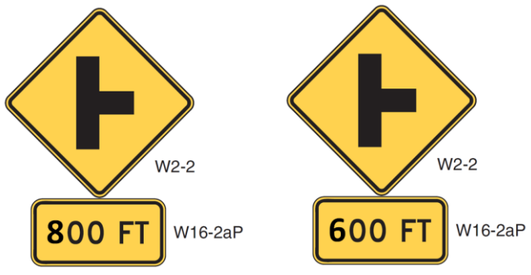
  Location does not meet required sight distance of 610 feet per the VDOT road design manual. Approximately 490 feet of sight distance is provided looking right on the eastbound Camp Carysbrook Road approach. Vegetation should be trimmed back to maximize sight distance (Photograph 5.3). Skid marks were present during the field visit indicating sight distance issues exist. Cutting back vegetation is a short-term fix and may not improve sight distance to the required VDOT standard. The Camp Carysbrook Road approach has a steep incline to Route 8 making it difficult for vehicles on Route 8 to see a side street exists. This intersection has major, long-term reconstruction recommendations contained in Section 5.3.

Photograph 5.3 – Sight Distance Right on Camp Carysbrook (Looking South)

Photograph 5.4 – Northbound Route 8 Approach to Camp Carysbrook Road – side street on right is blocked by vegetation

5.1.2 Speed Limit and Signing

- **S2.** Replace existing "WATCH FOR TURNING VEHICLES" signs on the southbound Route 8 approach to Life Drive with a T Intersection Warning (W2-2) sign and an "800 FEET" distance plaque (W16-2P). This recommendation will inform the driver of the approximate location of the Life Drive intersection.
- **S2.** Replace existing "WATCH FOR TURNING VEHICLES" signs on the northbound and southbound Route 8 approaches to Smith Creek Road with T Intersection Warning (W2-2) signs and a "600 FEET" and "800 FEET" distance plaque (W16-2P) on the northbound and southbound approach, respectively. This recommendation will inform the driver of the approximate location of the Smith Creek Road intersection. With limited sight distance provided at this intersection, it is important that drivers are made aware of the intersection location.

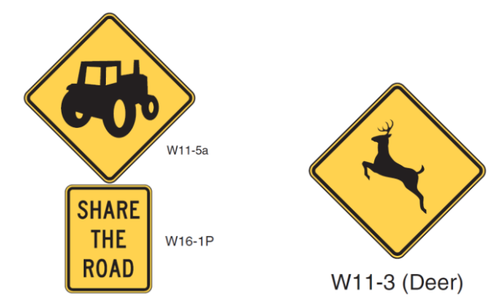


- **S2.** Remove two "DO NOT PASS WHEN SOLID LINE IS ON YOUR SIDE" signs (located between Life Drive and Smith Creek Road - Photograph 5.5 and south of Smith Creek Road). Passing zones do not exist on corridor which creates an issue when slow moving vehicles are traveling Route 8 (Photograph 5.6); however based on an assessment conducted by VDOT staff, passing zones should not be permitted within the study area without accompanied road widening.
- **S2.** The installation of a Vehicle Traffic Warning Sign (W11-5a) with a "SHARE THE ROAD" (W16-1P) supplemental plaque should be considered within any highly traveled tractor areas which is typically common north of Riner along the study corridor.

Photograph 5.5 – "DO NOT PASS WHEN SOLID LINE IS ON YOUR SIDE" sign on Route 8 corridor

Photograph 5.6 – Example of slow moving vehicles on Route 8

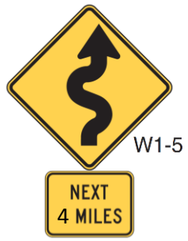
- **S2.** A Deer Crossing Warning (W11-3) sign should be installed on northbound and southbound Route 8 at least a half mile in advance of Life Drive. According to the VDOT Traffic Engineering Memorandum TE-369.0 (dated 12/1/2011), Deer Crossing Warning (W11-3) signs should be installed when there are five or more deer crashes over two years in a mile long segment when the speed limit is greater than 45 MPH. The Deer Crossing Warning sign criterion is met at the subject intersection and should be considered for installation.



- **S3:** Perform a speed study along the Route 8 study corridor. Special consideration should be given to the following two areas:
  - Riner - With the dense number of access points and the proximity to the Auburn school complex, Riner may warrant a reduced speed limit. As previously mentioned, this section of Route 8 has 18 crashes between 2009 and 2011, with five injury and one fatal crash. A reduction in speed limit can help reduce the number of overall crashes and the severity of those that do occur. This section of the corridor currently has a 45 MPH speed limit.

- South of Riner to the Floyd County Line - under existing conditions, this section of the Route 8 study corridor has six advisory speed plaques in the southbound direction and six in the northbound direction. This section of the corridor currently has a 55 MPH speed limit. It is recommended that a speed study be conducted along the corridor to see if the 45 MPH zone should be extended south to the Floyd County line, and eliminate several existing speed advisory plaques, creating more of an emphasis on the critical speed advisory plaques which recommend a speed lower than 45 MPH.

- **S2 & S3.** A speed limit change, multiple advisory speed zones, and several warning signs exist throughout the southern half of the corridor (south of Cloverlea Drive, approximately 5 miles). This section of the corridor traverses through Riner and several horizontal and vertical curves. Maps showing the existing warning and speed limit signs within the subject section of the corridor are included in the Appendix. The following signing recommendations are proposed within the subject section of the study corridor should a 45 MPH speed limit be warranted as a result of the recommended speed study.
  - All Horizontal Alignment Warning signs, with the exception of those recommended herein, should be removed and a Winding Road (W1-5) should be installed just south of Riner for southbound vehicles and just north of the Little River for northbound vehicles. The Winding Road sign should have a "NEXT 4 MILES" supplemental distance plaque (W7-3aP).



W7-3aP

  - A Turn (W1-1) sign with a "25 MPH" advisory speed plaque (W13-1P) is recommended on the northbound and southbound approaches to the curves located near Larkspur Circle and Laurel Ridge Mill Road. Ten total crashes occurred within the vicinity of these two curves during the three year period of 2009 through 2011. Six of the ten crashes were fixed object – off road which can be attributed to the roadway alignment. Four of the ten crashes resulted in injuries. Slowing vehicles down through the subject curves can help mitigate this recurring crash pattern. The 25 MPH advisory speed was selected to meet VDOT standard ball bank limiting angle criteria.
  - A Curve (W1-2) sign with a "40 MPH" advisory speed plaque (W13-1P) is recommended on the northbound and southbound approaches to the curve located near Broad Shoals Road.

  - The "40 MPH" advisory speed plaque (W13-1P) on the T Intersection Warning (W2-2) sign for the northbound Route 8 approach to Camp Carysbrook Road should be replaced with a "600 FEET" distance plaque (W16-2P). The 40 MPH advisory speed was selected to meet VDOT standard ball bank limiting angle criteria.

- **S2.** The three out of date "REDUCED SPEED LIMIT AHEAD" signs should be replaced with the updated version (W3-5).
  - Two signs located near Riner in vicinity of 45 MPH speed zone, other sign is located at northern limit of study area for 35 MPH zone just south of I-81. Should the speed limit change as a result of the recommended speed study, these signs should be relocated appropriately.

W3-5

- **S2.** Add delineator guidance devices to the existing guardrail in study corridor to assist drivers through the existing curves in the corridor.
- **S2.** The two yellow "SCHOOL BUS STOP AHEAD" (S3-1) signs should be upgraded to the fluorescent yellow-green background.

- **S4.** Existing Chevron (W1-8) signs appear to not meet the MUTCD sign spacing requirement (provided below). The existing Chevron signs should be checked against the required spacing and adjusted accordingly at the curves near Old Rough Road, Valley View Church Road, Broad Shoals Road, Larkspur Circle, and Laurel Springs Road.
    - Curves with 20-30 MPH advisory speed = 80 foot sign spacing
    - Curves with 35-45 MPH advisory speed = 120 foot sign spacing

W1-8

5.1.3 Access Management

The following two access management recommendations are listed as short-term but should continue to be considered as the Route 8 corridor develops into the future. Eighteen total crashes occurred within this segment of Route 8 from 2009 through 2011, all of which can be attributed to a high density of access. Of the 18 crashes, five resulted in an injury and one was fatal. Improvements to access management through this area will help mitigate these crashes.

- **S5.** Continually improve access/reduce number of driveways as redevelopment occurs. Figure 5.1 shows the density of access within Riner.
- **S5.** Positively define access by reducing wide throat widths at existing access points. Photograph 5.7 and Photograph 5.8 show two examples of existing wipe down access on the Route 8 corridor.

Figure 5.1 – Existing Access Points in Riner

Photograph 5.7 – Undefined Access

Photograph 5.8 – Undefined Access

5.1.4 Safety

- **S6.** Perform a Roadway Safety Assessment (RSA) on the Route 8 study corridor.

5.1.5 Other

- **S7.** The owner/operator of the Sinkland Farms should provide manual traffic control (police officer) during fall events or other high traffic volume events that cause significant queues of traffic along Route 8.

5.2 Mid-Term Recommendations

5.2.1 Roadway Improvements

- **M1.** Install guardrail with delineators at the following locations:
  - East side of Route 8 through the curve near Laurel Ridge Mill Road
  - East and west side of Route 8 through the curve near Larkspur Circle
  - East side of Route 8 through curve near Valley View Church Road
  - West side of Route 8 through the curve near Broad Shoals Road
  - Extend existing guardrail south at mile marker 46.4 to the existing auto sale lot entrance on the east side of Route 8
  - Northwest and southwest corners of the Route 8 and Camp Carysbrook Road intersection
  - Replace existing low, nonstandard height guardrail with standard height guardrail at Smith Creek Road
- **M2.** Construct the following turn lanes on Route 8. All turn lanes should be constructed with 200 feet of storage and 200 feet of taper where feasible. In addition to meeting the VDOT Road Design Manual turn lane warrants, the proposed turn lanes offer a safety benefit to the corridor. The Route 8 intersections with Life Drive and Childress Road have an existing rear-end crash pattern, the installation of left-turn lanes should help mitigate this recurring crash pattern.
  - Route 8 at Life Drive
    - Southbound Left-Turn Lane
  - Route 8 at Smith Creek Road
    - Northbound Right-Turn Lane*
    - Southbound Left-Turn Lane
  - Route 8 at Childress Road
    - Northbound Left-Turn Lane
    - Southbound Right-Turn Lane
  - Route 8 at Meadow Creek Road & Dairy Road
    - Northbound Left-Turn Lane
    - Southbound Right Turn Taper
  - Route 8 at Camp Carysbrook Road
    - Northbound Left-Turn Lane
    - Southbound Right-Turn Lane

  *Although this turn lane does not meet warrant thresholds based on the VDOT road design manual, a northbound right-turn lane is recommended due to limited sight distance for northbound traveling vehicles through the horizontal and vertical curve just south of Smith Creek Road.

- **M3.** Conduct routine maintenance to maintain a flush shoulder with the Route 8 edges of pavement. There are several random areas throughout the corridor with pavement-edge drop-offs that should not be more than two inches.

- **M4.** Widen the shoulders on Route 8 ranging from ten feet to thirteen feet (total graded and paved) in the following critical areas along the corridor. For sections that do not require guardrail, the proposed shoulder should include eight feet total paved shoulder with rumble strips and two feet of gravel shoulder. Where guardrail exists or is warranted, thirteen feet (total graded and paved) should be provided.
  - Curve near Old Rough Road
  - Curve near Valley View Church Road
  - Curve near Broad Shoals Road
  - Curve near Larkspur Circle
  - Curve near Laurel Ridge Mill Road
- **M5.** As identified in Section 2.5, VDOT is planning to construct a northbound and southbound left-turn lane on Route 8 at Fairview Church Road/Union Valley Road in 2015. As part of the Auburn School Complex project, the following turn lane improvements are planned to be constructed on Route 8:
  - Left- and right-turn lanes on Route 8 at the Proposed Middle School Access
  - Left- and right-turn lanes on Route 8 at the Existing Elementary/Proposed High School Access

5.2.2 Parking

- **M6.** Provide a Park and Ride lot at Route 8/I-81 interchange
  - Per VDOT's website, a Park and Ride lot currently exists at the interchange with vehicles parking along the shoulder. The website states the Park and Ride lot provides 12 parking spaces and does not provide bus service, lighting, or an emergency phone service. Sight distance becomes limited by the vehicles parked along the shoulder. The parked vehicles along the shoulder also create an additional safety hazard in the Route 8 corridor as the clear zone (shoulder) is compromised by parked vehicles. A more suitable location should be identified to construct a safe Park and Ride lot off of Route 8 in the vicinity of the I-81 interchange that promotes safe and convenient access for users. After construction of the lot is complete, vehicles should be prohibited from parking along the shoulder by posting "NO PARKING" (R8-3) signs.

5.2.3 Access Management

- **M7.** Childress Road
  - Remove residential access adjacent to Childress Road (existing resident has two access points on Route 8 (Photograph 5.9).
  - Remove the landscape gravel area adjacent to Childress Road to eliminate driver confusion of it serving as a vehicle path (Photograph 5.10).

Photograph 5.9 – Residential Access Adjacent to Childress Road

Photograph 5.10 – Gravel Strip Connecting Childress Road and Route 8

5.2.4 Signing

- **M8.** Upgrade all signs to meet current MUTCD standards.

5.2.5 Other

- **M9.** Construct bicycle/pedestrian improvements within Riner near the Auburn School Complex as identified in the Virginia School Travel Plan – Auburn Campus. A grant application has been submitted by Montgomery County for these improvements.

- **M10.** Monitor Route 8/Union Valley Road/Fairview Church Road and Route 8/Auburn School entrances to determine if additional traffic control is needed.

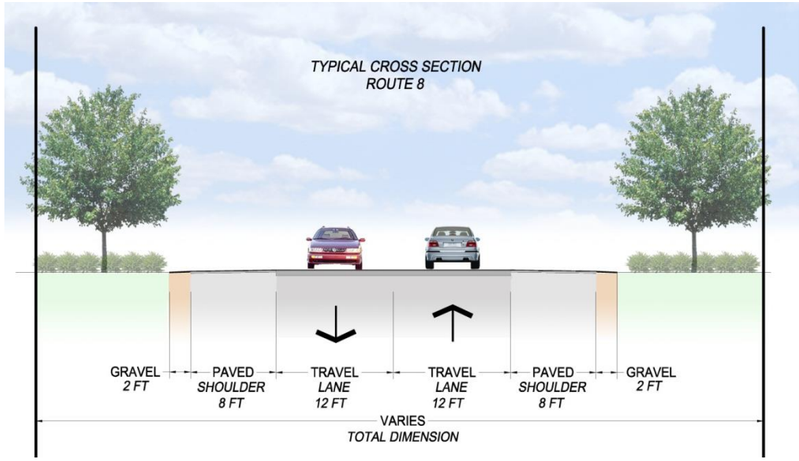
5.3 Long-Term Recommendations

5.3.1 Roadway Improvements

- **L1.** Along the entire study corridor, widen the Route 8 travel lanes to 12 feet with accompanied shoulder widths ranging from 10 feet to 13 feet (total graded and paved), on both sides of Route 8. Sections that do not require guardrail should consist of eight feet total paved shoulder with rumble strips and two feet of gravel shoulder. Where guardrail exists or is warranted, 13 feet (total graded and paved) should be provided. This improvement will bring the Route 8 lane width and shoulder width up to standard with the VDOT Road Design Manual. The typical existing Route 8 cross section is shown in Photograph 5.11. The proposed Route 8 cross section is illustrated in Figure 5.2.

Photograph 5.11 – Existing Route 8 Cross Section

Figure 5.2 – Proposed Route 8 Cross Section



- **L2.** Clear zones are areas that are designed to be free of fixed objects or hazards (i.e. trees, sign supports, utility poles, light poles, etc) and available for safe recovery for out of control or errant vehicles. Based on a visual review of the corridor, the clear zone should be improved along the entire corridor with special attention given to the horizontal/vertical curves within the study corridor.

5.3.2 Intersection Reconstruction

- **L3.** Camp Carysbrook Road
  - Raise the eastbound Camp Carysbrook Road approach to Route 8 to eliminate the severe incline and the inability of Route 8 vehicles to see that a side street exists (Photograph 5.12 and Photograph 5.13).
  - Reduce the vertical slope on the side of Route 8 on the curve just south of Camp Carysbrook Road to improve sight distance to the required VDOT standard for both the northbound Route 8 and eastbound Camp Carysbrook Road approaches (Photograph 5.14)

Photograph 5.12 – Eastbound Camp Carysbrook Road Approach to Route 8

Photograph 5.13 – Northbound Route 8 Approach to Camp Carysbrook Road

Photograph 5.14 – Curve on Route 8 South of Camp Carysbrook Road (Looking South)

- **L4.** Meadow Creek Road/Dairy Road
  - Realign either Meadow Creek Road or Dairy Road to intersect each other west of Route 8. This will remove one of these roads from the current intersection configuration, eliminating the closely spaced intersection (existing condition shown in Photograph 5.15 and Photograph 5.16). Additionally, a 90-degree realignment of the connecting road with Route 8 should be included to eliminate the skew.

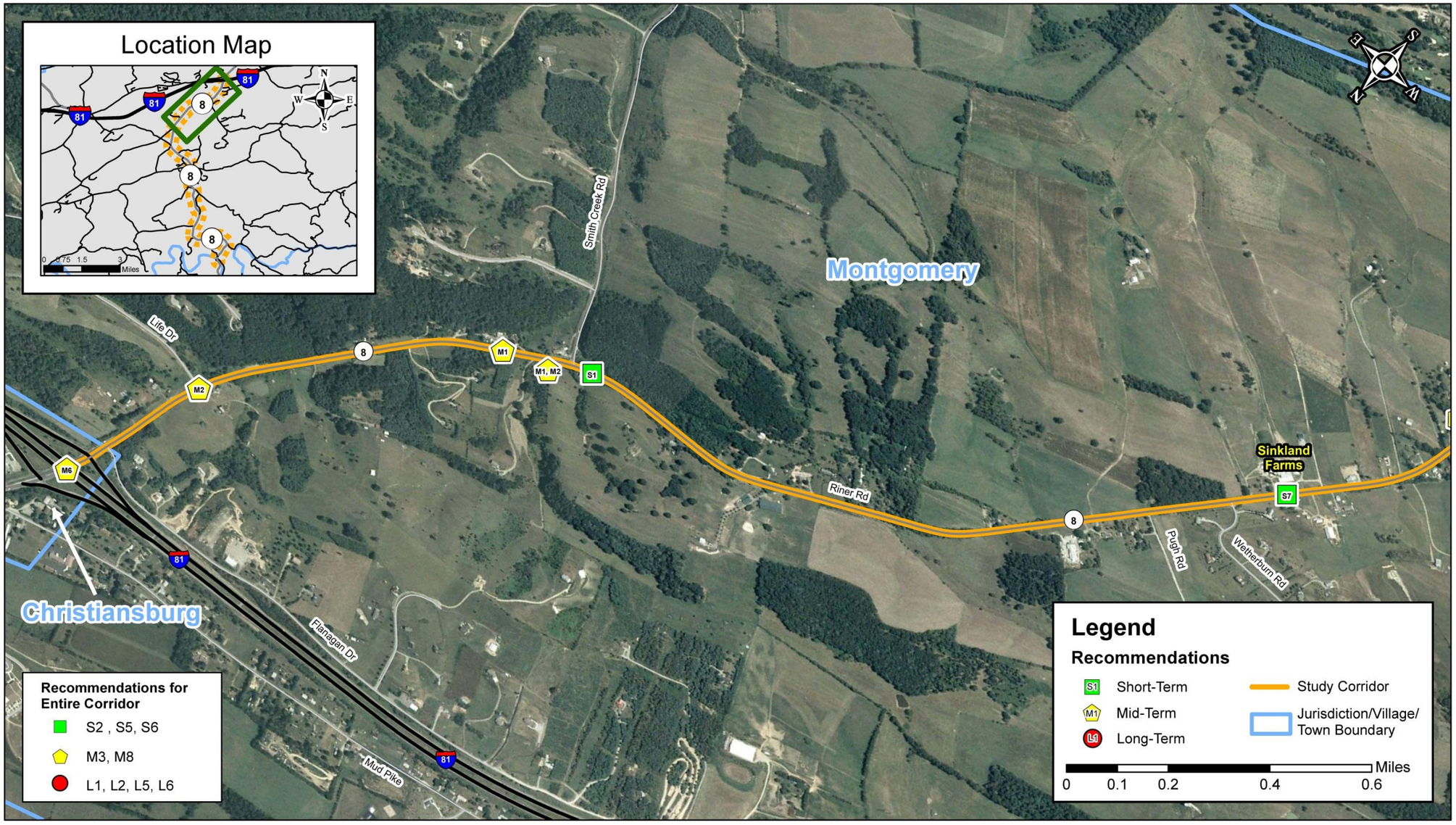
Photograph 5.15 – Closely spaced Meadow Creek Road and Dairy Road Intersections (Looking North)

Photograph 5.16 – Closely spaced Meadow Creek Road and Dairy Road Intersections (Looking South)

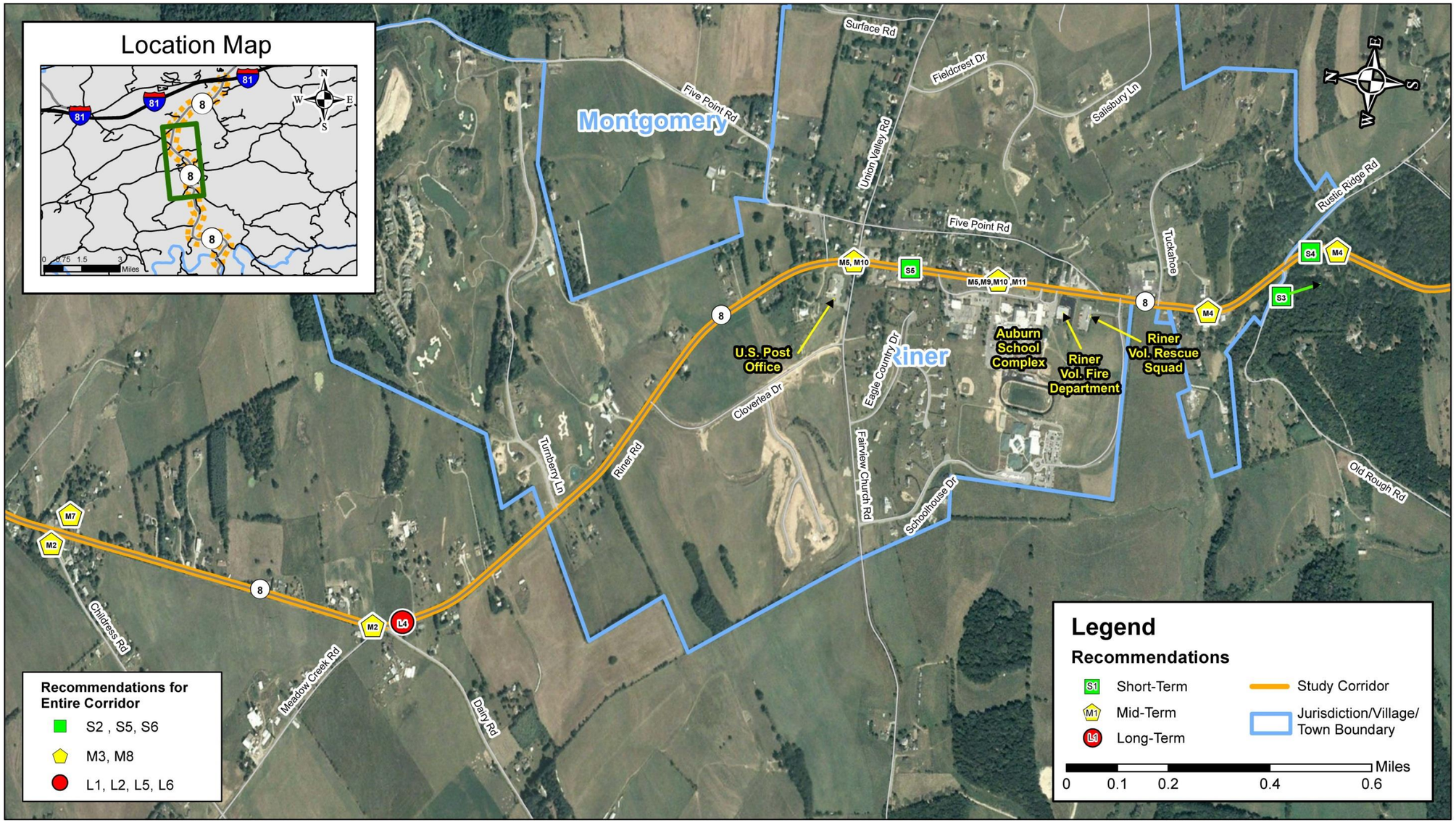
5.3.3 Other

- **L5.** Monitor traffic growth and incremental improvements to determine if expansion of roadway to a 3- or 4-lane facility, or alternate route, is warranted. The Future 2035 Route 8 AADT volumes are projected to be 12,200 VPD north of Meadow Creek Road and 11,000 VPD south of Meadow Creek Road. The projected 2035 AADT volumes are nearing the limit of what a typical two-lane rural road can accommodate.

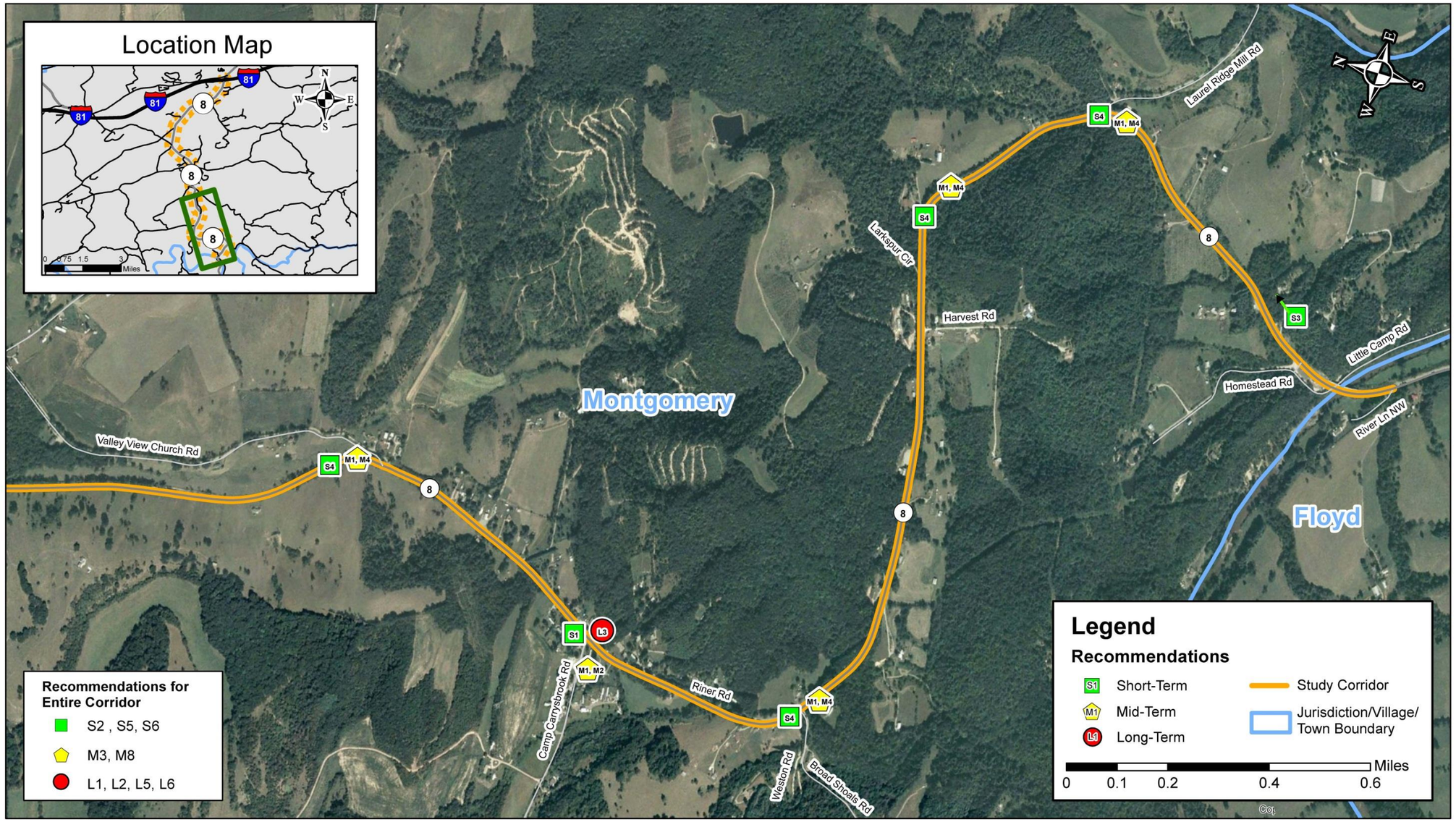
- **L6.** Construct bicycle lane, sidewalk, and/or paved multi-use path, where feasible, along the Route 8 corridor or identify an alternate route. The Riner Village Plan has several recommendations addressing the need for safe pedestrian friendly facilities (i.e. trails, pathways, sidewalks, and bikeways) to link residential, commercial, and civic neighborhoods with each other and neighboring communities.



Route 8 Corridor Study	Corridor Recommendations	Figure 5.3



Route 8 Corridor Study	Corridor Recommendations	Figure 5.4



Route 8 Corridor Study | Corridor Recommendations | Figure 5.5

6. PLANNING LEVEL COST ANALYSIS

6.1 Potential Funding Sources

There are a variety of potential funding sources, both private and public, that could potentially be used to further plan, design, and construct the improvements identified in Chapter 5. Some of these funding sources may apply only to specific improvements while others may apply to a broader range of improvements. The following represents some of the key potential funding sources.

- Surface Transportation Program (STP) Funds for road improvements; and pedestrian, bicycle, and transit improvements
- Highway Safety Improvement Program (HSIP) Funds for spot or systemic safety improvements
- Transportation Alternatives (TA) Funds for roadway, pedestrian, bicycle, SRTS and transit improvements
- State maintenance funds –guardrail, signing, pavement overlays and other maintenance activities
- Revenue Sharing Funds for roadway improvements
- Economic Development Access (EDA) Funds for road improvements to provide adequate access for new or expanding establishments
- Primary Funds for roadway improvements
- Private Funds as development occurs along the Route 8 study corridor

Funding limits vary for each of the aforementioned funding sources. The improvements identified herein can be separated into smaller projects for funding purposes.

6.2 Planning Level Costs

Table 6.1 shows an associated timeframe for implementation (short, mid, long), an estimated planning level cost, and lead agency(s) for each proposed recommendation contained in Chapter 5. Right-of-way impacts associated with each proposed recommendation can significantly alter the timeframe for implementation and estimated planning level cost. The provided planning level costs are preliminary and not based on design.

Table 6.1 – Route 8 Proposed Recommendation Matrix

ID	Proposed Recommendation	Issue	Approximate Construction Costs (2013 Dollars)*	Lead Agency(s)
Short-Term Recommendations (6-12 months)				
S1	Cut back vegetation at Smith Creek Road and Camp Carysbrook Road to improve sight distance	Sight distance and meet VDOT standards	$5,000 - $7,000	VDOT
S2	Remove, replace, and install new warning signs throughout corridor (as defined in Chapter 5)	Will allow for removal of unneeded warning signs and upgrade of existing warning signs to draw more attention to the critical warning signs and meet VDOT standards	$5,000 - $7,000	VDOT
S3	Perform a speed study along the Route 8 corridor	Traffic operations, safety, and multiple existing speed advisory zones	$10,000 - $20,000	VDOT/Montgomery County
S4	Improve existing chevron sign spacing at the identified locations	Positively direct traffic through existing curves in corridor, safety, and meet VDOT standards	$10,000 - $15,000	VDOT
S5	Continually improve access/reduce number of driveways as redevelopment occurs	Access management, safety, and meet VDOT standards	Performed through site development/ redevelopment (private funds)	VDOT/Montgomery County
	Positively define access by reducing wide throat widths at existing access points.	Access management, safety, and meet VDOT standards	$50,000 - $80,000 per access point	VDOT
S6	Perform Roadway Safety Assessment (RSA) on the Route 8 study corridor	Safety	$40,000 - $50,000	VDOT/Montgomery County
S7	Provide manual traffic control (police officer) during Fall events or other high traffic volume events at Sinkland Farms	Traffic operations and safety	N/A	Montgomery County to Enforce Owner
Mid-Term Recommendations (1 to 5+ years)				
M1	Install guardrail with delineators at identified locations	Safety	$500,000 - $750,000	VDOT
M2	Construct right- and left-turn lanes at identified locations	Traffic operations, safety, and crash reduction	$1,750,000 - S2,250,000 for Right- and Left-Turn Pair (4) $1,400,000 - $1,800,000 for Left-Turn Lane (1)	VDOT
M3	Conduct routine maintenance to maintain a flush shoulder with the Route 8 edges of pavement (shoulder wedging)	Traffic operations, safety, and crash reduction	$25,000 - $50,000	VDOT
M4	Widen shoulder on both sides of Route 8 ranging from 10 feet to 13 feet with rumble strips at identified locations	Traffic operations, safety, crash reduction, meet VDOT standards	$1,000,000 - $1,500,000	VDOT
M5	Construct planned right- and left-turn lanes at Fairview Church Road/Union Valley Road and Auburn School Complex proposed access locations	Traffic operations, safety, and crash reduction	$1,770,000 (Funded)	VDOT/Auburn Schools
M6	Provide Park and Ride lot at Route 8/I-81 interchange	Removes cars from parking on Route 8 shoulder and provides for potential future transit stop location	$200,000 - $400,000	VDOT
M7	Intersection reconstruction – Childress Road • Remove residential access adjacent to Childress Road • Landscape gravel area adjacent to Childress Road	Eliminate driver confusion and access management	$500,000 - $750,000	VDOT
M8	Upgrade all signing to meet current MUTCD standards	Meet VDOT standards	$20,000 - $40,000	VDOT
M9	Construct bicycle/pedestrian improvements within Riner near the Auburn School Complex as identified in the Virginia School Travel Plan – Auburn Campus	Limited existing bicycle/pedestrian accommodations in the vicinity of the Auburn School Complex/Riner area	Grant Application	Montgomery County
M10	Monitor Route 8/Union Valley Road and Route 8/Auburn Schools entrance to determine if additional traffic control is needed	Traffic operations and safety	$200,000 - $300,000 for traffic signal $500,000 - $750,000 for roundabout	VDOT

ID	Proposed Recommendation	Issue	Approximate Construction Costs (2013 Dollars)*	Lead Agency(s)
Long-Term Recommendations (5 to 20+ years)				
L1	Along entire study corridor, widen travel lanes to 12 feet with accompanied shoulder widths ranging from 10 feet to 13 feet	Traffic operations, safety, crash reduction, and meet VDOT standards	$8,000,000 - $12,000,000	VDOT
L2	Improve clear zone along Route 8 with special attention given to the horizontal/vertical curves within the study corridor	Safety	$50,000 - $75,000	VDOT
L3	Intersection reconstruction – Camp Carysbrook Road • Raise the eastbound Camp Carysbrook Road approach to Route 8 • Reduce the vertical slope on the side of Route 8 on the curve just south of Camp Carysbrook Road	Sight distance, safety, improve side street distinguishability to Route 8 traffic, and meet VDOT standard	$1,500,000 - $2,000,000	VDOT
L4	Intersection reconstruction – Meadow Creek Road/Dairy Road • Realign to remove closely spaced intersections	Traffic operations, safety, crash reduction, and meet VDOT standard	$3,500,000 - $5,000,000	VDOT
L5	Monitor traffic growth and incremental improvements to determine if expansion of roadway to a 3- or 4-lane facility, or alternate route, is warranted	Traffic operations	$150,000 - $250,000 for further study to determine needs of the corridor, develop alignments, etc.	VDOT
L6	Construct bicycle lane, sidewalk, and/or paved multi-use path, where feasible, along the Route 8 corridor or identify an alternate route	Bicycle/Pedestrian	$3,500,000 - $10,000,000 (depending on bicycle/pedestrian accommodation provided)	VDOT/Montgomery County

*Approximate construction costs do not include PE, ROW, utility relocations, construction admin or inspection, etc. and are preliminary and not based on design

7. PUBLIC INVOLVEMENT

An important component of the Route 8 Corridor Study planning process was the involvement of the public. Over the duration of the study, two citizen workshops were held. A variety of stakeholders, including residents, property owners, business owners, employees, and commuters in the Route 8 study area, participated in these meetings. The objectives of the citizen workshops were the following:

- To inform and educate the public about the study, its objectives, and its outcomes.
- To encourage and gather input and feedback in a formal setting from the public regarding the issues to be studied, the recommended improvements considered, and the future vision for the corridor.

Techniques used to educate and obtain input from the public at the citizen information meetings included presentations, questionnaires, comment stations, and mapping exercises. The public involvement activities were established to allow the public to identify the following items:

- General corridor conditions
- Areas of congestion and safety concerns
- Desired locations for bicycle and pedestrian improvements
- Concerns for the future of the corridor
- Desired corridor improvements

Results from the public involvement process are included in the **Appendix**.

The following two citizen information meetings were conducted to obtain feedback and engage the public in the Route 8 planning process:

- Citizen Information Meeting #1: Project Introduction and Existing Conditions –January 23, 2013
    - Approximately 50 individuals attended the first meeting held at the Riner Volunteer Fire Department in Montgomery County, Virginia.
    - The goal of this meeting was to gain public feedback on general corridor conditions, areas of congestion and safety concerns, desired locations for bicycle and pedestrian improvements, and concerns for the future of the corridor.
- Citizen Information Meeting #2: Review of Corridor Recommendations – April 9, 2013
    - Approximately 39 individuals attended the second meeting held at the Riner Volunteer Fire Department in Montgomery County, Virginia.
    - The goal of this meeting was to inform the public of the proposed recommended improvements along the corridor, gain feedback on those recommended improvements, and identify additional improvements for the study corridor.

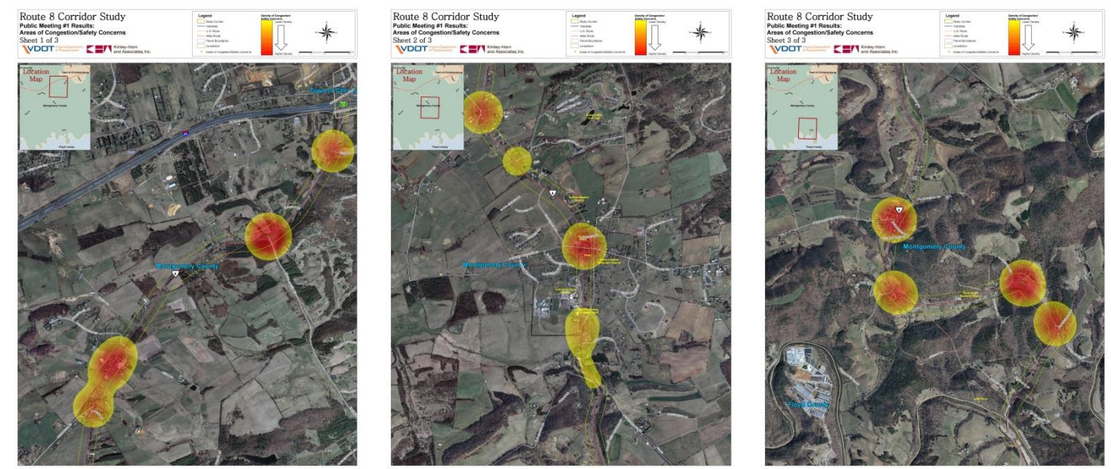
7.1 Summary of Public Feedback from Citizen Information Meeting #1

The first meeting was held in Montgomery County, Virginia at the Riner Volunteer Fire Department on January 23, 2013, and was attended by approximately 50 individuals. This meeting was designed to introduce the project to the public, to explain the study process, and to collect comments and input from the public regarding existing conditions and areas for improvement. The public was offered several methods in which feedback could be provided, which included Aerial Boards, Question Boards, Questionnaire, and general conversation with project team members at the meeting. These methods are explained in detail in the following sections.

7.1.1 Aerial Boards

At the workshop, display boards containing aerial maps of the study corridor were set up to allow the public to pinpoint locations of congestion and safety concerns, as well as locations of desired bicycle and pedestrian improvements. Meeting attendees were supplied with yellow and blue dots and asked to place yellow dots on the map in locations with perceived safety or congestion issues and the blue dots in locations of desired bicycle and pedestrian improvements. As shown in **Figure 7.1**, the results of this exercise were plotted on aerial maps using a geographic information system (GIS) spatial analyst tool (kernel density) to identify locations with a high density of dots.

Figure 7.1 – Areas of Congestion and Safety Concerns



The following areas were identified as main areas of congestion and safety concerns along the Route 8 study corridor:

- Life Drive
- Smith Creek Road
- Sinkland Farms
- Childress Road
- Meadow Creek Road/Dairy Road
- Turnberry Lane
- Union Valley Road/Fairview Church Road
- Auburn Schools/Fire Department
- Camp Carysbrook Road
- Curve near Broad Shoals Road
- Curve south of Grace Brethren Church
- Curve near Laurel Ridge Mill Road

No areas were identified as desired bicycle and pedestrian improvement locations along Route 8.

7.1.2 Question Boards

In addition, display boards containing questions were used to obtain feedback on corridor-wide concerns. Meeting attendees were asked to answer the questions on sticky notes and place their responses on the display boards. The four questions are listed below along with a summary of the responses. All question board responses are provided in the **Appendix**.

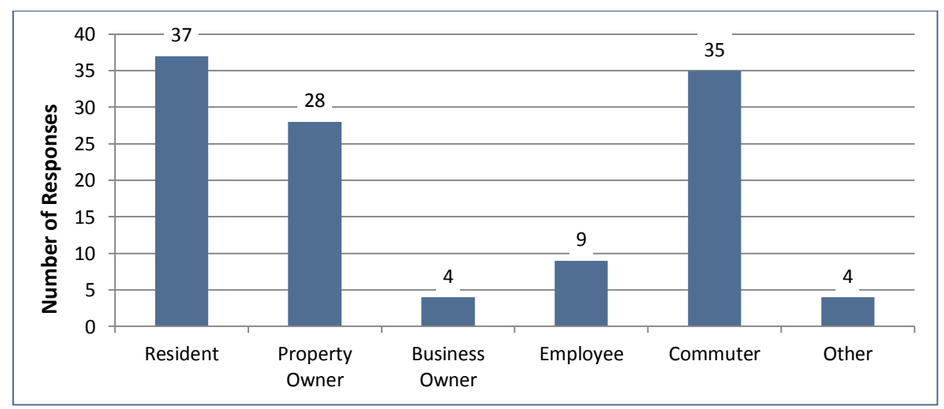
1. What is the primary traffic issue(s) on the corridor that concern you?
    - Limited sight distance at intersections (Smith Creek Road, Broad Shoals Road, Laurel Ridge Mill Road, Old Rough Road, Camp Carysbrook Road, Meadow Creek Road, Dairy Road, Turnberry Lane)
    - Lack of turn lanes
    - High traffic volumes (AM and PM peak hours)
    - Sharp curves
    - Lack of passing zones
    - High speed limit
    - Closely spaced intersections
    - Commuter parking needed at I-81 Exit 114
    - Traffic backups during school drop-off at Auburn
2. If you could change some things along the corridor, what would it be in priority order?
    - Improve sight distance at intersections
    - Add turn lanes
    - Widen shoulders
    - Add passing lanes or short 3-lane sections
    - Lower the speed limit
    - Improve snow/ice removal along the corridor
    - Connect Turnberry Lane to Five Points Road
    - Traffic Control at Union Valley Road
    - Areas of concern: Life Drive, Smith Creek Road, Camp Carysbrook Road, Auburn School Entrances
3. What is your greatest concern for the future of the corridor?
    - Continued traffic growth due to development
    - Traffic volumes not accommodated by a two-lane road
    - Residential and commercial development in what is now farmland
    - Safety along the corridor
    - Poor visual design of corridor
    - Turn lanes at intersections
    - Four-lane from Depot Street (Christiansburg) to Riner with median and left/right turn lanes
4. Where and what type of pedestrian or bicycle improvements are needed in the corridor?
    - Bikes should not be allowed on Route 8
    - Add bike lane, reduce speed limit, and improve valleys/curves
    - Alternate routes are more conducive for bicyclists

7.1.3 Questionnaire

Meeting attendees also received a questionnaire, a copy of which is included in the **Appendix**, with questions to answer about their experiences in the corridor with respect to traffic, safety, pedestrian issues, bicycle issues, and overall character of the corridor. Attendees were also encouraged to take extra copies of the questionnaire to community members who were unable to attend the meeting. Questionnaires could be dropped in a comment box provided at the meeting or mailed to the address provided on the form by February 18, 2013. Fifty-seven questionnaire responses were received from the public. This survey should not be considered a random sample of the public opinion; therefore, no statistical significance can be concluded from the results. However, the survey does reflect opinions and responses from interested citizens in the area.

A summary of the interest of the respondents is shown in **Figure 7.2**. Individuals with multiple interests in the corridor were encouraged to select multiple categories. The largest number of individuals (37) classified themselves as residents in the corridor, followed by commuters through the corridor (35), and property owners (28).

Figure 7.2 – Questionnaire Respondents Interest in the Corridor



Respondents were asked to categorize general corridor conditions, which included condition of streets, signage and wayfinding, lighting, sidewalks, access, traffic flow, pedestrian accommodations, bicycle accommodations, safety, landscaping, and overall appearance, as excellent, good, fair, or poor.

- The only category that was rated by over half of the respondents as either excellent or good was signage and wayfinding (**Figure 7.3**).
- Three categories were rated by over 90% of respondents as poor. These categories were related to corridor use by pedestrians and bicyclists as shown in **Figure 7.4** When asked what type of pedestrian facility respondents would prefer along the corridor, the largest number of individuals (20) responded with paved multi-use path, followed by sidewalks on one side of the street (13). When asked what type of bicycle facility respondents would prefer along the corridor, the largest number of individuals (28) responded with paved multi-use path, followed by striped bike lanes (18).

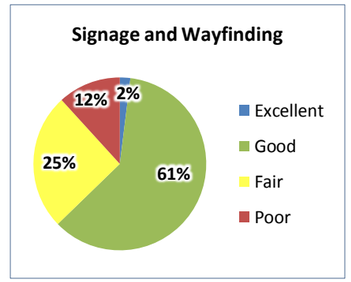
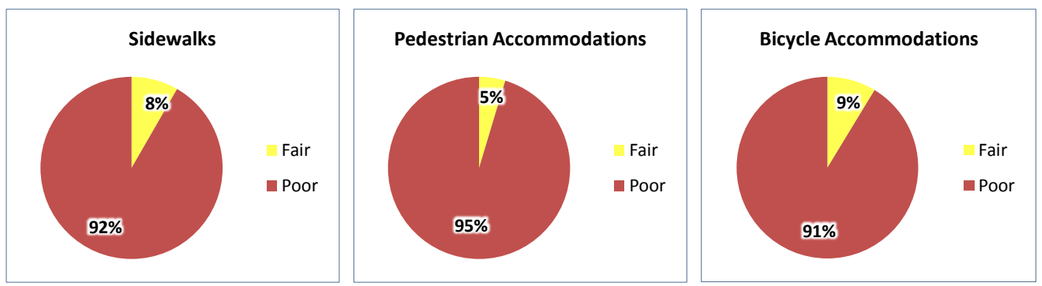


Figure 7.3 – Condition of Corridor Signage and Wayfinding

Figure 7.4 – Condition of Sidewalks, Pedestrian Accommodations, and Bicycle Accommodations



- As shown in **Figure 7.5**, corridor safety was rated as either poor or fair by 98% of individuals. Respondents indicated that major areas of safety concern to vehicular traffic along Route 8 include the Smith Creek Road intersection, Meadow Creek Road/Dairy Road intersection, Union Valley Road/Fairview Church Road intersection, Camp Carysbrook Road intersection, Auburn School Complex, and Broad Shoals Road intersection. Safety concerns at these locations were given as poor sight distance, lack of turn lanes, high traffic volumes, and high speeds. Respondents indicated that the entire corridor presents a safety concern to pedestrian and bicycle traffic. Narrow lanes, high traffic volumes, lack of shoulders, high speed limit, no bike lanes, no sidewalks, and sharp curves were listed as reasons for this concern.

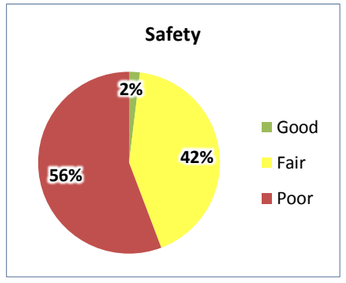


Figure 7.5 – Condition of Corridor Safety

Questionnaire respondents were also asked to indicate the type of improvement they wanted to see along the Route 8 corridor as well as their greatest concern for the future of the corridor. Individuals were permitted to select more than one improvement and/or concern when answering these questions. The results of these questions are shown in **Figure 7.6** and **Figure 7.7** respectively.

Figure 7.6 – Desired Improvements along the Corridor

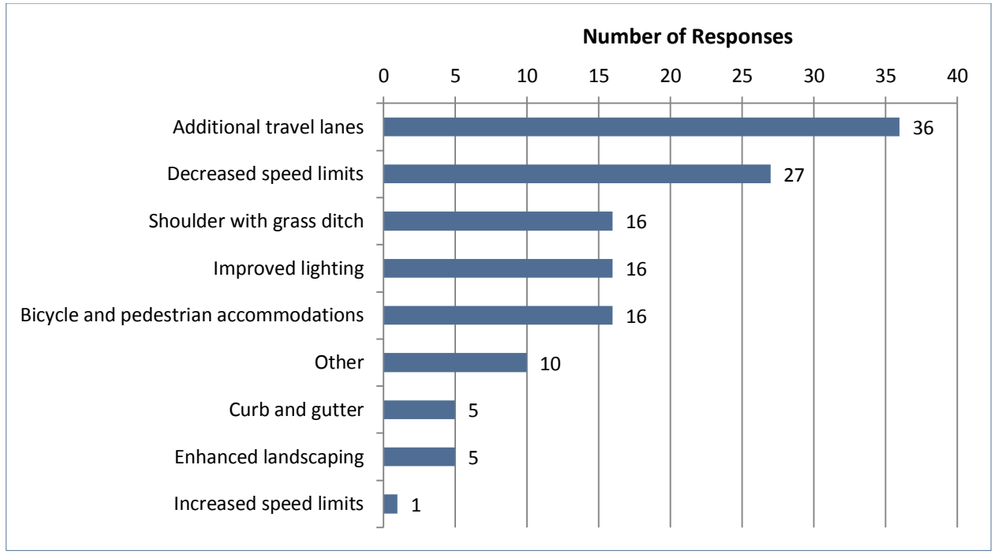
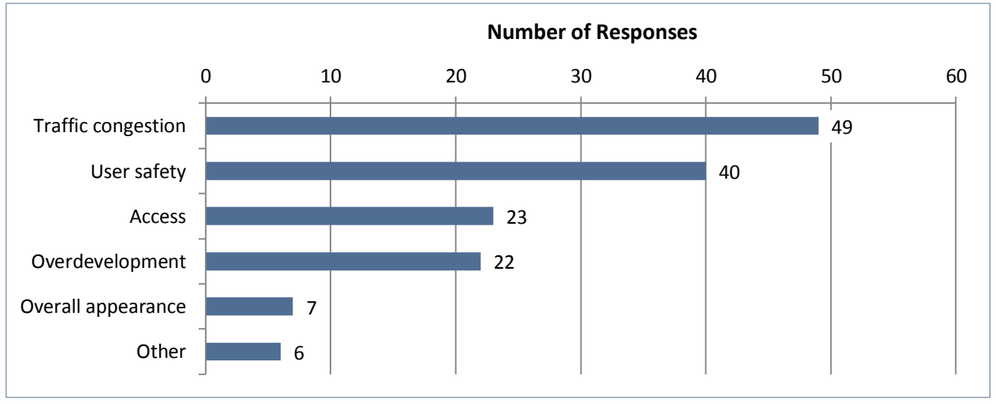


Figure 7.7 – Greatest Concern for the Future of the Corridor



Input from the questionnaires was carefully reviewed and analyzed. Information received helped the study team to validate empirical results with public feedback of operations and safety in the corridor. A summary of the results from each question in the questionnaire is provided in the **Appendix**.

7.2 Summary of Public Feedback from Citizen Information Meeting #2

The second meeting was held in Montgomery County, Virginia at the Riner Volunteer Fire Department on April 9, 2013, and was attended by approximately 39 individuals. This meeting was designed to review the results of the first meeting, explain the proposed short-, mid-, and long-term corridor recommendations, and to collect comments and input from the public on the proposed recommendations. The public was offered several methods in which feedback could be provided, which included a Questionnaire, Aerial Boards and general comments with project team members at the meeting. These methods are explained in detail in the following sections.

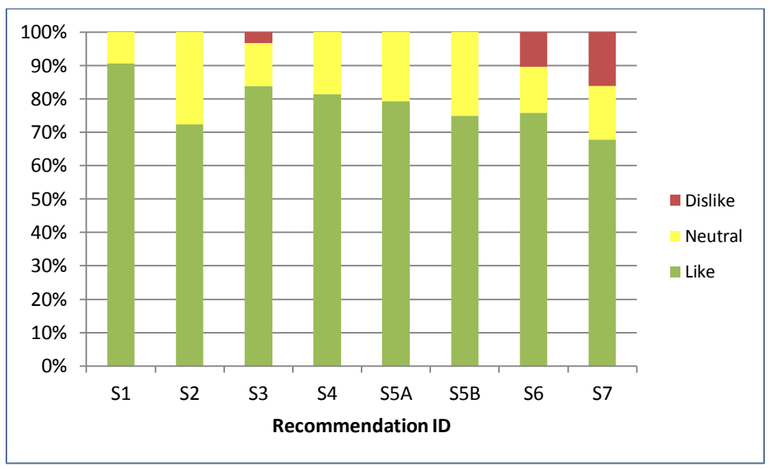
7.2.1 Questionnaire

Meeting attendees received a questionnaire, a copy of which is included in the **Appendix**, which listed each proposed short, mid, and long-term recommendation. For each recommendation, individuals were asked to select "like", "neutral", or "dislike" based on their opinion of the recommendation. In addition, space was provided on the questionnaire to provide any additional comments on each recommendation as well as additional recommendations. Questionnaires could be dropped in a comment box provided at the meeting.

Thirty-two questionnaire responses were received from the public. This survey should not be considered a random sample of the public opinion; therefore, no statistical significance can be concluded from the results. However, the survey does reflect opinions and responses from interested citizens in the area. A summary of the questionnaire results is provided below and the complete results are provided in the **Appendix**.

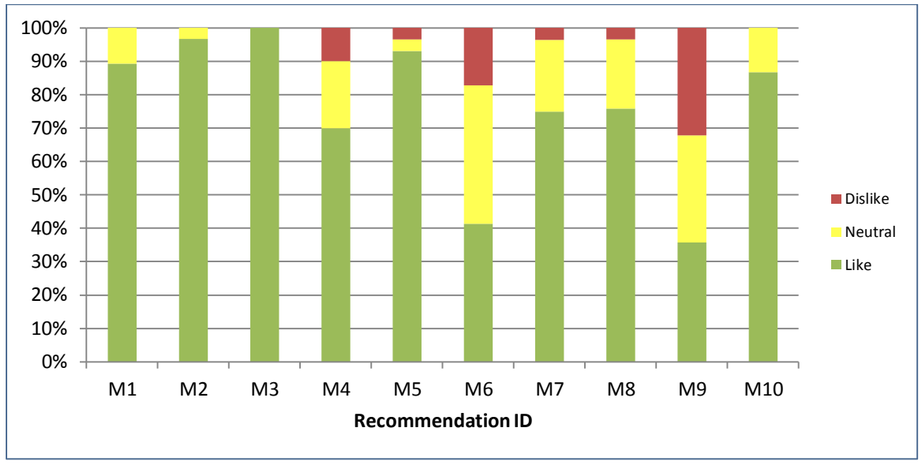
The public opinion of the proposed short-term recommendations is shown in **Figure 7.8**. All of the short-term recommendations received a rating of "like" by 65% or more of the respondents. In addition, four of the short-term recommendations received zero "dislike" ratings. These recommendations were cutting back the vegetation at Smith Creek Road and Camp Carysbrook Road to improve sight distance (S1), installing new warning signs throughout the corridor (S2), improving existing chevron spacing (S4), and improving access (S5).

Figure 7.8 – Public Opinion of Proposed Short-Term Recommendations



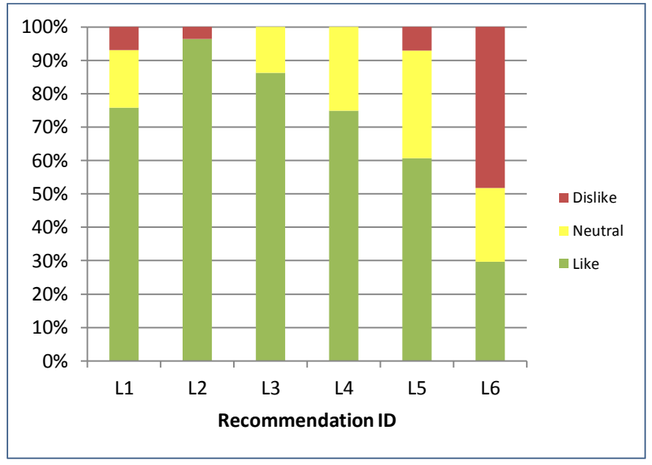
The public opinion of the proposed mid-term recommendations is shown in **Figure 7.9**. The proposed recommendation to conduct routine maintenance to maintain a flush shoulder with the edges of pavement (M3) received a rating of "like" by 100% of respondents. In addition, three other proposed mid-term recommendations received zero "dislike" ratings. These recommendations were installing guardrail with delineators (M1), constructing right- and left-turn lanes (M2), and monitoring the intersections of Route 8 with Union Valley Road and with the Auburn Schools entrance to determine if additional traffic control is justified (M10). The proposed mid-term recommendation with the highest percentage of "dislike" ratings (32%) was the recommendation to construct bicycle/pedestrian improvements within Riner near the Auburn School complex (M9).

Figure 7.9 – Public Opinion of Proposed Mid-Term Recommendations



The public opinion of the proposed long-term recommendations is shown in **Figure 7.10**. The proposed long-term recommendation with the highest percentage of "like" ratings (96%) was the recommendation to improve the clear zone along Route 8 with special attention given to the horizontal/vertical curves within the study corridor (M2). In addition, two of the proposed long-term recommendations received zero "dislike" ratings. These recommendations were reconstructing the Camp Carysbrook intersection (L3) and reconstructing the Meadow Creek Road/Dairy Road intersection (L4). The proposed mid-term recommendation with the highest percentage of "dislike" ratings (48%) was the recommendation to construct bicycle lanes, sidewalk, and/or a multi-use path along Route 8 or an alternative route (L6). Respondents commented that this recommendation is disliked because Route 8 is too dangerous for bicycle traffic due to poor sight distances, narrow pavement, and high traffic volumes.

Figure 7.10 – Public Opinion of Proposed Long-Term Recommendations



7.2.2 Aerial Boards

At the workshop, boards containing aerial maps of the study corridor with the locations of the proposed short-, mid-, and long-term recommendations were displayed. Each aerial board contained a table which described the recommendations shown on that board. In addition, the recommendation labels on the aerial boards corresponded to the recommendation IDs on the questionnaire. Meeting attendees were encouraged to use the aerial boards to locate the proposed recommendations listed on the questionnaires. Meeting attendees were also supplied with sticky notes to provide comments on the proposed recommendations or additional recommendations. The sticky notes could be placed on the aerial boards at the location that corresponded to the comment. Comments provided on the sticky notes were combined with the questionnaire responses and are included in the Citizen Information Meeting #2 summary in the **Appendix**.

Route 68