Section 4(f) of the USDOT Act of 1966 (Title 49, USC, Section 303) requires special considerations be made regarding the "use" of any publicly owned park, recreation area, wildlife/waterfowl refuge or historic property that is listed in or eligible for the National Register of Historic Places (National Register). These properties are called "4(f) Properties." "Use" is defined as a permanent easement, fee taking, or "constructive use" of a Section 4(f) property. Bridges listed in or eligible for listing in the National Register are 4(f) properties. As such, before demolition and replacement of a historic bridge can occur, the Federal Highway Administration (FHWA) must confirm that, on the basis of extensive studies and analysis, there are no "feasible and prudent" alternatives to this use of the resource.

The use of most historic bridges is covered under a programmatic Section 4(f) evaluation known as the "Programmatic Section 4(f) Evaluation and Approval for FHWA Projects that Necessitate the Use of Historic Bridges" (Historic Bridge Programmatic Section 4(f) Evaluation)**.**[1] For the purpose of the Historic Bridge Programmatic Section 4(f) Evaluation, a proposed action will "use" a bridge that is on or eligible for inclusion on the National Register when the action will impair the historic integrity of the bridge either by rehabilitation or demolition. Rehabilitation that does not impair the historic integrity of the bridge as determined by procedures implementing the National Historic Preservation Act of 1966, as amended, is not subject to Section 4(f). That is to say, in general, if a rehabilitation project results in a "No Adverse Effect" finding for the bridge, the bridge is not subject to Section 4(f).

To apply the Historic Bridge Programmatic Section 4(f) Evaluation, three alternatives that avoid any use of the historic bridge must be examined: do nothing, build a new structure at a different location without affecting the historic integrity of the historic bridge, and rehabilitate the historic bridge without affecting the historic integrity of the structure.

Additionally, the "Programmatic Agreement among the Federal Highway Administration, the Indiana Department of Transportation (INDOT), the Indiana State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (ACHP) Regarding Management and Preservation of Indiana's Historic Bridges" (Historic Bridge PA) governs the project development process for historic bridges in Indiana. This agreement states that FHWA will work with INDOT, and the bridge owner if the bridge does not belong to INDOT, to develop a Purpose and Need statement and an alternatives analysis for any project involving a historic bridge. Rehabilitation for vehicular use must be thoroughly evaluated before other alternatives are considered.

This document provides guidance in preparing a Historic Bridge Alternatives Analysis for review by INDOT, which after approval, will be submitted to consulting parties for review as part of the Section 106 consultation process. The goal is that the resultant Alternatives Analysis is in accordance with the Historic Bridge PA and fulfills the requirements of the Historic Bridge Programmatic Section 4(f) Evaluation when applicable.

Please note that final approval of the preferred alternative does not occur until FHWA approves the NEPA document. INDOT approval of the Historic Bridge Alternatives Analysis

[1] http://www.environment.fhwa.dot.gov/4f/4fbridge.asp

allows its distribution for consulting party review. Later, INDOT signature of the 800.11(e) "no adverse effect" finding or FHWA signature of the 800.11(e) "adverse effect" finding constitutes **draft** agency concurrence in the purpose and need statement, alternatives analysis, and preferred alternative. INDOT or FHWA signature **does not** constitute **final** approval of the preferred alternative, but rather release of the 800.11(e) document for consulting party review and comment.

The environmental document for the subject bridge project will need to *summarize* the alternatives analyzed in the Historic Bridge Alternatives Analysis Document and why each was or was not feasible and prudent. The Historic Bridge Alternatives Analysis Document should be included in an appendix to the environmental document. After the public hearing comment period has expired, the CE should be updated as appropriate (finalize alternatives analysis, preferred alternative, and Commitments Summary Form) and forwarded to INDOT for final review. Once FHWA has assured that all of the Historic Bridge Programmatic Agreement requirements have been fully addressed, FHWA will be in a position to grant final NEPA approval. FHWA final approval of the CE will affirm that all Historic Bridge PA requirements have been fully addressed, serve to confirm that FHWA has concluded its responsibilities under Section 106, and serve as FHWA approval of the Historic Bridge Programmatic 4(f) and the preferred alternative.

These guidelines were created in order to increase the consistency and quality of alternative analysis documents, as well as streamline the review process. This document provides the recommended process for writing these documents, and indicates the components required for inclusion in the documents. Below is an outline of the components that should be included in these documents. An annotated outline with specific guidance follows.

Some components of this document were influenced by guidelines in use by the Texas Department of Transportation (TxDOT) titled *Historic Bridge Programmatic Section 4(f) Guidelines and Standards of Uniformity* (prepared by Mead & Hunt, Inc., April 2009).

Suggested Components of the Historic Bridge Alternatives Analysis Document

I. COVER SHEET/TITLE PAGE
II. TABLE OF CONTENTS
III. EXISTING STRUCTURE DATA
IV. EXISTING CONDITIONS
V. PURPOSE AND NEED
VI. ALTERNATIVES
VII. MINIMIZATION AND MITIGATION
VIII. PRELIMINARY PREFERRED ALTERNATIVE

APPENDICES[2]
A. MAPS
B. PHOTOGRAPHS
C. DRAWINGS
D. COST ESTIMATES

[2] Any of the items listed as appendices here can also be incorporated into the text of the document as appropriate.

I. COVER SHEET/TITLE PAGE

Provide a cover sheet or title page as illustrated below.

Historic Bridge Alternatives Analysis

BRIDGE NUMBER: _____

DESIGNATION NUMBER: _____

ROUTE IDENTIFICATION AND FEATURE CROSSED:
_____ over _____

COUNTY: _____

NBI NUMBER: _____

PROJECT LOCATION: _____

PREPARED BY: _____
(Name of INDOT staff or name of consultant staff. It is expected that authorship of this document should be a collaboration of both engineering and cultural resources staff. Both Professional Engineers and Qualified Professional Historians/Architectural Historians should contribute to the report preparation [Engineers—provide existing structure data, inspection information, design criteria, cost criteria, etc.; CR QPs—provide National Register of Historic Places criteria, list of contributing features, analysis of the impacts of each alternative to the historic integrity of the structure, etc.]).

DATE: _____

II. TABLE OF CONTENTS

If the magnitude of the document warrants, provide a Table of Contents segregated by major document sections.

III. EXISTING STRUCTURE DATA

A. <u>Identification/History</u>

Bridge No.:
Project Location: (Route Number, Feature Crossed, City / County, District)
Designation No.: (As determined)
Year Built:
Years Repaired:
Most Recent Field Inspection Date:
Average Daily Traffic (ADT)/Year of ADT:
Percentage of Commercial Vehicles:

Low volume road?: (Yes/No) A low-volume road is defined as having a design year ADT of less than or equal to 400.
Functional Classification:
Detour Length: (Detour length is defined as the total additional travel a through-bound vehicle would experience from closing the bridge. This is determined by the shortest route on which a vehicle with a loading of HS-20 [36 tons] is legally capable of traveling.)
Load Rating:
Sufficiency Rating[3]:
National Register of Historic Places Status: (Eligible or Listed?)
Historic Bridge Prioritization Status: (Select or Non-Select?)
Historic Character-Defining Features: (Pinned or Riveted Connections, Decorative Railing, Exceptional Length or Skew, etc.)

B. Structure/Dimensions

Surface Type: (Original concrete deck, asphalt overlay, etc.)
Out to Out of Copings: (Width, feet-inches)
Out to Out of Bridge Floor: (Length, feet-inches)
Clear Roadway Width: (Length, feet-inches)
Number of Lanes on Structure:
Skew: (Angle and Direction; i.e., Left or Right)
Type of Superstructure: (Reinforced Concrete Slab, Prestressed Concrete, Structural Steel, etc.)
Spans: (No. and length of each span, feet-inches)
Type of Substructure/Foundation: (Pier Type & Shape, Abutment/End Bent Type, Piles or Spread Footings, etc.)
Seismic Zone: (only if in Zone 2)

C. Appurtenances

Bridge Railing: (Type, height in inches, measured from roadway surface)
Curbs: (Presence, one or both sides, height in inches, width in inches)
Sidewalks: (Presence, one or both sides, height in inches, width in inches)
Utilities: (Power, telephone, etc.)
Railroad: (Presence, if affected by project construction or maintenance of traffic)

D. Approaches

Roadway Width: (feet-inches)
Surface Type: (Asphalt or Concrete)

[3]The sufficiency rating measures a bridge's capability to remain in vehicular service, based on a formula incorporating condition rankings, load capacity, roadway and structure geometrics, traffic counts, presence of suitable detour routes, and other bridge inspection factors. This rating is used as one of the factors for determining if federal funding can be used for rehabilitation and/or replacement of an existing bridge structure. To be eligible for rehabilitation, a bridge must have a sufficiency rating of 80 or less. To be eligible for replacement, the bridge must have a sufficiency rating of less than 50.

Guardrail: (Type)
Guardrail End Treatment: (Type)

IV. EXISTING CONDITIONS

Provide brief statements on the condition of the structural elements. The following provides guidance on the content of this section. Photographs should be provided to support the statements made in each section about deficiencies or inadequacies.

A. Bridge Deck

Indicate the overall condition of the bridge deck (excellent, fair, poor). Describe the extent and location of spalling, presence of existing patches, extent and location of cracking, signs of leakage, etc. If curbs or sidewalks are present, the satisfying INDOT criteria must be evaluated within this context. Indicate any structural, functional, or geometric deficiencies or inadequacies.

B. Superstructure

Indicate the overall condition of the superstructure (excellent, fair, poor). If known or if visible, identify prior repair or maintenance work performed. Where applicable, identify the extent and location of specific structural deficiencies, e.g., cracking, spalling of concrete, rust on metal components, deformation, loss in concrete or metal components. Identify fracture-critical or fatigue-prone members. Identify damage due to collision by vessels, vehicles, etc. Indicate any structural, functional, or geometric deficiencies or inadequacies.

C. Substructures and Foundations

Indicate the overall condition of the substructures and foundations and slope protection (excellent, fair, poor).. If known or if visible, identify prior repair or maintenance work performed, e.g., patching of concrete. Where applicable, identify the extent and location of specific structural deficiencies, e.g., cracking, leaching, deterioration, settlement, rotation, exposed reinforcement. Indicate overall adequacy of drainage with respect to the substructure and foundation and identify problems, e.g., erosion. If known for a bridge in a waterway, indicate evidence (or lack of evidence) for scour, either from visual inspection or from an underwater inspection report. Indicate any structural, functional, or geometric deficiencies or inadequacies.

D. Approaches

Indicate the overall condition of the approaches (excellent, fair, poor). All features within the project limits should be checked for compliance to the current safety standards. Describe other pertinent features that affect driveability and safety. Indicate any structural, functional, or geometric deficiencies or inadequacies.

E. Slopewalls.

Indicate the overall condition and material of existing slopewalls (excellent, fair, poor). Indicate any structural, functional, or geometric deficiencies or inadequacies.

V. PURPOSE AND NEED

The purpose and need statement outlines the problem(s) of the transportation facility and the goal(s) for that facility. The purpose and need section should not be written so narrowly as to describe only the recommended alternative. The purpose and need should be concise and can include the identification of current needs, current capacity, future demand, safety issues, roadway deficiencies, system linkage and legislative directive. The types of needs often associated with bridge projects fall into three main groups: structural deficiencies, functional inadequacies, and geometric deficiencies.

Common concerns of the purpose and need are narrowly defining the project purpose and need; project goals that are too vague or broad; omitting local agencies' policies and goals established in transportation, land use, and other relevant planning studies.

The following is a sample structure for a purpose and need statement:

Background – a short discussion of the location and existing facility.

Purpose – a very clear, concise description of the primary goals the project is expected to attain.

Need – a description of the problems or unsatisfactory conditions that currently exist or are expected with the existing facility or project area.

Other goals/objectives – a description of desired outcomes that are not central to the P&N but are nonetheless important considerations. For example, a travel corridor selected as best addressing identified transportation problems resulting from planning analyses may be part of the project's purpose and need statement.

The above information was primarily taken from the INDOT *Procedural Manual for Preparing Environmental Documents* (2008 Version) and further information and guidance about Purpose and Need can be found in that document:
http://www.in.gov/indot/files/Procedural_Manual_for_Preparing_Environmental_Studies_2008.pdf

An example Purpose and Need statement can be found as an attachment to this document (Figure 1).

VI. ALTERNATIVES

The alternatives analysis must address the following alternatives (A-F) for both Select and Non-Select Bridges (Select Bridges must be preserved as part of the project). The alternatives analysis must prove why each alternative either is or is not feasible and prudent, and it should document the justification for the decision to proceed with the preferred alternative.

Please step down through the alternatives until a feasible and prudent alternative is formulated. Alternatives A-F are to be considered hierarchically. They should be studied in order and the first one that is found to be prudent and feasible while meeting the Purpose and Need of the project should be designated as the preferred alternative. For example, if rehabilitation for continued vehicular use is prudent and feasible, and thus, becomes the preferred alternative, no further analysis is needed.

If replacement is the proposed alternative for a Non-Select bridge, each of the alternatives must be analyzed to determine if there is a feasible and prudent alternative that avoids the use of the historic bridge or minimizes the harm to the historic bridge. If no avoidance alternative is determined to be feasible and prudent or no alternative that poses the least harm to the bridge is determined to be feasible and prudent, then an alternative that uses the historic bridge may be chosen.

The term "feasible" refers to an alternative that is possible to engineer, design and build. The term "prudent" means there are unique problems or unusual factors involved with the use of such alternatives. This means that the cost, social, economic and environmental impacts, and/or community disruption resulting from such alternatives reach extraordinary magnitudes. One can use a totality of these circumstances to establish that these unique problems, unusual factors or other impacts reach extraordinary magnitudes. A transportation agency must select an avoidance alternative if it is feasible and prudent. By contrast, an alternative may be rejected if it is not feasible and prudent.

It is important to document all aspects of engineering assessments and decisions, and to provide these in non-technical terms as much as possible for the lay reader since many consulting parties may not be familiar with engineering terminology. A preliminary cost estimate should be included for each alternative with the detailed cost information included in the appendix. After the discussion of each alternative, provide a summary statement for that alternative. The summary statement should act as a closing argument for the alternative. Be factual and to the point. As explained later in Section VIII, an alternatives analysis table should be included.

Tips for Alternatives Analysis Discussions

- Avoid vague statements: *The bridge has unacceptable safety hazards. The bridge does not meet load capacity requirements*. Be specific about the deficiencies. Provide factual data.
- Avoid alarmist statements: *The bridge poses an immediate danger to the motoring public.* Provide factual data, including accident data
- Only address the standards that are applicable to the specific project/bridge. Explain which chapter of the design manual is applicable and why. Remember to reference Chapter 72-7.0 "Historic Bridge on Low-Volume Local Road" when appropriate.
- If a design exception is needed, explain the factors involved and explain whether it would be appropriate to pursue the design exception.
- Be prepared to answer the question, "Why is the bridge structurally deficient?" Do not state that a bridge is structurally deficient because of its low sufficiency rating: *The bridge's sufficiency rating is 25.5, and therefore, it is structurally deficient*. Sufficiency rating is not tied to thresholds for structural deficiency.
- Provide documentation to back up statements made: *The bridge should be replaced because modern farm equipment can't use it.* Provide information about location and number of farms or results of interviews with nearby property owners. What is the detour length? *The bridge has a history of many vehicular accidents*. Provide the accident data and photographs illustrating the damage.
- When discussing rehabilitation, provide detailed information: *Many of the structural members are in poor condition and require replacement.* Explain which members need replacement and why. Consider a diagram showing this information. Include photographs illustrating the deterioration. What approximate percentage of the members overall will need to be replaced?
- Avoid making recommendation statements without providing the reason: *Ten south truss members, 4 north truss members, and approximately 50% of the lower chord will need to be replaced. The spandrel walls are beyond repair. The bridge needs to be widened.* Why? Provide condition ratings and recent inspection information. Reference the applicable standards.

A. No Build/Do Nothing

The discussion should begin by stating that this alternative means that no federal funds will be expended and that no action would occur. It should be noted that the no build alternative is an avoidance alternative since it would not use the historic bridge. The evaluation should consider all consequences of proceeding with the no build alternative to determine if it is feasible and prudent. The discussion should describe how this alternative would affect the structural, functional, and geometric deficiencies outlined in the purpose and need. A discussion of anticipated impacts to other infrastructure that would be used if the bridge were to become unusable should be included as appropriate. An estimate should be given of the remaining time before the first repairs to the structure are expected.

B1. Rehabilitation for Continued Vehicular Use (two-lane or one-lane option) Meeting Secretary of Interior's Standards for Rehabilitation[4]

B2. Rehabilitation for Continued Vehicular Use (two-lane or one-lane option) NOT Meeting Secretary of Interior's Standards for Rehabilitation

This alternative is to rehabilitate the structure for continued vehicular use, either with two lanes or one lane of traffic across the bridge, as appropriate. Attachment B of the Historic Bridge PA ("Standard Treatment Approach for Historic Bridges") states that when rehabilitation is the selected alternative, the bridge owner will develop plans to rehabilitate the bridge in accordance with the "Secretary of the Interior's Standards for Rehabilitation" (Secretary's Standards) and applicable guidelines, or as close to the Secretary's Standards as is practicable. This is in keeping with the Historic Bridge Programmatic Section 4(f) Evaluation, which states that rehabilitation of the historic bridge without affecting the historic integrity of the structure must be examined.

The Standards were written for buildings and not bridges. Therefore, sometimes it is hard to directly apply them to bridge rehabilitation projects. However, some general principles can be applied. Generally, you should start out with the option of least harm. If that is not possible, investigate the next least harmful option. Repairs should occur before replacement of materials; if replacement is needed, materials should be replaced in-kind, etc.

Sometimes, rehabilitating a bridge following the Secretary's Standards (B1) will result in a bridge that is still structurally or geometrically deficient and the project Purpose and Need is not met. In that case, a rehabilitation *that does not meet* the Secretary's Standards (B2) must also be explored. For example, if a rehabilitation project following the Secretary's Standards (B1) involves retaining a historic railing that does not meet current design standards (through obtaining a design exception), another rehabilitation alternative (B2) that replaces the railing with a new one that meets design standards should be examined. It could be that this second alternative (B2) also does not meet purpose and need for other reasons or is not prudent, but it must be explored nonetheless.

The discussion for Alternative B1 and B2 should describe the members or elements that are in need of replacement or repair, the materials and construction techniques that will be used in the rehabilitation, the bridge's load capacity before and after the rehabilitation, how the bridge will serve traffic following the rehabilitation, and the cost of the alternative. The discussion should describe how this alternative would affect the structural, functional, and geometric deficiencies outlined in the purpose and need. The discussion should explain which elements of the bridge that contribute to its historic nature will need repair or replacement, and how the repair or replacement effects the overall historic material integrity. Include a statement regarding the expected service life of the bridge once rehabilitation has been completed.

A table should be used to summarize the existing conditions and applicable design criteria. In a table format, the reader can quickly and easily see comparable information regarding the structure's deficiencies. This table could manifest itself in several ways, but a format

[4] The Secretary of Interior's Standards for Rehabilitation can be found at the following website: http://www.nps.gov/hps/tps/standguide/rehab/rehab_standards.htm.

similar to that shown as an example in Figure 2 (attached) is recommended to capture the relevant information.

1. This alternative is Feasible:
   a. If the minimum design standards in the *Indiana Design Manual*, including those from Chapter 72-7.0 "Historic Bridge on Low-Volume Local Road," can be addressed, or
   b. If INDOT approves a design exception for continued vehicular use, or
   c. If the bridge spans an active railroad, the minimum design standards of the railroad can be addressed.

2. This alternative is Prudent:
   a. Select Bridge – If the initial rehabilitation cost is less than 80% of the replacement cost, rehabilitation is warranted; or if the initial rehabilitation cost is equal to or greater than 80% of the replacement cost, the owner may request further consultation with FHWA to determine rehabilitation eligibility.
   b. Non-Select Bridge - If the initial rehabilitation cost is less than 40% of the replacement cost, rehabilitation is warranted.

3. This alternative may not be Prudent and replacement may be warranted if the initial rehabilitation cost of a Non-Select Bridge is greater than or equal to 40% of the replacement cost, or the bridge meets any two of the following criteria that cannot be economically corrected as part of a rehabilitation project:
   a. The bridge's waterway opening is inadequate (i.e., National Bridge Inventory Item 71 is rated 2 or 3).
   b. The bridge has a documented history of catching debris due to inadequate freeboard or due to piers in the stream.
   c. The bridge requires special inspection procedures (i.e., the first character of National Bridge Inventory Item 92A or 92C is Y).
   d. The bridge is classified as scour-critical (i.e., National Bridge Inventory Item 113 is rated 0, 1, 2, or 3).
   e. A fatigue analysis conducted in accordance with *Indiana Design Manual* indicates the bridge has fatigue-prone welded details that are expected to reach the end of their service lives within the next 20 years.
   f. The bridge has a Sufficiency Rating of lower than 35.

When evaluating this alternative, explain whether a design exception is needed. If so, what specific exception(s) would be needed? Explain the factors involved and explain whether it would be appropriate to pursue the design exception(s).

C1. <u>Rehabilitation for Continued Vehicular Use (one-way pair option) Meeting Secretary of Interior's Standards for Rehabilitation</u>

C2. <u>Rehabilitation for Continued Vehicular Use (one-way pair option) NOT Meeting Secretary of Interior's Standards for Rehabilitation</u>

A bridge may be rehabilitated and left in place, and a new bridge and new approaches may be built adjacent to it. This effectively creates one bridge and approaches for each direction

of travel to create a one-way pair. For this situation, the new bridge must meet all design standards for a new bridge. Where appropriate, the new one-way bridge must be able to accommodate future widening to provide for two-way travel. Attachment B of the Historic Bridge PA states that when rehabilitation is the selected alternative, the bridge owner will develop plans to rehabilitate the bridge in accordance with the Secretary's Standards and applicable guidelines, or as close to the Secretary's Standards as is practicable. This is applicable in a one-way pair option, and this is in keeping with the Historic Bridge Programmatic Section 4(f) Evaluation, which states that rehabilitation of the historic bridge without affecting the historic integrity of the structure must be examined.

Sometimes, rehabilitating a bridge following the Secretary's Standards (C1) will result in a bridge that is still structurally or geometrically deficient and the project Purpose and Need is not met. In that case, a rehabilitation *that does not meet* the Secretary's Standards (C2) must also be explored. It could be that this second alternative (C2) also does not meet purpose and need for other reasons or is not prudent, but it must be explored nonetheless.

The discussion should describe how this alternative would affect the structural, functional, and geometric deficiencies outlined in the purpose and need. In addition to many of the same issues that are addressed in the rehabilitation option described above, which can be incorporated into the discussion by reference, the analysis of this alternative should include details regarding the new bridge and its appearance, location, and potential impacts to the historic bridge. Additionally, this alternative should outline how much new right-of-way will be required, and the associated cost. Include a statement regarding the expected service life of the bridge once rehabilitation has been completed.

1. This alternative is Feasible:
   a. If the minimum design standards in the *Indiana Design Manual,* including those from Chapter 72-7.0 "Historic Bridge on Low-Volume Local Road," can be addressed, or
   b. If INDOT approves a design exception for continued vehicular use for the Select bridges that require a design exception, which are listed in Chapter 5, Volume 4 (List of Select and Non-Select Bridges) of the Historic Bridge Inventory, or
   c. If the bridge spans an active railroad, the minimum design standards of the railroad can be addressed.

2. This alternative is Prudent:
   a. Select Bridge – If the initial rehabilitation cost is less than 80% of the replacement cost, rehabilitation is warranted; or if the initial rehabilitation cost is equal to or greater than 80% of the replacement cost, the owner may request further consultation with FHWA to determine rehabilitation eligibility.
   b. Non-Select Bridge - If the initial rehabilitation cost is less than 40% of the replacement cost, rehabilitation is warranted.

3. This alternative may not be Prudent and replacement may be warranted if the initial rehabilitation cost of a Non-Select Bridge is greater than or equal to 40% of the replacement cost, or the bridge meets any two of the following criteria that cannot be economically corrected as part of a rehabilitation project:

a. The bridge's waterway opening is inadequate (i.e., National Bridge Inventory Item 71 is rated 2 or 3).
b. The bridge has a documented history of catching debris due to inadequate freeboard or due to piers in the stream.
c. The bridge requires special inspection procedures (i.e., the first character of National Bridge Inventory Item 92A or 92C is Y).
d. The bridge is classified as scour-critical (i.e., National Bridge Inventory Item 113 is rated 0, 1, 2, or 3).
e. A fatigue analysis conducted in accordance with *Indiana Design Manual* indicates the bridge has fatigue-prone welded details that are expected to reach the end of their service lives within the next 20 years.
f. The bridge has a Sufficiency Rating of lower than 35.

When evaluating this alternative, explain whether a design exception is needed. If so, what specific exception(s) would be needed? Explain the factors involved and explain whether it would be appropriate to pursue the design exception(s).

D. Bypass (non-vehicular use)/Build New Structure

This alternative calls for the rehabilitation of the historic bridge for non-vehicular use and the construction of a new bridge. Therefore, many of the same issues that are covered by the previous options may also be included or referenced in the analysis of this alternative. Remember that load capacity and safety requirements for pedestrian bridges are not the same as vehicular bridges. As a result, additional information regarding pedestrian load ratings and railings should be included in the discussion of this alternative. Additionally, site considerations need to be taken into account and explained, such as how pedestrian access will be achieved, parking issues, ADA requirements, etc. The cost of the alternative should be included. The discussion should describe how this alternative would affect the structural, functional, and geometric deficiencies outlined in the purpose and need.

It is also important to note that for Select Bridges, the owner is responsible for rehabilitation costs associated with the historic bridge. For Non-Select Bridges, a responsible party other than the owner must come forward to fund preservation/maintenance for this to be a prudent alternative.

Because all Select Bridges must be preserved, it is possible that the feasible and prudent alternative would be to implement this alternative while affecting the historic integrity of the existing bridge. It might not be possible to avoid affecting the historic integrity of the existing bridge. In that case, two alternatives should be explored and labeled as D1 and D2. The alternative that bypasses the existing structure and builds a new structure without affecting the historic integrity of the existing structure should be labeled as Alternative D1. The alternative that bypasses the existing structure and builds a new structure while affecting the historic integrity of the existing structure should be labeled as Alternative D2.

When evaluating this alternative, explain whether a design exception is needed. If so, what specific exception(s) would be needed? Explain the factors involved and explain whether it would be appropriate to pursue the design exception(s).

E. Relocation of Historic Bridge and New Bridge Construction

This alternative calls for the moving of the historic bridge to a new location for some other use and the construction of a new bridge in its place. Discussion of the conditions of the new location for the historic structure along with an explanation of its future use should be provided. The analysis should also include discussion of any realignment of the roadway, new right-of-way or easements that are required by the new bridge structure, and what type of structure will replace the existing historic bridge. The cost of the new structure should be discussed. The discussion should describe how this alternative would affect the structural, functional, and geometric deficiencies outlined in the purpose and need.

It is important to note that for Select Bridges, the owner is responsible for rehabilitation costs associated with the historic bridge in its new location/use. For Non-Select Bridges, a responsible party other than the owner must come forward to fund relocation/preservation/maintenance for this to be a prudent alternative.

F. Replacement --Demolition of Historic Bridge and New Bridge Construction

This alternative calls for the demolition of the historic bridge and the construction of a new bridge in its place. Because this alternative calls for the construction of a new bridge, many of the same issues that are covered by the relocation option can be included or referenced in the analysis of this alternative. The cost of the new structure should be discussed. The discussion should describe how this alternative would affect the structural, functional, and geometric deficiencies outlined in the purpose and need.

It is important to note that this alternative is NOT an option for Select Bridges. For Non-Select Bridges, this becomes a prudent alternative after the bridge has been marketed per the requirements of the Historic Bridge PA, and no responsible party other than the owner has come forward to fund relocation/preservation/maintenance of the bridge.

VII. MINIMIZATION AND MITIGATION

In addition to evaluating if there is a feasible and prudent avoidance alternative, minimization and mitigation of unavoidable impacts to the historic resource is required. Minimization means that the impacts are reduced to the maximum extent possible. Mitigation refers to actions that compensate for the impacts to the historic resource.

A. Minimization

If design modifications that lessen the harm to a rehabilitated historic bridge are utilized, they should be noted. Such measures might include:

- Hiding strengthening members
- Replacing rivets that need to be replaced with round-headed bolts, rather than polygonal-headed bolts
- Use of non-standard or aesthetic railing
- Design exceptions

B. Bridge Marketing

For Non-Select Bridges, explain the marketing measures that have occurred per the Historic Bridge PA, including when notices were published in newspapers, when the bridge was posted to the INDOT marketing website, and when signs were installed at the bridge site. Indicate whether any serious inquiries have been made about the structure as a result of the marketing efforts so far.

C. Mitigation

The Historic Bridge PA prescribes the mitigation measures for impacts to historic bridges. Please explain whether the bridge owner will need to consult with the Indiana SHPO to determine if photo documentation of the bridge is needed. If this consultation has already occurred and the requirements are known, specify the photo documentation standards and distribution requirements. If this consultation has not yet occurred, please indicate that it will occur as appropriate.

VIII. PRELIMINARY PREFERRED ALTERNATIVE

This section should specifically note which alternative is recommended as feasible and prudent, and therefore is the preliminary preferred alternative for the proposed project. This statement should be short and explicit.

An alternatives analysis table should be included to quickly and easily show comparable information regarding the alternatives side-by-side. This table could manifest itself in several ways to show how the alternatives compare to each other. The tables shown as examples are recommended since they includes the issues considered in the alternatives analysis (Figures 6-7).

APPENDICES

Any of the items listed as appendices here can also be incorporated into the text of the document as appropriate, in place of or in addition to appendices.

A. MAPS

Maps that show the bridge location must be included. All maps should include a scale, a north arrow, and a key or legend. To accurately illustrate the bridge location, three types of maps are recommended for inclusion in the document:

1. Overview map showing the bridge location within the county and state.
2. USGS topographic quadrangle map (1:24000 scale) showing the bridge location. The caption of the topographic map should be properly titled, for example; “Portion of the USGS 7.5’ series Miami, Indiana topographic quadrangle showing the location of the project area.”
3. Aerial photograph with the bridge identified. Aerial photographs must include the date of aerial photos in the caption. For example, “A 2008 aerial photograph showing the project location.”

B. PHOTOGRAPHS

Color photographs of the project area that show the bridge approaches, views looking upstream and downstream of the bridge, and land use surrounding the bridge are recommended. Provide photographs depicting in sufficient detail the overall condition of the bridge and its elements. The photographs can then be used in reviewing and evaluating the existing condition and alternatives recommendations. The following procedures apply to photographs.

1. Log all photographs as taken.
2. Beneath each photograph, identify the following:
    a. the photo vantage point,
    b. the direction the photographer is looking, and
    c. the description of the view.

C. DRAWINGS

Provide schematics, as necessary, for the existing bridge cross section and the preferred alternative bridge cross section. Consider providing separate schematics according to spans outlining the work that needs to be undertaken for specific alternatives. Highlighting and marking up these drawings to illustrate the proposed work is helpful for consulting parties that are not familiar with engineering drawings. Example drawings are attached (s 3-4).

D. COST ESTIMATES

A preliminary cost estimate should be included for each alternative discussed. Minor miscellaneous items may be combined into one lump-sum item. The preliminary cost estimate, projected to the scheduled contract letting, should be based on INDOT's current construction-cost-estimating software system. An example cost estimate is attached (Figure 5).

FIGURE 1. EXAMPLE PURPOSE AND NEED STATEMENT

The purpose of the project is to provide a structurally sufficient and hydraulically adequate structure that provides a safe and efficient crossing of CR 100 over Blue Creek at this location. The need for the action is due to the poor condition of the existing structure. The structure is suffering from overall deterioration. According to the most recent bridge inspection (2011), the deck is in fair condition and the superstructure and substructure are both in poor condition. The bridge inspection report noted several deficiencies as outlined in the existing conditions section of the document. The most recent sufficiency rating (2011) for the bridge was determined to be 37.9 (of out of a possible 100 points).

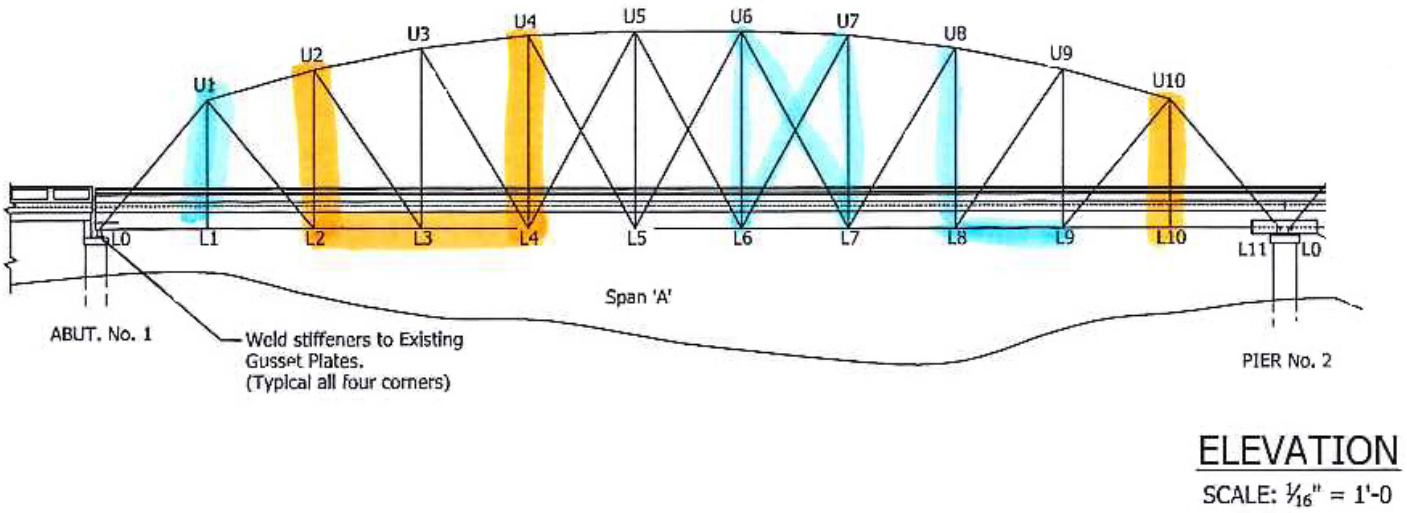
The bridge has a clear roadway width of 22 ft. This is below current INDOT design standards for this type of roadway (travelway plus 2 ft on each side; Figure 55-3A from the Design Manual). The location of the pier in the center of the waterway causes drift to accumulate and is causing considerable scour with the possibility of debris hitting the pier, resulting in damage to or failure of this member.

FIGURE 2. TABLE TEMPLATE TO SUMMARIZE BRIDGE'S EXISTING CONDITIONS AND APPLICABLE DESIGN CRITERIA

Design Element	Design Manual Section	Minimum Design Criteria	Existing Condition	Proposed Condition[5]	Design Exception Required
Travel Lane	Chapter & Section/Figure No.	Ft.	Ft.	Ft.	Yes/No
Shoulder	Chapter & Section/Figure No.	Ft.	Ft.	Ft.	Yes/No
Structural Capacity	Chapter & Section/Figure No.	Load Rating	Load Rating	Load Rating	Yes/No
Clear Roadway Width	Chapter & Section/Figure No.	Ft.	Ft.	Ft.	Yes/No
Vertical Clearance	Chapter & Section/Figure No.	Ft.	Ft.	Ft.	Yes/No
Other elements as applicable	Chapter & Section/Figure No.	Measurement	Measurement	Measurement	Yes/No

[5] What the rehabilitation work will provide after completion.

FIGURE 3. DRAWING EXAMPLE TO ILLUSTRATE NEEDED WORK FOR A REHABILITATION ALTERNATIVE ON A STEEL TRUSS



*orange indicates members to be replaced
*blue indicates members to be repaired

FIGURE 4. DRAWING EXAMPLE TO ILLUSTRATE NEEDED WORK FOR A REHABILITATION ALTERNATIVE ON A CONCRETE RAILING

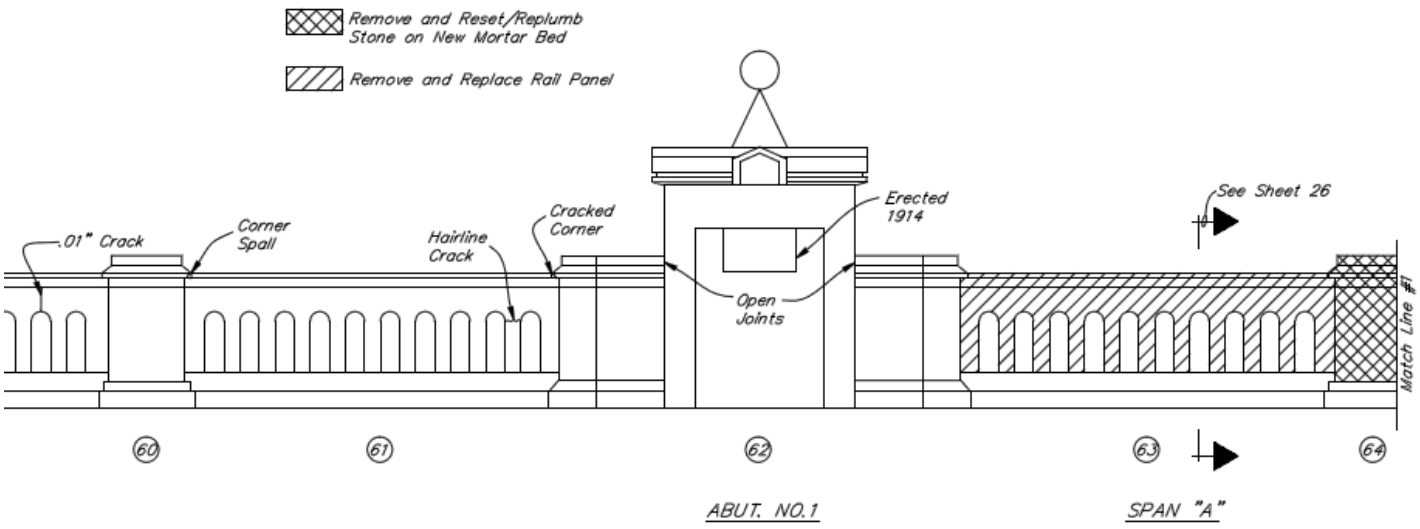


FIGURE 5. EXAMPLE COST ESTIMATE FOR A REHABILITATION ALTERNATIVE

Item No.	Item Code	Description	Quantity	Unit	Unit Price	Item Total
1	105-06845	CONSTRUCTION ENGINEERING	1	LS	$30,000.00	$30,000.00
2	110-01001	MOBILIZATION AND DEMOBILIZATION	1	LS	$60,000.00	$60,000.00
3	201-01015	CLEARING AND GRUBBING	1	LS	$2,000.00	$2,000.00
4	202-02241	GUARDRAIL, REMOVE	1,400	LFT	$6.00	$8,400.00
5	202-XXXXX	TEMP. TRAFFIC SIGNALS AND EQUIPMENT, REMOVE	1	LS	$3,000.00	$3,000.00
6	207-08263	SUBGRADE TREATMENT, TYPE IA	425	SYS	$10.00	$4,250.00
7	303-01180	COMPACTED AGGREGATE, NO. 53	60	TON	$25.00	$1,500.00
8	402-07433	HMA SURFACE, TYPE B	35	TON	$75.00	$2,625.00
9	402-07438	HMA INTERMEDIATE, TYPE B	46	TON	$65.00	$2,990.00
10	402-07441	HMA BASE, TYPE B	185	TON	$55.00	$10,175.00
11	406-05520	ASPHALT FOR TACK COAT	0.1	TON	$400.00	$40.00
12	601-01522	GUARDRAIL TRANSITION TYPE TGB	4	EACH	$2,000.00	$8,000.00
13	601-02103	GUARDRAIL, W BEAM, SHOP CURVED, 6 FT. 3 IN. SPACING	200	LFT	$60.00	$12,000.00
14	601-94689	GUARDRAIL END TREATMENT, OS	4	EACH	$3,000.00	$12,000.00
15	601-99105	GUARDRAIL, W BEAM, 6 FT. 3 IN. SPACING	1,200	LFT	$35.00	$42,000.00
16	706-05732	CONCRETE BRIDGE RAILING TRANSITION, TBC	4	EACH	$2,000.00	$8,000.00
17	801-06775	MAINTAINING TRAFFIC	1	LS	$30,000.00	$30,000.00
18	609-XXXXX	EXISTING BRIDGE REHABILITATION COST	14,220	SFT	$85.00	$1,208,700.00
		SUB TOTAL				**$1,445,680.00**
		CONTINGENCIES - 20%				**$289,136.00**
		TOTAL				**$1,734,816.00**

FIGURE 6. ALTERNATIVES ANALYSIS TABLE TEMPLATE

Alternative	Meets Project Purpose & Need?	Construction Cost	ROW Amount & Cost	Total Cost	Other Factors	Feasible & Prudent?
A- No Build	Yes/No	Cost	ROW in acres & Cost	Cost	If applicable, explain	Yes/No. If no, explain.
B-1-Rehabilitation for Continued Vehicular Use (two-way or one-way option) (Rehab Work = No Adverse Effect)	Yes/No	Cost	ROW in acres & Cost	Cost	If applicable, explain	Yes/No. If no, explain.
B-2-Rehabilitation for Continued Vehicular Use (two-way or one-way option) (Rehab Work = Adverse Effect)	Yes/No	Cost	ROW in acres & Cost	Cost	If applicable, explain	Yes/No. If no, explain.
C1-Rehabilitation for Continued Vehicular Use (one-way pair option) (Rehab Work = No Adverse Effect)	Yes/No	Cost	ROW in acres & Cost	Cost	If applicable, explain	Yes/No. If no, explain.
C2-Rehabilitation for Continued Vehicular Use (one-way pair option) (Rehab Work = Adverse Effect)	Yes/No	Cost	ROW in acres & Cost	Cost	If applicable, explain	Yes/No. If no, explain.
Bypass (non-vehicular use)	Yes/No	Cost	ROW in acres & Cost	Cost	If applicable, explain	Yes/No. If no, explain.
Relocate	Yes/No	Cost	ROW in acres & Cost	Cost	If applicable, explain	Yes/No. If no, explain.
Replacement	Yes/No	Cost	ROW in acres & Cost	Cost	If applicable, explain	Yes/No. If no, explain.

FIGURE 7. ALTERNATIVES ANALYSIS TABLE EXAMPLE

Alternative	Meets Project Purpose & Need?	Construction Cost	ROW Amount & Cost	Total Cost	Other Factors	Feasible & Prudent?
A-No Build	No	N/A	N/A	N/A	Deterioration of superstructure would continue & lead to eventual closure of the bridge. Bridge's waterway opening is inadequate. Bridge does not meet the required load capacity.	The alternative is not prudent because it does not meet the project purpose and need.
B-1-Rehabilitation for Continued Vehicular Use (two-way or one-way option)(Rehab Work = No Adverse Effect)	No	$1,417,323	No new ROW required	$1,417,323	Design exception needed to retain existing railing. Bridge's waterway opening would still be inadequate.	The alternative is not feasible because it cannot be constructed in accordance with sound engineering principles and practices and it does not meet the project purpose and need.
B-2-Rehabilitation for Continued Vehicular Use (two-way or one-way option) (Rehab Work = Adverse Effect)	No	$1,525,480	No new ROW required	$1,525,480	Total replacement of character-defining railing. Bridge's waterway opening would still be inadequate.	The alternative is not feasible because it cannot be constructed in accordance with sound engineering principles and practices and it does not meet the project purpose and need.
C-1-Rehabilitation for Continued Vehicular Use (one-way pair option) (Rehab Work = No Adverse Effect)	No	$3,99,5523	2.5 acres ($15,000)	$4,010,523	Impacts to 3.0 acre of wetland. Design exception needed to retain existing railing. Existing Bridge's waterway opening would still be inadequate.	The alternative is not feasible because it cannot be constructed in accordance with sound engineering principles and practices and it does not meet the project purpose and need. Additionally, increased wetland impacts and mitigation costs make it not prudent.
C-2-Rehabilitation for Continued Vehicular Use (one-way pair option) (Rehab Work = Adverse Effect)	No	$3,99,5523	2.5 acres ($15,000)	$4,118,680	Impacts to 3.0 acre of wetland. Total replacement of character-defining railing. Existing Bridge's waterway opening would still be inadequate.	The alternative is not feasible because it cannot be constructed in accordance with sound engineering principles and practices and it does not meet the project purpose and need. Additionally, increased wetland impacts and mitigation costs make it not prudent.
Bypass (non-vehicular use)	Yes	$2,533,633	2.5 acres ($15,000)	$2,548,633	Impacts to 3.0 acre of wetland. Responsible party other than owner must come forward to assume ownership of bridge.	This alternative is not prudent because no party has come forward to fund preservation/maintenance of the historic structure.
Relocate	Yes	$1,693,633	0.5 acre ($5,000)	$1,698,633	Responsible party other than owner must come forward to take & relocate bridge.	This alternative is not prudent because no party has come forward to fund relocation/preservation/maintenance of the historic structure.
Replacement	Yes	$1,693,633	0.5 acre ($5,000)	$1,698,633	None	Yes.