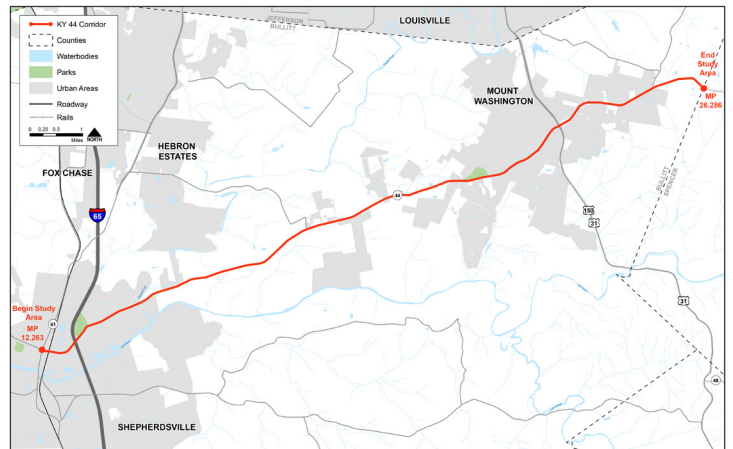




## KENTUCKY TRANSPORTATION CABINET

# KY 44 PROGRAMMING STUDY

Executive Summary, March 2023





# Executive Summary

Over the years, the Kentucky Transportation Cabinet (KYTC) has developed various design concepts for most of the 14-mile section of the KY 44 corridor between KY 61 in Shepherdsville and the Spencer County line east of Mt. Washington. Improving KY 44 is expected to be a costly undertaking, take many years to complete, and have to be constructed in sections.

KYTC contracted with WSP USA in March of 2022 to perform a data-driven review of all previous design decisions along the corridor and develop a prioritized plan for moving forward. The purpose of this analysis is to make sure KYTC and its partners are on track to use KYTC resources efficiently, at the right locations, and in the right order. The study team was also tasked with identifying innovative traffic flow and safety improvement opportunities also known as Transportation System Management and Operations (TSMO), that may not have been investigated in the past. Some of these improvements could be implemented relatively quickly and may provide noticeable congestion relief and safety benefits prior to completion of major full-corridor improvements. Consideration should also be given to inclusion of TSMO solutions in any ultimate improvement projects. This study also developed Performance Based Flexible Solutions (PBFS) and incorporated those into a project priority programming scheme for the KY 44 corridor.

## Highway Plan and Other Active Roadway Projects

KYTC provided a list of active and proposed projects in the study area vicinity, shown in Figure ES-1. There are six projects along the corridor vicinity programmed in Kentucky's 2022-2028 Enacted Highway Plan (Highway Plan). KYTC also provided a list of Local Public Agency (LPA) projects also active in the study area.

### Highway Plan Projects\*

- ▶ 5-43.00: Reconstruct KY 44 from KY 1319 (Kings Church Road) to Spencer County line – (State Construction Funds [SPP]) | D 2022 \$1,200,000; R 2023 \$1,000,000; U 2024 \$850,000; C 2025 \$5,350,000 – Total \$8,400,000

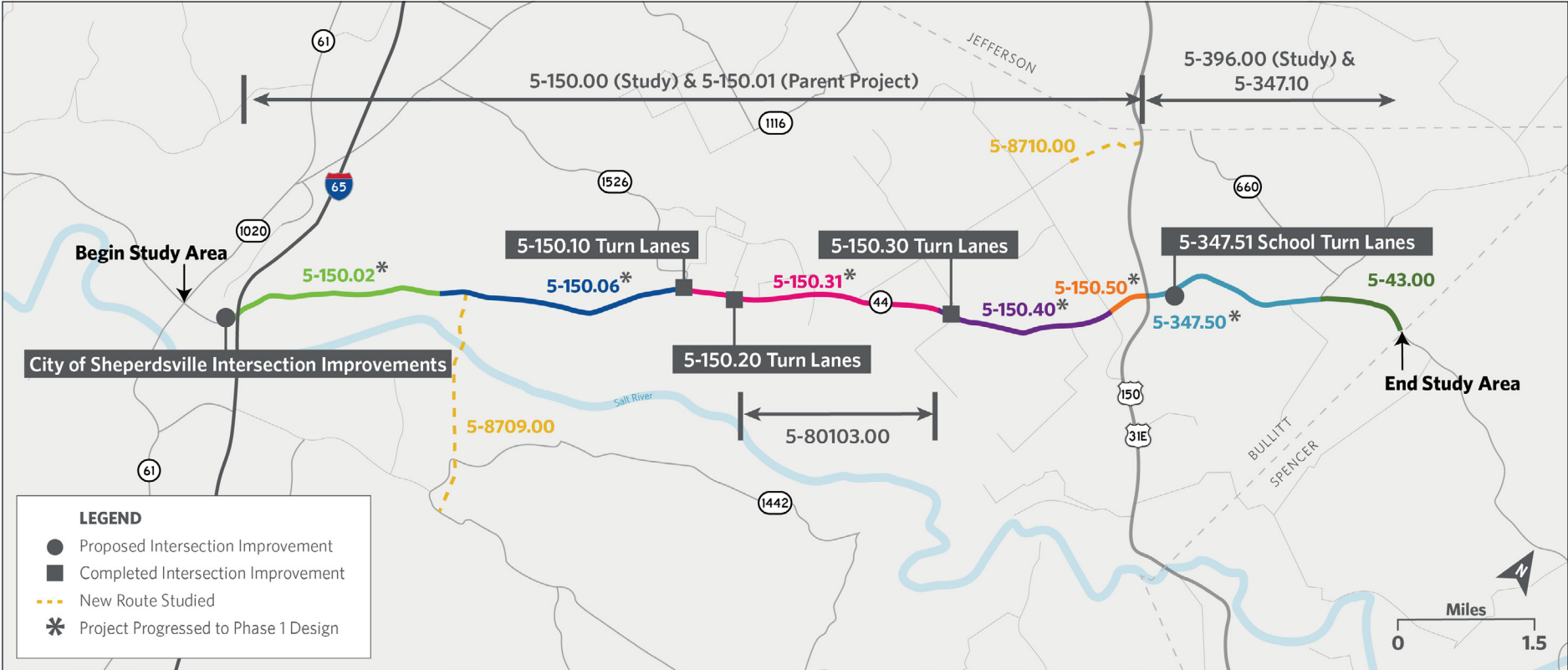
- ▶ 5-150.02: Reconstruct KY 44 from I-65 to Chimney Rock Drive – (SPP) | D 2025 \$2,080,000; R 2026 \$7,640,000; U 2027 \$9,790,000; C 2028 \$19,430,000 – Total \$38,940,000
- ▶ 5-150.50: Reconstruct KY 44 from United States Route (US) 31EX to US 31E – (SPP) | D authorized; R 2023 \$1,630,000; U 2024 \$580,000; C 2025 \$1,883,000 – Total \$4,093,000
- ▶ 5-347.50: Reconstruct KY 44 from US 31E to KY 1319 (Kings Church) – (SPP) | D 2022 \$1,300,000; R 2025 \$4,500,000; U 2026 \$1,700,000; C 2027 \$13,200,000 – Total \$20,700,000
- ▶ 5-347.51: New Turn Lanes in front of Bullitt East High School – (Federal Statewide Transportation Program Flex Funds [STPF]) | D, R, U & C authorized. Let to construction November 2022.
- ▶ 5-80103.00: Reconstruct KY 44 from Bogard Lane to Armstrong Lane – (SPP) | D 2022 \$2,300,000; R 2025 \$4,700,000; U 2026 \$6,600,000; C 2027 \$14,600,000 – Total \$28,200,000

\*D: Design, R: Right-of-Way, U: Utilities, C: Construction

### Local Public Agency Projects

- ▶ 5-347.10: Widening of KY 44 from 2 to 4 Lanes in Bullitt County from US 31E to KY 1319 (Kings Church Road) and a 3 Lane Section from KY 1319 (Kings Church Road) to the Spencer County line – KIPDA federal STBG-SLO | \$1,130,000 D funds authorized; no other phases programmed or identified – D5 assisting Bullitt County LPA with design
- ▶ No SYP: KY 44/Adam Shepherd Pkwy Intersection Improvements – City of Shepherdsville - Local funds only | In Design with Construction anticipated 2025.

Figure ES-1: Recently Constructed, Proposed and Programmed Projects





## Existing Conditions

The KY 44 corridor’s current conditions were evaluated with respect to roadway geometrics, existing number of intersections and access points, bicycle and pedestrian activity, safety, travel speeds, and traffic operations. KY 44 has a two-lane cross-section through a majority of the study corridor with exceptions in the Shepherdsville and Mt. Washington areas. Additionally, there are 536 unsignalized access points throughout the study area, as well as nine signalized intersections, mostly in Shepherdsville and Mt. Washington.

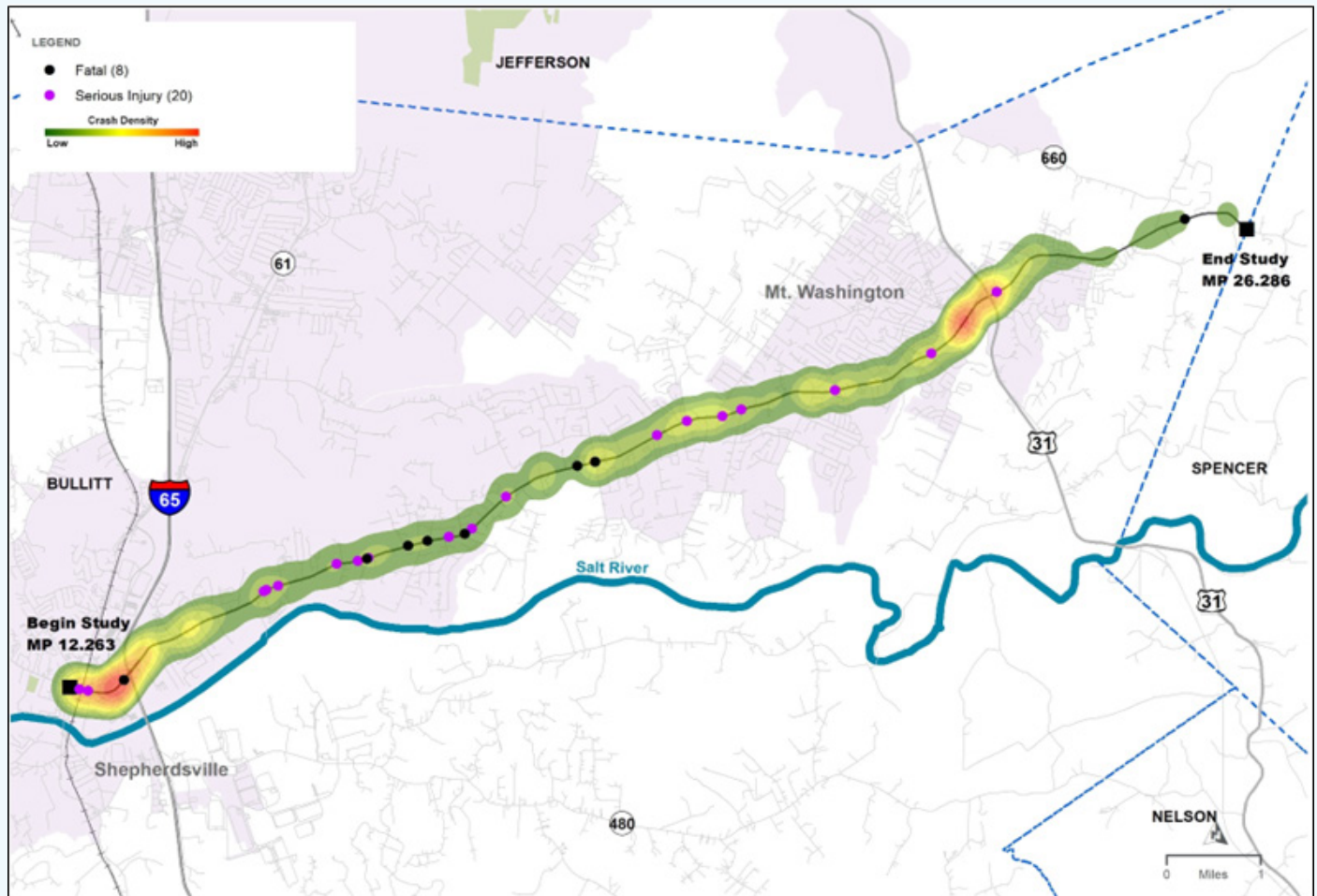
A historical crash analysis was performed to examine traffic safety trends and to identify safety issues along KY 44. The density of crashes along the KY 44 study corridor was plotted to show areas with higher concentrations (**Figure ES-2**), and where fatal and serious injury crashes occurred.

Operating speeds were analyzed temporally and geographically to assess the efficiency of traffic flow along KY 44 and to determine locations where differences in speed occur, which present the potential for an increase in crashes. The data showed the 85th percentile speeds were generally at or below the posted speed limit; indicating excessive speeding does not appear to be an issue in the study area.

## Traffic Operations

A traffic analysis was performed to establish baseline existing traffic volumes for 2022 and to forecast future growth out to 2045. The forecast accounted for previous studies, projects, traffic forecasts, and known planned developments and permits in the study area. This extensive accounting resulted in the most accurate growth rate based on all available data. The updated growth rate was then applied to project future volumes in the study area.

Figure ES-2: KY 44 Crash Density Map (2017 – 2021)

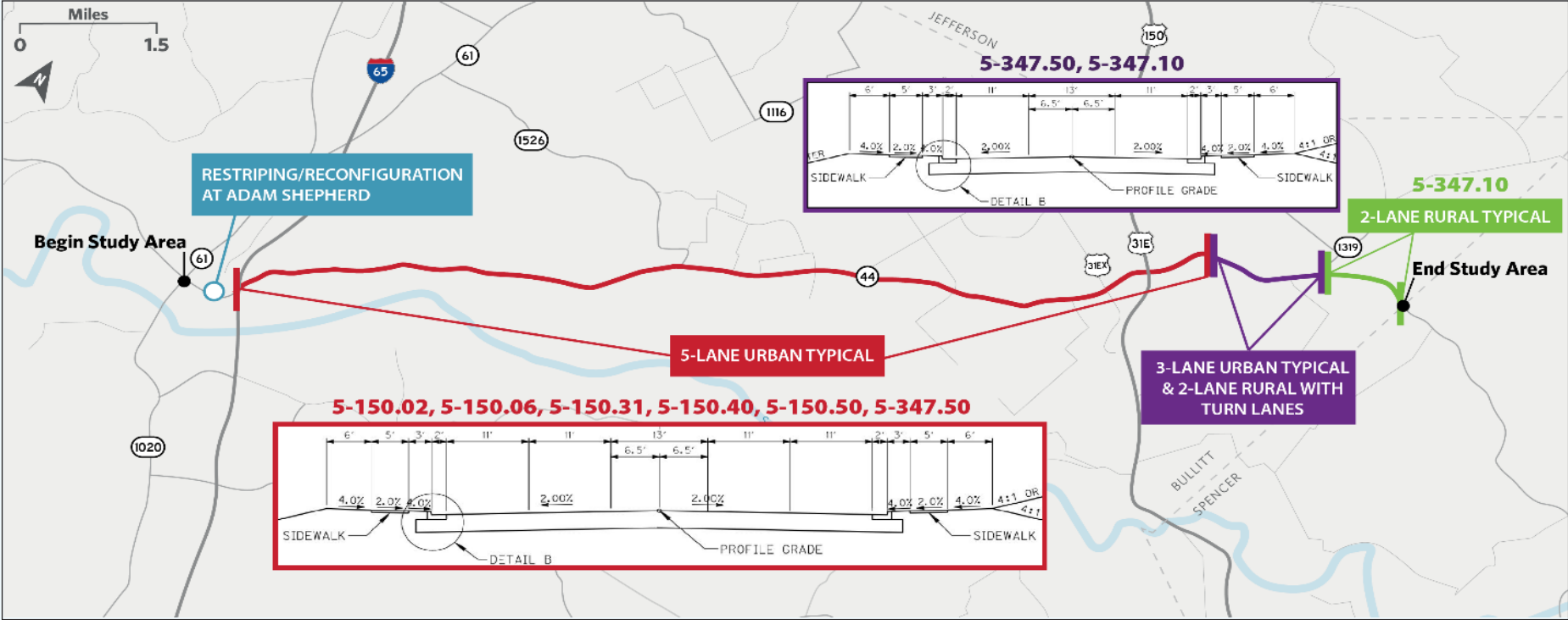


### Existing Phase 1 Design Projects

Five sections of KY 44 from I-65 to US 31E were advanced to Phase 1 Design (preliminary engineering) as Item No. 5-150.01, which resulted from the 2006 KY 44 Alternatives Study<sup>1</sup> (Item No. 5-150.00). The design called for an urban five-lane typical section with 11-foot travel lanes, a 13-foot two-way left-turn lane (TWLTL), curb and gutter, and five-foot sidewalks on both sides of the road (see green section in figure below). Phase 1 Design was also completed from US 31E to KY 1319 (Kings Church Road), Item No. 5-347.50. This section was designed with 11-foot travel lanes and a 13-foot TWLTL in both an urban five-lane segment from US 31E to Love Avenue and a three-lane urban segment from Love Avenue to Winning Colors Drive (see Figure ES-3: Red section). Both segments included curb and gutter with five-foot sidewalks on each side. A rural two-lane or three-lane segment was designed for Winning Colors

Drive to KY 1319 (Kings Church Road). The easternmost section of KY 44 in Bullitt County (Item No. 5-43.00) from KY 1319 (Kings Church Road) to the Spencer County line has not yet completed Phase 1 design (see purple section in figure below). Estimated cross-section and total cost to improve this segment were initially developed in KYTC's 2012 KY 44 Corridor Study<sup>2</sup> (Item No. 5-396.00). Note that Bullitt County and KYTC are currently working to develop a Phase 1 design concept covering this area using STBG-SLO funds under LPA project 5-347.10. That project spans the project limits of both 5-347.50 and 5-43.00. Although 5-347.10 cross-sections are still in development, they are generally expected to be consistent with those already established for project 5-347.50 and the 5-396.00 study. **Figure ES-3** shows a summary of the Phase 1 Design typical sections proposed for the KY 44 corridor.

Figure ES-3: Summary of Phase 1 Design on KY 44



1 2006 KY 44 Alternatives Study (5-150.00)  
 2 2012 KY 44 Corridor Study (5-396.00)

## Corridor Concepts Incorporating PBFS and TSMO Solutions

The project team investigated ways to optimize performance of the Existing Phase 1 Design concepts through the consideration of PBFS and TSMO concepts. The PBFS approach seeks a design concept that will meet the goals and the purpose and need of a project but with minimum impact and cost. An example would be the widening of a corridor in specific localized areas that are justified by data rather than a wholesale widening along its entire length. Examples of TSMO solutions include coordinating traffic signal timing along a series of intersections, minimizing access points in busy/overcrowded areas, mitigating congestion at bottleneck locations, and providing opportunities for real-time traveler advisory information. It is anticipated that the proposed PBFS concepts will be considered for incorporation into the Existing Phase 1 designs as they advance toward construction. Similarly, it is anticipated that identified TSMO concepts might be considered for incorporation into the Existing Phase 1 designs or be considered separately for immediate or near-term implementation. Both represent opportunities to deliver relief to the travelling public more quickly and at a potentially lower cost.

### Short-Term Solutions and TSMO Strategies

1. Improved traffic signal operations - Replace the current standard traffic signal controllers (model 170) with advanced traffic signal controllers (model 2070) and install advanced vehicle detection hardware at 12 traffic signals along the project corridor. Benefits include improved detection of vehicles at intersections; enhanced (real-time) traffic count collection and ability to coordinate traffic signals through the corridor leading to reduced wait times and congestion. Enhanced data collection will also better inform designers of traffic conditions as they work to advance larger roadway improvement projects in the corridor. KYTC is currently upgrading the traffic signal controllers and has identified \$200,000 in TSMO funding to install the advanced vehicle detection hardware at the signalized intersections. This work by state forces is anticipated to be complete by Summer 2023. Once signal upgrades are complete, KYTC anticipates entering into a Traffic Engineering Services contract to analyze existing conditions and identify opportunities to optimize throughput at each intersection, prepare and implement individual signalized intersection optimization and corridor-wide signal coordination plans, and monitor improvements while making data available for future design projects. The estimated fee for this work is \$80,000.
2. Coordination on local projects - The planned lane reconfiguration/restriping work at the Adam Shepherd Parkway intersection being done by the City of Shepherdsville will benefit from more accurate intersection turn data, potentially improving the current design. The current Item 5-347.50 design work east of US 31E near Mt. Washington would also benefit from more accurate signal data. This data will be available with the updated signal control equipment mentioned above.
3. Initiate a more detailed study of the crash history for the interior portion of the study area between Chimney Rock Drive and Fisher Lane/Armstrong Lane – These segments had fewer crashes than others in the study corridor, however, several of the intersections have Excess Expected Crashes (EEC) higher than zero, and the crashes were more serious (fatal and serious injury). There are also several schools in this area and stakeholders noted a desire for safer operations at the school entrances. Engaging KYTC's Highway Safety Improvement Program (HSIP) branch may provide mitigating safety countermeasures in the near term before the proposed segment cross-sections are fully built out. The estimated fee for this HSIP study is \$200,000 to \$300,000. Future construction costs would be determined in the study. The analysis would also include recommendations regarding potential funding sources.
4. Implementation of ITS devices – ITS devices can provide information to travelers to inform trip making, which improves safety and reduces congestion, particularly in the event of an incident. There are four locations on the KY 44 corridor where implementing ITS devices would help drivers make informed decisions about their route:
  - ▶ West of KY 61 – placing a dynamic message sign to alert drivers of incidents along I-65 would allow them to detour from I-65 and use KY 61 instead.
  - ▶ Approaching I-65 – placing a travel time information sign on either side of I-65 with information on the travel time to Louisville would allow drivers to decide if they want to take I-65 to Louisville or choose an alternate route.

- ▶ East of KY 1526 – placing a dynamic message sign on the westbound lane of KY 44 to alert drivers to any incidents in Shepherdsville or along I-65 would allow them to detour using KY 1526.

The estimated cost for these devices is \$75,000 per sign, or \$300,000 total.

### PBFS Options

As project data was analyzed and Project Team and stakeholder feedback reviewed, the concepts

developed for existing Phase I Designs were re-examined for opportunities to apply KYTC’s latest PBFS, TSMO, and Complete Streets initiatives. **Table ES-1** shows three new PBFS corridor concepts as well as a TSMO and Urban Strategies concept. Based on the recently released KYTC *Complete Streets, Roads, and Highways Manual (2022)*, the Project Team agreed to recommend a five-foot sidewalk on the north side of KY 44 and a ten-foot multi-use path on the south side throughout the corridor.

**Table ES-1: KY 44 Corridor Concept Features**

Corridor Concepts	Concept Features
Option 1 - Existing Phase I Design	<ul style="list-style-type: none"> <li>- Adds maximum capacity for majority of corridor</li> <li>- Provides through-travel lanes with continuous left turn lane</li> <li>- Three-lane section east of Love Avenue also provides through-travel lanes</li> <li>- No proposed changes west of I-65</li> </ul>
Option 2 - PBFS Design A	<ul style="list-style-type: none"> <li>- Adds five-lane capacity in congested segments near Shepherdsville and Mt. Washington</li> <li>- Three-lane cross-section for most of the corridor interior while still providing through-lanes</li> <li>- Three-lane section from Love Avenue to KY 1319 (Kings Church Road); two lanes to Spencer County line</li> </ul>
Option 3 - PBFS Design B	<ul style="list-style-type: none"> <li>- Four or Five lanes in more congested segments east of KY 1526 (Bells Mill Road) to Stringer/Louise</li> <li>- Three-lane cross-section from near the Bullitt Central High School area to KY 1526 (Bells Mill Road) still provides through-lanes</li> <li>- Three-lane section from Winning Colors to KY 1319 (Kings Church Road) provides through-lanes</li> <li>- Four or five lanes from US 31E to Winning Colors. Four lanes with median reduces crashes.</li> <li>- Three-lane cross-section in dense residential area west of Mt. Washington to reduce ROW impacts.</li> </ul>
Option 4 - TSMO & Urban Strategies	<ul style="list-style-type: none"> <li>- Three-lane cross-section for most of corridor to reduce costs while providing through-travel lanes</li> <li>- Option for five-lane section for short segments in Shepherdsville and Mt. Washington for worst congestion</li> <li>- Optional four-lane section with raised median in Shepherdsville and Mt. Washington to reduce crashes</li> <li>- Three-lane section from Winning Colors to KY 1319 (Kings Church Road) provides through-lanes</li> <li>- Closely examine widening in urban areas to verify it actually reduces congestion/improves LOS</li> <li>- Dynamic message and traveler information signs</li> <li>- Utilize access management in urban areas</li> <li>- Signal upgrades and optimization to reduce congestion, especially in urban areas</li> <li>- Streetscape improvements in Shepherdsville and Mt. Washington</li> <li>- Improve crosswalks to be ADA compliant at signalized intersections in urban areas</li> <li>- Consider mid-block crossings in some locations in urban areas</li> </ul>



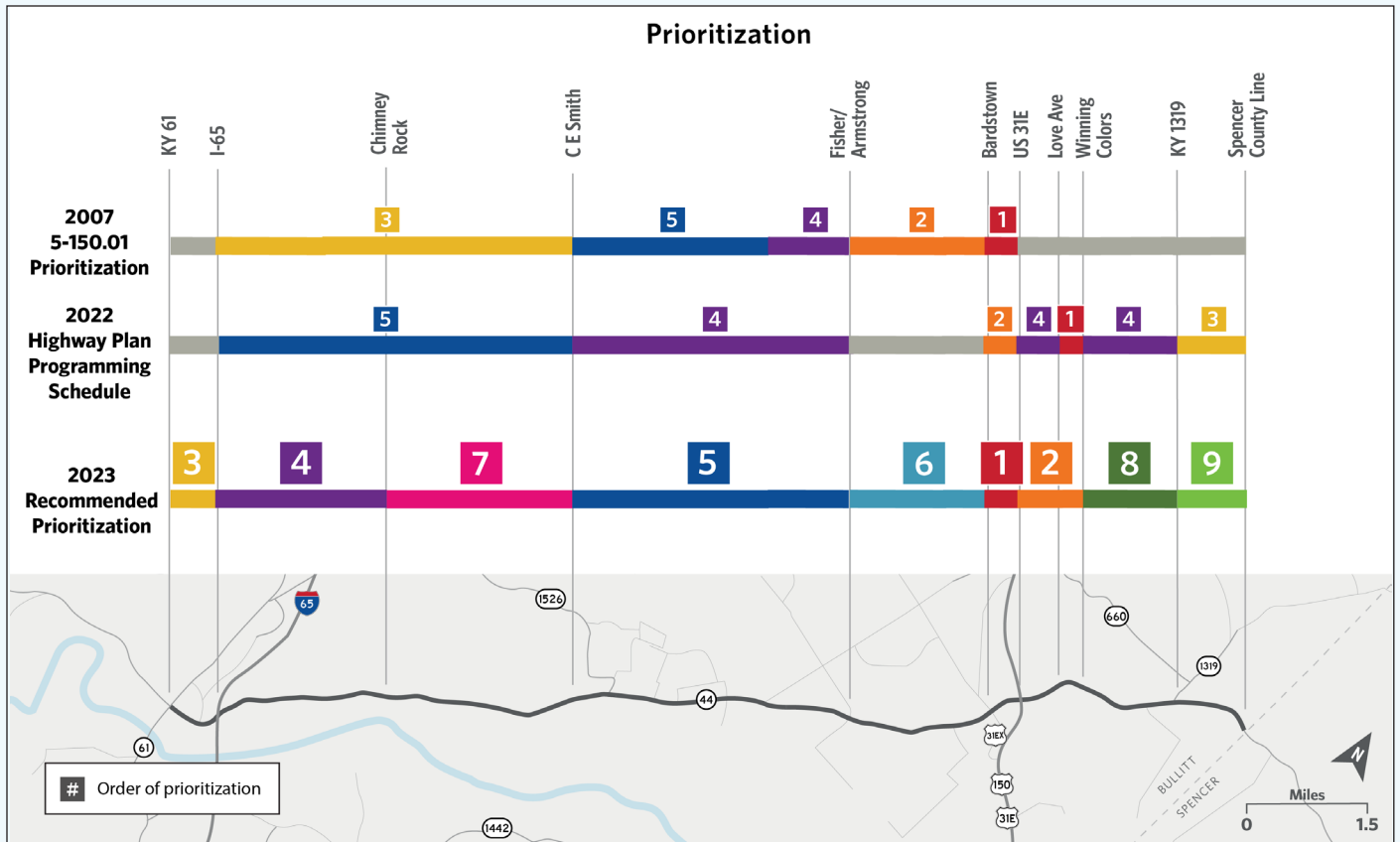
For each of the concepts (including the Existing Phase 1 Design), traffic operations, safety, and travel time savings were analyzed. Cost estimates (including design, right-of-way, utilities, and construction) were developed, and right-of-way impacts identified. This evaluation showed locations where traffic might operate at an acceptable Level of Service (LOS) with a reduced cross-section at both the segment and intersection level. While the Existing Phase 1 design's five-lane section is satisfactory from a traffic operations standpoint, the added weaving that five lanes allow, especially at intersections, often creates additional conflicts, potentially reducing safety benefits below that of a three-lane section or four-lane section with a raised median. The interior of the corridor, where the PBFS options propose three- and four-lane sections, is also the location of the majority of injury and fatal crashes. Though the Existing Phase 1 Design has the greatest travel time savings, all PBFS and TSMO options provide some level of travel time savings through the corridor. Right-of-way acquisition is the same between the Existing Phase 1 Design and PBFS Option 2 and is slightly higher for PBFS Option 3, however the PBFS options reduce the required relocations which lowers overall right-of-way costs. The PBFS and TSMO options align the construction costs to the demonstrated need for capacity, while

measurably improving safety and travel times through the corridor. After review of the above evaluations, it was apparent the highest value recommendation may be a corridor concept that is a combination of parts of two or more of the concepts. The project team strongly recommends that each of these concepts be considered for incorporation into the current proposed design as each segment advances toward construction.

### Project Prioritization

Based on the identified needs along the corridor, traffic and safety analyses, right-of-way impacts, overall cost, travel times, the evaluation of existing and potential new network connections, and input from stakeholders, the Project Team developed a prioritization plan for existing construction segments. **Figure ES-4** shows the prioritization that was determined for the breakout sections of 5-150.01 (top row) that was proposed in 2007, the prioritization of projects shown in the current *Highway Plan* based on initial year of construction, and the proposed order of priority based on the analyses from this study (bottom row). NOTE: Gray sections indicate the section was not considered in that prioritization and does not indicate a lower priority.

Figure ES-4: Proposed KY 44 Corridor Project Prioritization



## Recommendations and Programming

The final list of improvement strategies for the study was developed based on Project Team and stakeholder feedback, as well as the criteria used to evaluate all Corridor Concepts (see **Table ES-1**). After evaluation of the options, it was apparent the best corridor

recommendation is a combination of parts of two or more of the concepts, with a mix of TSMO and PBFS features depending on the segment needs. **Table ES-2** gives a description of the recommendation for each segment along with cost estimates. **Figure ES-5** shows the options recommended for each segment.

Figure ES-5: Recommended Corridor Concepts

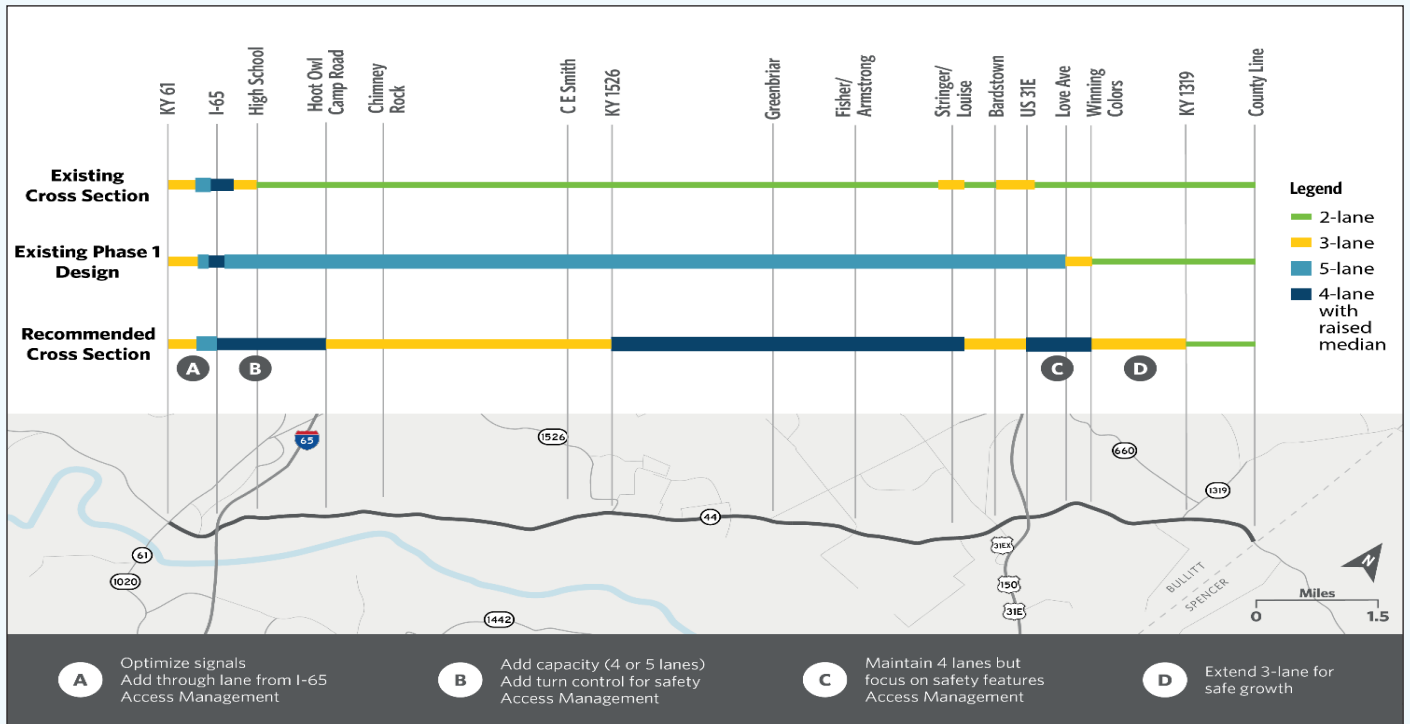


Table ES-2: Recommendations for KY 44

Priority	Segment Begin	Segment End	Item No.	Description	Design	ROW	Utilities	Construction	Total	Highway Plan Cost (Existing Phase 1 Design)
1	US 31 EX (Bardstown Road)	US 31E	5-150.50	3-lane urban section with 5' sidewalk on north side and 10' multi-use path on south side.	\$495,000	\$1,635,000	\$2,760,000	\$4,439,000	\$9,329,000	\$4,093,000
2	US 31E	Winning Colors Drive	5-347.50 - Section 1 (formerly 5-347.51*)	4-lane urban divided section with turn lanes and 5' sidewalk on north side and 10' multi-use path on south side.	\$700,000	\$980,000	\$3,300,000	\$7,000,000	\$11,980,000	\$10,571,000
3	KY 61	I-65	N/A	Maintain existing 3-lane urban cross-section from KY 61 to Hester Street; transition to a 4-lane urban cross-section with a median between Hester Street and Adam Shephard Parkway; expand to a five-lane urban cross-section from Adam Shephard Parkway to I-65, extending the exit ramp from I-65 southbound onto KY 44 to connect to the right turn lane into Adam Shephard Parkway; 5' sidewalk on north side and 10' multi-use path on south side.	\$130,000	\$125,000	\$800,000	\$1,300,000	\$2,355,000	N/A
4	I-65	Chimney Rock Drive	5-150.02	4-lane urban section from I-65 to Hoot Owl Camp Road; 3-lane urban section with TWLTL from Hoot Owl Camp Road to Chimney Rock; 5' sidewalk on north side and 10' multi-use path on south side.	\$1,277,000	\$369,000	\$2,759,000	\$12,314,000	\$16,719,000	\$38,940,000
5	CE Smith Lane	Armstrong Lane	5-150.31	3-lane urban section with TWLTL from CE Smith Road to KY 1526; 4-lane divided cross-section with a raised median and turn lanes from KY 1526 to Armstrong Lane; 5' sidewalk on north side and 10' multi-use path on south side.	\$2,010,000	\$6,097,000	\$11,526,000	\$18,041,000	\$37,674,000	\$33,280,000
6	Armstrong Lane	US 31 EX (Bardstown Road)	5-150.40	4-lane urban divided cross-section with a raised median and turn lanes from Armstrong Lane to Stringer Lane; 3-lane urban section from Stringer Lane to US 31ES (Bardstown Road); 5' sidewalk on north side and 10' multi-use path on south side.	\$1,560,000	\$3,372,000	\$6,926,000	\$10,644,000	\$22,502,000	\$28,073,000
7	Chimney Rock Drive	CE Smith Lane	5-150.06	3-lane urban section with TWLTL from Chimney Rock to CE Smith Road and 5' sidewalk on north side and 10' multi-use path on south side.	\$1,005,000	\$525,000	\$7,248,000	\$9,105,000	\$17,883,000	\$26,845,000
8	Winning Colors Drive	KY 1319	5-347.50 - Section 2 (formerly 5-347.56)	4-lane urban cross-section and 5' sidewalk on north side and 10' multi-use path on south side.	\$342,000	\$503,000	\$1,133,000	\$3,425,000	\$5,403,000	\$10,129,000
9	KY 1319	Spencer County Line	5-43.00	2-lane rural cross-section with 5' sidewalk on north side and 10' multi-use path on south side; includes right of way for ultimate 3-lane section.	\$137,000	\$537,000	\$927,000	\$1,901,000	\$3,502,000	\$8,400,000

\*Prior to 2018, Item Number 5-347.51 was "KY-44 SECTION 1 FROM US 31E EASTWARD TO PARKLAND TR/WINNING COLORS DRIVE (2008BOPC)". In the 2018 Highway Plan, the Item Number was reallocated to "NEW TURN LANES IN FRONT OF BULLITT EAST HIGH SCHOOL. (BREAKOUT FROM 5-347.50) (18CCN)". The turn lane project went to construction in 2022. If this section advances in a future Highway Plan, a unique Item Number (other than 5-347.51) will need to be assigned.

## Network Connection Analyses

In addition to evaluating PBFS and TSMO potential solutions, new connecting roadways and improvements to existing roadways that intersect KY 44 were reviewed to determine their feasibility and ability to relieve traffic on KY 44. Four connector routes were modeled using the KIPDA Travel Demand Model in a 2040 traffic scenario. The results of the analyses showed the following:

- ▶ Constructing a northwest bypass of Mt. Washington by improving and extending KY 2706 (Greenbriar Road) to connect to US 31E north of Mt. Washington is expected to reduce traffic volumes on KY 44 between KY 2706 and US 31E by 15%, enhancing the viability of a three-lane facility through this area. An initial study was performed under KYTC Item 5-8710.00, but additional evaluation of this concept is recommended.
- ▶ Constructing a new interchange at I-65 north of Shepherdsville and improving the KY 1526 corridor is expected to slightly reduce traffic in Shepherdsville near the existing I-65 interchange. This will, however, also increase traffic on KY 44 in the vicinity of the KY 1526 intersection making a three-lane facility through this area less feasible. Further study of a new interchange at this location is recommended.

## Implementation

The recommendations from this study were developed into an implementation plan that shows the priorities and interdependency of the projects, as well as a proposed timeline. **Figure ES-6** is a timeline graphic that shows the order of the prioritized segments broken down by phase of work. This includes additional work linked to some of the segments, such as signal upgrades and optimization and pursuit of KYTC HSIP assistance.



Figure ES-6: Implementation Timeline for KY 44 Projects/Segments

