

KENTUCKY TRANSPORTATION CABINET

# US 127 2+1 Corridor Study Lincoln & Casey Counties

Executive Summary | October 2023



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# Executive Summary

The objective of the US 127 Corridor Study is to develop and evaluate potential improvement concepts to address safety and mobility along US 127, including the consideration of adding 2+1 passing lanes and the addition or extension of truck climbing lanes. The study area extends from MP 15.500 northeast of Liberty to MP 23.175 at the Casey / Lincoln County line then from MP 0.000 in Lincoln County to the Lincoln/Boyle County line at mile point (MP) 10.690, as shown in **Figure ES-1**. The full study area is 18.365 miles long.

KYTC provided a list of committed and proposed projects in the study area vicinity. There are two projects in the study area vicinity included in Kentucky’s 2022-2028 *Enacted Highway Plan (Highway Plan)*, shown below. Project 8-80150.00 is intended to implement the recommendations of this study following its conclusion and 8-8702.00 is likely to become an active project in the next Highway Plan. The associated improvements have been considered in the current study.

Highway Plan Projects		Design	ROW	Utilities	Construction
<b>8-80150.00</b> <b>MP 15.500-23.175</b>	Add lanes (2+1) to US 127 from Liberty to the Lincoln County line. (same as IP20200049)	2024	2026	2026	2028
<b>8-8702.00</b> <b>MP 18.746-19.046</b>	Correct vertical alignment on US 127 and Kentucky Route (KY) 152 Near Intersection (same as IP20150181)	2023	2024	2024	2025
<b>8-80000.00</b> <b>MP 9.60-9.74</b>	New Turning Lane at Arcadia View Drive	2021	2022	2022	2023
CHAFs					
<b>IP20210064</b>	Improve safety and mobility along US 127 from Casey / Lincoln County line to Lincoln / Boyle County line. (8-80150.00 was extended to include this CHAF)				

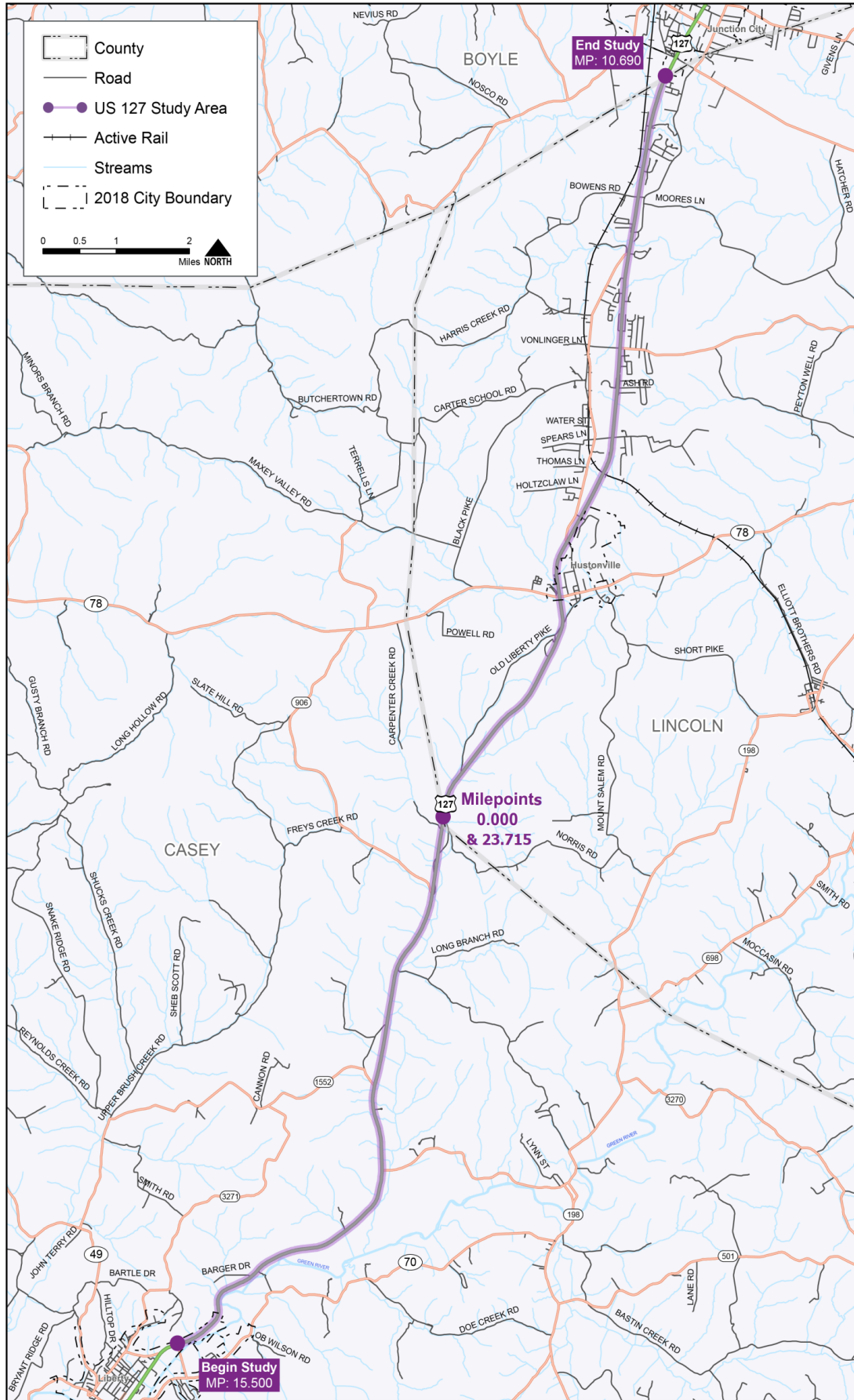
## Existing Conditions

A detailed inventory of the existing physical and geometric design characteristics was compiled to evaluate the existing conditions along US 127 and inform the development of improvement concepts. According to HIS data and a field review, a 12-foot lane width is maintained through most of the study area except for 11-foot lane width between MP 14.81 and 19.371 in Casey County. US 127 consists of two-lanes with a truck climbing lane in the northbound direction from MP 4.05 to 4.63. Turn lanes are intermittent through the study area. Paved shoulders are present, but the surface width varies throughout the study area from 2 feet to 11 feet. Grades in the study area range from 0.0% to 4.7%. The right-of-way is typically 60 feet to 85 feet from the road centerline in Casey County and greater than 100 feet from the

road centerline in Lincoln County. The speed limit is set at 55 mph for the entire study area. There are 136 total access points across the study area. Of those, 100 access points are private driveways and 36 are unsignalized intersections. All intersections in the study area are unsignalized and stop controlled on the side street. There are no designated pedestrian or bicycle facilities on US 127 in the study area.

To estimate a future growth rate, historical traffic growth, model growth rates and population growth were considered. Despite a declining population in Casey and Lincoln counties, a 0.75% annual growth rate was chosen for AADT, DHV and truck volumes since traffic counts in the corridor consistently indicate this growth pattern. This growth rate resulted in 2045 AADTs ranging from 5,400 to 13,150.

Figure ES-1: US 127 Corridor Study Area



Operating speeds were analyzed temporally and geographically to determine their relation to US 127 operations. Vehicular 85th percentile travel speeds along US 127 were recorded above the posted speed limit of 55 mph (from 53 to 73 mph) along the entirety of the corridor during the peak hours of 7:00am and 4:00pm, with the exception of the KY 78 intersection approaches, which dip slightly below in the southbound direction. Vehicular speeds during the off-peak hours are up to 5 mph faster than during the peak hours. By location, speeds were generally higher in the middle of the study area and lower at either end likely due to entering the more urbanized areas of Liberty and Junction City.

A historical crash analysis was performed to examine traffic safety trends and to identify potential safety issues along US 127. Five years of data (2017 to 2021) were used in the analysis and within the five-year analysis period, 152 crashes were reported in the study area. A majority of the crashes (67.1%) were property damage only crashes. There were three fatal crashes, eight serious injury, and 13 minor injury crashes over the five-year study period. Of the 11 fatal and serious injury crashes, three involved motorcycles at intersections with specific narrative notes on sight being an issue. The manner of collisions for the fatal and serious injury crashes included roadway or lane departure crashes along segments and angle crashes at intersections. Speed was noted to be a factor in crash severity as there are changes throughout the corridor depending on intersection density and horizontal or vertical curvature.

Approximately 36 percent of crashes in the study area are single vehicle crashes followed by rear end (24%), and angle (18%) type crashes. A review of the single vehicle crashes showed that nearly half were animal involved collisions. Locations of crashes suggests that most crashes occurred in locations with access points and intersections or in areas where horizontal curvature changes to “C-Class” curves in Casey County, where most of the study area has “A-Class” curves. Rear end and angle crashes were fairly common at intersections and driveways.

Overall, US 127 operates safer than expected based on Excess Expected Crashes (EECs) and other safety data metrics. Operating speed and design speeds are not the same, as operating speeds are higher than the design speed. Based on crash reports, crash data, and public feedback, safety issues are typically linked to limited sight distance, sudden roadway geometric changes, and driver impatience in areas that lack provided passing zones and the drivers disobey the

law and provided infrastructure. Due to the higher speeds of the study area and the narrow shoulders in some areas, an above average amount of crashes that occur along this facility resulted in a fatal or injury crash.

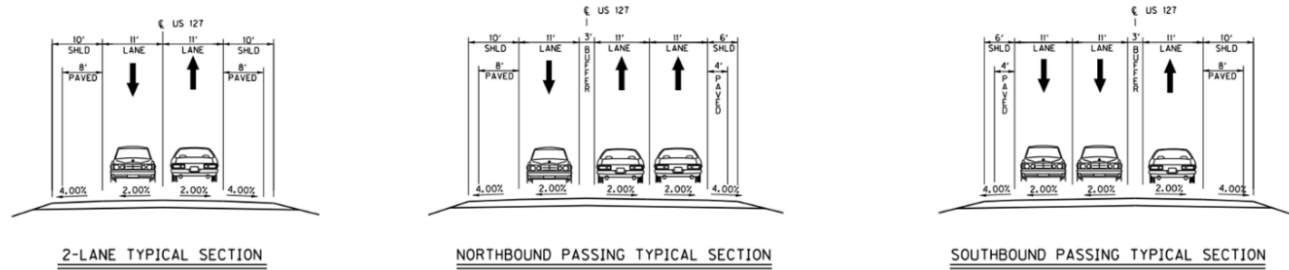
## Development and Analysis of Potential Improvement Concepts

Based on the existing conditions, traffic operations, speed and safety analysis, an initial list of potential improvement concepts was developed and presented to the project team at the Project Team Meeting #2. Left turns in areas with added lanes, either 2+1 or truck climbing lanes, were eliminated. As part of the review and analysis of the corridor, a specific examination was done for Transportation Systems Management and Operations (TSMO) aspects and needs that would help the roadway operate at a better level across all criteria. TSMO recommendations were included in corridor and spot improvement concepts. The list of improvement strategies for the corridor, as well as spot improvements, were refined based on feedback from the Project Team and stakeholders, additional data generated to answer questions posed at project team meetings, and criteria based on the goals and objectives of the project. Each improvement strategy was also evaluated with respect to safety, traffic operations and mobility, environmental impacts, right-of-way impacts, and cost estimates.

### Full Corridor Concept

With the Project Team's concurrence, the initial separate corridor concepts from Project Team Meeting #2 were merged into one since they were becoming similar to one another through process of elimination of passing lane locations. Striped passing zones were re-introduced in several areas that could not accommodate 2+1 or climbing lanes due to access issues or due to intersections with left turns exceeding 10 per hour. Left turns exceeding 10 turns per hours in areas that added lanes, either 2+1 or truck climbing lanes, were eliminated. The merged corridor concept is shown below in **Figure ES-3**. The proposed cross-sections are shown in **Figure ES-2**. Additional elements that should be considered in the corridor that were derived from the TSMO assessment include confirmation of rumble strips (center & edges) throughout, upgrade guardrails to current height and standards, verify/re-locate No Passing Zone signs, enhance striping to full 6" width, and provide updated lighting where pedestrian or bicycle activity exists.

Figure ES-2: US 127 Corridor Concept Cross Sections

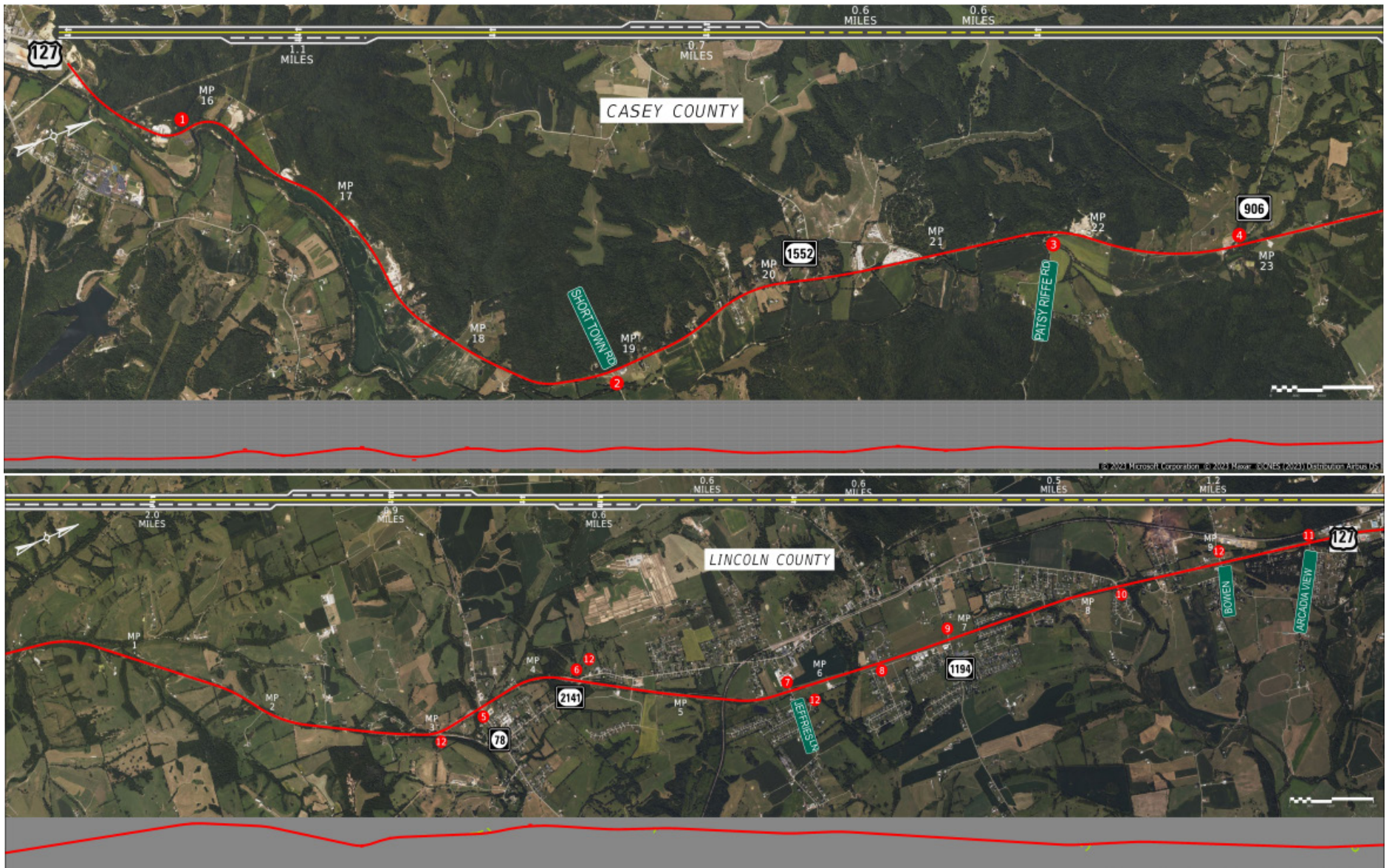


\* Lincoln County Typical Sections shown. Casey County shoulder options similar but vary in width.

Benefit-cost ratios for corridor concepts were separated into Casey County and Lincoln County, then a total cost and benefit-cost ratio was provided if both counties were completed as one project. The Casey County corridor concepts were broken into three types based on shoulder width, including eight-foot shoulders, six-foot shoulders, and four-foot shoulders (all with an additional two feet of unpaved shoulder), while Lincoln County had one corridor concept, maintaining the current eight-foot paved shoulder with two feet unpaved. The total benefit-cost ratio for the entire project ranged from 0.64 to 0.83

depending on the crash costs mentioned in section 8.1.8. The Casey County benefit-cost ratios were 0.58-0.76 for the eight-foot shoulder concept, 0.53-0.70 for the six-foot shoulder concept, and 0.41-0.54 for the four-foot shoulder concept and the Lincoln County benefit-cost ratio ranged from 0.68-0.88. While this ratio did not exceed 1.00, there was discussion regarding potential costs savings through shoulder width recommendations and right of way, especially in Casey County. **Table ES-1** has the full details of the benefit-cost analysis for each county and a total benefit-cost ratio at the bottom.

Figure ES-3: US 127 Full Corridor Concept



**Table ES-1: Benefit-Cost Analysis for Recommended Full Corridor Concept**

County	Full Concept	Description	Sub Concept	Sub Description	BMP	EMP	Total Cost	Construction Cost	Benefit / Cost Ratio Range
Casey	Full Build, 8' Shoulder	Full build for Casey County with 8' shoulders, passing lanes, enhanced striping, turn lanes, and guardrail upgrades	Left Turn Lane	Install northbound left turn lane at KY 906	21.6	21.85	\$28,400,000	\$21,000,000	0.58-0.76
			Left Turn Lane	Install southbound left turn lane at Short Town Road	18.85	19.05			
			Passing Lane	NB Passing Lane	16	17.1			
			Passing Lane	SB Passing Lane	19.2	19.9			
			Enhanced Striping	Install 6 inch striping throughout	15.5	22.882			
			Shoulder Width	Increase Shoulder Width to 8'	15.5	22.882			
	Full Build, 6' Shoulder	Full build for Casey County with 6' shoulders, passing lanes, enhanced striping, turn lanes, and guardrail upgrades	Left Turn Lane	Install northbound left turn lane at KY 906	21.6	21.85	\$25,600,000	\$19,100,000	0.53-0.70
			Left Turn Lane	Install southbound left turn lane at Short Town Road	18.85	19.05			
			Passing Lane	NB Passing Lane	16	17.1			
			Passing Lane	SB Passing Lane	19.2	19.9			
			Enhanced Striping	Install 6 inch striping throughout	15.5	22.882			
			Shoulder Width	Increase Shoulder Width to 6'	15.5	22.882			
	Full Build, 4' Shoulder	Full build for Casey County with 4' shoulders, passing lanes, enhanced striping, turn lanes, and guardrail upgrades	Left Turn Lane	Install northbound left turn lane at KY 906	21.6	21.85	\$25,200,000	\$18,900,000	0.41 - 0.54
			Left Turn Lane	Install southbound left turn lane at Short Town Road	18.85	19.05			
			Passing Lane	NB Passing Lane	16	17.1			
			Passing Lane	SB Passing Lane	19.2	19.9			
			Enhanced Striping	Install 6 inch striping throughout	15.5	22.882			
			Shoulder Width	Increase Shoulder Width to 4'	15.5	22.882			



County	Full Concept	Description	Sub Concept	Sub Description	BMP	EMP	Total Cost	Construction Cost	Benefit / Cost Ratio Range
Lincoln	Full Build, 8' Shoulder	Full build for Lincoln County with 8' shoulders, passing lanes, enhanced striping, turn lanes, and guardrail upgrades	Left Turn Lane	Install southbound left turn lane at KY 2141/Danville Pike	4.1	4.25	\$44,350,000	\$39,500,000	0.68 - 0.88
			Left Turn Lane	Install southbound left turn lane at Jeffries Lane	5.74	5.75			
			Left Turn Lane	Install southbound left turn lane at Ash Road	6.4	6.41			
			Right Turn Lane	Install southbound right turn lane at Ash Road	6.4	6.41			
			Left Turn Lane	Install southbound left turn lane at Arcadia View Dr	9.6	9.7			
			Passing Lane	NB Passing Lane - MP 0-2	0	2			
			Passing Lane	SB Passing Lane - MP 2.3-3.4	2.3	3.4			
			Passing Lane	NB Passing Lane - MP 4-4.5	4	4.5			
			Passing Lane	NB Passing Lane - MP 5.9-6.8	5.9	6.8			
			Passing Lane	SB Passing Lane - MP 6.9-8.1	6.9	8.1			
			Enhanced Striping	Install 6 inch striping throughout	0	10.686			
	<b>Full Concept</b>	<b>Description</b>	<b>Sub Concept</b>	<b>Sub Description</b>	<b>BMP</b>	<b>EMP</b>	<b>Total Cost</b>	<b>Construction Cost</b>	<b>Benefit/ Cost Ratio Range</b>
<b>Total</b>	<b>Full Build</b>	<b>Full Build of Full Study Area</b>					<b>\$72,750,000</b>	<b>\$60,500,000</b>	<b>0.64-0.83</b>

Benefit cost ratios are based on 8 foot shoulders in Casey County.

## Spot Improvement Concepts

The spot improvement concepts moved forward from the initial screening were also evaluated based on traffic operations, safety, environmental impacts, right-of-way impacts and costs, as well as input from the Project Team and Stakeholders. The benefit-cost ratio of the individual spot improvements varied. There was discussion of the value of each spot improvement, noting that the benefit-cost ratio for each

improvement depended on the specific crash history and did not include mobility benefits provided such as warranted left turn lanes. It was also noted that cost estimates were based on the cost of constructing each improvement individually, and that costs may be lower when spot improvements were bundled together. **Table ES-2** shows the recommended spot improvements along with cost, reduction in fatal and injury crashes and the benefit-cost ratio.

**Table ES-2: Recommended Spot Improvements for the US 127 Corridor**

Number	Location	MP	Description	Cost	Fatal & Injury Crash Reduction (2017-2021)	Benefit / Cost Ratio
1	Add curve chevrons near Liberty - NB and SB	15.6-16.1 (Casey)	Chevrons to be added NB and SB, in addition to new speed advisory signs	D \$1,090 R \$0 U \$0 C \$10,900	16%	41.40
2	Improve sight distance at Short Town Rd, add SB Left Turn Lane	18.85-19.05 (Casey)	Levelling out two 'humps' on US 127 from private driveway to end of gas station parking lot will improve sight distance both directions from Short Town Rd. Also, close private driveway access to US 127.	D \$101,000 R \$0 U \$15,000 C \$1,013,000	46%	0.09
3	Improve sight distance at Patsy Riffe Rd	21.6-21.85 (Casey)	Extending the intersections with US 127 further north would provide better sight distance to the south. Also, retract unrequired guardrail to improve SB sight line.	D \$74,000 R \$20,000 U \$60,000 C \$739,000	25%	0.06
4	Multiple improvements at KY 906	22.80-22.87 (Casey)	1) Close southern end of Loop Rd 2) Cut rock face back to improve NB sight distance 3) Improve alignment of KY 906 to improve sight distance 4) Provide left turn lane from US 127 NB to KY 906 5) Add intersection warning signs 6) Improve alignment of northern end of Loop Rd to US 127	D \$170,000 R \$2,400 U \$0 C \$1,731,000	59%	0.86
5	Improve sight distance at KY 78	3.35-3.50 (Lincoln)	Move stop bar on KY 78 westbound forward to correct location	D \$900 R \$0 U \$0 C \$9,300	25%	70.52
6A	Reduce potential conflicts at KY 2141/ Danville Pike - Option A	4.10-4.25 (Lincoln)	Eliminate NB left turns onto KY 2141. Make KY 2141 and Danville Pike right-only onto US 127. Eliminate crossing across US 127. Add SB left turn lane onto Danville Pike.	D \$48,000 R \$0 U \$15,000 C \$482,000	44%	4.60
6B	Reduce potential conflicts at KY 2141/ Danville Pike - Option B	4.20 (Lincoln)	Close KY 2141. Make Danville Pike right-in right-out onto US 127. Add SB left turn lane onto Danville Pike.	D \$52,000 R \$0 U \$15,000 C \$522,500	44%	4.25

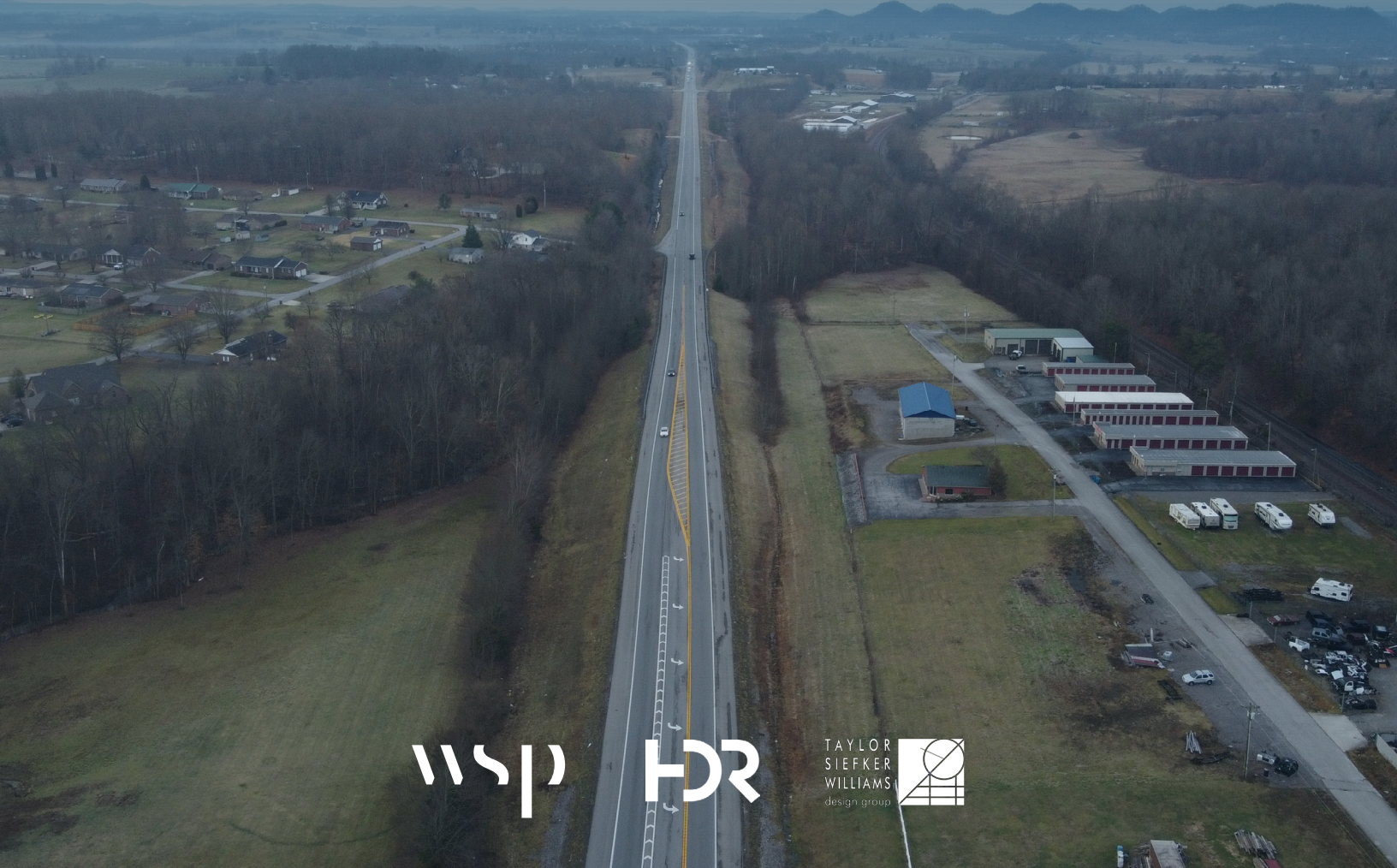
Number	Location	MP	Description	Cost	Fatal & Injury Crash Reduction (2017-2021)	Benefit / Cost Ratio
7	Add SB Left Turn Lane at Jefferies Ln	5.74-5.75 (Lincoln)	Provide warranted LTL. Will require splitting passing zone	D \$34,000 R \$0 U \$0 C \$343,000	44%	0.20
8	Add SB Left Turn Lane at Ash Rd	6.40-6.41 (Lincoln)	Provide warranted LTL	D \$46,600 R \$0 U \$0 C \$466,000	44%	0.05
9A	Multiple improvements at KY 1194 - Option A	6.85-7.00 (Lincoln)	1) Eliminate NB Left Turn from US 127 into KY 1194 2) Add guidestriping from KY 1194 to US 127 SB	D \$300 R \$0 U \$0 C \$3,000	0%	0.00
9B	Multiple improvements at KY 1194 - Option B	6.85-7.00 (Lincoln)	1) Close western part of KY 1194 onto US 127 2) Add guidestriping from KY 1194 to US 127 SB	D \$4,000 R \$0 U \$15,000 C \$39,000	0%	0.00
10	Add SB Right Turn Lane at KY 2141/ Sierra Ln	8.22-8.28 (Lincoln)	Provide warranted RTL	D \$26,500 R \$0 U \$0 C \$265,000	14%	1.35
11	Add SB Left Turn Lane at Arcadia View Dr	9.65-9.71 (Lincoln)	Provide warranted LTL. Will require splitting passing zone	D \$50,400 R \$0 U \$0 C \$504,000	44%	0.04
12	Stripe angled intersection 'flares'	(1) 3.09; (2) 5.75; (3) 8.54; (4) 9.02 (All Lincoln)	Stripe through pavement flares at (1)CS 3015; (2) Jeffries Ln; (3) KY 2141/Indian Camp Rd; (4) Bowens Loop Rd	D \$100 R \$0 U \$0 C \$1,100	0%	0.00
				D \$100 R \$0 U \$0 C \$1,100	0%	0.00
				D \$100 R \$0 U \$0 C \$1,100	0%	0.00
13	Passing Lanes in Lincoln County	5.9-8.1 (Lincoln)	Provide Passing Lane NB 5.9-6.8 and SB 6.9-8.1	D \$840,000 R \$480,000 U \$150,000 C \$8,400,000	42%	0.77

## Study Recommendations

After discussing the refined list of potential improvement concepts and associated detailed evaluation at the third Project Team Meeting, the Project Team decided to carry the merged corridor concept forward, with the addition of NB and SB passing lanes in Lincoln County in combination with the spot improvement concept at KY 1194. The spot improvement concepts were accepted as a group. The corridor and spot improvement concepts were grouped by County as requested by the District.

Upon completion of this study, there are funds for future project development phases of this corridor in the Six Year Plan.

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WSP

HDR

TAYLOR  
SIEFKER  
WILLIAMS  
design group

