

Lone Oak Road (US 45) Reversible Lanes Feasibility Study

McCracken County
KYTC Item No. N/A

Executive Summary December 2020



EXECUTIVE SUMMARY

The Kentucky Transportation Cabinet (KYTC) initiated the Lone Oak Road (US 45) Reversible Lanes Feasibility Study to further evaluate the feasibility of reversible lanes on US 45 from Clinton Road (KY 339) to Jackson Street (US 62/KY 731), as shown in **Figure ES-1**.

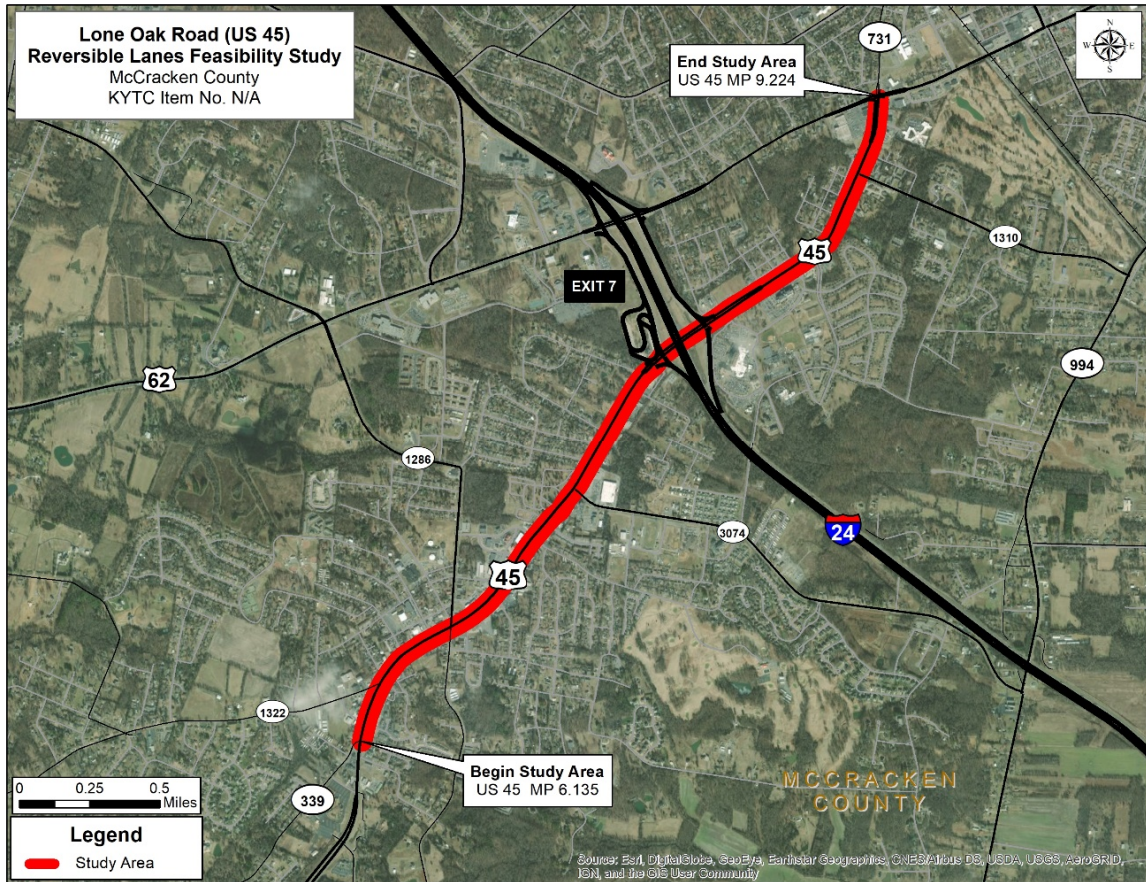


Figure ES-1: Study Area

Warrant Analysis for Reversible Lanes

Based on findings from the 2004 National Cooperative Highway Research Program (NCHRP) Synthesis 340 report *Convertible Roadways and Lanes*, there are general conditions that warrant reversible operations and the report lists basic requirements for their effective use, summarized as follows:

1. **Limited right-of-way (or ability to acquire it).**
2. **65 percent or more of the traffic moves in one direction during peak hours.**
3. **Predictable patterns of high demand and/or congestion.**
4. **Volumes at or near capacity.**

1. Limited right-of-way

Existing right-of-way on the study portion of US 45 ranges from 56 feet to 72 feet. Parking lots and some adjacent businesses would have to be purchased and the adjacent utility lines would need to be relocated before widening could occur. Acquiring the additional right-of-way and relocating the existing utilities was estimated by District 1 as part of this study to cost \$31 million, which makes a seven-lane widening project non-viable.



2. 65 percent or more of the traffic moves in one direction during peak hours

A 2030 traffic analysis was performed that includes already committed projects, such as the KY 1286 (Friendship Road) Relocation Project (KYTC Item No. 1-153), and the diversion of traffic expected for the reversible lanes. The diversion analysis found adding capacity in the peak direction through the Reversible Lane System (RLS) implementation would increase demand in the peak direction by about 15%. Similarly, decreasing capacity in the off-peak direction would reduce demand in the off-peak direction by about 20 percent. **Table ES-1** presents a summary of the 2030 RLS peak hour traffic volumes and directional splits, which shows 65 percent or more of the traffic moves in one direction during peak hours.

Table ES-1: 2030 RLS Peak Hour Traffic Summary

Segment	Direction	AM Peak		PM Peak	
		Volume	Split	Volume	Split
South of I-24	NB	1,800	69%	950	33%
	SB	790	31%	1,900	67%
North of I-24	NB	1,280	74%	750	38%
	SB	450	26%	1,210	62%

3. Predictable patterns of high demand and/or congestion

The study portion of US 45 is one of the most congested roadways in Paducah during morning and afternoon peak periods. Traffic during these daily commuter periods is directionally imbalanced, with most traffic traveling northbound into Paducah during the morning and southbound out of town during the afternoon.

4. Volumes at or near capacity

Based on results from the existing traffic analysis, Lone Oak Road is currently operating below capacity. The 2020 peak hour volume-to-capacity (V/C) ratios are under the target threshold of 1.0, specifically under 0.8, indicating that the existing number of lanes is sufficient even during periods with the highest congestion. By 2030, the southbound PM peak hour V/C ratio is

expected to rise to 0.96 south of I-24, as shown in **Figure ES-2**. Volumes do not approach capacity north of I-24.

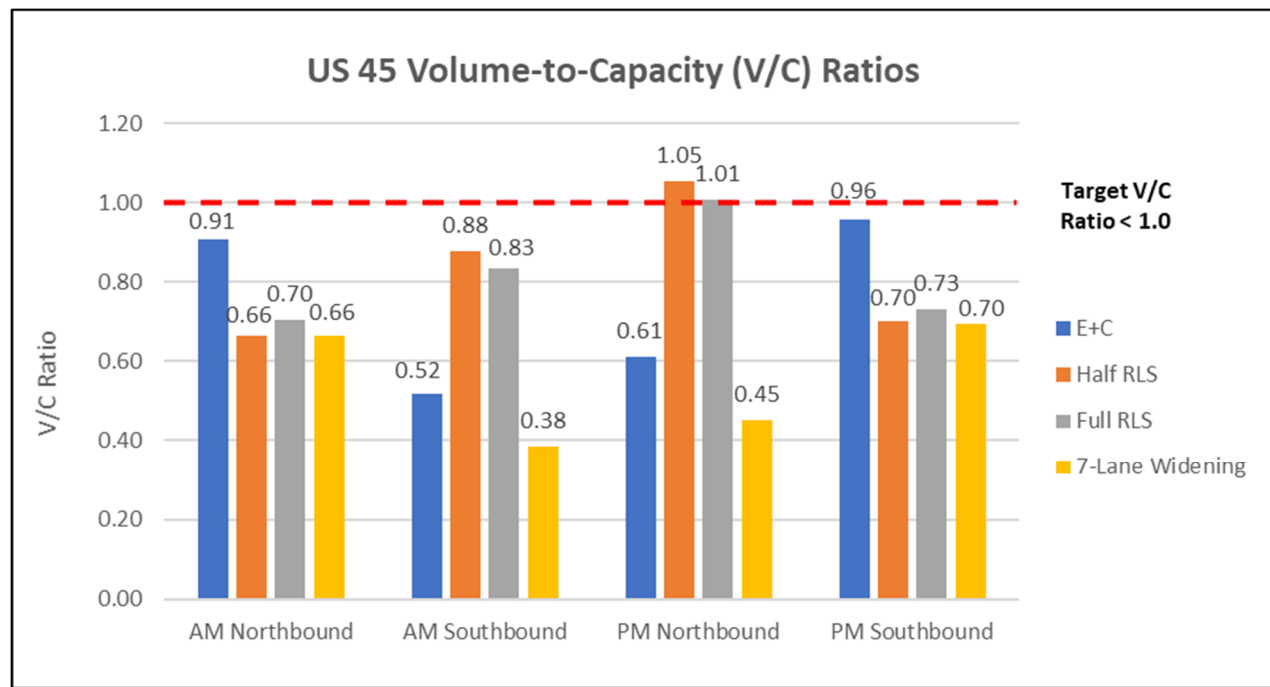


Figure ES-2: Volume-to-Capacity (V/C) Ratios South of I-24

Conclusions

Reversible lane systems are considered one of the most cost-effective methods to increase peak direction capacity of an existing roadway. These systems have generally been well received by the public and typically achieve small safety benefits in addition to the increased roadway capacity. Through an examination of existing conditions, a field review, and a traffic analysis, it has been determined that additional through capacity is likely not needed on the study portion of Lone Oak Road (US 45) by 2030. Congestion is concentrated at the major signalized intersections, particularly KY 1286 (Friendship Road). Relocating KY 1286 to the existing Lakeview Drive intersection as proposed in the committed KYTC Project Item No.1-153, and installing additional turn lanes at both the relocated KY 1286 approach as well as the Lakeview Drive approach will significantly improve traffic operations on Lone Oak Road.

To provide additional traffic relief at the congested signalized intersections, two spot improvements were identified: intersection improvements at US 62 (Jackson Street) and protected/permissive left-turns with a Flashing Yellow Arrow (FYA) at the I-24 interchange.

US 62 (Jackson Street) Intersection Improvements

This intersection was identified as being especially congested and having unmet demand on the westbound Jackson Street approach. Vehicles in the shared right/through lane are unable to turn right when through traffic queues during the PM peak. By 2030, queues will become longer and vehicles will experience more delay at this intersection. An improvement option is to relocate the raised median and restripe the approach to provide a dedicated right-turn lane, as shown in **Figure ES-3**. This would reduce unmet demand and improve the Level of Service (LOS) from E to LOS D in 2030.



Figure ES-3: US 62 Intersection Improvement Concept

I-24 Interchange Protected/Permitted Left-Turns

At the I-24 interchange, left-turns from Lone Oak Road (US 45) to I-24 have unmet demand and are only served by protected phases. Maintaining a protected left-turn phase but also allowing the lefts to turn during a permissive phase with a FYA, as shown in **Figure ES-4** would result in improvements to traffic operations at both ramp terminal intersections. This would reduce the unmet demand and improve the LOS from D to LOS C in 2030.

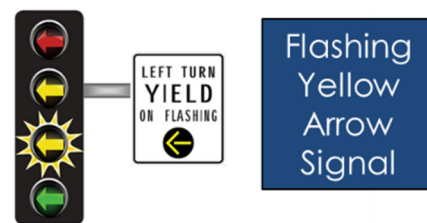


Figure ES-4: Protected-Permissive Signal Operations at I-24

Future RLS Implementation

Should capacity needs change, implementation of an RLS is a viable alternative to a seven-lane widening given the ratio of the major to minor traffic flow during the peak hour. Installing reversible lanes would require the following traffic operations and maintenance updates by KYTC District 1:

- Signal Modifications
 - Convert the five-section protected/permmissive left-turn signal heads to flashing yellow left-turn arrow signal heads at the Berger Road, Parkview Drive, and I-24 intersections, a total of five signal head replacements.
- Lane-Use Signals
 - The Manual on Uniform Traffic Control Devices (MUTCD) recommends at least one and preferably two lane-use signal spans are visible to motorists at all times.
 - For the RLS Scenario between Clinton Drive (KY 339) and up-to but not including the I-24 interchange, 15 new lane-use signal spans are anticipated.
 - For the RLS Scenario between Clinton Drive and US 62 (Jackson Street), 27 lane-use signals are anticipated.
- Central Operation System/Computer
 - Remote monitoring of local controllers and synchronization of internal clocks will be required.
 - The district currently uses cellular connections to set the clocks at the signals along US 45. Similar controllers/cabinets will be needed for the lane-use signals.
- Specialized Signal Timing Software
 - Not needed.
- Additional KYTC staff and/or contractor maintenance staff
 - No additional staff is anticipated.
 - After activation, additional staff may be necessary to observe and respond to real and perceived operational issues during the initial operation period.



**Overhead
Lane-Use
Signal**