potential impact on the environment, the community, and local owners of homes and businesses.

- Routing I-69 along the Ford and Breathitt Parkways is perhaps the most context-sensitive solution possible. In particular, using the existing Parkways as I-69 would minimize negative impacts resulting from construction of a new facility on new alignment, thus, providing the ultimate "minimal impact" alternative.
- The Ford Parkway and Breathitt Parkway adequately meet AASHTO guidelines for most design elements. Some deficiencies are minor and could be accepted as design exceptions. There are a few deficiencies that should be addressed in the near future, particularly those that deal with public safety. Alternate 2 would address these issues.
- Many deficiencies on the existing Parkways could be considered acceptable under the principle of design flexibility. Flexibility is allowed in AASHTO guidelines if flexible design options are supported by engineering studies. In recent years, flexibility and context-sensitive solutions have been encouraged due to public concern about the community and environmental impacts of highway projects.
- Precedents already exist at locations along many interstate highways throughout the United States where expressways currently operate safely and effectively with design conditions that do not meet current AASHTO guidelines.
- Using the existing Parkways as I-69 addresses another issue, i.e., financial feasibility, since Alternate 2 along the existing Parkways offers the lowest cost solution at a time when government must ensure that funds are used more effectively.
- Minor improvements can be made to the existing Parkways under Alternate 2 to address operational and safety problems for a fraction of the cost of the other alternates, and yield most of the same benefits. The money saved could be used to advance other segments of I-69 in Kentucky, or consider I-69 connectors to other cities not directly along the route.
- Minor improvements can be made more quickly to the existing Parkways under Alternate 2, allowing the route to be designated as I-69 sooner and thus expedite the economic benefits.
- If I-69 Alternate 2 is implemented along the Ford and Breathitt Parkways, a program of improvements to upgrade the Parkways could be developed. This program could be phased-in over time in a fiscally-responsible manner as funds are available and as operational conditions warrant, rather than implementing improvements that do not appear to be needed now or in the immediate future.
- Public involvement to date has indicated that most support routing I-69 along the existing Parkways, rather than constructing a new facility. There also appears to be strong support for I-69 designation of the Parkways at the earliest possible date and for designating connector routes to other communities not directly served by the I-69 corridor.

RECOMMENDED NEXT STEPS

Regardless of the direction of future I-69 corridor initiatives and the level of reconstruction along the Parkways, short and long range improvement strategies are recommended. To develop a program of improvements, additional data collection and analyses are recommended:

- Operational Considerations – Further analysis of safety and operational considerations may include field review of high crash segments, clear zones, and existing sign installations.
- Mainline Geometry and Typical Section – Field review of roadway cross-sections would determine consistency with original construction specifications. Further study is needed to determine the most appropriate median and guardrail treatments.
- Bridges – Additional data collection is required to obtain vertical bridge clearances at the edge of the outside shoulder, as recommended by AASHTO. The condition and application of bridge safety appurtenances should also be reviewed for corrections.
- Interchanges and Ramps – Interchanges and ramps require the most additional study. Items include designs that contribute to safety and operational problems, mainline capacity constraints, or weaving problems.

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I-69: EDDYVILLE TO HENDERSON CORRIDOR PLANNING STUDY

EXECUTIVE SUMMARY

Kentucky Transportation Cabinet - Division of Planning
March 2005

The Kentucky Transportation Cabinet (KYTC) has undertaken a corridor planning study for the portion of Interstate 69 (I-69) from Eddyville to Henderson, Kentucky. A Notice to advise the public of this study was published in the Federal Register, Vol. 67, No. 184 on Monday, September 23, 2002.

The study area for this section (shown at right) includes the following routes:

- The Wendell H. Ford (Western Kentucky) Parkway, from I-24 near Eddyville in Lyon County to the Edward T. Breathitt (Pennyrile) Parkway in Hopkins County, hereinafter called the Ford Parkway and Breathitt Parkway, respectively; and
- The Breathitt Parkway, from the Ford Parkway in Hopkins County to Henderson at or near the Henderson Bypass (KY 425) in Henderson County.

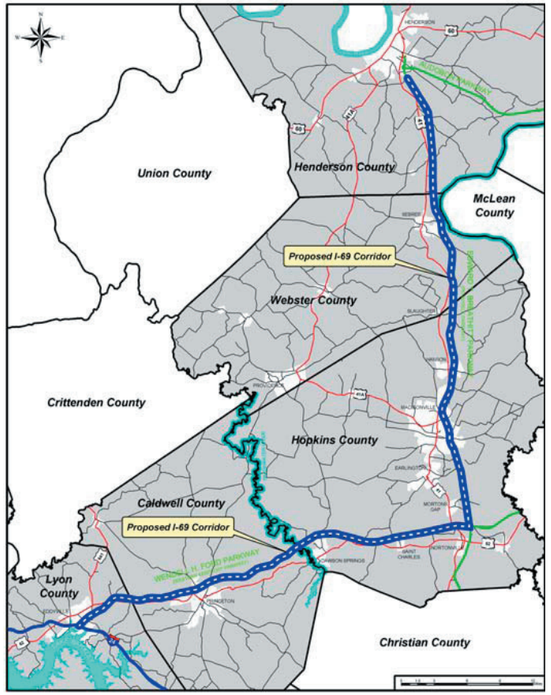
STUDY PURPOSE

The primary purpose of the study is to review existing conditions along the Ford Parkway and the Breathitt Parkway to:

- Identify locations where either or both of the Parkways adequately meet AASHTO highway design guidelines for interstates;
- Evaluate the degree to which the Parkways meet or fall short of those guidelines, if problem areas are found;
- Identify options for making improvements to the Parkways to address any problem areas; and
- Make recommendations regarding the suitability of routing I-69 along the Ford and Breathitt Parkways.

PROJECT BACKGROUND

I-69 (Corridor 18) was one of several Priority Corridors identified by the U.S. Congress as part of the federal Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and continued in subsequent federal transportation legislation.



Study Area: I-69 Eddyville to Henderson

- A national feasibility study was completed in 1995 by the Federal Highway Administration, which concluded that the future construction of I-69 from Canada to Mexico was economically feasible.
- The Corridor 18 Special Issues Study, completed in 1997, identified a Representative Corridor along the Parkway system in Kentucky, which best serves the purposes of Corridor 18 and yields the most benefits relative to facility costs.
- In recent years, the Transportation Cabinet has a goal to utilize as much of the existing infrastructure as possible. Thus, I-66 (Corridor 3) and I-69 (Corridor 18), would be routed along the state's existing Parkway system to the maximum extent possible.

This study has integrated the national I-69 goals with the local needs and concerns identified for the Eddyville to Henderson segment. Preliminary project goals have been established to help form the basis of the project purpose and need for this I-69 Section of Independent Utility (SIU), as follows:

- Maximize the use of the existing Parkways;
- Serve local industry; and
- Provide an improved facility for increasing truck traffic.

STUDY ACTIVITIES

The findings and recommendations identified through this study were the result of the Strategic Corridor Planning process for I-69. Study activities included the following:

- Data collection, review and analysis utilizing the KYTC's Highway Information System, as-built plans, crash data, and other information provided by local Highway District offices;
- Implementation of a Public Involvement Plan including meetings with the Project Team, local officials, interest groups and the public;
- Determination of AASHTO minimum design criteria to compare against the existing conditions of the Parkways in order to identify locations that do not meet AASHTO guidelines;
- Development and evaluation of five (5) improvement options representing incremental levels of investment; and
- Recommendations, including identification of additional study needs and next steps to further define deficiencies along the Parkways and validate the recommended alternative.

KEY FINDINGS

In their present form, the Ford and Breathitt Parkways do not operate in a manner appreciably different from the way they would operate if they were designed to meet existing design guidelines for interstate highways. These two Parkways already provide many basic design characteristics, or physical features, that are common for interstate highway facilities, such as full control of access, divided cross-sections, two travel lanes in each direction, and 70 mile-per-hour design speeds.

It is the actual dimensions of some of these physical features (the width of medians, the length and curvature of ramps, the width of bridges, the height of overpasses, etc.) on the Parkways that do not meet the minimums for current interstate design standards. To facilitate an understanding of where the deficiencies are relative to each other, the locations have been summarized on the attached figures. Deficiencies are coded to match the legend on each map.

The findings presented here are based on available data and limited field reviews. Additional analysis in future phases of this project will serve to further define the conclusions and recommendations drawn from this analysis.

The key findings include the following:

Operational Considerations and Safety

Crash data for the Parkways were considered for a four-year period from 1998 to 2001.

- Crash Analysis (Ford Parkway): When compared to other state parkways, there is one high crash segment along the Ford Parkway near the US 62 interchange at Eddyville in Lyon County (MP 3.702 to MP 5.610) where the crash rate exceeds the statewide average for all parkways. 72% of these accidents were a combination of collisions with fixed objects or animals. Another segment between MP 0.000 and MP 3.702, just east of the I-24 interchange in Lyon County, nearly exceeds the statewide average for parkways and should be considered a potential high crash segment.
- Crash Analysis (Breathitt Parkway): When compared to other parkways, there is one high crash segment where the actual crash rate exceeds the statewide average for Parkways. The high crash segment is in Hopkins County between MP 41.002 and MP 42.437, near the KY 70/85 exit at Madisonville. Sixty-nine percent (69%) of these accidents are the result of rear-end collisions likely related to the ramp operations at Interchange 42 at Madisonville. There is also one potential high crash segment in Hopkins County between MP 42.437 and 44.337, near the US 41A exit at Madisonville.
- Crash Analysis (as an Interstate): When compared to Kentucky interstate highways, rather than state parkways, one additional high crash segment was identified along the Ford Parkway located just east of the I-24 interchange in Lyon County (between MP 0.000 and MP 3.702). 74% of these crashes are either a collision with an animal or fixed object.

Comparison of Preliminary Cost Estimates

Alternative	Meet Current Standards	Future Expansion w/o Additional ROW[2]	Impact on Environment	Cost (million)	Cost per Mile (million)
1. No Build	No	n/a	Least	$0.0[3]	$0.0
2. Minor Upgrade	Yes[1]	No	Least	$151.7	$1.9
3. Partial Reconstruction	Yes	No	Minimal	$379.7	$4.7
4. Full Reconstruction	Yes	Yes	Minimal	$851.8	$10.6
5. New Alignment	Yes	n/a	Substantial	$1,364.0	$22.0

[1] Improvements under this alternate would be targeted toward upgrading the design features along the routes that potentially represent the most significant safety and operational issues. Design exceptions would be considered where safety and operational conditions would not create an undue risk to motorists.

[2] This column answers the question: If additional travel lanes are required to meet future capacity after I-69 improvements are made, could the lanes be added within the right-of-way provided under each alternative?

[3] Funding for routine maintenance activities would still be needed.

These alternatives represent incremental levels of infrastructure investment to implement I-69 between Henderson and Eddyville. The table provides a cost comparison of each of the potential alternatives. Although dismissed from further consideration, a cost estimate for construction of a new alignment parallel to the parkways is included for comparison purposes.

CONCLUSIONS

Based on the Strategic Corridor Planning process, the following study findings identify considerations for the selection of a recommended improvement option. These include the following:

- It can generally be concluded that the sections of the Breathitt and Ford Parkways under consideration for designation as I-69 are currently providing efficient and safe travel routes through the Western Kentucky region.
- In the short-term, designating these roadways as I-69 would not substantially alter their operating characteristics in a manner that would be different than the conditions currently experienced along the two Parkways today.
- Other interstate highways across Kentucky and throughout the United States have varying degrees of design characteristics that do not meet current interstate standards. Therefore, signing the Ford and Breathitt Parkways as I-69 today may not be an unrealistic option and merits further investigation.
- In the long-term, I-69 will begin developing across the country and additional traffic and trucks will be induced to the corridor. Addressing the major geometric deficiencies along the parkways would help improve safety and operational conditions.
- Independent of the decision of when the Parkways should be officially designated as I-69, it will be necessary to provide for a systematic program of highway improvements along the Parkways.
- The program of identified improvements should serve to maintain acceptable operational levels of service and safety and address the areas along the Parkways that do not meet interstate design criteria.

RECOMMENDATIONS

It is recommended that Alternative 2, Minor Upgrades and Spot Safety Improvements, proceed into future phases of project development, as needed, based on the following:

- Major construction of an Interstate 69 route on new alignment should be dismissed from further consideration because it would not meet the first goal established for the project, to maximize the use of existing Parkways.
- The other major reconstruction alternates, Alternates 3 and 4, should also be dismissed from further consideration in future project development, since each would require additional right-of-way. Maximizing the use of existing right-of-way supports context-sensitive design principles and maximizes the use of existing infrastructure, resulting in the least

- Potential High Crash Segments: There are five (5) additional segments considered to be potential high crash segments, including three (3) in Hopkins County and two (2) which are side-by-side in Webster County.
- Additional Finding Related to Crash Analysis: There were only 6 crashes coded as 'median cross-over' or 'head-on' collisions on the parkways. Three interchanges are located in high crash locations – Exits 1 and 4 on the Ford Parkway and Exit 42 on the Breathitt Parkway. Further analysis in the high crash segments may identify corrections related to horizontal clearance, wildlife measures, ramp design or operational controls. However, this is not unlike other existing interstates in Kentucky.
- Traffic Volumes (2002): Existing traffic volumes along the Ford Parkway range from 9,000 vpd in Lyon County to 10,900 vpd in Hopkins County. For the Breathitt Parkway, 2002 traffic volumes range from 10,500 vpd in Hopkins County near the Ford Parkway to 26,400 vpd in Hopkins County (within the urban area of Madisonville).
- Truck Percentages (2002): Existing truck percentages range from 25.0% to 31.3% along the Ford Parkway while truck percentages range from 22.9% to 32.9% along the Breathitt Parkway.
- Traffic Volumes without I-69 (2030): Average annual growth rates along the Parkways range from 1.7% to 2.1%. These rates result in traffic volumes ranging from 15,100 to 18,100 vpd along the Ford Parkway and from 17,200 to 43,500 vpd along the Breathitt Parkway.
- Traffic Volumes with I-69 (2030): Assuming I-66 and I-69 will travel along a portion of the Ford Parkway, growth rates range from 3.2% to 3.7% along the Ford Parkway. Rates range from 2.2% to 2.3% along the Breathitt Parkway. These result in traffic volumes ranging from 23,100 to 30,500 vehicles per day along the Ford Parkway and from 19,100 to 50,500 vehicles per day along the Breathitt Parkway.
- Truck Percentages (2030): Future truck volumes were not forecast as part of this study; however, truck traffic is expected to increase substantially if the national goals of I-69 are met.
- Level of Service (2002): All Parkway segments operate at LOS C or better in the Year 2002 and should therefore be considered acceptable at present.
- Level of Service (2030): Future year (Year 2030) levels of service are expected to operate at acceptable conditions throughout the study area both with and without the I-69 designation, since only one segment along either Parkway is expected to fall below LOS C. This segment, expected to operate at LOS D, is found in Hopkins County in the urban area of Madisonville and can, therefore, be considered an acceptable LOS.

Mainline Geometry/Typical Section

- Design Speed: The Ford and Breathitt Parkways meet or exceed minimum design speed guidelines for interstate highways in rural and urban areas.
- Lane Width: Lane widths on the mainline of the two Parkways meet the minimum AASHTO guidelines for freeway design.
- Outside Shoulder Width: It is anticipated that all of the existing outside shoulders will meet interstate highway criteria for shoulder width.
- Inside Shoulder Width: The Parkways do not fully conform to AASHTO design guidelines for inside shoulder widths on freeways. All of the Ford Parkway and sections of the Breathitt Parkway have 3' inside shoulder widths, while guidelines recommended a 4' inside shoulder.
- Median Width: The existing median width along the Breathitt Parkway meets AASHTO standards for rural freeways with the exception of a short roadway section between Milepoint 39.550 and Milepoint 42.437 in Hopkins County. While portions of the Ford Parkway also meet accepted practice, the majority in Caldwell and Hopkins Counties do not meet current AASHTO standards.
- Clear Zones: It is not possible to evaluate the applicability of current design standards and availability of acceptable clear zones with the information currently available.
- Guardrail Placement and Condition: Sufficient information does not exist on the as-built plans to evaluate the placement of guardrail along the I-69 corridor.
- Superelevation: The design speeds and maximum radius used for the design of the mainline sections of the existing Parkways are acceptable and in general compliance with the

intent of the current AASHTO design guidelines.

- Horizontal Alignment: The horizontal curvature for the Parkways is acceptable and in general compliance with current AASHTO design guidelines.
- Vertical Alignment: The majority of vertical curves along the Parkways are sufficient to meet current AASHTO guidelines. Of the five (5) unacceptable vertical curves, three (3) are located on the Ford Parkway and two (2) on the Breathitt Parkway.

Bridges and Overpasses

- Lateral Clearance (Ford Parkway): Of the 22 mainline bridges along the Ford Parkway, 14 (70%) fail to meet the minimum 38'-00" lateral (horizontal) clearance.
- Lateral Clearance (Breathitt Parkway): Of the 28 mainline bridges on the Breathitt Parkway, 14 (50%) fail to meet the minimum lateral (horizontal) clearance.
- Vertical Clearance: Five (5) overpass structures along the two Parkways do not meet minimum vertical clearance standards of 16'-00".
- Functional Adequacy: Thirteen (13) bridges are considered functionally obsolete. Of these thirteen (13) structures, 2 pass over the Parkways (both along the Ford Parkway) and 11 are mainline bridges (6 on the Breathitt Parkway and 5 on the Ford Parkway). Two (2) overpasses are considered structurally deficient, with one located along each Parkway.

Interchanges and Ramps

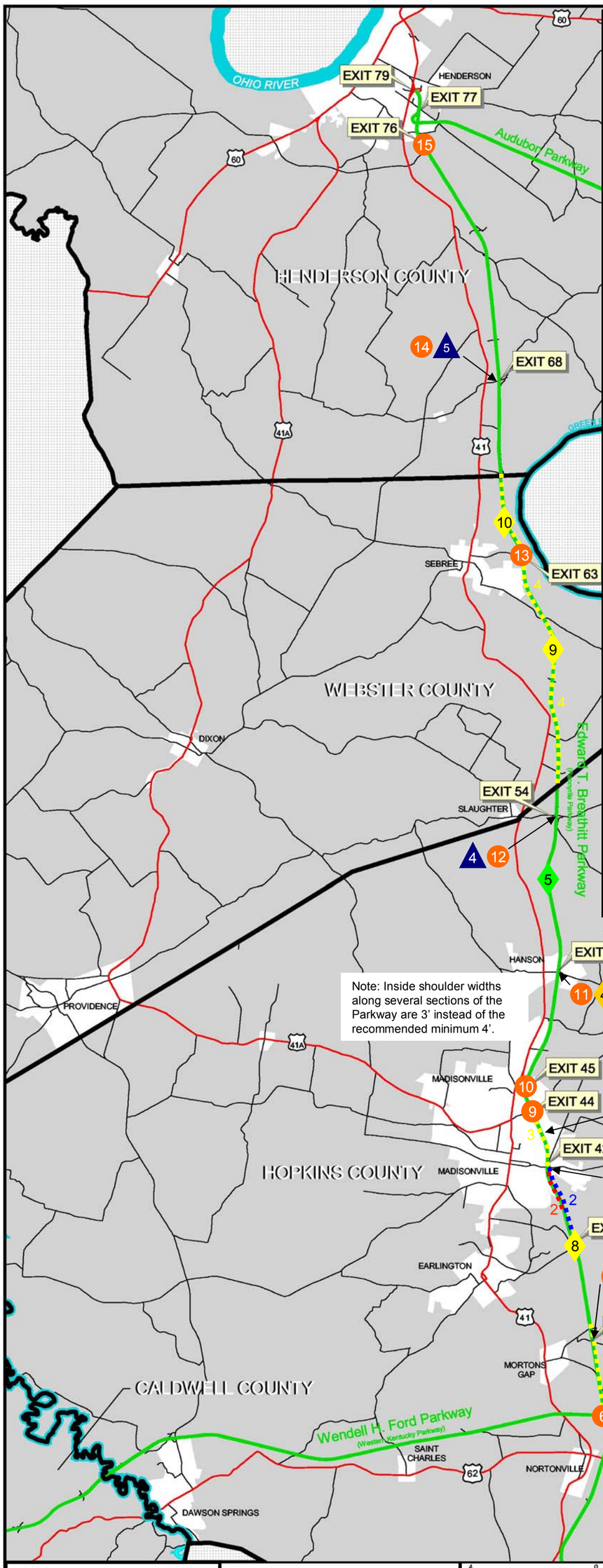
- Design Speed: Although there was insufficient information from the as-built plans to properly locate or quantify possible deficiencies on the Ford and Breathitt Parkways, many of the ramps do not meet the minimum guidelines for design speed.
- Lane Width: Lane widths ranged from 15' to 18' and are acceptable and in general compliance with AASHTO guidelines.
- Shoulder Width: Ramps at interchanges on the two Parkways do not meet AASHTO guidelines for shoulder width.
- Horizontal Alignment: Many of the directional and loop ramps at the existing interchanges do not meet recommended design guidelines for horizontal alignment.
- Vertical Alignment: The as-built plan sets do not provide vertical profile information for ramps. However, it is not anticipated that significant problems exist in this area.
- Superelevation: Many of the directional and loop ramps have superelevations that exceed the 8% maximum.
- Speed-Change Lanes: Existing ramps on the Ford and Breathitt Parkways do not meet the minimum guidelines for tapers.
- Weaving Characteristics: There are three (3) interchanges where the length of weaving is below recommended design guidelines. Two are on the Ford Parkway: KY109 at MP 24.437 in Hopkins County and the Breathitt Parkway at MP 38.373 in Hopkins County. The third is the KY 56 interchange on the Breathitt Parkway at MP 62.632 in Webster County.

POTENTIAL IMPROVEMENT ALTERNATES

Alternates for I-69 include the following:

- No Build Alternate – KYTC could elect to participate no further in developing I-69, thus, leaving a gap in the national I-69 route. Under this scenario, the Parkways would still connect the sections of I-69 in Tennessee and Indiana.
- Minor Upgrades and Spot Safety Improvements to the Parkways – This alternate would address key safety and operational concerns but obtain design exceptions or approval of design flexibility for a number of circumstances where the Parkways do not meet current AASHTO guidelines.
- Partial Reconstruction of the Parkways – This alternate would enable the Parkways to meet most AASHTO guidelines but attempt to maintain improvements within the right-of-way by making extensive use of median barriers and guardrail along the parkways.
- Full Reconstruction and Widening of the Parkways – This alternate would enable the Parkways to meet full AASHTO guidelines by obtaining additional right-of-way along the Parkways for widening and reconstruction.

The construction of a new I-69 route on new alignment would not maximize the use of the existing Parkway system and would not ultimately meet the purpose and need for the I-69 project. For this reason, this alternate has been dismissed from further consideration.



Note: Inside shoulder widths along several sections of the Parkway are 3' instead of the recommended minimum 4'.

Deficiency Type	Milepoint	Deficiency Description
Breathitt Parkway - Hopkins County		
6	38.373	All ramps have substandard geometrics
7	37.058	All ramps have substandard geometrics
7	37.054	Horizontal clearance less than minimum (note: bridge is over 200')
8	39.774	Horizontal clearance less than minimum (note: bridge is over 200')
8	42.437	All ramps have substandard geometrics
2	42.418	Horizontal clearance less than minimum (note: bridge is under 200')
3	43.438	Horizontal clearance less than minimum (note: bridge is under 200')
9	44.337	All ramps have substandard geometrics
10	44.713	All ramps have substandard geometrics
11	48.500	All ramps have substandard geometrics
4	48.971	Horizontal clearance less than minimum (note: bridge is under 200')
5	51.941	Vertical clearance less than minimum
12	54.073	All ramps have substandard geometrics
4	54.122	Vertical curve radius less than minimum
2	34.271 - 37.070	Potential high crash segment (critical rate 0.9-.99)
2	39.550 - 42.437	Median width less than minimum
2	41.002 - 42.437	High crash segment (critical rate >= 1.0)
3	42.437 - 44.337	Potential high crash segment (critical rate 0.9-.99)
Breathitt Parkway - Webster County		
9	59.280	Horizontal clearance less than minimum (note: bridge is over 200')
13	62.632	All ramps have substandard geometrics
10	63.887	Horizontal clearance less than minimum (note: bridge is over 200')
4	55.003 - 65.305	Potential high crash segment (critical rate 0.9-.99)
Breathitt Parkway - Henderson County		
5	68.500	Vertical curve radius less than minimum
14	68.373	All ramps have substandard geometrics
15	76.258	All ramps have substandard geometrics

Deficiencies Legend

- Horizontal Clearance (Bridge over 200')
- Horizontal Clearance (Bridge under 200')
- Vertical Clearance
- Vertical Alignment
- Interchange
- Median
- High Crash Segment (based on average rates for Interstates)
- Potential High Crash Segment (based on average rates for Interstates)

4 0 4 8 Miles

Location Map

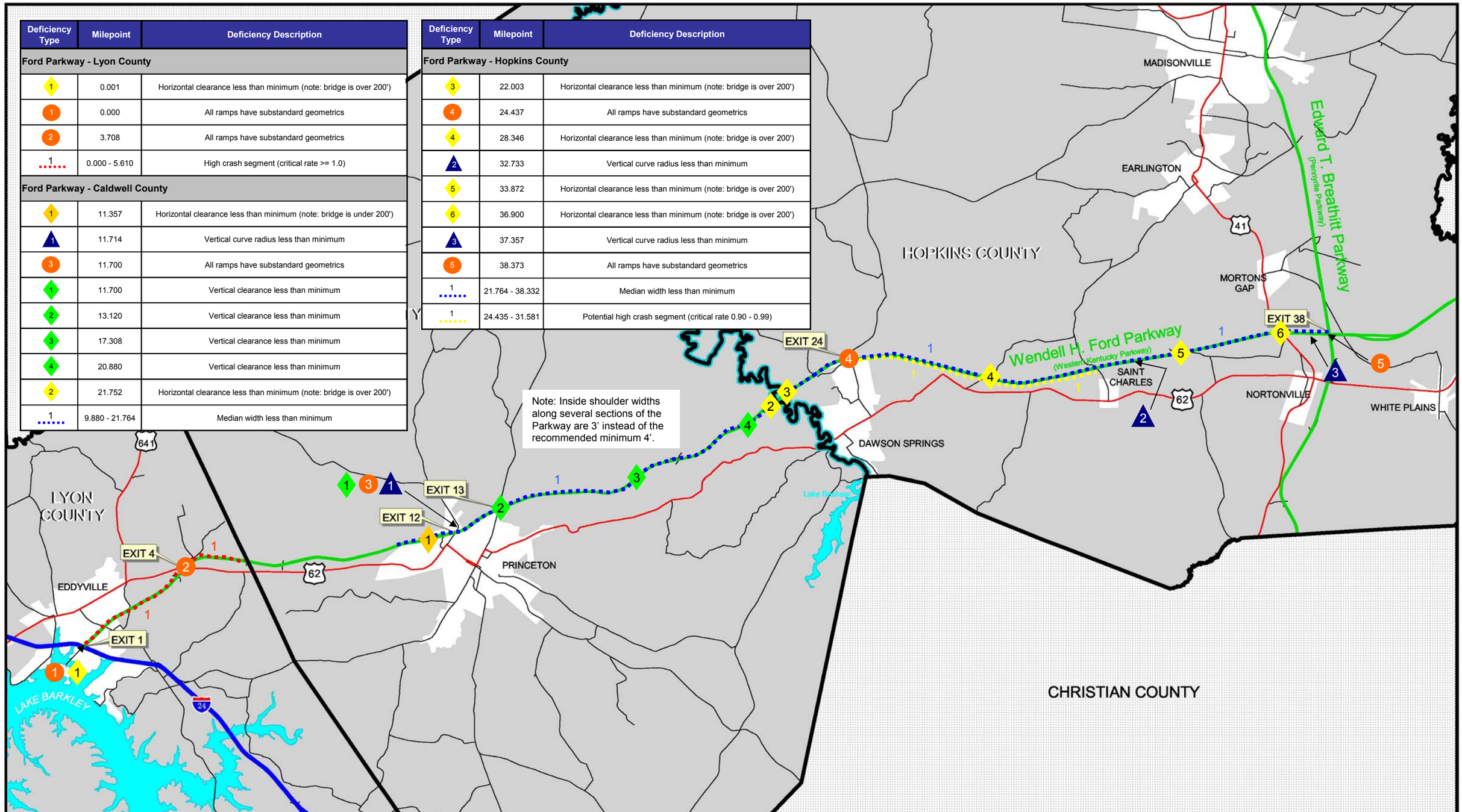
Deficiencies Summary
Breathitt Parkway

I-69 Corridor

Henderson, Webster, Hopkins
Caldwell, and Lyon Counties,
Kentucky
Item No. 2-69.10

Deficiency Type	Milepoint	Deficiency Description
Ford Parkway - Lyon County		
1	0.001	Horizontal clearance less than minimum (note: bridge is over 200')
1	0.000	All ramps have substandard geometrics
2	3.708	All ramps have substandard geometrics
1	0.000 - 5.610	High crash segment (critical rate >= 1.0)
Ford Parkway - Caldwell County		
1	11.357	Horizontal clearance less than minimum (note: bridge is under 200')
1	11.714	Vertical curve radius less than minimum
3	11.700	All ramps have substandard geometrics
1	11.700	Vertical clearance less than minimum
2	13.120	Vertical clearance less than minimum
3	17.308	Vertical clearance less than minimum
4	20.880	Vertical clearance less than minimum
2	21.752	Horizontal clearance less than minimum (note: bridge is over 200')
1	9.880 - 21.764	Median width less than minimum

Deficiency Type	Milepoint	Deficiency Description
Ford Parkway - Hopkins County		
3	22.003	Horizontal clearance less than minimum (note: bridge is over 200')
4	24.437	All ramps have substandard geometrics
4	28.346	Horizontal clearance less than minimum (note: bridge is over 200')
2	32.733	Vertical curve radius less than minimum
5	33.872	Horizontal clearance less than minimum (note: bridge is over 200')
6	36.900	Horizontal clearance less than minimum (note: bridge is over 200')
3	37.357	Vertical curve radius less than minimum
5	38.373	All ramps have substandard geometrics
1	21.764 - 38.332	Median width less than minimum
1	24.435 - 31.581	Potential high crash segment (critical rate 0.90 - 0.99)



Deficiencies Legend

- Horizontal Clearance (Bridge over 200')
- Horizontal Clearance (Bridge under 200')
- Vertical Clearance
- Vertical Alignment
- Interchange
- Median
- High Crash Segment (based on average rates for Interstates)
- Potential High Crash Segment (based on average rates for Interstates)

3 0 3 6 Miles

N W E S

Location Map

Deficiencies Summary
Ford Parkway
I-69 Corridor

Henderson, Webster, Hopkins Caldwell, and Lyon Counties, Kentucky
Item No. 2-69.10