A DATA NEEDS ANALYSIS STUDY

Item 7-1116.00 Bridge Replacement on Herrington Lake, KY 152 at Mercer/Garrard County line

Prepared By: Division of Planning & District 7
Kentucky Transportation Cabinet
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I. INTRODUCTION

A. Data Needs Analysis (DNA) Studies

A DNA Study is a Pre-Design Scoping Study performed on projects that did not have a prior Planning study. A DNA Study is a shortened version of Planning study and is conducted to better define the scope of the project before design starts. They are done to document existing data, to initiate early project requests and to accomplish early agency coordination.

A preliminary environmental overview is also a part of these studies to identify potential environmental impacts due to the project. These studies help develop a project schedule and identify possible alternates and costs. A "Purpose and Need" statement is developed by the Project team. By investigating a project early in the process, scope creep can be kept to a minimum.

B. FHWA Recommended Elements for Purpose and Need

Federal Highway Administration (FHWA) National Environmental Policy Act (NEPA) recommends that the following nine elements may be considered as part of Purpose and Need statement during the transportation decision making of a project:

- Legislation
- Project Status
- System Linkage
- Modal Interrelationships
- Transportation Demand
- Capacity
- Safety
- Roadway Deficiencies
- Social Demands/Economic Development

As part of developing a Purpose and Need statement for the current project, these FHWA recommendations will be addressed to the extent applicable.

C. Item 7-1116.00 DNA Study

Item 7-1116.00 is a Bridge Replacement project on Herrington Lake on KY 152 at the Mercer/Garrard County line.

The Project Team discussed and developed possible alternates and planning level cost estimates for the alternates based on project scope. Other information that will be of assistance in the Project Development Phase of this project was noted during the study.

D. Project Location

The bridge project is located on KY 152 over Herrington Lake at the Mercer/Garrard county line (See Figure 1 below and Exhibit 1 in Appendix A). Mile point locations for the bridge are MP 18.818 to 18.894 in Mercer County and MP 0 to 0.076 in Garrard County. The bridge has an ID 084B00005N. Bridge deck width is 20 ft and bridge length is 797.9 ft.

Beginning at its intersection with Chimney Rock Road on the west side of the project, KY 152 is flanked by residential property on either side. There are residential properties on the east end of the project. There is a camping area on Chimney Rock Road and there are Marinas at the end of the same road. There are several other marinas and businesses within the project vicinity.

A topographic map of the study area is shown as Exhibit 2 in Appendix A.

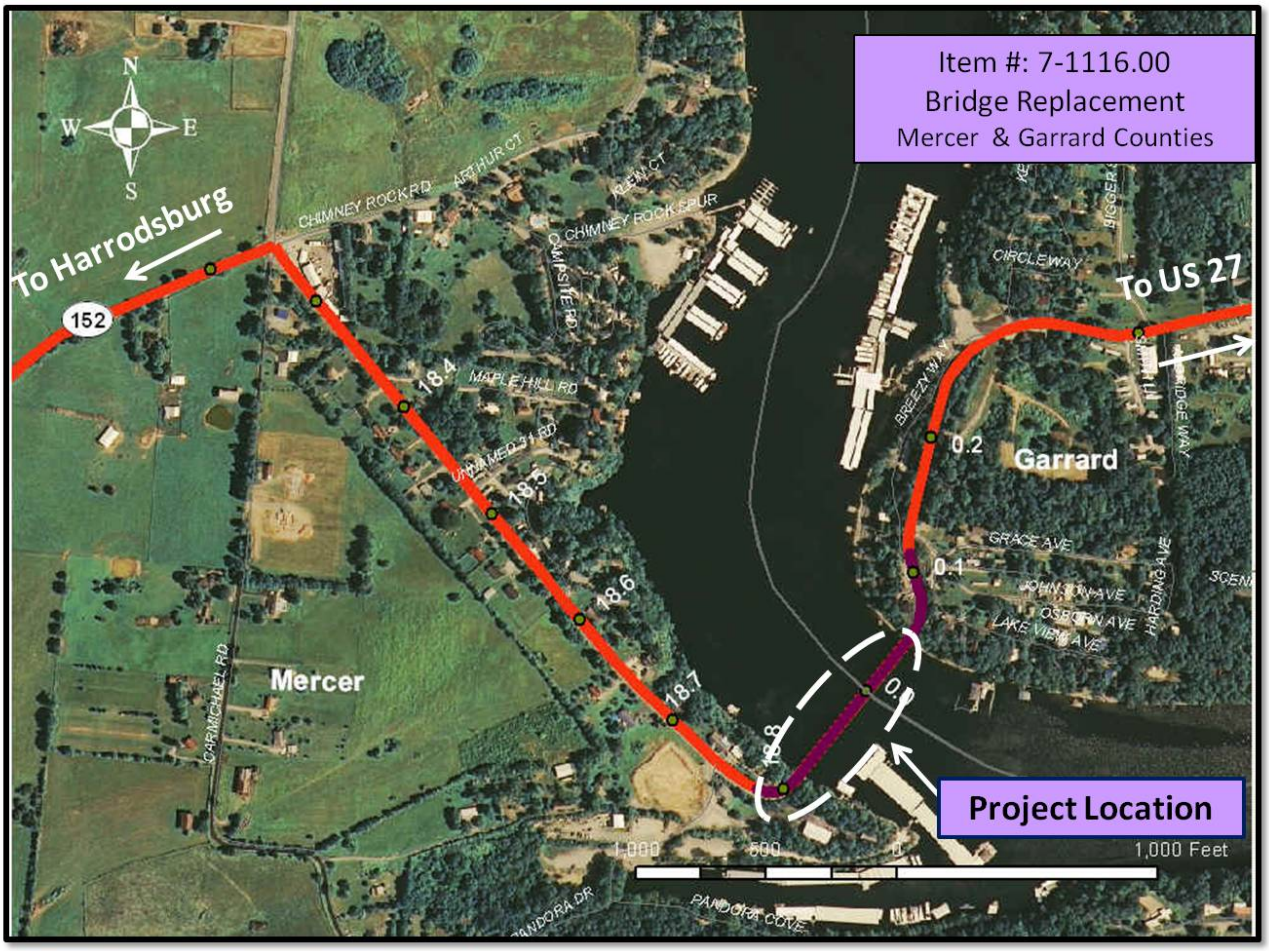

Figure 1: Project Location Map

II. PROJECT PURPOSE AND NEED

As discussed in Section IB, FHWA recommends nine elements to be considered as part of Purpose and Need for a project. For the current project, these nine elements will be discussed in the following section. A Purpose and Need statement agreed by the Project Team can be seen in Section VII later in this report.

A. Legislation

The following is a description of the project as it is listed in the 2010 General Assembly's Enacted Roadway Plan. 2010 Highway Plan projects for District 7, Mercer and Garrard Counties can be seen in Appendix B.

MERCER	P:			0	P:			0
Item No: 07-1116	D:	BRO	2010	1,000,000	D:	BRO	2010	1,000,000
Route: KY-152	R:	BRO	2012	500,000	R:	BRO	2012	500,000
	U:	BRO	2012	400,000	U:	BRO	2012	400,000
DESCRIPTION	C:			0	C:			0
REPLACE BRIDGE AND APPROACHES ON KY-152 OVER HERRINGTON LAKE AT THE MERCER/GARRARD COUNTY LINE (B05). (SR=3.0); (084B00005N)								

B. Project Status

Federal funds (BRO) have been authorized at the time of this report. See below current Project status. Previously, a bridge repair project was completed in 2009 which increased the Sufficiency Rating from 2.0 to 28.9.

Preconstruction Project Status for 7-1116.00

Description: REPLACE BRIDGE AND APPROACHES ON KY-152 OVER HERRINGTON LAKE AT THE MERCER/GARRARD COUNTY LINE (B05). (SR=3.0); (084B00005N)
Location: Route1 MERCER COUNTY KY-152 From MP 18.818 to MP 18.894
Route2 GARRARD KY-152 0 - 0.076
Length: 0.1 mi.

Project Status: Active

Current Phase Info:

Phase	Fund Code	Estimated Cost	Scheduled FY	Phase Funding Status	Authorized Date	Authorized Amount
Design	BRO	$0.00		AUTHORIZED	4/21/2011	$1,000,000.00
Right of way	BRO	$350,000.00	2012	ESTIMATED		$0.00
Utility Relocation	BRO	$280,000.00	2012	ESTIMATED		$0.00
Construction	BRO	$8,330,000.00	2014	NON-SIXYEAR		$0.00

Highway Plan Phase Info:

Phase	Funding	FY	Amount
Design	BRO	2010	$1,000,000.00
Right of way	BRO	2012	$500,000.00
Utility Relocation	BRO	2012	$400,000.00
Construction	BRO	2014	$11,000,000.00

Project Authorization can be seen in Appendix C.

C. System Linkage

KY 152 connects the Cities of Harrodsburg and Burgin on the west side of the project to US 27 in the East. See Figure 2 for a System Linkage map.

D. Modal Interrelationship

There is no public transit or intermodal use currently on this route.

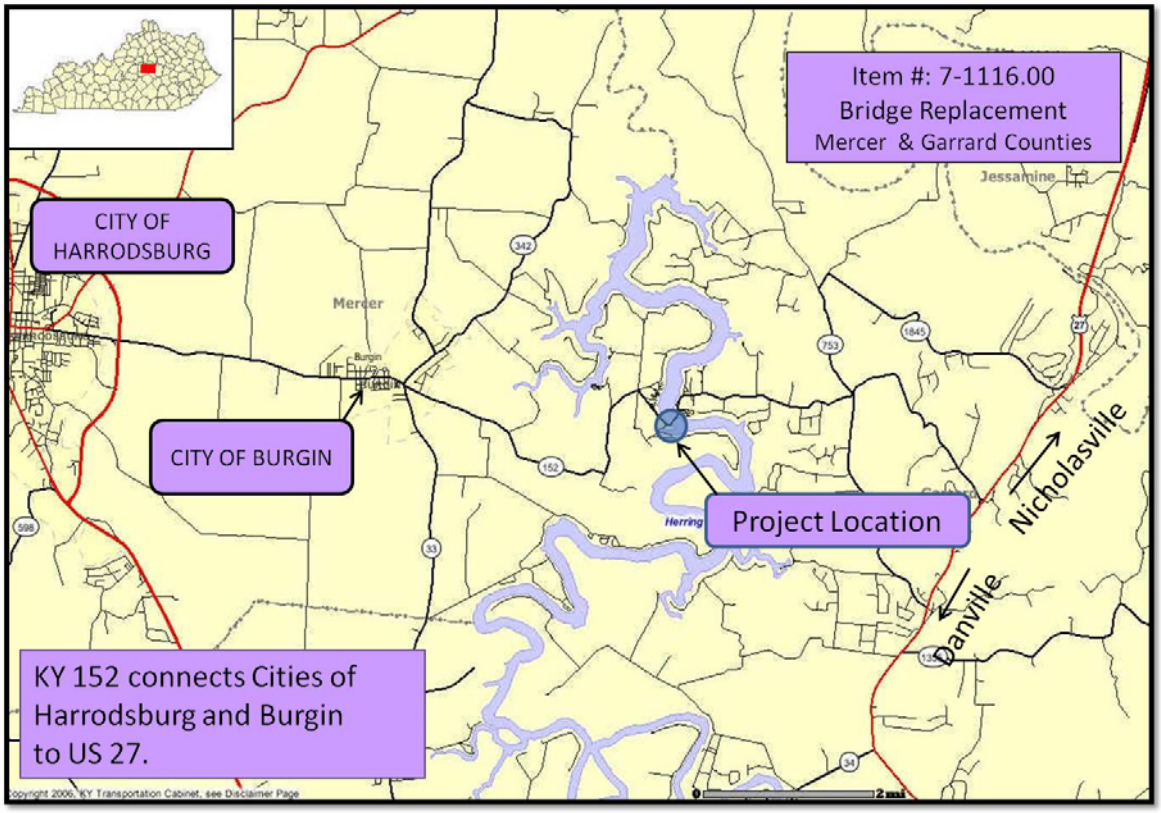

Figure 2: System Linkage Map

E. Social Demands or Economic Development

According to Director of Economic Development in Garrard County, KY 152 is the main artery between Mercer and Garrard counties. Herrington Lake and Peninsula Golf course are major attractions. The upgrade of US 127 to four lane traffic has caused an increase in traffic on KY 152. There is a lot of real estate development in the area.

F. Transportation Demand

Traffic data was obtained from CTS – Traffic Counts summary data. The 2010 ADT on KY 152 along the project is estimated at 1590. A traffic forecast has been requested at the time of this report. There is no truck data collected in the area.

G. Capacity

According to the KYTC Division of Planning's Adequacy Ratings Data, the Volume to Service Flow (VSF) ratio on this segment is 0.23 in Mercer County and 0.11 in Garrard County.

H. Safety

The crash history of this segment was studied using Kentucky State Police data. In the past ten years, six crashes have been reported at either end of the bridge. There were two side swipe crashes, one rear end crash, two run-off road crashes and one crash with a tree. The approaches to the bridge have sharp horizontal curves. Appendix D shows crash locations in the project area.

I. Geometric Deficiencies

a. Existing Roadway Conditions

The current roadway approach is two 9-10 foot lanes. Shoulder width is 1-3 feet. There are no shoulders on the bridge. There is guardrail at the edge of the pavement on the bridge. Bridge width is 20 feet. KYTC Common Geometric Practices for Rural Collector Roads suggest a lane width of 12 feet and 8 feet shoulders for a speed limit of 35 mph with an ADT over 2000 (Appendix E).

The Composite Adequacy Rating percentile of the roadway is 75.9 in Mercer County and 44.0 in Garrard County. The rating is a composite of roughness (IRI), safety (CRF) and service (VSF) of the roadway and compares this segment to other similar State roads. For example, a rating of 76 means that about 24% of the roads are rated better in that functional class in Kentucky. Figures 3 & 4 show the existing roadway on Herrington Lake bridge. Roadway approaches to the bridge have horizontal curves that do not meet KYTC Current Geometric criteria.

Figure 3: Roadway on Herrington Lake Bridge

Figure 4: Roadway on Herrington Lake Bridge at the West End

Other existing roadway information is available in the roadway plans in Appendix F. A summary of the existing conditions at the project site can be seen in Table 1.

Figure 5: Structural condition of the bridge in 2009

Table 1: Existing Conditions and Data Summary

County	*Mercer and Garrard*	**Item No.**	*7-1116.00*
Route Number(s)	*KY 152*	**Funding Type**	*BRO*
ADT (2010)	*1,590*	**MP**	*18.818 to 18.894 (Mercer), 0 to 0.076 (Garrard)*
Terrain	*Level*	**Posted Speed**	*35 mph*
Median Type	*Undivided*		
Roadway Data			
Functional Classification	*Rural Major Collector*	**State Primary Road System**	*State Secondary Route*
National Highway System (NHS)	*No*	**Coal Haul Route**	*No*
National Truck Network	*No*	**Truck Weight Classification**	*AA*
Bike Route	*No*	**Adequacy Rating Percentile**	*75.9 (Mercer) & 44.0 (Garrard)*
Roadway Geometry			
	Existing Conditions	**KYTC Common Geometric Practices (35 mph Design Speed)**	
Number of Lanes	*2*	*2*	
Lane Width	*9 - 10 foot*	*12 foot*	
Shoulder Width	*1 - 3 foot*	*8 foot*	
Bridge Data *(see Appendix I for Bridge Inventory Report)*			
Bridge Number	*084B00005N*		
Bridge Type	*4 span Steel Truss*		
Max. Span Length	*210 foot (45',60',3-210',45')*		
Length	*797.9 foot*		
Sufficiency Rating	*28.9*		
Bridge Roadway width curb to curb	*20.0*		
Deck width out to out	*20.0*		

b. Existing Bridge Conditions

The 797.9 foot bridge was built in 1924. It has six spans total; there are 4 main spans and 2 approach spans (one approach span on each end of the bridge). The main spans are steel deck truss and the approach spans are a girder/floorbeam system. Repairs were done in 1940, 1944, 1991, 2003 and 2009. The bridge had a Sufficiency Rating of 2.00 before the 2009 repairs. The interim repairs improved the Sufficiency Rating to 28.9. The bridge is functionally obsolete because of the geometric deficiencies.

Typical view of previously rehabed diagonals. Having problems were the bolt holes had to be redrilled during the rehab.

Typical view of floor beam bracing. Most have heavy section loss and some braces are completely gone or broken.

Close up view of bearing device #2 at Pier #2. Bearing device needs to be replaced.

Exterior view of bearing device #2 at Pier #2. Bearing device needs to be replaced.

Figure 6: Severe rusting seen on the bridge before 2009 repairs

Posted weight limit

Due to the condition and changes in the weight carrying capacity of the bridge, the posted weight limit is 15T (see Figure 7). A memo was released on June 1, 2010 by District 7 Office to this effect (Appendix G).

History of the Bridge Piers

The history of the piers was discussed during the Project Team meeting. In the Bridge Inspection File there was an article (Appendix H) concerning substructure movement written by F.C. Mahan, former Design Engineer in the Bridge Section in Central Office from 1931 – 1942. The article was written sometime after 1943, but the exact date is unknown. The article states that the bridge was built in 1924 when Herrington Lake was still empty. After the bridge was built, the lake was flooded and an inspection report from 1932 revealed that the deep water pier nearest the Mercer County side was having movement. At this point, the pier had actually risen approximately 16 inches. Elevation surveys were performed from 1934–1936. At the height of movement, the pier had risen approximately 30 inches and tilted upstream and toward the Mercer County side approximately 12 inches. The piers were built by the Weber Chimney Company of Chicago and are hollow.

Figure 7: Current posted weight limit on the bridge is 15T

Bridge Inventory and Inspection reports can be seen in Appendix I.

Drainage

FEMA Flood Insurance Rate Maps (FIRM) are shown in Appendix J. The lake is designated as Zone A for floods. Zone A represents a 100 year flood zone. Dix Dam is located approximately 8 miles north of the bridge. The dam is used to control the water level and typically in the late fall, the water level is lowered. Melting snow and rain runoff from the winter and spring then refills the lake before the summer season. Kentucky Utilities Power Plant is the owner of the dam.

III. PRELIMINARY ENVIRONMENTAL OVERVIEW

A. Air Quality

Mercer and Garrard Counties are in attainment for all monitored air pollutants.

B. Archaeology

The OSA database indicated that there were no sites recorded in close proximity to the project area, but no surveys have taken place in the area to verify. An Archaeology Phase I survey will need to be completed in order to rule out any impacts to archaeological sites. Optimum time for a survey would be during a winter draw-down when more of the shoreline is exposed.

C. Threatened and Endangered Species

The USFWS has identified the known and potential presence of threatened and endangered species in Mercer County (See Table 1) and Garrard County (Table 2). During a site visit on May 2, 2011 potential habitat was observed for the bat species in the project area; however a Habitat Assessment will need to be conducted to examine the habitat potential more closely. A Biological Assessment may also be needed. It is unlikely that federally listed mussel species would be found in this location due to the depth. No historical records of endangered mussels have been found. Endangered bats would not likely use the bridge for anything other than a temporary night roost. Any impacts to threatened and endangered species must be mitigated for through coordination with USFWS.

D. Hazardous Materials

During a site visit on May 2, 2011, no properties were observed that would have a high probability of hazardous materials. However, due to the age of the bridge, it will need to be tested for asbestos prior to demolition.

Table 2–USFWS listing of Threatened and Endangered Species in Mercer County

Group	Species	Common Name	Legal Status
Mammals	*Myotis sodalis*	Indiana bat	E
	Myotis grisescens	Gray bat	E
Mussels	*Pleurobema clava*	*Pleurobema clava*	E
	Cyprogenia stegaria	fanshell	E
	Epioblasma torulosa rangiana	Northern riffleshell	E
	Obovaria retusa	Ring Pink	E
Plants	*Trifolium stoloniferum*	Running Buffalo Clover	E

Table 3 – USFWS listing of Threatened and Endangered Species in Garrard County

Group	Species	Common Name	Legal Status
Mammals	*Myotis sodalis*	Indiana bat	E
	Myotis grisescens	Gray bat	E
Plants	*Trifolium stoloniferum*	Running Buffalo Clover	E

E. Historic Resources

The bridge itself was built in 1924, which means it meets the first screening requirement for listing on the National Register for Historic Places. Several homes near the bridge or within the project viewshed are also potentially older than 50 years and may therefore be eligible for the National Register of Historic Places. A thorough assessment of the eligibility and listed status of the bridge and other structures should be completed in future project phases.

F. Permitting

Any impacts below the ordinary high water mark within Herrington Lake will need a USACE 404 Permit (NW 14 or LOP depending on impact size) and potentially a Water Quality Certification from the Division of Water.

G. Noise

The scope of the project may require noise analyses if additional lanes of traffic are planned for this project. The noise associated with construction and demolition will be temporary.

H. Socioeconomic

There will likely be no socioeconomic impacts associated with this project.

I. Section 4(f) Resources

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

J. Section 6(f) Resources

At this time, there do not appear to be any resources in the project area that are protected under Section 6(f) of the Land Water Conservation Fund Act.

IV. OTHER PROJECT INFORMATION

A. Utilities at Site

The location of utilities will need to be verified as the project survey is completed in Phase I Design. Utilities that may be affected by each alternate are electricity, gas, cable TV, telephone and water.

B. Right of Way

Existing right of way could not be easily determined as old plans or microfilm could not be located for this segment of KY 152.

V. PROJECT TEAM MEETING, GEOTECHNICAL ASSESSMENT & SITE VISIT

A. Project Team Meeting

A Project Team meeting was held on January 11, 2011 at the District 7 office in Lexington. It was attended by the KYTC Central Office Planning team and District 7 Office staff. An introduction to DNA Pre-Design Scoping studies was presented which was followed by a PowerPoint presentation and discussion of the DNA study for Item 7-1116.00. Existing conditions, preliminary environmental overview, possible alternates were discussed and a draft “Purpose and Need” statement was defined. Meeting minutes can be seen in Appendix K.

B. Preliminary Geotechnical Assessment

At the Project Team meeting held in January, 2011, it was discussed whether the piers are stable and re-usable. Existing piers have been re-used on other bridge replacement projects depending on their condition. The Project Team decided that the stability and re-use has to be further investigated. The KYTC Geotechnical Branch was consulted to assess and make recommendations regarding the substructure.

Findings of the preliminary geotechnical assessment (partial copy) can be seen in Appendix L. Portions of the report can be seen below:

"A bridge at the same location may require a new foundation or portions of the existing foundations may be reused. This office has discussed reuse of these piers in the past. A site visit was performed to review the existing piers. It is unlikely that it would be desirable or economically viable to reuse abutment number 1, abutment number 2, or piers 1, 4 or 5 as shown in the below schematic (retrieved from the Division of Structural Design's plan database). Due to their size and location in the lake, it could be very desirable to reuse piers 2 and/or 3".

"In order to make a decision as to whether Pier 2 and/or Pier 3 can be reused, a thorough investigation would be required. Drilling through the footing in numerous places would be desirable to examine the bearing stratum of both piers. Additionally, the existing concrete would need to be examined so that a useful remaining service life can be determined. Similar studies have been undertaken by the Cabinet in the past. Replacement of the bridge at approximately the same location or just adjacent to this location, without the reuse of the piers, will also require a very thorough site investigation. It would be very desirable to try to find out the mechanism that caused the movement at pier 2 so that future problems with a new bridge can be avoided".

C. Site Visit Observations

A site visit was held on May 2, 2011 which was attended by KYTC Central Office Planning team and District 7 Office staff. A walk through was conducted from one end of the bridge to the other end. Alternates proposed during the project team meeting were discussed.

Possible alignments to improve the horizontal curves at the bridge approaches and resulting impacts were discussed. The closest pier on the west side was visited by some members of the team. The recent structural repairs to the bridge may sustain the bridge for 3 - 4 more years. Some members of the team visited the marinas and the access roads leading to them which fall in the vicinity of the proposed bridge at an alternate location. Investigation of Environmental and Utilities was also part of the site visit.

VI. PROPOSED TYPICAL SECTION

The Project Team discussed the proposed typical section for the project. Bridge design criteria should follow the proposed project design criteria on KY 152 as established in the Highway Design Guidance Manual.

KY 152 is a Rural Major Collector. Current ADT (2010) is estimated at 1590. A traffic forecast is not available at this time. If the future estimated ADT is over 2000, KYTC Common Geometric Practices (see Appendix D) for Rural Collector Roads suggest a lane width of 24 feet and 8 feet shoulders for a speed limit of 35 mph. The Team decided that a typical section will be finalized during Phase I studies. However, for the purpose of this study and cost estimates, the typical section is as shown in Figure 8.

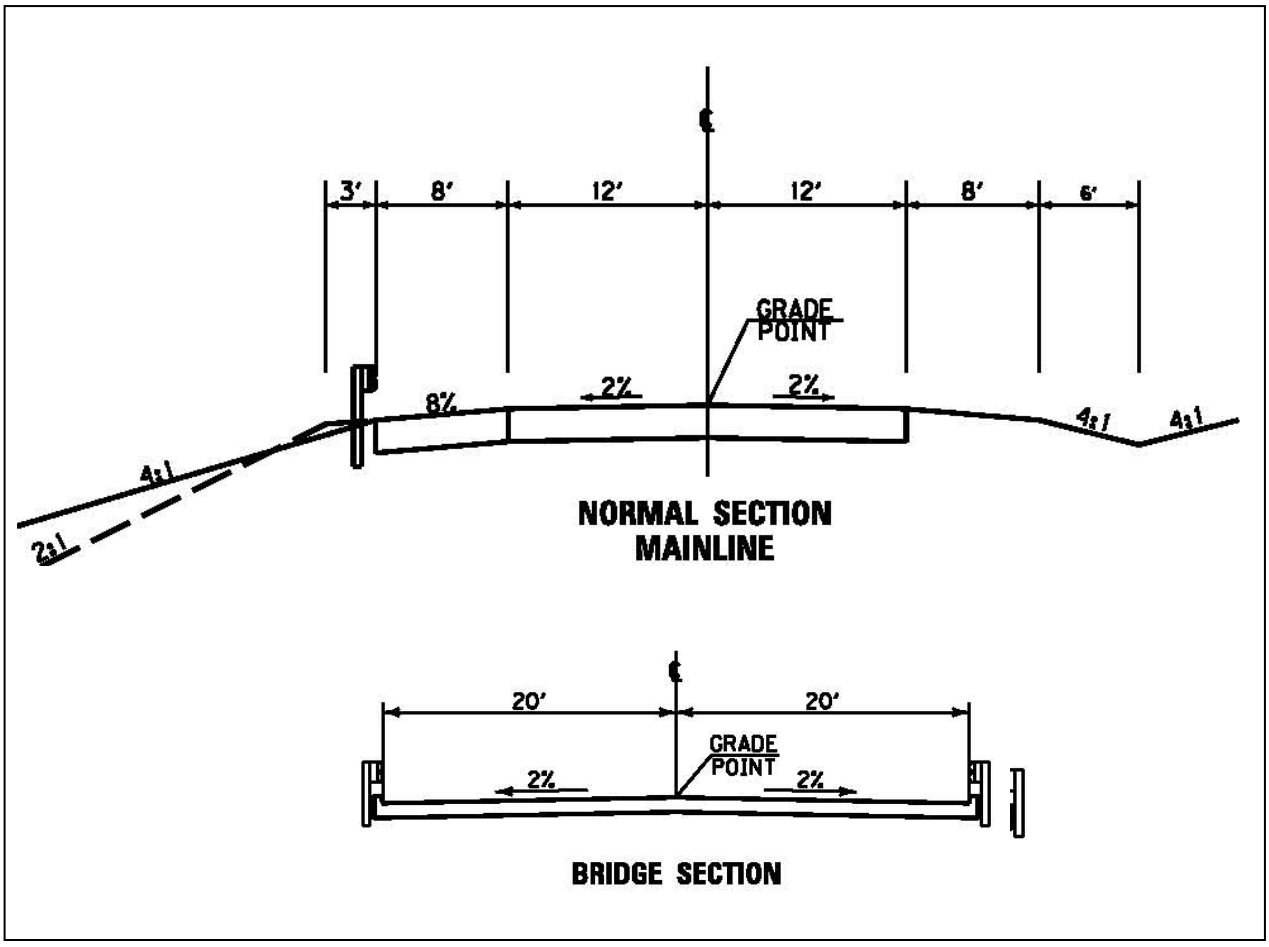

Figure 8: Proposed Typical Section

VII. PROJECT PURPOSE AND NEED STATEMENT

A Purpose and Need Statement is the foundation for project decision making. The need for the Bridge Replacement is to improve the current posted weight limit of 15 tons and improve the bridge's geometric deficiencies.

Based upon the information presented in Section II (Project Purpose and Need) of this report and discussion of the Project Team, the following Purpose and Need Statement was agreed upon by the Project Team:

> **The purpose of the project is to address the structural capacity of the bridge, the geometric deficiencies of the bridge and the approach roadway on each side, and to maintain connectivity and enhance the movement of recreational traffic.**

VIII. POSSIBLE ALTERNATES

At the Project Team meeting, the Team decided to consider the following alternates. Each of the alternates has advantages and disadvantages.

- ALTERNATE 1: No Build
- ALTERNATE 2: Replace with a bridge at same location
- ALTERNATE 3: Replace at an adjacent location
- ALTERNATE 4: Replace at an alternate location

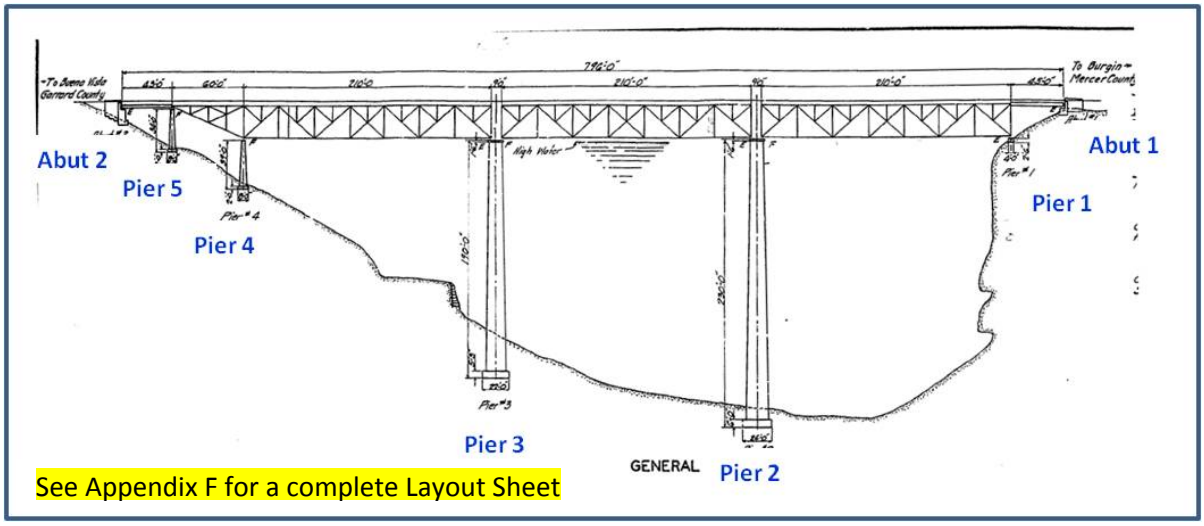

Figure 9: Elevation of the existing bridge

Complete description of the alternates is provided below. Basis of cost estimation is shown in Appendix O.

A. ALTERNATE 1 – No Build

In the last 10 years there have been two maintenance/repair projects on this bridge. The most recent project was done to keep the bridge open and provide more time to move forward on replacing the bridge while only increasing the sufficiency rating from 2.0 to 28.9. Even with this improvement, the existing bridge has a current posted limit of 15T and is functionally obsolete (geometric deficiency). This alternate will lead to the closing of the bridge in possibly two to three years. This alternate is undesirable.

B. ALTERNATE 2 - Replace with a bridge at the current location

The KYTC Geotechnical Branch was consulted to examine the condition of the existing piers. Preliminary Geotechnical findings were explained in Section V of this report. Also, Appendix L has a copy of the report. According to the report, further investigation is necessary to determine re-use of the deep water piers. Also, the remaining service life of the piers needs to be determined.

Some of the advantages of this alternate are possible construction cost savings because of re-use (remain in place) of some or all of the existing piers. Required right of way will be minimal. Ferry service or a detour route is needed during construction. If ferry service is not feasible during construction, motorists have to detour over 30 miles to reach US 27 from KY 152. This is a disadvantage for this alternate.

Considering the crashes occurring in the roadway curves leading to and leaving the bridge, geometric improvements to the approach roadway such as horizontal curve, sight distance may be included in this alternate. On the west side of the bridge, there is a steep drop in grade on the side road close to the approach roadway. Estimated length of each approach reconstruction is 750 feet.

A life cycle cost should be considered when comparing costs between Alternate 2 and Alternate 3, because, if the substructure is reused in Alternate 2, the typical 100 year life span for a bridge may not be obtainable since the existing substructure is already 86 years old. More information (complete inspection of the bridge structure, etc.) than is available must be obtained to properly calculate the life cycle cost. The life cycle cost should be considered in Phase I Design if using existing piers continues as an option.

There are four possibilities along the existing alignment that have been considered for this alternate whereby the final decision will be based on the geotechnical assessment.

- Alternate 2a: Use all existing piers
- Alternate 2b: Replace the deep water pier nearest the Mercer County side which showed upward movement/tilting and re-use the remaining piers
- Alternate 2c: Replace all piers
- Alternate 2d: Replace the abutments and piers except the two deep water piers

A sketch of this alternate is shown in Figure 10.

Alternate 2a: *Use all existing piers*

The first of these alternates is to use all the existing piers if they are found re-usable. This alternate involves replacing the superstructure, rehabilitating the piers and abutments and realigning the bridge approaches (2-lane roadway construction) to improve the geometric deficiencies.

The following is the estimated cost for Alternate 2a:

Phase	**Estimated Cost**
Right of Way	$1,000,000
Utilities	$750,000
Construction	$6,400,000

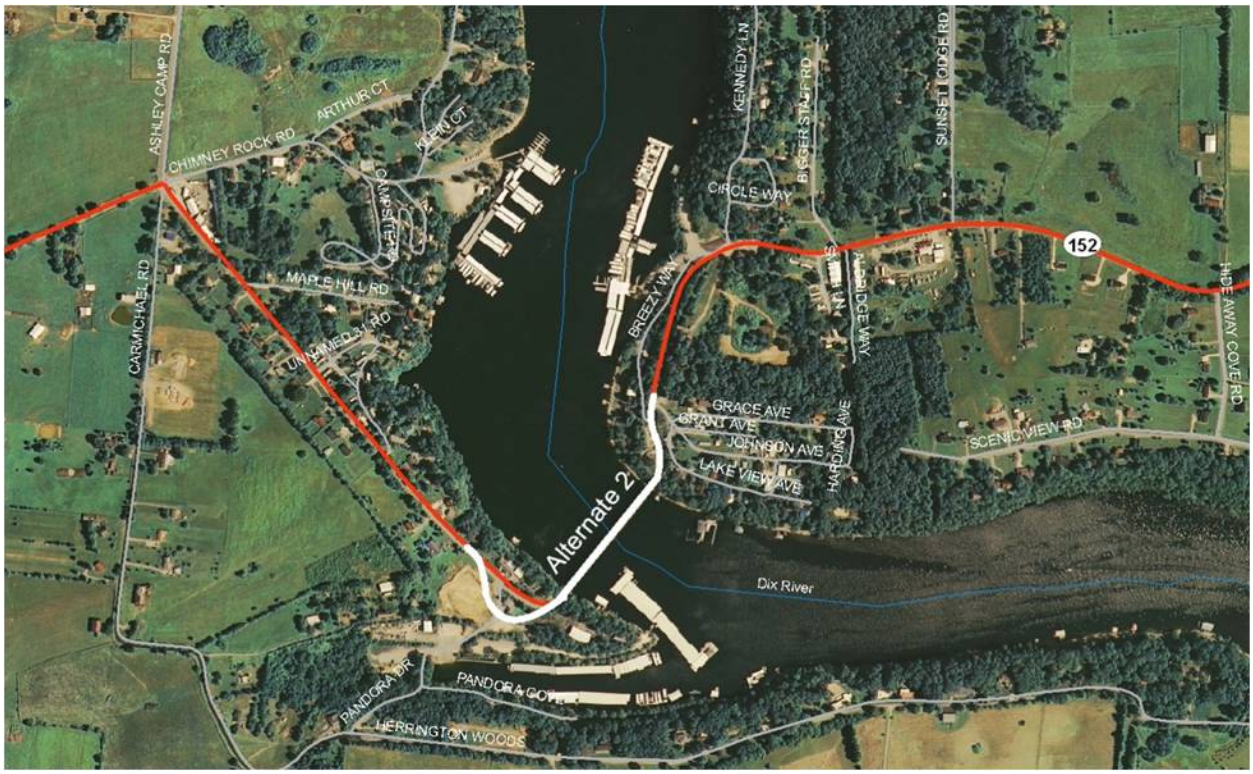

Figure 10: Alternate 2 - Replace with a bridge at the current location

Alternate 2b: *Replace the deep water pier which showed upward movement/tilting and re-use the remaining piers*

The second of these alternates is to replace the deep water pier nearest the Mercer County side which showed upward movement/tilting and re-use the remaining piers. The estimated cost for this alternate has been determined for replacing the pier in the same location or eliminating the pier and utilizing a longer span length for the bridge. The longer span length would require the beam depth to increase, which would cause the cost of the bridge to increase. This alternate involves replacing the superstructure, rehabilitating the remaining piers and abutments and realigning the bridge approaches (2-lane roadway construction) to improve the geometric deficiencies.

The following is the estimated cost for Alternate 2b:

Phase	Estimated Cost
Right of Way	$1,000,000
Utilities	$750,000
Construction	$6,750,000

Alternate 2c: *Replace all piers*

The third of these alternates is to replace all piers if they cannot be re-used. This alternate involves replacing the bridge, piers, and abutments, and realigning the bridge approaches (2-lane roadway construction) to improve the geometric deficiencies.

The following is the estimated cost for Alternate 2c:

Phase	Estimated Cost
Right of Way	$1,000,000
Utilities	$750,000
Construction	$10,500,000

Alternate 2d: *Replace the abutments and piers except the two deep water piers*

The fourth of these alternates would replace the abutments and piers except the two deep water piers. This alternate involves replacing the superstructure, abutments and all the piers except the two deep water piers, rehabilitating the two deep water piers, and realigning the bridge approaches (2-lane roadway construction) to improve the geometric deficiencies.

The following is the estimated cost for Alternate 2d:

Phase	Estimated Cost
Right of Way	$1,000,000
Utilities	$750,000
Construction	$6,800,000

Additional costs involved in a ferry service operation are listed under Table 4. Section X discusses detour and ferry service options in detail.

C. ALTERNATE 3: Replace with a bridge at an adjacent location

This alternate involves construction of a new bridge approximately 50 feet and set at an angle adjacent to the existing bridge. This would help to improve the sharp curves that are on each end of the existing bridge. This also takes into account that the locations of the piers may be different from the existing bridge whereby longer spans may be utilized without piers being located in the deep part of the lake.

The advantage of this alternate is that no detour (over 30 miles) is required during construction of the new bridge since existing bridge will remain open. During the previous bridge close down in 2009 (Appendix M), the main concern of the motorists was the lengthy detour of over 30 miles which can be avoided with this alternate. KY 152 traffic can continue to operate on the existing route without interruption during the construction of the new bridge, but will experience some delays during the tie-in of the reconstructed approaches. The right of way estimated cost includes the acquisition of several homes/buildings that have access to the lake. Estimated length of each approach reconstruction is 750 feet. This alternate is more expensive compared to Alternate 2.

A sketch of this alternate can be viewed below in Figure 11.

The following is the estimated cost for ALTERNATE 3:

Phase	**Estimated Cost**
Right of Way	$1,000,000
Utilities	$750,000
Construction	$11,000,000

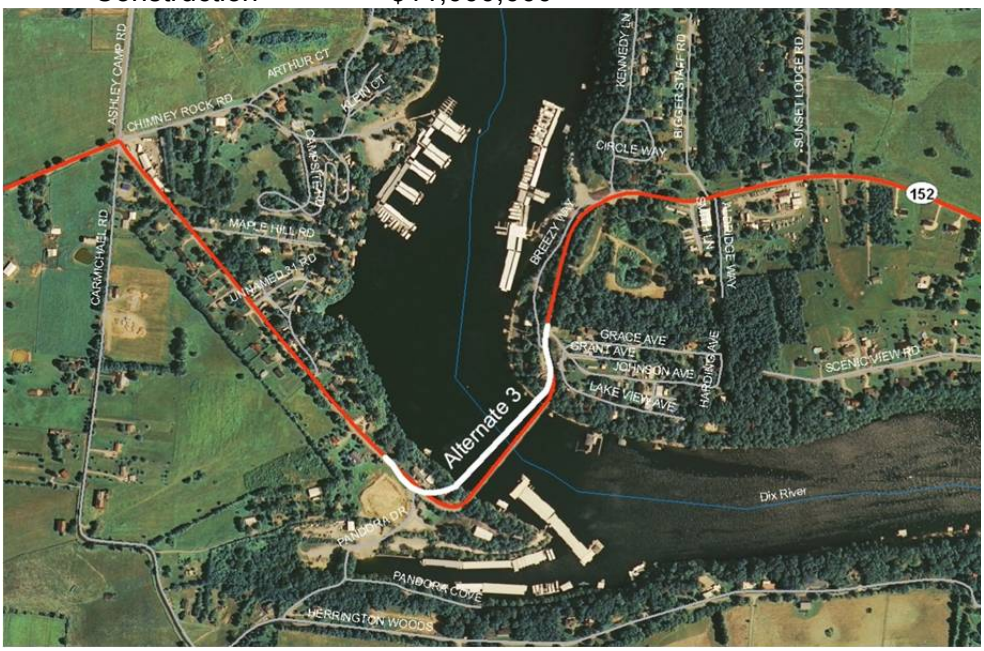

Figure 11: Alternate 3 - Replace with a bridge at an adjacent location

D. ALTERNATE 4: Replace with a bridge at an alternate location

This alternate will consider a new location for the new bridge. The new alignment would connect KY 152 on the west side at Chimney Rock Road to KY 152 on the east side in the vicinity of Kennedy Lane. This alternate would involve the construction of a new bridge, and new approaches to tie to KY 152 on both sides.

The advantage of this alternate is that traffic can be maintained on the existing Kennedy Mill Bridge while the new bridge and approaches are constructed. Therefore, there would be no need for a detour route or ferry service for this alternate. Another advantage is that the new roadway can be built in accordance with KYTC Current Geometric Practices for horizontal and vertical geometry. Current geometric deficiencies of KY 152 leading to and leaving the existing bridge location can be avoided and safety can be improved. Estimated length of approaches is 1850 feet total.

The disadvantage is that the alternate will affect the marinas located along this alternate. This alternate will be the most expensive compared to the other alternates because of the possibility of relocating the operating marinas. The cost to relocate the marinas along with the higher cost for construction, right of way, and utilities would possibly eliminate the feasibility of this alternate as a viable alternate for this project. **The estimated costs below do not reflect the cost associated with the relocation of the marinas which could be a significant cost.**

A sketch of this alternate is shown below in Figure 12.

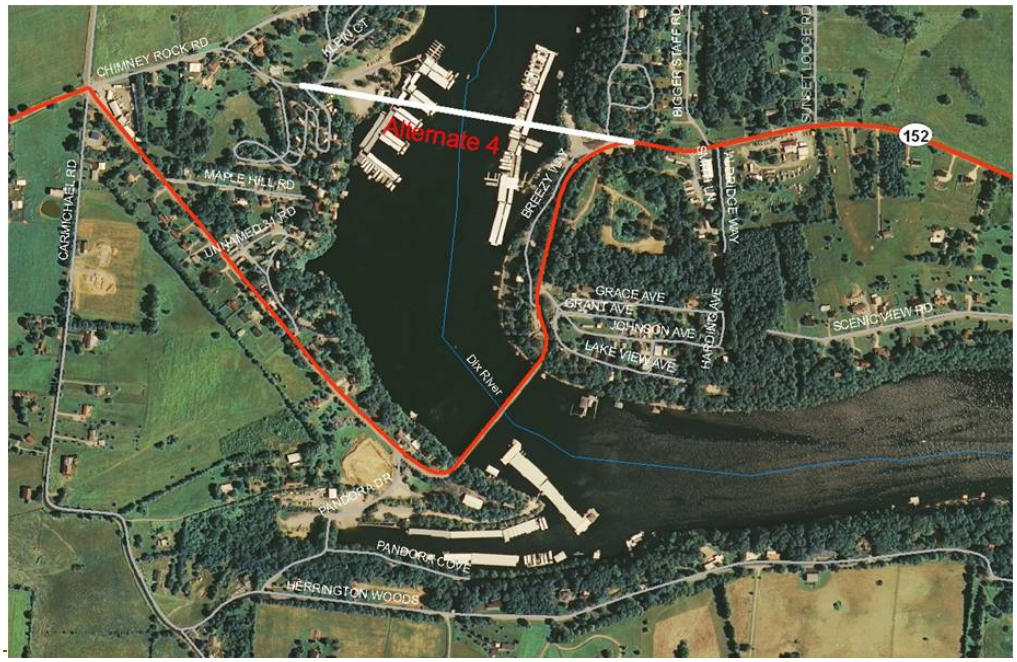

Figure 12: Alternate 4 - Replace with a bridge at an alternate location

The following is the estimated cost for ALTERNATE 4 (not including cost for relocating marinas) :

Phase	**Estimated Cost**
Right of Way	$1,000,000
Utilities	$750,000
Construction	$15,070,000

Figure 13: Chimney Rock Road and Boat launch ramp may be used as access road for Ferry Service during construction

Figure 14: Another view of Chimney Rock Road and Boat launch ramp

IX. SUMMARY OF ALTERNATES AND THEIR COST ESTIMATES

The alternates mentioned in the previous section have been summarized in the following table for comparison purposes.

Table 4: Summary of Alternates and their cost estimates

ALTERNATE	DESCRIPTION	RIGHT OF WAY	UTILITIES	CONSTRUCTION	TOTAL [x]
2010 BIENNIAL PLAN		$500,000	$400,000	$11,000,000	$11,900,000
ALTERNATE 1	No build	-	-	-	-
ALTERNATE 2	Replace with a bridge at the current location				
Alternate 2a	*Use all existing piers*	$1,000,000	$750,000	$6,400,000	$8,150,000 [+∞]
Alternate 2b	*Replace the deep water pier which showed upward movement/tilting and re-use the remaining piers*	$1,000,000	$750,000	$6,750,000	$8,500,000 [+∞]
Alternate 2c	*Replace all piers*	$1,000,000	$750,000	$10,500,000	$12,250,000 [+∞]
Alternate 2d	*Replace the abutments and piers except the two deep water piers*	$1,000,000	$750,000	$6,800,000	$8,550,000 [+∞]
ALTERNATE 3	Replace with a bridge at an adjacent location	$1,000,000	$750,000	$11,000,000	$12,750,000
ALTERNATE 4	Replace with a bridge at an alternate location	$1,000,000	$750,000	$15,070,000	$16,820,000 [♦]

x Design costs are not included

+ add $810,000 for a ferry service operation (2 year construction period assumed) if used

∞ add $150,000 for upgrade of local roads leading to and leaving the ferry service if used

♦ does not include cost of relocating marinas, cost includes local roads upgrade

X. OTHER ISSUES

A. Public Involvement Discussion

There was a discussion at the beginning of the DNA Study whether Public Involvement which includes input from the Public Officials can be introduced into the Project early in the project development phase. This issue was discussed at the Project Team meeting. It was decided by the Project Team that the DNA Study will not involve any Public Involvement activities. Public Involvement will be included early in the Phase I Design, which will start in a few months.

XI. CONSTRUCTION

A. Detour route

In the Plans for the 2009 repair project (see Appendix F), the detour involved re-routing eastbound traffic from KY 152 along KY 33/US 68/KY 29, then south on KY 1268 to reach US 27. During construction, the detour was actually routed to continue northward on US 68 to KY 29, then along KY 29 to reach US 27. It was decided that the detour needed to avoid KY 1268 because this road has a section with a historic stone laid arch culvert that has a single, 13 foot wide lane with several sharp curves on each side of the structure. The total length of the modified detour when the bridge was closed during the 2009 Bridge repairs was over 30 miles.

If a detour route has to be used for the proposed project, it would be the same as the detour used during the 2009 bridge closure.

B. Ferry Service

The proposed detour route discussed in the previous section would put motorists over 30 miles out of their way. That was a primary area of concern to the motorists when the bridge was closed for repairs in 2009 (Appendix M). The possibility of using ferry service to transport motorists and their vehicles during construction was discussed at the Project Team meeting.

On the west side, Chimney Rock Road is an access road (approximately 1700 ft) from KY 152 that leads to the lake side. It is a county road (CR 1131 & CR 1152), 19 ft wide at the junction of KY 152. The road has no shoulders. Possibility of using Chimney Rock Road for access to ferry service should be evaluated for feasibility for traffic diversion.

On the east side, there is no good access road for traffic leaving the ferry service to reach KY 152. Kennedy Lane is a County Road and is on a hill with only private road connections to the Lake. It is a single lane, 10 ft wide road. The other roads from the lake side to KY 152 are Private roads. Traffic diversion on Private roads would require an easement.

Floating bridges (military type) can also be used during construction. The Team agreed that a floating bridge may not be practical or useful in the current situation.

XII. SUMMARY

The DNA study investigated several alternates and presented the advantages and disadvantages of the alternates. During Phase I studies, the alternates will be further developed and a preferred alternate may be recommended.

As indicated in the report, if the new bridge is located at the current location or an adjacent location, more detailed Geotechnical investigation is necessary to investigate the underlying cause of pier movement experienced in the past. Necessary solutions are needed to prevent future problems with the new bridge at the same location.

As seen in Table 4 in Section IX, the estimated cost of some of the alternates exceeds the programmed cost in the 2010 Biennial Plan. Additional funds may have to be requested depending on which alternate is selected.

Upon completion of the project, a new bridge built to current KYTC Geometric Practices for the bridge and approaches will replace the current bridge that has a Sufficiency Rating of 28.9 and eliminate the current restricted weight of 15T. The Project Purpose and Need to improve connectivity and enhance recreational activity will be achieved.

Additional Project photos can be seen in Appendix N.

For more information regarding this study please contact:

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