



COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET

transportation.ky.gov

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GOVERNOR

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SECRETARY

May 18, 2021

Mr. John Ballatyne
Environment, Planning and System Performance – Team Leader
Federal Highway Administration
John C. Watts Federal Building
330 West Broadway
Frankfort, KY 40601

SUBJECT: Reconstruction/Relocation of US 641
Between Eddyville and Fredonia
Lyon and Caldwell Counties
Draft Environmental Assessment
KYTC Item # 1-187.31

Dear Mr. Jeter,

Enclosed with this letter is one copy of the draft Environmental Assessment (EA) for proposed improvements to US 641 in Lyon and Caldwell counties. The project proposes to reconstruct and relocate the existing roadway from the US62/US 641 intersection approximately 1.7 miles west of the I-69 Overpass to just north of Fredonia tying to a previously improved facility that extends to Marion, KY.

The KYTC has previously reviewed and heavily edited an earlier draft. We respectfully request your agency approval of the Draft EA. Should you have any questions concerning this matter, please contact myself or Tim Foreman for assistance at (502) 234-0644 or Tim.Foreman@ky.gov

Sincerely,

A handwritten signature in black ink, appearing to read "Danny Peake".

Danny Peake, Director
KYTC Division of Environmental Analysis

DRP/tef

Pc: B. Whybark (D1) C. Kuntz (D1)

ADMINISTRATIVE ACTION:
ENVIRONMENTAL ASSESSMENT (EA)

LYON-CALDWELL COUNTIES US 641

KYTC Item #1-187.31

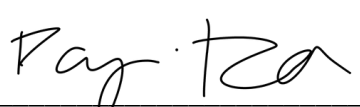
The proposed highway project involves the reconstruction/relocation of US 641 between Eddyville and Fredonia in Lyon and Caldwell Counties. A range of build alternatives to widen the route to realign it cross-country were evaluated alongside the No-Build option. The project area stretches in far Western Kentucky, from just east of the CSX railroad crossing along US 62 to just north of Fredonia.

Submitted pursuant to 42 U.S.C. 4332(2)(c) by the U.S Department of Transportation, FHWA, and KYTC Division of Environmental Analysis.

Approved for Public Availability

For FHWA

Date

Recommended by



Date
5/18/21

For KYTC

Date

May 2021



- I. PROJECT DESCRIPTION.....1
 - A. Project Area and Setting1
 - B. Description of Existing1
- II. PURPOSE AND NEED1
 - A. Purpose1
 - B. Need for The Project.....3
 - 1. Connectivity3
 - 2. Freight Movement and System Linkage.....3
 - 3. Safety3
 - 4. Logical Termini.....6
 - 5. Traffic.....6
 - 6. Legislation.....6
- III. ALTERNATIVES 7
 - A. Project History.....7
 - B. NO-BUILD ALTERNATE9
 - C. ALTERNATES CONSIDERED BUT ELIMINATED10
 - D. BUILD ALTERNATIVES.....12
- IV. AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS.....15
 - A. AIR QUALITY15
 - B. NOISE.....17
 - 1. Noise Receptors.....17
 - 2. Existing Noise Levels.....18
 - 3. Impacts18
 - 4. Noise Abatement Criteria.....18
 - 5. Indirect & Cumulative Impacts.....18
 - C. Terrestrial and Aquatic Ecosystems.....19
 - 1. Water Quality and Stream Impacts.....19
 - a. Baseline Conditions19
 - b. Water Quality Analysis.....19
 - c. Potential Impacts20
 - d. Public Water Sources / Groundwater20

- e. Agency Consultation21
- f. Permits..... 22
- g. Cumulative and Indirect Impacts..... 22
- 2. Floodplains..... 22
 - a. Floodplain Encroachment..... 22
 - b. Coordination and Permits..... 22
 - c. Cumulative and Direct Impacts 22
- 3. Wetlands..... 23
 - a. Baseline Conditions 23
 - b. Field Studies 23
 - c. Jurisdictional Wetlands..... 23
 - d. Non-Jurisdictional Wetlands..... 24
 - e. Cumulative and Indirect Impacts..... 24
 - f. Agency Coordination and Permits..... 24
- 4. Wild and Scenic Rivers..... 25
- 5. Federally Threatened and Endangered Species 25
 - a. Baseline Conditions 25
 - b. Coordination 25
 - c. Field Studies 26
 - d. Cumulative and Indirect Impacts..... 28
- D. SECTION 106 AND CULTURAL RESOURCES..... 29
 - 1. Historic Resources 29
 - 2. Archeological Resources..... 31
 - a. Records Review 31
 - b. Archeological Site Data 31
 - c. Map Data 32
 - d. Soil Review 32
 - e. Summary 33
- E. Socioeconomic Impact..... 33
 - 1. Land Use 33
 - 2. Community Impacts 34

- a. Baseline Condition34
- b. Population34
- c. Age Distribution34
- d. Community Cohesion35
- e. Employment and Labor Force35
- f. Community Resources.....35
- g. Impacts.....36
- 3. RELOCATIONS AND DISPLACEMENTS36
 - a. Relocations and Displacements.....36
 - b. Relocation Assistance37
 - c. Replacement Housing.....37
 - d. Competing Projects for Available Housing38
- 4. Environmental Justice38
- 5. Farmland.....38
- 6. Pedestrian and Bicycle Facilities.....39
- F. HAZARDOUS MATERIALS AND UNDERGROUND STORAGE TANKS39
 - 1. Conclusions Regarding Findings39
 - 2. Recommendations Regarding Future Study40
 - 3. Summary.....40
- G. VISUAL IMPACTS40
- H. IMPACTS OF CONSTRUCTION ACTIVITIES.....40
- I. MITIGATION MEASURES42
- J. COMMENTS AND COORDINATION43
- V. References.....45

Figures

- Figure 1: THREE YEAR CRASH LOCATIONS4
- Figure 2: PROJECT ALTERNATES.....5
- Figure 3: PROJECT TYPICAL SECTION6
- Figure 4: NOISE RECEPTOR LOCATIONS.....8

Figure 5: Bat Survey Locations.....12

Tables

Table 1: THREE YEAR CRASH RATE4
 Table 2: TYPE OF CRASHES5
 Table 3: ESTIMATED TRAFFIC6
 Table 4: ENVIRONMENTAL IMPACTS FOR THE PRELIMINARY PREFERRED ALTERNATE14
 Table 5: EXISTING AND FUTURE NOISE LEVELS (dBA Leq).....17
 Table 6: STREAM IMPACTS.....20
 Table 7: JURISDICTIONAL WETLANDS24
 Table 8: STATE AND FEDERAL THREATENED AND ENDANGERED SPECIES REPORTED AS HAVING THE POTENTIAL TO OCCUR IN THE PROJECT AREA.....26
 Table 9: SUMMARY OF THE IMPACTS FOR BUILD ALTERNATES.....36
 Table 10: MITIGATION MEASURES42

Exhibits

Exhibit 1: VICINITY MAP2
 Exhibit 2: ALTERNATES Electronic Appendix
 Exhibit 3: TYPICAL SECTIONS..... Electronic Appendix
 Exhibit 4: NOISE..... Electronic Appendix
 Exhibit 5: AQUATIC AND TERRESTRIAL Electronic Appendix
 Exhibit 6: HISTORICAL RESOURCES Electronic Appendix
 Exhibit 7: ARCHEOLOGICAL SITES Electronic Appendix
 Exhibit 8: SOCIOECONOMIC IMPACTS Electronic Appendix
 Exhibit 9: HAZMAT/UST..... Electronic Appendix

I. US 641 PROJECT DESCRIPTION

A. Project Area and Setting

The proposed project is located in northern Lyon and western Caldwell Counties in western Kentucky.

According to the U.S Census Bureau for 2010, **Caldwell County** has a total area of approximately 345 mi² exhibiting a diverse topography with portions of the southern and western county lying on a well-developed sinkhole plain and a line of sandstone-capped hills and broken ridges which mark the Dripping Springs escarpment, comprising an upland area northeast of the sinkhole plain. As of 2010, the population was 12,984. Its county seat is Princeton.

Lyon County has a total area of approximately 214 mi². Kentucky Lake marks the southwestern boundary of the county, and the Cumberland River marks most of the northwestern boundary. Lake Barkley, a multipurpose reservoir on the Cumberland River, crosses the center of the county. The area known as the *Land Between the Lakes* is a hilly area with many ridge top elevations exceeding 500 feet. The highest elevations in this part of the county are found on the drainage divide between Kentucky Lake and Lake Barkley. Away from the valleys, the topography is rolling to hilly. A well-developed karst plain is found on the eastern edge and northeastern corner of the county. As of 2010, the population was 8,314. Its county seat is Eddyville.

B. Description of Existing

The project begins at the US 62/US 641 intersection approximately 1.7 miles west of the I-69 overpass. The existing alignment extends north, generally, through Fredonia and then to the west, leaving the study corridor (see **Exhibit 1**, Vicinity Map). The existing roadway has two 11-foot driving lanes with two to four-foot shoulders. There are numerous deficiencies in both the horizontal and vertical geometry. The existing road has a posted speed limit of 55 mph, except in Fredonia where it drops to 35 mph. US 641 has residences on either side and is used by a significant number of large trucks. US 641 in the project area is a Minor Arterial and an “AAA” truck weight class roadway. Class AAA truck weight roadways allow maximum gross weight limits of 80,000 pounds per vehicle.

II. PURPOSE AND NEED

The Purpose and Need Statement establishes why the KYTC proposes to advance a transportation improvement and drives the decision-making process for alternatives’ consideration, analysis, and selection.

A. Purpose

The project purpose is to facilitate freight movement along the US 641 corridor from I-24 and I-69 to Marion (this is the last of three sections of US 641 improvement projects to Marion), to improve safety and emergency vehicle response times between Eddyville and Fredonia, to maintain connectivity while minimizing the potential detrimental economic effects of bypassing Fredonia, to provide improved access to regional recreational and tourist areas and reduce congestion, and to minimize the acquisition of privately-owned land in favor of using publicly owned land to help maintain the property tax base which is already strained.

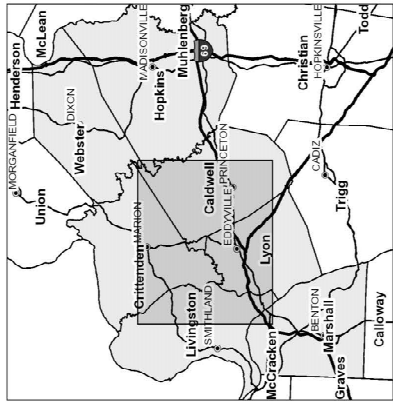
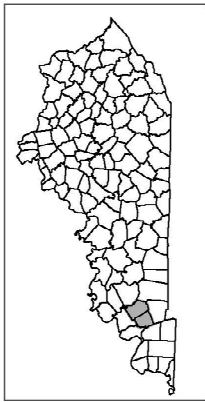
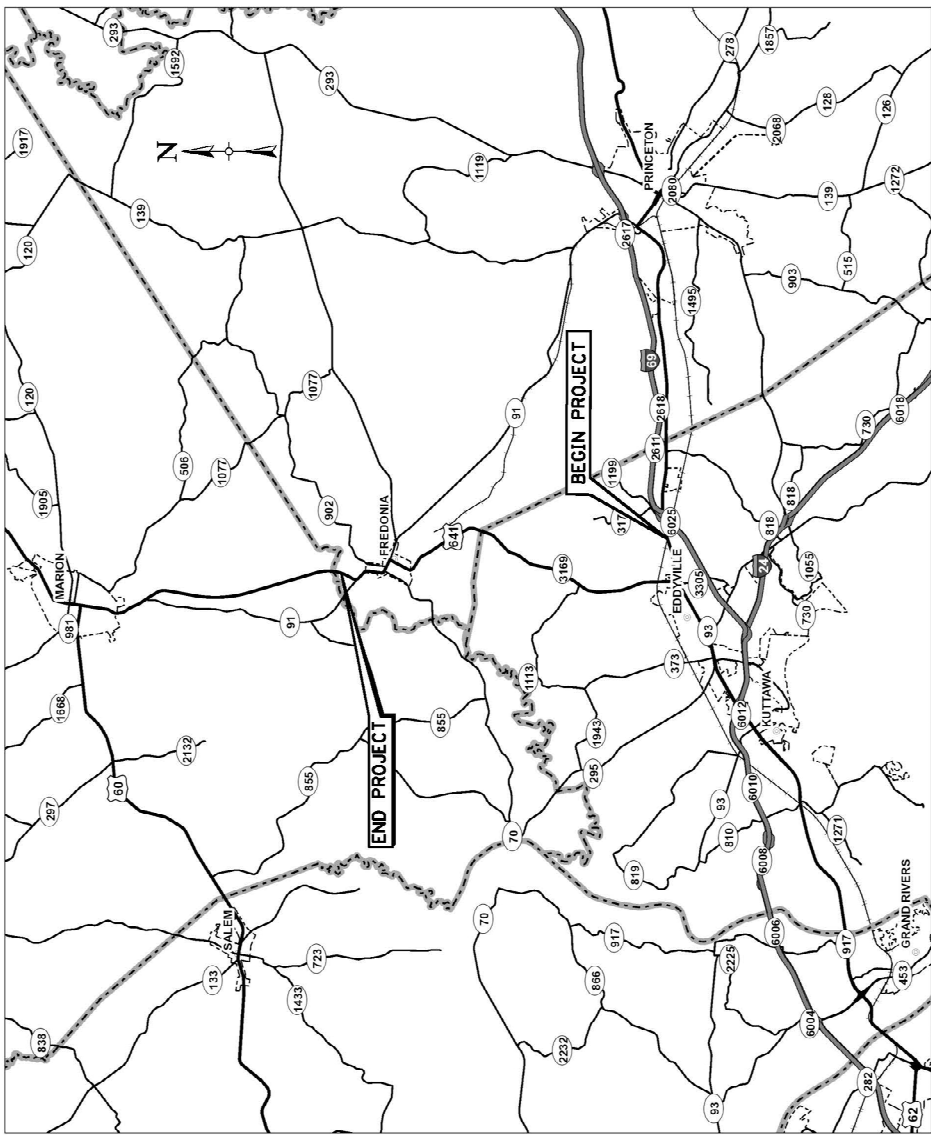
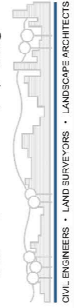


EXHIBIT 1
LYON/CALDWELL COUNTIES
US 641
Item No 1-187.31
VICINITY MAP

EA Partners, PLLC



AMERICAN ENGINEERS, INC.
DESIGNING YOUR FUTURE
www.aei.com

Scale = N.T.S.

B. Need for The Project

1. Connectivity

The proposed project will increase system continuity and is a logical link in the improvement of this corridor. US 641 is a Minor Arterial linking travelers to US 62 at its southern end, which in turn provides connectivity to I-24 and I-69. I-24 provides linkage to the extensive Land Between the Lakes recreation area, Paducah, and points west, and to Hopkinsville and additional points to the east. I-69 provides linkage to Mayfield and destinations to the south, and to Henderson and destinations to the north. At the project's northern end, the reconstruction of US 641 from Fredonia to Marion has recently been completed, and the National Highway System (NHS) and National Truck Network (NN) designations of this section would complete the connection.

2. Freight Movement and System Linkage

Currently I-24 and I-69 are the only roadways in Lyon and Caldwell Counties to be designated NN and NHS routes. The NHS was developed in response to requirements established in the Intermodal Surface Transportation Efficiency Act (ISTEA) to designate highways critical to the nation's economy, defense, and mobility. The NN designation allows access to US 641 for trucks with increased dimensions, including 102-inch width trucks, regardless of the geometrics for a distance of 15 miles beyond their exit from the interstate. To accommodate access to the NN routes and the NHS routes, KRS 189.222 allows all 102-inch-wide trucks to be driven on any state highway for a distance of up to fifteen (15) miles from an interstate or parkway exit. Therefore, while the existing US 641 is not designed for these trucks, access is still available for up to 5 miles beyond Fredonia creating truck crashes and conflicts. However, access does not reach Marion which is about 21 miles from the interstate. The proposed project, combined with the two reconstructed sections of US 641 from Fredonia to Marion will encourage an increasing use of US 641 as a route for freight movement by allowing for the legal operation of 102-inch width trucks between Eddyville and Marion, and improving access to the NN and the NHS, therefore helping to eliminate the current conflict of oversize trucks on the existing roadway that is not designed to accommodate their use..

Completing this truck network would allow for the opportunity to increase site development and boost economic vitality in the region. Providing a direct connection to I-24 and I-69 will provide a uniform facility capable of safely accommodating the existing and future truck traffic, helping to decrease truck crashes and reduce congestion concerns.

3. Safety

The KYTC's Highway Information System (HIS) functionally classifies the existing roadway as a Minor Arterial. Crash Data was analyzed for the period of three Years from October 1, 2016 to September 30, 2019 using Kentucky State Police crash data for the project length of 10.015 Miles. During this period there were a total of 70 crashes that occurred for both Lyon and Caldwell Counties along this corridor of US 641. Using the analysis procedure from the Kentucky Transportation Center's (KTC) report, "*The analysis of traffic Crash Data in Kentucky (2012-2016)*", the US 641 crash rates are compared to the Critical Crash Rates for a similar roadway and for average crash rates in both Lyon and Caldwell Counties.

The Critical Crash Rate Factor is the ratio of the average crashes for the route to the Critical Crash Rate (CCR). When the CCR is higher than 1.0, the causes of crashes are considered to not be a random occurrence. As summarized in **Table 1**, the crash rates for 100 million vehicle miles (100 MVM CR) were evaluated along the existing facility and compared with the Kentucky statewide average critical crash rate for a Minor Arterial roadway for each county based on existing traffic counts collected in 2017/2018.

Table 1: THREE YEAR CRASH RATE

US 641 Lyon - Caldwell, Kentucky										
Route	Length Miles	ADT (vpd)	Crashes	Injury	Crash/ 100 MVM All	Crash / 100 MVM Injury	State Avg. (All) CCRF	State Avg. (Injury) CCRF	County Avg. (All) CCRF	County Avg. (Injury) CCRF
Lyon US 641 MP 0.00 to 5.715	5.715	3099	29	12	149.5	61.9	0.7	1.4	0.7	1.3
Caldwell US 641 MP 0.00 to 4.3	4.3	2515	41	12	346.2	101.3	1.6	2.3	1.5	2.2
Higher than State Average for Minor Arterial (100MVM): CCR Average						221	45			
Higher than Caldwell Co. Average for Minor Arterial (100MVM): CCR Average						226	47			

The entire route in both counties shows that the roadway is well above the average injury crash rate when compared to the state average crash rate for 100 MVM and when compared to each individual county crash rate. When looking at all crashes, Lyon County’s is above the statewide average for a Minor Arterial for all crashes for the first 2.668 miles, as well as for injury crashes for the entire 5.715 miles. In Caldwell County, crashes are above the statewide average crash rate for 100 MVM for both all crashes and for injury crashes for the entire 4.3-mile segment.

As shown in **Table 2** and on **Figure 1**, the type of crashes shows that for single vehicle crashes Lyon County US 641 crashes are two times greater and Caldwell County US 641 crashes 30% greater than the state average of 39.6% of total crashes. Backing collisions are also high on US 641 in Caldwell County with 14.6% being nearly four times higher than the state average of 3.7%. Trucks crashes in Lyon County are 17.2%, over two and a half times higher than the state average of 6.5% crashes.

Table 2: TYPE OF CRASHES

US 641 10-1-2016 to 9-30-2019	Lyon County MP 0.0 to 5.715	Caldwell County MP 0.0 to 4.300	
Crash Type	Percent of Total	Percent of Total	2017 KY Average
Single Vehicle	82.8%	53.7%	39.6%
Sideswipe (Opposite Dir.)		9.8%	18.6%
Sideswipe (Same Dir.)		2.4%	
Rear-End	13.8%	9.8%	27.6%
Backing	3.4%	14.6%	3.7%
Angle		7.3%	29.8%
Head-On		2.4%	2.5%
Truck Crashes	17.2%	4.9%	6.5%
Fatality	0.0%	0.0%	0.5%
Injury Only	41.4%	26.8%	17.5%
Property Damage Only	58.6%	73.2%	82.0%
Above Statewide Average			

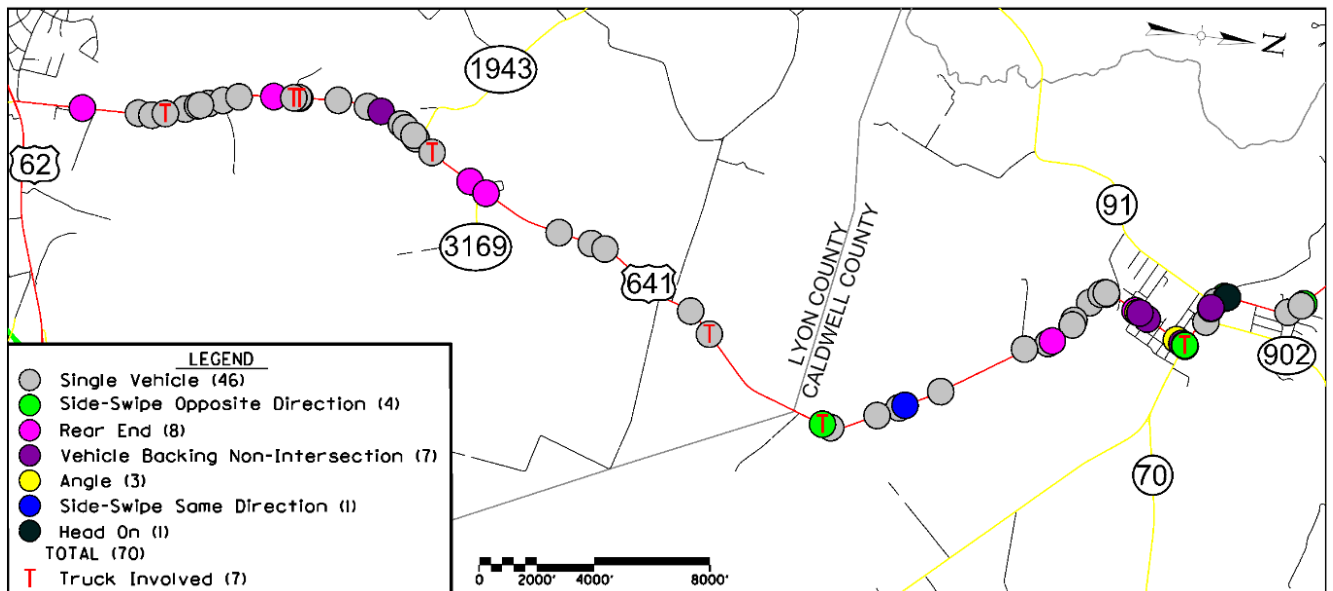



Figure 1: Three-Year Crash Locations

Deficiencies such as narrow lane and shoulder widths, substandard horizontal and vertical geometry, insufficient stopping and passing sight distances contribute to the frequency and severity of crashes. Safety is further compromised by the high volume of large trucks. The proposed project would widen

driving lanes, shoulders, and ditch widths, and improve vertical and horizontal alignments to better accommodate truck traffic.

4. Logical Termini

Logical termini are defined as the rational end points for a transportation project and for a review of environmental impacts. A project must have independent utility or be able to stand alone (i.e., be usable and reasonable even if no further transportation work is done in the area). A project must not restrict consideration of alternatives for reasonably foreseeable transportation projects. The relocation begins at US 62 near the interchange with I-69 and ties into the recently completed four-lane section from Fredonia to Marion at the northern end of the project, providing independent utility and addressing current and long-term transportation needs. This project is part of a long-range plan to four lane US 641 from US 62 to Marion. 

5. Traffic

According to the Kentucky Transportation Cabinet’s updated 2008 Traffic Forecast Report, the projected estimates for years 2019 and 2040 Average Daily Traffic (ADT) are shown below for four segments of the existing roadway. Segment 11 is from US 62 to KY 3169, Segment 12 is from KY 3169 to a connector to existing US 641, Segment 13 is from existing US 641 to KY 70, Segment 14 is from KY 70 to the end of the build alternate and Segment 15 is from the end of the build alternate north.

Table 3: ESTIMATED TRAFFIC

Segment Number	2007 ADT (2008 Traffic Forecast)	Build Growth Rate (2008 Traffic Forecast)	Adjusted Current Year (2019)	Design Year (2040)	PROJECTED 2019 ADT	PROJECTED 2040 ADT	Truck Percentage
11	2,100	3.85%	2,395	5,295	2,400	5,300	34
12	2,000	4.00%	2,321	5,289	2,350	5,300	34
13	2,000	4.30%	2,403	5,817	2,400	5,850	29
14	2,500	3.53%	2,749	5,694	2,750	5,700	25
15	3,800	2.98	3,919	7,261	3,950	7,300	23

6. Legislation

This project is listed in KYTC’s Recommended 2020-2026 Six Year Plan as Item 01-187.50, the relocation of US-641 from south of the Lyon/Caldwell County line to Fredonia. It is also listed in the 2019-2022 Statewide Transportation Improvement Program (STIP) as Item 01-187.5 and .6.


III. ALTERNATIVES

A. Project History

Years of study and analysis by environmental specialists, planning and design engineers, and local and state elected officials were undertaken in the development of this project. Additionally, extensive public involvement (public meetings, comments and letters, numerous meetings with local government officials, property owners, Section 106 consulting parties, and other interested parties) provided input on how to revise proposed alignments to minimize environmental impacts while fulfilling the purpose of the project. Chronological highlights of the project history leading to the selection of the Preliminary Preferred Alternate are described below.

- A Pre-Design Conference was held on **March 9, 2006**.
- Notice to Proceed was received on **August 31, 2006**.
- An information meeting with local officials was held on **October 4, 2006** followed by the first Citizen's Advisory Committee (CAC) Meeting on **October 17, 2006**.
- On **February 14, 2007**, the cultural-historic consultant submitted a "Precoordination for Properties" document to KYTC's Division of Environmental Analysis (DEA). Two properties were identified that were potentially eligible for listing in the National Register - the Rice-Beck-Sutton Farm east of US 641 just south of the Lyon-Caldwell County line and the Holt-Goodman Farm north of US 62 and east of US 641 near the community of Fairview. The consultant's recommendations were that the National Register boundary for the Rice-Beck-Sutton Farm be limited to the domestic space associated with the dwelling and the boundary for the Holt-Goodman Farm include the entire present-day farm boundary. Both preliminary alternatives (Alternate 1 and 2) potentially had an adverse effect on the Holt-Goodman Farm.
- A meeting was held on **March 1, 2007** to determine additional mapping and alignment studies needed to develop alternatives east of the two original alignments at the south end of the project to avoid the Holt-Goodman farm.
- An Environmental Progress Meeting was held on **May 18, 2007** to discuss the expanded Area of Potential Effect (APE) and a general time frame to complete the field work.
- On **June 25, 2007**, DEA solicited comments from FHWA concerning the eligibility and boundaries of the Rice-Beck-Sutton Farm and the Holt-Goodman Farm. It was further requested that a copy of the pre-coordination of properties document be forwarded to the SHPO for comments.
- A meeting was held on **August 13, 2007** concerning the potential for National Register listing of the Holt-Goodman Farm. The cultural-historic consultant and DEA agreed the farm is eligible and the entire farm comprises the historic boundary. FHWA disagreed and sent a letter the same day to the SHPO requesting their position. EA presented an alignment shift that would reduce potential impacts to the property and indicated studies had begun on two additional alternatives (Alternates 3 and 4) east of the original study corridor.
- The SHPO's response was received **September 14, 2007**. The response stated the entire Holt-Goodman Farm is eligible for National Register Historic Places (NRHP) Listing under Criteria A for agricultural context and Criteria C for architecture.
- A progress meeting was held **October 3, 2007** followed by a second CAC meeting on **October 4, 2007**. The consultant presented four alternatives (Alternates 1, 2, 3 and 4) and explained that

sections of each alternate could be combined with sections of another alternate to minimize impacts to environmental features, including the Holt-Goodman Farm and Rice-Beck-Sutton Farm. It was decided that these alternates would be available for viewing at the District 1 office and presented at the upcoming public meeting.

- The public meeting was held on **December 4, 2007**. Public comments indicated the public preferred a new route on the west side of Fredonia. The public overwhelmingly chose Alternate 3 as their preferred alternate.
-  a letter to the Kentucky Heritage Council dated **December 21, 2007**, FHWA requested that the *De Minimis Rule* be applied to satisfy Section 4(f) (federal policy on publicly owned lands, wildlife and waterfowl refuges, and historic sites) requirements because of their assessment that impacts from Alternates 1 and 2 to the Holt-Goodman Farm would not constitute an Adverse Effect. Response from the Heritage Council dated **January 25, 2008** stated that the alignment would have an Adverse Effect on the property and is therefore not eligible for the *De Minimis Rule*. Subsequently, a progress meeting was held on **March 7, 2008** to discuss next steps.
- In July of 2008, the cultural historic consultant submitted an addendum report addressing the potential eligibility and boundary of the Crider Stock Farm which fronts KY 902 on the west side of Fredonia.
- A Consulting Party (property owners and others with a vested interest in the project) meeting was held on **July 31, 2008** to receive input on historic properties in the project corridor. The owner of the Crider Stock Farm requested a determination of eligibility for the NRHP.
- A meeting was held on **December 10, 2008** to discuss responses to the consulting parties report and the potential historic boundary for the Crider Stock Farm. The property was determined eligible by consensus. DEA was confident the Historic Council would find the property eligible and an avoidance alternate on the east side of Fredonia may be required. The possibility of historic properties on the east side of Fredonia and shifting to State funding were also discussed. It was decided to make a cost comparison of State versus Federal project funding and to survey the properties on the east side of Fredonia before proceeding with the project. This effort delayed the project significantly. Meetings were held on **August 11, 2009** and **September 2, 2009** to discuss avoidance alternates.
- DEA conducted a cultural historic survey on the east side of Fredonia in 2011 to assess potential historic properties. The results were included in the 2008 report addendum and submitted to the SHPO in **October of 2011**.
- Studies began again in 2011 with the development of two corridors to assess potential impacts with future alternates. One was a two-lane alternate in the existing US 641 and KY 902 corridors (Corridor D). The other was a four-lane cross country alternate on the east side of Fredonia using part of Alternates 3, 2 and a new Corridor C.
- A public meeting was held on **August 13, 2013**. Public comments indicated the two biggest concerns with the project were impacts to farms and other properties, and the potential for a four-lane roadway in the future.
- Manuscripts with the Lyon County Judge Executive's suggestions for an alignment on the east side of Fredonia were submitted on **October 28, November 19, and December 13 of 2013** to KYTC for consideration.

- Manuscripts with suggestions from the Caldwell County Judge Executive were submitted on **March 8, 2016**.
- The Lyon County Judge Executive's recommended alignment was received on **March 17, 2016**.
- On **August 21, 2018**, the Secretary and assistant Secretary of the Transportation Cabinet met with the Lyon County Judge Executive to discuss his recommendations.
- Meetings were held with the Secretary on **December 4, 2018**, the Secretary and Governor's staff on **December 5, 2018** and with the Governor and Secretary on **April 2, 2019** to discuss the selection of a Preliminary Preferred Alternate.
- A public meeting, preceded by a local officials meeting, was held on **August 27, 2019** to present the Preliminary Preferred Alternate. After watching the project video presented at the meeting, approximately 77% of those in attendance felt that the process of choosing the Preliminary Preferred Alternate was thorough. Although many were concerned about property and farmland impacts as well as potential negative business impacts to Fredonia, the project received strong support.
- In early **October of 2019**, requests for comments were solicited from Lyon and Caldwell County Judge Executives, Mayors of Eddyville and Fredonia, Sheriffs and EMS responders, and the Lake Barkley Partnership for Economic Development for Lyon and Caldwell Counties. The Mayor of Fredonia responded with a phone call only. The Caldwell County Judge Executive expressed support for an improved two-lane rather than a four-lane facility to reduce land acquisition and right-of-way expense. The Lyon County Judge Executive expressed appreciation that the Preliminary Preferred Alternate takes less property from taxpayers but requested that the alternate be in alignment with the railroad in Caldwell County. The Lyon County Sheriff responded in support of the implementation of the Preliminary Preferred Alternate, and strongly supports utilization of the Western Kentucky Correctional Complex (WKCC) farmland and did not believe the alternate would have detrimental effects as it relates to the proximity of the correctional facility. These responses are included in the Appendix.

B. NO-BUILD ALTERNATE

If the No-Build Alternate were to be selected, only routine maintenance would be provided on US 641, leaving the facility in its current condition. This alternative would be less expensive initially with no funds expended on right-of-way acquisition, utility relocation, or project construction. No detour to allow for construction would be required. There would also be no construction traffic disruptions or environmental impacts. For these reasons, the No-Build Alternate is a viable one to consider in the determination of a preferred alternate.

However, if the No-Build Alternate were selected, the objectives of the purpose and need would not be met. As traffic continues to increase, including large truck traffic, congestion, accident numbers, emergency response times and travel times would also increase (refer to Section II.B.5, "Traffic"). These delays would negatively impact motorists and residents by increasing expenses related to time, energy and financial demands, and by compromising safety. In addition, freight movement would become more hampered and current design standards would not be met.

Because the project is rural in nature, it is expected that the No-Build Alternate will not adversely impact or benefit mass transit, light rail, and public transit. Due to shoulder widening with the build alternate, there may be some benefit to bicyclists who wish to cycle on an improved rural road that would not be realized with implementation of the No-Build Alternate. However, there are no dedicated bike lanes proposed, and this benefit may be offset by safety considerations.

C. ALTERNATES CONSIDERED BUT ELIMINATED

As part of the Section 106 (from the National Historic Preservation Act) process, seven (7) alternatives were developed to avoid or minimize effects to properties possibly eligible for the National Register of Historic Places (NRHP). These alternatives are Alternates 1, 2, 3, 4, 11, Corridor 3-2-C, and Corridor D shown in **Figure 2**. Potential impacts on three (3) different properties have been the impetus for the development of these alignments. They are the Holt-Goodman Farm, the Rice-Beck-Sutton Farm and the Crider Stock Farm.

Except for Corridor D, all six (6) alternates utilize the same typical section shown in **Figure 3**. Initial construction for some alternates was to be two lanes with provisions for four lanes in the future. Access on all the alternates is partially controlled except for Alternate 11 which is fully controlled from the southern terminus to New Bethel Church Rd. The design speed is 70 mph. Corridor D utilizes a two-lane typical section, access is by permit, and the design speed is 55 mph except in Fredonia where it drops to 35 mph.

1. Alternate 1

Alternate 1 begins at the US 62/I-69 interchange. It diverges from US 62 to curve to the right and travels northwest approximately 2.4 miles, where it again curves to the right to pass slightly east of the existing alignment for approximately 2.7 miles. It crosses existing US 641 approximately 1500 feet north of the US 641/Beck Road intersection, curving to the left and traveling northwest for approximately 2.6 miles. The alignment curves to the right bypassing Fredonia on the west side tying into the recently constructed section of US 641 (Item No. 1-187.23) for a total length of 9.3 miles.

2. Alternate 2

Alternate 2 begins at the same location but travels west approximately 0.5 mile before curving to the right. It then travels just east of the existing facility for approximately 0.9 miles before curving again to the right to roughly follow the Alternate 1 alignment, diverging from Alternate 1 approximately 0.6 miles south of the US 641/Beck Rd intersection. It then travels generally north for approximately 1.6 miles before curving left to roughly parallel the existing road to the northwest for approximately 2.2 miles. It then curves right to bypass Fredonia to the west and tie into Item No. 1-187.23 for a total approximate length of 10.0 miles.

3. Alternate 3

Alternates 3 and 4 were developed to avoid impact to the Holt-Goodman Farm. Alternate 3 begins on US 62 approximately 1500 feet west of the interchange, traveling generally northwest approximately 2.6 miles before curving to the right and merging with Alternate 1 slightly south of where it crosses Beck Road. From this point it is concurrent with Alternate 1 for a total length of approximately 8.7 miles.

4. Alternate 4

Alternate 4 begins on US 62 at the south-bound ramps of the I-69 interchange. It curves to the right, then travels slightly southwest of Alternate 3 until merging with Alternate 1 approximately 0.8 mile north of the US 641/ Beck Road intersection. From this point it is concurrent with Alternate 1 for a total length of approximately 8.9 miles.

5. Alternate 11 (not shown on Figures or Exhibits)

Alternate 11 is the same as Alternate 1 but is a fully controlled access facility to New Bethel Church Road, requiring frontage roads to access properties. The proposed facility then becomes partially controlled.

6. Corridor 3-2-C

The alignment follows Alternate 3 for approximately 4.0 miles to Beck Road crossing existing US 641 and then follows Alternate 2 for approximately 2.1 miles to approximately 2200 feet south of J. D. Bugg Road. From there a corridor only was studied. Corridor C curves off to the northeast on the east side of Fredonia for approximately 1.5 miles to the north side of Fredonia crossing US 641 and KY 91 approximately 1100 feet west of the KY 70 intersection. It curves to the northwest and then back to the north tying into Item #1-187.23, for a total length of approximately 9.4 miles.

7. Corridor D

Corridor D follows existing US 641 for approximately 7.9 miles from the US 62 intersection to the south side of Fredonia. The corridor continues to the west on the south side leaving US 641, curves to the north and follows KY 902. It leaves KY 902 near the US 641 intersection, follows existing US 641 and ties into Item #1-187.23 for a total length of approximately 9.1 miles.

Five (5) alternatives (Alternates 1, 2, 3, 4 and 11) were eliminated due to Adverse Effects to one or more of the three historic properties previously discussed. Alternates 1, 2 and 11 had an Adverse Effect on both the Holt-Goodman Farm and the Crider Stock Farm. Alternates 3 and 4 had an Adverse Effect on the Crider Stock Farm. An alternative in Corridor 3-2-C avoids historic properties but has an impact on farm properties. An alternative in Corridor D has a big impact on residential properties and potentially has an Adverse Effect on the Crider Stock Farm. The existing corridor eliminates a four-lane option in the future, has less desirable horizontal geometry and the speed limit drops to 35 mph in Fredonia.

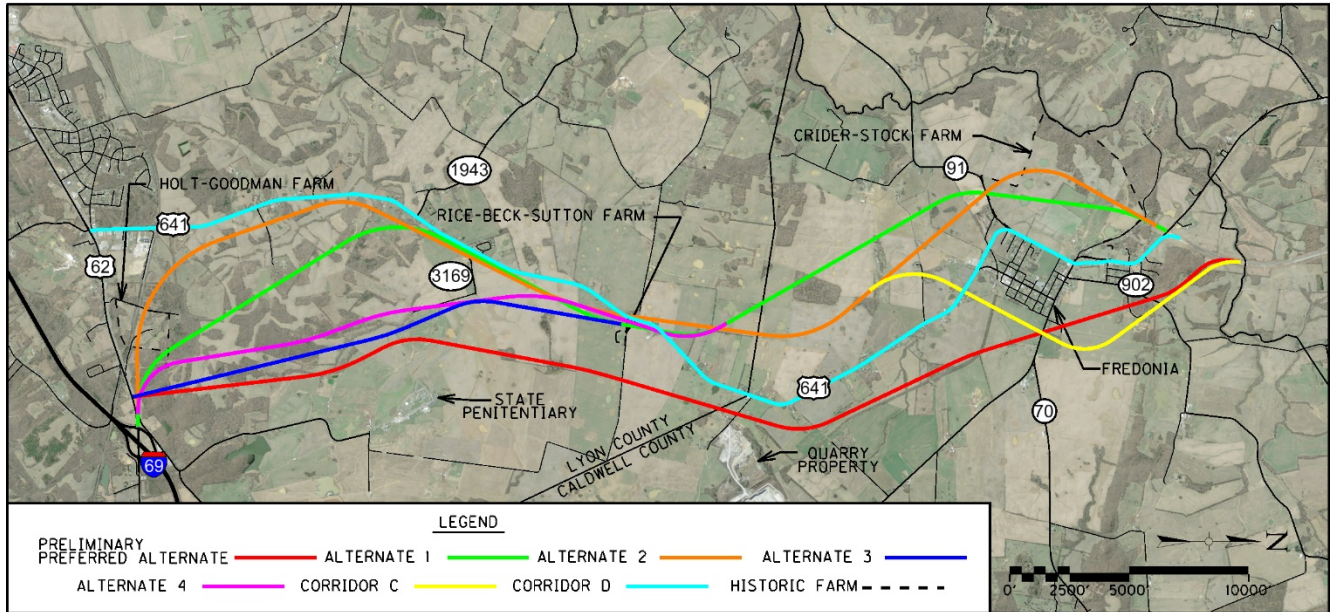


Figure 2: Project Alternates

D. BUILD ALTERNATIVES

Preliminary Preferred Alternate

The Preliminary Preferred Alternate begins on US 62 approximately 1300 feet west of the I-69/US 62 interchange. The alignment generally runs northwest approximately 2.0 miles and then curves to the northeast approximately 3000 feet south of New Bethel Church Road. It continues northeast approximately 3.2 miles crossing Beck Road approximately 0.5 miles east of the US 641 intersection. In these two segments it crosses approximately 2.8 miles of Commonwealth of Kentucky property. The alignment curves to the left approximately 1600 feet south of Bakers Road and runs generally northwest for approximately 3.2 miles crossing KY 91 on the east side of Fredonia approximately 1200 feet west of the KY 70 intersection. It curves to the northwest and then back to the north and ties into Item #1-187.23, for a total length of approximately 9.2 miles.

The proposed project typical section (**Figure 3**) will consist of four lanes (two 12-ft lanes in each direction), outside shoulders of 12 ft (10 ft paved), and inside shoulders of 6 ft (4 ft paved) with a 40-ft depressed grass median. Initial construction will be two lanes with provisions for four lanes in the future. Geometry will be based on a 70-mph design speed. Under current state law, the speed limit would remain at 55 mph for this type of facility. Access will be partially controlled.

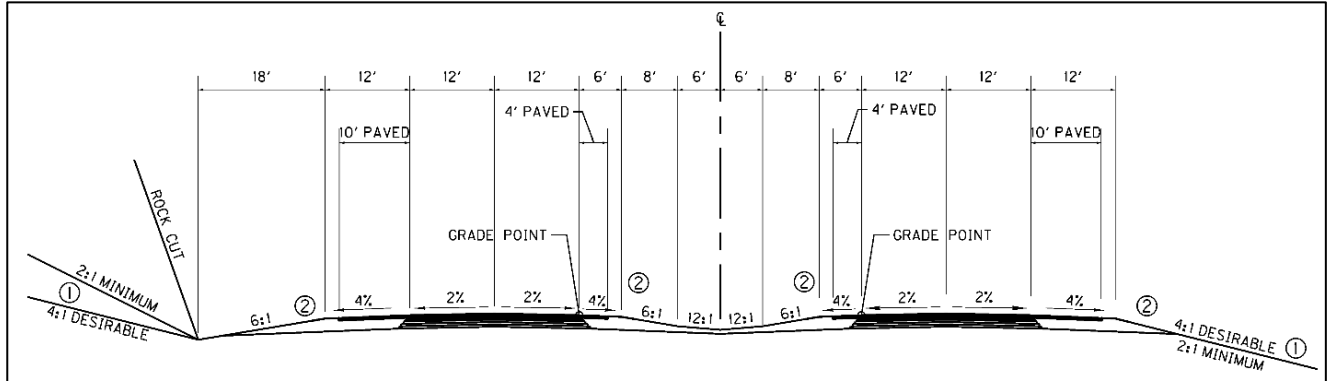


Figure 3: Project Typical Section

The project team has recommended the Preliminary Preferred Alternate as the best option to meet the project’s purpose and need. The alignment avoids impacts to the three (3) historic properties identified in the project corridor. The NHS and NN designations of this alternate, which ties into the Fredonia-to-Marion section, would complete the connection to the north, allowing the efficient movement of freight in the region. Connectivity between I-69, I-24, Eddyville and Fredonia would be improved with a facility that exceeds current standards for a 55-mph speed limit. The proposed geometry will improve safety which should reduce crashes and congestion. Shifting the alignment farther east to utilize State-owned property reduces impacts to private farms by approximately 95 acres and the cross-country route minimizes residential relocations.

Final selection of a Preferred Alternate will be made only after identification of mitigation measures, where appropriate, and consideration of public comments received at the Public Hearing, to be held following the approval of this EA. Environmental impacts for the preliminary preferred alternate are shown in Table 4.

**Table 4: ENVIRONMENTAL IMPACTS FOR THE PRELIMINARY
PREFERRED ALTERNATE**

Study Area	Preliminary Preferred Alternate
Approx. Length (mi)	9.2
Design	Avoids Crider Stock Farm and Holt-Goodman Farm; ties into Item No. 1-187.23
Water Quality	Construction may result in increased sedimentation, increased surface runoff due to loss of mature trees and vegetation, streambank erosion & increased water temp, resulting in cumulative impacts to the aquatic ecosystem.
Groundwater Resources	No wellhead protection areas or springs are located within the project area. One domestic water well is located near the end of the project but is outside of ROW limits.
Streams	Culverts and possibly one bridge will be required at approximately 8 intermittent and 13 ephemeral stream crossings (this includes blueline and non-blueline streams). Total stream impact is approximately 10,703 linear feet.
Floodplains	The project will not encroach on the 100-year floodplain. A Special Flood Hazard Area with low flood risk occurs along Sinking Fork Livingston Creek (also called Mill Bluff Creek).
Approx. Jurisdictional Wetlands Acquired (acres)	Wetland A - 0.029 acres Wetland I - 0.080 Total-0.109
Non-jurisdictional Wetlands Affected (acres)	Wetland L-0.266
Permits	KY Division of Water (DOW) Section 401 Individual Water Quality Certification (WQC) and a KY Pollutant Discharge Elimination System (KPDES) permit, along with a Section 404 US Army Corps of Engineers (USACE) Individual Permit (IP) are anticipated.
Terrestrial Ecosystems	Total land area required is 409 acres; 103.5 is forested.
Threatened and Endangered Species	USFWS's Information for Planning and Consultation lists four species with potential to occur in the area: endangered gray bat (<i>Myotis grisescens</i>), endangered Indiana bat (<i>M. sodalis</i>), threatened northern long-eared bat (<i>M. septentrionalis</i>), and threatened Price's potato-bean (<i>Apios priceana</i>).
Section 106 Cultural Historic Resources	A recommendation of No Adverse Effect for the project, per 3/3/2021 concurrence from SHPO
Section 106 Archaeological Resources	No sites identified in overview, Phase I under way to be completed for FONSI approval
Section 4(f)	No Section 4(f) sites affected
Relocations	8
Businesses	2
Farmland	213 acres privately owned; 95 acres publicly owned (WKCC farm)
Environmental Justice	No impacts to minority or low-income communities anticipated
Hazardous Materials/Underground Storage Tanks	3 sites recommended for Phase II assessments in the event they are impacted by the final design alternative

IV. AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

Lyon and Caldwell Counties are situated in the Pennyroyal or Mississippian Plateau physiographic region of Kentucky. The Pennyroyal is an upland plain underlain by Mississippian-aged rock beds and is characterized by karst topography, including sinkholes, caves, and subsurface streams.

Topography of the project area mostly consists of flat terrain and gently sloping hills. The northern half of the project is situated on a karst plain on which numerous sinkholes have formed. Sinking streams, springs, and features associated with limestone geology and underground drainage are found throughout the landscape. In contrast to the northern section of the project, the southern section is characterized by steeper relief, dendritic drainage patterns, and fewer sinkholes.

The majority of the project occurs on a karst plain underlain by Mississippian-age rock beds, mostly limestones. The dissolution of underlying limestone has led to the development of sinkholes, sinking streams, and caves. Mill Bluff Cave/Spring is located in the northern section of the project vicinity, 1.6 mi south-southwest of Fredonia in Caldwell County. An overhanging cliff composed of Ste. Genevieve limestone contains the main entrance and side entrance; according to the Kentucky Geological Survey (KGS), the cliff and entrance area is approximately 160 ft wide and 60 ft high. A large subsurface stream flows through the cave passage, and the cave is believed to drain a large area of Caldwell County to the east.

Another cave system, Skinframe Sinks (Rice) Cave is located approximately 1.5 mi east of the project alternates in Caldwell County. The system is in the vicinity of Skinframe and Brewster Creeks, and the mapped cave passages generally extend to the east, north, and south (KGS 1985). It does not appear that the project alternates will be crossing over the cave system. No city, state, or federal parks are in the project area.

Baseline reports have been completed for Highway Noise, Terrestrial and Aquatic Ecosystems, Socioeconomic Impacts, Hazardous Materials and Underground Storage Tanks, and Section 106 and Cultural Resources along with a qualitative review of Air Quality. The results of these studies and additional potential impacts are discussed below.

A. AIR QUALITY

The project is listed in the State Transportation Improvement Program FY 2019 – FY 2022 (STIP) (pg. 81) and on the Recommended KY Six-Year Plan FY 2020 – FY 2026 (pg. 152). The following pollutants were considered in the project area with the following qualitative discussion:

Carbon Monoxide (CO): Based on the Kentucky CO Screening Criteria, this project does not meet the criteria requiring a CO project level analysis and will not produce a projected violation of the CO standard.

Ozone (O₃): This project is located in an Ozone attainment area and is not a project-level concern.

Particulate Matter_{2.5} (PM_{2.5}): This project is located in a PM_{2.5} attainment area and it is not a project-level concern. Therefore, the conformity procedures of 40 CFR 93 do not apply to this project.

Particulate Matter₁₀ (PM₁₀): All areas in Kentucky are in attainment for PM₁₀. Therefore, the conformity procedures of 40 CFR 93 do not apply to this project.

Nitrogen Dioxide (NO₂): All areas in Kentucky are in attainment for Nitrogen Dioxide (NO₂).

Mobile Source Air Toxics (MSATs): In a typical project with multiple build alternatives in an EA, the amount of MSAT emitted would be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each alternative. The VMT estimated for each of the Build Alternatives is slightly higher than that for the No-Build Alternative, because the additional capacity increases the efficiency of the roadway and attracts rerouted trips from elsewhere in the transportation network. This increase in VMT would lead to higher MSAT emissions for the preferred action alternative along the highway corridor, along with a corresponding decrease in MSAT emissions along the parallel routes. The emissions increase is offset somewhat by lower MSAT emission rates due to increased speeds; according to EPA's MOVES2010b model, emissions of all of the priority MSAT decrease as speed increases. Regardless of the build alternate's corridor in this area, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by over 80 percent between 2010 and 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

Climate Change and Impacts of Greenhouse Gases (CO₂): Climate change is a critical national and global concern. Carbon dioxide (CO₂) is the largest component of greenhouse gas emissions; other prominent emissions include methane (CH₄), nitrous oxide (N₂O) and hydrofluorocarbons (HFCs). These emissions are different from criteria air pollutants since their effects in the atmosphere are global rather than localized, and also since they remain in the atmosphere for decades to centuries, depending on the species.

Greenhouse gas emissions have accumulated rapidly as the world has industrialized, with concentration of atmospheric CO₂ increasing from roughly 300 parts per million in 1900 to over 400 parts per million today. Over this timeframe, global average temperatures have increased by roughly 1.5 degrees Fahrenheit (1 degree Celsius), and the most rapid increases have occurred over the past 50 years. Scientists have warned that significant and potentially dangerous shifts in climate and weather are possible without substantial reductions in greenhouse gas emissions. They commonly have cited 2 degrees Celsius (1 degree Celsius beyond warming that has already occurred) as the total amount of warming the earth can tolerate without serious and potentially irreversible climate effects. For warming to be limited to this level, atmospheric concentrations of CO₂ would need to stabilize at a maximum of 450 ppm, requiring annual global emissions to be reduced 40-70% below 2010 levels by 2050. State and national governments in many developed countries have set GHG emissions reduction targets of 80 percent below current levels by 2050, recognizing that postindustrial economies are primarily responsible for GHGs already in the atmosphere. As part of a 2014 bilateral agreement with China, the U.S. pledged to reduce GHG emissions 26-28 percent below 2005 levels by 2025; this emissions reduction pathway is intended to support economy-wide reductions of 80 percent or more by 2050.

GHG emissions from vehicles using roadways are a function of distance travelled (expressed as vehicle miles travelled, or VMT), vehicle speed, and road grade. GHG emissions are also generated during roadway construction and maintenance activities.

B. NOISE

1. Noise Receptors

Nine (9) receptor sites were chosen to be representative of residential, commercial and church development along the project corridor that are similar in land use function and noise impact. These nine receptor sites represent a total of approximately thirty-four (34) residential and commercial receptors and two (2) churches. Future noise levels were calculated for No-build and proposed alternate scenarios.

Land use categories along with their respective design noise level criteria are described in Table 1 of 23 CFR Part 772. Land use category B and C apply to this project. Category B Noise Abatement Criteria (NAC), according to FHWA and the Kentucky Transportation Cabinet’s (KYTC) Noise Abatement Policy, is 67 dBA Leq. This applies to the exterior of a residence (single or multi-family). Hotels and motels that function as apartment dwellings should be treated as Category B as well. Category C includes active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings. The majority of building types that make up a site defines a site category. For example, a site with mostly residential structures would be classified as a category B site. A site classified as both B and C means there is a mix of building types (e.g. residential and churches) in that area. The 2040 modeled no-build levels range from 45.7 to 70.8 dBA Leq. The 2040 modeled build alternate levels range from 39.1 to 60.7 dBA for the Preliminary Preferred Alternate.

Table 5: EXISTING AND FUTURE NOISE LEVELS (dBA Leq)

RECEPTOR	LAND USE CATEGORY	DESCRIPTION	EXISTING	NO-BUILD	PRELIM. PREF. ALT.
3	B	Residence	49.1	53.8	49.4
4	B/C	Church	62.7	70.8	60.7
5	B	Residence	59.1	67.1	48.3
6	B	Residence	44.5	48.3	44.3
7	C	Church	43.8	50.8	49.3
8	B	Residence	53.2	45.7	47.1
9	B	Residence	51.8	*	43.9
10	B	Residence	45.0	*	39.1
11	B	Residence	46.8	*	42.9

*No-Build traffic was not available for these receptors

2. Existing Noise Levels

The nine (9) receptor sites shown in **Figure 4** have existing noise levels ranging from 43.8 to 62.7 dBA Leq, shown in **Table 5**.

3. Impacts

Future noise levels were calculated for the No-Build and proposed alternate scenarios. The 2040 modeled No-Build levels range from 45.7 to 70.8 dBA Leq. The 2040 modeled build alternate levels range from 39.1 to 60.7 dBA for the Preferred Alternate as shown in **Table 5**.

From the KYTC Noise Analysis and Abatement Policy, construction noise is unavoidable but temporary in nature and reasonable efforts will be made to reduce impacts to receptors to the extent practicable. For a majority of projects, construction will not persist in a given area for a long period of time. In the unusual instance where construction will persist for a period longer than two years and where impacts to nearby receptors are determined to be likely, the project team shall have the flexibility to incorporate construction noise abatement measures into the project. This may involve shielding of equipment with acoustic barriers, restricting certain types of work to specific hours of the day, requiring source control on equipment (mufflers) or other measures to reduce noise impacts.

4. Noise Abatement Criteria

According to 23 CFR Part 772 receptors R4 and R5 exceed the residential NAC of 67 dBA Leq for the No-Build scenario. No receptor experiences an increase in noise greater than 10 dB for the build alternates as compared to the existing levels or approaches or exceeds the NAC of 67 dBA. 🗨️

In general, the project tends to move roadways and noise sources away from sensitive receptors especially pulling traffic away from Fredonia as a bypass.

5. Indirect & Cumulative Impacts

Indirect effects are caused by the action of the project and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in

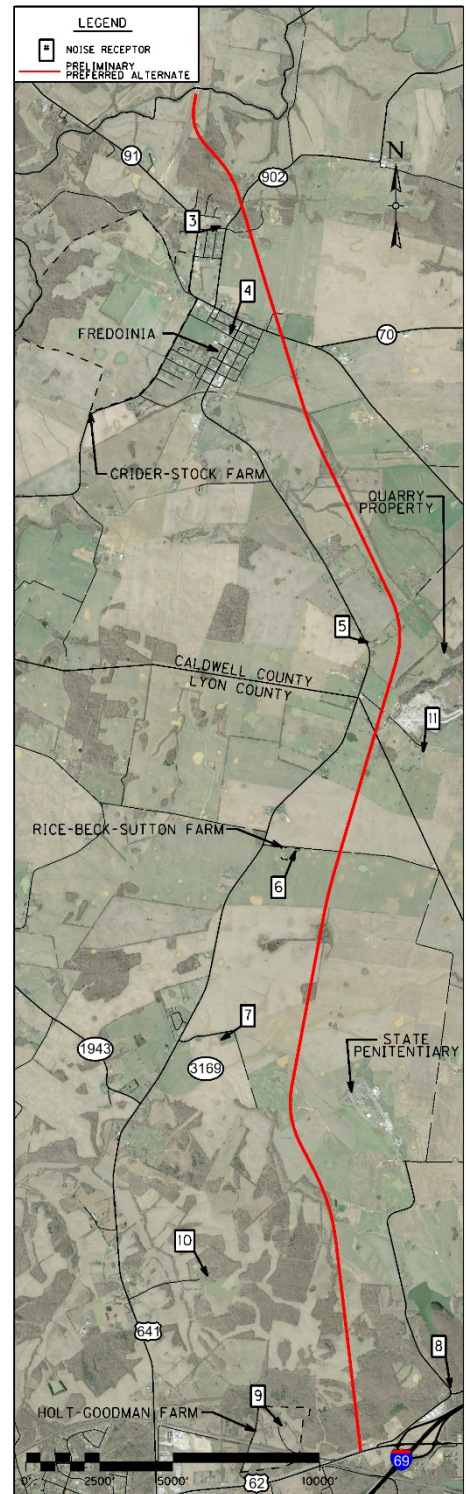


Figure 4: Noise Receptor Locations

the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Cumulative impact is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

C. Terrestrial and Aquatic Ecosystems

1. Water Quality and Stream Impacts

Refer to **Exhibit 4** (electronic appendix), Topographic Quadrangle showing blueline streams, aquatic survey sites, stream crossings and water wells. **Exhibit 5** (electronic appendix) is an aerial image showing wetlands, stream crossings, cave locations, and water wells.

a. Baseline Conditions

The project area lies within the Livingston Creek watershed, designated by the eleven-digit Hydrologic Unit Code (HUC), 05130205250. The Eddyville and Fredonia USGS 7.5' topographic quadrangle maps show seven blueline or blueline intermittent streams within the project corridor: an unnamed tributary of **Skinframe Creek, Dry Fork**, two unnamed tributaries of Dry Fork, and three unnamed tributaries of **Sinking Fork/Mill Bluff Creek**. This watershed is located within the eight-digit HUC 05130205, Lower Cumberland River sub-basin.

Stream surveys were conducted for the previous alternates considered and are generally located downstream from the Preliminary Preferred Alternate. Overall, water quality testing produced results within normal ranges. However, several streams had elevated levels of orthophosphate and slightly low dissolved oxygen levels. Agricultural runoff, silt, and animal wastes likely influence these parameters.

The macroinvertebrate communities of nine (9) streams, located downstream of the project area, were surveyed and produced Macroinvertebrate Biotic Index (MBI) scores of "Excellent", "Good", and "Poor" for three locations on Skinframe Creek, and scores ranging from "Very Poor" to "Fair" for 5 unnamed tributaries of Skinframe Creek. The survey site on Dry Fork produced a "Fair" score. Fish surveys conducted on three streams produced Kentucky Index of Biotic Integrity (KIBI) scores of "Good" for Skinframe Creek, "Fair" for an unnamed tributary of Skinframe Creek, and "Poor" for Dry Fork.

b. Water Quality Analysis

Streams impacted by the proposed project were evaluated for fish, mussel, and macroinvertebrate habitat, and sampling was conducted in those streams supporting aquatic life. Methods for collecting aquatic species and determining water quality followed the Kentucky Division of Water (DOW) manual Methods for Assessing Biological Integrity of Surface Waters in Kentucky (2002), and the Barbour et al. (1999) Rapid Bioassessment Protocols for Use in Wadable Streams and Rivers.

Water quality samples were taken from nine (9) streams in 2007 and 2008, downstream of the Preliminary Preferred Alternate and were sampled during surveys for previously considered alternates. Streams crossed by the Preliminary Preferred Alternate were dry during field investigations in 2018 and

2019. All samples were analyzed with HACH water analysis procedures and a DREL 2000 portable spectrophotometer.

A Rapid Bioassessment Stream Habitat Assessment form was filled out for each stream crossed by the Preliminary Preferred Alternate. Scores ranged from a value of 29 to 114 with an average score of 86, indicating streams crossed by the alternate are of marginal quality.

c. Potential Impacts

All alternates will impact first- or second-order streams that drain to **Livingston Creek**. Generally, direct impacts will be limited to placement of culverts and channel relocations. Riparian zones of these streams will be impacted during construction, and some areas will be lost due to roadway and shoulder construction and maintenance. Loss of the original stream channel could alter the macroinvertebrate community located in each stream. Loss of riparian zones containing mature trees may increase surface runoff within the watershed. Indirect impacts can occur if newly excavated material from disturbed zones washes downstream into surrounding streams.

Culverts, and possibly one bridge, will be utilized for stream crossings. Channel relocation is possible during construction. The Preliminary Preferred Alternate requires bridge/box culvert construction over Dry Fork of Skinframe Creek (stream length 1,287 ft) and culvert placement at 7 additional intermittent streams and approximately 13 ephemeral stream crossings (total impact length 9,416 ft). **Table 6** below summarizes individual stream impacts. Impacts on streams not previously disturbed will include loss of substrate and vegetation along banks. Streambank erosion may occur where soil is exposed, and vegetation is not yet established. Resulting sedimentation could impair water quality by decreasing oxygen availability while increasing turbidity, suspended solids, conductivity, and nutrient load.

Table 6: STREAM IMPACTS

Stream and Nearest Station Number (STA)	Stream Order	Stream Designation*	Future Impact	Approximate Length within ROW Limits	Watershed Drainage Area [†]
E-1, Unnamed Tributary of Skinframe Creek (STA 2010+00)	1 st	Ephemeral	Culvert	239 ft	6 ac
E-3, Unnamed Tributary of Skinframe Creek (2010+00)	1 st	Ephemeral	Culvert	456 ft	6 ac

d. Public Water Sources / Groundwater

Lyon and Caldwell Counties are situated in the Pennyroyal or Mississippian Plateau physiographic region of Kentucky. The Pennyroyal is an upland plain underlain by Mississippian-aged rock beds and is characterized by karst topography, including sinkholes, caves, and subsurface streams (KDFWR 2013). These types of features are common in the project area.

The percentage of residents that receive public water in Lyon and Caldwell Counties was 100% and 93%, respectively, based on estimated 2008 populations for the counties. The remaining population relies on private domestic wells or other sources (KY Geologic Survey 2019).

The Kentucky Environmental and Public Protection Cabinet – Division of Water (KEPPC – DOW) and the USGS Hydrology of Kentucky Viewer (2007) were consulted for information on groundwater. One (1) domestic water well is located near the end of the project but is outside of right-of-way limits. Joe Ray, KEPPC – DOW geologist, indicated that three (3) regional springs on **Livingston Creek** and “lower” **Skinframe Creek** could be affected by runoff that enters sinkholes and sinking streams in this karst topographic setting. An unnamed sinking creek crossed by the alignment is expected to trace to **Mill Bluff Spring** during planned Nonpoint Source investigations. It is also suspected that the sinking streams, “upper” Skinframe Creek and **Brewster Creek** drain underneath the project alignment and outlet at Rubin Ray Spring, located 3,700 ft southwest of Mill Bluff Spring. The flow route for Dry Fork of Skinframe Creek passes beneath the alternate and likely discharges at **Cohorn Spring**, located along “lower” Skinframe Creek. Also, an unnamed tributary northeast of Dry Fork Skinframe Creek probably carries flood-overflow water from Brewster and “upper” Skinframe sinking creeks. **Cash Spring**, located west of the alternate, is a minor domestic-use spring (Ray, letter dated 2 January 2008).

The Preliminary Preferred Alternate crosses a sinking stream called Sinking Creek or Mill Bluff Creek. The stream eventually enters a cave system, Mill Bluff Cave/Spring, approximately 1 mile from the nearest point on the project. Mill Bluff Cave/Spring is located in the northern section of the project vicinity, 1.6 miles south-southwest of Fredonia in Caldwell County. The cave is a known gray bat habitat.

An overhanging cliff composed of Ste. Genevieve limestone contains the main entrance and side entrance; according to the Kentucky Geological Survey (KGS), the cliff and entrance area is approximately 160 ft wide and 60 ft high. A large subsurface stream flows through the cave passage, and the cave is believed to drain a large area of Caldwell County to the east (KGS 1985). To the east of this area is an upstream entrance that is mostly flooded due to the stream that enters the cave at this location. The stream appears to travel underground for an estimated distance of 2,700 ft before emerging at the downstream (main) entrance and draining to Livingston Creek. The upstream entrance is approximately 1 mile from the nearest point on the Preliminary Preferred Alternate; the downstream, main entrance is situated approximately 1.5 miles from the nearest point on the project. Kentucky Speleological Survey data from 1982 indicates the cave is 1.541 miles in length (Accessed 8 January 2008).

Another cave system, Skinframe Sinks (Rice) Cave is located approximately 1.2 miles east of the project in Caldwell County. The system is in the vicinity of Skinframe and Brewster Creeks, and the mapped cave passages generally extend to the east, north, and south (KGS 1985).

Due to high groundwater-sensitivity concerns due to karst topography, silt and runoff from disturbed areas should be managed and Best Management Practices (BMP’s) and a Groundwater Protection Plan should be followed (Ray, letter dated 2 January 2008).

e. Agency Consultation

A data request sent to the Kentucky Division of Water (DOW) Water Quality Branch, Standards and Specifications Section revealed no designated Special Use Waters within or adjacent to the project area (see Appendix, Correspondence). The online Kentucky Watershed Viewer shows no 303(d) listed waters and one 305(b) listed water located adjacent to the project area. Skinframe Creek, located downstream of the project area, was designated a Cold Water Aquatic Habitat on May 31, 2016. The DOW

Outstanding National Resource Water is also designated an Exceptional Water and Reference Reach Water.

The online USGS Kentucky Hydrology Viewer returned no wellhead protection areas or water wells within the project area. The Source Water Protection Viewer shows the project area is located within a Source Water Protection Area (KY Energy and Environment Cabinet 2019).

f. Permits

Any culverts exceeding 300 feet in length will require a Section 401 Water Quality Certification. The placement of culverts less than 300 feet in length may require a Nationwide Permit from the USACE. Similarly, channel changes that exceed 300 linear feet to a stream shown as a blue line stream on a USGS topographic map require coordination with the DOW and the USACE. Channel changes are anticipated on this project and will require a Section 404 Individual Permit as well as a Section 401 Water Quality Certification.

g. Cumulative and Indirect Impacts

The Preliminary Preferred Alternate requires bridge/box culvert construction over Dry Fork (stream impact length 1,287 feet) and culvert placement at seven (7) additional intermittent streams and approximately thirteen (13) ephemeral stream crossings (total stream impact length 10,703 feet). Impacts on streams not previously disturbed will include loss of substrate and vegetation along banks. Stream bank erosion may occur where soil is exposed and vegetation is not yet established. Resulting sedimentation could degrade water quality by decreasing oxygen availability while increasing turbidity, suspended solids, conductivity, and nutrient load.

2. Floodplains

a. Floodplain Encroachment

Federal Emergency Management Agency (FEMA) floodplain mapping shows most of the project area with a Zone X designation, which is area of minimal flood hazard. A Special Flood Hazard Area with low flood risk occurs along Sinking Fork Livingston Creek (also called Mill Bluff Creek) (FEMA 2019). This stream's riparian zone will be impacted during construction, and some areas will be lost due to roadway and shoulder construction and maintenance.

b. Coordination and Permits

During final design any required permits will be determined at that time.

c. Cumulative and Direct Impacts

Data provided by the Federal Emergency Management Agency (FEMA) were consulted for floodplain locations in the project area. No impacts to 100-year floodplains are anticipated.

3. Wetlands

a. Baseline Conditions

Plants commonly found in wetlands delineated for the project included black willow (*Salix nigra*) and sycamore (*Platanus occidentalis*) in the shrub layer and soft rush (*Juncus effusus*), Frank's sedge (*Carex frankii*), and obligate spikerush (*Eleocharis ovata*) in the herbaceous stratum.

b. Field Studies

The Lyon and Caldwell County soil surveys, NWI maps, aerial photographs, and USGS topographic maps were studied to locate potential wetlands. On-site wetland determinations were conducted using the criteria outlined in the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0) (USACE 2012). Criteria included the presence of wetland hydrology, hydric soils, and hydrophytic vegetation. Soil types were identified using soil borings and a Munsell soil color chart.

c. Jurisdictional Wetlands

The Preliminary Preferred Alternate impacts two jurisdictional wetlands, Wetland A and I, for a total impact of 0.109 ac. Each wetland may be considered jurisdictional by USACE due to its connection to waters of the United States. Wetlands and their jurisdictional status will be verified by USACE. **Table 7** below is a summary of jurisdictional wetlands and impacts. See **Exhibit 5** (electronic appendix) for their locations.

Wetland A, 0.058 acres in size, consists of emergent fringe (PEM1) surrounding Pond 1. It is located just north of US 62 at the southernmost end of the proposed alignment. In terms of hydrology, primary indicators are surface water, high water table (< 12 in), saturation, visible inundation on aerial imagery, and true aquatic plants (i.e. *Potamogeton* sp.). One secondary indicator (i.e. crayfish burrows) is present. Within the sampling plot, obligate spikerush (*Eleocharis ovata*) is dominant, thus satisfying both the Rapid Test and Dominance Test (100%) for hydrophytic vegetation. Some tree removal, however, is evident. Soils are identified as the Hammack-Baxter complex (HxD), 12-20% slopes, and are silty clay in texture. From the surface to a depth of five inches, the soil sample yields a hydric matrix color of 10YR 6/1 with 7.5YR 5/8 redox concentrations. The remaining seven inches are a matrix color of 7.5YR 5/8 with gleyed depletions.

Wetland I is approximately 500 feet northeast of Wetland H and 0.2 miles south of Livingston Creek. It is small in area (0.080 acres) and classified as palustrine emergent (PEM1). Soil saturation at a depth of three inches indicates the presence of wetland hydrology. Dominant shrubs and herbaceous species are black willow (*S. nigra*), sycamore (*Platanus occidentalis*), barnyard grass (*E. crus-galli*), soft rush (*Juncus effusus*), and Frank's sedge (*Carex frankii*). Each is hydrophytic and therefore satisfies the Dominance Test (100%). Like Wetland H, soils are a Zanesville silt loam (ZaC3) with a silty clay texture. The sample is hydric throughout, yielding a depleted matrix color of 10YR 6/2 with redox concentrations of 7.5YR 4/6.

Table 7: JURISDICTIONAL WETLANDS

WETLAND	TYPE	SIZE (acres)	APPROXIMATE ACRES REQUIRED	% AFFECTED
A	Emergent	0.058	0.029	50%
I	Emergent	0.080	0.080	100%

d. Non-Jurisdictional Wetlands

Wetlands not adjacent to or lacking a significant downstream nexus with waters of the United States are considered non-jurisdictional wetlands. A non-jurisdictional wetland, Wetland L, will be impacted by the project for a total impact of 0.266 ac.

Wetland L has a total area of 0.266 acres and is located approximately 0.6 miles east of existing 641, in the Jacob’s farm field. This wetland is classified as palustrine scrub-shrub/aquatic bed (PSS1/PAB1). Primary hydrological indicators are surface water (0-3 inches), saturation, algal mat, and true aquatic plants. Dominant species in the herbaceous and shrub strata were buttonbush (*Cephalanthus occidentalis*), and water pennywort (*Hydrocotyle americanum*). These are both hydrophytic species passing the Rapid test and Dominance test at 100%. Soils are a silty clay with top 3 inches brown, and gleyed at 3-15” yielding a color matrix of 5YR 5/1 throughout; indicating hydric soil is present. The soil is part of the Robertsville silt loam series. This wetland is not connected to any other water bodies; therefore, it may be considered non-jurisdictional.

Ponds 1, 6, and 7 are situated within the project’s ROW for a total area of 0.807 acres

e. Cumulative and Indirect Impacts

Numerous wetlands were delineated in the project’s vicinity. Impacts to two (2) potentially jurisdictional wetlands and one (1) non-jurisdictional wetland were determined to be unavoidable. Wetlands A and I are considered palustrine emergent wetlands following the Cowardin, et al. classification, and Wetland L is palustrine scrub-shrub/aquatic bed. When wetlands are filled, loss of habitat and changes to natural drainage patterns will occur. Partial destruction of a wetland may include loss of habitat within and adjacent to the impacted area. Because several wetlands and ponds will be filled, there will be a loss of filtering capacity, erosion control, and water and sediment retention from the removal of wetland plants. Temporary effects to remaining wetlands may include increases in sedimentation and degraded water quality downstream from construction. Impacts to a wetland’s hydrology may eventually change the wetland’s size, classification, plant composition, and soil characteristics. Wetlands and ponds that are filled will no longer serve as wildlife habitat or as a water source for wildlife. Both Wetland A and I have a significant nexus to Skinframe Creek or Livingston Creek, respectively, and are therefore likely to be jurisdictional.

f. Agency Coordination and Permits

A Section 404 Individual Permit from the USACE is not likely to be required because less than 0.5 acres of probable jurisdictional wetland area will be filled. Since impacts to wetlands would be greater than 0.1 acre, mitigation would be required. Mitigation for wetland impacts will be subject to the USACE approval and will be a condition of the Section 404 Permit. The Division of Environmental Analysis (DEA)

of the Kentucky Transportation Cabinet (KYTC) will determine the total amount of wetlands affected after final project plans become available during Phase II Design. Subsequently, an appropriate compensatory wetland mitigation plan will be developed and implemented, if required.

4. Wild and Scenic Rivers

There are no Wild or Scenic Rivers located in the project vicinity.

5. Federally Threatened and Endangered Species

a. Baseline Conditions

Topography of the project area mostly consists of flat terrain and gently sloping hills. The northern half of the project is situated on a karst plain on which numerous sinkholes have formed. Sinking streams, springs, and features associated with limestone geology and underground drainage are found throughout the landscape. Plain elevations range from approximately 390 to 470 feet (ft) above sea level with most of the terrain situated in the low 400s. In contrast to the northern section of the project, the southern section is characterized by steeper relief, dendritic drainage patterns, and fewer sinkholes. Ridgetop elevations at approximately 600 ft slope to an average elevation of 430 ft in valley bottoms.

Open, forested, and wetland areas are the main types of terrestrial habitats. Open terrestrial habitat consists of farm fields, roadsides, residential areas, and disturbed areas. Within the project corridor, forested areas are disjunct, having been fragmented by agriculture and development; however, larger forested tracts function as terrestrial habitats, providing food and shelter for various wildlife groups. Most wetlands in the area have developed in sinkholes or at the edges of farm ponds; and others occur in situations where plants have colonized shallow or breached ponds. Approximate areas of each habitat were measured: open area (304.3 ac), forested area (103.5 ac), and jurisdictional and non-jurisdictional wetland area (0.484 ac). See **Exhibit 5** (electronic appendix) for locations of wetlands and to view aerial imagery of open, forested and wetland areas.

b. Coordination

The Endangered Species Act of 1973 protects species currently listed as threatened or endangered by the U.S. Fish and Wildlife Service (USFWS) and as such, these species are subject to the Biological Assessment (BA) requirements outlined in Section 7 of the Act.

A species list specific to the defined project area was generated using USFWS's Information for Planning and Consultation (IPaC). The generated list, dated 16 October 2019, lists four species with the potential to occur in the project vicinity: gray bat (*Myotis grisescens*, USFWS endangered), Indiana bat (*Myotis sodalis*, USFWS endangered), northern long-eared bat (*Myotis septentrionalis*, USFWS threatened), and Price's potato-bean (*Apios priceana*, USFWS threatened).

Records and correspondence from KDFWR (2019) and KSNPC (2007) indicate that several federal/state listed endangered or threatened species have the potential to occur within the project area as shown below in **Table 8**.

Table 8: STATE AND FEDERAL THREATENED AND ENDANGERED SPECIES REPORTED AS HAVING THE POTENTIAL TO OCCUR IN THE PROJECT AREA

Species	Agency Reporting Potential Occurrence	Listed Status
American coot (<i>Fulica americana</i>)	KDFWR	KDFWR Endangered
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	KDFWR, KSNPC	KY Threatened, KSNPC Threatened
Barking treefrog (<i>Hyla gratiosa</i>)	KDFWR, KSNPC	Special Concern

Refer to Table 11 in the baseline report for estimated acreage of potential habitat for each species.

According to the map, “Known Indiana bat habitat in Kentucky and within 20 miles” (August 2019) the project is not in a known habitat area but is considered potential habitat. (USFWS 2019). The Caldwell County section of the project is located within “Known Summer 1 Habitat” for the northern-long eared bat based on the USFWS map of “Known northern-long eared bat habitat in Kentucky and within 20 miles” (USFWS 2019).

c. Field Studies

A Biological Assessment (BA) was conducted in 2007 for species listed at that time. Survey sites are shown in **Figure 5**. Surveys for federally threatened and endangered species resulted in the capture of gray bats (*Myotis grisescens*) at three locations: Mill Bluff Cave, Livingston Creek, and along a road corridor. Indiana bat (*Myotis sodalis*) calls were recorded by acoustic monitoring along Livingston Creek. Two individual northern long-eared bats (*Myotis septentrionalis*) were captured during surveys. Surveys for Price’s potato-bean (*Apios priceana*) did not identify the plant.

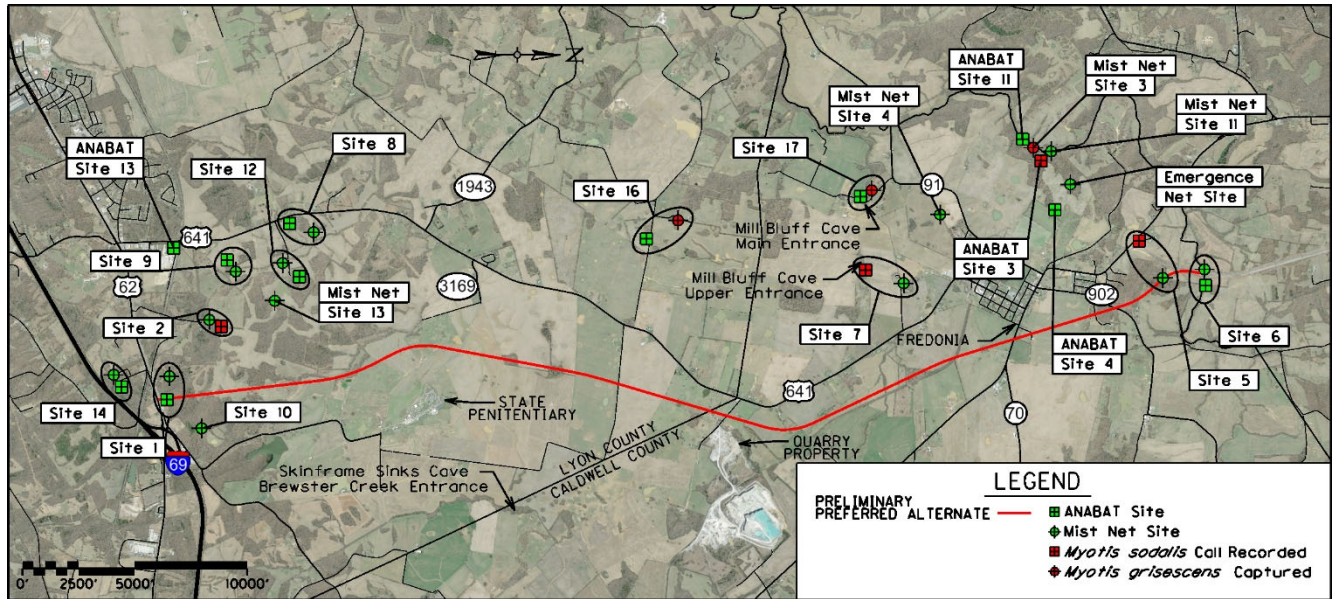


Figure 5: Bat Survey Locations

Several state-listed species were found in the project corridor. The cattle egret (*Bubulcus ibis*) was identified in a cattle pasture; the great blue heron (*Ardea herodias*) was sighted in various locations, and the southeastern myotis (*Myotis austroriparius*) was captured outside of Mill Bluff Cave.

Mill Bluff Cave appears to be the closest potential winter and summer habitat for the gray bat. Survey data indicate the cave may be used seasonally by gray bat bachelor colonies and/or is used as a non-maternity summer site. The cave could also be a potential summer roost site and winter hibernaculum for the Indiana bat and northern long-eared bat, although neither species was captured during surveys at the cave. The main Mill Bluff Cave entrance is approximately 1.5 miles (straight-line distance) from the project’s nearest ROW limits. The upstream entrance which is typically flooded and where the stream sinks into the ground is approximately 1 mile from the Preliminary Preferred Alternate. A large subsurface stream flows through the Mill Bluff cave passage. The upstream entrance is mostly flooded due to the stream that enters the cave. The stream travels underground for an estimated distance of 2,700 ft before emerging at the downstream (main) entrance and draining to Livingston Creek.

Another cave system, Skinframe Sinks (Rice) Cave is located approximately 1.2 miles east of the project in Caldwell County. The system is in the vicinity of Skinframe and Brewster Creeks, and the mapped cave passages generally extend to the east, north, and south (KGS 1985). No bat habitat information was found regarding this cave.

Forested areas within the project area provide potential summer habitat for the Indiana bat and northern long-eared bat; potential roost trees with loose or peeling bark (e.g., hickory, white oak, maples) are common components of wooded areas in the project vicinity. Forested riparian corridors are potential foraging habitat for all three protected bat species.

Areas of potential habitat for Price's potato-bean were examined during the flowering period of the species in summer 2007. Despite the presence of several areas of potentially good habitat, no individual plants were observed during floristic surveys.

A new BA will need to be conducted and coordinated with USFWS for Section 7 concurrence. 

d. Cumulative and Indirect Impacts

Construction of the Preliminary Preferred Alternate will eliminate plant communities and habitats in the project area and may force some wildlife species to relocate. The new roadway will split forested habitats, decreasing area that may serve as wildlife habitat and reducing or eliminating travel corridors used by wildlife. As a result, there may be an increase in terrestrial faunal road mortalities during construction and due to post-construction use of the roadway. While habitat fragmentation will occur as a result of this project, fragmentation has previously occurred throughout the project vicinity primarily due to agricultural activities. Other potential impacts may occur if placement of fill facilitates the spread of invasive species. Invasive plants can be introduced into areas through spraying and mowing operations and the movement of construction equipment.

Potential summer roosting and foraging habitat was found for the gray bat, Indiana bat and northern long-eared bat, which are federally endangered or threatened species. Indiana bat and northern long-eared bat habitat is potentially found throughout the forested portions of the project area, while foraging and watering habitat for all three bat species could potentially occur along streams. The clearing of trees may impact potential summer roosting and foraging habitat. Loss of trees along streams and fence rows may limit movement of *M. sodalis* and *M. septentrionalis* by reducing or eliminating travel corridors. While forest fragmentation is extensive in the area due to farming and development, clearing of trees for the new roadway will result in additional fragmentation. Surrounding forested area and streams could provide suitable alternative roosting and foraging habitat. Potential impacts can be lessened by clearing trees during the suitable season.

An indirect impact to *M. sodalis*, *M. grisescens* and *M. septentrionalis* is the potential for siltation of streams that the species may forage over for insects or depend on as a water source. A considerable increase in silt could affect stream quality and the larval forms of insects that bats prefer (e.g., mayflies, moths, beetles). Macroinvertebrate communities, along with their aquatic habitats will be eliminated where culverts or bridge piers are constructed. Livingston Creek, in particular, is an important travel and foraging corridor for the gray bat. Stormwater runoff carrying vehicular related pollutants is a water quality concern for Livingston Creek and its tributaries.

Typical habitats for *A. priceana* include mesic sites in open forests, forest edges and gaps, and riparian zones of creeks and rivers. The amount of forested area that will be impacted by the project is approximately 103.5 acres, some of which may be suitable habitat for the species. The loss of this type of habitat may have a direct effect on the species; however, similar habitat to what is being removed occurs within the project's vicinity.

An indirect effect on *A. priceana* is the potential for invasive species to infiltrate the project area, potentially limiting habitat for native species such as *A. priceana*. This species was not found during field

surveys; therefore, indirect effects are not anticipated. New developments and utility lines that are constructed as a result of the road project could have future impacts on potential habitat for *A. priceana*.

D. SECTION 106 AND CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act requires federal agencies, in this case the Federal Highway Administration (FHWA), to consider the effects on cultural resources of the proposed highway project. The Section 106 process seeks to accommodate historic preservation concerns with the needs of the project through consultation among FHWA officials, KYTC, the Kentucky Heritage Council (which is the State Historic Preservation Office (SHPO)), and other interested parties including the Advisory Council on Historic Preservation. One goal of consultation is to identify properties listed or eligible for listing on the National Register of Historic Places (National Register) in the project area. Consultation also aids in assessing effects, and ways to avoid, minimize, or mitigate any adverse impacts on historic properties. Refer to **Exhibits 6A, B and C** (electronic appendix).

1. Historic Resources

During the previous baseline studies for the project a Pre-coordination for Historic Properties was conducted in February of 2007 for the purpose of providing KYTC's Division of Environmental Analysis information to use to coordinate with the SHPO regarding the ***Rice-Beck-Sutton Farm*** on US 641 and the ***Holt-Goodman Farm*** on US 62. The eligibility and potential National Register boundaries of these two properties did influence the development of alternates.

According to the report, The Rice-Beck-Sutton Farm is located east of US 641, just south of the Lyon-Caldwell County line. It is approximately 292 acres and has remained intact since 1871 or before. The main dwelling on the farm today is an uninhabited two-story brick dwelling with exterior gable and chimneys in poor condition. There are three agricultural structures to the west of the house and one barn to the east. Based on the comparison of past and present-day aerial photographs, the field sizes and patterns have changed significantly since 1930.

The study concluded that the National Register boundary for the Rice-Beck-Sutton Farm is limited to the domestic space associated with the main dwelling under Criterion B, as this dwelling retains an historic association with William C. Rice who was significant in the histories of Lyon and Caldwell counties. The property was unable to meet Criterion A because the field patterns of the farm have changed dramatically to reflect modern mechanized farming practices and the farm no longer reflects diverse historic agriculture. The deteriorated physical condition and alterations to the main dwelling prevent the building unable to meet Criterion C for architecture.

The Holt-Goodman Farm is located north of US 61 and east of US 641 near Fairview in northeastern Lyon County. The older two-story framed dwelling known as the Cumberland House appears to date from the early twentieth century. To the north of the Cumberland House are numerous period agricultural outbuildings, and to the northeast are two domestic outbuildings. South of the complex is a modern dwelling, and northeast of the complex is a lake built after a 1967 aerial photograph was taken. The 1967 aerial photograph shows that the relocation of the Illinois Central Railroad in the early 1960s divided the farm into two tracts of approximately 53 and 20 acres. Although the farm entry road was

realigned, the rail line was parallel to the existing fence lines and had minimal impact to the field patterns.

The study concluded that the National Register boundary for the Holt Farm follows the present-day boundary. Although the farm was split by the rerouting of the Illinois Central Railroad in the 1960s, it retains sufficient agricultural integrity to meet Criterion A for agriculture. The Cumberland House and associated historic agricultural outbuildings meet Criterion C, but because the farm has no known association with a significant person in the history of Lyon County, it did not meet Criterion B.

The two farms discussed above were part of the impetus for the development changes to Alternates 1 and 2, however, they are not affected by the current Preliminary Preferred Alternate.

A new cultural historic baseline study was completed in October and November 2019. GIS data provided by KHC indicated 20 previously surveyed resources are located within or on properties that extend into the APE. Of the previously identified sites only one, Site 47 is individually listed in the NRHP. Another site, 112 was previously determined eligible for listing in the NRHP under Criterion B by KHC.

During the field survey, a total of 117 cultural historic sites (comprised of buildings and a cemetery) were identified within the APE. Twenty sites had been previously surveyed in the proposed project's APE (Sites 5, 9, 41, 42, 43, 45, 46, 47, 53, 52, 76, 89, 105, 107, 109, 111, 112, 114, but field investigations found that two of these resources have been demolished (CA 53 and LY 60). It is recommended that Sites 1–46, 48–88, 90–111 and 113–114 are not individually eligible for listing in the NRHP under Criterion A, B, or C and that Site 47 retains the integrity to be listed in the NRHP under Criterion C as a significant example of Victorian Gothic architecture in a small-town setting. Also, it is recommended that Site 89 is eligible for listing in the NRHP under Criterion C as a significant example of a Craftsman Bungalow in a small-town setting. Site 112 remains individually eligible for listing in the NRHP under Criterion B for its association with William C. Rice, a notable figure in Lyon and Caldwell Counties in both farming and business. Site 116 is recommended eligible for listing in the NRHP under Criterion A and Criteria Consideration D for the cemetery's age and association with the settlement era and pioneering families of Caldwell County. Also, Site 117 is recommended eligible under Criterion A and Criteria Consideration D for the cemetery's age and role as a primary cemetery for the community of Fredonia with association with Caldwell County's Caucasian and African American communities in the nineteenth century. The NRHP status of Site 115 is undetermined due to inability to access the property. Given the dwelling's location outside the APE and in a stand of trees, the proposed project has minimal potential to indirectly affect it. While confirmation of the cemeteries' boundaries is recommended, based on current information, it is recommended that the proposed project will not directly affect any of these eligible resources and will not diminish any of the qualities that make them significant.

In a letter dated April 9th, 2020, the KYTC-DEA issued a review letter indicating that, per the February 25, 2020 meeting for the EA Draft review, the SHPO was consulted and a revised Area of Potential Effect (APE) was established for the project. The revision was to include the "remainder of Fredonia, Kentucky". From August to October of 2020 an addendum to the cultural/historic baseline was completed for the remaining Fredonia area.

From the field survey, a total of 88 cultural historic sites were identified within the APE. 75 were previously undocumented. Thirteen resources (Sites 120–121, 138, 164–166, 175, 181–183, 196, 200,

and 204 [CA 246, CA 247, CA 35, CA 42–44, CA 250, CA 31–32, CA 251, CA 225, and CA 36]) were previously surveyed and have an undetermined NRHP-status in the KHC database. Sites 118–163 and 167–205 (CA 350–351, CA 246–247, CA 352–367, CA 35, CA 368–392, CA 393–400, CA 250, CA 401–405, CA 31–32, CA 406– 417, CA 251, CA 418–420, CA 225, CA 421– 423, CA 36, and CA 242) are recommended not eligible for listing in the NRHP individually or as part of a historic district under Criterion A, B, or C. However, Fredonia Craftsman Historic District, Sites 164–166 (CA 42–44), are recommended to be eligible for listing under Criterion C as excellent examples of Craftsman-style residences.

The proposed project area is located approximately 1,800 ft at its closest point from the recommended NRHP boundary for the proposed historic district and as such, the US 641 reconstruction project will have no direct effect on the NRHP-eligible resources. Given the proposed historic district's location in relation to the project area, the trees immediately surrounding the residences, and the intervening buildings that will obstruct the view of the project during and after completion, the proposed project will not be visible from Sites 164–166 (CA 42–44). It is recommended that the proposed project will result in No Effect to the Fredonia Craftsman Historic District. An overall finding of No Adverse Effect as presented in the revised report of August 13, 2020 remains the overall recommendation for the project. Pursuant to a letter dated March 3, 2021, the SHPO is in concurrence with this finding.

2. Archeological Resources

a. Records Review

A search of records maintained by the National Register of Historic Places (NRHP) and the Office of State Archaeology (OSA) was conducted to: 1) determine if the study area had been previously surveyed for archaeological resources; 2) identify any previously recorded archaeological sites that were situated within the study area; 3) provide information concerning what archaeological resources could be expected within the study area; and 4) provide a context for any archaeological resources located within the study area. The NRHP records indicated that no archaeological sites listed in the NRHP were situated within the current APE.

b. Archeological Site Data

The OSA records show that, prior to the records review, seventy (70) archaeological sites had been recorded in Caldwell County. The data indicated that the majority of the sites consisted of prehistoric open habitations without mounds. Other site types recorded in the county included rockshelters, sites of undetermined type, non-mound earth works, stone mounds, an earth mound, a historic farm/residence, an isolated find, a mound complex, a site (other), a quarry, and a workshop.

The majority of sites in Caldwell County were found on dissected uplands. Sites have also been recorded on floodplains, hillsides, unspecified landforms, undissected uplands, terraces, and other. The sites cover a variety of temporal periods, consisting of Woodland, Archaic, Late Prehistoric, Paleoindian, and Historic. Several other sites have components that are unspecified or are Indeterminate Prehistoric.

The OSA records show that, prior to the records review, 140 archaeological sites had been recorded in Lyon County. The data indicated that the majority of the sites consisted of prehistoric open habitations without mounds. Other site types recorded in the county included historic farms/residences,

cemeteries, earth mounds, isolated finds, open habitations with mounds, other sites, an industrial site, an isolated burial, a mound complex, other Special Activity Area, and a quarry.

The majority of sites in Lyon County were found on dissected uplands. Sites have also been recorded on floodplains, hillsides, terraces, unspecified landforms, and undissected uplands. The sites cover a variety of temporal periods, consisting of Historic, Archaic, Late Prehistoric, Woodland, and Paleoindian. Several other sites have components that are Indeterminate Prehistoric.

c. Map Data

In addition to the file search, a review of available maps was initiated to help identify possible historic structures or archaeological site locations within the proposed study area.

The 1931 Eddyville, Kentucky, 15-minute series topographic quadrangle shows three Map Structures (MS 1–MS 3) very near to, or within, the APE. MS 2 appears to be labeled Jones School, while the others are unlabeled structures. The 1926 map shows MS 1 and, instead of Jones School, it has Jones Chapel in the location of MS 2. MS 3 does not appear on the 1926 map. The 1954 Eddyville, Kentucky, 7.5-minute series topographic quadrangle shows MS 1, and a new structure (MS 4) to the west of MS 1. The 1954 Fredonia, Kentucky, 7.5-minute series topographic quadrangle shows a structure (MS 5) very close to, or within, the APE, which is located east of Fredonia where a structure does not appear in the earlier maps. Finally, the 1955 Eddyville, Kentucky, 15-minute series topographic quadrangle shows MS 1, MS 4, and MS 5. The 1957 General Highway Map for Caldwell County has MS 5 likely mapped, but it is hard to tell due to a road located close to the structure. The 1957 General Highway Map for Lyon County has MS 1 and MS 4 mapped.

From the review of maps, it appears that MS 1 was constructed prior to 1926 and was extant at least until 1957. MS 2 appeared as Jones Chapel then Jones School in the 1926 and 1931 maps, respectively, but this structure is not mapped in 1954. MS 3 only appears on the 1931 Eddyville, Kentucky, 15-minute series topographic quadrangle so it was likely constructed after 1926 and was not extant by 1954. MS 4 appears as a new structure on the 1954 Eddyville, Kentucky, 7.5-minute series topographic quadrangle and was extant at least until 1957. MS 5 first appears on the 1954 Fredonia, Kentucky, 7.5-minute series topographic quadrangle and was extant at least until 1957. There are no more recent maps available to review but, upon reviewing aerial photographs, it is likely that MS 5 is still extant at the present time. See Exhibit 7(electronic appendix).

d. Soil Review

The soils mapped within the APE were also reviewed in order to define areas that may contain intact cultural deposits. Eight soil series (Ashton, Cynthiana, Faywood, Jessup, Lindside, Newark, Nolin, and Rossmoyne) were mapped for the study area (Soil Survey Staff 2019). The Ashton, Cynthiana, Faywood, Jessup, and Rossmoyne series soils are Alfisols, and they are generally found on landforms that formed during the late Pleistocene or earlier (Soil Survey Staff 1999:163–165). Archaeological deposits would only be found on or very near the ground surface on landforms mapped with Alfisols. Lindside, Newark, and Nolin series soils are Inceptisols and they are found on stream terraces, floodplains, or alluvial fans. Inceptisols have the potential to contain deeply buried, intact cultural deposits (Soil Survey Staff 1999). These soils are mapped in the floodplain of the North Fork Gunpowder Creek in the northern part of the

APE, in a few areas of the central portion of the APE, and along what appears to be a relict creek bed originally part of the South Fork Gunpowder Creek in the southern part of the APE. These soils represent approximately 6.1 percent of the study area, and they have a high potential to contain significant intact prehistoric cultural deposits.

e. Summary

The NRHP and OSA data revealed that none of the previous archaeological surveys are within the APE. No archaeological sites have been recorded within the APE; however, one site (15Ca67) is located adjacent to the northern end of the APE. A review of historic maps shows that the APE has the potential to contain archaeological deposits associated with five historic map structures. As such, these areas have a high potential to contain historic cultural deposits. A Phase I archeological survey is required for the footprint of the Preliminary Preferred Alternate prior to FONSI approval and completion of the Section 106 process.

E. Socioeconomic Impact

1. Land Use

Refer to Exhibits 8A and 8B (electronic appendix), Socioeconomic Impacts. The proposed project is located in northern Lyon and western Caldwell Counties. The area is primarily rural in nature, and existing land use is mainly agricultural and farmland, as well as recreational in Lyon County. An estimated fifty-five (55%) percent of the project area is cropland, mostly corn, soybean, and small grain production, and approximately twenty-five percent is pastureland. Residential housing is scattered throughout the alignments. Land use in areas near the towns, including Eddyville and Fredonia, is residential/small business.

Lyon County contains a portion of the Land Between the Lakes, a 170,000-acre outdoor recreation area approximately 35 miles west of Clarksville, TN and 30 miles southeast of Paducah, KY. The area forms an inland peninsula bordered by Lake Barkley on the east and Kentucky Lake on the west. Together these lakes joined by a canal form one of the largest man-made bodies of water in the world. Recreational activities in the area include fishing, hunting, camping, horseback riding, hiking, and biking at Lake Barkley State Park, Kenlake State Resort Park, and Kentucky Dam Village State Resort Park. The Land Between the Lakes is the most visited attraction in the state of Kentucky.

The Pennyrile Westpark Industrial Development Park is also located in Lyon County near the junction of Interstate 24 and the Wendell Ford Western Kentucky Parkway. It is an 800-acre site targeted to a single large industrial client with all utilities including natural gas located on the site. The site consists of 500 acres owned by the Commonwealth of Kentucky and an additional 300+ acres which is privately owned and held under option by the Pennyrile Westpark Industrial Development Authority, an organization responsible for the marketing and development of the site. The labor market for the park consists of most of western Kentucky and extends into Indiana, Illinois, and Tennessee.

Community resources include the Lyon County Public Library in Eddyville, and the Lyon County School District, also in Eddyville. The Caldwell County School District is located in Princeton, approximately ten miles east of the project corridor. Although there are health clinics in Lyon County, the nearest

Emergency Room service is at the Caldwell County Hospital in Princeton. New Bethel Baptist Church is within the project corridor, but would not be acquired by any of the alternates

This project would provide a facility which would improve travel in the area with relatively minor changes to the existing land uses. The primary change in land use would be the conversion of approximately 213 acres of private farmland and 95 acres of public farmland on the prison property to highway right of way. The project's purpose and need is compatible with current development trends and is not expected to have negative indirect effects upon land use patterns. Positive indirect impacts include an anticipated improvement to existing traffic patterns and improved access to the industrial park. The proposed project may encourage freight movement and support continued economic development to the surrounding area. See Exhibits 8A and 8B (electronic appendix).

2. Community Impacts

a. Baseline Condition

The project area is essentially rural in nature, and existing land use is primarily agricultural with farmland present along the project corridor. The existing corridor is bordered by farmland and scattered residences, with the community of Eddyville to the east of the southern terminus, and the community of Fredonia at the northern terminus.

The town of Eddyville (2010 population of 2,554) is near the southern end of the proposed project. The town of Fredonia (2010 population of 401) is near the north end of the proposed project.

b. Population

According to the US Census Bureau, while the population of the United States and Kentucky were estimated to increase by 4.0% and 2.0% respectively from the April 1, 2010 Census to the 2017 ACS 5-year population estimate, it is estimated that Lyon County's population decreased slightly by 0.6% for the same time period. It is estimated that Caldwell County's population decreased by 1.9% for the period given.

The primary urban center of Caldwell County is Princeton, the county seat. Lyon County is rural in nature, with Eddyville serving as the major town and county seat. While estimates indicate a decrease in the population of the city of Princeton of 2.5% from 6,329 persons in 2010 to 6,173 persons in 2017, estimated populations of Eddyville and Fredonia have increased. The population of Eddyville experienced an estimated increase of 0.9% from 2,554 persons in 2010 to 2,576 persons in 2017. The population of Fredonia in experienced an estimated increase of 17.5% from 401 persons in 2010 to 471 persons in 2017.

c. Age Distribution

The US Census Bureau American Community Service (ACS) estimates for 2013-2017 show that the population of persons 65 and older in both counties is higher than the state population percentage of 17.1% for Kentucky. In Caldwell County it is 19.5, and in Lyon County it is 24.1%.

The 2013-2017 American Community Survey estimates 17.3% of the population have a disability in Kentucky; 19.6% with a disability in Caldwell County, and 21.1% with a disability in Lyon County.

d. Community Cohesion

Estimates for 2017 indicate that the following groups contained larger percentage populations in both Lyon and Caldwell Counties than in Kentucky and the United States: Persons 65 years and older (Lyon County, 24.1%, Caldwell County 19.4%, Kentucky 15.1%, United States 14.9%); White alone (Lyon County 98.5%, Caldwell County 92.3%, Kentucky 87.3%, United States 73.0%); Veterans, (Lyon County 13.1%, Caldwell County 6.5 %, Kentucky 6.3%, United States 5.9%).

Community cohesion in the residential areas along US 641 should not be adversely affected because regional access to goods and services are expected to be improved from the construction of the project. Although all of the alternates divert from the existing roadway to varying degrees, most relocates should be able to relocate in the project area. No social clusters are expected to be affected, and the project is not expected to have any divisive or disruptive impacts to neighborhoods or to negatively affect low-income or minority groups. If possible, some relocates may choose to rebuild or move their homes to sites on remaining parcels. Race and ethnic composition are expected to remain the same.

e. Employment and Labor Force

According to Data USA, in 2017 Caldwell County had a median household income of \$46,182. The median property value is \$95,300, and the home ownership rate is 72.9%. Most people in the county drive to work, with the average commute time is 22.1 minutes, and average car ownership is 2 cars per household.

The economy of Caldwell County employs approximately 5,300 people, with the largest industries in Manufacturing (1,210 people) and Health Care and Social Assistance (592 people). Median household income is \$46,182. The poverty rate is 17.5%. Princeton is the trade center for Caldwell County.

According to Data USA, in 2017 Lyon County had a median household income of \$50,268. The median property value is \$122,900, and the home ownership rate is 82.5%. Most people in the county drive to work, with the average commute time is 20 minutes, and average car ownership is 2 cars per household.

The economy of Caldwell County employs approximately 2,800 people, with the largest industries in Manufacturing (543 people), Retail Trade (491 people) and Health Care and Social Assistance (317 people). Median household income is \$50,080. The poverty rate is 14.1%. Eddyville is the trade center for Lyon County.

f. Community Resources

Community resources include the Lyon County Public Library in Eddyville, and the Lyon County School District, also in Eddyville. The Caldwell County School District is located in Princeton, approximately 10 (ten) miles east of the project corridor. Although there are health clinics in Lyon County, the nearest Emergency Room service is at the Caldwell County Hospital in Princeton. New Bethel Baptist Church is within the project corridor but would not be acquired by the Preliminary Preferred Alternate. These resources are not expected to be impacted by the project. There are no 4(f) or 6(f) resources within the Preliminary Preferred Alternate corridor. In general, the proposed project is expected to improve accessibility to community resources and improve mobility in the region.

g. Impacts

The cumulative socioeconomic effects of the project are expected to be beneficial. The proposed project is not predicted to significantly alter land use trends in the corridor. It is compatible with local, state, and regional plans for land use, and will enable officials to meet increased traffic demands while maintaining a safe, efficient route. The proposed project will provide area residents with a facility that is expected to improve safety and level of service while supporting potential economic development. It is anticipated that the project will improve emergency vehicle response times and may alleviate future capacity problems of the existing roadway.

Minor negative impacts to tax revenues are anticipated. These impacts include property acquisition, some property value reductions due to partial property acquisition, and the temporary disruption that accompanies a construction project. These negative impacts are anticipated to be offset by the expected benefits of the project to the communities in the project area.

3. RELOCATIONS AND DISPLACEMENTS

a. Relocations and Displacements

As shown in **Table 9** below, each of the proposed alternates would require relocations:

Table 9: SUMMARY OF THE IMPACTS FOR BUILD ALTERNATES

Alternate	PREF
Residential Relocations	8
Mobile Homes	0
Churches	0
Miscellaneous (Barns, Metal Bldgs., Sheds)	2 (approx.)
Substation or Business Relocations	2 (1 of each)
Cemeteries/Non-Profit Relocations	3
Approx. Acres Of Farmland Acquired	308
Farms Impacted or Severed	13 Impacted; 4 Severed
Minority Communities or Neighborhoods	0
Handicapped Residents	0

Selection of the Preliminary Preferred Alternate would require approximately 8 residential relocations, with impacts to approximately ten (10) farms and an additional nine (9) farms may be severed.

Martin Marietta Aggregates, located at 297 Fredonia Quarry Road in Caldwell County, may be impacted by the proposed alternate. The B2B Yellow Pages lists this business to be classified as “Petroleum Services and Equipment, Home Improvement & Remodeling Services, Quarries, and Stone Crushed Retail”. Lafarge is also listed as a tenant at this location, classified as “Lime & Limestone” products.

A substation was identified near Station 2260+00 of the proposed project as shown on **Exhibit 9** (electronic appendix). This substation would have to be relocated with the implementation of the Preliminary Preferred Alternate. No churches are anticipated to be impacted by the proposed project, and no minority communities were identified in the project area.

There are numerous social services resources in Lyon County, including those that assist seniors and veterans, whose populations are represented in higher percentages when compared to percentages across the commonwealth of Kentucky. Most of these are located in Eddyville and don’t appear to be impacted by the proposed project.

There are three (3) cemeteries in the project area. The City of Fredonia Cemetery is located east of Fredonia and not expected to be impacted by the Preliminary Preferred Alternate. Two additional cemeteries are located near the northern end of the proposed project north of Fredonia. The first (Resource A) is an early nineteenth-century cemetery with approximately 20 visible internments and likely other, non-marked burials. The second (Resource B) is located southwest of the first on a wooded hill and is much larger, with 200-300 depressions. This cemetery may contain Caucasian and African American internments possibly dating from 1823 to 1949. Some of these burials may include the remains of slaves. The boundaries of this cemetery are unknown and may extend into the proposed project.

Windshield surveys did not indicate the presence of handicapped residents; however, there are a relatively high percentage of elderly and disabled residents in Lyon County and the Fredonia area, and they may need special services if they are required to relocate. If these considerations are discovered during the right-of-way phase of the project, Relocation Agents shall contact local senior citizen organizations, the health department, the Social Security Office, and/or elected officials for assistance in identifying special needs of the residences. Every effort will be made to ensure that relocatees will be moved with minimal disruption.

b. Relocation Assistance

Should relocations become necessary, all housing is available to all persons without regard to race, creed, color, or national origin as required by Title VI of the Civil Rights Act of 1966. Relocation personnel will assist relocatees in finding Decent, Safe, and Sanitary (DS &S) replacement housing within their financial means with a minimum amount of disruption. The assistance will conform in complete accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, and all applicable statutes, regulations, and guidance that concern the social and economic health and well-being of persons who are displaced by a public project.


c. Replacement Housing

Replacement housing in Lyon and Caldwell Counties is available, based on information provided by local real estate agents. Lyon County is a higher-priced area due to its proximity to the Land Between the Lakes recreation area. Rural homes are available in this area starting at about \$70,000; however, lower-

priced homes are available in and around Eddyville. Caldwell County consists of a somewhat lower market with housing also available. Houses in and around Fredonia can be found in the \$50,000 to \$100,000 range. According to information from the KY Cabinet for Economic Development, the median home price in 2010 was \$70,000 in Caldwell County and \$88,500 in Lyon County.

It must be noted that not all homes will be of fair and equitable market value. No relocated individuals will be moved into homes of lesser value than the acquired home. As a result, Special Relocation Advisory Services and/or Last Resort Housing funds may be necessary for this project. These funds are available to assist in any relocation if it is determined that the relocation would cause undue hardship on a family utilizing typical relocation methods. These funds would also be available if needed for any hardship relocations that may occur from alignment or right-of-way shifts in the project corridor. Additionally, the project could be divided into two segments for right-of-way acquisition in successive fiscal years. This would offset competition for and availability of adequate housing for the relocated families.

d. Competing Projects for Available Housing

Based on the KYTC's Enacted 2018  Highway Plan, other scheduled projects in Lyon County include the addition of a restroom facility to the east and westbound weigh stations on I-24, and Asset Management projects to address pavement conditions along I-24. In Caldwell County, scheduled projects include a new connector northeast of Princeton, a bridge project on KY 126 over Dreen Creek, and pavement projects on I-24 and I-69. These projects are not expected to compete for housing with the proposed project due to their scope and distance from the project corridor.

4. Environmental Justice

In accordance with the Federal-aid Highway Act of 1970 and Executive Order 12898 on Environmental Justice, every consideration has been given in the planning and development of this project to consider environmental impacts which might disproportionately or adversely affect minority or low-income groups. Windshield surveys, interviews with local officials, and review of census data revealed no evidence that the proposed build alternates will have any disproportionate or adverse effects to minority or low-income populations, and it is not anticipated that any neighborhoods or communities would be adversely impacted.

There are numerous social services resources in Lyon County, including those that assist seniors and veterans, whose populations are represented in higher percentages when compared to percentages across the commonwealth of Kentucky. Most of these are located in Eddyville and don't appear to be impacted by the proposed project.

5. Farmland

Caldwell County relies heavily on agriculture to sustain its economy. According to Kentucky Agricultural and Food Profiles, in 2012 Caldwell County had approximately 133,500 acres in farm operations, representing 60.5% of the land in Caldwell County. By comparison, farm operations in the commonwealth of Kentucky comprised approximately 51.6% of the land area, and approximately 40.5% of the land area in the United States. Most of the farm operations (320) were between 50-500 acres,

with about 175 less than 50 acres and 43 greater than 500. The value of the land used for farming operations was estimated to be \$365,111,000, with income from farms estimated to be \$7,541,000. Caldwell County had a total value of crop sales of approximately \$33,393,000 in 2012, comprised of soybeans at 38%, corn at 32%, wheat at 23%, and tobacco at 6%. The county's total value of animal sales was approximately \$5,107,000, comprised primarily of breed and stud fees at 97%. According to USDA 2012 data, 1,124 people (17.6% of total county employment) directly received income from farm operations.

Lyon County also depends on agriculture to sustain its economy. According to Kentucky Agricultural and Food Profiles, in 2012 Caldwell County had approximately 41,638 acres in farm operations, representing 56.7% of the land in the county. By comparison, farm operations in the commonwealth of Kentucky comprised approximately 51.6% of the land area, and approximately 40.5% of the land area in the United States. Most of the farm operations (149) were between 50-500 acres, with 60 less than 50 acres and 10 greater than 500. The value of the land used for farming operations was estimated to be \$84,314,000 with income from farms estimated to be \$1,864,000. Lyon County had a total value of crop sales of approximately \$5,290,000 in 2012, comprised of soybeans at 42%, corn at 26%, wheat at 8%, tobacco at 12%, and other crops at 12%. The county's total value of animal sales was approximately \$1,492,000, comprised primarily of cattle and calves at 94%. According to USDA 2012 data, 425 people (12.2% of total county employment) directly received income from farm operations.

Impacts will occur to agriculture as a result of this project. The project corridor contains prime, unique, statewide or local important farmland, requiring the completion of a U.S Department of Agriculture Form AD-1006 ("LESA Form") by the Natural Resource Conservation Service (NRCS). The Preliminary Preferred Alternate will require a direct conversion of farmland. Land Evaluation Criterion scores are being evaluated by NRCS as of the writing of this document and will be shown on the LESA Form. The results of this determination will be included in the FONSI. When the form has been completed, if the farmland impacts meet or exceed the critical level of 160, avoidance, minimization, and mitigation will be considered, as appropriate.

6. Pedestrian and Bicycle Facilities

KYTC considered the need for bicycle facilities and pedestrian walkways as required by the Kentucky Pedestrian and Bicycle Travel Policy (July 2002). No dedicated bicycle facilities or pedestrian walkways have been included in the proposed build alternates. Due to the primarily rural nature of the project area, it is anticipated that there will be little pedestrian traffic and no need for pedestrian walkways as part of the project. Construction of the proposed roadway would provide 12-foot shoulders that could be used by bicyclists if desired, resulting in potential aesthetic benefits provided from cycling on a rural road.

F. HAZARDOUS MATERIALS AND UNDERGROUND STORAGE TANKS

1. Conclusions Regarding Findings

The investigation produced negative results for four major classes of hazardous material sites: it revealed no RCRA hazardous waste generators; CERCLIS Superfund sites; no UST sites; or coal mines or gas wells.

Seven sites were remote enough from the corridor that they should not present any problems and ten sites, within the project corridor, were judged to be insignificant.

Finally, it revealed the presence of three (3) sites in the Project Right-of-Way which present observed, suspected, or at least potential hazardous materials.

2. Recommendations Regarding Future Study

Three (3) sites in the project corridor are recommended for further study at this time.

- **Sub-station (at 2261+00):** It is recommended that this site have a limited Phase II survey performed to ascertain the possible presence of PCBs associated with the transformers if in final design the alignment takes this site.
- **Railroad Corridor (at 2368+50):** It is recommended that this site have a limited Phase II survey performed to ascertain the possible presence of hazardous materials/petroleum products which may have leaked over the years onto the track subgrade, if, in final design the alignment takes this site.
- **Repair Facility (at 2438+75):** It is recommended that this site have a limited Phase II survey performed to ascertain the possible presence of hazardous materials/petroleum products which may have leaked over the years onto the ground, if, in final design the alignment takes this site.

3. Summary

The Project corridor features three sites which contains known, suspected, or potential hazardous materials. It is recommended that limited Phase II investigations be completed for these sites if the final design takes them or possibly even a portion of them. See **Exhibit 9** (electronic appendix).

G. VISUAL IMPACTS

The view while driving along the existing facility is rural in nature, with visible farmland present. At the northern end of the project, the alignment passes near the small town of Fredonia (population approximately 400) so in this section of the proposed roadway, there will be some residential homes visible to the west as well. Visual impacts with the construction of an improved facility will be mostly positive due to decreased congestion and more efficient traffic flow and will remain mostly rural in nature. Those residents experiencing loss of a portion of their property will likely experience negative visual and psychological impacts; however, property acquisition has been kept at a minimum.

H. IMPACTS OF CONSTRUCTION ACTIVITIES

The effects of the construction will be temporary and minor with improved accessibility resulting from the implementation of this project. Mitigation for the effects of construction on the socioeconomic environment will include:

A maintenance-of-traffic plan will be prepared during the design phase. The KYTC Division of Environmental Analysis and the KYTC Division of Highway Design will coordinate construction commitments in the design notes. The Contractor will follow all requirements as outlined by KYTC.

Impacts to the natural environment from construction will include potential erosion and sedimentation that could affect the residential and agricultural grounds near the project. Provisions contained in Sections 212 and 213 of the Kentucky Department of Highway Standard Specifications (KDHSS) will mitigate erosion and sedimentation.

KYTC will develop erosion control plans during the final design and implement best management practices during design and construction. In time, revegetation will stabilize the construction sites and impacts will diminish. Planting vegetation within construction and right-of-way limits will stabilize highway shoulders; prevent drop-offs, rills, and gullies; beautify the roadside; and prevent sedimentation of culverts and nearby streams.

Construction waste will be managed in accordance with KDHSS Section 204 and other applicable state regulations. Debris generated during removal of structures and obstructions will be managed in accordance with KDHSS Section 203 and other applicable state regulations.

Standard noise reducing measures will be implemented during the construction phase to prevent construction noise from becoming a public nuisance.

Road construction activities have the potential to generate fugitive dust. Fugitive dust consists of particulate matter that becomes airborne directly or indirectly as a result of human activity. Road construction can generate fugitive dust from earth-moving equipment (e.g., bulldozers, graders) and trucks loading and unloading or transporting earthen materials. Wind can cause fugitive dust in areas cleared of vegetation during construction. To minimize fugitive dust generation, KYTC will follow KDHSS Section 107.01.4. During construction, KYTC or its contractor will apply water or other approved materials (chemical dust suppressants), as appropriate, to control dust.

Based on the Series XII, 2004 Generalized Geologic Map for Land-Use Planning by the Kentucky Geological Survey, University of Kentucky, the type of rock generally found along the Preliminary Preferred Alternate in Lyon County is limestone, shale, sandstone, and siltstone in the northeast portion of the county, with alluvium bordering Brewster and Sinkhole Creeks. Alluvium deposits are subject to flooding, and soils derived from alluvium deposits have a moderate to high shrink-swell capacity, which may affect roadways and other structures.

Lyon County is in close proximity to the New Madrid Seismic Zone. Should faults in this area become active, soil creep, slumps and landslides may occur along slopes due to ground motion and erosion.

In Caldwell County, the underlying limestone continues, and forms a well-developed karst plain, characterized by springs, hundreds of sinkholes, and underground drainage through conduits or caves, found in the eastern edge and northeastern corner of the county. Karst landscapes form when acidic water seeps through the soil into fractured and soluble limestone, and sinkholes are depressions on the land surface where water drains underground, usually circular and ranging in size from a few feet to hundreds of feet in diameter.

According to KYTC's Drainage Manual, the best option is to avoid karst elements altogether. Alignment development should consider the location of individual karst elements such as sinkholes and strive to avoid impacting them.

I. MITIGATION MEASURES

A summary of mitigation commitments is provided below in **Table 10**.

Table 10: MITIGATION MEASURES

ENVIRONMENTAL IMPACTS	MITIGATION COMMITMENTS
<p>Water Quality</p>	<p>Stream reaches located downstream of the project have MBI scores ranging from Very Poor to Excellent. Only Skinframe Creek has Good and Excellent MBI scores. Downstream KIBI scores range from Poor to Good. RBP scores for streams crossed by Preliminary Preferred Alternate range from 29 (ditch) to 114, with an average score of 86, indicating these headwater streams are of marginal quality. Implementation of best management practices during construction, culvert placement, and channel relocation will provide stable, properly functioning stream channels. An erosion control plan that adheres to FHWA's and KYTC's guidelines should be implemented. KYTC should follow the standards of Sections 212 and 213 of the Kentucky Department of Highways Standard Specifications Manual during construction.</p>
<p>Streams</p>	<p>The Kentucky Division of Water Draft Stream Mitigation Guidelines (October 2001) considers mitigation appropriate when channel changes are greater than 300 linear feet and occur in watersheds larger than 250 acres. Mitigation may still be required from the USACE regardless of drainage area.</p>
<p>Groundwater</p>	<p>Due to high groundwater-sensitivity concerns in the project area and karst features in the vicinity including sinking streams and caves, silt and runoff from disturbed areas should be managed and Best Management Practices and a Groundwater Protection Plan should be followed.</p>
<p>Wetlands</p>	<p>Mitigation, if required, will be subject to USACE approval and will be a condition of the Section 404 Permit. Best Management Practices to prevent or minimize erosion and sedimentation should be considered during design and implemented during construction, with an erosion control plan that follows FHA and KYTC guidelines. KYTC should follow the standards of Sections 212 and 213 of the KYDOH's Standard Specifications Manual during construction.</p> <p>The DEA of the KYTC will determine the total amount of wetlands affected after final project plans become available. Subsequently, an appropriate compensatory wetland mitigation plan will be developed and implemented if necessary</p>
<p>Permits</p>	<p>Any stream impacts exceeding 300 feet in length may require a Section 401 Water Quality Certification. Impacts less than 300 feet in length may require a Nationwide Permit from the USACE. Similarly, channel changes that exceed 300 linear feet to a stream shown as a blueline stream on a USGS topographic map require coordination with the DOW and the USACE. Channel changes are anticipated on this project and likely will require a Section 404 Individual Permit and a Section 401 Water Quality Certification.</p>

ENVIRONMENTAL IMPACTS	MITIGATION COMMITMENTS
<p>Terrestrial Ecosystems</p>	<p>Planting native species of vegetation will stabilize construction areas, prevent drop-offs, rills, and gullies, and help prevent sedimentation of streams.</p> <p>Further Section 7 coordination with the USFWS will be conducted by KYTC when the final alignment is chosen. A Biological Assessment of the Indiana bat (<i>Myotis sodalis</i>), gray bat (<i>M. grisescens</i>), northern long-eared bat (<i>M. septentrionalis</i>), and Price’s potato-bean (<i>Apios priceana</i>) will be completed prior to construction. In addition to surveys for these species, further efforts may need to be taken in order to avoid impacting summer roosting <i>M. sodalis</i> and <i>M. septentrionalis</i>, including removal of potential roost trees between October 15 and March 31 as per USFWS guidance.</p>
<p>Threatened and Endangered Species</p>	<p>Section 7 coordination with the USFWS will be conducted by KYTC and a biological assessment for the Indiana bat, gray bat, northern long-eared bat and Price’s potato bean will be completed in conjunction with the FONSI. In addition to surveys for these species, further efforts may be required in order to avoid impacting summer roosting <i>M. sodalis</i> and <i>M. septentrionalis</i>, including removal of potential roost trees between October 15 and March 31 as per USFWS guidance.</p>
<p>Section 106: Archaeological Resources</p>	<p>A Phase I Archaeological Survey of the Preliminary Preferred Alternate will be completed prior to the FONSI. Any sites requiring additional work will be addressed via an MOA.</p>
<p>Socioeconomic</p>	<p>In accordance with the Uniform Relocation Assistance and Real Property Acquisition Act of 1970, the Kentucky Transportation Cabinet relocation personnel will assist relocatees in finding Decent, Safe, and Sanitary (DS &S) replacement housing or commercial sites within their financial means with a minimum of disruption. The assistance will conform in complete accordance with all applicable statutes, regulations, and guidance that concern the social and economic health and well-being of persons who are displaced by a public project.</p>
<p>Hazardous Materials and Underground Storage Tanks</p>	<p>The Project corridor features three sites which contains known, suspected, or potential hazardous materials. It is recommended that limited Phase II investigations be completed for these sites if the final design takes them or possibly even a portion of them.</p>
<p>Construction/Maintenance</p>	<p>A maintenance-of-traffic plan will be prepared during the design phase. Controls to prevent impacts from erosion and sedimentation on residential and commercial properties, and to protect karst features from sedimentation and non-point source pollution. Measures will be taken to control noise and dust. Clean up, fencing, and re-vegetation of right of way and construction-limit areas will be undertaken.</p>

J. COMMENTS AND COORDINATION

The potential impacts from this project have been assessed through coordination with and materials received from federal and state transportation, resource, and regulatory agencies. The following agencies have participated in the project:

- Kentucky Transportation Cabinet
- Kentucky Department of Environmental Protection, Division of Water
- Kentucky Department of Fish and Wildlife Resources
- Kentucky Heritage Council (State Historic Preservation Officer)
- USDA Natural Resources Conservation Service
- US Fish and Wildlife Service
- Kentucky State Nature Preserves Commission
- Local government officials

Input from the public and consulting parties was also initiated early in project development and continued as the project progressed, resulting in the recommendation of the Preliminary Preferred Alternate. A public meeting was held on December 4, 2007 at the Lion's Club in Fredonia. An additional public meeting was held on August 27, 2019 at the First Cumberland Presbyterian Church in Fredonia to present the Preliminary Preferred Alternate. Refer to Section III.A *Project History* and the 2019 Socioeconomic Baseline report for further details.

V. References

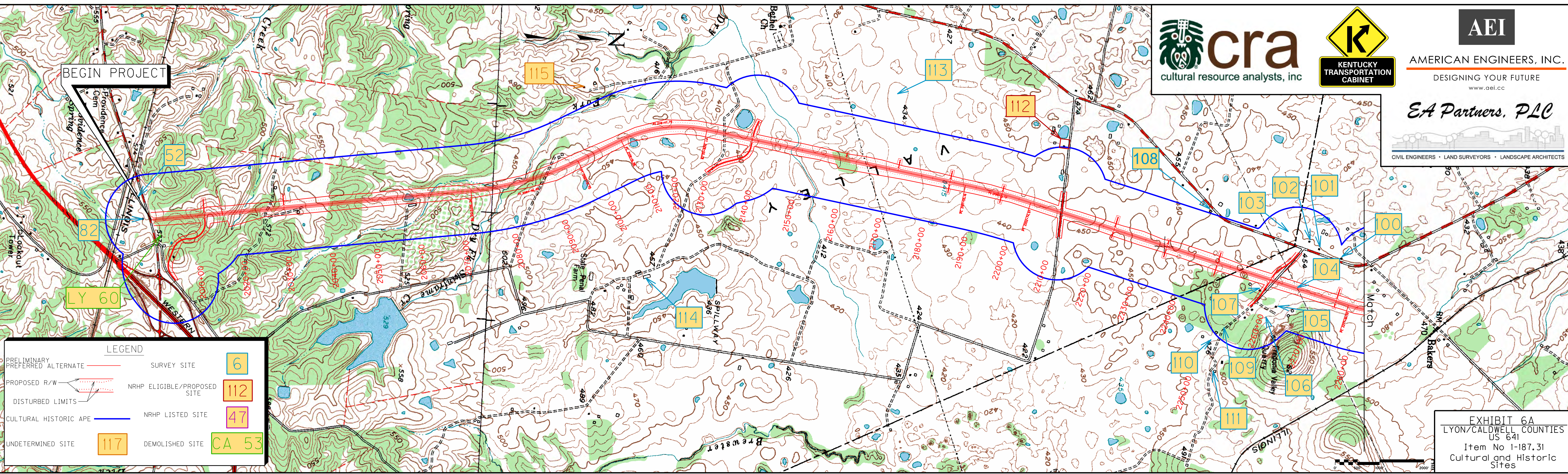


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BEGIN PROJECT



LEGEND

PRELIMINARY PREFERRED ALTERNATE	—	SURVEY SITE	6
PROPOSED R/W	—	NRHP ELIGIBLE/PROPOSED SITE	112
DISTURBED LIMITS	—	NRHP LISTED SITE	47
CULTURAL HISTORIC APE	—	DEMOLISHED SITE	CA 53
UNDETERMINED SITE	117		

EXHIBIT 6A
LYON/CALDWELL COUNTIES
US 641
Item No 1-187.31
Cultural and Historic Sites

LEGEND

PRELIMINARY PREFERRED ALTERNATE	—	SURVEY SITE	6
PROPOSED R/W	—	NRHP ELIGIBLE/PROPOSED SITE	117
DISTURBED LIMITS	—	NRHP LISTED SITE	47
CULTURAL HISTORIC APE	—	DEMOLISHED SITE	CA 53
UNDETERMINED SITE	117		



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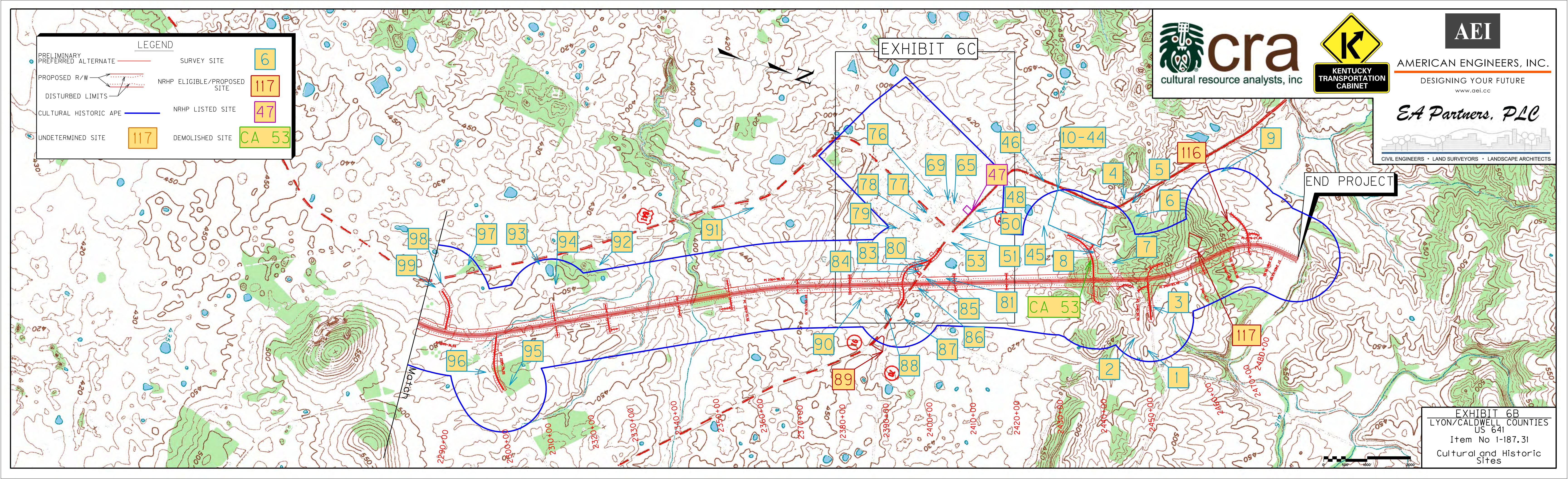
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EXHIBIT 6C

END PROJECT

Match

EXHIBIT 6B
LYON/CALDWELL COUNTIES
US 641
Item No I-187.31
Cultural and Historic Sites



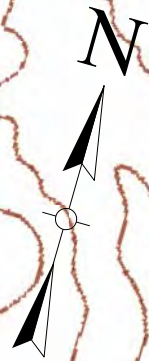
LEGEND

PRELIMINARY PREFERRED ALTERNATE	SURVEY SITE	6
PROPOSED R/W	NRHP LISTED SITE	47
DISTURBED LIMITS	NRHP ELIGIBLE SITE	47
CULTURAL HISTORIC APE		



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Fredonia Craftsman Historic District

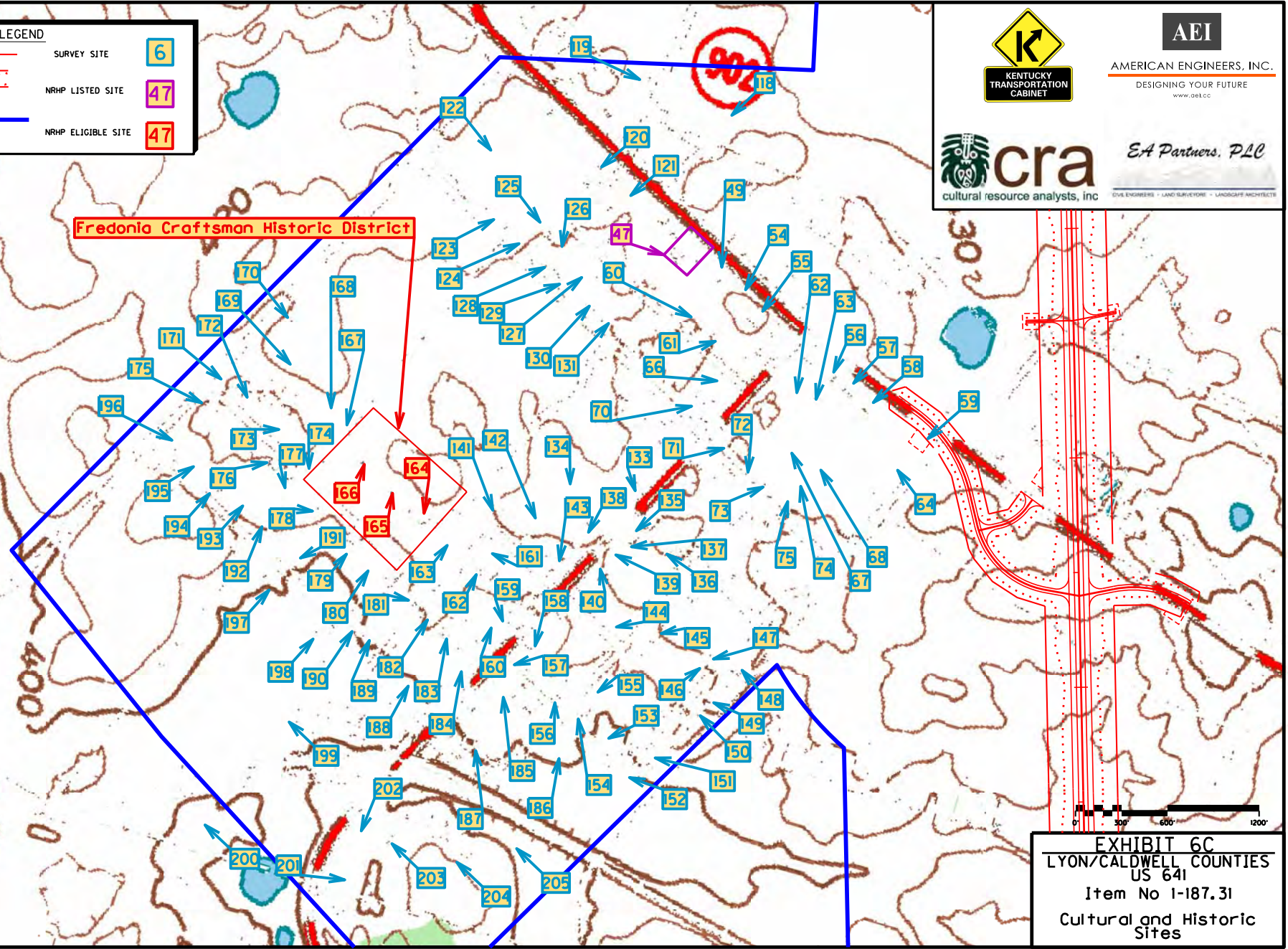


EXHIBIT 6C
 LYON/CALDWELL COUNTIES
 US 641
 Item No 1-187.31
 Cultural and Historic Sites

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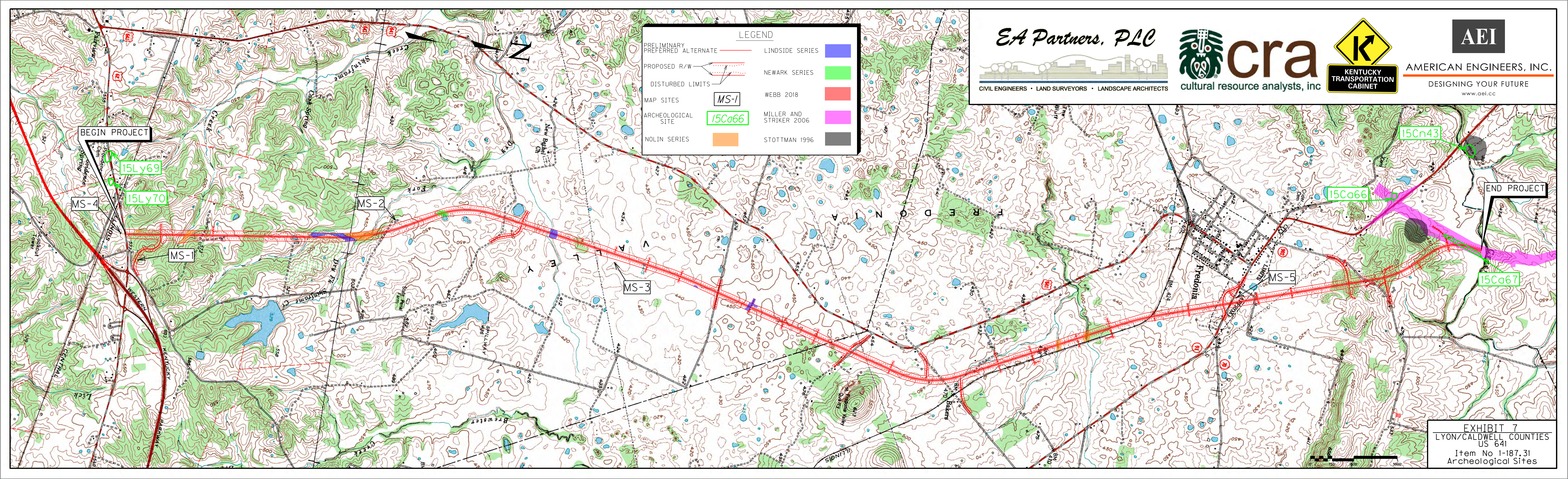
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LEGEND

PRELIMINARY PREFERRED ALTERNATE		LINDSIDE SERIES	
PROPOSED R/W		NEWARK SERIES	
DISTURBED LIMITS		WEBB 2018	
MAP SITES		MILLER AND STRIKER 2006	
ARCHEOLOGICAL SITE		STOTTMAN 1996	
NOLIN SERIES			

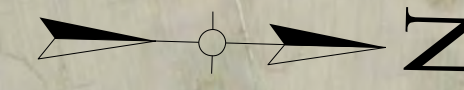


BEGIN PROJECT

END PROJECT

EXHIBIT 7
LYON/CALDWELL COUNTIES
US 641
Item No 1-187.31
Archeological Sites

BEGIN PROJECT



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KENTUCKY
TRANSPORTATION
CABINET

AEI

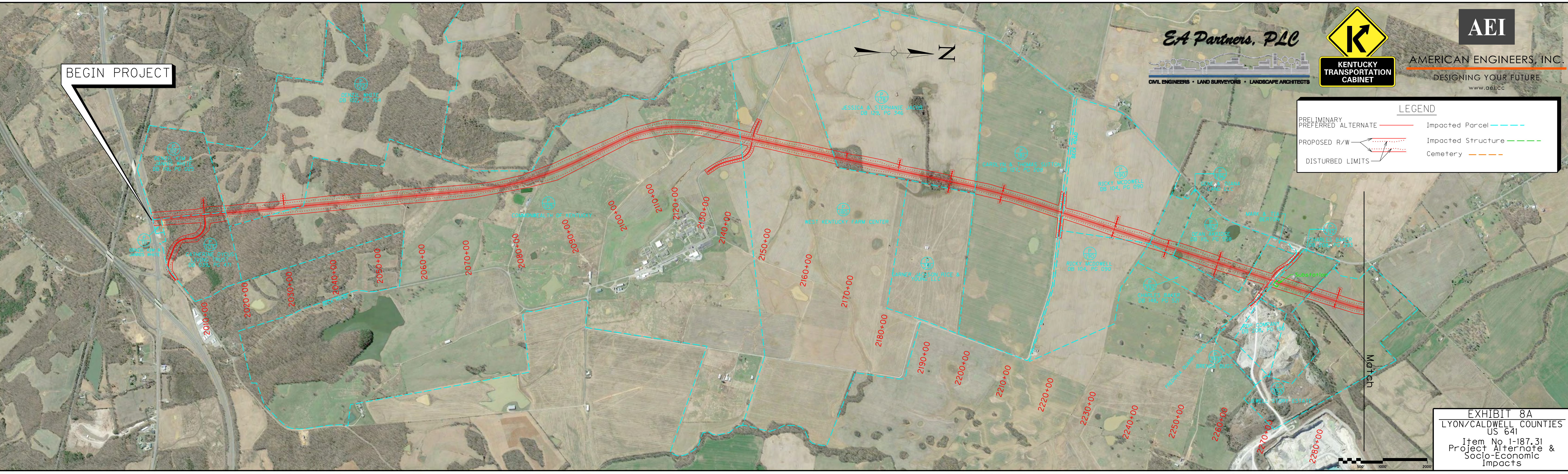
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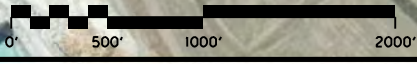
LEGEND

- PRELIMINARY ALTERNATE
- PROPOSED R/W
- DISTURBED LIMITS
- Impacted Parcel
- Impacted Structure
- Cemetery



Match

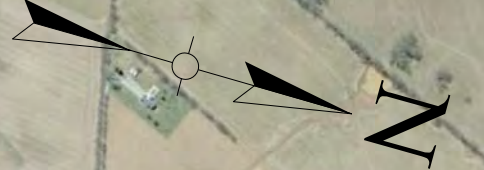
EXHIBIT 8A
 LYON/CALDWELL COUNTIES
 US 641
 Item No 1-187.31
 Project Alternate &
 Socio-Economic
 Impacts



- P 377 JOHN & BRENDA HENDERSON
- P 376 CHRISTOPHER & MARY HOOKS PHILIP & NATALIE PARISH
- P 375 SHARON CHAMBLISS
- P 373 HEARL & BEVERLY JONES
- P 372 HEARL, BEVERLY & BRENT JONES



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END PROJECT

LEGEND

PRELIMINARY PREFERRED ALTERNATE		Impacted Parcel	
PROPOSED R/W		Impacted Structure	
DISTURBED LIMITS		Cemetery	



EXHIBIT 8B
LYON/CALDWELL COUNTIES
US 641
Item No 1-187.31
Project Alternate &
Socio-Economic
Impacts



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LEGEND

- PHASE II RECOMMENDED
- PRELIMINARY PREFERRED ALTERNATE
- PROPOSED R/W
- DISTURBED LIMITS

CIVIL ENGINEERS • LAND SURVEYORS • LANDSCAPE ARCHITECTS

CRIDER-STOCK FARM

BEGIN PROJECT

END PROJECT

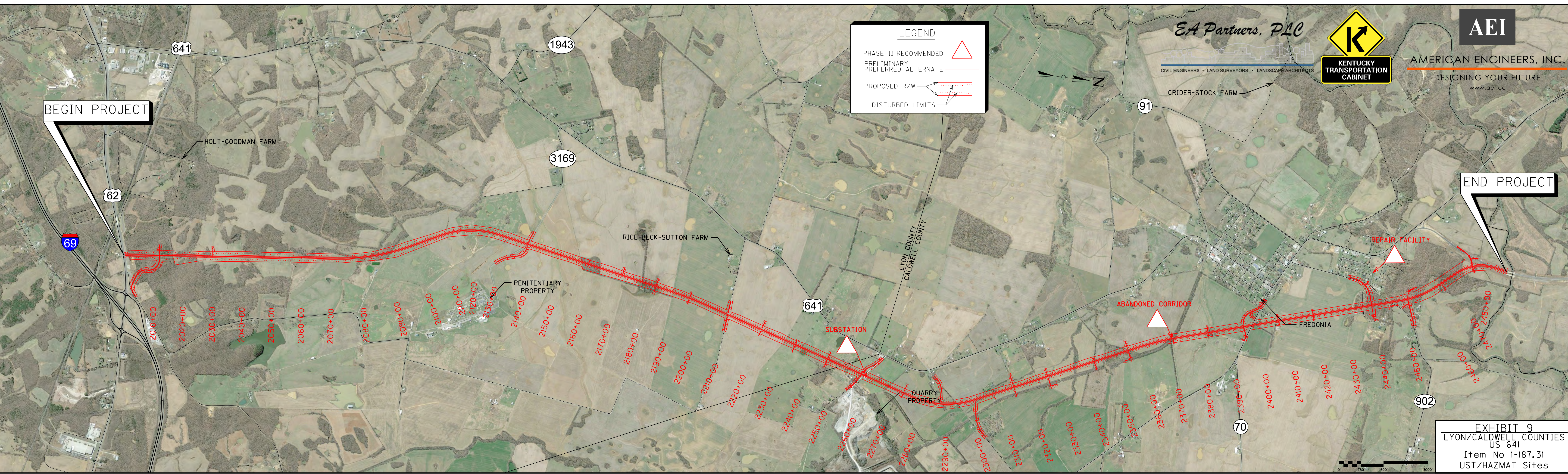


EXHIBIT 9
 LYON/CALDWELL COUNTIES
 US 641
 Item No I-187.31
 UST/HAZMAT Sites

