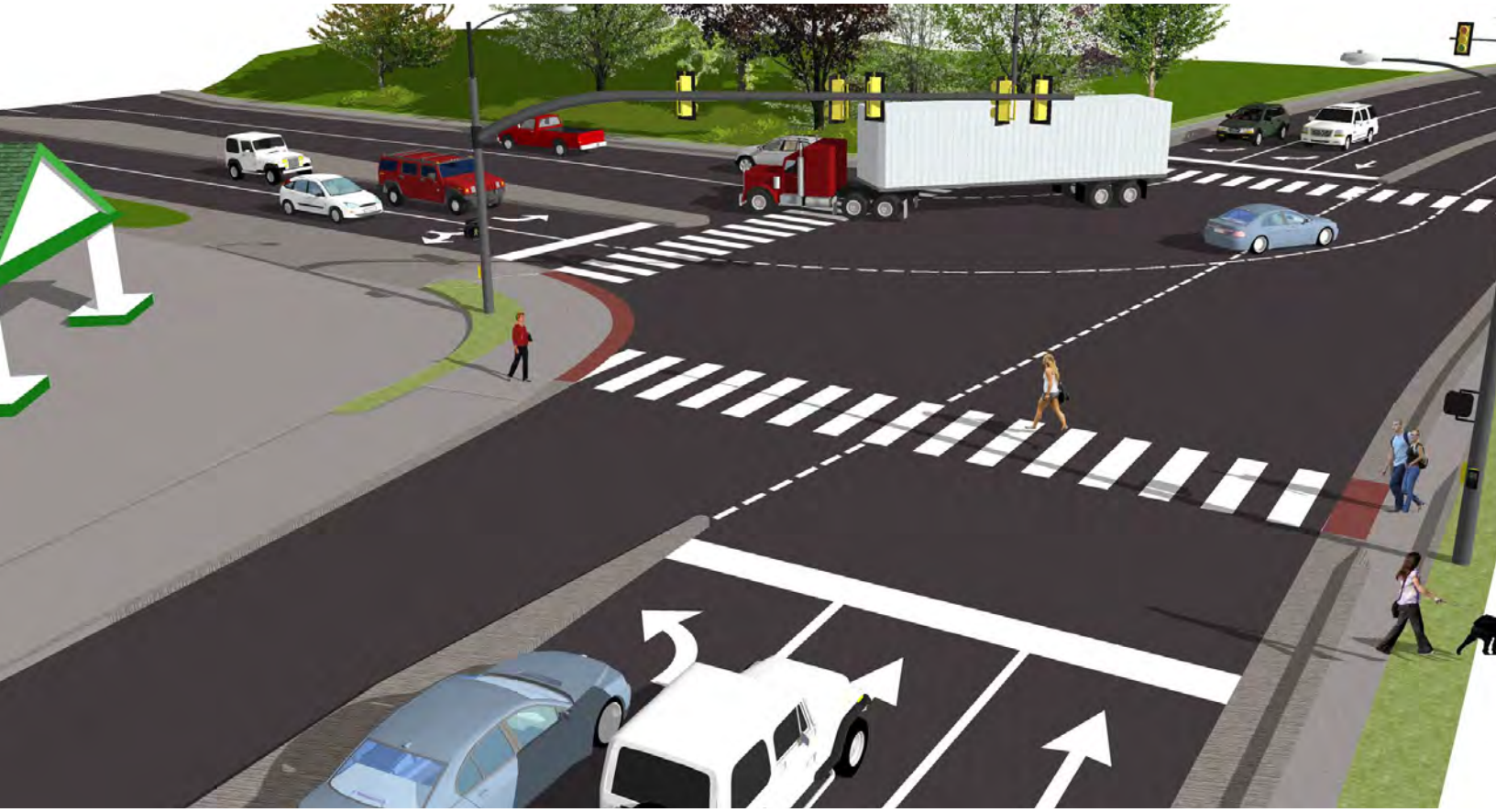

Gloucester County Business 17 Corridor Planning Study

May 10, 2013

Submitted to:

Virginia Department of Transportation

Prepared by:

HNTB Corporation

HNTB

VDOT

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1 Background

At the request of Gloucester County, the Virginia Department of Transportation (VDOT) has contracted the Consultant to conduct a transportation study assessing the traffic operations, safety and multi-modal network along Main Street (Route 17 Business) in Gloucester County, Virginia. The project recommends complete streets concepts that are designed for every user of the road irrespective of the mode of travel. To achieve this, the project team evaluated the operations and safety of the study corridor, identified the locations with concerns including traffic congestion, missing/unsafe pedestrian/bike facilities, and unsafe roadway elements. The proposed solutions are targeted to provide a safe environment for all users of the road, regardless of age, ability or mode of travel.

This study is targeted to improve the efficiency of Main Street while safely moving vehicular and pedestrian traffic, and preserving the vibrant downtown atmosphere of the study area. Improved flow along the Main Street corridor will provide relief to the heavy commuter traffic that travels through the corridor. Ultimately this will also attract more pass by trips, which will benefit the businesses along the corridor. Another priority of this study is to improve the pedestrian environment on both ends of the Courthouse Village to provide non-motorized access across Route 17 Bypass to the adjoining destinations. This will help achieve the overarching goal of creating a seamless network of multi-modal paths throughout the County.

2 Study Area

The study area is defined as the 2.5 miles corridor of Main Street, a principle arterial, beginning at the northern intersection with Route 17 Bypass to the southern intersection with Route 17 Bypass, in the Gloucester Courthouse Area. Based on the input from the County and the Consultant's observations, 10 different locations were identified for analysis. These locations are listed below and shown in **Figure 1**.

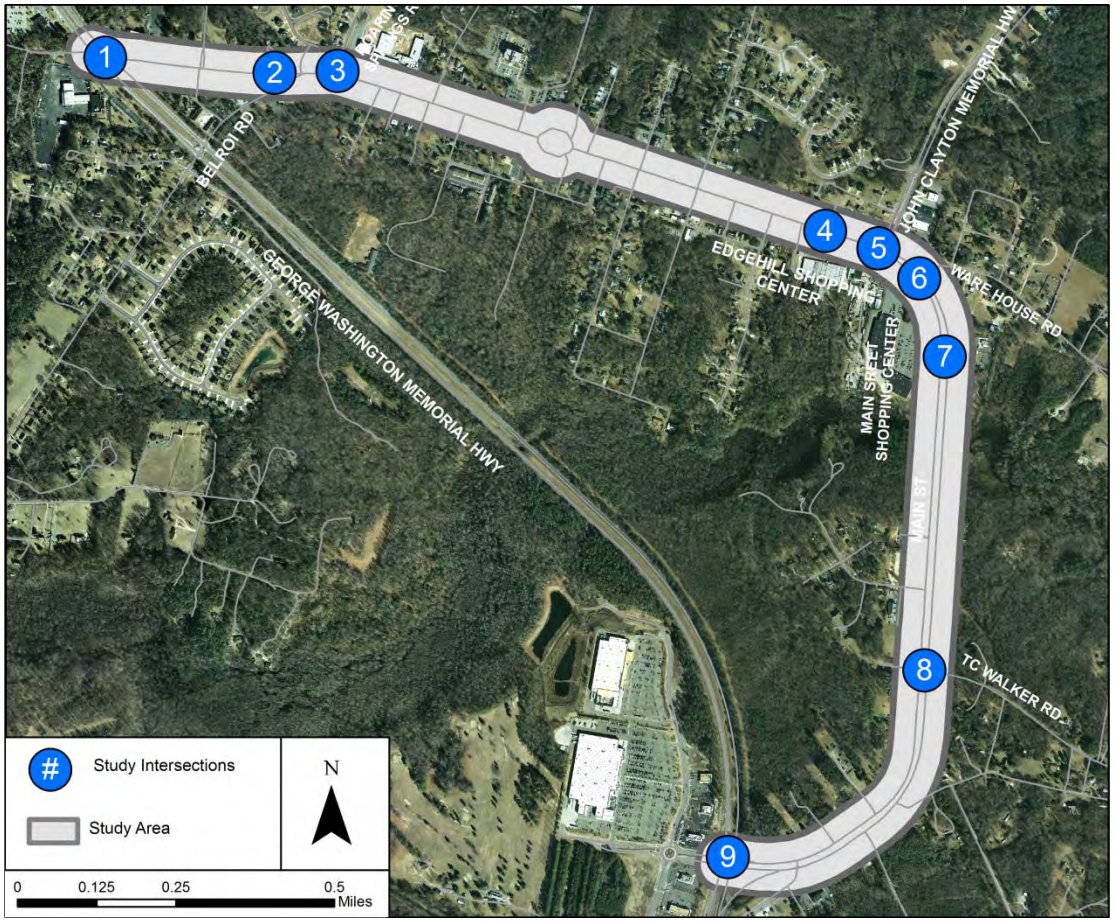
1. Route 17 Bypass (north)/Main Street
2. Main Street/Belroi Road (VA 616)
3. Main Street/Roaring Springs Road (VA 616)
4. Access points to Main Street from Edgehill Shopping Center
5. Main Street/John Clayton Memorial Highway (VA 3/14)
6. Main Street/Ware House Road (VA 621)
7. Access points to Main Street from Main Street Shopping Center
8. Main Street/TC Walker Road (VA 629)
9. Route 17 Bypass (south)/Main Street
10. Multi-modal/Spot Improvements along the study corridor

Three of these intersections are currently signalized:

- Intersection #1 - Route 17 Bypass (north)/Main Street
- Intersection #5 - Main Street/John Clayton Memorial Highway (VA 3/14)
- Intersection #9 - Route 17 Bypass (south)/Main Street

The remaining intersections are two-way stop controlled, with movement priority given to Main Street traffic. Main Street is a two-lane roadway with a speed limit of 25mph, from the northern intersection with Route 17 Bypass to its intersection with VA 3/14. After this point, Main Street transitions to a four-lane divided highway with a speed limit of 35 mph. As it approaches TC Walker Road, speed limit increases to 45 mph and stays the same till the southern intersection with Route 17 Bypass. All the crossroads in the study area are two-lane local roads with the exception of VA 3/14 which is a four-lane highway.

Figure 1: Study Area



3 Project Methodology/Process

This project was initiated by the County of Gloucester through VDOT to improve both vehicular and multimodal traffic along Main Street in Gloucester County. The involvement of local staff and citizens of the area was critical to understanding the unique challenges, limitations, and opportunities within the corridor. The comments received from the public are presented in **Appendix A**.

The Consultant conducted field visits to gain a firsthand perspective of the corridor's character. After the initial walk-through of the corridor an operational and safety analysis was performed to identify areas of

concern for vehicular and pedestrian traffic. Under VDOT's guidance, three (3) meetings with Gloucester County staff and two (2) public meetings were conducted to help understand the issues facing the corridor and their impact. These meetings gave insight to different challenges at the study locations, and provided feasible opportunities for solutions. A summary of the existing conditions is presented in **Chapter 4**. For more detailed analysis, refer to Technical Memorandum #1, Existing Conditions, in **Appendix B** of this report.

Based on feedback received from the first public meeting and the findings in Technical Memorandum #1, alternatives at each location were developed to address the problems identified in the study area. These options incorporated Complete Streets aspects into the solutions considered. Plan view designs, associated costs, and pros and cons of each alternative were discussed in Technical Memorandum #2 (presented in **Appendix C**). These alternatives were presented at the second public meeting held in March 2013. A matrix ranking of the alternatives was developed to facilitate the screening process. The alternatives were ranked based on the following factors:

- Traffic Operations (both vehicular and multimodal)
- Environmental/Cultural/Historical impacts
- Right-of-Way/Utility Impacts
- Construction Cost
- Aesthetic Appearance
- Safety
- Property Owner Coordination

The matrix shown in **Figure 2** helped balance the competing concerns when evaluating alternatives at the study locations. The matrix was used at the public meeting at the request of the County to show the pros and cons of each alternative.

Based on VDOT standards, feedback from the second public meeting, and input from the County staff, one preferred alternative at each location was selected by the project team. A walk through was performed by VDOT staff to ensure that the final alternative at each location is feasible. Detailed plan view designs, 3D views, and cross-sections were developed for the refined alternatives where appropriate. The final recommended improvements along the corridor are presented in **Chapter 5** of this report. Funding opportunities and the ideal sequence of implementing these improvements are discussed in **Chapter 6**.

The study corridor was also evaluated for the future year 2034. It was assumed that the final set of improvements recommended in this study will be implemented by that year. A discussion on this qualitative analysis is presented in **Chapter 7** of this report.

Figure 2: Sample ranking matrix for alternatives

Main Street @	Alternative	Traffic Operations		Environmental/ Cultural/ Historic Impacts	Right of Way/ Utility Impacts	Construction Cost	Aesthetic Appearance	Safety	Property Owner Coordination
		Multimodal Accomodation	Vehicular Traffic						
Route 17 Bypass (north)	No Build	●	●				○	◗	
	Alternative 1	○	●	●	●	◖	○	○	●
Belroi Rd. / Roaring Springs Rd.	No Build	●	○				●	◗	
	Alternative 1	◖	●	◗	◖	●	●	○	◗
	Alternative 2	○	◖	●	●	◖	○	○	○
Edgehill Shopping Center	No Build	○	●				○	◗	
	Alternative 1	○	◖	●	●	◖	○	○	◗
John Clayton Memorial Hwy	No Build	●	○				○	◗	
	Alternative 1	◖	◖	◖	◖	◗	○	●	●
	Alternative 2	◖	●	○	○	◗	○	●	◗
	Alternative 3	◗	●	○	◗	◗	◗	◖	◗
Ware House Road	No Build	●	○				○	◗	
	Alternative 1	◗	◗	●	○	●	○	◗	○
	Alternative 2	◖	◖	●	○	◗	○	◖	○
Main Street Shopping Center	No Build	●	○				○	◗	
	Alternative 1	◖	◖	●	○	◗	○	◖	○
	Alternative 2	◗	◗	●	○	●	○	◗	○
TC Walker Road	No Build	●	○				◗	◗	
	Alternative 1	◗	○	●	●	◗	●	○	●
Route 17 Bypass (south)	No Build	●	●				○	◗	
	Alternative 1	○	●	●	●	○	◖	○	●

RATINGS GUIDE				
Excellent	Good	Average	Sub-Par	Poor
●	◖	○	◗	●

4 Existing Conditions Summary

4.1 Operations

To determine the existing traffic conditions, available traffic counts[1] were gathered and an annual growth rate of four (4) percent (based on historical growth rates) was applied to generate 2012 volumes. **Figure 3** shows volumes in average annual daily traffic (AADT), and peak hour traffic. These volumes were analyzed to allow issues at each location to be identified. This analysis combined with observations from the field visits and the public meetings helped prioritize the problem locations. Detailed citizen comments can be found in **Appendix B**.

Location 1: Route 17 Bypass (north)/Main Street

There were no vehicular operational issues identified at this intersection, as it functions at LOS C in both the AM and PM peak periods. At this location, no concerns were raised by the citizens at the first public meeting.

While there are no vehicular issues at this intersection, there are currently no pedestrian and bike facilities. In the future, Bay Transit will construct a transit center on the west side of Route 17 Bypass, which will need pedestrian connectivity with the neighborhoods. Additionally, there is a shopping center with a grocery store and pharmacy on the west side of Route 17 Bypass with no pedestrian access to/from the Courthouse area. There are also no pedestrian connections to the wellness center and hospital to the north of this intersection at Hospital Drive. This creates a safety hazard and impediment to the multimodal fabric of the community.

Location 2: Main street/Belroi Road (VA 616)

This is an angled intersection with potential safety concerns due to site distance and driver comfort. No crashes occurred at this intersection between 2009 and 2010. Rather, it was brought to the study team's attention by the citizens. At the initial public meeting, a few citizens requested the team to consider a roundabout and more pedestrian/bike accommodations at this location.

Location 3: Main Street/Roaring Springs Road (VA 616)

During the public meeting a few citizens requested the team to consider a roundabout and more pedestrian/bike accommodations at this location. No crashes occurred at this location in two years (2009-2010). However, there are safety concerns for pedestrians at this location due to the placement of the crosswalk. The angled intersection also makes it difficult for motorists to see approaching pedestrians and cyclists on Main Street.

The current crosswalk across Roaring Springs Road is behind the stop bar for cars which is an issue for children walking to the nearby elementary school. There is also no marked crosswalk across Main Street at this intersection, which due to the proximity of the elementary school, should be addressed.

[1] Foxmill Centre 527 TIA in 2010, Roundabout Study in 2006, The Villas at Gloucester Courthouse TIA in 2007

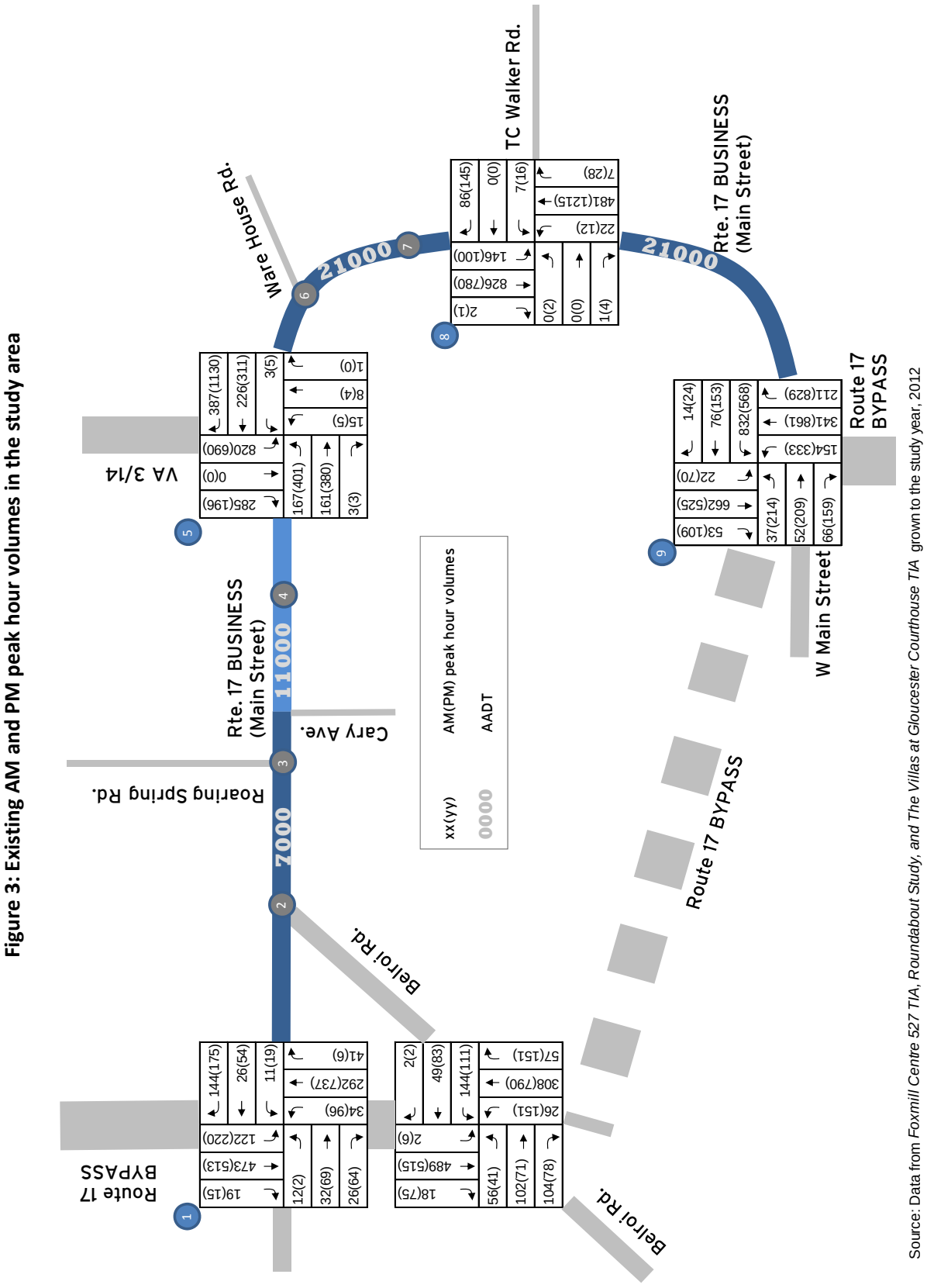


Figure 3: Existing AM and PM peak hour volumes in the study area

Source: Data from *Foxmill Centre 527 TIA, Roundabout Study, and The Villas at Gloucester Courthouse TIA* grown to the study year, 2012

Location 4: Access points to Main Street from Edgehill Shopping Center

This shopping center is on the west side of Main Street in the vicinity of the intersection of Main Street/John Clayton Memorial Highway (VA 3/14). While one fatal crash was reported at this location in two years, it was not caused by deficiencies in the transportation network.

Currently there are three (3) access points to the shopping center, of which two are full access driveways approximately 200 feet apart. These driveways provide access to multiple businesses including a restaurant, hardware store, auto parts store and other businesses. Deliveries to the businesses require truck access.

The full access driveway closest to the intersection of Main Street and John Clayton Memorial Highway (VA 3/14) is about 220 feet from the intersection. During the evening peak hour, queues occasionally reach 520 feet beyond this entrance which is both a safety and operational concern. In the future years, queues from the intersection of Main Street and Route 3/14 will extend past this entrance blocking the access point to the shopping center a majority of the time.

Location 5: Main Street/John Clayton Memorial Highway (VA 3/14)

This location was one of the top priorities of this study, as the intersection currently has issues including traffic congestion, access management, and pedestrian safety. A large number of commuters, who live in the northern portion of Gloucester County and Middle Peninsula but work in Hampton Roads, use VA 3/14 to reach Route 17 Bypass in the morning and vice versa in the evening. The heavy directional traffic at this intersection creates delays, which cause cars to remain idle for long periods of time, negatively affecting air quality.

Traffic operational analysis and field observations at this intersection showed long traffic delays and heavy congestion (LOS D) in the AM; longer delays and heavier congestion (LOS E) in the PM. Refer to **Appendix B** for details on operational analysis. The right turn from westbound Main Street to VA 3/14 has a tight turning radius making the turn difficult and unsafe for large trucks.

At the initial public meeting, citizens raised concerns about the private driveway on the southern leg of the intersection. Currently, the southern leg of the intersection which serves one private business, is allocated an entire signal phase, reducing the green time on the other busy approaches. There are three entrances within 150 feet on the south side of Main Street prior to the heavily congested intersection of Main Street/ John Clayton Memorial Highway (VA 3/14) which results in unsafe and inefficient traffic flow.

The pedestrian connections from the historic downtown to the intersection of VA 3/14 have been improved recently by the street-enhancement project. However, there are no multi-modal connections between the shopping centers and the the bowling alley, movie theater and Brown Park on VA 3/14, and the boat landing on Ware House Road.

Location 6: Main Street/Ware House Road (VA 621)

The intersection of Main Street and Ware House Road is currently not signalized. Three (3) crashes occurred at this intersection in two years. This intersection is on a horizontal curve creating sight

distance issues, which can be a contributing factor to the crashes. The intersection is also closely spaced to Main Street and VA 3/14, which causes queues from the upstream intersection to block this intersection, making it difficult for drivers to access Ware House Road. This location also does not have sidewalks or crosswalks.

Location 7: Access points to Main Street from Main Street Shopping Center

When vehicles leave the southern exit of the shopping center, they have difficulty making a left onto Main Street as they are unable to find a gap in the traffic. These vehicles have to cross two travel lanes and a median which impacts driver safety. There are also no bike or pedestrian facilities accessing the shopping center, which has both the local post office and the library.

Location 8: Main Street/TC Walker Road (VA 629)

This location was discussed at the public meeting as citizens were concerned that left turning vehicles from TC Walker Road are unable to find adequate gaps. The separated highway here allows left turning vehicles to make a two-step left turn, by taking advantage of the 20-30 feet wide medians. This area is not connected to the multimodal network and is vehicle oriented.

Location 9: Route 17 Bypass (south)/Main Street

This intersection had failing LOS in the morning peak hour in the existing conditions with the westbound approach of Main Street experiencing heavy delays. However, operations improve drastically with signal optimization. The signal timing at this location is currently being addressed in the 'Route 17 Corridor Signal Coordination Project[2]' conducted by VDOT. There were five (5) crashes identified at this intersection in two years. There were no concerns raised by the citizens at the public meeting.

Currently, the only pedestrian facilities at this location are the sidewalks on the west leg of the intersection. This results in the businesses on the west side of Route 17 Bypass to be isolated from the neighborhoods in the Courthouse area. There are many retail and commercial establishments in the development which would benefit from the ability of people to walk to these attractions. There is also a county park to the north of the Foxmill shopping center, which is not accessible by foot for the residents of Gloucester Courthouse.

4.2 Safety

There were 64 crashes within the 2.5-mile corridor in three years. Half of these crashes were angle crashes followed by rear end crashes at 30 percent of total crashes. There was one fatal crash in the study area due to reasons not related to the deficiencies in the roadway network. The key findings from the safety analysis that were incorporated into this study are as follows:

- No intersection is seen as "dangerous", having a high frequency of any type of crash. This is a positive finding, which makes it necessary to focus improvements over the entire corridor.

[2] UPC #98806

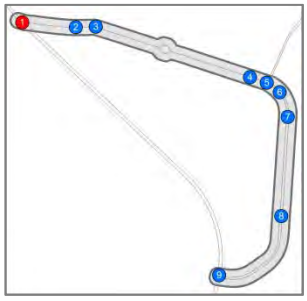
- Three crashes occurred on the westbound approach of the intersection of Route 17 Bypass (south)/Main Street in two years. The current signal timing generates large delay on the westbound approach resulting in failing LOS on this approach. The changes proposed by VDOT's 'Route 17 Corridor Signal Coordination Project' will address operations at this intersection. Two angle crashes occurred at the merge point of the right turn lane from Route 17 Bypass northbound and Main Street. However, this channelized right has been upgraded recently and currently there are no roadway deficiencies identified.
- Angle crashes are the most common crash type seen along the corridor from Justice Drive to Ware House Road at most of the stop-controlled intersection. There were angle crashes at almost every intersection along this section of road. The cause for these crashes was identified as lack of visibility for vehicles entering from the side streets due to the vehicles parked on Main Street adjacent to the side streets.
- Rear end crashes were observed to be higher between Route 17 Bypass (south) to VA 3/14 due to "start and stop" traffic during the peak hours.

5 Recommended Improvements

The final recommendations are a result of the methodology discussed in **Chapter 2**. The existing conditions were reviewed, input was sought from the public and the County staff, and alternative layouts were developed with VDOT's guidance. These alternatives were then reviewed by the public and the project team, and a final alternative was chosen at each location. Detailed documentation of various alternatives considered leading to the final recommendations can be found in **Appendix C**.

5.1 Route 17 Bypass (north)/Main Street - Location 1

The operations at this location were acceptable in the peak hours. There were no concerns raised by the citizens at the first public meeting. However, improvements are suggested at this location to create a contiguous multi-modal network in the study area. The recommended improvements are shown in plan view in and the cross-section of the north leg (Route 17 Bypass) of the intersection is shown in **Figure 5**.



<u>Recommendations</u>

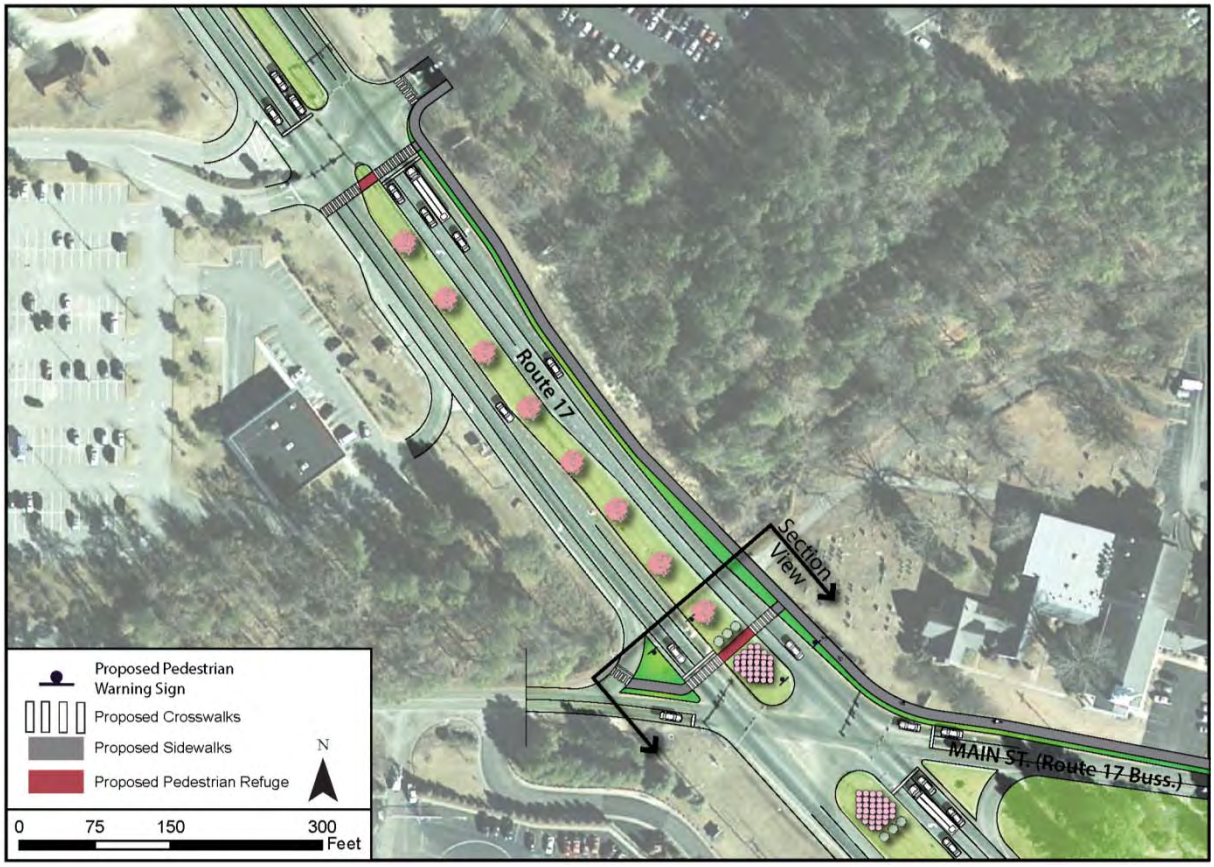
- A high visibility crosswalk[3] with ADA compliant ramps and a pedestrian refuge should be added on the north leg of the intersection on Route 17 Bypass. This will provide access for pedestrians/bikers to the future transit center and other planned development in the area.
- A sidewalk should be provided along Route 17 Bypass to the intersection of Route 17 Bypass/Hospital Drive. Crosswalks with ADA compliant ramps and a pedestrian refuge should be installed on the south leg of the intersection of Route 17 Bypass/Hospital Drive, connecting the

[3] Guidelines for the Installation of Marked Crosswalks, http://www.virginiadot.org/business/resources/Marked_20Crosswalks_20Final_20Guidelines_2012-14-05.pdf VDOT, accessed on April 8, 2013

hospital and community centers with the shopping center and neighborhoods on the west side of Route 17 Bypass. This will allow pedestrians and cyclists to access these activity centers safely.

- Provide pedestrian count-down signal heads at the crosswalks to increase pedestrian comfort while crossing the intersection.
- At the second public meeting, citizens requested a separate right turn lane on Fiddlers Green Road. Current volumes do not warrant a separate turn lane. However, in the long term a follow-up analysis is warranted, when the transit center and the planned 84 unit housing development are built. This could be achieved within the existing road alignment by restriping the approach.

Figure 4: Plan view of recommendations at Route 17 Bypass (north)/Main Street



The costs associated with these improvements are presented in **Table D-1** in **Appendix D.**

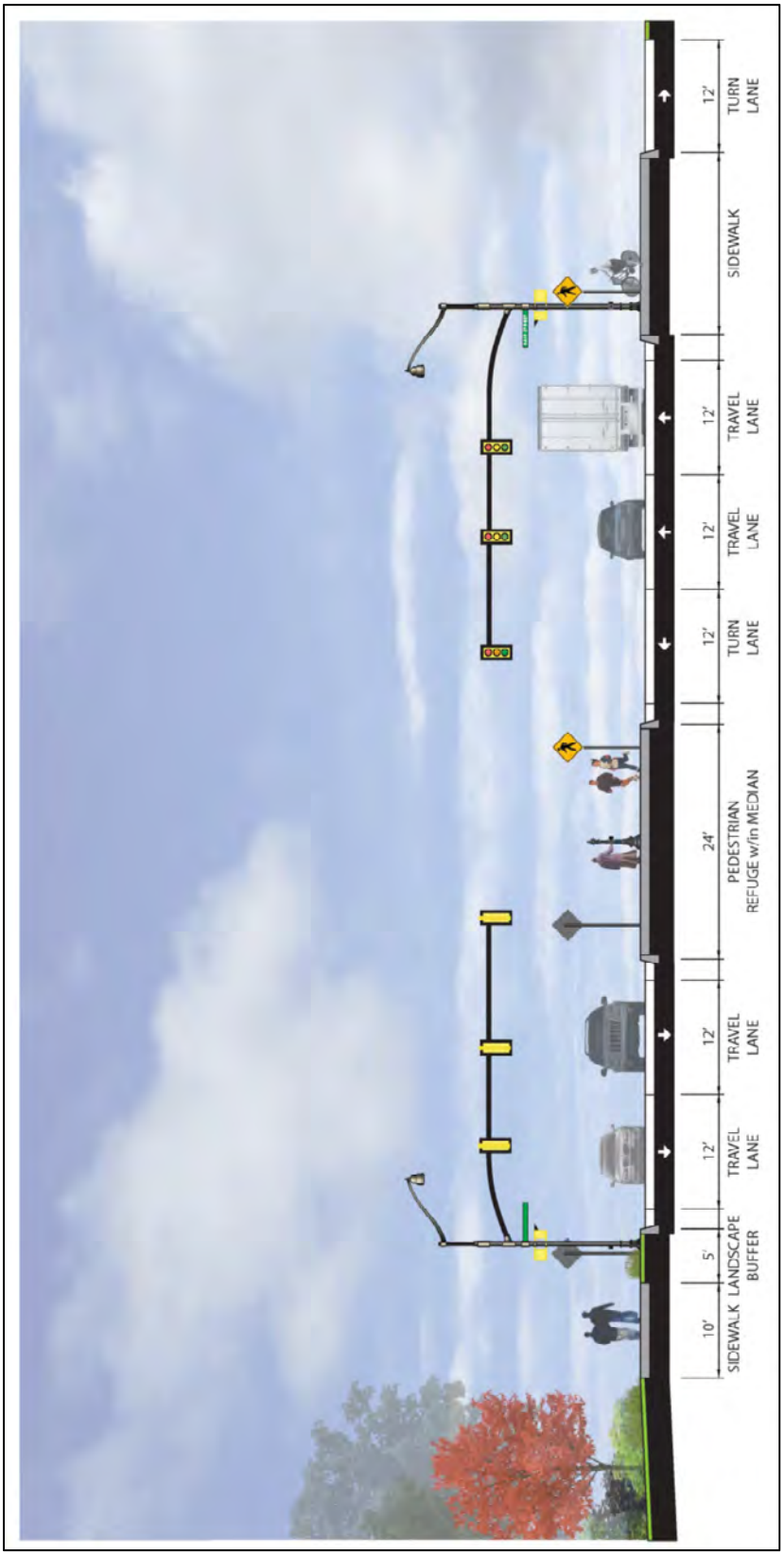
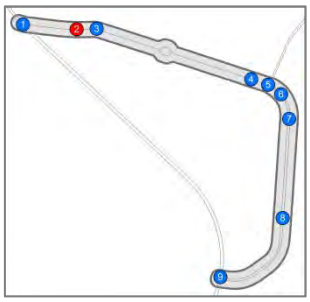


Figure 5: Typical cross-section on the north leg of Route 17 Bypass (north)/Main Street

5.2 Main Street/Belroi Road (VA 616) - Location 2



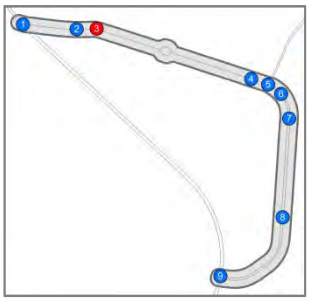
The reasons for concern at this intersections are sight distance and driver comfort. At the initial public meeting, citizens suggested a roundabout and more pedestrian/bike accommodations at this location. The roundabout alternative was eliminated during the screening process due to high construction cost and lesser safety to the pedestrians. The final set of improvements recommended at this location can be seen in **Figure 6.**

Recommendations:

- This intersection is recommended be realigned using the existing pavement such that Belroi Road intersects Main Street at a right angle. Eliminating the angled intersection will improve the operation and safety at this location as the left-turning vehicles from Belroi Road can make the turn with good visibility and comfort. As this option can be implemented within the existing right-of-way, construction costs were relatively lower.
- Crosswalks should be installed across Belroi Road and the east leg of Main Street. These crosswalks provide access between the neighborhoods along Belroi Road and the proposed trail to Beaverdam Park[4]. As the crosswalk on Main Street will cross free flowing traffic, advanced pedestrian warning signs should be placed at this intersection warning drivers of the potential pedestrian presence.
- Sidewalks should be built along the east side of Belroi Road to connect with the existing sidewalks along Main Street. Sidewalks should also be continued on the north side of Main Street to Route 17 Bypass to provide a complete network of sidewalks along Main Street.
- The crosswalk at Gloucester Town Drive should be moved approximately 20 feet towards the intersection and the current stop bar should be placed behind the crosswalk to ensure that the cars stop before the crossing.

The costs associated with these improvements are presented in **Table D-2** in **Appendix D.**

5.3 Main Street/Roaring Springs Road (VA 616) - Location 3



In the first public meeting, citizens requested more pedestrian/bike accommodations and a roundabout at this location. A roundabout at this location was found not feasible due to the lack of right of way. Detailed documentation on various options considered is presented in **Appendix C.**

[4] Pedestrian/Bicycle Path Feasibility Study for the Gloucester County Courthouse and Beaverdam Park Area, 2002

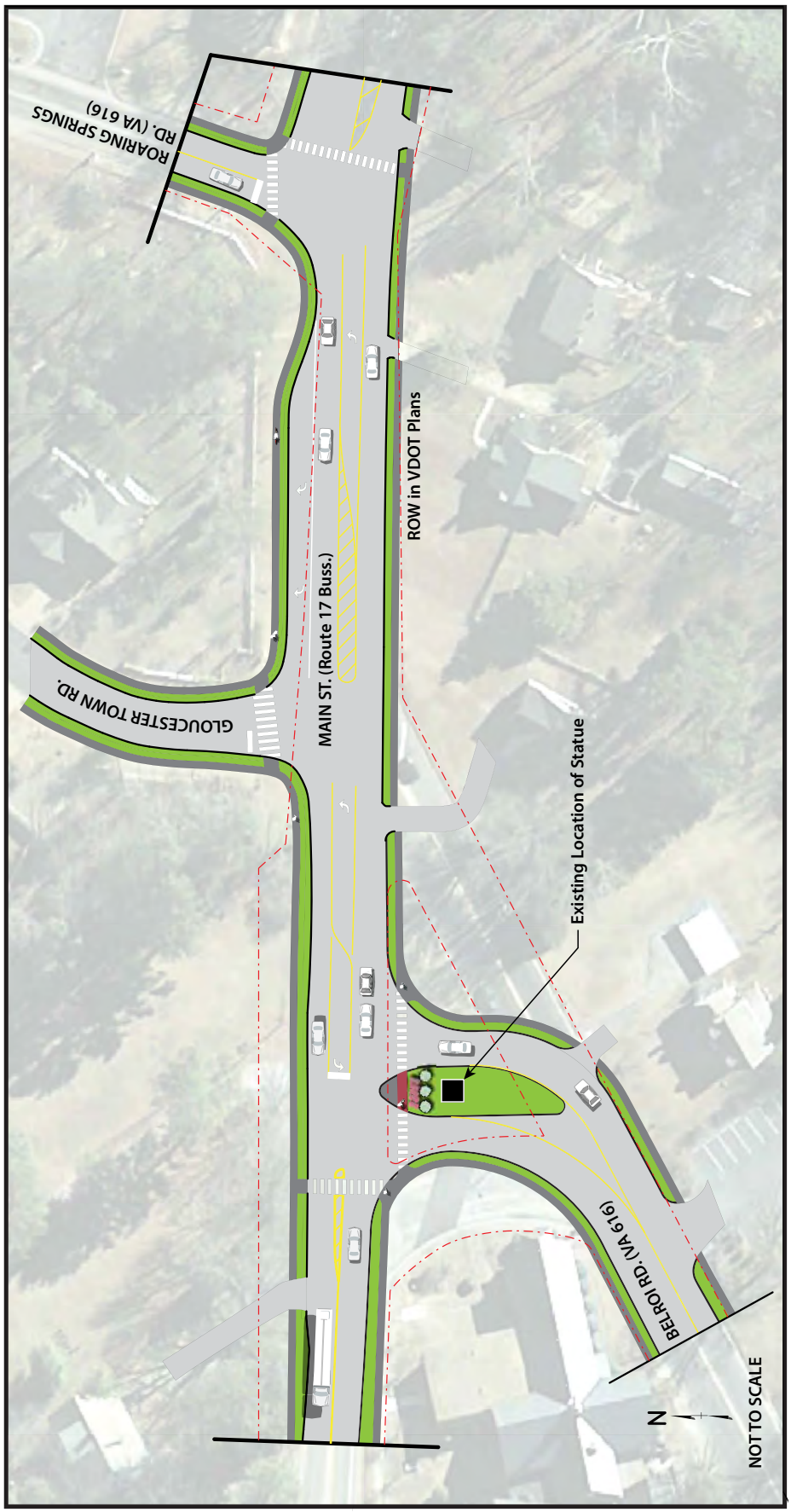


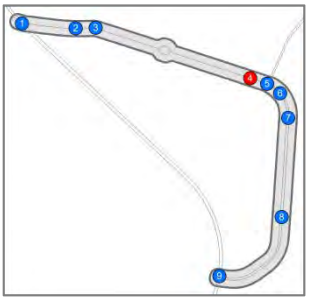
Figure 6: Plan view of recommended improvements at Main Street/Belroi Road (VA 616)

Recommendations:

- At Roaring Springs Road the existing stop bar should be moved behind the crosswalk to ensure cars stop prior to the pedestrian crossing. This recommendation is shown in **Figure 6** along with Location 2.
- A crosswalk should be installed across the east leg of Main Street to provide an additional crossing location for children traveling to the elementary school. School crossing signs should also be installed in advance of the crosswalk.

These pedestrian improvements will connect to the proposed trails/paths in the 2002 study, 'Pedestrian/Bicycle Path Feasibility Study for the Gloucester County Courthouse and Beaverdam Park Area'. The costs associated with these improvements are presented in **Table D-2** in **Appendix D.**

5.4 Edgehill Shopping Center- Location 4

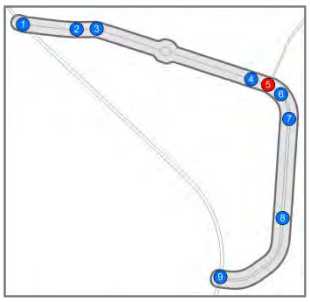


The shopping center currently has three driveways, of which two provide full access to Main Street. The full entrance closest to the intersection of Main Street/ John Clayton Memorial Highway (VA 3/14) is occasionally blocked by eastbound vehicles queuing back from the intersection during the PM peak hour. This conditions is expected to get worse in the future. Every full access point to the shopping center will create nine (9) potential conflict points compared to two (2) conflict points for a right-in right-out entrance. With these findings, the following improvements are recommended.

Recommendations

- The full access driveways could be consolidated to improve traffic operations and safety as every full access creates nine (9) potential conflicts between vehicles. Consolidating the access points would direct vehicles to a safe access point further from the queues generated at the major intersection nearby.
- Prior to the consolidation, VDOT and the County should coordinate closely with business owners to ensure that the results are agreeable to all stakeholders. Meetings should be held on site to reach a mutual agreement to ensure all the businesses have adequate access while improving the safety of their patrons.
- The parking lot serving the shopping center might need to be redesigned for efficient internal circulation, if this recommendation is carried forward. This process should involve all of the business owners, VDOT, and county staff to ensure that everyone's concerns are addressed.

5.5 Main Street /John Clayton Memorial Highway (VA 3/14) - Location 5



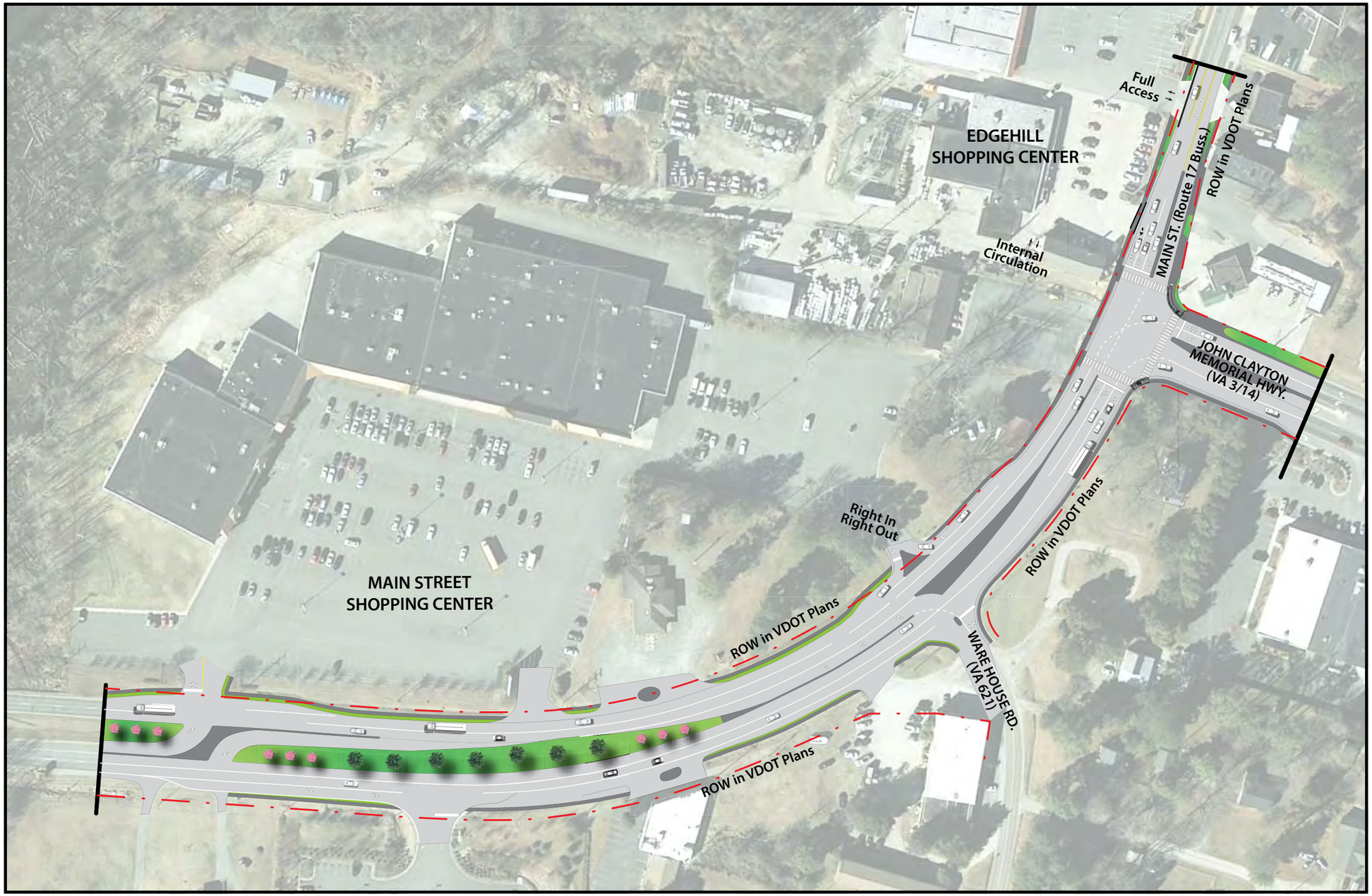
As discussed in **Chapter 4**, this is one of the major intersections in the study area. Heavy traffic congestion, queues, and delays were observed in the southbound direction during the AM peak hours and the westbound direction during the PM peak hours. Areas of concern at this location include: poor traffic operations, user misperception associated with a driveway being part of the intersection, lack of pedestrian/bike accommodations, closely spaced entrances on the south side of Main Street, and a tight turning radius for trucks turning westbound right. The final set of improvements recommended at this location can be seen in **Figure 7.**

Recommendations

- Add crosswalks with ADA compliant ramps for pedestrians and bicycles to cross VA 3/14 and both legs of Main Street, linking the Main Street Shopping and Edgehill shopping centers to the bowling alley.
- Provide pedestrian count-down signal heads to increase pedestrian comfort.
- Extend the sidewalk up VA 3/14 to connect to the bowling alley allowing pedestrians to safely access the bowling alley from the downtown.
- In the near term, a dual left turn from VA 3/14 can be provided to Main Street. This will increase the number of vehicles able to clear the intersection during the AM peak period, reducing the number of idling vehicles and shortening the approach queue.
- In the long-term, the accesses points on the south side of the intersection should be consolidated and the internal circulation should be redesigned to ensure access to all the properties. The primary access point to the businesses on the south side of this intersection would be at Ware House Road. To travel west on Main Street or north on Route 3/14, vehicles would use the U-turn lane at the southern entrance of the Main Street shopping center. This improvement is critical to operations and safety at this location. However, the success of this recommendation is contingent upon coordination among the property owners, VDOT and the County.
- In the long term, dual right turns should be provided on westbound Main Street by narrowing the median. This would accommodate the heavy commuter traffic in the PM peak hour and prevent queues spilling back to Ware House Road and beyond.
- Similarly, the median on the north leg of the intersection should be narrowed to widen the receiving lanes as shown in **Figure 7**. This improvement to the intersection will provide a better turning radius for the truck traffic.

The costs associated with these improvements are presented in **Table D-3** in **Appendix D.**

Figure 7: Plan view of recommended improvements on Main Street from John Clayton Memorial Highway (VA 3/14) to Main Street Shopping Center



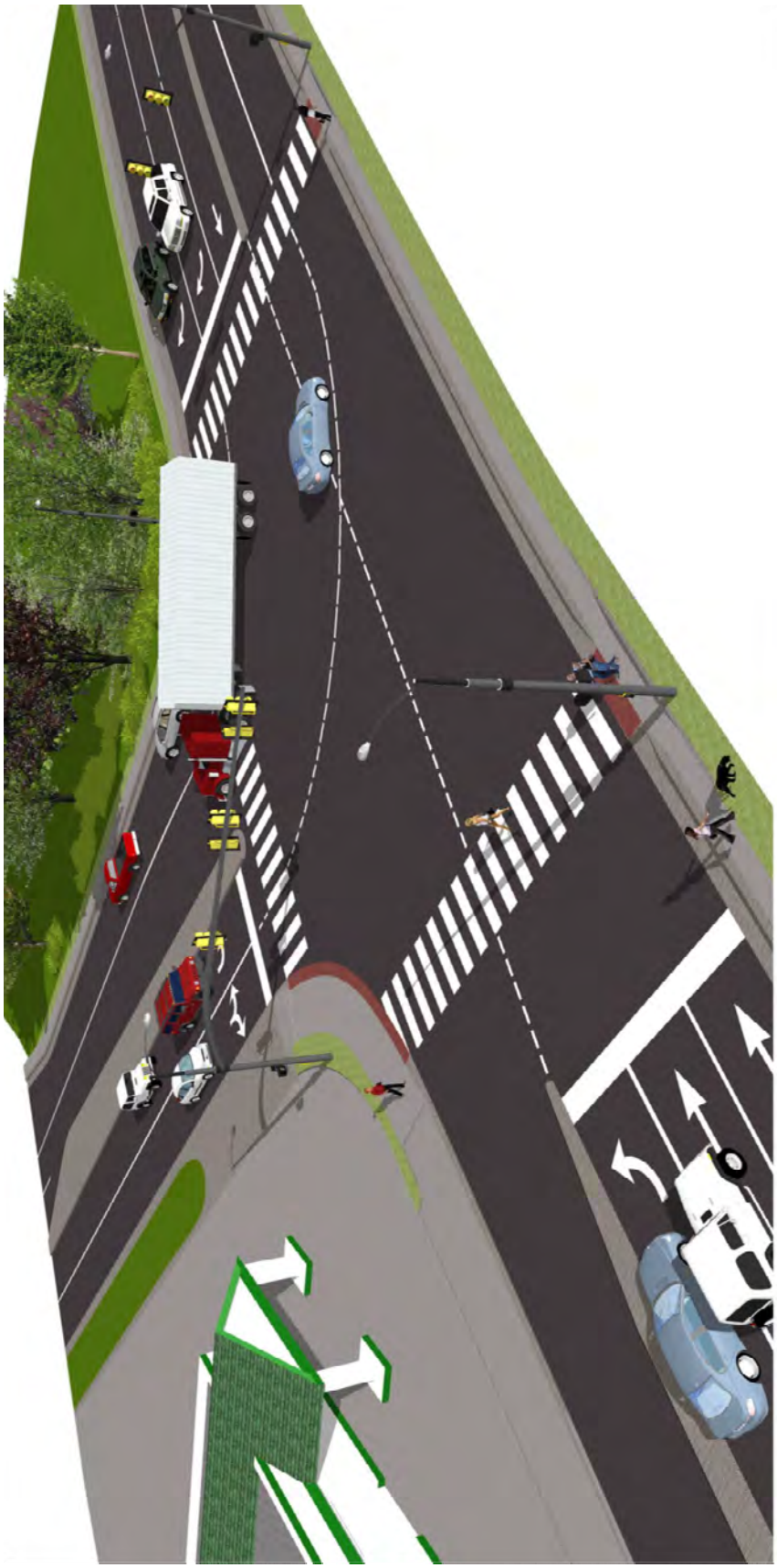
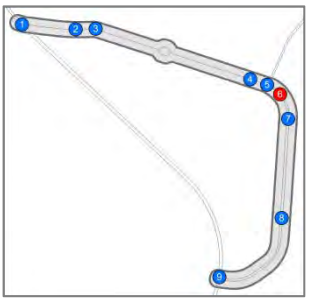


Figure 8: 3-D view of recommended improvements on Main Street/John Clayton Memorial Highway (VA 3/14)

5.6 Main Street/Ware House Road (VA 621) - Location 6



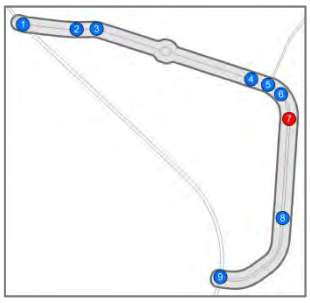
This is an unsignalized intersection on a horizontal curve with sight distance issues. The intersection is also closely spaced with Main Street and VA 3/14. In the long-term, the entrance to the shopping center at this intersection will be the primary access point to all the businesses on the south side of the intersection of Main Street /John Clayton Memorial Highway. The final set of improvements recommended at this location are shown in **Figure 7.**

Recommendations

- At the intersection of Main Street/Ware House Road, make the access to the shopping center a right-in right-out only.
- Through traffic on Ware House Road will need to turn left on to Main Street and turn right at one of the access points to the shopping center. A merge lane is provided for this traffic by narrowing the median on Main Street. This will increase driver comfort and safety as they need to cross only two lanes of traffic at a time.
- Extend the sidewalk from the north entrance of Main Street Shopping Center to the southern entrance to provide multi-modal access to the County library and post office.

The costs associated with these improvements are presented in **Table D-4** in **Appendix D**.

5.7 Main Street/ Main Street Shopping Center- Location 7



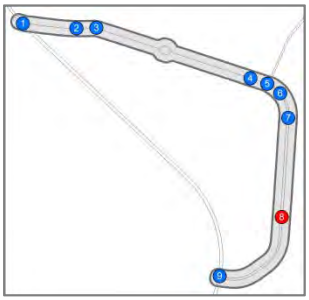
Concerns were expressed by five (5) citizens about the left turn onto Main Street from the shopping center. There are also no pedestrian connections to the post office or library. The recommendations at this location are shown in **Figure 7** and the costs associated with these improvements are presented in **Table D-4** in **Appendix D**.

Recommendations:

- Make the access point a right-in right-out and left-in only as shown in **Figure 7.** This will eliminate the unsafe turning movements.
- Add a turn bay for U-turns on southbound Main Street, to allow vehicles exiting the Main Street Shopping Center at Ware House Road to travel west on Main Street or north on Route 3/14. This will essentially serve the traffic that wishes to turn left out of the shopping center. In the long-term when the access points on the south side of VA 3/14 are consolidated, this will also serve the traffic from these businesses.
- Extend the sidewalk from the north entrance of Main Street Shopping Center to the southern entrance. This ensures that pedestrians do not have to walk through the parking lot to reach the County Library. This sidewalk will also help support the mixed-use development planned in the area.

- With the mixed use development planned[5] in this area, pedestrian volumes might be high enough in the future to warrant a crosswalk with a Pedestrian Hybrid Beacon (PHB).

5.8 Main Street/TC Walker Road (VA 629) - Location 8

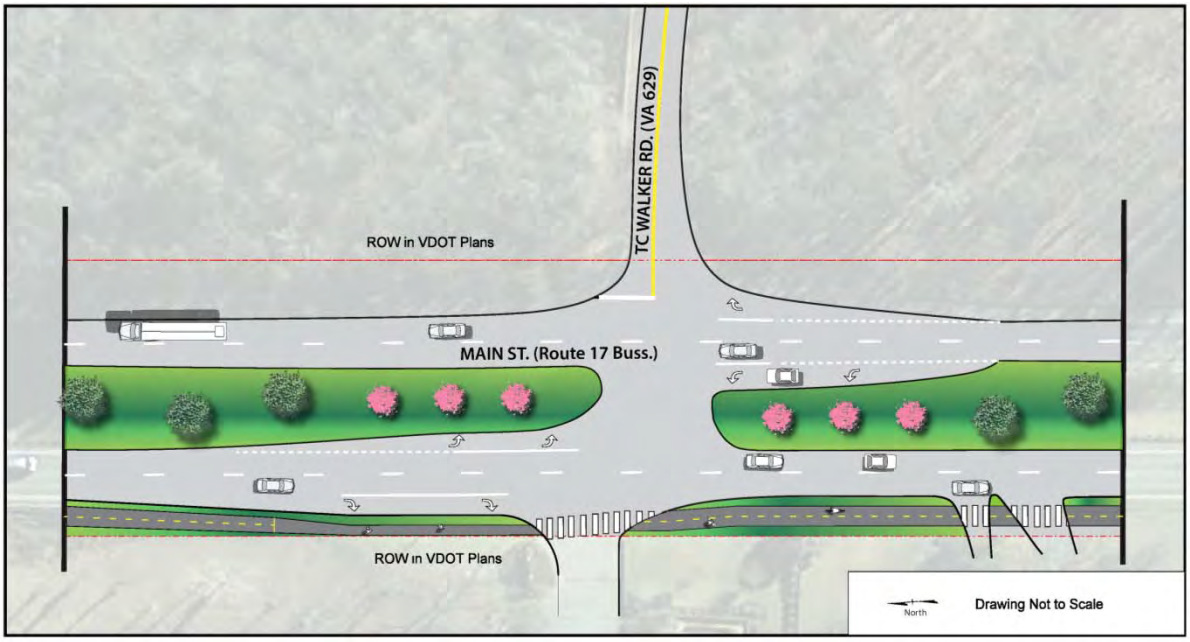


Some of the concerns at this location are vehicles turning left from TC Walker Road unable to find adequate gaps, and lack of pedestrian accommodations. As the medians are about 20-30 feet wide, vehicles could use this area as a refuge and make two-step left-turns.

Recommendations:

- Provide gateway treatments such as a welcome sign and/or plantings in the median and on both sides of the roadway as shown in **Figure 9**. Signing can also be used to indicate traffic entering from the right side, for northbound traffic. This will create a transitional zone to the town and alert the Route 17 Business traffic to other movements, encouraging traffic to slow down. It will also beautify the corridor, and enhance the atmosphere of the approach to downtown. These treatments are similar to those recommended in the Village Plan[5] for the rural entry ways to Gloucester Courthouse.

Figure 9: Plan view of recommended improvements at Main Street/TC Walker Road (VA 629)



- The right turn bay at this location should be narrowed to a 10 foot lane which will allow a sidewalk to be built next to the turn bay to connect the segments of the suggested multi-use

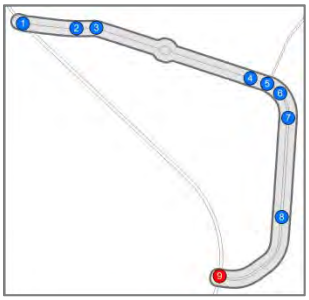
[5] **Gloucester Courthouse Village Plan, 2009**

trail. When the trail is designed, an easement could be obtained from the property owner to build this section as trail instead of a sidewalk.

- Under current conditions, crosswalks are not appropriate at this intersection for various reasons including the large crossing distance, high speed, and lack of pedestrian generators in the vicinity. If pedestrian volumes increase in the future, the median on Main Street can be narrowed and the travel lanes moved inward, creating a tighter lane configuration. This will slow traffic, increase pedestrian visibility and reduce the crossing distance.

The costs associated with the improvements at this intersection as well as the multi-use path between Main Street shopping center and Route 17 Bypass (south) are presented in **Table D-5** in **Appendix D**.

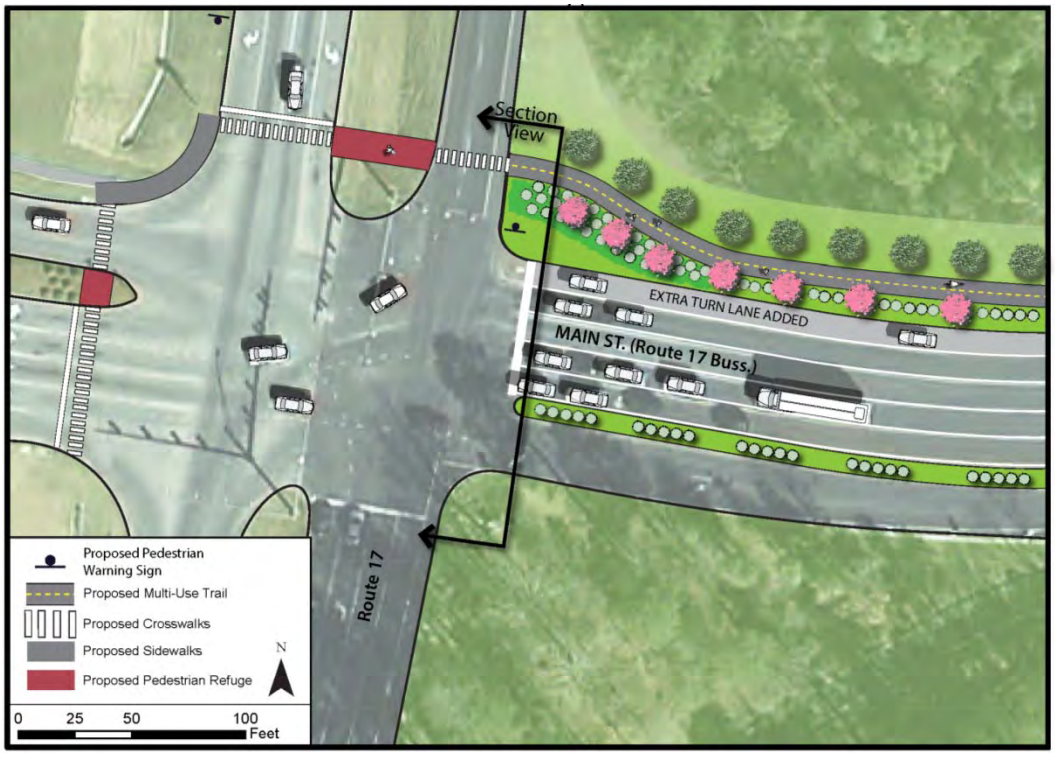
5.9 Route 17 Bypass (south)/Main Street - Location 9



As the signal timing at this intersection is currently being reviewed as part of 'Route 17 Corridor Signal Coordination Project' conducted by VDOT, this study will address the multi-modal deficiencies.

There were no concerns raised by the citizens at the public meeting. However, improvements are suggested at this location to create a contiguous multi-modal network in the study area. A plan view and a cross-section of the recommended improvements are shown in **Figure 10** and **Figure 11** respectively.

Figure 10: Plan view of recommended improvements at Route 17 Bypass (south)/Main Street



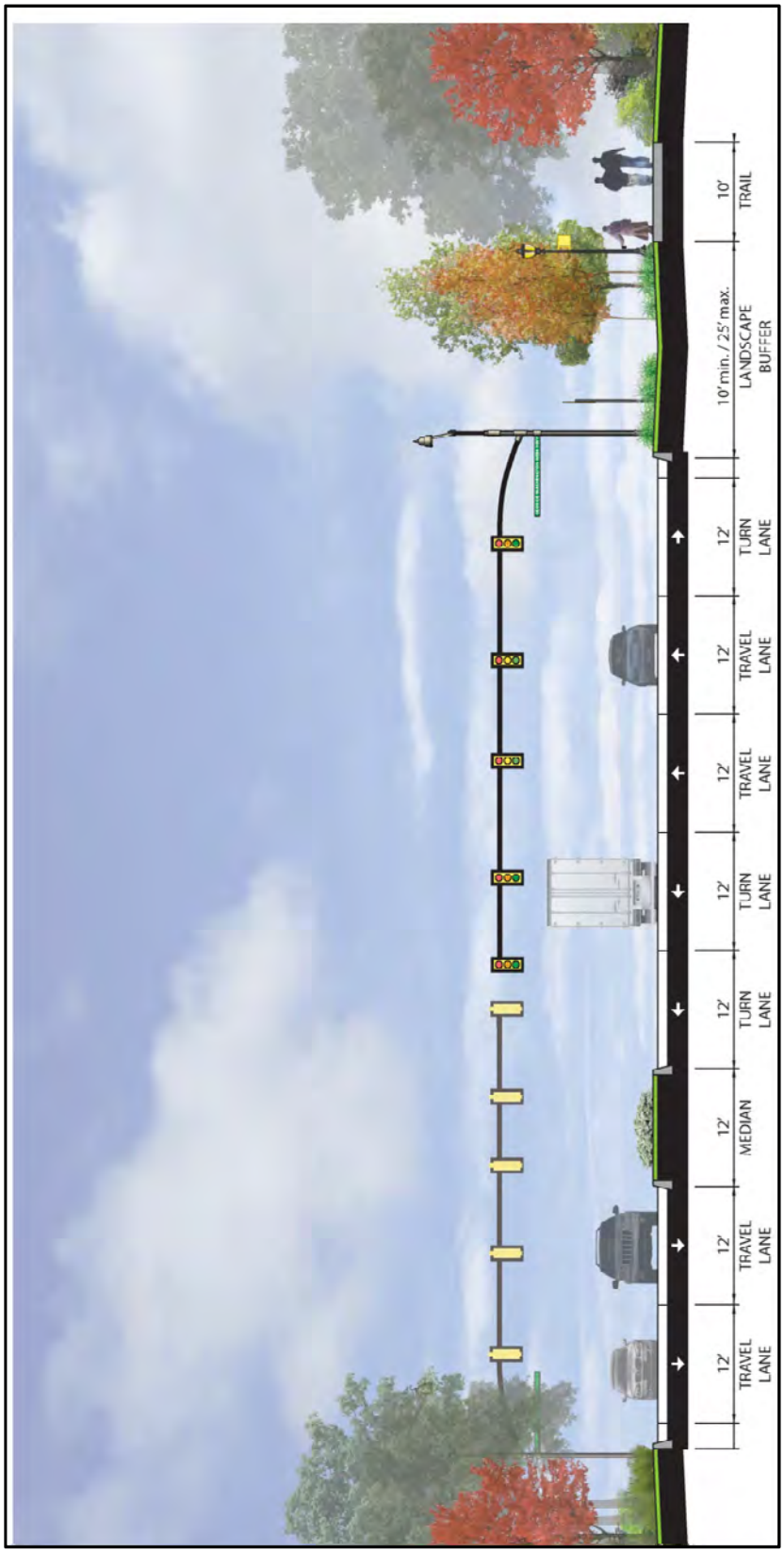


Figure 11: Typical cross-sectionon the north leg of Route 17 Bypass (south)/Main Street

Data shows five (5) crashes occurred on Main Street at this intersection. However, the intersection has been upgraded recently which indicates that the cause for a majority of these crashes has been addressed by these improvements.

Recommendations:

- Add crosswalks with ADA compliant ramps and a pedestrian refuge on the north leg of the intersection for pedestrians and bicycles to cross Route 17 Bypass. These crosswalks will connect the businesses on the west side of Route 17 Bypass with the residential areas of Gloucester Courthouse via the recommended multi-use path.
- Extend the suggested multi-use path starting at Main Street shopping center (on the west side of Main Street) to this crosswalk.
- Add a crosswalk with ADA compliant ramps and a pedestrian refuge on the west leg of the intersection.
- Provide pedestrian count-down signal heads at both crosswalks to increase pedestrian comfort while crossing the intersection.
- Eliminate the channelized right turn on the east leg of Main Street to make the intersection pedestrian friendly. Extend the existing right turn lane to the intersection. The removal of this channelized turn will not impact traffic operations as the capacity is maintained.

The costs associated with these improvements are presented in **Table D-6** in **Appendix D**.

5.10 Multimodal and Spot Improvements in the Project Area - Location 10

The areas along the study corridor which do not fall into any of the above locations are discussed below. Multi-modal improvements (shown in **Figure 12**) are recommended to create a seamless network of pedestrian facilities in the study area. These pedestrian improvements will help foster multimodal transportation in Gloucester Courthouse, ensuring the town is accessible to all users.

W11-2

- The mid-block crossings on Main Street, in front of Botetourt Elementary School and Edgehill Shopping Center do not have any signs alerting vehicular traffic to the presence of pedestrians. Pedestrian warning signs should be added at the approaches to these locations.

  The Manual on Uniform Traffic Control Devices (MUTCD) has guidance on the appropriate signage for these locations. The Non-Vehicular Warning Sign W11-2 shown is the appropriate pedestrian crossing sign. When this sign is used as an advanced warning sign at least 50 feet before the crosswalk, a supplemental 'AHEAD' or 'distance xx' plaque should be used with the sign. When this sign is placed at a crosswalk, an arrow pointing towards the crosswalk (MUTCD sign W16-7P) could be used. In addition, sign R1-6 in MUTCD could be placed at the crosswalk. Pedestrian warning signs are important for pedestrian visibility, especially at night.

R1-6

In addition to advanced warning signs, these two midblock crossings could have textured materials such as brick/stamped and colored pavement. Brick or colored mid-block crossings make drivers more aware of the unexpected crossing and enhance the downtown aesthetic of the corridor. Locations along the study area with crosswalks should be converted into striped/ textured surface to improve visibility.

- The intersection of Main Street/Corr Street has a pedestrian crossing sign with no marked crosswalk. A crosswalk should be provided on Main Street connecting to the existing pedestrian ramps. This would provide another location to cross Main Street before Botetourt Elementary School. For guidance on crosswalk design, refer section 3b.18 of MUTCD and VDOT's Guidelines for the Installation of Marked Crosswalks.
- During the public meetings, citizens complained about lack of visibility at the intersections along Main Street due to large trucks parked adjacent to the intersections. This concern was also validated by the crashes that were consistently seen at most of the stop-controlled intersections along Main Street. To ensure that the vehicles on the minor street have adequate sight distance, signs should be placed on Main Street restricting parking for trucks in the spaces adjacent to the intersection. Signs saying "Compact Cars Only" can be used to discourage large vehicles from parking near intersections.
- A 10-foot multi-use trail should be built on the west side of Main Street from the southern entrance of the Main Street shopping center (in front of the library) to the intersection of Route 17 Bypass (south)/Main Street. This trail will create a pedestrian and bike connection between the residential areas near Gloucester Courthouse and the retail developments west of Route 17 Bypass via the downtown. Based on the latest VDOT plans, about 20-feet of right-of-way is available on the west side of Main Street, which can accommodate this path.

  As there are multiple driveways and turn lanes in this section of Main Street, coordination between property owners, VDOT, and the County is essential. While the existing roadway features and embankments might prove to be a challenge, creating seamless pedestrian and bike connections will improve the multimodal network of the county. The trail can also serve as a recreational amenity for the community.

  In the second public meeting, many citizens verbally shared their approval of this recommendation.
- Multiple trails are proposed[6] in the study area. Some of the primary facilities are a loop trail along east side of Route 17 Bypass and west side of Main Street, and another trail running parallel to Main Street, south of the Edgehill shopping center. Any sidewalks/trails built in this area are recommended to be tied to these facilities to generate a network of trail system.

[6] Gloucester Courthouse Capital Village Sub-Area Plan, 2013.

Figure 12: Multi-modal improvements along the study corridor

6 Implementation Plan

Based on the input from the public, County staff, VDOT staff, and the Consultant's field visits, locations of highest concern were identified. The priority ranking of these concerns is presented in **Table 1**. These rankings should help VDOT and the County in allocating public funding when available; while all improvements are needed, the priority locations represent the most pressing needs of the corridor.

Table 1: Priority Rankings

Location	Priority
1. Route 17 Bypass (north)/Main Street	High
2. Main Street/Belroi Road (VA 616)	Low
3. Main Street/Roaring Springs Road (VA 616)	Low
4. Access points to Main Street from Edgehill Shopping Center	Medium
5. Main Street/John Clayton Memorial Highway (VA 3/14)	High
6. Main Street/Ware House Road	High
7. Access points to Main Street from Main Street Shopping Center	High
8. Main Street/TC Walker Road (VA 629)	Low
9. Route 17 Bypass (south)/Main Street	Medium
10. Multi-modal/Spot Improvements along the study corridor	High

All the improvements suggested in this study are per VDOT and AASHTO safety standards. They are critical for a safe and efficient transportation network in the downtown Gloucester. However, as public funds might be limited, these improvements are phased to guide implementation. Additionally, different types of funds that can be used for each of these improvements are indicated in this chapter. Details on the funding sources, types of projects that qualify for funds and their funding mechanism can be found in **Appendix E**.

Location 1: Route 17 Bypass (north)/Main Street

Short Term

- Crosswalk with a pedestrian refuge should be added on the north leg of the intersection on Route 17 Bypass.
- A sidewalk should be provided along Route 17 Bypass to the intersection of Route 17 Bypass/Hospital Drive.
- Crosswalks should be installed on the south leg of the intersection of Route 17 Bypass/Hospital Drive.
- Provide pedestrian count-down signal heads at the crosswalks.

Long Term

- A follow-up analysis is recommended for a separate right turn lane on Fiddlers Green Road when the transit center and the planned housing development are built. This could be achieved by restriping the existing pavement.

Funding:

- Transportation Alternatives
- Highway Safety Improvement plan
- Revenue Sharing Program

Location 2: Main street/Belroi Road (VA 616)

Short Term:

- Sidewalks should be built along the east side of Belroi Road.
- Sidewalks should be installed on the north side of Main Street to Route 17 Bypass.
- Move the crosswalk and stop bar on Gloucester Town Drive as recommended.

Long Term:

- Realign the Belroi Road to create a conventional right angle intersection with Main Street.
- Install crosswalks across the east leg of Main Street.

Funding:

- Transportation Alternatives
- Recreational Access Program
- Revenue Sharing Program

Location 3: Main Street/Roaring Springs Road (VA 616)

Short Term:

- Move the crosswalk and stop bar on Roaring Springs Road as recommended.
- A crosswalk should be installed on the east leg of Main Street.

Funding:

- Transportation Alternatives
- Recreational Access Program
- Revenue Sharing Program

Location 4: Access points to Main Street from Edgehill Shopping Center

Short Term:

- County and VDOT staff should meet with the business owners to discuss access management at this location.
- Possible internal circulation solutions should be discussed.

Long Term:

- The access points to the shopping center could be consolidated as recommended.

Funding:

- Private Public Partnership
- Highway Safety Improvement Program

Location 5: Main Street/John Clayton Memorial Highway (VA 3/14)

Short Term:

- Add crosswalks to cross VA 3/14 and both legs of Main Street.
- Install pedestrian count-down signal heads and pedestrian ramps on either side of the crosswalks.
- Restripe the southbound right lane to a shared right and left turn lane from VA 3/14 to Main Street.
- Extend the sidewalk on the east side of VA 3/14 up to the bowling alley.

Long Term:

- Consolidate the access points on south side of the intersection and improve internal circulation to direct this traffic to the entrance at Ware House Road.
- Modify the median on the north leg of the intersection to widen the receiving lanes on the north leg of the intersection.
- Modify the median and add dual right-turns from Main Street to VA 3/14.

Funding:

- Transportation Alternatives
- Congestion Mitigation and Air Quality Improvement Program

Location 6: Main Street/Ware House Road (VA 621)

Short Term:

- Add a sidewalk from the intersection of Main Street/John Clayton Memorial Highway to the church.

Long Term:

- Provide a receiving lane for the left turning traffic from Ware House Road by modifying the median.

Funding:

- Transportation Alternatives
- Highway Safety Improvement Program

Location 7: Access points to Main Street from Main Street Shopping Center

Short Term:

- Extend the sidewalk from the intersection of Main Street/Ware House Road to the southern entrance of the Main Street Shopping Center.

Long Term:

- Modify the median to add a turn bay on southbound Main Street.
- Modify the left-turn bay on northbound Main Street.

Funding:

- Transportation Alternatives
- Virginia Recreational Trails Program
- Public Private Partnership

Location 8: Main Street/TC Walker Road (629)

Short Term:

- Provide gateway treatments in the median.

Long Term:

- Build a multi-use trail on the west side of Main Street.
- Narrow the southbound right turn bay on Main Street to 10-feet which will allow for the installation of a sidewalk.

Funding:

- Transportation Alternatives
- Virginia Recreational Trails Program
- Public Private Partnership

Location 9: Route 17 Bypass (south)/Main Street

Short Term:

- Add crosswalks across the northern leg of Main Street.
- Add a crosswalk on the west leg of the intersection.
- Provide pedestrian countdown signal heads at all crosswalks.

Long Term:

- Extend the multi-use path to this intersection.
- Eliminate the channelized right turn on the east leg of Main Street and extend the right-turn lane to the intersection.

Funding:

- Transportation Alternatives
- Virginia Recreational Trails Program
- Public Private Partnership

Location 10: Multi-modal/ Spot Improvements along the study corridor

Short Term:

- Provide signs saying “Compact Cars Only” for parking spots near intersections.
- Install marked crosswalks at the intersection of Main Street/Corr Street.
- Add pedestrian warning signs at the mid-block crossings on Main Street near Botetourt Elementary School and Edgehill Shopping Center.

Long Term:

- Build a 10-foot wide multi-use trail from the southern entrance of Main Street Shopping Center to the intersection of Route 17 Bypass (south)/Main Street.

Funding:

- Transportation Alternatives
- Land and Water Conservation Fund
- Virginia Recreational Trails Program
- Recreational Access Program
- Revenue Sharing Program
- Public Private Partnership

7 2034 Conditions Analysis

The transportation network in the study area was analyzed for the year 2034. Multiple sources including, HRTPO’s Long Range Transportation Plan, Gloucester County’s Courthouse Village Sub-Area Plan, and approved TIAs from VDOT were reviewed to understand the projected changes in the land use, regional traffic patterns, and trip generation by the year 2034.

Based on the Gloucester Courthouse Village Sub-Area Plan, high-density mixed-use development is proposed along Main Street (between the historic courthouse and Main Street shopping center) with retail in the lower level and residential in the upper levels. Considering these changes and the overall growth in traffic, an annual growth rate of 1.7 percent is applied to the existing traffic to obtain 2034 traffic conditions. The forecasted traffic volumes in the year 2034 are shown in **Figure 13.**

It is also assumed that by 2034, roadway improvements recommended in this study are incorporated throughout the Main Street corridor.

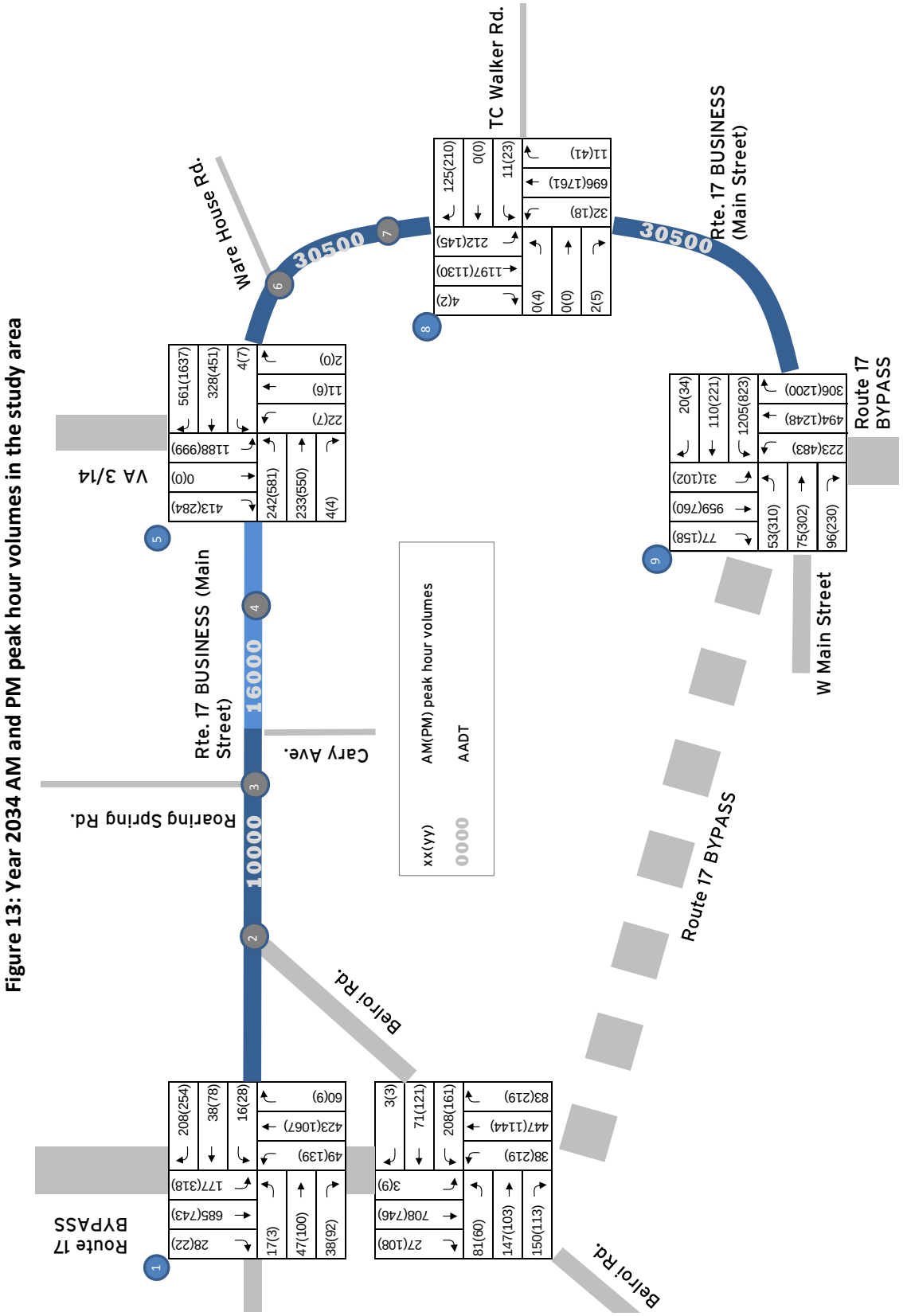


Figure 13: Year 2034 AM and PM peak hour volumes in the study area

Note: Annual growth rate of 1.7% is used based on HRTPO's 2034 Long-Range Transportation Plan

7.1 Operations

Based on a Synchro analysis, some of the key observations in the study area are as follows:

At the north intersection of Route 17 Bypass and Main Street, traffic operations remain acceptable in 2034 with LOS C in the AM peak hour and LOS D in the PM peak hour.

At the intersection of Main Street and Route 3/14, if all the improvements proposed in this study are implemented, traffic operations remain acceptable in 2034 with LOS C in the AM peak hour and LOS D in the PM peak hour.

At the south intersection of Route 17 Bypass and Main Street, with the existing geometry, the intersection will fail both in the AM and PM peak hours. By converting the inner westbound through lane into a left-turn lane, the intersection will operate at LOS D both in the morning and evening peak hours. However, this location should be further studied due to the possible safety concerns of triple left-turn lanes.

7.2 Safety

This section presents a qualitative assessment of safety in the year 2034, assuming that the recommended improvements in this study are implemented.

Rear end crashes were observed to be higher between Route 17 Bypass (southern intersection) to Route 3/14 between 2009 and 2010. One of the major causes for these crashes was identified to be the stop and go traffic on Main Street due to the delays at Route 3/14. The long range improvements recommended at Route 3/14 will help mitigate queues significantly in the peak hour caused by the commuter traffic in the existing year as well as 2034.

At the intersection of Route 17 Bypass (south)/Main Street, westbound traffic volumes will increase significantly. In the existing conditions, rear end crashes occurred on this approach due to large delays and queues. The triple left suggested for the year 2034, will help alleviate congestion on this approach, thereby reducing the potential for more crashes.

Angle crashes occurred at most of the stop controlled intersections between Justice Drive and Ware House Road. One of the proposed improvements is to limit larger vehicles in parking spaces adjacent to the side streets. This will certainly help reducing the angle crashes at the stop controlled intersection. However, by the year 2034, as the main line traffic increases, it is essential to evaluate the sight distance at each intersection to ensure good visibility.

Appendix A: Public Outreach

BUSINESS 17 CORRIDOR TRANSPORTATION STUDY - Comments from the public meeting on 9/13/2012

VDOT is conducting a transportation study for the Business 17 corridor, to address existing traffic congestion and safety issues, and to explore potential multimodal improvements to enhance mobility and safety for motorists, pedestrians and bicyclists.

Your input is valuable and critical for the team to fully understand the existing traffic and safety issues, therefore to propose effective and practical solutions.

Please write down your observations, concerns and comments about any traffic congestion/safety problems on the corridor. See the **STUDY AREA MAP** for project limits. Thank you!

Contact: Lawrence Marcus <lmarcus@HNTB.com> or Craig VanDussen (Craig.VanDussen@VDOT.Virginia.gov)

LOCATION (Location 1 thru 8, or specify if not in the list)	**Traffic Issue, Described in Detail** (Time of day, observations, comments, etc.)	**Contact (Optional)** (Name, phone number and E-Mail)
1	Lots of traffic here, largely in afternoon. Could use dedicated right turn lane for those turning onto Rt. 14. For those turning left onto Rt. 14 from Main St., the turn lane is fine, but it limits access to Texaco property on corner. Coming into Gloucester from Rt. 14, there needs to be better access going straight to get into the Main St. Center shopping area. Potentially the laundry building could be moved or demolished to make way for a better intersection, but keeping all the historic buildings. The biggest need here is good crosswalks at the corner and sidewalk improvements to make this intersection pedestrian and bike friendly.	Thane Harpole 804-815-4467 fairfield@inna.net
6	Exist from Warehouse Rd is dangerous. Need new way for a left turn – either through making more room on Rt. 17 Bus South for turning vehicles, or make people turn right and then turn left at Rt. 14/Main St. Intersection into the shopping center.	Thane Harpole 804-815-4467 fairfield@inna.net
4, 5, 7	I don't see any problems here.	Thane Harpole 804-815-4467 fairfield@inna.net

Please write down your comments, concerns, observations and/or suggestion about the traffic congestion/safety problems. See the **STUDY AREA MAP** for project limits.

BUSINESS 17 CORRIDOR TRANSPORTATION STUDY - DATA COLLECTION FORM

LOCATION (Location 1 thru 8, or specify if not in the list)	**Traffic Issue, Described in Detail** (Time of day, observations, comments, etc.)	**Contact (Optional)** (Name, phone number and E-Mail)
1 & 2	Very poor access from Main St. Center making a left towards Main St. especially since we no longer can go to the light by the laundry shopping center.	Nkeenan49@cox.net
#4 - #5 Main St./Belroi & Roaring Springs Road	A roundabout in this area would be great. A configuration to accommodate pedestrians and bike riders along with the roundabout to ease traffic issues in this area is needed.	Marjo Holthaus marjoann@cox.net
#1 & #6 Rt. 3/VA-14 & Main St./Warehouse Rd.	Another roundabout in the area of 1 and 6 would be great. If there could be a pedestrian walk over to provide access from Main St. to businesses on Rt. 14, it might extend the Main St. village in a positive way.	Marjo Holthaus marjoann@cox.net
#2 – Main Street Center entrance	A better entrance and access to this business section might include re-routing the road to better connect with Route 14. It is a quite challenging entrance.	Marjo Holthaus marjoann@cox.net
Not on list	Carey Drive – entrance to B17 Draining tearing up cars No trucks on Carey (South) Use to by-pass circle	Charles Thompson 693-0154

Please write down your comments, concerns, observations and/or suggestion about the traffic congestion/safety problems. See the **STUDY AREA MAP** for project limits.

BUSINESS 17 CORRIDOR TRANSPORTATION STUDY - DATA COLLECTION FORM

LOCATION (Location 1 thru 8, or specify if not in the list)	**Traffic Issue, Described in Detail** (Time of day, observations, comments, etc.)	**Contact (Optional)** (Name, phone number and E-Mail)
#2	Cross-over at upper end of Main Street Center to take heat off intersection	Charles Thompson 693-0154
#2	Light at library intersection	Charles Thompson 693-0154
1	Why not make both 3/14 lanes coming into G.K. able to make left turns?	Ralph Jackson 804-815-5095 RALPHJACK62@yahoo.com
ALL	Brick crosswalks @ Main Street intersections	Ralph Jackson 804-815-5095 RALPHJACK62@yahoo.com
2	Traffic light?	Ralph Jackson 804-815-5095 RALPHJACK62@yahoo.com

Please write down your comments, concerns, observations and/or suggestion about the traffic congestion/safety problems. See the **STUDY AREA MAP** for project limits.

BUSINESS 17 CORRIDOR TRANSPORTATION STUDY - DATA COLLECTION FORM

LOCATION (Location 1 thru 8, or specify if not in the list)	**Traffic Issue, Described in Detail** (Time of day, observations, comments, etc.)	**Contact (Optional)** (Name, phone number and E-Mail)
1	Traveling Main St. to turn left on Rt. 14, backed up in the evenings; traffic entering/exiting Edgehill Shopping Center – difficult to crossover	dcanada4@cox.net
2	Should be one way in and out, not 2 way at both entrances	dcanada4@cox.net
6	Signal light should be at this location or #2 scenario @ the library	dcanada4@cox.net
2	Concerned about proposed development and additional traffic	dcanada4@cox.net
1	Traffic light at Rt. 17/Bus/Rt. 14 implies parking lot across from Rt. 14 is a public road, when it's a private parking lot. That light (from that direction – of lot) is misleading to public.	

Please write down your comments, concerns, observations and/or suggestion about the traffic congestion/safety problems. See the **STUDY AREA MAP** for project limits.

BUSINESS 17 CORRIDOR TRANSPORTATION STUDY - DATA COLLECTION FORM

LOCATION (Location 1 thru 8, or specify if not in the list)	**Traffic Issue, Described in Detail** (Time of day, observations, comments, etc.)	**Contact (Optional)** (Name, phone number and E-Mail)
7	Turning right from T.C. Walker Rd. out Rt. 17 Bus. Is problematic at heavy traffic times of the day due to steady volume of cars at Rt. 17 Business (coming from WalMart direction). (5PM and after)	
1	Intersection of Rt. 17 Bus. At Rt. 14 is a real bottleneck during periods of heavy traffic. Morning and evening "rush" hour times	
2	Need a traffic signal at this exit point, especially since no egress to go in both directions from other exits in parking lot.	
1	A) Late afternoon – stacking on 17N Bus. Turning to Rte. 3/14 B) Short duration stacking 17S Bus. Turning to Rte. 3/14 Protected right turn at (A) would help but would be difficult given limited turning radius and heavy truck traffic	
2/7	Encourage right-in-right-out @ Main St. Center by improving T.C. Walker Intersection making U-turns safer and easier.	

Please write down your comments, concerns, observations and/or suggestion about the traffic congestion/safety problems. See the **STUDY AREA MAP** for project limits.

BUSINESS 17 CORRIDOR TRANSPORTATION STUDY - DATA COLLECTION FORM

LOCATION (Location 1 thru 8, or specify if not in the list)	**Traffic Issue, Described in Detail** (Time of day, observations, comments, etc.)	**Contact (Optional)** (Name, phone number and E-Mail)
	Expand through truck prohibition signage to reduce number of trucks passing through	
1	7:00 AM to 8:30 AM a great deal of traffic backs up on John Clayton attempting to make left turn onto Main St. Could be resolved by allowing both lanes to turn left.	
1	Vehicles exiting bowling alley and movie theater try a turn left on JCMH and cannot see vehicles coming up the hill traveling towards Main St. Solution: No left turn sign or traffic light.	
Not on list Entrance/Exit at Library Main St. Center?	Very difficult for vehicles to exit parking lot at library and make a left turn onto Main St. This is difficult because of traffic coming both ways. Solution would be creation of a designated turn lane or installation of a traffic light.	
Not on List Parking along Main St. (Business area)	It is difficult to make a left or right turn onto Main St. from many of the side streets due to visibility. Visibility is impaired as a result of vehicles parked on the roadway. Solution: Limit times for parking in certain spots. Allow few spots to remain open during heaviest traffic hours.	

Please write down your comments, concerns, observations and/or suggestion about the traffic congestion/safety problems. See the **STUDY AREA MAP** for project limits.

BUSINESS 17 CORRIDOR TRANSPORTATION STUDY - DATA COLLECTION FORM

LOCATION (Location 1 thru 8, or specify if not in the list)	**Traffic Issue, Described in Detail** (Time of day, observations, comments, etc.)	**Contact (Optional)** (Name, phone number and E-Mail)
1 & 8	How come there's a traffic signal serving a privately-owned property at Edgehill, but we take our lives in our hands every time we exit Lewis Avenue and DuVal Avenue to enter Main Street?	Hugh C. Dischinger

BUSINESS 17 CORRIDOR TRANSPORTATION STUDY – Comments from the public meeting on 3/18/2013

LOCATION (Location 1 thru 9)	**Preference/Thoughts on Alternatives** (Preferred Alternative, Observations, Comments, etc.)	**Contact (Optional)** (Name, phone number and E-Mail)
Main Street and Belroi Road	Prefers alternative 2. The road needs to be wide enough for school buses.	Anne Lanan, 804-693-1471, alanan@gc.k12.va.us
	Prefers existing. You can utilize existing right-of-way better. There is not enough of a problem at this location to justify the alternatives.	
Main Street and Route 3/14	Alt. 1 is the best. Alt 3 is unattainable.	
	In Alt. 2 eliminate left turn on Route 14 onto Calhoun St. The traffic turning left is very low and this would allow the turn lanes to Main Street to be lengthened.	Rick Wiatt, 804-815-4790, Rwaitt@Carltonabbott.com
	Remove Turning late to Calhoun St. (a private development) for more room	
	Make this a "T" intersection or roundabout	Nathan Brown, 804-815-3690, nbrown46@cox.net
Main Street and Ware House Road	Close entrance to Route 621 (Ware House Road) Add new road from intersection #7 to Route 621. Land is available for acquisition.	Tabb M. Bridges
	Move intersection 5 to intersection 6. Install a traffic light with Route 14 going from Brown Park to Intersection 6. Make existing Route 14 a stub road that ends at existing bridge	Nathan Brown, 804-815-3690, nbrown46@cox.net
Main Street at Ware House Road & Main Street at Library	Alt 1 for Ware House Road, Do nothing at Main Street Shopping Center entrance	
	Tie into Ware House Rd intersection at the stoplight	Gilbert Birdsall, 804-824-5363
Main Street at Library	Close the intersection	Nathan Brown, 804-815-3690, nbrown46@cox.net

Appendix B: Tech Memo#1- Existing Conditions

Gloucester Transportation Planning Study
Draft Technical Memorandum #1
Existing Conditions

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1 Setting and Study Objectives

The Virginia Department of Transportation (VDOT) has requested HNTB to conduct a transportation study assessing the existing and future traffic operating conditions along Main Street or Route 17 Business in Gloucester County, Virginia. This project will evaluate the operations and safety of the study corridor, identify the causes of traffic congestion and recommend solutions. The study also includes an evaluation of the existing pedestrian/bike facilities and the proposal of new multimodal accommodations. These accommodations will extend the village neighborhood design and improve non-motorized access across Route 17 Business to adjoining neighborhoods and amenities.

This Technical Memorandum summarizes the results of Work Scope Task 3 - Existing Condition Analysis. The existing condition analysis will serve as a benchmark for the roadway improvement alternatives and future conditions in the year 2034.

2 Existing Conditions

After reviewing past studies conducted by the state and county, gathering current traffic (2012) and crash data (2008-2010) in the study area, operation and safety analyses were performed. The results of these analyses are presented in this memo. To evaluate traffic conditions and quantify system performance Synchro 7 was used. Measures of Effectiveness (MOEs) including Level of Service (LOS), delay and queue are reported at key locations in the study area.

2.1 Study Area and Roadway Network

The study area is defined as Route 17 Business/Main Street from the north intersection with Route 17 Bypass to the south intersection with Route 17 Bypass, in the Gloucester Court House Area. This is approximately 2.5 miles as shown in **Figure 1**.

The following intersections/driveways are included in the analysis:

1. Main Street/ Route 17 Bypass (north intersection)
2. Main Street/ Belroi Road
3. Main Street/ Roaring Springs Road (VA 616)
4. Access points to Main Street from Edgehill Shopping Center
5. John Clayton Memorial Highway (VA 3/14)/ Main Street
6. Main Street/ Ware House Road
7. Access points to Main Street from Main Street Shopping Center
8. Main Street/ TC Walker Road
9. Main Street/ Route 17 Bypass (south intersection)
10. Driveway locations and multi-modal accommodations along the study corridor

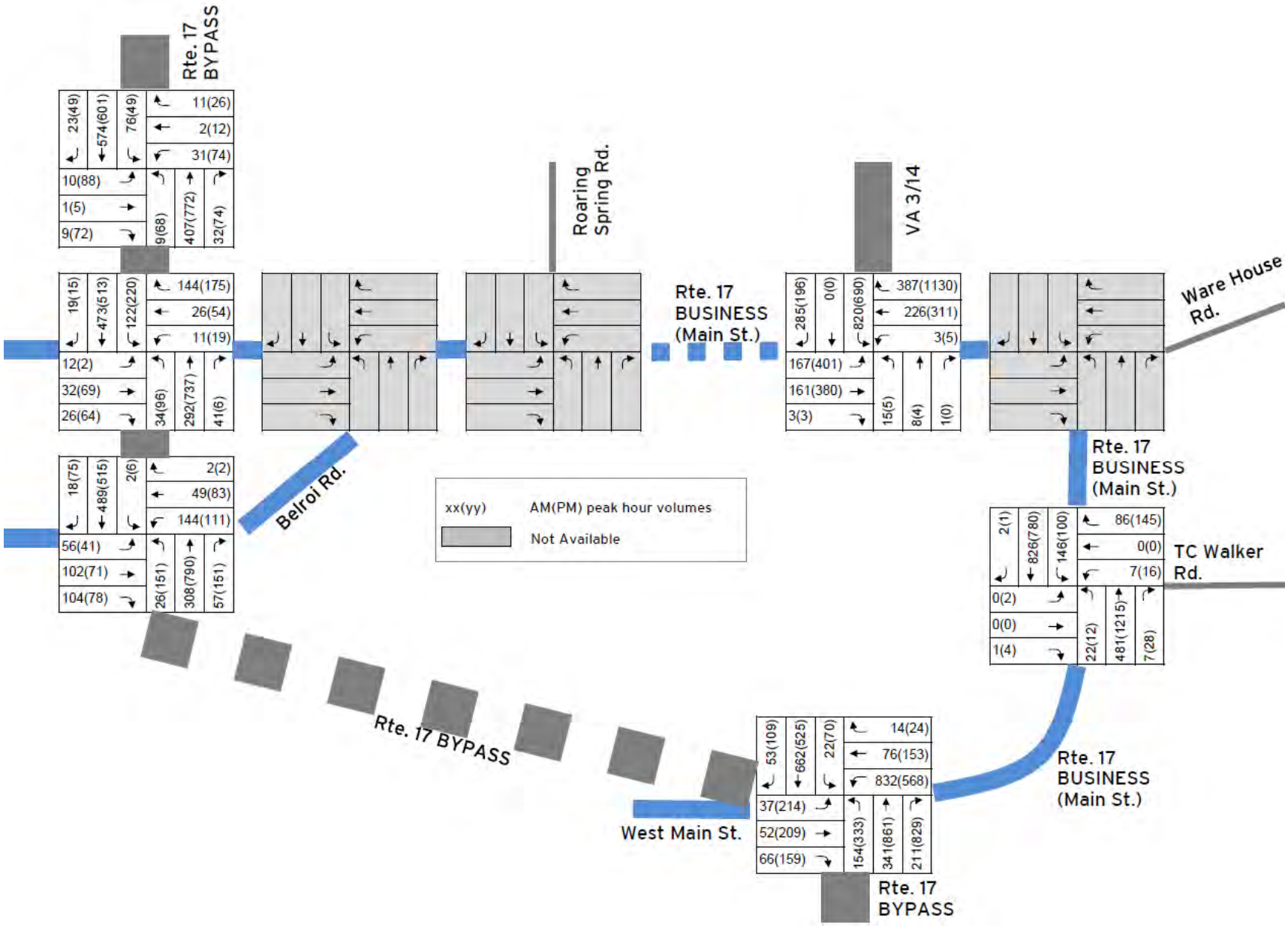
Figure 1: Study Area for Gloucester Transportation Planning Study

Intersections #1, #5 and #9 are controlled by traffic signals. The remaining intersections are two-way stop controlled, with movement priority to Main Street traffic. Available traffic counts[1] were gathered and an annual growth rate of 4 percent was applied to generate 2012 volumes. **Figure 2** shows volumes in the AM and PM peak hours respectively.

HNTB conducted a field evaluation of the study area to observe land uses, traffic operations, traffic patterns, topography, travel times and queues. These observations were conducted during the AM and PM peak periods.

[1] Foxmill Centre 527 TIA in 2010, Roundabout Study in 2006, The Villas at Gloucester Courthouse TIA in 2007

Figure 2: AM and PM Peak Hour Volumes in the study area



2.2 Operational Analysis Findings

An operational analysis was conducted at three signalized intersections in the study area using Synchro 7. Current signal timings were provided by VDOT. The AM and PM peak hour operational analysis results are shown in **Tables 1** and **2** respectively. In the analysis a LOS of C or better is assumed to be the standard to be obtained.

- In the AM peak hour, the intersection of Route 17 Bypass and West Main Street (Intersection #9) operates at LOS F with the given signal timing. However, when analyzed after signal optimization, this signal will operate at LOS C which is an acceptable LOS.

Table 1: AM Peak Hour LOS for Intersections along Route 17 Business

ID	Intersection	Movement	Movement Volume	Movement Delay	Available Storage (feet)	Average Queue (50th Percentile)	Maximum Queue (95th Percentile)	Approach	Delay	LOS	Delay	LOS
1	VA 17 BYP & Main Street (North Intersection)	EBL	12	42.7	180	25	74	EB	42.7	D	21.8	C
		EBT	32									
		EBR	26									
		WBL	11	40.7	215	21	56	WB	32.3	C		
		WBT	26									
		WBR	144	30.2	215	0	35					
		SEL	122	40.3	250	62	140	SE	18.1	B		
		SET	473	12.7	600	90	168					
		SER	19	9.7	600	0	17					
		NWL	34	50.7	115	22	m57	NW	18.9	B		
		NWT	292	15.7	990	27	107					
		NWR	41									
5	Main Street & Route 3/14	EBL	167	45.1	225	60	#218	EB	34.3	C	35.4	D
		EBT	161	23.3	900	28	70					
		EBR	3									
		WBL	3	53.2	310	104	#298	WB	24.2	C		
		WBT	226									
		WBR	387	7.1	310	0	40					
		NBL	15	46.1	10	10	41	NB	46.1	D		
		NBT	8									
		NBR	1									
		SBL	820	51.8	260	322	#860	SB	41.7	C		
		SBT	0									
		SBR	285	12.9	260	2	62					
9	VA 17 BYP & W Main Street (South Intersection)	EBL	37	41.7	300	10	28	EB	38.4	D	165.7	F
		EBT	52	42.1	330	15	36					
		EBR	66	33.7	260	8	31					
		WBL	832	414.0	470	~345	#535	WB	376.8	F		
		WBT	76	33.0	470	20	45					
		WBR	14	32.3	290	0	19					
		NBL	154	40.9	320	45	84	NB	23.8	C		
		NBT	341	16.0	900	51	123					
		SBL	22	48.2	250	13	40	SB	23.8	C		
		SBT	662	23.7	5000	160	264					
		SBR	53	14.7	280	0	22					

Highlighted items show LOS designation (red – above capacity, yellow – approaching capacity, green – below capacity) and queue lengths (pink)
#- Volume for 95th percentile exceeds capacity, queue may be longer
m-Volume for 95th percentile queue is metered by upstream signal

- At the intersection of Main Street and Route 3/14 (Intersection #5):

- In the AM peak hour, the average/50th percentile queues on the southbound thru (SBT) and southbound left (SBL) movements are higher than the available storage length for the approach; this implies that queued SB vehicles could be blocking driveways or access points. In the AM, the peak direction of traffic flow is SB.
- In the PM peak hour, the intersection operates at LOS E with an average delay of over a minute per vehicle. Average/50th percentile queues on the westbound right (WBR) movement, which is the peak direction of travel, extends beyond the adjacent intersection of Ware House Road. The maximum queue at this location goes up to 1,300 feet possibly blocking the next upstream intersection at times.

Table 2: PM Peak Hour LOS for Intersections along Route 17 Business

ID	Intersection	Movement	Movement Volume	Movement Delay	Available Storage (feet)	Average Queue (50th Percentile)	Maximum Queue (95th Percentile)	Approach	Delay	LOS	Delay	LOS
1	VA 17 BYP & Main Street (North Intersection)	EBL	2	46.6	180	61	140	EB	46.6	D	31.0	C
		EBT	69									
		EBR	64									
		WBL	19	45.2	215	45	99	WB	35.3	D		
		WBT	54									
		WBR	175	31.2	215	0	43					
		SEL	220	94.2	250	142	#341	SE	40.2	D		
		SET	513	17.8	600	123	211					
		SER	15	14.9	600	0	18					
		NWL	96	64.9	115	68	m131	NW	18.9	B		
		NWT	737	13.0	990	79	79					
		NWR	6									
5	Main Street & Route 3/14	EBL	401	119.7	225	195	#571	EB	71.7	E	66.0	E
		EBT	380	21.5	900	82	158					
		EBR	3									
		WBL	5	55.3	310	203	#468	WB	70.5	E		
		WBT	311									
		WBR	1130	74.8	310	424	#1306					
		NBL	5	70.0	10	6	28	NB	70.0	E		
		NBT	4									
		NBR	1									
		SBL	690	62.6	260	427	#941	SB	53.5	D		
		SBT	0									
		SBR	196	21.7	260	17	92					
9	VA 17 BYP & W Main Street (South Intersection)	EBL	214	47.8	300	70	#123	EB	43.3	D	43.4	D
		EBT	209	46.7	330	69	121					
		EBR	159	32.8	260	18	60					
		WBL	568	86.0	470	192	#359	WB	74.4	E		
		WBT	153	37.1	470	46	85					
		WBR	24	35.4	290	0	27					
		NBL	333	52.4	320	109	#204	NB	33.5	C		
		NBT	861	26.1	900	237	362					
		SBL	70	49.1	250	44	99	SB	27.4	C		
		SBT	525	26.8	5000	138	213					
		SBR	109	16.2	280	0	34					

Highlighted items show LOS designation (red – above capacity, yellow – approaching capacity, green – below capacity) and queue lengths (pink)
#- Volume for 95th percentile exceeds capacity, queue may be longer
m-Volume for 95th percentile queue is metered by upstream signal

2.3 Safety Analysis

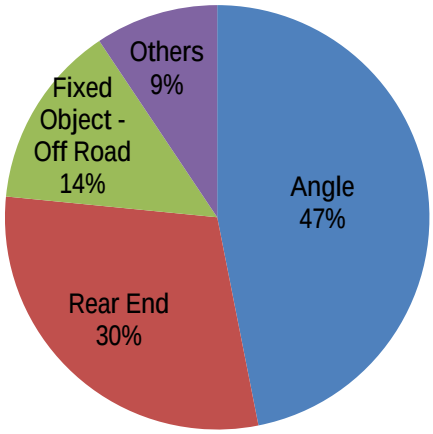
The most recent three years of crash data was received from VDOT. The available data were from January 2008 to December 2010, including information such as location, crash severity, collision type, pedestrian fatality/injury, etc.

There were a total of 64 crashes in three years with approximately 20 crashes per year. The crash data were processed and analyzed from three key perspectives; collision type, crash severity, and pedestrian involvement. From these perspectives, patterns emerged which will help guide future analysis efforts in this study and are summarized at the end of this section.

2.3.1 Crashes by Collision Type

Standard VDOT collision type categories were used for this analysis. All crash records were classified into 16 categories, shown in **Exhibit 1** in the Appendix, to provide a snapshot of the crash history. The analysis results for major collision types in the study area are shown in **Figure 3**.

Figure 3: Crash Analysis by Collision Type

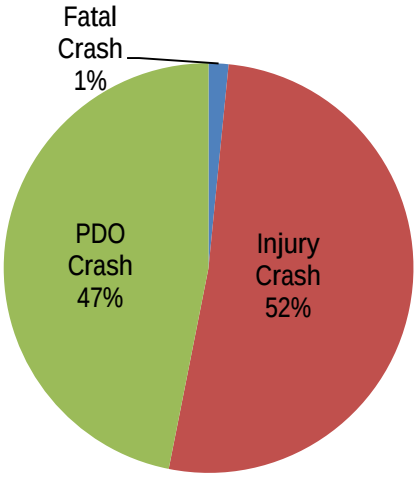


It was observed that angle, rear end and fixed object (off road) crashes collectively consisted of almost 91 percent of all crashes from 2008 to 2010. Almost half (47 percent) of all 64 crashes in the three years were angle crashes, followed by 19 rear end crashes which were 30 percent of all crashes on the corridor.

2.3.2 Crashes by Severity

The data were evaluated based on the damage caused by the accidents, including fatal, injury, and property damage only (PDO). The analysis results by crash severity are shown in **Figure 4**. For crash severity distribution by year, refer to **Exhibit 2** in Appendix.

Figure 4: Crash Analysis by Severity



Along the corridor 52 percent of all crashes are injury crashes followed by POD Crashes at 47 percent. There was one fatal crash at the west entrance of the Edgehill Shopping center in the year 2010 which is a fixed object crash (off-road).

Exhibits 3 and **4** in the Appendix provide geographical distribution of crashes shown by type and severity respectively. Reader should note that only 2009 and 2010 data were able to be presented on the maps; 2008 data were not shown due to lack of latitude-longitude information.

2.3.3 Crashes by Pedestrian Fatality/Injury

Pedestrian safety is a critical aspect when performing crash analysis. The data were examined to investigate pedestrian fatalities or injuries in the three year analysis period. Fortunately there were no recorded pedestrian related crashes in the analysis period.

2.3.4 Summary and Analysis

In reviewing the crash data, key aspects emerged including: the range of the locations, lack of clustering of crash locations, and frequency of types. The absence of pedestrian related crashes is a positive finding, although it may be due to few pedestrians in the study area. From the previous analysis some findings can be drawn.

- No intersection is seen as “dangerous”, having a high frequency of any type of crash. This is a positive finding, which makes it necessary to focus improvements over the entire corridor. Around the intersection of West Main Street and Route 17 Bypass (south) clustering of crashes was found, with four angle crashes, three rear-end crashes and one off-road crash during the analysis period. There were several injuries as well as property damage as a result of the crashes. The merge point of the right turn lane from Route 17 Bypass NB and Main Street requires the attention of the study due to the concentration of crashes.
- Angle crashes are generally seen along the corridor from Justice Drive to Ware House Road at most of the stop-controlled intersection. There were angle crashes at almost every intersection along this section of road. Angle crashes tend to be caused by “conflicting” movements such as vehicles entering the traffic stream from nearby property or turns at intersections. In this case, vehicles on the minor road seem to be failing to yield to the traffic on Main Street. These

crashes often lead to injury and this is case here since most of the injury crashes in the study area are angle crashes in this stretch of the road. A study should be conducted to focus on sight distance from side streets, and methods of reducing the locations where vehicles can enter where sight distances are poor or obstructed. Also, turning movements at the intersections should be reviewed to determine if geometrics or other factors are leading to unsafe conditions.

- Rear end crashes were observed to be higher between Route 17 Bypass (south) to Route 3/14. In this segment, the roadway has little adjacent development, and fewer intersections. Rear end crashes tend to be caused by "start and stop" traffic and in some situations by merging traffic or turning traffic which tends to be slower than regular traffic. These observations will be considered while developing improvements in this study.
- There was a fatal crash in 2010 at the west entrance of Edgehill Shopping Center which deserves special attention. This is where the only fatal crash, during the study analysis years, occurred. Police report will be reviewed for further analysis. Some combination of geometrics, traffic operations or perhaps adjacent land uses is the possible cause. This location will be considered further in the project.

3 Existing Traffic Issues

Based on operational analysis, safety analysis, and input from the public, concerns at each of the key locations in the study area are identified and discussed below.

Location 1: Main Street/ Route 17 Bypass (North Intersection)

- No reported concerns.
- The intersection operates at LOS C in AM and PM which is acceptable.

Location 2: Main Street/ Belroi Road

- Angled intersections are inherently unsafe although a one-way connection southbound from Route 17 Business is available. Some incorporation of this intersection into a Roundabout at VA 616 may be possible.
- Currently there is only one crosswalk at this intersection (crossing Gloucester Town Drive); all the other approaches have no pedestrian/bike accommodations.
- There are no sidewalks on Belroi Road approaching this intersection.
- Sidewalks are present only on the north side of Main Street.

Location 3: Main Street/ Roaring Springs Road (VA 616)

- There are currently no crosswalks or pedestrian signage at this intersection.
- A Roundabout was requested by the public at this location.

Location 4: Edgehill Shopping Center

- A fatal crash occurred at the western driveway of this shopping center.
- The eastern access point of the shopping center is located too close to the intersection of Main Street and VA 3/14.
- There are no crosswalks for access to the shopping center from the north side of Route 17 Business.

Location 5: Main Street / John Clayton Memorial Highway (VA 3/14)

- Heavy traffic congestion, queues, and delay in the SB direction in the morning and WB direction in the evening.
- Private driveway is part of the intersection creating unsafe access points.
- No pedestrian and bike accommodations including crosswalks, pedestrian signals, or bike accommodations.
- Sight distance issue with the bowling alley on VA 3/14.
- Tight turning radius and heavy truck traffic caused difficult right turning from WB Main Street to Northbound (NB) VA 3/14.
- New developments will increase traffic load in the years to come.

Location 6: Main Street/ Ware House Road (VA 621)

- Three crashes occurred at this intersection between years 2009 and 2010.
- Currently, this is an unsignalized intersection on a horizontal curve with sight distance issues.
- The intersection is only 300 feet from the intersection of Main Street and VA 3/14. In the PM peak hour, vehicles from Ware House Road have difficulty to turn left or right because of long backup from VA 3/14 queues.
- The sidewalk adjacent to the shopping center ends north of this intersection.

Location 7: Main Street Shopping Center

- At the southern driveway vehicles leaving the shopping center making a left onto Main Street are unable to find gaps to cross the 2 lanes and median (about 75 feet) creating a safety hazard. Due to this difficult left-turn, some motorists had to either turn right on southbound Main Street and make U-turn at T C Walker Road intersection, or cut to the Laundromat parking lot and use the VA 3/14 signal.
- There are no sidewalks along Main Street at this location.

Location 8: Main Street/ TC Walker Road (VA 629)

- Two crashes occurred at this intersection between 2009 and 2010.
- Vehicles turning left from TC Walker Road are unable to find gaps (to cross about 75 feet).

Location 9: Main Street/ Route 17 Bypass (South Intersection)

- Crash analysis revealed that about five crashes occurred at this intersection between 2009 and 2010.
- The intersection operates at LOS F in AM with the current signal timing. However, with signal optimization, LOS C can be achieved.
- In the PM, the intersection operates at LOS D.

Key Driveways within the Project Area:

- Trucks and other big vehicles parked next to the intersections result in creating sight distance issues for motorists pulling out from the side streets.
- Citizens complained of high truck traffic on Carey Avenue.

Multimodal Considerations in the Project Area:

- All the crosswalks are painted. Brick crosswalks should be considered.
- Sidewalks are not contiguous from the intersection of Route 17 Bypass (North)/ Main Street to the intersection of Main Street/Belroi Road.

- With the planned multiuse trail in the area, pedestrian and bike facilities in the study area will be necessary to ensure the users of the trail have a pedestrian and bike network to connect to in Gloucester Court House.
- A shared road along Main Street will be considered to incorporate bicycles into the transportation network.

Appendix

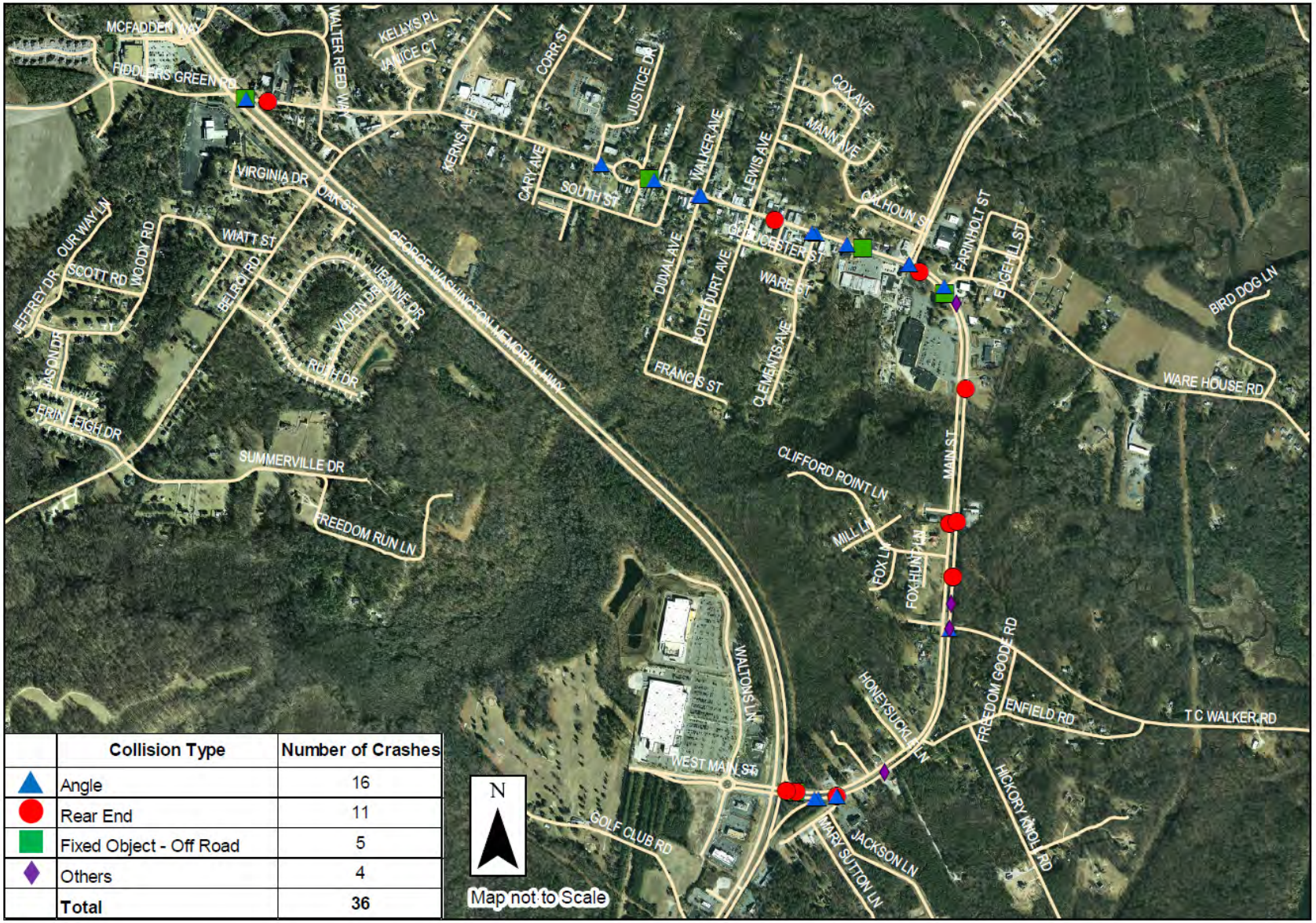
Exhibit 1: Crash Analysis By Collision Type

Collision Type (VDOT Standard Categories)	Number of Crashes			
	2008	2009	2010	TOTAL
1. Rear End	5	8	6	**19**
2. Angle	10	8	12	**30**
3. Head on	2	0	0	**2**
4. Sideswipe - Same direction of travel	0	0	0	**0**
5. Sideswipe - Opposite direction of travel	0	0	0	**0**
6. Fixed object in road	0	1	1	**2**
7. Train	0	0	0	**0**
8. Non-Collision	0	1	0	**1**
9. Fixed Object - Off Road	3	5	1	**9**
10. Deer	0	0	0	**0**
11. Other Animal	0	0	0	**0**
12. Pedestrian	0	0	0	**0**
13. Bicyclist	0	0	0	**0**
14. Motorcyclist	0	0	0	**0**
15. Backed Into	0	0	0	**0**
16. Other	0	0	1	**1**
TOTAL	**20**	**23**	**21**	**64**

Exhibit 2: Crash Analysis by Severity

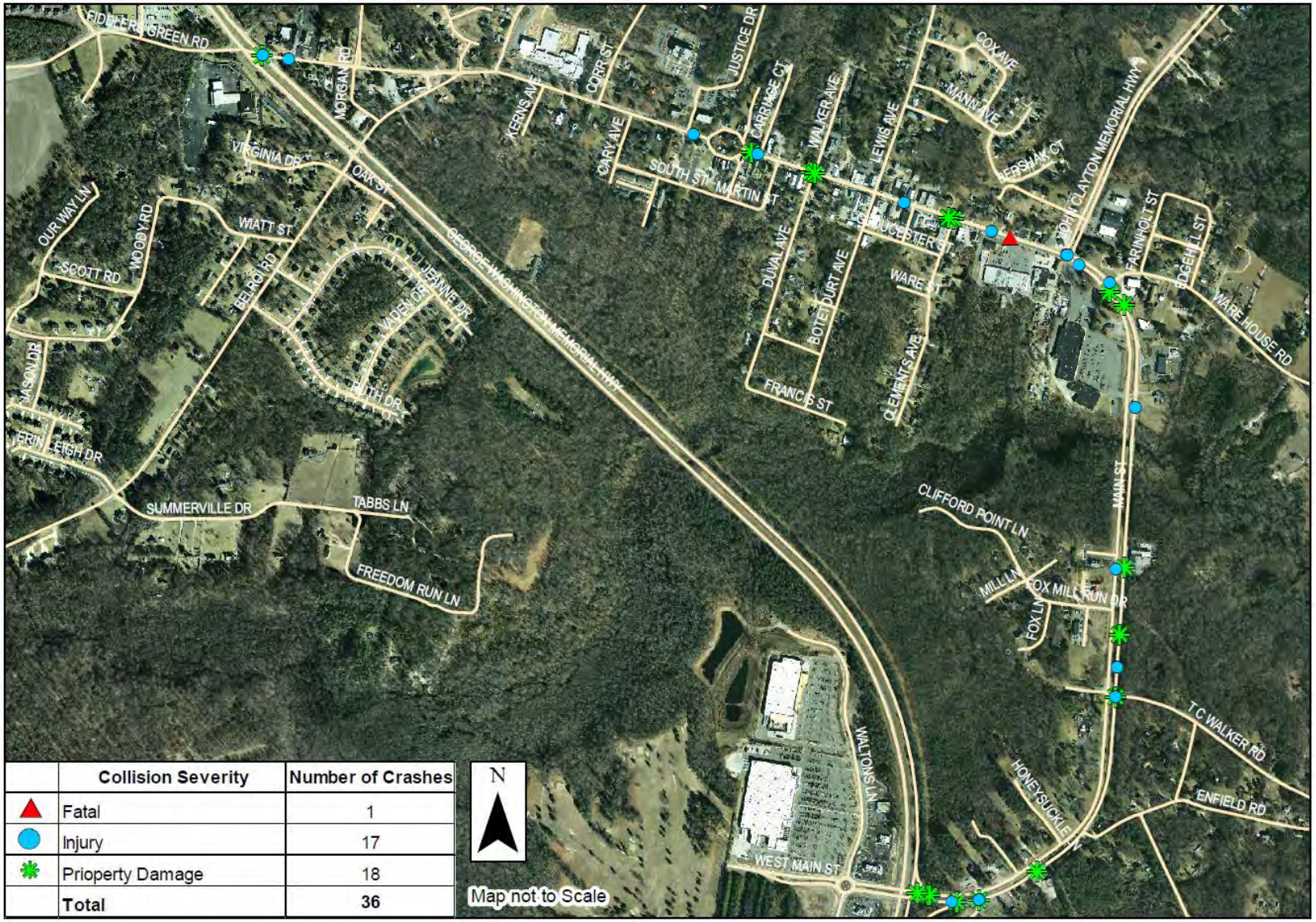
Crash Severity	Number of Crashes			
	2008	2009	2010	TOTAL
Fatal Crash	0	0	1	**1**
Injury Crash	12	12	9	**33**
Property Damage Only (PDO) Crash	8	11	11	**30**
TOTAL	**20**	**23**	**21**	**64**

Exhibit 3: Map showing crashes by type



	Collision Type	Number of Crashes
▲	Angle	16
●	Rear End	11
■	Fixed Object - Off Road	5
◆	Others	4
	Total	**36**

Exhibit 4: Map showing crashes by severity



	Collision Severity	Number of Crashes
▲	Fatal	1
●	Injury	17
✱	Prioperty Damage	18
	Total	**36**

Appendix C: Tech Memo#2 - Improvements Considered

Gloucester Transportation Planning Study

Technical Memorandum #2: Complete Streets and Potential Improvements

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Study Objectives

The Virginia Department of Transportation (VDOT) has requested HNTB to conduct a transportation study assessing the existing and future traffic operating conditions along Main Street /Route 17 Business in Gloucester County, Virginia. This project evaluates the operations and safety of the study corridor, identifies the causes of traffic congestion and recommends solutions. It also includes an evaluation of the existing pedestrian/bike facilities and proposes new multimodal accommodations. These accommodations will extend the village neighborhood design and improve non-motorized access across Route 17 Business to adjoining neighborhoods and destinations.

This **Technical Memorandum** provides a summary of existing conditions, and identifies alternative modifications to address problems identified in the study area. The recommendations incorporate Complete Streets aspects into the designs. It will serve as a basis for the Public Meeting #2, likely to be held early in 2013. After a review of the alternatives based on feedback from the Public Meeting and other reviewer comments, a set of recommended improvements at each location are selected. More detailed plan view designs will be developed for these selected options. Three locations will then be selected to have detailed cross sections prepared showing the proposed designs and treatments.

The analysis conducted for this Memo included:

- A review of the comments from the Public Meeting in October 2012. This meeting solicited participants' opinions and observations at nine "Hot Spot" locations identified by VDOT and the County staff at the beginning of the study.
- Input received from the coordination meeting with county staff in March 2012.
- An analysis of operational and safety concerns for the current year, using crash data and field review.
- The development of alternatives that address issues related to vehicular movements in the study area.
- An examination of pedestrian and bicycle accommodations throughout the study corridor. Roadway improvements were suggested to safely accommodate pedestrians and bicyclists and enhance the downtown atmosphere of the corridor.
- The advantages, disadvantages and "planning level" construction costs for each alternative.

Study Area and Roadway Network

The study area is defined as Route 17 Business/Main Street, beginning at the northern intersection with Route 17 Bypass and extends to the southern intersection with Route 17 Bypass, in the Gloucester Court House Area. The corridor is approximately 2.5 miles as shown in **Figure 1**.

The following intersections/driveways are included in the analysis:

1. Main Street/Route 17 Bypass (northern intersection)
2. Main Street/Belroi Road
3. Main Street/Roaring Springs Road (VA 616)

4. Access points to Main Street from Edgehill Shopping Center
5. John Clayton Memorial Highway (VA 3/14)/Main Street
6. Main Street/Ware House Road
7. Access points to Main Street from Main Street Shopping Center
8. Main Street/TC Walker Road
9. Main Street/Route 17 Bypass (southern intersection)
10. Multi-modal/ Spot Improvements along the study corridor

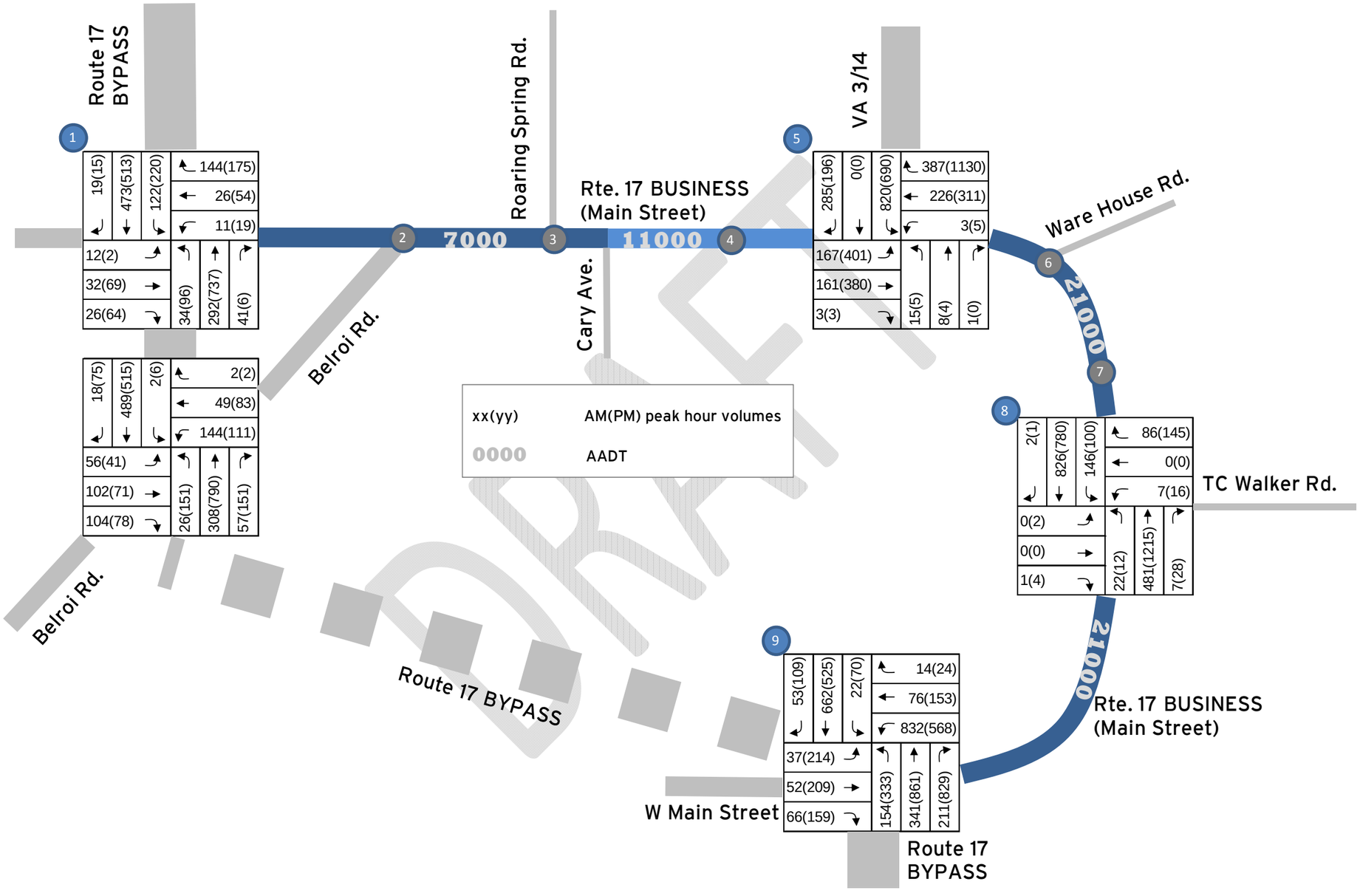
Figure 1: Study Area for Gloucester Transportation Planning Study

Intersections #1, #5 and #9 are controlled by traffic signals. The remaining intersections are two-way stop controlled, with movement priority to Main Street traffic.

Available traffic counts[1] and AADTs[2] were gathered in the study area. Based on this information, an annual growth rate of 4 percent was applied to generate 2012 volumes. **Figure 2** shows volumes in the AM and PM peak hours, and AADT on Main Street. HNTB conducted a field evaluation of the study area to observe land uses, traffic operations, traffic patterns, topography, travel times and queues.

[1] Foxmill Centre 527 TIA in 2010, Roundabout Study in 2006, The Villas at Gloucester Courthouse TIA in 2007
[2] Virginia Department of Transportation, Retrieved October 2011: http://www.virginiadot.org/info/2011_traffic_data_by_jurisdiction.asp

Figure 2: AM and PM Peak Hour Volumes in the study area



Source: Data from *Foxmill Centre 527 TIA, Roundabout Study, and The Villas at Gloucester Courthouse TIA* grown to the study year, 2012

Potential Improvements

Based on an operational analysis, a safety analysis, and input from the public, concerns at each of the key locations in the study area were identified. Alternatives were developed to address the identified issues.

Cost associated with each alternative was presented for each location. The construction costs are prepared using standard unit prices based on VDOT Transportation and Mobility Panning Division Statewide Planning Level Cost Estimates. The unit price includes 25% cost for preliminary engineering and construction contingencies. These do not account for additional right of way acquisition, significant utility relocation or other unusual conditions.

Cost –benefit analysis was done at location where benefits can be quantified. The purpose of this is to provide a way of comparing varying levels of traffic improvements or multimodal accommodation against construction costs.

Location 1: Main Street/Route 17 Bypass (north intersection)

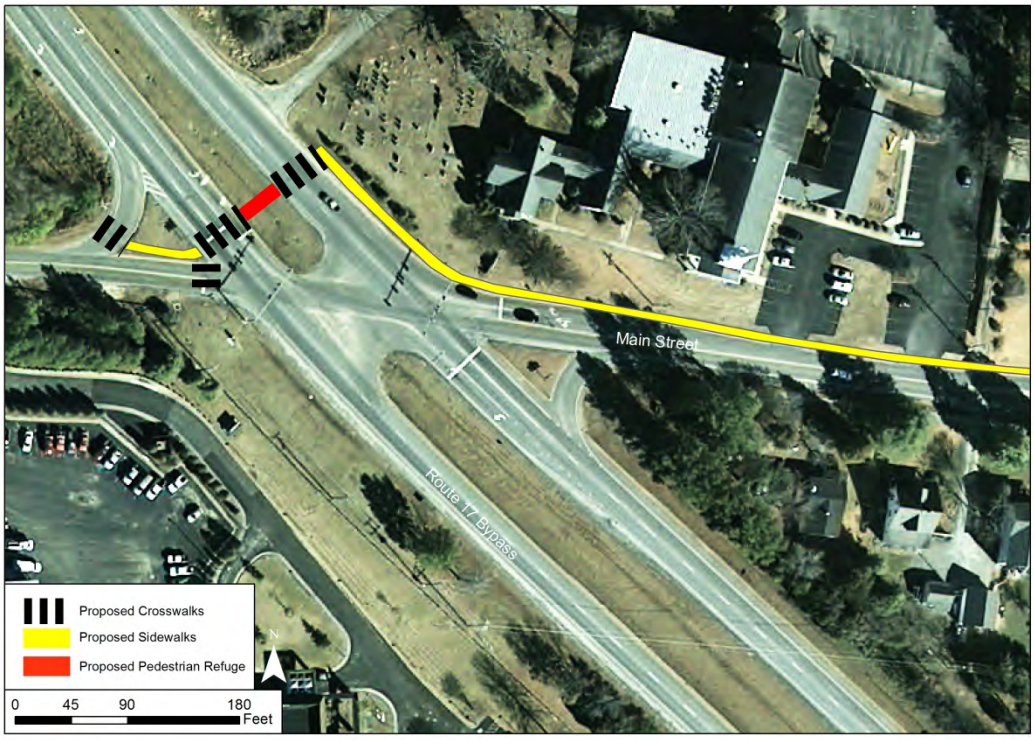
No operational issues were identified at this location in the exiting conditions analysis. There were no concerns raised by the citizens at the public meeting. However, improvements are suggested at this location to create a contiguous multi-modal network in the study area. The proposed improvements at this location are shown in **Figure 3**.

Route 17 Corridor Signal Coordination Study currently being done by VDOT addresses signal improvements (if any) at this location.

Improvements

1. Add crosswalks on the north leg of the intersection for pedestrians and bicycles to cross 17 Bypass.
2. Extend suggested sidewalk on the north side of Main Street to the crosswalk.
3. Provides pedestrian count-down signal heads to increase pedestrian comfort while crossing the intersection.

Figure 3: Improvements at Main Street/Route 17 Bypass (north intersection)



Location 2: Main Street/Belroi Road

During the public meeting, citizens requested a roundabout and more pedestrian/bike accommodations at this location. No crashes occurred at this location in 2009 and 2010. This intersection is an angled intersection. This configuration is not recommended in normal traffic engineering designs due to safety concerns and driver comfort.

The existing lane configuration and alternatives proposed at this location are shown in **Figure 4**. Summary of cost associated with each alternative is shown in **Table 1**. More detailed construction cost worksheets for each alternative are presented in **Appendix B, Tables B-1** and **B-2**.

Alternative 1- Improvements

1. Based on the guidance from FHWA[3], a traditional roundabout can be provided at this location. Right-of-way is available for a roundabout with an inscribed circle diameter of 140 feet which is higher than the suggested range by FHWA to accommodate a WB-50 truck. A detailed design study is recommended to carry this alternative forward.
2. Provide pedestrian crosswalks across Belroi Road and the west leg of Main Street.
3. The crosswalk at Gloucester Town Drive should be moved approximately 20 feet towards the intersection and the current stop bar should be placed behind the crosswalk to ensure that the cars stop before the pedestrian crossing.

[3] Roundabouts: An Informational Guide; FHWA; accessed on Nov 11th 2012; http://www.fhwa.dot.gov/publications/research/safety/00068/

4. Sidewalks should be built along the east side of Belroi Road to connect with the existing sidewalks along Main Street. Sidewalks should also be continued on the north side of Main Street to provide a complete network of sidewalks along Main Street.

Pros:

- A roundabout causes drivers to slow down on all the approaches which is a safer environment for pedestrians and bikers to cross.
- The crosswalks will have refuges at the middle enabling pedestrians to cross the roads safely.
- This location has nearly equal volumes on all the approaches in the AM and PM peak hour which is ideal for roundabouts.
- Roundabouts enhance the residential downtown atmosphere and are aesthetically pleasing.
- The angled intersection is eliminated.

Cons:

- Drivers might be unfamiliar with the operations and geometry of a roundabout causing confusion.
- Relatively high design and construction cost compared to simpler configurations.
- Awkward approach with unbalanced legs and private driveways within close vicinity.
- The statue at this intersection needs to be moved to the center island of the roundabout.

<u>Alternative 2 - Improvements</u>

1. A two-way stop-controlled T-intersection with Belroi Road realigned at Main Street is an alternative that can be considered. This alternative provides crosswalks across Belroi Road and the east leg of Main Street similar to Alternative 1.
2. The crosswalk at Gloucester Town Drive should be moved approximately 20 feet towards the intersection and the current stop bar should be placed behind the crosswalk to ensure that the cars stop before the pedestrian crossing.
3. Sidewalks should be built along the east side of Belroi Road to connect with the existing sidewalks along Main Street. Sidewalks should also be continued on the north side of Main Street to provide a complete network of sidewalks along Main Street.

Pros:

- Maintains the traditional intersection design similar to the current condition at the location for traffic on Main Street and those turning right onto Belroi Road.
- Experienced bikers can share the lanes with vehicles.
- Eliminates the angled intersection.
- Improves safety at 25% of the cost of Alternative 1 (as shown in Table 1).

Cons:

- Proposed crosswalk is relatively unsafe as traffic on Main Street will be in free flow conditions. Pedestrian warning signs can be used to make traffic aware of the pedestrian crossings.
- Right of way might be an issue, as would the relocation of underground or above ground utilities.

Summary of cost associated with each alternative is shown in **Table 1**. More detailed construction cost worksheets for each alternative are presented in **Appendix B, Tables B-1** and **B-2**.

Table 1: Cost per Alternative at Main Street/Belroi Road

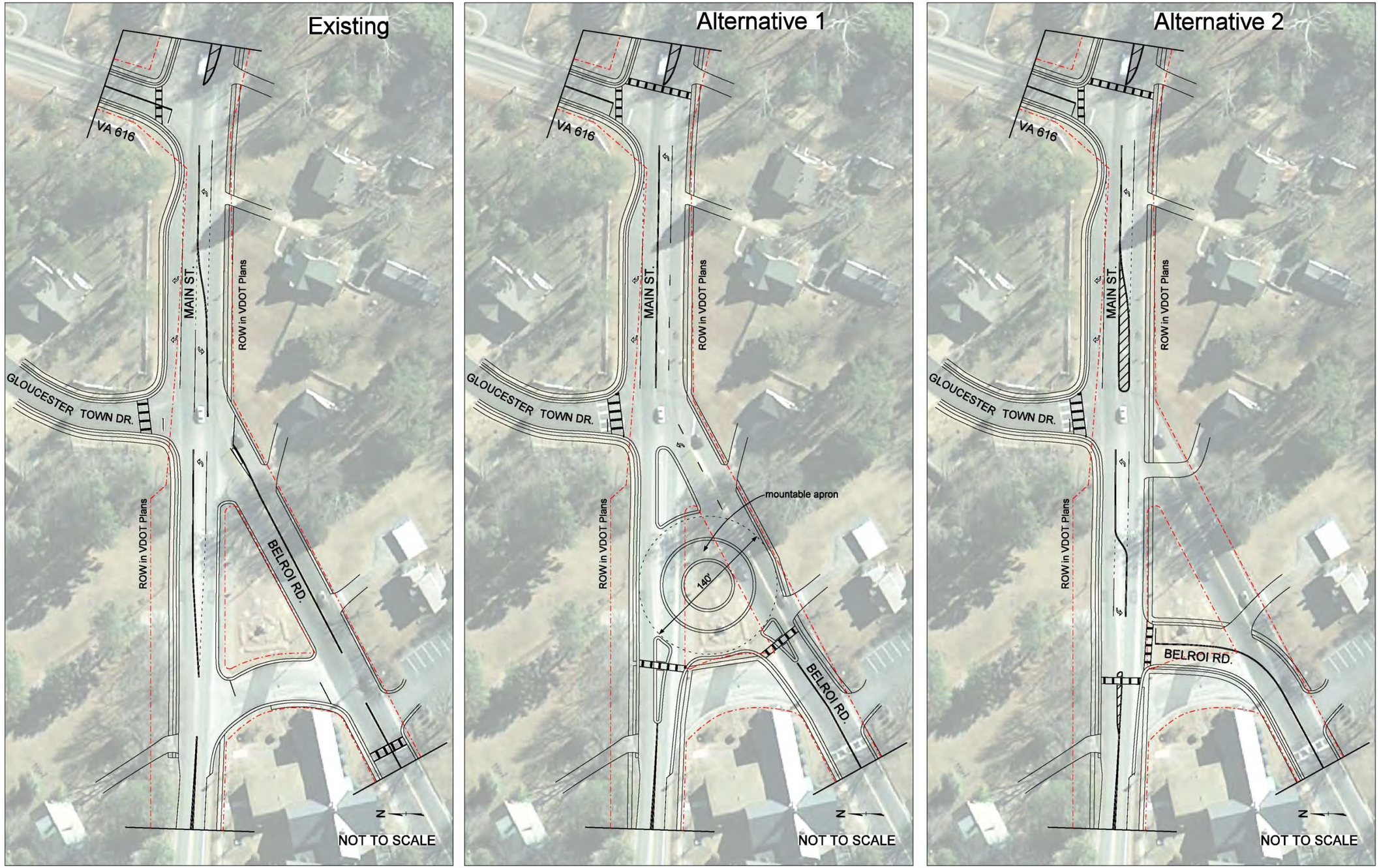
Cost Calculation for Proposed Improvements	ALTERNATIVE 1	ALTERNATIVE 2
Signals	$ -	$ -
Pavement Items (Demolition, Paving, curb and Gutter)	$ 1,640,000	$ 296,000
Multi-modal facilities	$ 275,000	$ 275,000
Sub Total^	$ 1,915,000	$ 571,000
Maintenance of Traffic (15% of costs)	$ 246,000	$ 44,400
Pavement Markings & Signing Items (8% of costs)	$ 131,200	$ 23,700
Construction, Engineering & Inspection (CEI) Costs (15% of Project Cost)	$ 287,300	$ 85,700
Overall Project Cost*	$ 2,202,300	$ 656,700

^ Includes 25% for preliminary engineering and construction contingencies ; and 3% inflation rate per year

* Does not include ROW or utility relocation costs

Source: Unit pricing based on VDOT Transportation and Mobility Panning Division Statewide Planning Level Cost Estimates

Figure 4: Alternatives at Main Street/Belroi Road



Location 3: Main Street/Roaring Springs Road (VA 616)

During the public meeting citizens requested a roundabout and more pedestrian/bike accommodations at this location. No crashes occurred at this location during 2009 and 2010. A roundabout cannot be accommodated at this location without acquiring significant additional right of way from adjacent residential properties. The minimum inscribed circle diameter needed for a mini-roundabout is 90 feet, with a larger diameter needed likely due to truck traffic on Main Street.

Improvements:

1. At Roaring Springs Road the existing stop bar should be moved behind the crosswalk to ensure cars stop prior to the pedestrian crossing. This recommendation is shown in **Figure 4** along with Location.
2. Add a cross walk across the east leg of Main Street to provide an additional crossing location for children traveling to the elementary school.

Pros:

- The alternative provides access to the proposed trail to the Beaverdam Park.

Cost is included in the cost estimate for Location 2 shown in **Table 1**.

Location 4: Edgehill Shopping Center

This shopping center is on the west side of Main Street in close vicinity of the intersection of Main Street/ VA 3/14. One fatal crash was reported at this location between 2009 and 2010. The shopping center currently has two driveways with full access to Main Street which are about 200 feet apart.

Improvements:

1. These driveways can be consolidated into one full access entrance. VDOT design guidance states that on 30mph arterial roadways, full access entrances need to be at least 440 feet apart and partial access driveways have to be at least 250 feet apart[4].

Pros:

- The consolidation of driveways to the westerly location will improve safety and reduce traffic conflicts close to the intersection.

Location 5: Main Street /John Clayton Memorial Highway (VA 3/14)

Heavy traffic congestion, queues, and delays were observed in the South bound (SB) direction during the AM peak hours and the westbound (WB) direction during the evening peak hours. At the public meeting complaints were received about the private driveway on the southern side of the intersection creating

[4] Appendix F: Access Management Design Standards for Entrances and Intersections; VDOT; accessed on Nov 25th 2012; http://www.extranet.vdot.state.va.us/locdes/Electronic%20Pubs/2005%20RDM/AppendF.pdf

an unsafe access point. Currently, there are no pedestrian and bike accommodations at this location in spite of it being adjacent to shopping centers.

The right turn from WB Main Street to VA 3/14 has a tight turning radius making the turn difficult and unsafe for large trucks. New developments planned in the vicinity will further increase the traffic load in future years. Citizens also complained about a lack of sight distance due to the bowling alley on VA 3/14.

The existing lane configuration and alternatives proposed at this location are shown in **Figure 5**. Cost-benefit analysis at this location is shown in **Tables 2, 3 and 4**. For Measures of Effectiveness (MOEs) for each alternative and detailed cost worksheets, refer to the **Appendix A** and **B** respectively.

Alternative 1 - Improvements

1. Convert the medians on VA 3/14 and Main Street into travel lanes.
2. Add crosswalks for pedestrians and bicycles to cross VA 3/14 and both legs of Main Street.
3. Provides pedestrian count-down signal heads to increase pedestrian comfort while crossing the intersection.
4. Extend the side walk up VA 3/14 to connect to the Bowling Alley.

Pros:

- Reduced vehicular delays. For more information see **Appendix A.**
- Reduced key approach queues (southbound left-turns and westbound right-turns)
- No major reconfiguration of the intersection is required.
- Average queues on all the movements do not exceed the available storage length.
- Overall intersection delay is reduced by 40 seconds in the PM peak hour compared to the existing conditions.

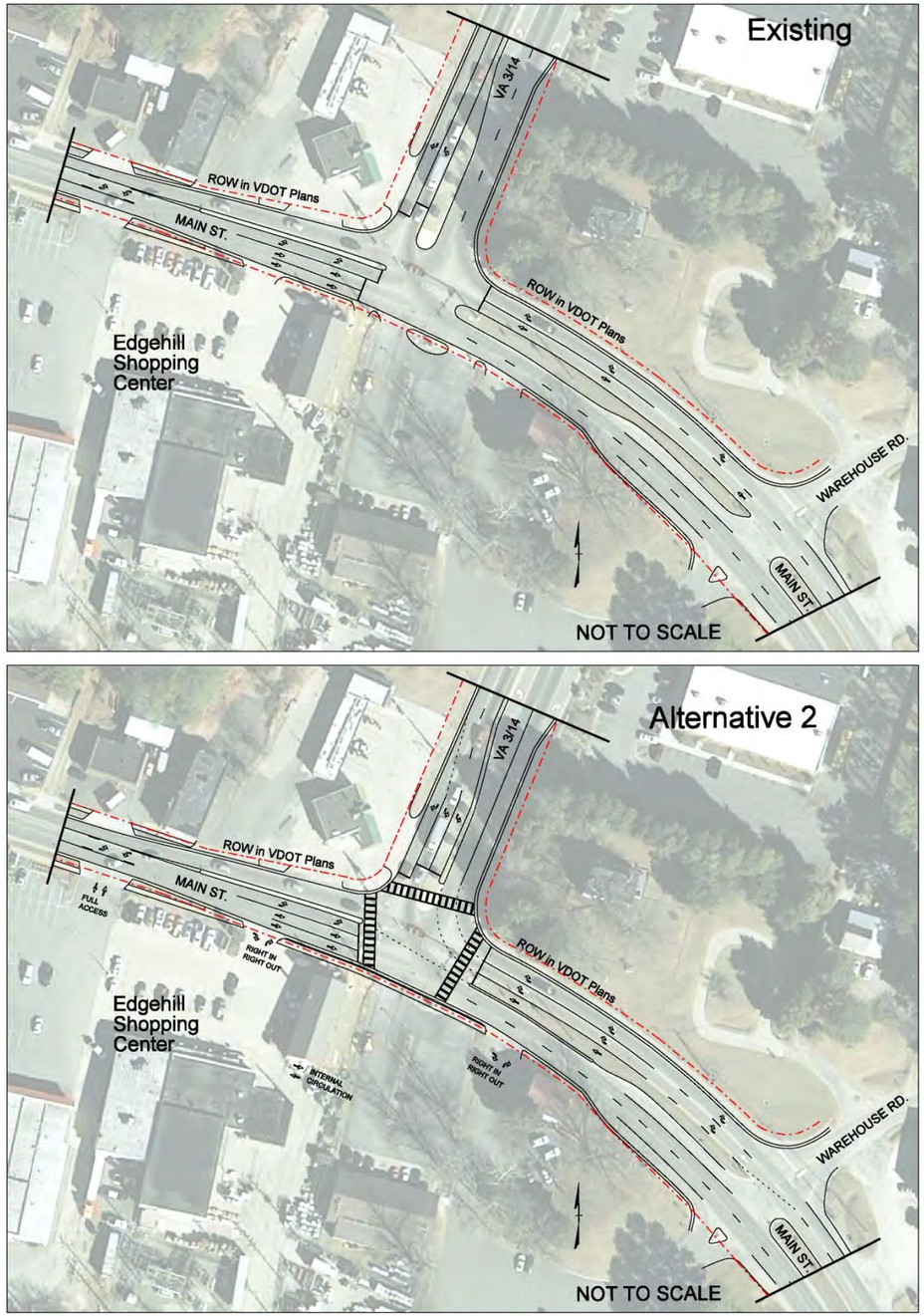
Cons:

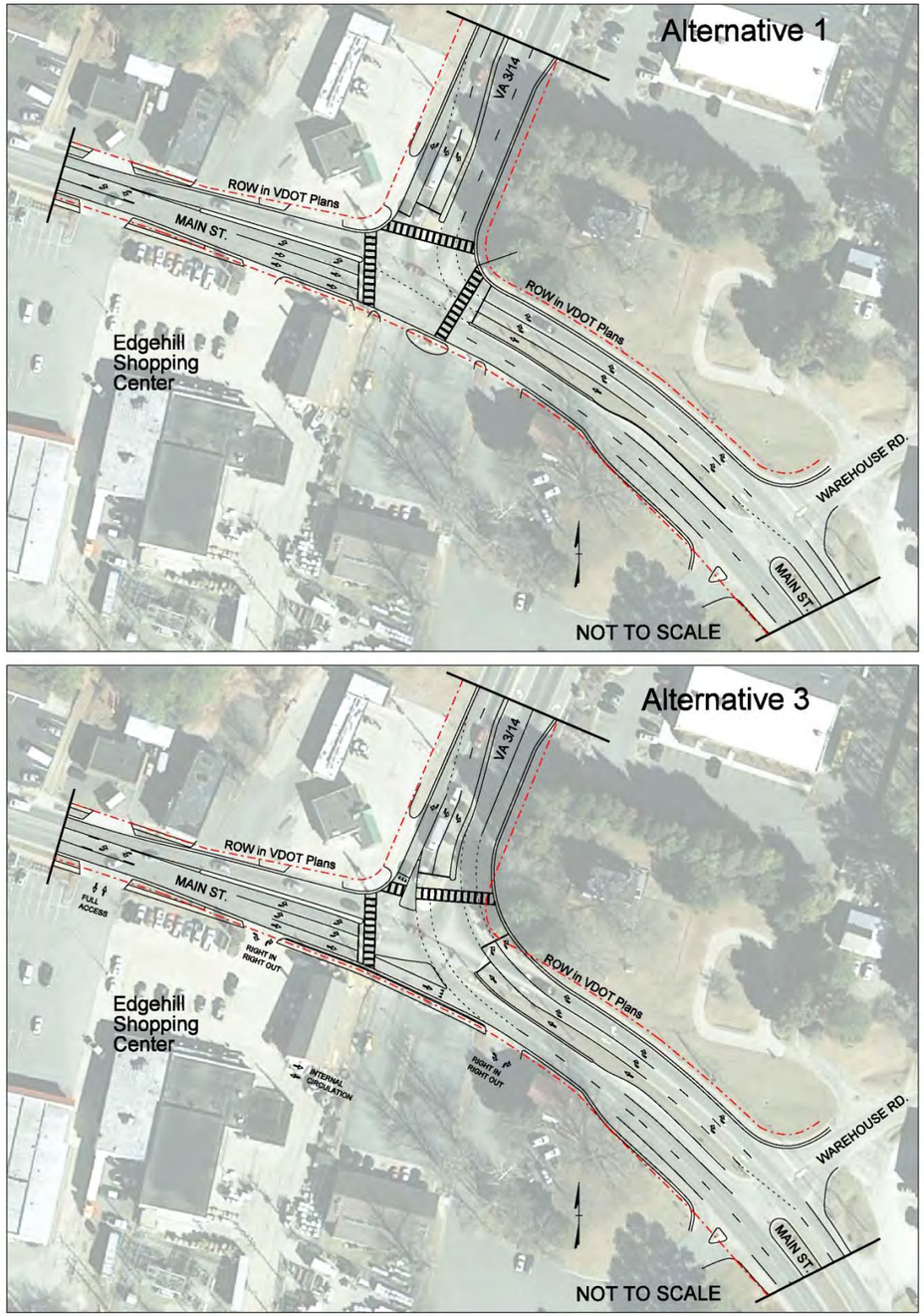
- Traffic signal modification and equipment relocation/replacement is required.
- Issues such as close driveway spacing on the south side of the intersection will not be resolved.

Alternative 2 - Improvements

1. Convert the medians on VA 3/14 and Main Street into travel lanes.
2. Add crosswalks for pedestrians and bicycles to cross VA 3/14 and both legs of Main Street.
3. Provide pedestrian count-down signal heads to increase pedestrian comfort.
4. Consolidate the entrances on the south side of the intersection as shown in **Figure 5.** Ensure that the internal circulation is improved to provide access to all the properties.
5. Modify the Laundromat access into a right-in right-out controlled by a stop-sign and move it further south of the intersection as shown in **Figure 5**; full access would need to be provided via the Edgehill Shopping Center parking lot entrance.
6. Extend the side walk up VA 3/14 to connect to the Bowling Alley.

Figure 5: Alternatives at Main Street /John Clayton Memorial Highway (VA 3/14)





Pros:

- Reduced vehicular delays.
- Reduced key approach queues (southbound left-turns and westbound right-turns).
- Concern voiced in the public meeting regarding the private parking lot being part of the traffic signal will be resolved if property owners concur with the improvement.
- The issue of close driveway spacing of the properties on the south side of the intersection will be resolved.
- The existing traffic signal equipment (poles and mast arms) will be upgraded to decorative type which fits in with the historic old-town atmosphere.
- Average queues on all the movements do not exceed the available storage length.

Cons:

- Traffic signal modification and equipment relocation/replacement is required.
- The Laundromat access on private property will be changed resulting in increased parking lot traffic movements.

Alternative 3 - Improvements

1. Realign the southbound left turns and westbound right turns.
2. Convert the southbound right turn and eastbound through movement into Yield-sign controlled.
3. Add crosswalks for pedestrians and bicycles to cross VA 3/14 and Main Street (west leg).
4. Provide pedestrian count-down signal heads to increase pedestrian comfort.
5. Consolidate the entrances on the south side of the intersection as shown in **Figure 5.** Ensure that the internal circulation is improved to provide access to all the properties.
6. Modify the Laundromat access into a right-in right-out controlled by a stop-sign and move it further south of the intersection as shown in **Figure 5**; full access would need to be provided via the Edgehill Shopping Center parking lot entrance.
7. Extend the side walk up VA 3/14 to connect to the Bowling Alley.

Pros:

- Significantly improved the alignment of the two major vehicular movements (southbound left-turns and westbound right-turns) and increased intersection traffic capacity.
- Reduced vehicular delays.
- Reduced key approach queues (southbound left-turns and westbound right-turns).
- Concern voiced in the public meeting regarding the private parking lot being part of the traffic signal will be resolved if property owners concur with the improvement.
- The issue of close driveway spacing of the properties on the south side of the intersection will be resolved.
- The existing traffic signal equipment (poles and mast arms) will be upgraded to decorative type which fits in with the historic old-town atmosphere.

- The intersection delay is reduced by 25 and 55 seconds from existing conditions in the AM and PM peak hour respectively.
- Average and maximum queues on all the movements do not exceed the available storage length.
- The cost-benefit ratio (shown in **Table 4**) is highest for this alternative.

Cons:

- Yield control for westbound right turns on Main Street decreases pedestrian safety on the proposed crosswalk across Route 3/14.
- Need to acquire ROW as shown in **Figure 5**.
- Does not resolve southern leg driveway spacing issue.
- Traffic signal modification and equipment relocation/replacement is required.
- The Laundromat access on private property will be changed resulting in increased parking lot traffic movements, changes to parking lot circulation can be seen in **Figure 5**.

Cost-benefit analysis at this location is shown in **Tables 2, 3 and 4**. More detailed construction cost worksheets for each alternative are presented in **Appendix B, Tables B-3, B-4** and **B-5.**

Table 2: Cost per Alternative at Main Street/John Clayton Memorial Highway

Cost Calculation for Proposed Improvements	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Signals	$ 330,000	$ 330,000	$ 330,000
Pavement Items (Demolition, Paving, curb and Gutter)	$ 79,000	$ 79,000	$ 103,000
Multi-modal facilities	$ 186,000	$ 226,300	$ 164,300
Sub Total^	$ 595,000	$ 635,300	$ 597,300
Maintenance of Traffic (15% of costs)	$ 89,300	$ 95,300	$ 89,600
Pavement Markings & Signing Items (8% of costs)	$ 32,700	$ 32,700	$ 34,600
Construction, Engineering & Inspection (CEI) Costs (15% of Project Cost)	$ 89,300	$ 95,300	$ 89,600
Overall Project Cost*	$ 684,300	$ 730,600	$ 686,900

^ Includes 25% for preliminary engineering and construction contingencies ; and 3% inflation rate per year

* Does not include ROW or utility relocation costs

Source: Unit pricing based on VDOT Transportation and Mobility Panning Division Statewide Planning Level Cost Estimates

Table 3: Total Benefits per Alternative at Main Street/John Clayton Memorial Highway

Benefit Calculation for Main Street & Route 3/14		Delay (sec/veh)	Peak hour traffic Volume	Delay (pers-hr)	Total Peak-hr Delay (pers-hr)	Total Reduction in Peak-hr Delay	Annual Peak-hr Savings (USD)	Annual Peak-Period Savings (USD)
Existing	AM	35.4	2076	25.5	25.5	N/A	--	--
	PM	66.0	3126	71.6	71.6	N/A	--	--
Alternative 1	AM	22.0	2245	17.2	17.2	8.4	$ 33,460.51	$ 204,020.62
	PM	24.7	3381	29.0	29.0	42.6	$ 170,560.12	
Altrenative 2	AM	13.2	2245	10.3	10.3	15.2	$ 60,904.30	$ 273,727.94
	PM	15.7	3381	18.4	18.4	53.2	$ 212,823.64	
Alternative 3	AM	8.2	2245	6.4	6.4	19.1	$ 76,497.37	$ 306,226.42
	PM	12.1	3381	14.2	14.2	57.4	$ 229,729.05	

Assumptions

1. Average peak period vehicle occupancy of 1.25 persons per vehicle (TTI 2010 Urban Mobility Report).
2. Average loss of income at $16/hr due to delay (TTI 2010 Urban Mobility Report).
3. Benefit calculation in terms of 2012 USD.
4. Does not include benefits from pedestrain mobility and safety, fuel savings and lower emissions

Table 4: Cost –Benefit Analysis at Main Street/John Clayton Memorial Highway

Cost-Benefit Analysis for Main Street & Route 3/14	Annual Peak-Period Savings (USD)	Cost (USD)	Benefit-Cost Ratio
Alternative 1	$ 204,020.62	$ 684,300.00	0.30
Alternative 2	$ 273,727.94	$ 730,600.00	0.37
Alternative 3	$ 306,226.42	$ 686,900.00	0.45

Assumptions

Benefit-cost calculation in terms of 2012 USD.

Locations 6 & 7: Main Street/Ware House Road (VA 621) & Main Street Shopping Center

Vehicles that leave the shopping center and make a left onto Main Street at the south driveway are unable to find a gap in the traffic. These vehicles have to cross two travel lanes and a median which creates a safety hazard. Three crashes occurred at Main Street and Warehouse Road between 2009 and 2010. This is an unsignalized intersection on a horizontal curve with sight distance issues. The intersection is also closely spaced with Main Street and VA 3/14.

The existing lane configuration and alternatives proposed at this location are shown in **Figure 6**. Total cost associated with each alternative is shown in **Table 5**. For detailed construction cost worksheets for each alternative, refer to **Tables B-7** and **B-6**.

Alternative 1 - Improvements

1. Signalize the southernmost driveway of the shopping center (use 2009 MUTCD Section 4C.09 Warrant 8, Roadway Network) and provide full access to Main Street from the shopping center.
2. At the intersection of Main Street/Ware House Road, make the access to the shopping center a right-in right-out only. Through traffic on Warehouse Road will need to turn left on to Main Street and turn right at the newly signalized intersection to access the shopping center.

Figure 6: Alternatives at Main Street/Ware House Road & Main Street Shopping Center

3. Extend the sidewalk from the intersection of Main Street and VA 14/3 to the southern entrance of Main Street Shopping Center to provide access to the County Library.
4. Add crosswalks to the north leg of Main Street at the signalized intersection of shopping center and Main Street to allow pedestrians and bicycles to cross the divided highway.
5. Provide pedestrian refuge in the median of Main Street for pedestrian safety when crossing.
6. Provide pedestrian count-down signal heads to increase pedestrian comfort.
7. Add a sidewalk from the intersection of Main Street and VA 3/14 to the signalized intersection.

Pros:

- At the intersection of the Main Street and south driveway of the shopping center, signalization will improve safety for left-turns from the shopping center to northbound (NB) Main Street. This will eliminate the need for vehicles to turn right and make a U-turn at the intersection of Main Street/TC Walker Road to access NB Main Street.

Cons:

- Longer travel time for users traveling from Warehouse Road to Main Street Shopping Center.
- If Alternative 3 is chosen at intersection of Main Street/ John Clayton Memorial Highway (VA 3/14), traffic flow will be continuous in the SB direction. As a result, left-turns from Ware House Road might not find sufficient gap.

<u>Alternative 2 - Improvements</u>

1. Signalize the intersection of Main Street/Ware House Road and synchronize the timing with the controller at Main Street and VA 3/14. MUTCD Warrant 1, 2 or 3 might be met if traffic from new developments is included.
2. Make the southernmost driveway of the shopping center a right-in right-out.
3. Extend the sidewalk from the intersection of Main Street and VA 14/3 to southern entrance of the Main Street Shopping Center. This ensures that pedestrians do not have to walk through the parking lot to reach the County Library.
4. Add crosswalks to the north leg of Main Street at the signalized intersection of Main Street/Ware House Road to allow pedestrians and bicycles to cross the divided highway.
5. Provide pedestrian refuge in the median of Main Street for pedestrian safety when crossing.
6. Provide pedestrian count-down signal heads to increase pedestrian comfort.
7. Add a sidewalk from the intersection of Main Street and VA 3/14 to the Church.

Pros:

- At Main Street/Ware House Road, the signalization will improve overall safety. Signalization will eliminate the sight distance issue.

Cost-benefit analysis at this location is shown in **Table 5**. More detailed construction cost worksheets for each alternative are presented in **Appendix B, Tables B-6** and **B-7.**

Table 5: Alternatives at Main Street/Ware House Road & Main Street Shopping Center

Cost Calculation for Proposed Improvements	ALTERNATIVE 1	ALTERNATIVE 2
Signals	$ 665,000	$ 665,000
Pavement Items (Demolition, Paving, curb and Gutter)		
Multi-modal facilities	$ 167,000	$ 167,000
Sub Total^	$ 832,000	$ 832,000
Maintenance of Traffic (15% of costs)	$ 99,800	$ 99,800
Pavement Markings & Signing Items (8% of costs)	$ 53,200	$ 53,200
Construction, Engineering & Inspection (CEI) Costs (15% of Project Cost)	$ 124,800	$ 124,800
Overall Project Cost*	$ 956,800	$ 956,800

^ Includes 25% for preliminary engineering and construction contingencies ; and 3% inflation rate per year
* Does not include ROW or utility relocation costs
Source: Unit pricing based on VDOT Transportation and Mobility Panning Division Statewide Planning Level Cost Estimates

Location 8: Main Street/TC Walker Road (VA 629)

During the public meeting, citizens complained that vehicles turning left from TC Walker Road are unable to find adequate gaps. There are limited options to resolve this issue, as the travel lanes are only about 10-11 feet wide which is the common method for reducing speeds. The medians are about 20-30 feet wide which enables vehicles to make two-step left-turns. Proposed signal at the southern entrance of Main Street Shopping Center (in Alternative 2); will result in gaps in the Main Street traffic addressing this issue.

Two crashes occurred at this intersection between 2009 and 2010. This is a challenging location for improvements as it is primarily a user perception issue, with a low crash rate of one per year.

Improvements:

1. Provide gateway treatments such as a safely located welcome sign and/or vegetation in the median and on both sides of the roadway. Signing can also be used to indicate traffic entering from the right side, for northbound traffic. This will create a transitional zone to town and alert the Route 17 Business traffic to other movements.
2. Remove the right turn bay for southbound Main Street to provide right-of-way for a proposed multiuse trail connecting the residential areas near Gloucester Court House and the downtown with the retail west of Route 17 Bypass. The removal of this turn bay will not negatively affect traffic operations at the intersection due to the low volume of right turning vehicles.
3. Under current conditions, crosswalks are not appropriate at this intersection for various reasons like large crossing distance, high speed, and lack of demand. If pedestrian volumes increase in the future the medians of Main Street can be narrowed, creating a tighter lane configuration. This will slow traffic, increase pedestrian visibility and reduce crossing distance.

Pros:

- Improved safety.
- Increased motorist comfort for all movements.
- Relatively low cost and increased visual attractiveness of the area.

Figure 7: Improvements at Main Street/ TC Walker Road

Location 9: Main Street/Route 17 Bypass (south intersection)

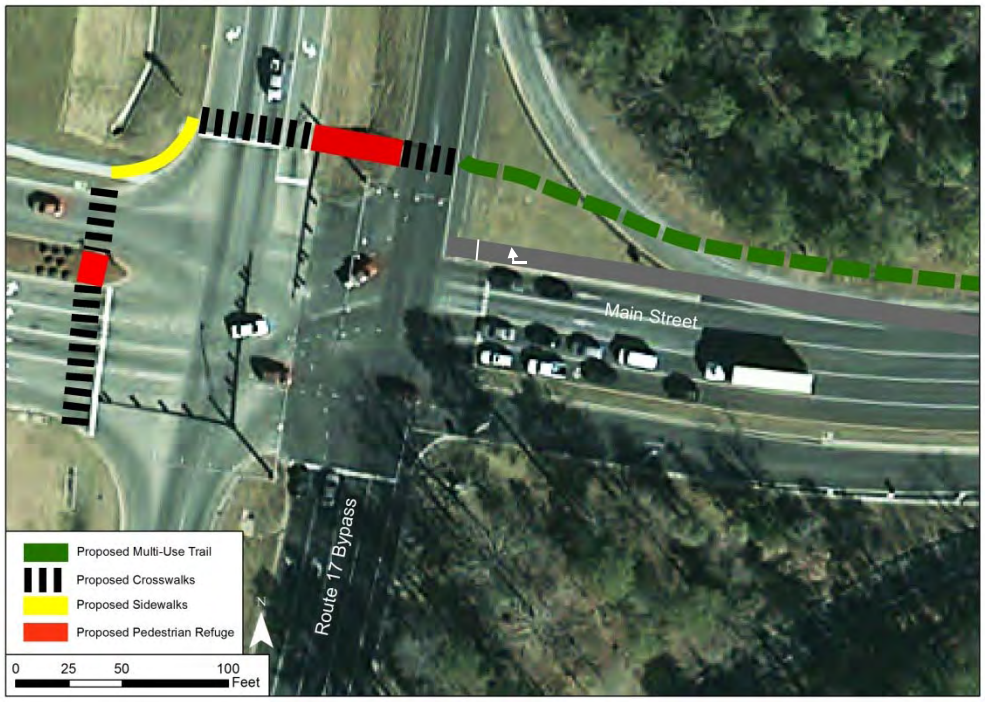
There were no concerns raised by the citizens at this location in the public meeting held as part of this project. However, improvements are suggested at this location to create a contiguous multi-modal network in the study area. The proposed improvements at this location are shown in **Figure 8**.

Data shows five crashes occurred on Main Street at this intersection. However, visual inspection did not identify any substandard or unusual roadway configurations. The intersection has been upgraded recently, and these improvements appear to have addressed the operational issues. Route 17 Corridor Signal Coordination Study currently being done by VDOT addresses signal improvements (if any) at this location.

Improvements:

1. Add crosswalks on the north leg of the intersection for pedestrians and bicycles to cross Route 17 Bypass. Extend suggested multi-use path (on the west side of Main Street) to this crosswalk.
2. Add a crosswalk to the west leg of the intersection.
3. Provides pedestrian count-down signal heads at both crosswalks to increase pedestrian comfort while crossing the intersection.
4. Eliminate the channelized right turn on the east leg of Main Street to increase pedestrian safety. Extend the existing right turn lane to the intersection.

Figure 8: Improvements at Main Street/ Route 17 Bypass (south intersection)



Location 10: Multimodal and Spot Improvements in the Project Area

The areas along the study corridor which do not fall into any of the above locations are discussed below. Multi-modal facilities (shown in **Figure 9)** are recommended such that a seamless network of paths is created in the study area.

- The mid-block crossings on Main Street, in front of Botetourt Elementary School and Edgehill Shopping Center do not have any signs warning the vehicular traffic. Pedestrian warning signs should be added at the approaches to these locations.

W11-2

The Manual on Uniform Traffic Control Devices (MUTCD) has guidance on the appropriate signage for these locations. The Non-Vehicular Warning Sign W11-2 shown here is the appropriate pedestrian crossing sign. When this sign is used as an advanced warning sign at least 50 feet before the crosswalk, a supplemental 'AHEAD' or 'distance xx' plaque should be used with the sign. In addition, sign R1-6 in MUTCD could be placed at the crosswalk. Pedestrian warning signs are important for pedestrian visibility, especially at night.

R1-6

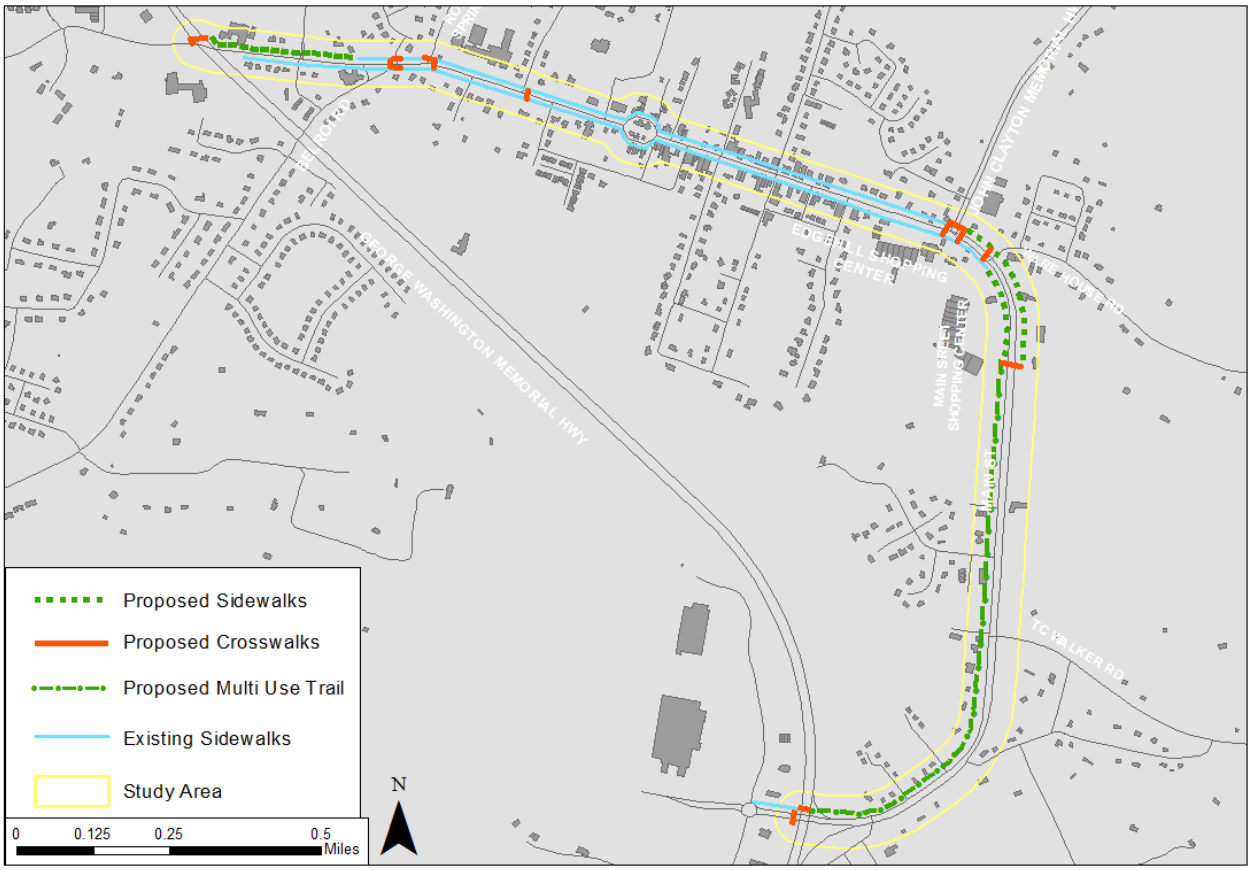
In addition to advanced warning signs, these two midblock crossings could use textured materials such as brick. Brick mid-block crossings make drivers more aware of the unexpected crossing and enhance the downtown aesthetic of the corridor. Locations along the study area with crosswalks should be converted into striped/ textured to improve visibility.

- The intersection of Main Street/Corr Street has a pedestrian crossing sign with no marked crosswalk. A crosswalk should be provided on Main Street connecting to the existing pedestrian ramps. This

would provide another location to cross Main Street before Botetourt Elementary School. For guidance on crosswalk design, refer section 3b.18 of MUTCD.

- During the public meetings, citizens complained about lack of visibility at the intersections along Main Street due to large trucks parked adjacent to the intersections. This concern was also validated by the crashes that were consistently seen at most of the stop-controlled intersections along Main Street. To ensure that the vehicles on the minor street have adequate sight distance, signs should be placed on Main Street restricting parking for trucks in the spaces adjacent to the intersection. Signs saying "Compact Cars Only" can be used.
- A multi-use 10 feet trail should be built on the west side of Main Street from the southern entrance of the Main Street shopping center (in front of the library) to the intersection of Main Street/Route 17 Bypass. This trail will create a pedestrian connection between the residential areas near Gloucester Court House and the retail developments west of Route 17 Bypass via the down town. Based on the latest VDOT plans, 20 feet of right-of-way is available on the west side of Main Street which can accommodate this path.
- The sub-area plan by the County of Gloucester proposes multiple trails in the study area. Some of the primary ones are a loop trail along east side of Route 17 Bypass and west side of Route 17 Business, and another trail running parallel to Route 17 Business, south of the Edgehill shopping center. Any sidewalks/trails built in this area are recommended to be tied to these proposed facilities to generate a network of trail system.

Figure 9: Proposed multi-modal imporvements in the study area



Appendix A: MOEs at Main Street and VA 3/14

AM PEAK - DELAY AND LOS

			EXISTING					ALTERNATIVE 1					ALTERNATIVE 2					ALTERNATIVE 3				
				Approach		Intersection			Approach		Intersection			Approach		Intersection			Approach		Intersection	
Intersection	Movement	Movement Volume	Delay	Delay	LOS	Delay	LOS	Delay	Delay	LOS	Delay	LOS	Delay	Delay	LOS	Delay	LOS	Delay	Delay	LOS	Delay	LOS
Main Street & Route 3/14	EBL	167	45.1	34.3	C	35.4	D	17.1	15.3	B	22.0	C	11.4	10.6	B	13.2	B	21.8	11.3	B	8.2	A
	EBT	161	23.3					13.4					9.8					0.1				
	EBR	3											-					-				
	WBL	3	53.2	24.2	C			27.9	15.9	B			-	9.1	A			-	4.2	A		
	WBT	226											19.9					5.9				
	WBR	387	7.1					8.8					2.8					3.3				
	NBL	15	46.1	46.1	D			30.3	30.3	C			-	-	-			-	-	-		
	NBT	8																				
	NBR	1																				
	SBL	820	51.8	41.7	C			31.3	27.3	C			17.6	16.2	B			12.2	9.5	A		
	SBT	0											-					-				
	SBR	285	12.9					15.9					12.0					0.3				

AM PEAK - QUEUES

				EXISTING		ALTERNATIVE 1		ALTERNATIVE 2		ALTERNATIVE 3	
Intersection	Movement	Available Storage (feet)	Average Queue (50th Percentile)	Maximum Queue (95th Percentile)	Average Queue (50th Percentile)	Maximum Queue (95th Percentile)	Average Queue (50th Percentile)	Maximum Queue (95th Percentile)	Average Queue (50th Percentile)	Maximum Queue (95th Percentile)
Main Street & Route 3/14	EBL	225	60	#218	31	#109	37	82	24	63
	EBT	900	28	70	14	47	17	36	0	0
	EBR						-	-	-	-
	WBL	310	104	#298	64	#218	-	-	-	-
	WBT						72	150	24	55
	WBR	310	0	40	0	26	0	13	0	14
	NBL	10	10	41	6	31	-	-	-	-
	NBT									
	NBR									
	SBL	260	322	#860	114	#391	123	#294	109	195
	SBT						-	-	-	-
	SBR	260	2	62	0	71	0	55	0	0

PM PEAK - DELAY AND LOS

			EXISTING					ALTERNATIVE 1					ALTERNATIVE 2					ALTERNATIVE 3				
				Approach		Intersection			Approach		Intersection			Approach		Intersection			Approach		Intersection	
Intersection	Movement	Movement Volume	Delay	Delay	LOS	Delay	LOS	Delay	Delay	LOS	Delay	LOS	Delay	Delay	LOS	Delay	LOS	Delay	Delay	LOS	Delay	LOS
Main Street & Route 3/14	EBL	401	119.7	71.7	E	66.0	E	42.0	27.2	C	24.7	C	26.0	17.5	B	15.7	B	44.3	25.1	C	12.1	B
	EBT	380	21.5					11.7					8.5					0.3				
	EBR	3											-					-				
	WBL	5	55.3	70.5	E			34.6	18.3	B			-	11.5	B			-	5.5	A		
	WBT	311											27.9					6.6				
	WBR	1130	74.8					13.8					6.9					5.2				
	NBL	5	70.0	70.0	E			41.7	41.7	D			-	-	-			-	-	-		
	NBT	4																				
	NBR	1																				
	SBL	690	62.6	53.5	D			36.0	32.8	C			22.4	20.8	C			15.5	12.4	B		
	SBT	0											-					-				
	SBR	196	21.7					21.3					15.4					0.2				

PM PEAK - QUEUES

				EXISTING		ALTERNATIVE 1		ALTERNATIVE 2		ALTERNATIVE 3	
Intersection	Movement	Available Storage (feet)	Average Queue (50th Percentile)	Maximum Queue (95th Percentile)	Average Queue (50th Percentile)	Maximum Queue (95th Percentile)	Average Queue (50th Percentile)	Maximum Queue (95th Percentile)	Average Queue (50th Percentile)	Maximum Queue (95th Percentile)
Main Street & Route 3/14	EBL	225	195	#571	94	#369	88	#260	74	#171
	EBT	900	82	158	40	102	37	67	0	0
	EBR						-	-	-	-
	WBL	310	203	#468	117	#334	-	-	-	-
	WBT						106	#255	37	86
	WBR	310	424	#1306	28	154	81	171	0	27
	NBL	10	6	28	3	21	-	-	-	-
	NBT									
	NBR									
	SBL	260	427	#941	133	#389	114	#270	96	183
	SBT						-	-	-	-
	SBR	260	17	92	0	65	0	50	0	0

Highlighted items: LOS designation (red – above capacity, yellow – approaching capacity, green – below capacity); Queue lengths greater than available storage (pink)
#- Volume for 95th percentile exceeds capacity, queue may be longer
m-Volume for 95th percentile queue is metered by upstream signal

Appendix B: Costing worksheets

Table B-1: Cost estimate for Alternative 1 at Main Street/Belroi Road

DESCRIPTION	LOCATION	UNIT COST	LENGTH Miles	AMOUNT
Pavement Items (Remove existing pavement and build roundabout)		$ 1,640,000	1	$ 1,640,000
Pedestrian Facilities				
5 crosswalks	West and North legs at Belroi Rd, and East and North legs at Roaring Springs Rd	$ 40,000	5	$ 200,000
10 ADA Ramps	2 ramps on either side of each crosswalk	$ 7,500	10	$ 75,000
Subtotal				$ 1,915,000
Preliminary Engineering and Construction Contingency (25% of the total cost)		Included		
Overall Project Cost*				$ 1,915,000

* Includes 25% for preliminary engineering and construction contingencies; and 3% inflation rate per year

Table B-2: Cost estimate for Alternative 2 at Main Street/Belroi Road

DESCRIPTION	LOCATION	UNIT COST	LENGTH Miles	AMOUNT
Pavement Items (Reconfigure the intersection)				
Re-align and pave an appraoach	South leg	$ 7,380,000	0.04	$ 296,000
Pedestrian Facilities				
5 crosswalks	West, South and North legs at Belroi Rd, and East and North legs at Roaring Springs Rd	$ 40,000	5	$ 200,000
10 ADA Ramps	2 ramps on either side of each crosswalk	$ 7,500	10	$ 75,000
Subtotal				$ 571,000
Preliminary Engineering and Construction Contingency (25% of the total cost)		Included		
Overall Project Cost*				$ 571,000

* Includes 25% for preliminary engineering and construction contingencies; and 3% inflation rate per year

Table B-3: Cost estimate for Alternative 1 at Main Street/John Clayton Memorial Highway

DESCRIPTION	LOCATION	UNIT COST	LENGTH Miles	AMOUNT
Signal replacement		$ 330,000	1	$ 330,000
Pavement Items (Remove current median and pave)				
Add 200' of left turn lane including taper	SB approach	$ 760,000	0.04	$ 31,000
Add 330' of pavement in the place of a median	WB approach	$ 760,000	0.063	$ 48,000
Pedestrian Facilities				
3 crosswalks	East, West and North legs	$ 40,000	3	$ 120,000
6 ADA Ramps	2 ramps on either side of each crosswalk	$ 7,500	6	$ 45,000
Countdown poles	2 ramps on either side of each crosswalk	$ 3,500	6	$ 21,000
Sidewalk	East side of Route 3/14 upto Bowling alley	$ 490,000	0.05	$ 25,000
Subtotal				$ 620,000
Preliminary Engineering and Construction Contingency (25% of the total cost)		Included		
Overall Project Cost*				$ 620,000

* Includes 25% for preliminary engineering and construction contingencies; and 3% inflation rate per year

Table B-4: Cost estimate for Alternative 2 at Main Street/John Clayton Memorial Highway

DESCRIPTION	LOCATION	UNIT COST	LENGTH Miles	AMOUNT
Signal replacement		$ 330,000	1	$ 330,000
Pavement Items (Remove current median and pave)				
Add 200' of left turn lane including taper	SB approach	$ 760,000	0.04	$ 31,000
Add 330' of pavement in the place of a median	WB approach	$ 760,000	0.063	$ 48,000
Pedestrian Facilities				
3 crosswalks	East, West and North legs	$ 40,000	3	$ 120,000
6 ADA Ramps	2 ramps on either side of each crosswalk	$ 7,500	6	$ 45,000
Countdown poles	2 ramps on either side of each crosswalk	$ 3,500	6	$ 21,000
Sidewalk	South side of Main Street East side of Route 3/14 upto Bowling alley	$ 490,000	0.08	$ 40,000
Stop sign	South leg	$ 300	1	$ 300
Subtotal				$ 635,300
Preliminary Engineering and Construction Contingency (25% of the total cost)		Included		
Overall Project Cost*				$ 635,300

* Includes 25% for preliminary engineering and construction contingencies; and 3% inflation rate per year

Table B-5: Cost estimate for Alternative 3 at Main Street/John Clayton Memorial Highway

DESCRIPTION	LOCATION	UNIT COST	LENGTH Miles	AMOUNT
Signal replacement		$ 330,000	1	$ 330,000
Pavement Items (Remove current median and pave)				
Add 200' of left turn lane including taper	SB approach	$ 760,000	0.04	$ 31,000
Add 180' of pavement for right turn lane	North eastern corner of the intersection	$ 760,000	0.03	$ 23,000
Add 330' of left-turn lane including taper	WB approach	$ 760,000	0.06	$ 46,000
Concrete Islands	SB and EB approaches	$ 760,000	0.004	$ 3,000
Pedestrian Facilities				
2 crosswalks	West and North legs	$ 40,000	2	$ 80,000
4 ADA Ramps	2 @ West and North legs each	$ 7,500	4	$ 30,000
Countdown poles	2 @ West and North legs each	$ 3,500	4	$ 14,000
Sidewalk	South side of Main Street East side of Route 3/14 upto Bowling alley	$ 490,000	0.08	$ 40,000
Stop sign	South leg	$ 300	1	$ 300
Subtotal				$ 597,300
Preliminary Engineering and Construction Contingency (25% of the total cost)		Included		
Overall Project Cost*				$ 597,300

* Includes 25% for preliminary engineering and construction contingencies; and 3% inflation rate per year

Table B-6: Cost estimate for Alternative 1 at Main Street/Ware House Road & Main Street Shopping Center

DESCRIPTION	LOCATION	UNIT COST	LENGTH Miles	AMOUNT
Signalize Intersection	Southern driveway of Main Street Center	$ 660,000	1	$ 660,000
Build a median island to make an approach RIRO	West leg of Main Street and Ware House Rd	$ 5,000	1	$ 5,000
Pedestrian Facilities				
Sidewalk on both sides of Main Street	East side (from Ware House to library) West side (from VA3/14 to library)	$ 490,000	0.34	$ 167,000
Subtotal				$ 832,000
Preliminary Engineering and Construction Contingency (25% of the total cost)		Included		
Overall Project Cost*				$ 832,000

* Includes 25% for preliminary engineering and construction contingencies; and 3% inflation rate per year

Table B-7: Cost estimate for Alternative 2 at Main Street/Ware House Road & Main Street Shopping Center

DESCRIPTION	LOCATION	UNIT COST	LENGTH Miles	AMOUNT
Signalize Intersection	Main Street and Ware House Rd	$ 660,000	1	$ 660,000
Build a median island to make an approach RIRO	Southern driveway of Main Street Shopping Center	$ 5,000	1	$ 5,000
Pedestrian Facilities				
Sidewalk on both sides of Main Street	East side (from Ware House to library) West side (from VA3/14 to library)	$ 490,000	0.34	$ 167,000
Subtotal				$ 832,000
Preliminary Engineering and Construction Contingency (25% of the total cost)		Included		
Overall Project Cost*				$ 832,000

* Includes 25% for preliminary engineering and construction contingencies; and 3% inflation rate per year

Appendix D: Cost Estimates

Cost estimates are based on the statewide planning level costs developed by VDOT Transportation and Mobility Planning Division in 2009. A three (3) percent escalation per year was applied to generate these cost estimates. However, costs may vary considerably based on the economic conditions at the time of construction.

Table D-1: Cost estimate for final set of improvements at Route 17 Bypass (north)/Main Street

DESCRIPTION	LOCATION	UNIT COST	LENGTH(mi)/ NUMBER	AMOUNT
Pedestrian Facilities				
2 crosswalk	West and North legs	$ 20,000	2	$ 40,000
4 ADA Ramps	2 ramps on either side of each crosswalk	$ 7,500	4	$ 30,000
Countdown poles	2 poles on either side of each crosswalk	$ 3,500	4	$ 14,000
Sidewalk	Sidewalk on north side of Main Street between Belroi Road and VA 17 Bypass north	$ 490,000	0.28	$ 138,000
Add pedestrian phasing		$ 50,000	1	$ 50,000
Subtotal^				$ 272,000
Maintenance of Traffic (15% of costs)				$ 40,800
Pavement Markings & Signing Items (8% of costs)				-
Construction, Engineering & Inspection (CEI) Costs (15% of Project Cost)				$ 40,800
Overall Project Cost*				$ 353,600

^ Includes 15% for preliminary engineering, 10% for construction contingencies ; and 3% inflation rate per year

* Does not include ROW or utility relocation costs

Source: Unit pricing based on VDOT Transportation and Mobility Panning Division Statewide Planning Level Cost

Table D-2: Cost estimate for final set of improvements at Main Street/Belroi Road (VA 616)

DESCRIPTION	LOCATION	UNIT COST	LENGTH(mi)/ NUMBER	AMOUNT
Pavement Items (Reconfigure the intersection)				
Re-align and pave an approach	South leg	$ 7,380,000	0.04	$ 296,000
Pedestrian Facilities				
5 crosswalks	West, South and North legs at Belroi Road; East and North legs at Roaring Springs Road	$ 20,000	5	$ 100,000
10 ADA Ramps	crosswalk	$ 7,500	10	$ 75,000
Subtotal^				$ 471,000
Maintenance of Traffic (15% of costs)				$ 70,700
Pavement Markings & Signing Items (8% of costs)				$ 23,700
Construction, Engineering & Inspection (CEI) Costs (15% of Project Cost)				$ 70,700
Overall Project Cost*				$ 636,100

^ Includes 15% for preliminary engineering, 10% for construction contingencies ; and 3% inflation rate per year

* Does not include ROW or utility relocation costs

Source: Unit pricing based on VDOT Transportation and Mobility Panning Division Statewide Planning Level Cost

Table D-3: Cost estimate for final set of improvements at Main Street/John Clayton Memorial Highway (VA 3/14)

DESCRIPTION	LOCATION	UNIT COST	LENGTH(mi)/ NUMBER	AMOUNT
Signal replacement		$ 330,000	1	$ 330,000
Pavement Items (Remove current median and pave)				
Add 200' of pavement in the place of median	SB approach	$ 760,000	0.04	$ 31,000
Add 330' of pavement in the place of median	WB approach	$ 760,000	0.063	$ 48,000
Pedestrian Facilities				
3 crosswalks	East, West and North legs	$ 20,000	3	$ 60,000
6 ADA Ramps	2 ramps on either side of each crosswalk	$ 7,500	6	$ 45,000
Countdown poles	2 poles on either side of each crosswalk	$ 3,500	6	$ 21,000
Sidewalk	South side of Main Street East side of VA 3/14 up to Bowling alley	$ 490,000	0.08	$ 40,000
Subtotal^				$ 575,000
Maintenance of Traffic (15% of costs)				$ 86,300
Pavement Markings & Signing Items (8% of costs)				$ 32,700
Construction, Engineering & Inspection (CEI) Costs (15% of Project Cost)				$ 86,300
Overall Project Cost*				$ 780,300

^ Includes 15% for preliminary engineering, 10% for construction contingencies ; and 3% inflation rate per year

* Does not include ROW or utility relocation costs

Source: Unit pricing based on VDOT Transportation and Mobility Panning Division Statewide Planning Level Cost

Table D-4: Cost estimate for final set of improvements at Main Street/Ware House Road & Main Street Shopping Center

DESCRIPTION	LOCATION	UNIT COST	LENGTH(mi)/ NUMBER	AMOUNT
Pavement Items				
Modify median	At Ware House Road and southern driveway of Main Street Shopping Center	$ 440,000	0.16	$ 71,000
Add pavement in the place of median		$ 760,000	0.21	$ 160,000
Pedestrian Facilities				
Sidewalk on both sides of Main Street	East side (from Ware House to library) West side (from VA 3/14 to library)	$ 490,000	0.34	$ 167,000
Subtotal^				$ 398,000
Maintenance of Traffic (15% of costs)				$ 59,700
Pavement Markings & Signing Items (8% of costs)				$ 5,700
Construction, Engineering & Inspection (CEI) Costs (15% of Project Cost)				$ 59,700
Overall Project Cost*				$ 523,100

^ Includes 15% for preliminary engineering, 10% for construction contingencies ; and 3% inflation rate per year

* Does not include ROW or utility relocation costs

Source: Unit pricing based on VDOT Transportation and Mobility Panning Division Statewide Planning Level Cost Estimates

Table D-5: Cost estimate for final set of improvements at Main Street/TC Walker Road (VA 629)

DESCRIPTION	LOCATION	UNIT COST	LENGTH(mi)/ NUMBER	AMOUNT
Pedestrian Facilities				
1 crosswalk	West leg	$ 20,000	1	$ 20,000
Multi-use path	Between the southern entrance of Shopping Center and Route 17 Bypass south intersection	$ 980,000	0.95	$ 931,000
Subtotal^				$ 951,000
Maintenance of Traffic (15% of costs)				$ 3,000
Pavement Markings & Signing Items (8% of costs)				$ -
Construction, Engineering & Inspection (CEI) Costs (15% of Project Cost)				$ 142,700
Overall Project Cost*				$ 1,096,700

^ Includes 15% for preliminary engineering, 10% for construction contingencies ; and 3% inflation rate per year

* Does not include ROW or utility relocation costs

Source: Unit pricing based on VDOT Transportation and Mobility Panning Division Statewide Planning Level Cost Estimates

Table D-6: Cost estimate for final set of improvements at Route 17 Bypass (south)/Main Street

DESCRIPTION	LOCATION	UNIT COST	LENGTH(mi)/ NUMBER	AMOUNT
Pavement Items (Remove channelized right and re-pave)				
Add 250' of pavement in the place of a median	WB approach	$ 760,000	0.047	$ 36,000
Pedestrian Facilities				
2 crosswalks	West and North legs	$ 20,000	2	$ 40,000
4 ADA Ramps	2 ramps on either side of each crosswalk	$ 7,500	4	$ 30,000
Countdown poles	2 poles on either side of each crosswalk	$ 3,500	4	$ 14,000
Sidewalk	Connecting the two crosswalks	$ 490,000	0.01	$ 5,000
Add pedestrian phasing		$ 50,000	1	$ 50,000
Subtotal^				$ 175,000
Maintenance of Traffic (15% of costs)				$ 26,300
Pavement Markings & Signing Items (8% of costs)				$ 5,400
Construction, Engineering & Inspection (CEI) Costs (15% of Project Cost)				$ 26,300
Overall Project Cost*				$ 233,000

^ Includes 15% for preliminary engineering, 10% for construction contingencies ; and 3% inflation rate per year

* Does not include ROW or utility relocation costs

Source: Unit pricing based on VDOT Transportation and Mobility Panning Division Statewide Planning Level Cost Estimates

Appendix E: Funding Opportunities

There are various types of funding opportunities that can be used to fund the recommendations in this study. They can be broken down in to five categories; Federal, State, Local, Private Public partnership, and Private. Between these funding groups there are multiple funding opportunities, from those dedicated to bike and pedestrian funding, climate protection, and roadway improvements. By combining the funding opportunities from the following discussion, a means to fund the recommended improvements in this report can be achieved.

Federal

- **Transportation Alternatives:** The 'Moving Ahead for Progress in the 21st Century Act (MAP-21)' was passed by congress on June 29, 2012 and signed into law by President Obama on July 6, 2012. This two-year bill was enacted to govern Federal transportation spending in the United States. MAP-21 established a new program, Transportation Alternatives (TA), for funding pedestrian accommodations, bicycling accommodations, and Safe Routes to school. This new program combines projects that were previously funded under multiple programs including Transportation Enhancements, Recreational Trails, Safe Routes to School, and several other discretionary programs. This new program sets aside two percent of a state's MAP-21 funding for projects. Applications that can be used to help fund the recommendations in this study include:
    - Construction, planning, and design of on-road and off-road trail facilities for pedestrians, bicyclists, and other non-motorized forms of transportation, including sidewalks, bicycle infrastructure, pedestrian and bicycle signals, traffic calming techniques, lighting and other safety-related infrastructure, and transportation projects to achieve compliance with the Americans with Disabilities Act of 1990.
    - Construction, planning, and design of infrastructure-related projects and systems that will provide safe routes for non-drivers, including children, older adults, and individuals with disabilities to access daily needs.
    - Inventory, control, or removal of outdoor advertising.
    - Historic preservation and rehabilitation of historic transportation facilities.
    - Vegetation management practices in transportation rights-of-way to improve roadway safety, prevent against invasive species, and provide erosion control.
    - Any environmental mitigation activity including pollution prevention and pollution abatement activities and mitigation that addresses storm-water management, control, and water pollution prevention. Abatement related to highway construction or due to highway runoff, to reduce vehicle-caused wildlife mortality or to restore and maintain connectivity among terrestrial or aquatic habitats.

  Under this new program, states must spend a portion of its TA funds on recreational trail projects, unless the state opts out of the program. Fifty percent of all TA funding will be distributed based on their total share of the state population. For 2013 the 'Apportionment for Transportation

Alternatives' in Virginia is $21,603,840 out of which $1,527,161 is set aside for Recreational Trails. More information on Map-21 can be found at: http://www.fhwa.dot.gov/map21/tap.cfm

- **Congestion Mitigation and Air Quality (CMAQ) Improvement Program**: This program funds projects that support surface transportation projects and other related efforts that contribute to air quality improvements and provide congestion relief that that will help attain the national ambient air quality standards stated in the 1990 Clean Air Act amendments.

  Each year the funding is available to local areas that do not meet the National Ambient Air Quality Standards (NAAQS) called non-attainment areas or former non-attainment areas that are now in compliance with the NAAQS also called maintenance areas. CMAQ-funded projects may include bicycle and pedestrian facility improvements, bicycle racks and lockers, and roadway improvements that mitigate the amount of time cars are spent idling.

  As of May 2009, five regions (both non-attainment and maintenance areas) in Virginia were eligible for CMAQ funds. These regions include, Northern Virginia, Richmond, Hampton Roads, Fredericksburg, and Shenandoah national park. For more information visit: http://www.fhwa.dot.gov/environment/air_quality/cmaq/

- **Highway Safety Improvements Program (HSIP):** This a new program structured to make significant progress in reducing highway fatalities and serious injuries. It involves identification of high crash locations and provides funding for improvement projects after thorough analysis. This program includes the Bicycle and Pedestrian Safety (BPS) Program which incorporates the previous Hazard Elimination Safety Program (HES).

  The VDOT Traffic Engineering Division (TED) administers these federal funds within the Commonwealth of Virginia. Local governments and VDOT Districts need to submit their safety proposals for locations where improvements are recommended. The candidate projects are selected based on documented risk assessments for non-motorized improvements. Safety enhancement projects using these funds:

  - Should be designed and constructed within three years.
  - Should not require acquisition of significant rights of way.
  - Should not require extensive environmental review and mitigation.

  Details on HSIP application guidelines, deadlines and project selection can be found on the VDOT TED website at: http://www.virginiadot.org/business/trafficeng-default.asp

- **Land and Water Conservation Fund (LWCF):** Projects involving acquisition and development of outdoor recreational areas and facilities like trails are eligible for funding under the LWCF. This program provides up to 50 percent of the matching funds for States and local governments for eligible projects. The LWCF evaluation process ranks land acquisition over other development activities.

  To apply for the grant the state must maintain and update a statewide recreation plan. The Commonwealth of Virginia distributes the funds through the Department of conservation and Recreation. A document outlining the application process can be accessed from

http://www.dcr.virginia.gov/forms/DCR199-110.pdf. More information about the state program can be found at http://www.dcr.virginia.gov/recreational_planning/lwcf.shtml and information on the national program can be accessed from: http://www.nps.gov/lwcf/

State

- **Virginia Recreational Trails Program (RTP):** RTP is a matching reimbursement grant program that provides for the creation and maintenance of recreational trails. It is an assistance program of the Department of Transportation's Federal Highway administration, and is administered through the Virginia Department of Conservation and Recreation. RTP funds are available to fund trails for hiking, bicycling, in-line skating, equestrian use, cross-country skiing, snowmobiling, and four-wheel driving. RTP grants are for projects with primarily recreational value rather than those with more utilitarian transportation value. Some of the activities RTP funds can be used for include:
    - Development and rehabilitation of trailside and trailhead facilities and trail linkages.
    - Purchase and lease of trail construction and maintenance equipment.
    - Construction of new trails (with restrictions for new trails on Federal lands).
    - Acquisition of easements or property for trails.
    - Assessment of trail conditions for accessibility and maintenance.
    - Development and dissemination of trail related publications.
    - Educational programs to promote trail safety and environmental protection.

  The application process for this funding is two-stage. It requires a preliminary application in Word format, and only applications selected from the preliminary round will be required to complete the second proposal phase. The second phase requires the completion of the Proposal Description and Environmental Screening Application. Grant awards are usually made for between $25,000 and $100,000.

  For the detailed application process in Virginia visit http://www.dcr.virginia.gov/recreational_planning/trailfnd.shtml and for national information visit http://www.fhwa.dot.gov/environment/rectrails/

- **Recreational Access Program (RAP):** RAP is a funding program to provide adequate access to recreational areas or historic sites operated by the Commonwealth of Virginia, a local government, or an authority.

  This program is administered by the Commonwealth Transportation Board (CTB) with the concurrence of the Director of the Department of Conservation and Recreation and/or Director of the Department of Historic Resources. Prior to the allocation of the funds, the local (county, city, or town) governing body must request the access funds.

    - Recreational Access Program funding may not be used for the acquisition of rights of way or adjustments of utilities.
    - The access project should end either at the entrance to the area or at an internal parking lot serving the park facility or historical area.

- Recreational bikeways are expected to be open to the public at all times.
- No fee may be charged for the use of these roads or bikeways.
- These funds are intended for eligible costs associated with design and construction of bikeways.

For a bikeway to a facility operated by a state agency, the maximum unmatched funds allocated are $75,000. If the facility is operated by a locality or an authority, a maximum of $60,000 unmatched funds may be allocated. Up to an additional $15,000 may be requested if matched on a dollar-for-dollar basis by the locality or authority.

Additional information is available in the current guide for the Recreational Access Program and on the VDOT website at: http://www.virginiadot.org/business/local-assistance-access-programs.asp

- **Revenue Sharing Program:** The purpose of this program is to provide additional funding for use by a county, city, or town to construct, reconstruct, or improve the highway systems. Locality funds are matched with state funds with statutory limitations on the amount of state funds authorized per locality.

  Towns not maintaining their own streets are not eligible to receive revenue sharing funds directly; their requests must be included in the application of the county in which they are located. Construction may be accomplished by VDOT or by the locality under agreement by VDOT.

  The Revenue Sharing Program is intended to provide funding for relatively small, immediately needed improvements or to supplement existing projects. Funds are normally expected to be used in the same fiscal year they are received. Funds may be de-allocated if the project is not initiated within three years. Below is a list of work that could be considered eligible for Revenue Sharing financing:

  - Deficits on completed VDOT administered construction or improvement projects.
  - Supplemental funding for projects listed in the adopted Six-Year Plan and ongoing construction or improvement projects/
  - Construction or improvements included in either the adopted Six-Year Plan or the locality's capital plan.
  - Improvements necessary for the acceptance of specific subdivision streets otherwise eligible for acceptance into the system for maintenance.
  - New hard surfacing (First Paving).
  - New Roadway included in a locally adopted plan.

  Details on application deadlines and project selection can be found on the VDOT website at: http://www.virginiadot.org/business/local-assistance-access-programs.asp#Revenue_Sharing

Local and Public Sources

- **City and County Governments:** Cities and counties can finance trail development through their normal capital improvement processes.

- **Natural Resources Districts:** NRDs have been identified as major participants in the trails development process because of their interest in resource conservation and drainage way. NRDs levy property taxes and use these proceeds for capital development projects.
- **Sanitary and Improvement Districts**: SIDs are a financing tool for subdivisions, allowing developers to issue general obligation bonds to finance public improvements (including parks and trails) serving their developments.
- **Tax Increment Financing (TIF):** TIF uses added tax revenues created by a redevelopment project to finance project-related improvements, including public open spaces and trails.

Public-Private Partnership

Based on the experiences of multi-modal planners in the State of Virginia, trails are often initiated and built using agreements between private developers and public planning agencies. This planning document can make partnering with private parties more likely in the future. The recommendations in this plan of bike and pedestrian accommodations serve as a guide for nearby developers, and provide a basis for private funding as described below.

The Gloucester County should look for opportunities to partner with private sector elements to develop seamless pedestrian and bike network that evolve with the community. Some of the avenues through which a public-private partnership can be established are as follows:

- Private builders and businesses are required to fund bike/pedestrian facilities by providing easement and/or building a part or complete facility as a part of proffers agreement for new development where a bike/pedestrian accommodations has been planned as per the community's comprehensive plan/other planning documents.
- In some cases, private developers may be willing to fund bike/pedestrian projects lead by the public sector:
    - In exchange of open space and/or park credits, and traffic credits toward the impacts of new development.
    - If the business believes that the trail improves the quality of life for their employees or improves the value of their property.
    - If it brings more business to the establishment and helps with the commercial development
    - As a marketing effort for the business in exchange of plaques along the trail crediting the donating party.
- Selling the utility easements along bike/pedestrian sections to utility companies can provide funding necessary for the construction, maintenance and establishment of other trail sections.
- Sanitary and Improvement Districts are a financing tool for subdivisions, allowing developers to issue general obligation bonds to finance public improvements (including park, trails and sidewalks) serving their developments.

Private Financing

- Local non-profit organizations have raised money in the past for planning and construction of trails.
- Local environmental land trusts have raised funds to purchase land for trail development.
- Private builders, businesses, and corporations have realized the importance of trails and recreational spaces in developing a strong community and positive work environment. Financial support for local trails helps the businesses develop a good rapport with the community while the community is also benefited by the new facilities, making it a win-win situation.