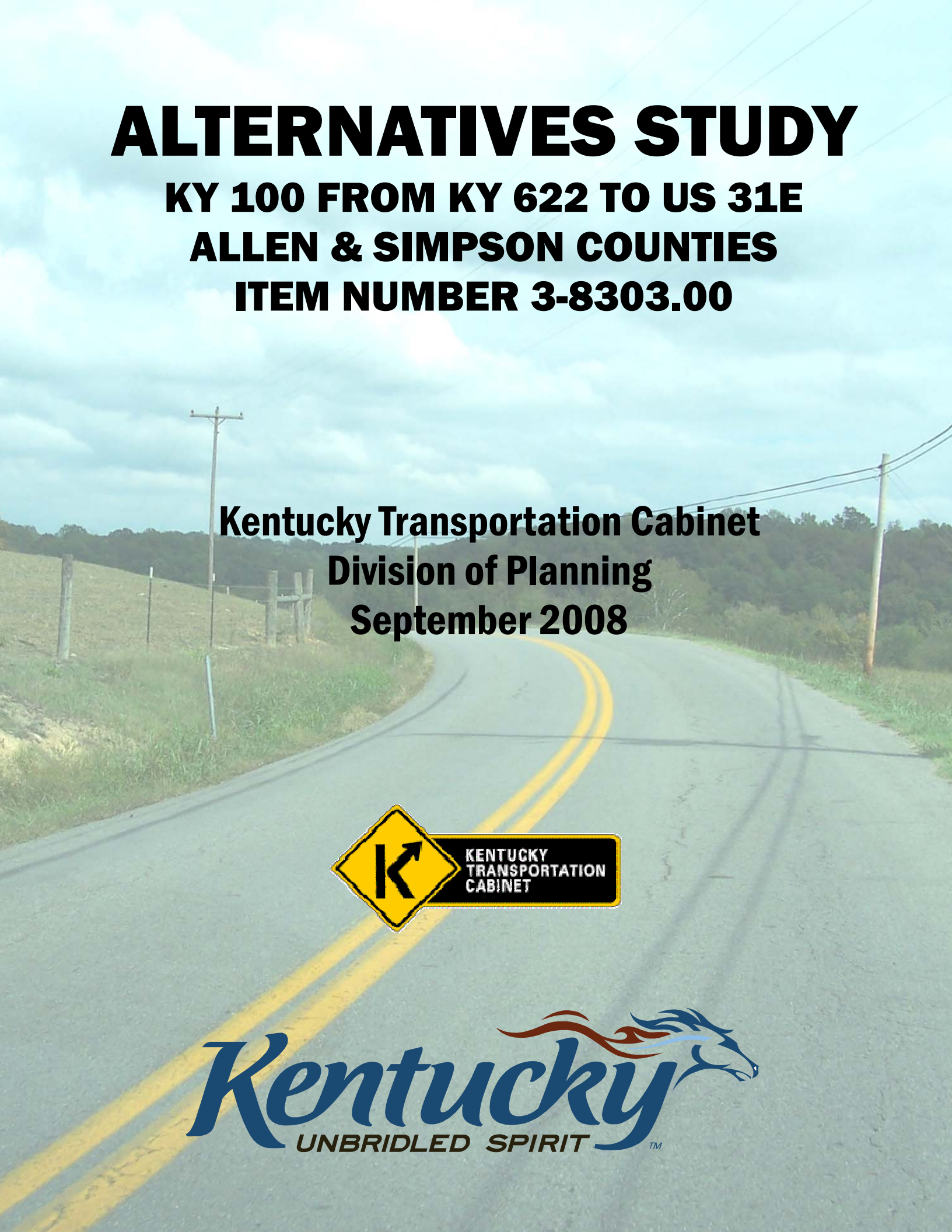
ALTERNATIVES STUDY

KY 100 FROM KY 622 TO US 31E
ALLEN & SIMPSON COUNTIES
ITEM NUMBER 3-8303.00



Kentucky Transportation Cabinet
Division of Planning
September 2008

KENTUCKY TRANSPORTATION CABINET

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EXECUTIVE SUMMARY

Alternatives Study
Allen & Simpson Counties: Item Number 3-8303
KY 100 from KY 622 to US 31E

As part of the Kentucky primary highway network, KY 100 is a rural two-lane facility which connects US 31E near Scottsville in Allen County to I-65 near Franklin in Simpson County. KY 100 is functionally classified as a rural major collector, and it provides a link between the employment, education, governmental, health and recreation service centers in Allen and Simpson Counties. With the improvements to the KY 100 corridor from Franklin to Scottsville currently underway, the next priority for improvement is slated as the section of KY 100 from the intersection with KY 622 in Simpson County to US 31E in Allen County.

This alternatives study was conducted to develop and evaluate alternatives for improving KY 100 in Allen and Simpson Counties, starting at KY 622 in eastern Simpson County and ending approximately fifteen miles east at US 31E in Allen County. This study was developed using a project team approach, with the project team being composed of personnel from the Kentucky Transportation Cabinet's Central Office and Bowling Green Highway District Office, and the Barren River Area Development District. The process of developing this alternatives study included analyzing roadway and traffic conditions; developing a draft purpose and need statement; coordinating with resource agencies and meeting with local officials, stakeholders, and the public to identify their concerns and preferences related to transportation improvements in the area; investigating environmental concerns in the area, including environmental justice and community impacts; and developing and evaluating potential improvement alternatives. Two public meetings, as well as two meetings with local officials and stakeholders, were included as part of this study.

The purpose of this project is to improve safety and provide a better connection for travelers along KY 100 from the intersection with KY 622 to the intersection

with US 31E as part of an overall improvement strategy for the entire KY 100 corridor. While existing and projected traffic volumes indicate that the level of service will remain acceptable at least until Year 2030, the existing geometrics increase travel times and create safety concerns at certain locations. Traffic consists primarily of passenger cars, but there is a relatively large proportion of heavy vehicles, and horse and buggy traffic is fairly common due to the Mennonite communities in the area. This mixture of vehicles combined with the roadway geometrics and narrow cross-section creates safety concerns, and several locations were identified as having potentially high crash rates.

Due to the length of the study corridor, it was divided into six segments which collectively cover the entire study corridor and could be reconstructed independently. In addition, eight locations were identified for potential spot improvements, which are low-cost improvements that focus on small areas of the existing route where specific problems have been identified. Other options that were considered include the no-build alternative and a new four-lane corridor alternative. Based on technical analysis and community input, the project team selected and prioritized a set three spot improvements and three segment improvements. The recommended improvement locations are shown in Figure ES-1. Phased cost estimates and estimated beginning and ending mile points keyed to KY 100 are provided in Table ES-1.

Figure ES-1: Recommended Improvement Locations

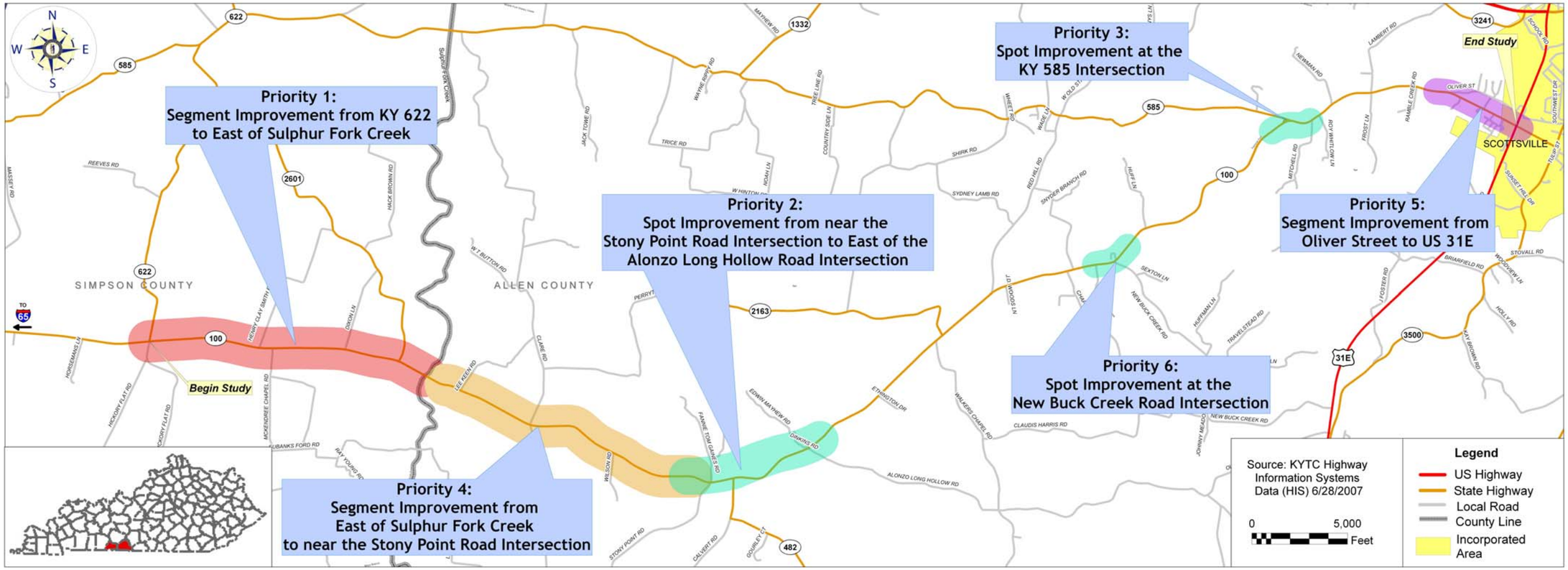

Table ES-1: Cost Estimates for Recommended Improvements

Priority	Description (Cost Estimates Assume a 2-Lane Rural Cross-Section Unless Otherwise Noted)	Mile Point Range (Allen County Unless Otherwise Noted)	Estimated Cost				
			Design	ROW	Utilities	Construction	**Total**
1	Red Segment: Reconstruct KY 100 from KY 622 to East of Sulphur Fork Creek	Simpson County 16.3 - Allen County 0.4	$1,200,000	$640,000	$1,500,000	$9,600,000	**$12,800,000**
2	Spot D: Curve, Bridge, and Intersection Improvements from near the Stony Point Road Intersection to East of the Alonzo Long Hollow Road Intersection	2.7 - 4.5	$660,000	$360,000	$830,000	$5,400,000	**$7,250,000**
3	Spot F: Reconstruct Intersection of KY 100 and KY 585	9.9 - 10.6	$170,000	$93,000	$220,000	$1,400,000	**$1,880,000**
4	Orange Segment: Reconstruct KY 100 from East of Sulphur Fork Creek to Stony Point Road	0.4 - 3.1	$1,200,000	$580,000	$1,300,000	$8,700,000	**$11,900,000**
5	Purple Segment: Reconstruct KY 100 from Oliver St. to US 31E (3-Lane Urban Cross-Section)	11.8 - 12.7	$480,000	$380,000	$670,000	$3,800,000	**$5,330,000**
6	Spot E: Reconstruct Intersection of KY 100 and New Buck Creek Rd.	7.5 - 8.2	$170,000	$93,000	$210,000	$1,400,000	**$1,870,000**

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APPENDICES

1.0 INTRODUCTION

1.1 Study Purpose

The purpose of this alternatives study is to develop, evaluate, and prioritize alternatives for improving the section of KY 100 from the KY 622 intersection in Simpson County to the US 31E intersection in Allen County. This study is intended to provide an estimate of funding needs for potential improvements within the study corridor and to provide information that can be used if and when these improvements are carried forward to the design phase. This study is also intended to lay the groundwork for satisfying requirements of the National Environmental Policy Act (NEPA) regarding consideration of environmental issues.

The following items were included in the development of this study:

- Analyze existing roadway and traffic conditions, and identify concerns that should be addressed;
- Coordinate with resource agencies, local officials, and the public to inform them about the planning study and to identify their concerns related to transportation improvements in the study corridor;
- Develop a draft Purpose and Need Statement;
- Investigate environmental concerns in the study area, including environmental justice and community impacts;
- Develop and evaluate potential improvement alternatives; and
- Recommend improvements to be carried forward.

1.2 Programming

This study was funded in the *Enacted Six-Year Highway Plan 2007-2012* as Item Number 03-8303.00, "Widen and improve KY-100 from US 31E to KY-622 in Simpson County," with beginning and ending mile points of 16.34 in Simpson County and 12.654 in Allen County, respectively. No funding is programmed for future project phases at this time. On the Unscheduled Projects List, this project

is ranked as a high priority at the district level and as a medium priority at the regional level.

1.3 Other Transportation Projects in the Area

Several transportation projects in the immediate vicinity of the KY 100 corridor have been scheduled in the *Enacted Six-Year Highway Plan 2007-2012*:

- Reconstruct and widen KY 100 from I-65 to KY 622 (Item Number 3-8306.00): This project is currently in the design phase. When completed, it will result in an improved segment of KY 100 from I-65 to the beginning of the study corridor.
- Replace KY 100 bridge and approaches over Trammel Creek (Item Number 3-8100.00): This project is located within the KY 100 study corridor and is currently in the design phase.
- Construct a two-way left-turn lane on US 31E from KY 100 to the Primary Center entrance (Item Number 3-8301.00).

1.4 Study Process

This study was conducted using a project team approach. The project team included representatives from the Kentucky Transportation Cabinet (KYTC) Central Office, the KYTC Bowling Green Highway District Office, and the Barren River Area Development District (BRADD). In addition, agency coordination and public involvement activities were conducted to solicit input from a variety of resource agencies, local officials, and the public.

A total of three project team meetings, two local officials and stakeholders meetings, and two public information meetings were held as part of this alternatives study. Complete minutes for the project team meetings, local officials and stakeholders meetings, and public meetings are provided in Appendices B, C, and D, respectively. Brief summaries of these meetings are as follows:

- An initial project team meeting was held on May 16, 2007. Items discussed at this meeting included existing conditions, goals and objectives, environmental issues, other projects in the area, and preliminary design criteria.
- A local officials and stakeholders meeting was held on July 19, 2007. Information on traffic volumes, crash history, and the environmental footprint was presented to the local officials and stakeholders. The officials identified a number of concerns. Some of these concerns were general in nature (e.g. Mennonite communities in the area and heavy truck traffic), but most pertained to problems at specific locations.
- A public meeting was held on August 16, 2007. Information on traffic volumes, crash history, and the environmental footprint was presented to the public. Members of the public provided information on their concerns about potential improvements, as well as specific problems that they would like to see addressed. This meeting was very well-attended, with 151 members of the public noted on the sign-in sheets.
- A second project team meeting was held on October 24, 2007. The results of the previous public meeting were discussed, and short-term and long-term project goals were identified. A variety of improvement alternatives were discussed, including building a new corridor, reconstructing the existing corridor, and making spot improvements to the existing corridor. A set of alternatives was selected to present at the next local officials meeting.
- A second local officials and stakeholders meeting was held on November 29, 2007. The main issues identified through the previous phase of the planning study, along with a draft Purpose and Need Statement, were presented. The initial set of improvement alternatives identified by the project team were also presented to the local officials and stakeholders, and they were given the opportunity to comment on these alternatives.
- A second public information meeting was held on January 8, 2008. The previously identified issues and concerns were presented, along with a

purpose and need statement and the preliminary set of improvement alternatives. Members of the public were given comment forms on which to state their preferences and priorities regarding potential improvements within the study corridor. Twenty-five members of the public were noted on the sign-in sheets.

- A third project team meeting was held on March 6, 2008. Previous work on the planning study was reviewed, environmental concerns were discussed, and the results of the most recent public information meeting were summarized. Based on this information, a prioritized list of spot improvements and segment improvements recommended to be carried forward was developed.

2.0 CORRIDOR DESCRIPTION

2.1 Project Location

The study corridor begins at the KY 622 intersection at MP 16.340 in Simpson County and continues east to the US 31E intersection at MP 12.654 in Allen County. The study corridor is shown in Appendix A, Exhibit 1. Land use along the corridor is primarily rural in nature, with a higher concentration of residential development in the Scottsville area at the eastern end of the corridor. KY 100 connects with I-65 approximately six miles west of the beginning of the study corridor, and many residents of Allen County use this portion of KY 100 to access the Interstate.

2.2 Roadway Characteristics

Data related to the existing roadway characteristics for this section of KY 100 was obtained from the Division of Planning's Highway Information System (HIS) database. This data is included in Appendix E and is summarized below. Additional information was obtained from field visits, meetings with personnel from the Bowling Green Highway District Office, and public involvement.

This section of KY 100 is classified in the State System as a state secondary route, and is functionally classified as a rural major collector. The truck weight class is AAA, and the route is not part of the National Highway System. The speed limit is 55 miles per hour (MPH) except in the Scottsville area at the eastern end of the study corridor, where it is reduced to 45 MPH.

No specific information on vertical grades is available, but the terrain in the area is generally rolling. There are a number of sharp vertical curves, particularly in the Simpson County and western Allen County portions of the study corridor. These vertical curves restrict sight distance and create safety concerns, especially when intersections are located in the vicinity. Abrupt horizontal curves are also a major safety concern within the study corridor. A table containing the degree of horizontal curvature for segments of KY 100 within the study corridor was obtained from HIS and is included in Appendix E. The degrees of curvature were used to calculate design speed based on horizontal curvature, assuming a maximum superelevation of six percent. A large number of segments were found to have design speeds based on horizontal curvature of 45 MPH and 50 MPH, which is below the posted speed limit of 55 MPH. The actual design speed for these segments may be even lower due to vertical curvature and sight distance restrictions.

The existing cross section consists of two through lanes with narrow paved and unpaved shoulders. In Simpson County, the through lanes are nine feet wide and the shoulders are four feet wide. In Allen County, the through lanes range from nine to ten feet wide, and the shoulders are two feet wide. Heavy vehicles make up a relatively large proportion of the traffic composition on this route, and there is also a significant amount of horse and buggy traffic due to the large number of Mennonites in the area. Many members of the public expressed concerns about the large proportion of trucks on such a narrow roadway. They also expressed concerns that the narrow shoulders don't provide room for horse and buggy traffic to pull over to allow vehicles to pass, do not provide a place for

disabled vehicles to pull over, and do not provide an adequate recovery zone for vehicles that leave the travel lanes.

Several bridges are located along this section of KY 100:

- B00004 is located at Sulphur Fork Creek at the Allen-Simpson County Line
- B00016 is located at Middle Fork Drakes Creek at MP 3.968 in Allen County.
- B00015 is located at Long Hollow Branch at MP 4.149 in Allen County.
- B00014 is located at Trammel Fork at MP 9.181 in Allen County.

The Trammel Fork bridge is scheduled to be replaced as a separate project which is currently in the design phase. No structural concerns were noted regarding the other three bridges, but local officials and members of the public expressed concerns about the narrow width of the bridges, especially given the high number of large trucks using the route.

2.3 Traffic Characteristics

Four traffic count stations are located along this section of KY 100. Station 508 covers the portion beginning at KY 622 at the western end of the study corridor and ending at the KY 482 intersection; Station 558 covers the segment from KY 482 to Red Hill Road; Station 505 covers the segment from Red Hill Road to KY 585; and Station 563 covers the segment from KY 585 to US 31E at the eastern end of the study corridor. Average daily traffic volumes (ADT) for these count stations were obtained from the Division of Planning's Traffic and Equipment Management Branch. Data was available from as early as 1965 and as recently as 2006, depending on the particular count station. These historic ADT volumes were used to estimate current (Year 2007) and future (Year 2030) ADT volumes for each station. The results of this analysis are presented in Table 1

Table 1: Current and Future Traffic Volumes and Levels of Service

Segment Description	Traffic Count Station	Existing (Year 2007)		Projected (Year 2030)		
		ADT*	LOS†	ADT	LOS for Unimproved Sections	LOS for Improved Two-Lane Sections
From KY 622 to Allen County Line	508	2,680	B	5,570	C	C
From Allen County Line to KY 482	508	2,680	C	5,570	C	C
From KY 482 to Red Hill Road	558	2,310	B	4,080	C	B
From Red Hill Road to KY 585	505	2,570	C	4,670	C	C
From KY 585 to US 31E	563	3,540	C	5,210	C	C

*Average Daily Traffic (vehicles per day)
†Level of Service

Current ADT volumes range from 2,310 vehicles per day near the middle of the study corridor to 3,540 vehicles per day at the eastern end of the study corridor near Scottsville. Although the eastern end of the study corridor currently has the highest traffic volumes, traffic volumes at the western end of the study corridor have historically grown at a faster rate. This trend is expected to continue due to anticipated developments near I-65. Future ADT volumes in the year 2030 are expected to range from approximately 4,000 vehicles per day near the middle of the study corridor to approximately 5,600 vehicles per day at the western end of the study corridor. Currently, heavy vehicles make up 12% of the traffic volumes on KY 100 throughout the study corridor, and it has been assumed that the proportion of heavy vehicles in the traffic stream will remain unchanged.

Level of Service (LOS) is a measure of how well a transportation facility is operating. It ranges from A, which indicates that there is no congestion, to F, which indicates that the traffic demand exceeds the capacity of the facility. A design hour level of service of C is considered acceptable in rural areas, while a level of service D is acceptable in urban areas. For rural two-lane highways such as KY 100, level of service is based primarily on percent time spent following. The ADT volumes in Table 1 were used to calculate design-hour volumes (DHV), and the HCS+ computer program was used to calculate design-hour levels of

service for each segment under three different scenarios: Current traffic volumes on the existing route, future traffic volumes on the existing route, and future traffic volumes on an improved route. Geometric data from HIS was used in conjunction with the design-hour traffic volumes to calculate existing and future levels of service (LOS) on the existing route. For the purpose of calculating future levels of service on an improved route, it was assumed that the improved route would consist of two twelve-foot-wide travel lanes with eight-foot-wide shoulders, that passing sight distance would be available on 70% of the improved route, and that the improved alignment would allow a base free-flow speed of 60 MPH. The results of this analysis are summarized in Table 1, and printouts containing the details of the HCS+ analysis are provided in Appendix F.

Under current traffic and geometric conditions, LOS ranges from B to C. If no improvements were made to KY 100, the LOS in Year 2030 would be C on all segments, which is acceptable. If the entire route was upgraded to an improved two-lane cross-section with adequate geometrics, the Year 2030 LOS would improve to B on one segment and would remain at C on the remaining segments. The results of the level of service analysis are presented graphically in Appendix A, Exhibits 2 through 4. The results of this analysis indicate that anticipated traffic volumes are low enough that improvements to the study corridor will not be necessary to provide an adequate level of service in Year 2030.

2.4 Safety

Crash data was used to calculate critical rate factors in accordance with the procedure described in *Analysis of Traffic Crash Data in Kentucky (2001-2005)*, published by the Kentucky Transportation Center. A critical rate is the crash rate for a given type of roadway at which it can be said with 99.5% significance that the roadway in question is more prone to crashes than similar roadways throughout the state. A critical rate factor (CRF) is the ratio of the actual crash rate at the location of interest to the critical rate; therefore, a CRF approaching or greater than 1.00 indicates that there is a high probability that the location of

interest is a high-crash location. The data used in this analysis was obtained from the Collision Reports Analysis for Safer Highways (CRASH) database maintained by the Kentucky State Police for the time period beginning on January 1, 2004 and ending on December 31, 2006.

The study corridor was broken into four segments based on changes in traffic volume, which affects the calculation of critical rate factors. The segment from KY 622 at the western end of the study corridor to KY 482 in western Allen County was further divided into two segments, with the break point between segments corresponding to the county line, resulting in a total of five segments of similar length. Critical rate factors were calculated for each of the five segments and are presented in Table 2 and on Exhibit 5 in Appendix A. None of the segments had critical rate factors approaching 1.00. The two segments at the western end of the project had the highest critical rate factors: The segment from KY 622 to the Allen-Simpson County line had a critical rate factor of 0.75, and the segment from the Allen-Simpson County line to KY 482 had a critical rate factor of 0.74. This is not surprising given that the horizontal and vertical curvature is most pronounced on these two segments. The segment with the next highest critical rate factor, 0.64, begins at Red Hill Road and ends at KY 585. This segment includes the Trammel Creek Bridge, which was identified as a high-crash spot. The remaining two segments, from KY 482 to Red Hill Road at the middle of the study corridor, and from KY 585 to US 31E at the eastern end of the study corridor, both had critical rate factors of 0.40.

Critical rate factors were also calculated for one-tenth-mile spots. Spots with a critical rate factor of 0.90 or higher were considered potentially high-crash locations. These spots and are listed in Table 3 and shown graphically Appendix A, Exhibit 5. Five of the seven spots are located between KY 622 and Clare Road/New Roe Road in eastern Allen County and western Simpson County. As noted previously, this area is located within the two segments with the highest critical rate factors. Most of these spots have critical rate factors slightly less

than 1.00, although the spot at MP 0.85 in Allen County, just east of the Sulphur Fork Bridge, has a critical rate factor of 1.28.

Table 2: Critical Rate Factors for Segments

County	Segment Begin Point	Segment End Point	ADT*	Number of Crashes on Segment (Jan. 2003 - Dec. 2005)				Segment Total Crash Rate†	Critical Crash Rate†	CRF‡
				Fatality Crashes	Injury Crashes	Property Damage Only	Total Crashes			
Simpson	MP 16.34 (KY 622)	MP 19.115 (Cnty Line)	2,410	1	4	16	21	287	380	0.75
Allen	MP 0.000 (Cnty Line)	MP 3.339 (KY 482)	2,410	0	6	18	24	272	366	0.74
Allen	MP 3.339 (KY 482)	MP 6.586 (Red Hill)	2,050	0	1	10	11	151	380	0.40
Allen	MP 6.586 (Red Hill)	MP 10.228 (KY 585)	2,250	1	7	13	21	234	365	0.64
Allen	MP 10.228 (KY 585)	MP 12.654 (US 31E)	3,400	0	3	10	13	144	364	0.40

*Average Daily Traffic (vehicles per day)
†Number of crashes per hundred million vehicles miles traveled
‡Critical Rate Factor = Segment Total Crash Rate / Critical Crash Rate

Table 3: Critical Rate Factors for Tenth-Mile Spots

County	Mile Point at Center of Spot	Intersections	ADT* (2005)	Number of Crashes at Spot (Jan. 1, 2003 - Dec. 31, 2005)				Spot Total Crash Rate†	Critical Crash Rate†	CRF‡
				Fatality Crashes	Injury Crashes	Property Damage Only	Total Crashes			
Simpson	16.790	Farm entrance	2,410	0	1	2	3	1.1	1.18	0.96
Simpson	17.450	Henry Clay Smith Rd.	2,410	0	0	3	3	1.1	1.18	0.96
Simpson	18.7		2,410	0	1	2	3	1.1	1.18	0.96
Allen	0.05	Private entrances	2,410	0	0	3	3	1.1	1.18	0.96
Allen	0.85		2,410	0	0	4	4	1.5	1.18	1.28
Allen	9.15	Trammel Creek	3,400	0	2	6	8	2.1	1.00	2.14
Allen	12.65	US 31E	3,400	0	2	3	5	1.3	1.00	1.34

*Average Daily Traffic (vehicles per day)
†Number of crashes per million vehicles
‡Critical Rate Factor = Spot Total Crash Rate / Critical Crash Rate

Details on the weather conditions, roadway conditions, light conditions, and manners of collision at the high-crash spots are provided in Table 4. The majority of collisions involved single vehicles, and at most of the spots a relatively high proportion of the collisions occurred at night. Exceptions to this pattern include the Henry Clay Smith Road intersection, the Trammel Creek bridge, and the US 31E intersection. The collisions at Henry Clay Smith Road included one single vehicle crash, one opposing left-turn crash, and one rear-end crash. The two multi-vehicle collisions may be attributable to the poor sight distance at this intersection. Collisions at the Trammel Creek Bridge are evenly split between single vehicle and sideswipe collisions. The high number of sideswipe collisions may be due to the narrowness of the bridge. Crashes at the US 31E intersection, which is signalized, are mainly rear-end collisions.

Table 4: Crash Details at High-Crash Spots

County & Mile Point at Center of Spot		Simpson County 16.79	Simpson County 17.45	Simpson County 18.7	Allen County 0.05	Allen County 0.85	Allen County 9.15	Allen County 12.65
Intersections		Farm entrance	Henry Clay Smith Rd.		Driveways		Trammel Creek	US 31E
Crash Factors		Number of Applicable Crashes at Spot						
Weather	Clear	1	2	1	2	2	3	5
	Cloudy	1	1	0	0	1	2	0
	Rain	0	0	2	1	0	3	0
	Other	1	0	0	0	1	0	0
Roadway Condition	Dry	2	3	1	2	3	5	5
	Wet	0	0	1	1	0	3	0
	Ice/ Other	1	0	1	0	1	0	0
Manner of Collision	Angle	0	0	0	1	0	0	0
	Backing	0	0	0	0	0	0	0
	Head-on	1	0	0	0	0	0	1
	Opposing Left Turn	0	1	0	0	0	0	0
	Rear End	0	1	0	0	1	0	4
	Sideswipe	0	0	0	0	0	4	0
	Single Vehicle	2	1	3	2	3	4	0
Light Condition	Dark	2	1	2	2	3	2	1
	Dawn/ Dusk	1	0	1	0	0	0	0
	Daylight	0	2	0	1	1	6	4

3.0 AGENCY COORDINATION

The KYTC Division of Planning solicited input regarding this Alternatives Study from a variety of resource agencies. Their responses are included in Appendix G and are summarized below.

U.S. Coast Guard: The project does not involve bridges over navigable waters of the United States, and a Coast Guard bridge permit is therefore not required.

U.S. Department of Health & Human Services: Consideration should be given to potential future growth along the corridor when developing alternatives so that injuries are reduced for all users of the corridor. Areas considered during the NEPA process should include air quality, water quality and quantity, wetlands and floodplains, hazardous materials and wastes, non-hazard solid waste and other materials, noise, occupational health and safety, land use and community and neighborhood impacts, and environmental justice.

Kentucky Commerce Cabinet, State Historic Preservation Office: The agency indicates that there are many cultural resources and a number of previously recorded archaeological sites within the project area. The Section 106 Review Process must be completed if the project is federally funded or subject to Corps of Engineers permits.

Kentucky Department of Agriculture: No specific issues or concerns were identified.

Kentucky Environmental and Public Protection Cabinet (EPPC): The EPPC **Department for Environmental Protection** requested input from a number of agencies through the State Environmental Review Process. Some of these agencies had also been contacted by the Division of Planning directly and sent their responses directly to the Division of Planning. Agency comments received through the State Environmental Review Process, as well as comments from

agencies within the EPPC that were sent directly to the Division of Planning, are listed below.

- EPPC **Division for Air Quality**: The agency indicates that Kentucky Administrative Regulations **401 KAR 63:010** and **401 KAR 63:005** apply to this project. These regulations relate to fugitive emissions and open burning. In addition, the project must meet the conformity requirements of the Clean Air Act as amended and the transportation planning provisions of Title 23 and Title 49 of the United States Code. An investigation into compliance with applicable local government regulations is also suggested.
- EPPC **Division of Conservation:** The agency states that there are no agricultural districts or agricultural conservation easements established in the project area. However, the agency would like to see the issue of loss of farmland addressed and has listed resources for obtaining farmland designations and soil survey information. In addition, the agency has concerns about erosion and sedimentation control during and after earth-disturbing activities and recommends that best management practices be utilized to prevent nonpoint source water pollution.
- EPPC **Department for Natural Resources:**
    - The Lloyd Wildlife Management Area lies within the study area. It includes 366 acres of forestland, including a small "old growth" forest just north of Highway 491. [This comment does not appear to pertain to this study.]
    - A limestone quarry is located on KY 1332 in Allen County. The exact location is shown on a map provided.
- EPPC **Division of Water:** The agency found that the information provided warranted an endorsement of the project. Additional comments are listed below:
    - Trammel Fork is listed as a Coldwater Habitat, Exceptional Water, and Reference Reach Stream.

- The project's location in a karst region can lead to groundwater pollution. Experienced karst hydrogeologists should review the area to ensure that groundwater will not be adversely affected. Measures should be taken to protect the area's groundwater, possibly including newly-developed "rain garden" technology.
- No stream construction permit is required.

- EPPC **Division of Waste Management:**
  - Solid waste generated by the project must be disposed of at a permitted facility, and underground storage tanks, asbestos, lead paint, and other contaminants must be properly addressed if they are encountered.
  - No known Underground Storage Tanks were found in the project area.
  - A list of Superfund sites in Simpson County was provided.
  - No historic landfills were noted in the project area.
- **Kentucky Commerce Cabinet, Department of Fish & Wildlife Resources**:
  - The federally endangered Indiana bat and gray bat are known to occur near the study area. The area is designated in Kentucky's State Wildlife Action Plan as a "Mussel Priority Conservation Area" and a "Fish and Lamprey Conservation Area" due to the potential presence of several "Species of Greatest Conservation Need" located in Trammel Creek, the Middle Fork of Drakes Creek, and Sulphur Fork Creek. Appropriate avoidance and/or mitigation measures should be taken to address these species.
  - The project has the potential to impact wetland habitats. Appropriate avoidance and/or mitigation measures should be taken.
  - The US Army Corps of Engineers and the Kentucky Division of Water should be contacted prior to any work within waterways or wetland habitats.

- The agency provided recommended practices for portions of the project that impact streams.

- **Kentucky State Nature Preserves Commission (KSNPC):** The agency emphasizes the importance of minimizing physical impacts to streams at crossings and water quality downstream from proposed crossings due to the presence of KSNPC-listed and federally threatened species in the area. The agency also indicates that this project would be a good candidate for using bridge designs at stream crossings that afford roosting use by gray myotis.

Kentucky Justice and Public Safety Cabinet:

- **Kentucky State Police:** KY 100 in Allen and Simpson Counties has been identified as a "High Crash Roadway." Steep drop-offs in some areas could contribute to crashes. Population and industrial growth in the area along with access to I-65 will cause traffic, including commercial traffic, to increase.
- **Kentucky Vehicle Enforcement:** The route is considered a non-designated highway which does not allow trucks larger than 8 feet wide and 65 feet overall length. Some companies receiving citations complain that they are not aware of the restrictions due to a lack of signing.

Kentucky Transportation Cabinet:

- **Permits Branch:**
  - The project should be classified as a partially or fully controlled access facility. Details related to access control are provided.
  - The design speed should equal the anticipated posted speed limit if possible.
  - The permits branch requests early notification if the proposed roadway is to be placed on the National Highway System.
- **Office of Special Programs:**

- The safety needs of bicyclists and pedestrians should be incorporated into the design as there are many small communities, churches, and schools along the route, and the Southern Lakes and Mammoth Cave KYTC designated bike routes are in close proximity.
- A minimum of 4 feet of paved shoulder beyond any rumble strips is recommended, along with proper signage, to accommodate bicyclists and pedestrians.

- **Construction Branch:** It is critical to provide a wide enough easement to properly maintain at least one lane of traffic during the construction phases.
- **Geotechnical Branch:**
  - The study area includes the St. Louis Limestone, Salem and Warsaw Limestone, and the Fort Payne Formations. A discussion of the characteristics of these formations is provided along with a map showing their locations within the study area. Sinkholes may be encountered in all three formations, especially the St. Louis Limestone, and are the branch's only concern.
  - Oil and gas wells exist throughout the area and are also shown on the map provided. They should be researched further if new alignments are chosen.

University of Kentucky, Kentucky Geological Survey: The agency provided a summary of geologic concerns in the study area. The main concern appears to be karst potential.

4.0 ENVIRONMENTAL CONCERNS

4.1 Environmental Overview

Information on potential environmental concerns was obtained through coordination with the KYTC Division of Environmental Analysis (DEA). DEA completed a checklist addressing concerns related to archaeology; cultural and

historic resources; socioeconomic, air quality, and noise concerns; underground storage tanks and hazardous waste; ecology; and the need for special permits. This checklist is provided in Appendix H. The Division of Planning also prepared an environmental footprint to graphically illustrate known features of environmental concern in the area. The environmental footprint is included in Appendix H.

Personnel from the Bowling Green Highway District Office also noted that a home and farm at 7231 Scottsville Road in Franklin was built in the 1800's and is listed on the National Historic Register. Photographs of this home are included in Appendix H.

4.2 Environmental Justice and Community Impacts

Environmental justice is required by Executive Order 12898, which was signed on February 11, 1994. This Executive Order states that "...each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations...." The KYTC also considers elderly populations when evaluating environmental justice.

In order to identify potential environmental justice concerns, an *Environmental Justice Report* was prepared by the Barren River Area Development District (BRADD) to assess the community demographics within the study area. This report is included in Appendix I. The report notes that there are small concentrations of minorities within the study area. No concentrations of persons below the poverty level or of elderly residents are expected to be disproportionately affected by the project. The BRADD will continue to monitor the study area for environmental justice concerns throughout the development of the project.

5.0 PURPOSE AND NEED

Based on the information provided thus far in this report, and through public involvement and resource agency coordination, the following purpose and need statement was developed:

> As part of the Kentucky primary highway network, KY 100 is a rural two-lane facility which connects US 31E near Scottsville in Allen County to I-65 near Franklin in Simpson County. KY 100 is functionally classified as a "rural major collector", linking the employment, education, governmental, health and recreation service centers in Allen and Simpson Counties.
>
> With the improvements to the KY 100 corridor from Franklin to Scottsville currently underway, the next priority for improvement is slated as the section of KY 100 from the intersection with KY 622 in Simpson County to US 31E in Allen County.
>
> The purpose of this project is to improve safety and provide a better connection for travelers along KY 100 from the intersection with KY 622 to the intersection with US 31E as part of an overall improvement strategy for the entire KY 100 corridor.

6.0 ALTERNATIVES CONSIDERED

The project team considered several alternatives for the section of KY 100 between KY 622 and US 31E, including the no-build alternatives. These alternatives are discussed in detail below. Cost estimates for these alternatives are included in Table 5.

6.1 No-Build Alternative

This alternative would involve no reconstruction within the study corridor. Improvements would be limited to maintenance and operations activities. This alternative would be the least expensive in terms of up-front costs and would

have the least community and environmental impacts. However, this alternative would not adequately address the project goals of improving safety and providing a better connection for travelers along the KY 100 corridor.

6.2 Spot Improvements

Based on a review of highway geometrics, crash data, and comments from local officials, stakeholders and the public, several locations were identified as potential candidates for spot improvements. Potential improvements, along with cost estimates, were developed to address the issues identified at these locations. A description of these spot improvements is provided below. Spot improvement locations are shown graphically in Appendix A, Exhibit 6. Photographs taken at the spot improvement locations are included in Appendix J. With the exception of Spots G and H, the cost estimates provided in Table 5 for these spot improvements are based on an assumed cross section consisting of two twelve-foot lanes with eight-foot shoulders, four feet of which would be paved.

- Spot A is located at the H. C. Smith Road intersection in Simpson County. The main problem at this location appears to be the sharp vertical curve which obscures sight distance. This spot was identified as a potentially high-crash location.
- Spot B is located at the Sulphur Fork Bridge at the Allen-Simpson County line. This bridge was improved recently, and the project team did not identify any particular issues with the bridge itself. However, crash data does indicate a spot with a potentially high crash rate near the bridge, and local officials and members of the public identified this location as a problem spot. One local official indicated that the curve just east of the bridge is dangerous.
- Spot C is located at the Clare Road/New Roe Road intersection in Allen County. This intersection is located in a horizontal S-curve, and there is a paved parking area in the northwest quadrant of the intersection where parked vehicles could obstruct intersection sight distance. There is also a

vertical curve to the east of the intersection which reduces visibility. While the intersection itself was not identified as a high-crash location, there is a spot just west of the intersection, at the beginning of the S-curve, which has a high critical rate factor.

- Spot D is located in the Stony Point area in Allen County and extends from Stony Point Road to Alonzo Long Hollow Road. This spot originally consisted of four separate spots which were combined into one spot due to their close proximity to each other: The Stony Point Road and KY 482 intersections; the horizontal curve between KY 482 and Drakes Creek; Drakes Creek Bridge; and the Alonzo Long Hollow Road intersection.
- Spot E is located at the New Buck Creek Road intersection in Allen County. This is a skewed intersection located in a horizontal curve. A vertical curve to the east of the intersection reduces sight distance.
- Spot F is located at the KY 585 intersection in Allen County. KY 585 intersects KY 100 at a severe skew in a sharp horizontal curve. Comments from the public indicate that this is a dangerous intersection with many vehicles on KY 585 running the stop sign, and vehicles on KY 100 running off the road.
- Spot G is located at the Oliver Street intersection in Scottsville. The large skew angle at this intersection makes it somewhat difficult for drivers turning onto KY 100 to see conflicting traffic. Local officials indicated that congestion is a problem when school is starting and ending, especially in the morning when a large number of vehicles are turning left from KY 100 onto Oliver Street. The assumed cross section used to generate cost estimates for improvements at this location consists of two through lanes and a two-way left-turn lane with curb, gutter, and sidewalks. These assumptions were made to allow for improved traffic flow and to be consistent with potential segment improvements adjacent to this intersection.
- Spot H is located at the US 31E intersection in Scottsville. Although the KY 100 approaches are wide enough to accommodate two vehicles in

each direction, there are no marked turn lanes. This adversely affects traffic operations and may be confusing to drivers. This intersection has a critical rate factor of 1.34 which indicates that there may be a safety problem at this location. The assumed cross section used to generate cost estimates for improvements at this location consists of two through lanes and a left-turn lane with curb, gutter, and sidewalks. These assumptions were made to allow for improved traffic flow and to be consistent with potential segment improvements adjacent to this intersection.

6.3 Segment Improvements

Improvements to longer segments were considered in addition to the spot improvements listed above. The entire section of KY 100 from KY 622 to US 31E, except for the Trammel Creek Bridge, which is to be replaced as a separate project, was divided into six segments. The break points between segments were selected so that these segments could be rebuilt independently as funding became available. If all segments were eventually rebuilt, the result would be a completely improved route between KY 622 and US 31E. These segments are shown graphically in Appendix A, Exhibit 7 and are discussed below. Cost estimates for these improvements, with the exception of the Purple Segment, are based on a rural cross-section consisting of two twelve-foot lanes with eight-foot shoulders, four feet of which would be paved.

- The Red Segment begins at KY 622 in Simpson County and extends east to the Allen County line at Sulphur Fork Creek. This segment includes three spots with potentially high crash rates, including the H. C. Smith Road intersection which was identified as a potential spot improvement. The replacement of the Sulphur Fork Creek bridge could be included in the reconstruction of this segment or the Orange Segment.
- The Orange Segment begins at the Allen-Simpson County line and continues east to a point near the Stony Point Road intersection. This segment includes the Clare Road/New Roe Road intersection, which was

identified as a potential spot improvement, and the high-crash spot just west of this intersection. The replacement of the Sulphur Fork Creek bridge could be included in the reconstruction of this segment or the Red Segment.

- The Yellow Segment begins near the Stony Point Road intersection and continues east to the KY 2163 intersection. This segment includes the potential spot improvement location in the Stony Point area.
- The Green Segment begins at the KY 2163 intersection and continues east to the Trammel Creek bridge. This segment would tie into the proposed western approach for the Trammel Creek bridge replacement project that is currently in the design phase.
- The Blue Segment begins at the Trammel Creek bridge and ends near the Oliver Street intersection in Scottsville. This segment would tie into the proposed eastern approach for the Trammel Creek bridge replacement project that is currently in the design phase.
- The Purple Segment begins near the Oliver Street intersection and continues east to the US 31E intersection in Scottsville. Due to the high access point density in this area, along with the presence of several nearby schools and a housing complex with a large number of elderly residents, this section should be designed to better accommodate pedestrians and turning traffic. For the purposes of preparing a cost estimate, it was assumed that the new cross-section would consist of two through lanes, a two-way left-turn lane, curb and gutter, and sidewalks.

6.4 New Corridor Alternative

At the first public meeting, several citizens suggested building a four-lane highway on a new alignment. The Division of Planning developed a preliminary alignment for this alternative to use as the basis for a cost estimate. This alignment is included in Appendix A, Exhibit 8. The project team felt that even if this alternative was implemented, a significant amount of local traffic would continue to use the existing route and the safety issues identified through this

planning study would need to be addressed to safely accommodate the residual traffic. Therefore, the cost of spot improvements to the existing route was included in the cost estimate for the new corridor alternative. The project team also recognized that the existing route would have to be maintained in addition to the new route at an average annual cost of approximately $120,000.

Table 5: Cost Estimates for Build Alternatives

Spot Improvements						
Spot	Description (2-Lane Rural Cross Section Unless Otherwise Noted)	Estimated Cost				
		Design	ROW	Utilities	Construction	**Total**
A	H. C. Smith Rd.	$210,000	$110,000	$260,000	$1,700,000	**$2,280,000**
B	Sulphur Fork Bridge	$180,000	$98,000	$230,000	$1,500,000	**$2,010,000**
C	Clare Rd./ New Roe Rd.	$330,000	$180,000	$410,000	$2,700,000	**$3,620,000**
D	Stony Point Area	$660,000	$360,000	$830,000	$5,400,000	**$7,250,000**
E	New Buck Creek Rd.	$170,000	$93,000	$210,000	$1,400,000	**$1,870,000**
F	KY 585	$170,000	$93,000	$220,000	$1,400,000	**$1,880,000**
G	Oliver Street (3-lane urban section)	$92,000	$73,000	$130,000	$730,000	**$1,030,000**
H	US 31E (3-lane urban section)	$95,000	$75,000	$130,000	$750,000	**$1,050,000**

Segment Improvements						
Segment	Description (2-Lane Rural Cross Section Unless Otherwise Noted)	Estimated Cost*				
		Design	ROW	Utilities	Construction	**Total**
Red	KY 622 to County Line	$990,000	$540,000	$1,200,000	$8,100,000	**$10,900,000**
Orange	County Line to Stony Point Rd.	$1,200,000	$680,000	$1,600,000	$10,000,000	**$13,700,000**
Yellow	Stony Point Rd. to KY 2163	$1,300,000	$690,000	$1,600,000	$10,000,000	**$13,800,000**
Green	KY 2163 to Trammel Creek	$1,200,000	$670,000	$1,500,000	$10,000,000	**$13,500,000**
Blue	Trammel Creek to Oliver St.	$940,000	$510,000	$1,200,000	$7,700,000	**$10,300,000**
Purple	Oliver St. to US 31E (3-Lane Urban Section)	$480,000	$380,000	$670,000	$3,800,000	**$5,330,000**
**Includes costs for spot improvements located within the segment*						

New Corridor					
	Estimated Cost				
	Design	ROW	Utilities	Construction	Total
New Corridor (4-Lane Divided Rural Cross Section)	$9,150,000	$8,770,000	$11,000,000	$71,800,000	**$101,000,000**
Spot Improvments to Existing Route	$1,907,000	$1,082,000	$2,420,000	$15,580,000	**$21,000,000**
Total Up-Front Costs for New Corridor					**$122,000,000**
Cost to Maintain Existing Route					*$120,000/year*

7.0 RECOMMENDATIONS

7.1 Improvements Recommended To Be Carried Forward

Improvements recommended to be carried forward are listed below in order of descending priority:

- **Priority 1 - Red Segment:** The project team decided to include Spot B (the Sulphur Fork Creek bridge) in the Red Segment and make this the top priority. This would address several high-crash locations and would be a continuation of the proposed improvements to KY 100 from I-65 to KY 622. The original cost estimate for this segment did not include Spot B, so the estimated cost of Spot B was added to the estimated cost for the Red Segment to obtain a revised estimated cost of $12.8 million.
- **Priority 2 - Spot D (Stony Point Area):** This portion of KY 100 has numerous geometric deficiencies, several narrow bridges, and was by far the highest-ranked spot improvement based on the survey questionnaire from the second public meeting. The project team feels that making this spot improvement will address most of the problems associated with the Yellow Segment.
- **Priority 3 - Spot F (KY 585 Intersection):** This spot was identified as the second highest priority spot improvement based on the survey questionnaire from the second public meeting. The project team feels that the KY 585 intersection is the main problem location within the Blue Segment.
- **Priority 4 - Orange Segment:** This segment of KY 100 contains two high-crash locations, one of which would be addressed with reconstruction of the Red Segment, and was ranked as the second most critical segment based on the survey questionnaires from the second public meeting. The Orange Segment also contains Spot C (New Roe Road and Clare Road), which the public identified as the third highest priority spot improvement location. Reconstructing this segment, combined with reconstructing the Red Segment and Spot D, would result in a continuous improved roadway from KY 622 to Alonzo Long Hollow Road. The cost of Spot B was originally included in the

cost estimate for the Orange Segment, but since it was decided to include Spot B as part of the Red Segment, the cost of Spot B was subtracted from the original estimated cost of the Orange Segment to obtain a revised estimated cost of $11.9 million.

- **Priority 5 - Purple Segment:** This segment includes both Spot G (the Oliver Street intersection) and Spot H (the US 31E intersection). Because there are numerous access points along this segment, several nearby schools, and a relatively high concentration of residential units, including a housing complex with a large number of elderly residents, the project team recommends rebuilding this segment as an urban roadway with curb, gutter, and sidewalk. Support for improvements in this area was expressed at the local officials and stakeholders meetings.
- **Priority 6 - Spot E (New Buck Creek Road):** This intersection is located on a segment of KY 100 that contains both horizontal and vertical curvature. Visibility at the intersection is restricted for vehicles on KY 100 and on New Buck Creek Road. Although the crash data does not indicate that this intersection is a high-crash location, members of the public stated that crashes do occur in this location. The project team feels that the New Buck Creek Road intersection is the main problem spot within the Green Segment.

Phased cost estimates and approximate beginning and ending mile points for the recommended improvements are provided in Table 6. The recommended improvements and their priority are shown graphically in Appendix A, Exhibit 9.

Table 6: Phased Cost Estimates and Mile Point Ranges for Recommended Improvements

Priority	Description (2-Lane Rural Cross Section Unless Otherwise Noted)	Mile Point Range (Allen County unless otherwise specified)	Estimated Cost				
			Design	ROW	Utilities	Construction	**Total**
1	Red Segment: KY 622 to East of Sulphur Fork Creek	Simpson County 16.3 - Allen County 0.4	$1,200,000	$640,000	$1,500,000	$9,600,000	**$12,800,000**
2	Spot D: Stony Point Area	2.7 - 4.5	$660,000	$360,000	$830,000	$5,400,000	**$7,250,000**
3	Spot F: KY 585	9.9 - 10.6	$170,000	$93,000	$220,000	$1,400,000	**$1,880,000**
4	Orange Segment: East of Sulphur Fork Creek to Stony Point Rd.	0.4 - 3.1	$1,200,000	$580,000	$1,300,000	$8,700,000	**$11,900,000**
5	Purple Segment: Oliver St. to US 31E (3-Lane Urban Section)	11.8 - 12.7	$480,000	$380,000	$670,000	$3,800,000	**$5,330,000**
6	Spot E: New Buck Creek Rd.	7.5 - 8.2	$170,000	$93,000	$210,000	$1,400,000	**$1,870,000**

7.2 Improvements Not Recommended To Be Carried Forward

In addition to recommending the improvements listed above, the project team selected several improvements that should not be carried forward at this point. These alternatives are as follows:

- Spot A (Henry Clay Smith Road): This spot will be addressed when the Red Segment is reconstructed.
- Spot B (Sulphur Fork Bridge): This spot will be included with the reconstruction of the Red Segment.
- Spot C (Clare Road/New Roe Road): This spot will be addressed when the Orange Segment is reconstructed.
- Yellow Segment: The project team feels that the main issues on this segment will be addressed with the reconstruction of Spot D (the Stony Point area). Therefore, it is not recommended that the entire segment be rebuilt at this time.
- Green Segment: The project team feels that the main issues on this segment will be addressed with the reconstruction of Spot E (the New Buck Creek Road intersection). Therefore, it is not recommended that the entire segment be rebuilt at this time.
- Blue Segment: The project team feels that the main issues on this segment will be addressed with the reconstruction of Spot F (the KY 585 intersection). Therefore, it is not recommended that the entire segment be rebuilt at this time.
- Spot G (Oliver Street): This spot will be addressed when the Purple Segment is reconstructed.
- Spot H (US 31E): This spot will be addressed when the Purple Segment is reconstructed.
- New Corridor Alternative: The projected traffic volumes for Year 2030 are not high enough to require the construction of a new four-lane route. In addition, a substantial amount of local traffic would continue to rely on the existing route to access local properties. To maintain access for this local traffic, the existing route would need to be maintained at an estimated cost of $120,000

per year, and the safety improvements identified in this report would still need to be implemented. Therefore, the project team does not consider the new corridor alternative to be a cost-effective solution for addressing the goals and objectives identified for the KY 100 corridor.

7.3 Operations Projects

In addition to the recommended build options, the following operations improvements are recommended:

- Evaluate the US 31E intersection for potential short-term traffic improvements. These improvements could include better delineation of travel lanes and shoulders, and possibly the addition of left-turn lanes on KY 100.
- Consider placing signage on KY 100 to alert truck drivers to any restrictions.

8.0 ACKNOWLEDGEMENTS

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- Andrew Stewart, Highway District 3 Design
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- Misti Wilson, Highway District 3 Planning

The following individuals from the Kentucky Transportation Cabinet's Division of Planning may be contacted if additional information is required:

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