

Corridor Improvement Study
North Franklin Street

US Route 460 Business

From Cambria Street to Independence Boulevard
Town of Christiansburg, Virginia



Prepared for the
New River Valley Metropolitan Planning Organization

By
Whitman, Requardt & Associates, LLP

June 9, 2014



Whitman, Requardt and Associates
Engineers and Planners





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TABLE OF CONTENTS

EXECUTIVE SUMMARY 1

INTRODUCTION 2

EXISTING CONDITIONS 3

 Corridor Description 3

 Upcoming Projects 4

 Traffic Volumes 4

 Crash Analysis 5

 Traffic Operational Analysis 6

PROPOSED CORRIDOR IMPROVEMENTS 8

 Safety and Operational Improvements 8

 Access Management Improvements 10

 Multi-Modal Improvements 11

SUMMARY OF FINDINGS/CONCLUSION 12

APPENDIX A A-1

APPENDIX B B-1

APPENDIX C C-1

APPENDIX D D-1



EXECUTIVE SUMMARY

The New River Valley Metropolitan Planning Organization (MRV-MPO) requested a study of the US Route 460 Business (North Franklin Street) corridor in the Town of Christiansburg from the Cambria Street intersection through the Independence Boulevard intersection. The corridor was reviewed to identify potential safety and operational improvements, locations where access management strategies should be used, potential multi-modal improvements and to integrate recommended improvements with potential long-term projects that will impact the North Franklin Street corridor in the future.

Safety and Operational Improvements

A review of crash data indicated two high crash intersections within the study corridor. The first location is the intersection of North Franklin Street at Cambria Street. A planned intersection improvement project will help to address the crash frequency at this intersection. The second location is at the entrance to the Northgate Village shopping center. Angle crashes involving left-turning traffic exiting the shopping center are the most predominant crash type. The recommendation is to close the existing median to all but southbound left-turns from North Franklin Street into the shopping center. Left-turning traffic exiting the shopping center would access North Franklin Street via the adjacent traffic signal at the Cambria Street intersection.

Operational improvements were identified for the intersection of North Franklin Street at Ellett Road, where additional access points to both Horne Funeral Home and Christiansburg High School are located, resulting in a five-leg intersection with a large median opening. The recommendation is to realign the entrance to Horne Funeral Home so it shares a single access point with Christiansburg High School, creating a standard four-leg intersection. This would be combined with reducing the size of the median opening and lengthening the northbound left-turn lane from North Franklin Street to the shared entrance of Horne Funeral Home and Christiansburg High School.

Access Management Improvements

Access management improvements were identified along the southbound lanes of North Franklin Street between Cambria Street and Patricks Way. The recommendation is to consolidate access points to the Christiansburg Recreation Center and private businesses from five to two. The existing entrance roadway between the Recreation Center and Foothills Plaza would remain open. The other access points, including Patricks Way, would be closed, with a new access road being constructed approximately 125 feet north of the existing Patricks Way, which would be removed. This location is consistent with the future location for the Route 114 Peppers Ferry Connector. Construction of the new consolidated access will also require relocating the entrance to Trinity Baptist Church and closing the median opening at Central Avenue to accommodate required turning lanes at the new intersection.

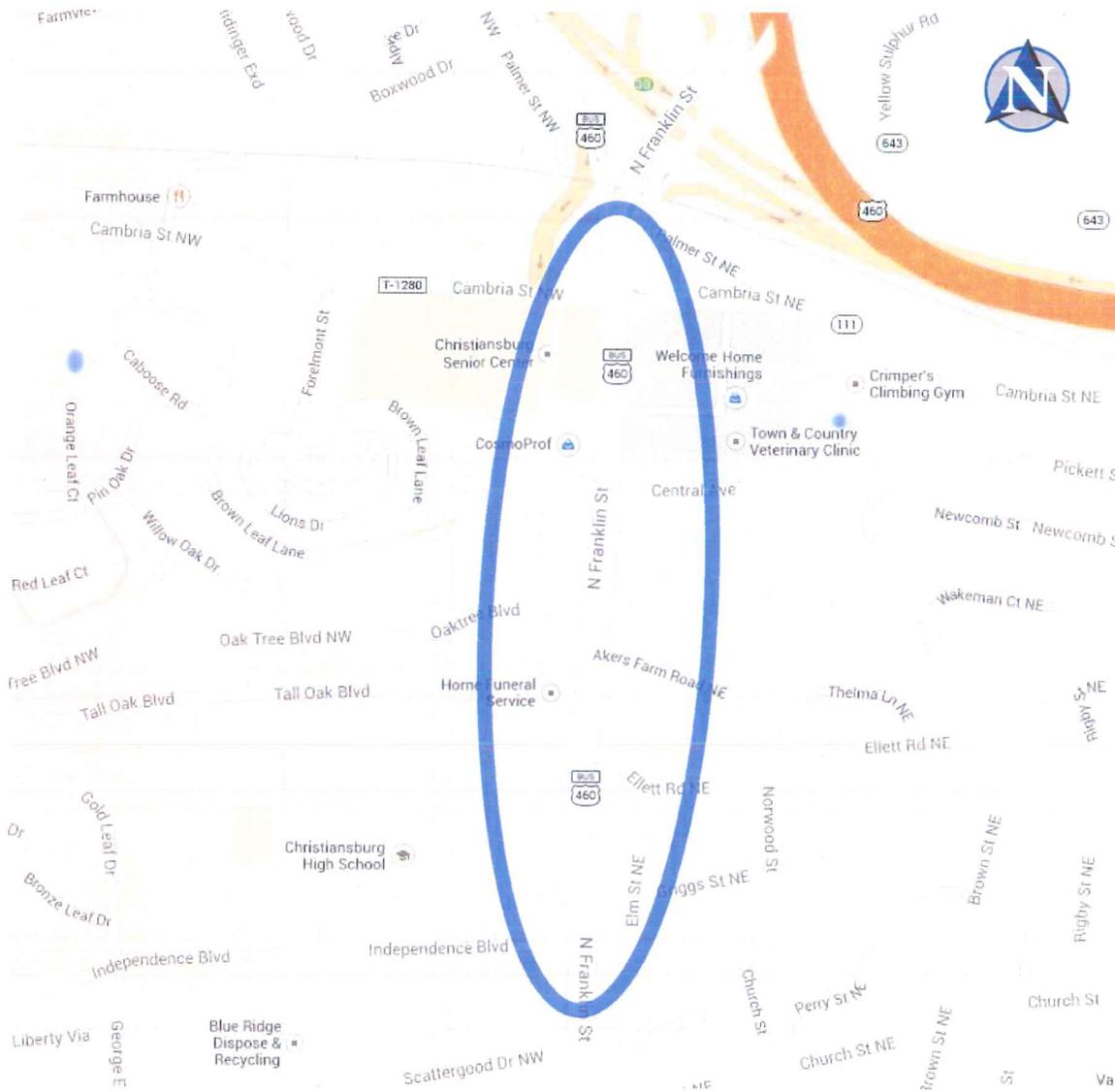
Multi-Modal Improvements

Sidewalks are recommended along both sides of North Franklin Street to connect existing sidewalk segments within the study area, and to connect to the proposed Huckleberry Trail Extension near Christiansburg High School. Actuated pedestrian crossings of North Franklin Street are recommended at the existing signalized intersections and at the location for the new access road north of the existing Patricks Way when a traffic signal becomes warranted. Existing bus stops will also be relocated.



INTRODUCTION

This study evaluates the operational and safety characteristics of the North Franklin Street corridor from Cambria Street to Independence Boulevard within the Town of Christiansburg, as shown in the map below. This study was conducted to develop recommendations to improve traffic safety and operations along the North Franklin Street corridor, including access management strategies to facilitate safety and operational improvements within the corridor study area. Multi-modal transportation along the corridor was also reviewed to identify recommended improvements. The study need is driven by existing traffic volumes and patterns, along with safety and access management concerns.





EXISTING CONDITIONS

Corridor Description

North Franklin Street extends from downtown Christiansburg to the south to the corporate limits with Montgomery County to the north, and serves as an urban minor arterial. In the study area, North Franklin Street is a four-lane, divided roadway posted with a 45 MPH speed limit. The roadway primarily has shoulder and ditch sections, but in certain areas adjacent to new developments there are short segments of curb and gutter with sidewalks. North Franklin Street directly serves numerous commercial businesses, professional offices, a church, a funeral home, the Christiansburg Recreation Center, and Christiansburg High School within the study area. Adjacent residential developments access North Franklin Street via Cambria Street, Patricks Way, Ellett Road, Elm Street, and Independence Boulevard.



North Franklin Street looking south from the Cambria Street Intersection

There are two primary intersections within the study area. At the northern end of the corridor is the signalized intersection with Cambria Street and the US Route 460 Bypass off-ramp, which is a five-leg intersection. Northbound North Franklin Street has two exclusive through lanes, a shared through-right lane, and an auxiliary left-turn lane. Southbound North Franklin Street has one through lane and one shared through-right lane. Left-turns from southbound North Franklin Street to Cambria Street must utilize the jughandle ramp in the northwest quadrant of the intersection. The southbound US 460 Bypass off-ramp has a shared through-right lane and an exclusive left-turn lane. Eastbound Cambria Street has an exclusive left-turn lane, a shared left-through lane, and an auxiliary right-turn lane. Westbound Cambria Street has one through lane, an auxiliary left-turn lane, and an auxiliary right-turn lane with slip ramp to northbound North Franklin Street.

At the southern end of the corridor is the signalized intersection with Independence Boulevard and Elm Street. North Franklin Street has two through lanes along with both left- and right-turn auxiliary lanes in both directions. Independence Boulevard has a short auxiliary left-turn lane, a single through lane, and an exclusive right-turn lane. Elm Street is a single shared lane for left, through, and right turning movements.



Upcoming Projects

Two short-term projects are planned for the study area of North Franklin Street that will impact the corridor. The first is a planned improvement project at the Cambria Street intersection, which will realign the US Route 460 Bypass ramp to a T-intersection with southbound North Franklin Street, approximately 600 feet north of the existing Cambria Street intersection. This improvement will change the Cambria Street intersection to a traditional 4-leg signalized intersection, improving traffic operations and safety at this location. The proposed improvements were incorporated into the future build analysis for this study.

The second planned project is the extension of the Huckleberry Trail from Cambria Street to Independence Boulevard, where it will connect to an existing sidewalk that extends into downtown Christiansburg. The currently proposed trail alignment would parallel North Franklin Street at the southern end of the study corridor near Christiansburg High School.

Long term, a connector road from North Franklin Street to Peppers Ferry Road (State Route 114) has been proposed. The Route 114 Connector would connect to North Franklin Street just north of the existing Patricks Way and extend to the west and north through a reserved right-of-way. As part of that project, Patricks Way would be removed and the entrance to Trinity Baptist Church would be shifted to the north, to connect to the new intersection. Traffic impacts resulting from this new roadway were not analyzed as a part of this study.

The locations for these projects are depicted in an overview map of the northern areas of the Town of Christiansburg, located in Appendix D.

Traffic Volumes

Peak hour turning movement counts were collected along the corridor during the AM, Midday, and PM peak hours by Peggy Malone and Associates in September 2013, as a part of this study. Raw data for the counts is contained in Appendix A. AM and PM peak hour counts are depicted at each intersection and commercial entrance along the corridor in a graphic contained at the end of Appendix A.

48-hour bi-directional counts were also collected along the corridor in September 2013 when turning movement count data was collected. These counts indicated an average weekday traffic volume of 28,600 vehicles per day. Raw data for the counts is contained in Appendix A.

Past historical Virginia Department of Transportation (VDOT) data indicates Annual Average Daily Traffic (AADT) volumes of 29,000 in 2010, 28,000 in 2007, and 28,000 in 2004. Count data from before 2004 was not utilized due to the opening of the Route 460 Bypass, which altered traffic patterns and volumes in the area. The historical traffic data indicates low annual growth in traffic volumes within the study corridor. An annual growth rate of 0.5% was utilized for the purpose of analyzing the future no-build and proposed improvements for a design year of 2024.



Crash Analysis

Detailed crash report data along the North Franklin Street corridor within the study area was provided by the Town of Christiansburg, for the time period of April 1, 2010 through July 31, 2013, a period of 3 years and 4 months. The crash data indicated that North Franklin Street experiences a higher than average crash rate compared to similar urban minor arterials. However, due to the short length of the corridor and the presence of two signalized intersections, the corridor crash rate is not an accurate representation of corridor safety.

Individual crash reports for each intersection and commercial entrance along the corridor were examined, to determine where higher crash locations were located and to determine any crash patterns that might be improved through safety, operational, or access management improvements along the corridor. Crash data indicated two intersections with a high number of crashes. Summarized crash data is provided in the same graphic as peak hour turning movement counts, and is located in Appendix A.

The first location is the Cambria Street intersection, which had a total of 30 reported crashes within the time period reviewed. The majority of crashes were rear-end collisions, with 19 total among all approaches near the intersection. 9 angle or sideswipe crashes occurred involving southbound traffic from North Franklin Street or the US Route 460 Bypass off-ramp either disregarding the traffic signal or performing a prohibited turning movement. The planned intersection improvements should serve to reduce the angle and sideswipe crashes at this intersection. Additionally, improved intersection operations resulting in reduced delays and queues may also help to reduce the frequency of rear-end crashes.



US Route 460 Bypass Off Ramp and Southbound North Franklin Street approaching the Cambria Street Intersection



The second high crash location is the entrance to the Northgate Village shopping center, which had a total of 16 reported crashes within the time period reviewed. The majority of crashes were angle collisions, with 14 total occurring in the intersection. 10 of the angle crashes involved traffic turning left out of Northgate Village to southbound North Franklin Street. Of those 10 crashes, 8 involved vehicles being struck by northbound traffic on North Franklin Street, with 2 being struck by southbound traffic. One of the other crashes was pedestrian-related, resulting in a fatality to the pedestrian crossing North Franklin Street.



Left-turning vehicle from Northgate Village blocking northbound North Franklin Street and southbound left-turn lane

Additionally, the intersection of Patricks Way had a total of 7 reported crashes within the time period reviewed. The majority of crashes were angle collisions, with 5 total occurring at the intersection, with all 5 of those crashes involving traffic entering North Franklin Street from Patricks Way, being struck by a vehicle traveling southbound on North Franklin Street.

Traffic Operational Analysis

Traffic operational and capacity analysis was conducted using Synchro Version 8.0 to assess traffic operations along the North Franklin Street corridor within the study area for both signalized and unsignalized intersections. Signal timing data was provided by VDOT and the Town of Christiansburg for use in the analysis, and is contained in Appendix A.

Analysis of the existing 2014 existing traffic conditions for the North Franklin Street corridor revealed that significant delays and poor levels of service exist at both signalized intersections within the study area. The Cambria Street intersection experiences particularly poor levels of service and high delays due to the 5-leg configuration which requires the US Route 460 Bypass Off Ramp and both legs of Cambria Street to operate split phased from all other traffic movements within the intersection.

Analysis of the future 2024 No Build traffic conditions for the North Franklin Street corridor was conducted to analyze future traffic operational conditions assuming no roadway improvements along



the corridor. Analysis results indicate that without roadway improvements along the corridor, signalized intersection delays will increase above existing 2014 conditions, with worsening levels of service.

Analysis of the future 2024 Build conditions for the North Franklin Street corridor was conducted to analyze future traffic operational conditions, accounting for both the planned improvements to the Cambria Street intersections and the improvements proposed as a part of this study and detailed in the following section of this report. Analysis results indicate significant improvements in delays and levels of service at the signalized intersections along the corridor, particularly when combined with the development of coordinated traffic signal timings within the study area.

Table 1 summarizes the results of the capacity, delay, and level of service results based on Highway Capacity Manual signalized intersection methodology outputs from Synchro. Detailed traffic analysis results are contained in Appendix C.

TABLE 1- Signalized Intersection V/C Ratio, Delay, and Level of Service Summary

Intersection	Design Year	Peak Hour	Overall Intersection		
			Volume/ Capacity Ratio	Avg. Delay (sec)	Level of Service
US Route 460 Bypass Off Ramp at North Franklin Street	2014 Existing	AM	N/A	N/A	N/A
		PM	N/A	N/A	N/A
	2024 No Build	AM	N/A	N/A	N/A
		PM	N/A	N/A	N/A
	2024 Build	AM	0.17	16.4	B
		PM	0.72	22.7	C
North Franklin Street at Cambria Street	2014 Existing	AM	0.89	76.0	E
		PM	0.98	131.2	F
	2024 No Build	AM	0.92	84.0	F
		PM	1.03	140.2	F
	2024 Build	AM	0.78	36.1	D
		PM	0.85	57.6	E
North Franklin Street at Independence Boulevard / Elm Street	2014 Existing	AM	0.86	69.4	E
		PM	0.81	91.1	F
	2024 No Build	AM	0.91	75.7	E
		PM	0.85	103.5	F
	2024 Build	AM	0.88	51.0	D
		PM	0.80	39.4	D



Projected traffic volumes resulting from the change in access patterns to the commercial properties along southbound North Franklin Street will consolidate traffic volumes that currently use five separate entrances. A significant amount of that traffic will utilize the new connector road, which would replace the existing Patricks Way, connecting North Franklin Street to Oak Tree Boulevard. Traffic volumes at the new intersection, resulting from access consolidation, would not warrant construction of a traffic signal. 2014 Existing, 2024 No Build, and 2024 Build analysis results indicate high levels of delay and poor levels of service, particularly during the PM Peak Hour when conflicting traffic volumes are at their highest.

However, this new connector road will eventually connect to the Route 114 Connector, which will likely result in an increase in traffic volumes utilizing the new connection in the longer term, which will likely warrant the construction of a traffic signal at this location. In the meantime, this intersection should continue to be monitored as additional residential and commercial development occurs to determine if and when a traffic signal may be warranted prior to the construction of the Route 114 Connector.

Table 2 summarizes the results of the capacity, delay, and level of service results based on Highway Capacity Manual unsignalized intersection methodology outputs from Synchro. Detailed traffic analysis results are contained in Appendix C.

TABLE 2 – Patricks Way V/C Ratio, Delay, and Level of Service Summary (Unsignalized)

Intersection	Design Year	Peak Hour	Eastbound Patricks Way (Future Route 114 Connector)		
			Volume/ Capacity Ratio	Avg. Delay (sec)	Level of Service
North Franklin Street at Patricks Way (Future Route 114 Connector)	2014 Existing	AM	0.76	49.3	E
		PM	1.53	152.6	F
	2024 No Build	AM	0.91	66.1	F
		PM	2.04	224.9	F
	2024 Build	AM	1.03	81.4	F
		PM	2.52	231.7	F

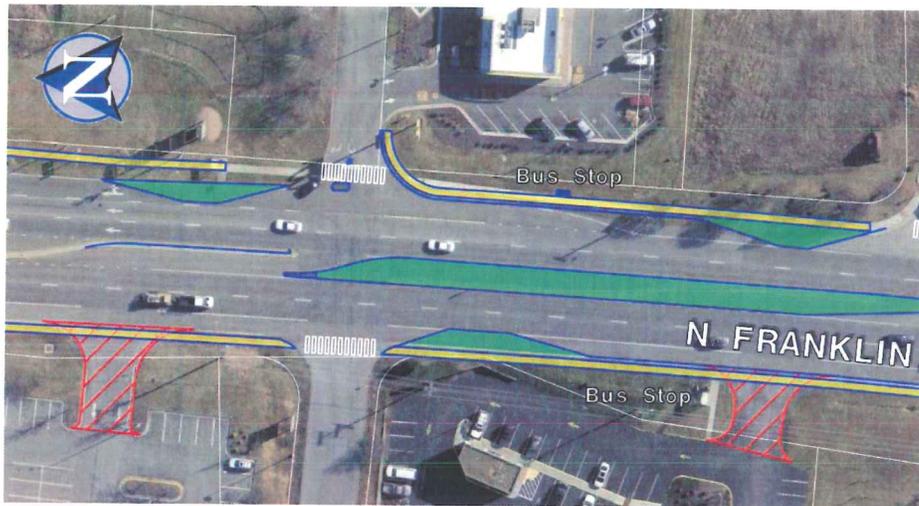
PROPOSED CORRIDOR IMPROVEMENTS

Safety and Operational Improvements

The intersection of North Franklin Street with Cambria Street and the US 460 Bypass Off-Ramp experiences the highest number of crashes and the most congestion of any intersection within the study corridor. The 5-leg configuration, with southbound North Franklin Street and the US Route 460 Bypass Off-Ramp entering the intersection parallel to each other frequently results in drivers either disregarding their applicable traffic signal, or being confused by the intersection configuration, resulting in a large number of angle and sideswipe crashes. Further, the congestion results in a large number of rear-end crashes both at the intersection, and further from the intersection due to the long queues. Two previous studies have been conducted for this location and have recommended the realignment of the US Route 460 Bypass Off-Ramp to a new signalized intersection with southbound North Franklin Street, approximately 600 feet to the north of the existing intersection. This proposed project would significantly improve traffic operations at the existing intersection by reducing queues and delays, and would also likely result in a reduction in crashes.

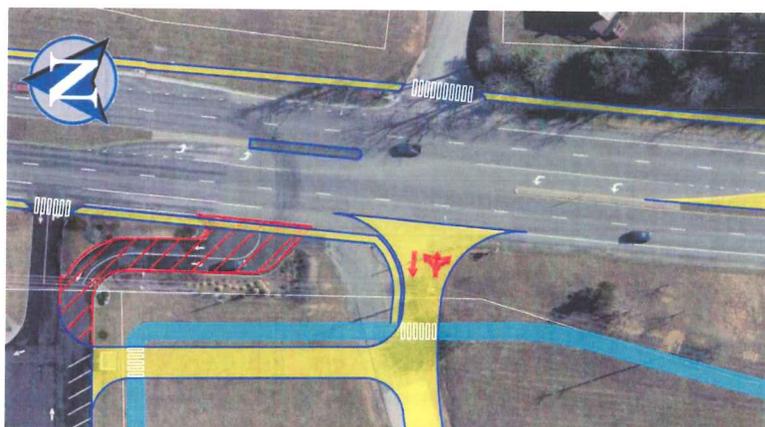


At the Northgate Village shopping center, where angle crashes involving traffic exiting the shopping center are common, the partial closure of the existing median is recommended to improve safety. Specifically, the existing median would be closed to all but southbound North Franklin Street traffic turning into Northgate Village. Left-turning traffic exiting Northgate Village would be able to access North Franklin Street via the adjacent traffic signal at the Cambria Street intersection. Left-turning traffic to and from the west side of North Franklin Street is relatively low, and an alternate access location to the south can be utilized. Additionally, bump-outs in the northbound right-turn lane are proposed to improve safety by restricting drivers from bypassing through traffic queues in the right-turn lane.



Proposed safety improvements to the Northgate Village shopping center entrance

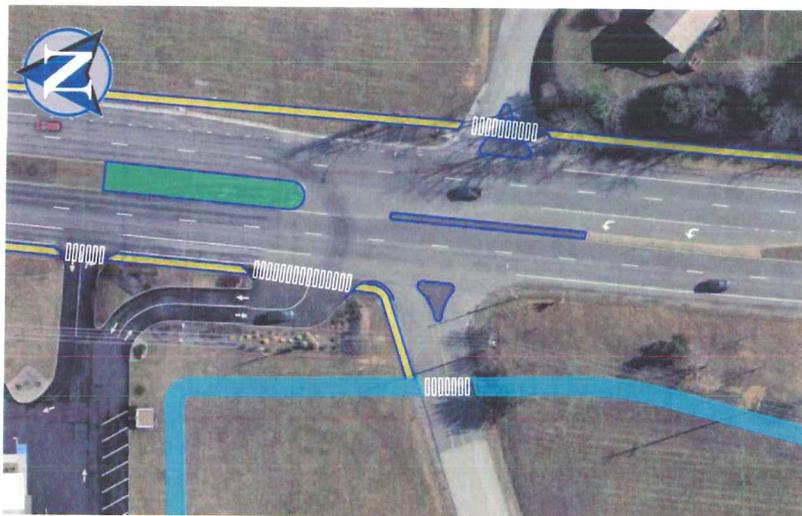
Operational improvements were identified for the intersection of North Franklin Street at Ellett Road, where access to both Horne Funeral Home and Christiansburg High School are located, which is a five-leg intersection with a large median opening. Crash frequency is relatively low at this location; however, the configuration of the intersection is atypical. The preferred improvement is to realign the primary access to Horne Funeral Home so it shares a single access point with Christiansburg High School. This would create a standard four-leg intersection. The size of the existing median opening would be reduced, and the northbound left-turn lane from North Franklin Street to the shared entrance of Horne Funeral Home and Christiansburg High School would be lengthened.



Preferred operational improvements at Ellett Road / Horne / Christiansburg High School entrance



An alternate improvement was also developed for this location that would not require realignment of the Horne Funeral Home entrance through a portion of Christiansburg High School property. This improvement alternative would extend the existing divided median further to the north to restrict left-turning movements both in and out of Ellett Road and Christiansburg High School. The southbound left-turn lane to Ellett Road would be removed, with this traffic utilizing the signalized intersection at Independence Boulevard to turn left onto Elm Street. Left-turning traffic exiting Christiansburg High School and Ellett Road would also utilize the signalized intersection at Independence Boulevard. Right turns into and out of both Christiansburg High School and Ellett Road would continue to be permitted. However, it may be possible that undesirable U-turns or movements across opposing lanes could occur with this intersection configuration, which may result in an increased frequency of crashes.



Alternate improvement option at Ellett Road / Horne / Christiansburg High School entrance

Access Management Improvements

Potential locations where access management strategies could be utilized were identified along the southbound lanes of North Franklin Street between Cambria Street and Patricks Way. Presently, there are five access points to properties to the west side of North Franklin Street within this area. Several of these entrances serve low volumes of traffic primarily as right-in right-out entrances. Recommendations include closing the entrances to the Christiansburg Recreation Center and Foothills Plaza, consolidating traffic from those two entrances to the existing shared entrance located between the Recreation Center and Foothills Plaza. As part of these improvements, a new public right of way is recommended to connect the Recreation Center parking lot to Oak Tree Boulevard, to provide access from a public street to both the Food Lion shopping center and the outparcel developments along North Franklin Street.

Further to the south, the entrance to Davidson's Pharmacy would be closed, and Patricks Way would be closed and removed. To replace these access points, a new access road connecting North Franklin Street to Oak Tree Boulevard would be constructed approximately 125 feet to the north of the existing Patricks Way. This new access road would be located where the future Route 114 Connector is planned to intersect North Franklin Street. This new connection will require relocating the entrance to Trinity Baptist Church to align it with the new access roadway. Additionally, the existing median opening at Central Avenue will be closed to accommodate the required turning lanes at the new intersection.



Access Management consolidation improvements from Christiansburg Recreation Center to Patricks Way

The Akers Farm Road median opening was reviewed for potential safety, operational, or access management improvements. This intersection experiences a low frequency of crashes and restriction of access would increase the frequency of U-turns at other intersections, potential increasing the crash risk at adjacent locations.

A decision matrix was developed to evaluate existing median openings and access locations to review the impacts to traffic operations, access and traffic circulation, vehicular conflicts, and vehicular safety based on potential strategies at each location. The decision matrix is contained in Appendix B.

Multi-Modal Improvements

To create a more pedestrian friendly corridor within the study area, construction of new sidewalks are recommended along both sides of North Franklin Street. These would connect existing segments of sidewalks that have been constructed with newer developments to create a continuous sidewalk network into downtown Christiansburg. Along the southbound lanes, the proposed sidewalk would connect to the proposed Huckleberry Trail Extension in the vicinity of Christiansburg High School. Proposed sidewalk and trail locations and alignments are depicted in the recommended improvements contained in Appendix D.

To facilitate pedestrian and bicycle movements across North Franklin Street, actuated signalized pedestrian crossings of North Franklin Street are recommended across the southern legs of the intersections of Cambria Street and Independence Boulevard at the existing traffic signals. An actuated signalized pedestrian crossing is also recommended across the southern leg of the intersection future Route 114 Connector road when a traffic signal becomes warranted.

To accommodate the proposed sidewalk and roadway improvements, it will be necessary to shift the locations of the Blacksburg Transit stops along both sides of North Franklin Street to locations where buses may safely pull out of the mainline through lanes for passenger loading and unloading. Proposed locations for these stops are depicted in the recommended improvements contained in Appendix D.



SUMMARY OF FINDINGS/CONCLUSION

The proposed improvements for the US Route 460 (North Franklin Street) corridor will serve to improve roadway safety and vehicular operations by reducing the number of conflict points, and to provide for multi-modal transportation options within the study area by providing a connected network of pedestrian and bicycle facilities that will access transit stops along with residential, commercial, and recreational destinations along the corridor. Improvements are depicted graphically in Appendix D

Safety improvements recommended as a part of this study should be broken out into a stand-alone project to potentially qualify for Highway Safety Improvement Program (HSIP) funding through VDOT. The recommended safety improvements are related to the Northgate Village shopping center access and specifically include:

- Restrict the existing median opening to only southbound left-turn traffic
- Convert the exit lane from Northgate Village to right-out only
- Construct bump outs in the northbound through lane to restrict drivers from utilizing the right-turn lanes as a through movement

Operational, access management, and multi-modal improvements recommended as a part of this study could also be broken out into a stand-alone projects.

Operational improvements should occur within a singular construction project and include:

- Reconstruct the Horne Funeral Home Entrance to connect to a slightly realigned Christiansburg High School entrance road
- Extend the existing median for the southbound left-turn lane to reduce the median opening
- Extend the existing northbound left-turn lane to provide additional storage length for vehicles

Access management improvements should occur within a singular construction project and include:

- Construct a new access roadway approximately 125 feet north of the existing Patricks Way, connecting North Franklin Street to Oak Tree Boulevard
- Close and remove the existing Patricks Way
- Close the existing entrances at the Christiansburg Recreation Center, Foothills Plaza, and Davidson's Pharmacy. Provide access to these developments via a new public right of way.

Multi-modal improvements could occur as either a single project, or as segmental projects, and include:

- Construct sidewalks along both northbound and southbound North Franklin Street, connecting to existing sidewalk segments, the proposed Huckleberry Trail extension, and the relocated Blacksburg Transit bus stops

The long-term projects planned for the North Franklin Street corridor area to extend the Huckleberry Trail will further improve multi-modal transportation options within the study area. The proposed future Route 114 Connector will have a significant impact on traffic volumes and patterns within the study area. It may be possible that this new roadway could serve to reduce traffic volumes, which would likely have a further positive impact for improving safety and vehicular operations within the study area.





NRV MALL

PEPPERS FERRY RD.



HUCKLEBERRY EXTENSION

WALMART

ROUTE 450

SPRADLIN FARM

N. FRANKLIN ST.

PROPOSED PEPPERS FERRY RD. & N. FRANKLIN ST. CONNECTOR

PROPOSED ROUTE 450 EXIT REALIGNMENT

CAMERIA ST.

RECREATION CENTER

PROPOSED HUCKLEBERRY EXTENSION

N. FRANKLIN ST.

OAK TREE

PROPOSED HUCKLEBERRY EXTENSION

C. H. S.

INDEPENDENCE BLVD.

