



US 51 BRIDGE PROJECT

KYTC Item No. 1-100.00 & 1-1140.00

Wickliffe, KY to Cairo, IL

January 2014

Alternative Selection Report

US 51 OHIO RIVER BRIDGE PROJECT

KYTC Item No. 1-100.00 & 1-1140.00

Wickliffe, KY to Cairo, IL

EXECUTIVE SUMMARY

PROJECT OVERVIEW

The US 51 Bridge Project proposes replacement or rehabilitation of the existing US 51 Bridge that connects Ballard County, Kentucky with Cairo, Illinois. The planning phase of this project was completed in 2014; this *Executive Summary* summarizes the findings of the planning phase.

The US 51 Bridge carries US 51, US 60, and US 62 traffic across the Ohio River. It also provides a connection to the US 60/US 62 Mississippi River Bridge to Missouri, approximately ½ mile to the south. Maintaining the cross-river connectivity is important to the local communities, resident farms, and other businesses in the region. During the traffic counts completed in January 2013, over 150 large trucks (including farm, grain, and logging trucks) were observed using the US 51 bridge over an 8-hour period.

If the US 51 Bridge were not available for local traffic, the detour trip between Wickliffe, KY and Cairo, IL increases from 7 miles to 80+ miles per direction. Adding approximately 70 miles per direction to trips between Illinois and Kentucky would be a hardship to area residents. This is especially true for the population of Cairo, IL which exhibits elevated concentrations of minority and low income populations, which rely on the US 51 Bridge to access jobs in Wickliffe, KY. On the Kentucky side of the river, the US 51 Bridge is essential to farmers. Agriculture is a major component of Ballard County's economy and the bridge facilitates transport of crops and livestock from the county's farms to the interstates and ports in Illinois.



Existing US 51 Bridge

PROJECT PURPOSE & NEED

The primary purpose of the proposed project is to rehabilitate or replace the existing US 51 Ohio River Bridge in order to: improve or replace the functionally obsolete/structurally deficient bridge; maintain cross-river connectivity between Wickliffe, KY and Cairo, IL; and improve safety on the bridge and its approaches.

CONDITION OF THE EXISTING BRIDGE

The existing bridge was constructed between 1936 and 1938.

The bridge is rated both Functionally Obsolete (because of its substandard geometric features) and Structurally Deficient (because the original design load for the bridge is less than today's current design standards). This does not mean the existing bridge is unsafe.

Following the 2012 inspection and 2013 load rating analysis, KYTC assigned the US 51 Bridge a sufficiency rating of 39.8 on a 100-point scale. Bridges considered structurally deficient or functionally obsolete with a sufficiency rating less than 50.0 are eligible for replacement with federal funds under the Federal-Aid Highway Bridge Replacement or Rehabilitation Program.

The existing bridge was designed before seismic design was required. Applying today's seismic design criteria, preliminary estimates indicate that severe damage or collapse is probable in the event of a major earthquake.

The functional and geometric deficiencies affect the bridge's ability to carry traffic over the river in an effective manner.

Bridge Geometric Deficiencies:

- Narrow 10-foot lanes
- Narrow 1'-3" shoulders
- No accommodations for pedestrians or bicyclists
- One of the sag vertical curves in Span 2 does not meet current AASHTO design standards for headlight sight distance.
- The horizontal curve on the Kentucky approach does not meet current AASHTO or state design standards.

Currently the bridge is allowed to carry legal loads, but permit loads (i.e. oversize or overweight vehicles) are not allowed. ***Under the no-build scenario it is anticipated the bridge would be closed to truck traffic around 2025 and closed to all traffic around 2030.***



Narrow lanes and shoulders

TRAFFIC OPERATIONS

The 2013 Average Annual Daily Traffic (AADT) volume on the US 51 Bridge is 5,400 vehicles per day (vpd). Approximately 35% of the bridge traffic is trucks. By 2040, the bridge AADT is anticipated to increase to 6,200 vpd, which translates to 370 vehicles per hour traveling in the peak direction during the 2040 design hour. Based on these volumes, a two lane facility provides adequate capacity for anticipated future traffic demands.

CRASHES AND SAFETY

During October 2008-September 2012, there were 18 vehicle crashes on the bridge between the 20 mph curve in Kentucky and the US 60/US 62/US 51 intersection in Illinois. Of these, there were no fatalities and one injury collision. Crashes were largely concentrated at either end of the bridge. The bridge approach in Kentucky has a critical rate factor (CRF) of 1.13 and the bridge approach in Illinois has a CRF of 1.52; both are considered high crash spots under KYTC analysis methodology. The primary crash types were sideswipes and single vehicle collisions.

INPUT

During coordination activities in April and May 2013, agencies, local officials, and members of the public were given opportunities to review and comment on the range of alternatives considered. Input indicated that the bridge is a vital link for farming operations; therefore, closures and lane restrictions should be minimized during any future construction efforts. Survey respondents indicated a strong preference for constructing a new river crossing at or near the existing location.

RECOMMENDATION

Combined Alternate 2 shown in the attached map is recommended to advance for additional development. Combined Alternate 2 represents a range of potential crossing locations located upstream of the current US 51 Bridge structure - within 2,000 feet of its present location. In future project development phases, designers should look at alignment, cross-section, and bridge type options that best fit within this corridor. Cable stay, truss, and arch bridges are all considered suitable bridge types at this location.

Combined Alternate 2 is approximately 1.8 miles in length and would require a horizontal clearance of 900 feet for the navigational channel based on correspondence provided by the US Coast Guard. A vertical clearance of at least 113 feet above the zero gage at Cairo is recommended for the mid 700-foot portion of the primary navigation channel. Final vertical clearance requirements will be determined in future phases of project development when more detailed information is available.

Construction is estimated to cost \$180-210 million¹ depending on the selected cross-section.

Combined Alternate 2 Planning Level Cost Estimate (44 ft Clear Roadway Width on Bridge)	
Phase	Cost (millions) ¹
Design	\$25.2
Right-of-Way	\$0.9
Utilities	\$0.1
Construction	\$210.0
Total	\$236.2

¹ Cost Estimates in 2013 Dollars

ENVIRONMENTAL CONCERNS FOR RECOMMENDED ALTERNATE

A windshield survey was conducted in Fall 2013 to identify environmental concerns that should be addressed as part of any future project development activities. The survey found the following environmental considerations in the Combined Alternative 2 footprint that will require further analysis in future project phases:

- Habitat for endangered species: Indiana bat, Gray bat, listed mussel species, pallid sturgeon
- Potential bald eagle habitat, including a known nest site in the vicinity
- Streams, Floodplains, & Wetlands
- Potential for economic effects associated with barge moorings along shore



- Interstate
- US Highway
- State Highway
- Local Road
- Railroad
- State Boundary
- County Boundary
- Study Area
- Streams
- Combined Alternate 2

- Community Resources**
- Airport
 - Boat Ramp
 - Cemetery
 - Health Facility
 - Park
 - School
- Major Employers**
- Industrial Area
 - Marine Transportation



**US 51
Ohio River Bridge
Recommended
Alternate**

Alternative Selection Report



**US 51 Ohio River Bridge Study between Wickliffe, KY, and Cairo, IL
Kentucky Transportation Cabinet
Item No. 1-100.00 and 1-1140.00**

January 2014

**Submitted to:
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Attachments

Attachment A: Needs & Deficiencies Report

Apx A: Existing Bridge Conditions White Paper

Apx B: Geotechnical White Paper

Apx C: Traffic Operations White Paper

Attachment B: Purpose & Need Statement

Attachment C: Environmental Overview Report

Apx A: Geotechnical White Paper

Apx B: Resource Agency Letters regarding Threatened & Endangered Species

Apx C: Socioeconomic White Paper

Apx D: Cultural Resources White Paper

Apx E: Hazardous Materials White Paper

Attachment D: Alternatives Screening Report

Apx A: Meeting Summaries & Key Stakeholder Correspondence

Apx B: Purpose & Need Statement

Apx C: Alternative Environmental Maps

Attachment E: Bridge Rehabilitation Fact Sheet

Attachment F: Engineering Considerations White Paper

Attachment G: Bridge Type Concepts Fact Sheet

Attachment H: Tech Memo for Recommended Alternative Windshield Survey

Attachment I: Project Team Meeting Summaries

Attachment J: Resource Agency Meeting Summaries & Correspondence

Attachment K: Public Outreach Materials

Attachment L: River Hydraulics and Navigation Overview

Apx A: United States Coast Guard Correspondence

Apx B: United States Army Corps of Engineers Ohio River Navigation Charts

Apx C: Federal Emergency Management Agency Flood Insurance Studies

Apx D: Legacy Height Datums on the Mississippi and Illinois River Systems

Electronic Attachments

Attachment 1: Alternative Selection Report with Attachments

Attachment 2: Public Meeting Summary

Attachment 3: Agency Coordination Notebook

Attachment 4: GIS Mapping and Aerials

Attachment 5: Project Mailing List

Alternative Selection Report

The US 51 Bridge Project (KYTC Item Nos. 1-100.00 and 1-1140.00) proposes replacement or rehabilitation of the existing US 51 Bridge that connects Ballard County, Kentucky with Cairo, Illinois. The planning phase of this project was completed in 2013; this *Alternative Selection Report* summarizes the findings of the planning phase.

The US 51 Bridge carries US 51, US 60, and US 62 traffic across the Ohio River. The bridge carries approximately 5,400 vehicles across the Ohio River each day between Wickliffe and Ballard County, KY and Cairo, IL with approximately 35% of that being truck traffic. It also provides a connection to the US 60/US 62 Mississippi River Bridge to Missouri, approximately ½ mile to the south.

This *Alternative Selection Report* describes the activities completed under the planning phase of work, divided into four topic areas:

- Chapter 1 describes the existing transportation needs in the study area and identifies the purpose for the project.
- Chapter 2 details major environmental constraints in the study area. These should be further evaluated in any future phases of project development.
- Chapter 3 describes the alternative development process: which alternatives were considered and how the range of alternatives was pared down.
- Chapter 4 summarizes coordination and outreach activities undertaken as part of the planning phase of the project. In addition to internal project team meetings, the team coordinated with federal, state, and local resource agencies, local officials and stakeholders, and members of the public.
- Chapter 5 describes the recommended alternative to advance to future phases of project development.

All supporting documentation, project reports, white papers, and meeting summaries developed during the planning phase of the US 51 Bridge Project are appended to this report to form a single, consolidated source for project information. These documents are discussed in the following chapters.

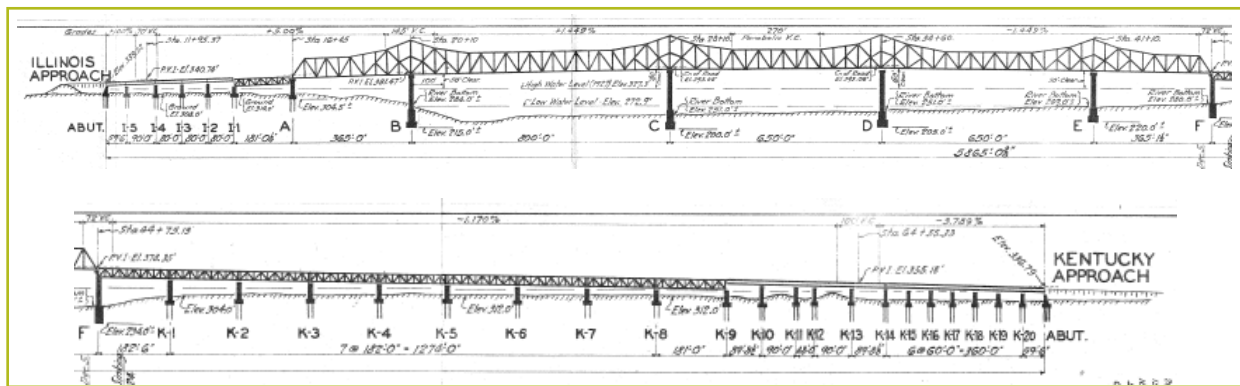
1. Project Area Needs & Project Purpose

The *Needs & Deficiencies Report (Attachment A)* provides a planning level overview of the existing roadway and traffic conditions within the Study Area, shown in **Figure 2**.

1.1. Existing Bridge Geometry & Condition

The US 51 Bridge was constructed between 1936 and 1938. It consists of 32 spans with 4 distinct bridge types, shown in **Figure 1**. The bridge crosses nearly perpendicular to the Ohio River near the confluence of the Ohio and Mississippi Rivers. The existing bridge contains two 10-foot wide lanes with two 1.25-foot wide shoulders. One of the vertical curves on the bridge does not meet current AASHTO policy for headlight sight distance (i.e., how far ahead drivers can see at night). The horizontal curve on the Kentucky approach is signed with a 20 mph speed limit; this curve does not meet AASHTO or state design policies.

Figure 1: Drawing of Bridge Profile, 1936



Based on the October 2012 fracture critical inspection, the bridge deck, superstructure, and substructure were each rated Satisfactory. Last painted in 2007, the paint was rated in Good condition. Today, the bridge can carry all legal loads, but permit loads are not allowed.

Following the 2012 inspection and 2013 load rating analysis, KYTC assigned a sufficiency rating of 39.8. The bridge is rated both Functionally Obsolete (because of its substandard geometric features) and Structurally Deficient (because the original design load for the bridge is less than today's current design standards).

The 2013 Average Annual Daily Traffic (AADT) volume on the US 51 Bridge is 5,400 vehicles per day (vpd). Approximately 35% of the bridge traffic is trucks. By 2040, the bridge AADT is anticipated to increase to 6,200 vpd, which translates to 370 vehicles per hour traveling in the peak direction during the 2040 design hour. Based on these volumes, a two-lane facility provides adequate capacity for anticipated future traffic demands.

During October 2008-September 2012, there were 18 vehicle crashes on the bridge between the 20 mph curve in Kentucky and the US 60/US 62/US 51 intersection in Illinois. Of these, there were no fatalities and one injury collision. Crashes were largely concentrated at either end of the bridge. The bridge approach in Kentucky has a CRF of 1.13 and the bridge approach in Illinois has a CRF of 1.52; both are considered high crash spots under KYTC analysis methodology. The primary crash types were sideswipes and single vehicle collisions.



- Interstate
- US Highway
- State Highway
- Local Road
- Railroad
- State Boundary
- County Boundary
- Study Area



0 2,000 4,000 Feet

0 0.5 1 Miles

Figure 2
US 51
Ohio River Bridge
Study Area

1.2. Other Highways

US 60/US 62 and US 51 are the primary highways in the study area. US 60/US 62 connects Barlow, KY to Wickliffe, KY through Illinois to Missouri. US 51 connects Wickliffe, KY to Cairo, IL before crossing I-57 in Illinois.

In Kentucky, both US 60/US 62 and US 51 have two 11-12-foot lanes with narrow shoulders. Both highways are rural principal arterials and are listed on the National Highway System, which includes roadways important to the nation's economy, defense, and mobility. US 60/US 62 and US 51 are state designated truck routes with a 40 ton gross vehicle weight limit. Several locations along both routes have substandard horizontal curve radii. US 51, approaching the Ohio River Bridge, is susceptible to flooding, although it lies on an embankment. The roadway shows signs of subsidence in places where the embankment has been undercut by water.

In Illinois, bridge traffic stops at a three-leg intersection; US 51 turns to the north while US 60/US 62 turns to the south. US 51 going north off the bridge is a principal arterial with four lanes that provides the main thoroughfare through Cairo. The highway progresses through a two mile series of closely spaced stop-controlled intersections in town. Generally, paved sidewalks run alongside either side of the highway through Cairo.

US 51 is also part of two National Scenic Byways: The Great River Road and The Ohio River Byway. In Kentucky, portions of US 51 are designated as part of two statewide bicycle routes: the Mississippi River Trail and the Ramblin' River Tour.

1.3. Project Purpose

The primary purpose of the project is to rehabilitate or replace the existing US 51 Ohio River Bridge in order to:

- Improve or replace the functionally obsolete/structurally deficient bridge;
- Maintain cross-river connectivity between Wickliffe, KY and Cairo, IL; and,
- Improve safety on the bridge and its approaches.

The full *Purpose and Need Statement* is included as **Attachment B**. The Purpose and Need was developed with input from resource agencies, the public, and the project team, and formed the basis for the alternative development and screening process.

In addition to the primary purpose of the project, secondary considerations were developed to describe other goals for the project. These include:

- Developing a cost-effective, constructible solution;
- Being sensitive to local resources like freight routes, communities, historic resources, and the environment;
- Improving system reliability during and after construction;
- Providing safe cross-river mobility for bicyclists; and,
- Providing for commercial river navigation in line with US Coast Guard recommendations.

2. Existing Natural & Human Environment

The *Environmental Overview Report (Attachment C)* provides a planning level overview of the existing conditions within the natural and human environment of the Study Area. Information was collected from readily available sources to identify “red flag” issues and fatal flaws for the alternatives development process.

Potential red flag issues are those identified resources within the Study Area that should be carefully considered as the project moves forward. Those issues, summarized in **Table 1**, include:

- Section 4(f) resources – Several large wildlife refuges/preserves lie within the Study Area, plus a number of smaller parks and known historic resources. To the extent possible, these resources should be avoided as alternatives are developed.
- Environmental Justice communities – The community of Cairo exhibits elevated concentrations of minority and low income populations. As the bridge provides an important link between communities and access to jobs, alternatives should be developed to avoid disproportionately affecting these groups.
- Threatened/Endangered species habitat – A number of known federally listed species occur in the Study Area. This includes known nest sites for the Interior Least Tern and Bald Eagles. There is also a known maternity colony and potential summer habitat for the Indiana bat. Surveys and additional coordination with USFWS will be required.
- Streams, floodplains, and wetlands – There are a number of water resources within the Study Area.
- Prime and statewide importance farmlands – Approximately fifty-five percent of soils in the Study Area (14,366 acres) are classified as prime farmland. Two percent of soils (370 acres) are classified as statewide important farmland.
- Hazardous materials sites and UST locations – Preliminary research identified 36 active and former UST sites located within the Study Area. There are also a number of waste disposal sites and industrial sites in the Study Area which could contain hazardous materials. In addition there are concerns of lead contamination under the existing US 51 Bridge.
- Geotechnical concerns – The Study Area is in proximity to the New Madrid fault. There is also the potential for high water and flood events near the Ohio River.

Table 1: Summary of Red Flag Environmental Issues

Category	Identified Issues in Study Area
Geology & Soils	<ul style="list-style-type: none"> - New Madrid seismic zone - Potentially severe and seasonal flooding
Water Resources	<ul style="list-style-type: none"> - Groundwater Wells - Rivers & Streams - Floodplains - Wetlands
Ecological Resources	<ul style="list-style-type: none"> - Boatwright Wildlife Management Area - Axe Lake Swamp State Nature Preserve - Cypress Creek National Wildlife Refuge - Other natural habitats for threatened & endangered species
Community Resources	<ul style="list-style-type: none"> - Prime & Statewide Importance Farmlands - Potential Environmental Justice Populations in Illinois - Cairo Parks: Fort Defiance, Halliday Park, & Saint Mary's Park - Scenic Byways along US 51 - 70+ mile detour per direction
Air Quality	<ul style="list-style-type: none"> - No key issues identified
Noise	<ul style="list-style-type: none"> - Sensitive receptors concentrated in Cairo, Wickliffe, Barlow, & Mound City
Cultural & Historic Resources	<ul style="list-style-type: none"> - Two NRHP Archaeological Sites: Levee in Barlow Bottoms & Mound City Marine Ways - Two NRHP Historic Districts: Cairo & Mound City National Cemetery - Three NRHP Listed Properties: Barlow House, Magnolia Manor, & Old Customs House - Two NRHP Eligible Structures: US 51 Bridge, US 60/US 62 Bridge
Hazardous Materials	<ul style="list-style-type: none"> - Lead contamination under bridge - Two waste disposal sites: Barlow transfer station, Mound City landfill - Environmental concern sites - Industrial sites along Illinois riverfront - Known UST locations

2.1. River Hydraulics

The *River Hydraulics and Navigation Study (Attachment L)* summarizes existing conditions along the Ohio River relative to the existing structure. The design team coordinated with the United States Army Corps of Engineers (USACE) to obtain hydraulic information of the Ohio River at the US 51 Bridge (Ohio River Milepoint 980.4):

- 2% Flowline = 321 ORD
- Normal Pool (Considered the Average June Pool) = 298.1 ORD
- US 51 Bridge Low Steel Illinois Span = 376.2 ORD
- US 51 Bridge Low Steel Center Span = 387.3 ORD

The above information is presented in the context of the Ohio River Datum (ORD). Below is a summary of the datum per the Cairo USACE Gage.

- Cairo Gage Ohio River Milepoint: 979.5
- Cairo Gage Elevation ORD: 270.9
- Cairo Gage Elevation NGVD 29: 270.47
- Cairo Gage Elevation NAVD: 270.87

3. Alternatives Development Process

The Initial Alternatives Screening Report (Attachment D) describes the conceptual alternatives that were developed and evaluates them against two levels of screening criteria. In the Level 1 Screening, all suggested alternatives were evaluated against the project Purpose and Need. Alternatives that passed this level of screening then advanced to Level 2 Screening. At this stage, additional planning-level information was prepared before alternatives were evaluated against the secondary considerations developed. The screening process resulted in a single alternative recommended for advancement for any future project development activities. Agencies, stakeholders, and the public were provided with opportunities to review and comment on alternatives throughout the process.

3.1. Range of Alternatives

Project engineers developed a selection of conceptual alternatives for consideration, shown in **Figure 3**. These alternatives were developed to represent the range of potential alternatives for consideration, including No Build, Rehabilitation, Superstructure Replacement and New Bridge Location Alternatives.

In the No Build Alternative, routine maintenance would continue on the existing structure, such as routine bridge inspections and replacement of isolated steel members as the condition falls below acceptable levels. This alternative serves as a baseline for comparison against other alternatives. Under the No Build Alternative, the bridge will remain structurally deficient and functionally obsolete. Under this scenario it is anticipated the bridge would be closed to truck traffic around 2025 and closed to all traffic around 2030.

In the Rehabilitation Alternative, it is anticipated repairs would be undertaken around year 2020 to keep the bridge open to traffic through the year 2045. This alternative includes repairing/strengthening structural steel members, patching concrete on the piers, repainting the structure, and placing a new deck. Additional information about this alternative is presented in the *Bridge Rehabilitation White Paper (Attachment E)*. The rehabilitation alternative does not address any of the sub-standard geometrics; therefore the bridge would remain classified as functionally obsolete. Also, seismic retro-fit costs have not been included in this appraisal and could be significant.

Alternative 1 would rebuild a new superstructure at the existing location of the US 51 Bridge. The existing piers would be retrofitted as needed to support the new superstructure and meet seismic guidelines. During construction, cross-river motorists would have to detour to an alternative river crossing, which increases the detour trip between Wickliffe and Cairo from 7 miles to 80+ miles per direction. It is anticipated the superstructure replacement alternative would extend the service life of the bridge 75 years.

All other build alternatives (Alternatives 2, 2A, 2B, 3, 3A, 4, and 5) would construct a new Ohio River Bridge structure upstream (north) of the existing US 51 Bridge. The existing bridge would remain in service through construction to maintain a river crossing and then be demolished once the new bridge is open to traffic. The new build alternatives would have a service life of at least 75 years.



- River Milepoint
- Sail Line
- == Interstate
- == US Highway
- == State Highway
- == Local Road
- Railroad
- State Boundary
- County Boundary
- Park
- City
- Lake/Pond
- Swamp/Marsh
- Wildlife Management Area
- Proposed Alternatives**
- Alternative 1
- Alternative 2
- Alternative 2A
- Alternative 2B
- Alternative 3
- Alternative 3A
- Alternative 4
- Alternative 5



0 2,000 4,000 Feet

0 0.5 1 Miles

Figure 3
US 51
Ohio River Bridge
 Range of Alternatives

3.2. Local Preferences

During coordination activities in April and May 2013, agencies, local officials, and members of the public were given opportunities to review and comment on the range of alternatives. Input indicated that the bridge is a vital link for farming operations; therefore, closures and lane restrictions should be minimized during any future construction efforts. Survey respondents indicated a strong preference for constructing a new river crossing at or near the existing location. Other key concerns expressed include:

- The US 51 approach in Kentucky should be improved to minimize closures during flood events.
- Constructing a replacement bridge at or near the existing location would minimize negative impacts and costs.
- Bypassing Cairo would have substantial negative impacts on the town.
- The bridge is an essential link between communities, providing access for commuters, hospitals, teachers, farmers, shopping, and more. It is essential to maintain a connection between the states during construction.
- The project should also address the nearby link to Missouri.
- An improved connection nearer the interstate could help spur economic development.
- The bridge and its location at the confluence of the rivers are important to the area's history.
- The new bridge should be wider and have fewer curves.

3.3. Alternatives Screening

In the first level of screening, each alternative was evaluated to determine if it met the Project Purpose. Three alternatives did not pass this level of screening: No Build, Rehabilitation, and Alternative 5. The No Build alternative was carried forward as a baseline for comparison between alternatives and the Rehabilitation alternative was carried forward for additional study based on public interest.

Following the Level 1 screening, several alternatives were combined. Alternatives 2, 2A, and 2B were combined into a single "Combined Alternative 2" to represent a new bridge located immediately upstream of the existing US 51 Bridge location. Alternative 3 was eliminated from further consideration as it represents a combination of both Alternatives 3A and 4, both of which advanced to the next level of screening. **Figure 4** presents alternatives that advanced to Level 2, shown alongside known community resources.

Next, additional engineering details were developed for the remaining alternatives. This includes typical sections, approach alignments, preliminary bridge type concepts and span arrangements, preliminary cost estimates, and more. Details of these efforts are presented in the *Engineering Considerations White Paper (Attachment F)* and the *White Paper on Bridge Type Concepts (Attachment G)*.



- Interstate
 - US Highway
 - State Highway
 - Local Road
 - Railroad
 - State Boundary
 - County Boundary
 - Streams
 - Alternate 1
 - Alternate 2A
 - Alternate 3A
 - Alternate 4
 - Buffer
- Community Resources**
- ✈ Airport
 - 🚤 Boat Ramp
 - ☠ Cemetery
 - 🏥 Health Facility
 - 🌳 Park
 - 🎓 School
- Major Employers**
- 🏭 Industrial Area
 - 🚢 Marine Transportation



0 1,000 2,000 Feet

0 0.5 1 Miles

Figure 4
US 51
Ohio River Bridge
 Level 2 Alternatives

A range of cross-section options are recommended. For the Rehabilitation Alternative, the cross-section would match the existing, with a total width of 22.5 feet. For the other build alternatives,

- Two 12-foot travel lanes, with paved shoulder widths varying from 4-10 feet;
- A 2.0% cross slope;
- A minimum design speed of 45 mph, with a preferred design speed of 55 mph where practical.
- A maximum superelevation rate of 6%.
- A maximum vertical grade of 5%; a maximum grade of 3% is preferred where practical.

Also for the build alternatives, the center of the primary river navigation channel should have a 113-foot vertical clearance from the zero gage at Cairo and should meet the horizontal clearances established by the Coast Guard, which vary by alternative. See the *White Paper on Bridge Type Concepts (Attachment G)* for additional detail. Final vertical clearance requirements will be determined in future phases of the project when more detailed information is available. No significant right-of-way or utility issues were identified during this phase of study.

For the superstructure replacement alternative, a truss or arch bridge would be feasible. For Combined Alternative 2 or Alternative 4, a cable stay, truss, or arch bridge would be suitable. Alternative 3A would be best suited for a cable stay type bridge. Additional analysis to consider bridge types should be considered in future project phases.

The five remaining alternatives were measured against the secondary considerations developed alongside the project purpose. Impacts are based on 500-foot wide corridors; final impacts will be less severe as future design phases of work narrow the project footprint for the preferred alternative. **Table 2** presents the results of this screening; cells shaded green indicate those that perform best in a category and cells shaded orange indicate those that perform worst in a category. **Table 3** presents a comparative summary.

Table 2: Screening Against Secondary Considerations

Performance Measure	No Build	Rehab	Alt 1 (Superstructure Replacement)	Combined Alt 2	Alt 3A	Alt 4
<i>Cost Effective, Constructible Solution</i>						
Complexity of Construction	Low	Medium	High	Low	Low	Low
Estimated Construction Cost (millions)	\$4	\$50+	\$210 - \$220	\$180 - \$210	\$350 - \$400	\$290 - \$330
Ongoing Maintenance Cost	High	Medium	Low	Low	Low	Low
Estimated Service Life	10-15 yrs	25 yrs	75 yrs	75+ yrs	75+ yrs	75+ yrs
User Costs during Construction/Rehabilitation	Low	Medium	High	Low	Low	Low
<i>Sensitivity to Local Resources</i>						
Duration of Bridge Closure (For Construction or Rehab)	Low (1 wk/2yr)	Medium (2-3 mo)	High (1-2 yrs)	None	None	None
Estimated number of residential relocations	None	None	None	None	Some	None
Estimated number of business relocations	None	None	None	None	None	None
Potential impacts to EJ communities	TBD	TBD	TBD	TBD	TBD	TBD
Acreage within parks	None	None	None	None	None	None

Performance Measure	No Build	Rehab	Alt 1 (Superstructure Replacement)	Combined Alt 2	Alt 3A	Alt 4
Acreage in wildlife refuges	None	None	None	None	Boatwright 160 acres	Boatwright 30 acres
Proximity to known historic resources	US 51 Bridge*	US 51 Bridge*	US 51 Bridge*	US 51 Bridge*	US 51 Bridge*	US 51 Bridge*
Proximity to known archaeological sites	None	None	None	None	None	None
Maintain/improve truck access to river ports	Yes	Yes	Yes	Yes	No	Yes
Impacts to recreational boating facilities	None	None	None	None	None	None
Number of stream crossings	No Change	No Change	No Change	No Change	9	1
New Alignment in 100-yr floodplain (acreage)	No Change	No Change	Minor Increase	110 acres	360 acres	290 acres
New Alignment in wetlands (acreage)	No Change	No Change	Minor Increase	50 acres	220 acres	70 acres
Proximity to species habitats	TBD	TBD	TBD	TBD	TBD	TBD
New Alignment in prime/statewide farmlands (acreage)	No Change	No Change	Minor Increase	60 acres	340 acres	260 acres
<i>System Reliability</i>						
Travel time (Wickliffe to Cairo) during construction	Minor Increase	Increase	Increase	No Change	No Change	No Change
Travel time (Wickliffe to Cairo) after construction	No Change	No Change	No Change	Minor Decrease	Increase	Increase
Sufficient width to divert traffic during crashes or bridge maintenance	No	No	Yes	Yes	Yes	Yes
Meets FHWA seismic guidance	No	No	Yes	Yes	Yes	Yes
<i>Bicycle Mobility</i>						
Bike Path on Bridge	No	No	Feasible	Feasible	Feasible	Feasible
<i>River Navigation</i>						
Recommended for further study by USCG	N/A	N/A	No**	Yes	Yes	Yes
<p><i>* Cost estimate does not include measures necessary for seismic retro-fit.</i></p> <p><i>* The historic US 51 Bridge will likely have to be demolished when a new bridge is built or as its condition deteriorates to unsafe levels unless another entity is identified to take over maintenance responsibilities.</i></p> <p><i>**This alternative would not be preferred and is not recommended by the USCG unless there is a solution to reduce the impacts to the navigation channel.</i></p>						

Table 3: Comparative Summary

Metric	No Build	Rehab	Alt 1	Combined Alt 2	Alt 3A	Alt 4
Alternative Length	0 mi	1.5 mi	1.5 mi	1.8 mi	8.1 mi	4.9 mi
Clear Roadway Width of Bridge	22.5 ft	22.5 ft	32-44 ft	32-44 ft	32-44 ft	32-44 ft
USCG recommended horizontal navigational opening	No Change	No Change	No Change	900 ft	1,200 ft	1,000 ft
Performs best in how many categories	15	12	13	19	14	16
Performs worst in how many categories	5	4	5	0	9	3

In terms of alternatives which provide a cost effective and constructible solution, the Rehabilitation and Combined Alternative 2 provide the lowest cost options.

The No Build, Rehabilitation, and Combined Alternative 2 are the most sensitive to local resources. Alternative 1 would result in the longest duration bridge closure, which would require motorists to detour 80+ miles per direction to other river crossings during construction. Alternative 3A would result in the most potential impacts: residential relocations, impacts to the Boatwright Wildlife Management Area, reduced port access, additional stream crossings, farmland acquisitions, and additional right-of-way within both the 100-year floodplain and wetlands. Alternative 4 may also have potential impacts to the Boatwright Wildlife Management Area, which is protected by Section 4(f) law.

In terms of system reliability, Combined Alternative 2 is the only option that maintains or reduces travel times between Wickliffe, KY and Cairo, IL, provides a usable river-crossing for vehicles during incidents (e.g. crashes), and meets FHWA seismic design guidelines.

Any of the build alternatives in new locations provide a feasible link for incorporating a bicycle path.

Any new location build alternative was recommended for further study based on correspondence with the US Coast Guard.

4. Outreach & Coordination Activities

Over the course of the planning phase of work, team members from KYTC, IDOT, FHWA, and the consultant team met regularly to discuss issues. Meeting summaries are included as **Attachment I**. In addition, the project team reached out to local officials, resource agencies, and the public throughout the course of the work. The following subsections describe these efforts; key messages have been incorporated into the previous chapters.

4.1. Agency Coordination

This planning-level study included a location study, an environmental overview, and recommendations for a preferred alternative to be considered further under NEPA in the next phase of work. Consistent with federal efforts to strengthen linkages between planning and NEPA efforts, resource agencies were engaged early in this process so that the decisions documented herein can be carried forward into NEPA. Throughout the study process, multiple opportunities for agency coordination were provided to gather input on study issues. Cooperating Agency and Participating Agency coordination was conducted pursuant to Section 6002 of SAFETEA-LU. Section 106 coordination regarding historic resources will begin in the next phase of the project.

In March and April 2013, numerous federal, state, and local resource agencies were invited to participate in the planning efforts for the US 51 Bridge Project. Local government representatives were also included in this outreach. Invitations were sent to the groups listed in **Table 4**; recipients noted with an asterisk agreed to participate in the process.

Table 4: Invited Agency Participants

Category	Recipient
National Agencies & Groups	<ul style="list-style-type: none"> • US Army Corps of Engineers* • US Coast Guard, Bridge Branch* • US EPA • US Fish & Wildlife Service* • US Housing & Urban Development • FEMA • Federal Motor Carrier Safety Administration • American Association of Truckers
State Agencies in Kentucky	<ul style="list-style-type: none"> • KY Cabinet for Commerce • KY Cabinet for Economic Development* • KY Cabinet for Education & Workforce Development* • KY Energy and Environment Cabinet* • KY Environmental and Public Protection Cabinet • KY Transportation Cabinet • KY Department of Agriculture: NRCS • KY Department of Environmental Protection*: Divisions of Waste Management*, Air Quality*, Water • KY Department of Fish & Wildlife Resources* • KY Department of Natural Resources: Division of Forestry • KY Department of Parks* • KY State Police* • KY Geological Survey* • KY Heritage Council* • KY Historical Society • KY Motor Transport Association • KY Nature Preserves* • KY Public Transit Association • KY Tourism Council • UK Department of Anthropology
State Agencies in Illinois	<ul style="list-style-type: none"> • IL Department of Agriculture* • IL Department of Natural Resources • IL Environmental Protection Agency • IL Historic Preservation Agency* • IL State Archaeological Survey • IL State Museum
Local Representatives in Kentucky	<ul style="list-style-type: none"> • Purchase ADD* • Ballard County: Judge/Executive*, Road Department, Chamber of Commerce, School Board*, Economic & Industrial Development Board* • City of Wickliffe: Mayor*, City Clerk, Public Works Director

Category	Recipient
Local Representatives in Illinois	<ul style="list-style-type: none"> • Southern Five Regional Planning District* • SIDEZ* • Alexander-Cairo Port District • City of Cairo: Mayor, Chamber of Commerce* • Mound City Mayor • Alexander County: County Commissioners, County Highway Engineer, Villages (East Cape, McClure, Tamms, Thebes) • Pulaski County: County Commissioners*, Development Association*, County Highway Engineer, Villages (Karnak, Mounds, Grand Chain, Olmsted, Pulaski, Ullin)
Other Groups requesting to join process	<ul style="list-style-type: none"> • Missouri Department of Transportation* • Shawnee Community College* • 1st State Bank in Olmsted*

A kick-off meeting/webinar was held on April 30, 2013 to discuss the project purpose and collect input from the agencies and stakeholders. Representatives from 24 organizations attended; a summary of the meeting and one follow-up written comment received are presented in **Attachment J**.

In August 2013, agencies and local officials were provided with a project update and copy of the *Alternative Screening Report (Attachment D)* describing the alternative development and screening process. Six responses were received from agencies and local officials, the majority in support of Combined Alternative 2. Some letters identified future mitigation requirements for streams, wetlands, air quality, etc. which will be explored further during any future phases of project development. Copies of agency correspondence are presented in **Attachment J**.

4.2. Public Outreach

The project team also reached out to local residents, businesses, and other members of the public throughout the planning phase of the project. Relevant materials are included as **Attachment K**.

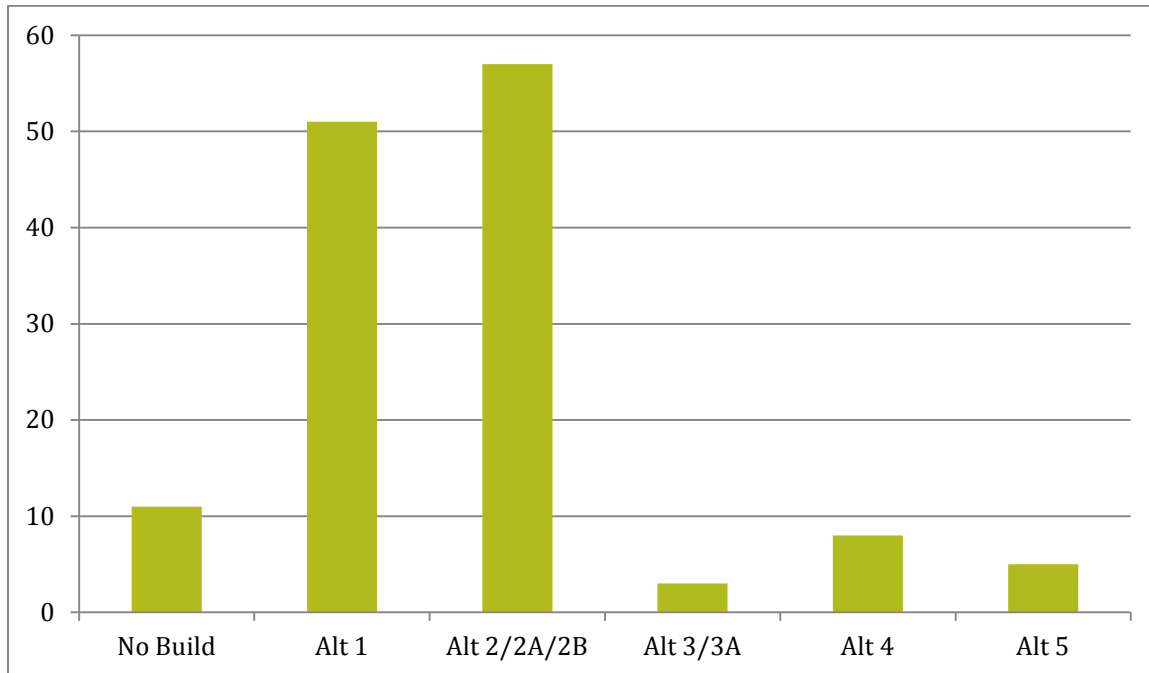
In April 2013, a newsletter was sent to property owners along one or more of the corridors, county and local government representatives, resource agencies listed above, and media contacts. The newsletter provided basic information about the bridge, the project, and upcoming meetings scheduled for May. The newsletter is included in **Attachment K**.

Two public meetings were held in May 2013. On Monday, May 20, the first meeting was held at Cairo High School from 4:00-7:00 PM. On Tuesday, May 21, the second meeting was held at the Community Center in LaCenter, KY from 4:00-7:00 PM. Information was presented about existing bridge conditions, traffic volumes, environmental resources, alternatives, and the project purpose and timeline. Between the two meetings, over 130 members of the public attended and over 120 survey questionnaires were returned. Many community members indicated that the US 51 river crossing is an essential link for local traffic between both states.

Generally, survey respondents identified the primary objective of the US 51 Bridge Project as maintaining cross-river connectivity (37% of responses), followed by improving safety (30%) and replacing the functionally obsolete bridge (30%).

Figure 5 shows public alternative preferences based on the 120 completed surveys that were returned. Additional information is provided in **Attachment K** and **Section 3.2**. Official records of the meeting – including individual survey forms – are on file with the KYTC and included with the electronic files of this report.

Figure 5: Which Alternative Do You Feel is Best for the US 51 Bridge in the Future?



5. Recommended Alternative

In light of the screening process detailed above, Combined Alternative 2 is recommended to advance for additional development. Combined Alternative 2 represents a range of potential crossing locations located upstream of the current US 51 Bridge structures - within 2,000 feet of its present location. In future project development phases, designers should look at alignment, cross-section, and bridge type options that best fit within this corridor. Cable stay, truss, and arch bridges are all considered suitable bridge types at this location.

Combined Alternative 2 is approximately 1.8 miles in length and would require a horizontal clearance of 900 feet for the navigational channel based on correspondence provided by the US Coast Guard. A vertical clearance of at least 105.3 feet above the zero gage at Cairo is recommended at the piers of the primary navigation channel and at least 113 feet above the zero gage at Cairo is recommended for the mid 700-foot portion of the primary navigation channel. Final vertical clearance requirements will be determined in future phases of project development when more detailed information is available.

Table 5 illustrates anticipated costs for NEPA/Design, Right-of-Way Acquisition, Utility Relocation, and Construction for Combined Alternative 2 for a range of bridge typical sections. See the *White Paper on Bridge Type Concepts (Attachment G)* for additional detail on the typical sections. Assumptions used in developing cost estimates are noted below the table.

Table 5: Combined Alternative 2 – Planning Level Cost Estimates

Table 5: Combined Alternative 2 - Planning Level Cost Estimates ³									
Potential Bridge Typical Section	DESIGN ²				CONSTRUCTION ¹	RIGHT OF WAY	UTILITIES	TOTAL	TOTAL (rounded)
	NEPA	PHASE 1	PHASE 2	TOTAL DESIGN					
DESIRABLE (44 ft clear roadway width on bridge including 10 foot shoulders)	\$4,200,000	\$8,400,000	\$12,600,000	\$25,200,000	\$210,000,000	\$900,000	\$100,000	\$236,200,000	\$240,000,000
MINIMUM CRITERIA (36 ft clear roadway width on bridge including 6 foot shoulders)	\$4,000,000	\$8,000,000	\$12,000,000	\$24,000,000	\$200,000,000	\$800,000	\$100,000	\$224,900,000	\$230,000,000
PRACTICAL SOLUTIONS (32 ft clear roadway width on bridge with 4 foot shoulders)	\$3,800,000	\$7,600,000	\$11,400,000	\$22,800,000	\$190,000,000	\$900,000	\$100,000	\$213,800,000	\$220,000,000

¹ Construction Costs include a 25% Contingency.

² Design Cost = 10% of Construction Cost (40% Phase 1, 60% Phase 2) + NEPA (2% of Construction Cost)

³ All Cost Estimates in 2013 Dollars

A windshield survey was conducted in Fall 2013 to identify additional environmental concerns that should be addressed as part of any future project development activities. As documented in **Attachment H**, the survey found the following environmental considerations in the Combined Alternative 2 footprint that will require further analysis in future project phases:

- Habitat for endangered species: Indiana bat, Gray bat, listed mussel species, pallid sturgeon
- Potential bald eagle habitat, including a known nest site in the vicinity
- Streams & Wetlands

- Potential for economic effects associated with barge moorings along shore

Combined Alternative 2 is recommended as the Preferred Alternative for the following reasons:

- Satisfies the project purpose.
- Minimizes construction complexity, maintenance costs, and user costs during construction while providing an estimated 75+ year service life.
- Maintains the best cross-river connectivity option of the alternatives considered. The existing US 51 Bridge would be available as a cross-river connection during construction of the new Ohio River Bridge.
- Best minimizes impacts to the human and natural environment of the alternatives considered. However, it will result in impacts to historic resources (i.e., the existing US 51 truss bridge), floodplains, wetlands, and prime/statewide importance farmlands.
- Maintains or reduces travel times, provides a usable river-crossing for vehicles during incidents (e.g. crashes), and meets FHWA seismic design guidelines.
- Provides a feasible link for incorporating a bicycle path.
- Satisfies the US Coast Guard's concerns for river navigation at a conceptual level.

In addition, Combined Alternative 2 best satisfies resource agency, local official, and public concerns.