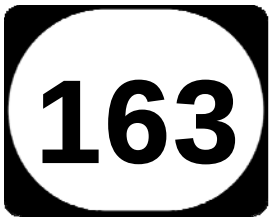
ALTERNATIVES PLANNING STUDY

Final Report



Kentucky 163 South

from near the proposed Tompkinsville Bypass to the Tennessee state line

Monroe County, Kentucky
Item No.: 03-8310.00

Prepared for:

KENTUCKY TRANSPORTATION CABINET
DIVISION of PLANNING

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EXECUTIVE SUMMARY

The KY 163 South *Alternatives Planning Study* was prepared to assist the Kentucky Transportation Cabinet (KYTC) in defining the scope and extent of improvements best suited to meet the current and future needs of this facility, which is located between the proposed Tompkinsville Bypass and the Kentucky-Tennessee state line in Monroe County, a distance of about 7 miles.

Tompkinsville, located just north of the study area, is the county's economic activity center. Improved connectivity would play an important role in the region's future economic growth and development.

Planning Process. A project team approach was used, consisting of representatives from the KYTC Central Office and District 3, the Barren River Area Development District, and Qk4. Public involvement activities included project team meetings, resource agency coordination, meetings with local officials and stakeholders, and public information meetings.

Existing Conditions. KY 163 typically has two narrow driving lanes, narrow-to-no shoulders, and winds through a hilly and wooded area with restricted sight distances, providing few opportunities to pass slower vehicles. Heavy freight truck and recreational vehicle traffic are common.

It is a major north-south connector in Monroe County and for the area in general. It is commonly used as a short-cut between the interstates and major highways in Kentucky and Tennessee. Existing traffic volumes are between 1,470 and 3,190 vehicles per day (vpd), and are projected to increase to 2,400 to 5,100 vpd by 2030.

Although the crash data identified no high crash locations, area residents and local officials insisted safety is the top concern. They noted that many crashes occur and that the database is under-reporting the actual number because drivers choose not to document the crash.

Most crashes occur during daylight hours on dry roads, with a majority involving a single vehicle (*i.e.*, fixed object, driver loses control, runs off road, and other), followed by head-on crashes (*i.e.*, crossing the centerline or passing improperly). Both of these contributing factors can be heavily influenced by roadway geometrics such as sharp curves, steep hills, limited visibility, and limited passing opportunities. An analysis of the "as-built" plans shows that most of the road only meets the geometric standards for a 35-MPH design speed, although the posted speed limit is 55-MPH.

The public identified several high crash locations based on their experiences and local knowledge. Most of these locations, after a detailed engineering analysis, were found to coincide with locations that had the worst combinations of horizontal and vertical deficiencies. This analysis validated the public-identified high crash locations in the absence of a high number of recorded crashes.

Corridor Issues and Goals. Corridor issues and concerns were identified through discussions with KYTC officials, local officials, and stakeholders; site visits; traffic records; and public information meetings. Safety overshadowed all other issues, prompted mainly by the substandard conditions of KY 163. Other corridor issues included: minimizing/avoiding impacts to communities and historic properties, promoting economic development, providing passing opportunities, and considering environmental impacts.

The project team — following a careful consideration of corridor issues — developed the following project goals:

- Improving safety
- Correcting geometric deficiencies
- Improving regional connectivity and accessibility
- Improving passing opportunities
- Avoiding adverse community and right-of-way impacts
- Encouraging economic growth

Alternatives Analysis. Improvement options in the following categories were evaluated:

- Do Nothing – involves only routine roadway maintenance. This option was not recommended because it would not address the project goals. However, the Do Nothing option will be considered for baseline comparisons throughout the decision-making process.
- Maintenance / Operations Projects – involves relatively low-cost, but effective, improvements that can be quickly implemented through maintenance type activities (*e.g.*, traffic control devices at critical locations, lighting, pavement striping, removal of vegetation and other visual obstructions, and modifying street corner radii).
- Spot Improvements – are relatively short-distance improvements that address immediate and short-term needs, and generally involve roadway reconstruction to correct horizontal and vertical deficiencies.
- Combinations of Spot Improvements – result from the combination of two or more sequential Spot Improvements to form a more comprehensive improvement alternative.
- New Corridor Options – involve the construction of new roadways that deviate significantly from the existing alignment. These options include bypassing the existing alignment from the proposed Tompkinsville Bypass to the Tennessee state line.

To determine the most effective improvements to KY 163, the project team discussed a new corridor versus numerous spot improvements. Due to the public support of a new corridor, the project team carefully considered the feasibility of that option. However after detailed discussion and analysis, **a new corridor was found to be unjustified based upon projected traffic volumes, cost effectiveness, and the top goal of improving safety on KY 163**. Consequently, the project team decided to recommend individual spot improvements, focusing on the most critical locations (*i.e.*, those with high crash rates, sharp curves, steep hills, restricted visibility, and limited passing opportunities).

Prioritized from highest to lowest, the project team recommended the following alternatives be carried forward as shown in Table ES -1 below:

Table ES 1 Recommended KY 163 Reconstruction Projects

Priority	Alternative	Description	Mile Post	Length (miles)	Est. Cost* (million dollars)
1	Spot 2 (S2)	Realignment of KY 163 to the east at Marshall Curve, south of the proposed Tompkinsville Bypass	6.15 – 7.05	0.9	Design: $0.2 R/W $0.7 Utility: $0.3 Construction: $3.0 Total: $4.2
2	Spot 1 (S1)	Curve Correction North of the proposed Tompkinsville Bypass	7.4 – 8.0	0.6	Design: $0.2 R/W: $0.4 Utility: $0.2 Construction: $2.0 Total: $2.8
3	Combined Spot 1 East (CS1E)	Combination of Spots 5W and 6; Hestand Area Bypass and Curve Correction at Ned Jackson Rd.	2.0 – 4.1	1.8*	Design: $0.6 R/W: $1.3 Utility: $0.7 Construction: $5.9 Total: $8.5
4	Combined Spot 2 (CS2)	Combination of Spots 7,8, and 9; Curve Corrections from TN State Line to the Denton Murphy Rd. area	0.0 – 1.9	1.9	Design: $0.6 R/W: $1.4 Utility: $0.7 Construction: $6.3 Total: $9.0
5	Spot 3 (S3)	Redesign and rebuild the intersection at KY 3144 and KY 163	6.15	0	Design: $0.1 R/W: $0.1 Utility: $0.1 Construction: $1.1 Total: $1.4

** Mileage length refers to actual miles including new bypass, not indicative of mile posts on existing corridor.*

The recommended construction projects are also shown on Figure ES -1 below.

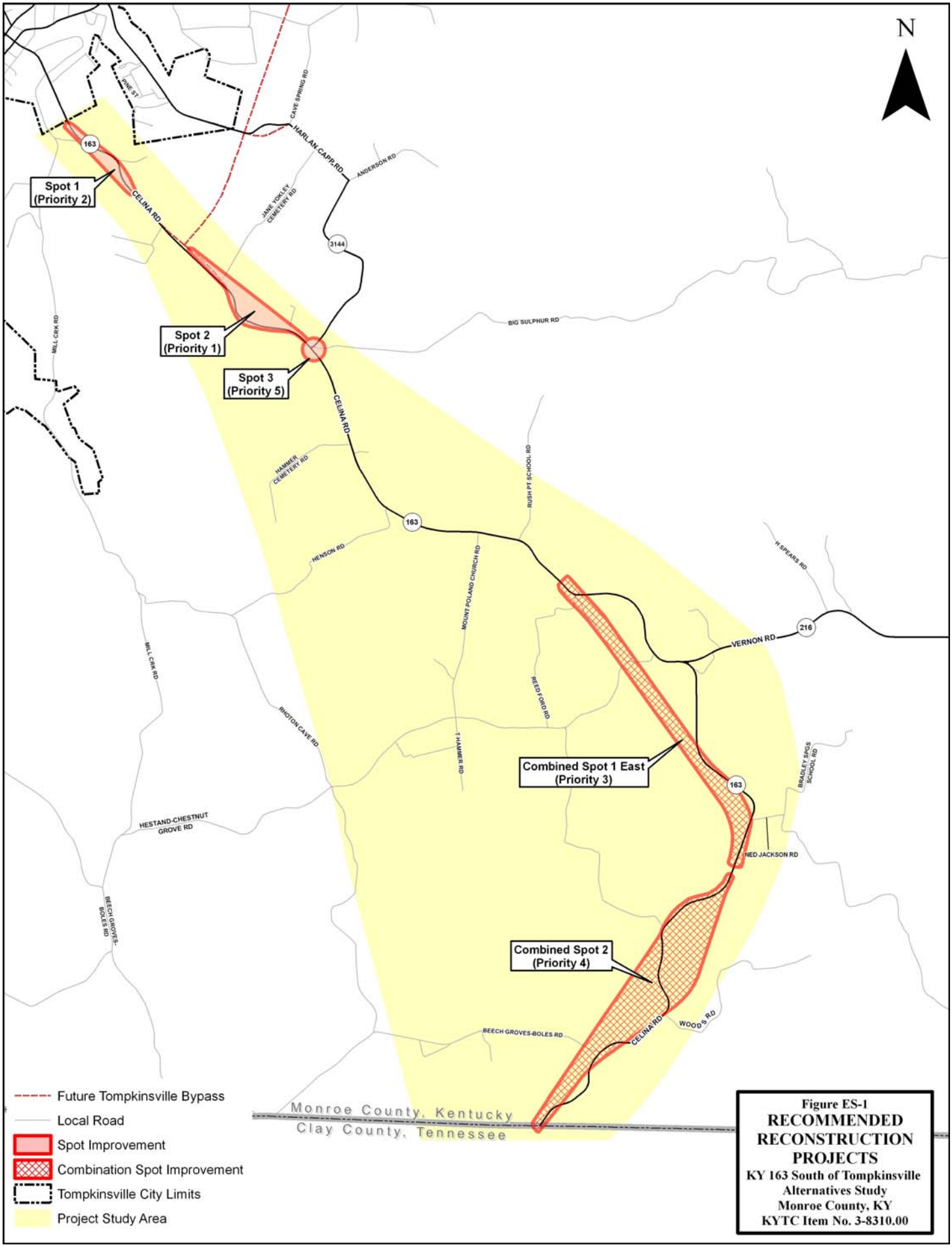


Figure ES-1
RECOMMENDED RECONSTRUCTION PROJECTS
KY 163 South of Tompkinsville Alternatives Study
Monroe County, KY
KYTC Item No. 3-8310.00

1.0 INTRODUCTION

1.1 Project Location

The section of KY 163 under study is located in south-central Kentucky in Monroe County, between the Tennessee state line and Tompkinsville, a distance of about 7 miles. KY 163 within the study area is a segment of the Cordell Hull Scenic Byway, which stretches from Mammoth Cave National Park to the Tennessee state line. Specifically, the project begins near the southern terminus of the proposed Tompkinsville Bypass intersection with KY 163, and ends at the KY 163/SR 51 intersection at the Kentucky-Tennessee state line. The study area has a shape somewhat resembling a pork chop about 8 miles long and about 2.5 miles wide at its widest point, as indicated by the highlighted area on Exhibit 1, *Project Study Area*, in Appendix A.

1.2 Study Purpose

The purpose of the *Alternatives Planning Study* is to provide information to the Kentucky Transportation Cabinet (KYTC) so that it can investigate options to improve KY 163. The study examines improvement strategies to address both current and future needs of KY 163. This, in turn, will help the KYTC make decisions regarding the need for roadway improvements, and to define potential improvements that would better serve the Monroe County residents and the traveling public.

Funds for the planning study were included in the *Enacted Six-Year Highway Plan FY 2007-2012*, approved May 2006.

1.3 The Planning Process

The study process was to first identify, collect, and study critical information concerning the project corridor. The next step, with the help of meetings with elected officials, stakeholders, and the public, was to identify the project goals and objectives. The process concluded with recommendations. In the future, the study will be used as a starting point for the next steps toward the implementation of improvements identified in this study. The next steps are detailed highway engineering design, environmental and alternatives analysis, right-of-way acquisition, utility relocation, construction, and operations and maintenance.

Specifically, the process for this project included four project team meetings, two sets of meetings with Elected Officials (EO) and Stakeholders, two public informational meetings, and coordination with resource agencies including the Tennessee Department of Transportation (TDOT). The objectives of the two sets of EO/Stakeholder and the two public meetings were to identify the problems and issues of the corridor, and to receive input on the proposed improvement alternatives. The information from the first set of meetings and the resource agency coordination was used to identify options presented in the second set of meetings. Consequently, that information was used to identify the recommendations herein.

1.4 Corridor Issues

Key issues associated with the KY 163 South corridor are:

1. Safety issues concerning the curves and visibility restrictions

2. Coordination with TDOT

3. Other regional highway projects in Kentucky

4. The percentage of truck traffic, and the activity generated by the two lumber mills located in the area

Safety Overview: Safety is the overwhelming corridor issue, with concerns focused on crashes and near crashes, the high percentage of commercial trucks and sub-standard roadway geometrics (*i.e.*, narrow driving lanes and shoulders, sharp curves, steep grades, restricted sight distances, and limited passing opportunities). Local users consistently voiced safety concerns associated with the large volume of commercial trucks and recreational vehicles on KY 163's curvy alignment. Two sections of KY 163 have been reconstructed to add passing lanes that, although generally beneficial, also raise safety concerns.

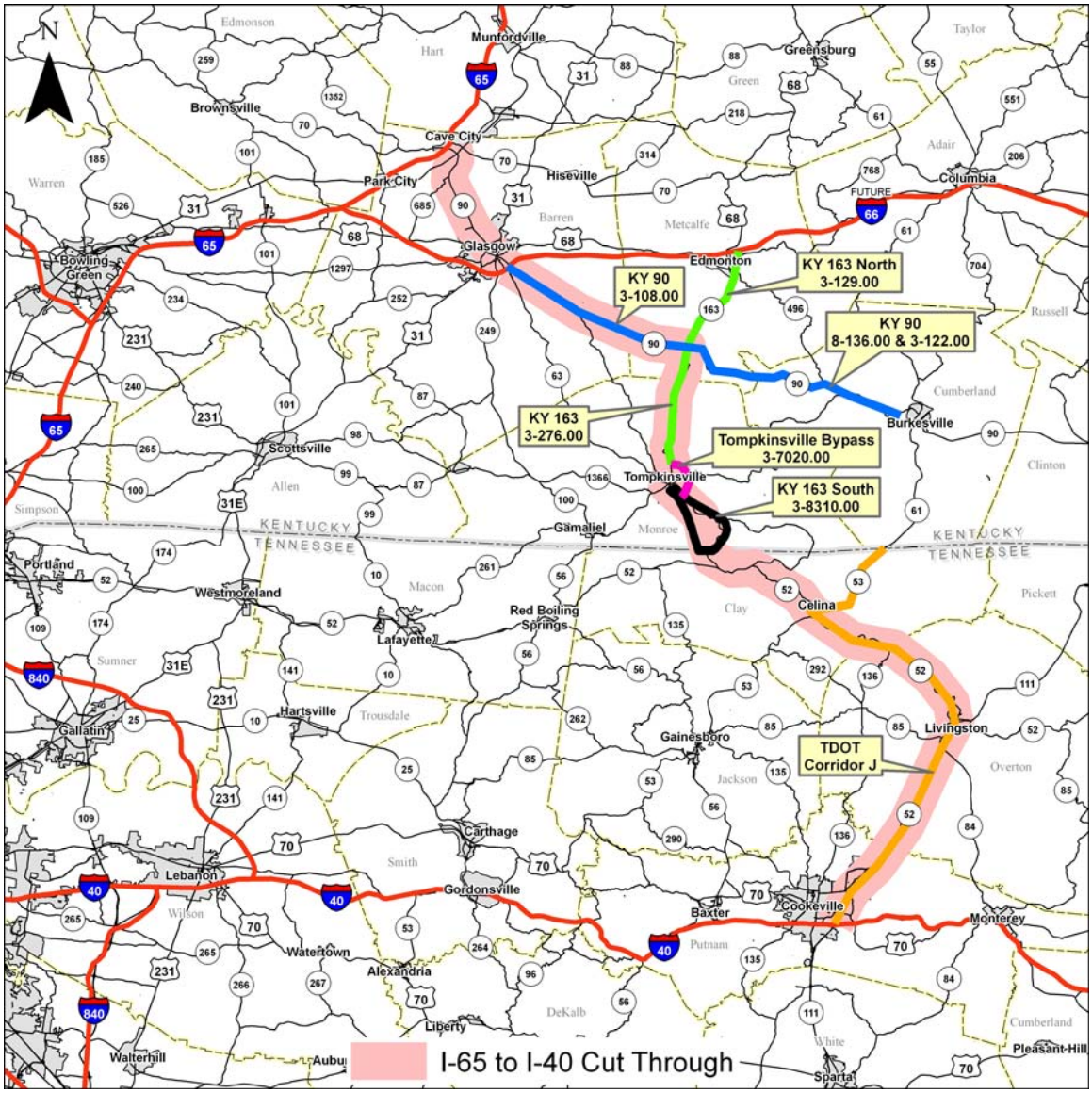
Truck Traffic: 15% of the average daily traffic (ADT) on KY 163 is truck traffic. This is a rather high percentage particularly on a facility where lane and shoulder widths fail to meet current design standards. Contributing factors to the high volume of truck traffic are the two lumber mills located in the study area, one in the north and one in the south. The northern mill straddles KY 163. At this mill, access control is an issue. The lack of any clearly defined access point causes traffic conflicts with trucks pulling onto and crossing KY 163 at random locations.

TDOT Coordination: Coordination with TDOT was necessary because KY 163 not only serves as a regional connector within Kentucky but also as a link to Tennessee. KY 163 changes to SR 51 at the Tennessee state line, and then terminates at Moss, Tennessee. Commercial traffic frequently uses this stretch of KY 163 / SR 51 to bypass the Nashville area when traveling between I-40 at Cookeville, Tennessee, and I-65 at Cave City, Kentucky. Of the long-range transportation projects sponsored by TDOT, "Corridor J" is the route north from Cookeville to SR 51 at Moss. However, TDOT currently has no plans to improve SR 51 from Moss to the KY 163 junction at the Kentucky state line.

Other Regional Highway Projects in Kentucky: Five other highway projects listed in the *Kentucky Enacted Six-Year Highway Plan FY 2007-2012* that would affect regional travel in the vicinity of the study area are:

- Eastern Tompkinsville KY 163 Bypass, KYTC Item No. 3-7020.01
- KY 163 Reconstruction from Tompkinsville north to KY 90 in Metcalfe County, KYTC Item No. 3-276.00
- KY 90 in Metcalfe and Cumberland Counties, KYTC Item No. 8-136.00 and 3-122.00
- KY 90 in Barren County, KYTC Item No. 3-108.00
- KY 163 in Metcalfe County to the Louie B. Nunn Cumberland Parkway, KYTC Item No. 3-129.00

The five aforementioned Kentucky projects, as well as corridor J in Tennessee, are illustrated on the map below:



2.0 EXISTING CONDITIONS

2.1 Characteristics of KY 163

The following information is based on both field observations and a review of KYTC Highway Information System (HIS) data. Tables 1 and 2 present an inventory of roadway characteristics. The shaded boxes in Table 2 indicate sections that are less than desirable. Refer to the color photographs in Appendix B illustrating typical examples of existing KY 163 roadway sections.

KY 163 is a two-lane, undivided roadway that closely follows the lay of the land. Several reduced speed curves are present, as well as oblique angled intersecting roads and direct access driveways. Sight distances are frequently limited, and vehicle-passing opportunities are restricted. Shoulders are narrow to almost non-existent, frequently falling off sharply near the roadway edge. Despite these deficiencies, KY 163 South is a designated school bus route with stops along the roadway. Two sections of KY 163 have passing lanes, one near the northern lumber mill for northbound traffic (from mile post 5.24 to mile post 5.76) and one further south, just north of Hestand. The passing lane nearest Hestand has a passing lane for northbound traffic from mile post 3.85 to mile post 4.25 and a passing lane for southbound traffic from mile post 4.0 to mile post 4.55. Between mile post 4.0 and 4.25 the overlap of the passing lanes results in a four-lane section as KY 163 negotiates a hilltop.

Lane widths vary from 10 to 11-feet wide. The posted speed limit is 55 miles per hour (mph) for most of the study corridor, with advisory speeds as low as 35 mph where roadway geometrics restrict travel speed. Shoulder width varies from 2 feet to 4 feet wide, with 2-foot-wide shoulders comprising about 80% of the length. The percent passing sight distance[1] is almost 0% for the entire length except the sections with passing lanes. A windshield survey indicated almost the entire roadway is striped for “no passing,” with few opportunities to pass outside the two sections with truck climbing/passing lanes. In addition, KY 163 has several locations with steep grades, reduced speed curves, and some rock cuts. In the study area, KY 163 is a State Secondary system roadway that is functionally classified as a Rural Major Collector, with an AAA truck weight class rating. It is not listed on the National Truck Network or National Highway System.

The existing horizontal and vertical alignment deficiencies of KY 163 were analyzed. Although most of the corridor is signed for 55 mph, less than 10% of the corridor meets both the vertical or horizontal design criteria for that speed. The road was also examined for 45-mph design criteria and less than 85% of KY 163 met those design criteria.

Utility line and pole placement varies from adjacent to the roadway to a large offset from the roadway, with numerous crossings of KY 163 due to the road’s winding nature. The locations of homes relative to the roadway vary widely, ranging from a far distance away from the roadway to fairly close to the roadway. The more recently constructed residences appear to be positioned further from the roadway.

[1] Percent Passing Sight Distance - the percent of segment length (estimated to the nearest 10%) that has available passing sight distance (as measured from the driver's eye to the road surface) of at least 1,500 feet. This information is only available for Kentucky maintained roads classified as State Primary or State Secondary.

Table 1: Existing Highway System

Begin MP	Begin Route	End MP	End Route	State System	National Truck Network	National Highway System	Functional Classification	Truck Weight Class
KY 163,	Monroe County							
0.000	KY TN State Line	0.537	Beech-Groves-Boles Rd	State Secondary	No	No	Rural Major Collector	AAA
0.537	Beech-Groves-Boles Rd	0.948	Woods Rd	State Secondary	No	No	Rural Major Collector	AAA
0.948	Woods Rd	1.435	Denton Murphy Ln	State Secondary	No	No	Rural Major Collector	AAA
1.435	Denton Murphy Ln	2.224	Ned Jackson Rd	State Secondary	No	No	Rural Major Collector	AAA
2.224	Ned Jackson Rd	3.148	J Thompson Rd	State Secondary	No	No	Rural Major Collector	AAA
3.148	J Thompson Rd	3.227	KY 216	State Secondary	No	No	Rural Major Collector	AAA
3.227	KY 216	3.386	Hestand-Chestnut Grove Rd	State Secondary	No	No	Rural Major Collector	AAA
3.386	Hestand-Chestnut Grove Rd	3.420	Baxter Branch Culvert	State Secondary	No	No	Rural Major Collector	AAA
3.420	Baxter Branch Culvert	4.016	Reed Ford Rd	State Secondary	No	No	Rural Major Collector	AAA
4.016	Reed Ford Rd	4.449	Rush Point School Rd	State Secondary	No	No	Rural Major Collector	AAA
4.449	Rush Point School Rd	4.671	Mount Poland Church Rd	State Secondary	No	No	Rural Major Collector	AAA
4.671	Mount Poland Church Rd	5.200	Henson Rd	State Secondary	No	No	Rural Major Collector	AAA
5.200	Henson Rd	5.542	Grissom Rd	State Secondary	No	No	Rural Major Collector	AAA
5.542	Grissom Rd	5.589	Hammer Cemetery Rd	State Secondary	No	No	Rural Major Collector	AAA
5.589	Hammer Cemetery Rd	6.153	KY 3144	State Secondary	No	No	Rural Major Collector	AAA
6.153	KY 3144	6.306	C Carlock Rd	State Secondary	No	No	Rural Major Collector	AAA
6.306	C Carlock Rd	6.793	Jane Yokley Cemetery Rd	State Secondary	No	No	Rural Major Collector	AAA
6.793	Jane Yokley Cemetery Rd	7.224	Clark Estates Rd	State Secondary	No	No	Rural Major Collector	AAA
7.224	Clark Estates Rd	7.660	Rush Ln	State Secondary	No	No	Rural Major Collector	AAA
7.660	Rush Ln	7.901	Ford-Carter Rd	State Secondary	No	No	Rural Major Collector	AAA

Source: KYTC Highway Information System (HIS)
MP = Mile post

Table 2: Geometric and Traffic Characteristics of Existing Highway

Begin MP	End MP	Length (miles)	No. of Lanes	Lane Width (feet)[1]	Shoulder Width (feet)[1]	% Passing Sight Distance[2]	Speed Limit (mph)	Roadway Type	Terrain Type	Pavement Type	ADT			Percent Truck	LOS[1]		Composite Adequacy Rating[3]	Composite Adequacy Percentile[3]
											2006	2030	percent increase		2006	2030		
KY 163, Monroe County																		
0.000	1.435	1.44	2	10	2	0	55	Undivided	Rolling	Mixed Bituminous	1,470	2,400	63.3%	15	C	C	76.90	41.03
1.435	3.227	1.79	2	10	2	17	55	Undivided	Rolling	Mixed Bituminous	1,470	2,400	63.3%	15	C	C	76.90	41.03
3.227	3.743	0.52	2	10	2	0	55	Undivided	Rolling	Mixed Bituminous	2,380	3,800	59.7%	15	C	C	76.90	41.03
3.743	3.850	0.11	2	10	4	0	55	Undivided	Rolling	Mixed Bituminous	2,380	3,800	59.7%	15	C	C	76.90	41.03
3.850	4.000	0.15	3	11	4	0	55	Undivided	Rolling	Mixed Bituminous	2,380	3,800	59.7%	15	C	C	93.00	92.39
4.000	4.250	0.25	4	11	4	0	55	Undivided	Rolling	Mixed Bituminous	2,380	3,800	59.7%	15	C	C	88.00	88.92
4.250	4.550	0.30	3	11	4	0	55	Undivided	Rolling	Mixed Bituminous	2,380	3,800	59.7%	15	C	C	88.00	88.92
4.550	5.150	0.60	2	11	2	0	55	Undivided	Rolling	Mixed Bituminous	2,380	3,800	59.7%	15	C	C	86.90	87.56
5.150	5.237	0.09	2	10	4	0	55	Undivided	Rolling	Mixed Bituminous	2,380	3,800	59.7%	15	C	C	86.90	87.56
5.237	5.757	0.52	3	11	4	0	55	Undivided	Rolling	Mixed Bituminous	2,380	3,800	59.7%	15	C	C	98.00	97.51
5.757	5.850	0.09	2	11	2	0	55	Undivided	Rolling	Mixed Bituminous	2,380	3,800	59.7%	15	C	C	98.00	97.51
5.850	6.793	0.943	2	11	2	0	55	Undivided	Rolling	Mixed Bituminous	2,380	3,800	59.7%	15	C	C	86.50	83.82
6.793	6.950	0.157	2	11	2	0	55	Undivided	Rolling	Mixed Bituminous	3,190	5,100	59.9%	15	C	C	86.50	83.82
6.950	7.700	0.75	2	11	2	55	55	Undivided	Rolling	Mixed Bituminous	3,190	5,100	59.9%	15	C	C	86.50	83.82
7.700	7.961	0.26	2	11	2	55	55	Undivided	Rolling	Mixed Bituminous	3,190	5,100	59.9%	15	C	C	95.50	93.82
7.961	8.183	0.22	2	11	2	55	45	Undivided	Rolling	Mixed Bituminous	3,190	5,100	59.9%	n/a	C	C	95.50	93.82
8.183	8.482	0.30	2	11	2	55	35	Undivided	Rolling	Mixed Bituminous	3,190	5,100	59.9%	n/a	C	C	95.50	93.82
8.482	8.530	0.05	2	11	2	55	25	Undivided	Rolling	Mixed Bituminous	3,190	5,100	59.9%	n/a	C	C	95.50	93.82

Source: KYTC Highway Information System (HIS). ** Information not available.

[1] Lane and shoulder widths that do not meet current design standards (i.e., less than 12-foot-wide driving lanes and 8-foot-wide shoulders), and unacceptable Level of Service (LOS) ratings (i.e., D, E, F) are shaded.

[2] Percent Passing Sight Distance - the percent of segment length (estimated to the nearest 10%) that has available passing sight distance (as measured from the driver's eye to the road surface) of at least 1,500 feet. This information is only available for Kentucky maintained roads classified as State Primary or State Secondary.

[3] Composite Adequacy Rating is a method being developed by KYTC to assess a roadway's condition and prioritize highway improvements. The ratings are calculated by individual functional class and based upon three roadway components (safety, service, and condition) with each component comprised of several measures. The rating scores 100 as a perfect, or near perfect, highway. The Composite Adequacy Percentile ranks a particular roadway section compared to other Kentucky roads in the same functional class into a percentile. For example, a road section with a composite adequacy percentile of 75.0 means that 25% of the roads are rated better. Composite adequacy data is from the April 10, 2007, update.

2.2 Current and Future Traffic Volumes and Levels of Service

Traffic Volumes. The section of KY 163 under study currently has traffic volumes ranging from 1,470 to 3,190 vehicles per day (VPD), which are projected to increase to about 2,400 to 5,100 VPD by the year 2030. This represents a projected traffic volume increase of about 60-63%. The predicted traffic volumes represent unconstrained traffic increases based on past growth trends.

Truck traffic volumes along KY 163 South are about 15%, which is very close to the average for this highway functional classification (statewide average truck percent for a rural major collector is 12%). For reference, truck volume on KY 163 north of Tompkinsville is about 19%.

Level of Service. Traffic conditions were examined to determine existing and projected Levels of Service (LOS). LOS is a measure listed in the *2000 Highway Capacity Manual*, published by the Transportation Research Board, and is commonly used to evaluate and describe roadway traffic conditions. LOS is a qualitative measure of operational conditions, and the motorists' perception of those conditions. The conditions are usually defined in terms such as speed, travel time, maneuverability, delay, passing opportunities, and comfort and convenience. The letters "A" through "F" designate the six levels of service. LOS "A" represents the best operating conditions (*i.e.*, free flow conditions), while LOS "F" defines the worst (*i.e.*, severe congestion). According to the national standards listed in the *2000 Highway Capacity Manual*, the lower levels of service (*i.e.*, D, E, and F) are undesirable for safe and efficient operation. The lower levels generally involve unstable traffic flows, and drivers have little freedom to maneuver. Typically, LOS "C" is the minimum acceptable for roads in rural areas, such as KY 163.

The LOS analysis performed for KY 163 indicates the existing LOS is "C" for the entire study area (see Tables 2 and 3, and Exhibit 2, in Appendix A). By the year 2030, the KY 163 roadway length is expected to remain at LOS "C." The LOS "C" is surprisingly poor considering the traffic volumes and is primarily a result of the lack of passing opportunities.

Table 3: Existing and Future ADT and LOS

Begin Mile post	End Mile post	2006 ADT	2006 LOS	2030 ADT	2030 LOS
KY 163, Monroe County					
0.00	**3.2**	**1,470**	**C**	**2,400**	**C**
3.2	**6.8**	**2,380**	**C**	**3,800**	**C**
6.8	**8.5**	**3,190**	**C**	**5,100**	**C**

Source: KYTC Highway Information System (HIS), 2006; forecasts and LOS prepared by Qk4.

2.3 Crash Data

Crash data is an important factor in any transportation planning project. The data can not only yield where crashes are occurring, but also why. Police reports identify many conditions, including the locations of the crashes, the type of crash, and the conditions of the road. Unfortunately, however, not all crashes are reported and not all information that would be useful from a transportation planning perspective is readily available. This appears to be the case for the KY 163 South corridor. Public, agency, and local official comments identify safety (i.e., reduction of crashes) as the top concern, and they also identified several high crash areas. This information does not exactly match the police reports. However, much of the information was obtained directly from crash victims and eye witnesses, and the condition of the road supports the claims; therefore, the project team considered the unofficial crash information to be reliable and the concern for safety valid.

The crash data analyzed was from January 2002 through December 2006. Because the summary did not identify any high crash areas, each crash report was obtained and reviewed, which also failed to identify any high crash areas. The 8-mile section of KY 163 in southern Monroe County that was examined had only 27 recorded crashes. Of the 27 crashes reported, there was 1 fatality crash, 21 injury crashes, and 5 property damage only crashes. The fatality crash occurred near mile post 1.0, which is in the vicinity of East Woods Road, shown on Exhibit 2, in Appendix A.

According to the local residents, crashes included both passenger vehicles and large trucks, and were mainly single-vehicle crashes, although a few multi-vehicle crashes were recalled. Despite a notable Amish presence in the area, no one could recall a conflict between an Amish horse buggy and a motor vehicle. However, many recounted dangerous situations with a high potential for a conflict with either the buggy or a dismounted passenger. The high crash areas are illustrated on Exhibit 2 and are as follows:

- Marshall Curve in the north, just south of the proposed Tompkinsville Bypass. There is an “S” curve in this area that is on a grade. The combination has resulted in several crashes. The public mentioned that several fatalities have occurred in the past few years, although the crash data does not show this.

- Northern Lumber Mill. The roadway geometrics in this section are standard; in fact there is a three-lane section. The problem is a combination of careless driving (this is the first passing opportunity in some distance) and the close proximity of equipment and supplies associated with the lumber mill in an environment of minimal access control to KY 163.

- Reed Ford Road/End of 4-Lane Section. At this site, the southbound outside passing lane ties back into the through lane in a left-hand curve. Traffic on the outside passing lane must merge left to get back into the travel lane and then continue veering left to negotiate the curve. Several vehicles have failed to make both movements and have run off the road.

- Hestand Area/KY 216 intersection. KY 163 in Hestand is a combination of sharp curves, rolling hills, and poor sight distance. The KY 163/KY 216 intersection occurs at a very oblique angle at a curve on a hill top just south of Hestand.

- Curve near Ned Jackson Road. The sharp curve north of Ned Jackson Road limits sight distance, causing a dangerous situation for motorists.

- Curves North of Tennessee. For the southern mile of the corridor, KY 163 is a combination of very hilly and curvy alignment.

Table 4, *Crash Type Statistics*, compares factors about the reported crashes on KY 163. The data reveals the majority of crashes are occurring on dry roads, which minimizes the significance of weather conditions as a major contributing factor affecting the safety on KY 163 in the study area. Additionally, about 59% of crashes are occurring during daylight hours, which reduces the importance of low light conditions as a contributing factor affecting safety. Fixed object and roadway departure crashes are the most common type of crashes, representing 48% of all crashes. These two crash types are closely related and typically involve a single vehicle impacting immobile objects such as a tree, utility pole, fence, guardrail, earth embankment or ditch, signpost, animal, etc. Contributing factors to fixed object crashes include excessive speed for existing conditions, poor highway geometrics, and emergency action to avoid colliding with an object on the roadway (*e.g.*, another vehicle, agricultural equipment, animal, etc.).

Poor/restricted visibility, speed differentials between vehicles, driver error, and limited passing opportunities — combined with a roadway not meeting current design standards — are the likely leading factors for crashes on KY 163. This argument is supported by the documented poor visibility on these roadways (see Table 2).

Table 4: Crash Type Statistics

Begin MP	End MP	Length (miles)	Total Crashes	Crashes			Type of Crash					
				During Daylight Hours	Clear	On Dry Roadway	Head On	Rear End	Side-swipe	Roadway Departure	Fixed Object	Other
KY 163, Monroe County												
0.00	**8.53**	**8.53**	**27**	**59%**	**45%**	**64%**	**14%**	**10%**	**9%**	**24%**	**24%**	**19%**

Source: KYTC Highway Information System (HIS). Research period January 2002 to December 2006

Appendix C, *KY 163 South Crash A*nalysis, contains the detailed crash analysis for the project study area, with mile point (MP) locations. Exhibit 2 provides a graphic presentation of the high crash areas identified through the public involvement process.

3.0 ENVIRONMENTAL SETTINGS AND RESOURCES

Following is a synopsis of the key environmental elements and resources that would have an effect on the selection of any proposed build alternative. Such effects could include permitting, legal protection, and minimization, mitigation, or avoidance. The synopsis summarizes the results of environmental investigations that are based primarily upon literature, archival, and database reviews; map research; limited amounts of fieldwork; and coordination with state and federal agencies. An Environmental Overview report is included in Appendix J. The environmental elements are illustrated on Exhibits, 3, 4, and 5 in Appendix A.

3.1 Topography

Topographic relief is rather pronounced throughout the study area. The area east of the existing roadway is very steep, and would be the least cost effective for realignment, based solely on topography. The western section of the study area contains more drainage features (*i.e.*, streams, springs, caves, etc.), and would likely require the placement of the greatest number of structures. In many areas, especially in the south, the current alignment of KY 163 follows the ridgeline. Elevations in the study area range from about 700 to 1,046 feet above mean sea level.

3.2 Geotechnical Overview

A Geotechnical Overview Report was prepared to summarize geologic concerns for the study area (see Appendix G). The overview included field reconnaissance and research. Where possible, the key elements that are summarized below are illustrated on Exhibit 7 in Appendix A.

- The majority of the existing alignment lies within lower portions of the St. Louis Limestone, and upper portions of the Salem and Warsaw Limestones. These formations are well known for karst landscapes, with sinkholes, springs, disappearing streams, and caves. The study area includes several large diameter and deep sinkholes through which surface drainage enters underground streams and caves. Avoidance and minimization of karst features is preferred for any build alternative options. Sinkholes or dropouts identified prior to, or during, construction should be handled in accordance with Kentucky Department of Highways current specifications.

- One cave, Rhoton Cave, was identified in the field and on topographic mapping. Two separate cave entrances were observed, in addition to several springs along the study area's western limits near Rhoton Cave Road.

- The soil overburden generally consists of thick reddish brown residual clay soils containing abundant chert fragments, with overburden thickness varying greatly due to differing rates of weathering and drainage patterns.

- Several small streams and creeks are present; any new alignment will require structures to cross the streams, with a single or double reinforced concrete box culvert accommodating new roadway construction. Structure foundations will most likely consist of shallow spread footings bearing on competent bedrock, as identified from geotechnical exploration. Rock will normally be encountered near stream-crossing locations at depths of less than 15 to 20 feet below the finished roadway grade.

- Roadway embankments and cut slopes will be required for new roadway construction in order to balance cut and fill for the selected finished road grade. Based upon prior experience with residual soils and rock types from the St. Louis Limestone and Salem and Warsaw Formations, embankments of 2H:1V will likely provide an acceptable safety factor. Cuts exceeding 10 feet may require slopes from 2.5 H:1V to 3H:1V.
- Two oil wells, four water wells, and no gas wells were identified either during site visits or from Kentucky Geological Survey records. One oil well is located along KY 216 near Hestand; the second is west of Moore's Mill near the study area's western boundary. All wells encountered during construction should be handled in accordance with KYTC Standard Specifications.

3.3 Land Use

Land use within the study area is similar to the rest of unincorporated Monroe County, consisting of forested areas (about 40%) and agricultural pasture/grassland (about 50%), with the remaining 10 percent comprised of the following: widely scattered rural-residential single-family dwellings, two churches, eight known cemeteries, one commercial retail establishment (Frances Bar-B-Que), and two lumber mills. KY 163 passes through one small town/community, Hestand, consisting of several widely spaced buildings in a potential historic district. No public parks, schools, or government facilities are located in the study area. Land Use is shown on Exhibit 6, in Appendix A.

3.4 Cultural and Historic Resources

The historical and cultural resource overview included a records search, literature review, database inquiries, and a windshield survey of the study area. The study area contains one National Register of Historic Places (NRHP) listing, the Baxter Barlow House (Site L), and another site determined eligible for listing as a result of previous coordination conducted on the proposed Tompkinsville Bypass — the Thompson/Brown/Hammer House (Site B). The windshield survey and preliminary assessment identified two additional individual sites (Sites B and M) and one district (Hestand—composed of five contributing properties), which appear potentially eligible to meet NRHP criteria. These sites can be seen on Exhibit 3, Appendix A.

The National Register has four basic criteria to determine eligibility. The site descriptions below reference which criteria/criterion make the site eligible. The eligibility of the sites in the study area are based primarily, if not entirely, on Criteria C; Architecture. The criteria are:

- Criterion A: A property may be eligible if it is associated with events that have made a significant contribution to the broad patterns of our history.
- Criterion B: A property may be eligible if it is associated with the lives of persons significant in our past.
- Criterion C: A property may be eligible if it embodies the distinctive characteristics of a type, period, or method of construction.
- Criterion D: A property may be eligible if it has yielded, or may be likely to yield, information important in prehistory or history.

The eligible and potentially eligible sites are listed below, and identified on Exhibits 3, 4, and 5. Preliminary NRHP boundaries for the individual sites and district follow the property lines on record at the Property Valuation Administrator (PVA) office. A historic marker for Moore's Mill

(the mill itself has been destroyed) is located near Hestand along KY 163. This site is not considered eligible for listing on the NRHP. This preliminary assessment was based primarily on Criterion C, architecture. NRHP eligibility determination will require additional research, photography, physical examination, evaluation relative to similar historic properties in Monroe County, and consultation with the State Historic Preservation Office (SHPO).

Individual Historic Sites		Historic District	
Site	Description	Site	Description
B	Thompson/Brown/Hammer House (NR eligible, MR-95*)	Hestand Historic District properties (NRP):	
G	Dwelling (MR-99*)	H	Dwelling
L	Baxter Barlow House (NR listed, MR-294*)	I	Germany Christian Church (MR-100*)
M	General Emmert Place (MR-101*)	J	Joshua Hestand House (MR-102*)
		K	Hestand Post Office (MR-147*)
		L	Baxter Barlow House (NR listed, MR-294*)

* Kentucky Heritage Council (KHC) site identification number; identifies the location by a County prefix (MR = Monroe) and a unique identification number.

3.5 Archaeological Resources

In general, the study area is considered to have a moderate to high potential for containing numerous prehistoric and historic archaeological sites. If improvements to KY 163 are implemented that require federal funds or permits, then the impacted study area portions should be considered for a Phase I level archaeological investigation (*i.e.*, shovel test probe excavations in accessible areas) and a historic structure survey. The Phase I survey would identify archaeological sites and help determine whether a site is eligible for NRHP listing, in compliance with Section 106 of the National Historic Preservation Act of 1966 (as amended).

3.6 Streams

The study area includes portions of two watersheds, with about 66% in the Green River watershed and about 34% in the Upper Cumberland River watershed. The streams in the Green River watershed include Mill Creek, Sweetwater Creek, and Line Creek. The streams in the Upper Cumberland River watershed include Baxter Branch and McFarlan Creek.

The study area consists of 13 blue-line streams, including both perennial streams (water always present) and intermittent streams (water present except in late summer and fall). Ephemeral streams (water present only during or immediately after precipitation events) may also be present.

3.7 Wetlands and Ponds

National Wetland Inventory (NWI) map reconnaissance indicated the presence of wetlands and ponds within the study area. Also consulted were USGS National Hydrology Dataset (NHD), Soil Survey of Monroe County, Kentucky (for locations of hydric and potentially hydric soils), and aerial photographs. Field observations were also made to verify the presence of wetlands and ponds identified through secondary sources. Wetlands were not delineated (*i.e.*, a determination of size and jurisdictional status was not made). More intensive field surveys would be required to confirm and delineate NWI map wetlands, as well as identify any wetlands not appearing on the maps, and determine jurisdictional status. If wetlands cannot be avoided,

final wetland determination and any potential impacts would be coordinated with the U.S. Army Corps of Engineers (USACE)[2] during final design of any proposed improvement.

3.8 Threatened and Endangered Species

In accordance with the provisions of the Fish and Wildlife Coordination Act, and the Endangered Species Act, coordination was made with the appropriate state and federal agencies (see Section 4.4, Resource Agency Coordination, and Appendix H). Table 5, *Protected Species in Monroe County*, lists the protected species identified by the federal and state agencies for Monroe County.

Table 5: Protected Species in Monroe County

Common Name	Scientific Name	Federal Status[1]	State Status[1]
Mammals			
Indiana bat	*Myotis sodalis*	E	
gray bat	*Myotis grisescens*	E	T
Freshwater Mussels			
fanshell	*Cyprogenia stegaria*	E	E
ring pink	*Obovaria retusa*	E	E
orangefoot pimpleback	*Plethobasus cooperianus*	E	E
rough pigtoe	*Pleurobema plenum*	E	E

[1] Status: E=endangered; T=threatened; C=candidate.

The Kentucky State Nature Preserve Commission (KSNPC) reported a review of their database using a 1-mile buffer of the project area returned "no records" of endangered, threatened, or special concern plants and animals or exemplary natural communities monitored by the KSNPC. Within a 5-mile buffer, the *Thoburnia atripinnis* (Blackfin sucker; KSNPC Special Concern, federal species of management concern) occurs in the East Fork of the Barren River and Mill Creek. This species lives only in the Kentucky counties of Allen, Barren, Metcalfe, and Monroe. KSNPC recommended using a written erosion control plan with stringent erosion control methods to minimize water quality impacts.

3.9 Farmlands

Monroe County has a land area of about 212,479 acres. Of that, 162,481 acres (76%) are in agricultural use, which is the county's lowest total area of land in farms since the Census of Agriculture began in 1909. Approximately half of the agricultural land is used for pasture, and the other half is divided between woodland and cropland. The same general percentages represent the agricultural land in the study area. Major crops include corn for grain, burley tobaccos, and alfalfa. According to a color-coded map of Important Farmland (dated March 1984) provided by the Monroe Natural Resources Conservation Service (NRCS), prime farmland totals about 55,500 acres, while statewide importance farmland totals about 38,500 acres. No unique or local importance farmland was reported. Monroe County has about 30% of its soil classified as prime farmland, most of which is located in the northern and central parts of the county. In the county's southern half (where the study area is located), prime farmland is generally located around the river and creek valleys, and in other valleys.

[2] A jurisdictional wetland is a wetland regulated by USACE as a "water of the United States" under the Clean Water Act. USACE is responsible for making the determination regarding jurisdiction. Impacts to jurisdictional wetlands must be mitigated (e.g., recreated, restored, or enhanced).

3.10 Hazardous Materials Concerns

Relevant data regarding the potential of hazardous materials sites to occur in the study area was collected from numerous sources including federal and state databases, and a windshield survey of the study area. The database search and survey identified three possible contamination sites (see Table 6, *Possible Contamination Sites*). The primary sources of potential contamination at these sites involve fuel distribution and/or vehicle/equipment maintenance that pose similar contamination concerns (*e.g.*, underground storage tanks [USTs], fuel spills/leaks, soil contamination, waste petroleum products, heavy metals, solvents, corrosives, batteries, tires, miscellaneous debris piles, repair parts, abandoned equipment/vehicles, etc.). Other sources of potential contamination concerns include: pole-mounted electrical transformers, aboveground storage tanks (ASTs), and pesticide/herbicide/rodenticide use on farms. Structures with suspected asbestos containing building materials (ACBM) were also observed. Construction activities in and near these sites will require further investigations to determine the risk and extent of any contamination, and may require special procedures and permits. Sites 1-3 listed below are identified on Exhibit 3, Appendix A.

Table 6: Possible Contamination Sites

Site Number	Site Name or Description	Suspected Contaminant or Area of Concern
1	Graham Pallet Co. 3255 Celina Road (KY 163)	Possible soil contamination from UST systems usage in the form of heavy metals, volatile organic compounds, and semi-volatile organic compounds.
2	John King Garage, 3611 Celina Road (KY 163)	Possible soil contamination from UST systems usage in the form of heavy metals, volatile organic compounds, and semi-volatile organic compounds. Possible soil contamination from leaking UST systems.
3	Poindexter Grocery, 1402 Vernon Road (KY 216)	Possible soil contamination from UST systems usage in the form of heavy metals, volatile organic compounds, and semi-volatile organic compounds. Possible soil contamination from leaking UST systems.
Not Mapped*	Power Pole Mounted Electrical Transformers	Polychlorinated Biphenyls (PCB's)
Not Mapped*	Agricultural Operations	Petroleum products, pesticides, herbicides, and rodenticides
Not Mapped*	Aboveground Storage Tanks (ASTs)	Heating fuel oils, gasoline, and liquid propane
Not Mapped*	Residential Dwellings and Commercial Buildings	Asbestos Containing Building Material (ACBM)

* Sites are found at various locations within the study area.

3.11 Environmental Justice

The purpose of an Environmental Justice report is to identify disproportionately high concentrations of minority, low-income, or elderly households. *Environmental Justice Executive Order 12898: Federal Actions to Address Environmental Justices in Minority Populations and Low-Income Populations* (signed February 11, 1994), directed federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations.

The Barren River Area Development District (BRADD) prepared the *KY 163 Alternatives Study, Monroe County, Environmental Justice Report*, April 2007, which is included as Appendix I. The *Environmental Justice Report* was based upon Census data, field observations, and information from local officials. The study area is contained within one census block group. The Environmental Justice review concluded that two minority populations are in the study area's block group; "Hispanic/Latino" and "Native Hawaiian and other Pacific Islander." These populations were notably higher than the county and state averages. According to local residents, a small cluster of mobile home trailers in the vicinity of the sawmill located on KY 163 south of Ned Jackson Road is occupied seasonally by transient workers many of whom are Hispanic/Latino. Environmental Justice concerns associated with minority and/or low-income populations could occur at this site. No other areas of concern were identified.

4.0 CABINET, AGENCY, AND PUBLIC COMMENTS

4.1 KYTC Project Team

The KY 163 alternatives study Project Team met four times during the course of the study. The Project Team consists of KYTC Central Office and District 3 staff, and the consultant team. Each meeting was documented with meeting minutes (see Appendix D). A summary of the major topics discussed at each meeting follows:

1. February 15, 2007, at KYTC District 4. At this project team kick-off meeting, members were introduced, the type of study was discussed, and the study's scope and schedule were reviewed. Major topics of discussion included: the project's purpose and range of improvements to consider; the general existing conditions; other current, scheduled, and proposed projects near the KY 163 South study area; TDOT coordination; public involvement; and a tentative schedule of events.

2. March 15, 2007, at KYTC District 3. The project was reviewed in terms of the scope of work, baseline studies, and a tentative schedule. Team members reviewed the study area footprint, existing highway conditions and crash statistics, travel patterns, other KYTC projects in the region, and TDOT coordination. The team identified a preliminary set of goals and issues, and the range of improvement options to consider. Preparations and needs for the first round of public involvement meetings were discussed.

3. July 25, 2007, at KYTC District 3. The project team reviewed past activities, new information on the existing conditions, the build alternatives, crash data, traffic forecasts, comments from the public and elected official/stakeholder meetings; and then prepared for the next round of public involvement.

4. October 16, 2007, at KYTC District 3. The project team met to review input received from the public meetings and to identify and prioritize a final set of improvements.

4.2 Local Officials / Stakeholders

A group of elected officials and local stakeholders met twice during the study process to provide valuable local knowledge about the project and possible improvement options. The meetings were documented with meeting minutes (see Appendix E).

1. March 29, 2007, at the Monroe County Economic Development Center in Tompkinsville. This meeting was divided into a morning and an afternoon session. The morning session was attended by the local elected officials and the afternoon session was attended by members of the Chamber of Commerce Transportation Committee (stakeholders). Each group was informed of the study's purpose and scope of work, along with a tentative schedule of events. The two groups reviewed the study area footprint, existing highway conditions and crash statistics, travel patterns, other KYTC projects in the region, and TDOT coordination efforts. Each group was surveyed on issues/problems/needs, and their comments closely paralleled those previously identified by the project team. Roadway safety and geometrics were key concerns, followed by a strong desire to increase the potential for economic development with an improved highway system. Each group also identified possible locations for improvement opportunities.

2. September 6, 2007, at the Monroe County Economic Development Center in Tompkinsville. The elected officials and stakeholders joined together as one group at this meeting. The objectives were to review the environmental overview, high crash areas data, and project goals; discuss roadway deficiencies and the proposed set of alternative concepts; and prepare for the September 13, 2007, public meeting. All of the proposed alternative concepts were reviewed. There are three general types of alternative concepts: spot improvements (S), combinations of spot improvements (CS), and a new corridor (NC). In general, those in attendance understood the disadvantages of a new corridor option, and that such disadvantages could delay any improvements to the existing corridor. Each attendee was asked to fill out a survey form and provide their input on which alternatives were of the highest priority.

4.3 Public Information Meetings

Public information meetings were held April 17, 2007, at the Tompkinsville Elementary School and September 13, 2007, at the Germany Church of Christ. See Appendix F for the public information meeting summaries. The Public Involvement Summary Notebooks are on file with KYTC.

1. April 17, 2007. This was the first meeting conducted to inform the public of the proposed KY 163 South improvement project, and to receive their input concerning issues to consider and problems to correct. No improvement alternatives were presented (i.e., it was a “Blank Map” meeting). Large-scale aerial photograph exhibits were available to generate discussion and for attendees to write or mark on to indicate their areas of concern, preferences, and recommendations. Forty-one (41) people attended the meeting, and 14 comment forms were returned. On the comment forms, most attendees answered the question, “How often do you travel the roadway?” with “Daily.” The top problems identified were sharp curves, large trucks, and poor visibility, and the top objective was to improve safety. The favored places to avoid were homes and cemeteries. Attendees were generally supportive of the need for improvements to KY 163. Comments were received both in favor of and opposed to relocating KY 163 South on a new alignment, commonly referred to as the “straight-line approach.” Those favoring a road on new alignment (the majority opinion) primarily envisioned it as a means of securing Monroe County’s economic development opportunities, and the county’s ability to attract employers with a modern highway providing convenient and economical access to other regional highways. Those opposed to any relocation of KY 163 South (the minority opinion) were concerned about potential adverse impacts to existing business establishments due to loss of business from reduced traffic volumes on the existing route. During the presentation it was noted that crash data identified no high crash areas. This fact generated much relating of first-hand knowledge about high crash areas. Several people identified the same locations and concerns, which proved very useful in the development and prioritization of spot improvements.

2. September 13, 2007. This was the second meeting to present to the public the KY 163 South improvement alternatives considered by the project team, and to receive their input/comments concerning them. Several tables were prepared with large-scale aerial photograph exhibits of the study area with which to generate discussion and on which to identify areas of concern, preferences, and recommendations. Photographs of sharp curves, steep inclines, restricted visibility, improved passing lane sections, and poor

intersection geometrics were inserted on the aerial maps. All attendees were asked to complete a comment form. Forty-one (41) people attended the meeting and signed the sign-in sheet. Eighteen (18) comment forms representing 21 people were returned. Meeting attendees ranked their two most preferred alternatives in order of first and second choices, while also providing explanations and justifications for their particular choices. Some of the alternatives seemed to be more popular than others with the meeting attendees. Attendees also ranked specific spot improvements and combinations of spot improvements. Detailed rankings can be seen in the Summary of Comment Forms for Public Information Meeting # 2 in Appendix F.

4.4 Resource Agency Coordination

During this study, 65 state and federal resource agencies were surveyed by mail to learn their concerns about the study area and obtain their input regarding possible KY 163 improvements. The mailing was sent in May 2007. The survey only identified the study corridor, not alternative alignments. Twenty responses were received. Only project-specific or substantive comments are summarized below; many were generic replies that said "no comments or concerns" or recommended use of Best Management Practices (BMPs). See Appendix H for their complete responses.

U.S. Department of Agriculture, Natural Resources and Conservation Service: If federal funding is used, the Land Evaluation and Site Assessment (LESA, form AD-1006 or form NCRS –CPA-106) analysis will be required through coordination with the Monroe County District Conservationist, Mr. Kenneth Johnson. Mr. Johnson provided GIS shapefiles of soil information for Monroe County that has been used to create a map showing prime farmland and farmland of statewide importance which is included with the response letter in Appendix H.

Kentucky Department of Fish and Wildlife Services: The gray bat and Indiana bat are listed as federally endangered species that could occur in the project area. Specific BMPs were identified for wetlands and stream mitigation, and future coordination with USACE was recommended.

Kentucky Geological Survey: The project area includes karst features, but no potential for landslides, unconsolidated sediments, prior mining activities, or earthquake fault potential, and only minimal potential for earthquake ground motion.

Kentucky Division of Waste Management: On the southern and western edge of the study area there is the former Chestnut Grove Road Open Dump, which has been cleaned. Four superfund sites have been identified in Monroe County: three are closed and the fourth is the Tompkinsville Warehouse, but none are within the study area. One listed former UST with contaminated soil, John King Garage, is near the northern edge of the study area. Best Management Practices (BMPs) must be used to dispose of waste during any construction of a new road.

5.0 PROJECT GOALS

Based upon a consideration of the identified corridor issues, input from local officials, citizens, and resource agencies, and an evaluation of existing and forecasted highway conditions, the project study team generated the following project goals:

- Improving safety
- Correcting geometric deficiencies
- Improving regional connectivity and accessibility
- Improving passing opportunities
- Minimizing/avoiding adverse community and right-of-way impacts
- Encouraging economic growth

Improving safety by correcting geometric deficiencies

Improving safety along KY 163 was the primary concern of the project team, elected officials and stakeholders, and the public. Closely associated with improved safety is improving roadway geometrics. Individuals involved with identifying the project goals were in agreement that improving safety and/or geometrics on KY 163 would also improve regional travel and offer potential economic development benefits for the county.

Improving Regional Connectivity and Accessibility

KY 163 provides a major link to Tennessee for a multi-county region. KY 163 serves as part of the road network linking I-65 in Cave City, Kentucky, and I-40 in Cookeville, Tennessee, by avoiding the Nashville metropolitan area. Other Kentucky roads that constitute this link are either being improved, or are programmed to be improved, including the Tompkinsville Bypass and reconstruction of KY 163 north of Tompkinsville to KY 90, which is also programmed to be improved. Completing the improvement of these connections for regional travel would benefit the economic activity and competitiveness of Monroe County and improve safety and travel efficiency.

Improving Passing Opportunities

Passing opportunities occur in two locations along the corridor. The rest of the corridor has little to no passing opportunities. Consequently, travel speeds in these passing locations are often too high for the roadway and present another safety problem. Some corrections to the existing passing lanes could be implemented to improve safety, and additional passing opportunities would improve overall travel time, level of service, and safety.

Minimizing/Avoiding Adverse Community and Right-of-Way Impacts

Citizens expressed concern about right-of-way impacts and identified alignments off of the current KY 163 roadway to avoid such impacts. Relatively flat, buildable land along the corridor is not very common; therefore, citizens expressed concern about using such land for new right-of-way. The community of Hestand is the only identified cluster of houses and other buildings within the project corridor.

Encouraging Economic Growth

Improving this roadway would play an important role in the county's future economic growth by improving commercial truck access and efficiency. An improved road would be expected to reduce travel times and transportation costs to and from markets and suppliers. Improved safety would also encourage transportation shipments and activity, as well as boost the County's economic development opportunities. A modernized highway would improve Monroe County's ability to attract employers by providing convenient and economical connectivity to the region.

6.0 ALTERNATIVES CONSIDERED

The following alternatives were developed to address the goals and objectives formulated through the study process.

6.1 Do Nothing

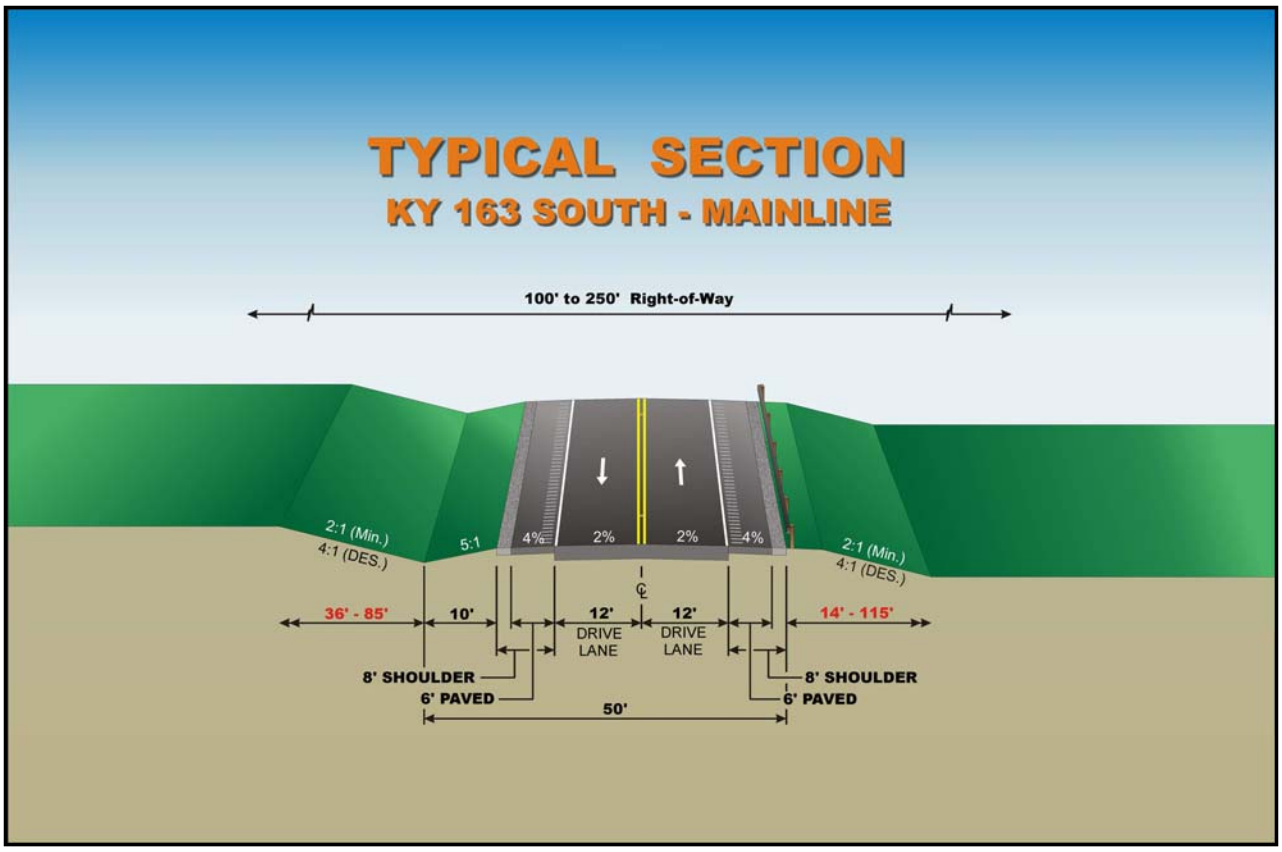
This alternative involves no action to improve the facility. The Do Nothing Alternative would leave the existing roadway essentially as is, other than routine roadway maintenance (*e.g.*, resurfacing, restriping, patching, etc.). In the short-term, the Do Nothing Alternative is the least expensive improvement option, since no funds would be expended for right-of-way acquisition, displacement of residences or businesses, utility relocations, or construction. There would also be no construction period traffic disruptions, or construction-induced environmental impacts. However, the Do Nothing Alternative should not be construed as a continuation of the status quo. Normal growth in the area would contribute to increased traffic volumes. Traffic from existing and future development, as well as regional through traffic, would continue to use the existing roadway. Traffic forecasts conducted for this study show an increase in the 2030 traffic volume on KY 163 of about 62% over the 2006 volume. The Do Nothing Alternative would leave the area with a transportation system that fails to address safety concerns identified by the project team, local officials, stakeholders, and area citizens. The existing geometric deficiencies would remain and an increased potential for crashes could be expected. This alternative was presented and discussed by the project team members, who concluded it was not in the public's best interest because the long-term benefits from implementing proposed improvements are expected to be substantially greater than any negative factors associated with their construction and operation. The Do Nothing Alternative was not recommended because it did not address the project goals.

Even though the Do Nothing Alternative does not meet the project goals, it does provide the decision-making team with a basis for comparing the impacts and benefits of improvement alternatives considered throughout the project development process; therefore, it will be referred to, as appropriate, for baseline comparisons.

6.2 Improvement Alternatives

Three different types of improvements were considered: spot improvements, combinations of spot improvements, and an entirely new corridor. Individually, each improvement is intended to correct a specific roadway alignment deficiency, improve the existing roadway to current design standards including lane and shoulder width, and/or improve the roadway's operational performance.

For the purpose of developing preliminary cost estimates, it was assumed that any proposed reconstruction would be a rural typical section with two 12-foot-wide travel lanes and eight-foot-wide shoulders. The design criteria used was a 55-mph design speed for a Rural Collector. This typical section matches that of the proposed Tompkinsville Bypass and the reconstruction of KY 163 north of Tompkinsville. The right-of-way impacts could range from 100 feet in flat terrain to 250 or more feet in hilly terrain. Below is a typical section illustrating the template used to estimate the costs and impacts of the build alternatives.



Build Alternatives are listed in Table 7, *KY 163 Improvement Alternatives*, which provides a brief description of each improvement and its estimated length, cost, potential impacts, and public support. Refer to Exhibit 3 in Appendix A for the improvement locations.

The cost estimates were based on the Tompkinsville Bypass estimates and the reconstruction estimates of KY 163 North and include design, right-of-way, utilities, and construction. The average construction cost estimate for these two projects was $3.14 million per mile. The construction cost was increased by 5% to $3.3 million per mile because of recent increases in oil prices.

- **Spot improvements** consist of small sections of KY 163 where a reconstructed curve could be tied back into the existing alignment in the shortest distance possible. Given the hilly and curvy alignment, some spot improvement options are considerably longer than others. In all, nine spots were identified where relatively short improvement could be implemented. Spot improvement alternatives were identified sequentially from north to south. Each improvement's beginning and ending point is an approximation used for planning purposes only. More detailed design is required to accurately identify the start and end points of each improvement.

    - S1: from the proposed Tompkinsville Bypass north to correct a curve. This spot is 0.6 mile long and would cost approximately $2.8 million. Existing and 2030 ADT volumes at this spot are 3,190 and 5,100 vpd, respectively.

    - S2: Marshall Curve, just south of the proposed bypass. This sharp curve could be fixed by the realignment of KY 163 to the east. The realignment option is 0.9 mile in length and is estimated to cost $4.2 million. Spot improvement S2 received the most public support of all the spot improvements.

- S3: This spot is at the intersection of KY 3144 (Harlan Capp Rd.) and KY 163. The improvement would involve the reconstruction of this intersection at an estimated cost of $1.4 million.

- S4: This spot is located at the northern lumber mill; it is about 1,100 feet long and would require no major reconstruction. Rather, it would require coordination with the lumber mill to implement safety improvements.

- S5: Hestand Area. Two options exist: bypass Hestand to the west (5W) or to the east (5E). The west option is 1.3 miles in length and is estimated to cost $6.1 million. The east option is 0.8 mile in length and is estimated to cost $3.8 million.

- S6: Ned Jackson Road Curve. This spot is 0.3 mile in length and is estimated to cost approximately $1.4 million.

- S7: This spot is a curve correction at Denton Murphy Lane. It is 0.6 mile in length and is estimated to cost approximately $2.8 million.

- S8: This spot is a curve correction at East Woods Road. It is 0.57 mile in length and is estimated to cost approximately $2.7 million.

- S9: This spot is a curve correction from the TN state line to Beech Groves-Boles Road. It is 0.58 mile in length and is estimated to cost approximately $2.7 million.

- **Combinations of Spot Improvements (CS)** are longer sections that encompass two or more of the spot improvements listed above. Two such alternatives were considered, both in the southern portions of the study area.

  - CS1E is comprised of Spots 5W and 6, and is 1.8 miles in length and costs $8.5 million.

  - CS1W is comprised of a new alignment that is 2.1 miles in length. It bypasses the existing KY 163 alignment and connects between Spot 5W and Spot 7. The cost is $9.9 million.

  - CS2 is comprised of Spots 7, 8, and 9. It has a length of 1.9 miles, and costs $9.0 million.

- **New Cross-country corridor alignments** (NC1 and NC2) include two different concepts. The two concepts start at the Tennessee state line but differ by the location of the northern termini. NC1 ends just south of the bypass, at Jane Yokley Cemetery Road, and NC2 ends at the northern lumber mill. The concept of constructing a new corridor received the most public support of all alternative concepts (including spot improvement alternative S2).

  - NC1 would be 5 miles in length and cost an estimated $23.6 million.

  - NC2 would be approximately 3.9 miles in length and cost an estimated $18.5 million.

Table 7: KY 163 Improvement Alternatives

Alternative		Mile Post	Miles	Total Costs (Millions)[1]	ROW Acres	Relocations	Stream Crossings	Sinkholes	High Crash Area	2006 ADT (veh/day)	Public Support (Rank 1)[2]	Public Support (Rank 2)[2]
Spot Improvements												
Spot	Options											
S 1 - Curve Correction: North of Tompkinsville Bypass	S1	7.4 - 8.0	0.6	$2.8	16	1	0	0	Yes	3,190	1	2
S 2 - Marshall Curve: South of the Bypass. Realignment of KY 163 to the east	S2	6.15 - 7.05	0.9	$4.2	19	1	0	2	Yes	2,380	7	1
S 3 - Redesign and rebuild the intersection at KY 3144 and KY 163	S3	6.15	0	$1.4	0	0	0	0	Yes	2,380		1
S 4 - Implementation of safety actions at the lumber mill. Maintenance/Operations only project	S4	5.25 - 5.45	0.2	$0.4	1	0	0	0	Yes	2,380		
S 5 W. - Hestand Area: Bypass to the west of existing KY163	S5 W.	2.6 - 4.1	1.3*	$6.1	37	1	1	1	Yes	2,380		1
S 5 E. - Hestand Area: Bypass to the east of existing KY163	S5 E.	3 - 3.8	0.8	$3.8	21	2	1	0			1	1
S 6 - Curve Correction at Ned Jackson Rd.	S6	2.1 - 2.4	0.3	$1.4	7	1	0	0	Yes	1,470		
S 7 - Curve Correction at Denton Murphy Rd.	S7	1.3 - 1.9	0.6	$2.8	14	2	0	0	Yes	1,470		
S 8 - Curve Correction at E. Woods Rd.	S8	.58 - 1.3	0.57	$2.7	16	2	0	0	Yes	1,470		
S 9 - Curve Correction: from TN state line to Beech Grove Rd.	S9	0 - .58	0.58	$2.7	18	5	0	0	Yes	1,470		
Combined Spots												
CS1E - Combination of Spots 5W and 6: Hestand area bypass and curve correction at Ned Jackson Rd.	S 6, S5W	2 - 4.1	1.8*	$8.5	54	3	1	1	Yes	1,407	1	2
CS1W – Combination of Spot 5W and New bypass to the west of existing alignment and terminating at Spot 7	S5W	1.3 - 4.1	2.1*	$9.9	51	4	1	1	No	1,407		
CS 2 - Combination of Spots 7,8, and 9: Curve corrections from TN state line to the Denton Murphy Rd. area	S7, S8, & S9	0 - 1.9	1.9	$9.0	49	6	0	0	Yes	1,470	2	1
New Corridor Options												
NC1 - New Corridor: from the TN state line to just south of Tompkinsville Bypass at J. Yokley Cemetery Rd.	1		5	$23.6	144	6	2	2	No	1,080	11	
NC2 - New Corridor: from the TN state line to the northern lumber mill.	2		3.92	$18.5	113	4	4	4	No	1,080		

[1] *Cost estimate includes construction, utility, right-of-way, and design costs.*

[2] *Public Support Rank 1 and 2 were derived from comments received at the second public information meeting, held 9/13/2007. The numbers in the Rank 1 and Rank 2 columns indicate the number of respondents selecting the alternative as the first and second choices, respectively.*

** Mileage length refers to actual length of the new alignment and is not indicative of mileage along the existing corridor.*

Table 8 below and Exhibit 2 illustrate existing and projected traffic and LOS for the existing road, the LOS for rebuilding the existing road (far right column), and a new corridor (next to last row), including the residual traffic on KY 163 (last row).

Table 8: KY 163 Existing and Projected ADT and LOS

	Begin Milepost	End Milepost	2006 ADT	2006 LOS	2030 ADT	2030 No Build LOS	2030 Build LOS
KY 163:	**0.0**	**3.2**	**1,470**	**C**	**2,400**	**C**	**B**
	3.2	**6.8**	**2,380**	**C**	**3,800**	**C**	**B**
	6.8	**8.5**	**3,190**	**C**	**5,100**	**C**	**C**
New Alignment:	**0.0**	**6.8**	**1,080**	**A**	**1,720**	**--**	**A**
Residual Traffic:	**0.0**	**3.2**	**490**	**B**	**680**	**B**	**--**
	3.2	**6.8**	**1,300**	**C**	**2,080**	**C**	**--**

Where improvements to the existing road are made, the 2030 LOS is expected to increase from "C" to "B." For a new corridor, the projections indicate that between 30% of traffic in the southern study area and 55% of traffic in the northern study area would remain on the existing alignment of KY 163. The methodology for projecting the residual traffic was based on a combination of traffic volumes on KY 216 and the forecasted traffic from the ITE Trip Generation manual for the lumber mills, one restaurant, and each residence currently along KY 163.

7.0 RECOMMENDATIONS

Following the public meetings, the project team took into account all of the available information and identified alternatives to be carried forward and those to be eliminated from further consideration. The criteria that were considered in the decision included project goals, costs, impacts, traffic volumes, and public comments. In determining the alternatives to be carried forward, the project team first separated all alternatives into two project categories: maintenance or construction. Then the options were prioritized within their respective categories based on the criteria mentioned above. Each alternative and the detailed justification for its current status are identified below.

7.1 Alternatives Recommended Not To Be Carried Forward

The project team members made a careful review and consideration of the existing conditions, right-of-way acquisitions, cultural and environmental constraints, and engineering considerations. The project team first identified the following alternatives to be eliminated from further consideration based on the following reasons.

New Corridors 1 and 2 (NC1 and NC2), after detailed discussion and analysis, were found to be unjustified by the project team based upon projected traffic volumes, cost effectiveness, and the top goal of improving safety on KY 163. It was determined that a new corridor would not attract a sufficient amount of traffic to justify the costs. A significant amount of residual traffic would continue to use the current alignment of KY 163 to access homes, businesses, and KY 216. These vehicles would still have to negotiate the substandard conditions; therefore, neither of these options alone would adequately address the goal of safety. If a new corridor were built, the reconstruction of some of the substandard curves and hills on existing KY 163 would still need to be completed to address safety, which would increase the cost of this option. Moreover, the existing KY 163 alignment would have to be maintained at an estimated cost of $8,000 per mile per year. Another long-term cost associated with this project would be the improvement of rural county roads that would intersect the new route. It was noted that the new corridor option was the most desired based on the comments received from the public meetings. However, the analysis of this alternative revealed significant drawbacks that resulted in the decision not to recommend construction of a roadway on new alignment. Consequently, the project team decided to recommend individual spot improvements, focusing on the most critical locations (*i.e.*, high crash locations, sharp curves, steep hills, restricted/limited visibilities, limited passing opportunities).

Spots 7, 8, and 9 (the southernmost spots) are not recommended because individually none would fully address the project goal of increased safety; rather, they are replaced with the advancement of Combined Spot 2 (CS2).

Spot 5E, 5W, and 6 are not recommended because as isolated projects none would adequately address the goal of safety. Rather, Spots 5W and 6 are replaced with the advancement of Combined Spot 1 East (CS1E).

7.2 Alternatives Recommended To Be Carried Forward

The project team discussed the remaining alternatives and organized them into Maintenance/Operations projects and Reconstruction projects. The Reconstruction projects are listed below the Maintenance/Operations project in order of priority. Each of the recommendations is illustrated in detail on Exhibits 8 through 13 in Appendix A.

Maintenance / Operations Project:

Spot 4 is in a unique category since the approach to address it would include coordination with the lumber mills and the improvement of access control and clear zones along this 3-lane section of KY 163. It was recommended to be removed from the list of Reconstruction options and advanced as a Maintenance/Operations project due to the fact that it does not require major reconstruction activities. The estimated cost for this project is $400,000 (See Exhibit 11).

Reconstruction Projects and Prioritization:

1. Spot 2 (Marshall Curve) was identified as the top priority because this is a long-known safety problem and high crash area, with a substantial amount of traffic. Of the comments received, this spot was identified by seven comments as the top priority (the remainder of the spots received either zero, one, or two top rankings). (See Exhibit 9.)

2. Spot 1 (north of the Bypass) was identified as the second priority mainly because of the high volume of traffic using this section as well as the safety problems with the substandard curves. The traffic volume through this spot is anticipated to increase after the bypass is constructed. (See Exhibit 8.)

3. CS 1E (Combined Spots 6 and 5W) was identified as the third priority because it would address the safety problem in the Hestand area and serve a higher traffic volume than CS 2 to the south. The option would remove much of the traffic from the substandard KY 163/KY 216 intersection, thereby improving the safety of that area. (See Exhibit 12.)

4. CS 2 (State line to D. Murphy Curve) was identified as the fourth priority because it would serve less traffic than Spots 1, 2, or CS 1, but still address the safety problem in the south, just north of the Tennessee state line. (See Exhibit 13.)

5. Spot 3 (KY 163/KY 3144 intersection) was identified as the fifth priority because it is anticipated that much of the traffic using KY 3144 would use the Tompkinsville Bypass, once it is constructed, rather than the existing KY 163/KY 3144 intersection. (See Exhibit 10.)

Due to the relatively short length and nature of each recommended improvement, each improvement would be expected to be completed in one construction phase. Cost estimates are included in Table 9.

Table 9 Recommended KY 163 Reconstruction Projects

Priority	Alternative	Description	Mile Post	Length (miles)	Est. Cost* (million dollars)
1	Spot 2 (S2)	Realignment of KY 163 to the east at Marshall Curve, south of the proposed Tompkinsville Bypass	6.15 – 7.05	0.9	Design: $0.2 R/W $0.7 Utility: $0.3 Construction: $3.0 Total: $4.2
2	Spot 1 (S1)	Curve Correction North of the proposed Tompkinsville Bypass	7.4 – 8.0	0.6	Design: $0.2 R/W: $0.4 Utility: $0.2 Construction: $2.0 Total: $2.8
3	Combined Spot 1 East (CS1E)	Combination of Spots 5W and 6; Hestand Area Bypass and Curve Correction at Ned Jackson Rd.	2.0 – 4.1	1.8*	Design: $0.6 R/W: $1.3 Utility: $0.7 Construction: $5.9 Total: $8.5
4	Combined Spot 2 (CS2)	Combination of Spots 7,8, and 9; Curve Corrections from TN State Line to the Denton Murphy Rd. area	0.0 – 1.9	1.9	Design: $0.6 R/W: $1.4 Utility: $0.7 Construction: $6.3 Total: $9.0
5	Spot 3 (S3)	Redesign and rebuild the intersection at KY 3144 and KY 163	6.15	0	Design: $0.1 R/W: $0.1 Utility: $0.1 Construction: $1.1 Total: $1.4

** Mileage length refers to actual miles including new bypass, not indicative of mile posts on existing corridor.*