

## **APPENDIX B-2**

Screening Report Supplement



### **Screening Report Supplement**

I-69 Ohio River Crossing Project Evansville, IN and Henderson, KY

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## INTRODUCTION

The July 2017 *Screening Report* recommended carrying forward three corridors – West Corridor 1, West Corridor 2, and Central Corridor 1 – for further development and evaluation (see Figure 1-1). Follow-on studies were to include the possible location and configurations for local interchanges, the disposition of and long-term maintenance costs for the existing US 41 bridges, and tolling scenarios with the resulting traffic patterns. The information described in this *Screening Report Supplement* represents the next step in the development of the project corridors. Except those described below, changes to the corridors since their evaluation in the July 2017 *Screening Report* have been minor and do not change the evaluations or conclusions presented in the initial report.

The July 2017 *Screening Report* included assumptions for each corridor regarding the future use of the existing US 41 bridges. For West Corridors 1 and 2, it was assumed that both US 41 bridges would be removed and the new I-69 bridge would have six lanes. For Central Corridor 1, it was assumed that both US 41 bridges would remain open and the new I-69 bridge would have four lanes. The July 2017 *Screening Report* stated that the future use of the existing bridges for each corridor would be subject to further evaluation.

For each corridor, three bridge scenarios were considered:

- Build a 6-lane I-69 bridge for all cross-river traffic and remove both US 41 bridges from vehicular use
- Build a 4-lane I-69 bridge and retain one US 41 bridge for local traffic
- Build a 4-lane I-69 bridge and retain both US 41 bridges for local traffic

At this time, the disposition of any existing bridge(s) taken out of vehicular use has not been determined. Future analysis will determine whether the bridge(s) would be removed or converted to non-vehicular use.

Based on this approach, the bridge scenarios presented below in Table 1-1 and shown in Figure 1-2 were defined.







BRIDGE SCENARIO #	CORRIDOR	NUMBER OF I-69 LANES	NUMBER OF US 41 BRIDGES/LANES IN SERVICE
1	No Build	0	2 / 4
2	West Corridor 1	6	0 / 0
3	West Corridor 1	4	1/2
4	West Corridor 1	4	2 / 4
5	West Corridor 2	6	0 / 0
6	West Corridor 2	4	1/2
7	West Corridor 2	4	2 / 4
8	Central Corridor 1	6	0 / 0
9	Central Corridor 1	4	1 / 2
10	Central Corridor 1	4	2 / 4

Table 1-1.	US 41	and I-69	River	Bridae	<b>Scenarios</b>
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Table Note: For the bridge scenarios that include four lanes for the I-69 bridge, the bridge would be marked for four lanes, but it would be constructed to allow for striping for six lanes in the future.

The purpose of this *Screening Report Supplement* is to use the design, traffic, and cost data developed since publication of the *Screening Report* to identify the combination of bridge scenarios and interchange locations that best meet the project's purpose and need. The best combination of these elements for each corridor will be evaluated as an alternative in the Draft Environmental Impact Statement (DEIS). Section 2 describes the additional alternatives development activities completed since July 2017. Section 3 presents the criteria used to screen the bridge scenarios. Section 4 compares the bridge scenarios within each corridor against the criteria and provides a recommendation regarding the selection of an alternative within each corridor to be carried forward into the DEIS.







## **2** ALTERNATIVES DEVELOPMENT

Following the completion of the July 2017 *Screening Report*, preliminary designs were developed and refined for the corridors that were recommended to be carried forward for more detailed evaluation, which included West Corridor 1, West Corridor 2, and Central Corridor 1. The No Build Alternative was also carried forward as a baseline comparison for the build alternatives. These corridors were further developed based on public and agency input, environmental and right-of-way issues, and traffic analysis. The following sections discuss the development of the recommended corridors.

#### 2.1 INTERCHANGE DEVELOPMENT

The July 2017 *Screening Report* identified *potential* interchange locations only; decisions on the location and configuration of those interchanges required additional study. The design team developed several interchange options for each corridor, taking into consideration local access for residents and businesses, minimum interchange spacing requirements, traffic demand, and geometrics. The interchange locations for each corridor, shown in Figure 2-1, were developed to provide acceptable levels of access, traffic performance, and safety to a sufficient level of detail to establish potential footprint impacts and right-of-way requirements. The interchange footprints are relatively compact, given the options at those locations, but they are large enough to allow refinement and optimization during final design.







#### 2.1.1 WEST CORRIDOR 1

- The existing US 41/Veterans Memorial Parkway interchange would be revised to make I-69 the through movement, with new ramps to/from Veterans Memorial Parkway.
- Under Bridge Scenario 2, which would take both existing bridges out of service, interchanges would be provided at Waterworks Road/Ellis Park and Wolf Hills Road/Stratman Road. Under Bridge Scenarios 3 and 4, which keep one or both US 41 bridges in service, local access to Waterworks Road/Ellis Park and Wolf Hills Road/Stratman Road would remain via US 41 and the existing bridge(s).
- An interchange would be constructed at Watson Lane to provide access to the commercial strip and adjacent residential areas. This interchange could be configured as a single-point urban interchange, which may reduce both right-of-way impacts and conflicts with nearby intersections.
- The interchange at US 60 would be modified to provide connections to and from existing US 41, US 60, and I-69.
- US 41 (formerly named the Edward T. Breathitt Pennyrile Parkway) south of US 60 to KY 425, where I-69 in Kentucky currently ends, would be modernized to meet interstate standards.

#### 2.1.2 WEST CORRIDOR 2

- The existing US 41/Veterans Memorial Parkway interchange would be revised to make I-69 the through movement, with new ramps to/from Veterans Memorial Parkway.
- Under Bridge Scenario 5, which would take both existing bridges out of service, interchanges would be provided at Waterworks Road/Ellis Park and Wolf Hills Road/Stratman Road. Under Bridge Scenarios 6 and 7, which keep one or both US 41 bridges in service, local access to Waterworks Road/Ellis Park and Wolf Hills Road/Stratman Road would remain via US 41 and the existing bridge(s).
- The Watson Lane interchange could be a single-point urban interchange, which may reduce both right-of-way impacts and conflicts with nearby intersections. The interchange at US 60 would be modified to provide connections to and from existing US 41, US 60, and I-69.
- US 41 (formerly named the Edward T. Breathitt Pennyrile Parkway) south of US 60 to KY 425, where I-69 in Kentucky currently ends, would be modernized to meet interstate standards.

#### 2.1.3 CENTRAL CORRIDOR 1

- A new interchange would be developed for I-69 about halfway between the existing US 41/Veterans Memorial Parkway and the I-69/Green River Road interchanges, making the through movement be for I-69 with ramps to/from Veterans Memorial Parkway.
- Under all three bridge scenarios, an interchange would be provided at US 60.



- Under all three bridge scenarios, the connection to existing US 41 to the north would be provided via an interchange and a new roadway. The new roadway would provide local access and connect to existing US 41 just south of its interchange with US 60.
- US 41 (formerly named the Edward T. Breathitt Pennyrile Parkway) south of US 60 to KY 425, where I-69 in Kentucky currently ends, would be modernized to meet interstate standards.

#### 2.2. AVOIDANCE OF SENSITIVE RESOURCES

As the design team collected data from the field, coordinated with agencies, and gathered input from the public, additional environmental and cultural resources were identified. For each of the following sensitive resources, the design team modified the corridors to avoid or minimize impacts.

- Eagle Slough Natural Area. This privately-owned natural area located north of Waterworks Road to the east of existing US 41 includes various types of wetlands including forested, scrub-shrub, herbaceous, and open water. The unique mixture of wetlands provides habitat for a variety of plants and animals, including more than 160 bird species and 65 vascular plant species. Among these species are the bald eagle (federally-protected; state species of special concern) and bald cypress (state threatened). Bald cypress is a southern tree reaching its northern limits of distribution in Indiana. Some of the largest bald cypress trees in the state of Indiana are present in these habitats where open water meets land. Although their presence has not been documented on the site, the federally endangered Indiana bat and the federally threatened northern long-eared bat may use the area during summer and migration based on the habitat present. Eagle Slough also provides an educational and recreational resource for the community. An early alignment of West Corridors 1 and 2 would have had right-of-way impacts to the northwest corner of this property, but as the design has been refined, right-of-way impacts to the property have been avoided.
- McClain House and Lee Baskett House. The original alignment of Central Corridor 1, including its interchange with US 60, was designed to avoid impacts to these two National Register of Historic Places (National Register)-eligible properties based on available data regarding their boundaries. Through additional coordination with the Kentucky Heritage Council, the boundaries of these historic sites have been clarified, and the design has been modified to avoid right-of-way impacts. The modifications require realigning US 60 and the interchange approximately 400 feet to the south, and reconstructing the US 60 bridge over the railroad.
- Vigo Coal Wetland Mitigation Site. This forested wetland located adjacent to, and south of, I-69 near the northern terminus of Central Corridor 1 was constructed as part of required mitigation for wetland impacts at another location. An earlier alignment for Central Corridor 1 would have resulted in fill being placed in a substantial portion of this mitigation site. The design of the interchange at this location has since been adjusted to avoid impacts to this site.



#### 2.3 TYPICAL SECTION REFINEMENT

The typical section (the number and width of lanes and shoulders) for I-69 has been refined to reduce costs while still meeting interstate design standards. Interstate design standards call for minimum 10-foot outside and inside shoulders on six-lane bridges (three lanes in each direction). Four-lane bridges (two lanes in each direction) are permitted to have minimum 10-foot outside and 4-foot inside shoulders. Bridges longer than 200 feet are permitted to use 4-foot shoulders, regardless of the number of lanes.

The concepts used to develop costs for the July 2017 *Screening Report* assumed 10-foot inside and outside shoulders on the six-lane bridges (West Corridors 1 and 2), including the Ohio River bridge. The four-lane Ohio River bridges (Central Corridors 1 and 2, and East Corridor) also included 10-foot inside and outside shoulders; this would allow for a future restriping to six lanes and would still meet the 4-foot shoulder requirement for long bridges.

The design team has revised the typical section for the Ohio River bridge to include width for six 12-foot lanes and 4-foot wide inside and outside shoulders. This is the recommended section for all bridge options, whether four or six lanes. In the 4-lane configuration, the initial roadway would be striped for four 12-foot lanes, 8-foot inside shoulders and 12-foot outside shoulders. If in the future six lanes were required, the river bridge could be restriped to provide six 12-foot lanes, and 4-foot inside and outside shoulders. This change results in a savings of considerable deck area on the Ohio River bridge and substantially reduces the cost of the bridge.

#### 2.4 COST ESTIMATE UPDATES

Cost considerations are an important part of alternative development, especially considering the role of financial feasibility in the project's purpose and need. The cost estimates provided in the July 2017 *Screening Report* have been updated to incorporate revised quantities based on the additional detail described above. The cost factors used in the July 2017 report have not been changed. As design progresses throughout the National Environmental Policy Act (NEPA) process, cost estimates will continue to be updated based on revised quantities, additional detail, and refined cost factors.

Right-of-way and construction costs in this current estimate are shown in both current year 2017 dollars (as were used in the July 2017 *Screening Report*) and future year-of-expenditure (YOE) dollars. The analysis assumed average inflation rates of 4% over the next 10 years and 2.5% thereafter. Long-term operations and maintenance costs are shown in YOE dollars, which provides better information for the states in establishing their budgets. For example, right-of-way costs would be incurred in an earlier year than construction and therefore would be subject to less inflation. The conversion to YOE dollars also accounts for the fact that both right-of-way acquisition and construction of West Corridors 1 and 2 are anticipated to take longer than Central Corridor 1 due to the number of parcels involved and complexity of construction, respectively. Under best-case scenarios, Central Corridor 1 could be open to traffic in 2025, while either West Corridor 1 or West Corridor 2 could be open in 2027, assuming that funding is identified and scheduled soon after the Final Environmental Impact Statement/Record of Decision (FEIS/ROD).



Table 2-1 also includes additional construction-related costs, which are presented in the column titled "Other," that would be incurred for each bridge scenario. These include the costs of final design, procurement of a contractor, and construction engineering and inspection during construction. However, several other potential costs such as construction financing, debt service, and toll collection have not yet been estimated and are not included in the total cost estimate.

As shown in Table 2-1, when evaluating comparable bridge scenarios (i.e., scenarios that keep the same number of existing US 41 bridges in service), West Corridor 2 scenarios are the most expensive, followed by West Corridor 1 and Central Corridor 1. Also, the construction cost of bridge scenarios that remove both US 41 bridges from service are the highest within each corridor, due to the need to construct six lanes for the I-69 approach roadway.

BRIDGE SCENARIO	CONSTR (\$	UCTION M)	RIGHT-( (\$	OF-WAY M)		
	2017	YOE	2017	YOE		
1 - No Build	0	0	0	0	0	0
2 - West Corridor 1, 0 US 41 Bridges	754	1,053	68	79	153	1,285
3 - West Corridor 1, 1 US 41 Bridge	710	991	68	79	143	1,213
4 - West Corridor 1, 2 US 41 Bridges	719	1,004	68	79	145	1,228
5 - West Corridor 2, 0 US 41 Bridges	759	1,061	105	123	153	1,337
6 - West Corridor 2, 1 US 41 Bridge	714	997	105	123	143	1,263
7 - West Corridor 2, 2 US 41 Bridges	726	1,013	105	123	147	1,283
8 - Central Corridor 1, 0 US 41 Bridges	813	1,070	21	24	154	1,248
9 - Central Corridor 1, 1 US 41 Bridge	763	1,004	19	22	144	1,170
10 - Central Corridor 1, 2 US 41 Bridges	759	1,000	19	22	144	1,166

#### Table 2-1. Construction-Related Costs

Table Note: Other costs include final design, procurement of a contractor, and construction engineering and inspection during construction.

#### 2.5 LIFE-CYCLE MAINTENANCE COSTS

In the July 2017 *Screening Report,* a qualitative assessment was used to compare the cost to maintain the existing US 41 bridges, if retained, and the new I-69 roadway and bridge. Since that time, the design team has prepared a *US 41 Existing Bridges Evaluation Report* to quantify the cost of maintaining each bridge through 2062 (see Table 2-2). This timeframe was used because it is 35 years beyond the estimated completion date of West Corridor 1 or West Corridor 2; repair, major maintenance, and reconstruction activities are reasonably foreseeable during that period; and it provides consistency with other cost and financial analyses that will be performed on the project. The analysis considers the potential maintenance cost differences under various potential traffic scenarios. A new I-69 has the potential to shift existing traffic from US 41, particularly trucks, which will be dependent to a large extent on the toll policy.



The *US 41 Existing Bridges Evaluation Report* indicated that, based on engineering analyses only, if a single bridge remained in service for vehicular use (Bridge Scenarios 3, 6, and 9), the newer southbound bridge was preferred. Although the estimated life-cycle maintenance cost estimates for each of the bridges are comparable, the newer southbound bridge offers a higher absolute load rating, additional cross section width between the trusses, and higher confidence regarding repair and rehabilitation requirements. A final recommendation, incorporating engineering, environmental, and community factors, will be provided in the DEIS.

Table 2-2 also presents an estimated cost to maintain the new I-69 roadway and bridge over the same period. These values were based on detailed maintenance cost estimates prepared for the Louisville–Southern Indiana Ohio River Bridges (ORB) project. The ORB estimates were considered because the type and size of the new ORB bridges are similar to what would be required for a new I-69 bridge.

BRIDGE SCENARIO	US 41 BRIDGES (\$M)	I-69 (\$M)	TOTAL (\$M)
1 - No Build	267	0	267
2 - West Corridor 1, 0 US 41 Bridges	0	150	150
3 - West Corridor 1, 1 US 41 Bridge	129	124	253
4 - West Corridor 1, 2 US 41 Bridges	242	124	366
5 - West Corridor 2, 0 US 41 Bridges	0	150	150
6 - West Corridor 2, 1 US 41 Bridge	129	122	251
7 - West Corridor 2, 2 US 41 Bridge	242	124	366
8 - Central Corridor 1, 0 US 41 Bridges	0	159	159
9 - Central Corridor 1, 1 US 41 Bridge	129	116	245
10 - Central Corridor 1, 2 US 41 Bridges	242	116	358

#### Table 2-2. Maintenance Costs

Table Notes: (1) All costs are shown in YOE dollars. (2) Maintenance costs are based on maintenance required from 2018 to 2062.

#### 2.6 TRAFFIC MODELING/TOLL SCENARIO EVALUATION

The design team has updated and enhanced the Evansville Metropolitan Planning Organization's (EMPO) regional travel demand model to enable analysis of regional traffic patterns, diversion potential, and congestion levels for each corridor and bridge scenario, including a wide range of potential tolling scenarios. The enhancements also extended the forecast year of the model from 2040 to 2045, the project's design year. The results of the traffic analysis are discussed further in Section 3.

Consistent with the EMPO's fiscally-constrained *Metropolitan Transportation Plan*, tolling I-69 will be a key part of the financing for this project. The toll policy will define business rules and toll rates for different vehicle types and will be developed with the federally required financial plan prior to construction. The NEPA process will not determine the toll policy but will evaluate, and document in the DEIS, the environmental consequences associated with tolling being a part of the project.



# **3** EVALUATION CRITERIA

The July 2017 *Screening Report* summarized the project's purpose and need and used a range of engineering and environmental criteria. The July 2017 corridor screening evaluation applied criteria based on environmental impacts, cost-effectiveness, cross-river mobility, and safety to compare and narrow the list of potential corridors. None of the criteria were pass/fail; rather they were used collectively to weigh the strengths and weaknesses of each bridge scenario. This document includes an additional level of screening to compare and narrow the list of potential bridge scenarios within the three identified corridors, and applies criteria based on environmental impacts, traffic conditions, safety, impacts on the existing US 41 corridor, redundancy, and life-cycle costs.

#### 3.1 POTENTIAL ENVIRONMENTAL IMPACTS

The July 2017 *Screening Report* evaluated each of the corridors on a range of potential environmental impacts based on data from windshield surveys and previous studies. For this evaluation, only limited consideration of environmental impacts is appropriate. Bridge scenarios that construct a four-lane I-69 would be designed with an open median that could be closed if additional lanes were needed in the future. As a result, within a corridor, the three bridge scenarios would have nearly identical impacts to right-of-way and environmental resources and these factors would not make a material difference when selecting a bridge scenario. A full evaluation of impacts will be completed and documented in the DEIS for each of the alternatives to be carried forward from this screening.

Because the bridge scenarios under consideration in this screening supplement involve the disposition of the existing US 41 bridges, it is appropriate to address the potential for impacts under Section 4(f) of the US Department of Transportation Act of 1966. The existing northbound US 41 bridge has been determined to be eligible for listing in the National Register, and is therefore subject to protection under Section 4(f). The southbound US 41 bridge is more than 60 years old and is also considered to be eligible for the National Register. For bridge scenarios that would no longer use one or both of these bridges for vehicular traffic, an evaluation will be conducted to determine if the bridge would remain in place for another use or if it would be removed; this evaluation will be documented in the DEIS. Bridge options that would result in removal of one or both US 41 bridges would require a Section 4(f) evaluation to determine there are no feasible and prudent alternatives to their removal.

## 3.2 CROSS-RIVER TRAFFIC DISTRIBUTION, POTENTIAL TOLL REVENUE AND POTENTIAL TOLLING ASSUMPTIONS

Table 3-1 presents the results of the regional traffic model analysis for the project design year (2045). For each bridge scenario, the analysis considered a "low traffic" and a "high traffic" set of



tolling assumptions to provide estimates of the potential range of traffic that would use each crossing, depending on the final tolling policy. For this evaluation, it was assumed that "low traffic" conditions would correspond to lower use of I-69 and "high traffic" conditions would correspond to higher use of I-69. Tolling only one of the river crossings, or tolling one crossing at a lower rate than the other, could result in more traffic using the non-tolled or lower rate crossing.

"Low traffic" assumptions are generally based on tolling the new I-69 crossing at rates similar to those now being charged in the Louisville, Kentucky, metropolitan area, with no tolls or significantly reduced tolls on the US 41 bridges resulting in relatively low volumes of traffic using the new I-69 bridge.

"High traffic" assumptions use toll rates similar to the Louisville area bridges for bridges on both I-69 and US 41 with the same toll rates on all bridges. These scenarios increase traffic on the I-69 crossing, more equally distribute traffic, and make better use of the new interstate bridge capacity. For example, bridge scenarios that retain both US 41 bridges (Bridge Scenarios 4, 7, and 10) and have no toll on US 41 ("low traffic" assumption) result in only 13,000 to 14,000 vehicles using I-69 each day. Under the "high traffic" assumptions (equal tolls on all bridges), those same scenarios result in a relative balance of traffic between the two roadways. Bridge scenarios that retain one US 41 bridge (Bridge Scenarios 3, 6, and 9) similarly have a relative balance of traffic between the two roadways under all toll assumptions considered.

	LOW TRAFFI	C SCENARIO	IC SCENARIO	
BRIDGE SCENARIO	US 41	I-69	US 41	I-69
1 - No Build	50,200	N/A	50,200	N/A
2 - West Corridor 1, 0 US 41 Bridges	N/A	50,200	N/A	50,200
3 - West Corridor 1, 1 US 41 Bridge	26,000	27,300	24,200	28,500
4 - West Corridor 1, 2 US 41 Bridges	40,200	13,000	27,500	27,000
5 - West Corridor 2, 0 US 41 Bridges	N/A	47,100	N/A	47,100
6 - West Corridor 2, 1 US 41 Bridge	28,300	24,700	24,700	27,900
7 - West Corridor 2, 2 US 41 Bridges	39,800	12,900	26,800	26,200
8 - Central Corridor 1, 0 US 41 Bridges	N/A	46,700	N/A	46,700
9 - Central Corridor 1, 1 US 41 Bridge	26,400	23,100	23,400	25,000
10 - Central Corridor 1, 2 US 41 Bridges	42,300	13,700	26,300	26,300

#### Table 3-1. Forecasted Traffic Volumes

#### 3.3 OPTIMIZE BRIDGE CAPACITY

The goal of optimizing bridge capacity is to provide acceptable travel conditions without creating excess cross-river traffic capacity that unnecessarily adds long-term bridge maintenance costs. The following metrics were used to evaluate each bridge scenario's achievement of this goal:

• Level of service (LOS) is a qualitative measure used to describe the quality of traffic service. As described in Section 3.1 of the July 2017 *Screening Report*, one of the project's performance measures based on the purpose and need is to provide a river crossing for



I-69 operating at a minimum of LOS D in 2045, with LOS C being preferable. As shown in Table 3-2, each bridge scenario is projected to provide LOS C or better for the I-69 river crossing.

• Volume to capacity (V/C) ratio is the relationship between projected traffic volumes and a roadway's capacity, which is the maximum number of vehicles that can be theoretically accommodated over a period (e.g., an hour). A V/C ratio approaching 1 indicates that a roadway is operating close to maximum capacity; a lower V/C ratio indicates that a roadway has excess capacity. Kentucky Transportation Cabinet (KYTC) *Design Memorandum No.* 03-11 recommends that, in urban areas, a V/C ratio of 1.0 be targeted and that a proposed design that would result in a V/C lower than 0.8 should be evaluated to confirm that the surplus capacity is warranted.

Table 3-2 provides the estimated V/C ratio for each bridge scenario based on the "high traffic" toll assumptions. Although all V/C ratios are below 0.8, the bridge scenarios that provide eight cross-river travel lanes result in V/C ratios much lower than the recommended 0.8 ratio. Therefore, regardless of corridor, the 8-lane bridge scenarios would all have excess capacity.

BRIDGE SCENARIO	V/C RATIO	РЕАК НС I-69	OUR LOS US 41	CROSS-RIVER CAPACITY
1 - No Build	0.70		D	N/A
2 - West Corridor 1, 0 US 41 Bridges	0.55	С		Adequate
3 - West Corridor 1, 1 US 41 Bridge	0.62	С	D	Adequate
4 - West Corridor 1, 2 US 41 Bridges	0.43	С	В	Excess
5 - West Corridor 2, 0 US 41 Bridges	0.47	С		Adequate (1)
6 - West Corridor 2, 1 US 41 Bridge	0.70	С	D	Adequate
7 - West Corridor 2, 2 US 41 Bridges	0.42	В	В	Excess
8 - Central Corridor 1, 0 US 41 Bridges	0.54	С		Adequate
9 - Central Corridor 1, 1 US 41 Bridge	0.70	В	D	Adequate
10 - Central Corridor 1, 2 US 41 Bridges	0.49	А	С	Excess

#### Table 3-2. Cross-River Traffic and Capacity Evaluation

(1) While V/C ratio is low, 6-lanes on I-69 are required with this scenario to accommodate operational needs associated with nearby entrances/exits.

#### 3.4 SAFETY CONSIDERATIONS

At this stage of the design process, comparisons of the bridge scenarios on the basis of safety are limited due to the level of design detail available. However, a few observations are possible and warrant consideration.

Two distinct traffic streams cross the river: those with origins or destinations within the project area, and those that are traveling through the project area. When a vehicle enters or exits an interstate, it creates a potential for crashes due to the need to merge and the differences in speed. Therefore, the separation of these two traffic streams would reduce the potential for crashes.



Bridge scenarios that retain one or both existing US 41 bridges would separate local and through traffic and would thus improve safety for both local traffic on US 41 and through traffic on I-69.

The presence of an elevated roadway, especially where it is built on retaining walls, can potentially reduce sight distances at nearby intersections. This potential is greatest for West Corridor 2, where the highway would be located immediately adjacent to existing US 41. For West Corridor 2, the US 41 intersections at Watson Lane and Rettig Road/Marywood Drive, that provide connections to the residential areas to the west would have the greatest potential safety concerns related to limited sight distances. This is especially the case for Bridge Scenario 7 – Low Traffic Scenario, which has higher traffic volumes remaining on US 41.

#### 3.5 US 41 CORRIDOR ACCESSIBILITY/VISIBILITY

The existing US 41 corridor between US 60 and the Ohio River (referred to locally as "the commercial strip") represents a significant portion of the commercial activity in Henderson County, particularly for vehicle-oriented services such as gas stations, fast food restaurants, and automobile dealerships. Today, these businesses benefit from both high accessibility (US 41 is a major artery) and high visibility (40,000+ vehicles pass by daily). Public input received to date indicates that maintaining both benefits is desirable.

With West Corridor 1, the alignment for I-69 would avoid most of the businesses along the US 41 commercial strip, leaving it largely intact and continuing to support the commercial activity. It is also sufficiently separated from the US 41 roadway such that elevated fills and bridges on I-69 would not impact sight distances at intersections along US 41. Bridge Scenarios 3 and 4 would facilitate local cross-river access via the existing US 41 bridge(s). With Bridge Scenario 2, both US 41 bridges would be removed from service and would require local cross-river traffic to use I-69.

All of the West Corridor 2 bridge scenarios would remove all businesses along the west side of US 41 through the commercial strip. Less than half of the existing US 41 right-of-way would remain to the east of I-69, where a new two-lane roadway would be provided through the commercial strip for local traffic. These changes would alter the function of US 41, converting it from an independent commercial corridor into more of a frontage road for I-69.

For Central Corridor 1, each of the bridge scenarios would shift through traffic from US 41 to the new I-69 roadway to the east. Bridge Scenario 8 would remove both existing US 41 bridges from service and would require all cross-river traffic to use I-69, which would greatly reduce traffic volumes on existing US 41 through the commercial strip and could affect the viability of businesses along US 41 that depend on passing traffic. On the other hand, Bridge Scenarios 9 and 10 would retain one or both US 41 bridges, which would maintain local cross-river access on US 41 and would help maintain the viability of traffic dependent businesses on the commercial strip.

#### 3.6 RELIABILITY AND REDUNDANCY

US 41 is the only current roadway that crosses the Ohio River in the Evansville metropolitan area. The next nearest crossing is 30 miles upstream in Owensboro, Kentucky. Incidents in the past, either a vehicle crash or a barge striking a bridge pier that have resulted in closure of one or both US 41 bridges, have caused major delays for cross-river traffic. A new I-69 bridge would be



designed to current standards: it would be wider than the existing US 41 bridges, and thus less likely to require a full closure due to a vehicle crash, and it would be designed to be more resistant to barge strikes and seismic events than the existing US 41 bridges. As a result, any alternative that would construct a new bridge for I-69 would improve the reliability of cross-river traffic in the event of an incident.

Public input during the screening process has strongly supported creating a second crossing in the area to reduce the impacts of even a very short-term bridge closure. Bridge Scenarios 3, 4, 6, and 7 would all provide two or more bridges for area traffic, although the I-69 bridge would be quite close to the US 41 bridge(s) and it is possible that an extreme incident could affect all the bridges. Bridge Scenarios 9 and 10 would provide more separation between bridge locations decreasing the likelihood that the bridges would be affected by the same incident. Bridge Scenarios 2, 5, and 8 would all provide a single bridge to serve the region.

While each of the bridge scenarios would improve reliability of cross-river travel based on current standards, those that provide multiple bridges would provide additional redundancy benefits in case of extreme incidents.

#### 3.7 TOTAL PROJECT COST AND FINANCIAL FEASIBILITY

Sections 2.4 and 2.5 present construction-related and long-term maintenance cost estimates for each bridge scenario. Table 3-3 below aggregates the cost estimates for a total cost for each bridge scenario in 2062 (35 years after construction). As shown in the table, the maintenance costs for retaining the two US 41 bridges results in the total cost for Bridge Scenarios 4, 7, and 10 being the highest total cost scenario for each corridor. Bridge Scenarios 3, 6, and 9 all retain one of the US 41 bridges, but the long-term maintenance costs for the remaining US 41 bridge is offset somewhat by the construction cost savings of only needing four lanes on I-69. This makes the total costs of these three scenarios comparable to Bridge Scenarios 2, 5, and 8, which remove both US 41 bridges and construct a new six-lane I-69 bridge. The total scenario cost difference between Bridge Scenarios 3, 6, and 9 range from \$8 million to \$31 million more than Bridge Scenarios 2, 5, and 8. As noted earlier, several other potential costs such as construction financing, debt service, and toll collection have not yet been estimated and are not included in the total cost estimate.

Regardless of the toll policy that is adopted prior to construction, toll revenue projections do not cover total project costs for any of the alternatives, thereby requiring funding from other sources to make the project financially feasible. Alternatives that toll all cross-river bridge users would minimize the need for other funding sources. A decision regarding toll policy will not be made until the project is ready for construction and will consider public input and all available funding sources.



BRIDGE SCENARIO	CONSTRUCTION- RELATED COST (\$M)	MAINTENANCE COST (\$M)	TOTAL COST (\$M)
1 - No Build	0	267	267
2 - West Corridor 1, 0 US 41 Bridges	1,285	150	1,435
3 - West Corridor 1, 1 US 41 Bridge	1,213	253	1,466
4 - West Corridor 1, 2 US 41 Bridges	1,228	366	1,594
5 - West Corridor 2, 0 US 41 Bridges	1,337	150	1,487
6 - West Corridor 2, 1 US 41 Bridge	1,263	251	1,514
7 - West Corridor 2, 2 US 41 Bridges	1,283	366	1,649
8 - Central Corridor 1, 0 US 41 Bridges	1,248	159	1,407
9 - Central Corridor 1, 1 US 41 Bridge	1,170	245	1,415
10 - Central Corridor 1, 2 US 41 Bridges	1,166	358	1,524

#### Table 3-3. Total Project Costs

Table Notes: (1) All costs are shown in YOE dollars. (2) Maintenance costs are based on maintenance required from 2018 to 2062.



# **4** BRIDGE SCENARIO COMPARISON

Based on the evaluation criteria in Section 3, the bridge scenarios were compared and evaluated within each corridor. These evaluations were used to develop a recommended alternative within each corridor to be carried forward for more detailed evaluation in the DEIS. The following sections summarize the findings of the evaluation within each corridor.

#### 4.1 WEST CORRIDOR 1, BRIDGE SCENARIOS 2-4

West Corridor 1 is the most westerly alignment being considered, and would avoid most of the businesses along the US 41 commercial strip, leaving it largely intact and continuing to function as a destination for commercial activity. It is also sufficiently separated from the US 41 roadway such that elevated fills and bridges on I-69 would not impact sight distances at intersections along US 41.

Bridge Scenario 2 would optimize cross-river bridge capacity, providing the needed six traffic lanes across the river, all on the new I-69 bridge. However, it would require all local cross-river traffic to use I-69 to cross the Ohio River, resulting in local traffic having to share the I-69 roadway with higher speed through traffic, adding additional turning movements to access and exit I-69, and possibly reducing safety. With only a single river bridge, Bridge Scenario 2 would not provide route redundancy in case of an extreme incident. Although this scenario has the lowest cost of the West Corridor 1 scenarios, it is not recommended to be carried into the DEIS due to the safety, redundancy, and accessibility concerns described above.

Of these West Corridor 1 bridge scenarios, Bridge Scenario 3 would retain one of the existing US 41 bridges for two-way local cross-river traffic and would optimize cross-river bridge capacity, providing two lanes on existing US 41 and four lanes on the new I-69 bridge. Local cross-river traffic would not be required to enter and exit I-69 to cross the river and would avoid the need to mix with higher speed through traffic on I-69. This scenario also provides for two independent bridges across the river, making full closures due to extreme incidents less likely. With a total estimated cost of \$1,466 million, Bridge Scenario 3 is \$31 million (about 2 percent) more expensive than Bridge Scenario 2, but it provides additional safety and reliability benefits and is therefore recommended to be retained as a practical and feasible alternative for study in the DEIS.

Bridge Scenario 4 also is not recommended to be retained because it would result in eight total bridge lanes across the river; long-term traffic forecasts only show that six lanes are needed. At \$128 million more than Bridge Scenario 3 with no additional benefits, this scenario is not recommended for further consideration.

Table 4-1 provides a summary of the evaluation of West Corridor 1 bridge scenarios.



EVALUATION CRITERIA	BRIDGE SCENARIO 2	BRIDGE SCENARIO 3	BRIDGE SCENARIO 4
	(0 US 41 BRIDGES)	(1 US 41 BRIDGE)	(2 US 41 BRIDGES)
Section 4(f) Impacts to Historic Bridges	2 bridges taken out of service, Section 4(f) impacts to be determined	1 bridge taken out of service, Section 4(f) impacts to be determined	Bridges remain in service, no Section 4(f) impacts to historic bridges
Traffic Distribution/ Potential Toll Revenue	All traffic on I-69 bridge	Traffic balanced under low and high traffic assumptions	Traffic balanced under high traffic assumption Imbalanced under low traffic assumption
Bridge Capacity Optimization	Adequate capacity	Adequate capacity	Excess capacity
Safety Considerations	Local/interstate traffic	Local/interstate traffic	Local/interstate traffic
	mixed	separated	separated
	No sight distance	No sight distance	No sight distance
	concerns	concerns	concerns
US 41 Corridor Accessibility/Visibility	US 41 Corridor visible from interstate Less accessible due to closure of US 41 bridges	US 41 Corridor visible from interstate Accessible from I-69 and US 41 bridge	US 41 Corridor visible from interstate Accessible from I-69 and US 41 bridges
Reliability and	No route redundancy	Route redundancy	Route redundancy
Redundancy		provided	provided
Project Cost and	Lowest cost bridge	\$31 million more than	\$159 million more than
Financial Feasibility	scenario	Bridge Scenario 2	Bridge Scenario 2

Table 4-1	West	Corridor 1	Bridge	Scenario	Comparison
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#### 4.2 WEST CORRIDOR 2: BRIDGE SCENARIOS 5–7

The West Corridor 2 alignment would be located along the west side of the US 41 commercial strip and would remove all businesses along the west side of US 41 in this area. Less than half of the existing US 41 right-of-way would remain to the east of I-69, where a new two-lane roadway would be provided through the commercial strip. These changes would alter the function of US 41, converting it from an independent commercial corridor into more of a frontage road for I-69.

Bridge Scenario 5 would provide the optimum six lanes for cross-river traffic, all on the new I-69 bridge, and both US 41 bridges would be taken out of service. This scenario has an advantage over Bridge Scenario 6 because it shifts all local cross-river traffic to I-69 and reduces traffic volumes on US 41, which would become more of a frontage road to I-69, rather than an independent commercial corridor. Reducing traffic on US 41 improves safety at the cross-road intersections due to the proximity of I-69. To some extent, it also mitigates the concerns of limited sight distance due to the immediately adjacent elevated I-69 roadway. With the lowest total cost of the three bridge scenarios in this corridor, similar footprint impacts, and these safety advantages, Bridge Scenario 5 is recommended to be retained as a practical and feasible alternative for study in the DEIS.



Bridge Scenario 6 would provide the optimum six lanes for cross-river traffic on two bridges: four lanes on the new I-69 bridge and two lanes on one of the existing US 41 bridges. However, as described in Section 3.5, with US 41 functioning as a frontage road to the interstate, the higher traffic volumes on US 41, compared to Bridge Scenario 5, would not mitigate the intersection safety and limited sight distance concerns caused by the immediately adjacent elevated I-69 roadway. With total costs being higher than Bridge Scenario 5, similar footprint impacts, and additional safety concerns, Bridge Scenario 6 is not recommended for further consideration.

Bridge Scenario 7 also is not recommended to be retained because it would result in eight total bridge lanes across the river; long-term traffic forecasts show that only six lanes are needed. At \$135 million more than Bridge Scenario 6 with no additional benefits, this scenario is not recommended for further consideration.

Table 4-2 provides a summary of the evaluation of West Corridor 2 bridge scenarios.

EVALUATION CRITERIA	BRIDGE SCENARIO 5 (0 US 41 BRIDGES)	BRIDGE SCENARIO 6 (1 US 41 BRIDGE)	BRIDGE SCENARIO 7 (2 US 41 BRIDGES)
Section 4(f) Impacts to Historic Bridges	2 bridges taken out of service, Section 4(f) impacts to be determined	1 bridge taken out of service, Section 4(f) impacts to be determined	Bridges remain in service, no Section 4(f) impacts to historic bridges
Traffic Distribution/ Potential Toll Revenue	All traffic on I-69 bridge	Traffic balanced under low and high traffic scenarios	Traffic balanced under high traffic scenario Imbalanced under low traffic assumption
Bridge Capacity Optimization	Adequate capacity	Adequate capacity	Excess capacity
Safety Considerations	Sight distance concerns, but minimized by reduced traffic on US 41	Sight distance concerns	Sight distance concerns, most serious under low traffic assumption
US 41 Corridor Accessibility/Visibility	US 41 Corridor visible from interstate Directly accessible from adjacent interstate	US 41 Corridor visible from interstate Accessible from I-69 and US 41 bridge	US 41 Corridor visible from interstate Accessible from I-69 and US 41 bridges
Reliability and Redundancy	No route redundancy	Route redundancy provided	Route redundancy provided
Project Cost and Financial Feasibility	Lowest cost bridge scenario	\$27 million more than Bridge Scenario 5	\$162 million more than Bridge Scenario 5

#### Table 4-2. West Corridor 2 Bridge Scenario Comparison

#### 4.3 CENTRAL CORRIDOR 1: BRIDGE SCENARIOS 8–10

Central Corridor 1 would create a new roadway corridor for I-69 about 2 miles east of US 41, geographically separated from the existing US 41 commercial strip.

Bridge Scenario 8 would provide the needed six lanes, all on the new I-69 bridge, requiring that all local traffic cross the river on I-69. For local traffic between Henderson and downtown



Evansville, this route would add approximately 4 miles of travel distance and would require all local cross-river trips to use the I-69 crossing. This configuration would also have the greatest potential impact on the commercial strip in terms of reduced traffic visibility and accessibility, and it would not provide the route redundancy in case of an extreme incident. For these reasons, Bridge Scenario 8 is not recommended for further consideration.

Bridge Scenario 9 would optimize cross-river bridge capacity, providing four cross-river lanes on the new I-69 bridge and two lanes on one of the existing US 41 bridges. By maintaining one existing US 41 bridge, this scenario would maintain local cross-river access to the US 41 commercial strip, as well as provide a separate travel route that could be used in the case of an incident on either bridge. With a total cost of \$1,415 million, Bridge Scenario 9 is only \$8 million more expensive than Bridge Scenario 8, but it provides additional benefits; therefore, it is recommended to be retained as a practical and feasible alternative for study in the DEIS.

Bridge Scenario 10 is not recommended to be retained because it would result in eight total bridge lanes across the river; long-term traffic forecasts show that only six lanes are needed. At \$109 million more than Bridge Scenario 9 with no additional benefits, this scenario is not recommended for further consideration.

Table 4-3 provides a summary of the evaluation of Central Corridor 1 bridge scenarios.

EVALUATION CRITERIA	BRIDGE SCENARIO 8 (0 US 41 BRIDGES)	BRIDGE SCENARIO 9 (1 US 41 BRIDGE)	BRIDGE SCENARIO 10 (2 US 41 BRIDGES)
Section 4(f) Impacts to Historic Bridges	2 bridges taken out of service, Section 4(f) impacts to be determined	1 bridge taken out of service, Section 4(f) impacts to be determined	Bridges remain in service, no Section 4(f) impacts to historic bridges
Traffic Distribution/ Potential Toll Revenue	All traffic on I-69 bridge	Traffic balanced under low and high traffic scenarios	Traffic balanced under high traffic scenario Imbalanced under low traffic scenario
Bridge Capacity Optimization	Adequate capacity	Adequate capacity	Excess capacity
Safety Considerations	Local/interstate traffic Mixed	Local/interstate traffic separated	Local/interstate traffic separated
US 41 Corridor Accessibility/Visibility	US 41 Corridor not visible from interstate Lowest accessibility	US 41 Corridor not visible from interstate Accessible from US 41 bridge	US 41 Corridor not visible from interstate Accessible from US 41 bridges
Reliability and Redundancy	No route redundancy	Route redundancy provided	Route redundancy provided
Project Cost and Financial Feasibility	Lowest cost bridge scenario	\$8 million (<1%) more than Bridge Scenario 8	\$117 million more than Bridge Scenario 8

#### Table 4-3. Central Corridor 1 Bridge Scenario Comparison



#### 4.4 RECOMMENDED DEIS ALTERNATIVES

With this additional information and analyses, INDOT and KYTC have confirmed the recommendations of the July 2017 *Screening Report* and recommend that the following provide a reasonable range of alternatives to evaluate in detail in the DEIS:

- No Build Alternative: required by NEPA to serve as a baseline for comparison
- West Alternative 1: West Corridor 1, with four lanes on I-69 and retaining one of existing US 41 bridges (Bridge Scenario 3)
- West Alternative 2: West Corridor 2, with six lanes on I-69 and taking both existing US 41 bridges out of service (Bridge Scenario 5)
- Central Alternative 1: Central Corridor 1, with four lanes on I-69 and the retaining one of the existing US 41 bridges (Bridge Scenario 9)

The build alternatives are shown in Figure 4-1.

As additional environmental investigations are completed for the DEIS (e.g., environmental justice, threatened and endangered species, Section 4(f) resources, etc.), the alternatives recommended for evaluation in the DEIS may have to be revised as impacts, mitigation, and minimization efforts are further developed. As part of the more detailed evaluations for the DEIS, additional environmental justice outreach efforts such as surveys and meetings in identified area environmental justice communities will be conducted to evaluate the potential effects on low-income and minority populations. Finally, as noted above, the disposition of the existing US 41 bridge(s) taken out of vehicular use will be determined through future analysis and documented in the DEIS.





