CARPENTER MARTY transportation

WV-51 Feasibility Study

Final Report

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Table of Contents

List of Appendices

I. Executive Summary

A. Purpose and Background

The purpose of this study is to determine the feasibility of traffic safety and pedestrian mobility improvements throughout the WV-51 corridor study area, also known as Martin Luther King (MLK) Jr. Blvd and W. Washington Street in Charles Town, West Virginia. The study was initiated and sponsored by the West Virginia Division of Highways (DOH), Hagerstown/Eastern Panhandle Metropolitan Planning Organization (HEPMPO), and the City of Charles Town.

B. Existing Capacity and Safety Concerns

The most notable crash trend is the rear end crashes on the westbound approach of the Y-intersection. This is expected to be due to the "EXCEPT WHEN TURNING RIGHT" regulatory sign that is posted under the stop sign on this approach. Therefore, the existing intersection operation is not recommended to be maintained.

Capacity analysis assumed all-way stop-controlled operations at the Y-intersection, without the continuous westbound right turn movement, due to software constraints. The results show an LOS F for the westbound approach during the PM peak with 2019 count data, and excessive delays by 2039. It is expected the current delays are not as excessive as is shown in the capacity analysis results. This does show the intersection would not function if it was a true all-way stop-controlled intersection. Furthermore, signal warrants are not currently met with 2019 count data or 2039 Design Year volumes. For this reason, other intersection improvements were considered.

C. Countermeasures Considered

Many countermeasures and improvements were recommended for consideration throughout the WV-51 study area. Major alternatives are listed first, followed by countermeasure improvements which are common for all alternatives. The countermeasures listed may be implemented together or may be independent solutions. The countermeasures are not necessarily recommended to be implemented concurrently. Countermeasures and improvements include:

- Alternative 1: Install roundabout at WV-51 & CR-13 Y-intersection
- Alternative 2: Install new connector road with CR-13 intersection approach stubbed
- Alternative 3: Install new connector road with one-way conversion
- On-street parking improvements
- Pedestrian infrastructure improvements
- Bicycle infrastructure improvements
- Access management improvements
- West Street intersection improvements
- Stormwater management improvements
- Norfolk Southern (NS) Railroad crossing improvements
- Roadway lighting improvements
- Landscaping improvements
- Relocate existing overhead utilities underground

D. Recommendations

All alternatives show an improvement compared to the No Build option. As described, there are many positive and negative aspects associated with all three alternatives. It is recommended all three alternatives be advanced to the next stage of the National Environmental Policy Act (NEPA) process.

II. Purpose and Background

The purpose of this study is to determine the feasibility of traffic safety and pedestrian mobility improvements throughout the WV-51 corridor study area, also known as MLK Jr. Blvd and W. Washington Street in Charles Town, West Virginia. The study was initiated and sponsored by the West Virginia DOH, HEPMPO, and the City of Charles Town.

A project location map is provided in **Figure 1.** An aerial of the study area is provided in **Figure 2**, with the study intersections marked with red dots.

Figure 1 - Project Location Map

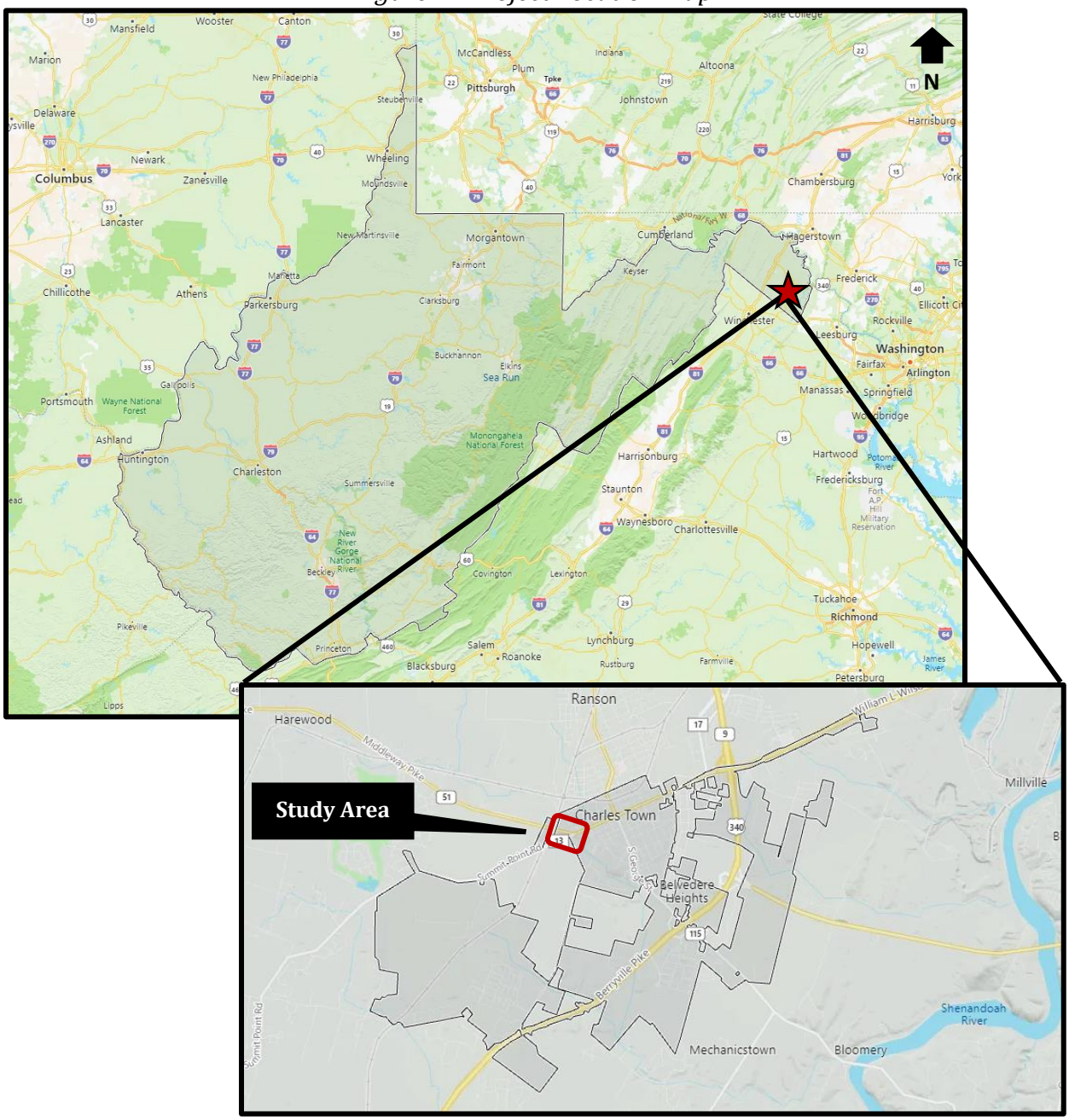
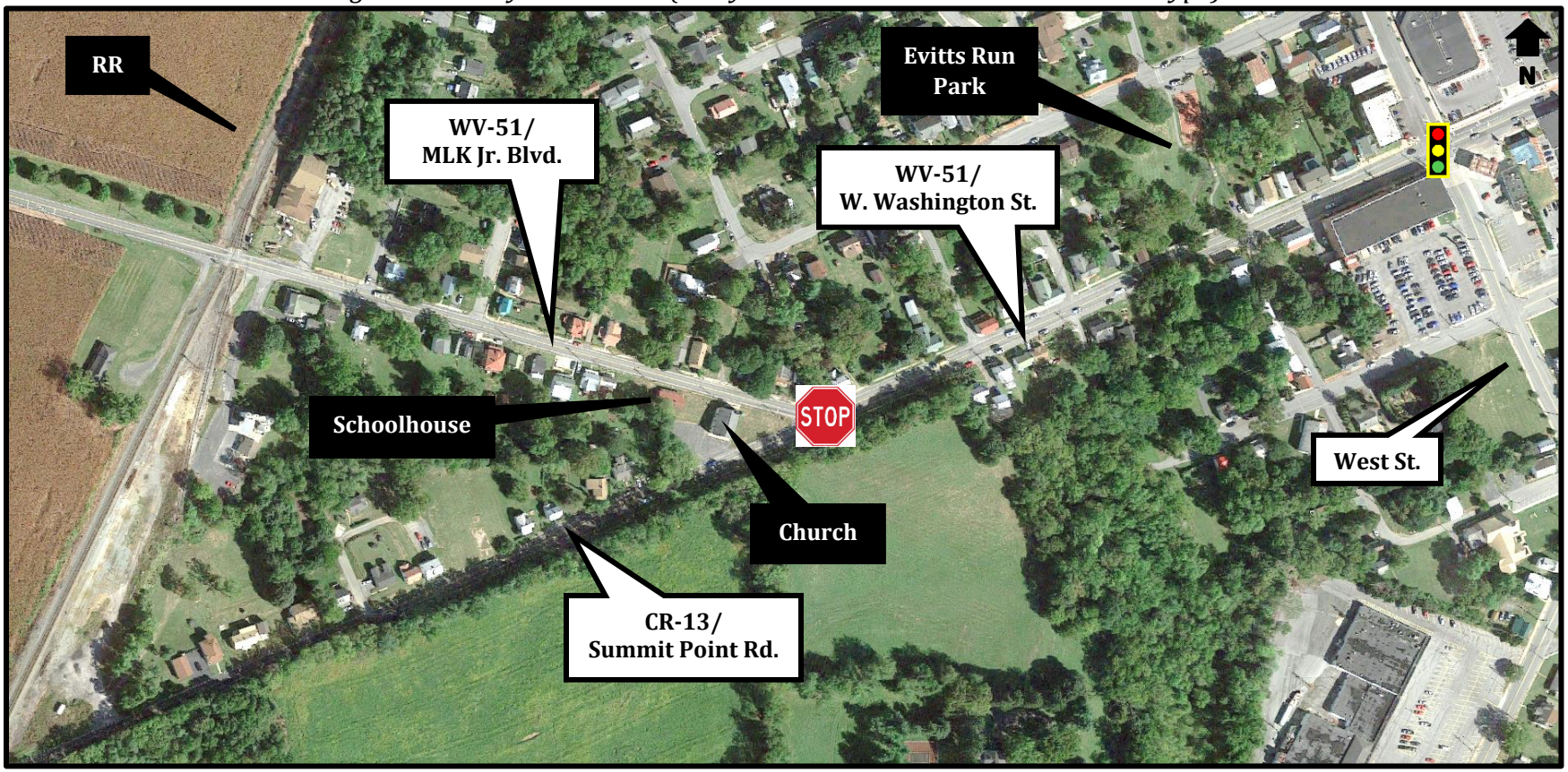


Figure 2 – Study Area Aerial (study intersections marked with control type)



III. Existing Conditions

A. Land Use

The WV-51 study corridor is approximately 0.44 miles long in total. The study limits extend for 0.21 miles of MLK Jr. Boulevard to the west of Summit Point Road, ending at the Norfolk Southern (NS) railroad crossing, and 0.23 miles on W. Washington Street from the Summit Point Road intersection to West Street. The study area is located on the western limits of the City of Charles Town and roughly serves as the transition between the rural area to the west and the city to the east. The maintaining agencies within the study area are WVDOT and the City of Charles Town.

Residential development is located along the entire corridor. A historic schoolhouse and the Zion Baptist Church are located in the west corner of the intersection. Evitts Run Park is located on the north side of WV-51, west of West Street. Commercial/retail developments are located to the east, in the downtown central business district of the City. This complementary mixture of land uses contributes to the pedestrian and bicycle trip potential. The Summit Point Motorsports Park is approximately 7.5 miles southwest of the study area, on Summit Point Road (CR-13). This site draws visitor traffic through the area.

B. Roadway Conditions

WV-51 serves as a northwest-southeast connector from Charles Town to Inwood, connecting many villages in between. WV-51 connects major roadways including I-81, US-11, WV-9, and US-340. The WV-51 corridor has a posted speed limit of 25 MPH within the study area. WV-51 has a state classification of "Feeder" roadway, federal functional classification of Urban Minor Arterial, and is Surface Transportation Program Eligible. It generally has a two-lane typical section within the study area, with an added westbound left turn lane at the signalized West Street intersection. Each through lane is approximately 10-11 feet wide. Sidewalk is present on the approaches to the signalized intersection and along the north side of the corridor. Paved or gravel areas for parking are provided on the south side of the corridor throughout the study area. Many residents utilize the sidewalk on the north side of the corridor to park on, obstructing the walking path of pedestrians. It was noted some residences do not have available off-street parking.

CR-13 serves as an east-west connector from Charles Town to Summit Point and Swimley, connecting the various developments in between. CR-13 connects major roadways including WV-51 and SR-672. The corridor has a posted speed limit of 25 MPH within the study area. CR-13 has a state classification of "Essential Arterial" roadway, federal functional classification of Urban Major Collector, and is Surface Transportation Program Eligible. It has a two-lane typical section within the study area and each of the lanes are generally 10 feet wide. No pedestrian features are present along CR-13 within the study area. Graveled on-street parking is present on the north side of the road, in front of several houses.

C. Intersection Conditions

The corridor includes two study intersections:

- All-way stop-controlled intersection of W. Washington Street & MLK Jr. Boulevard & Summit Point Road
- Signalized intersection of W. Washington Street & West Street

While several minor street intersections are present between the two intersections, for the purposes of this study, only the two identified study intersections were analyzed. Each is described below in detail.

W. Washington Street & MLK Jr. Boulevard & Summit Point Road

The intersection of W. Washington Street & MLK Jr. Boulevard & Summit Point Road is an all-way, stop-controlled Y-intersection. The exception to the all-way stop is the allowance of continuous southwest-bound right turns. An "EXCEPT WHEN TURNING RIGHT" regulatory sign is posted under the stop sign on this approach. Single-lane approaches are provided for each leg. The intersection has no turn lanes, rumble strips/stripes, or raised pavement markers. Horizontal and vertical curvature is present through the intersection. Intersection lighting is present in the west corner, mounted on a utility pole on the south side of W. Washington Street. Sight distance obstructions were noted at the intersection, specifically in the north corner.

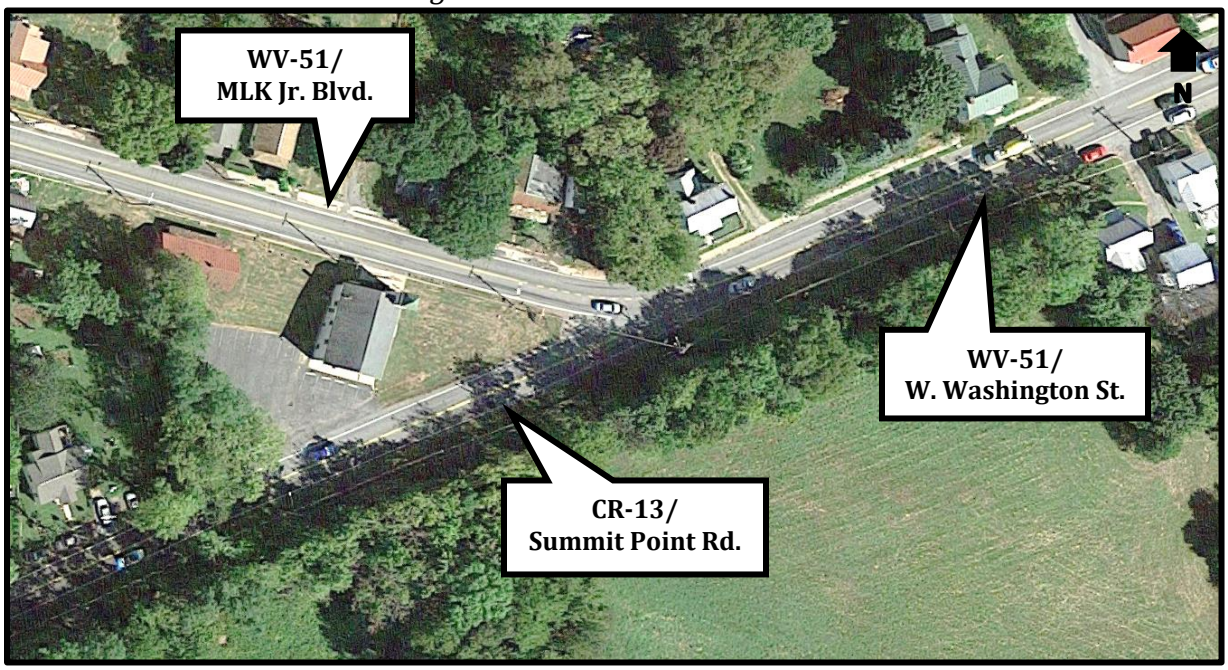
A 'Stop Ahead' warning sign is posted on each intersection approach as follows:

- On Summit Point Road approach approximately 320' before the intersection
- On W. Washington Street approach approximately 390' before the intersection
- On MLK Jr. Boulevard approach approximately 250' before the intersection

All approaches have a single stop sign posted on the right side of the road at the stop line. Signs directing drivers that WV-51 continues to the right are posted approximately 70' before the intersection on the W. Washington Street approach. A sign directing drivers that CR-13 is the next right is located approximately 150' before the intersection on the MLK Jr. Boulevard approach. Speed limits signs are located just after the intersection on all three approaches. A combination of signs directing drivers to WV-51 West, CR-13, Inwood, the Motor Sports Park, and the Locust Hill Golf Course are located in the southwest corner of the intersection.

In order to simplify analysis of the intersection, it was assumed that WV-51 runs east/west and that CR-13 runs north/south, intersecting with WV-51 at a right angle. This was done under the assumption that WV-51 acts as the mainline route through the intersection and CR-13 acts as the side-street. **Figure 3** shows an aerial of the existing intersection.

Figure 3 – Y-intersection Aerial



W. Washington Street & West Street

The intersection of W. Washington Street & West Street is a signalized, four-way intersection with curb and gutter on all approaches. The N. West Street (southbound) and W. Washington Street (westbound) approaches both have dedicated left turn lanes. Crosswalks, pedestrian signal heads, and pedestrian push buttons are located on each approach. The signal is a mast-arm configuration with two, three-section heads located on each arm. Radar detection is also located on each signal pole. Intersection lighting is located in the northeast corner of the intersection.

Signs denoting WV-51 and the direction to US-340 South are present at the stop line on both W. Washington Street approaches. The mast arm facing the S. West Street approach has signs directing drivers to WV-51 East and West mounted on the arm. The W. Washington Street approach also has signage located approximately 85' before the intersection denoting the route as WV-51 West for traffic exiting the intersection onto the approach. A sign directing drivers to the right to Old Route 340 is located approximately 170' before the intersection. **Figure 4** shows an aerial of the existing intersection.

Figure 4 – W. Washington Street & West Street Intersection Aerial

D. Field Observations

Field observations were conducted on February 25, 2021. Detailed field observation notes are provided in **Appendix A**. Key observations to note include:

- Existing sidewalk on MLK Jr. Boulevard is used for on-street parking and results in no pedestrian access to the feature.
- Several sensitive structures are located within the study area and must not be impacted with any proposed alternatives, including the historic schoolhouse and church (shown in **Figure 2**).
- The turning radius for the right turn movement from MLK Jr. Boulevard to W. Washington Street is difficult for any vehicle to make without crossing the double yellow centerline of W. Washington Street.
- For anyone not familiar with the Y-intersection, approaching on the MLK Jr. Boulevard leg can be confusing due to the skew of the intersection and the allowable continuous right turning movement for the westbound W. Washington Street traffic.
- There is little to no stormwater management throughout the study area, which was noted as an existing issue.

E. Traffic Count Data Collection

Vehicle turning movement count data for the study intersections was provided by HEPMPO. Data was collected for 24 hours on June 12, 2019. The data included vehicular turning movements and pedestrian/bicycle crosswalk movements. The AM and PM peak hours were determined to be from 7:30-8:30 AM and 4:45-5:45 PM, respectively.

WVDOH provided the following linear annual growth rates for the study area:

- 1.5238% for WV-51
- 1.3632% for CR-13
- 0.25% for West Street

A potential residential development was identified south of the study area along CR-13. The growth rates provided cover the planned potential growth in the area. Peak hour traffic volumes for the intersections were projected to a Design Year of 2039 using the growth rates provided by WVDOH. The count data, growth rate communications, and traffic volumes used for analysis can be found in **Appendix B**. As noted previously, traffic volumes were oriented to assume WV-51 as an east/west road. All subsequent analysis will be oriented in the same manor.

The City of Charles Town along with HEPMPO collected train count data on Thursday, April 29th, 2021 from 7-11 AM and 2-6 PM. Two trains were present during the AM collection period, and three trains were present during the PM collection period. The longest period of time in which the train crossing gates were down was four minutes. The longest resulting westbound queue was 41 vehicles. Train count data can be found in **Appendix B**.

F. Public and School Transit

Charles Town is served by public transit via the Eastern Panhandle Transit Authority (EPTA). There are two fixed routes (#16 and #20) which pass through the eastern study corridor terminus at the W. Washington Street & West Street intersection.

The rest of the corridor within the study area is not served by a fixed route, nor is it planned in the next five years based on their recent Transit Development Plan. The corridor is within ¾ mile of the fixed routes and can be served by their demand-response. These deviations must be scheduled previous business day and EPTA limits the number on a given trip to ensure on-time performance is acceptable.

School busses run along WV-51, with designated stops within the study area at the following general locations:

- West of Davenport Street
- West of Morgan Street
- In front of Zion Baptist Church
- West of N. Johnson Street
- West of Water Street

G. Corridor Planning References

Many planning resources from the County, City, and HEPMPO reference this project and study area. The references demonstrate need for improvements and planning history in the area. The planning references include:

- Charles Town Transportation Plan (2014)
- Jefferson County Comprehensive Plan (2014)
- Charles Town West End Master Plan (2015)

- Charles Town Walkability and Connectivity Study (2016)
- HEPMPO Long Range Transportation Plan (2018)
- Historically Hip Charles Town 2040 Comprehensive Plan (2018)
- HEPMPO Regional Traffic Safety Study (2019)
- Charles Town Pavement Report (2021)

These corridor planning references relevant excerpts are provided in **Appendix C**.

The Historically Hip Charles Town 2040 Comprehensive Plan includes a future transportation network plan and future bike and pedestrian network plan. The future transportation network plan shows a new roundabout at the MLK Jr. Boulevard & W. Washington Street & Summit Point Road intersection, and additional new roadway connections and roundabouts nearby. The future bike and pedestrian network plan show new bicycle and pedestrian paths proposed north, east, and south of the study area.

IV. Public and Stakeholder Involvement

Several virtual meetings were held throughout the study process to allow stakeholder and public involvement. A stakeholder group was formed that included representatives from organizations which would have a stake in the project, such as WVDOH, HEPMPO, Zion Baptist Church, and Charles Town officials. The first stakeholder meeting was held on 3/4/2021 and the second stakeholder meeting was held on 5/3/21. The stakeholder meeting attendee lists are provided in **Appendix D**.

A public involvement meeting was hosted on 4/8/2021 and was open to all who wished to attend. The meeting was advertised through the WVDOH, HEPMPO, and City media platforms. The Martinsburg Journal Certificate of Publication is provided in **Appendix D**.

Comments were requested from the attendees of both public and stakeholder meetings. Multiple avenues to submit questions or comments were provided including online submission, email, USPS, and phone calls. The public comment period ended on 5/8/2021. All comments/questions received can be seen in **Appendix D**. Text was added to this report to address comments and answer questions from with public.

Some additions made due to comments/questions received during the stakeholder and public involvement meetings include:

- Truck turning movements through a proposed roundabout and the West Street intersection was a noted concern. This was addressed through exhibits showing truck turn movements through the intersections, as described later in this report.
- The impacts of train traffic on the study area were voiced as a concern. This is what prompted the City of Charles Town along with HEPMPO to collect train count data on Thursday, April 29th, 2021.
- The option of constructing the connector road just to the east of the railroad was considered. This text is provided in Section VII.B.
- Grade separation by bridging WV-51 over the railroad was considered. This text is provided in Section VII.J.

V. Existing Conditions Analysis

A. Capacity Analysis

Capacity analysis was conducted at both study intersections using Highway Capacity Software (HCS) version 7.8.5. Existing signal timings were provided for the intersection of W. Washington Street & West Street. The analysis utilized the existing lane configurations and phasing (for the signalized intersection).

The intersection of W. Washington Street & MLK Jr. Boulevard & Summit Point Road was assumed to be an all-way stop-controlled intersection without the continuous westbound right turning movement. This was assumed due to the atypical intersection control and constraints of HCS7, and capacity analysis software platforms in general. This is expected to produce conservative results by adding additional delay to that approach.

Existing conditions capacity analysis results are summarized in **Table 1**. Note that approach directions assume the intersection orientations explained previously. Detailed capacity analysis can be seen in **Appendix E**.

Table 1 – Existing Conditions Capacity Analysis Summary

Intersection	Approach	2019		2039	
		AM	PM	AM	PM
W. Washington St. & MLK Jr. Blvd. & Summit Point Rd.	Eastbound	B/14.2	B/12.8	D/27.5	C/17.4
	Westbound	B/10.6	F/78.5	B/13.5	F/249.8
	Northbound	A/9.2	B/10.6	B/10.9	B/11.8
	Total	**B/12.3**	**F/53.8**	**C/20.6**	**F/162.9**
W. Washington St. & West St.	Eastbound	B/11.6	B/10.3	B/15.2	B/11.8
	Westbound	B/10.6	B/11.5	B/12.5	B/14.4
	Northbound	C/21.0	D/36.6	C/21.1	D/43.5
	Southbound	C/20.4	C/22.2	C/20.5	C/22.4
	Total	**B/13.6**	**B/17.6**	**B/15.8**	**B/19.5**

As can be seen, the Y-intersection is currently shown to experience an LOS F for the westbound approach during the PM peak. This approach is expected to experience excessive delays by 2039. Again, note the analysis assumed the intersection to be an all-way stop-controlled intersection without the continuous westbound right turning movement. It is expected the delays are not as excessive as is shown in the capacity analysis results. This does show the intersection would not function with acceptable LOS if it was a true all-way stop-controlled intersection.

The analysis at the W. Washington Street & West Street signalized intersection shows capacity is operating at acceptable LOS now, and is expected to continue to be acceptable through 2039 if no improvements are made.

B. Signal Warrant Analysis

Eight-hour, four-hour, and peak hour vehicular volume signal warrants were assessed at the intersection of W. Washington Street & MLK Jr. Boulevard & Summit Point Road using 2019 count data and 2039 Design Year volumes. Analysis was conducted with right turn

discounts applied to the volumes. **Table 2** shows the results of the signal warrant analysis. Detailed signal warrant analyses can be found in **Appendix F**.

Table 2 – Signal Warrant Analysis Results

Year	Peak Hour Warrant	Four-Hour Warrant	Eight-Hour Warrant
2019	Not Met	Not Met	Not Met
2039	Not Met	Not Met	Not Met

Warrants are not met with 2019 count data or 2039 Design Year volumes. For this reason, other intersection improvements should be considered. The warrants outlined in the Manual on Uniform Traffic Control Devices (MUTCD) are to be used as guidelines to determine the installation of a signal. Signals may also be installed based on safety, sight distance, pedestrians, and/or engineering judgement. Installing a signal which does not meet vehicular volume warrants can result in a possible increase in crashes.

C. Turn Lane Length Calculations

Turn lane lengths were calculated for turning movements at study intersections. Turn lane warrant analyses were also provided for those turning movements from WV-51 to CR-13. This was done to show if a turn lane would be warranted should WV-51 become a free-flowing segment. A design speed of 5 MPH over the posted speed limit and 2039 Design Year volumes were utilized for analysis. **Table 3** shows the results of the turn lane length calculations. All possible turn lanes were analyzed regardless of whether turn lanes or proposed intersection improvements are recommended. All turn lane lengths listed are inclusive of a 50-foot diverging taper. Turn lane length calculations and warrant analyses can be found in **Appendix F**.

Table 3 – Turn Lane Calculation Results

Intersection	Left Turn Lanes	Right Turn Lanes
W. Washington St. & MLK Jr. Blvd. & Summit Point Rd.	225' WBL (WV-51 to CR-13) – Warrant Met 100' NBL (CR-13 to WV-51)	100' EBR (WV-51 to CR-13 – Warrant Not Met 200' NBR (CR-13 to WV-51)
W. Washington St. & West St.	100' EBL (WV-51 to N. West St.) 200' WBL (WV-51 to S. West St.) 225' NBL (S. West St. to WV-51) 100' SBL (N. West St. to WV-51)	225' EBR (WV-51 to S. West St.) 100' WBR (WV-51 to N. West St.) 150' NBL (S. West St. to WV-51) 150' NBL (N. West St. to WV-51)

VI. Crash Analysis

A. Overall Study Area Crash Data

Crash data for the study area was provided by HEPMPO for five complete years of available data (2015-2019). A total of 44 crashes were obtained. The crash report for each documented crash was reviewed to correct information, where necessary, and to properly locate crashes within the study limits. The original crash data query included 45 crashes, which was adjusted to 44 crashes after reviewing and relocating crashes. Crash data was plotted on an aerial map to identify crash patterns and probable causes. The crash

diagrams for the study area are included in **Appendix G**. **Table 4** represents a breakdown of the crash data.

Table 4 – Overall Study Area Crash Statistics

Crash Year	Number	Percent
2015	11	25.0%
2016	9	20.5%
2017	6	13.6%
2018	10	22.7%
2019	8	18.2%

Crash Severity	Number	Percent
Property Damage Only	30	68.2%
Injury	14	31.8%

Hour of Day	Number	Percent
6:00 AM	5	11.4%
7:00 AM	1	2.3%
8:00 AM	3	6.8%
9:00 AM	1	2.3%
10:00 AM	1	2.3%
11:00 AM	2	4.5%
12:00 PM	2	4.5%
1:00 PM	6	13.6%
2:00 PM	1	2.3%
3:00 PM	6	13.6%
4:00 PM	3	6.8%
5:00 PM	6	13.6%
7:00 PM	3	6.8%
8:00 PM	1	2.3%
9:00 PM	2	4.5%
11:00 PM	1	2.3%

Crash Type	Number	Percent
Rear End	25	56.8%
Angle	7	15.9%
Sideswipe - Passing	5	11.4%
Fixed Object	4	9.1%
Left Turn	1	2.3%
Pedestrian	1	2.3%
Bicycle	1	2.3%

Day of Week	Number	Percent
Sunday	3	6.8%
Monday	4	9.1%
Tuesday	7	15.9%
Wednesday	10	22.7%
Thursday	4	9.1%
Friday	6	13.6%
Saturday	10	22.7%

Pavement Condition	Number	Percent
Wet	6	13.6%
Dry	38	86.4%

Light Condition	Number	Percent
Day (light)	34	77.3%
Night (dark)	10	22.7%

Fatality Analysis Reporting System (FARS) data also shows a fatal crash occurred on 1/1/2005 involving a parked car at the Y-intersection.

B. Intersection Crash Data

Table 5 identifies crash trends of note in the study area. Three or more crashes of the same kind were considered a "trend".

Table 5 – Crash Trends by Intersection

Intersection/Segment	Crash Trends
W. Washington St. & MLK Jr. Blvd. & Summit Point Rd.	▪ Rear End - WV-51 (W. Washington St.) approaching the intersection ▪ Angle – Left turning vehicles from MLK Jr. Blvd. to W. Washington St. and SB through vehicles on W. Washington St. from WV-51 to CR-13
W. Washington St. & West St.	▪ Rear End – WV-51 (W. Washington St.) NB on the approach ▪ Sideswipe-Passing - WV-51 (W. Washington St.) NB on the approach ▪ Angle – WV-51 (W. Washington St.) NB and N. West St at the intersection
W. Washington St between study intersections	▪ Rear End – SB just south of the signalized intersection

The most notable crash trend in the study area is the rear end crashes on the westbound approach of W. Washington Street at the Y-intersection. This is expected to be due to the "EXCEPT WHEN TURNING RIGHT" regulatory sign that is posted under the stop sign on this approach. Vehicles on any approach to the intersection do not know if vehicles on this approach will be stopping or not.

C. Crash Rates

HEPMPO provided a crash rates for the study area data. This was used to compare study area crash rates to statewide average crash rates to show the need for improvements in the study area. Crash rates were provided for the segment of WV-51 through the study area and for the intersection of W. Washington Street & MLK Jr. Boulevard & Summit Point Road.

The segment has a crash rate of 421 crashes per 100 MVMT (million vehicle miles travelled). This is much greater than the 2013 statewide average of 163 crashes per 100 MVTM. This shows the need for improvements along the segment.

The intersection has a crash rate of 0.677 crashes per MEV (million entering vehicles). Industry standard is to watch or consider low-cost safety improvements if the intersection shows 1.0-1.5 crashes per MEV. The crash rate calculations can be found in **Appendix G**.

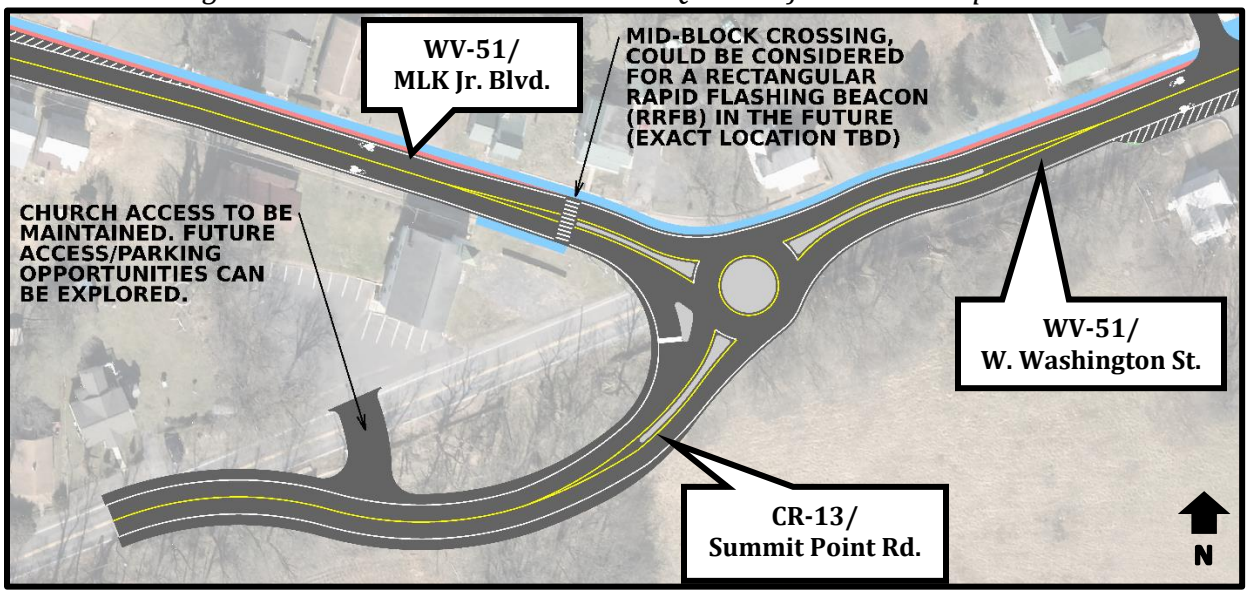
VII. Countermeasure Evaluation

The following section provides countermeasures for consideration throughout the WV-51 study area. Major alternatives are discussed first, followed by countermeasure improvements which are common for all alternatives. The countermeasures listed may be implemented together or may be independent solutions. The countermeasures are not necessarily recommended to all be implemented concurrently.

A. Alternative 1: Install Roundabout at WV-51 & CR-13 Y-Intersection

Consideration was given to converting the intersection of W. Washington Street & MLK Jr. Boulevard & Summit Point Road to a roundabout. Capacity analysis shows a single lane circulating roundabout with single lane approaches would operate with acceptable LOS through the 2039 Design Year. The Summit Point Road approach would need to be relocated east in order to achieve acceptable angles of entry. The MLK Jr. Boulevard approach would also require a yielding right turn lane (onto Summit Point Road) to achieve acceptable turning radii. The access to the church would be maintained. The exact details of the access point and parking opportunities could be determined during detailed design. Additional improvements are incorporated into this alternative, which are described later in this section. A quick-reference concept plan of the roundabout can be seen in **Figure 5**. Detailed concept plans for this alternative are provided in **Appendix H**.

Figure 5 – Alternative 1 Roundabout Quick-Reference Concept Plan



The center island and approach splitter islands would be mountable, to allow large articulated trucks to traverse the intersection. This design is typically referred to as a "mini-roundabout". Truck movements from eastbound MLK Jr. Boulevard to southbound Summit Point Road would be prohibited, but it is expected trucks are unlikely to make that movement currently. Truck turning movements through the roundabout was a noted concern during the public involvement meeting. An exhibit showing truck turn movements through the intersection is provided in **Appendix H**.

Capacity analysis results are summarized in **Table 6**. Detailed capacity analysis can be found in **Appendix E**.

Table 6 – Alternative 1 Capacity Analysis Summary

Intersection	Approach	2039	
		AM	PM
W. Washington St. & MLK Jr. Blvd. & Summit Point Rd.	Eastbound	A/8.5	A/7.3
	Westbound	A/4.9	B/14.9
	Northbound	A/8.4	A/6.4
	Total	**A/7.5**	**B/12.0**

Positive aspects of this alternative include:

- Replace existing all-way stop-control intersection with proven safer intersection type (roundabout)
- Traffic calming associated with roundabouts
- Capacity and operational improvements compared to existing conditions
- All existing movements and travel paths remain

Negative aspects of this alternative include:

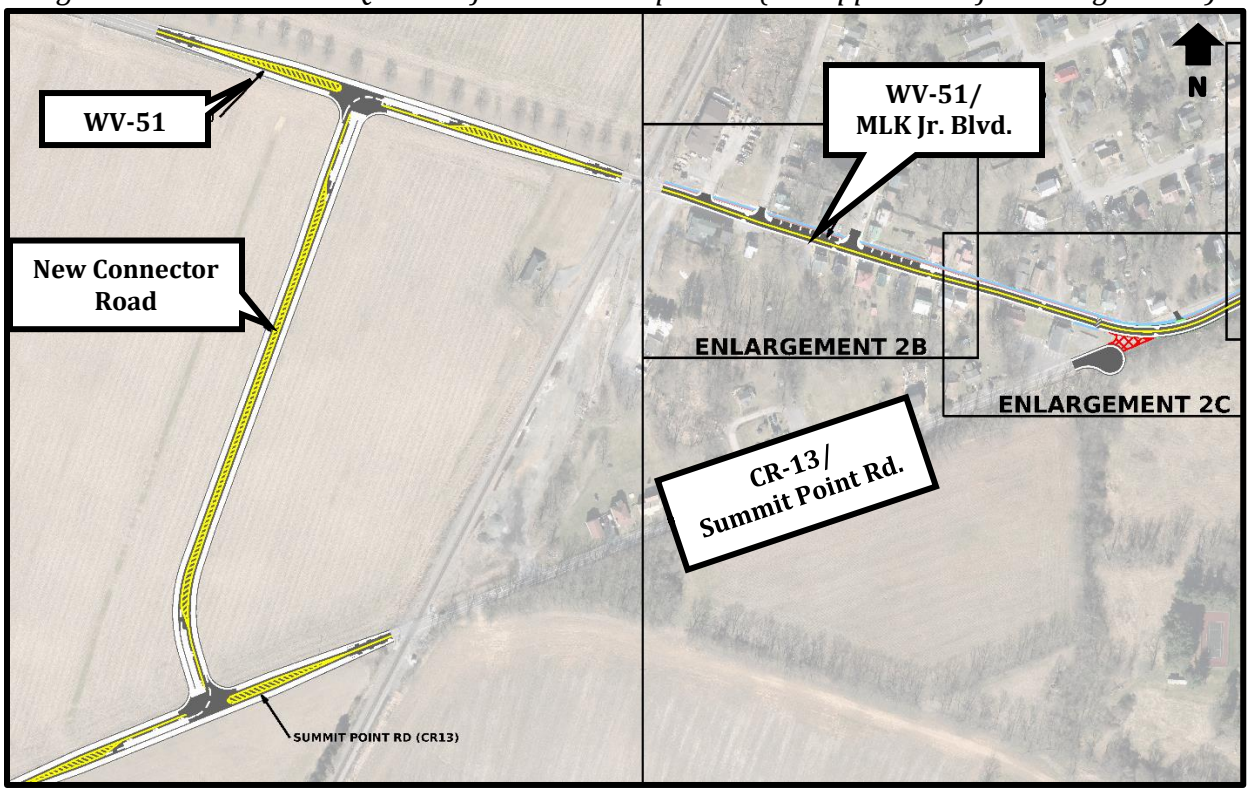
- Initial driver confusion and general public resistance associated with roundabouts, which is expected to be minimal since this is not the first roundabout in the area
- Right-of-way takes necessary for roundabout implementation

B. Alternative 2: New Connector Road with CR-13 Intersection Approach Stubbed

Consideration was given to constructing a new connector road between WV-51 and CR-13 Summit Point Road, west of the NS railroad tracks. This would result in Summit Point Road being stubbed off before the existing Y-intersection, with a cul-de-sac provided. The cul-de-sac could include a mountable curb so emergency vehicles can still access Summit Point Road quickly from the east and in case a train is blocking the ingress/egress. WV-51 approaches would be continuous, free-flowing movements at the existing Y-intersection. The existing horizontal curve on WV-51 (at the existing Y-intersection) would be revised to be a more gradual curve with a larger radius. This would improve safety, operations, and sight distance through this area.

Two new T-intersections would be formed: the new connector road with WV-51 and Summit Point Road. Both intersections are shown with the new connector road approaches being stop-controlled. Turn lanes are proposed at the new intersections to provide deceleration space for turning vehicles and allow for more continuous flow of through traffic. Note, the new intersections could be designed as roundabouts instead of stop-controlled intersections, if desired. Additional improvements are incorporated into this alternative, which are described later in this section. A quick-reference concept plan of the alternative can be seen in **Figure 6**. Detailed concept plans for this alternative are provided in **Appendix H**.

Figure 6 – Alternative 2 Quick-Reference Concept Plan (see Appendix H for enlargements)



The option of constructing the connector road just to the east of the railroad was considered. This option was dismissed for the following reasons:

- Inability to obtain permanent right-of-way from NS railroad
- New connector road intersections would be very close to the railroad
- Lack of space of MLK Jr. Boulevard to install turn lanes at the connector road

Capacity analysis results are summarized in **Table 7**. This alternative results in acceptable LOS during both peak hours through the 2039 Design Year. Detailed capacity analysis can be found in **Appendix E**. Turn lane length calculations can be seen in **Appendix F**.

Table 7 – Alternative 2 Capacity Analysis Summary

Intersection	Approach/Movement	2039	
		AM	PM
WV-51 & New Connector Road	Eastbound	A/0.0	A/0.0
	Westbound Left	A/9.1	A/8.9
	Northbound	C/16.9	C/15.1

Positive aspects of this alternative include:

- Elimination of existing all-way stop-control intersection
- Continuous free-flow movement along WV-51
- Ability to design the new connector road intersections with adequate sight distance and needed turn lanes

Negative aspects of this alternative include:

- All church traffic and residents on Summit Point Road forced to utilize the new connector road if they were coming from the north, east, or west. This includes added travel time and distance, and the need to cross the NS railroad twice.
- The presence of a train would essentially trap traffic westbound on Summit Point Road
- Initial driver confusion of the change in travel paths
- Right-of-way takes that would come with the new connector road
- Added roadway to be maintained
- Possible pedestrian safety issue for pedestrians crossing MLK Jr. Boulevard to go to/from the church. A crossing improvement to mitigate this issue is described later in this section.
- Increased emergency response times (expected to be minimal due to mountable curb at cul-de-sac)
- Increased school bus travel times

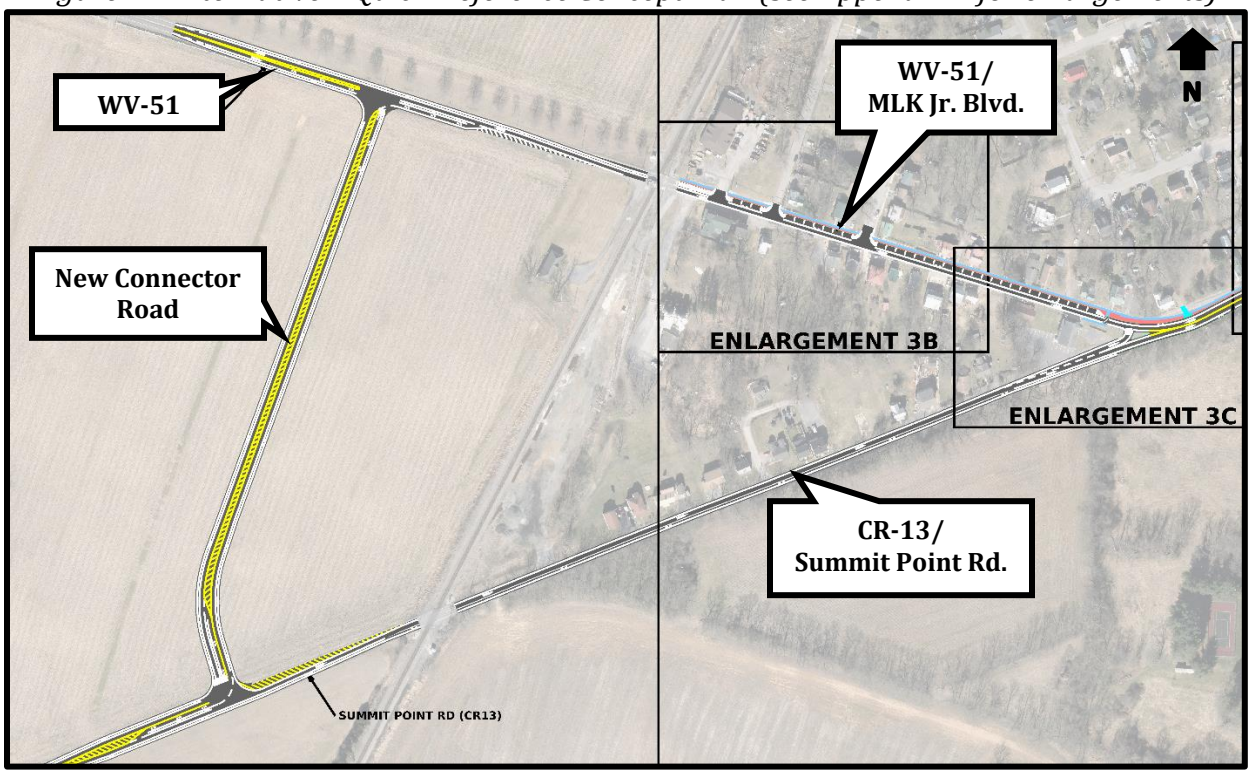
C. Alternative 3: New Connector Road with One-Way Conversion

Consideration was given to the construction of the new connector road described above coupled with a one-way conversion. Rather than stubbing Summit Point Road off before the existing Y-intersection (as in Alternative 2), it is proposed that WV-51 and Summit Point Road be converted to one-way traffic between the Y-intersection and the new connector road. WV-51 would be one-way traveling westbound, and Summit Point Road would be one-way traveling northbound to eastbound. The northbound Summit Point Road approach

would include a yielding left turn lane to allow traffic originating between the new connector road and the Y-intersection to turn west to continue west or utilize the connector road to travel south.

Like Alternative 2, both new T-intersections are shown with the new connector road approaches being stop-controlled. The new connector road intersections could be designed as roundabouts instead of stop-controlled intersections, if desired. Additional improvements are incorporated into this alternative, which are described later in this section. A quick-reference concept plan of the alternative can be seen in **Figure 7**. Detailed concept plans for this alternative are provided in **Appendix H**.

Figure 7 – Alternative 3 Quick-Reference Concept Plan (see Appendix H for enlargements)



Capacity analysis results are summarized in **Table 8**. This alternative results in acceptable LOS during both peak hours through the 2039 Design Year. Detailed capacity analysis can be found in **Appendix E**.

Table 8 – Alternative 3 Capacity Analysis Summary

Intersection	Approach/Movement	2039	
		AM	PM
WV-51 & New Connector Road	Eastbound	A/0.0	A/0.0
	Westbound Left	B/12.1	B/12.0
	Northbound Left	B/12.2	D/32.7

Positive aspects of this alternative include:

- Elimination of existing all-way stop-control intersection
- Continuous free-flow movement along WV-51
- Ability to design the new connector road intersections with adequate sight distance and needed turn lanes
- Additional space available along MLK Jr. Boulevard for on-street parking, sidewalks, and bike lanes
- Increased pedestrian safety on WV-51 and on Summit Point Road, as traffic would only be coming from one direction and the distance to cross WV-51 would be decreased
- Compared to Alternative 2, the presence of a train would not trap traffic on Summit Point Road between the railroad tracks and the Y-intersection, eastbound egress is permitted

Negative aspects of this alternative include:

- All arriving church traffic and residents on Summit Point Road would be forced to utilize the new connector road if they were coming from the north, east, or west. This includes added travel time and distance, and the need to cross the NS railroad twice. Exiting traffic would be forced to go eastbound, which could be the same as their existing operation or only add minimal travel time if destined west or south.
- Initial driver confusion of the change in travel paths and introduction of one-way streets
- Right-of-way takes that would come with the new connector road
- Added roadway to be maintained
- Increased emergency response times
- Increased school bus travel times

D. On-Street Parking Improvements

The addition of delineated on-street parking in one or both directions along WV-51 throughout the study area was considered with all alternatives, as described below:

- On both sides of W. Washington Street from just southwest of West Street to approximately Johnson Street
- On north side of MLK Jr. Boulevard from east of Davenport Street to Eagle Avenue. For Alternative 3, this portion of on-street parking is proposed to be increased so that the parking would begin approximately at the church.

Detailed concept plans showing the proposed delineated on-street parking for each alternative are provided in **Appendix H**.

As noted during field observations, on-street parking is needed for some residences along MLK Jr. Boulevard. On-street parking could also be utilized by the church. The presence of on-street parking can act as a traffic calming measure, to slow vehicle speeds and create a more complete-streets feel. However, on-street parking introduces the possibility of crashes associated with vehicles entering and exiting parking spots and door swings. This is not anticipated to be an issue within the study area, as residents are already parking

along the street in non-designated spots (on the sidewalk). If space is available, back-angle parking could be considered, which provides the added benefit of drivers having better sightlines when exiting the parking spot.

E. Pedestrian Infrastructure Improvements

All alternatives are proposed to include the installation of sidewalk and ADA curb ramps throughout the study area. The sidewalk and adjacent brick buffer should match the existing infrastructure in the downtown area. The addition of delineated on-street parking along MLK Jr. Boulevard in each alternative ensures pedestrians will be able to utilize the sidewalk and vehicles would no longer need to park on it. The enforcement of this is recommended if needed in the future.

The improved infrastructure will promote walkability within the area, providing a safe travel path for residents to walk between the existing single-family homes, Evitts Run Park, the retail developments within Charles Town, and the church.

All alternatives are proposed to include the installation of a mid-block crossing with rectangular rapid flashing beacons (RRFBs) across W. Washington Street at S. Water Street to allow for safer pedestrian access to Evitts Run Park. A pedestrian crossing is also proposed in each alternative on MLK Jr. Boulevard near the church. An RRFB could be considered at this location in the future, if determined necessary. Note, these crossing locations were not chosen based on existing pedestrian crossing volumes or crashes. The location recommendations were based on local input and direction regarding pedestrian origins and destinations and complementary land uses. The crossing locations shown in the concept plans are conceptual. The exact location will be determined during detailed design to ensure adequate sight distance is provided. Detailed concept plans showing the proposed pedestrian infrastructure for each alternative are provided in **Appendix H**.

F. Bicycle Infrastructure Improvements

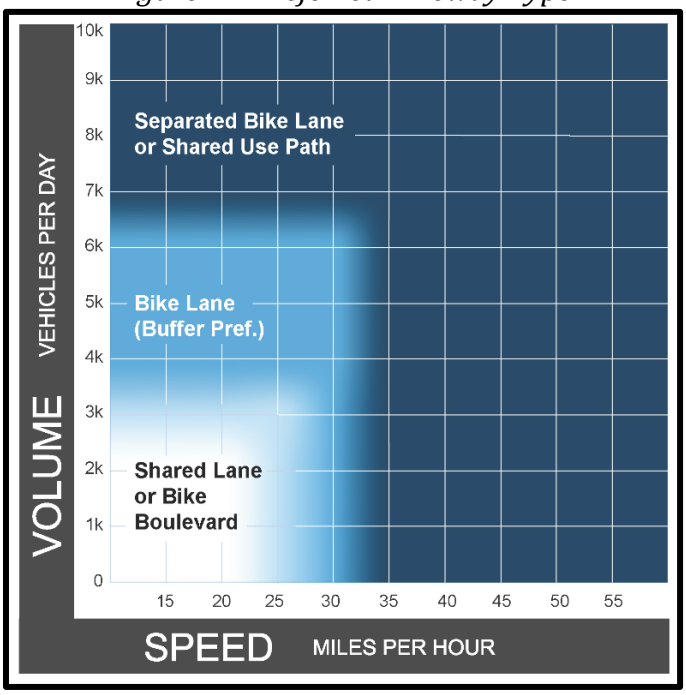
Bicycle count data (seen in **Appendix B**) shows a number of cyclists currently utilize the crosswalks at the West Street signalized intersection. Count data was not processed for cyclists utilizing the roadway at either study intersection. However, it can be assumed that if cyclists are utilizing the crosswalks at the West Street signalized intersection, there are most likely cyclists utilizing the existing sidewalks and possibly some in the roadway throughout the corridor. Cyclists currently utilizing the existing sidewalk and pedestrian crossings along the corridor instead of riding in the roadway is likely due to the high level of stress associated with the absence of bike infrastructure. The addition of dedicated bike lanes would remove these cyclists from the pedestrian traffic zones, creating a safer travel path for pedestrians. Additionally, dedicated bike lanes would provide a safer travel path for any cyclists currently utilizing the roadway and could promote the use of bicycles as a travel mode for those who are not currently utilizing the method due to the lack of dedicated, safe travel paths.

Figure 8, from the FHWA 2019 *Bikeway Selection Guide,* shows the preferred bikeway type based on the relationship between roadway volume and speed. The 2019 Annual Average Daily Traffic (AADT) on WV-51 was 12,721[1]. The posted speed limit throughout the study

[1] Provided in the WVDOT crash rate analysis.

area is 25 MPH. Based on **Figure 8**, a separated bike lane or shared use path would be preferred for the study area.

Figure 8 – Preferred Bikeway Type



In general, the existing conditions with no bike lanes poses the highest stress for all modes of travel, considering the cyclist would either ride on the existing sidewalk (where provided) with the pedestrians or in the roadway with the vehicles. The option of added bicycle infrastructure was considered with each alternative, and is provided as follows:

- Alternative 1: Sharrow pavement markings in vehicle travel lanes
- Alternative 2: Sharrow pavement markings in vehicle travel lanes, with dedicated bike lanes provided for each direction on the new connector road
- Alternative 3: Dedicated bike lanes provided on the new connector road and one-way segments of WV-51 and Summit Point Road. Sharrow pavement markings in vehicle travel lanes would be provided on MLK Jr. Boulevard from Y-intersection to West Street.

Overall, Alternative 3 provides the greatest opportunity for the addition of bicycle infrastructure in the study area. Detailed concept plans showing the proposed bicycle infrastructure for each alternative are provided in **Appendix H**.

G. Access Management Improvements

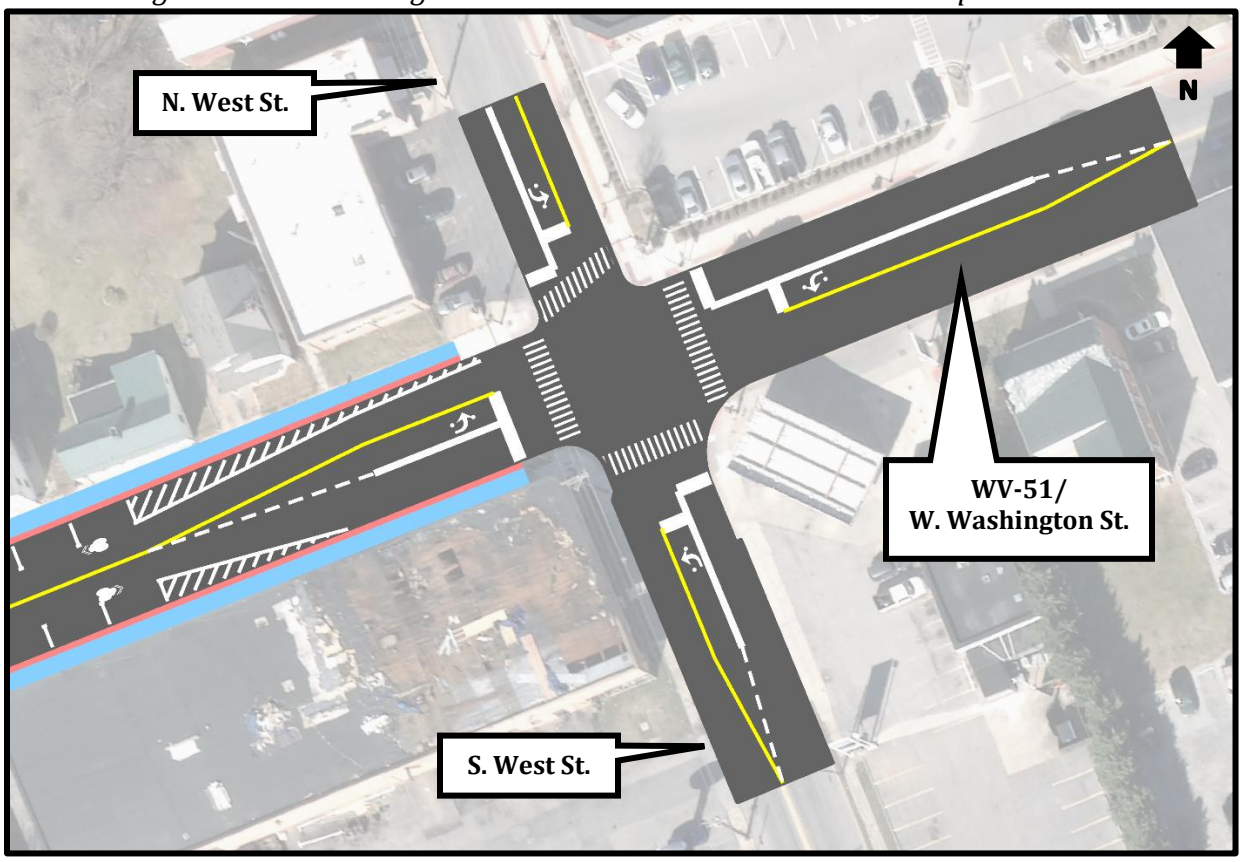
There are several developments along WV-51 and Summit Point Road within the study area, which currently have multiple drives and/or open frontage to the roadway, specifically near West Street. Access management strategies and improvements throughout the corridor should be considered in the future if development or redevelopment occurs.

Specific access management improvements associated with the above alternatives include the access to the gas station located in the east corner of the W. Washington Street & West Street intersection. It is recommended that the existing mountable curb along the entire site frontage be removed and replaced with two defined access points: one each on W. Washington Street and S. West Street. The access points should be set as far back from the intersection as feasible to maintain site circulation and truck fuel drop off at the site.

H. West Street Intersection Improvements

Existing conditions analysis shows the W. Washington Street & West Street intersection has acceptable capacity now and is expected to be acceptable through 2039. However, by only providing southbound and westbound left turn lanes, sight lines are not acceptable. The addition of left turn lanes for northbound and eastbound approaches (which do not currently have left turn lanes) is proposed for all alternatives. This can be implemented through restriping only; the revision of existing roadway width or curb is not anticipated. This simple improvement is expected to improve safety and operations at the intersection. A quick-reference concept plan of the intersection improvements can be seen in **Figure 9**. Detailed concept plans showing the intersection improvements in each alternative are provided in **Appendix H**.

Figure 9 – W. Washington Street & West Street Intersection Improvements



It was noted during stakeholder and public meetings that truck turns are an existing issue at this intersection. Based on the count data, the highest truck turn movements are

eastbound right (9 trucks/day), westbound left (7 trucks/day), and northbound left (7 trucks/day). The addition of the left turn lanes on the northbound and eastbound approaches does further reduce (by a small margin) the area for truck turns. The stop lines for each approach are set back to the furthest allowable recommended distance from the intersection. Truck turn simulations are provided in **Appendix H**. Since West Street is not a state route, truck turn prohibitions and/or truck routing signs could be considered for the intersection and area. Only trucks accessing business on West Street should utilize this street.

The resulting capacity analysis with the additional turn lanes is summarized in **Table 9**. Full capacity analysis can be found in **Appendix E**.

Table 9 – Signal Improvements Capacity Analysis Summary

Intersection	Approach	2039	
		AM	PM
W. Washington St. & West St.	Eastbound	B/18.7	B/16.1
	Westbound	B/14.4	B/20.0
	Northbound	B/18.6	C/20.8
	Southbound	B/18.0	B/17.9
	Total	**B/17.7**	**B/18.7**

The addition of a left turn signal phase for the westbound approach was considered, based on public and stakeholder request. It was not recommended for the following reasons:

- Capacity analysis shows it is not needed
- The addition of the eastbound left turn lane is expected to further improve operations
- Traffic signal reconstruction may be necessary to achieve this addition

While left turn signal phasing is not recommended at this time, it could be considered in the future if operational issues are noted.

I. Stormwater Management Improvements

As noted during field observations, there is little to no existing stormwater management throughout the study area, which was stated as an issue during rain events. Stormwater management improvements were considered for each alternative, as described below:

- For all alternatives, wherever new curb is proposed along WV-51, closed storm sewer would be installed. This would include catch basins, manholes, and associated storm sewer piping. Also, existing storm sewer pipes in the areas would either be replaced or connected to the proposed storm sewer system to minimize the amount of water flowing on the roadway and sidewalks. Stormwater treatment would be addressed per WVDOT standards.
- For all alternatives, stormwater management is critical at Evitts Run. In future design phases, analysis will be performed on the stormwater flows in this area to determine any additional proposed storm sewer items/requirements that may be necessary to ensure adequate drainage.

- For Alternatives 2 and 3, stormwater drainage along the new connector road and associated improvements along WV-51 and Summit Point Road would be handled by utilizing roadside ditches. There would be no closed storm sewer system along these stretches.

J. NS Railroad Crossing Improvements

Consideration for improvements to the NS railroad crossings of WV-51 and Summit Point Road are recommended in the future. While railroad impacts were outside the scope of this project, the railroad is noted to have impacts on the study area. Sometimes while a train is present, vehicle queues could extend to the Y-intersection. This likely increases crashes in the area, with vehicles not expecting the queue. The impact of the railroad on each proposed alternative should be considered. The following improvements could be considered (see **Figure 10** below for examples):

- Queue cutter traffic signals
- Traffic signals with railroad preemption and/or blank-out signs
- Roadway lighting
- Pedestrian/bicycle infrastructure and crossing gates

Figure 10 – Railroad Preemption Option Examples

Grade separation by bridging WV-51 over the railroad was considered. However, this is expected to cost approximately $4.6 million. This cost does not include right-of-way purchases or utility relocations needed. This would require railroad right-of-way (previously described as being infeasible to obtain) or variance. Several homes and buildings would be impacted by the earthwork needed. For these reasons, this option was considered infeasible.

K. Additional Improvements to Consider

In addition to the alternatives and improvements described above, other improvements for the study area were also proposed to be implemented with each alternative or to be considered for future implementation, as follows:

- Corridor lighting is proposed for the length of WV-51, Summit Point Road, and the new connector road. The lighting should match those existing in the downtown area. This is expected to improve nominal and substantive safety for all modes of travel.

- Improved landscaping is proposed for the length of WV-51, Summit Point Road, and the new connector road. Street trees are recommended where possible but should be placed so adequate intersection sight lines are provided. Any trees removed during construction of the proposed improvements should be replaced with new trees. This is expected to enhance the aesthetics and historic feel of the corridor, serving as an entrance to the City.
- Relocate existing overhead utilities underground. This is expected to improve the aesthetics and feel of the corridor while also removing fixed objects within the clear zone.

VIII. Planning-Level Cost Estimates

Cost estimates were prepared for each alternative plus recommended improvements, as described in the previous section and shown in the concept plans in **Appendix H**. The construction cost estimates assume the following:

- 15% engineering design
- 30% contingency
- 10% environmental, geotechnical, federal requirements
- 10% inflation rate for an estimated 2025 construction year
- Right-of-way costs
- All other public or private utility relocation costs are not included

The estimated cost for each countermeasure alternative is summarized in **Table 10.** Detailed cost estimates are included in **Appendix I.** It should be noted that, since survey work is not included with this study, existing right-of-way, utilities, and possible impacts are conceptual.

Table 10 – Cost Estimates

Countermeasures	Total
Alternative 1: Install roundabout at WV-51 & CR-13 Y-intersection	$4,875,000
Alternative 2: New connector road with CR-13 intersection approach stubbed	$6,328,000
Alternative 3: New connector road with one-way conversion	$6,386,000

IX. Decision Matrix

Some key evaluation criteria have been used to compare the alternatives. The comparison decision matrix is provided in **Table 11**.

Table 11 – Decision Matrix

Alternative	Safety	Cost	R/W Impacts	Impact to Traveling Public
No Build	Existing high crash rates persist	$0 (lowest)	None (lowest)	None
1 – Roundabout	Proven safer intersection	$4,875,000 (moderate)	0.65 AC total (moderate)	Minimal
2 – CR-13 Stubbed	Eliminate existing Y-intersection	$6,328,000 (high)	3.07 AC total (highest)	Church and residents on CR-13 forced to use new connector road
3 – One-way Conversion	Reduced number of conflict points at Y-intersection	$6,386,000 (highest)	2.52 AC total (high)	Some rerouting for Church and residents on CR-13, less impactful than Alt. 2

X. Recommendations

All alternatives show an improvement compared to the No Build option. As described, there are many positive and negative aspects associated with all three alternatives. It is recommended all three alternatives be advanced to the next stage of the NEPA process.