Presentation Outline

- Study Area
- Bridge History
- Bridge Condition
- Project Selection Process
- Selected Alternative
- Pier Strengthening
- Section 106 and Section 6002 coordination
- Next Steps
Two Historic Towns – One Community

One of two Ohio River bridges between Cincinnati and Louisville

I-65 Bridge - 46 miles
Markland Dam - 26 miles
I-275 Bridge – 65 miles
Connecting Two Historic Towns That Work As One Community

**Madison, Indiana**
- Largest National Historic Landmark District with 1,800+ buildings
- Clifty Falls State Park & other tourist attractions, including Madison Regatta
- Population 12,600

**Milton, Kentucky**
- Historic river town susceptible to flooding
- Rural community divided by 400 ft tall bluff
- Population 600
US 421 Bridge History

• 3,181-foot long truss structure with two 10-foot wide travel lanes
• Built in 1929 by J. G. White through National Toll Bridge Company
  – Tolled until 1949: 5¢ for pedestrians, 45¢ for vehicles
• Purchased by Kentucky in 1939; half interest sold to Indiana in 1970s
US 421 Bridge Today

- 10,700 vpd (2008)
- 4% truck traffic
- 70% of bridge traffic destined for Madison
- 48 reported crashes on bridge in 4 years, plus other minor accidents (trucks knocking off side view mirrors)
- Last major rehabilitation in 1997
- Weight limit posted in April 2009 to prohibit trucks over 15 tons
US 421 Bridge Condition

• 2009 Sufficiency Rating of 6.5 out of 100 possible points
• Since 1994, $11.2 million invested in bridge
• Structurally Deficient & Functionally Obsolete
• Remaining Service Life of the structure estimated at 10 years
Milton-Madison Bridge Project

- Led by the “M3T” – leadership from KYTC, INDOT, and FHWA in both states
- Extensive coordination with
  - Stakeholders
  - Resource agencies,
  - Historic preservation groups,
  - Project Advisory Group
  - Members of the public
- Extensive media coordination
- Project Website

States and FHWA agreed to regular meetings where key decisions were made
Managing Expectations From The Beginning

1. A Constructible & Affordable Bridge
2. Consensus among Agencies, Stakeholders, Public
3. Federally Approved Environmental Document
4. In the end, KYTC & INDOT will own one Bridge

**NOT Project Purpose and Need**

Clearly define what the project sponsors (KYTC/INDOT) expected from this project
Milton-Madison Bridge Project
Purpose and Need

• Improve or replace functionally obsolete/structurally deficient bridge

• Improve or maintain cross-river mobility and community connectivity

• Improve safety

Developed with input from resource agencies, Project Advisory Group (PAG) members, local officials, and the public
Consider Everyone’s Ideas

1. Do Nothing
2. Rehabilitation
3. Superstructure Replacement
4. Multiple New Alignments (12)
5. Tunnel
6. Pontoon Bridge
7. TSM
8. Transit
9. Ferry

Partnering Conference 2008
Missouri DOT Presentation on Practical Solutions Inspires Superstructure Replacement Alternative
Initial Bridge Location Alternatives

ALL alternatives considered
Screening of Alternatives

20 Alternatives were reduced to 5 for detailed study through:

- Technical Analysis
- Input from PAG
- Agency Screening webinar
- Section 106 Screening webinar
- Agency/Section 106 comment period
- Public Input

Costs were not part of initial screening
**Key Finding of the Initial Screening Process**

- Eight alternatives eliminated because they did not meet Purpose & Need
- Seven alternatives eliminated because they would have major impacts or face excessive challenges *(Red Flags)*

*Tell stakeholders why you made the decision*
$50 million savings for over Tiber and Canip Creek Options
• Fracture Critical Inspection
• Diverse opinions on alternatives
• Superstructure replacement can be done
• Costs of Superstructure replacement much less than others
• Local officials wanted a bridge ASAP
• Project could be built to meet TIGER grant requirements

Present availability of funding and practical timeline for construction
The Proposed Action

Based on a variety of factors, the Superstructure Replacement with Minimal Approaches Alternative is beginning to emerge as a leading option

- Continued Bridge Deterioration
- Impacts to Historic Resources
- Impacts to Homes and Businesses
- Lowest Cost Alternative
- Availability of TIGER Grant
- Fastest Completion Time

Affordability can be a criteria for a NEPA decision
Superstructure Replacement with Minimal Approaches

- Milton Approach re-construction
- Structure No. 1 replacement
- Structure No. 2 replacement
  - Scour Mitigation and Pier Strengthening
  - Superstructure Replacement
- Structure No. 3 replacement
- Construction of Structure No. 4

No Right-of-Way required
Navigation Channel does not need to be widened
“Reasonable” expectation of traffic growth
Other Key Features of Superstructure Replacement with Minimal Approaches

1. Maximum 12 Month Closure
2. Temporary Ferry Service
3. Accommodate Peregrine Falcon
4. Numerous Section 106 commitments
5. Numerous environmental commitments
View from Milton

Existing

Proposed
Structure Design Requirements

1. Assure 75 year service life
2. Feasible
3. Permittable
4. Visually Acceptable
5. Develop Design Criteria
Benefits of Pier Strengthening

- Piers are in good condition.
- Minimize impacts to historic properties.
- Cost effective
- Can maintain existing navigational channel.

Avoided need for longer environmental process and more costly alignments
Pier Strengthening Considerations

- 75 year design life
- Design pier strengthening to accommodate all loading demands including wind and barge impact.
- Consideration of soil support loss (scour)
- Limited existing rock capacity.
Typical Existing River Piers

Existing Pier stem reinforcing extends 12’ into caisson

Un-reinforced Caisson

Un-reinforced Rock Socket 1.7’-6.7’ deep

20’ Water

60’ Soil

Boulders
Pier Construction Methods
Pier Construction Methods
Pier Construction Methods
Pier Construction Methods
Pier Construction Methods
Pier Construction Methods
Pier Construction Methods
Pier Construction Methods
Pier Construction Methods
Drilling through Piers
Drilling through Piers

Investment in coring & engineering was crucial in reuse of piers.
Detailed Inspection of Piers
Viable Foundation Options Considered

- **Encasement**
- **Drilled Shafts**
- **Soil Response**

Diagram details:
- Sheet Pile
- Boulders
- Shale
- Cap
- 3 drilled shafts each side
- Contraction Scour
- Local Scour
- Boulders
- Shale
- \( P_a \), \( P_p \)
Soil Response

1. Scour Mitigation is required
   - Prevent scour (Soil provides resistance to loads)
   - Placed below
     - Future Dredge Depth (14ft below Normal Pool)
     - Contraction Scour (2.7ft below mudline)

2. Soil Structure Interaction methods
   - Developed Soil and Rock Parameters
   - 3D Finite Element Analysis

Pier strengthening is more cost effective than constructing new piers
1) Scour Mitigation Measures

- Rip Rap with Filter
- Articulated Block Mat
- Jet Grouting
Proposed Pier Strengthening
Proposed Pier Strengthening
Proposed Pier Strengthening

1) Drill holes into existing unreinforced caisson

2) Grout dowels into holes and extend above top of caisson

3) Add stem reinforcement

4) Form and cast collar and new cap
Section 106 Commitments

1. 4 Span Truss Superstructure
Section 106 Commitments

2. Truss Profile “appearance” is established
   • Panel Geometry
   • Truss Depth Requirements in scope
3. Truss shall be painted (Color # 35526)
Section 106 Commitments

4. Sway Bracing shall be minimized
5. Specified INDOT TF-2 Railing
6. Aluminum Pedestrian Railing
Section 106 Commitments

7. Piers 2-5 encased and widened

8. Piers 2-5 shape similar to contract plans

9. Pier 6 shape similar to other piers

10. Ashlar form liners to be used on abutments, wing walls and any retaining walls
Section 106 Consultation Process
July 2009 – December 2009

Through a series of 4 meetings, consulting parties helped
• Define the Area of Potential Effect (APE)
• Identify 80 eligible historic resources
• Determine project effects on eligible historic resources
• Develop mitigation measures

At the September 2009 meeting, the group covered eligibility, preliminary effects, and began discussing mitigations.
Section 106 Consultation Process

**Representation from:**
- Advisory Council on Historic Preservation
- National Park Service
- National Trust for Historic Preservation
- Native American Tribes
- State Historic Preservation Offices in KY & IN
- Indiana Historic Landmarks Foundation
- Local historic preservation groups
- Area Residents

*Total 30+ participants*
Section 106 Consultation Process

Strategies employed for building consensus:

• In person meetings facilitate active participation/ call-in option for out-of-town agencies participation
• Participants understood the need to replace the bridge.
• Circulating draft documents prior to meetings gave consulting parties time to review and formulate comments; kept meeting discussions focused on key topics
• Focused on essential issues: team began discussing potential mitigations at second Section 106 meeting
• Gave consideration to all proposed mitigation
Mitigations – Important to Success

- New truss superstructure mimicking historic truss profile
- Free Ferry Service operating 24/7 between Milton & Madison
  - Plan to minimize disruptions from traffic using ferry
  - Temporary modifications at campground & boat ramp to create docks
- Funding for local programs to offset economic impacts of closure
  - Tourism/Marketing campaign in both cities
  - Historic Preservation Officer for Madison
  - Local business assistance through Madison Main Street Program
- Commitment to follow Section 106-like process on any future approach improvement projects (not programmed in either STIP)
- Measures to offset loss of historic bridge
  - Preserve builder plates from existing bridge
  - Photo documentation of existing bridge
  - Restoration of 1929 film of original bridge opening ceremony
Mitigations — Important to Success

- Updates to National Register District forms in Milton and Madison
- Archaeological Testing
- Measures to reduce construction impacts
  - Vibration monitoring on historic structures
  - Limits for construction and noise during festivals
- Emergency medical service in Milton/Trimble County during closure
- Relocation of Peregrine Falcon nest boxes
- Planning study for pedestrian/bicycle facilities in Milton
- Planning for scenic overlook/walkways along riverfront in Milton
- Underwater survey to relocate Madison Regatta race course downriver during construction
Keys to Success

Sense of Urgency by everyone engaged!

Use of Bi-State Project Management Team (KYTC, INDOT and FHWA) to make decisions

Use of Media Relations Firm to help shape and interpret our message to the media

Use of NEPA Legal Counsel trusted by FHWA General Counsel to review NEPA/Section 4f/Section 106 documentation

Compressed Section 106 Consultation for eligibility, preliminary effects, and mitigations into two meetings
Keys to Success

To meet the requirements for the stimulus program, the project schedule was dramatically accelerated.

NEPA process completed in 21 months, from initiation to signed FONSI. Field work, alternative selection, and final documents completed in 5 months.

Use of Section 6002 agency coordination process under SAFETEA-LU to expedite review periods and streamline permitting process/Concurrent Review of Documents

Use of Design-Build Contract to encourage innovation and meet construction timeline
• **Original Schedule had EA/FONSI completed in Fall 2012**

• FONSI Signed March 10, 2010

• All Permits Obtained – June 2010

• Design-Build Advertisement June 2010

• Letting - September 2010

• Begin Construction Fall 2010, with maximum 365-day bridge closure

• Bridge open to traffic September 2012

• Complete by May 2013
Animation
Key Project Documents

In-depth Engineering Study resulted in criteria and information documented in the following:

A. Scope of Services
B. Project Special Provisions
C. Contract Bridge Drawings
D. Contract Plan Details
E. Project Specific Reports (Binding)
F. Project Specific Reports (Information Only)
Project Reports & Special Provisions:

Binding Project Reports

i. FINAL REPORT - STUDY OF VESSEL COLLISION ON BRIDGE PIERS, MILTON MADISON BRIDGE, MARCH 2010 (BAKER)

ii. WIND ENGINEERING STUDY - FINAL REPORT (RWDI)

iii. MILTON-MADISON BRIDGE, GEOTECHNICAL OVERVIEW (KYTC/BAKER)

Other Project Specific Reports (Information Only)

i. PIER STRENGTHENING REPORT FOR EXISTING PIERS 6-9 (BAKER)

ii. EXISTING PIERS SERVICE LIFE ASSESSMENT (CTL)

iii. FINAL ENVIRONMENT ASSESSMENT REPORT FOR THE MILTON MADISON BRIDGE (WSA)

iv. PRELIMINARY HYDRAULIC and SCOUR ANALYSIS REPORT (WSA)

Design Criteria Special Provisions (Binding)

i. STRUCTURE PERFORMANCE CRITERIA (SPC) FOR BRIDGE NO.2

ii. STRENGTHENING OF EXISTING PIERS
Polling Summary

February 12, 2009, Public Meeting Participants at the Brown Gym in Madison

168 citizens attended
  • 18 Public Advisory Group (PAG) Members
  • 14 Section 106 Representatives
  • 6 People on the PAG and serving as 106 Reps
  • 130 Citizens

Keypads were used to collect data (overlap of groups)
  • General public, PAG, Section 106 Parties

Preference scores
  • Public and the PAG members were very similar
  • Section 106 parties were statistically different
  • Two models were built to understand the data
    1) Public and PAG
    2) Section 106

The results are intended to help designers understand visual/aesthetic preferences of participants.
Polling Summary

Bridge Concepts

• 18 bridge design concepts were presented
  – 6 arch designs
  – 1 truss-arch
  – 5 trusses
  – 6 cable-stay concepts

• Each concept included various combinations of bridge design properties
  – Visual complexity (low to high)
  – Color value (lightness to darkness)
  – Type of enclosure (overhead closed or open) “A” to “H”
  – Overall profile of the structure (number of peaks)
Polling Summary

General Observations

• More agreement on dislikes

• Preferred Cable-Stays (High Standard Deviation)

• Preferred profiles that repeat themselves

• Public/PAG and Section 106 average scores were often different
  – Higher highs and lower lows for Section 106 responses

• Process was well liked
  – 85% scored 7 or higher
Polling Summary

Arch Preference Summary

• Twin Arches Generally Preferred Over Singles

• Light Color preferred with Low to Moderate Complexity

• Single Arches
  – “H” shape preferred with Light Colors and Low/Moderate Complexity

• Twin Arches
  – “A” or “Modified A” shape preferred
Polling Summary

Truss Preference Summary

• More Haunches preferred
• Less Enclosure preferred
• Color & Haunches
  – Lighter Color Values preferred for Multiple Haunches (Peaks)
  – 106 preferred More Haunches regardless of Color
• Trusses slightly preferred by 106 Parties compared to Public
• Strongest Negatives generated by 3 of the Trusses shown
Polling Summary

Milton Madison
Average Mean Scores

4 Span Truss Bridge Similar to the Existing
Project Description and Overview
View from Madison
• Replace US 421 Bridge
  – Strengthen and widen existing piers
  – Improve roadway geometry
• No right of way Impacts
• Meet Tiger Grant schedule.
• Project length ≈ 0.696 miles.
Sidewalk Connection in Milton
Sidewalk Connection in Madison
Final Scour Design Sketch
Analysis Methodology

- Finite Element Method Required