

RED RIVER GORGE

TRANSPORTATION PLANNING STUDY

POWELL, MENIFEE, AND WOLFE COUNTIES, KY
EXECUTIVE SUMMARY | JULY 2023

PROJECT LOCATION
KY 77/KY 715

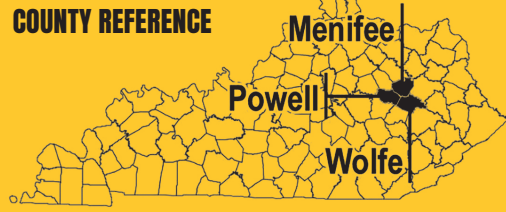


PREPARED FOR
TEAM KENTUCKY
TRANSPORTATION
CABINET

IN PARTNERSHIP WITH
OK4
Engineering Planning



COUNTY REFERENCE



EXECUTIVE SUMMARY

Study Background

The Kentucky Transportation Cabinet (KYTC) initiated a corridor study in January 2022 to explore anecdotal mobility issues within the Red River Gorge (RRG), specifically along KY 715 and KY 77 that provide access through the area. **Figure ES-1** shows the study area limits.

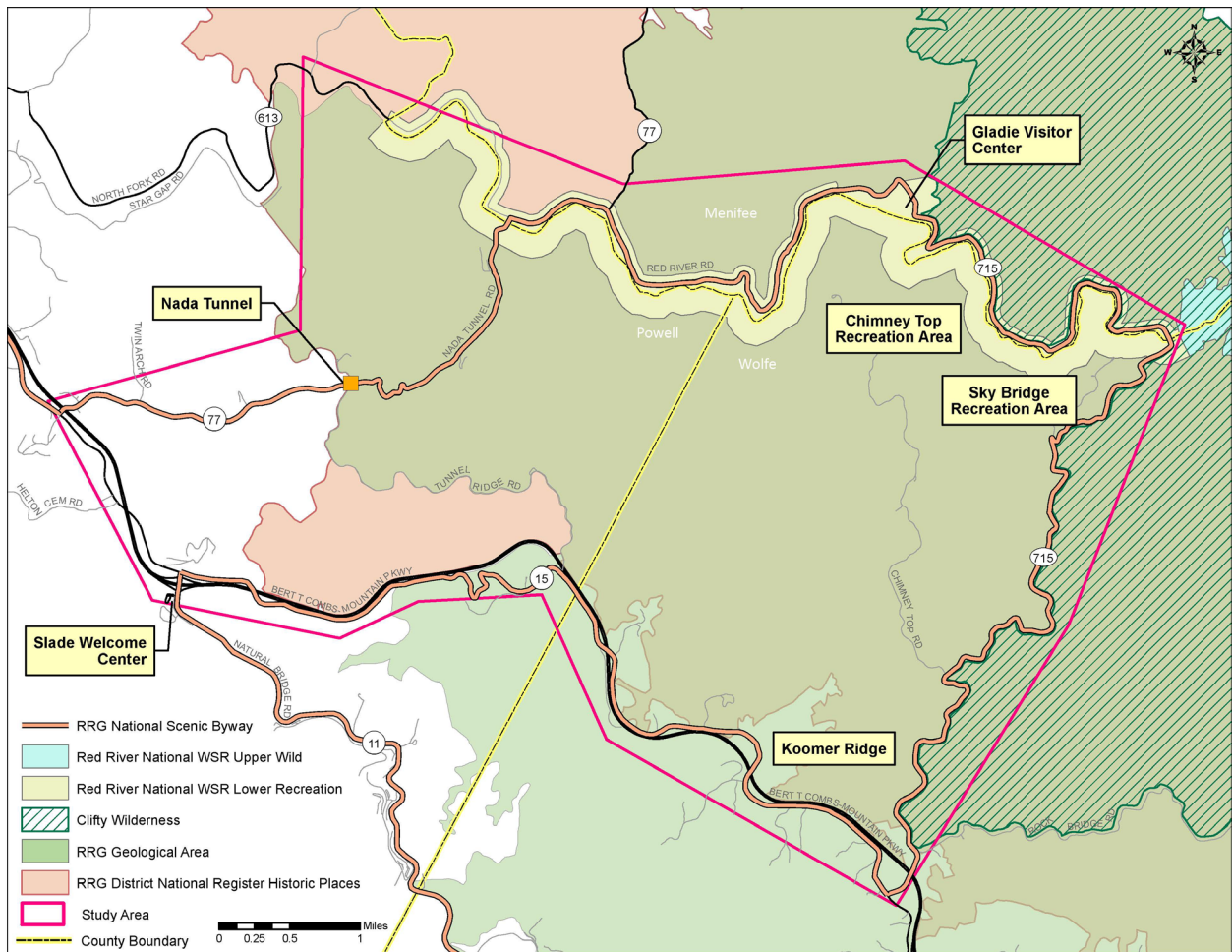
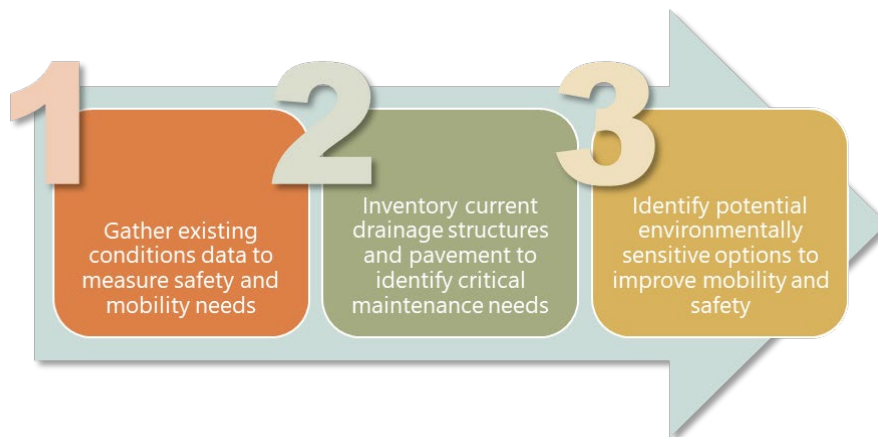


Figure ES-1: Study Area Boundary

The Red River Gorge Geological Area—within the Daniel Boone National Forest in east-central Kentucky—is certified as a National Natural Landmark and listed on the National Register of Historic Places. The 29,000-acre RRG features natural sandstone arches, high sandstone cliffs, natural bridges, rock shelters, and scenic waterfalls. It is a popular destination for climbers, campers, hikers, and other outdoor recreational users. Since 2020, the number of annual visitors

has been increasing, resulting in more traffic using the narrow roadways and limited parking—especially during fair-weather weekends in the spring and fall.

The study goals are three-fold:



Existing Conditions

Through the study area, KY 77 and 715 are classified as rural major collectors with two travel lanes (each 8-9 feet wide) and 1-foot or less of paved shoulder width. Some paved pull-offs are designated parking areas. Much of the 18.2-mile study corridor is composed of steep grades and sharp curves, necessitating a slower travel speed than the posted 35 mph limit. Both routes are state secondary routes, part of the Forest Highway System, and part of the RRG National Scenic Byway. There are eight bridges along the study corridor, plus 118 smaller pipes and culverts to support drainage flows. While structures are in Good or Fair condition, most pipes/culverts require maintenance or replacement to function properly. Pavement condition is also a concern, with several areas in poor condition or demonstrating evidence of past slips/slides.

Along KY 77 near MP 2.2 in Powell County, Nada Tunnel is roughly 900 feet long, 12 feet wide, and 13 feet high. The tunnel's narrow width and low vertical clearance create a one-way traffic bottleneck.

Crash data from 2017-2021 showed 71 crashes occurred throughout the study area: 42 along the KY 77/KY 715 corridor and the remainder associated with other highways. By severity, there was one fatality, 16 injury collisions, and 54 crashes resulting in property damage only (PDO). The majority are single-vehicle crashes (63%), followed by angle crashes (13%). Overall, 70% of reported study area crashes are classified as roadway departures, one of the emphasis areas identified by KYTC's Office of Highway Safety.¹

¹ Online at <https://transportation.ky.gov/HighwaySafety/Pages/default.aspx>

Standard practice to measure average daily traffic (ADT) flows on highways involves counting vehicles over several weekdays, focusing on typical peak commuter flows during AM and PM peak hours. KYTC counts over the past few years estimate the ADTs at 700 vehicles per day (vpd) on KY 77 and 200 vpd on KY 715. However, peak traffic volumes at RRG do not follow typical highway patterns as they are more influenced by seasonal recreational traffic than by commuters.

This study included an extensive traffic data collection effort to analyze true peak traffic, focusing on two fair-weather weekends in both April and October 2022. Summarized in **Figure ES-2**, Saturdays showed the highest weekly volumes and fall volumes (shown as red and yellow) were roughly double spring volumes (blue and green). When looking at hourly flows for Saturdays, the busiest time of day occurs in the early afternoon: 1 PM to 4 PM. Pedestrians, motorcycles, and bicyclists commonly use KY 77/KY 715 through RRG, in addition to passenger cars.

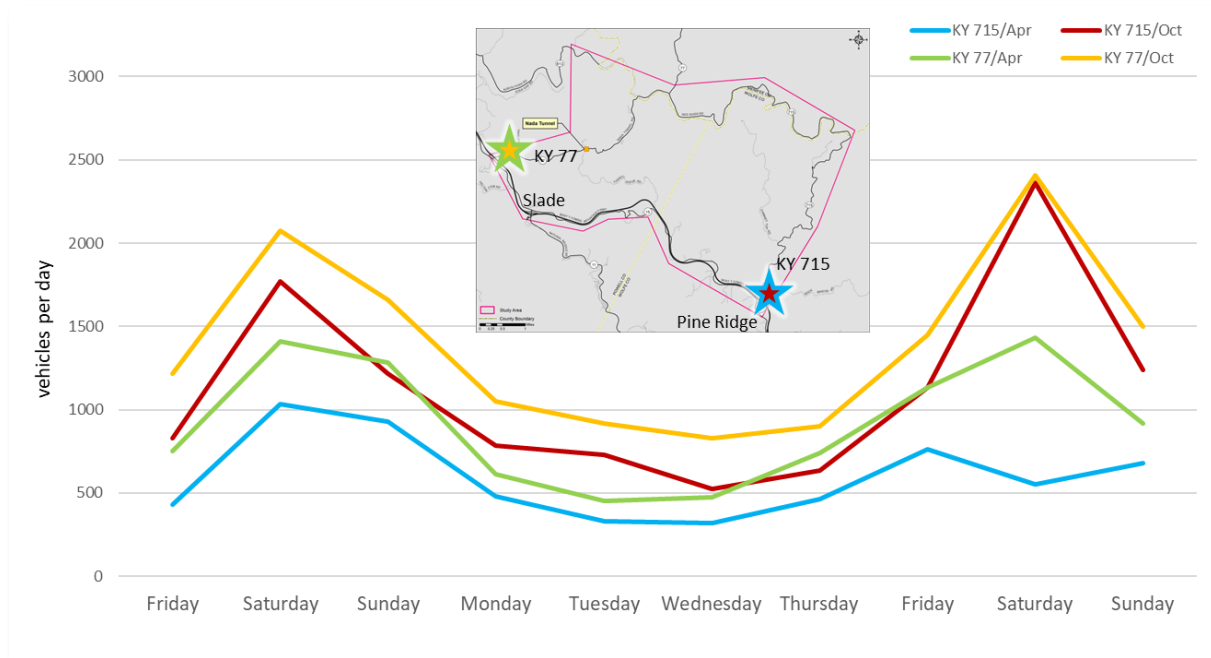


Figure ES-2: Seasonal Traffic by Day of Week

KYTC collected multiple days of spring and fall video footage at either end of the Nada Tunnel to measure these weekend traffic patterns, with key findings summarized in **Table ES-1**.

It should be noted that the west approach to the tunnel has a sharp curve blocking the view for eastbound drivers. Video footage showed multiple instances of drivers entering the tunnel

eastbound and having to back out to make space for oncoming traffic—in some instances with multiple cars backing out as a group.

Table ES-1: Performance Metrics at Nada Tunnel, October 2022

Metric*	Eastbound Entering RRG	Westbound Exiting RRG
12-hour volume entering tunnel	1033 vehicles	1297 vehicles
12-hour volume entering without delay	52%	46%
Average wait time for busiest hour	65 seconds	40 seconds
Platoons waiting 2+ minutes to enter tunnel	8%	5%
Longest wait observed	8.9 minutes 29 vehicles in queue	5.4 minutes 4 vehicles in queue

*Metrics reported for busiest of four observed Saturdays, which occurred Oct. 15, 2022

Study Goals

The intent of this study is to explore anecdotal mobility issues and maintenance needs within the RRG, specifically along KY 715 and KY 77. Analyses focus on current conditions, independent of any future development visions for the area that may influence travel demands. The study is designed to quantify transportation needs, and then present the costs, benefits, and impacts of potential improvements, so decision-makers can weigh which options are a good fit for RRG. Beyond hard data, another important piece of the study is to engage with the larger community of stakeholders—including residents, visitors, elected officials, and resource agencies. Any improvement concepts considered should be developed to minimize impacts to the environmentally sensitive area.

Build Concepts

Based on the data collection activities described above, analysts were tasked to define a list of potential improvement concepts that could address observed needs. Potential improvements were sorted into three groups:



Maintenance/Repairs



**Nada Tunnel
Delay Options**



**Other Operational
Options**

Each group is organized from less impactful, lower cost solutions to those having higher costs and greater impacts. Construction cost estimates are presented in FY 2022 dollars.

Maintenance/Repairs

Pipe Repairs. Field inventory identified 118 pipes/culverts along KY 77/KY 715, with 102 or 86% needing repairs or replacement: cleaning/repairing, adding an element (e.g., a missing headwall), or replacing. The combined construction cost estimate to address the needs is \$3.3 million.

Small Scale Pavement Projects. This catch-all covers several repair types at specific locations to address poor pavement conditions: curve widening, vegetation clearing, ditch lining, resurfacing, cribbing, ditch reconstruction, replacing guardrail, and signage. Divided among 15 locations, construction costs total an estimated \$8.6 million.

Nada Tunnel Delay Options

No-Build. With this option, the tunnel would continue to operate as it does today: one lane of traffic, with “Yield” signs at either entrance.

Temporary Signal. During busy weekends in the spring and fall, this option would set out a temporary traffic signal like those KYTC uses at construction zones with alternating one-way traffic. Adding a signal would increase delays due to required clearance times, with longer wait times for 84% of platoons versus measured delays during a busy Saturday in October 2022. While estimated up-front costs are relatively low, there would also be practical concerns with the system.

Peak Flaggers. This option would operate similarly to the signal option but rely on trained personnel to direct traffic flow through the tunnel during peak spring and fall weekends. As with the signal option, delay would increase compared to 2022 data. In addition, staffing expenses would increase as would potential safety risks for field personnel.

Signage. This option would add to existing advance warning signs to alert motorists unfamiliar with the tunnel. Today, warning signs exist near the KY 77 intersections with KY 11 and KY 715. “Share the Road” signs could also encourage motorists to watch for cyclists and pedestrians.

Realign Approach. The eastbound tunnel approach contains a curve, limiting visibility for travelers entering RRG; this option would realign the approach west of the tunnel. Cutting into the adjacent slope would be necessary but would not disturb the tunnel itself. Detailed geotechnical investigations, engineering designs, and environmental analyses would be required if this option were to advance. This option could improve drainage, thereby reducing the ponding and icing notorious at the tunnel portal. Planning-level construction costs range from \$450,000-\$1.1 million, depending on the alignment.

Widen Tunnel. With the highest costs and most impacts, widening the tunnel is the only option considered that would allow for two-way traffic flow. Detailed geotechnical investigations, engineering designs, and extensive environmental analyses would be required if this option were to advance. The tunnel is historic and an iconic RRG gateway; widening would significantly impact its character. The estimated construction cost is \$10+ million, plus additional costs for the approaches.

Other Operational Options

No-Build. The KY 77/KY 715 study corridor would continue to operate as it does today, with two-way traffic and no infrastructure improvements beyond typical maintenance levels.

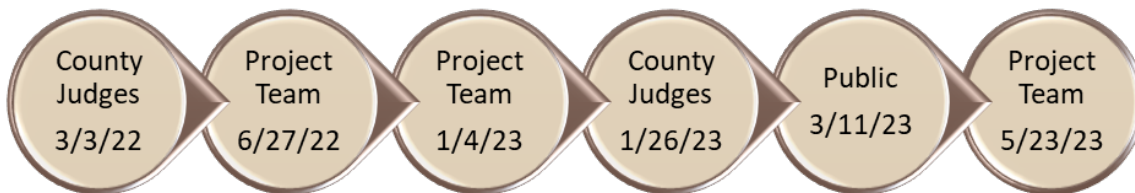
One-Way Travel. The KY 77/KY 715 study corridor would only serve one-way traffic. As the total drive time is around 50 minutes, this would significantly increase travel times and trip lengths for motorists accessing destinations near either endpoint without making a full circuit. Another possible option would make only the narrowest section of the corridor, near Sky Bridge, one-way.

Shuttle Service. Discussed further in the 2022 EA/FONSI published by the US Forest Service (USFS), a private contractor could operate an on-demand shuttle service to help reduce parking demands. Specific stops, parking areas, and operational features have yet to be defined.

Minor Widening. An ultimate, long-term Build solution would include minor widening, consistent striping, and other improvement measures to create a consistent typical section. This concept includes widening KY 77/KY 715 to provide a consistent typical section (two 10-foot-wide lanes with 1-foot-wide paved shoulders), consistent high-visibility striping, and grout-lined ditches to improve drainage. As appropriate, curve widening, vegetation clearing, and other repairs would be incorporated as well. The proposed concept has minor impacts on capacity but would improve safety and help create a consistent driver expectation for the corridor. Construction costs are estimated to total \$48 million.

Coordination Meetings

Three project team meetings, two briefings for the county Judge/Executives, and one public open house, paired with a study website, helped engage with key stakeholders and the community.



During February and March 2023, surveys were collected to obtain community perspectives on the proposed concepts. Overall, 69 completed surveys were submitted. After working through initial questions to think about how transportation influences their experience, participants were asked whether improvements were needed to address traffic/safety: 75% agreed that improvements are needed. Overall, survey participants love RRG and prefer less invasive improvements to preserve its natural beauty and ecosystems. Several participants suggested other improvement concepts.

As shown in **Figure ES-3**, adding a temporary traffic signal during peak seasonal weekends received the most support: 18 participants supportive and 18 participants strongly supportive, compared to 7 individuals who opposed or strongly opposed a signal. The signal, flaggers, and increased signage received more support than opposition. Realigning the eastbound approach received an even split between support and opposition, while widening the tunnel was strongly opposed by most individuals.

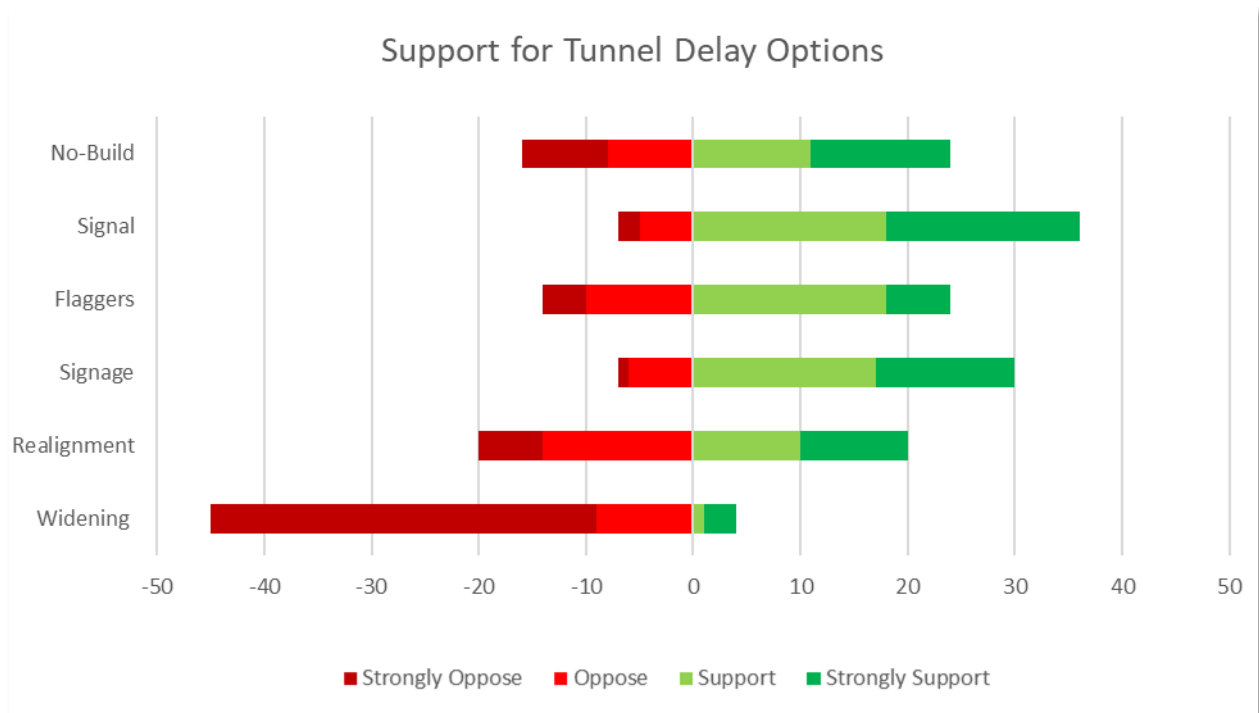


Figure ES-3: Survey Preferences for Tunnel Delay Options

Looking at options for the larger KY 77/KY 715 study corridor (**Figure ES-4**), minor widening and a shuttle service received more support than opposition. But opposition to the one-way routing concept (i.e., 17 individuals strongly opposed plus 7 individuals opposed) outweighed support (i.e., 6 individuals supporting or strongly supporting). Responses were evenly split regarding a No-Build solution.

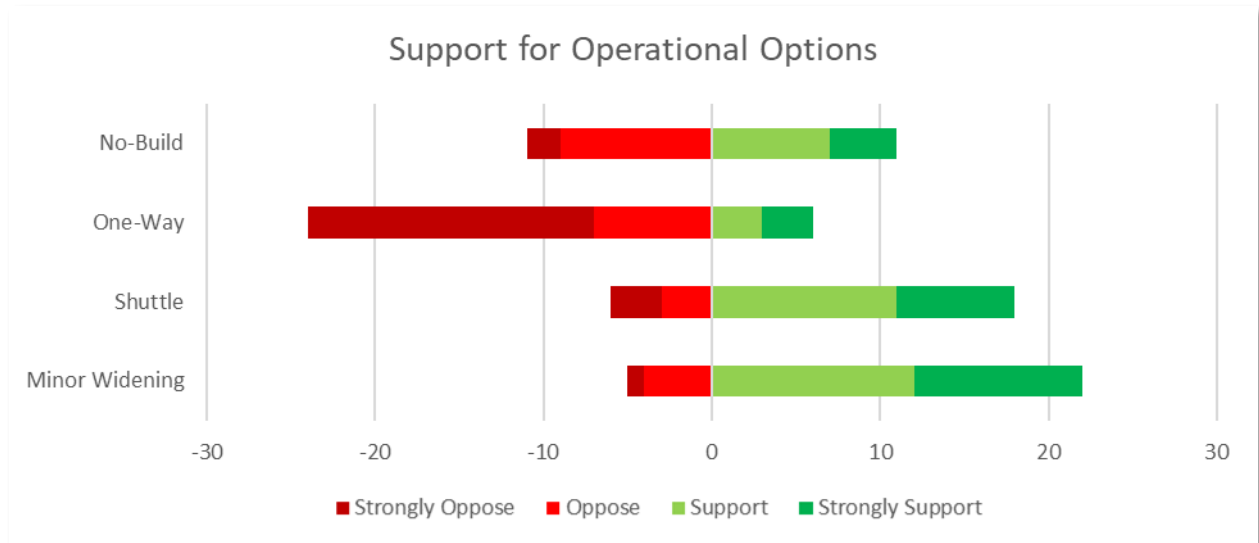


Figure ES-4: Survey Preferences for Other Operational Options

Recommendations

Based on engineering judgement, costs weighed against benefits, and input from both local officials and the public, both maintenance concepts (pipe repairs and small-scale spot improvements) are recommended to advance to maintain the corridor in a state of good repair.

Two measures are recommended to address delay at Nada Tunnel:

- Additional signage, primarily to increase alerts for oversize motorists or drivers unfamiliar with the area before reaching the one-lane, low clearance tunnel.
- Realigning the eastbound approach to the tunnel so motorists can see oncoming traffic without crossing the centerline or entering the portal.

Regarding other operational options, KYTC supports USFS coordination to launch a third-party shuttle service, although implementation is beyond KYTC's purview. Long-term, the minor widening concept is also a priority for implementation.

Project sheets in **Section 8.3** of the main report provide additional information on recommended measures.