VILLAGE HIGHWAY (VA ROUTE 24) CORRIDOR IMPROVEMENT STUDY

Campbell County, Virginia

Village Highway (VA Route 24) Corridor Improvement Study

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Prepared for

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Campbell County

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Introduction

Village Highway (VA Route 24) is a multimodal corridor that provides access to the Village of Rustburg's major destinations. Some of the major destinations include Rustburg Elementary School, Rustburg Middle School, and the Campbell County Courthouse. In addition to serving as a "Main Street" for the Village, Village Highway also provides a vital connection to rural communities within Campbell County and neighboring counties. The Central Virginia Transportation Planning Organization (CVTPO) has undertaken this study to address existing and expected future mobility challenges within this essential corridor.

Study Purpose

The purpose of this study is to investigate existing and future traffic conditions, traffic operations, multimodal features, and safety issues along Village Highway. The results of the investigation will lead to the development of recommendations that will help to minimize congestion, improve safety, and improve multimodal mobility within the Village Highway corridor. The key steps in the process include:

- **Review of Background Studies:** Review completed transportation studies and documentation relative to planned or programmed improvements in the study corridor.
- **Data Collection:** Collect vehicle turning movement counts (TMCs) during the AM and PM peak periods, assemble crash data from VDOT's PSI database, and present a summary of the traffic and crash data.
- **Existing Conditions:** Adjust traffic data to address COVID conditions and conduct traffic operational analyses utilizing traffic count data and information from the field review. Using Synchro and SimTraffic, develop measures of effectiveness (MOEs) for the intersections.
- **Future Volume Projections:** Collaborate with VDOT to develop traffic forecasts for the future horizon year (2045) scenario.
- **Future No Build Conditions:** Estimate future traffic demand under existing geometric conditions, plus the addition of any planned transportation related improvements. Future no build conditions establish a baseline which improvements can then be compared against.
- **Identification of Needed Improvements:** Develop a list of potential transportation improvements, along with timing and implementation strategies.
- **Future Build Conditions:** Recommend improvements informed by and vetted through a public involvement process, that accommodate future horizon year traffic demand and address safety issues.
- **Planning Level Cost Estimates:** Prepare planning level opinions of costs along with implementation strategies and funding opportunities.

Each step in the study informs subsequent steps and allows for the creation of a cohesive corridor plan. The results have been shared with the public through an interactive and transparent public engagement process, which is integral to the success of the plan, resulting in recommendations that will continue to benefit the citizens and businesses in the surrounding study area.

A summary of the recommended projects is included. This information is intended to aid the County, CVTPO, and VDOT with project prioritization and implementation when grant or other funding opportunities arise in the future. It will also help to inform current development and potential development of future transportation related projects that may affect them. Projects should continue to be updated in the future as a tool to track opportunities and needs within the corridor.

Study Area

The study area extends along Village Highway, from Brookneal Highway to Red House Road, a distance of approximately 1.5 miles. **Figure 1** provides an illustration of the study area, as well as the intersections this study examined. The study area includes the following four (4) signalized intersections and two (2) unsignalized intersections:

- Route 24 at Brookneal Highway (Signalized)
- Route 24 at Rocky Road (Unsignalized)
- Route 24 at Depot Road (Unsignalized)
- Route 24 at Carden Lane (Courthouse) (Signalized)
- Route 24 at US 501/Campbell Highway (Signalized)
- Route 24 at Red House Road (Signalized)

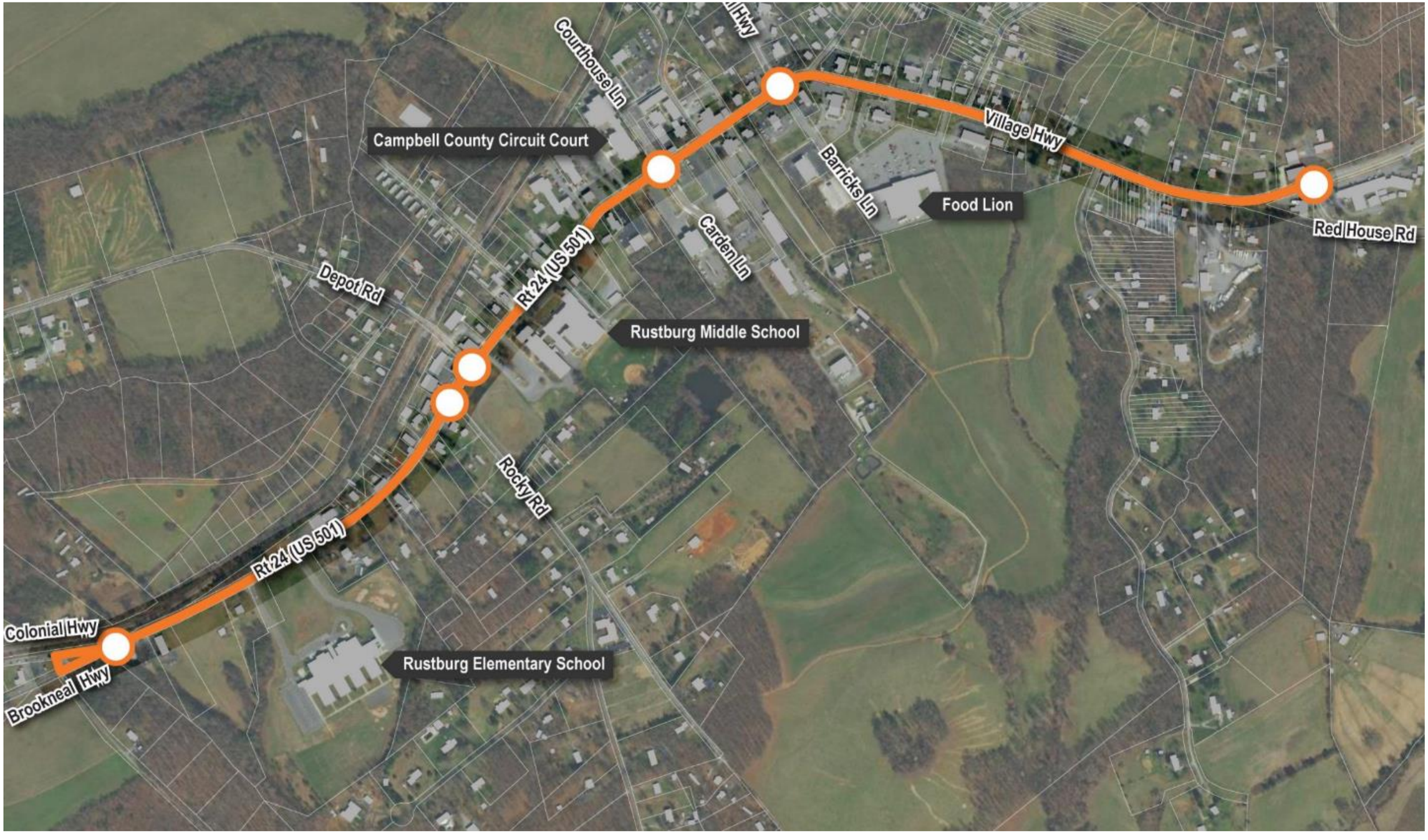
Village Highway is a two-lane undivided roadway with a continuous center two-way left turn lane (TWLTL). Village Highway is classified as a minor arterial and designed for "through" and local traffic. The posted speed is 25 mph within the core section, which extends from Silver Grove Road at the west to just east of Campbell Highway. On both the eastern and western fringes of the corridor, the posted speed limit is 35 mph. The Virginia Department of Transportation (VDOT) reports that the 2019 average daily traffic (ADT) counts are approximately 9,600 vehicles per day (VPD) on Village Highway west of US 501/Campbell Highway and 4,400 VPD east of US 501/Campbell Highway.

Within the study corridor, Village Highway is the main artery for the Village of Rustburg. The corridor serves many types of users, such as commuters, local institutional and commercial interests, agricultural equipment drivers, pedestrians, and bicyclists. As such, Village Highway serves many purposes including:

- Local residential and shopping access
- School related traffic
- Local and regional truck traffic
- Employment commuting
- Pedestrian and transit activity
- Local business access
- Emergency and security response

Village Highway must continue to accommodate a wide array of users with varying trip purposes. Maintaining and enhancing traffic flow within the corridor is of crucial importance, as well as balanced multi-modal accessibility.

Figure 1 – Study Area



Relevant Plans and Studies

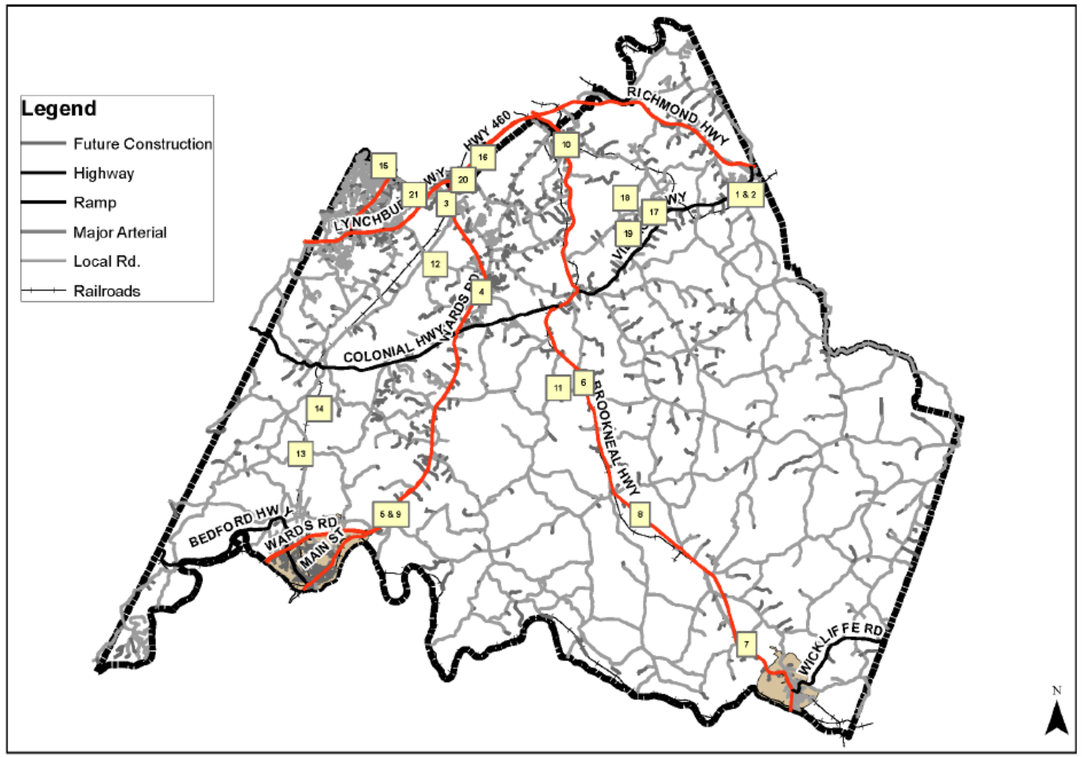
The following relevant studies and plans completed in the study area have been collected and reviewed. Below is a brief summary of each:

2019-2034 Campbell County Comprehensive Plan – The Comprehensive Plan identifies Village Highway as a minor arterial for the region. One recommendation identified in the Comprehensive Plan is to provide a sidewalk along the south shoulder of Village Highway, providing continuous pedestrian access from Rustburg High School to the village center. Per the Plan, "Campbell County supports all efforts to improve the safety and efficiency of Route 24."

The County has also developed a *Capital Improvement Plan* that summarizes the County's budget allocations for all departments and public works. The FY 2021 plan acknowledges Rustburg as a commerce center for the region and that Village Highway serves as a vital connection for the County and the corridor connects commuters, students, and merchants with the surrounding area.

VDOT FY 2020-2025 Six Year Improvement Program – The VDOT Six Year Improvement Program contains the approved and adopted list of transportation improvement projects for the current six-year period. Rustburg falls within District 3 (Lynchburg District). While no approved projects are programmed within the study corridor, the six-year plan lists several projects which will benefit the safe travel of commuters within Campbell County and neighboring counties. One such project is a shoulder widening on Brookneal Highway, near Winfall Road. The project is approximately 4 miles south of Rustburg and will allow more width for drivers to recover from lane departures, thus increasing safety.

Figure 2 – VDOT FY 2020-25 Six Year Improvement Program Projects



Central Virginia Transportation Planning Organization (CVTPO) Constrained and Vision Plan – The CVTPO Constrained and Vision Plan is the four-year transportation improvement program (TIP) for the CVTPO regional area. The effort involves several jurisdictions and agencies across the region and focuses on projects that are significant to the region. The region's TIP draws attention to immediate transportation needs. The most recent transportation improvement plan was adopted in 2020 and covers fiscal years 2021 – 2024. Within the Safety/ITS/Operational improvements grouping, one project in the study area is identified as shown in **Figure 3.**

Figure 3 – CVTPO 2021-2024 TIP

Construction: Safety/ITS/Operational Improvements

	System	UPC	Jurisdiction / Name / Description	Street(Route)	Estimate
Primary	109577		Amherst County	RICHMOND HIGHWAY (0060)	$711,613
			RTE 60 - CONSTRUCT SIDEWALK		
			FROM: RTE 1102 / 1112 (WASHINGTON ST / WHITEHEAD ST) TO: BUS 29 Business (0.3070 MI)		
Primary	108914		Bedford County	FOREST ROAD (0221)	$8,137,995
			#HB2.FY17 Route 221 Congestion and Safety Improvements		
			FROM: Graves Mill Road TO: Gristmill Drive (0.4000 MI)		
Primary	109555		Lynchburg	TIMBERLAKE ROAD (0460)	$3,233,297
			#HB2.FY17 BUS 460 - RECONSTRUCT INTERSECTION AT RTE 622		
			FROM: 0.087 MILE WEST OF RTE 622 TO: 0.104 MILE EAST OF RTE 622 (0.1910 MI)		
Primary	111976		Campbell County	LUSARDI DR / BROOKNEAL HWY / CAMPBELL HWY (0501)	$126,079
			PM3B18 CAMPBELL COUNTY - RTE 501 - CENTERLINE RUMBLE STRIPS		
			FROM: HALIFAX / CAMPBELL COUNTY LINE TO: 0.04 MILES NORTH ROUTE 898 (TRESTLE RD) (23.2400 MI)		
Primary	107015		Amherst County	SOUTH AMHERST HIGHWAY (7029)	$2,930,241
			BUS 29 - SHOULDER WIDENING/RUMBLE STRIPS/GR - AMHERST COUNTY		
			FROM: 0.03 MILE NORTH RTE 646 TO: 0.16 MILE NORTH RTE 661 (5.8200 MI)		
Primary	109586		Amherst County	SOUTH AMHERST HIGHWAY (7029)	$2,038,648
			BUS 29 - CONSTRUCT SIDEWALK (MADISON HEIGHTS)		
			FROM: 0.011 MILE SOUTH RTE 1054 (LAKEVIEW DR) TO: 0.01 MILE NORTH RTE 682 (WOODYS LAKE RD) (1.4210 MI)		
Primary	108054		Lynchburg District-wide	VARIOUS (9999)	$922,398
			DISTRICTWIDE - ADA COMPLIANCE CURB RAMP IMPROVEMENTS		
			FROM: VARIOUS TO: VARIOUS		
Primary	112887		Lynchburg District-wide	VARIOUS (9999)	$620,498
			DISTRICTWIDE CENTERLINE RUMBLE STRIP INSTALLATION		
			FROM: VARIOUS TO: VARIOUS		

Central Virginia Planning District Commission (CVPDC) Rural Long-Range Transportation Plan 2040 Update (RLRTP) – The CVPDC rural long-range transportation plan (RLRTP) complements the planning efforts of the surrounding metropolitan areas. The plan is part of a greater initiative to aid in the funding process and serves as a screen for the statewide prioritization process. Projects that are marked as priority can apply for state or federal funding through one of the various sources, such as SMARTSCALE or the Highway Safety Improvement Program (HSIP).

Existing Conditions

This corridor study includes a multifaceted approach that consists of crash analysis, establishing existing traffic volumes, intersection traffic operations analysis, detailed field review, and assessment of performance measures. Collectively, these elements uncover existing deficiencies in the network and provide a baseline on which future conditions can be established.

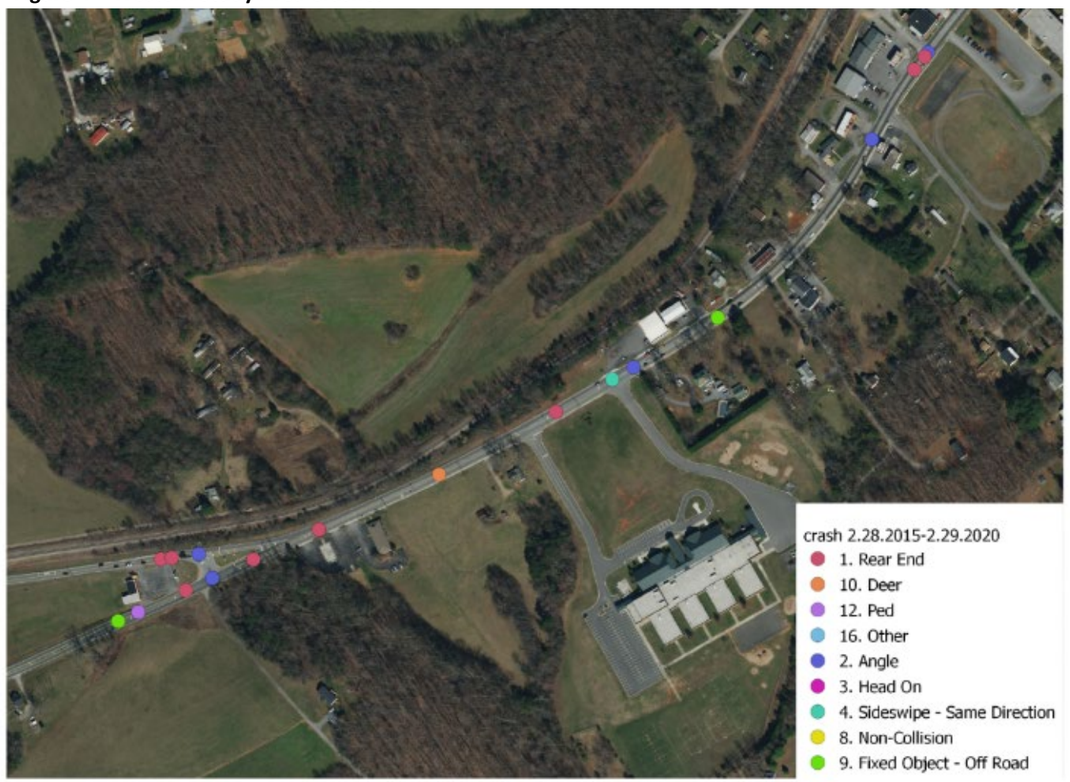
Crash Analysis

A crash analysis was performed on the Village Highway study corridor using crash data from the VDOT PSI and Tableau databases. The crash data covered the period from February 28, 2015 to February 29, 2020 and was used to identify crash patterns based on crash severity, roadway characteristics, and environmental characteristics. The detailed crash data is provided in **Appendix A.**

Summary of Corridor Crashes

The crash locations and crash heat maps are illustrated in **Figures 4** through **7.** Eighty-two (82) total crashes were reported within the study area over the five-year crash analysis period. Of the reported crashes, 59 involved property damage and 23 involved injuries. No fatalities were reported among the crashes found in the database. A total summary of the crashes, by type, is shown in **Table 1**. As would be expected, the heat map indicates that the crashes are concentrated at the intersection and driveway locations along Village Highway.

Figure 4 – Western Study Area Crashes



The number of crashes by year varies across the five-year study window, which peaked in 2018 with 23 crashes. As shown in Table 1, the predominant crash type is the rear end collision, contributing to 42 percent of all crashes. The next highest crash type is the angle collision, contributing to 24 percent of all crashes. The angle collisions are likely a result of the close density of driveway spacing throughout the study corridor.

Table 1 – Crash Statistics

Year	Rear End	Angle	Fixed Object	Side-swipe	Head On	Other	Ped	Deer	Total
Mar 2015 – Feb 2016	9	3	0	1	0	0	0	0	**13**
Mar 2016 – Feb 2017	3	1	4	0	1	2	1	0	**12**
Mar 2017 – Feb 2018	7	5	3	0	1	0	1	0	**17**
Mar 2018 – Feb 2019	8	6	7	1	0	0	0	1	**23**
Mar 2019 – Feb 2020	7	5	5	0	0	0	0	0	**17**
Total	**34**	**20**	**19**	**2**	**2**	**2**	**2**	**1**	**82**

The proportion of fixed object collisions, 23 percent, is noteworthy. VA-24 is lined on both sides with utility poles placed just behind the curb. As noted in the field review, Type 3 Object markers (OM3-R) have been placed at the base of the utility pole, in hopes to reduce the occurrence of drivers colliding with the poles.

Figure 5 – Western Study Area Crash Heat Map

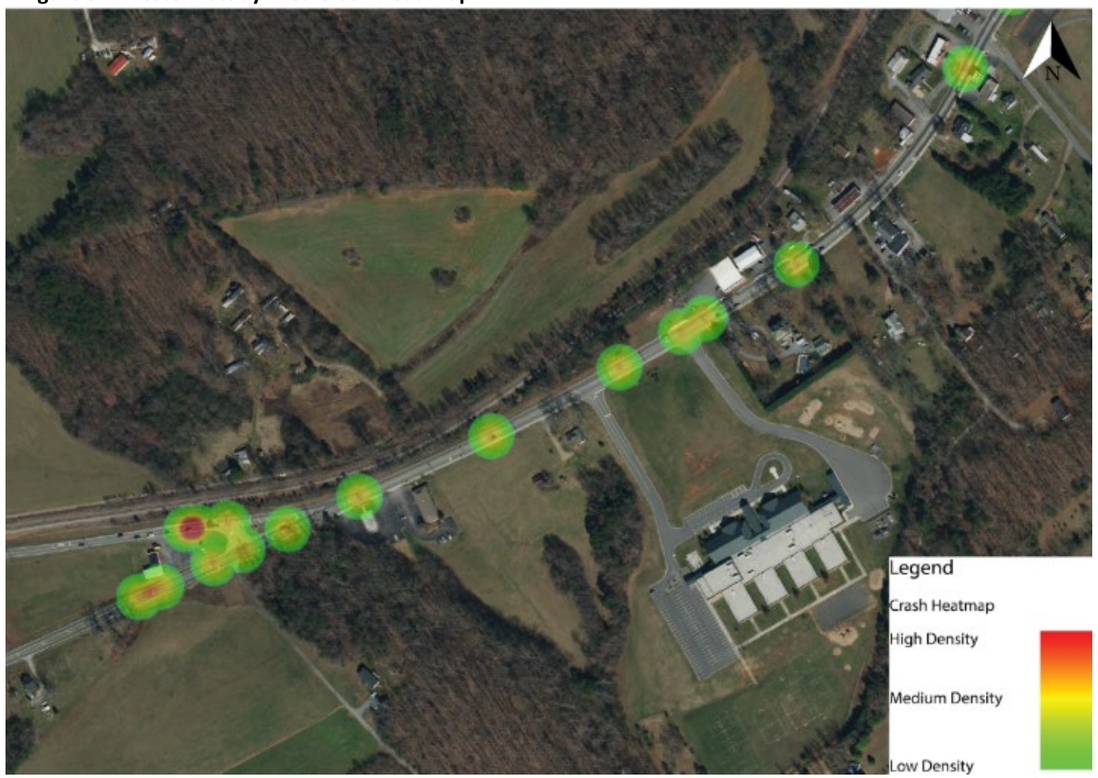


Figure 6 – Eastern Study Area Crashes

Figure 7 – Eastern Study Area Crash Heat Map

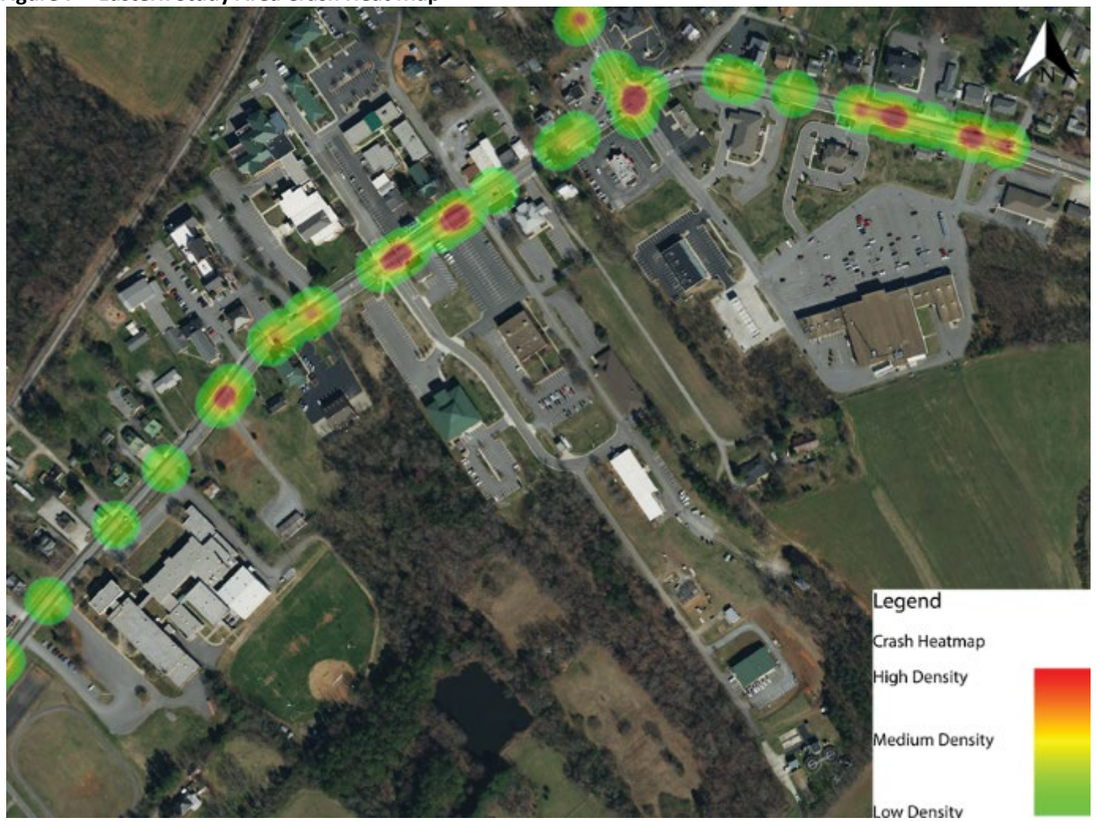


Table 2 displays the number of crashes according to roadway condition and severity of crash event. As shown in both tables, the proportion of daytime-to-nighttime crashes is greater than 2:1, which corresponds to the number of daylight hours in a 24 hour period. Likewise, a similar ratio can be seen in the proportion of dry-to-wet surface crashes, due to the greater number of trips occurring during dry weather.

Table 2 – Severity of Crashes by Roadway Condition (KABCO)

	Severity				
Conditions	**A**	**B**	**C**	**PDO**	**Total**
Daytime	3	15	1	44	**63**
Nighttime or Other	1	3	0	15	**19**
Total	**4**	**18**	**1**	**59**	**82**
Dry surface	3	15	1	46	**65**
Wet or other surface	1	3	0	14	**17**
Total	**4**	**18**	**1**	**59**	**82**

Crash Rates

Crash rates can be an effective tool to measure the relative safety on a particular segment along a corridor. They account for roadway characteristics such as segment length, number of crashes, and traffic demand; thereby, allowing for a “weighted” comparison of locations. Crash rates are expressed as "crashes per Million Entering Vehicles" (MEV) for intersection locations and as "crashes per Million Vehicle Miles Traveled" (MVMT) for roadway segments. **Figures 8** through **10** illustrate the segment and intersection crash rates for the corridor.

Table 3 summarizes the intersection crash rates along Village Highway. Of the six study intersections, US 501/Campbell Hwy intersection has the highest crash rate. Five (5) crashes occurred within the intersection, however, an additional 15 crashes occurred on US 501/Campbell Hwy immediately north of the traffic signal. The intersection is also the location of the only reported pedestrian crash. As noted, the intersection does not have pedestrian crossings.

The US 501/Brookneal Hwy intersection has the second highest crash rate in the study area. The intersection appears to have recently been upgraded to reduce conflicts at this T-intersection. The eastbound through movement was removed from Colonial Hwy, thus, all drivers must make a left turn to continue eastbound on VA-24. This improvement helps in limiting vehicle conflict points.

Table 3 – Intersection Crash Rates

Intersection	Intersection Rate	Rank
US 501/Brookneal Hwy	0.506	2
Rocky Rd	0.000	6
Depot Rd	0.165	4
Carden Ln	0.214	3
US 501/Campbell Hwy	0.632	1
Red House Rd	0.086	5

Figure 8 – Segment 1 Crash Rate

Figure 9 – Segment 2 Crash Rate

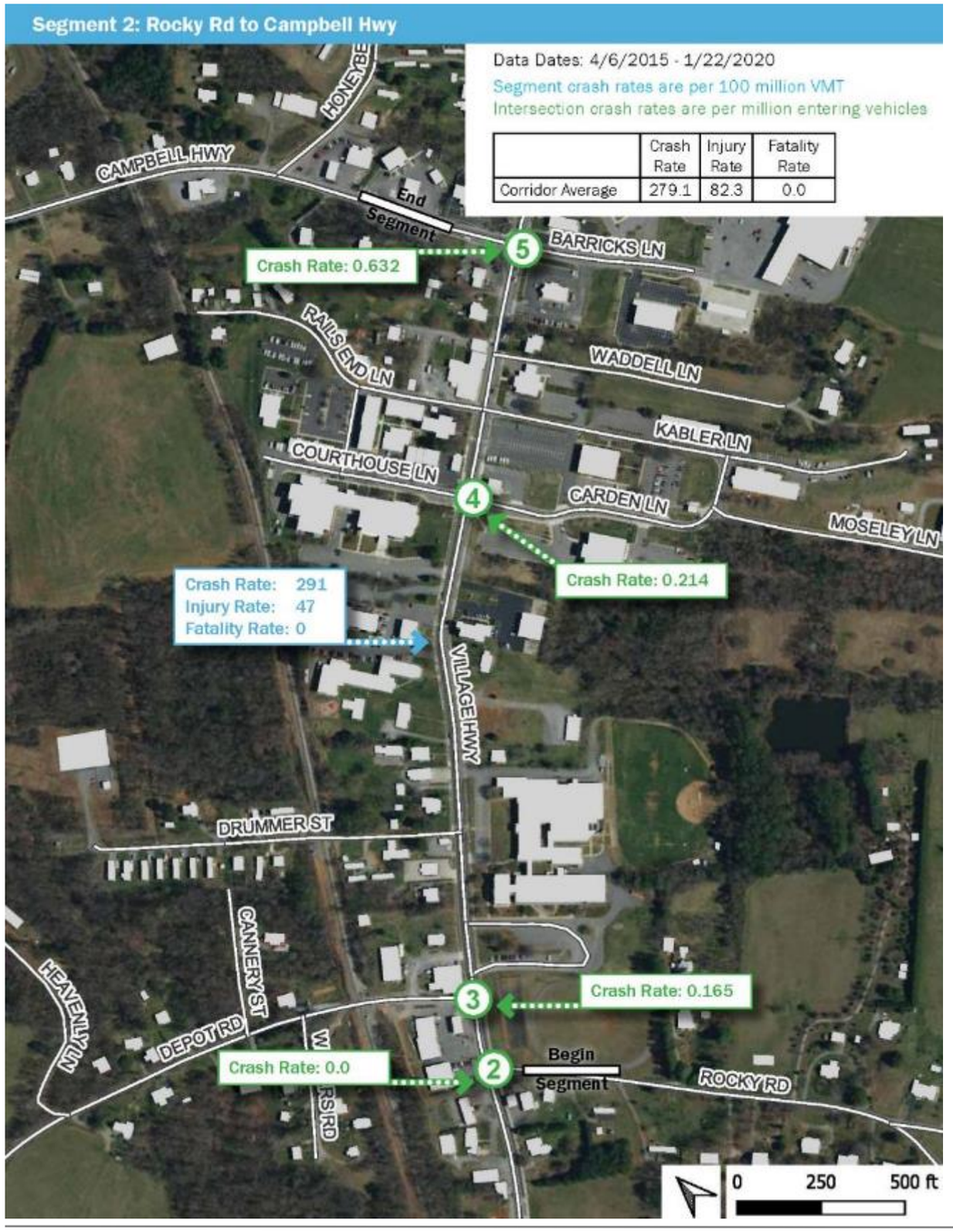
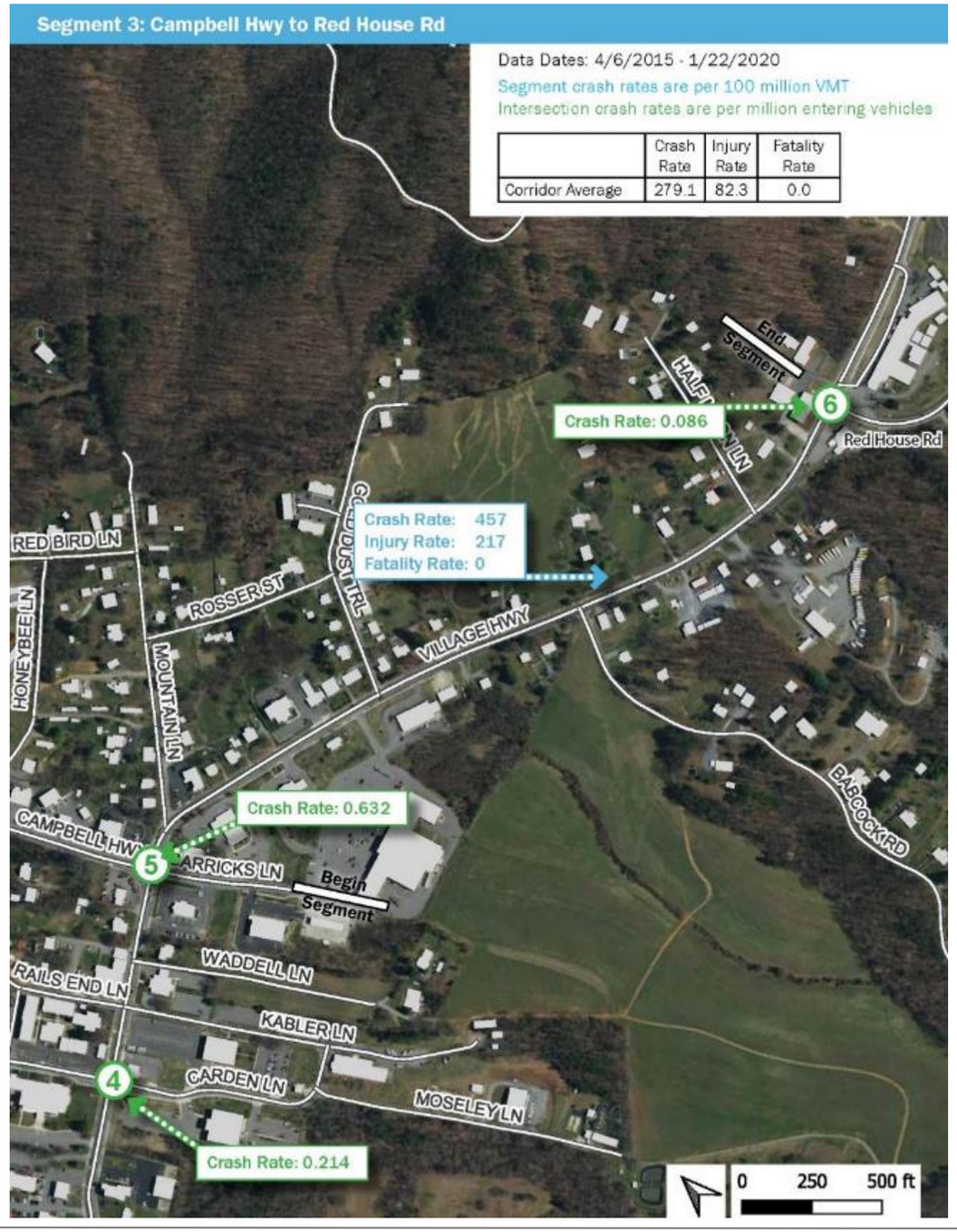


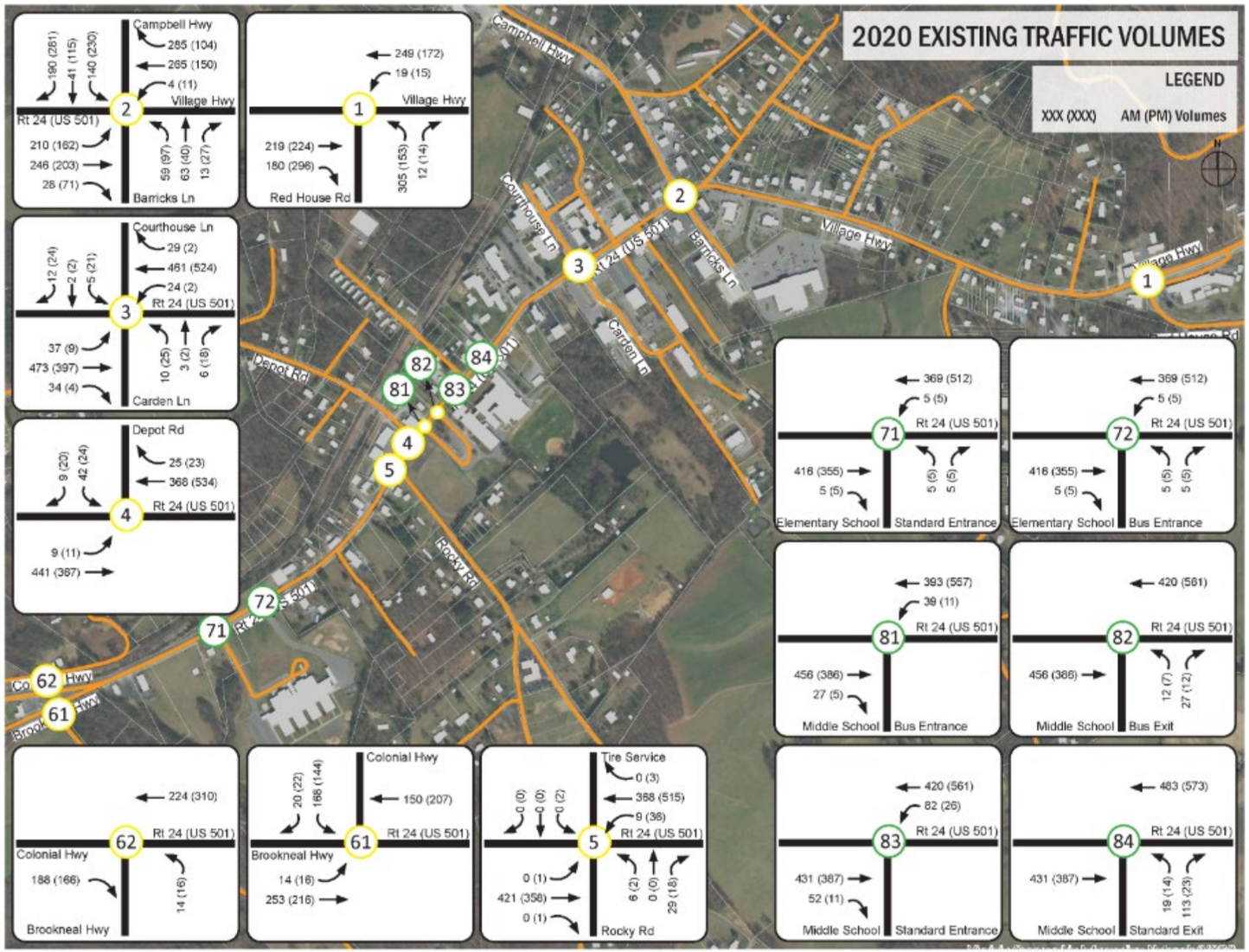
Figure 10 – Segment 3 Crash Rate



Existing Traffic Volume Development

Peak hour turning movement counts (TMC) conducted on February 12 and July 15, 2020 from 7 AM to 9 AM and 2 PM to 6 PM provide the basis for the existing traffic volumes. In February 2020, traffic counts were conducted at the intersection of Village Highway with US 501 (Campbell Hwy). This data was collected just prior to and also during the Covid-19 pandemic. Additional peak hour TMCs were conducted at the five other study intersections on July 15, 2020. All of the traffic counts are provided in **Appendix B**. The counts were adjusted to account for the on-going Covid-19 pandemic and schools not being in session. **Appendix C** contains a memo detailing the assumptions that the adjusted traffic volumes are based on. The existing AM and PM peak hour traffic volumes are illustrated in **Figure 11**.

Figure 11 – 2020 Existing Traffic Volumes



Access Management

Most of the Village Highway corridor is characterized by closely spaced intersections and frequent driveway entrances. The *VDOT Road Design Manual* provides spacing standards for different types of intersections and access points, which help to provide an appropriate balance between providing access to adjacent land uses and maintaining the flow of traffic, based on a roadway's functional classification and posted speed limit. By managing the location and spacing of entrances and intersections, planners and designers can reduce the number of conflict points, traffic congestion, and crashes. Businesses benefit from access management because more efficient traffic flow expands their market area.

VDOT classifies Village Highway as a Minor Arterial throughout the study area. VDOT's Access Management Design Standards indicate Principal and Minor Arterials should have "limited or partial" access control because the functional purpose of these roads is "high mobility, low to moderate access."[1] The access management standards applicable to Village Highway are listed in **Table 4.**

The spacing of commercial entrances along most of the Village Highway study corridor does not meet the access spacing standards. Campbell County should consider implementing access management techniques in the future to improve safety within the corridor. These techniques may include consolidating driveways, creating connections between adjacent parcels, eliminating driveways within the functional area of intersections, and providing turn lanes.

Table 4 - VDOT Access Spacing Standards

Description of Type of Access Points				Minimum Spacing Distance (feet)
From	Signalized Intersections	To	Other Signalized Intersections	880
From	Unsignalized Intersections & Full Median Crossovers	To	Signalized or Unsignalized Intersections & Full Median Crossovers	660
From	Full Access Entrances or Directional Median Crossovers	To	Other Full Access Entrances and Any Intersection or Median Crossover	355
From	Partial Access One- or Two-Way Entrances	To	Any Type of Entrance, Intersection, or Median Crossover	200

Source: VDOT Road Design Manual, Appendix F: Access Management Design Standards for Entrances and Intersections, Table 2.2: Minimum Spacing Standards for Commercial Entrances, Intersections, and Median Crossovers. Spacing above based on Minor Arterial with less than 30 mph legal speed limit.

Traffic Analysis Methodology

The study intersections' traffic operations were evaluated with Synchro/SimTraffic 11, a computer-based traffic analysis model that replicates procedures from the *Highway Capacity Manual* (*HCM*) (Transportation Research Board, 2000 and 2010). The average vehicle delays (in seconds) for each turning movement, as well as the Level of Service (LOS) on a scale of A (best) to F (worst) as defined in the *Highway Capacity Manual* were determined and reported with Synchro, and the maximum queue lengths (in feet) for each turning movement were determined and reported with SimTraffic.

Existing Traffic Operations

The existing conditions Synchro/SimTraffic models were developed per the existing intersection configurations, existing adjusted traffic volumes, and the current *VDOT TOSAM* guidance. The Synchro *HCM* based output reports and SimTraffic queue reports are provided in **Appendices D** and **E,** respectively. **Tables 5** and **6** summarize and **Figure 12** illustrates the existing conditions analysis results. The signal timing and phasing plans for all signalized intersections were provided by VDOT. As shown in Table 5, all movements at the unsignalized intersections currently operate at LOS C or better during both the AM and PM peak hours and all queues are accommodated within the provided storage lanes.

Table 5 – 2020 Existing Conditions Unsignalized Intersections Levels of Service, Delays, and Queues

Intersection	Movement	Storage	Taper	Effective Storage	AM			PM		
					LOS	Delay	Queue	LOS	Delay	Queue
Rocky Road	EBL/T/R**	-	-	-	A	0.0	0	A	8.5	3
	WBL	35	80	75	A	8.4	31	A	8.1	37
	WBT/R*	180	0	180	A	0.0	0	A	0.0	0
	NBL/T/R	-	-	-	B	13.7	37	B	11.8	30
	SBL/T/R*	80	0	80	A	0.0	0	C	22.7	25
Depot Road	EBL	35	80	75	A	8.2	31	A	8.6	34
	EBT*	180	0	180	A	0.0	5	A	0.0	0
	WBT/R*	55	0	55	A	0.0	0	A	0.0	5
	SBL/R	-	-	-	B	14.5	56	B	14.0	56
Bus Entrance	EBT/R*	55	0	55	A	0.0	34	A	0.0	9
	WBL*	100	0	100	A	9.4	76	A	8.2	31
	WBT*	100	0	100	A	0.0	13	A	0.0	0
Bus Exit	EBT*	100	0	100	A	0.0	16	A	0.0	0
	WBT*	160	0	160	A	0.0	7	A	0.0	0
	NBL/R	-	-	-	C	17.4	112	B	12.2	46
Auto Entrance	EBT/R*	160	0	160	A	0.0	13	A	0.0	0
	WBL*	220	0	220	A	9.2	63	A	8.2	31
	WBT*	220	0	220	A	0.0	0	A	0.0	0
Auto Exit	EBT*	220	0	220	A	0.0	0	A	0.0	0
	WBT	-	-	-	A	0.0	0	A	0.0	0
	NBL/R	-	-	-	C	16.4	106	B	12.6	54

** Distance between intersections*
*** Left turn LOS and delay reported*

[1] VDOT Road Design Manual Appendix F. Pg. F-11.

As shown in Table 6, all of the signalized intersections operate at LOS C or better overall during both peak hours and all of the individual movements operate at LOS D or better, with the exception of the side streets at Carden Lane and Campbell Highway which operate at LOS E. The queues are currently accommodated with the provided storage areas for all movements with the exception those listed below.

- Carden Lane: Eastbound left turn, westbound left turn, and southbound right turn
- Campbell Highway: Eastbound left turn, westbound left turn and southbound right turn

It should also be noted that the westbound approach Campbell Highway has a maximum queue length of 703 feet, or 29 vehicles during the AM peak hour.

Table 6 – 2020 Existing Conditions Signalized Intersections Levels of Service, Delays, and Queues

Intersection	Movement	Storage	Taper	Effective Storage	AM			PM		
					LOS	Delay	Queue	LOS	Delay	Queue
Colonial Hwy/Brookneal Hwy South	EBL	300	100	350	C	24.8	70	C	26.2	98
	EBT				A	8.5	171	A	7.5	160
	WBT	180	0	180	B	16.0	144	B	15.4	163
	SBL/SBR	75	0	75	B	16.9	62	B	17.1	58
	Intersection				B	13.3		B	13.3	
Colonial Hwy/Brookneal Hwy North	EBR	-	-	-	B	15.1	188	B	15.7	135
	WBT	200	0	200	A	4.2	95	A	4.5	145
	NBL	75	0	75	A	3.0	2	A	3.9	8
	Intersection				A	9..0		A	8.3	
Carden Lane	EBL	60	100	110	A	4.3	74	A	7.7	46
	EBT/R	-	-	-	A	9.2	188	B	10.3	183
	WBL	40	50	65	A	4.7	51	A	7.2	18
	WBT/R	-	-	-	A	9.8	197	B	12.1	259
	NBL/T	-	-	-	E	58.8	56	C	32.2	53
	NBR	85	110	140	E	55.8	31	C	30.5	36
	SBL/T	-	-	-	E	57.0	37	C	30.0	59
	SBR	40	60	70	E	55.8	47	C	28.7	62
	Intersection				B	10.8		B	13.0	
Campbell Hwy	EBL	150	200	250	C	22.7	243	C	23.0	222
	EBT/R	-	-	-	B	17.3	349	C	29.1	277
	WBL	100	80	140	B	19.6	66	C	31.7	112
	WBT/R	-	-	-	D	38.4	703	D	41.3	304
	NBL/T	-	-	-	E	79.3	221	D	51.3	197
	NBR	150	100	200	D	52.7	85	D	44.2	80
	SBL/T	-	-	-	E	67.9	332	D	46.9	375
	SBR	160	360	340	A	0.2	207	A	0.3	270
	Intersection				C	34.6		C	31.5	
Red House Road	EBT/R				B	19.8	307	B	15.3	244
	WBL	200	130	265	A	9.7	40	A	7.9	44
	WBT/R				B	10.1	172	A	6.3	111
	NBL/NBR				C	20.8	224	C	23.2	136
	Intersection				B	17.5		B	14.9	

Comparison of Existing Conditions and SimTraffic Results

Through discussions with County Staff and stakeholders, it is apparent that at times Rustburg Middle School traffic impacts Carden Lane which was not initially revealed in the SimTraffic microsimulation. In an effort to more accurately replicate field conditions with the traffic model several variables were tested with the AM peak hour analysis. A summary of the variables adjusted and results are below.

- Peak Hour Factor (PHF) – The peak hour factor at the auto entrance to the middle school was calculated to be 0.58, based on traffic counts. Various values between 0.5 and 0.7 were tested, however none of the scenarios produced queues extending to Carden Lane.
- Student Drop-Off Delay – The drop-off location for the school was simulated using both two-stop controlled (TWSC) and actuated signalized control in order to simulate the delay from drivers dropping off students. Dwell times between 10 and 15 seconds were tested as the amount of time to for one driver to drop-off students. In these tests, the current driveway configuration handled the arrival rate without traffic impacts to Village Highway.
- Mid-Block Driveway Connections – There are at least six driveway connections between Rustburg Middle School and Carden Lane. These driveways can limit the available storage for westbound drivers entering the school. Given the queues reported in the SimTraffic simulation, the queue would need to be about 5 times greater to reach the first driveway between Rustburg Middle School and Carden Lane.

On-site observations found that the student drop-off dwell time can vary greatly between drivers. Although the dwell time was not measured, it is likely that drivers who dwell more than 30 seconds would induce a great delay to other drivers arriving to the school.

One known contributor to congestion on Village Highway is the ingress of vehicles to the school through the Auto Entrance. The available storage for arriving vehicles at the current school is about 150 feet. The concept for the proposed Rustburg Middle School offers about 500 feet of storage for arriving vehicles. The school project will construct a new right turn lane into the site. In addition, the proposed concept includes separate left turn and right turn lanes for northbound exiting traffic. Thus, the proposed Rustburg Middle School should offer an improved service capacity for arriving automobile drivers during the AM peak.

Figure 12 – 2020 Existing Levels of service

Future 2045 Traffic Conditions

Future 2045 Traffic Volume Development

Traffic along Village Highway is anticipated to increase due to regional growth and development within the study area.

Regional Growth

Future 2045 regional traffic growth was forecasted using the regional travel demand model, VDOT SPS data, and VDOT historical traffic data for the intersections along Village Highway. The growth rates for the three data sources are summarized in **Table 7.** Based on the data, two growth rates were assumed on Village Highway and various rates on the side streets as shown in the table.

Development Traffic

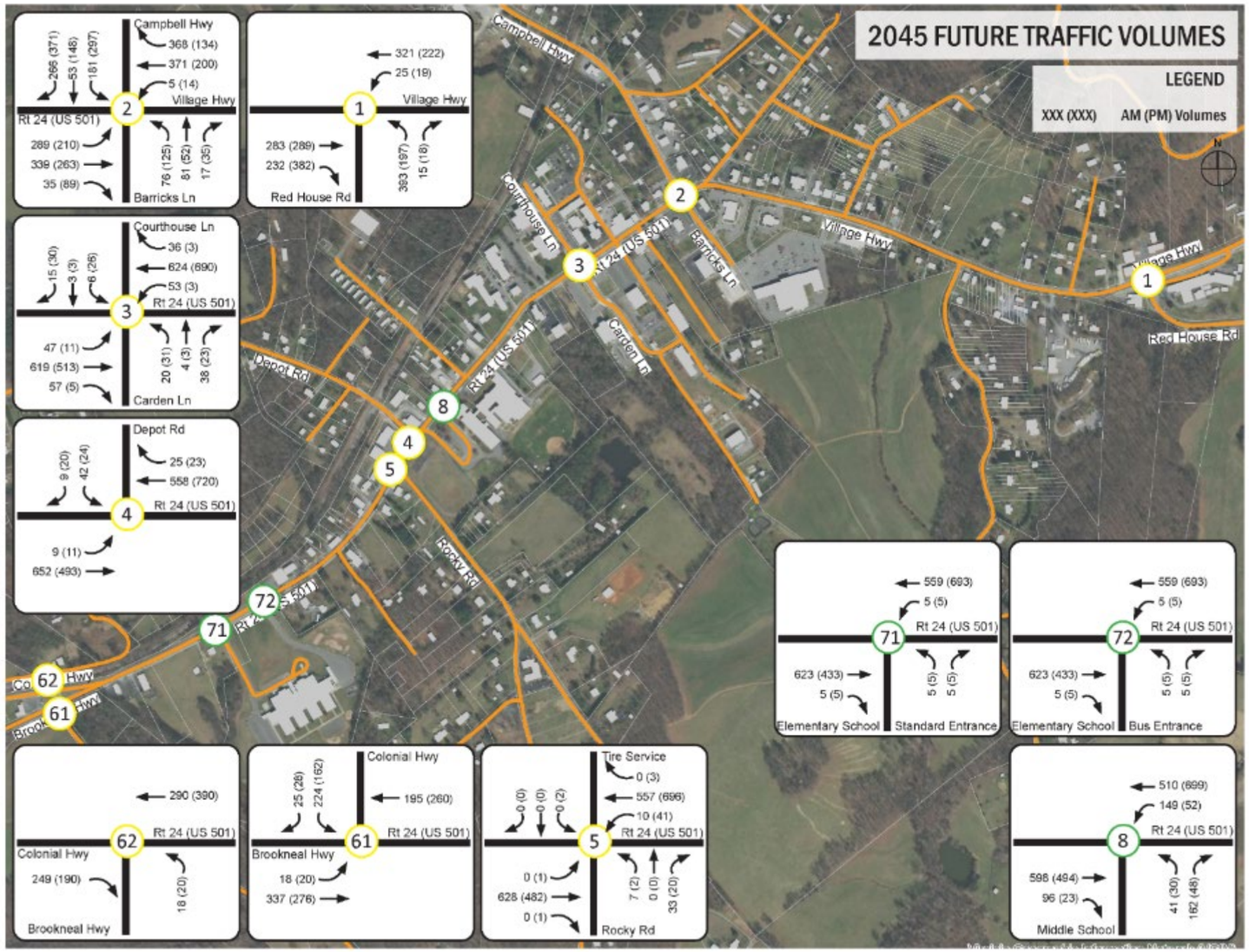
In addition to background traffic growth, traffic generated by the proposed Rustburg Middle School Replacement Project scheduled for completion in 2022, was included. Located on the south side of Village Highway between Rocky Road and Carden Lane, this project will include changes to the roadway network and will ultimately increase enrollment from 639 students to 900 students. The trip generation for the project is based on *the ITE Trip Generation Manual 10th Edition* and the new trips were distributed per the existing school travel patterns and proposed roadway network. The details related to the Rustburg Middle School Replacement Project are included in **Appendix F.**

The 2045 traffic volumes resulting from application of the background growth rates and Rustburg Middle School expansion are shown in **Figure 13**.

Table 7 – Regional Background Growth Rate Information

Roadway	Section	Growth Rates			
		SPS	TDM	VDOT	Recommended
Colonial Hwy (Route 24)		0.50%	1%	1.48%	1.03%
Village Hwy (Route 24/US 501)	Brookneal Hwy (US 501) - Depot Rd	1.62%	0.82%	0.26%	1.03%
	Depot Rd – Drummer St		1.02%		
	Drummer St – Campbell Hwy (US 501)		1.03%		
Village Hwy (Route 24)	Campbell Hwy (US 501) – Red House Rd	0.50%	1.09%	0.93%	1.16%
	East of Red House Rd	0.24%	1.16%		
US 501 (Brookneal Hwy)		0.89%	0.71%	1.51%	1.03%
US 501 (Campbell Hwy)		1.46%	1.16%	0.02%	1.16%
Depot Road		0.34%	1.85%	0.61%	0.50%
Red House Road		0.70%	0.95%	0.42%	1.16%
Rocky Road		-	-	2.17%	0.50%

Figure 13 – 2045 Future Traffic Volumes



Future 2045 Traffic Operations

The existing conditions Synchro/SimTraffic models were updated per the *TOSAM* guidelines, future 2045 traffic volumes shown in Figure 12, optimized signal timings, and with the proposed roadway improvements related to the Rustburg Middle School Replacement Project. The changes to the roadway network are detailed below.

- New roadway along the southern boundary of the school, parallel to Village Highway, that intersects Rocky Road and Carden Lane. At Rocky Road, the intersection will provide two-way stop control. At the Carden Lane intersection the design has yet to be finalized, either a stop-control or a roundabout will control traffic.
- Consolidation of four one-way driveways to one two-way driveway on Village Highway. This driveway will provide separate left and right turn lanes for vehicles exiting the school and an eastbound right turn lane for vehicles entering the school.
- Two two-way driveways on the new roadway, one for faculty and staff and the other for buses.
- An eastbound right turn lane on Village Highway at Carden Lane.

The resulting levels of service, delays, and queues are shown in **Tables 8** and **9** and **Figures 14** and **15**. (See **Appendices G** and **H** for the analysis printouts.) As shown in Table 8, most movements at the unsignalized intersections are expected to operate at LOS D or better during both the AM and PM peak hours and most queues are expected to be accommodated within the provided storage lanes. The southbound approach at the Rocky Road intersection and the northbound left turn movement at the Rustburg Middle School Main Entrance are both expected to operate at LOS E. The queues for the eastbound left turn movement at Depot Road and the northbound left turn movement at the Middle School Main Entrance are both expected to exceed the provided storage lanes but be accommodated within the effective storage area.

Table 8 – 2045 Future Conditions Levels of Service, Delays, and Queues Unsignalized Intersections

Intersection	Movement	Storage	Taper	Effective Storage	AM			PM		
					LOS	Delay	Queue	LOS	Delay	Queue
Rocky Road	EBL/T/R**	-	-	-	A	0	0	A	9.1	21
	WBL	35	80	75	A	9.2	28	A	8.5	42
	WBT/R*	180	0	180	A	0	0	A	0	0
	NBL/T/R	-	-	-	C	20.7	47	B	13.9	26
	SBL/T/R*	80	0	80	A	0	0	E	35.8	24
Depot Road	EBL	35	80	75	A	8.9	31	A	9.3	35
	EBT*	180	0	180	A	0	0	A	0	3
	WBT/R	-	-	-	A	0	0	A	0	7
	SBL/R	-	-	-	C	19.2	74	C	17.1	61
Rt. 24/Main Entrance	EBT	-	-	-	A	0	34	A	0	2
	EBR	100	100	150	A	0	20	A	0	2
	WBL	150	100	200	B	11.7	137	A	8.8	56
	WBT	-	-	-	A	0	0	A	0	0
	NBL	100	100	150	E	43.8	125	C	20.3	54
	NBR	-	-	-	D	25.2	192	B	12.3	58

** Distance between intersections documented as storage and effective storage*
*** Left turn LOS and delay reported*

Table 9 – 2045 Future Conditions Levels of Service, Delays, and Queues Signalized Intersections

Intersection	Movement	Storage	Taper	Effective Storage	AM			PM		
					LOS	Delay	Queue	LOS	Delay	Queue
Rt. 24/Colonial Hwy/Brookneal Hwy South Part	EBL	300	100	350	C	29.5	73	C	30.3	112
	EBT	-	-	-	B	10.6	216	A	8.3	196
	WBT	180	0	180	B	17.9	174	B	16.4	195
	SBL/SBR	75	0	75	B	18.2	76	B	18.2	61
	Intersection				B	15.1		B	14.2	
Rt. 24/Colonial Hwy/Brookneal Hwy North Part	EBR	-	-	-	B	15.9	222	B	16.6	170
	WBT	200	0	200	A	4.0	123	A	4.4	155
	NBL	75	0	75	A	3.7	8	A	5.2	31
	Intersection				A	9.3		A	8.3	
Rt. 24/Carden Lane	EBL	60	100	110	A	7.3	103	B	10.7	68
	EBT/R	-	-	-	B	16.4	417	B	13.3	252
	WBL	40	50	65	A	7.9	69	A	8.8	30
	WBT/R	-	-	-	B	16.1	405	B	18.0	342
	NBL/T	-	-	-	E	57.4	65	D	43.2	59
	NBR	85	110	140	D	54.1	96	D	39.7	83
	SBL/T	-	-	-	E	57.3	48	D	39.4	65
	SBR	40	60	70	E	55.4	54	D	35.5	63
	Intersection				B	17.9		B	18.0	
Rt. 24/Campbell Hwy	EBL	150	200	250	F	116.7	250	D	36.2	250
	EBT/R	-	-	-	B	18.5	542	D	37.3	546
	WBL	100	80	140	C	20.7	89	D	39.7	130
	WBT/R	-	-	-	F	96.7	2338	E	57.0	497
	NBL/T	-	-	-	F	140.1	330	E	74.7	329
	NBR	150	100	200	D	53.0	185	E	56.6	174
	SBL/T	-	-	-	F	132.2	631	E	64.9	608
	SBR	160	360	340	A	0.3	340	A	0.4	340
	Intersection				E	79.9		D	43.6	
Rt. 24/Red House Road	EBT/R				C	25.0	341	C	20.5	380
	WBL	200	130	265	B	12.4	57	B	11.2	45
	WBT				B	12.2	219	A	6.7	135
	NBL/NBR				C	30.2	357	C	31.7	228
	Intersection				C	23.2		B	19.8	

As shown in Table 9, the Colonial Highway/Brookneal Highway intersection and the Red House Road intersection are expected to operate at LOS C or better overall during both peak hours and all of the individual movements are also expected to operate at LOS C or better. Furthermore, the existing storage lanes at these intersections are expected to accommodate the queues.

The intersection of Carden Lane is expected to operate at overall LOS B during both peak periods. However, during the AM peak hour the northbound and southbound movements are expected to operate at LOS E. Additionally, the eastbound and westbound left turn queues as well as the northbound and southbound right turn queues are expected to exceed the provided storage lanes and the westbound through movement is expected to be lengthy, at over 400 feet.

The intersection of Campbell Highway with Village Highway is expected to experience numerous operational deficiencies in the future. The intersection is expected to operate at overall LOS E during the AM peak hour and many movements are expected to operate at LOS F during this period. During the PM peak hour the intersection is expected to operate at LOS D overall with many movements operating at LOS E. Lengthy queues are anticipated at this intersection for many movements. The most notable is the westbound through movement with a maximum queue length over 2,300 feet.

Figure 14 – 2045 Future Levels of Service

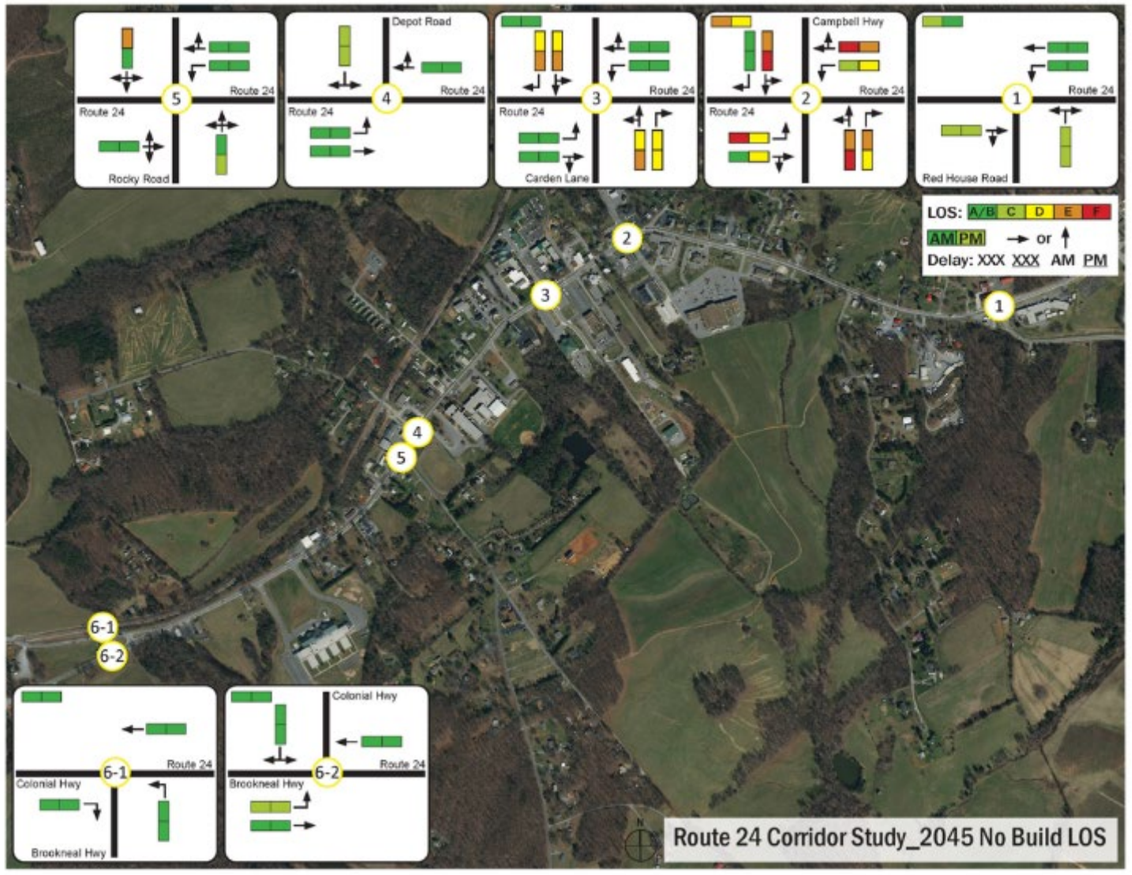
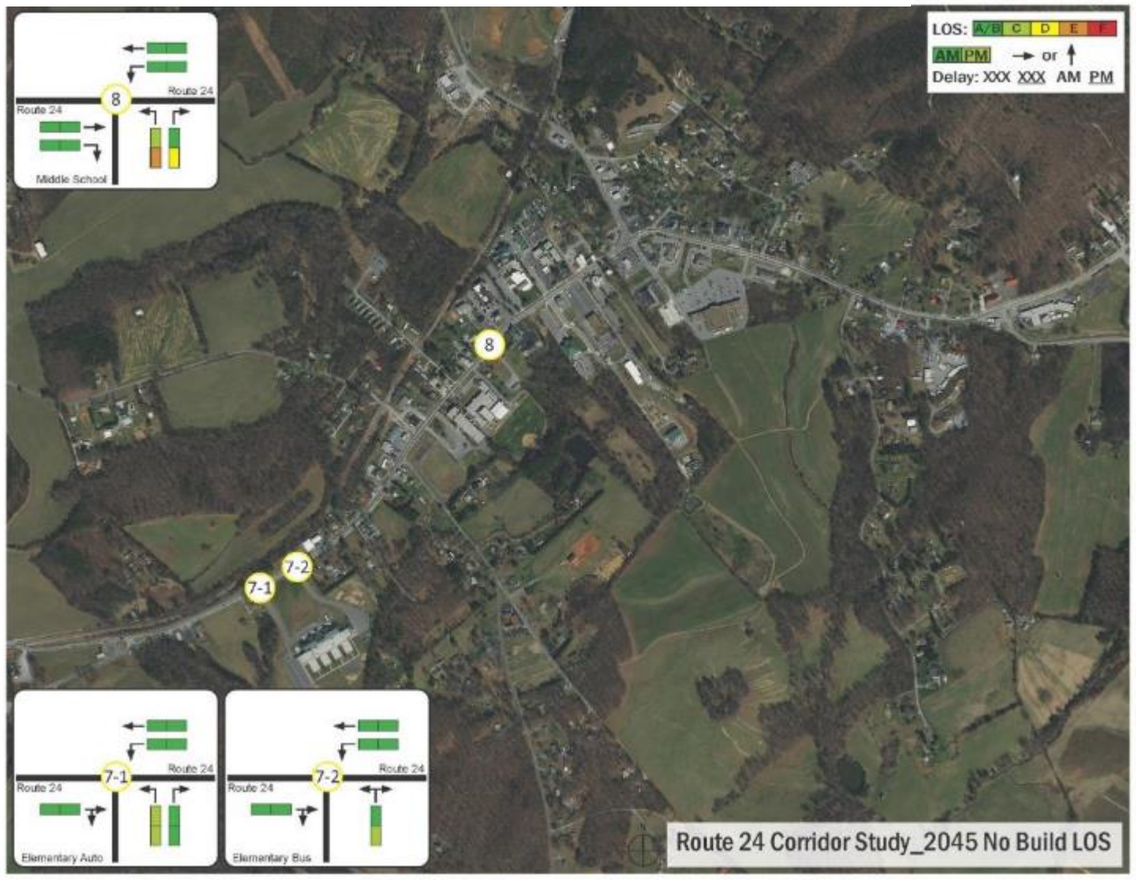


Figure 15 – 2045 Future Levels of Service School Intersections



Improvement Alternatives

Based on the safety and operational deficiencies identified in this study, improvement alternatives to address specific needs were considered throughout the corridor. **Table 10** lists specific locations and the type of need identified. **Table 11** lists the improvement alternatives for each of the locations with an identified need in Table 10. A detailed description of each improvement follows. The improvements related to the Middle School are not included as they are currently underway.

Table 10 – Safety Operations and Multimodal Improvement Needs

Location	Need		
	Safety	Operations	Multimodal
Brookneal Highway and Colonial Highway Intersection	X		
Village Highway Curve west of the Library	X		
Carden Lane Intersection		X	X
Food Lion Driveway	X		
Campbell Highway Intersection	X	X	X
South of Village Highway from Carden Lane to Babcock Road		X	X
Red House Road Intersection	X	X	X
Corridor Wide	X		X
Carden Lane to Campbell Highway (initial)	X		X

Table 11 – Improvement Alternatives Considered

Location	Improvement Alternatives
Brookneal Highway and Colonial Highway	Reconfigure intersection into a more conventional design.
Village Highway Curve west of the Library	Relocate utility poles and signs behind sidewalk.
Carden Lane Intersection	Optimize signal timings, monitor the need for an eastbound right turn lane.
Food Lion Driveway	Relocate entrance and organize turn lanes.
Campbell Highway Intersection	Intersection Improvements: Add a southbound through lane and westbound right turn lane allowing for more efficient signal phasing, provide pedestrian features, and modify access to Mountain Lane to eliminate left turns.
	Roundabout: Construct a roundabout, provide pedestrian features, and modify access to Mountain Lane to eliminate left turns.
South of Village Highway from Carden Lane to Babcock Road	Construct new roadway connection between Carden Lane and Babcock Road extending from the future middle school connector road.
Red House Road Intersection	Short Term: Add an eastbound right turn lane, provide pedestrian features, and provide a new access at the rear of the store.
	Long Term: Shift Red House Road to the east opposite the existing driveway.
Corridor Wide	Improve mid-block crossings with median refuges. Widen sidewalk to 10’ and sign as a multiuse path for bicyclists and pedestrians.
Carden Lane to Campbell Highway (initial)	Add streetscaping features including widened sidewalks, street trees and decorative tree grates, enhance sidewalks with color and texture, add crosswalks, and place overhead utilities underground.

Brookneal Highway and Colonial Highway Intersection

The analyses revealed a concentration of crashes at this location, and public input indicated concern with the unusual geometry and safety. The improvement concept shown in **Figure 16** replaces the current westbound right turn slip lane with a more standard turn lane. The result is an intersection that better meets driver expectations, consolidates all movements into one intersection, and reduces travel speeds for the westbound right turn movement.

Figure 16 – Brookneal Highway and Colonial Highway Intersection Improvement

Village Highway Curve west of the Library

Safety concerns at this location were raised through the public process. Examination of the crash history indicates that seven crashes occurred in the 350 foot stretch of roadway in this area. Of these seven crashes, four were collisions with fixed objects. As shown in **Figure 17** , throughout this area Type 3 object markers and chevron alignment signs are present to alert motorists to the curve and obstacles (utility poles and traffic signs). It is recommended that these obstructions be relocated to the back of the sidewalk.

Figure 17 – Curve West of the Library Looking East

Carden Lane Intersection

The primary concerns at this intersection are capacity, how it interacts with the Campbell Highway intersection to the east, and the increased school bus traffic resulting from the Middle School project. The recommended improvements for this intersection include the following.

- Optimize signal timings.
- Install pedestrian countdown timers.
- Monitor the need for an eastbound right turn lane. The turn lane warrants are met, however the urban conditions provide some flexibility as to whether or not to construct the turn lane. When the expanded middle school opens the need should be reexamined.

Food Lion Driveway Access Improvements

The crash summary revealed a significant history of crashes occurring between the First National Bank entrance on the west to the Gold Dust Trail intersection on the east. Presently, there are several entrances where the left turn movements from Village Highway overlap with one another. It appears that this conflict coupled with the two way left turn lane contributes to the crash rate.

Relocating the Food Lion shopping center entrance to the west and re-marking the left turn lanes as shown in **Figure 18** eliminates overlapping movements and should reduce the crash rate. This improvement involves a private entrance, thus a collaborative effort will be needed with the shopping center and impacted parcel owners.

Figure 18 – Food Lion Driveway Access Improvements

US 501/Campbell Highway Intersection

A variety of improvements were considered to address the operational and safety concerns at the intersection of Village Highway with Campbell Highway. Today, the traffic signal at the US 501/Campbell Hwy intersection currently operates with split phased timing, the side streets do not move at the same time. The signal controller allows one phase for the northbound movement and then provides a separate phase for the southbound movement. The split phase timing is a necessity due to geometric constraints within the intersection, however, split phase timing is inefficient. During the AM peak, the signal is forecast to be nearly at capacity, based on the year 2045 traffic projections.

Two alternative configurations were explored for this intersection, including adding capacity to the conventional signalized intersection and constructing a roundabout. The following provides a summary of each of these alternatives.

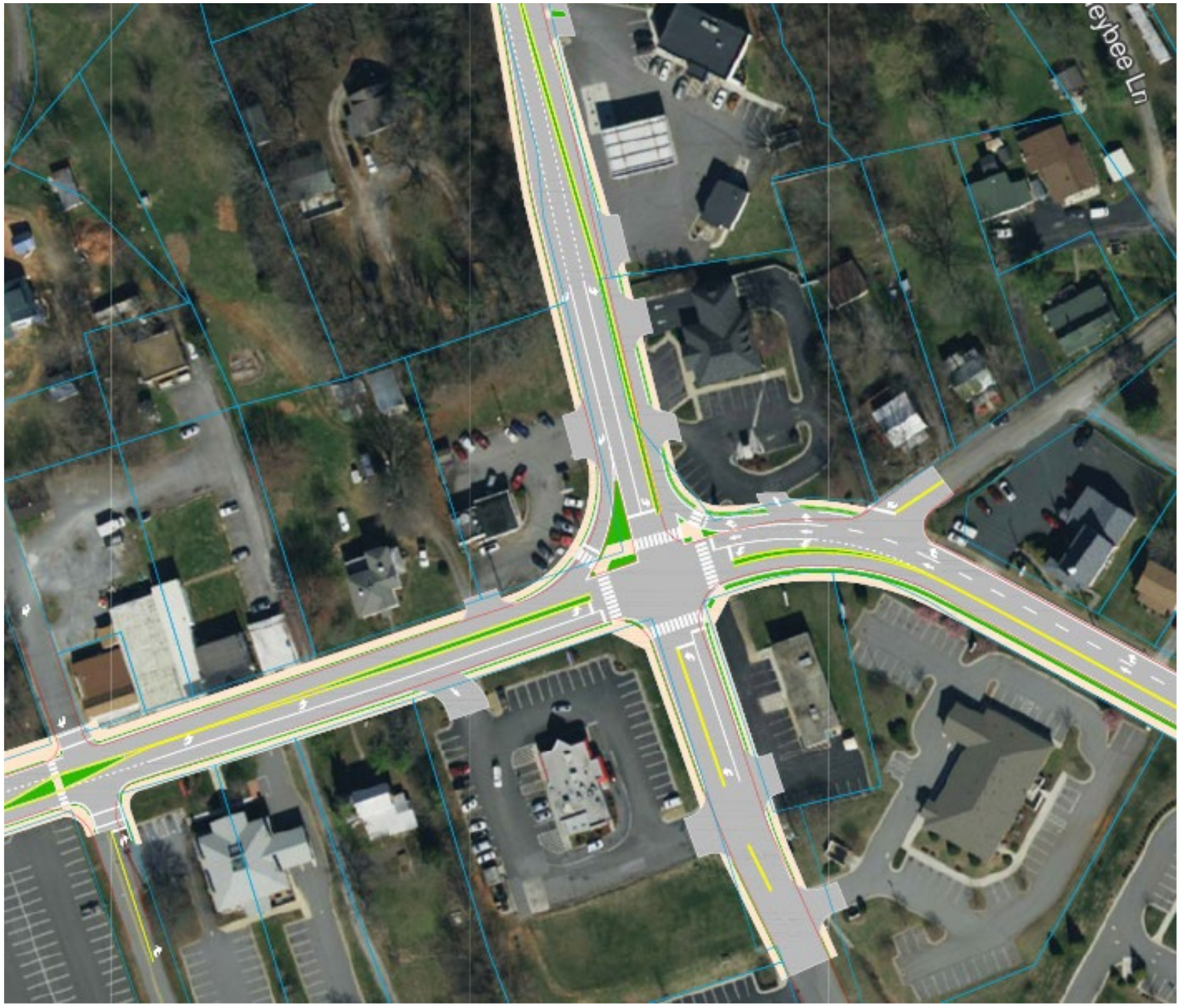
Intersection Improvements

Shown in **Figure 19**, this alternative includes a new southbound lane that allows for separation of the left turn and through movements. This change makes it safe for the side streets to move together, versus moving one approach at a time. In addition to the new southbound lane, a westbound right turn lane is included. The westbound left turn volume is very light, thus the minimal left turn pocket will suffice.

Along with the modifications noted above, to improve safety and organize site access in a manner that minimizes interruption to the mainline traffic while also removing site access from the "functional area" of the intersection (i.e. the area where cars queue on the mainline), traffic separators are shown. This impacts access to adjacent businesses and to Mountain Lane. Complete pedestrian features, including crosswalks, ADA ramps, and pedestrian signalization are also included in the design.

This configuration results in significantly reduced queueing and delays, improves safety, and improves conditions for pedestrians. Additional discussion related to Mountain Lane follows.

Figure 19 – Campbell Highway Intersection Improvements



Roundabout

A roundabout was tested using a variety of lane designations in response to the difference in AM peak and PM peak travel patterns. During the AM peak, the demand is highest on the westbound approach. In contrast, during the PM peak the demand is greatest on the southbound approach. The following four roundabout configurations were considered:

- No slip lanes,
- Southbound slip lane,
- Westbound slip lane, and
- Both southbound and westbound slip lanes.

All four roundabout configurations offer an improvement for pedestrian movements and vehicle safety. However, the roundabout with both slip lanes (southbound and westbound) is the only configuration that offers an improved volume to capacity (V/C) ratio during both the AM and PM peak hours. **Figure 20** illustrates the roundabout, with a 130 foot diameter to accommodate trucks, and slip lanes. As shown in Figure 20, there are significant right of way impacts, approaching full parcel acquisition, for both parcels on the north side of the roundabout.

Synchro and Sidra LOS and Delay

The 2045 no build conditions Synchro/SimTraffic and Sidra models were updated per the *TOSAM* guidelines, optimized signal timings, and with the proposed intersection improvements for each improvement alternative. The resulting levels of service, delays, and queues are shown in **Tables 12** and **13** for the two alternatives considered at the Village Highway/US 501/Campbell Highway intersection alongside the no build analysis results. (See **Appendices I** and **J** for the analysis printouts.) As shown in Tables 12 and 13, the roundabout operates with the lowest delays and shortest queues for both AM and PM peak hours compared to the no build and signalized intersection with additional lane improvements. While the roundabout functions the best operationally, the right of way needs and construction costs are anticipated to be greater for the roundabout, than the traffic signal alternative. Of note, the roundabout alternative began to experience failures when a PHF of 0.85 was applied.

Figure 20 – Campbell Highway Roundabout

Table 12 – 2045 Future Conditions Campbell Highway Intersection AM Peak Hour Levels of Service Delays, and Queues with Improvements

Intersection	Approach	Movement	NO-BUILD AM			SIGNAZLIZED AM			ROUNDABOUT AM		
			LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
Rt. 24/ Campbell Hwy	Rt. 24 EB	EBL	F	116.7	250	B	12.5	292	B	13.9	234
		EBT	B	18.5	542	A	9.5	324	B	13.9	234
		EBR	B	18.5	542	A	9.5	324	A	2.8	3
	Rt. 24 WB	WBL	C	20.7	89	C	21.3	43	A	9.4	93
		WBT	F	96.7	2338	C	29.2	379	A	9.4	93
		WBR	F	96.7	2338	A	0.4	250	A	7.7	78
	Barricks Lane NB	NBL	F	140.1	330	D	39.6	158	B	18.1	109
		NBT	F	140.1	330	D	48.3	171	B	18.1	109
		NBR	D	53.0	185	D	48.3	171	B	18.1	109
	Campbell Hwy SB	SBL	F	132.2	631	C	31.1	239	A	8.0	59
		SBT	F	132.2	631	C	35.0	177	A	8.0	59
		SBR	A	0.3	340	A	0.3	222	A	8.3	66
	Intersection		E	79.9		B	16.1		B	10.8	

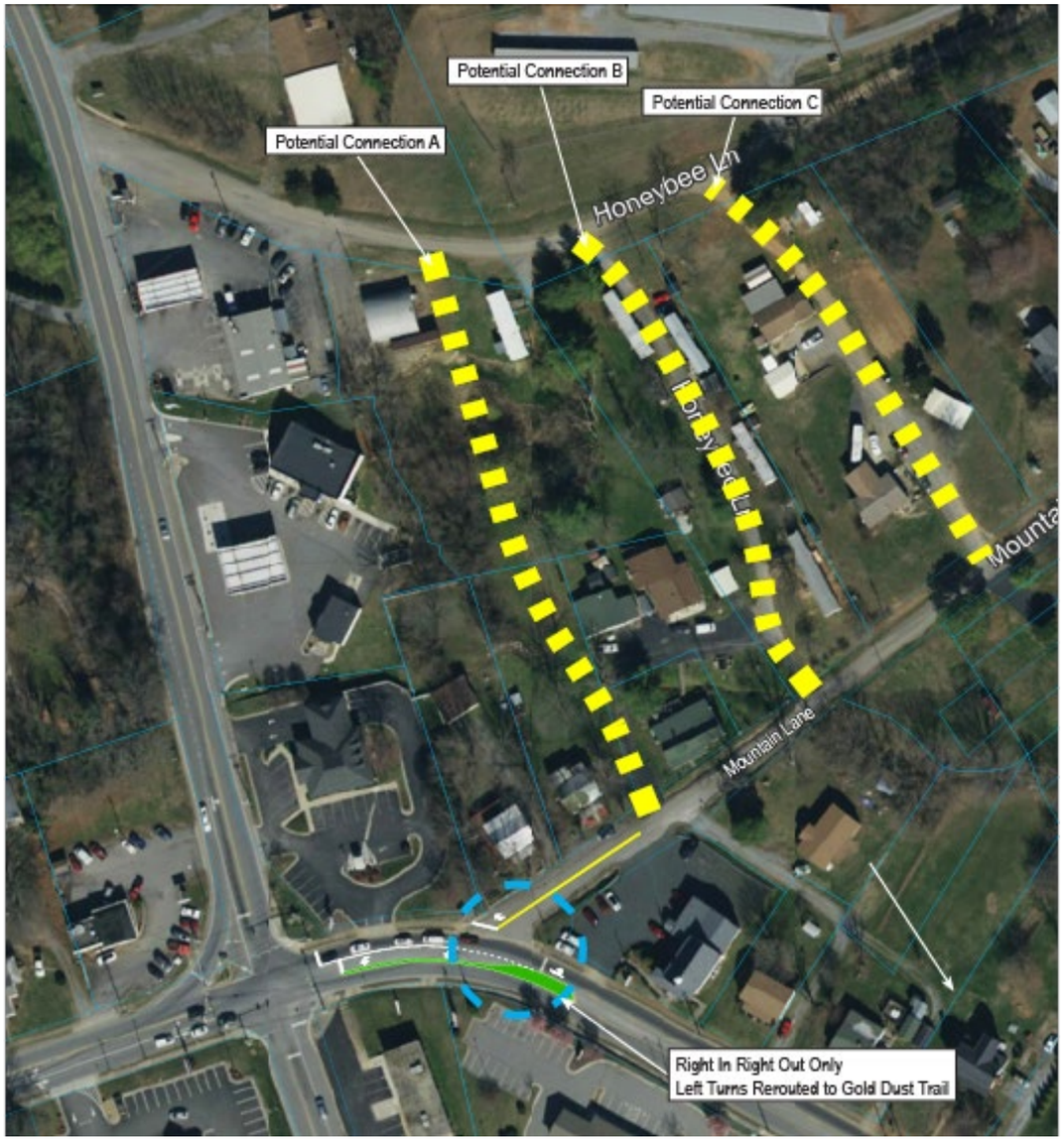
Table 13 – 2045 Future Conditions Campbell Highway Intersection PM Peak Hour Levels of Service Delays, and Queues with Improvements

Intersection	Approach	Movement	NO-BUILD PM			SIGNALLIZED PM			ROUNDABOUT PM		
			LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
Rt. 24/ Campbell Hwy	Rt. 24 EB	EBL	D	36.2	250	B	12.5	186	B	12.2	137
		EBT	D	37.3	546	B	18.9	261	B	12.2	137
		EBR	D	37.3	546	B	18.9	261	A	3.5	9
	Rt. 24 WB	WBL	D	39.7	130	B	17.5	75	A	5.8	39
		WBT	E	57.0	497	C	21.4	187	A	5.8	39
		WBR	E	57.0	497	A	0.1	95	A	4.2	20
	Barricks Lane NB	NBL	E	74.7	329	C	24.4	136	B	13.2	82
		NBT	E	74.7	329	C	30.2	130	B	13.2	82
		NBR	E	56.6	174	C	30.2	130	B	13.2	82
	Campbell Hwy SB	SBL	E	64.9	608	C	30.1	223	A	7.9	81
		SBT	E	64.9	608	C	30.1	195	A	7.9	81
		SBR	A	0.4	340	A	0.4	183	A	7.4	69
	Intersection		D	43.6		B	17.1		A	8.7	

Mountain Lane Connection

Acknowledging the change in access that both of the improvement concepts would have on Mountain Lane at Village Highway, a recommendation is being made to explore a stronger connection between Mountain Lane and Honeybee Lane as shown in **Figure 21**. An alignment study will need to be performed to explore benefits and challenges of various alternative alignments. This study would assess factors such as public input, costs, geometric challenges, and benefits for multiple alignments.

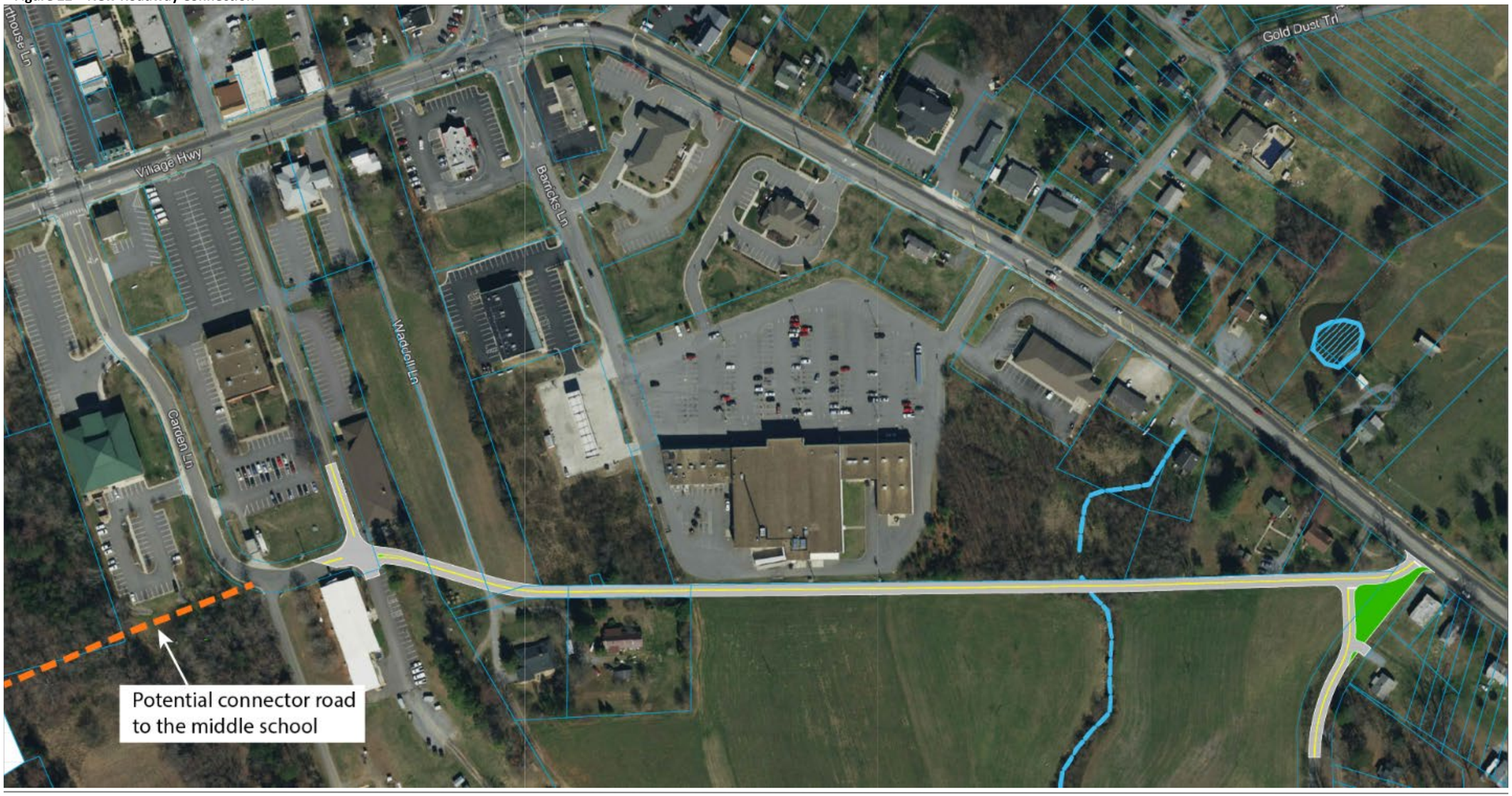
Figure 21 – Mountain Lane Connection



New Roadway Connection

The middle school project is constructing a new road between Rocky Road and Carden Lane. The concept illustrated in **Figure 22** shows how a new road could be extended from Carden Lane over to Babcock Lane. This new connection could help to relieve traffic on Village Highway, provide a comfortable lower volume route for bicyclists and pedestrians, and potentially allow access for new development. While not shown in Figure 22, in addition to the two travels lanes this project should include five foot bike lanes in both directions and a five foot sidewalk on at least one side of the roadway. If this full connection is made in the future, then improvements should be made to Rocky Road in anticipation of additional traffic.

Figure 22 – New Roadway Connection



Red House Road Intersection

Both a short term and long term improvement recommendation were developed at the Red House Road/Village Highway intersection. Both the short term and long term improvements address the need for an eastbound right turn lane, improved pedestrian features, and the increase in trips accessing the new community building use on the north side of Village Highway.

Short Term Improvement

The recommended short term improvements are shown in **Figure 23**. Currently an eastbound right turn lane is warranted. To alleviate the impact to the store caused by constructing the turn lane, a new access could be created to the back of the store. The addition of pedestrian count down signal heads and crosswalks will improve pedestrian comfort and safety.

Figure 23 – Red House Road Intersection Short Term Improvement

Long Term Improvement

As shown in **Figure 24** Shifting Red House Road to the east to line up with the driveway on the north side of Village Highway results in an improved access configuration. This longer term improvement includes the new eastbound right turn lane, modified access to the store, and pedestrian improvements as described in the short term recommendation.

Figure 24 – Red House Road Intersection Long Term Improvement

Multimodal Improvements

Mid-Block Pedestrian Crossings

Currently there are three crosswalks across Village Highway at unsignalized locations. Adding a raised median feature on each side of the crossing(s) provides a pedestrian refuge and improves comfort and safety for pedestrians crossing Village Highway. **Figure 25** illustrates this concept at the existing crossing between Rustburg Presbyterian Church and the library.

At the other two mid-block crossing locations the refuge island improvement may require additional changes such as modifying one of the county office parking lot entrances and considering the path of vehicles turning out of Drummer Street.

This type of treatment should be used at new crossing locations in the corridor as well.

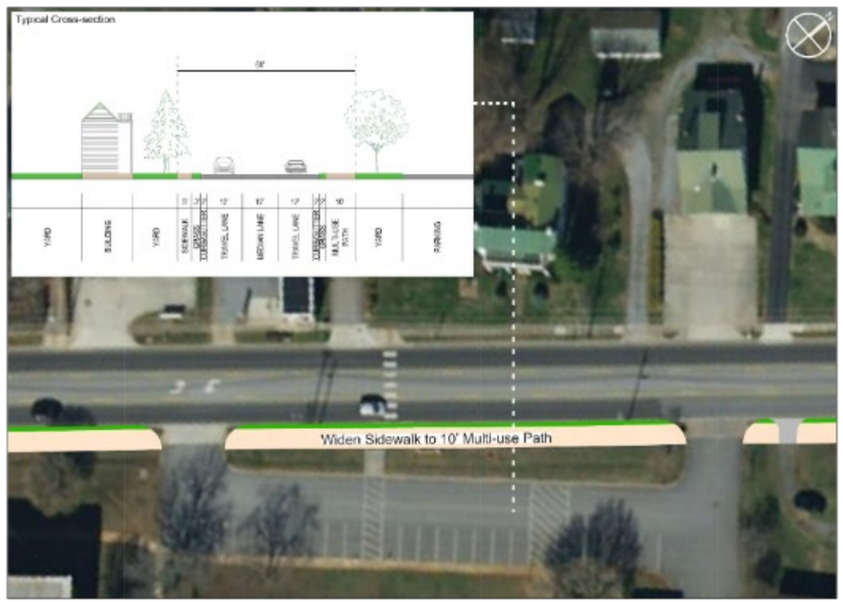
Shared Use Path

Widening the sidewalk along Village Highway by 5 feet, resulting in a 10 foot wide multiuse path for bicycles and pedestrians, improves comfort and safety for non-motorists. The path would extend from the elementary school to the Red House Road intersection. The project could be built in phases as funding, and cooperation of adjacent land owners, evolves. **Figure 26** is a series of panels showing the length of the study corridor and continuation of the sidewalk widening between the middle school and Red House Road. The conversion of the sidewalk to a multiuse path could occur in phases as opportunities arise for funding and right-of-way donations or acquisitions. **Figure 27** illustrates the widening of the sidewalk at a representative location in the corridor.

Figure 23 – Mid-Block Pedestrian Crossing

Figure 24 – Shared Use Path Plan View

Figure 25 – Illustration of Sidewalk Widening



Streetscaping

Streetscape improvements could help to improve the appearance of the roadway and Village area, shown in **Figure 28**. The importance of this area is underscored by Rustburg having been the County seat since 1784, the presence of the current County government complex, the Historic Courthouse Museum, together with a number of businesses, schools, and residential areas, make the village a center of activity for the County. Ideally, this prominence of the Village would be reflected in the quality and design of the streetscape, particularly in the few blocks that make up the civic, governmental, and historic core of the Village. Some conceptual streetscape improvements for these blocks that could help to improve a sense of "place" for the Village, while also helping to slow down traffic and improve pedestrian comfort and safety in the Village core are shown in **Figure 29** alongside the existing conditions.

Potential streetscape improvements shown include:

- Widen the sidewalks,
- Add street trees and decorative tree grates,
- Add color and texture to the sidewalk, potentially with brick surface as shown,
- Add crosswalks, and
- Place the overhead utilities underground.

It should be noted that this is a concept plan and improvements would be made where feasible based on funding and further engineering and detailed design.

The street scape effort could include a discussion about creation of pocket parks and more public space along the corridor. Opportunities could include utilizing space in front of both the old and new courthouses, and the County parking lot adjacent to Carden Lane, for public events, parks, farmers markets, and other such enhancements to help bring more people into the Village.

One of the most historic and visually appealing areas in Rustburg are the old courthouse grounds. The illustration below – in "before and after" versions - shows a visualization of what these types of streetscaping improvements could look like in this section of the street, with brick sidewalks, new landscaping, enhanced crosswalks and pedestrian-scaled street lights giving a sense of place and enhanced walkability to this block.

Figure 26 – Potential Streetscape Enhancements at old Courthouse

Figure 27 – Current Streetscape Conditions at old Courthouse

The streetscaping plan in **Figure 30** shows how the visual concept above could potentially be expanded over several blocks around the courthouse and government services area to create a pedestrian precinct with enhanced sidewalks, street trees, crosswalks, and a potential new park space in front of the new courthouse. This type of treatment would not only make the pedestrian experience more comfortable and pleasant, it could also act as an indirect traffic calming mechanism as studies have shown that traffic tends to slow down when there are visual cues that they are entering a more pedestrian focused part of the corridor.

Figure 28 – Streetscaping

Implementation

Cost Estimates

Planning level cost estimates were developed for the following projects discussed in the previous section of the report.

- Brookneal Highway and Colonial Highway intersection improvements,
- Food Lion Driveway: Relocation of the Food Lion shopping center entrance to the west, and re-marking of the left turn lanes in this section of Village Highway to eliminate the overlaps,
- Campbell Highway Intersection Improvements: New southbound lane and westbound right turn lane,
- Campbell Highway Roundabout: Roundabout with southbound and westbound slip lanes,
- New Roadway Connection: New road from Carden Lane to Babcock Lane, and
- Red House Road Intersection Long Term Improvement: Shift Red House Road to the east to line up with the driveway on the north. New eastbound right turn lane, access to the back of the store, and pedestrian count down signal heads and crosswalks.

The cost estimates shown in **Table 14** are based on VDOT's Project_estimate2.45 spreadsheet, reported in fiscal year 2021 dollars. A more detailed breakdown of the planning level cost estimates can be found in **Appendix K**. Quantities were determined based on the conceptual designs. Both Engineering & CEI and Contingencies are assumed to be 30% of the construction cost. Right-of-way and utility costs were not estimated for any of the projects. However, significant right-of-way costs are anticipated for some of the concepts. **Table 15** describes the likely right-of-way impacts.

Table 14 – Planning Level Cost Estimates

Improvement Alternative	Construction Cost	Engineering & CEI	Contingencies	Total Opinion of Probable Cost
Brookneal Highway and Colonial Highway Intersection Improvements	$313,100	$93,900	$93,900	$500,900
Food Lion Driveway	$261,400	$78,400	$78,400	$418,200
Campbell Highway Intersection Improvements	$2,370,500	$711,200	$711,200	$3,792,900
Campbell Highway Roundabout	$3,908,200	$1,172,500	$1,172,500	$6,253,200
New Roadway Connection	$1,410,200	$423,100	$423,100	$2,256,400
Red House Road Intersection: Long Term	$2,132,800	$639,800	$639,800	$3,412,400

Table 15 – Alternative Improvement Right-of-Way Impacts

Improvement Alternative	Full Parcel Acquisition	Partial Parcel Acquisition
Brookneal Highway and Colonial Highway Intersection	0	0
Food Lion Driveway	1	0
Campbell Highway Intersection Improvements	0	4
Campbell Highway Roundabout	2	7
New Roadway	0	10
Red House Road Intersection: Long Term	0	1

Funding Strategies

Tables 16 through **22** explain the purpose, details, and eligibility for the following funding sources.

- Smart Scale
- Highway Safety Improvement Program (HSIP)
- VDOT Revenue Share
- Transportation Alternatives Program (TAP)
- VDOT Road Maintenance
- Development Proffers
- Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Grants (previously TIGER)

Table 16 – Smart Scale

Purpose	SMART SCALE is a statewide program that intends to distribute funding based on a standard and objective evaluation of projects that will determine to how effectively they help the state achieve its transportation goals.
Details	There are two main pathways to funding within the SMART SCALE process—the construction District Grant Program (DGP) and the High Priority Projects Program (HPPP). A project applying to funds from the DGP is prioritized with projects from the same construction district. A project applying for funds from the HPPP is prioritized with projects statewide. The CTB then makes a final decision on which projects to fund.
Eligible Projects	Projects must address improvements to a Corridor of Statewide Significance, Regional Network, or Urban Development Area (UDA). Project types can include highway improvements such as widening, operational improvements, access management, and intelligent transportation systems, transit and rail capacity expansion, and transportation demand management including park and ride facilities.
Eligible Applicants	Projects may be submitted by regional entities including MPOS and PDCs, along with public transit agencies, counties, cities, and towns that maintain their own infrastructure. Projects pertaining to UDAs can only be submitted by localities.
Evaluation Criteria	There are five factors evaluated for all projects: Safety, Congestion Mitigation, Accessibility, Environmental Quality, and Economic Development. MPOs with a population greater than 200,000 are also evaluated by land use policy consistency.
Website	http://www.vasmartscale.org/

Table 17 – Highway Safety Improvement Program

Purpose	Established by the federal transportation legislation MAP-21, this program is structured and funded to make significant progress in reducing highway fatalities and injuries on all public roads.
Details	The Federal share for highway safety improvements is 90%, with certain types of projects (including, as relevant to this study, maintaining retro-reflectivity of pavement markings and the installation of traffic signs) eligible to be funded at 100%. If project cost is higher than what was originally submitted, the project manager and sponsor will be responsible for identifying sources for funding those estimates.
Eligible Projects	Projects involve the identification of high-crash spots or corridor segments, an analysis of crash trends and existing conditions, and the prioritization and scheduling of improvement projects.
Eligible Applicants	Local governments, VDOT District and Regional Staff.
Evaluation Criteria	• Evaluated on a statewide basis rather than on a local or district basis. • Locations or corridors where a known "substantive safety" problem exists as indicated by location-specific data on severe crashes, and where it is determined that the specific project action can with confidence produce a measurable and significant reduction in the number and/or consequences of severe crashes. • To achieve the maximum benefit, the focus of the program is on cost- effective use of funds allocated for safety improvements. • Priority will be given to projects having higher total number of deaths and serious injuries.
Website	http://www.virginiadot.org/business/ted_app_pro.asp

Table 18 – VDOT Revenue Share

Purpose	This program provides additional funding for use by a county, city, or town to construct, reconstruct, improve, or maintain the highway systems within such county, city, or town and for eligible rural additions in certain counties of the Commonwealth. Locality funds are matched, dollar for dollar, with state funds, with statutory limitations on the amount of state funds authorized per locality.
Details	Application for program funding must be made by resolution of the governing body of the jurisdiction requesting funds. Project funding is allocated by resolution of the CTB. Project costs are divided equally between the Revenue Share Fund and locality funding.
Eligible Projects	• Supplemental funding for projects listed in the adopted in the six-year plan • Construction, reconstruction, or improvement projects not including in the adopted six-year plan • Improvements necessary for the specific subdivision streets otherwise eligible for acceptance into the secondary system for maintenance (rural additions) • Maintenance projects consistent with the department's operating policies • New hardsurfacing (paving) • New roadway • Deficits on completed construction, reconstruction, or improvement projects
Eligible Applicants	Any county, city, or town in the Commonwealth
Evaluation Criteria	• Priority 1: Construction projects that have previously received Revenue Sharing funding • Priority 2: Construction projects that meet a transportation need • Priority 3: Projects that address deficient pavement resurfacing and bridge rehabilitation • Priority 4: All other projects
Website	http://www.virginiadot.org/business/local-assistance-access-programs.asp#Revenue_Sharing

Table 19 – Transportation Alternatives Program (TAP)

Purpose	This program is intended to help local sponsors fund community based projects that expand non-motorized travel choices and enhance the transportation experience by improving the cultural, historical, and environmental aspects of transportation infrastructure. It focuses on providing pedestrian and bicycle facilities and other community improvements.
Details	TAP is not a traditional grant program and funds are only available on a reimbursement basis. It is therefore important to have the necessary funding available to pay for services and materials until appropriate documentation can be submitted and processed for reimbursement. The program will allow a maximum federal reimbursement of 80% of the eligible project costs and requires a 20% local match.
Eligible Projects	• Pedestrian and bicycle facilities such as sidewalks, bike lanes, and shared use paths • Pedestrian and bicycle safety and educational activities such as classroom projects, safety handouts and directional signage for trails (Safe Routes to School) • Preservation of abandoned railway corridors such as the development of a rails-to-trails facility
Eligible Applicants	Any local governments, regional transportation authorities, transit agencies, natural resource or public land agencies, school districts, local educational agencies, or school, tribal government, and any other local or regional government entity with responsibility for oversight of transportation or recreation trails.
Evaluation Criteria	• Number of federal enhancement categories • Inclusion in a state, regional, or local plan • Public/private venture-cooperation (multi-jurisdictional) • Total cost and matching funds in excess of minimum • Demonstrable need, community improvement • Community support and public accessibility • Compatibility with adjacent land use • Environmental and ecological benefits • Historic criteria met, significant aesthetic value to be achieved and visibility from a public right of way • Economic impact and effect on tourism
Website	http://www.virginiadot.org/business/prenhancegrants.asp

Table 20 – VDOT Road Maintenance

The VDOT Road Maintenance category of funding covers a wide variety of maintenance and operations activities. Road maintenance funds comprise the majority of VDOT's scheduled funding (versus new construction). Road maintenance funding addresses needs having to do with pavement management, signals, pavement markings, signs, stripes, guardrails, and ITS (Intelligent Transportation Systems) assets that are considered to be of critical safety and operational importance. Maintenance funding also addresses operation services comprising ordinary and preventative maintenance work such as cleaning ditches, washing bridge decks, patching pot-holes, debris removal, snow and ice removal, emergency response, incident management, mowing, and equipment management.

Table 21 – Development Proffers

Purpose	Developer contributions, known as proffers, provide one potential source of funding for capital facilities. Proffers are typically cash amounts, dedicated land, and/or in-kindservices that are voluntarily granted to the locality to partially offset future capital facility costs associated with specific land developments. Recent legislation has limited the ability of local governments to receive proffers, but through the rezoning process developers may still consider proffering infrastructure improvements under the current legislation.
Details	The cost of the program can be partially financed with developer contributions.
Eligible Projects	• Rezoning requests that permit residential and/or commercial uses in accordance with State enabling legislation • Limited to offsetting impacts that are directly attributable to new development • To "accept" a proffer, a locality should have completed an exhaustive study to document the real project costs
Eligible Applicants	Any property owners or developers seeking a rezoning.

Table 22 – BUILD

Purpose	The BUILD Transportation grants replace the pre-existing Transportation Investment Generating Economic Recovery (TIGER) grant program. As the Administration looks to enhance America's infrastructure, FY 2018 BUILD Transportation grants are for investments in surface transportation infrastructure and are to be awarded on a competitive basis for projects that will have a significant local or regional impact.
Details	Since 2009, the Program has provided a combined $5.6 billion to 463 projects in all 50 states, the District of Columbia, Puerto Rico, Guam, the Virgin Island. The Consolidated Appropriations Act of 2018 made available $1.5 billion for National Infrastructure Investments, through September 30, 2020.
Eligible Projects	BUILD funding can support roads, bridges, transit, rail, ports or intermodal transportation.
Eligible Applicants	BUILD can provide capital funding directly to any public entity, including municipalities, counties, port authorities, tribal governments, MPOs, or others in contrast to traditional Federal programs which provide funding to very specific groups of applicants (mostly State DOTs and transit agencies).
Evaluation Criteria	Projects for BUILD will be evaluated based on merit criteria that include safety, economic competitiveness, quality of life, environmental protection, state of good repair, innovation, partnership, and additional non-Federal revenue for future transportation infrastructure investments.
Website	https://www.transportation.gov/BUILDgrants

Public Involvement

The project team utilized a collection of media announcements to seek input from the public and to encourage participation from the public about the study. Outreach activities included the following:

- A location-targeted Facebook Ad with the project name and date/time of the public meetings
- A printed paper flyer for distribution at locations within the corridor
- An electronic email flyer for distribution to known stakeholders within the corridor
- Changeable message signs facing drivers entering each end of the corridor (second meeting only)

Additional efforts were made to use a roadside dynamic message board; however, the board was not available.

First Public Meeting

The first (of two) public meeting was held online via GoToMeeting on Thursday, November 19, 2020. The presentation included a brief introduction of the Village Highway Corridor and the type of traffic issues which will be addressed in the forthcoming discussion. In addition, the presentation included a link to the MetroQuest public survey and a "walk-through" of the survey to familiarize users with the survey format.

At the end of meeting, several members of the asked questions and provided feedback. **Appendix L** includes the list of comments received from the public during the online meeting. Some of the comments included:

- How many people are attending the meeting?
- Will we be emailed the link for the survey?
- Can you propose widening Rocky Road or RT 24?
- There is not enough room for large vehicles to make eastbound right turns.
- Will you be reaching out to local businesses in the village of Rustburg?
- I do not feel safe walking because of the speed of the traffic.
- It is hard to cross the road at Hardee's.
- Can we prioritize a pedestrian crossing from Rustburg Middle School to the Rustburg Public Library?
- How large is the project and how much can it impact residents and commuters?

None of the alternative roadway geometries were presented during the first public meeting. However, notice was given to the public that a second meeting would take place during March 2021.

First Metroquest Survey

The results of the public input study are presented below. Surveytakers answered a series of questions, and users were asked to rank their concerns. The survey included options for users to drop pins at specific locations where issues were noted.

How do respondents use the corridor?

Most respondents use the corridor daily. Respondents cited a number of reasons for using the corridor, with 43% using the corridor to commute to and from work. Almost a quarter of respondents cite shopping as a reason for traversing the corridor. The corridor also serves a route for people passing through the area.

The results suggest that the corridor serves a variety of needs for residents of the town and the wider region. The diversity of land uses along the corridor, especially in the downtown, suggests that the corridor will continue to serve local trips throughout the town. Accessing the adjacent uses is a key concern for future improvement projects. Lynchburg's growth will continue to impact the number of travelers originating from and passing through the town.

Corridor Issues

Participants were asked to rank the five issues and problems in the study area, 1 being most important and 5 being least important. The chart on the following page shows the rankings for each of the five issue topics.

The chart on the following page shows that Traffic Queue/Congestion issues are of the greatest concern to respondents. The drop off in ranking between congestion and the other topics suggests that congestion was chosen as biggest issue by a significant number of respondents. The closeness of the ranks of the other topics means that they were ranked less consistently, but largely between second and fifth most important, which suggests that respondents were not as strongly concerned with these issues as with congestion.

Congestion

Participants reported experiencing congestion on weekdays, primarily in the morning and afternoon, but also some at night. Congestion issues were cited at the intersection of Route 24 and Route 501 (Campbell Hwy), and in both directions along the corridor. Rustburg Middle School was the next highest area of concern. Congestion relief efforts should be targeted at the intersection of Routes 24 and 501, as well as the middle school, based on this input.

The mapped comments for congestion issues line up with the comments given through the standard survey questions. The major concern is at the intersection of the study corridor and Campbell Hwy. There were lesser concerns at the middle school and the intersection with Red House Rd, at the eastern end of the study limits.

Accessibility

Participants expressed relatively equal levels of concern for a variety of accessibility issues. The most selected concerns included difficulty making left turns, vehicles blocking entrances and through travel mobility issues. Respondents encounter accessibility issues most often during weekday mornings and afternoons, likely as a result of commuting traffic and school pick up and drop off traffic. The responses indicate the need for improvements that increase access to the businesses and other destinations along the study corridor.

The mapped comments are also concentrated at the intersection of the study corridor and Campbell Highway. Respondents reported accessibility issues primarily between Depot Rd and Gold Dust Trail, where most of the corridor's destinations are concentrated.

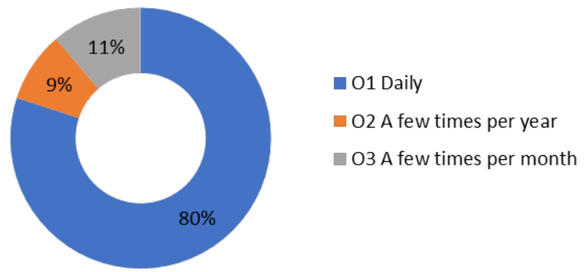
Safety

Respondents expressed the greatest concern for safety issues related to congestion, including sudden stops and rear-end crashes. Speeding, aggressive and distracted driving, and a lack of bike and pedestrian infrastructure were also cited by many respondents as safety concerns. Respondents reported experiencing the safety issues mostly during weekday mornings and afternoons, the same times that they experience the accessibility issues. The responses suggest that improvements that address congestion will also address residents' concerns about safety along the corridor.The mapped comments for safety show the most concern at the intersection of Campbell Hwy. Additional hotspots occur between Depot Rd and Rustburg Middle School, and at the entrance to the library.

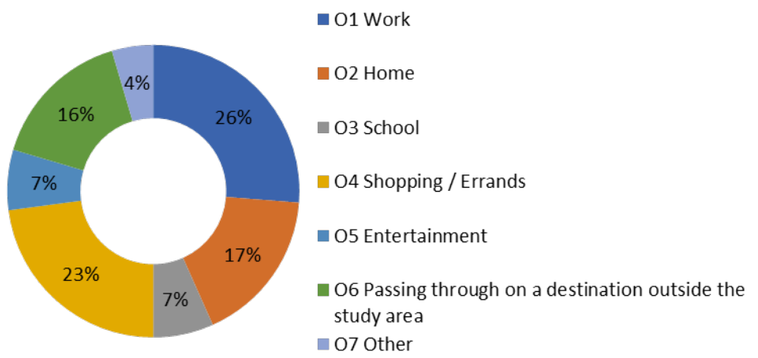
Multimodal

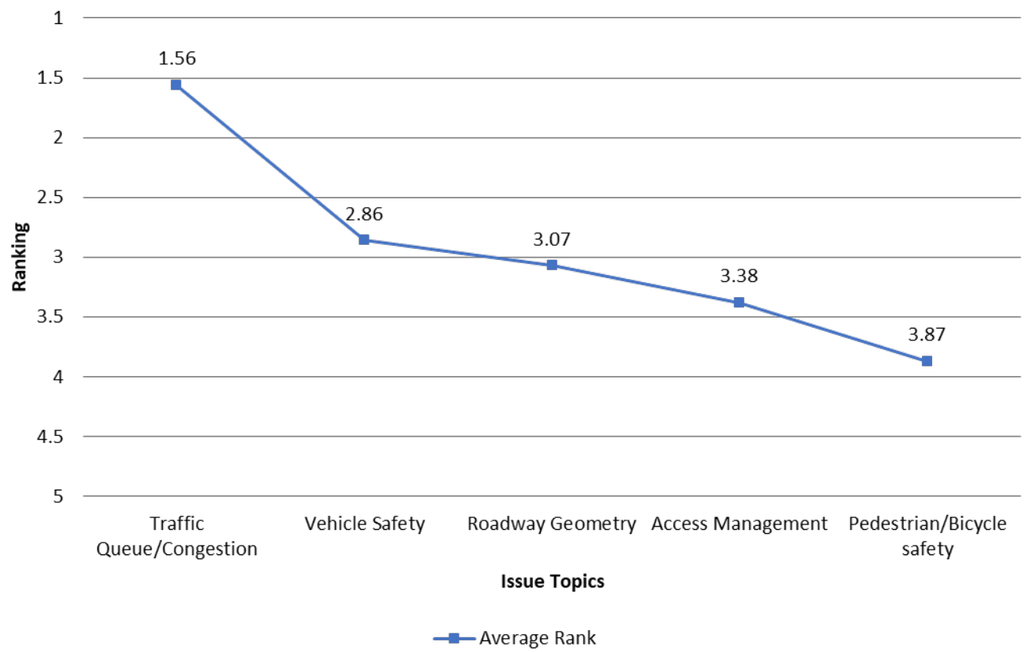
Most respondents travel the corridor by car, although a considerable percentage walked to their destinations. Most respondents expressed an interest in additional bike and pedestrian facilities along the corridor. The survey responses indicate a strong desire for additional bike and pedestrian accommodations on the corridor. Improvements to the sidewalks and pedestrian crossings on the corridor, as well as new sidewalks or shared-use paths would address residents' desires. The mapped comments for multimodal and other issues were evenly distributed throughout the corridor. Both the elementary and middle schools were marked as multimodal destinations, along with the county administrative buildings and other destinations in the core of the village.

How often do you use the corridors in the study area under typical conditions?

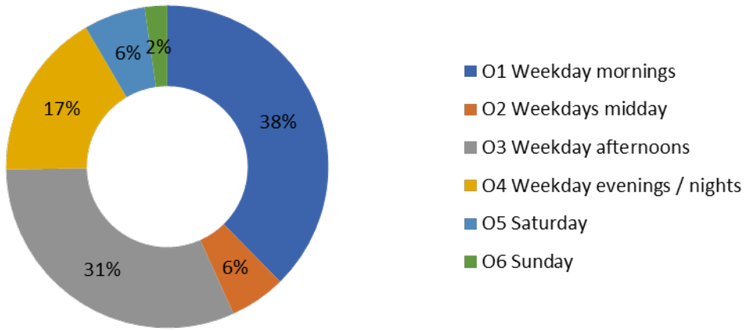


What is/are the reason(s) you travel along these corridors under typical conditions? (check all that apply)

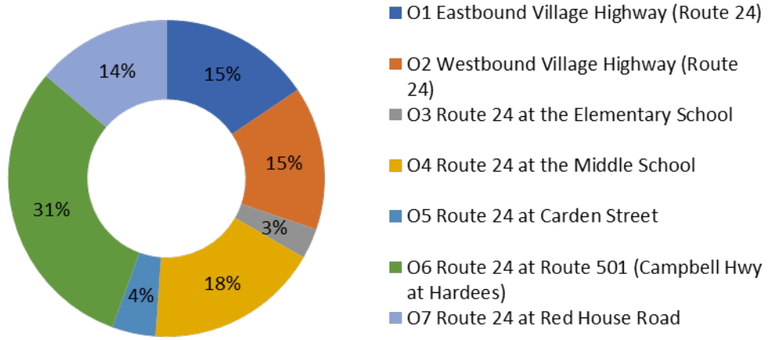


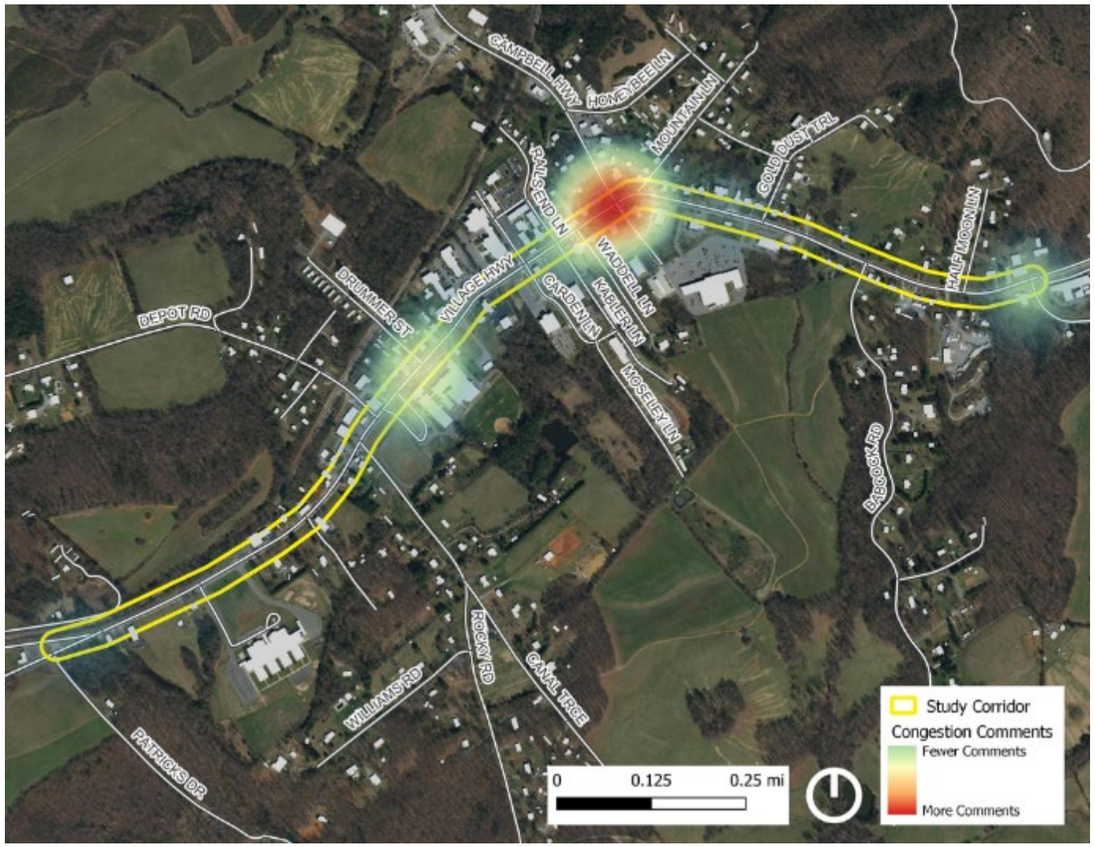


When do you experience congestion under typical conditions? (check all that apply)

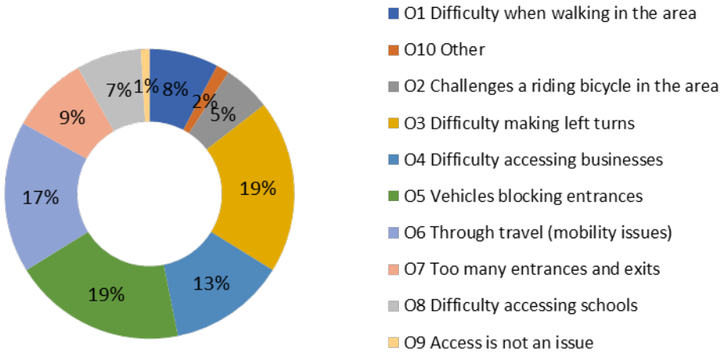


Where do you experience congestion under typical conditions? (check all that apply)

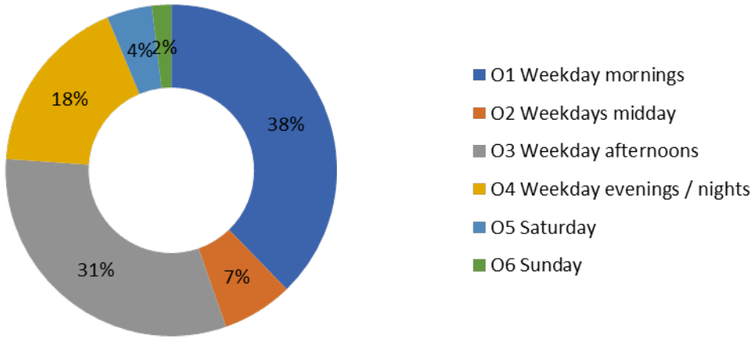


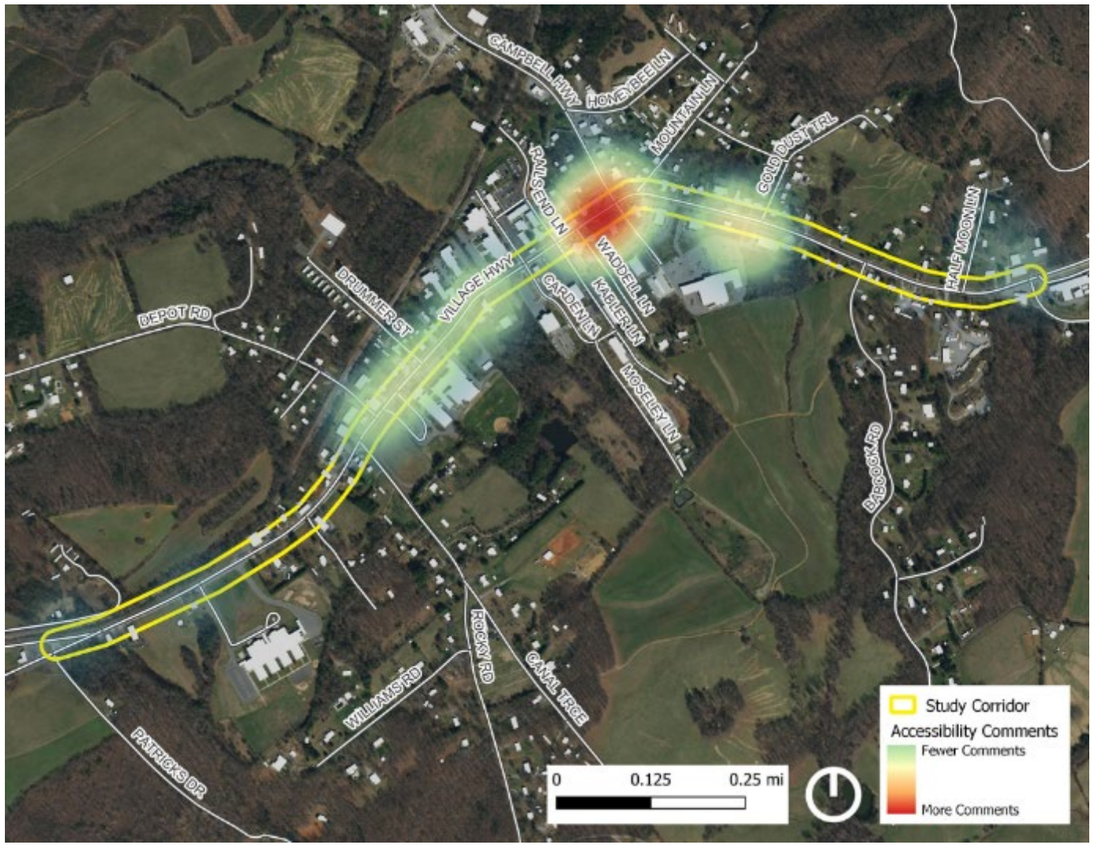


What accessibility issues do you experience when using these corridors under typical conditions? (check all that apply)

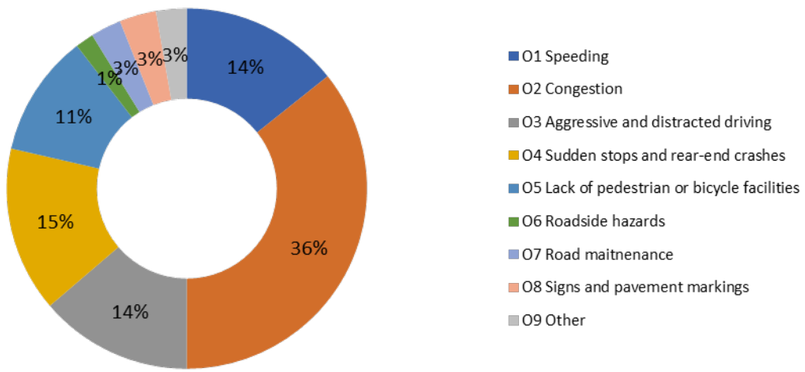


When do you experience accessibility issues under typical conditions? (check all that apply)

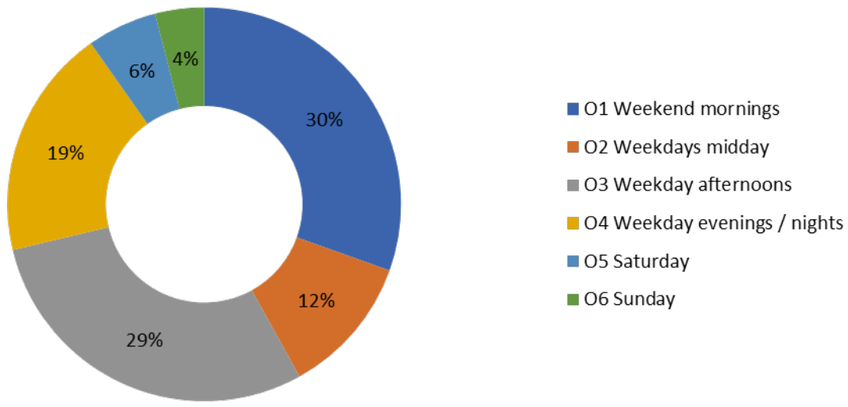


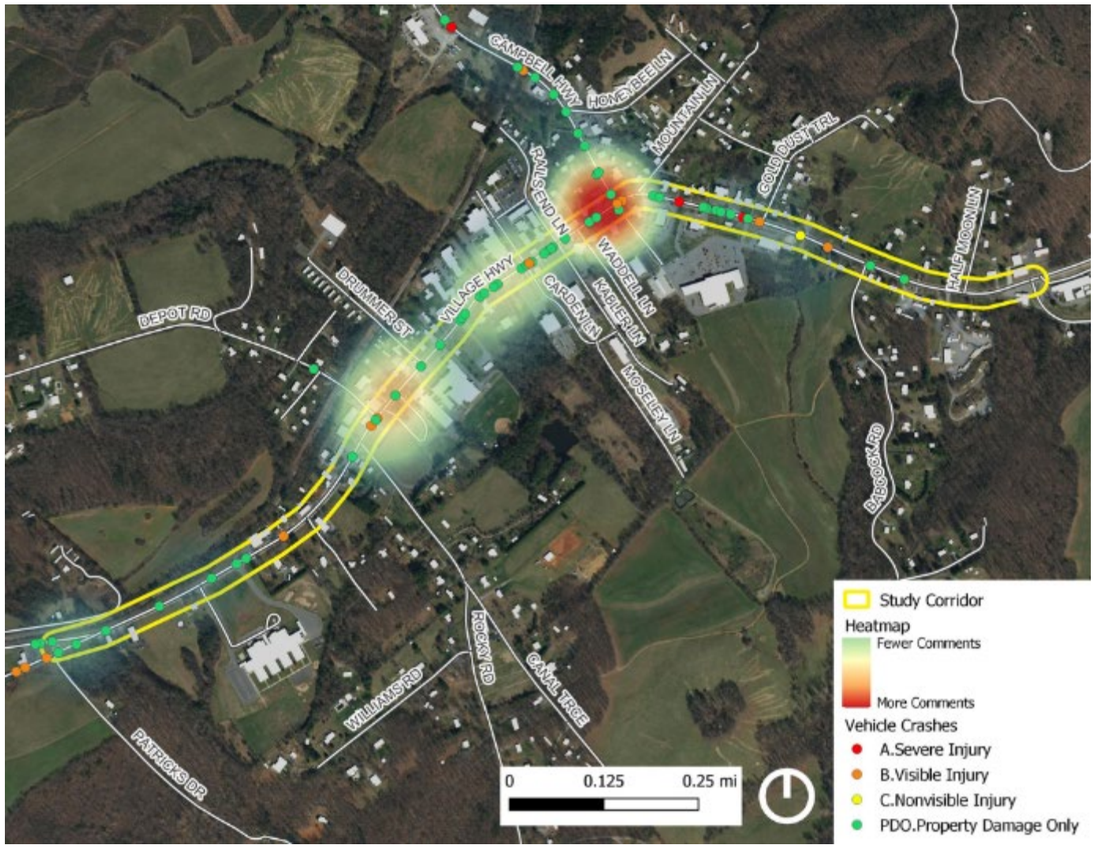


What safety issues do you experience when using these corridors under typical conditions? (check all that apply)

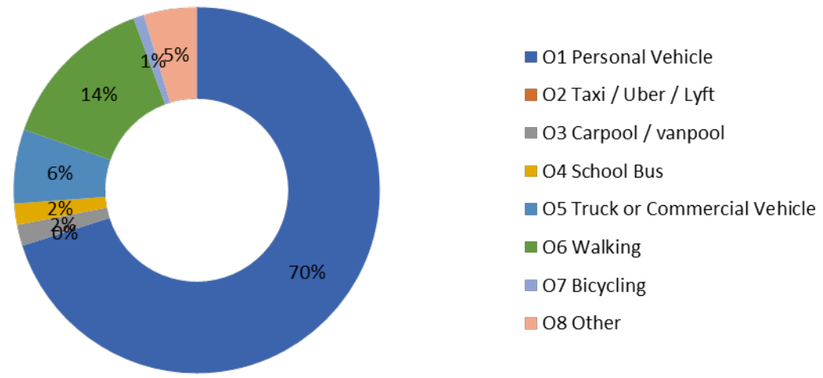


When do you experience safety issues along these corridors under typical conditions? (check all that apply)

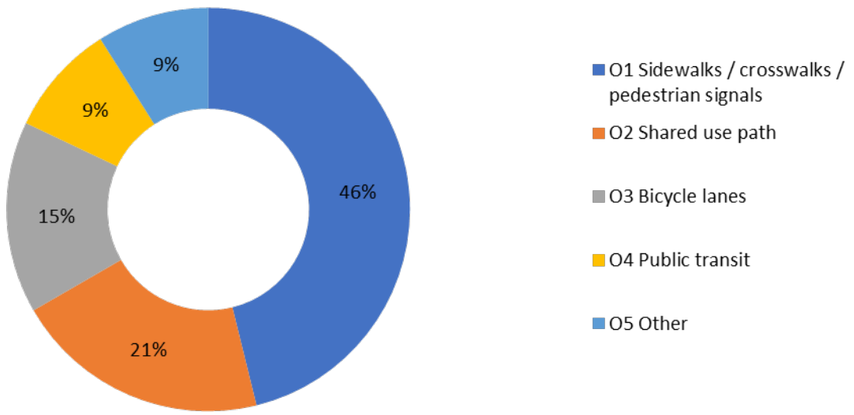




What mode(s) of travel do you use when traveling along these corridors under typical conditions? (check all that apply)



What multimodal facilities are needed along these corridors? (check all that apply)



Second Public Meeting

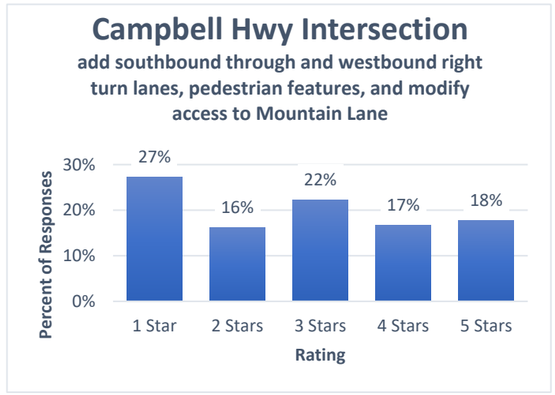
The second public meeting was held online via GoToMeeting on Wednesday, March 24, 2021 and was attended by 9 people. The presentation began with a brief project overview, a summary of the input collected during the first public meeting and survey and data on future congestion. The second part of the meeting included descriptions and graphics of the improvement alternatives developed by the project team. After the recommendations overview, the project team informed the attendees of the second online survey and briefly oriented attendees to the MetroQuest format. The meeting concluded with a question and answer session. Some of the questions included:

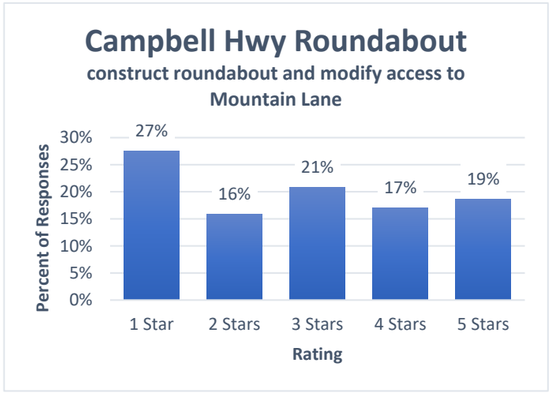
- Has any thought been given to requiring larger vehicles (GP trucks) to use a more "commercial" route? If only during the Congestion hours, as a possibility.
- Do have any strategies planned to help with access and signage of the Rustburg Volunteer Fire Department?
- What is the width of the current sidewalks in the Village?
- Why is bicycling from RES to RHS important? Once past either side of that the bicyclist would then need to move into traffic.
- Has the County acquired the property between the Fire Department and the Citizen Services Building that has been for sale for years to build the road proposed to Carden Lane from RMS?
- Can you talk about how businesses on the 24 Corridor will be impacted? Do you have time frame projections?

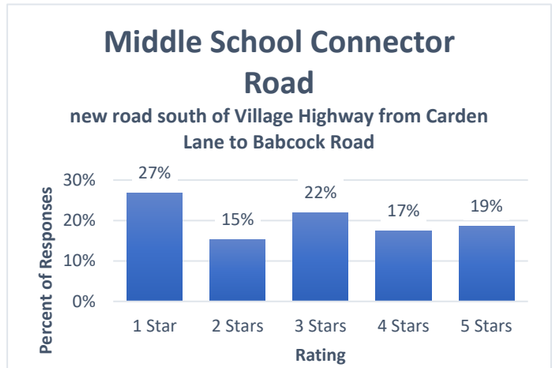
Second MetroQuest Survey

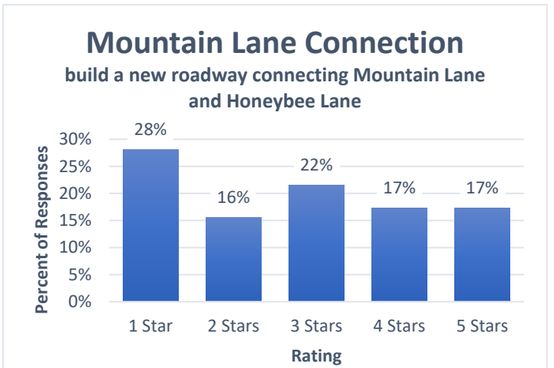
The second survey asked respondents to rate the potential improvements drafted by the project team. A text explanation and graphic rendering was provided for each of the eleven improvements. Respondents were asked to rate each improvement on a scale of 1 to 5 stars, with 1 being the lowest score and 5 being the highest. The results for each of the projects are shown in the following charts. Write-in comments from the second survey are contained in **Appendix M**.

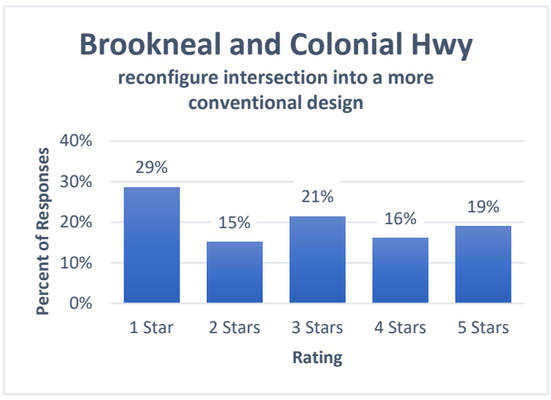
As shown in the charts, the responses are consistent across all of the potential improvements regardless of the type of project. Each of the potential improvements received more 1 star ratings (26-29%) than any other rating. It can not be discerned whether the responses indicate a lack of support to the specific potential improvements or a general resistance to change. Either way, as these projects move ahead into the design phase, additional public involvement is needed to convey the details of each project and gather input from the public.

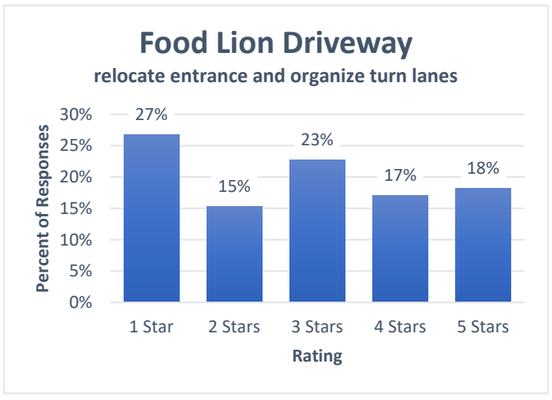


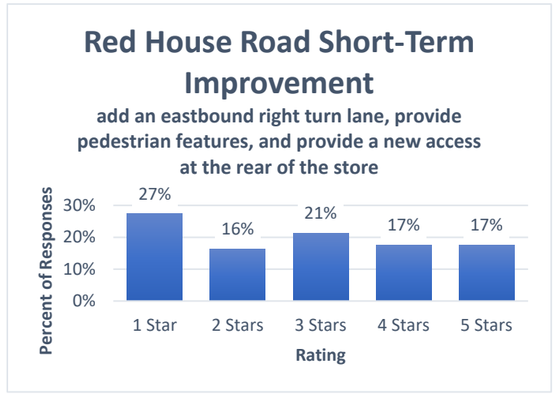


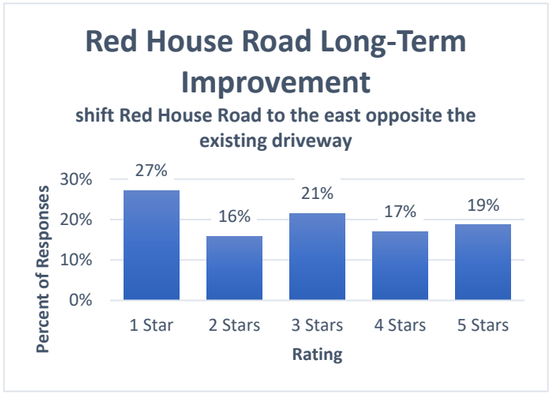






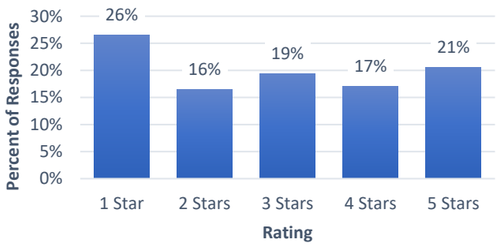






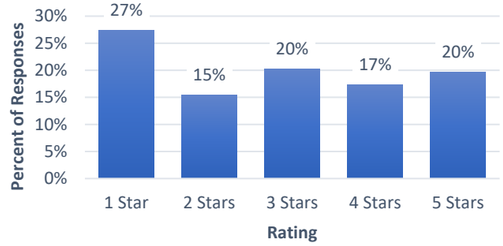
Mid-Block Pedestrian Crossing

improve mid-block crossings with median refuges



Shared Use Path

widen sidewalk to 10’ and sign as a multiuse path for bicyclists and pedestrians



Streetscaping

widen and enhance sidewalks, add street trees, add crosswalks, and place overhead utilities underground

Conclusion

Village Highway (VA Route 24) is a multimodal corridor that provides access to the Village of Rustburg's major destinations, while also serving the needs of regional commuters. Some of the major destinations in the village area include Rustburg Elementary School, Rustburg Middle School, and the Campbell County Courthouse. Situated at the overlap of Route 24 and Route 501, both regional arterials, in addition to serving as a "Main Street" for the Village, Village Highway also provides a vital connection to rural communities within Campbell County and neighboring counties. Thus, balancing the different roles of Village Highway as both a downtown main street and regional arterial is challenging.

This study, administered by the Central Virginia Transportation Planning Organization (CVTPO), included a review of background studies, field conditions, crash history, traffic counts, traffic projections, public input via two public meetings, two online surveys, and analysis of existing and future traffic operations in the study area. Using this base of information, recommendations were identified to address congestion, safety, multimodal conditions, and streetscaping.

The recommendations are supported by planning level sketches as needed to inform the technical analysis, facilitate discussions with the project study work group, and help in conveying the concepts to the public for input. While the concepts were found to be beneficial and generally feasible in terms of constructability, going forward additional effort will be required of the County and VDOT to prioritize and select projects to advance into grant applications and ultimately construction. To that end, this planning effort represents the first step in the process by identifying beneficial projects that help to reduce congestion, improve safety, improve multimodal options, and enhance the sense of place in the Village.

Perhaps the most significant recommendation in this document is improvement of the key intersection of Route 24 and Route 501 (Campbell Highway). Two alternatives were identified, each having merit in terms of safety and congestion reduction, and accommodation of pedestrians. The "standard intersection" configuration will be less impactful to adjacent businesses and in terms of cost, however, the roundabout configuration offers benefit in terms of reduced queues and an overall entry feature to the Village. Going forward, the County and VDOT, in coordination with the CVTPO, will need to continue the process of selecting a preferred alternative, and ultimately preparing a grant application for funding of this major project.

Numerous other improvements are identified and described in this study document. The cost estimates and funding strategies identified in the report provide information to guide the next steps toward implementation of the recommendations.