Final Report

US 60 Connectivity Study

Item 1-80250

TEAM KENTUCKY®
TRANSPORTATION CABINET

Prepared by:

Stantec

Q4

C2 STRATEGIC COMMUNICATIONS

May 2024

Executive Summary

The US 60 Connectivity Study (KYTC Item Number 1-80250) was initiated by the Kentucky Transportation Cabinet (KYTC) to examine a more direct corridor between US 60 in western Kentucky and I-57 in southern Illinois. The study area, shown in **Figure ES-1**, overlaps with highly environmentally sensitive areas flanking the Ohio River.

Given the known environmental resources within the study area, this study was completed as *Planning and Environmental Linkages Study* (PEL Study),[1] which takes a collaborative and integrated approach to the transportation decision-making process by considering potential environmental benefits and impacts during the planning phase.

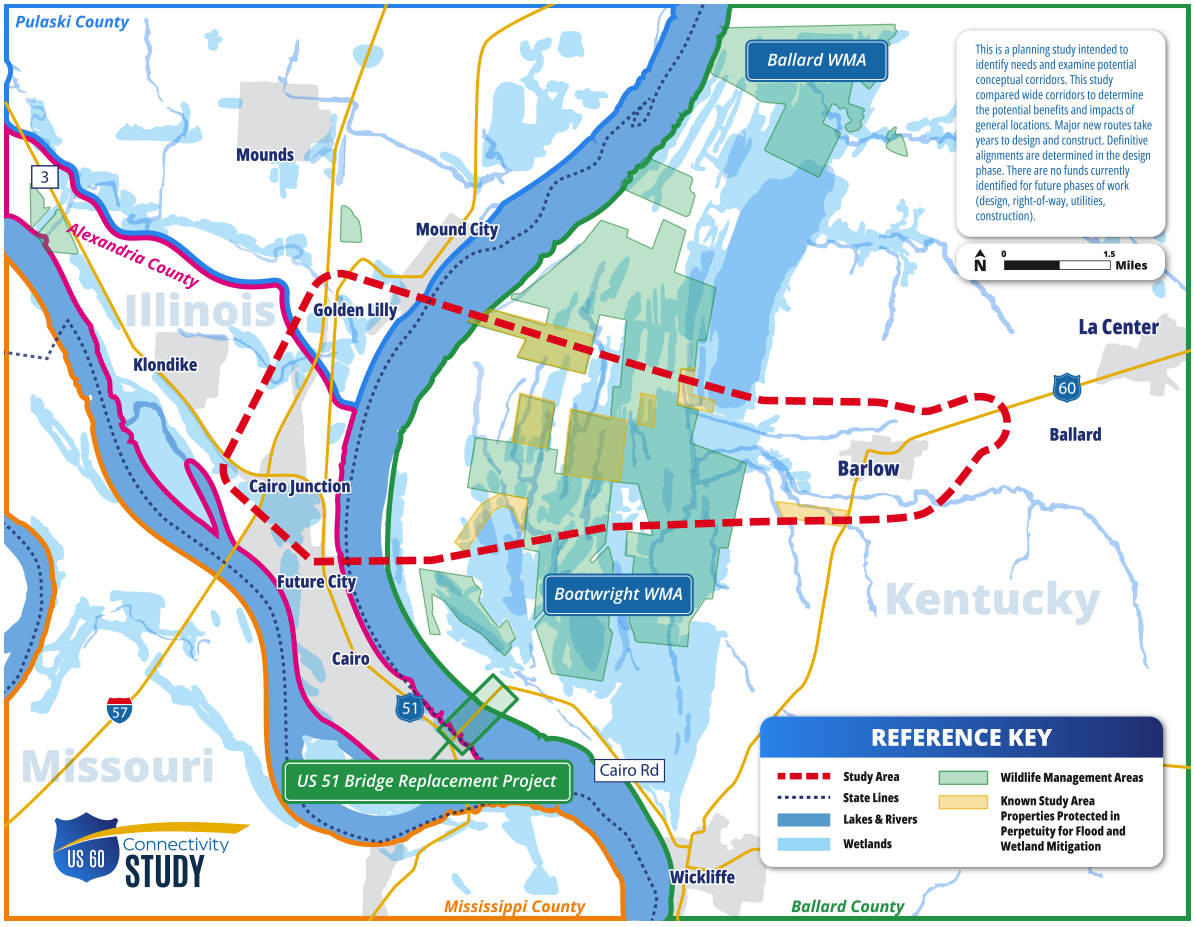


Figure ES-1. Study Area

[1] https://www.environment.fhwa.dot.gov/env_initiatives/PEL.aspx

Purpose and Need

South of the US 60 study area is the existing 86-year-old narrow two-lane structure carrying US 51, US 60, and US 62 across the Ohio River between Wickliffe, Kentucky and Cairo, Illinois. The US 51 Bridge Replacement Project (Item No. 1-1140)[2] would replace the crossing immediately north of its current alignment. As the US 51 project has advanced, questions have arisen concerning whether a more northern Ohio River crossing might provide advantages over the currently proposed crossing location. Because major river crossings are generational projects and remain in service for many decades, the US 60 Connectivity Study is being conducted to determine if relocating the Ohio River crossing to this study area would offer more short and long-term value for the local communities, region and state.

Traveling between I-24 in Kentucky and I-57 in Illinois using the existing US 51 Ohio River Bridge is approximately 13 minutes longer than a potential connection in the US 60 study area. For the 5,500 vehicles per day using the existing US 51 connection, travel speeds are reduced to 25 mph through Wickliffe and 30 mph through Cairo. A new corridor in the US 60 study area would allow for a 55-mph speed limit.

Local Officials and Stakeholders helped identify the primary objectives of the US 60 Connectivity Study. This effort resulted in the following three project goals for this study:

- Enhance Regional Mobility
- Provide Economic Development Opportunities
- Remain Sensitive to Environmental Resources

The purpose and need statement identifies the merits of the project. By defining why the expenditure of public funds is necessary and worthwhile, it allows decision makers to weigh the proposed action against the potential impacts.

The purpose of the US 60 connectivity project is to improve regional mobility by providing a more direct east-west cross-river corridor between I-24 in Kentucky and I-57 in southern Illinois.

Insufficient east-west mobility supports the need for this project.

[2] https://us51bridge.com/

Conceptual Corridors

Conceptual corridors were explored within the study area in a two-phase screening effort. Three (2,000 foot wide) initial corridors were identified to serve as a screening tool for identifying environmental red flags before focusing on two (1,000 foot wide) conceptual corridors to better assess the potential benefits and impacts. The conceptual corridors, shown in **Figure ES-2**, were developed to an approximate 15-percent design level so actionable cost estimates could be developed. Traffic forecast and economic development analysis estimates 10,000 to 12,700 vehicles per day would likely travel within the study area in the year 2045, so cost estimates and impacts are based on a two-lane roadway with a 55-mph design speed.

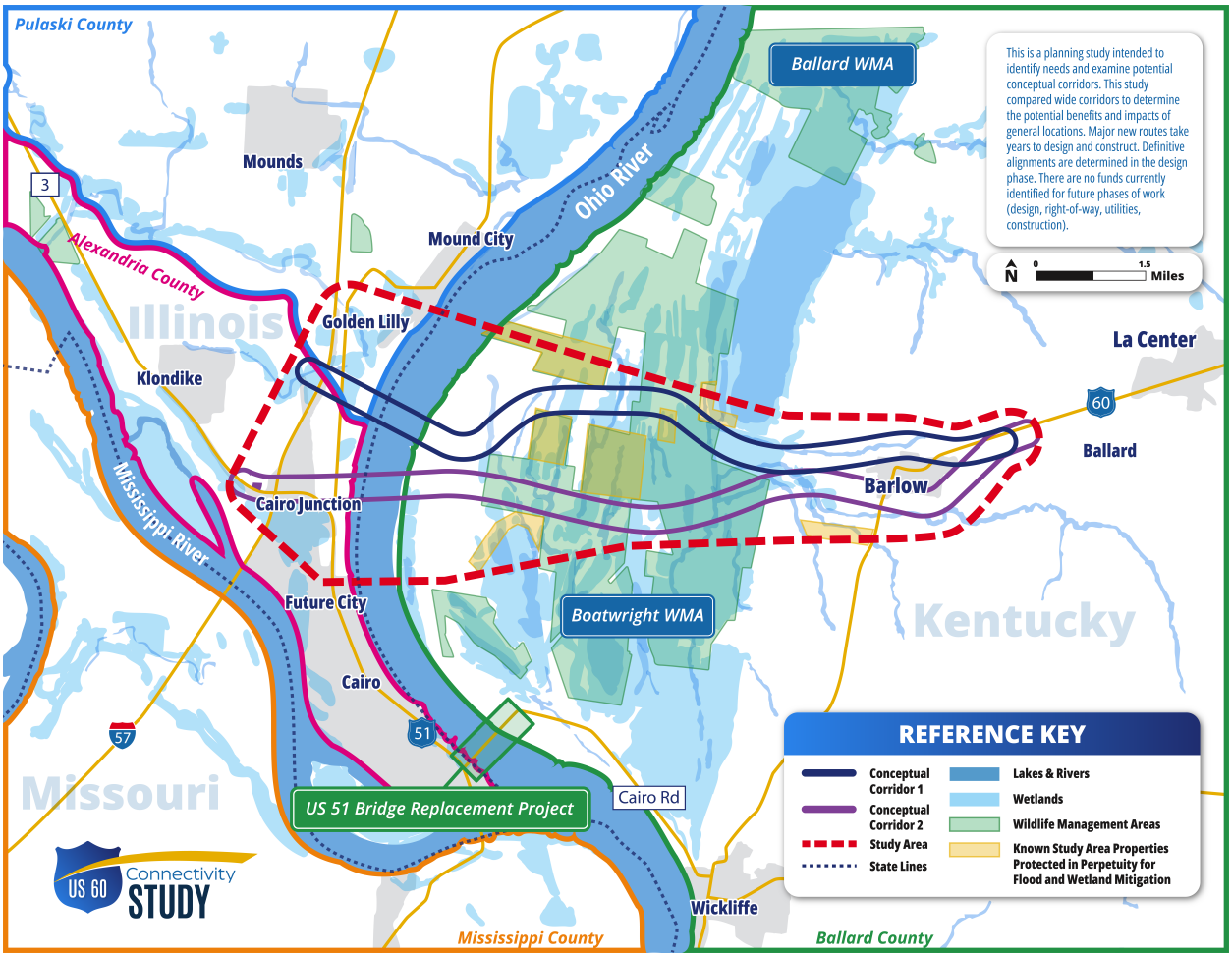


Figure ES-2. Conceptual Corridors

Both conceptual corridors begin at US 60 in Barlow, Kentucky and end at US 51 or I-57 just north of Cairo, Illinois. Corridor 1 takes a more northerly route through the study area before connecting to I-57 north of the Cairo Junction (SR 3/US 51) interchange, and Corridor 2 takes a more southerly route and ultimately connects to I-57 at the Cairo Junction interchange. **Table ES- 1** compares the environmental impacts of the two US 60 conceptual corridors. Conceptual Corridor 1 would have the fewest impacts to businesses, archaeological resources, Boatwright Wildlife Management Area, and public hunting lands. Conceptual Corridor 2 would have the fewest impacts to residences, farmland, Indiana bat habitat, streams, wetlands, and the 100-year floodplain. Both corridors would increase travel times for Environmental Justice (low-income and minority) persons in Cairo and Wickliffe should they need to cross the Ohio River.

Table ES-1: Environmental Impacts

Environmental Resources within Conceptual Corridor	Conceptual Corridor 1	Conceptual Corridor 2
Residences	**6**	3
Businesses	0	**3**
Cultural Historic Resources	0	0
Archaeological Resources	0	**1**
Cemeteries	0	0
Farmland (acres)	**177**	137
Trees/Indiana Bat Habitat (acres)	**83**	56
Streams (linear feet)	**4,972**	4,118
Wetlands (acres)	**91**	55
100-Year Floodplain (acres)	**196**	113
Parks (acres)	0	0
Boatwright WMA (acres)	23	**68**
Boatwright Properties **Protected in Perpetuity** (acres)	0	0
Illinois DNR Property (acres)	0	0
NRCS Properties **Protected in Perpetuity** (acres)	0	0
Public Hunting Lands (acres)	23	**68**
USACE-Owned Lands (acres)	0	0

Conceptual Corridor 1 would have **fewest impacts** to:

- Businesses
- Archaeological Resources
- Boatwright WMA
- Public Hunting Lands

Conceptual Corridor 2 would have **fewest impacts** to:

- Residences
- Farmland
- Indiana Bat Habitat
- Streams
- Wetlands
- 100-Year Floodplain

Both corridors would increase travel times for Environmental Justice (low-income and minority) persons near the study area.

The Boatwright Wildlife Management Area (WMA) is publicly owned, primarily by the Kentucky Department of Fish and Wildlife Resources (KDFWR). As the Boatwright WMA intersects the central portion of the study area, impacts to it would be unavoidable. The entire WMA is available for public hunting. Per Kentucky Revised Statue (KRS) 150.0241, Kentucky has a "No Net Loss" policy that requires the state to "maintain at least the same level of available public hunting land that currently exists."[3] Replacement hunting lands have not been identified as part of this study. Considering the quantity of the impact, finding replacement acreage of this magnitude within the same commission district and consistent with the same hunting discipline would be difficult, time consuming, and costly.

"This project would have significant impacts to fish and wildlife, public property, and the sportsmen and women of Kentucky. We also do not feel that any mitigation could compensate for such losses." ~ Feedback from the Kentucky Department of Fish and Wildlife Resources on the US 60 Connectivity Study

Considering the impacts to environmental resources, the potential for significant adverse impacts to the human and natural environment, and known public opposition, should a major project advance from the US 60 study area, the level of National Environmental Policy Act (NEPA) documentation is anticipated to be an Environmental Impact Statement (EIS), the highest level of NEPA documentation. Federal agencies prepare an EIS if a proposed major federal action has potential to significantly affect environmental resources. The regulatory requirements for an EIS are rigorous and typically take multiple years to complete.

Public Outreach

Public involvement was an integral part of the US 60 Connectivity Study. As shown in **Figure ES-3**, KYTC and its partners engaged key stakeholders, including elected officials in Kentucky and Illinois, regional leaders, agencies, and economic development parties that would be most impacted by the potential project.

[3] https://apps.legislature.ky.gov/CommitteeDocuments/262/20784/Oct%2020%202022%20KDFWR%20No%20Net%20Loss%20of%20Hunting%20Land%20Report.pdf

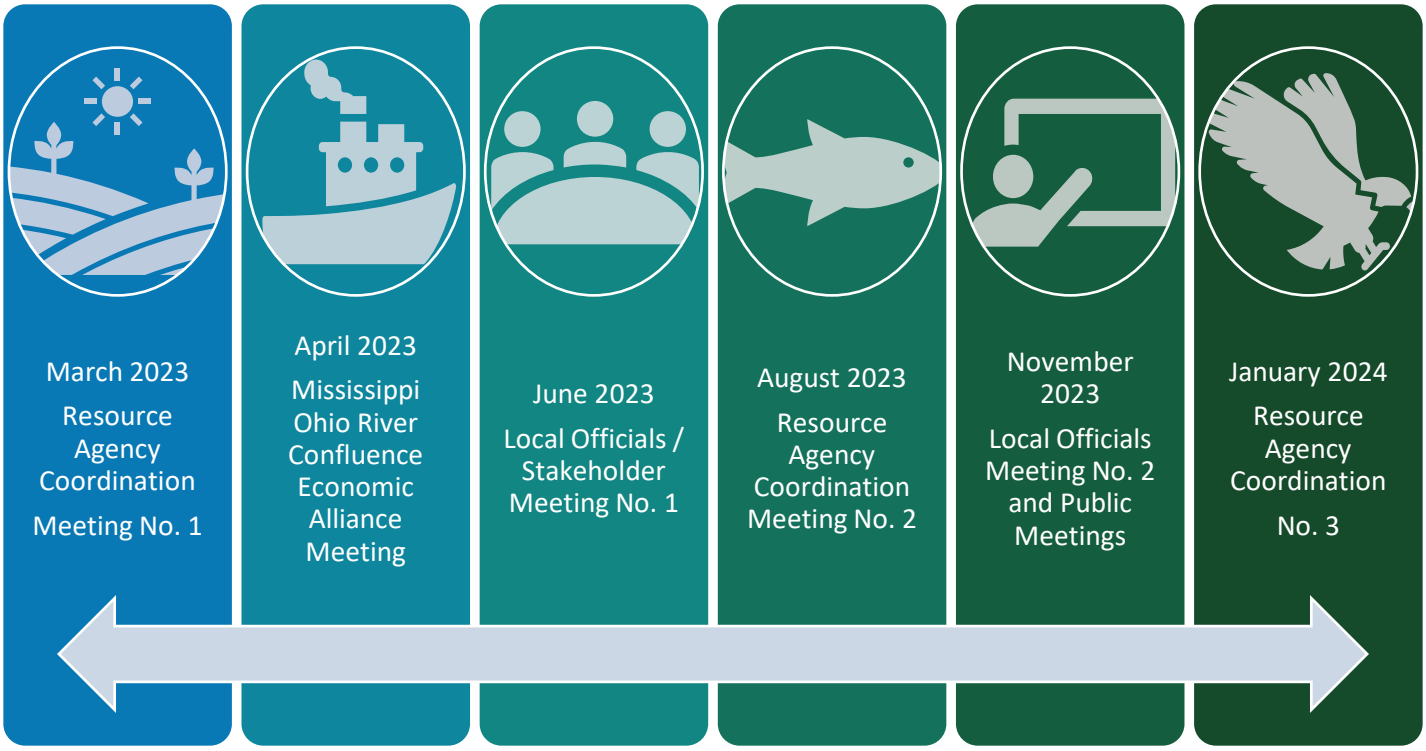


Figure ES-3. Public Outreach Meetings

Public information meetings were held on November 29, 2023, in Barlow, Kentucky and November 30, 2023, in Cairo, Illinois to share information and solicit input on the US 60 Connectivity Study. **KYTC received 815 total responses about the project, 83 percent of which were against the idea of relocating the Ohio River crossing from the US 51 corridor to the US 60 study area.** Most who submitted comments do not believe the relocation of the Ohio River crossing to this study area would enhance economic development opportunities or regional mobility. Additional qualitative comments against the US 60 Connectivity Study shared common themes concerning local wildlife preservation and recreational use within the study area. Project cost and overall economic impact of the region were also cited as recurring concerns.

Conclusions

The US 60 Connectivity Study was conducted to evaluate the feasibility of constructing a new US 60 corridor and Ohio River crossing between Barlow, Kentucky, and I-57 north of Cairo, Illinois.

Table ES-2 compares the estimated project costs, travel times, and environmental impacts of the two US 60 Connectivity Study Conceptual Corridors and the US 51 Bridge Replacement Project.

Table ES-2. Summary Table

US 60 Connectivity STUDY	US 60 Conceptual Corridor 1	US 60 Conceptual Corridor 2	US 51 Bridge Replacement
Total Project Cost *(2023 dollars)*	$1.3 billion	$1.2 billion	$383 million
Travel Time*	13 minutes	11 minutes	24 minutes
Project Lengths	9.9 miles	10.5 miles	1.9 miles
IMPACTED ENVIRONMENTAL RESOURCES			
Boatwright WMA *(acres)*	23	68	0
Streams *(linear feet)*	4,972	4,118	598
Wetlands *(acres)*	91	55	9

**from US 60 (Barlow, KY) to I-57 (Exit 1, IL)*

In addition to the cost comparisons and impacts cited in Table ES-2, the two projects show stark timeline differences to satisfy Federal NEPA documentation. To advance a major project in the US 60 Connectivity Study area, an EIS would likely be required, which involves rigorous requirements (including enhanced public involvement required to navigate the opposition cited by the public and local groups) and typically takes years to complete. In contrast, the US 51 Bridge Replacement Project completed the NEPA requirements in 2022, as well as all necessary federal, state, and local regulatory processes.

Along with the environmental regulatory hurdles, the US 60 Connectivity Study identified potential disproportionately high and adverse effects to Environmental Justice populations and received stated opposition for this project from several stakeholder groups including the Illinois Department of Transportation (IDOT), Kentucky Department of Fish and Wildlife Resources (KDFWR), Kentucky Division of Water (KDOW), Western Kentucky Wildlife Association, Ducks Unlimited, mayors from the Disadvantaged Communities of Wickliffe and Cairo, Director of the Ballard County Chamber of Commerce, and 83 percent of the public comments.

Given the myriad environmental challenges, opposition from IDOT, and the $1.3 billion needed to construct a project within the US 60 study area, KYTC does not recommend funding future phases of this project. Instead, *Kentucky's FY 2024 – FY 2030 Enacted Highway Plan* includes additional funding for the advancement of the US 51 Bridge Replacement Project (Item No. 1-1140).

Contents

Executive Summary 1
1. Introduction 1
1.1. Study Area 1
1.2. Project History 2
1.3. Planned and Committed Projects 3
2. Existing Transportation Network 4
2.1. Ohio River and Mississippi River Crossings 4
2.2. Functional Classification 5
2.3. Roadway Geometry 7
2.4. Speed Limit 8
2.5. Existing Traffic 9
3. Future Conditions 10
3.1. Population Trends 10
3.2. Historical Daily Traffic Volumes 11
3.3. Traffic Forecasting – Subarea Model 12
3.4. Economic Analysis 13
3.5. Future Year Daily Traffic Forecasts 13
4. Environmental Overview 14
4.1. PEL Study 14
4.2. Protected Lands 15
4.2.1 Boatwright WMA 15
4.2.2 Public Hunting Lands 16
4.2.3 Eminent Domain 18
4.3. Community Impacts 18
4.3.1 Communities 19
4.3.2 Environmental Justice 20

4.4. Aquatic & Terrestrial Ecosystems 22
4.4.1 Listed Species 23
4.4.2 Migratory Birds 26
4.4.3 Karst 27
4.4.4 Waters 27
4.4.5 Additional Impacts 31
4.5. Section 106 – Cultural Historic & Archaeological Resources 32
4.6. Section 4(f) 33
4.7. Section 6(f) 35
5. Preliminary Stakeholder Outreach on Study Goals and Objectives 36
5.1. Resource Agency Meeting No. 1 36
5.2. Mississippi Ohio River Confluence Economic Alliance 37
5.3. Local Officials / Stakeholder Meeting No. 1 39
5.4. Meeting with KDFWR and USFWS 40
6. Study Goals and Project Purpose 41
6.1. Enhance Regional Mobility 41
6.2. Provide Economic Development Opportunities 42
6.3. Remain Sensitive to Environmental Resources 44
6.4. Draft Purpose and Need Statement 44
7. Conceptual Corridors 45
7.1. Initial Study Corridor Concepts 45
7.2. Refined Study Corridor Concepts 48
7.3. Design Criteria 49
7.3.1 Geotechnical and Seismic Design Considerations 50
7.3.2 Floodplain 51
7.3.3 Structures 52
7.4. Cost Estimates 54
7.5. Affected Environmental and Potential Impacts 57

8. Stakeholder and Public Outreach on Corridor Concepts 60
8.1. Resource Agency Meeting No. 2 60
8.2. Local Officials / Stakeholder Meeting No. 2 61
8.3. Public Meetings 61
8.4. Resource Agency Outreach No. 3 62
9. Conclusions 64

Figures

Figure ES-1. Study Area ES-1
Figure ES-2. Conceptual Corridors ES-3
Figure ES-3. Public Outreach Meeting ES-6
Figure 1. Study Area 2
Figure 2. Regional Roadway Network 4
Figure 3. Existing Ohio and Mississippi River Crossings 5
Figure 4. Functional Classification 6
Figure 5. Number of Lanes and Lane Width 7
Figure 6. Speed Limits 8
Figure 7. Annual Average Daily Traffic (AADT) 9
Figure 8. Historical AADT Traffic Counts on the US 51 Ohio River Bridge 12
Figure 9. Subarea Model Network 12
Figure 10. Protected Lands 16
Figure 11. Public Hunting Lands 17
Figure 12. Municipalities 19
Figure 13. Census Tracts and Community Resources 21
Figure 14. Ecological Resources 23
Figure 15. Seasonal Survey Restrictions & Hunting Seasons 26
Figure 16. Flood Zone and Floodway 30
Figure 17. Trail of Tears National Historic Trail 33
Figure 18. Preliminary Stakeholder Outreach on Study Goals and Objectives 36
Figure 19. Stakeholder Responses 39
Figure 20. Study Goals and Objectives 41
Figure 21. Travel Times between I-24 and I-57 42
Figure 22. Radius of 60-Minute Travel Times for US 51 and Representative US 60 Connection 43

Figure 23. Initial Corridor Concepts 46
Figure 24. Refined Corridor Concepts 49
Figure 25. US 60 Typical Sections 50
Figure 26. Environmental Resources and Refined Corridors 58
Figure 27. Stakeholder Outreach on Corridor Concepts 60

Tables

Table ES-1. Environmental Impacts ES-4
Table ES-2. Summary Table ES-7
Table 1. Kentucky Population Trends & Projections 10
Table 2. Illinois Population Trends & Projections 11
Table 3. EJ Characteristics 21
Table 4. Federally Listed Species 24
Table 5. KDOW Water Resource Designations 28
Table 6. FEMA NFHL Designation Type 30
Table 7. Environmental Resources within Initial Corridors 47
Table 8. Current Year (2023) Cost Estimates by Phase 56
Table 9. Year of Expenditure Cost Estimates by Phase 56
Table 10. Environmental Resources within Refined Conceptual Corridors 57
Table 11. Mitigation Costs for the Refined Conceptual Corridors 59
Table 12. Concept Summary Table 64

Appendices

Appendix A: Traffic Forecasting and Economic Analysis Reports

Appendix B: PEL Environmental Technical Report

Appendix C: Meeting Summaries

Appendix D: FHWA PEL Questionnaire

1. Introduction

The US 60 Connectivity Study, Kentucky Transportation Cabinet (KYTC) Item Number 1-80250, is described in *Kentucky's 2022-2028 Enacted Highway Plan* as "a planning study for extending US 60 from Barlow, Kentucky, west to I-57 near Future City, Illinois."[4] This study fully examined the feasibility, costs, and impacts of a potential extension of the US 60 corridor over the Ohio River.

1.1. Study Area

The study area for the US 60 Connectivity Study, shown in **Figure 1**, encompasses 16,167 acres and is predominantly in Ballard County, Kentucky and Alexander County, Illinois. A small portion of Pulaski County, Illinois, overlaps the northwestern study limits.

Ballard County is in far western Kentucky, at the confluence of the Ohio and Mississippi rivers. The land use in the study area is primarily undeveloped or agricultural. The area is frequently flooded, and much is preserved for conservation. Most of the study area encompasses the Boatwright Wildlife Management Area. The current Ohio River crossing is in Wickliffe, south of the study area. Wickliffe serves as the county seat for Ballard County and is a historically disadvantaged area with high concentrations of persons below poverty level.

Study Area Portion of Ballard County, Kentucky

Alexander County is the southernmost county within Illinois. The Mississippi River borders it to the west and south. Its eastern border includes the Ohio River, Cache River State Natural Area, and Pulaski County. Cairo serves as the county seat. Alexander County, which is more developed than Kentucky's study area, has several small residential communities as well as commercial and industrial developments—especially within the city of Cairo, south of the study area. Cairo has been an historically disadvantaged area with high concentrations of minority persons and persons living below the poverty level.

[4] https://transportation.ky.gov/PrograManagement/2022%20Enacted%20Highway%20Plan/2022%20Enacted%20Highway%20Plan%20Combined%20Book%20June%2028%202022.pdf

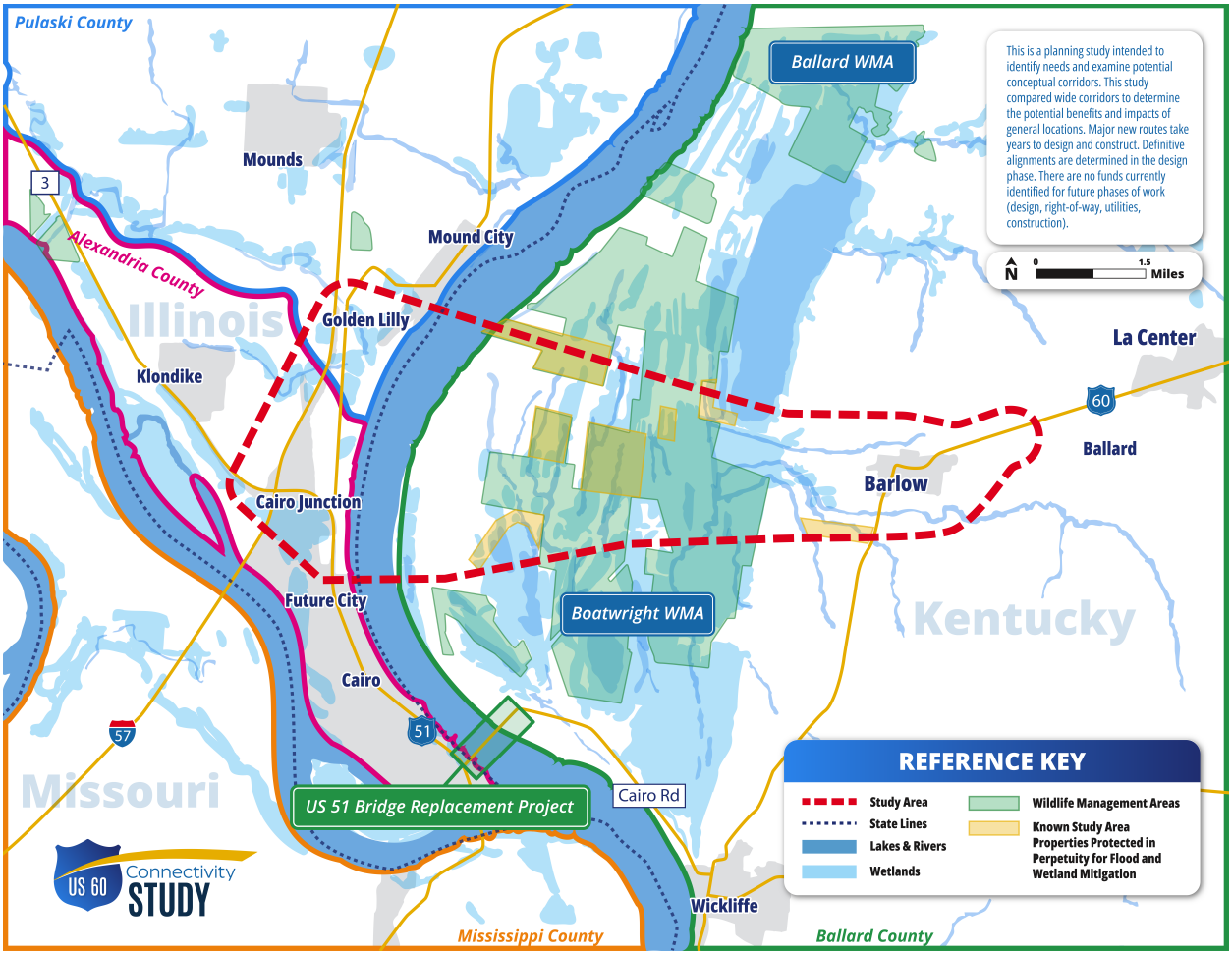


Figure 1. Study Area

1.2. Project History

South of the US 60 study area, the existing 86-year-old narrow two-lane structure between Wickliffe, Kentucky and Cairo, Illinois carries US 51, US 60, and US 62 across the Ohio River. The ongoing US 51 Bridge Replacement Project (KYTC Item No. 1-1140) would replace the crossing immediately north of its current alignment, as shown in Figure 1.[5] As the US 51 project has advanced, questions have arisen concerning whether a more northern Ohio River crossing might provide advantages over the currently proposed crossing location. Because major river crossings are generational projects and remain in service for many decades, this US 60 Connectivity Study is being conducted to determine if relocating the Ohio River

[5] https://us51bridge.com/

crossing to this study area would offer more short and long-term economic development opportunities for the surrounding communities, region and state.

1.3. Planned and Committed Projects

There are no active projects in the study area listed in *Kentucky's 2024-2030 Enacted Highway Plan*. However, four US 60 projects east of the study area are included and listed below. Collectively these projects would reconstruct about 12 miles of US 60 from the existing four-lane section near the Ballard/McCracken County line to Barlow.

- **Item No. 1-115.00 –** Paducah–Wickliffe Road**:** improve US 60 from Stafford Road to Bethel Church Road (Construction = $10 million).
- **Item No. 1-118.00** – Improve US 60 from Humphrey Creek bridge to 0.4 mile west of Hester Sullivan Lane (Utility Relocations = $10 million, Construction = $9.5 million).
- **Item No. 1-80300.00** – Address safety, congestion, and future capacity issues on US 60 through the City of LaCenter (Design = $1.5 million).
- **Item No. 1-80301.00** – Address safety, congestion, and future capacity issues on US 60 from proposed Barlow Eastern Bypass to Proposed LaCenter Southern Bypass (Design = $2.0 million).

2. Existing Transportation Network

The study team examined the conditions of the existing transportation network. These findings are shown in the following sections. As shown in **Figure 2**, I-24 is the east-west interstate connection between Kentucky and Illinois. I-57 is the north-south interstate connection through Illinois and Missouri.

Figure 2. Regional Roadway Network

2.1. Ohio River and Mississippi River Crossings

There are three Ohio River bridge crossings in the Purchase area of western Kentucky, as shown in **Figure 3**. The US 51 Ohio River Bridge in Ballard County provides the westernmost Ohio River crossing between Kentucky and Illinois and carries 5,300 vehicles per day (VPD). The I-24 and US 45 Ohio River bridges in McCracken County provide two additional crossings between Kentucky and Illinois, carrying 29,000 VPD and 6,000 VPD, respectively. There is no Mississippi River bridge connecting Kentucky and Missouri, making the Dorena-Hickman Ferry,[6] a tolled ferry, the only connection between the two states.

[6] www.dorena-hickmanferryboat.com

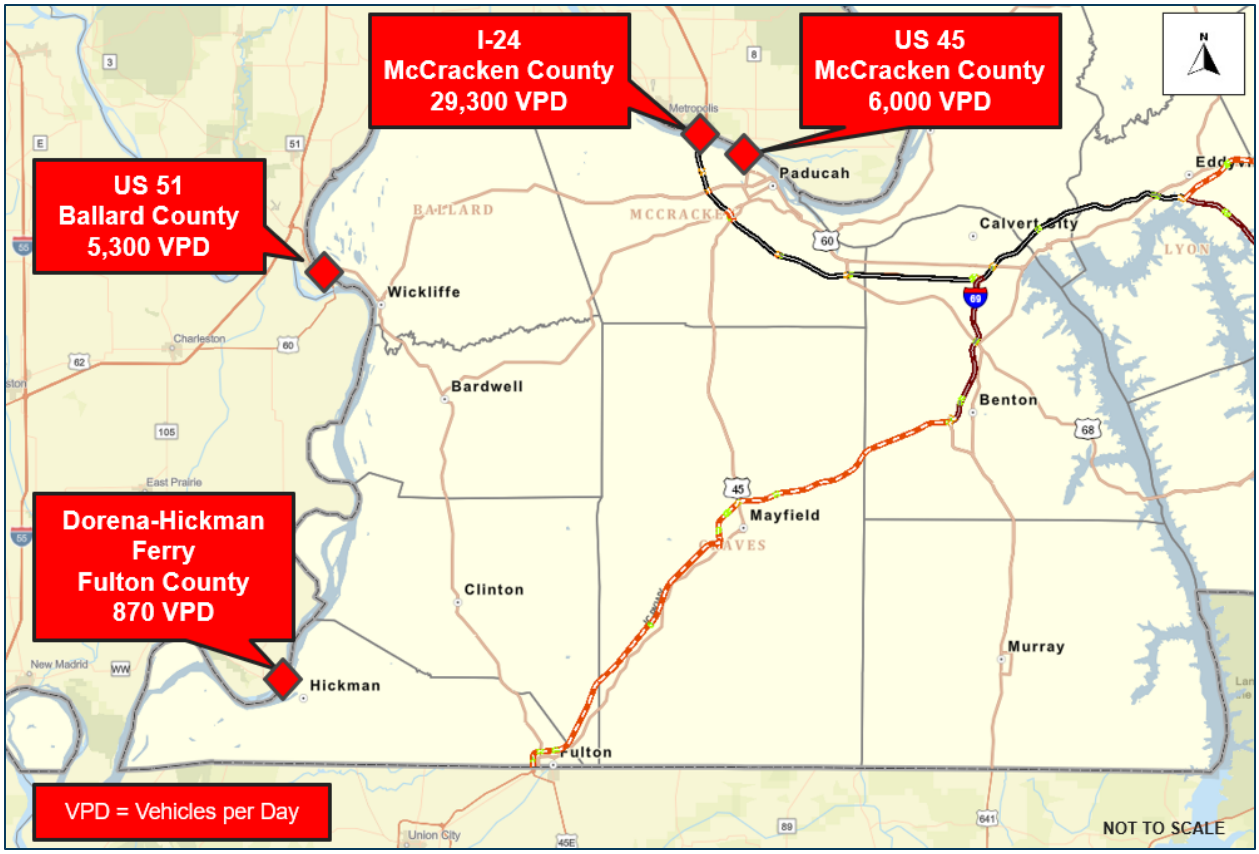


Figure 3. Existing Ohio and Mississippi River Crossings

If the US 51 Bridge was not available for local traffic, the detour trip between Wickliffe and Cairo would be 80 miles to the I-24 Ohio River Bridge and 90 miles to the Dorena-Hickman Ferry.

2.2. Functional Classification

Functional classification is the process of grouping streets and highways according to the character and travel service they provide. The functional classifications of the study area and adjacent routes are shown in **Figure 4**. Regarding the road network in Kentucky, US 60 and US 62 / KY 286 provide the primary east-west connections from Paducah to Wickliffe and farther east. US 51 provides the primary north-south connection with an existing Ohio River crossing into Cairo, Illinois. US 51, US 60, and US 62 are classified as rural principal aretierals, and KY 286, KY 121, and US 51 south of Wickliffe are clasified as rural minor artierals.

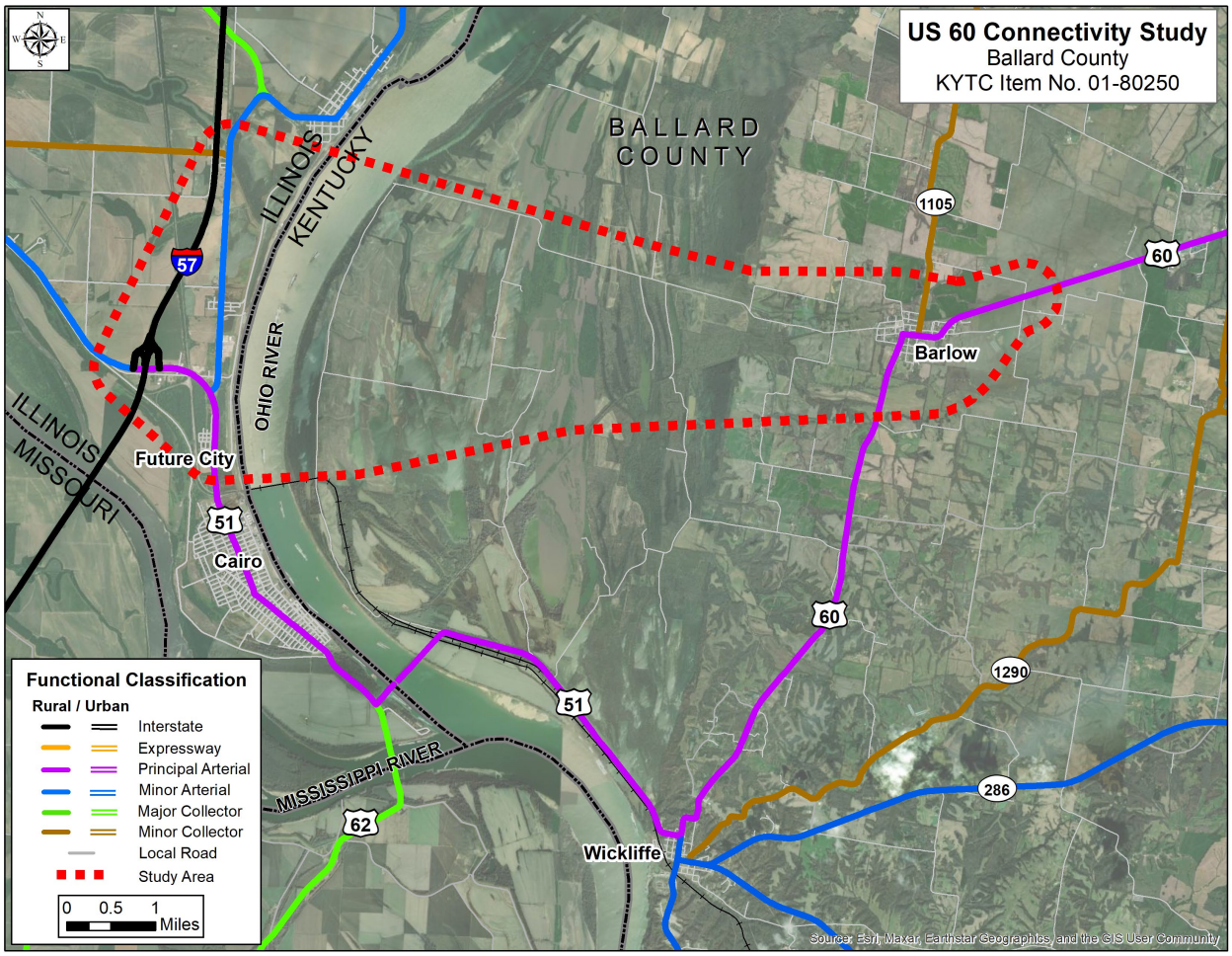


Figure 4. Functional Classification

In Illinois, US 51 provides the primary north-south connection in the study area and is classified as a principal arterial. I-57 is the longest interstate highway in Illinois. It starts at the southernmost point of Illinois in Cairo, runs concurrently with US 51, and then parallels SR 37 as it travels north through the center of the state. In Missouri, I-57 and US 62, a rural major collector, provide connections between Illinois and Missouri across the Mississippi River.

2.3. Roadway Geometry

The current number of lanes and estimated lane widths within the study area are shown in **Figure 5**. In Kentucky, US 60 and KY 286 are two-lane roadways with lane widths less than 11 feet. US 51 has two 11-foot-wide lanes through Wickliffe but narrows across the Ohio River bridge where the typical section includes two ten-foot-wide lanes.

In Illinois, US 51 has four lanes and is the main throughfare through Cairo, with approximately two miles of closely spaced, stop-controlled intersections in town. To the south, the US 62 Mississippi River crossing narrows to ten-foot-wide lanes before widening back to 11 feet in Missouri.

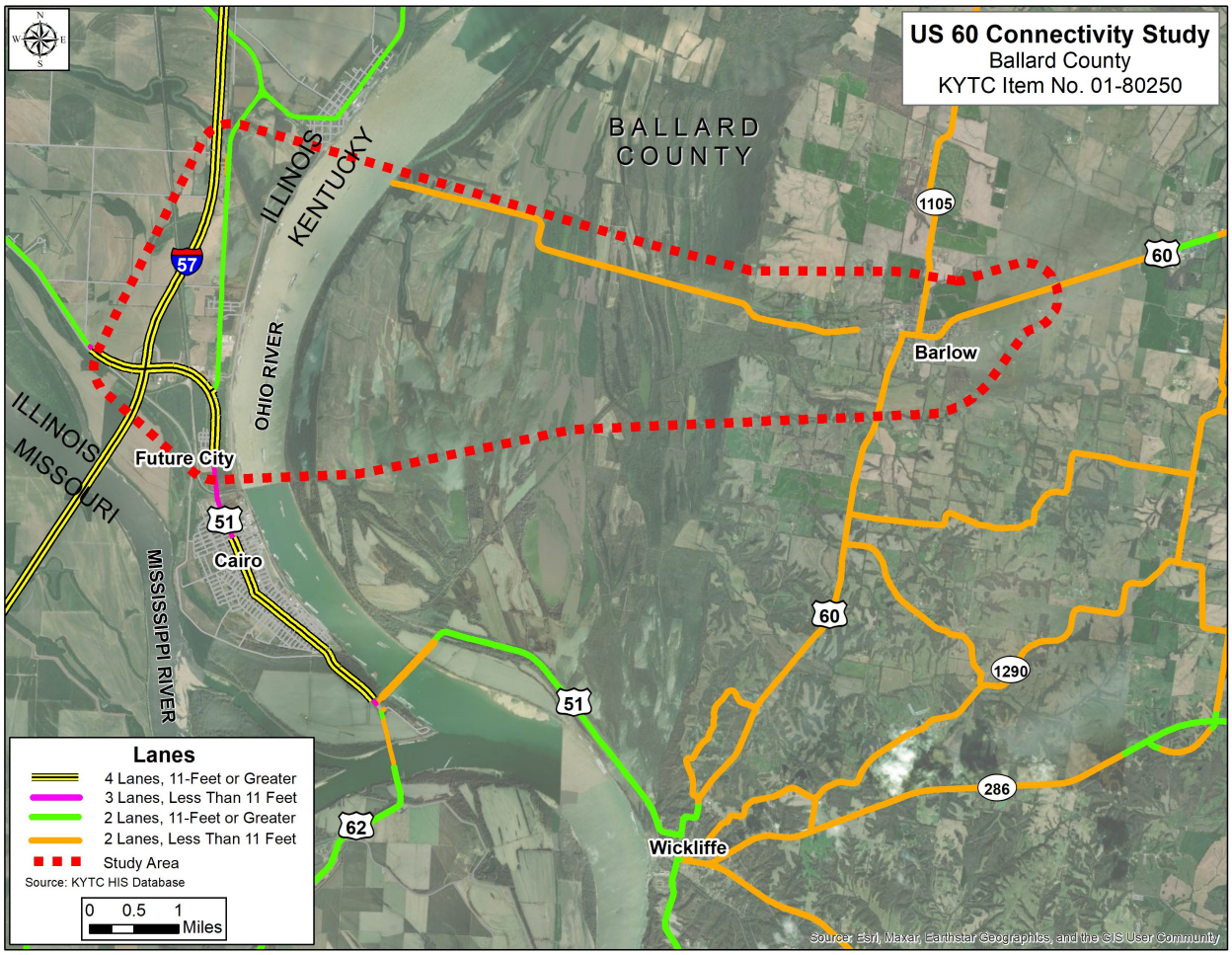


Figure 5. Number of Lanes and Lane Width

2.4. Speed Limit

Posted speed limits for roadways within the study area are shown in **Figure 6**. Posted speed limits are reduced to 25 miles per hour (mph) through Wickliffe and 30 mph through Cairo. In Kentucky, US 60, KY 286, KY 1290, KY 121, and US 51 have posted speed limits of 55 mph approaching Wickliffe.

US 60 in Wickliffe, Kentucky

US 51 in Cairo, Illinois

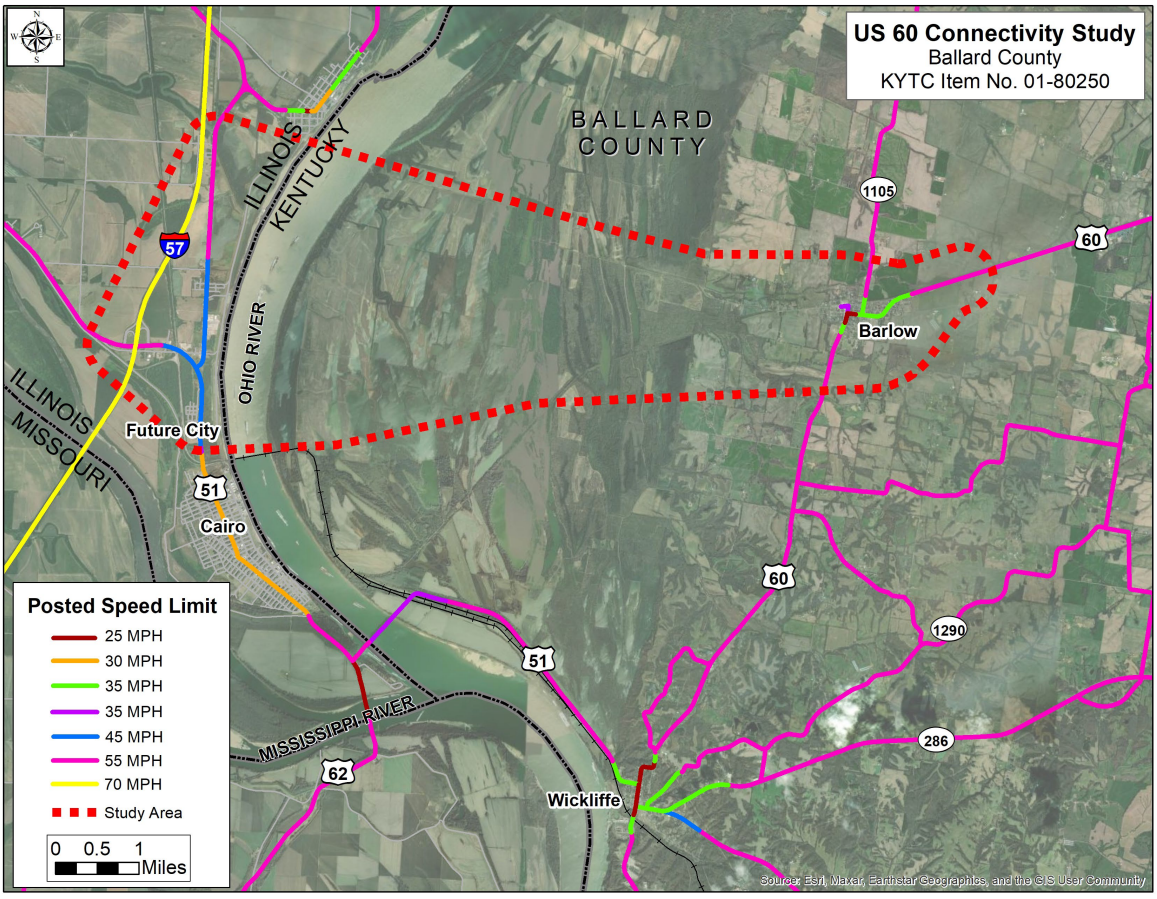


Figure 6. Speed Limits

2.5. Existing Traffic

The study team analyzed existing traffic volumes for roadways within the study area. The most current annual average daily traffic (AADT) volumes from KYTC, Illinois Department of Transportation (IDOT), and Missouri Department of Transportation (MODOT) traffic count stations are shown in **Figure 7.** Daily traffic on the US 51 Ohio River crossing is approximately 5,300 vehicles per day (VPD). In Kentucky, US 60 carries 5,200 VPD east of Barlow and 3,800 VPD approaching Wickliffe. In Illinois, US 51 carries 4,800 VPD through Cairo and I-57 carries around 15,000 VPD.

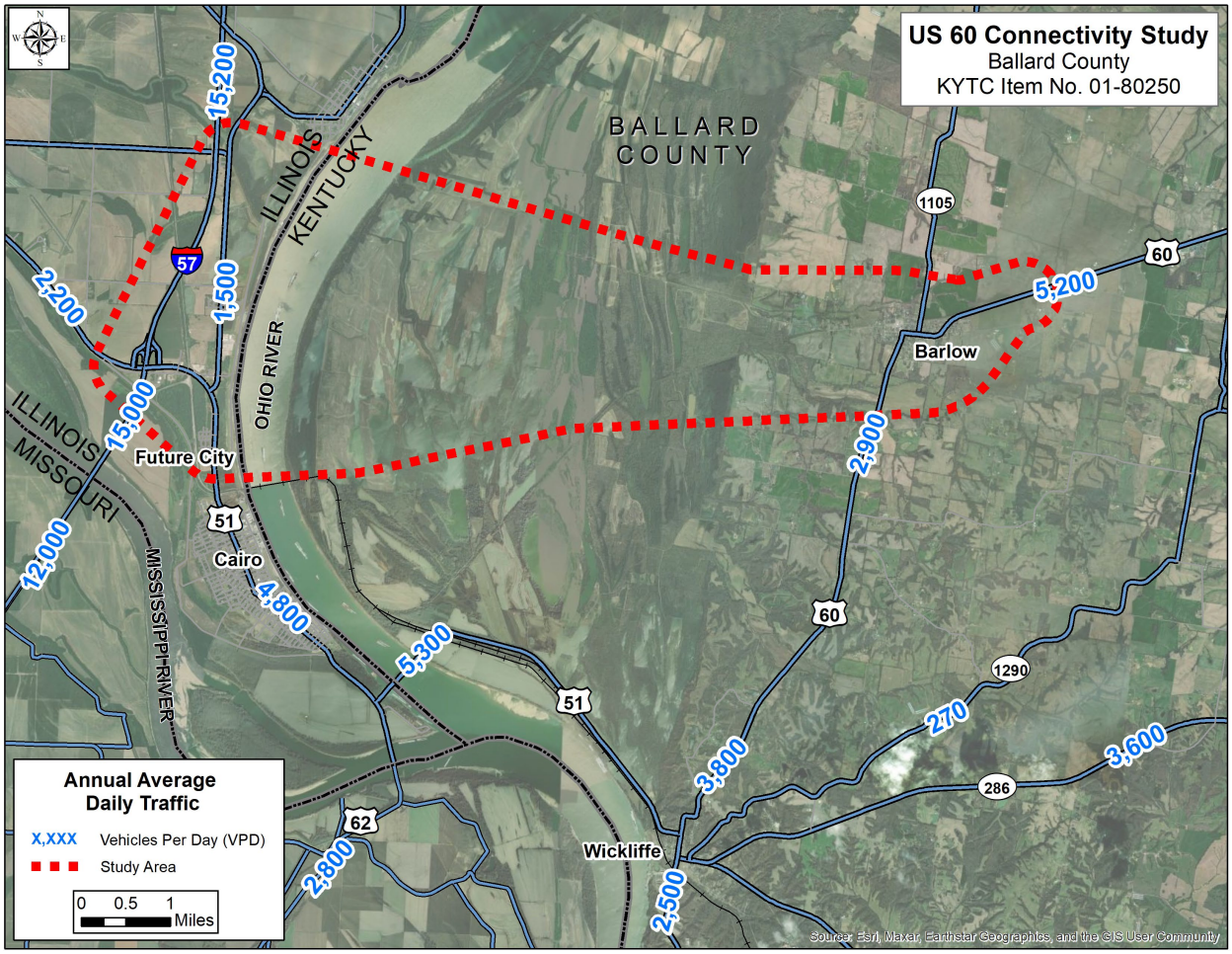


Figure 7. Annual Average Daily Traffic (AADT)

3. Future Conditions

To determine the need for and scope of potential transportation improvement options, it is necessary to estimate future conditions. This chapter summarizes the anticipated future conditions within the study area. The complete *Traffic Forecasting Report and Economic Analysis Report* is attached as **Appendix A**.

3.1. Population Trends

Population trends from the US Census over the past several decades are compared with population projections provided by the Kentucky State Data Center (KSDC) through 2050 in **Table 1** and the Illinois Department of Public Health through 2030 in **Table 2.** The projections are based on assumptions about future births, deaths, and in/out migrations.

Table 1. Kentucky Population Trends & Projections

	Kentucky		Ballard County	
Date	**Total**	**% Change**	**Total**	**% Change**
1960	3,038,156	-	8,291	-
1970	3,218,706	6%	8,276	0%
1980	3,660,777	14%	8,798	6%
1990	3,685,296	1%	7,902	-10%
2000	4,041,769	10%	8,286	5%
2010	4,339,367	7%	8,249	0%
2020	4,505,836	4%	7,728	-6%
2030	4,641,150	3%	7,180	-7%
2040	4,721,118	2%	6,558	-9%
2050	4,785,233	1%	5,979	-9%

**Source: U.S. Census Bureau through 2020; Kentucky State Data Center 2030-2050*

Historically, Kentucky's population has increased each decade and is anticipated to grow through 2050. In contrast, Ballard County's population experienced a 10 percent decline from 1980 to 1990, no growth from 2000 to 2010, and then a decline again from 2010 to 2020 of 6 percent. The Ballard County population is estimated to continue to decline each decade through 2050.

Table 2. Illinois Population Trends & Projections

	Illinois		Alexander County		Pulaski County	
Date	**Total**	**Percentage Change**	**Total**	**Percentage Change**	**Total**	**Percentage Change**
1960	10,081,158	-	16,061	-	10,490	-
1970	11,113,976	10%	12,015	-25%	8,741	-17%
1980	11,426,518	3%	12,264	2%	8,840	1%
1990	11,430,602	0%	10,626	-13%	7,523	-15%
2000	12,419,293	9%	9,590	-10%	7,348	-2%
2010	12,830,632	3%	8,238	-14%	6,161	-16%
2020	12,812,508	0%	5,240	-36%	5,193	-16%
2030	12,789,999	0%	5,201	-1%	3,980	-23%
2040	-	-	-	-	-	-
2050	-	-	-	-	-	-

**Source: U.S. Census Bureau through 2020; Illinois Department of Public Health 2030*

Historically, the population in Illinois has increased each decade, except between 1980 and 1990, and again between 2010 and 2020, when it experienced no growth, a trend anticipated to continue through 2030. In contrast, the population in Alexander and Pulaski counties experienced a decline in all but one of the decades (1970 to 1980) reviewed. Alexander County experienced a steep decline in population from 2010 to 2020, when it experienced nearly a 40% decline in population. The population in the area is estimated to continue to decline through 2030, with a sharp 23% decline estimated in Pulaski County and minor 1% decline predicted for Alexander County.

3.2. Historical Daily Traffic Volumes

The US 51 Ohio River bridge currently carries 5,300 vehicles per day (VPD). The bridge's historical annual average daily traffic (AADT) volumes from KYTC are in **Figure 8**. Looking over the past 30 years, the AADT on the US 51 Ohio River bridge has been steady, averaging 5,000 VPD. As part of the US 60 Connectivity Study, new counts were collected on the US 51 Ohio River bridge. Findings from these counts showed that the estimated AADT in February 2023 was 4,600 VPD and in August 2023 was 6,600 VPD. The difference in AADT values between February and August 2023 demonstrates significant variability in the counts collected at this fundamental location.

Year	AADT	Year	AADT	Year	AADT
2024		2014		2004	5520
2023		2013	4711	2003	
2022	5344	2012		2002	
2021		2011		2001	4880
2020	5800	2010	5350	2000	
2019	4840	2009		1999	
2018		2008		1998	
2017		2007	4290	1997	
2016		2006		1996	
2015		2005		1995	4690

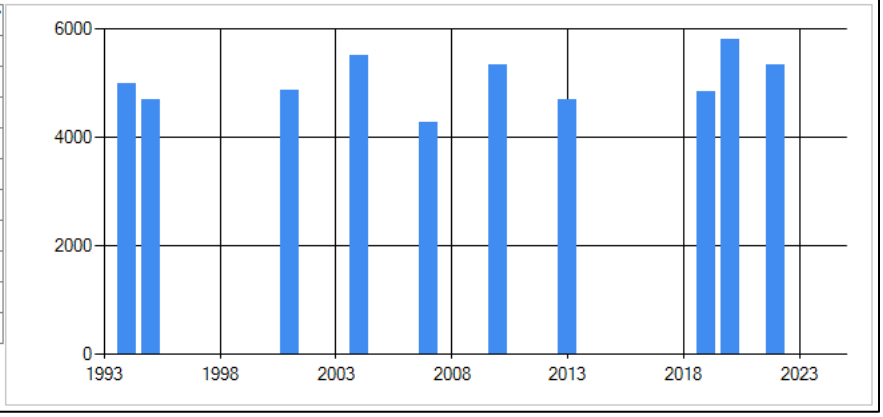


Figure 8. Historical AADT Traffic Counts on the US 51 Ohio River Bridge
(Source: KYTC Traffic Count Reporting System)

3.3. Traffic Forecasting – Subarea Model

To assess the impacts to travel demand for a new US 60 Ohio River crossing, the study team developed a special subarea traffic assignment model based on data derived from the Kentucky Statewide Traffic Model (KYSTM) and the Illinois Statewide Travel Demand Model (ISTDM). **Figure 9** presents a map of the subarea model network.

Based on a review and comparison of future year socioeconomic projections between the KYSTM and the ISTDM, the study team determined that the ISTDM was best suited for reflecting future year forecast trends outside Kentucky while the KYSTM was best suited for reflecting future year forecast trends inside Kentucky. The team used socioeconomic data from the KYSTM for the Kentucky zones and data from the ISTDM for the Illinois and Missouri zones.

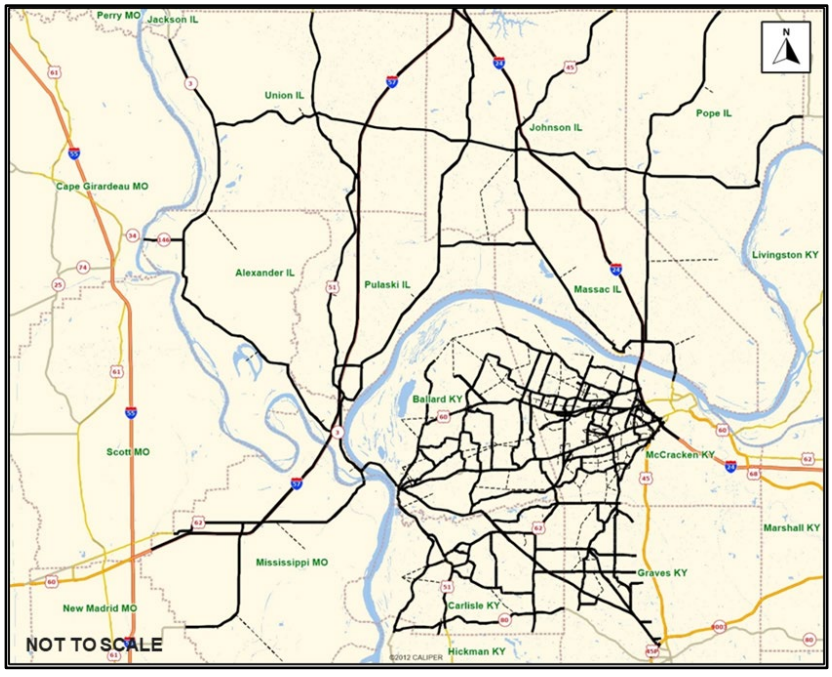


Figure 9. Subarea Model Network

3.4. Economic Analysis

As part of the US 60 Connectivity Study, an *Economic Analysis* was completed to identify potential direct and indirect benefits to the local economies and population as a likely result from the conceptual US 60 Ohio River crossing. This analysis considered regional trends and projections of population and employment as well as differences between traffic assignments of the two crossing location scenarios from the subarea model. It also included a review of changes in the pattern of economic development near Maysville, Kentucky before and after the construction of the new US 68 Ohio River bridge in 2000. While the analysis provided estimated changes in population and employment for each of the Traffic Analysis Zones (TAZs) from the KYSTM, the overall assessment of the analysis is that by 2045, a new crossing in the US 60 corridor would result in an approximate four percent increase in population and employment in the region, as compared to the baseline population and employment associated with the existing crossing location. The *Economic Analysis Report* is attached as part of **Appendix A**.

3.5. Future Year Daily Traffic Forecasts

The study team developed 2045 AADT forecasts based on population trends, historical traffic data, the subarea model analysis, and the economic analysis. **Given the variability of the traffic counts on the existing US 51 Bridge, a 2045 forecast range of 10,000 to 12,700 VPD is estimated at the conceptual US 60 Ohio River crossing.** These forecasts determine the number of lanes needed on the potential US 60 Ohio River crossing. While there is some variability in the number of existing and future daily river crossings, it was determined that two lanes would provide sufficient capacity in 2045.

4. Environmental Overview

Given the known environmental resources within the study area, this study was completed as a Planning and Environmental Linkages Study (PEL Study),[7] which takes a collaborative and integrated approach to the transportation decision-making process by considering potential environmental benefits and impacts during the planning phase.

The intent of a PEL Study is to identify potential benefits and impacts (direct and indirect) to environmental resources and provide recommendations for future avoidance, minimization, and/or mitigation efforts that could influence the environmental and overall decision-making process. The National Environmental Policy Act (NEPA) requires to the fullest extent practicable that federal actions be interpreted and administered in accordance with its environmental protection goals. It requires an interdisciplinary approach in planning and decision-making for any action that adversely affects the environment. The potential environmental impacts and need for safe and efficient transportation must be considered to reach a decision that is in the best overall public interest.

The complete *PEL Environmental Technical Report* is included as **Appendix B**.

4.1. PEL Study

This PEL Study process follows Federal Highway Administration (FHWA) PEL guidance regarding the integration of transportation planning documentation to be incorporated into the future NEPA process. Specifically, the study process included the following:[8]

- Pursuant to 23 United States Code (USC) Section 168, this planning study was developed through a process conducted pursuant to applicable federal law.
- This planning study was developed in consultation with the appropriate Resource Agencies.
- The planning process included broad multidisciplinary consideration of regional transportation needs and potential effects, including effects on the human and natural environment.

[7] https://www.environment.fhwa.dot.gov/env_initiatives/PEL.aspx

[8] https://www.fhwa.dot.gov/hep/guidance/pel/pelfaq16nov.cfm

- The planning process included public notice that the resulting planning study recommendations may be adopted during a subsequent environmental review process in accordance with Section 168.
- The planning documents will be made available for public review and comment.

In accordance with 23 USC 168,[9] environmental studies completed during a PEL study may be adopted during a subsequent environmental review process. These studies are intended to inform future analyses and document the project history and decision-making process, particularly regarding the corridor screening process, resource agency coordination, public involvement, and development of the project's purpose and need.

4.2. Protected Lands

As shown in **Figure 10**, much of the study area is preserved for recreational or conservation purposes. Protected properties include Barlow Park, Axe Lake Swamp State Nature Preserve (SNP), Boatwright Wildlife Management Area (WMA), Cypress Creek National Wildlife Refuge (NWR), Illinois Department of Natural Resources (IDNR) protected property,[10] Natural Resources Conservation Service (NRCS) Emergency Watershed Protection Program Floodplain Easements (FPE), and NRCS Wetlands Reserve Program Easements (WRPE). Various protections are afforded to each.

4.2.1 Boatwright WMA

The Boatwright WMA is publicly owned, primarily by the Kentucky Department of Fish and Wildlife Resources (KDFWR). Located in Ballard County, the WMA is composed of 8,847 acres and intersects the center of the study area.[11] It is open to the public and has many access points for fishing, boating, and hunting. KDFWR revenues are provided through licenses and permits for fishing, hunting, boating, and trapping.[12]

[9] https://www.fhwa.dot.gov/map21/docs/title23usc.pdf

[10] IDNR property identified as ""Miscellaneous" in Figure 10.

[11] https://app.fw.ky.gov/Public_Lands_Search/detail.aspx?Kdfwr_id=222

[11] https://app.fw.ky.gov/Public_Lands_Search/detail.aspx?Kdfwr_id=222

[12] https://fw.ky.gov/More/Pages/About-Us.aspx

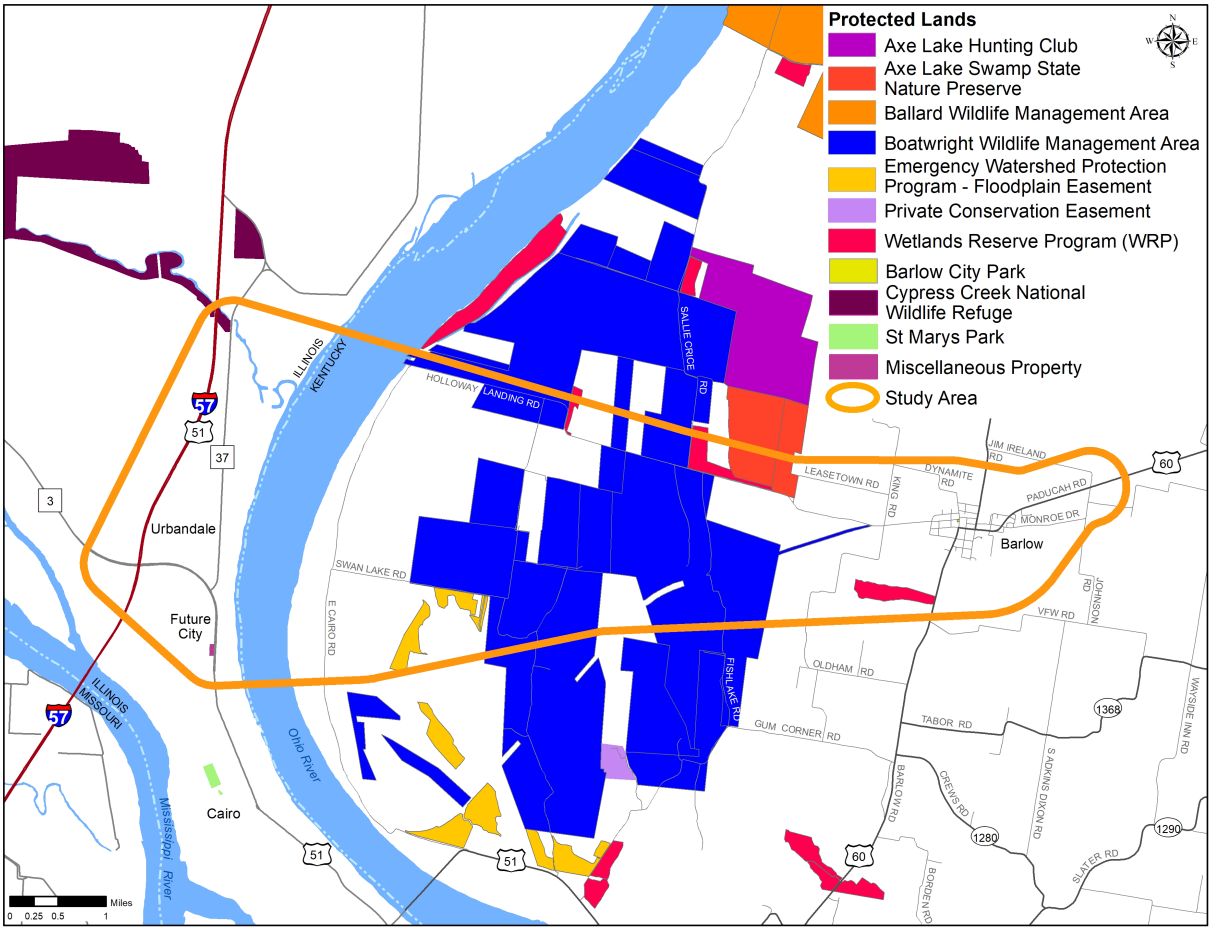


Figure 10. Protected Lands

4.2.2 Public Hunting Lands

Lands within the WMA are protected by various laws, funding stipulations, and land ownership (some are federally owned and were purchased as mitigation to offset impacts from Civil Works projects). As shown in **Figure 11**, the entire WMA is open for public hunting.[13] Seasonal restrictions occur where areas serve as waterfowl refuge from mid-October to mid-March.[14] Public hunting lands within the study area total 3,600 acres.

[13] https://fw.ky.gov/More/Documents/Boatwright_waterfowl.pdf

[14] https://app.fw.ky.gov/Public_Lands_Search/detail.aspx?Kdfwr_id=222

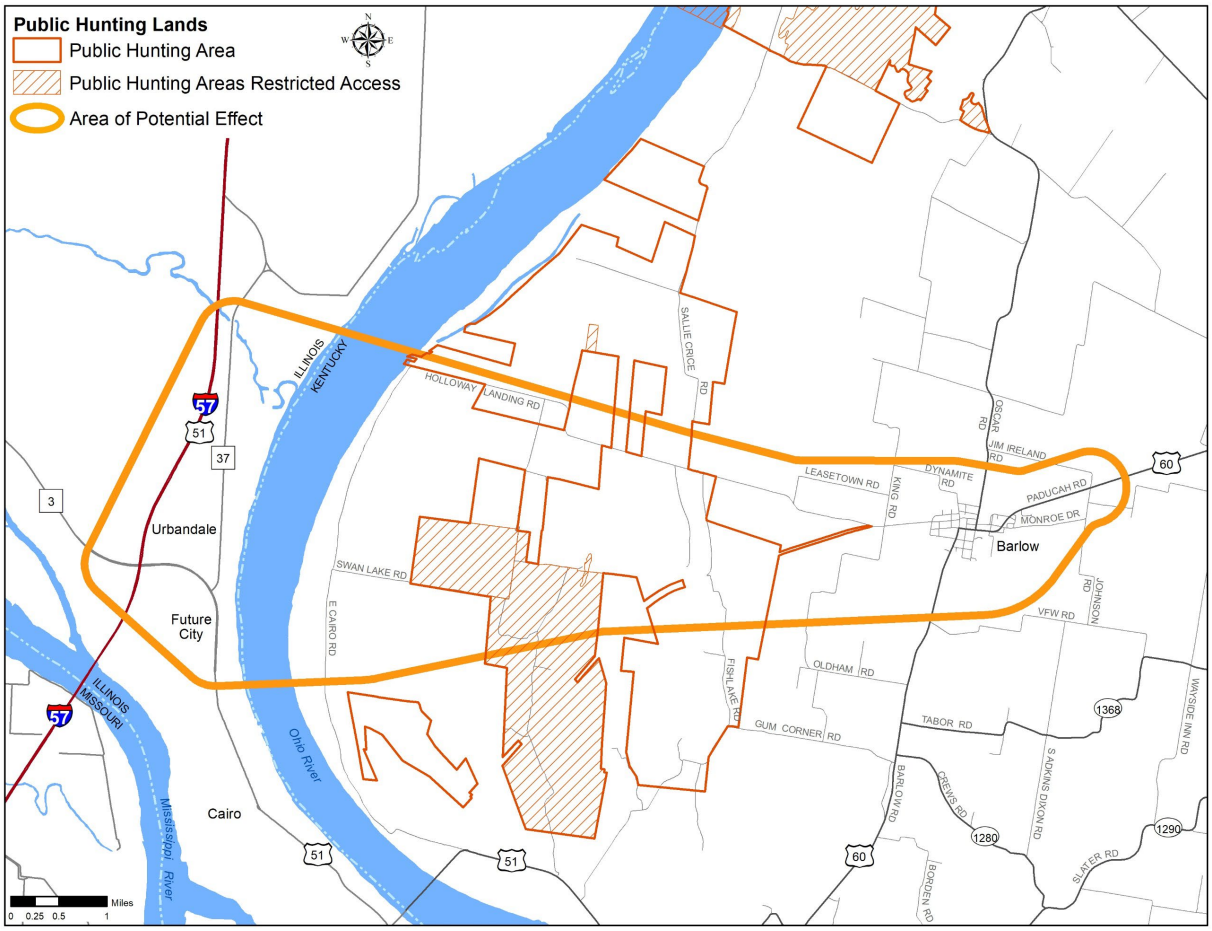


Figure 11. Public Hunting Lands

Per Kentucky Revised Statue (KRS) 150.0241, Kentucky has a "No Net Loss" policy that requires the state to "maintain at least the same level of available public hunting land that currently exists."[15] As the Boatwright WMA intersects the central portion of the study area, impacts to it would be unavoidable.

Early coordination with KDFWR noted the statutory requirement of "no net loss" (i.e., 1:1) replacement may not be sufficient to offset the adverse impacts to public hunting lands within the WMA. At the study level, replacement ratios and lands have not yet been identified. However, considering the quantity of impact, this mitigation cost could be significant. Coordination with the KDFWR should occur for potential project impacts.

[15] https://apps.legislature.ky.gov/CommitteeDocuments/262/20784/Oct%2020%202022%20KDFWR%20No%20Net%20Loss%20of%20Hunting%20Land%20Report.pdf

4.2.3 Eminent Domain

According to the Fifth Amendment to the *Constitution of the United States*, the government cannot seize private property without just compensation.[16] Kentucky's eminent domain law (KRS 416.540) defines "condemn" as a "means to take private property for a public use…."[17] According to case law, a property already devoted to a public use usually cannot be taken for another public use that will totally destroy or materially impair or interfere with the former use.[18] Thus, because all the protected properties, except the NRCS conservation easements, are publicly owned and it is assumed a roadway through these conservation areas would interfere with the former use, eminent domain could not be exercised to acquire the publicly owned lands.

4.3. Community Impacts

A US 60 Ohio River crossing concept would require consideration of both positive and negative community impacts. The concepts may shorten travel distances for some communities, lengthen travel distances for others, or bypass communities entirely.

There is limited residential development within the study area as it is predominantly conserved land. There are a few incorporated and unincorporated communities near the outskirts of the study area, primarily concentrated in Illinois, as shown in **Figure 12**. Since this study is exploring regional benefits and impacts of a more direct connection, communities within and outside of the study area may be impacted by this potential connection, as discussed in detail below.

[16] https://constitution.congress.gov/constitution/amendment-5/

[17] https://apps.legislature.ky.gov/law/statutes/statute.aspx?id=45368

[18] https://casetext.com/case/state-ex-rel-md-heights-etc-v-campbell

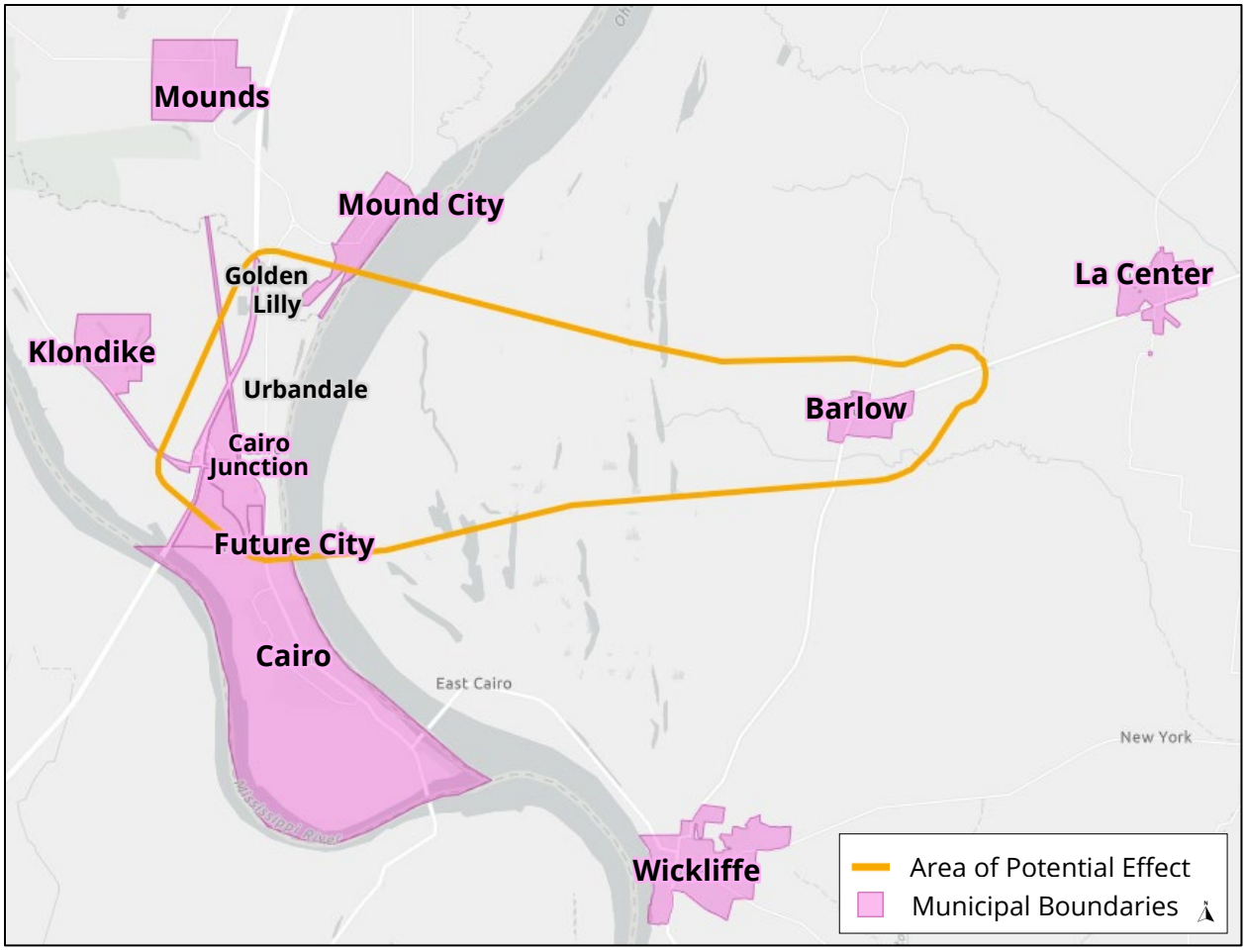


Figure 12. Municipalities

4.3.1 Communities

Due to their immediate proximity to the study area and the current US 51 bridge, Illinois communities would likely experience more adverse impacts as a result of the project compared to Kentucky residents.

Communities Linked

Currently, Illinois residents of Mound City, Golden Lily, Urbandale, and Future City travel south to Cairo to cross the US 51 Ohio River Bridge into Kentucky and access Barlow via US 60. A US 60 Ohio River crossing concept would shorten all their travel distances.

Similarly, residents of Barlow, Kentucky and neighboring LaCenter would likely benefit from a more direct connection to I-57 in Illinois.

Communities Diverted

In contrast, other communities may be diverted. Cairo is the closest community to the US 51 bridge and would likely experience the most adverse direct impacts. Cairo is primarily a minority and low-income community. Should the US 51 bridge be closed, the direct connection into the already disadvantaged city of Cairo would be lost, and with it would go convenient access to cross-river destinations plus economic benefits derived from pass-through traffic going to/coming from Kentucky.

On the Kentucky side, across from Cairo is Wickliffe, which has higher minority and low-income populations compared to Ballard County. This community would also likely experience similar adverse effects due to the closure of the US 51 bridge. Overall, a new connection could require further travel to area resources and job opportunities, and business sales from current pass-through traffic may be greatly reduced.

Community Cohesion

Due to their relative size, proximity to one another, and distance to area resources, the communities in Kentucky and Illinois likely experience a sense of community cohesion within their respective states. Additionally, the communities of Cairo, Illinois, and Wickliffe, Kentucky, experience a sense of cohesion due to the connection via the US 51 bridge. Based on the last available (2015) journey-to-work data from the American Community Survey (ACS), about 2% of commuters from each study area county travel across the Ohio River for work to another study area county across the river.

If a US 60 Ohio River crossing concept is recommended and the US 51 bridge is closed at a later date, the communities of Cairo and Wickliffe would likely experience adverse effects. The travel distance and time between these communities would be increased and community dependencies such as shopping, work, etc., may shift to other communities that would become more easily accessible.

4.3.2 Environmental Justice

A *Socioeconomic Analysis* (see **Appendix B**) was completed to identify areas of low-income and minority Environmental Justice (EJ) populations within the study area, including a review of US Census data, project mapping, and field observations. As shown in **Table 3** and **Figure 13**, EJ populations are present. Red text indicates areas where tract populations are greater than their respective counties.

Table 3. EJ Characteristics

	% Minority	% Below Poverty
Kentucky	16	16%
Ballard County	8	14%
Tract 9502	4	16%
Illinois	40	12%
Alexander County	37	25%
Tract 9578	67	38%
Pulaski County	36	18%
Tract 9710	24	18%

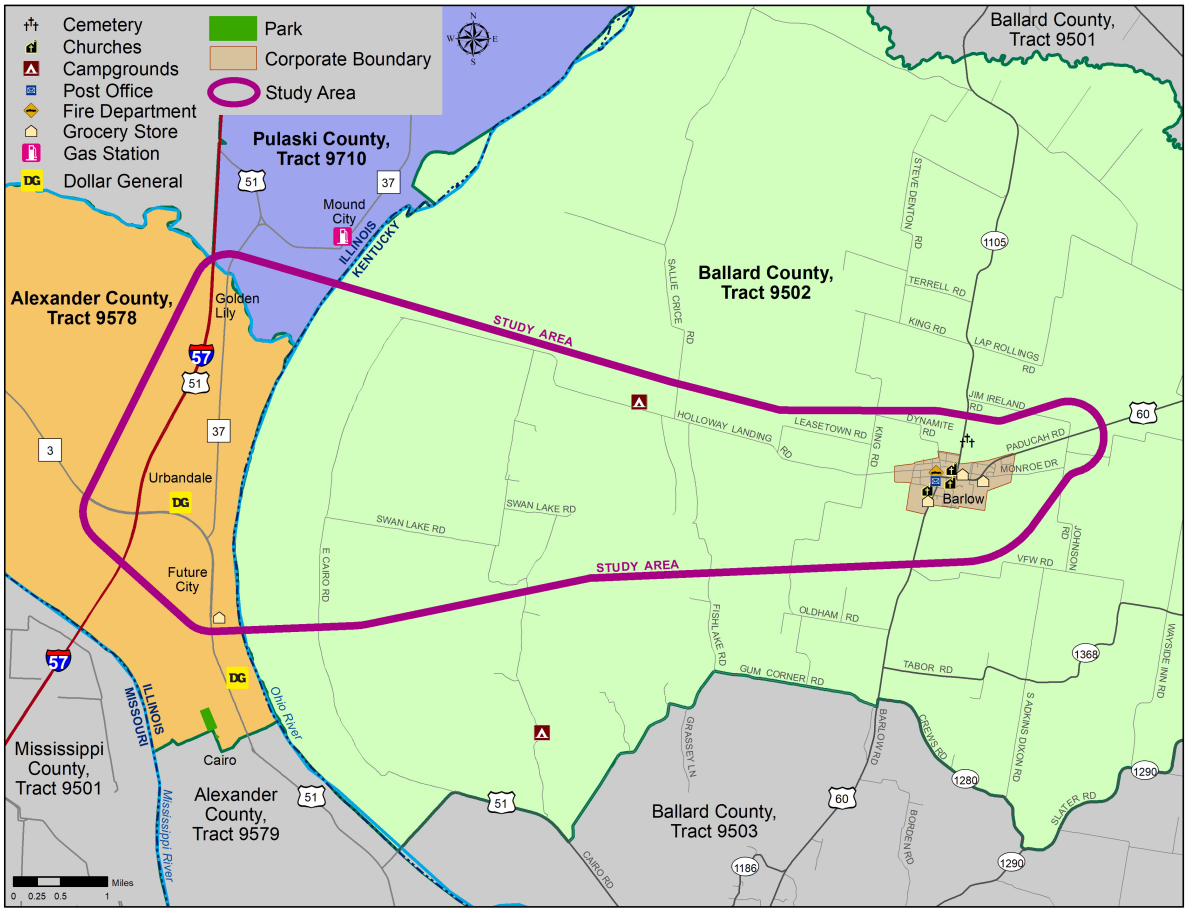


Figure 13. Census Tracts and Community Resources

The Alexander County study area census tract (9578) has the highest minority population at nearly 70 percent. Study area census tracts in Ballard and Alexander counties have a higher percentage of persons living below the poverty line than their respective counties. Current estimated housing values in the area indicate most are likely low income.

Coordination with local officials in Cairo and Wickliffe indicates they believe relocating the Ohio River crossing to the US 60 study area would adversely affect their communities. Similarly, the Illinois Department of Transportation has indicated concern for a project within this study area to disproportionately affect the EJ community of Cairo, noting its residents rely on the US 51 bridge to reach necessities such as healthcare and gas. An *Environmental Justice Impact Analysis* would be recommended to fully assess potential disproportionately high and adverse EJ impacts.

Regarding indirect effects to EJ populations, the benefits of improved mobility (e.g., access to residences and community resources, decreased emergency response times, reduced travel time and costs, and improved safety) would be made available to some EJ populations. However, if a US 60 alternative is recommended, and the US 51 bridge were to be closed, the EJ populations in other areas may experience increased travel costs from longer travel distances to work and community resources, as well as longer emergency response times to some areas.

4.4. Aquatic & Terrestrial Ecosystems

An *Ecological Report* (see **Appendix B**) was prepared to identify potential direct and indirect changes (benefits and impacts) to the aquatic and terrestrial environment. The report addresses protections afforded to conservation lands, WMAs, threatened and endangered (T&E) species, migratory birds, bald and golden eagles, and water resources (floodplain, stream, open water, wetlands). The report also discusses considerations of the *Clean Water Act* and the *Endangered Species Act* (ESA) Section 7 stipulations regarding federal, state, and local permits.

As shown in **Figure 14, the study area intersects an ecologically rich area.**

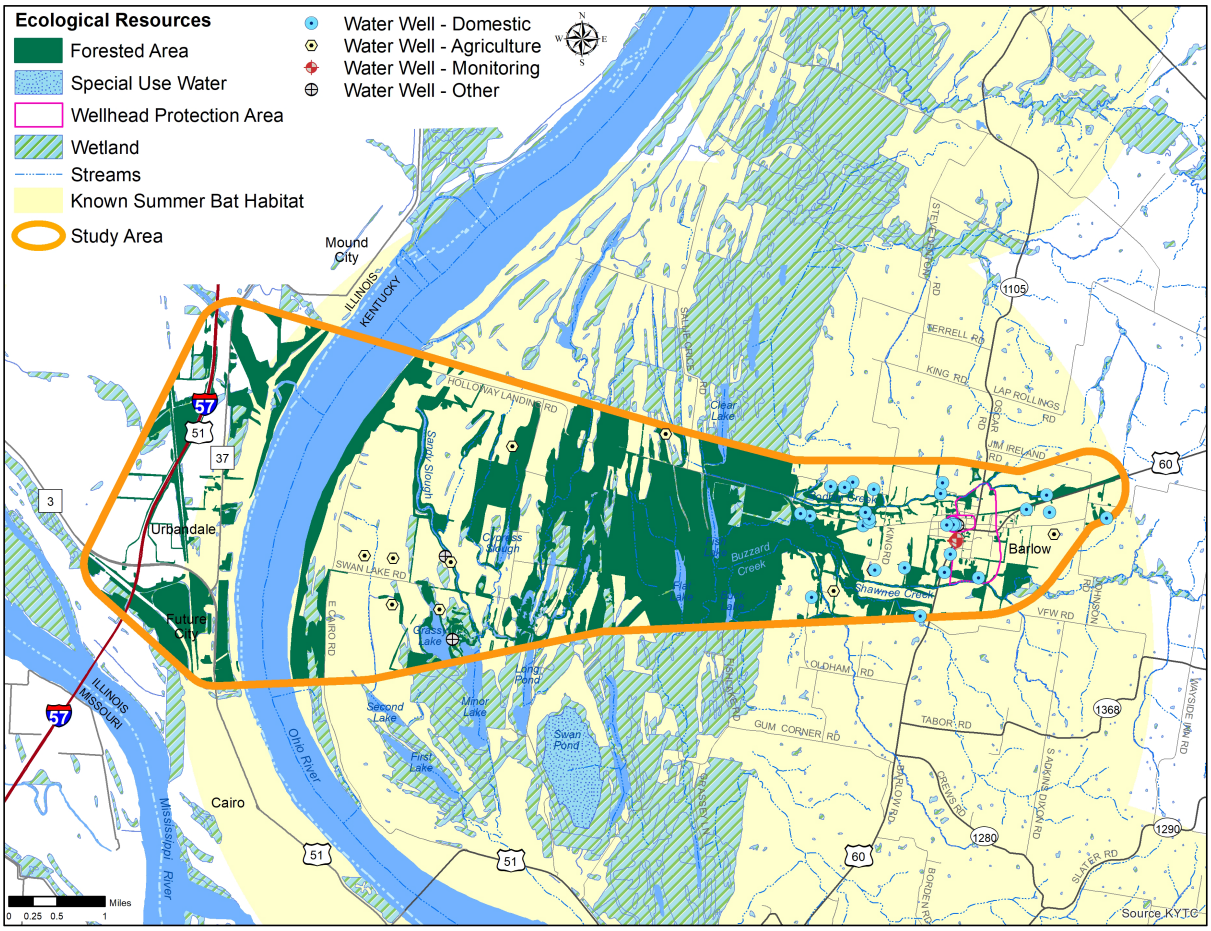


Figure 14. Ecological Resources

4.4.1 Listed Species

The USFWS's federally listed (IPaC) T&E species potentially occurring in the study area are included in **Table 4**. There are also numerous state-listed species and species of greatest conservation concern within the study area. Both states have wildlife action plans to consider.

Table 4. Federally Listed Species

	Name		Listing Status
Bats	Gray bat	*Myotis grisescens*	Endangered
	Indiana bat	*Myotis sodalis*	Endangered
	Northern long-eared bat	*Myotis septentrionalis*	Endangered
	Tricolored bat	*Perimyotis subflavus*	*Proposed Endangered*
Birds	Whooping crane	*Grus americana*	*Endangered, Experimental Population, Non-Essential*
Reptiles	Alligator snapping turtle	*Macrochelys temminckii*	*Proposed Threatened*
Fishes	Pallid sturgeon	*Scaphirhynchus albus*	Endangered
Mussels	Clubshell	*Pleurobema clava*	Endangered
	Fanshell	*Cyprogenia stegaria*	Endangered
	Fat pocketbook	*Potamilus capax*	Endangered
	Longsolid	*Fusconaia subrotunda*	Threatened
	Northern riffleshell	*Epioblasma torulosa rangiana*	Endangered
	Orangefoot pimpleback (pearlymussel)	*Plethobasus cooperianus*	Endangered
	Pink Mucket (pearlymussel)	*Lampsilis abrupta*	Endangered
	Rabbitsfoot	*Theliderma cylindrica*	Threatened
	Ring pink	*Obovaria retusa*	Endangered
	Rough pigtoe	*Pleurobema plenum*	Endangered
Insects	Monarch butterfly	*Danaus plexippus*	*Candidate*

The *Endangered Species Act (ESA) of 1973*, as amended, provides a law enacted for the conservation of federally listed T&E plants and animals and their habitats (16 USC 1531–1544). Numerous bat species have high potential for occurrence within the project area. Much of the study area is forested. Snags or loose bark on trees provide summer habitat and maternity roosting. Based on the August 2019 USFWS habitat maps in Kentucky and

within 20 miles[19], the study area primarily includes "Known Summer 1" habitat for the northern long-eared bat and "Known Summer 1" habitat for the Indiana bat. Some "Known Summer 2" habitat for the Indiana bat is also within the study area.

Kentucky is ranked in the top three states for freshwater mussel species diversity, which highlights the need to protect both these aquatic organisms and their habitats. A new Ohio River crossing would be located approximately one mile downstream from the Olmsted mussel bed and has potential for significant adverse impacts should local populations be identified at or adjacent downstream of the proposed bridge footprint.

The monarch butterfly is also a species of special concern and is included in the Illinois *Wildlife Action Plan*. The alligator snapping turtle is ranked as state-endangered in both Illinois and Kentucky and is included in both states' action plans.

The whooping crane is a state and federally listed endangered species and the study area is located within a federally designated experimental population area for the species.[20] Specifically, it is within the Eastern Migratory population of the species. According to the USFWS, "Whooping cranes continue to face threats from alteration and destruction of habitat—including migratory habitat and winter habitat—from wetland drainage, increased development and conversion of suitable habitat to agriculture."[21]

Considering the project scale, setting, and potential impacts, a *Biological Assessment* would likely be required as part of the ESA Section 7 consultation process with the USFWS. This assessment would evaluate the potential effects of the project on federally listed species. The multiple seasonal survey restrictions and hunting seasons would affect field assessment timeframes. **Figure 15** summarizes the seasonal restrictions to be considered. Since there is likely **potential for the project to adversely affect listed species**, a *Biological Opinion* would probably be required. This review process would also add review times for project schedule considerations.

[19] https://www.fws.gov/office/kentucky-ecological-services/protected-bats-kentucky
[20] https://www.federalregister.gov/documents/2001/03/09/01-5821/endangered-and-threatened-wildlife-and-plants-proposal-to-establish-a-nonessential-experimental
[21] https://www.fws.gov/species/whooping-crane-grus-americana

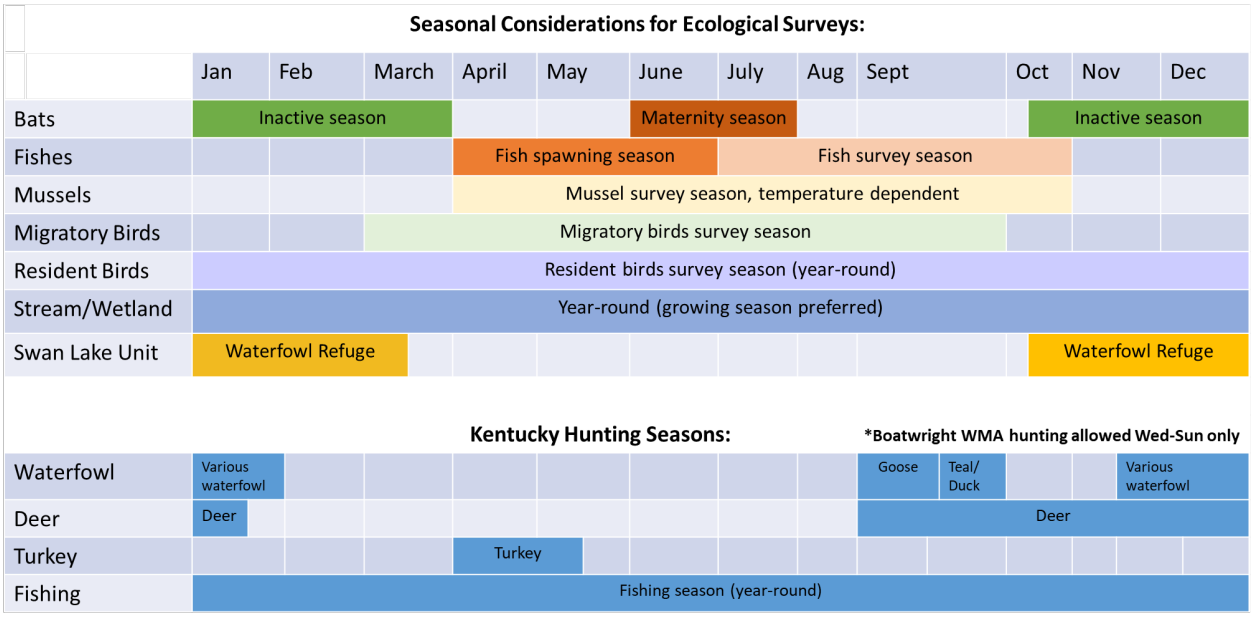


Figure 15. Seasonal Survey Restrictions & Hunting Seasons

4.4.2 Migratory Birds

The *Migratory Bird Treaty Act of 1918* (MBTA) implements four international treaties that the United States entered with Canada, Mexico, Japan, and Russia, and requires prior authorization by the US Department of the Interior's USFWS for the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species.

The *Bald and Golden Eagle Protection Act* (BGEPA) was introduced in 1940. The BGEPA protects bald eagles and golden eagles and provides these species with additional protections not covered by the MBTA. The BGEPA authorizes take permits for otherwise lawful projects. As part of an eagle take permit, the USFWS would require an *Eagle Conservation Plan* to avoid and minimize take of eagles. Although an eagle take permit is authorized by the Secretary of the Interior, coordination with each state's wildlife resource agency's avian staff should be anticipated.

Though no longer a T&E listed species, the bald eagle remains protected under the BGEPA and MBTA. Both breeding and wintering populations occur in Kentucky, with bald eagles usually laying eggs from January to March, but they can begin nest building and repair as early as October. Three bald eagles' nests were identified during initial field surveys within this project study corridor.

The study area is a critical hotspot for migrating waterfowl and neotropical songbirds, attracting dozens of species such as snow geese, white pelicans, bald eagles, wood ducks, scarlet tanagers, and Kentucky warblers. Birds serve a significant role in both public and private hunting ventures within western Kentucky. Resident and migratory populations also bring visitors to the area for ecotourism activities such as birdwatching, wildlife photography, and trail hiking.

The Swan Lake Unit of Boatwright WMA has established use restrictions designated in Kentucky Administrative Regulations 301 (KAR) 4:050, which requires the WMA to be closed to all public access from October 15 through March 31 to serve as a waterfowl refuge. With the western Kentucky region and Boatwright WMA property serving as a major flyway for numerous migratory bird species, especially waterfowl, this waterfowl refuge is providing strong ecological services to numerous waterfowl populations and an umbrella protection for other species that share in use of this type of habitat.

Coordination with KDFWR's aviary staff is often required for development of avoidance and minimization measures or requests for permit to take regarding any bird species in Kentucky. Avian take permits are acquired from the Secretary of the Interior via the USFWS Atlanta Office.

4.4.3 Karst

Based on information from the USGS *Karst Occurrence Map*, the study area is underlain by bedrock with limited or no potential for karst development. The Kentucky Biological Assessment Tool data report and the KyGovMaps Open Data Portal[22] identified zero sinkhole polygons within the study area.

4.4.4 Waters

The area is commonly referred to as Barlow Bottoms and is frequently flooded. In addition to the Ohio River, **there is an abundance of water resources within the area.**

Streams

The study area contains 398,283 linear feet of mapped National Hydrography Dataset (NHD) streams including artificial paths, canals/ditches, connectors, intermittent streams, and

[22] KyGovMaps Open Data Portal. Ky Water Resources Polygons Sinkholes. Accessed July 19, 2023. https://opengisdata.ky.gov/datasets/kygeonet::ky-water-resources-polygons-sinkholes/explore?location=37.069509%2C-89.091666%2C12.44

perennial streams. [23]

Kentucky Division of Water (KDOW) designations[24] identified by river mile index (RMI) within the study area include (**Table 5**):

Table 5. KDOW Water Resource Designations

Water Resource	RMI	Use Designation Type
Ohio River	974.1 – 952.7	Outstanding State Resource Water (OSRW)
		Exceptional Use Water T&E Species: *Plethobasus cyphyus,* & *Quadrula cylindrica*
Ohio River	981.3 – 938.9	Warm Water Aquatic Life Full Support
		Primary Contact Recreation Full Support
		Fish Consumption Partial Support
		Domestic Water Supply Full Support
Fish Lake		Warm Water Aquatic Life Full Support
		Secondary Contact Recreation Full Support
		Fish Consumption Partial Support
Shawnee Creek	0.0 – 3.4	Warm Water Aquatic Life Non-Support Water; Habitat Impaired by Impacts and/or Alterations
		Primary Contact Recreation Partial Support
		Fish Consumption Full Support
Shawnee Creek	3.4 – 12.9	Warm Water Aquatic Life Non-Support Water; Habitat Impaired by Impacts and/or Alterations
		Fish Consumption Full Support

[23] The National Hydrography Dataset (NHD) is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system.

[24] Kentucky Energy and Environment Cabinet. Kentucky Division of Water (DOW) Water Maps Portal. Water Health Portal and Water Quality Certification Viewer Maps. Accessed July 27, 2023. https://watermaps.ky.gov/

Wetlands

USFWS National Wetland Inventory (NWI) identified 703 acres of palustrine (i.e., freshwater) emergent wetland (PEM), and 3,568 acres of freshwater forested/shrub wetland (PFO/PSS) habitat in the study area.

The NHD Waterbody identified 382 acres of swamp/marsh within the study area. Bald-cypress-water tupelo forest is a unique ecological community type that is assumed associated with these swamp/marsh areas.

According to the Office of Kentucky Nature Preserves (OKNP) summary, Axe Lake Swamp "protects a portion of Kentucky's best-known example of a large, intact bald cypress-tupelo swamp." [25] The KY-Biological Assessment Tool report recorded the water hickory tree (*Carya aquatica*, a Kentucky state-threatened species) and Bald-cypress (*Taxodium distichum*) - Water tupelo (*Nyssa aquatica*) Forest (a Kentucky state-endangered community type) within the study area, which are often associated with bottomlands and floodplain swamps.

Based on current regulatory programs, acquisition of sufficient compensatory mitigation for this volume of wetlands impacts would be difficult to identify and coordinate.

Open Waters, Lakes, and Ponds

USFWS NWI identified 170 acres of freshwater pond, 255 acres of lakes, and 1,696 acres of riverine (Ohio River) habitat in the study area.

NHD Waterbody totaled 775 acres (386 acres lake/pond; 7 acres reservoir; 382 acres swamp/marsh) in the study area. It is not uncommon for open waters, lakes, ponds, and reservoirs to also provide wetland fringe around their perimeter; field surveys would be necessary to determine any potential wetland fringe features.

Floodplains

Within the 16,167 acres study area, 11,702 acres (72 percent) are located within Federal Emergency Management Agency's (FEMA's) National Flood Hazard Layer (NFHL) floodplains. Floodplain areas include 1,027 acres in Zone A, 10,631 acres in Zone AE, and 44 acres in Zone AH. **A substantial length of the approach roadway within Kentucky would need to be constructed on structure to avoid raising the 100 year flood elevation within the area.**

[25] Kentucky Energy and Environment Cabinet. Office of Kentucky Nature Preserves. Accessed July 14, 2023. https://eec.ky.gov/Nature-Preserves/Locations/Pages/Axe-Lake.aspx

Table 6 and **Figure 16** show the FEMA NFHL Designation Type and 100 Year Flood Zone.

Table 6. FEMA NFHL Designation Type

FEMA NFHL Designation Type	Acreage	Percentage of Study Area
Zone A	1,027	6.4%
Zone AE	10,631	65.8%
Zone AH	44	0.2%
Non-Floodplain	4,465	27.6%
Totals	16,167	100%

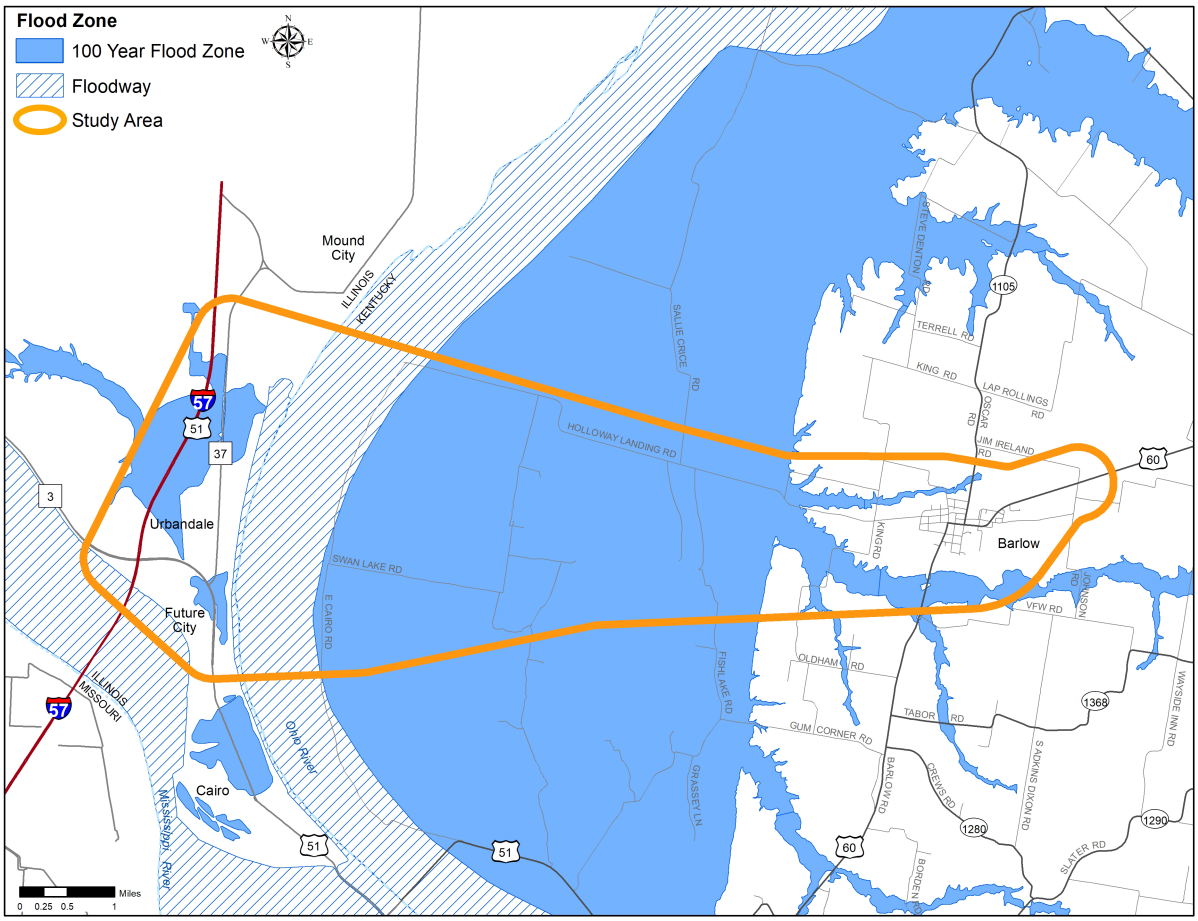


Figure 16. Flood Zone and Floodway

4.4.5 Additional Impacts

Additional potential ecological impacts to consider include those from human disturbance and ecotourism in the area.

Human Disturbance Impacts

Conversion of land into a transportation corridor would also aid in deforestation and habitat fragmentation within the region. The further fragmentation of mature bottomland forest is of particular concern, and negative impacts are likely for species that require large contiguous tracts of mature forest habitats. Fragmentation could also change size and available habitat areas for migratory waterfowl species. Additionally, the significant alteration or loss of major aquatic habitat features could include various lakes within Boatwright WMA that provide both wildlife habitat and ecotourism value.

A US 60 corridor route would increase public access to the area. **Adding new or more frequent human encounters via fragmented habitat could result in sensitive species experiencing a 'fight or flight' response, possibly resulting in species' abandonment of the area or negative impacts to species' reproduction. The introduction of additional vehicular traffic also increases the general risk of collisions with wildlife.**

In addition, highway roadsides are often subject to increased trash and debris. Plastics and other non-compostable materials can be harmful to wildlife including birds, mammals, fishes, reptiles, and amphibians.

Ecotourism Impacts

The International Ecotourism Society defines ecotourism as "responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education" (TIES, 2015). A few examples of common ecotourism activities include hiking, horseback riding, cycling, kayaking, wildlife viewing and birdwatching, wildlife photography, and observation of astronomical phenomena.

As boasted on the County's website, "Ballard County is home to over 30,000 acres of land for outdoor enthusiasts … [and] within a 6-hour drive for 60% of the total population of the United States who are looking for an outdoor challenge and other recreational pursuits."[26] According to Kentucky Department of Tourism's 2020 studies, Kentucky's Western Waterlands Region generated $664.9 million economic impact by tourism to the region.

[26] https://www.discoverballardcounty.com/things-to-do/

Nearly 5.9 million total visits were made in 2020 (an 8.5% decline from previous year, possibly related to pandemic conditions) with approximately 7% related to outdoors purposes[27].

A US 60 corridor concept would increase public access to, and potentially awareness of the ecological value within this study area, possibly increasing ecotourism revenue; however, the route may also serve as a connector that acts primarily as a pass-through rather than a destination. Although ecotourism aligns well with a "leave no trace" mentality, highway roadsides are often subject to increased trash and debris which unmaintained could be an aesthetics concern. Additionally, **the significant alteration or loss of major aquatic habitat features within the study area could include various lakes within Boatwright WMA that provide both wildlife habitat and ecotourism value.**

4.5. Section 106 – Cultural Historic & Archaeological Resources

The *National Historic Preservation Act of 1966* (NHPA), as amended (16 U.S.C. 470f), requires federal agencies to consider the effects their activities and programs have on historic properties (e.g., districts, sites, buildings, structures, objects) listed in or eligible for the National Register of Historic Places (NRHP).

Pursuant to 36 CFR Part 800, regulations implementing NHPA Section 106, a *Cultural Resources Literature Review / Archaeological Overview* was completed for the US 60 Connectivity Study (see **Appendix B**). Information about previously conducted cultural historic resource investigations and documented archaeological resources was gathered, and an environmental and cultural context of the region was created to assess the potential for discovering undocumented archaeological sites within the project area.

The area has a rich history, with both NRHP listed and potentially eligible sites located in the study area. The initial review of cultural historic resources identified two NRHP-listed sites: the Barlow House (S. 5th Street) and Twin Mounds site (also known as the Nolan site), both in Kentucky. The Twin Mounds site is owned and protected by the Archaeological Conservancy.[28] The review also noted a potential historic district in downtown Barlow, the

[27]Travel USA Visitor Profile for Western Waterlands. 2020 Study by Longwoods Travel USA for KY State Government. Accessed: July 24, 2023. https://www.kentuckytourism.com/docs/default-source/research/2020-ww-day-trip-visitation-report0ec163fb-6a24-4e66-bf77-eef7557b874f.pdf?sfvrsn=8a7f9c24_1

[28] The Archaeological Conservancy is a 501 non-profit organization that acquires and preserves archaeological sites in the United States.

Ohio River Levee System, and several properties in Illinois may be NRHP eligible. In addition, a section of the Trail of Tears National Historic Trail runs through the study area, as shown in **Figure 17**, likely requiring consultation with several Native American tribes should a future project identify any impacts to the resource.[29] South of the study area, the US 51 bridge is eligible, and Cairo has several NRHP-listed properties.

Figure 17. Trail of Tears National Historic Trail

Archaeological records on file at the Kentucky Office of State Archaeology (OSA) and the Illinois Inventory of Archaeological Sites (IAS) were reviewed to determine the extent of previous archaeological surveys completed in and around the project area within Ballard County, Kentucky, and Alexander County, Illinois. This review provided information on previous structures, cemeteries, roads, and railroad alignments, all of which are tools for identifying the location of potential historic-period archaeological sites, the knowledge of which facilitated identification of the study area.[30]

Based on the results of these planning-level reviews, **there is a moderate to high probability for both prehistoric and historic archaeological sites to be identified within the area. A separate survey, report, determination of eligibility and effects, and coordination with the respective State Historic Preservation Officers (SHPOs) would be required to fully assess potential impacts should a Build alternative advance.**

4.6. Section 4(f)

Section 4(f) of the *U.S. Department of Transportation Act of 1966* (USDOT) provides for protection of publicly owned park and recreation lands, NRHP listed/eligible cultural historic and archaeological sites, and publicly owned wildlife and waterfowl refuges during the development of transportation projects.

[29] https://www.nps.gov/trte/planyourvisit/maps.htm

[30] Per 36 CFR 800.16(d), the area of potential effects (APE) is the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist.

Known resources in the project area that would be considered for protection are Barlow Park, Axe Lake Swamp State Nature Preserve, Boatwright WMA, and Cypress Creek National Wildlife Refuge.

Before approving a project that uses Section 4(f) properties, FHWA must determine there is no feasible and prudent avoidance alternative and the project includes all possible planning to minimize harm, or FHWA makes a ***de minimis*** impact determination.[31] When multiple alternatives use Section 4(f) properties and the evaluation of avoidance alternatives concludes that there is no feasible and prudent avoidance alternative, then FHWA may approve only the alternative that causes the least overall harm in light of the preservation purpose of the statute.[32]

Any project concept within the study area would impact Section 4(f) protected properties. Assuming no feasible and prudent avoidance alternative exists, minimization efforts (alignment adjustments, commitments to off-season construction—this could consider recreational use and refuge timeframes, reduction of design speed, etc.) should be pursued to reduce the impact to Section 4(f) properties.

Considering the potential magnitude of impacts, a *de minimis* determination is not anticipated and current Programmatic Evaluations would not apply to this project type. Thus, **based on the anticipated costs of a project of this magnitude, it is assumed that any transportation project through the area would utilize federal transportation dollars and an Individual Section 4(f) Evaluation would be required. The documentation requires legal sufficiency review by FHWA's legal counsel. Finalization of the NEPA document and use of Section 4(f) property cannot proceed without FHWA approval (49 USC 303 [c][33]).[34]**

Complete avoidance of Section 4(f) properties is not possible within the study area as the Boatwright WMA is Section 4(f) protected and is unavoidable. Mitigation to offset impacts to this Section 4(f) protected property is likely but has not been quantified at the study level. Should a US 60 corridor concept be further considered, coordination with the KDFWR should occur to identify potential mitigation opportunities.

---

[31] https://www.ecfr.gov/current/title-23/chapter-I/subchapter-H/part-774/section-774.17

[32] https://www.ecfr.gov/current/title-23/chapter-I/subchapter-H/part-774/section-774.3

[33] https://www.govinfo.gov/app/details/USCODE-2009-title49/USCODE-2009-title49-subtitleI-chap3-subchapI-sec303

[34] https://transportation.ky.gov/EnvironmentalAnalysis/Environmental%20Resources/DEA%20Guidance%20Manual.pdf

4.7. Section 6(f)

Section 6(f) of the *Land and Water Conservation Fund Act of 1965* (LWCF) establishes a grant program for states and local governments to acquire and develop public outdoor recreation sites and facilities. Section 6(f) protects property acquired or developed with assistance under LWCF from conversion to another use unless the US Department of Interior (DOI)/National Park Service (NPS) approves a replacement land of at least equal value, location, and usefulness.

A review of the Trust for Public Land/LWCF past projects mapping tool indicated the Cypress Creek National Wildlife Refuge received LWCF monies and would be protected by Section 6(f).[35]

Direct coordination with the Department of Local Government would need to occur for a future project to verify this is the only Section 6(f) protected property. If 6(f) properties were to be impacted and converted to a use other than recreation, the NPS would require that replacement lands of equal value, location, and usefulness be provided as a condition of approval.

[35] https://lwcf.tplgis.org/mappast/?fbclid=IwAR1bnUFm0LBu4abV1Y--3ZT9uL6cyGk10AhzTbLI1ZA47DTWavR7ZsNgzxA

5. Preliminary Stakeholder Outreach on Study Goals and Objectives

Resource agencies, local officials, economic development groups and other project stakeholders helped identify the primary objectives of the US 60 Connectivity Study. **Figure 18** highlights the stakeholder outreach that was conducted to identify the study goals and objectives. A complete summary of the study's public outreach and public feedback is included in **Appendix C**. Information was also shared through the study's website, US60ConnectivityStudy.com.

Figure 18. Preliminary Stakeholder Outreach on Study Goals and Objectives

5.1. Resource Agency Meeting No. 1

A *Resource Agency Coordination Plan* was prepared for the US 60 Connectivity Study to be compliant with FHWA's environmental regulations and NEPA requirements. The goal of the plan is to support efficient environmental reviews for project decision-making.

The first Resource Agency Coordination (RAC) meeting was held March 30, 2023, to review existing environmental resources within the study area. The meeting's main objective was to seek feedback on additional resources and associated environmental requirements.

In total, 43 resource agency representatives attended the hybrid meeting. Comments and questions received during the meeting included:

- Some of the Boatwright Wildlife Management Area (WMA) is owned by the United States Army Corps of Engineers (USACE) as part of a mitigation effort from the Olmstead Dam, and the Kentucky Department of Fish and Wildlife Resources (KDFWR) has a lease agreement with them. They are funded through Pittman Robertson funds. If those are impacted, there may be additional costs to reimburse the use of those federal funds.
- Boatwright WMA consists of 13 different land purchases dating back to 1957; some of that would have utilized KY Fish & Wildlife Sportsman money, but majority of the acreage was acquired using federal grants including, Pitman Robertson Act funds, North American Wetland Conservation Act (NAWCA) grants, State Wildlife grants, conservation fund board grants, Kentucky heritage land and water conservation funds. Each would require consultation with the United States Fish and Wildlife Service (USFWS) for reimbursement costs and mitigation efforts.
- Elaborating on ecological efforts and expenses, particularly regarding Section 7, the impacts from the construction of a transportation corridor would likely adversely impact many species. Analyses and mitigation would be complex and costly, especially concerning mussels, migratory birds, state listed species, potential future listed species (monarch butterfly), and WMA-specific species. Direct, indirect, and cumulative impacts would need to be considered.
- It appears that a large quantity of wetlands could be impacted by the project. KDFWR could inform the cost of In-Lieu fees in that area, or, if credits are available, check the KY Wetwoods 2 mitigation bank[36] for the cost of credits to ensure this potential cost is added to the overall project cost.

5.2. Mississippi Ohio River Confluence Economic Alliance

The study team met with several economic development groups, including the Mississippi Ohio River Confluence Economic Alliance (MORCEA) on April 19, 2023. MORCEA was formed by representatives from Illinois, Kentucky, Missouri, and Tennessee creating a joint economic development group to promote growth across the four-state region. MORCEA's mission is to connect the communities of the Mississippi and Ohio River Confluence for the purposes of facilitating growth of the economy and marketing the region's unique assets, with the ultimate goal of enhancing the quality of life for both current and future generations.

[36] www.landcan.org/local-resources/West-Kentucky-Wetwoods-Mitigation-Bank-2/82403/

The primary objective of the meeting was to solicit feedback on study goals and to quantify the economic development opportunities of the US 60 Connectivity Study. Comments received by the study team during the meeting included:

- Though the conceptual US 60 crossing would directly connect Illinois and Kentucky, it would also affect local Missouri residents and businesses, economic development in general, as well as travelers going north, south, east, and west from other states.
- A two-lane bridge does not provide adequate capacity for anticipated future traffic demands. Currently there are no other four-lane crossings going east to west between St. Louis and Memphis.
- A direct east-west, four-lane route from Cape Girardeau, Missouri to Paducah, Kentucky would be a tremendously successful route in terms of both economic development and quality of life. There is no good route for industry to take efficiently, via interstate moving east or west, thus requiring a trip north to St. Louis, MO or south to Memphis, Tennessee. The alternative is traveling through the myriad of two-lane highways and driving through small towns to reach Paducah and the interstate infrastructure found there.
- A connection to I-57 (which leads to I-55 in Missouri) would help economic development in Illinois, Kentucky, and Missouri.
- This area of the tri-state region (in all three states of Missouri, Kentucky, and Illinois) is at a lower economic status. This region has been overlooked for a long time and hasn't had voices speaking for them on the infrastructure and development issues like other areas have.
- When the US 62 Mississippi River Bridge is no longer available for traffic, anticipated to occur sometime within the next 10 to 15 years, all residents of Cairo will have to go north to I-57 Exit 1 to travel to Missouri and points west. A US 62 Mississippi River Bridge closure would also add significant truck traffic through downtown Cairo.
- A project in the US 60 study area should not interfere with wildlife refuges, preserves, parks, or historic resources.
- Cairo has minimal resources that would be affected if bypassed by a new bridge north of town. Currently there are no gas stations, hospitals, or grocery stores plus limited shopping and very limited eating establishments.

5.3. Local Officials / Stakeholder Meeting No. 1

The first set of Local Officials and Stakeholders meetings were held June 15, 2023, in Cairo, Illinois and Kevil, Kentucky to provide stakeholders with an overview of the US 60 Connectivity Study and gather feedback on the potential benefits and impacts of constructing a new road and Ohio River crossing in the study area. A total of 38 people attended Local Officials/Stakeholder Meeting No. 1: 14 attendees in Cairo and 24 in Kevil (numbers do not include members of the study team). Each attendee received a questionnaire at each meeting as an opportunity to provide written feedback on the benefits and impacts of the project. A total of 11 people provided feedback by completing the questionnaire. Eight responses were in opposition to a potential new Ohio River crossing and three responses were supportive of the project, as shown in **Figure 19**.

Both meetings followed a format that began with a formal presentation followed by a question-and-answer session and open discussion forum where attendees were encouraged to ask questions about the project and to express their concerns and/or support of the potential new Ohio River crossing. Topics and comments by stakeholders from that discussion included:

- This project would redirect through traffic away from Cairo, traffic that supports the existing and proposed businesses.
- Any effort to bypass Wickliffe and Cairo would be devastating to local business owners.
- The City of Wickliffe stands firmly with the City of Cairo in opposition of this project.

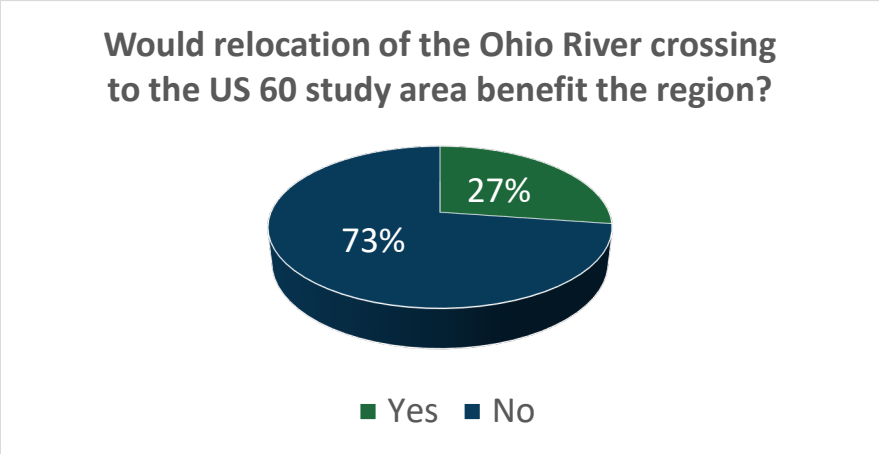


Figure 19. Stakeholder Responses

- This project, although very costly, is a generational project that would change the face of the rural counties in Southern Illinois, Southeast Missouri, and Western Kentucky. The benefits of economic development and commerce would be staggering. Commercial transportation would be easier and quicker and would provide a platform for growth and redevelopment in the Paducah/McCracken County gaseous diffusion site.

5.4. Meeting with KDFWR and USFWS

On August 1, 2023, the study team met with the Kentucky Department of Fish and Wildlife Resources (KDFWR) and the U.S. Fish and Wildlife Service (USFWS) representatives in Frankfort, Kentucky, to discuss the Boatwright WMA protections, specifically those regarding funds used, funding stipulations, replacement of hunting land requirements, and any other elements not already identified.

The study team provided funding information to KDFWR and USFWS, and discussed the process for working through mitigation for impacts to these public hunting lands, ecotourism impacts, and habitat impacts to the many species of greatest conservation need. Due to the magnitude of impacts, the statutory 1:1 mitigation requirement to offset public hunting land impacts would not likely offset project impacts. Should a project advance, coordination with KDFWR would be needed to determine what level of mitigation would be appropriate.

6. Study Goals and Project Purpose

Study goals and objectives inform the Draft Purpose and Need statement, which defines why the expenditure of public funds is necessary and worthwhile. They provide the merits of the project and allow decision-makers to weigh the proposed action against the potential impacts and to help screen options at future stages. Based on the initial stakeholder outreach, **Figure 20** summarizes the goals of a project within the US 60 Connectivity Study area are to:

- Enhance regional mobility
- Provide economic development opportunities
- Remain sensitive to environmental resources

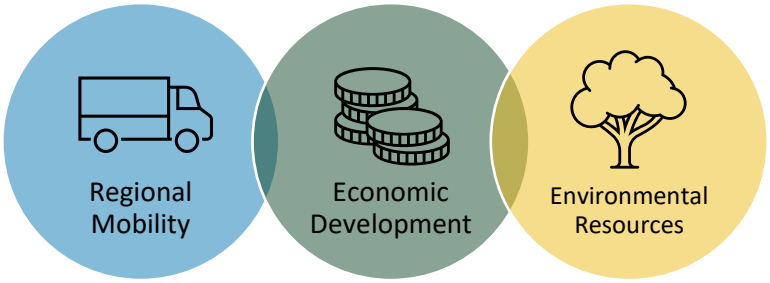


Figure 20. Study Goals and Objectives

6.1. Enhance Regional Mobility

Traveling between I-24 in Kentucky and I-57 in Illinois using the existing US 51 Ohio River Bridge is approximately 13 minutes longer than a potential connection in the US 60 study area, as shown in **Figure 21**. For the 5,300 vehicles per day using the existing US 51 connection, travel speeds are reduced to 25 mph through Wickliffe and 30 mph through Cairo. A new corridor in the US 60 study area would allow for a 55 mph speed limit.

Several major freight generators rely on the US 51 Ohio River Bridge. US 60 currently provides the only east-west designated truck route west of Paducah, connecting to US 51 near the Ohio River at Wickliffe. The US 51 Ohio River Bridge carries 35 percent trucks. Approximately 1,400 semi-trucks travel through Wickliffe daily and 900 semi-trucks travel through Cairo daily.

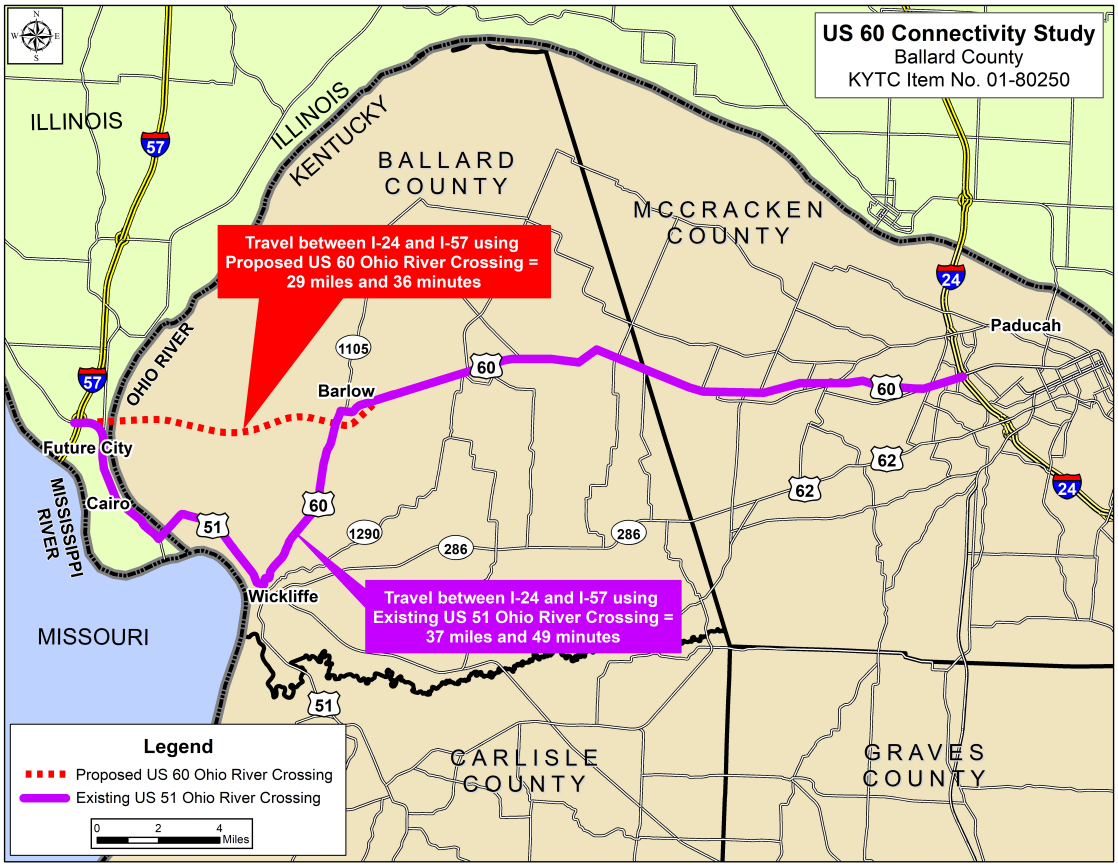


Figure 21. Travel Times between I-24 and I-57

6.2. Provide Economic Development Opportunities

Figure 22 provides a summary of the areas that are within 60 driving minutes from Barlow, Kentucky based on use of the existing US 51 crossing location (in red) versus a conceptual connector within the US 60 study area (in green). As shown, a more direct east-west connection would expand the accessible area within a 60-minute travel time, which could:

- Expand opportunities for available jobs (approximately 23,000 jobs) and labor pool (approximately 42,000 people) between Kentucky, Illinois, and Missouri by decreasing travel times. [37]
- Increase accessibility for regional destinations and industrial parks.
- Improve freight movement.
- Support existing industries and future development.

[37] Source: Kentucky Statewide Traffic Model (KYSTM) and the Illinois Statewide Travel Demand Model (ISTDM)

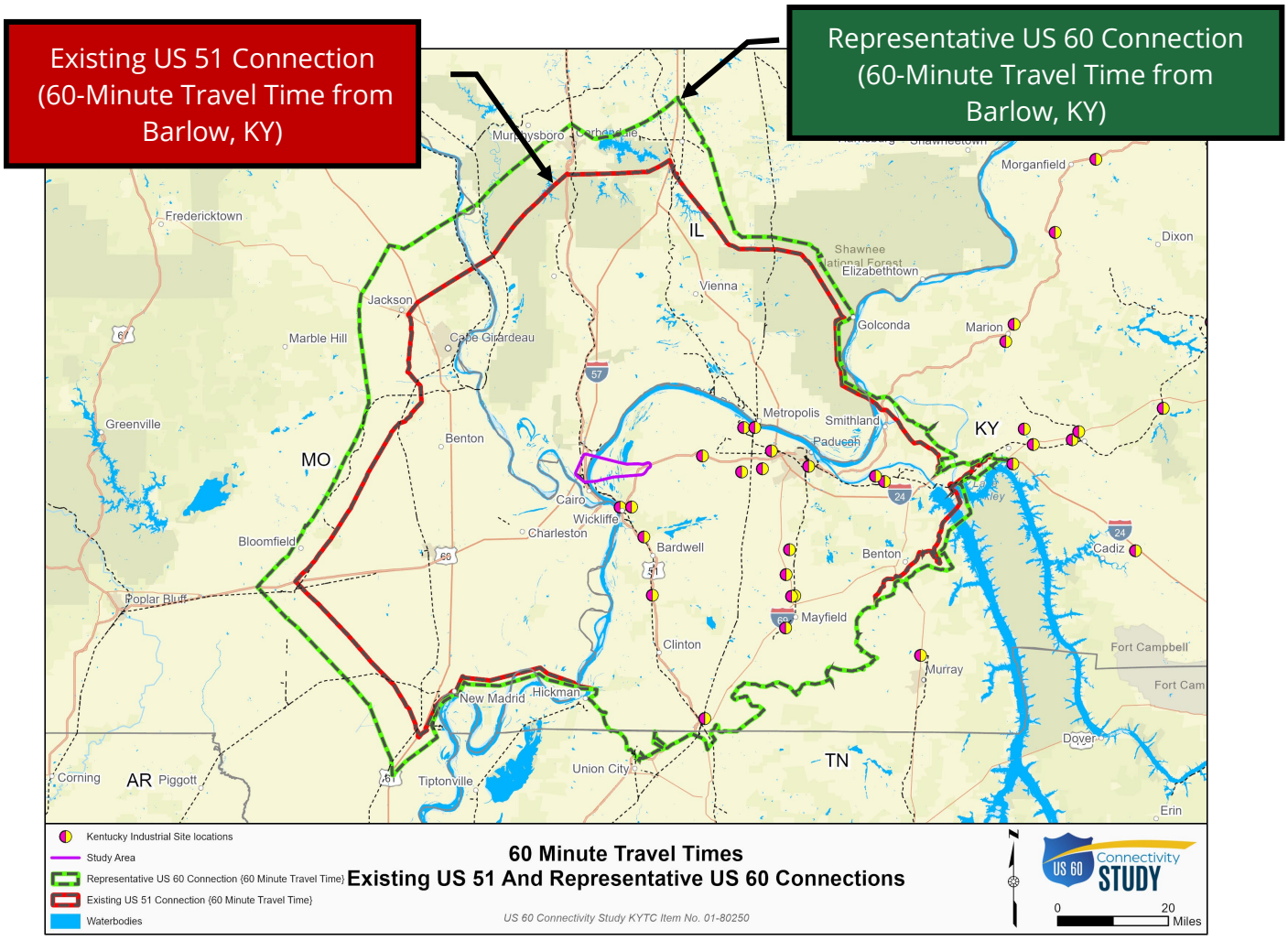


Figure 22. Radius of 60-Minute Travel Times for US 51 and Representative US 60 Connection

6.3. Remain Sensitive to Environmental Resources

The study area encompasses a highly environmentally sensitive area; therefore, a future project should avoid, minimize, and mitigate, as warranted, project impacts to resources within the area. Coordination initiated with resource agencies during the planning phase should continue to inform project team decisions.

6.4. Draft Purpose and Need Statement

A project's *Statement of Purpose and Need* relies on the goals and objectives developed during the planning process.[38] It may be further refined as more information is realized and through consultation with Resource Agencies and input from the public and other stakeholders. It is a living statement until the final NEPA document is approved and signed.

The Purpose and Need Statement identifies the merits of the project. By defining why the expenditure of public funds is necessary and worthwhile, the document allows decision makers to weigh the proposed action against the potential impacts.

The US 60 Connectivity Study's goals and objectives would inform a future project's Purpose and Need statement, which may evolve from this draft statement.

The purpose of the US 60 connectivity project is to improve regional mobility by providing a more direct east-west cross-river corridor between I-24 in Kentucky and I-57 in southern Illinois.

Insufficient east-west mobility supports the need for this project.

[38] https://www.federalregister.gov/documents/2016/05/27/2016-11964/statewide-and-nonmetropolitan-transportation-planning-metropolitan-transportation-planning

7. Conceptual Corridors

To examine the potential impacts of constructing a new road within the US 60 Connectivity Study project area, the study team identified three 2,000-foot-wide corridors that followed different alignments. These conceptual corridors were explored in a two-phase screening effort.

In phase one, three initial, conceptual corridors were identified to serve as a screening tool for estimating potential impacts. In phase two, information gathered from field reconnaissance and database searches, local officials, and resource agencies helped to inform refining the corridors to avoid as many potential areas of concern as possible. The two refined corridors were developed to approximately 15 percent design level to ensure reasonable quantity estimations for cost estimation and impact evaluation purposes. The screening process of these alternative concepts could be referenced in a future NEPA document.

7.1. Initial Study Corridor Concepts

As shown in **Figure 23,** the study team identified three initial study corridors, striving to avoid as many environmental features as possible. These corridors focus on areas where a roadway may be constructed within the 2,000-foot-wide buffers.

Initial Corridor A encompasses 2,317 acres and would provide the northernmost connection to I-57 in Illinois, north of Urbandale. Initial Corridor B encompasses 2,201 acres and would provide the most direct connection to I-57 in Illinois at existing Exit 1, between Future City and Urbandale. Initial Corridor C encompasses 2,395 acres and would provide the southernmost connection into Illinois near Future City.

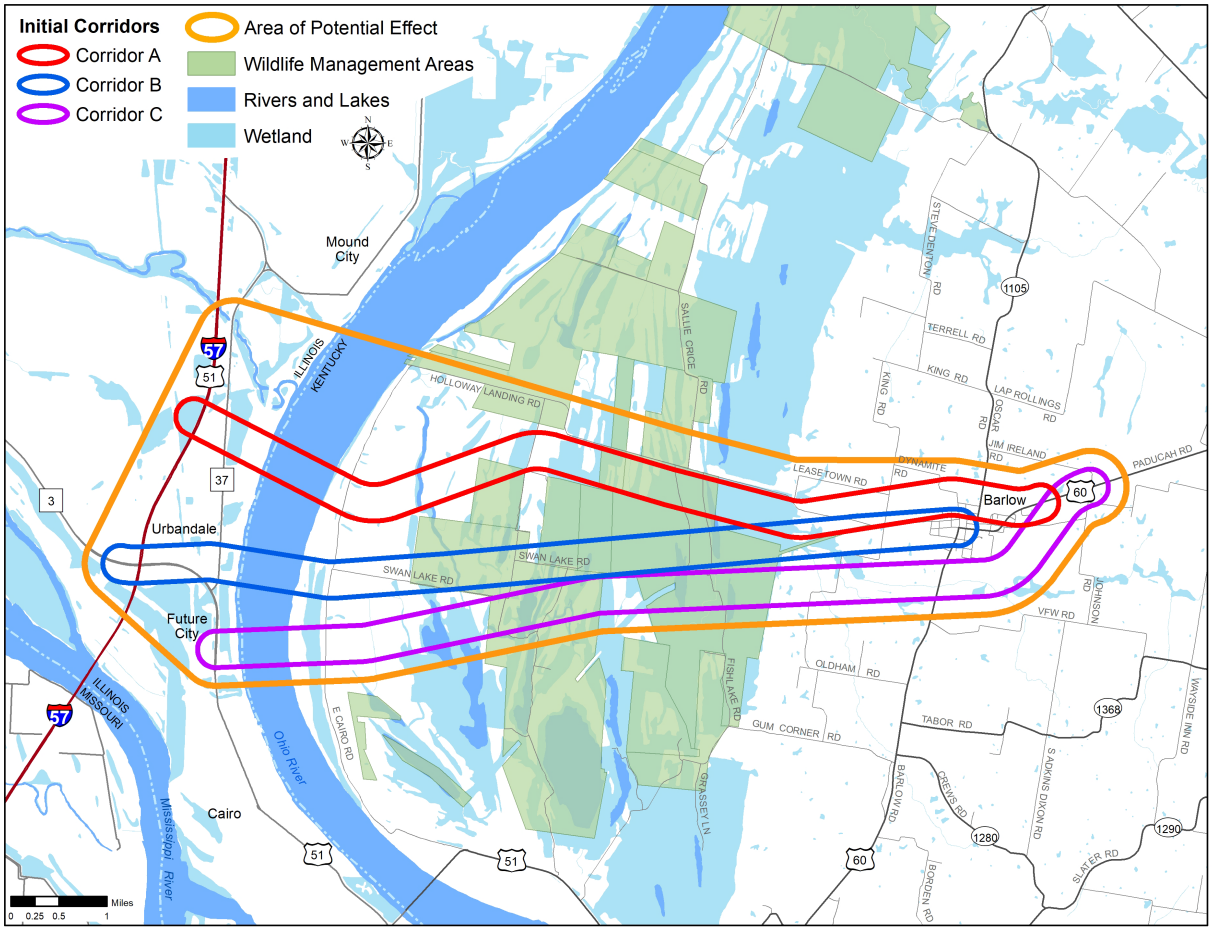


Figure 23. Initial Corridor Concepts

The study team quantified environmental resources within the corridors, a summary of which is shown in **Table 7**. Bold text emphasizes the highest quantity / level of impact. The study team performed additional research and coordinated with resource agencies to identify several properties within the study area that either had deed or funding restrictions intended to protect the properties in perpetuity. This information informed the phase two corridor refinement.

Table 7. Environmental Resources within Initial Corridors

Initial Corridor	A	B	C
Study Area (acres)	2,317	2,201	**2,395**
Residences	159	**162**	36
Businesses	4	**45**	3
Community Resources		Yes	
Cultural Historic Resources	9	6	**13**
Archaeological Resources	0	1	**4**
Cemeteries	**1**	0	0
Prime & Unique Farmland (acres)	323	**385**	301
State & Local Important Farmland (acres)	76	74	**130**
Axe Lake Swamp State Nature Preserve (acres)	0	0	0
Boatwright Wildlife Management Area (acres)	347	**893**	603
Cypress Creek National Wildlife Refuge (acres)	0	0	0
NRCS FPE 1052068 (acres)	0	0	**2**
NRCS FPE 959343 (acres)	0	2	66
NRCS WRPE 957664 (acres)	0	0	0
NRCS WRPE 986308 (acres)	0	0	0
NRCS WRPE 967117 (acres)	0	0	**68**
Barlow City Park (acres)	0	**0.35**	0
Public Hunting Lands & Public Fishing Areas (acres)	360	**881**	607
USACE-Owned Lands (acres)	**35**	0	0
IDNR Property (acres)	0	0	**3**
Length of Streams (feet)	63,124	49,548	**78,728**
Wetlands (acres)	904	**932**	891
100-Year Floodplain (acres)	1,325	1,287	**1,434**
Forested Area (acres)	**840**	756	819

ABBREVIATIONS: **NRCS**=Natural Resources Conservation Service, **FPE**=Floodplain Easement, **WRPE**=Wetland Reserve Program Easement, **USACE**=United States Army Corps of Engineers, **IDNR**=Illinois Department of Natural Resources

7.2. Refined Study Corridor Concepts

As shown in **Figure 24**, the study team refined the three initial conceptual corridors down to two potential 1,000-foot-wide corridor areas, based on resource research and feedback from resource agencies. Within those 1,000-foot buffers, the team developed conceptual corridors to approximately 15 percent design for better cost and impact estimation purposes.

The study team adjusted Initial Corridor A to avoid identified properties protected in perpetuity, evolving into Corridor 1.

Similarly, due to the number of properties protected in perpetuity in the central and southern portions of the study area, the team combined Initial Corridors B and C to create Corridor 2.

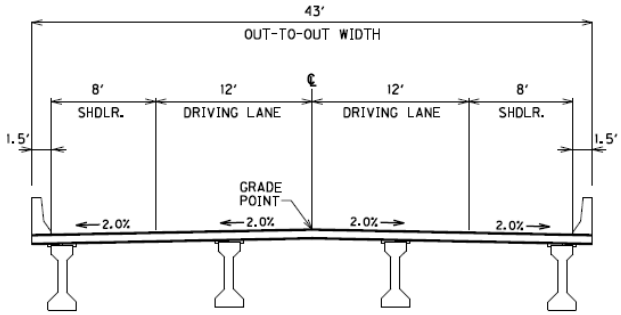
Both refined corridors begin at US 60 in Barlow, Kentucky and end at US 51 or I-57 just north of Cairo, Illinois. Corridor 1 takes a more northern route through the study area before connecting to I-57 north of the Cairo Junction (SR 3/US 51) interchange, and Corridor 2 takes a more southern route and ultimately connects to US 51 at the Cairo Junction interchange.

Figure 24. Refined Corridor Concepts

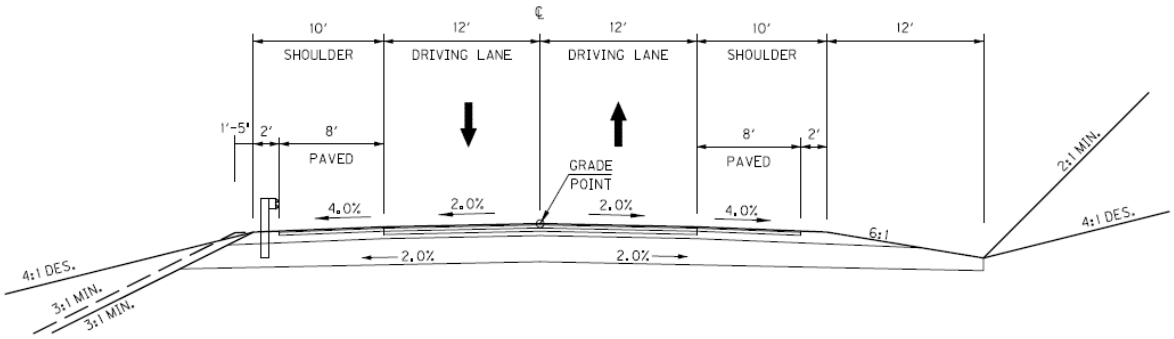
7.3. Design Criteria

The study team followed design guidelines from *AASHTO's A Policy on Geometric Design of Highways and Streets* dated 2018 and the *Kentucky Highway Design Guidance Manual*.

Each concept assumes the construction of a 55-mph two-lane rural arterial on new alignment. The typical sections are shown in **Figure 25**, which includes two 12-foot wide driving lanes and ten-foot shoulders (eight-foot paved).



Bridge Typical Section



Roadway Typical Section

Figure 25. US 60 Typical Sections

7.3.1 Geotechnical and Seismic Design Considerations

The study area consists of alluvial soils with depths greater than 200 feet deposited by the Ohio River and local tributaries. The underlying layers consist of clays, silts, and sands of varying thicknesses and consistencies. The topography of the area is relatively flat as is common in alluvial deposits and is characterized by agricultural fields and wetlands. As the study area is in an area of significant seismic potential, being less than 40 miles from the center of the New Madrid Fault zone, seismic concerns for embankments and structures are critical to their design. The movement of a structure during a seismic event is important, but the potential liquefaction (i.e., process where unconsolidated soil is rapidly converted to a liquid form due to vibration from a seismic event, thereby losing its strength) and movement of soils is of greater importance.

There is significant liquefaction potential in the area and ground improvement will be required to stabilize the soils to a depth of up to 75 feet to protect from the effects of an earthquake with a return interval of 1,000 years. This will be required at each abutment location and land pier location. Preliminary analyses indicate 3:1 embankment slopes will be stable if soils are improved for a width of approximately 100 feet (50 feet each side of centerline) in the areas of concern.

For the purpose of developing cost estimates for this study, which includes several miles of constructed embankment, it was assumed that the bridges were of priority in surviving a seismic event and that embankments could be reconstructed rather easily if damaged. The estimates were performed based upon reported costing of rigid inclusion ground improvement. For this order of magnitude estimate, ground improvement was estimated to be needed for a length and width of 100 feet by 100 feet at each bridge abutment and land pier.

In terms of general geotechnical aspects of construction in the area, it is estimated that a three-foot thick aggregate stabilizing layer will be required for the entire width and length of the roadway embankment to provide a working platform for access and to allow construction to begin. The materials necessary for construction of this working platform are included in the cost estimates.

7.3.2 Floodplain

The FEMA 100-year flood elevation in the area of the refined corridor concepts is approximately 330.1 feet above sea level.[39] Within the 16,167 acres study area, 11,702 acres (72 percent) are located below the 100-year flood, as shown in **Figure 16**. As a result, a substantial length of the approach roadway within Kentucky would need to be constructed on structure to avoid significantly increasing the water surface elevation within the area during flood events. The proposed road must also be built at an elevation above the 100-year flood (including some freeboard, or extra height above the flood elevation to provide a factor of safety) so that it can remain in service during flood events.

Any transportation project that includes work in a floodway, defined by FEMA as the channel of a river or stream (and adjacent land areas) that must be preserved in order to accommodate the base flood without cumulatively increasing the water surface elevation more than a designated height, must include an engineering analysis to determine if the

[39] Flood Insurance Rate Map Number 21007C0070C and 21007C0090C, Effective Date July 7, 2014

project will increase flood elevations. A "No Rise Certification" must be approved by FEMA before construction can commence.

FEMA floodway data at the location of the proposed Ohio River bridges indicate a 0.8-foot increase is allowable for the base flood elevation (BFE). The Hydrologic Engineering Center's River Analysis System (HEC-RAS)[40] 1D model that was developed for the US 51 Bridge Replacement Project was provided for use on this study. This model was utilized to assess the 100-year flood frequency elevation associated with the two refined corridor concepts. The study team used the model to estimate the amount of earthen fill allowable within the floodplain areas without adversely affecting water surface elevations during flood events. The proposed amount of roadway embankment included for the refined corridor concepts would increase the base flood elevation by approximately 0.16 feet, which is below the allowable threshold for a No Rise Certification in Kentucky.

7.3.3 Structures

The bridges for the proposed alignments were categorized under three different types: 1) roadway spans that include bridges outside the floodway; 2) the main navigation unit that spans the Ohio River navigation channel; and 3) main approach spans that extend from embankment ends to the main navigation unit.

Roadway Spans

The number, extent, and location of the roadway spans were determined primarily by the intersection of crossing features such as access roads or streams, hydraulic analyses performed to ensure that there is no rise in the flood elevation, and to tie in to I-57 on the west end of the alignment.

An optimization study was performed to determine the most economical span length for the roadway bridges. The study considered 140 feet precast prestressed concrete (PPC) I-beams and welded steel plate (WSP) girders ranging from 100 feet to 300 feet in 50 foot increments.

Based on the optimization study, it was determined that the 150 foot WSP girder spans would be the most efficient configuration. This project site is in a high seismic region, which had a major influence on the selection of the optimal span length. Because of the potential for high seismic accelerations, it is advantageous to utilize a lighter and more ductile superstructure to reduce demands on the substructure and foundation elements; thus, the

[40] www.hec.usace.army.mil/software/hec-ras/

WSP girders with a relatively short span length are preferrable.

A summary of roadway span assumptions is listed below:

- Bridge Type = Welded Steel Plate Girder
- Optimized Span Length = 150 feet
- Superstructure Depth = 5 feet
- Freeboard = 2 feet
- Minimum Vertical Clearance = 16 feet

Main Navigation Unit

Early U.S. Coast Guard (USCG) coordination that occurred as part of the US 51 Bridge Replacement Project indicated that alternates within this stretch of the Ohio River would likely require a horizontal clearance of 1,000 feet to 1,200 feet to provide safe passage for barge traffic. Two structure types were considered to meet the clearance requirements, including a 1,000 feet tied arch span and a cable-stayed bridge with a 1,200 feet middle span.

Quantities for the cable-stayed bridge were primarily extrapolated from two similar structures, the recently constructed Lewis and Clark Bridge on the east end of Louisville, KY and the older William H. Natcher Bridge in Owensboro, KY; both have a three-span configuration with a 1,200 feet main span. Similarly, the quantities for the tied arch concept were derived primarily from two sample projects: the recently constructed Wellsburg Bridge connecting Brooke County, West Virgina and Jefferson County, Ohio across the Ohio River and the tied arch carrying US 68 / KY 80 over Lake Barkley in Trigg County, KY. The Wellsburg Bridge is an 830 feet tied arch and the Lake Barkley bridge is a 550 feet span tied arch; each of these structures has a much wider cross-section than proposed for this study.

Tied Arch Bridge connecting West Virginia and Ohio
Source: Flatiron

Not surprisingly, the arch span had a higher unit cost per square foot of deck area relative to the cable-stayed bridge since the 1,000 foot span length is on the upper end of the optimal zone for a tied arch bridge. However, when combined with the lower cost approach spans, the tied arch yielded a lower total bridge cost, abutment-to-abutment, than the cable-stayed alternative. Consequently, the construction costs incorporated in the final estimate developed as part of this study are based on the tied arch concept.

A summary of the main navigation unit assumptions is listed below:

- Bridge Type = Tied Arch
- Horizontal Clearance = 1,000 ft
- Vertical Clearance
    - 105.3 feet above zero on the Cairo Ohio River Gauge (105.3 ft + 270.87 NAVD88 = 376.17 NAVD88)
    - 55 feet above the 50-year (2% annual frequency) flood elevation (55 ft + 320.97 NAVD88 = 375.97 NAVD88)
    - 69 feet above June Flow (69 ft + 298.13 NAVD88 = 367.13 NAVD88)
- Superstructure Depth = 11 feet
- Min PG EL. at Edge of Horizontal Clearance Window = 387.17 NAVD88

Main Approach Spans

The total length of the main river crossing, abutment to abutment, is 6,670 feet for Conceptual Corridor 1 and 6,147 feet for Conceptual Corridor 2. Minus the Main Navigation Unit, Conceptual Corridor 1 would require 21 Ohio River approach spans and Conceptual Corridor 2 would require 20 main approach spans. The grade changes considerably moving from embankment grade at the abutments to the main navigation unit where vertical clearance for marine traffic is required, as noted above.

A summary of approach span assumptions is listed below:

- Bridge Type = Steel Plate Girder
- Optimized Span Length = 300 feet
- Bridge Beam Depth = 11.5 feet

7.4. Cost Estimates

The study team performed detailed preliminary engineering on the refined conceptual corridors to better determine probable cost, right-of-way needs, potential utility impacts, and potential environmental impacts. The study team developed a 3D model using the same software KYTC requires for all design projects (Bentley Open Roads Designer).

The study team broke down the costs into the four phases of project development: 1) design/environmental; 2) right-of-way acquisition; 3) utility relocations; and 4) construction. For the construction costs, the team used a 3D model for each concept to produce earthwork and other major construction material quantities. Once quantities for more than 20 of the most significant typical construction bid items were identified, the study team used the KYTC Estimator Program to assign unit costs for each item. This program assigns unit bid prices for each construction item based on historical prices specific to the region of the state where the project is located.

The construction costs included a 25 percent contingency for miscellaneous items that cannot be explicitly quantified at this level of design but are traditionally included in the final construction estimate. Given the extremely large scale of the corridors under consideration, the design and environmental cost estimates were assumed to be ten percent of the construction cost estimate. The Construction Engineering & Inspection (CEI) cost estimates were assumed to be 12 percent of the construction cost estimate.

The study team derived right-of-way acquisition costs using the Property Value Administration (PVA) estimated values multiplied by the percentage of the area of the parcel to be acquired. Where right-of-way needs required 40 percent or more of a parcel to be acquired and where direct impacts or proximity to dwellings or commercial buildings occurred, the study team assumed total takings. This cost was then added to the projected relocation and labor costs for acquiring each parcel to calculate the total cost for right-of-way acquisition.

For utilities, the study team identified utility impacts and used KYTC District 1 historical expenditures to estimate the utility relocation costs.

A summary of the opinion of probable costs for each phase is shown in **Table 8** in current year (2023) dollars. **Table 9** shows the cost in anticipated year of expenditure, which escalated the 2023 cost estimates to the assumed year of expenditure (YOE). It was assumed that the earliest possible start of construction year would be 2032 and the earliest possible open to traffic year would be 2036. As shown below, total project costs range from $1.2 billion to $1.8 billion in YOE dollars.

Table 8. Current Year (2023) Cost Estimates by Phase

Concept	US 60 Conceptual Corridor	US 60 Conceptual Corridor 2
Design	$116,000,000	$110,000,000
Right-of-Way Acquisition	$17,000,000*	$19,500,000*
Utility Relocations	$1,500,000	$2,500,000
Construction	$1,162,000,000	$1,099,000,000
Total	$1,296,500,000	$1,231,000,000

* Right-of-Way estimates are for all privately owned property. Eminent domain is generally not allowed for public property devoted to a public use.

Table 9. Year of Expenditure Cost Estimates by Phase

Concept	US 60 Conceptual Corridor 1	US 60 Conceptual Corridor 2
Design	$116,000,000	$110,000,000
Right-of-Way Acquisition	$17,000,000*	$19,500,000*
Utility Relocations	$1,500,000	$2,500,000
Construction	$1,639,000,000	$1,550,000,000
Total	$1,773,500,000	$1,682,000,000

* Right-of-Way estimates are for all privately owned property. Eminent domain is generally not allowed for public property devoted to a public use.

7.5. Affected Environmental and Potential Impacts

Table 10 and **Figure 26** show how the refined conceptual corridors avoid or minimize impacts to some environmental resources. Bold text highlights the corridor having greater impacts. Known properties protected in perpetuity were completely avoided.

Table 10. Environmental Resources within Refined Conceptual Corridors

Environmental Resource	Conceptual Corridor 1	Conceptual Corridor 2
Study Area (acres)	**233**	180
Residences	**6**	4
Businesses	0	**3**
Cultural Historic Resources	0	0
Archaeological Resources	0	**1**
Cemeteries	0	0
Farmland (acres)	**177**	137
Forested Area (acres)	**83**	56
Streams (linear feet)	**4,972**	4,118
Wetlands (acres)	**91**	55
100-Year Floodplain (acres)	**196**	113
Parks (acres)	0	0
Boatwright WMA (acres)	23	**68**
Boatwright Properties (acres) - *Protected in Perpetuity*	0	0
IDNR Property (acres)	0	0
NRCS Properties (acres) - *Protected in Perpetuity*	0	0
Public Hunting Lands (acres)	23	**68**
USACE-Owned Lands (acres)	0	0

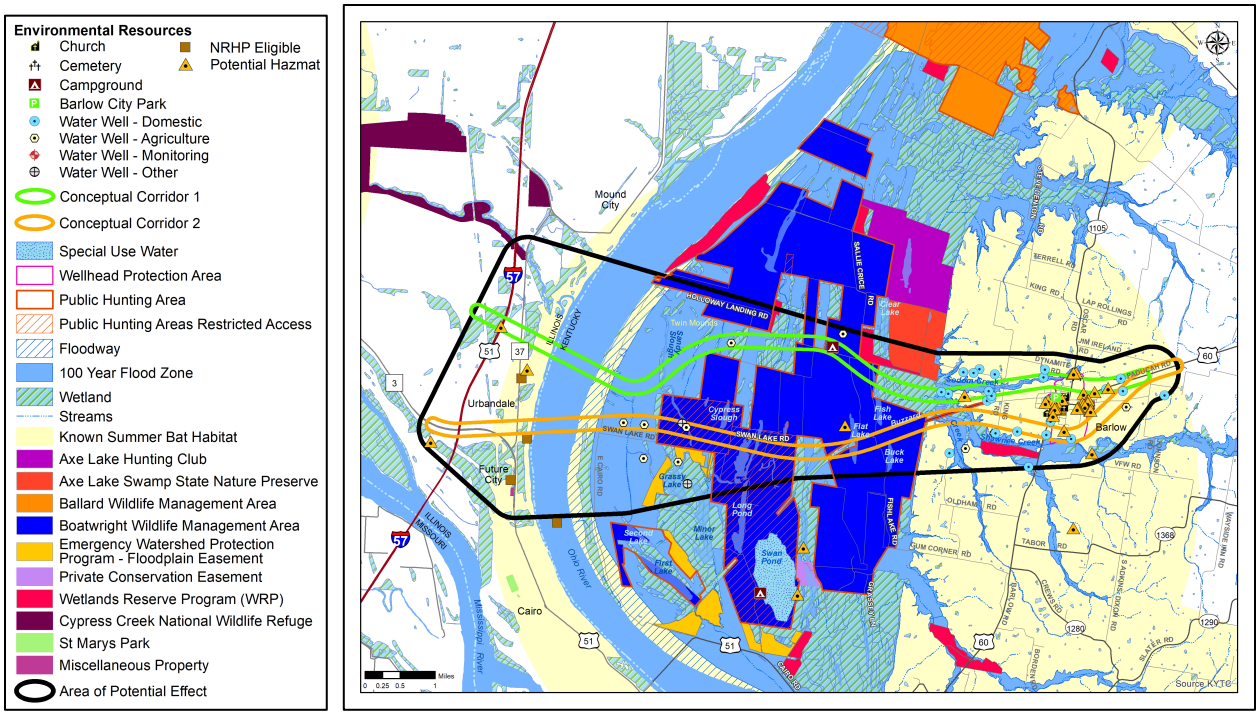


Figure 26. Environmental Resources and Refined Corridors

Geographic Information System (GIS) databases, research, windshield surveys, and limited field assessments within accessible areas of public-owned right-of-way were performed to identify environmental resources within the area. Future NEPA reviews would require additional field assessments. It is expected that resources would be identified beyond those known at the planning level. This information was prepared to facilitate the screening process, develop reasonable cost estimates, and support future project planning efforts. This information should inform the scale of a future NEPA review and support the decision-making process.

Various mitigation measures would likely be required for unavoidable adverse impacts from a future project. They should be identified through coordination with governing resources agencies, representatives, and impacted persons/properties. Preliminary compensatory estimates for tree, stream, and wetland impacts were included in the construction cost estimates and are provided for the refined corridors in **Table 11**. It is expected that there will be additional mitigation costs that cannot be quantified at the planning level. Adverse impacts to public hunting lands, the Boatwright WMA, ecotourism, other species protected under Section 7, NRHP-eligible properties, etc. may also likely require compensatory mitigation which could not accurately be defined without more thorough analyses and agency coordination.

Table 11. Mitigation Costs for the Refined Conceptual Corridors

	Conceptual Corridor 1	Conceptual Corridor 2
Tree Mitigation	$490,000	$330,000
Stream Mitigation	$6,110,000	$4,760,000
Wetland Mitigation	$22,310,000	$14,350,000
TOTAL	**$28,910,000**	**$19,440,000**

8. Stakeholder and Public Outreach on Corridor Concepts

Public involvement was an integral part of the US 60 Connectivity Study. As shown in **Figure** 27, KYTC and its partners engaged key stakeholders, including elected officials in Kentucky, Illinois, and Missouri, regional leaders, resource agencies, and economic development parties that would be most impacted by the potential project. Information was also shared through the study's website, US60ConnectivityStudy.com.

Figure 27. Stakeholder Outreach on Corridor Concepts

8.1. Resource Agency Meeting No. 2

The second resource agency meeting was held August 24, 2023, in LaCenter, Kentucky and online via Zoom to verify the environmental "red flags" and understand the benefits and impacts of potential initial corridors (Initial Corridor Concepts A, B, & C). Fourteen (14) resource agency representatives attended. Resource agencies were asked to share their opinions on the initial corridors as presented. No surveys were returned. Constructability and flooding concerns were mentioned during the meeting.

After the meeting, KDFWR shared additional information about the species and unique habitat present, ongoing work within the Boatwright WMA, and serious concern about the potential significant adverse impacts to fish and wildlife, public property, and the sportsmen and women of Kentucky.

"This project would have significant impacts to fish and wildlife, public property, and the sportsmen and women of Kentucky. We also do not feel that any mitigation could compensate for such losses." ~ Feedback from the Kentucky Department of Fish and Wildlife Resources on the US 60 Connectivity Study

The USACE Louisville District Regulatory Division emphasized that a project should minimize impacts to aquatic resources, endangered species, and historic properties as much as possible. It was also noted that other planned area projects may be negatively impacted by the mitigation requirements of a project of this scale.

8.2. Local Officials / Stakeholder Meeting No. 2

The second Local Officials and Stakeholders meetings was held November 29, 2023, in Wickliffe, Kentucky to share information and gather public feedback on the US 60 Connectivity Study. Information was provided through a formal presentation, followed by an open question-and-answer period.

Twenty-three (23) Local Officials and Stakeholders attended the meeting, and each attendee was encouraged to complete a questionnaire. Attendees could submit written questionnaires at the meeting or mail the forms to the project team. Comment forms were also available for submission on the study's website, US60ConnectivityStudy.com.

Of the 20 returned questionnaires, 50 percent stated they use the Kentucky portion of the study area for recreational use. 75 percent of responses selected the US 51 Bridge Replacement Project as their preferred option over the relocation of the Ohio River crossing to the US 60 study area.

8.3. Public Meetings

Public information meetings were held November 29, 2023, in Barlow, Kentucky and November 30, 2023, in Cairo, Illinois to share information and solicit input on the US 60 Connectivity Study. KYTC received 815 total responses about the project, 83 percent of which were against developing a new road and Ohio River crossing within the US 60 Connectivity Study area. Most who submitted comments do not believe the relocation of the Ohio River crossing to this study area would enhance economic development opportunities or regional mobility. Additional qualitative comments against a potential US 60 Ohio River crossing shared common themes concerning local wildlife preservation and

recreational use within the study area. Other recurring concerns from respondents included project costs and the economic impact to the region.

8.4. Resource Agency Outreach No. 3

The final resource agency outreach effort occurred in January 2024 after results from the public engagement were available and included in an email flyer update of study findings. An online survey was provided to encourage responses regarding the refined corridors. The purpose of this engagement was to collect Resource Agency opinions on potential Conceptual Corridor 1 and Conceptual Corridor 2's abilities to meet study goals (enhance regional mobility, enhance economic development opportunities, and to remain sensitive environmental resources); preferred concept; and any avoidance, minimization, or mitigation efforts to be considered.

Eleven responses were received. The following Resource Agencies represented include:

- Ballard County Extension Office
- Kentucky Department of Fish & Wildlife Resources
- Kentucky Division of Water
- Kentucky Transportation Cabinet Division of Environmental Analysis
- U.S. Army Corps of Engineers
- U.S. Department of Agriculture Natural Resources Conservation Service
- U.S. Fish & Wildlife Service

Opinions on the ability of a relocated Ohio River crossing corridor to enhance economic development opportunities were divided. Most believe the relocation of the Ohio River crossing to the study area would enhance regional mobility but would not remain sensitive to environmental resources. The majority preferred the US 51 Bridge Replacement Project advance to construction. If a corridor were to advance from this study, the Resource Agencies recommended the following avoidance, minimization, and/or mitigation efforts be considered:

- Outstanding State Resource Waters are present and mussel surveys should be completed for any concepts that advance.
- Avoidance of the Emergency Watershed Protection Program - Floodplain Easements (EWPP-FPE) held by U.S. Natural Resources Conservation Service (NRCS).

- Complete avoidance of the study area was recommended, noting concern for the potential catastrophic negative effects to the ecology, specifically considering the interconnections of the wetland habitat and recreational public lands.
- Avoidance and minimization of impacts to aquatic resources, wildlife habitat, and historic/cultural resources. Specifically:
    - Endangered Species habitats (forested, wetland, and riparian)
    - Waters of the U.S. (rivers, streams, wetlands)
- Wetland/waterfowl habitat restoration and mitigation.

About half of the responses noted mitigation for the significant environmental impacts would be challenging, if even feasible.

9. Conclusions

The US 60 Connectivity Study was conducted to evaluate the feasibility of constructing a new US 60 corridor and Ohio River crossing between Barlow, Kentucky, and I-57 north of Cairo, Illinois.

Given the known environmental resources within the study area, this study was completed as PEL Study, which takes a collaborative and integrated approach to the transportation decision-making process by considering potential environmental benefits and impacts during the planning phase. A *PEL Questionnaire,* included as **Appendix D**, was completed to summarize the relevant information from this study and reduce potential re-work.

Table 12 compares the estimated project costs, travel times, and environmental impacts of the two US 60 Connectivity Study Conceptual Corridors and the US 51 Bridge Replacement Project.

Table 12. Concept Summary Table

US 60 Connectivity STUDY	US 60 Conceptual Corridor 1	US 60 Conceptual Corridor 2	US 51 Bridge Replacement
Total Project Cost *(2023 dollars)*	$1.3 billion	$1.2 billion	$383 million
Travel Time*	13 minutes	11 minutes	24 minutes
Project Lengths	9.9 miles	10.5 miles	1.9 miles
IMPACTED ENVIRONMENTAL RESOURCES			
Boatwright WMA *(acres)*	23	68	0
Streams *(linear feet)*	4,972	4,118	598
Wetlands *(acres)*	91	55	9
**from US 60 (Barlow, KY) to I-57 (Exit 1, IL)*			

In addition to the cost comparisons and impacts cited in **Table 12** Concept Summary Table, the two projects have stark timeline differences to satisfy Federal NEPA documentation. To advance a major project in the US 60 Connectivity Study area, an EIS would likely be required, which involves rigorous requirements (including enhanced public involvement required to navigate the opposition cited by the public and local groups) and typically takes years to complete. In contrast, the US 51 Bridge Replacement Project completed the NEPA requirements in 2022, as well as all necessary federal, state, and local regulatory processes.

Along with the environmental regulatory hurdles, the US 60 Connectivity Study identified potential disproportionately high and adverse effects to Environmental Justice populations and received stated opposition for this project from several stakeholder groups including the Illinois Department of Transportation (IDOT), Kentucky Department of Fish and Wildlife Resources (KDFWR), Kentucky Division of Water (KDOW), Western Kentucky Wildlife Association, Ducks Unlimited, mayors from the Disadvantaged Communities of Wickliffe and Cairo, Director of the Ballard County Chamber of Commerce, and 83 percent of the public comments.

Given the myriad environmental challenges, opposition from IDOT, and the $1.3 billion needed to construct a project within the US 60 study area, KYTC does not recommend funding future phases of this project. Instead, *Kentucky's FY 2024 – FY 2030 Enacted Highway Plan* includes additional funding for the advancement of the US 51 Bridge Replacement Project (Item No. 1-1140).

Appendix A:

Traffic Forecast and

Economic Analysis Reports

Appendix B:

PEL Environmental

Technical Report

Appendix C:

Meeting Summaries

Appendix D:

FHWA PEL Questionnaire