2011

Pre-Design Scoping Study

Data

Needs

Analysis

US 421 Franklin County Bridge Replacements

Mile Points:

13.090, 14.059, 15.091

Item Numbers:

05-1057.00, 05-1058.00, 05-1059.00

Prepared By:

Kentucky Transportation Cabinet

Department of Highways District 5

Division of Planning

August 15, 2011

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I. INTRODUCTION

A. Study Purpose

The purpose of the Data Needs Analysis (DNA) is to address the nine elements of Purpose and Need as defined by the National Environmental Policy Act (NEPA) in order to develop a draft Purpose and Need Statement for the project(s). This study will also provide a more defined project scope, possible alternatives, planning-level cost estimates for the alternatives, an identification of possible environmental impacts, and other information that will be beneficial in the Project Development phase of this project.

B. Location

The bridge projects are located within 2 miles of each other on US 421 in the northwestern part of Franklin County (see Figure 1). Bridge #037B00023N is located over Flat Creek at MP 13.090 (see Figure 2). Bridge #037B0024N is located over Hudson Creek at MP 14.059 (see Figure 3). Bridge #037B00025N is located over Little Flat Creek at MP 15.091 (see Figure 4). Junction KY 12 is located approximately 2-4 miles south of the bridge projects. The approach to Lebanon Road (county road) is approximately 0.4 miles south of Bridge #037B00023N. The approaches to Flag Fork Road (county road) are directly south of Bridge #037B00025N. Maps of the project area, including topographic and orthographic, can be seen in Appendix A.

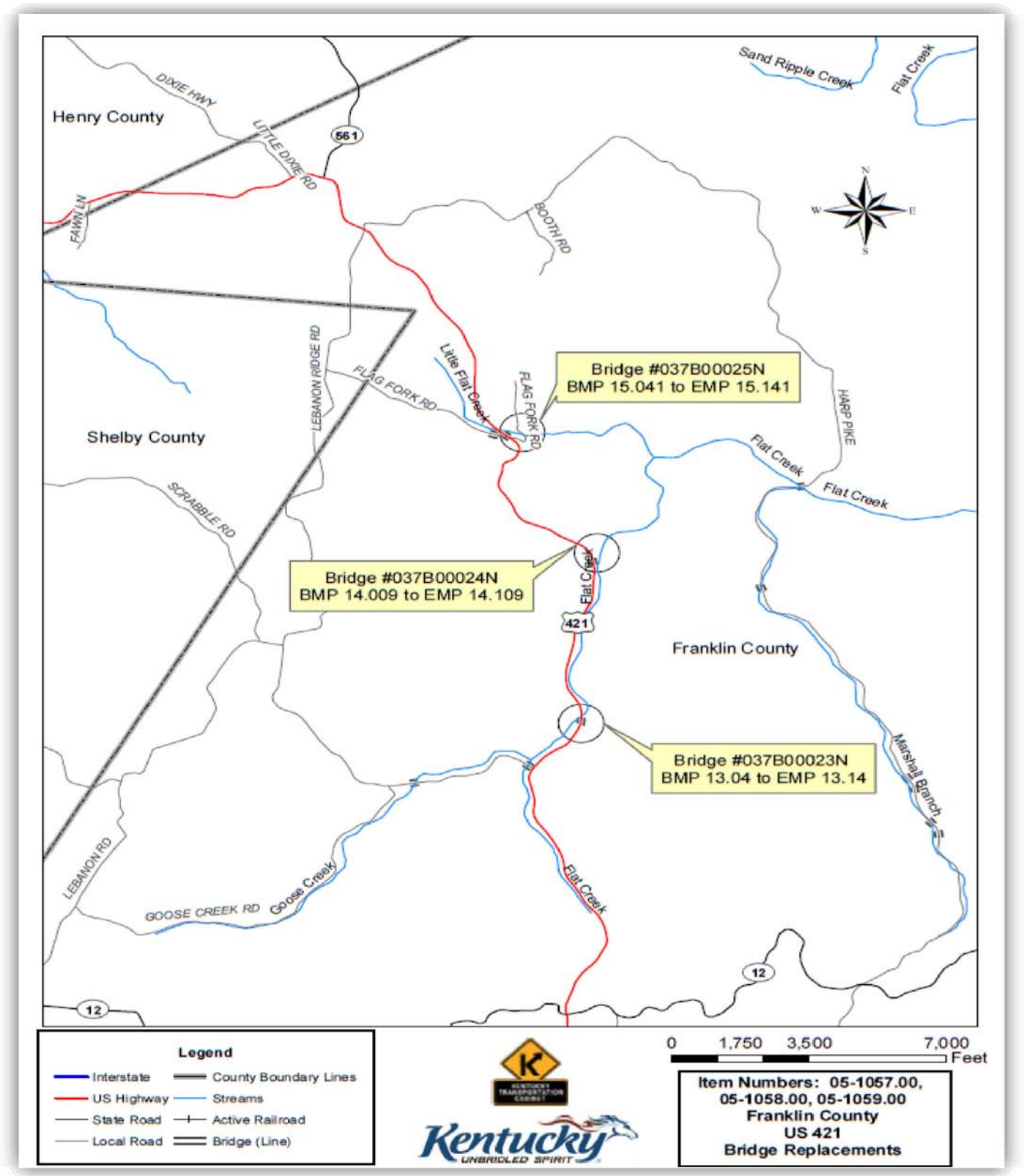

Figure 1: Project Location Map

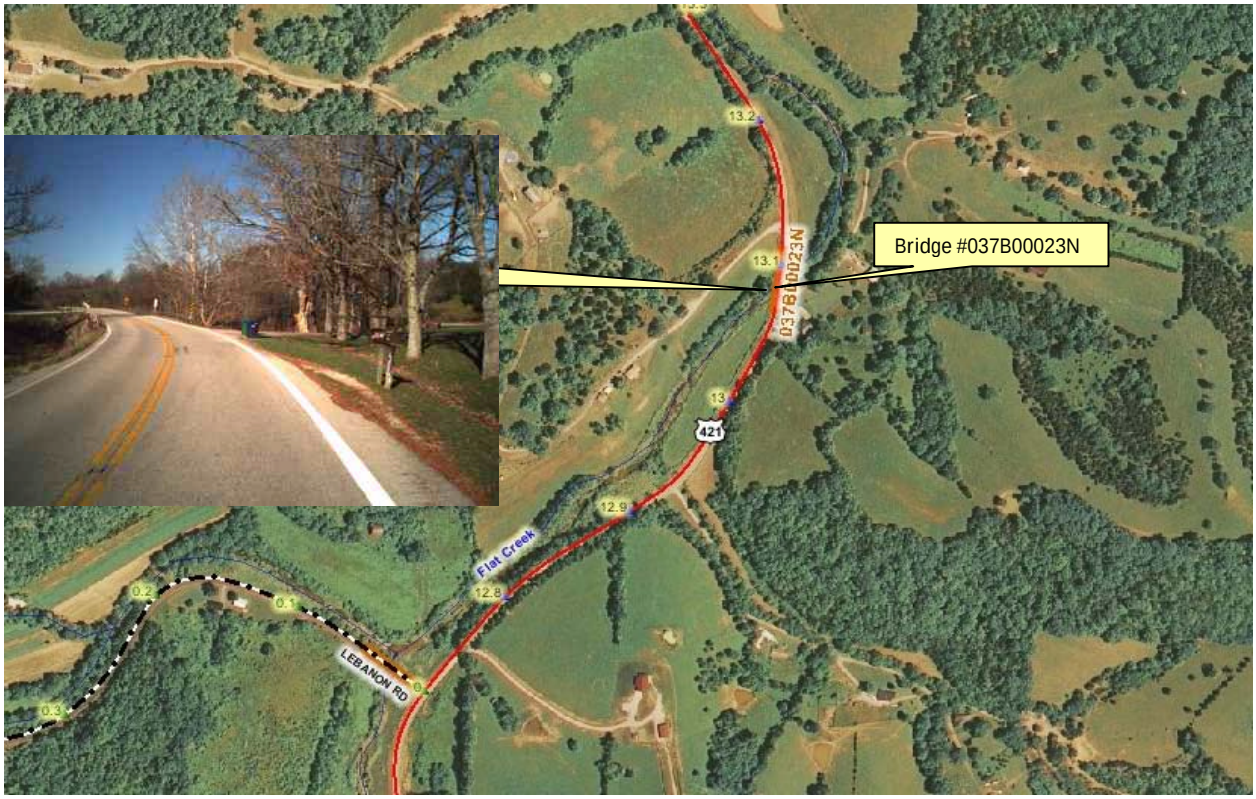

Figure 2: Bridge #037B00023N Location

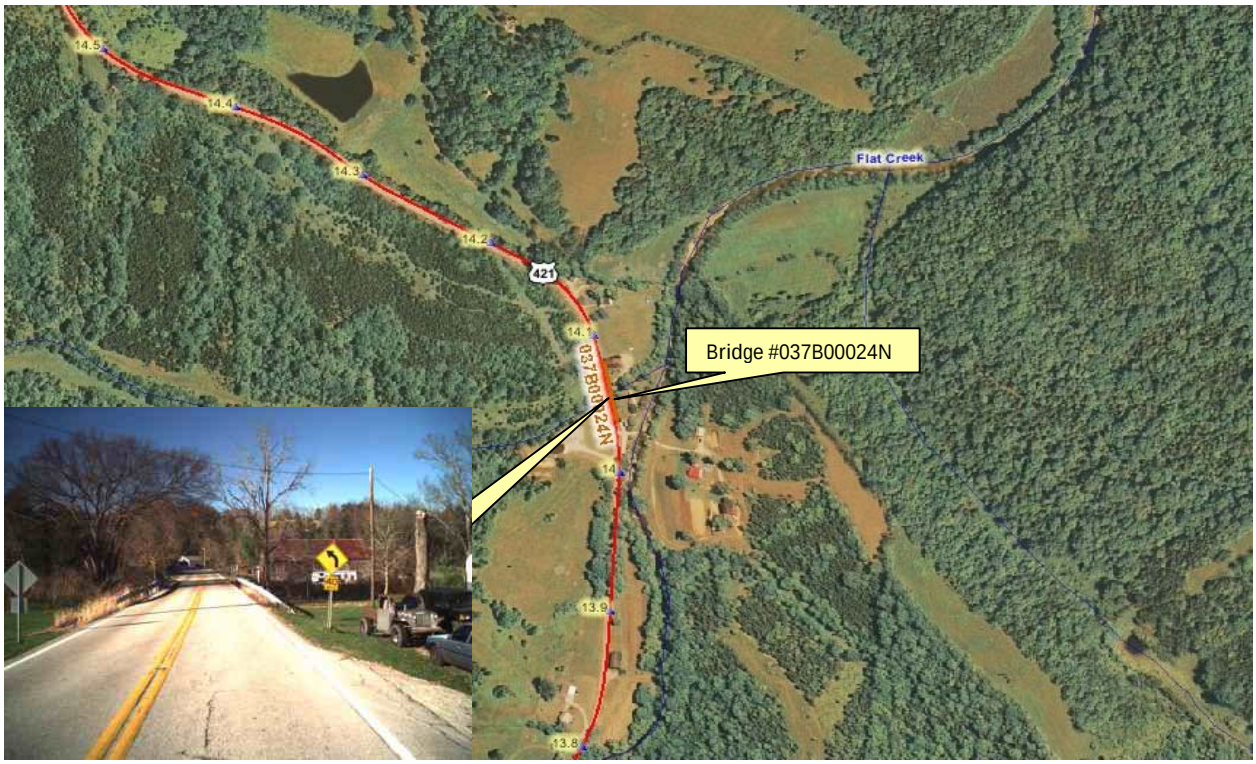

Figure 3: Bridge #037B00024N Location

Figure 4: Bridge #037B00025N Location

II. PROJECT PURPOSE AND NEED

A. Legislation

The following is a description of the projects as they are listed in the Six Year Highway Plan:

- Item #05-1057.00

Phase	Fund	Year	Estimate
D:	BRO	2012	170,000
R:	BRO	2014	150,000
U:	BRO	2014	30,000
C:	BRO	2016	390,000
	Total:		740,000

REPLACE BRIDGE ON US-421 (MP 13.09) OVER FLAT CREEK; 2.0 MI NORTH OF JCT KY 12; (STRUCTURALLY DEFICIENT, SR=46.8) 037B00023N

- Item #05-1058.00

Phase	Fund	Year	Estimate
D:	BRO	2012	120,000
R:	BRO	2014	100,000
U:	BRO	2014	60,000
C:	BRO	2016	200,000
	Total:		480,000

REPLACE BRIDGE ON US-421 (MP 14.059) OVER HUDSON CREEK; 2.8 MI NORTH OF JCT KY 12; (STRUCTURALLY DEFICIENT, SR=48.9) 037B00024N

- Item #05-1059.00

Phase	Fund	Year	Estimate
D:	BRO	2012	140,000
R:	BRO	2014	75,000
U:	BRO	2014	30,000
C:	BRO	2016	300,000
	Total:		545,000

REPLACE BRIDGE ON US-421 (MP 15.091) OVER LITTLE FLAT CREEK; 3.8 MI NORTH OF JCT KY 12; (STRUCTURALLY DEFICIENT, SR=48.7) 037B00025N

The total cost estimate in the highway plan for all three projects is $1,765,000. Refer to Appendix B for the complete listing of the projects in the Six Year Highway Plan.

B. Project Status

The bridges are structurally deficient with sufficiency ratings of 46.8, 48.9, and 48.7 as identified above. The highway plan design year is listed as 2012 in the Six Year Highway Plan.

Other projects in the area that are currently on the Unscheduled Projects List (UPL) include:

- 05 037 B0421 16.23 - Improve safety and level of service on US 421 from MP 11.132 to MP 16.047. This project is currently a low priority project.

The Project Identification Form (PIF) for this project is located in Appendix C.

C. System Linkage

The section of US 421 where the bridge projects are located is a rural area. However, the road provides access to Frankfort and I-64 to the south. Access is provided to New Castle and I-71 to the north (see Figure 5). A map of Franklin County can be viewed in Appendix D.

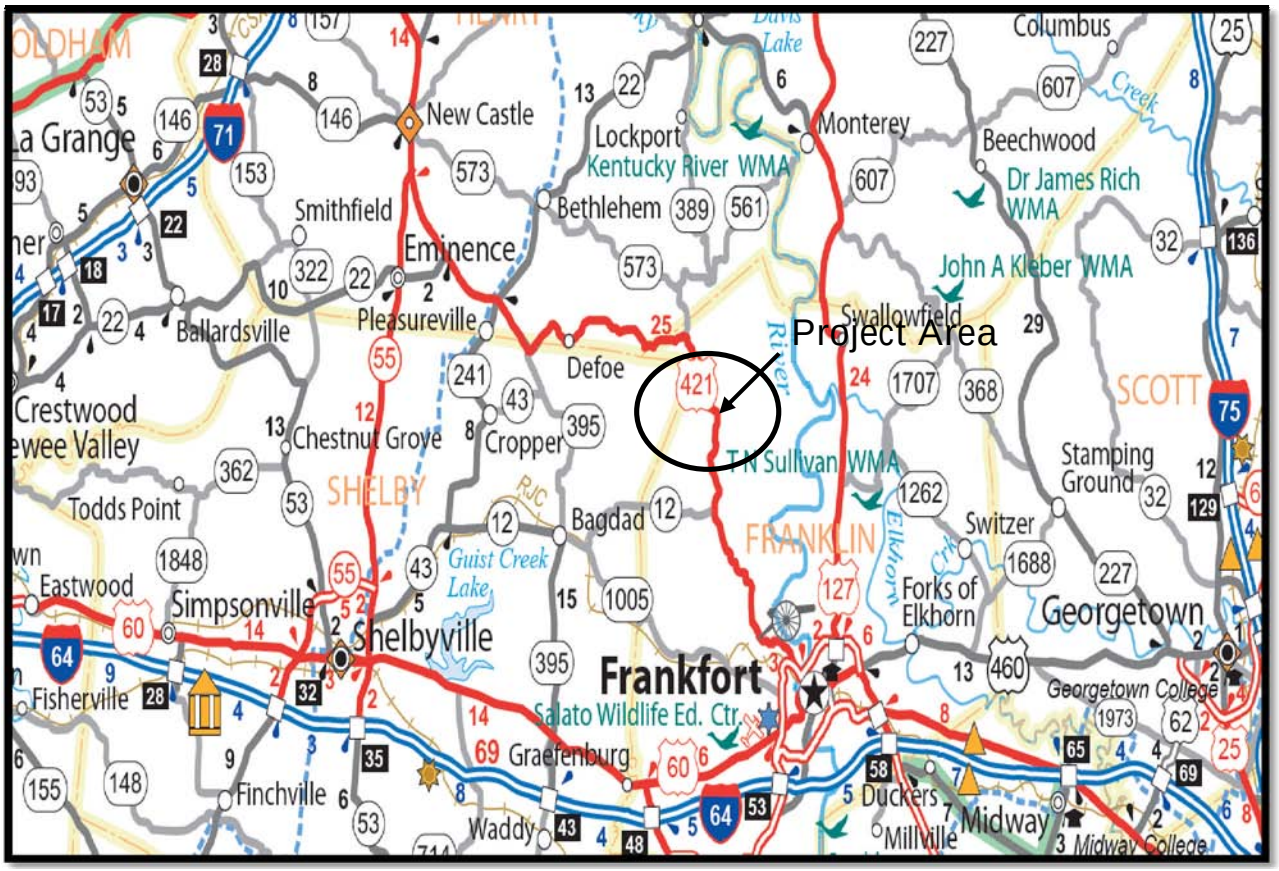

Figure 5: System Linkage

US 421 in this section can be summarized by the following roadway classifications:

- Functional Classification – Rural Principal Arterial
- State System – State Primary
- Truck Weight Classification – AAA (80,000 lbs maximum)
- Not on the National Truck Network
- Not a designated Bike Route

D. Modal Interrelationships

There are no rail lines near this section of roadway and currently public transportation does not operate on this route. Separate bike/pedestrian facilities are not needed in this area. The traffic flow on US 421 from BMP 11.132 to EMP 16.947, which all three bridge projects are within, consists of 9.4% single trucks and 1.3% combination trucks (tractor-trailers).

E. Social Demands and Economic Development

The projects are located in a rural area. However, as discussed before US 421 provides a link for local residents to Frankfort and I-64 to the south and New Castle and I-71 to the north. There are no other similar routes for residents of the area to use.

F. Transportation Demand

The last actual traffic count at this location (BMP 11.132 to EMP 16.947) had an average daily traffic (ADT) of 957 in 2010. Over the last few years the ADT has decreased slightly. However, as the trend line suggests, an overall growth in the amount of traffic can be expected in future years. Figure 6 contains traffic count data for the stretch of US 421 where the projects are located. The actual traffic counts were collected between 1966 and 2010. The trend line forecasts the general trend of traffic usage on this section of US 421 in the future based on the data that has been collected. Detailed traffic count data is located in Appendix E.

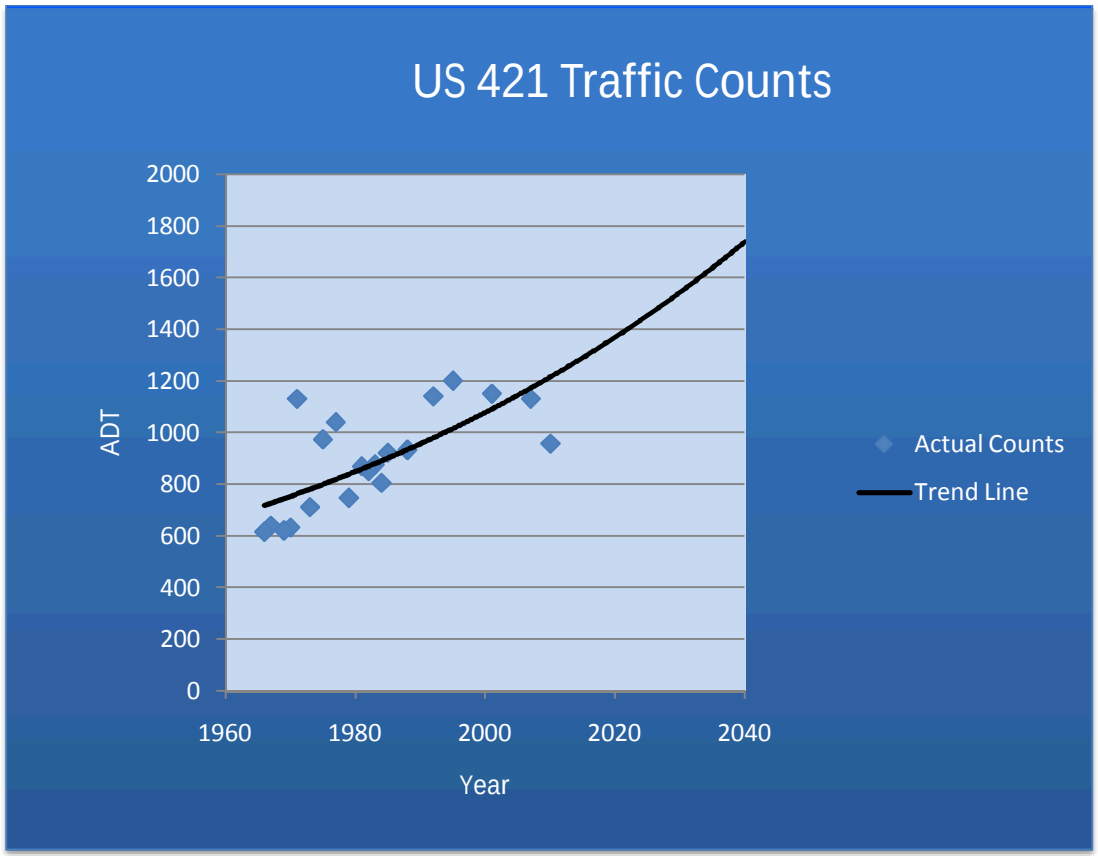

Figure 6: US 421 Traffic Counts

G. Capacity

The Volume/Service Flow ratio (V/SF), according to the 2010 Adequacy Rating Data for this section of US 421, is currently 0.15. The current roadway provides adequate service to existing traffic demands and should continue to do so in the future. No additional lanes should be needed for any of these projects.

H. Safety

Collision Data was obtained from the KY State Police database of collisions from a time period of January 1, 2000 to June 6, 2011. In total there were 33 collisions that occurred in the project areas during this time period. These 33 collisions resulted in 1 fatality and 26 injuries. The location and result of the collisions can be viewed in Figure 7. The majority of the collisions in the area occurred south of Bridge #037B00025N. It does not appear that the bridge affects this location, but a spot analysis was performed since a higher frequency of collisions occurred at this location. The spot analysis data can be found below in Figure 8 and Table 1. In addition, there are blind spots at all three bridges. This may be something to address as the projects move further along. This section of US 421 has a critical rate factor (CRF) of up to 0.90. More detailed collision data can be found in Appendix F.

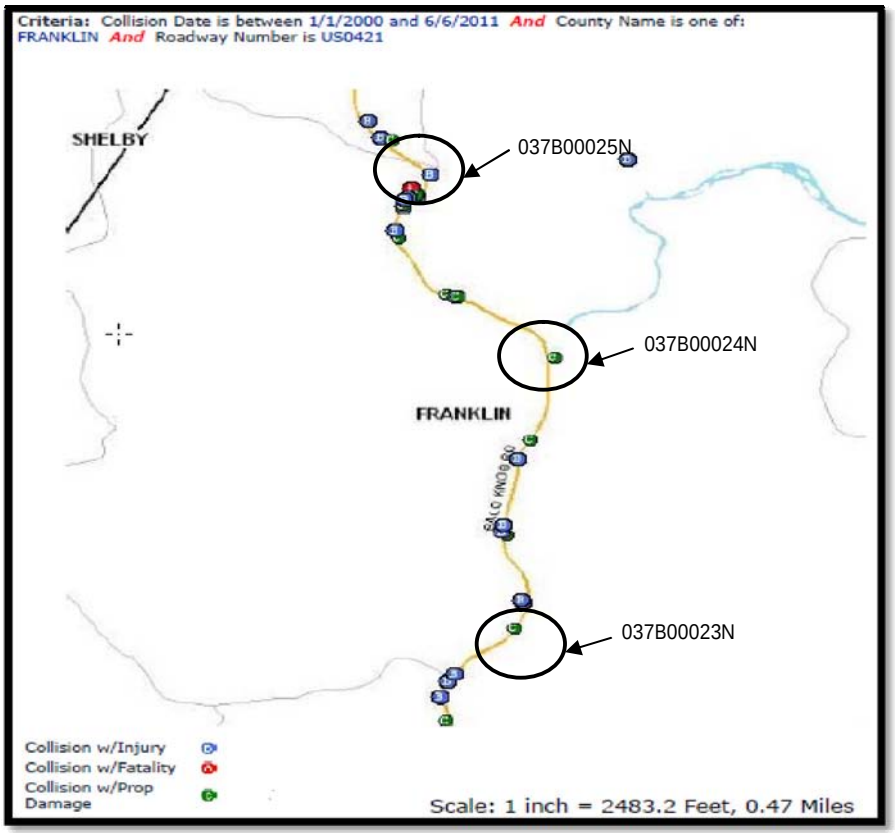

Figure 7: Collision Data

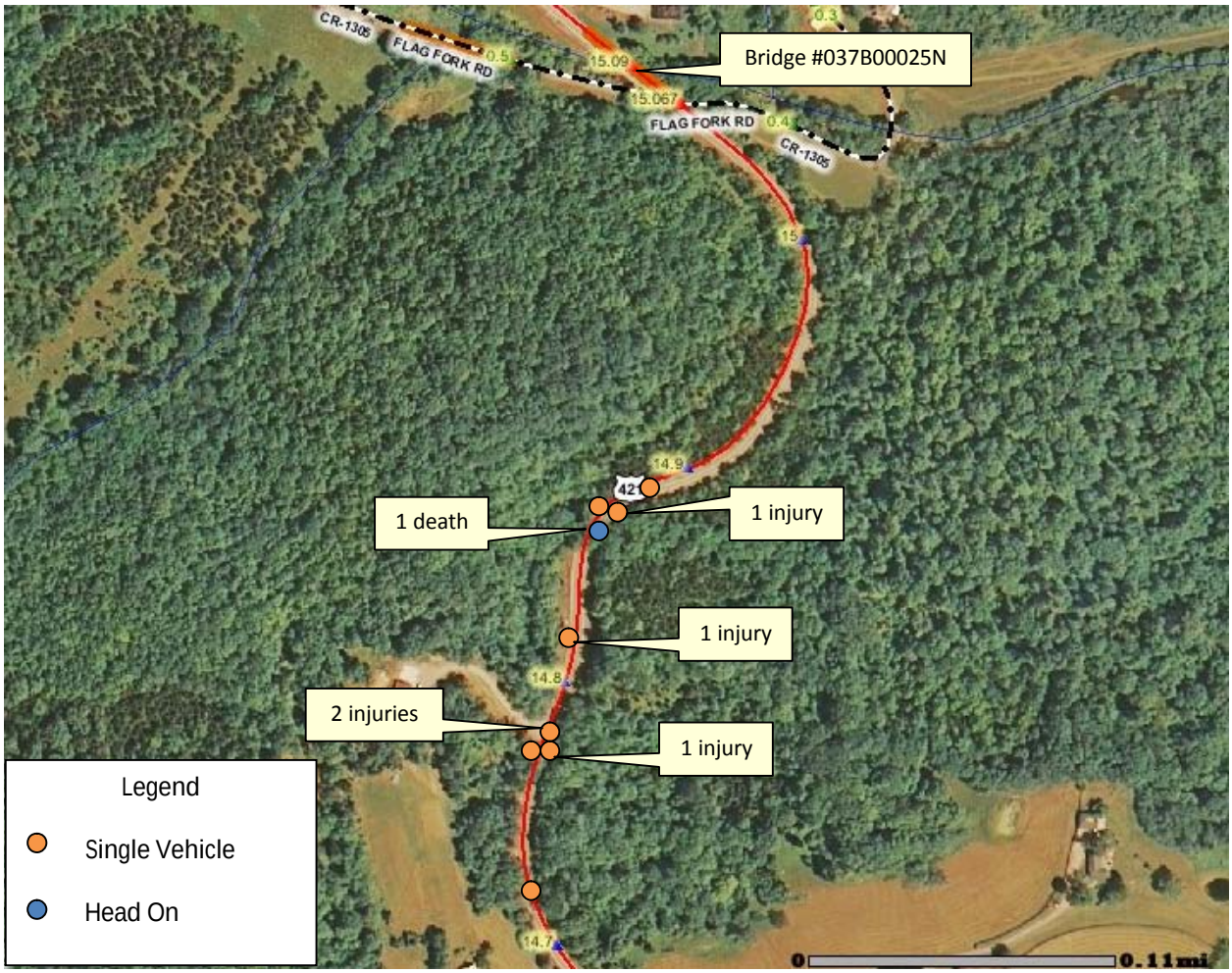

Figure 8: Spot Analysis South of Bridge #037B00025N

Table 1: Spot Analysis South of Bridge #037B00025N

MILEPOINT DERIVED	MOTOR VEHICLES INVOLVED	KILLED	INJURED	WEATHER	ROADWAY CONDITION	DIRECTIONAL ANALYSIS	MANNER OF COLLISION	ROADWAY CHARACTER	LIGHT CONDITION
14.719	1	0	0	CLEAR	DRY	COLLISION WITH FIXED OBJECT NON - INTERSECTION	SINGLE VEHICLE	CURVE & LEVEL	DAWN
14.767	1	0	0	CLEAR	DRY	RAN OFF ROADWAY (1 VEHICLE WITH/EARTH EMBANKMENT/DITCH)	SINGLE VEHICLE	CURVE & GRADE	DAYLIGHT
14.767	1	0	1	CLEAR	DRY	RAN OFF ROADWAY (1 VEHICLE WITH/EARTH EMBANKMENT/DITCH)	SINGLE VEHICLE	CURVE & GRADE	DAYLIGHT
14.77	1	0	2	CLEAR	DRY	OTHER COLLISIONS ON SHOULDER	SINGLE VEHICLE	CURVE & GRADE	DAYLIGHT
14.817	1	0	1	CLEAR	DRY	RAN OFF ROADWAY (1 VEHICLE WITH/EARTH EMBANKMENT/DITCH)	SINGLE VEHICLE	CURVE & GRADE	DAYLIGHT
14.861	2	1	0	CLEAR	DRY	HEAD-ON COLLISION	HEAD ON	CURVE & GRADE	DAYLIGHT
14.867	1	0	1	CLEAR	DRY	RAN OFF ROADWAY (1 VEHICLE WITH/EARTH EMBANKMENT/DITCH)	SINGLE VEHICLE	CURVE & GRADE	DAYLIGHT
14.867	1	0	0	RAINING	WET	COLLISION WITH FIXED OBJECT NON - INTERSECTION	SINGLE VEHICLE	CURVE & GRADE	DAYLIGHT
14.886	1	0	0	CLEAR	DRY	COLLISION WITH ANIMAL	SINGLE VEHICLE	STRAIGHT & LEVEL	DARK-HWY NOT LIGHTED

I. Roadway and Bridge Deficiencies

Within the project limits, the roadway currently has 10 ft lanes, 2 ft shoulders, approximately a 6.5% to 8.4% grade near Bridge #037B00025N, a minimal grade near the other two bridges, a posted speed limit of 55 MPH, and an Adequacy Rating of 48.80 percentile. KYTC's Common Geometric Practices for Rural Arterial Roads (see Appendix G) for this type of road recommends 11 ft lanes and 5 ft shoulders for a 55 MPH design speed.

Bridge #037B00023N is 66 feet long and 26 feet wide out to out (23 feet wide curb to curb). It is structurally deficient with a sufficiency rating of 46.8 and does not meet the guidelines stated above of 11 ft lanes and 6 ft shoulders. The deck is rated as serious, the superstructure is rated as poor, and the substructure is rated as fair. Furthermore, the bridge has severe spalling and deterioration with resteel exposed in areas. Steel plates have been placed on the edge of the bridge deck to protect motorists from traveling over the severely deteriorated areas. The guardrail is loosely attached to the sides of the bridge due to deterioration and cones are placed on the edge of the bridge to warn motorists of the area. A Structure Inventory and Appraisal Sheet for this bridge can be found in Appendix H. Photographs of this bridge can be seen below in Figures 9 and 10.

Figure 9: Bridge #037B00023N Looking North

Figure 10: Bridge #037B00023N East Edge at Pier 2

Bridge #037B00024N is 23 feet long and 22 feet wide out to out (22 feet wide curb to curb). It is structurally deficient with a sufficiency rating of 48.9 and does not meet the guidelines stated above of 11 ft lanes and 6 ft shoulders. The deck and superstructure are rated as poor. The substructure is rated as fair. Furthermore, the bridge has severe spalling and deterioration with resteel exposed in areas. The guardrail posts on both sides are no longer anchored to the bridge due to the condition of the concrete that they were anchored in. A Structure Inventory and Appraisal Sheet for this bridge can be found in Appendix H. Photographs of this bridge can be seen below in Figures 11 and 12.

Figure 11: Bridge #037B00024N Looking North

Figure 12: Bridge #037B00024N West (upstream) Profile

Bridge #037B00025N is 35 feet long and 29 feet wide out to out (27 feet wide curb to curb). It is structurally deficient with a sufficiency rating of 48.7 and does not meet the guidelines stated above of 11 ft lanes and 6 ft shoulders. The deck, superstructure, and substructure are all rated as poor. Furthermore, the bridge has severe spalling and deterioration with resteel exposed in areas. Box beams have been previously added to each side of the bridge. The old beams to the inside of these are heavily spalled and resteel is exposed. In addition, recent maintenance work has been done to the southwest wingwall. A Structure Inventory and Appraisal Sheet for this bridge can be found in Appendix H. Photographs of this bridge can be seen below in Figures 13 and 14. The recent maintenance work can be seen below in Figure 15.

Figure 13: Bridge #037B00025N Looking North

Figure 14: Bridge #037B00025N East (downstream) Profile

Figure 15: Recent Maintenance Work on Southwest Wingwall

All three of these bridges are located near curves in the roadway and have blind spots. It appears that Bridge #037B0025N has the most conflict due to a county road (Flag Fork Road) being located directly south of the bridge. To the south of this bridge is the spot of the majority of the crashes that occur on this section of the road (refer to the safety section of this study). Additional pictures of the bridges and roadway are contained in Appendix I.

Flooding over the bridges has not been reported. Also there does not appear to be a problem with debris catching the bridges. A flood prone areas map can be seen in Figure 16. According to the Flood Insurance Rate Maps (FIRM), Bridge # 037B00023N and # 037B00024N are both located in the special flood hazard zone A. This area is subject to flooding by the 1% annual chance flood (100 year flood). FIRM's of the project area are included in Appendix J. A floodway analysis may be performed in future project phases to determine the needed hydraulic opening for water under the bridges.

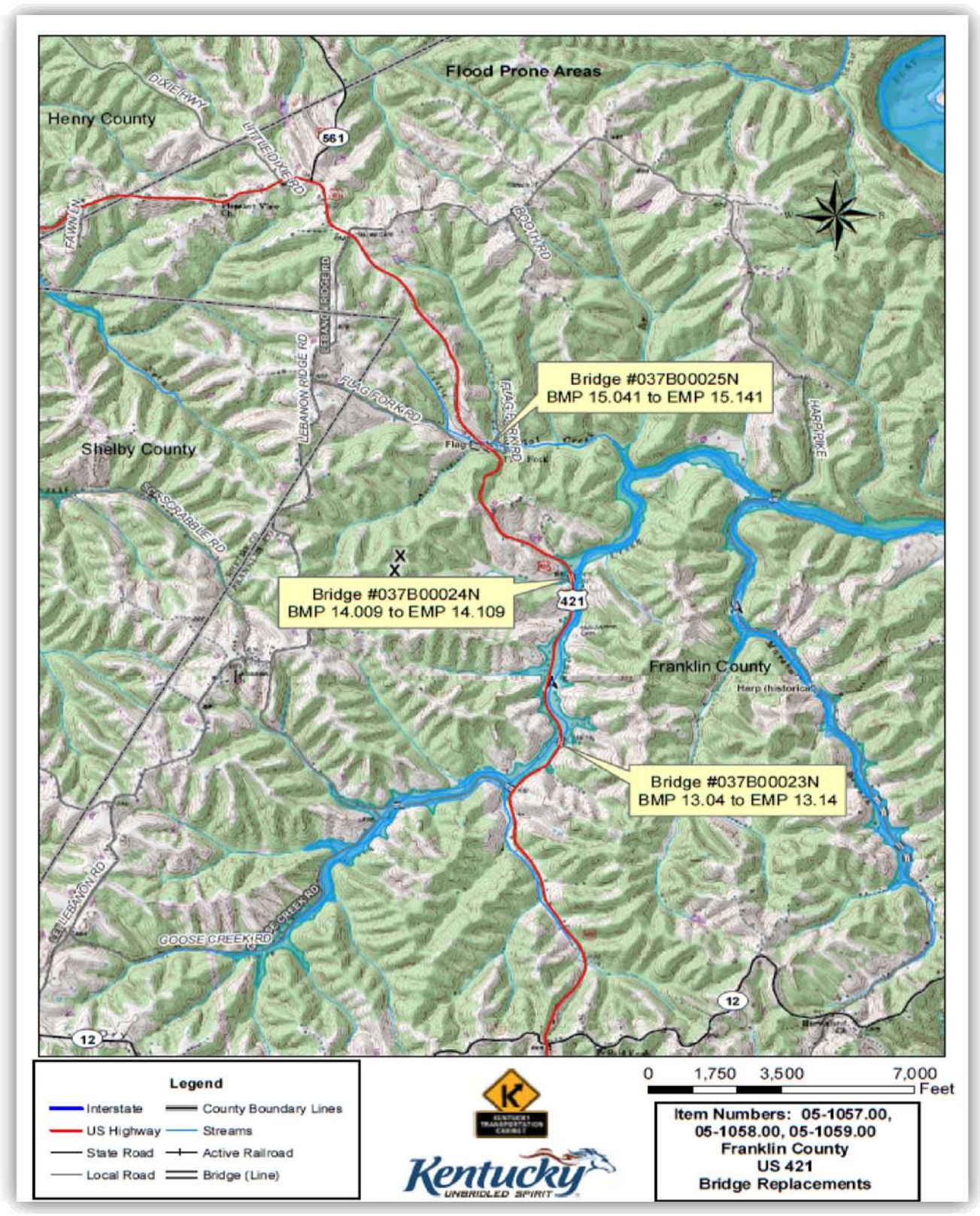

Figure 16: Flood Prone Areas Map

III. DRAFT PROJECT PURPOSE AND NEED STATEMENT

Based upon the information presented in Section II of this report and discussion of the project team, the following Purpose and Need Statement was drafted for this project:

The purpose of this project is to provide safe travel along US 421. This project is needed due to the structural deficiencies of the three bridges that are located on US 421. This route is the main connection for residents of the area and is relied upon to provide access to Frankfort, New Castle, I-64, and I-71.

IV. PRELIMINARY ENVIRONMENTAL OVERVIEW

A. Air Quality

Franklin County is in attainment for all monitored air pollutants.

B. Archaeology

An archaeology Phase I survey will need to be completed in order to rule out any impacts to archaeological sites.

C. Threatened and Endangered Species

The United States Fish and Wildlife Service (USFWS) has identified the known and potential presence of threatened and endangered species in Franklin County, which can be viewed below in Table 2. It is important to note that the project area is adjacent to the critical habitat of the Braun's rockcress. In addition, Threatened and Endangered Species reports from the Kentucky Department of Fish and Wildlife Resources (KDFWR) and the Kentucky State Nature Preserves Commission (KSNPC) can be found in Appendix K.

Table 2: USFWS Threatened and Endangered Species in Franklin County

Group	Species	Common name	Legal* Status	Known** Potential
Mammals	*Myotis grisescens*	gray bat	E	K
	Myotis sodalis	Indiana bat	E	P
Plants	*Arabis perstellata*	Braun's rockcress	E, CH	K
	Lesquerella globosa	globe bladderpod	C	K
	Trifolium stoloniferum	running buffalo clover	E	P

* Key to notations: E = Endangered, T = Threatened, C = Candidate, CH = Critical Habitat

**Key to notations: K = Known occurrence record within the county, P = Potential for the species to occur within the county based upon historic range, proximity to known occurrence records, biological, and physiographic characteristics.

D. Hazardous Materials

No properties appear to have a high probability for hazardous materials. However, due to the age of the bridge, it should be tested for asbestos prior to demolition.

E. Historic Resources

All three concrete bridges were constructed in 1929 which allows them to meet at least the first screening requirement for listing on the National Register of Historic Places. Figure 17 below shows possible structures that are 50 years or over near Bridge #037B00023N. Figure 18 does the same for Bridge #037B00024N and Figures 19 and 20 for Bridge #037B00025N. A more thorough assessment of the eligibility of the bridges and any other structures near the project area should be conducted in future project phases.

Figure 17: Possible Historic Structure near Bridge #037B00023N

Figure 18: Possible Historic Structure near Bridge #037B00024N

Figure 19: Possible Historic Structure near Bridge #037B00025N

Figure 20: Possible Historic Structure near Bridge #037B00025N

F. Permitting

Any impacts below the ordinary high water mark within Flat Creek, Hudson Creek, or Little Flat Creek will need a USACE 404 permit and potentially a Water Quality Certification from the Division of Water. All permits will need to meet the general requirements since none of the streams are considered special use.

G. Noise

The scope of the project should not require additional noise analysis since there are no additional lanes of traffic planned for the facility. Noise due to construction and demolition will be temporary.

H. Socioeconomic

There should be no socioeconomic impacts associated with this project. According to Census Data from 2000 the area surrounding the projects (census tract 711) does not have any concentrations of minorities. In addition, 6.5% of the population was below the poverty line and 10.7% of the population was 65 years and over. These are below the state and national averages. However, if the road is closed during construction and temporary structures are not put in place, there could be negative impacts to low income families due to the length of the detour required for the projects. Socioeconomic concerns should be addressed further in future project phases.

I. Section 4(f) Resources

If residences or structures located nearby are ruled as eligible for the National Register of Historic Places they could also be afforded protection under Section 4(f). The Kentucky Transportation Cabinet (KYTC) has options to mitigate and avoid impacts to section 4(f) resources including a programmatic agreement for mitigating historic bridges, using 'de minimus' guidance for minor strip takings.

J. Section 6(f) Resources

There does not appear to be any resources in the project area that are protected under Section 6(f) of the Land Water Conservation Fund.

V. PRELIMINARY PROJECT INFORMATION

A. Existing Conditions/Roadway and Bridge Data

Table 3: Existing Conditions and Data Summary			
County:	Franklin	Route Number:	US 421
Road Name:	Bald Knob Road	Item No.:	05-1057, 05-1058, 05-1059
BMP:	13.04, 14.009, 15.041	EMP:	13.14, 14.109, 15.141
Project Length:	0.3 miles	State Class:	Primary
Roadway Class:	Rural Principal Arterial	Access Control:	None
Truck Class:	AAA	Median Type:	None
ADT(current):	957	Posted Speed:	55 MPH
Terrain:	Rolling	Funding Type:	BRO
Roadway Data			
	Existing Conditions	Design Criteria*	
No. of Lanes:	2	2	
Lane Width:	10 ft	11 ft	
Shoulder Width:	2 ft	6 ft	
Minimum Radius:	-	965 ft	
Maximum Grade:	-	5%	
Adequacy Rating %:	48.8	-	*55 MPH Design Speed
Bridge Data			
	037B00023N	037B00024N	037B00025N
Type:	Concrete Tee Beam	Concrete Tee Beam	Concrete Tee Beam
Year Built:	1929	1929	1929
Skew:	30 degrees	0 degrees	45 degrees
Max. Span Length:	32 ft	21 ft	30 ft
Length:	66 ft	23 ft	35 ft
Width, out to out:	26 ft	22 ft	29 ft
Width, curb to curb:	23 ft	22 ft	27 ft
Sufficiency Rating:	46.8	48.9	48.7

B. Right of Way

If the bridges are built in place where the existing bridges are located right of way should be minimal. However, this requires the road to be shut down during the construction of the new bridges. Right of way may need to be bought to allow for a temporary diversion or realignment if the road is deemed too important to shut down. In addition, small amounts

of right of way may need to be added since the bridges will need to be widened to meet current standards. A temporary easement may also be required for the construction phase. Figures 21, 22, 23 show properties that are located near the bridges according to the Franklin County Property Value Administrator (PVA). Also from referencing the original plans of US 421 it appears that the standard right of way is 30 ft in both directions from the center line. The plans are not included since they are from 1927 and are very hard to see. It is also important to note that a church is located to the west of Bridge #037B00024N and part of the land may have to be purchased. Refer to Appendix L for pictures of the church and other properties that are located near the projects.

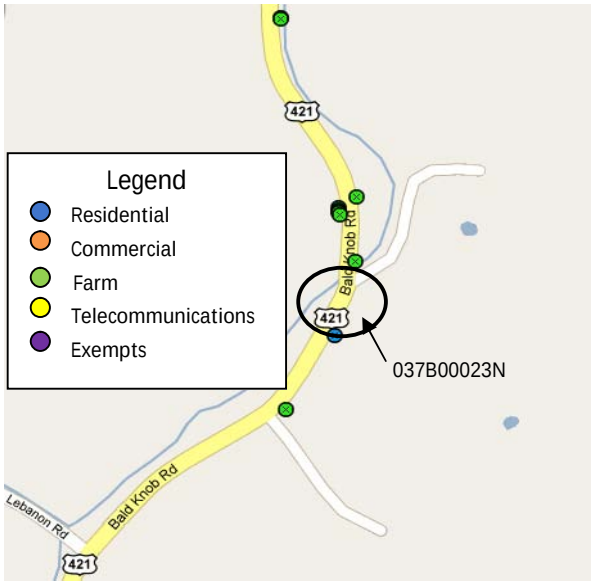

Figure 21: Properties near Bridge #037B00023N

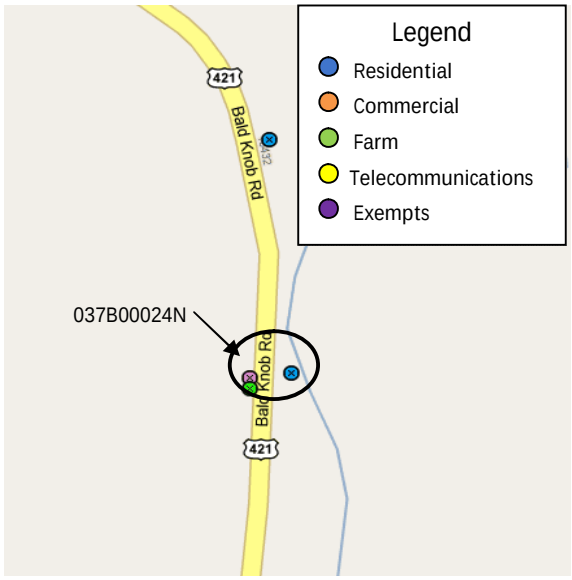

Figure 22: Properties near Bridge #037B00024N

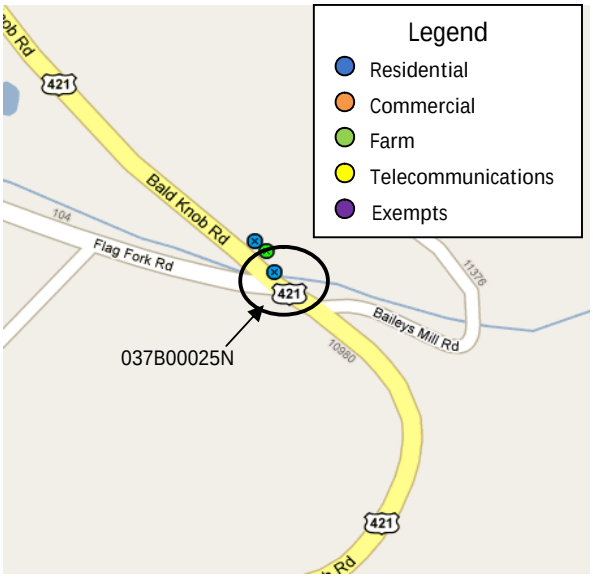

Figure 23: Properties near Bridge #037B00025N

C. Utilities

A request has been sent out to the utility companies in the area to determine what utilities are located within the project area. A list of the contacts for the utility companies in Franklin County can be found in Appendix M. A more in depth assessment of utilities in the area will need to be done as the project moves further along.

D. Agency Coordination

At this time the project team has not held an official meeting to discuss these projects.

VI. POSSIBLE ALTERNATIVES

The following is a description of several of the alternatives analyzed and discussed during the development of this study.

A. Alternative #1 – No Build

This option is not a feasible alternative due to the structural deficiency of the bridges. It would not address the draft purpose and need defined for these projects.

B. Alternative #2 – Build in place Using Existing State Routes as a Detour

This alternative would build a new structure where the current one is and use existing state routes to as a detour. This would require the bridges to be built at separate times. If the bridges were built simultaneously residents living in between the projects would be trapped. A county road (Flag Fork Road) does provide access between Bridges #037B00025N and #037B00024N. However, there is no access point between Bridges #037B00024N and #037B00023N. In addition, the bridges should be constructed during the summer months to avoid interfering with the school bus traffic that uses this route.

The detour would use KY 12 and KY 1922. The detour length is approximately 11 miles. The same stretch of US 421 between KY 12 and KY 1922 is approximately 10 miles. For vehicles traveling through the project area the detour would be minimal. However, for those that live within the stretch of US 421 affected a detour length of up to 20 miles could occur. Figure 24 details the detour.

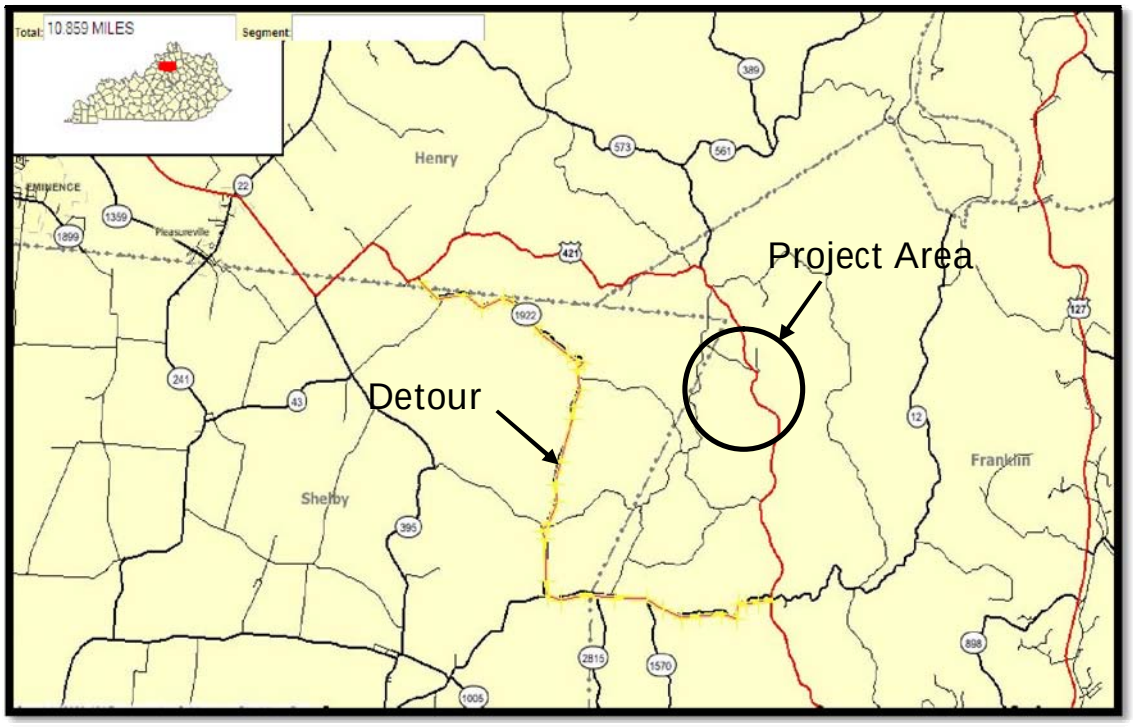

Figure 24: Detour Using Existing State Routes

The problem with this detour is that KY 12 is narrow, has no striping, and has multiple sharp curves for approximately the first two miles of the detour. Past this section the detour has striping and lesser degree curves but continues to be narrow. It would be less than desirable to send the amount of traffic and any large trucks that use US 421 on this detour.

The county road detour was also examined to determine if it was a more feasible option compared to the state route detour. The county road detour would be approximately 5 miles long. In addition, this detour could provide access between Bridge #037B00025N and Bridge #037B00024N using Flag Fork Road. However, this detour would not be adequate to handle the amount of traffic and any large trucks that travel on US 421. The road has no striping, is narrow, and has sharp curves. However, this detour could potentially be a better detour than the state detour. This is due to the fact that both routes are similarin nature with the county road being the shorter detour of the two.

While closing the road and detouring traffic is the optimal option, this may not be possible due to the lack of sufficient detours in the area. It is recommended that the project team meet with the Franklin County Engineer to determine if a detour in this area is feasible or not. Preliminary cost estimates for this alternative can be seen below in Table 4.

Table 4: Preliminary Cost Estimates for Detour Using Existing Routes

Detour Using Existing Routes			
	037B00023N	037B00024N	037B00025N
Design	$ 200,000.00	$ 125,000.00	$ 150,000.00
Right of Way	$ 30,000.00	$ 30,000.00	$ 30,000.00
Utilities	$ 30,000.00	$ 30,000.00	$ 30,000.00
Construction	$ 450,000.00	$ 300,000.00	$ 400,000.00
Total	$ 735,000.00	$ 485,000.00	$ 610,000.00

C. Alternative #3 – Build in place Using a Diversion

This alternative would build a diversion to allow US 421 to remain open during construction of the bridges. If a diversion was built at each site all three bridges could be built at the same time. The downside to this alternative is the extra cost associated with building a diversion.

For Bridge #037B00023N and Bridge #037B00024N a diversion is feasible due to land being available to use to the west of each existing structure. However, for Bridge #037B00023N a large amount of fill will be required for the diversion. This could result in a realignment being as good of an option as a diversion. For Bridge #037B00024N some trees will need to be cleared and possibly excavating a hill. The positive to a diversion at this bridge is that the stream is small which makes the temporary crossing easier to construct.

For Bridge #037B00025N the county road Flag Fork Road would have to be used in conjunction with a crossing to get back on US 421 after the project area. More than likely this section of Flag Fork Road would need to be filled in to be brought up to the level of US 421 and widened to accommodate the traffic that is diverted. This would likely require Flag Fork Road to be shut down which should not be a problem considering there are other access points. Since Bridge #037B00025N does not appear to have a feasible realignment a diversion will be needed if US 421 must remain open. Preliminary cost estimates for this alternative can be seen below in Table 5.

Table 5: Preliminary Cost Estimates for Diversion

Diversion			
	037B00023N	037B00024N	037B00025N
Design	$ 225,000.00	$ 150,000.00	$ 175,000.00
Right of Way	$ 40,000.00	$ 40,000.00	$ 40,000.00
Utilities	$ 30,000.00	$ 30,000.00	$ 30,000.00
Construction	$ 650,000.00	$ 450,000.00	$ 600,000.00
Total	$ 945,000.00	$ 670,000.00	$ 845,000.00

D. Alternative #4 – Build on a New Alignment

This alternative would build the bridges on a new alignment. For Bridge #037B00023N fill would be needed to bring the realignment up to the current level of US 421. The proposed realignment for this bridge can be seen below in Figure 25. The total length from tie in to tie in is 900 ft with 500 ft of this consisting of new roadbed. Approximately ½ acre of right of way would need to be purchased with this scenario. The curve to the south meets a 55 MPH design criteria while the curve to the north only meets a 45 MPH design criteria. However, a design exception for this curve should not be a problem considering that the existing curve is not any better. Considering that a diversion at this bridge would be similar to realignment, building the bridge on a new realignment should be considered.

Figure 25: Proposed Realignment for Bridge #037B00023N

For Bridge #037B00024N excavation work would be required. The proposed realignment for this bridge can be seen below in Figure 26. The total length from tie in to tie in is 1100 ft with the majority of this consisting of new roadbed. Approximately 1 acre of right of way would need to be purchased with this scenario. The curve to the south meets a 55 MPH design criteria while the curve to the north only meets a 45 MPH design criteria. However, a design exception for this curve should not be a problem considering that the existing curve only meets a 35 MPH design criteria. The cost for this realignment is greater due to a longer length of new roadbed required. A diversion at this bridge may be more feasible.

Figure 26: Proposed Realignment for Bridge #037B00024N

Bridge #037B00025N does not appear to have a feasible realignment. Any possible realignment would be outside the current budget limits for this project. Preliminary cost estimates for this alternative can be seen below in Table 6.

Table 6: Preliminary Cost Estimates for Realignment

Realignment			
	037B00023N	037B00024N	037B00025N
Design	$ 250,000.00	$ 200,000.00	
Right of Way	$ 50,000.00	$ 75,000.00	
Utilities	$ 30,000.00	$ 30,000.00	Not Feasible
Construction	$ 700,000.00	$ 700,000.00	
Total	$ 1,030,000.00	$ 1,005,000.00	

Tables of all the cost estimates along with the costs associated with recent bridge replacements in District 5 can be found in Appendix M.

VII. SUMMARY

This study is a Data Needs Analysis (DNA) of three projects located on US 421 in the northern part of Franklin County. Bridge #037B00023N is located over Flat Creek at MP 13.090. Bridge #037B0024N is located over Hudson Creek at MP 14.059. Bridge #037B00025N is located over Little Flat Creek at MP 15.091. Through analysis of existing roadway geometrics, bridge ratings, crash data, site visits, and discussion with the project team the following needs were identified:

- All three bridges are structurally deficient and need to be replaced.

The purpose of this project is to provide safe travel along US 421.

In order to determine which alternative will be the best to use, whether or not US 421 can be closed during construction needs to be determined. If US 421 can be temporarily closed and detoured around during construction then it makes the most sense to build the bridges on the existing alignment. If this is the case precast structures could be built to allow for shorter construction times. This option would save money and could probably be completed within the budget that the highway plan currently estimates. With this option no more than two of the bridges can be built at once due to ensuring access for local residents.

If US 421 cannot be temporarily closed during construction then the options are to create a diversion around the construction of the bridges or build the bridges on a new alignment. For Bridge #037B00023N it appears that a diversion would cost around the same as realignment. For this case realignment may be the most feasible alternative. For Bridge #037B00024N it appears that a diversion would cost less than realignment. For this case a diversion may be the most feasible alternative. For Bridge #037B00025N neither a diversion nor realignment works very well in the area. If it is necessary a diversion will most likely be the better of the two options. If these alternatives are used it would be possible to construct all of the bridges at once. Furthermore, cast in place structures may be as good if not better of an option than precast structures since time to construct is not as major of an issue. More detailed cost estimates should be done to determine if a diversion or realignment is more feasible at each bridge if one of these alternatives will have to be used.

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