

Alternatives Analysis
WV 601 Jefferson Road, US 119 to US 60
Environmental Assessment
May 2016

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ATTACHMENT 1 – Jefferson Road Improvements Traffic Analysis, Final Report Dated August 2015

ATTACHMENT 2 – Jefferson Road-Kanawha Turnpike Roundabout Traffic Analysis Results, Dated December 2, 2015

1.0 Introduction

The West Virginia Department of Transportation, Division of Highways (WVDOH), in cooperation with the Federal Highway Administration (FHWA), is proposing improvements to an approximately 1.7-mile section of WV State Route 601 (Jefferson Road) in Kanawha County between its intersection with US 119 (Corridor G – Davis Creek Interchange) in the south and its intersection with US Route 60 (MacCorkle Avenue) in the north (Figure 1 and Figure 2). The improvements will relieve current and future traffic congestion and improve safety and access to economic activity in the corridor.

Jefferson Road serves as a major connector between the communities and businesses west of the capital city (Charleston) and those south of the city. In the middle of the project area, Jefferson Road crosses Kanawha Turnpike (County Route 61/12) and a railroad, and this crossing involves an offset intersection, with two traffic lights, as shown in Figure 3. It is this offset intersection that creates the greatest bottleneck in the region.

The proposed project will generally widen Jefferson Road from two to five lanes, with two travel lanes in each direction and a center turning lane, and will eliminate the offset intersection with Kanawha Turnpike.

In 2013, WVDOH completed an initial phase of analysis and outreach called a Planning and Environmental Linkage (PEL) study. The study included meetings and phone call interviews with stakeholders as well as a public information workshop held in March of 2013. Eight (8) preliminary alternatives, detailed in Section 3.0, were presented in the PEL and at the public meeting. From these preliminary alternatives, two alternatives were selected for refinement and detailed analysis.

The following report is intended to support the Environmental Assessment (EA), prepared in accordance with the National Environmental Policy Act (NEPA). This report details the alternatives analysis, including development of a range of alternatives, the selection of alternatives to carry through the EA, and the selection of a Preferred Alternative. Final selection of an alternative will occur only after consideration for comments received on this analysis and the entire EA.

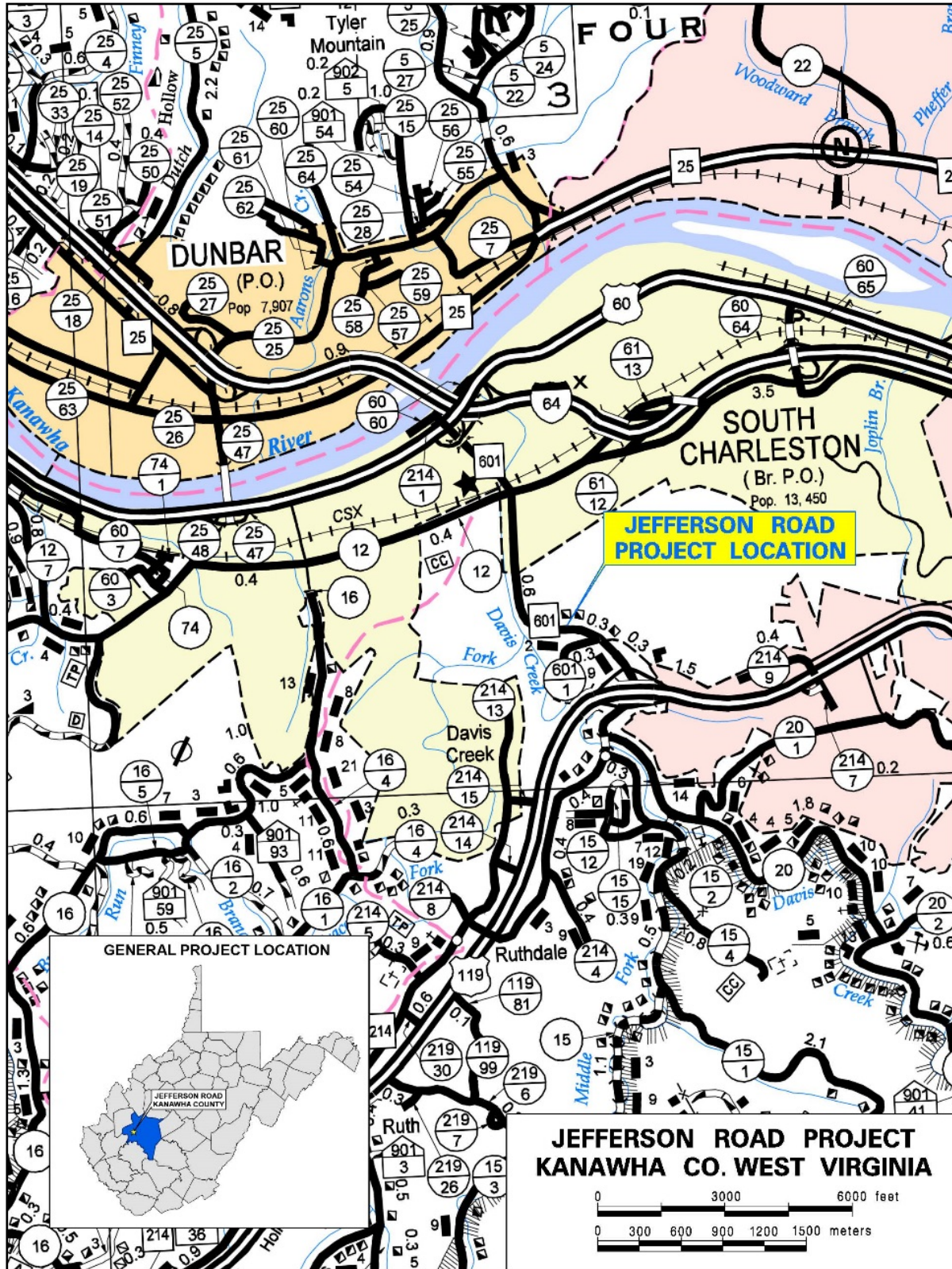


Figure 1. Highway Map Showing Project Location in Kanawha County, WV

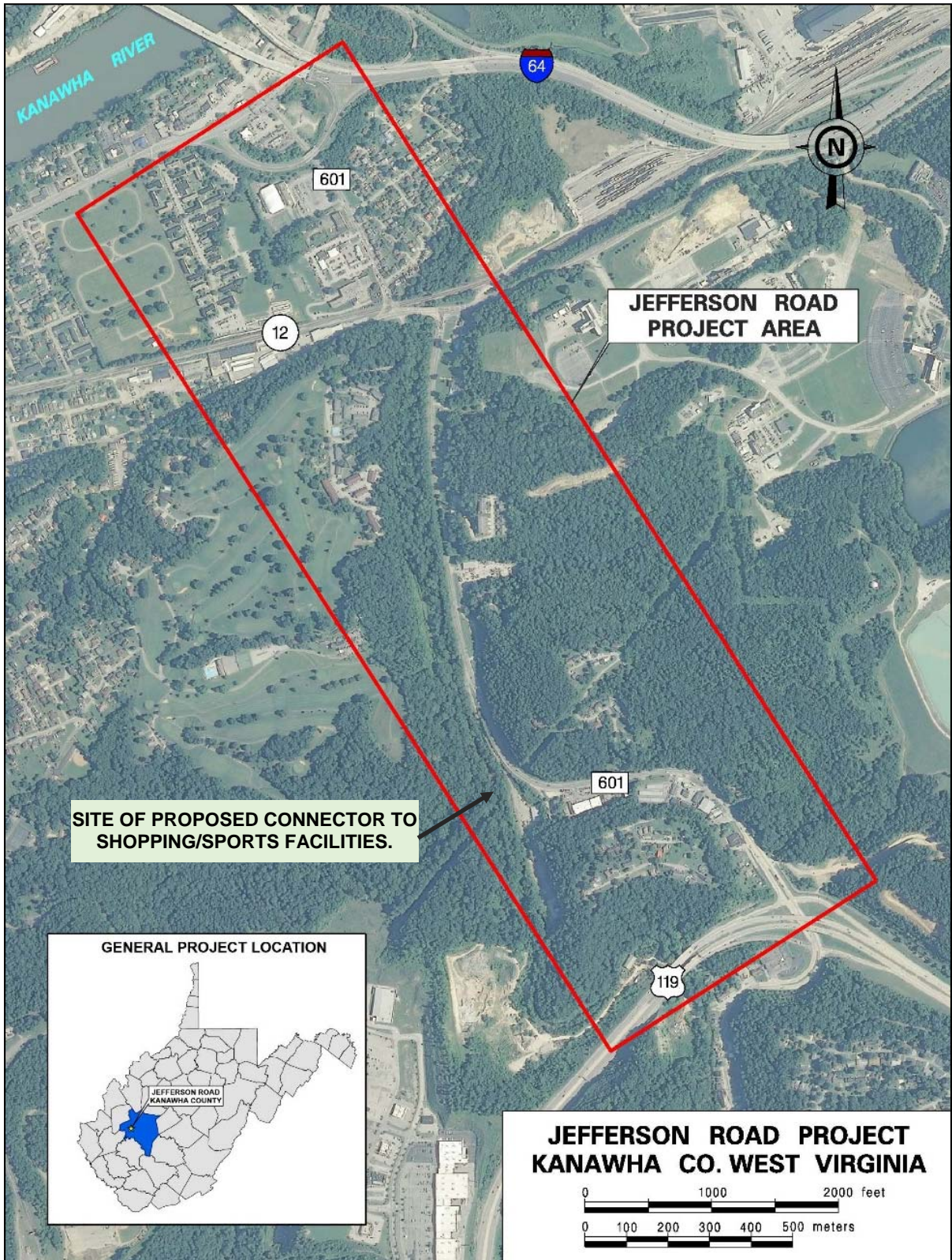


Figure 2. Aerial View of Project Area

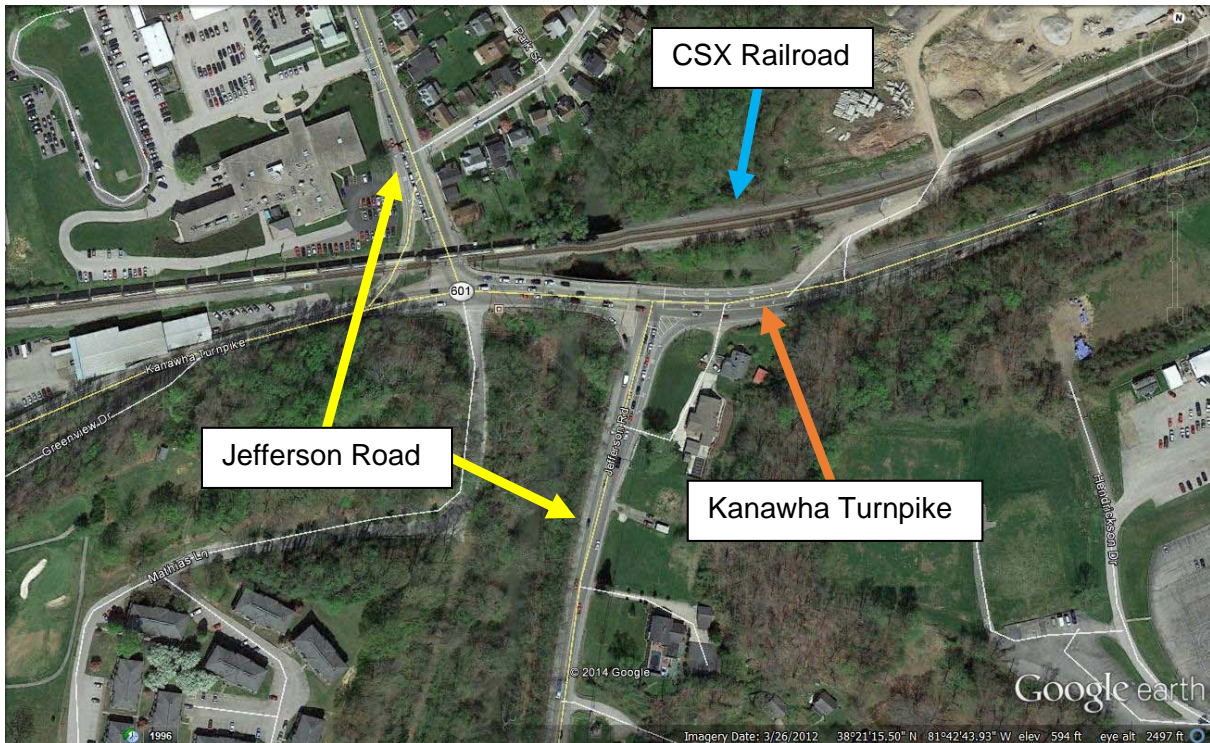


Figure 3. Aerial view of offset intersection of Jefferson Road (running north-south) and Kanawha Turnpike and railroad (both running east-west). This view also shows edge of a golf course and apartment complex on the left and edge of an industrial park on the right. (Source: Google Earth, March 2012 image)

1.1 Description of Project Area

The project area encompasses the region surrounding an approximately 1.7-mile long stretch of Jefferson Road (US 601), between US 119 (Corridor G – Davis Creek Interchange) and US 60 (MacCorkle Avenue). This area, shown in Figure 2, is approximately one and a half miles long and a half mile wide. The following paragraphs describe the Project Area, which has many reasons for its traffic congestion.

At the southern end of the Project Area, Jefferson Road intersects the Appalachian Development Highway System (ADHS) Corridor G (US 119). US 119 is a north-south, four-lane, limited access expressway that connects Charleston to Williamson in the southwest corner of the state. Access to many residential neighborhoods, a strip mall with a grocery store, and many service-oriented businesses lie to the north of the Project Area along Corridor G. Davis Creek and a quarry are immediately adjacent to the southwest portion of the Project Area.

To the south along Corridor G lies the region’s largest collection of “big box” retailers and restaurants. Several car dealerships also line Corridor G within a mile south of the Project Area. The “Southridge Center” shopping area, approximately one mile south, includes a WalMart Supercenter, Toys R Us, Home Depot, and Sam’s Club, among many other

businesses. Closer to the Project Area lies “The Shoppes at Trace Fork.” In addition to stores such as Target, Best Buy, and Dick’s Sporting Goods, the Trace Fork center includes an ice arena and several athletic fields.

An important planned future element of the Project Area is a new connector road between Jefferson Road and the Shoppes at Trace Fork. This roadway is called the RHL Boulevard Extension. This project is listed in the Kanawha County Commission’s Comprehensive Plan as a key transportation project and is included in the 2012-2015 TIP, June 2014 update of projects (Kanawha County Commission, 2014; RIC, 2014) and has undergone an environmental review by WVDOH and FHWA. This extension will connect to Jefferson Road near the northern end of the “S” curve, roughly along the current power line right-of-way visible in Figure 2.

The middle of the Project Area has a mixture of land uses, with a perennial stream (Davis Creek) along the west side and undeveloped, steep slopes, occasional residences, and a vacant lot, that recently housed a used car dealership, along the east side. Farther from the roadside, the Project Area includes an apartment complex and a golf course to the west, and the West Virginia Regional Technology Park to the east. (Figure 4). The Technology Park is an important feature in South Charleston and is growing.

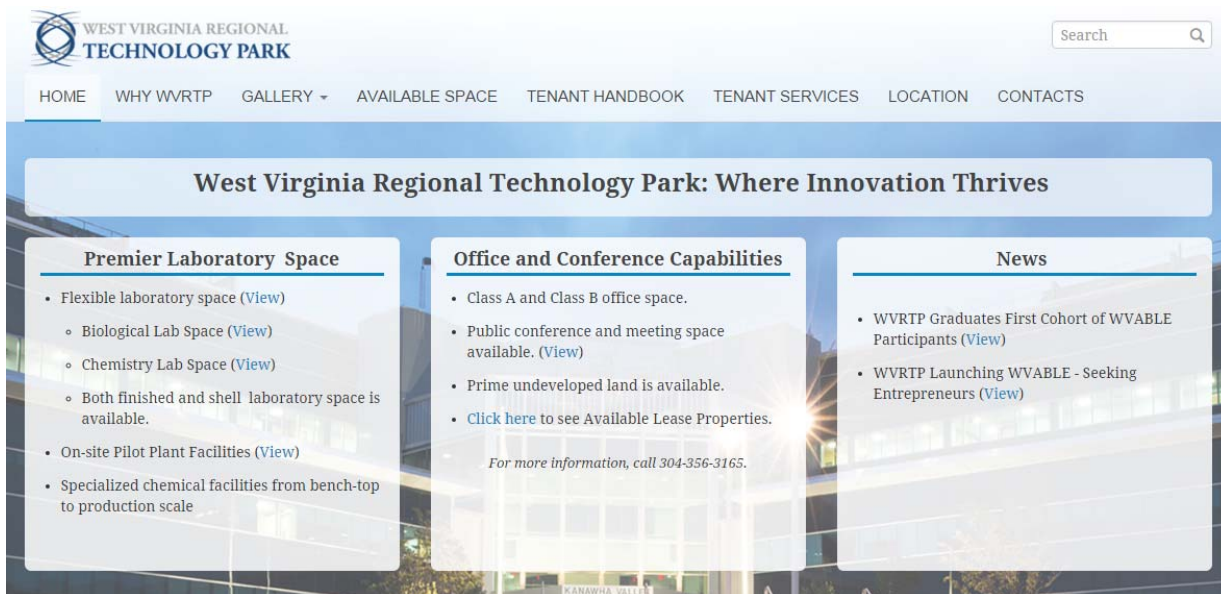


Figure 4. Website home page for the WV Regional Technology Park. Note advertising for conference space and available properties for lease. (<http://www.wvrtp.com/>)

The Technology Park is accessed along Kanawha Turnpike, which crosses Jefferson Road in the northern portion of the middle of the Project Area. Jefferson Road also crosses a major rail line (CSX) in this area. As shown in Figure 3, this intersection is offset; i.e., traffic is required to make a left turn and a right turn in order to stay on Jefferson Road heading north.

The flow of vehicles through the offset intersection is further complicated by occasional long delays for train crossings (Figure 5). For the 2015 traffic study, Stantec collected train crossing data for two weeks. Over that period, train crossings averaged 1 minute, 58 seconds in the AM peak period (7-9 AM) and 2 minutes 13 seconds in the PM peak period (4-6 PM). Details regarding existing and projected future traffic congestion is provided in Section 2.0 (Project Need), and the entire Traffic Study is included in Attachment 1.



Figure 5. Traffic at the Kanawha Turnpike offset intersection. The train is preventing vehicles from turning right onto Jefferson Road northbound at far left of photograph.

In the northern portion of the Project Area, centers of activity include a Bob Evans restaurant, a McDonalds restaurant, the South Charleston Community Center, and the WV State Police South Charleston Detachment. Dense residential neighborhoods lie adjacent to Jefferson on the east side of the northern project area and beyond the Police Station to the west.

At the very northern end of the Project Area, Jefferson Road intersects MacCorkle Avenue (US 60), a four-lane east-west corridor from which travelers can access additional local neighborhoods, the nearest hospital, industry, and shopping, as well as Interstate Highway 64 (I-64). I-64 is an east-west highway that runs between the states of Virginia and Missouri.

Unlike in the southern project area in which Jefferson Road has mostly two lanes, Jefferson for most of the project area north of the railroad tracks, Jefferson Road has three lanes. It has four lanes along the northernmost tenth of a mile for its junction with MacCorkle Avenue. The area in front of the Police Station is problematic. Despite having a third lane in this location, access is often blocked from the queuing southbound traffic stopped for the railroad and offset intersection (Figure 6).



Figure 6. Two views, facing south, of Jefferson Road adjacent to the WV State Police South Charleston Detachment. Left: markings in the road to help prevent traffic from blocking emergency vehicle access to/from the facility. Right: Southbound queueing traffic from the Kanawha Turnpike intersection, blocking the entrance to the police facility.

2.0 Purpose and Need

2.1 Project Need

As detailed in the following sections, Jefferson Road has the following needs in the Project Area:

- Congestion Relief
- Improved Safety
- Increased Opportunity for Economic Development

2.1.1 Congestion

Jefferson Road serves traffic in South Charleston as well as areas such as Dunbar, St. Albans, and regional through-traffic connecting between I-64 East and US 119 South. These travel demands have resulted in traffic volumes on Jefferson Road which exceed the capacity of a two-lane roadway.

Traffic study results (Stantec, 2015) indicate that excessive congestion is occurring, primarily in the PM peak hour, and by Year 2030 will overwhelm the capacity of the offset intersection of Jefferson Road and Kanawha Turnpike as currently aligned. For both signalized and unsignalized intersections, capacity and “level-of-service” (LOS) analyses were performed.

The complete traffic study is included in Attachment 1, and the study area used for the analysis is shown in Figure 7.

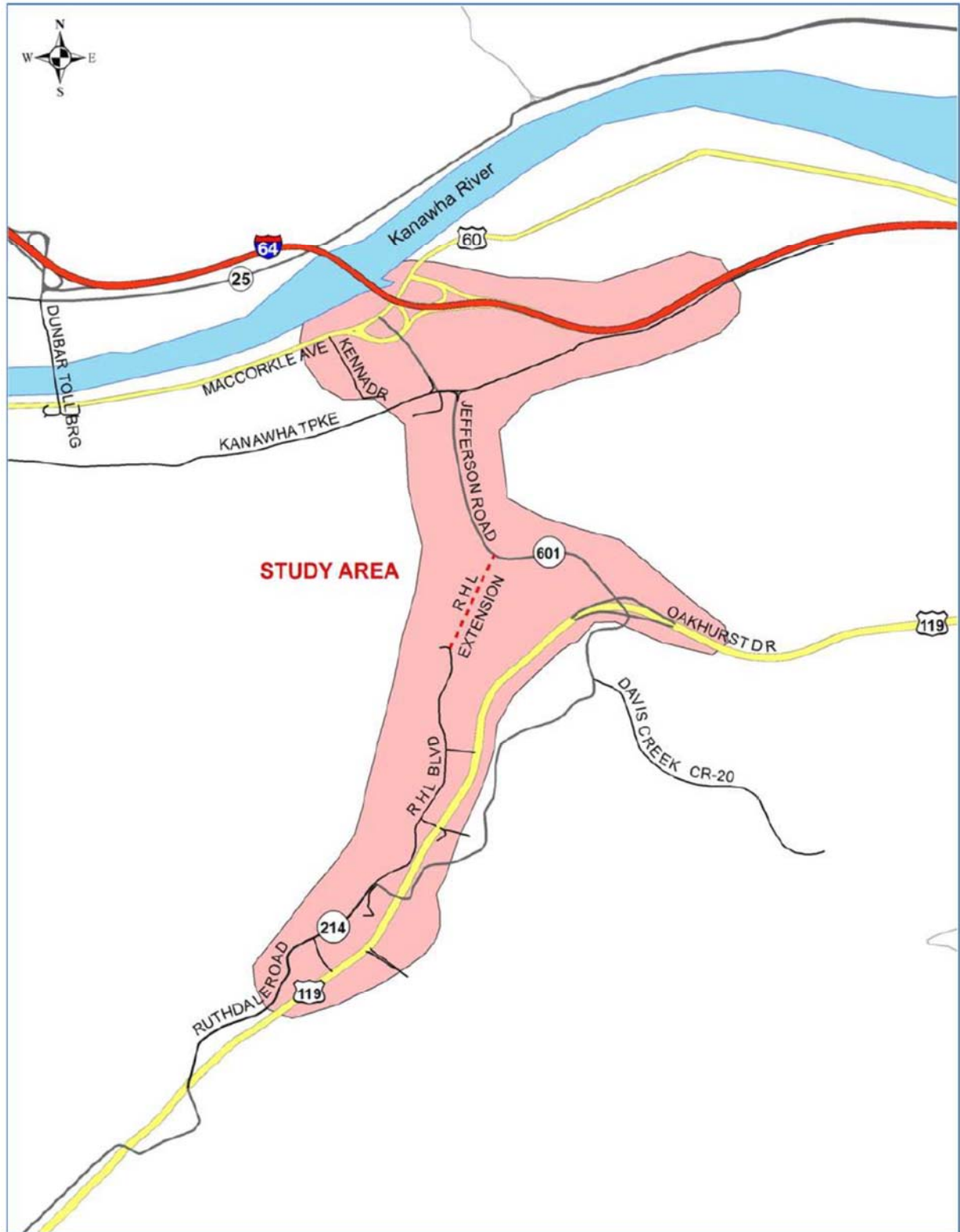


Figure 7. Traffic Study Area. Note location of future RHL Boulevard Extension. (Source: Stantec, 2015)

LOS for intersections is a “grade” for the amount of control delay a vehicle experiences. Control delay is the delay associated with vehicles slowing in advance of an intersection, the time spent stopped on an intersection approach, the time spent as vehicles move up in the queue, and the time needed for vehicles to accelerate to their desired speed. The thresholds for LOS are shown in Table 1.

Table 1. Level-of-Service Thresholds

LOS	Control Delay (seconds/vehicle)	
	Signalized Intersections	Unsignalized Intersections
A	< 10	< 10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

Note: Additional delay is considered acceptable at signalized vs. unsignalized intersections.

Source: TRB, 2011.

Comparing the existing condition to the future condition at Project Area intersections, one can see that LOS is the same or worse at *all* the intersections in *both* the AM and PM peak hours of traffic, with just two exceptions where LOS improves by just one grade in the future. LOS deteriorates the most at the following locations and times:

- Jefferson Road traffic turning into the Bob Evans in the PM peak hour (LOS C to E).
- Jefferson Road traffic turning into the north entrance of the South Charleston Community Center in the PM peak hour (LOS C to F).
- Jefferson Road traffic turning into the south entrance of the South Charleston Community Center in the AM peak hour (LOS B to D).
- Jefferson Road traffic turning onto Kramer Street in the AM peak hour (LOS C to E).
- Jefferson Road onto Corridor G southbound in the PM peak hour (LOS C to LOS F).

Table 2. Traffic at Intersections - Existing and Future (2030) Without the Project

Location (all on Jefferson Road)	Existing (2014) LOS and Control Delay				Future (2030) LOS and Control Delay			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Northbound at MacCorkle	139.3	F	281.0	F	120.0	F	254.8	F
Bob Evans	15.8	C	19.8	C	17.7	C	36.5	E
McDonalds	15.5	C	20.4	C	16.7	C	34.5	D
Community Ctr (north access)	21.2	C	16.8	C	27.8	D	53.8	F
Community Ctr (south access)	15.0	B	12.5	B	33.1	D	18.1	C
Washington St	14.9	B	15.8	C	15.8	C	14.5	B
Pennsylvania Ave	12.3	B	13.1	B	12.7	B	18.8	C
Kanawha Tnpk /Mathias Ln	99.8	F	60.9	E	154.1	F	174.2	F
Kanawha Tnpk	109.1	F	55.1	E	102.6	F	169.0	F
Kramer St	23.2	C	94.4	F	43.2	E	132.9	F
Corridor G (southbound)	16.7	C	24.3	C	19.7	C	98.6	F
Oakhurst Dr	44.1	D	44.2	D	46.1	D	69.7	E

Notes: Signal timings were adjusted for each analysis scenario. Additional intersections are included in the full traffic reports (Attachments 1 and 2).

Source: Stantec, 2015

The traffic study also analyzed travel times through the Project Area and the lengths of lines, or queues, in the Project Area. Although the traffic study included examination of train delay scenarios, these summary results presume no train delay as a “best-case scenario” for examining the future without the proposed project. Key results include the following:

- Average AM peak travel time on Jefferson Road northbound through the corridor (one of the typical morning commute routes) is forecast to increase from 3.6 minutes (existing) to 7.9 minutes (Year 2030).
- Average PM peak travel time from westbound Kanawha Turnpike to southbound Jefferson Road through the corridor (one of the typical evening commute routes) is forecast to increase from 4.1 minutes (existing) to 10.1 minutes (Year 2030).
- The maximum AM peak queues of northbound traffic on Jefferson Road before the Kanawha Turnpike intersection is forecast to increase from 363 feet to 1,986 feet.

- The maximum PM peak queues of southbound traffic on Jefferson Road before the Kanawha Turnpike intersection (in front of the Police Station) is forecast to increase from 449 feet to 1,564 feet.
- If the proposed Jefferson Road improvements are not in place, planned construction of the RHL Boulevard Extension will create new spillback queues toward the Shoppes at Trace Fork in the west and toward Kanawha Turnpike in the north.

The complete traffic study is included in Attachment 1. Tables show more comparisons between the existing conditions and the forecast future condition without implementing the project.

2.1.2 Safety

A safety analysis was conducted by Michael Baker International using crash data for the years 2013, 2014, and 2015. During the 3-year period, 273 crashes were reported along the 1.75 miles of Jefferson Road through the project area. The Annual Average Daily Traffic (AADT) during this time frame for this section of roadway was 21,800. Thus, the crash rate was calculated to be 6.54 crashes per million vehicle-miles traveled (VMT), which is four times the statewide average crash rate for similar facilities (1.63 crashes/ million VMT in 2013).

Because the project is addressing traffic approaching Jefferson Road as well as along it, crashes on those connecting roads at the intersections with Jefferson Road were also examined. A total of 333 crashes¹ were reported along the 1.75 mile corridor and at intersections with roads along that corridor. The breakdown of these crash locations is shown in a cluster map in Figure 8.

As shown on the map, higher numbers of crashes tend to occur at intersections, which is typical for this type of roadway. Jefferson Road at the Kanawha Turnpike intersection and to the north tended to have more crashes than the southern portion of the study area. In particular, the Jefferson Road intersections with MacCorkle Avenue (US 60) and Kanawha Turnpike experienced the highest number of crashes during the three-year analysis period. This would be expected given the traffic volumes which travel through these intersections and the traffic congestion in the area.

The road and light conditions and crash types were examined for the 333 crashes in the traffic study area. Most (261 or 78%) occurred with dry conditions, and most (278 or 83%) occurred in daylight. While some of the crashes were instigated by issues unrelated to traffic, such as a falling object or animal crossing, the vast majority (308 or 92%) were due to motor vehicle movements.

¹ Approximately 33 additional crashes are listed in the dataset for the traffic study area; however, for the purposes of analyzing the data, data points for which the location information was incomplete were eliminated from this study.

The collision types are broken down in Figure 9. Most of the crashes were rear end or right angle collisions (232 out of 333, or 70%). As compared to other types of collisions, such as sideswipes, these collision types more likely relate to stop-and-go traffic conditions and the number of access points and intersections.



Figure 8. Crash Locations for Project Area Crashes, 2013-2015

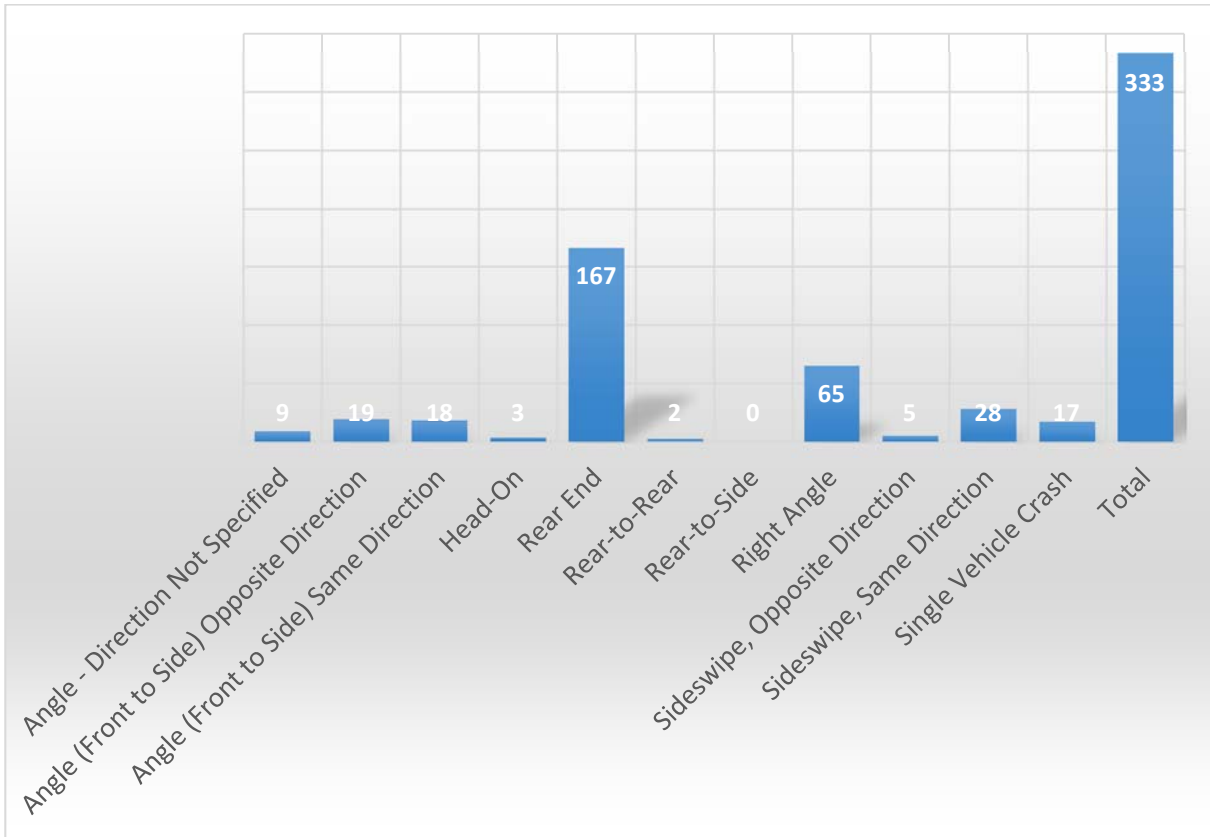


Figure 9. Crash Types for Project Area Crashes, 2013-2015

2.1.3 Economic Development

The West Virginia Regional Technology Park is experiencing growth, including the expansion of BridgeValley Community and Technical College. For example, a 55,000 sq ft Advanced Technology Center, shown in Figure 10 was opened in 2014.

The 260-acre Park can bring substantial additional economic development to South Charleston, but access is constrained by the severe congestion on Jefferson Road. Local officials also believe that commercial development along Jefferson Road itself and in the commercial area along US 119 is being hindered by the congestion on Jefferson Road.



Figure 10. New (2014) Advanced Technology Center just east of the Project Area.

2.2 Project Purpose

Based on the needs discussed in the previous section, WVDOH has developed the following project purpose statement:

The purpose of the Jefferson Road Improvement Project is to relieve congestion, improve safety, and improve opportunity for economic development in South Charleston, WV.

3.0 Analysis of Project Alternatives

3.1 Range of Alternatives

To fulfill the purpose and need, eight (8) conceptual alternatives were developed and analyzed by WVDOH for the Project. These included the No-Build Alternative and seven (7) Preliminary Build Alternatives. The build alternatives were considered preliminary because details such as precise access points and bicycle lane widths were not developed. The preliminary alternatives were assessed for feasibility and practicability and were shared with resource agencies and the public for their feedback.

3.1.1 No-Build Alternative

Under the No-Build Alternative, the proposed project is not implemented. This alternative includes all currently adopted and planned transportation improvements in the Project Area. Jefferson Road undergoes routine maintenance, but is not substantially altered.

3.1.2 Preliminary Build Alternatives

The Preliminary Build Alternatives all generally widen existing Jefferson Road from two lanes to five lanes, including a center turning lane. The roadway is considered an urban minor arterial, and has have a design speed of 40 mph south of Kanawha Turnpike and 35 mph north of Kanawha Turnpike.

Preliminary Alternative 1 – Alternative 1 has two options: Option A and Option B. Option B builds upon Option A.

Alternative 1 Option A widens Jefferson Road to five lanes, generally following the existing alignment from US 119 to approximately 600 feet south of Kanawha Turnpike. It includes a new bridge over Davis Creek and forms a four-leg, at-grade intersection with Kanawha Turnpike. Alternative 1 then follows existing Jefferson Road to the I-64 overpass ramp, widening the road to the east of the existing travel lanes, allowing the structures on the west side (e.g., the State Police Station and South Charleston Community Center) to remain in place.

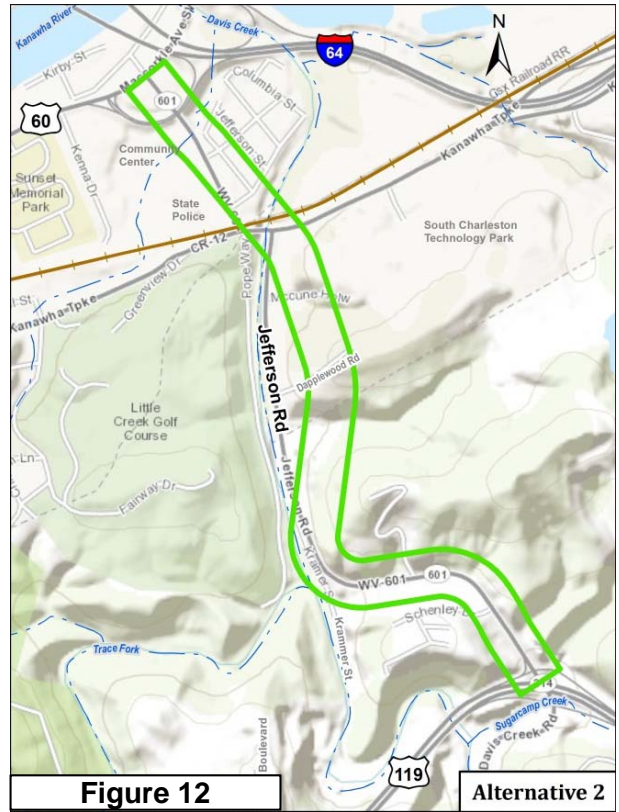
Alternative 1 Option B adds two single-lane flyover ramps (one northbound and one southbound) to allow Jefferson Road through-traffic to pass over Kanawha Turnpike and the railroad. The four-leg, at-grade intersection with Kanawha Turnpike still exists with this option for traffic traveling between Jefferson Road and Kanawha Turnpike. After bridging the railroad, the flyover ramps are supported on walls until their grade tapers downward to meet the remainder of Jefferson Road, south of the I-64 overpass. Because of the walls, the access locations for the WV State Police Station and for Washington Street are relocated, and an underpass is constructed for Pennsylvania Avenue.



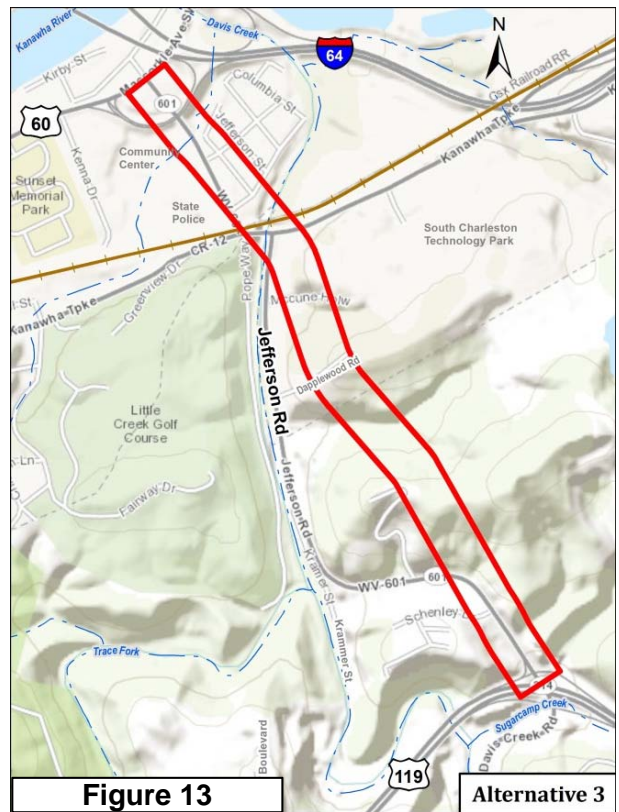
Figure 11

Alternative 1

Preliminary Alternative 2 - Alternative 2 provides a five-lane facility by generally following the southern part of the existing alignment from US 119 to approximately 400 feet north of the proposed intersection with RHL Boulevard Extension. It then diverges along a new alignment approximately 640 feet east of existing Jefferson Road as it approaches Kanawha Turnpike. It bridges Kanawha Turnpike, the railroad, and Davis Creek and ties back into existing Jefferson Road near the I-64 ramp overpass.



Preliminary Alternative 3 – Alternative 3 provides a five-lane facility that begins by following the southern part of the existing alignment from US 119 to the first horizontal curve. From there it would follow a new alignment approximately 1,450 feet to the east of existing Jefferson Road as it approaches Kanawha Turnpike. It bridges Kanawha Turnpike, the railroad, and Davis Creek and ties back into existing Jefferson Road near the I-64 ramp overpass.



Preliminary Alternative 4 – Alternative 4 has two options: Option A and Option B. Option B builds upon Option A.

Alternative 1 Option A widens the southern part of existing Jefferson Road to five lanes, from US 119 to Kramer Street, and then diverges along a new alignment to the west of Davis Creek. It parallels Davis Creek on an abandoned railroad bed to intersect with Kanawha Turnpike, forming a four-leg, at-grade intersection. North of Kanawha Turnpike, it follows existing Jefferson Road to I-64.

Alternative 4 Option B adds two single-lane overpasses (one northbound and one southbound) to allow Jefferson Road through-traffic to pass over Kanawha Turnpike and the railroad. The four-leg, at-grade intersection with Kanawha Turnpike still exists with this option for traffic traveling between Jefferson Road and Kanawha Turnpike.



Preliminary Alternative 5 – Alternative 5 widens the majority of the southern part of existing Jefferson Road to five lanes, from US 119 to near Dapplewood Road, and then diverges along a new alignment to the east of existing Jefferson Road in order to bridge Kanawha Turnpike, the railroad and Davis Creek. It then ties back into existing Jefferson Road near the I-64 ramp overpass.



Preliminary Alternative 6 – Alternative 6 widens existing Jefferson Road to five lanes, generally following the existing alignment from US 119 to approximately 600 feet south of Kanawha Turnpike, similar to Alternative 1. However, Alternative 6 includes a dual lane grade-separated interchange over Kanawha Turnpike, the railroad and Davis Creek, tying back into existing Jefferson Road near the I-64 overpass ramp.

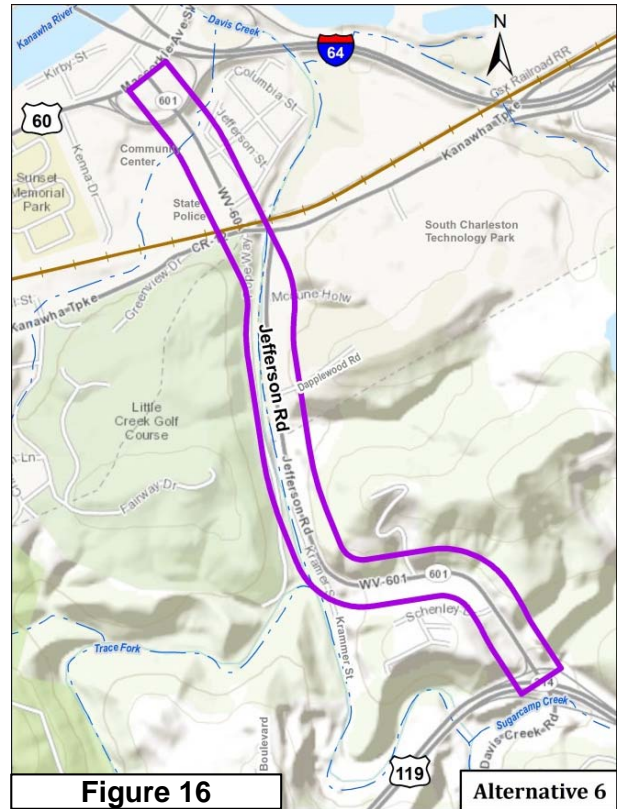


Figure 16

Alternative 6

Preliminary Alternative 7 – Alternative 7 widens the southern part of existing Jefferson Road to five lanes, from US 119 to near Dapplewood Road. It then diverges along a new alignment east of existing Jefferson Road and bridges Kanawha Turnpike, the railroad, and Davis Creek. It then continues along a new alignment just west of the existing roadway in the vicinity of the West Virginia State Police facility and ties back into the existing I-64 ramp.

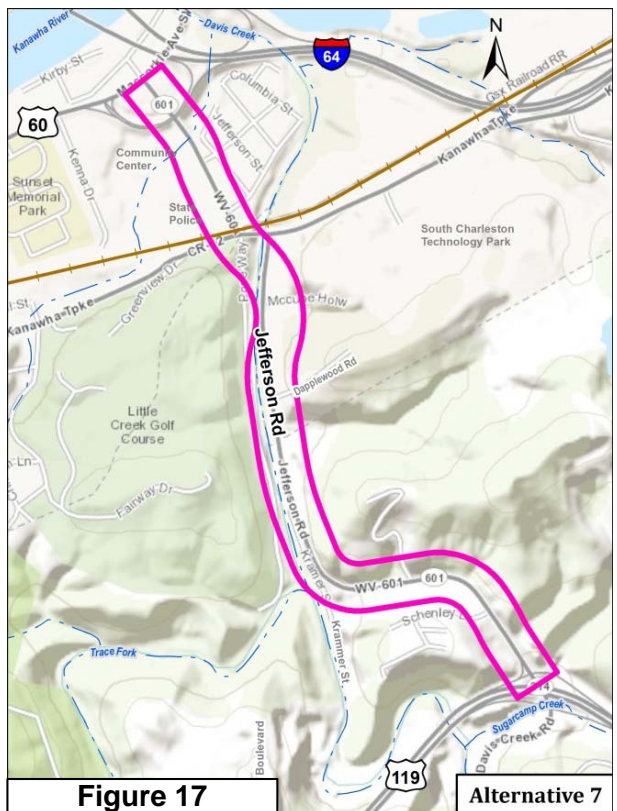


Figure 17

Alternative 7

3.2 Preliminary Alternatives Screening

In 2013, WVDOH produced a Planning and Environmental Linkage Study for the Jefferson Road Improvement Project. For this study, the preliminary alternatives were assessed as 500-foot wide corridors without detailed engineering. Key project issues were selected to aid in identifying the preliminary alternatives that represent the best opportunity to minimize the overall cost and impacts to the social, natural and cultural environments. A summary of the 2013 study results is presented in Table 3.

Table 3. Summary of 2013 Preliminary Alternatives Analysis

Issue	Alternative								
	1		2	3	4		5	6	7
	Option A	Option B			Option A	Option B			
Total Cost	\$37 M	\$55 M	\$56 M	\$51 M	\$48 M	\$66 M	\$41 M	\$52 M	\$87 M
Total Length (miles)	1.6	1.6	3.3	2.9	1.6	1.6	1.7	1.6	1.6
Excavation (cubic yards)	733K	748K	1,522K	1,495K	1,001K	1,016K	800K	788K	800K
Includes Overpass	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Displacements	20	27	33	27	27	27	30	30	15
Residential Right-of-Way	12.0 ac	26.7 ac	41.8 ac	45.0 ac	35.7 ac	35.7 ac	27.7 ac	23.2 ac	28.6 ac
Cemetery	-	-	-	-	1	1	-	-	-
Floodway (acres)	11.6	11.6	3.9	1.7	11.9	11.9	10.8	11.6	9.5
Hazardous Sites	8	8	6	2	7	7	7	8	8

Note: These numbers represent results of a preliminary screening and not final impact calculations if the corridors were developed with detailed design. These numbers are based on analysis done for the PEL (Michael Baker, 2013) and the 2013 Preliminary Design Study by TRC.

Screening criteria and their results are described below. Note that relocations is not one of the criteria. With the exception of Alternative 1, Option A, all of the Build Alternatives would require relocating between 27 and 33 residences (according to preliminary estimates). These differences were not considered substantial enough for basing an alternatives screening, especially because refined design could increase or lower these numbers.

First Screening: Impact to WV State Police Headquarters

Since the beginning of alternatives development, the WV State Police completed construction of a state-of-the-art headquarters alongside its older facility on Jefferson Road in the northern portion of the Project Area. WVDOH learned that it would take tens of millions of dollars to replace their new facility, which includes laboratories for forensic studies.

Therefore, Preliminary Alternative 7, which required the relocation of this building, was eliminated from further consideration.

Second Screening: Overall Length and Disturbance

Preliminary Alternatives 2 and 3 are the longest, would require the most residential property to be acquired, and would require the most excavation of material. Collectively, these issues have led to their elimination, with the following factors considered:

- With lengths of 3.3 and 2.9 miles, these alternatives are 80-100% longer than several other options that are 1.6 miles long. The longer length reduces the travel time improvements this project is providing.
- Although the residential relocations are similar to other remaining alternatives (27 to 33 residences), Preliminary Alternatives 2 and 3 would have 42 to 45 acres of residential property taken, as compared to several other alternatives that would take less than 30 acres.
- These alternatives require 50-100% more material to be excavated along the project. With relatively few areas requiring fill material, the excavated material could cause additional area impacts, to be worked out during final design.

Third Screening: Elimination of Similar Alternatives

Preliminary Alternatives 1, 4, and 6 provide very similar alignments, so these were examined for the possibility of screening out the least preferable alternative(s) from undergoing detailed design. Each of these alternatives would create a four-leg intersection at the Kanawha Turnpike crossing and provide a bridge over Kanawha Turnpike and the railroad. Preliminary Alternative 1 was carried forward for detailed analysis for the following reasons:

Preliminary Alternative 1 has the advantage over Preliminary Alternative 6 because it is planned for phased construction. The preliminary traffic analysis determined that even Alternative 1 Option A could substantially improve traffic congestion without the bridge over Kanawha Turnpike and the railroad (Stantec, 2013). (The more recent traffic analysis confirmed this [Stantec, 2015].) Therefore, project needs could be met even if full funding were not available. Also, Preliminary Alternative 1 would have less impact on the northern Project Area community (Jefferson Place) because the flyovers have only one lane and not two.

Preliminary Alternative 1 has the advantage over Preliminary Alternative 4 for several reasons. Preliminary Alternative 4 would cost more (\$66 million vs. \$55 million), would require a third more excavation (approximately 1.0 million cubic yards vs. 750 thousand cubic yards), and would likely impact a cemetery and a public golf course (the Little Creek Golf course).

Preliminary Alternatives Screening Results

WVDOH carried forward Preliminary Alternatives 1 and 5 for more detailed engineering and environmental analysis.

3.3 Public Input

During assessment of the preliminary alternatives, WVDOH hosted a public information workshop in March of 2013, followed by a public comment period. WVDOH received general comments of support for the project, comments regarding the design of the facility, and comments concerning potential environmental impacts. Most comments fell into one of four categories, which are listed below along with a summary of how the concern was addressed in the alternatives analysis.

- 1) Support for a grade-separated railroad crossing.

The grade separation for the railroad crossing was considered an important element to include in one of the alternatives carried forward for detailed analysis.

- 2) Support for bicyclist and pedestrian facilities.

Any alternative carried forward would include improvements to bicyclist and pedestrian facilities.

- 3) Concern for impacts to Jefferson Place neighborhood (e.g., relocations, access, and quality of life).

The alternatives carried forward do not bisect the Jefferson Place neighborhood, and minimize relocations to the extent practicable while incorporating other important project elements.

- 4) Concern for flooding implications of the project.

Any alternative carried forward would undergo a hydraulic analysis for preliminary assessment and the Selected Alternative would undergo detailed analysis yielding mitigation measures for preventing additional flooding problems.

3.4 Development of Alternatives Carried Forward

WVDOH commissioned TRC consultant engineers to conduct more detailed engineering design for Preliminary Alternatives 1 and 5. Since the 2013 preliminary study, several changes were made to the alternatives in light of analysis results.

3.4.1 Preliminary Alternative 1 Flyover Elimination

The flyover lanes (one in either direction) associated with Preliminary Alternative 1 Option B in the northern Project Area would present a particularly obstructive roadway in between the Jefferson Place neighborhood and the WV State Police Headquarters. Figure shows the typical sections for the northern part of Preliminary Alternative 1 Option B.

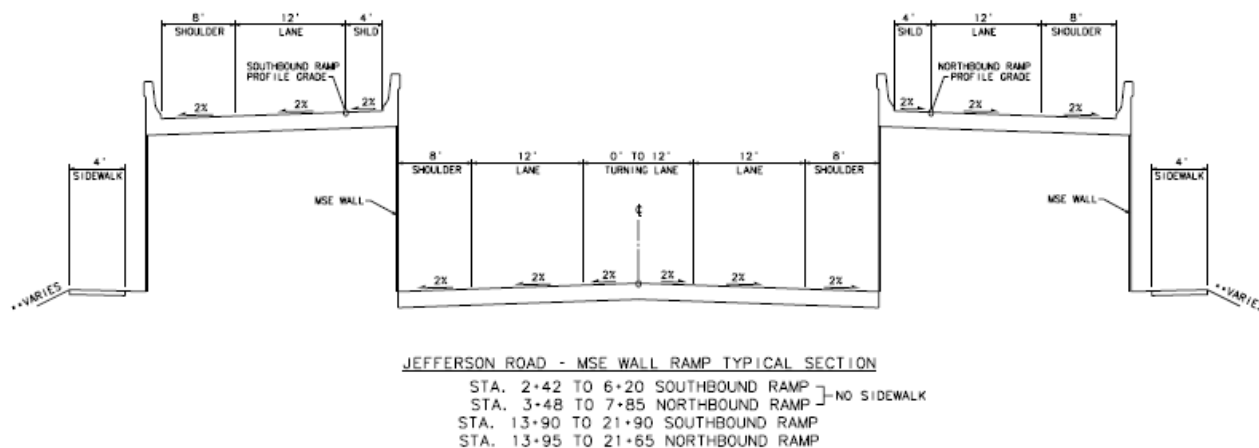


Figure 18. Typical section of Preliminary Alternative 1 Option B flyover section in northern Project Area (near the WV State Police Headquarters). Walls will block direct access to the main travel lanes of Jefferson Road when the flyover lanes are in place.

This consideration along with consideration for the reduced impacts associated with Option A, led WVDOH to carry Preliminary Alternative 1 Option A forward in the analysis. Option A costs \$18 million less, has half the residential acreage impact, and has 7 fewer residential relocations than Option B (Table 3). Additionally, traffic congestion can be substantially reduced simply with realigning the Kanawha Turnpike intersection portion of Jefferson Road (Stantec, 2013). Carrying forward Option A allows detailed assessment, along with public and agency review, of an alternative that does not involve the impacts associated with an added bridge over the Kanawha Turnpike and railroad.

3.4.2 Roundabout Options

WVDOH engineers examined the option of adding roundabouts to further improve congestion relief with the Build Alternatives. A roundabout option was considered at the future junction with the RHL Boulevard Extension, but was dismissed as part of this project and will be reconsidered along with a signalized alternative with the final design of the RHL Boulevard project.

The Kanawha Turnpike intersection is the other location considered for a roundabout. With Alternative 1, the location of the Kanawha Turnpike intersection, adjacent to the hill leading with the Mathias Lane neighborhood, does not allow for the addition of a roundabout.

However, with Alternative 5, the location of the Kanawha Turnpike intersection is farther east and can accommodate a roundabout. The roundabout replaces the traffic signal at the Jefferson Road Connector Road and is positioned beneath the bridge crossing.

In December 2015, WVDOH produced a preliminary traffic study for this roundabout option. Without the roundabout, Alternative 5 improves the overall Kanawha Turnpike intersection from LOS F to LOS C (Stantec, 2015; Attachment 1). With the roundabout, the estimated delays improve to LOS B overall, with some turning movements having LOS A (WVDOH, 2015; Attachment 2).

This Alternative 5 roundabout option requires more excavation, an additional residential relocation, and added cost as compared to the signalized option. WVDOH is carrying forward Alternative 5 with the Kanawha Turnpike roundabout for detailed analysis in the EA; however, the final intersection design will be determined after more detailed traffic study during the final design process.

3.4.3 Mathias Lane Access Moved

In the Preliminary version of Alternative 1, the access to Mathias Lane (near the Little Creek Golf Course) was relocated farther west along Kanawha Turnpike. During continued design and field views, it was determined this location would not work and the access needed to be moved to Jefferson Road, south of the Kanawha Turnpike intersection. This access point adds a new bridge over Davis Creek, with one lane in both directions, and new roadway to meet Mathias Lane where it turns west to enter an apartment complex.

The preliminary right-of-ways and centerlines for the two alternatives carried forward for detailed analysis are presented in Figure 19 and Figure 20. Detail of the roundabout option for Alternative 5 is shown in Figure 21.

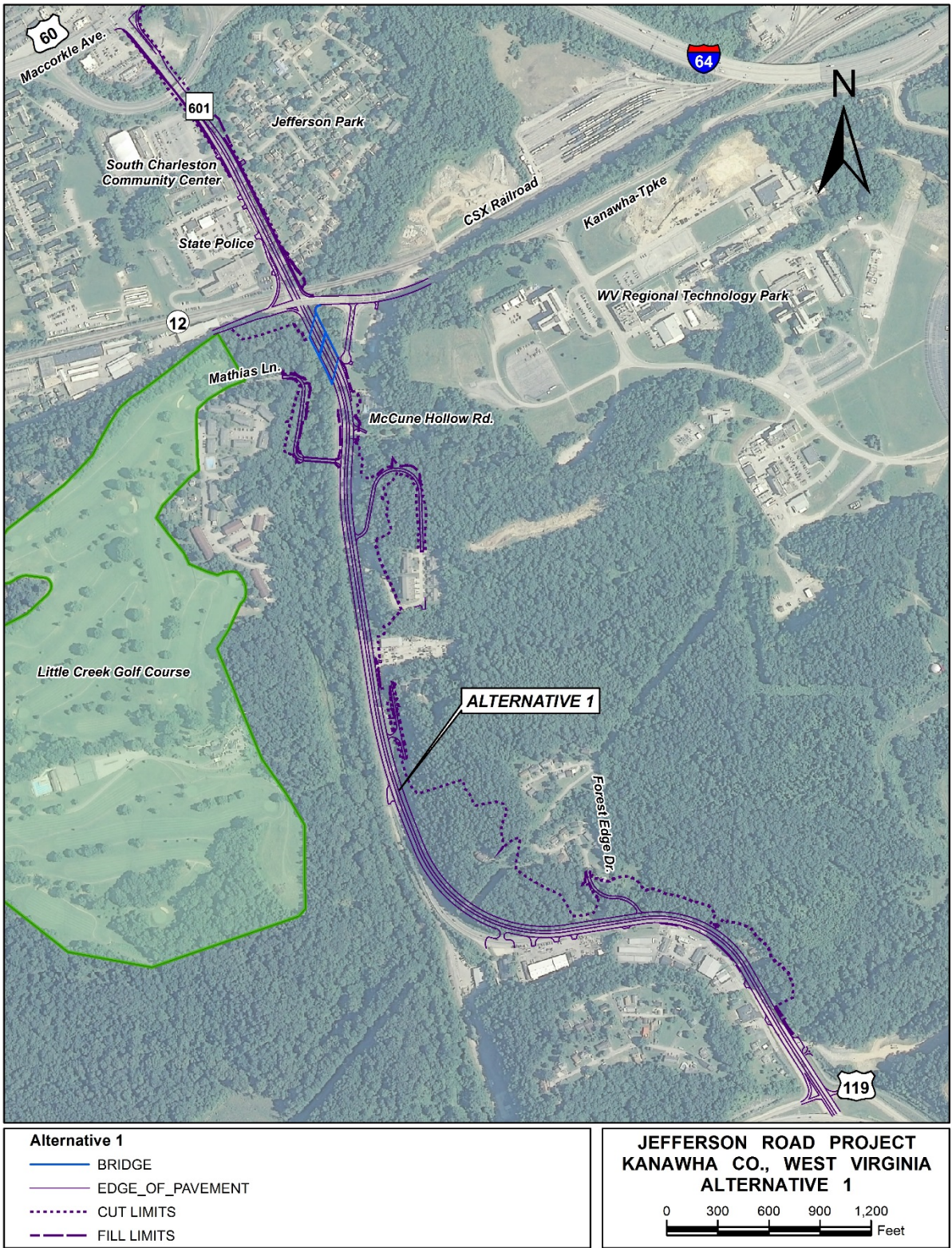


Figure 19. Alternative 1 (as refined in 2015)

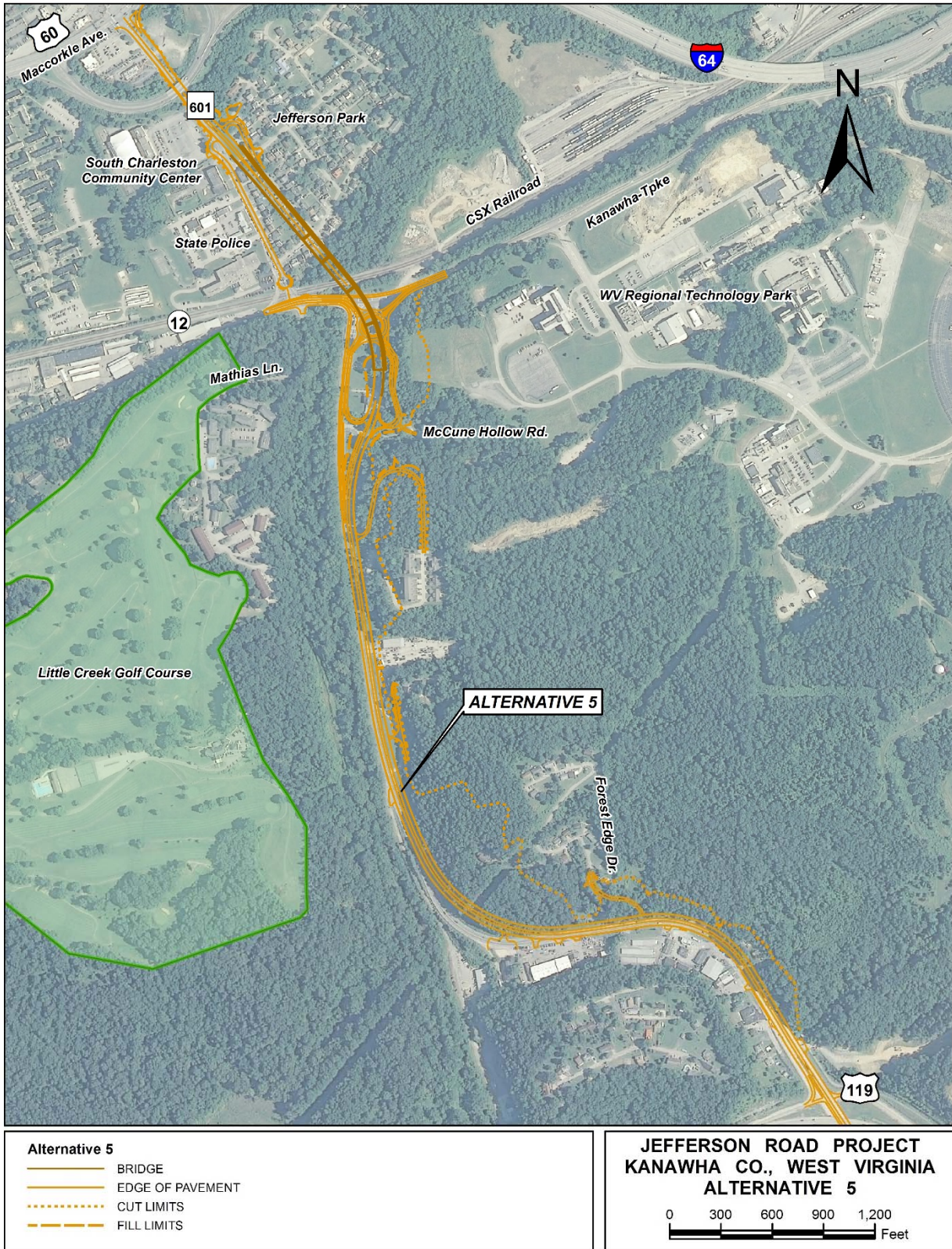


Figure 20. Alternative 5 (as refined in 2015)

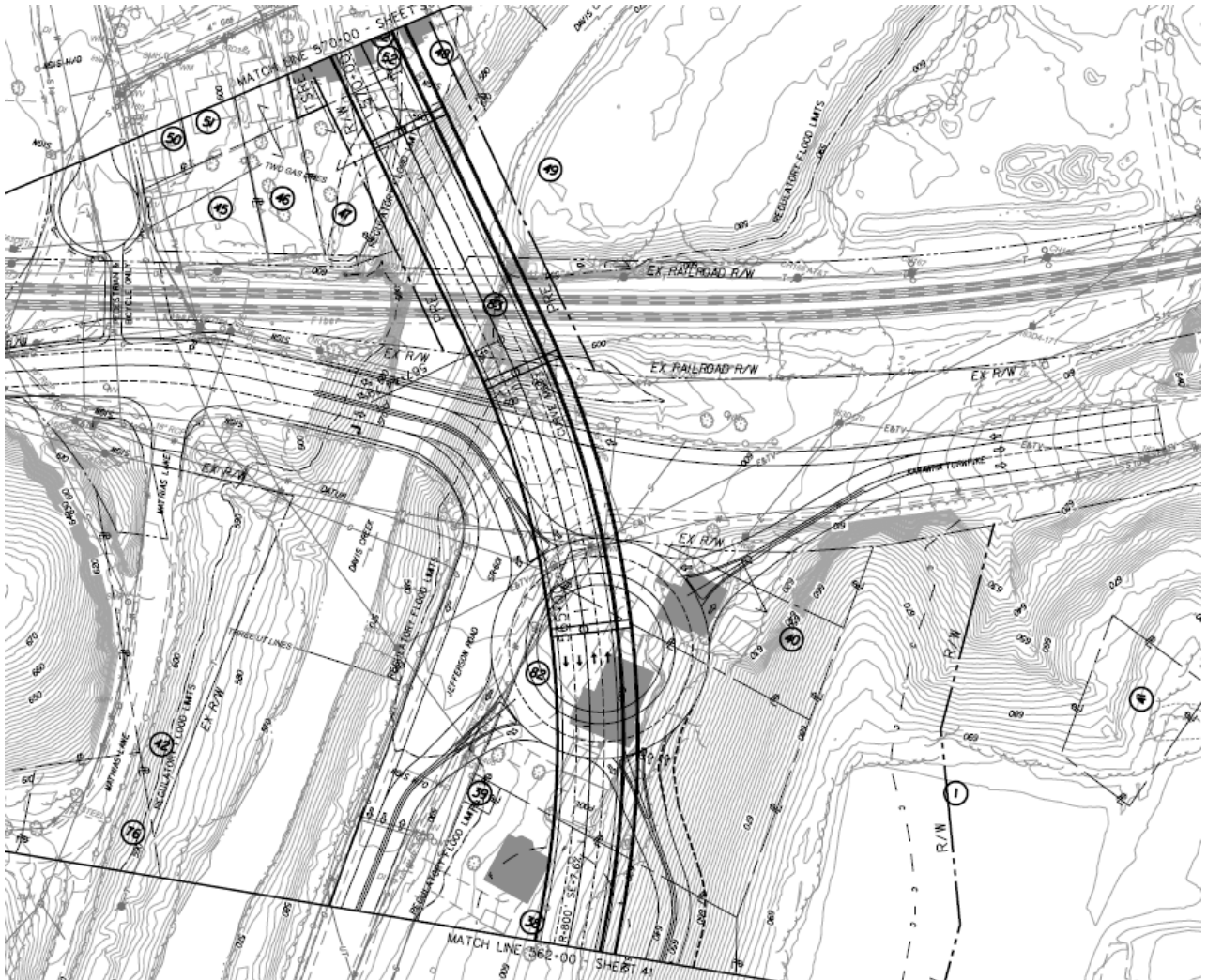


Figure 21. Preliminary plans for a new roundabout with Alternative 5 at the intersection between Jefferson Road and Kanawha Turnpike.

3.5 Selection of Preferred Alternative

Each of the alternatives carried forward was assessed for how well it satisfies each of the purpose and need components and for impacts to the natural, physical, and social environments.

3.5.1 Purpose and Need

Table 4 summarizes the purpose and need and which alternative fulfills each component. Each of the components are discussed in the following paragraphs. Although the No-Build Alternative does not meet the project's purpose and need, it is carried forward in the EA for analysis as a basis of comparison to the Build Alternatives.

Table 4. Purpose and Need Summary for the Alternatives

Project Purpose Element	No Build Alternative	Alternative 1	Alternative 5
Relieves Congestion	No	Yes	Yes
Improves Safety	No	Yes	Yes
Improves Access to Economic Activity	No	Yes	Yes

Congestion Relief: As discussed in Section 2.1.1, the No Build Alternative does not improve congestion. By the design year (2030), overall control delays, travel times, and queue lengths increase. Traffic congestion dramatically improves at the Kanawha Turnpike intersection and generally improves overall with both Build Alternatives. A comparison between the Build Alternatives' delay times and LOS in the design year (2030) is presented in Table 5. Additional details are available in Attachments 1 and 2.

Table 5. Traffic at Intersections - Future (2030) with the Build Alternatives

Location (all on Jefferson Rd)	Alternative 1				Alternative 5			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Northbound at MacCorkle	61.7	E	49.4	D	62.9	E	50.2	D
Bob Evans	17.5	C	19.3	C	18.0	C	35.2	E
McDonalds	17.5	C	19.2	C	17.7	C	22.2	C
Community Ctr (north access)	24.1	C	18.4	C	10.8	B	11.9	B
Community Ctr (south access)*	14.7	B	12.7	B	NA	NA	NA	NA
Washington St/ Park St*	10.6	B	12.2	B	5.0	A	8.9	A
Pennsylvania Ave	10.8	B	14.7	B	12.6	B	15.3	C
Kanawha Tnpk/ Mathias Ln**	33.3	C	42.8	D	10.8	B	12.5	B
Kramer St	25.0	C	52.1	F	11.0	B	12.9	B
RHL Boulevard (Proposed)	6.5	A	17.8	B	7.4	A	16.0	B
Corridor G (southbound)***	15.2	C	24.5	C	16.2	C	27.9	D
Oakhurst Dr	39.0	D	35.2	D	44.1	D	43.8	D

Notes: Signal timings were adjusted for each analysis scenario. The model includes the assumption that the RHL Boulevard Extension and a new signalized intersection with Jefferson Road are constructed by 2030.

*For Alternative 5, the area near the south entrance to the Community Center changes – the Washington Street access is moved and becomes a new access to Park St, which has a signalized intersection with the end of the old Jefferson Road.

** For the Kanawha Turnpike intersection, Alternative 1 results come from the August 2015 Stantec study and Alternative 5 results come from a separate, preliminary roundabout traffic study produced by WVDOH in December 2015.

*** The PM Peak Hour values for the Corridor G intersection do not match those in the 2015 Stantec report (Attachment 1), but were corrected by Stantec via email to WVDOH in April 2016.

Sources: Stantec, 2015; WVDOH, 2015

Additional details regarding control delay and LOS can be found in Attachments 1 and 2; however, the following observations can be made of the data presented in Table 5.

- At the Kanawha Turnpike intersection, Alternative 1 substantially reduces control delays - from 100 to 33 seconds in the AM and from 61 to 43 seconds in the PM. However, Alternative 5 further reduces those delay times down to 11 seconds in the AM and 13 seconds in the PM, resulting in better LOS than Alternative 1 at this intersection.
- Alternative 1 has better (less) control delay than Alternative 5 at three unsignalized locations specifically in the PM: Bob Evans, Pennsylvania Avenue, and Corridor G southbound. However, Alternative 5 has better control delay improvement at three other unsignalized locations in both the AM and PM: Community Center (north access), Washington Street/Park Street, and Kramer Street.

The travel times and queue length analyses also reveal differences in how well the Build Alternatives improve the No Build condition. The summary results discussed here are for the scenario in which no train is passing, as a “best case scenario.” Additional details can be found in Attachment 1; however, some observations include the following:

- At MacCorkle Avenue (northbound on Jefferson Road), Alternative 1 improves the length of the queuing traffic more than Alternative 5. Although the line is still improved with Alternative 5 (from 359 feet with the No Build to 223 feet with Alternative 5), Alternative 1 shortens the line to 168 feet. This is because northbound traffic on Jefferson Road does not encounter an intersection at Kanawha Turnpike; whereas, with Alternative 1, northbound traffic on Jefferson Road is stopped periodically at the Kanawha Turnpike intersection. In other words, the Alternative 1 intersections acts like a gate that allows a more limited amount of traffic to pass toward MacCorkle Avenue.
- At the Kanawha Turnpike intersection, Alternative 1 substantially reduces peak hour queues; however, Alternative 5 eliminates them. With Alternative 5, there is estimated to be a 10- to 13-second delay (see Table 5) as traffic slows in order to enter the roundabout, but the vehicles are constantly advancing.
- The peak maximum queues at the intersection with the future location of the proposed RHL Boulevard Extension are forecast to be 98 feet in the AM and 487 feet in the PM with Alternative 1 and 101 feet in the AM and 207 feet in the PM with Alternative 5.

Safety: Both Build Alternatives offer the following safety improvements as compared to the No Build Alternative:

- Both Alternatives will reduce the number of access points, which reduces the risk of crash. In the northern Project Area, both alternatives will relocate a row of homes and one office building that are currently adjacent to the roadway. In the middle Project Area, the offset Kanawha Turnpike intersection, which currently has traffic stopping two times, is changed to either one intersection (Alternative 1) or a roundabout with constantly flowing traffic (Alternative 5).
- Both Alternatives will increase the number of lanes, which will offer more opportunities for traffic to turn onto the road at non-signalized intersections. As seen in Figure 8, the sites with the highest crash incidence in the Project Area other than MacCorkle Avenue

and Kanawha Turnpike in the years 2013-2015 were the intersections with Dapplewood Drive (24) and Kramer Street (17). The northern Project Area, where there are many access points, also had many crashes.

- Both Alternatives offer a bike lane. As currently designed, Alternative 1 provides lining for a bike lane within the widened shoulder, while Alternative 5 provides a dedicated bicyclist/pedestrian lane. However, the latter could be added to Alternative 1 during final design. Regardless of the exact design, the increased space for bicyclists will make the choice to ride a bike through the corridor a safer one.
- With improved flow of traffic, there will be fewer stop-and-go situations. This will likely reduce the number of rear-end crashes, which is the most frequent type of crash in the Project Area (Figure 9).

Improved Access: Both alternatives improve the flow of traffic and reduce travel times through the Project Area. Both alternatives provide additional travel lanes and a dedicated right turn lane onto MacCorkle Avenue.

Both alternatives also provide a safer option than currently exists for bicyclists to access facilities in the region. There is an existing utility access path that parallels US 119 and terminates on Jefferson Road. This path is utilized by the public for walking, jogging, and bicycling. A bike lane on Jefferson Road will provide access from the population centers of Spring Hill and South Charleston to this path and provide a link to Davis Creek Road, allowing bicyclists easy access to Kanawha State Forest.

Improved travel conditions will likely make the Jefferson Road corridor more appealing for travelers who otherwise do not have to use the roadway. This is expected to improve economic activity for the businesses along Jefferson Road and along Corridor G, especially if the RHL Boulevard Extension is constructed as another access point to the Shoppes at Trace Fork.

Summary of Alternative Comparison with Respect to Purpose and Need: Although both Alternatives offer solutions to the project needs, Alternative 5 is expected to fulfill them to a greater extent than Alternative 1. The roundabout and bridge offer solutions that allow traffic to flow more constantly than with Alternative 1. Also, although no vehicle crashes in recent years involved the trains, public input has shown that the railroad crossing is a safety concern and Alternative 5 provides a bridge crossing while Alternative 1 does not.

3.5.2 Summary of Impacts

Table 6 provides a summary of the differences between the alternatives carried forward in the EA. Additional details are provided in the EA itself.

Table 6. Summary of Alternatives Carried Forward for Detailed Study

	No Build Alternative	Alternative 1	Alternative 5 (Preferred)
Length (miles)	1.7	1.6	1.7
Eliminates Offset Intersection	No	Yes	Yes
Includes Bridge Over Kanawha Trpk and RR	No	No	Yes
Davis Creek Crossings	No Impact	2	1
Residential Relocations	None	26	35
Commercial Relocations	None	1 small office/retail space building	1 small office/retail space building
Total Area Required	None	67.7 acres	71.4 acres
Total Area of Forest	None	35.5 acres	31.5 acres
2030 Design Year Noise Impacts	22*	2	3
Cultural Resources	No Impact	No Impact	No Impact
Floodplains		Encroaches on 100-year flow; requires coordination with FEMA. Backwater increases >0.1"	Backwater increases < 0.1"
Viewshed	No Impact	Little Impact	Introduces view of new bridge particularly in portions of Jefferson Place neighborhood
Hazardous Sites and Utilities Issues	Not Applicable	Yes, including replacement of main sewer pump	Yes, but does not require replacement of main sewer pump
Estimated Cost (includes construction, utilities, and right-of-way)	None	\$44.479 million	\$56.214 million

* Twenty (20) of the houses experiencing noise impact with the No Build Alternative will be relocated with one or both of the Build Alternatives.

3.5.3 Preferred Alternative

In order to provide greater improvements to congestion in the project area, WVDOH is proposing to construct Alternative 5.

Alternative 5 has additional costs, residential relocations, and visual impacts compared to Alternative 1. It also does not improve northbound queuing at the MacCorkle Avenue intersection to the degree Alternative 1 does.

However, Alternative 5 improves congestion at the region's worst intersection substantially better than Alternative 1 (Kanawha Turnpike) and overall shortens travel times to a greater extent. Regional planners, local officials, and commenters from the public stressed the importance of bridging Kanawha Turnpike and the railroad, and Alternative 5 provides such a bridge. Additionally, Alternative 5 does not require a second bridge over Davis Creek, has less effect on backwater conditions, and does not require relocation of a main sewer pump.

4.0 References

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