

## IX. RECOMMENDATIONS

This chapter presents the recommended safety improvement projects developed by the project team over the course of the study.

### A. Purpose and Need

As discussed in **Chapter V**, the defined purpose and need for the projects proposed in this Programming Study for Safety Improvements along US 431 is to improve safety, with an auxiliary goal to improve access and mobility.

### B. Recommendations

The following sections discuss the recommendations.

#### 1. Specific Recommendations and Priorities

A total of 20 specific spot improvements are recommended to address safety issues identified as a result of this study. Recommendations include widening segments, realigning curves, improving roadside features, and improving intersections. Individual project descriptions are shown on the detailed project cut sheets presented in **Appendix H**. Each sheet presents a narrative description of the site, the crash information for both 2000-2002 and 2003-2006 data sets, the priority level, the recommendation, and estimated costs. An explanatory guide to the tables presenting the crash data can be found in **Appendix G**. The following Locations are recommended for safety improvement projects:

Recommended Build Projects	
1-D: Intersection Improvements at US 79	1-R: Intersection Improvements at KY 176
1-G: Realign Segment at Hollow Bill	1-R: Intersection Improvements at KY 2107
1-H: Intersection Improvements at KY 1293	1-T: Intersection Improvements at Cleaton Rd
1-I: Intersection Improvements at KY 973	1-U: Extend 4-lane section at Parkway
1-J: Widen narrow Bridges at Penrod	2-A: Widen to 3 lanes at Central City
1-J: Realign Segment north of Penrod	2-D: Realign Segment at KY 81
1-K: Realign Segment at Union Ridge Road and Belcher Lane	2-K: Intersection Improvements at KY 250
1-M: Intersection Improvements at KY 2270	2-L: Intersection Improvements at Harmons Ferry Road
1-O: Intersection Improvements at KY 246	2-M: Cut embankment at Mill Street
1-Q: Intersection Improvements at KY 70	2-N: Intersection Improvements at KY 140

Each proposed project was ranked as High, Medium, or Low priority, as shown in the project descriptions in **Appendix H**. This decision was weighted by CRF, crash severity, and estimated cost to fix. **Exhibit 9.1** at the end of the chapter shows a map of the prioritized recommended projects.

Projects were ranked by CRF, severity, and cost as High, Medium, or Low Priorities.

In addition, a number of projects were identified and are recommended which do not fall into the established prioritization criteria. In these cases, no defined crash problems fell within the site boundaries. However, the projects do align with the stated project purpose and are considered worthwhile improvements to the corridor.

One of these Locations is a widening project within Livermore at Location 2-G that is a county and local priority. The community would like to incorporate access management principles and continue the existing three-lane section for about a half-mile south to the foot of the Green River Bridge. This project is in line with the secondary goal of this study to improve access and connectivity through the US 431 corridor although it is not merited solely on safety performance.



*Area in Livermore to be widened*

Likewise, a number of long term improvement projects are recommended to enhance the corridor, summarized in **Exhibit 9.2**. These projects fall beyond the scope of this programming study, but are recommended for more detailed planning efforts on an individual level.

**Exhibit 9.2 – Long Term Improvements**

Location	Description	Cost Estimate	
1-H/1-I	<b>Dunmor Bypass:</b> Construct 1.2-mile long new alignment east of Dunmor	D	\$850,000
		R	\$1,100,000
		U	\$600,000
		C	\$8,500,000
		T	\$11,050,000
1-O	<b>Beechmont Bypass:</b> Construct 1.6-mile long new alignment east of Beechmont	D	\$1,120,000
		R	\$1,650,000
		U	\$800,000
		C	\$11,200,000
		T	\$14,770,000
1-U	<b>Parkway Interchange:</b> Reconstruct toll-booth interchange to typical diamond configuration for interstate compliance	D	\$850,000
		R	\$250,000
		U	\$100,000
		C	\$8,500,000
		T	\$9,700,000
2-B	<b>Central City Bypass:</b> Construct 2.25-mile new alignment around southwest quadrant of Central City	D	\$850,000
		R	\$2,000,000
		U	\$1,000,000
		C	\$8,500,000
		T	\$12,350,000
2-D	<b>South Carrollton Bypass:</b> Construct 2.0-mile new alignment west of South Carrollton	D	\$1,400,000
		R	\$1,800,000
		U	\$800,000
		C	\$14,000,000
		T	\$18,000,000
2-N	<b>Bypass near Utica:</b> Construct 1.5-mile new alignment north of KY 140 incorporating drainage improvements	D	\$970,000
		R	\$1,700,000
		U	\$750,000
		C	\$9,700,000
		T	\$13,120,000
Total - Long Term Improvements			\$78,990,000

NOTE: Cost Estimates provided by KYTC Districts 2 and 3

## 2. General Recommendations

A number of trends appeared along the corridor length that impact overall safety along the study corridor. These factors include:

- *Interim Low Cost Improvements* – If more immediate lower-cost improvements are desired for any particular location or locations along the US 431 Corridor which have experienced a significant crash history, a Roadway Safety Audit for those locations can be an option. A Roadway Safety Audit utilizes an interdisciplinary team to identify possible low-cost improvements including more or modified signing, shoulder work, clearing right-of-way, rumble strips, etc. Such low-cost improvements could possibly be implemented in the

interim with dedicated federal funding prior to execution of the "recommended build" projects. These low-cost improvements should not be considered as replacements for those "recommended build" projects.

- *Access Control* – Limiting the frequency and size of private driveways accessing US 431 will reduce the number of conflict points and positively impact both safety and capacity;
- *Roadside Features* – Guardrails, vegetation, embankments, and other obstacles have the potential to impact operations in crash events; improvements to roadside features should be incorporated into any mainline projects; and
- *Heavy Truck Volumes* – Performance characteristics of large vehicles increase the need for key safety upgrades like turning lanes, adequate clearances, and large turning radii at intersections. This is especially relevant south of Russellville where US 431 is designated on the National Truck Network. South of Russellville, there are three structures, two of which are functionally obsolete, with widths of 25 feet each.

These factors should be taken into consideration during development phases for recommended projects.

### 3. Recommended for Continued Monitoring

Following the steps outlined in the previous chapters, analysts identified sites along the route which appeared as high crash areas. Statistical crash investigations and field observations suggested potential mitigations at most sites; however, three Locations did not satisfactorily reveal causal features which a project should address. These Locations are recommended for continued monitoring by transportation officials:

- *Location 1-L* consists of a curve immediately south of the recently



improved segment known as “Dead Man’s Curve” in southern Muhlenberg County. Seven crashes occurred in the period 2003-2005. It is too soon to determine whether the recent safety improvement project at Dead Man’s Curve (constructed in 2006) will improve safety on this adjoining segment.

- *Location 1-P* contains the intersection with Sylvania Street in Beechmont. This location has a CRF greater than 1.00 for both data sets but site geometrics do not indicate a likely cause. Crash trend analyses are also inconclusive. This location is just south of the recently constructed Muhlenberg South Elementary School.

*Views north  
(left) and  
south (right)  
at Sylvania Street*



- *Location 2-F* lies at the KY 85 intersection in Island. This intersection has wide lanes with full shoulders, turn lanes, and warning signage. There is a steep vertical grade and reduced speed zone to the south. A number of injury crashes and a fatality occurred at this location during 2003-2006 for a 1.63 CRF. The Kentucky State Police continue to monitor this site.



*KY 85 intersection north of Island*

## C. Project Costs

Cost estimates were developed for each recommended spot improvement by KYTC District personnel. Costs are divided by phase for design, right-of-way acquisition, utilities relocations, and construction. **Exhibit 9.3** presents these costs for each of the recommended spot improvements.

Exhibit 9.3 – Cost Estimates by Phase and Priority

Location	Project Description	Design Cost	ROW Cost	Utility Cost	Const Cost	Total Cost
<b>Phase I</b>						
<b>High Priority</b>						
1-I	Intersection Improvements at KY 973	\$20,000	\$0	\$0	\$50,000	\$70,000
1-J	Widen Bridges at Penrod	\$120,000	\$150,000	\$130,000	\$1,200,000	\$1,600,000
1-K	Realign segment near Union Ridge	\$560,000	\$1,000,000	\$900,000	\$5,600,000	\$8,060,000
1-Q	Intersection Improvements at KY 70	\$25,000	\$0	\$0	\$100,000	\$125,000
1-R	Intersection Improvements at KY 176	\$100,000	\$390,000	\$350,000	\$820,000	\$1,660,000
1-U	Widen Segment at Parkway Interchange	\$50,000	\$50,000	\$25,000	\$275,000	\$400,000
<b>High Priority Totals</b>		\$875,000	\$1,590,000	\$1,405,000	\$8,045,000	\$11,915,000
<b>Medium Priority</b>						
1-G	Realign Segment at Hollow Bill, north Logan County	\$400,000	\$600,000	\$360,000	\$4,040,000	\$5,400,000
1-M	Intersection Improvements at KY 2270	\$20,000	\$0	\$0	\$50,000	\$70,000
1-O	Intersection Improvements at KY 246	\$50,000	\$50,000	\$0	\$250,000	\$350,000
<b>Medium Priority Totals</b>		\$470,000	\$650,000	\$360,000	\$4,340,000	\$5,820,000
<b>Low Priority</b>						
1-D	Intersection Improvements at US 79	\$100,000	\$500,000	\$200,000	\$500,000	\$1,300,000
1-H	Intersection Improvements at KY 1293	\$225,000	\$570,000	\$160,000	\$2,270,000	\$3,225,000
1-J	Realign segment at Penrod	\$100,000	\$220,000	\$180,000	\$750,000	\$1,250,000
1-R	Intersection Improvements at KY 2107	\$100,000	\$180,000	\$100,000	\$350,000	\$730,000
1-T	Intersection Improvements at Cleaton Road	\$100,000	\$140,000	\$145,000	\$520,000	\$905,000
<b>Low Priority Totals</b>		\$625,000	\$1,610,000	\$785,000	\$4,390,000	\$7,410,000
<b>Phase I Totals</b>		\$1,970,000	\$3,850,000	\$2,550,000	\$16,775,000	\$25,145,000
<b>Phase II</b>						
<b>High Priority</b>						
2-D	Realign Segment at KY 81	\$75,000	\$200,000	\$125,000	\$300,000	\$700,000
<b>High Priority Totals</b>		\$75,000	\$200,000	\$125,000	\$300,000	\$700,000
<b>Medium Priority</b>						
2-A	Widen Segment at Parkway Interchange	\$115,000	\$200,000	\$460,000	\$950,000	\$1,725,000
2-L	Intersection Improvements at Harmons Ferry Road	\$100,000	\$150,000	\$200,000	\$500,000	\$950,000
2-M	Improve Roadside Geometry at Mill Street	\$20,000	\$0	\$0	\$75,000	\$95,000
2-N	Intersection Improvements at KY 140	\$100,000	\$200,000	\$200,000	\$750,000	\$1,250,000
<b>Medium Priority Totals</b>		\$335,000	\$550,000	\$660,000	\$2,275,000	\$4,020,000
<b>Low Priority</b>						
2-K	Intersection Improvements at KY 250	\$100,000	\$200,000	\$180,000	\$500,000	\$980,000
<b>Low Priority Totals</b>		\$100,000	\$200,000	\$180,000	\$500,000	\$980,000
<b>Phase II Totals</b>		\$510,000	\$950,000	\$1,165,000	\$3,075,000	\$5,700,000
<b>Total for Phase I &amp; Phase II</b>		<b>\$2,480,000</b>	<b>\$4,800,000</b>	<b>\$3,715,000</b>	<b>\$19,850,000</b>	<b>\$30,845,000</b>

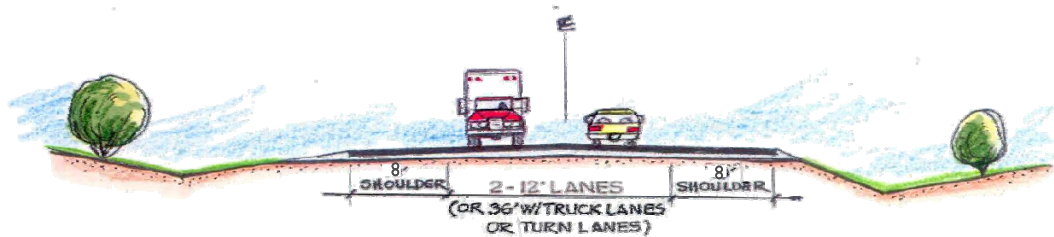


## D. Design Criteria

Potential design criteria are included in this section for planning purposes only. These criteria are general recommendations based on information gathered as part of the planning phase and recent improvements completed within the area. Specific geometric parameters should be defined on a case by case basis during future design phases of the project, as more detailed information is available.

The recommended cross section for improvements to two-lane sections of the route consists of two 12-foot wide lanes with an 8-foot wide paved shoulder. In sections where a turn lane is recommended, a third 12-foot wide turn lane should be added to accommodate vehicles. **Exhibit 9.4** presents an artistic rendering of the recommended typical cross section. Because of variations along the route, this template may not be applicable in all circumstances but should serve as a guide.

**Exhibit 9.4 – Typical Cross Section**



## E. Environmental Considerations

A number of issues related to environmental factors and sensitive land uses identified throughout this study should be considered as this project moves into future phases. These issues have been discussed in greater detail in previous chapters. Important issues include:

- *Farmlands* – Impacts to prime farmlands and farmlands of statewide significance are likely to accompany any improvements along this predominantly rural route. Three Agricultural Districts exist in Logan County, although impacts from the recommended spot improvements are unlikely.
- *Threatened and Endangered Species* – A variety of protected plant and animal species are likely to inhabit the study area. Habitats should be surveyed and construction impacts limited through restricted tree cutting and planned erosion

control measures. Impacted wetlands should be delineated and mitigated at a 2:1 or better ratio. Peabody Wildlife Management Area lies near US 431 north of Drakesboro, protecting a unique environmental area.

- *Historic Properties* – A number of historic districts, National Register properties, archaeological sites, and other historic places occur near the existing alignment.
- *Community Resources* – Consideration should be given to existing community resources throughout the study area. Churches, cemeteries, parks, and schools may be found near the existing route.
- *Environmental Justice* – Environmental Justice issues relating to low-income, elderly, disabled, and/or minority populations should be monitored during future phases due to concentrations of these populations in the study area.
- *Floodplains* – Portions of the project area fall into FEMA Zones A/AE (inundated by 100 year floods), X500 (inundated by 500 year floods), and X (beyond 100 year and 500 year floodplains). Crash records indicate a number of crash events were related to water pooling in the roadway. Improvements should provide adequate drainage facilities to address this issue.
- *Water Quality* – Consideration should be given to potential water quality issues in nearby rivers, streams, ponds, and wetlands. Erosion control measures should be implemented during construction activities.
- *Fault Lines* – A number of geologic faults stretch east-west through portions of the study area. Though most recommendations lie along the existing alignment, improvements off the existing alignment should plan for these features.

## **F. Construction Considerations**

Construction-related issues were also identified throughout this study. Discussed in more detail in previous chapters, potential issues related to construction of any recommended spot improvements include:

- *Erosion and Sediment Control* – Measures should be utilized to control erosion and sedimentation during and after commencement of earth-disturbing activities.
- *Air Quality* – Precautions should be taken to prevent particulate matter from becoming airborne. Open burning is prohibited. Requirements outlined in the Clean



Air Act and Titles 23 and 49 of the US Code should be met, in addition to any local government regulations.

- *Geotechnical and Subsurface Issues* – UST sites, gas and oil wells, abandoned underground mines, and/or faulted areas may be encountered during construction activities and require additional coordination. Additionally, ownership issues may arise for any coal and limestone deposits; some excavated stone may be suitable for construction purposes.

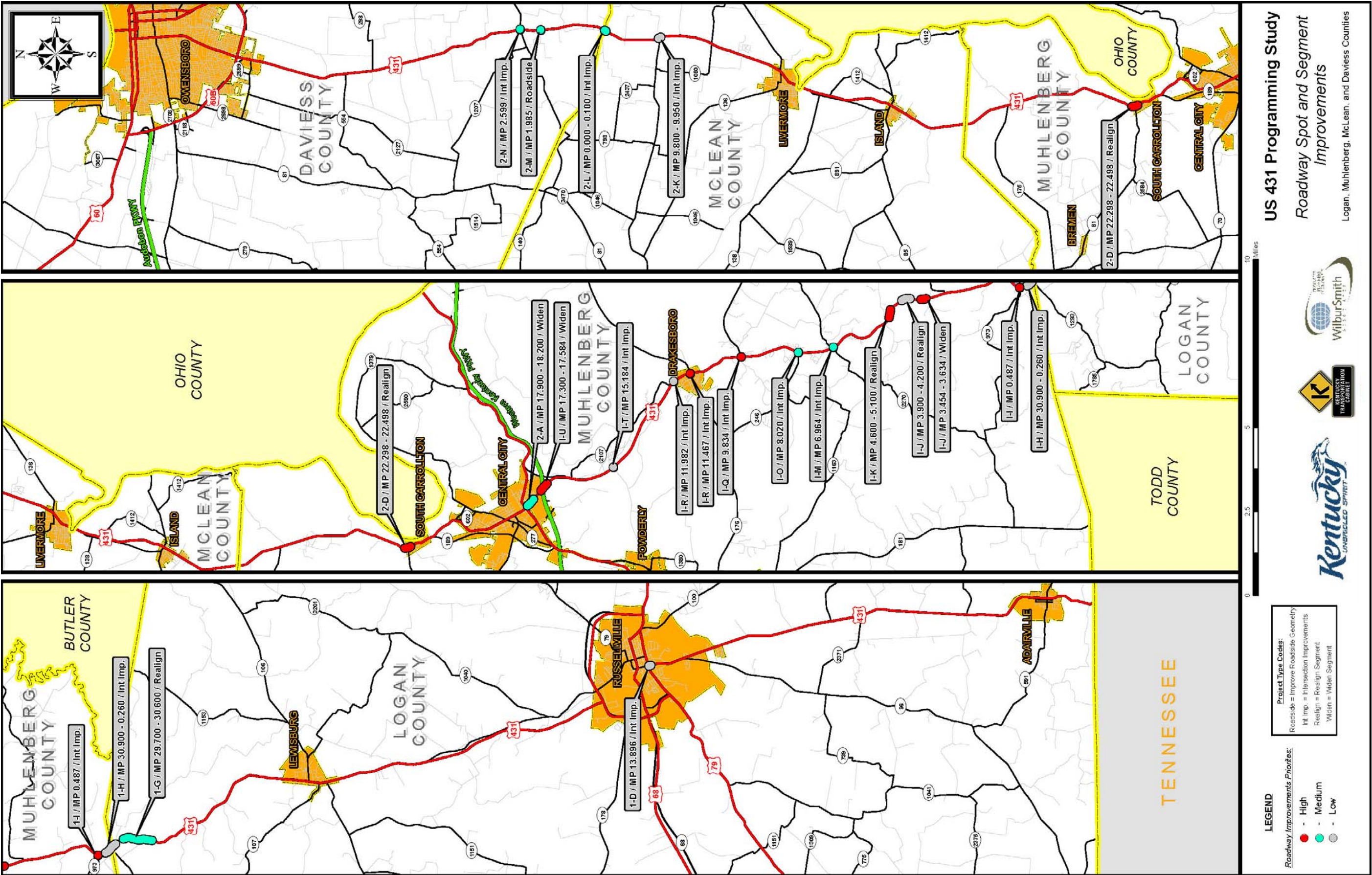


Exhibit 9.1