



# Milton Madison Bridge Project

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# Presentation Outline



- **Historical Context**
- **Environmental Alternatives**
- **NEPA Process**
- **Superstructure Replacement**
- **Design Build Letting**
- **Innovative Proposal**
- **Design Challenges**



## The Project Team

- **Kentucky Transportation Cabinet**
- **Indiana Department of Transportation**
- **Federal Highway Administration**
- **Environmental Study - Consultants**
  - Wilbur Smith Associates (Environmental)
  - Michael Baker Jr., Inc. (Bridge Study)

# Study Area



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

## 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



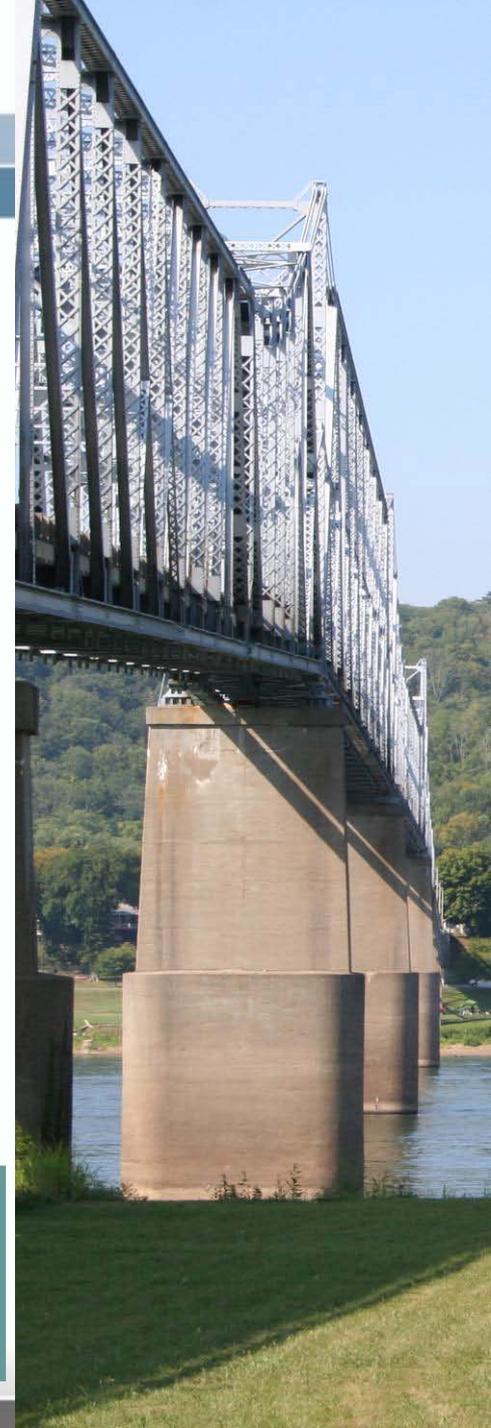




# Milton-Madison Bridge Project

- 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

- **Constructible & Affordable Bridge**
- **Consensus (Agencies, Stakeholders, Public)**
- **Federally Approved Environmental Document**
- **In the end, KYTC & INDOT will own one Bridge**

*NOT Project Purpose and Need*

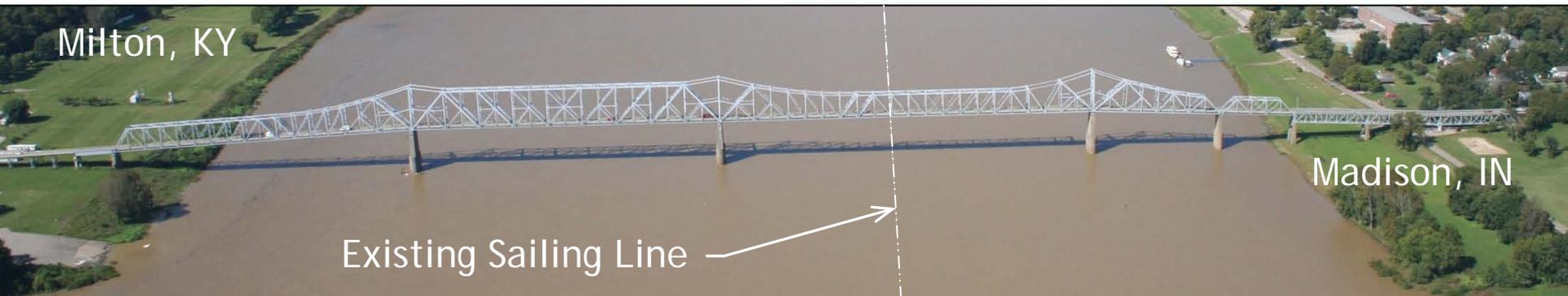
*Clearly define what the project  
sponsors (KYTC/INDOT) expected  
from this project*





## 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**
- **Posted in April 2009 to prohibit trucks over 15 tons**



## US 421 Bridge Condition

- **2009 Sufficiency Rating of 6.5 out of 100**
- **Since 1994, \$11.2 million invested in bridge**
- **Structurally Deficient & Functionally Obsolete**
- **Remaining Service Life of the structure estimated at 10 years**



# 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*





## Partnering Conference 2008

- **August 2008 Presentation on Practical Solutions**
- **Specific reference to a bridge over Missouri River**
- **Project Team meets after presentation to discuss Milton Madison implications**

*Partnering Conference 2008*

*Missouri DOT Presentation on Practical Solutions  
Inspires Superstructure Replacement Alternative*



# Bridge Replacement Alternatives

- **Do Nothing**
- **Rehabilitation**
- **Bridge Replacement** (with potential new alignments)
- **Superstructure Replacement**
  - Potential game changer
  - Lower costs
  - Less impacts to the historic district
  - But is it Feasible?

## Transparency

*Let stakeholders know we were looking at it early in development*



## Consider Everyone's Ideas

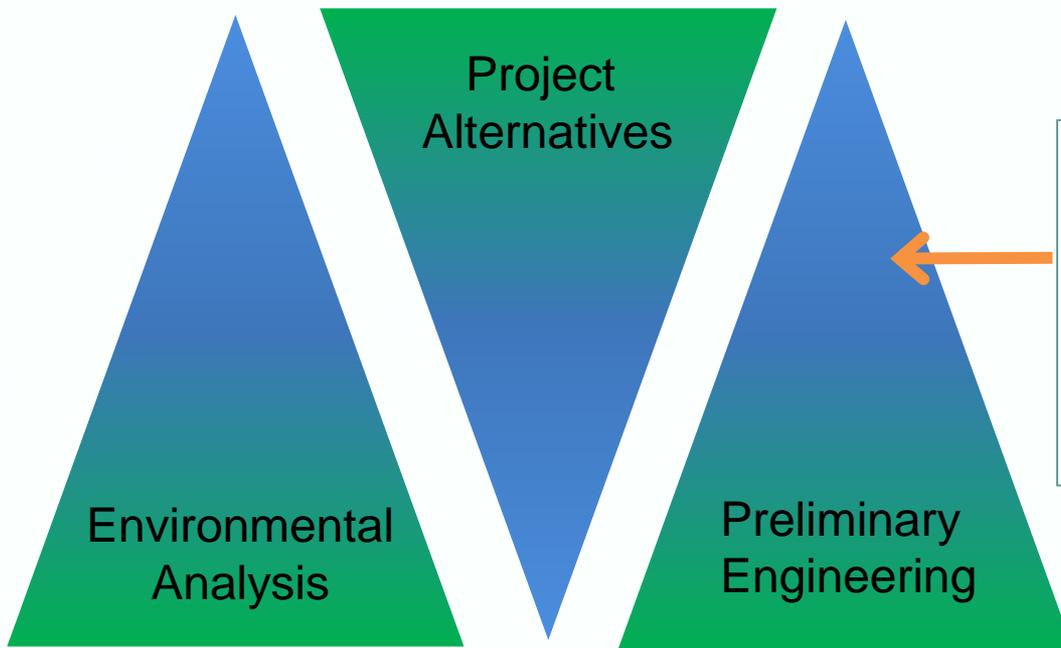
- Existing Alignment
- Multiple New Alignments (12)
- Tunnel
- Pontoon Bridge
- TSM
- Transit
- Ferry

### Transparency

*Listening is basis for  
development of cooperation  
and trust*



# Alternatives Selection

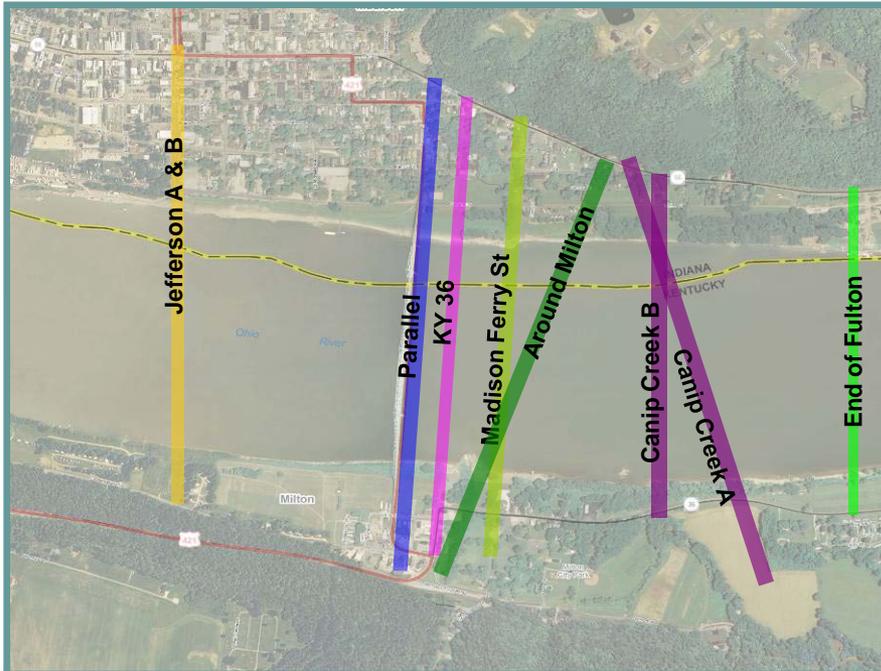


More detailed engineering analysis for Superstructure Replacement & Rehabilitation Alternative prior to selection of final alternative

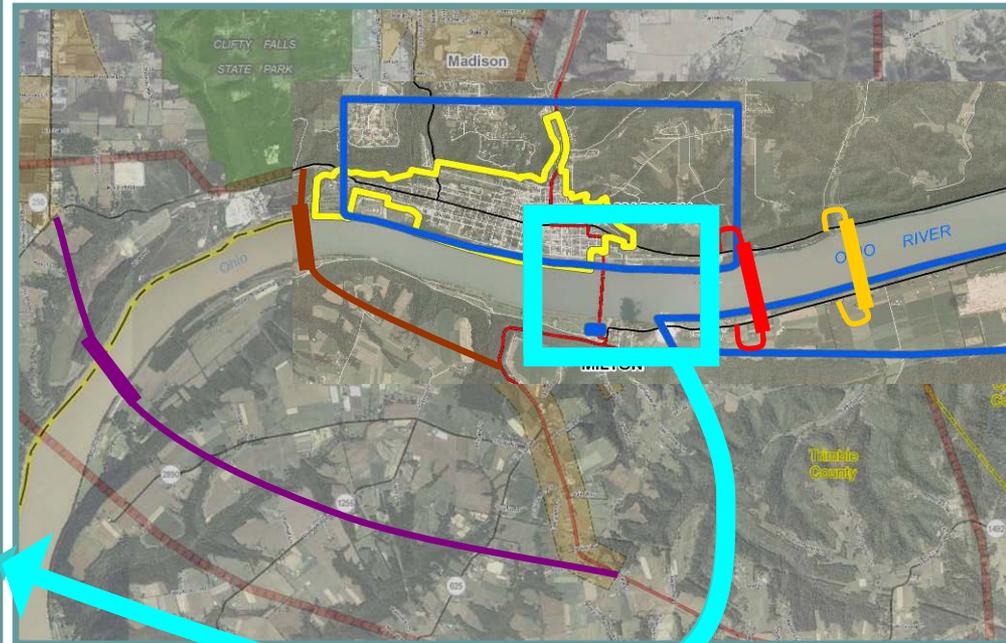
Approved FONSI

# Initial Bridge Location Alternatives

**ALL alternatives  
considered**



Downtown Alternatives



# 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

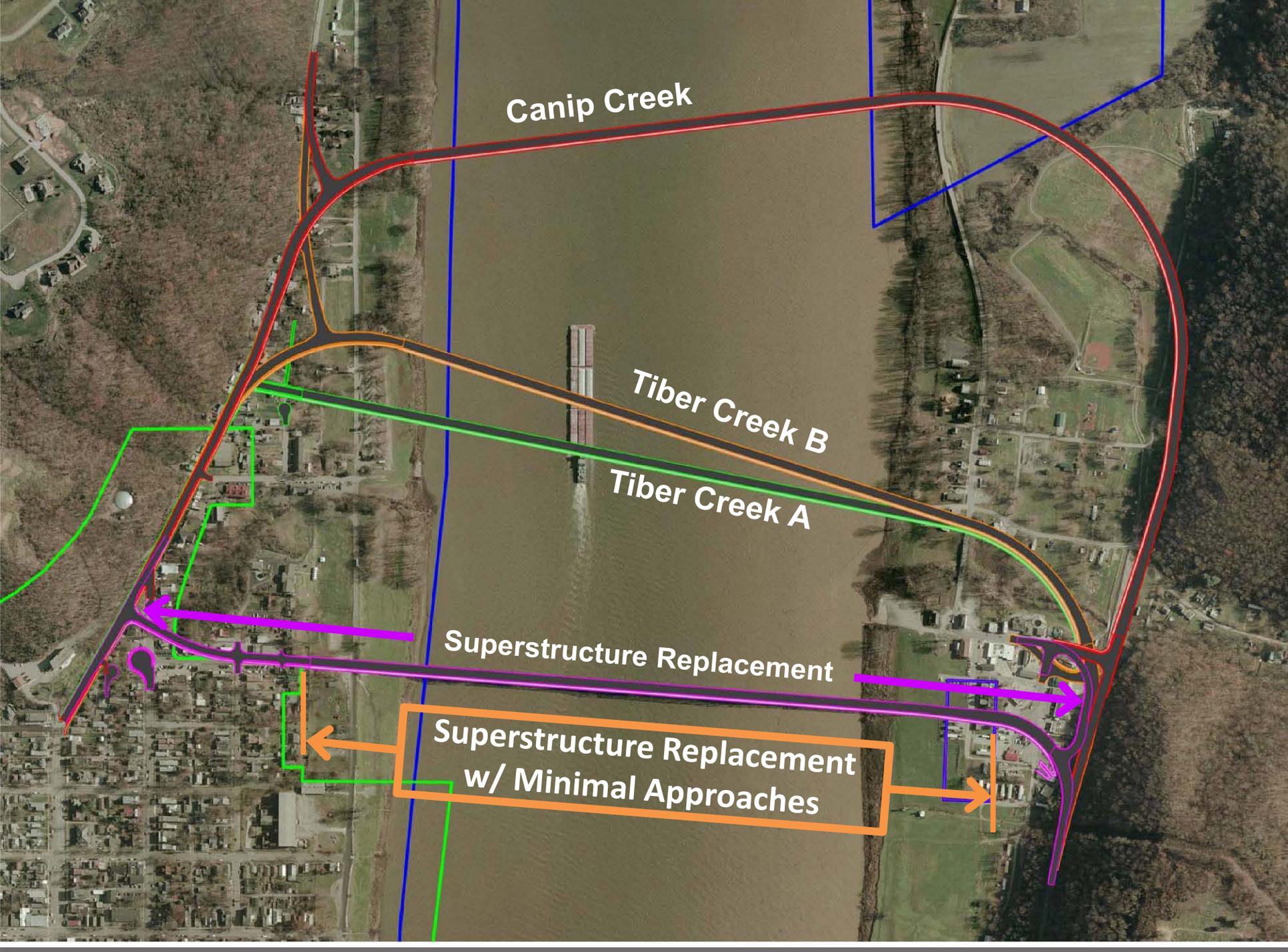


## Key Findings Initial Screening Process

- **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*





Canip Creek

Tiber Creek B

Tiber Creek A

Superstructure Replacement

Superstructure Replacement  
w/ Minimal Approaches



## Polling Summary – February 2009

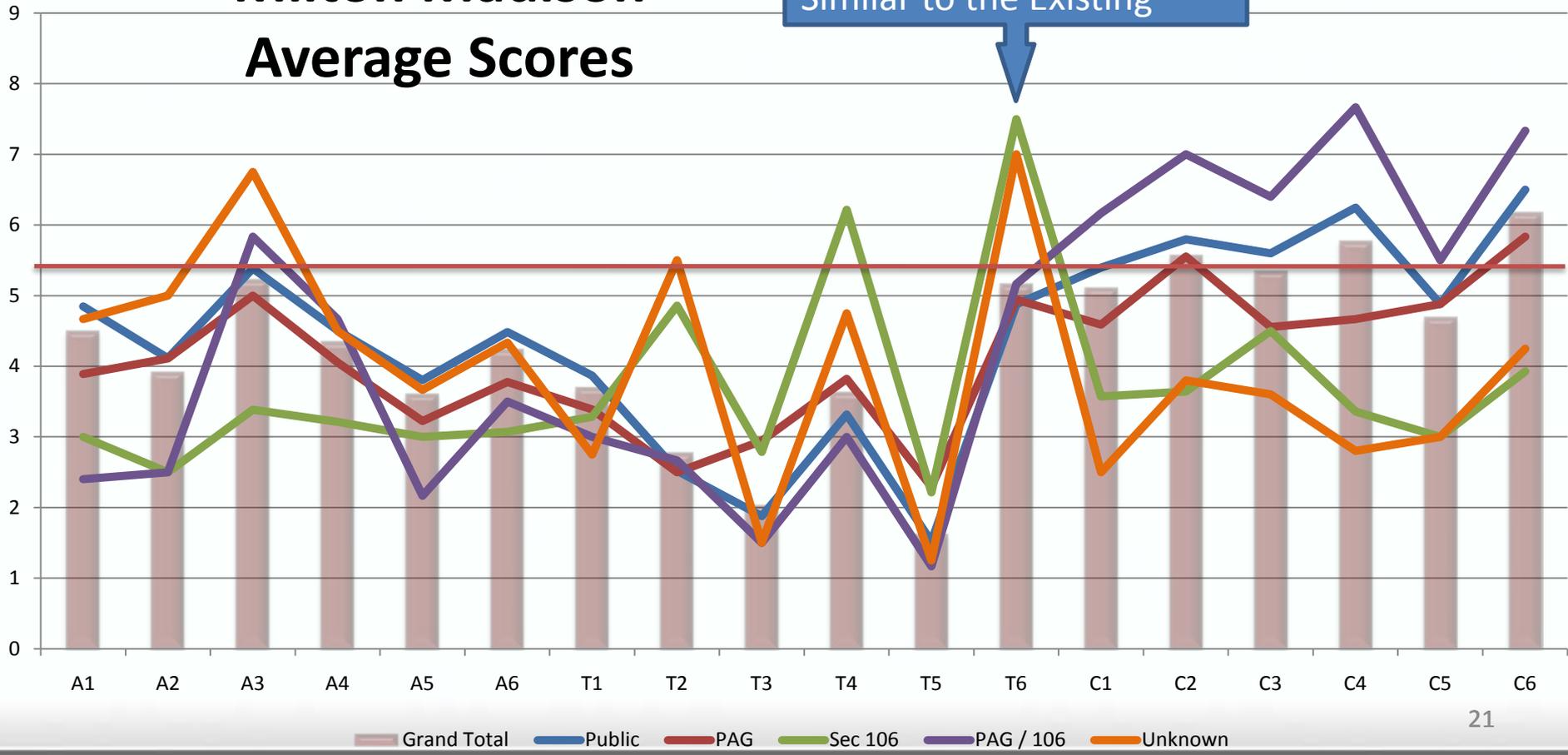
- **Public Meeting Held - 168 Citizens Attended**
- **Keypads Were Used For Preference Scores**
  - helped designers understand visual/aesthetic preferences of participants.
- **18 Bridge Design Concepts Were Presented**
  - 6 arch designs
  - 1 truss-arch
  - 5 trusses
  - 6 cable-stay concepts



# Polling Summary

## Milton Madison Average Scores

Proposed  
4 Span Truss Bridge  
Similar to the Existing





## Game Changers

- **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**
- **No ROW required**

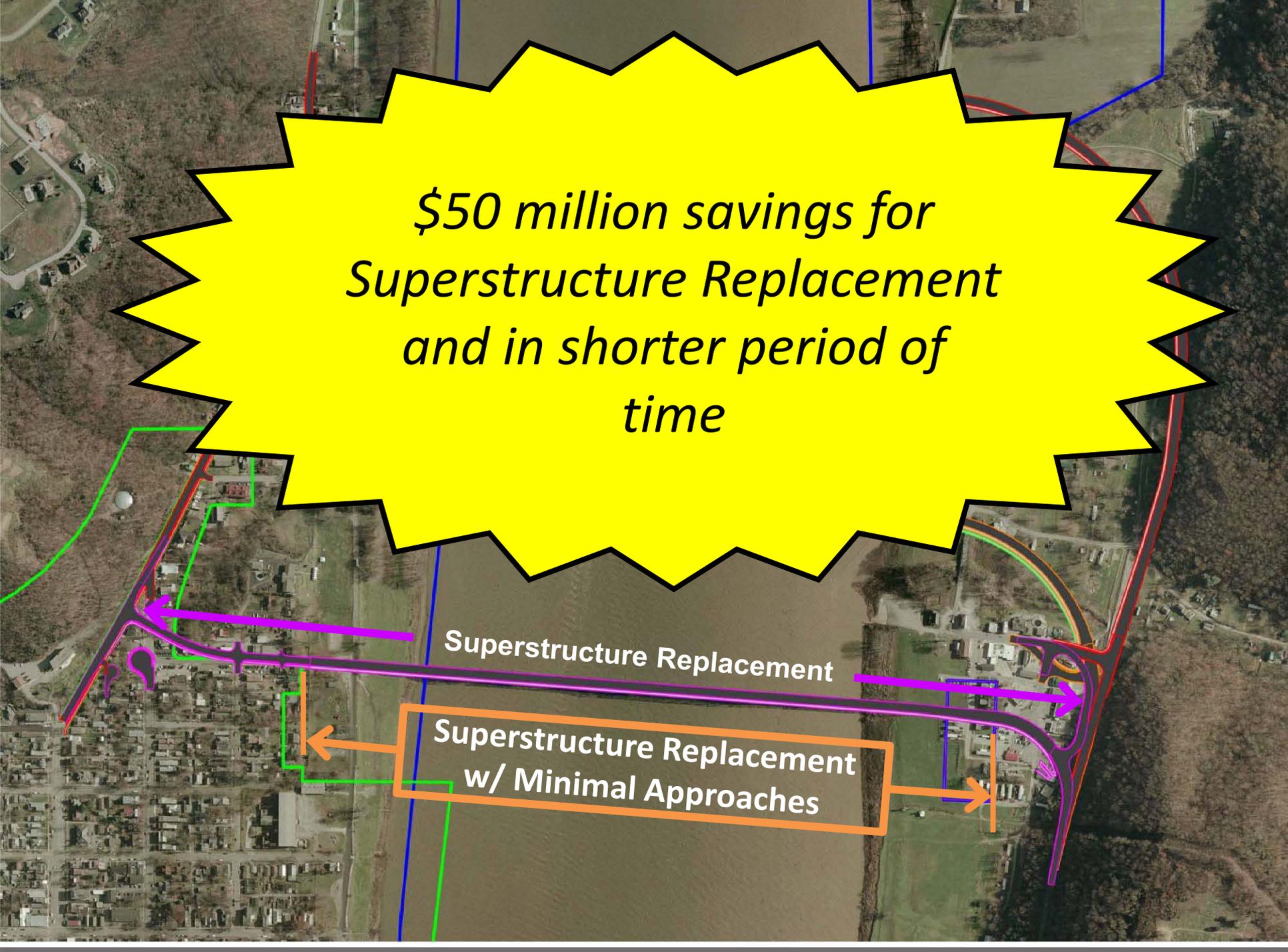
*Present availability of funding and practical timeline for construction*



*\$50 million savings for  
Superstructure Replacement  
and in shorter period of  
time*

Superstructure Replacement

Superstructure Replacement  
w/ Minimal Approaches



## The Proposed Action

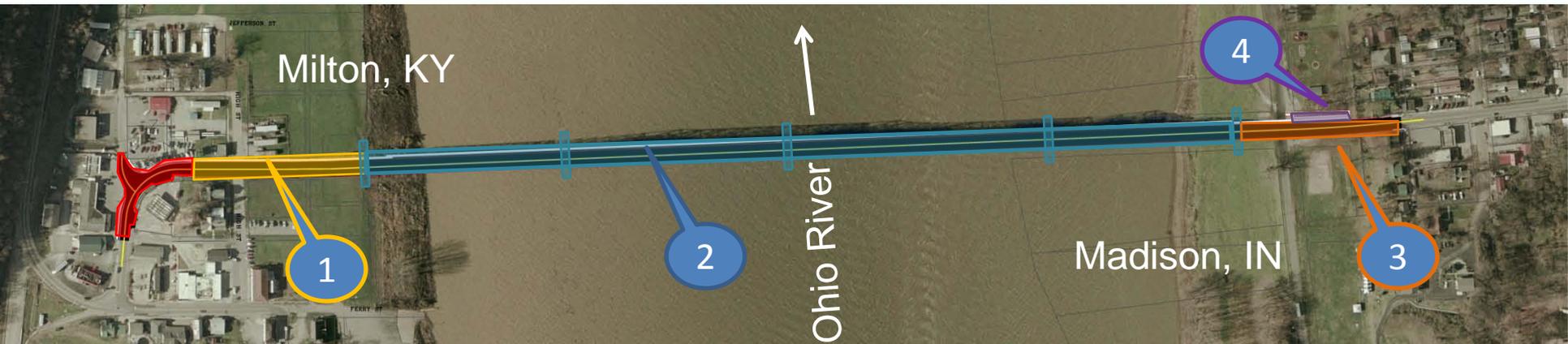
**Based on a variety of factors, the Superstructure Replacement with Minimal Approaches Alternative is beginning to emerge as a leading option**

- **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**
- **STR 1** replace KY Approaches
- **STR 2** Truss replacement
  - Pier Strengthening and Scour Mitigation
  - Superstructure Replacement
- **STR 3** – Replace IN Approaches
- **STR 4** – Pedestrian Access to Park

*No Right-of-Way  
required*

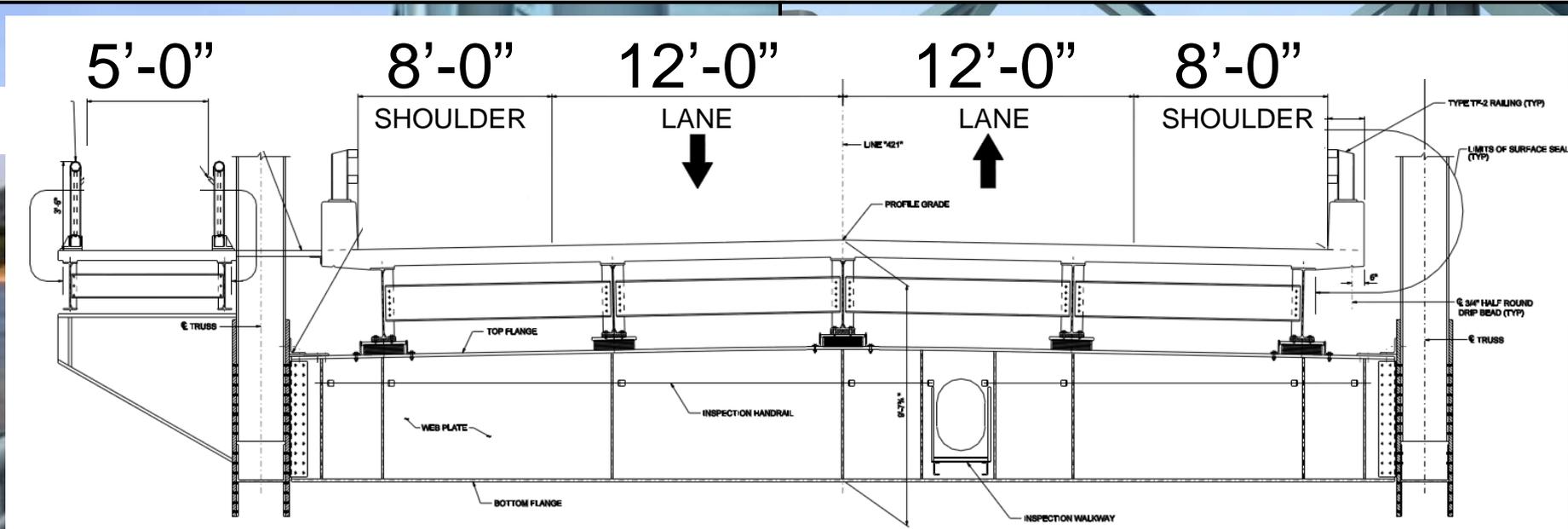


# Ferry Service



# Typical Section

- Existing Bridge is 20 ft curb to curb
- 5 ft pedestrian walkway





# Selected Alternative

**Existing Bridge**



**Proposed Bridge**



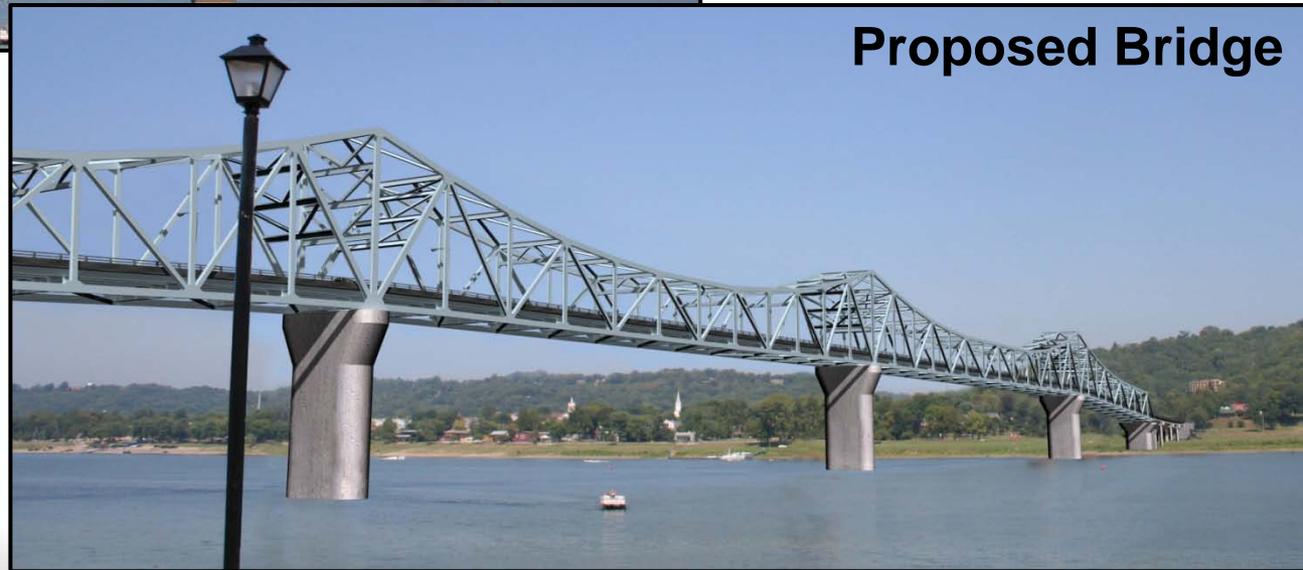


# Selected Alternative

**Existing Bridge**



**Proposed Bridge**





# Keys to Success

- **Sense of Urgency by everyone engaged!**
- **Use of Milton-Madison 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





# Section 106 Consultation Process

July 2009 – December 2010

*Through a series of 6 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
- Amend MOA

*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



## 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



*Sway Bracing, 100ft spacing*



*Sway Bracing Struts*



*Pedestrian View*

## 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





# 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

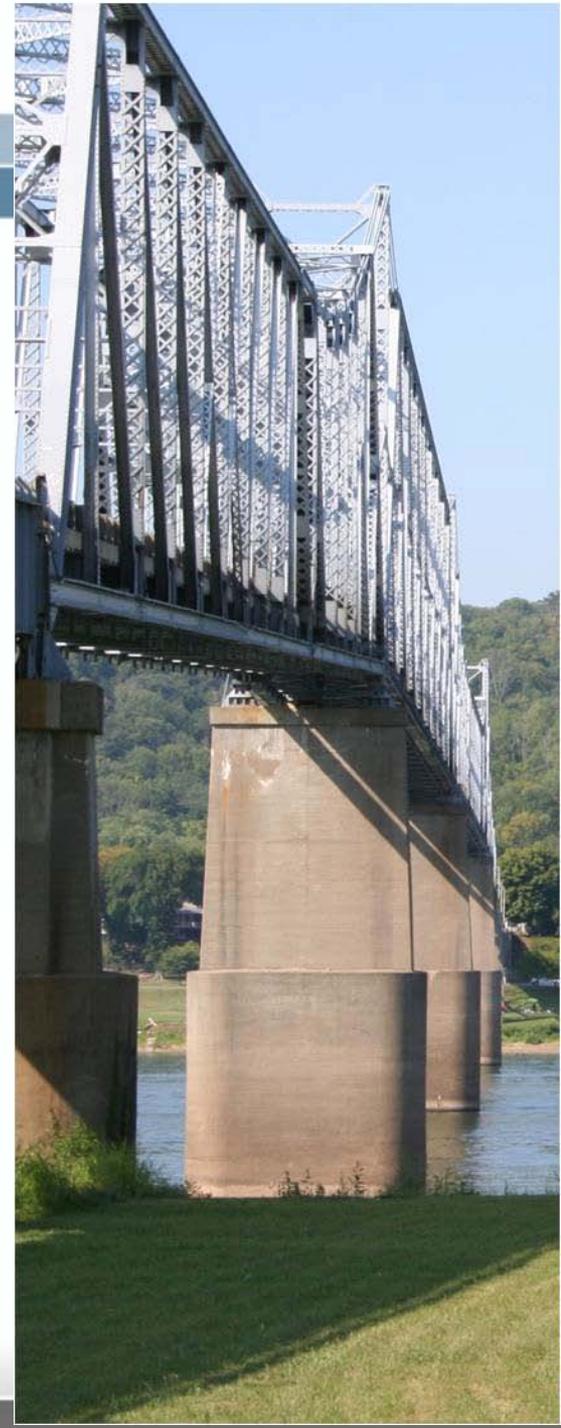
- Updates to National Register District forms in Milton and Madison
- Archaeological Testing
- Measures to reduce construction impacts
  - Vibration monitoring on historic structures
  - Limits for construction and noise during festivals
- Emergency medical service in Milton/Trimble County during closure
- 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



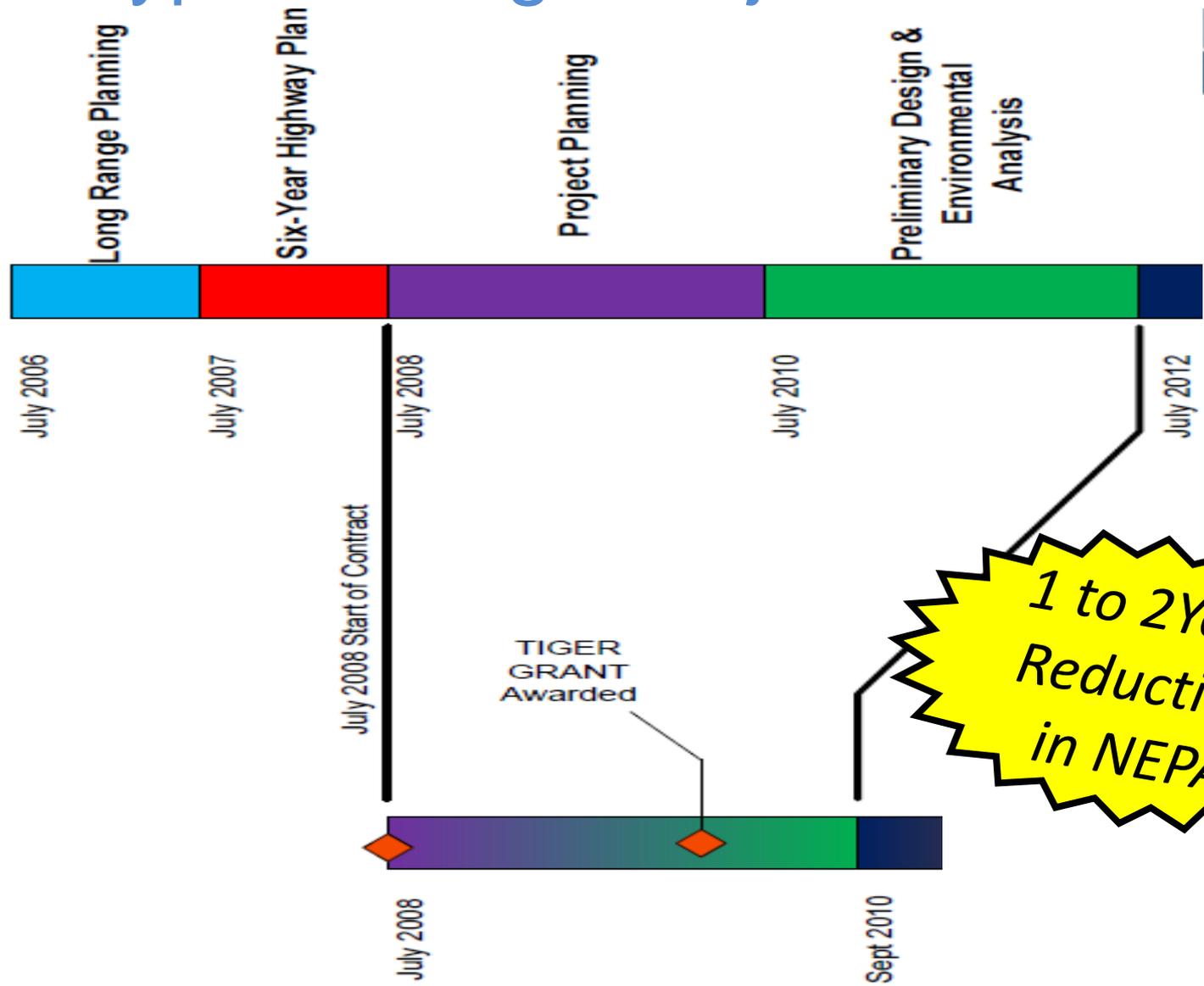
## EA / FONSI Schedule

*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**

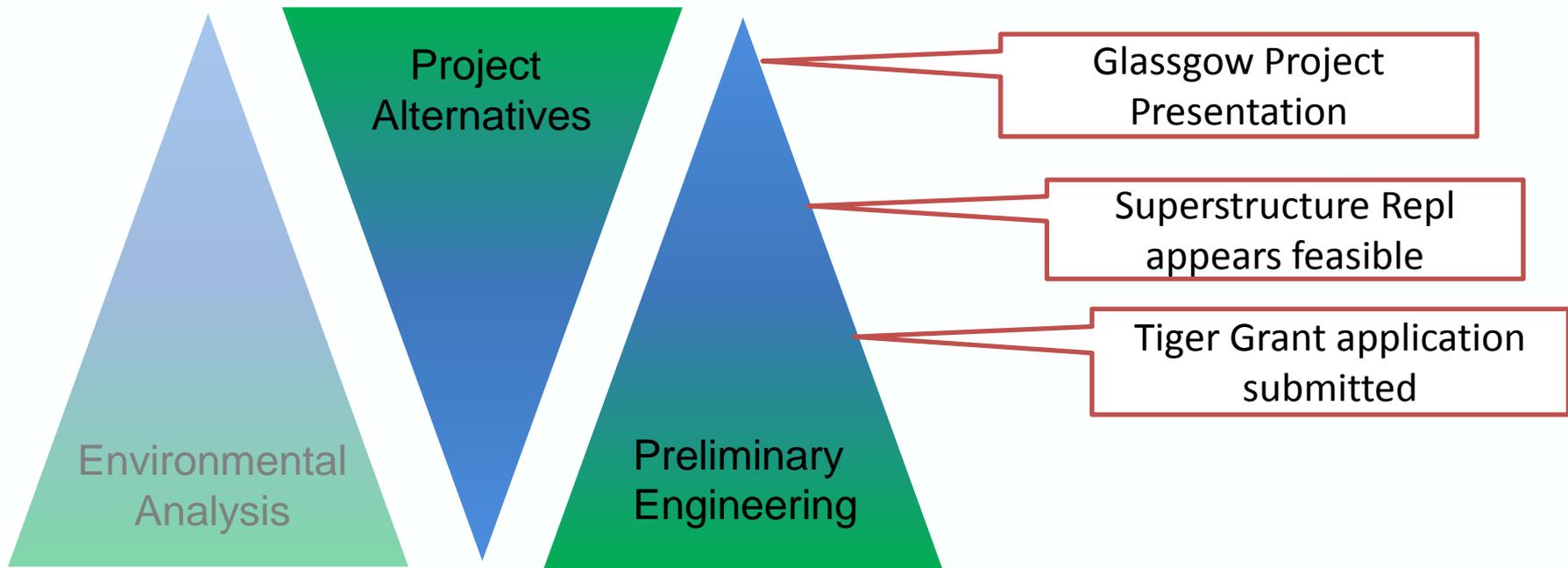


# Typical Bridge Project Timeline



## Milton Madison Project Timeline

# Alternatives Selection



Approved FONSI

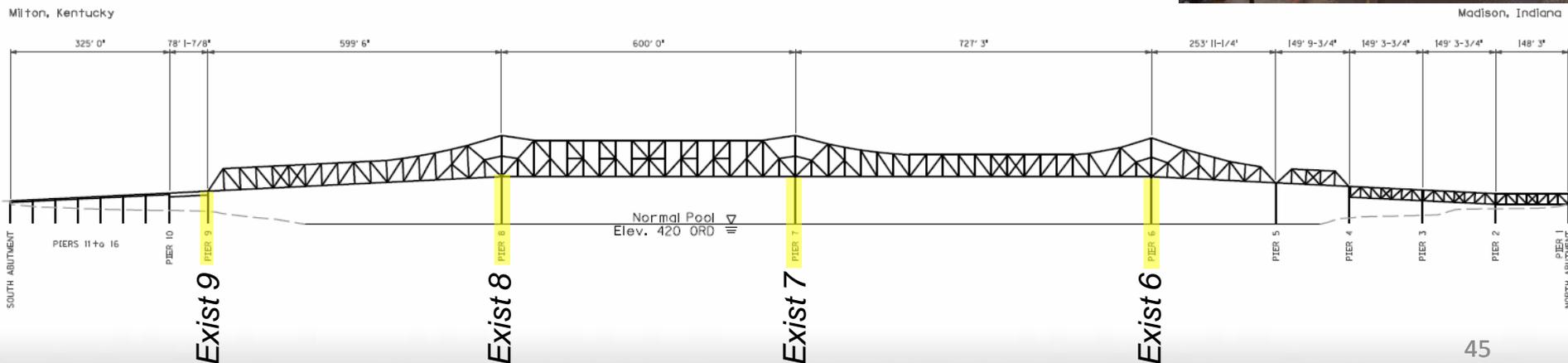


# Bridge Alternatives

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- **Rehabilitation**
- **Bridge Replacement**
- **Superstructure Replacement**
  - Potential game changer
  - Lower costs
  - Less impacts to the historic district
  - But is it Feasible?

# Pier Testing and Inspection

- **Vertical Coring (*Jan-Feb 09*)**
  - KYTC Cored piers 6-9 from deck to 50' into bedrock
  - Cores were extracted for laboratory testing



## Drilling through Piers



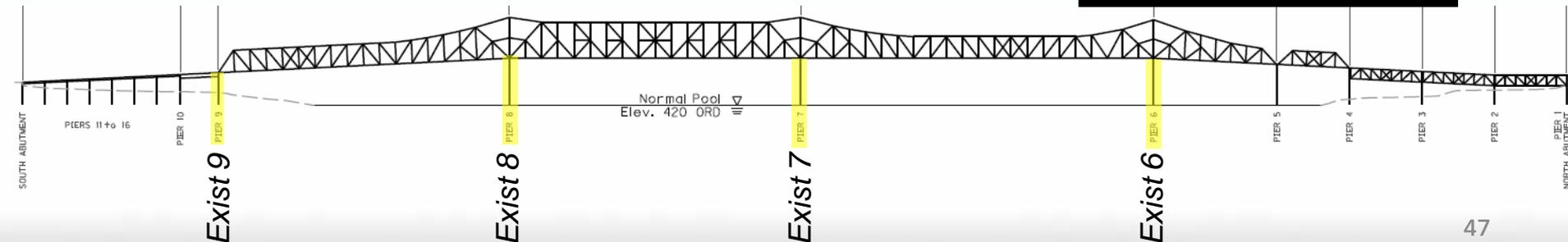
*Investment in coring & engineering was crucial in reuse of piers*



# Pier Testing and Inspection

## Physical Inspection Feb-Mar09

- Non Destructive testing
- Lab Testing of Samples
- Existing Condition and Service Assessment Reports



## Detailed Inspection of Piers



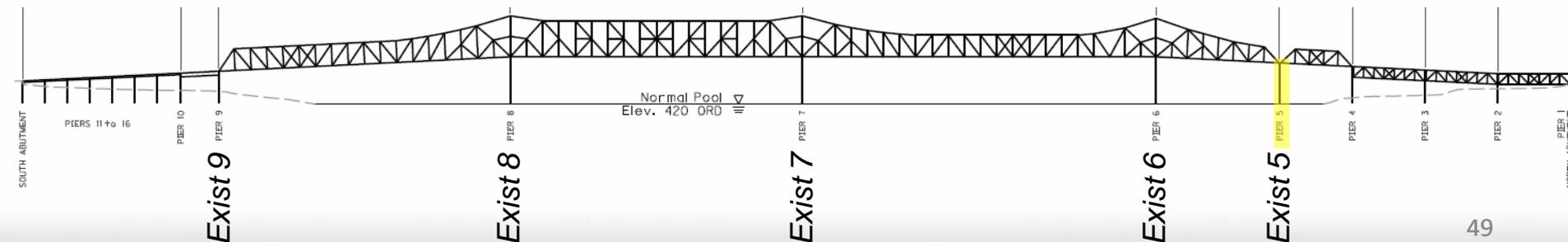
# Service Life Assessment

## ■ Piers 6 – 8

- General good condition
- Encase existing piers for long term durability

## ■ Pier 5 – Don't re-use

- High Chloride Levels
- Exposed rebar with section loss at waterline
- Structural issues with tie-down Pier.

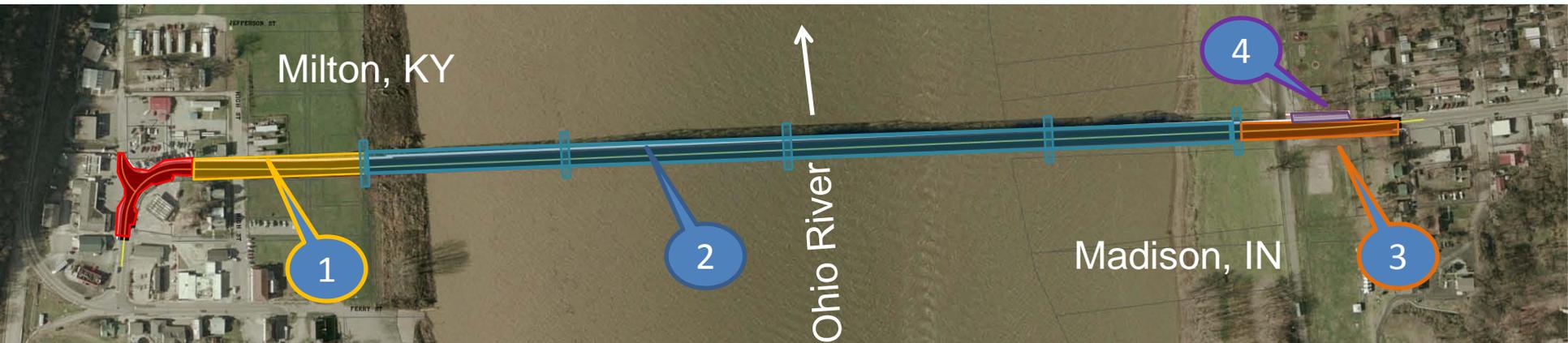




# Superstructure Replacement with Minimal Approaches

- **Key Reasons for Selection**
  - Continued Bridge Deterioration
  - Limited Impacts To Historic Resources
  - Piers Are Structurally Sound
  - Lowest Cost Alternative
  - Availability Of TIGER Grant
  - Fastest Completion And One Year Maximum Closure Time

# Superstructure Replacement with Minimal Approaches



- **Milton Approach re-construction**
- **STR 1** replace KY Approaches
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  - Superstructure Replacement
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*No Right-of-Way  
required*

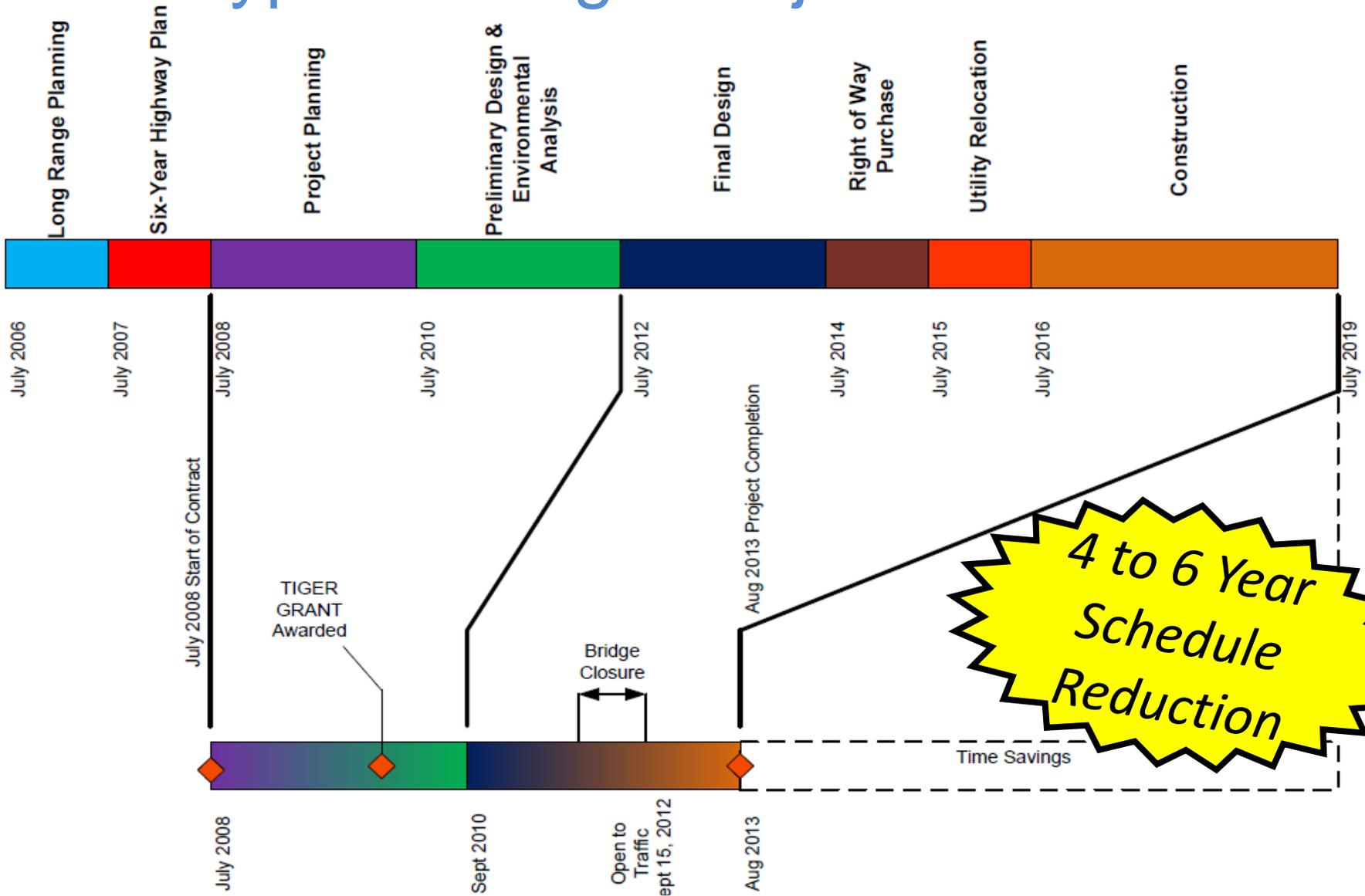




## Why Design-Build?

- **Pursuit of TIGER Grant placed a premium on starting project soon and completing in 2012**
- **No R.O.W. required and minimal utilities left Design as critical path item.**
- **Design-Build allows engineering and construction to occur at the same time.**

# Typical Bridge Project Timeline



**4 to 6 Year  
Schedule  
Reduction**

Time Savings

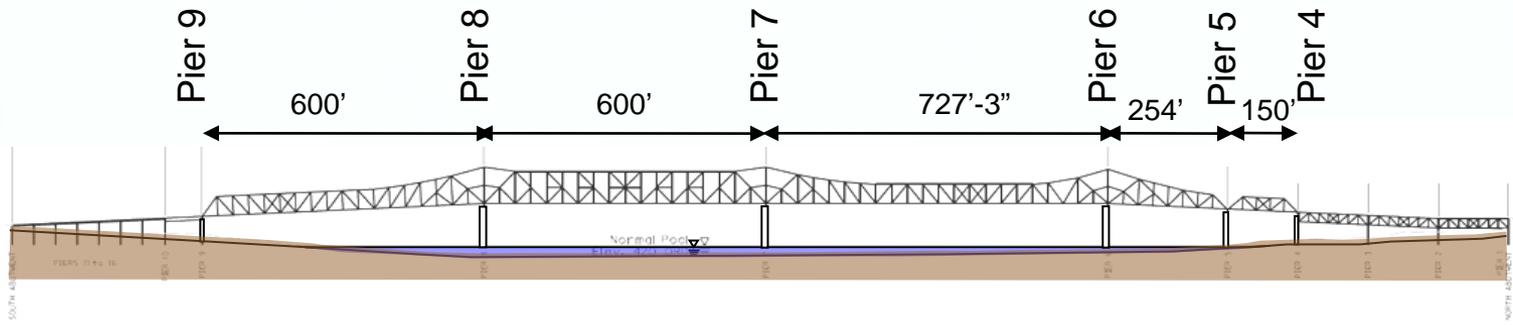
## Milton Madison Project Timeline

# Letting Requirements



*To support the development of a D/B scope*

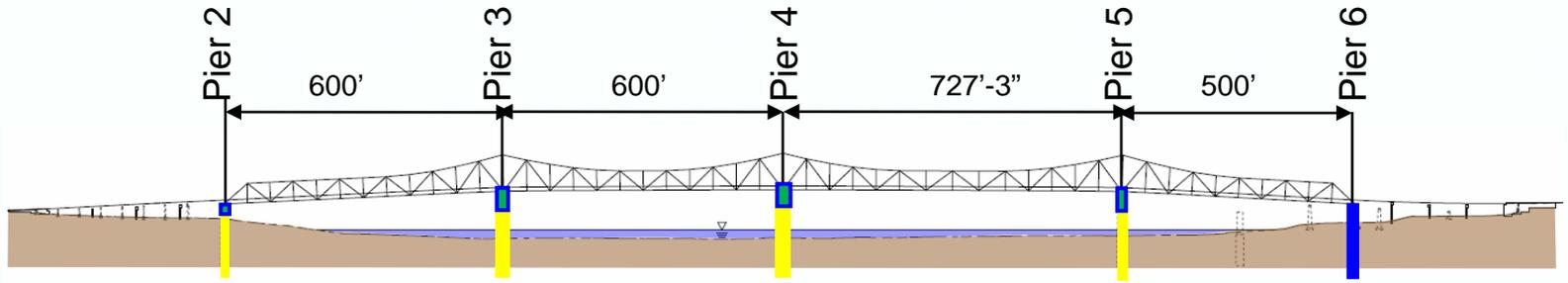
- **Designed For 75 Year Service Life**
- **Feasible**
  - Pier strengthening report
  - Constructable within 1 year closure
- **Permittable – Maintain Navigation Channel**
- **Visually Acceptable To The Community**
  - Develop Design Criteria To Ensure Commitments



### Existing Bridge

Milton, KY

Madison, IN



### Proposed Bridge

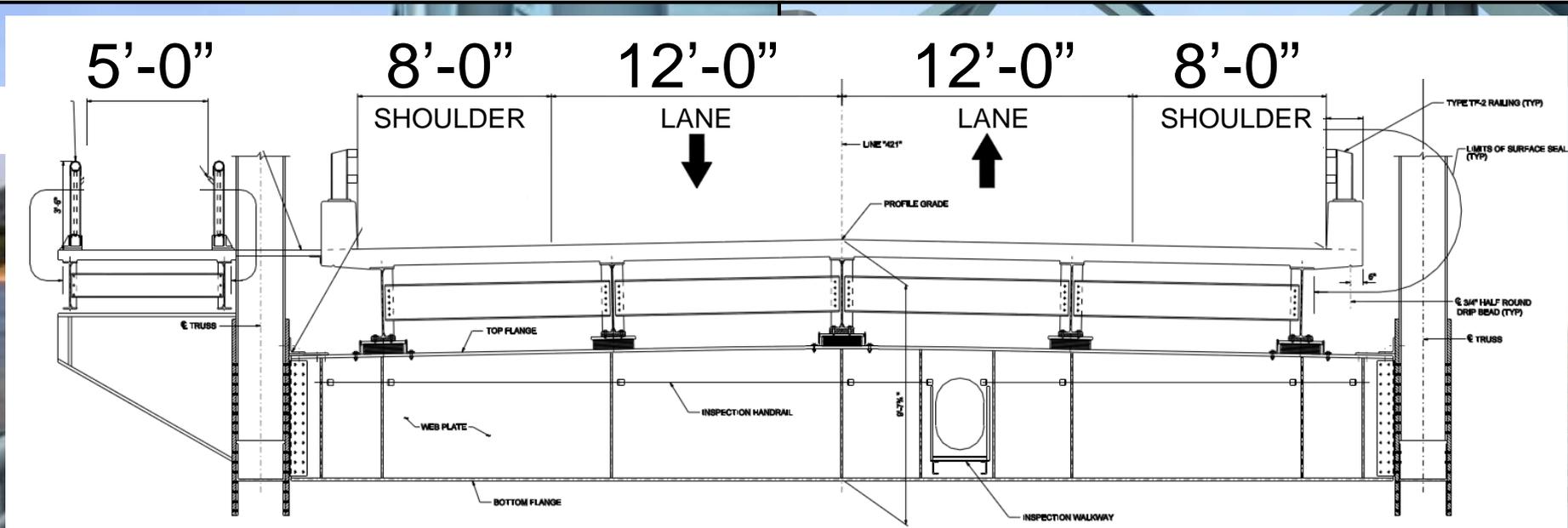
*Navigation Channel does not need to be widened*



-  Strengthen Existing Pier
-  New Pier Cap
-  New Pier

# Typical Section

- Existing Bridge is 20 ft curb to curb
- 5 ft pedestrian walkway





## Challenges in Reusing Existing Piers

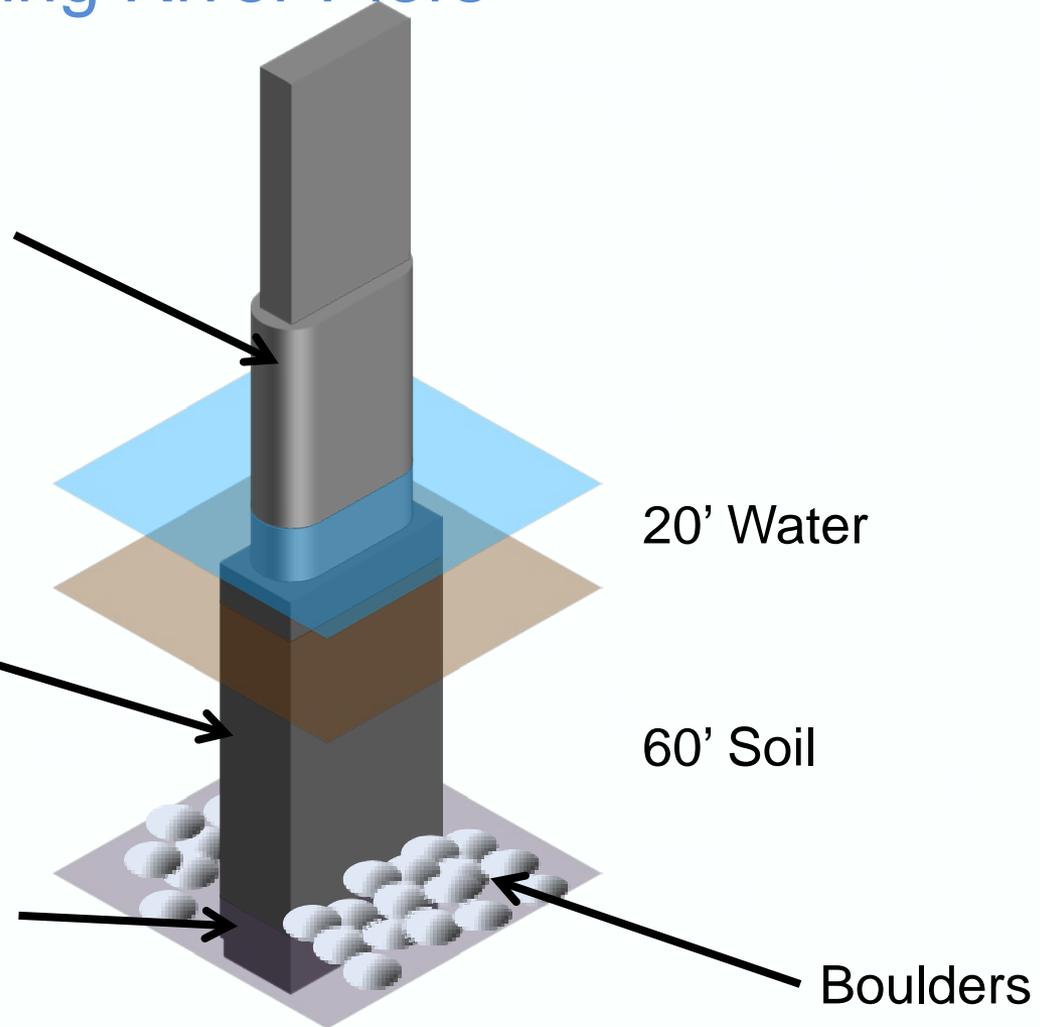
- **Bridge width more than double the existing**
- **12 months maximum closure.**
- **Assure piers have additional 75 service life.**
- **Design pier strengthening to accommodate all loading demands including wind and barge impact.**
- **Consideration of soil support loss (scour)**
- **Limited existing rock capacity.**

## Typical Existing River Piers

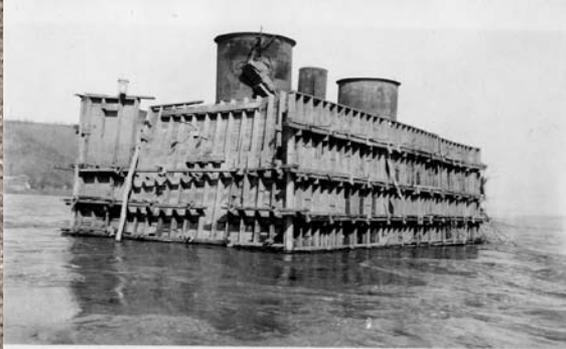
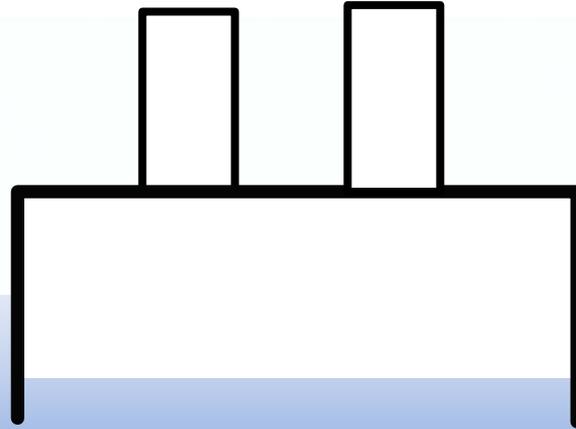
Existing Pier stem  
reinforcing extends  
12' into caisson

Un-reinforced  
Caisson

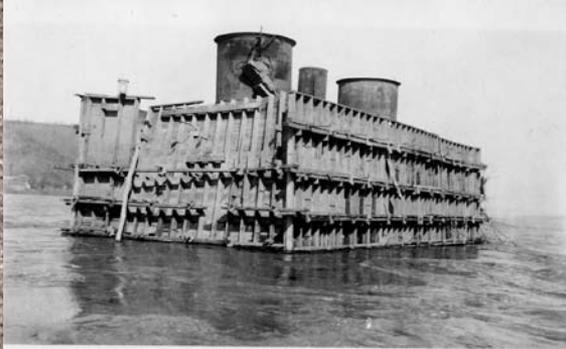
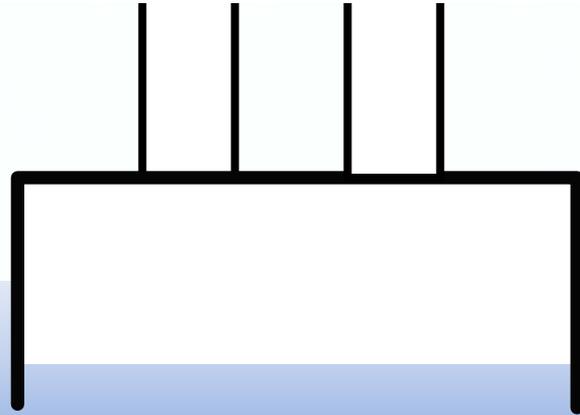
Un-reinforced  
Rock Socket 1.7'-6.7'  
deep



# Pier Construction Methods

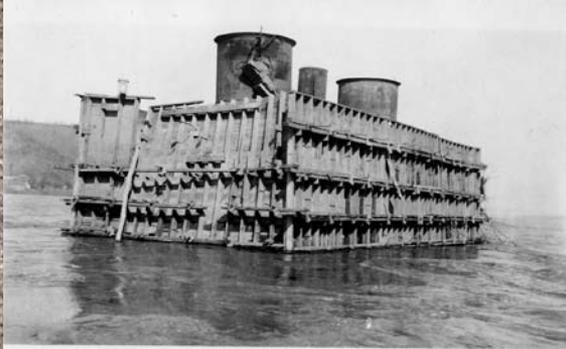
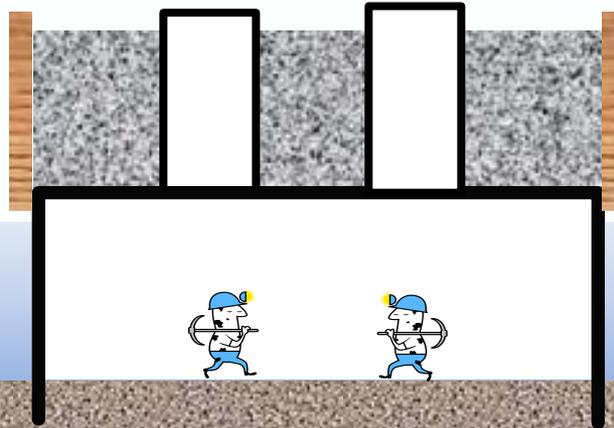


# Pier Construction Methods



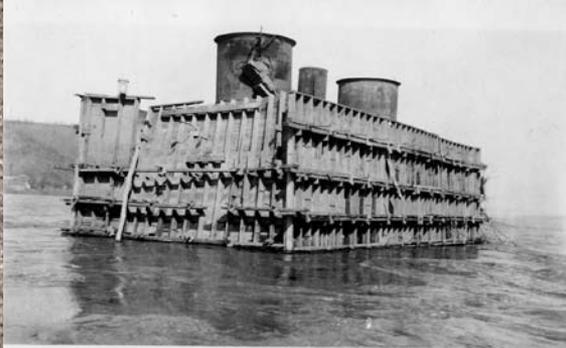
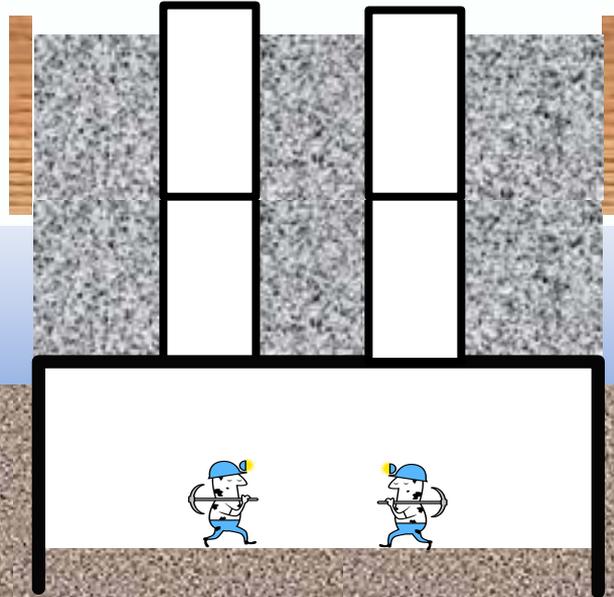


# Pier Construction Methods



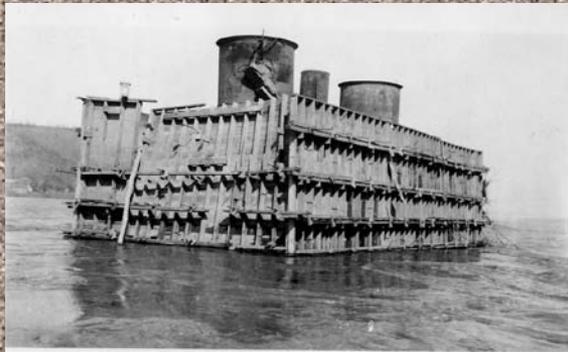
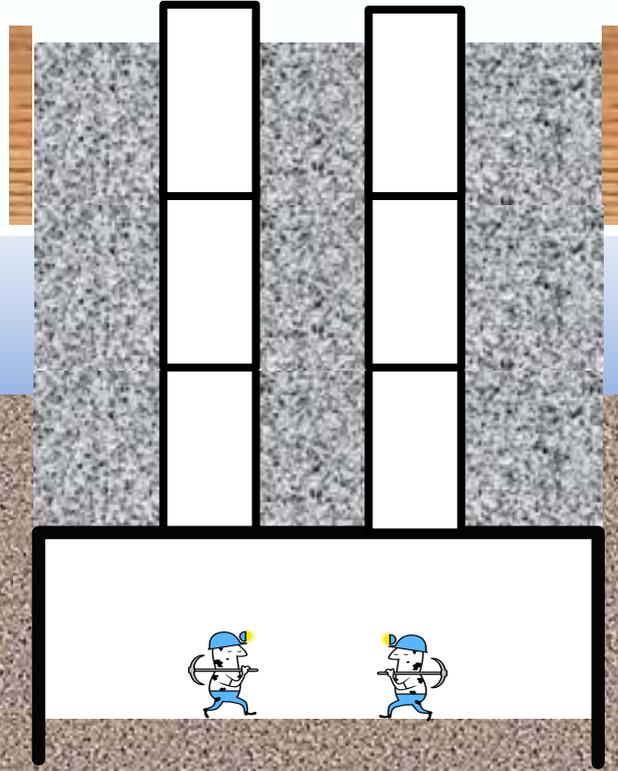


# Pier Construction Methods



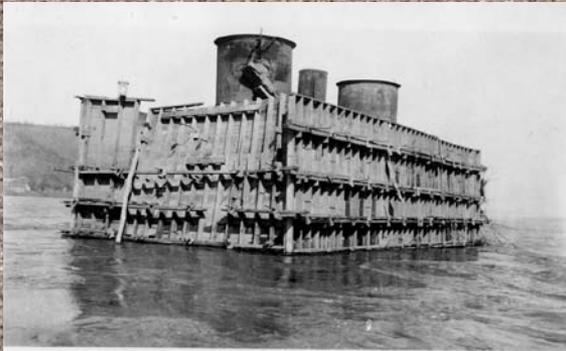
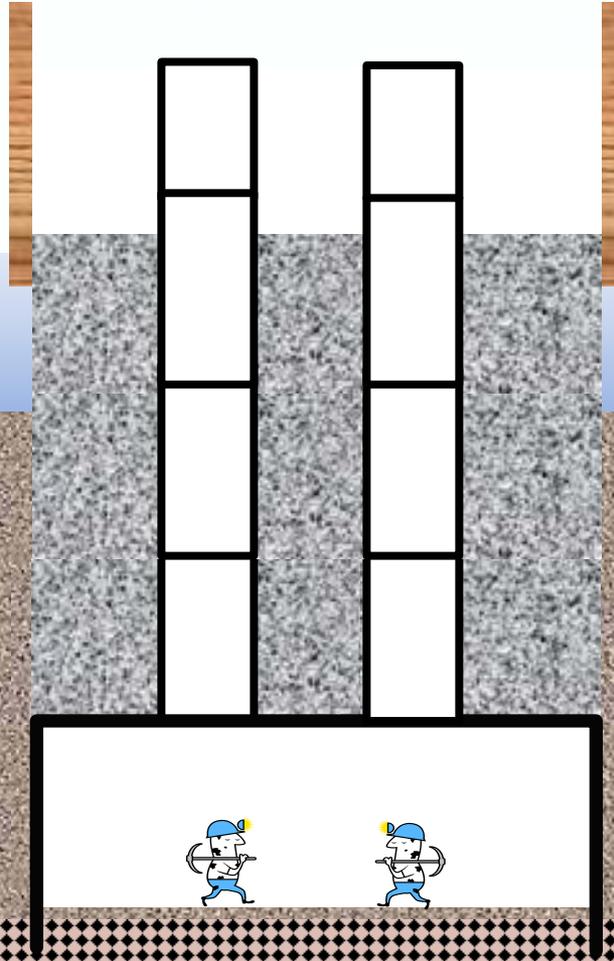


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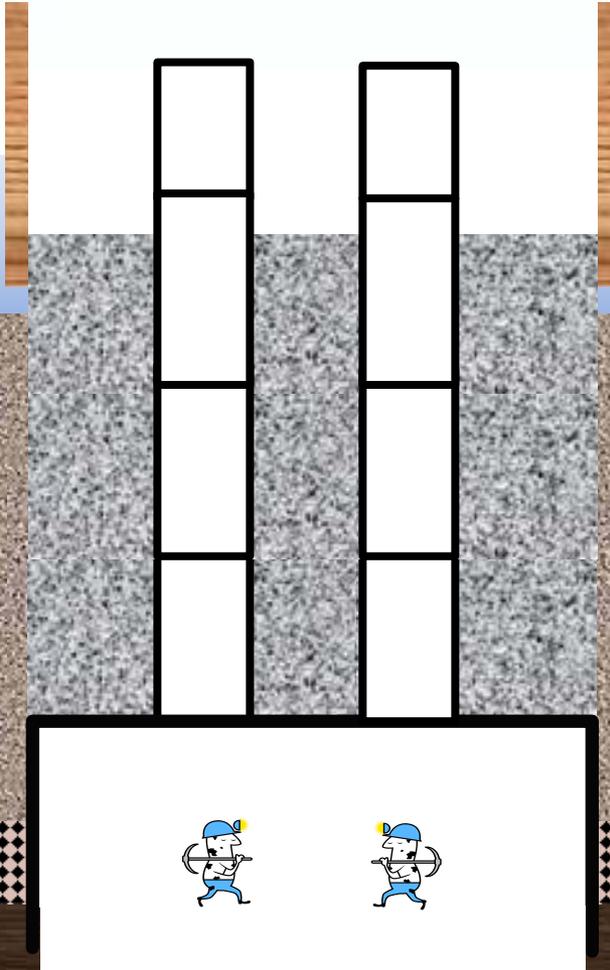
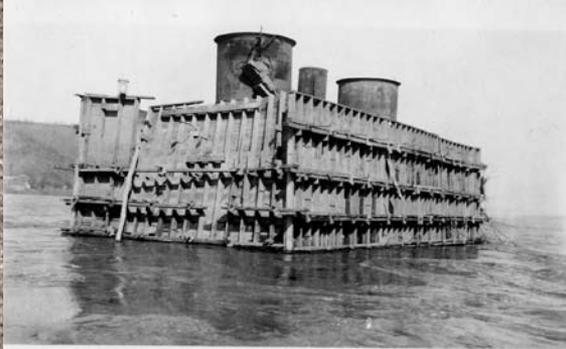


# Pier Construction Methods



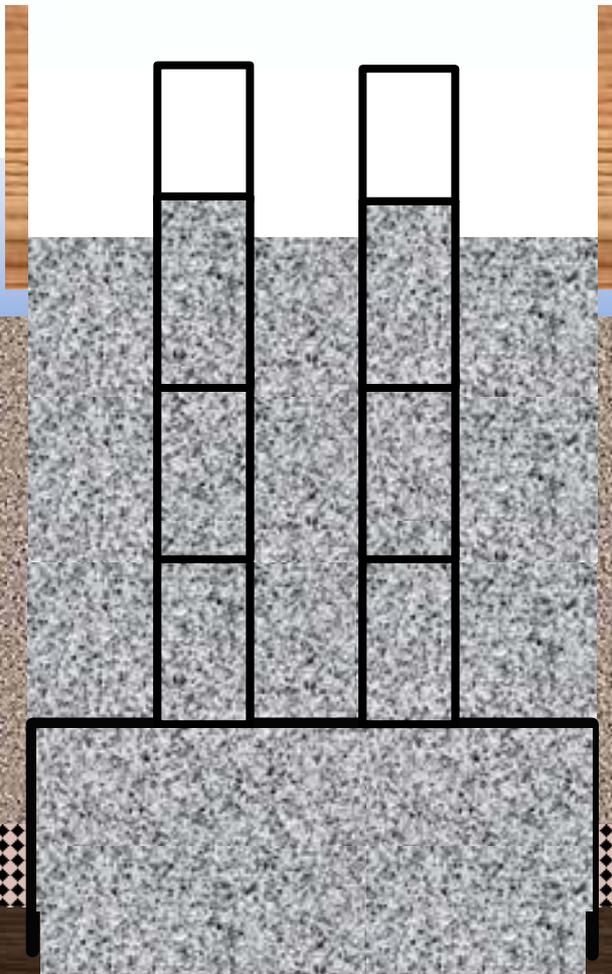
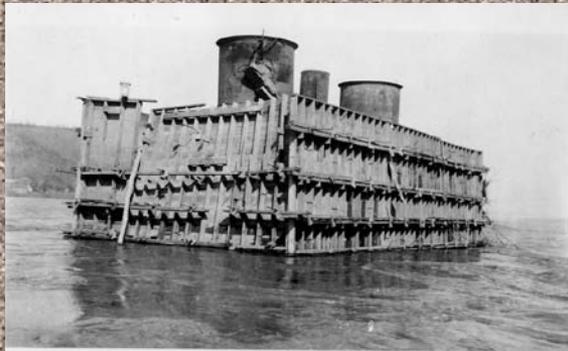


# Pier Construction Methods



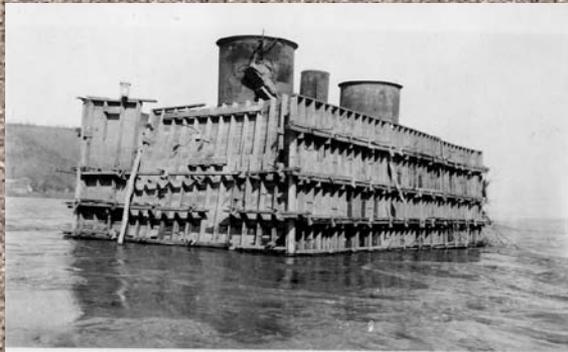
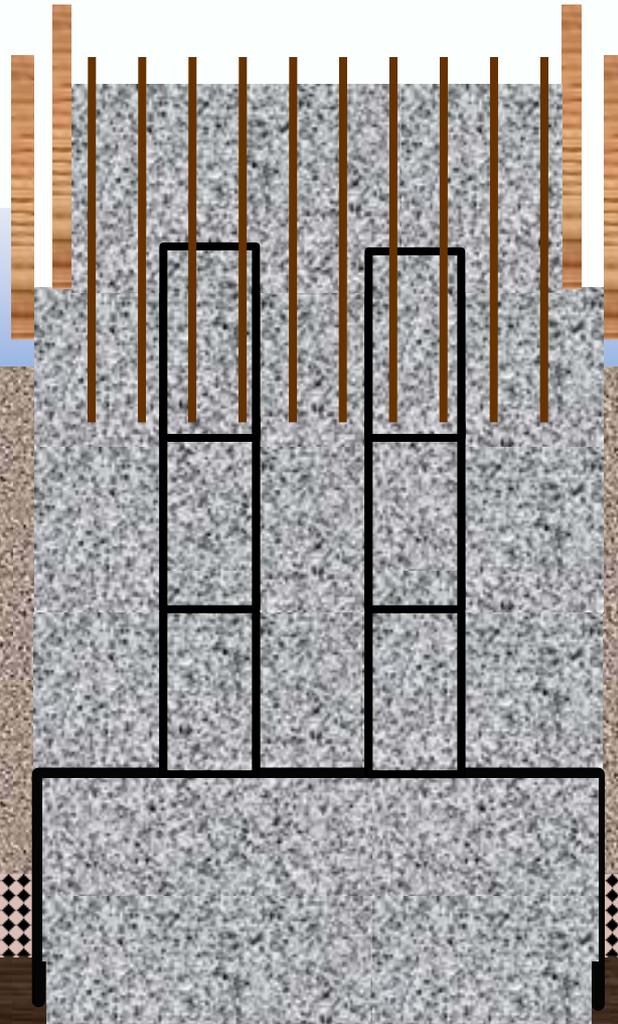


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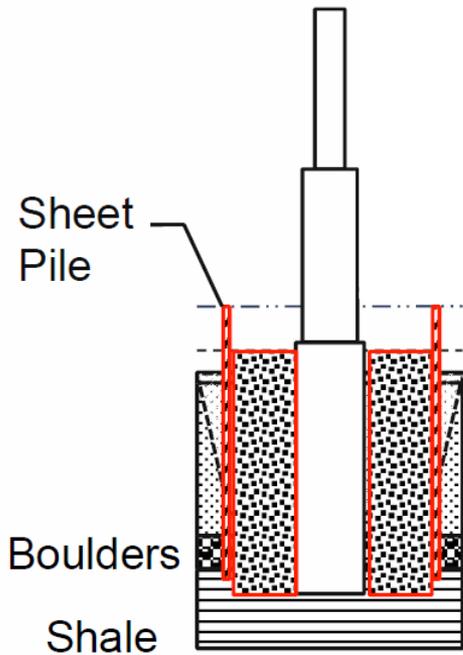




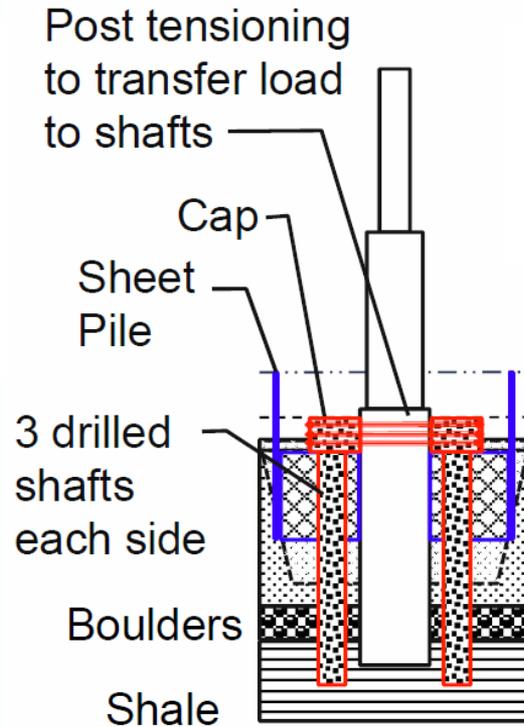
# Pier Construction Methods



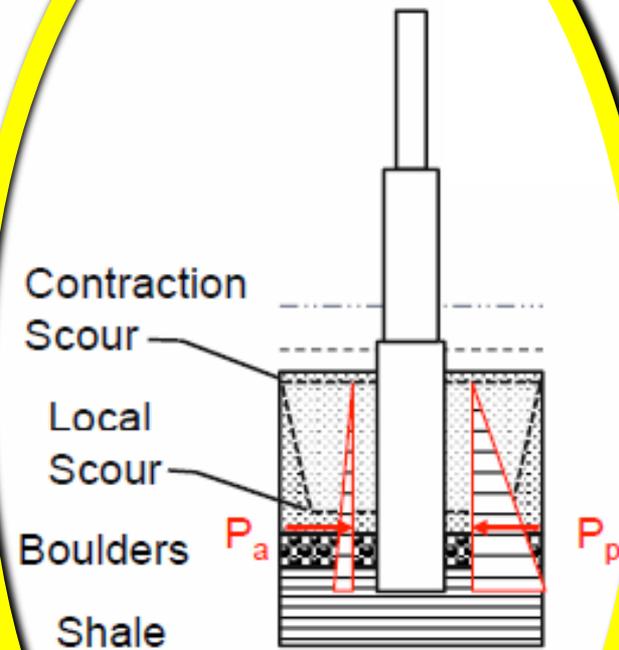
# Viabale Foundation Options Considered



**Encasement**

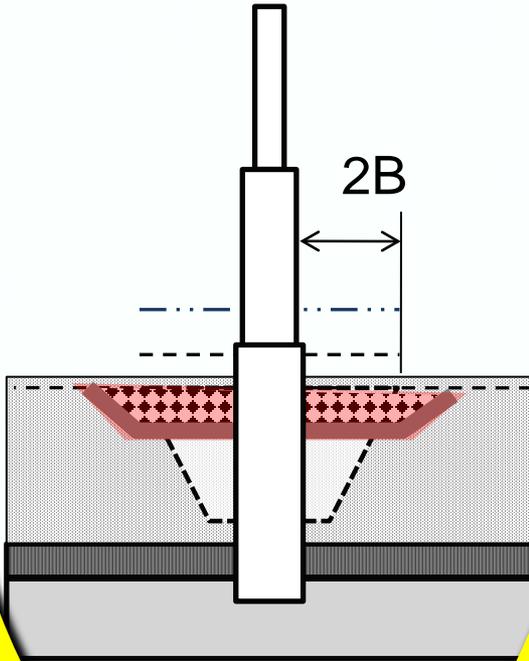
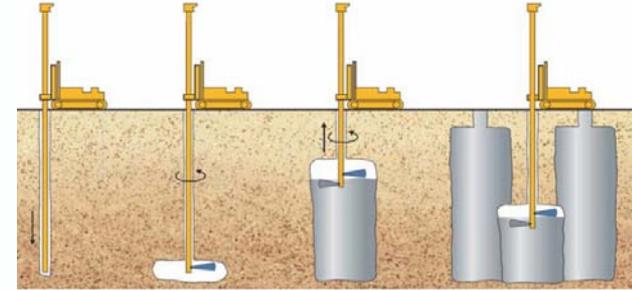


**Drilled Shafts**

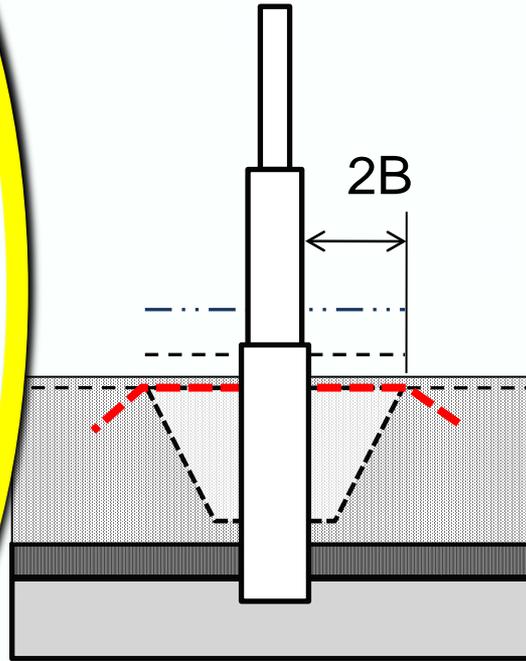


**Soil Response**

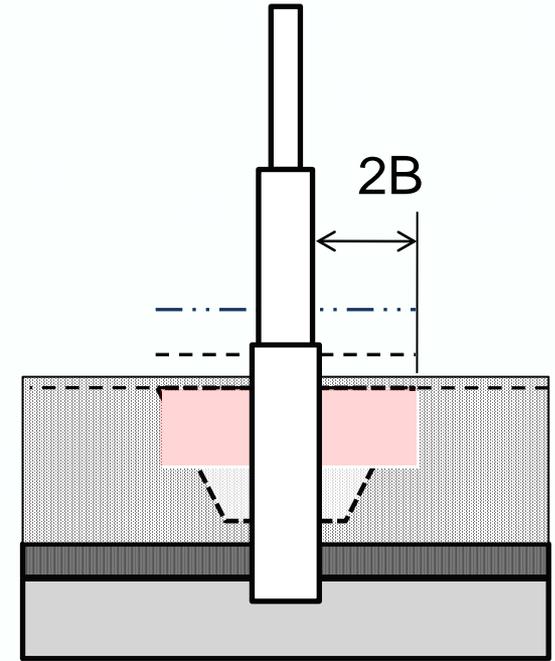
# Scour Mitigation Measures



Rip Rap  
with Filter



Articulated Block  
Mat



Jet Grouting

## Soil Response

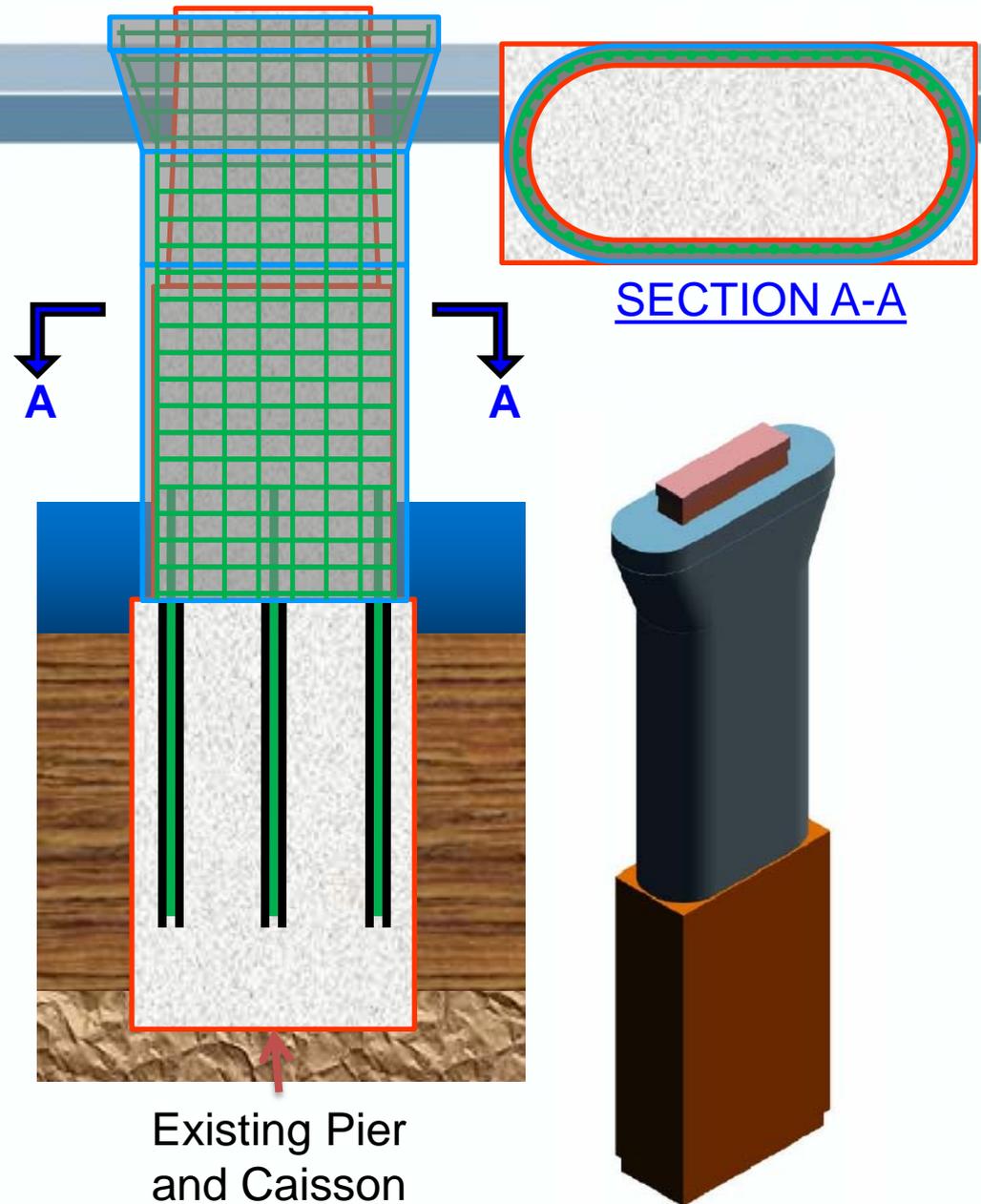
*Pier strengthening is more cost effective than constructing new piers*



- **Scour Mitigation is required**
  - Prevent scour (Soil resistance is key)
  - Rip Rap Placed below
    - Future Dredge Depth (14ft below Normal Pool)
    - Contraction Scour (2.7ft below mudline)
- **Soil Structure Interaction methods**
  - Developed Soil and Rock Parameters
  - 3D Finite Element Analysis

# Proposed Pier Strengthening

1. Drill holes into existing unreinforced caisson
2. Grout Rebar into Caisson
3. Add Stem Reinforcement
4. 2' thick encapsulation
5. Pier Cap Reinforcement
6. Form and Cast new Pier cap





# Key Project Documents

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

- **A. Scope of Services**
- **B. Project Special Provisions**
  - Structure Performance Criteria
  - Strengthening of Existing Piers
- **C. Contract Bridge Drawings**
  - Ensure stakeholder commitments are incorporated
- **D. Contract Plan Details**
  - Prescribed Scour Mitigation



# Project Reports & Special Provisions:

- **E. Binding Project Reports**
  - Vessel Collision Study (Baker)
  - Wind Engineering Study (RWDI)
  - Geotechnical Overview (KYTC/Baker)
- **F. Other Project Specific Reports (Information Only)**
  - Pier Strengthening Report (Baker)
  - Existing Piers Service Life Assessment (CTLGroup)
  - Final Environmental Assessment Report (WSA)
  - Preliminary Hydraulic And Scour Analysis (WSA)



## Design – Build Letting Summary

- **September 22, 2010**
- **Five Contractors submitted bids**
- **Award based on:**
  - Cost to construct project (*\$102-\$127 million*)
  - Length of bridge closure (*365 days max*)
  - Open to traffic (*Sept 2012 or May 2013*)



## Successful Award

- **Formula for Effective Bid Price**
  - lowest effective bid wins
- **[A + B – Adjustment]**
  - A = construction cost
  - B = closure days x \$25,000/day.
  - Adjustment = \$3.75 million for early opening



# The Bridge Construction Team

- **Walsh Construction Company**
  - Prime Contractor for Design/Build
    - Bid \$103.7 Million
    - 10 Days of Closure
    - Open to traffic September 2012
- **Engineering**
  - Burgess and Niple
  - Buckland and Taylor, LTD



# Design Review and Inspection

- **Michael Baker Jr., Inc. (Prime)**
  - Wilbur Smith Associates
  - American StructurePoint
  - VS Engineering, Inc.
  - TesTech
  - Pennoni Associates Inc. *(Shop Inspection)*
  - Doe Anderson *(Public Involvement)*

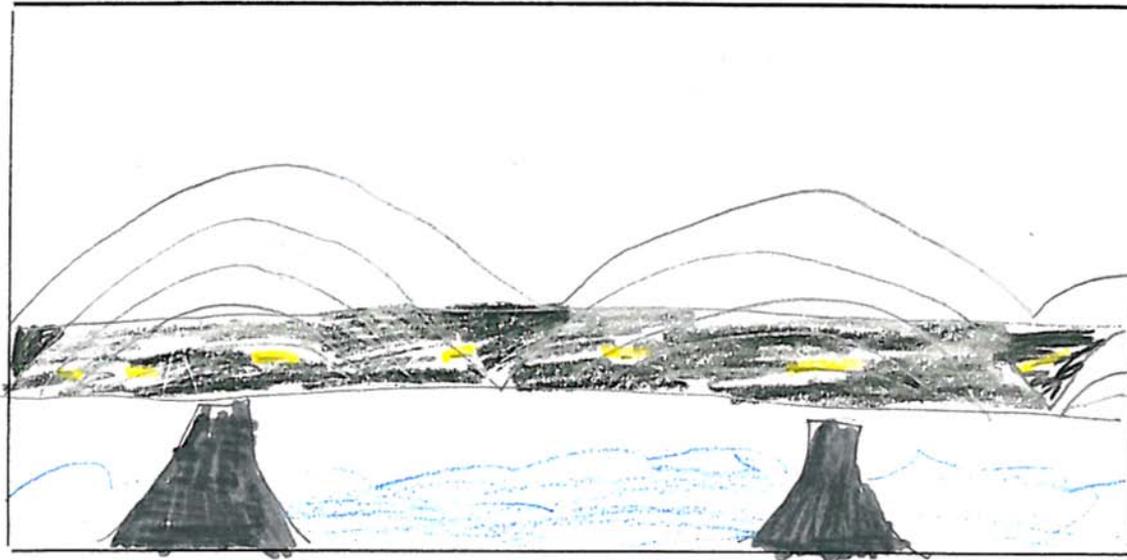
# Design Build



Madison needs a new bridge because

The bridge we have now is not safe and we don't want anybody getting hurt.

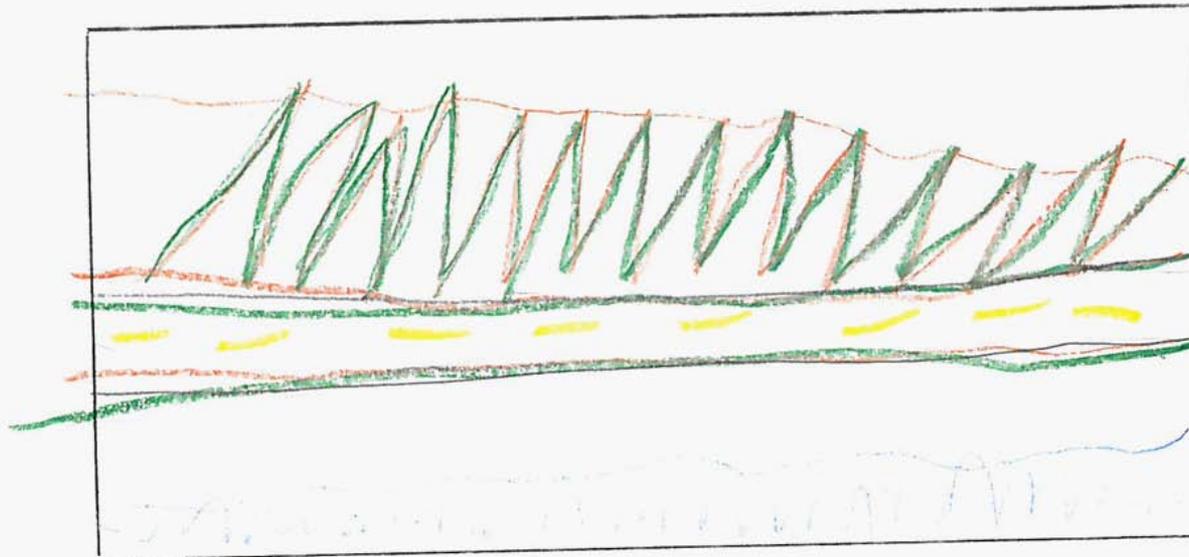
My idea of what the bridge should look like



### Madison needs a new bridge because

Madison needs a new bridge because its probably ready to fall down. The bridge has been weighed down by all those cars. The bridge needs to be rebuilt because it could look nicer. The bridge will look good once it is built.

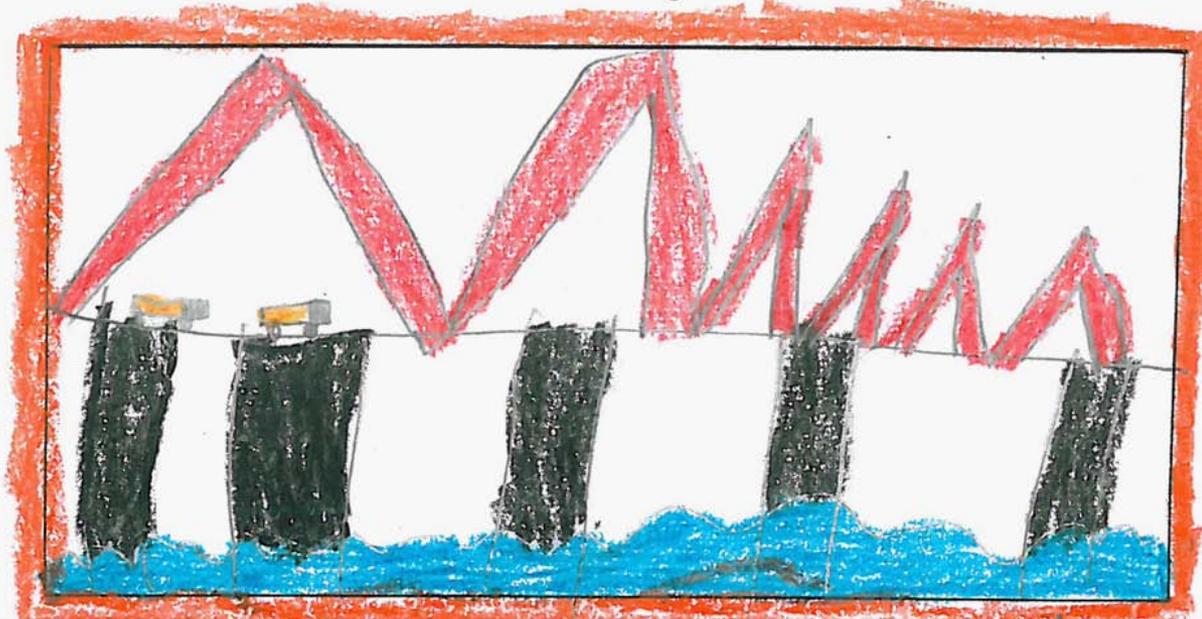
### My idea of what the bridge should look like



Madison needs a new bridge because

This Old One is almost a hundred years old, Madison and Kentucky wants to be safe and make a new bridge.

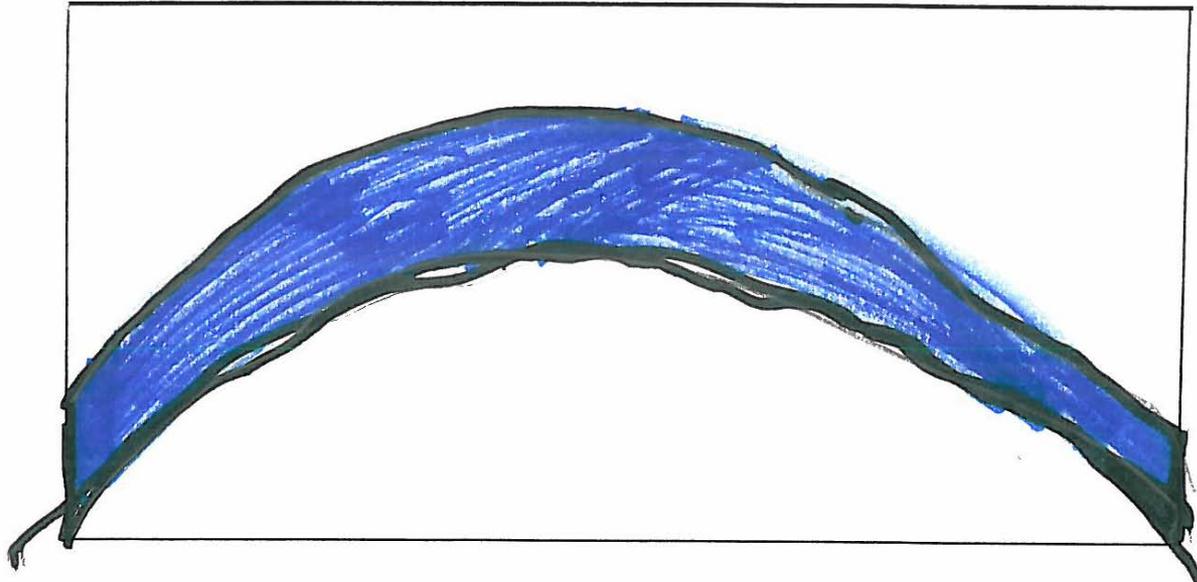
My idea of what the bridge should look like



Madison needs a new bridge because

It looks like when  
you are down by the  
river it looks like it  
is going to crack open.

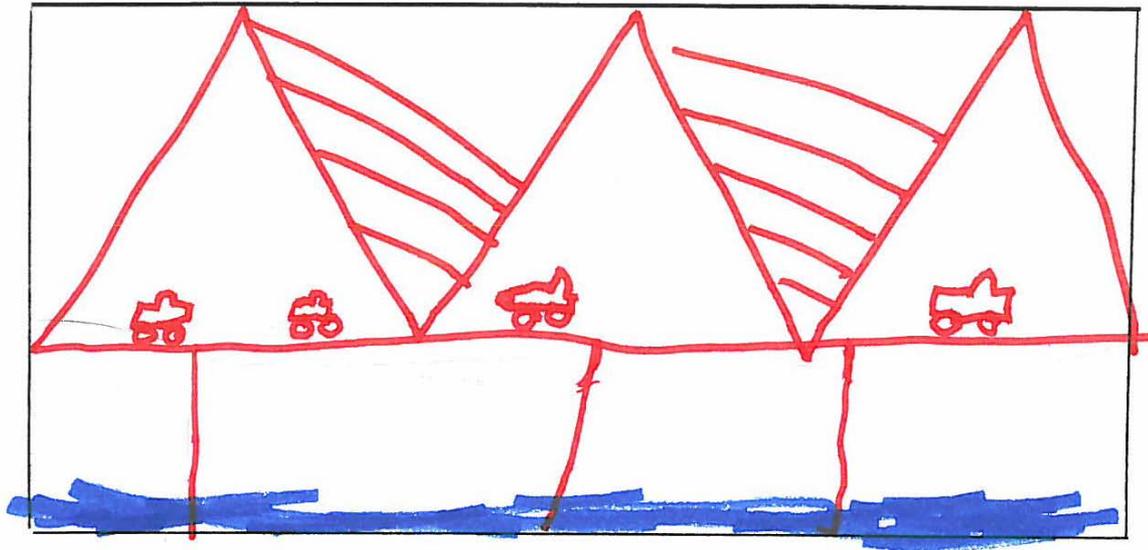
My idea of what the bridge should look like



Madison needs a new bridge because

The brige is way old and it  
woud be good to start fresh  
aigh.

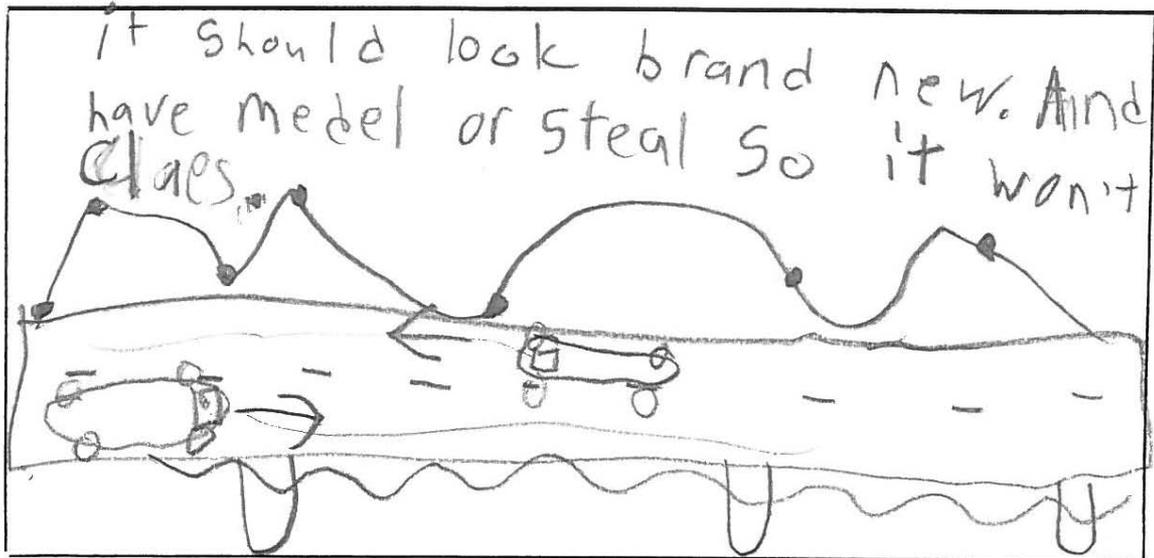
My idea of what the bridge should look like



Madison needs a new bridge because

it is getting really old the bolts are old, they could get loose and pieces will come off and claps. The color should be red or blue or white.

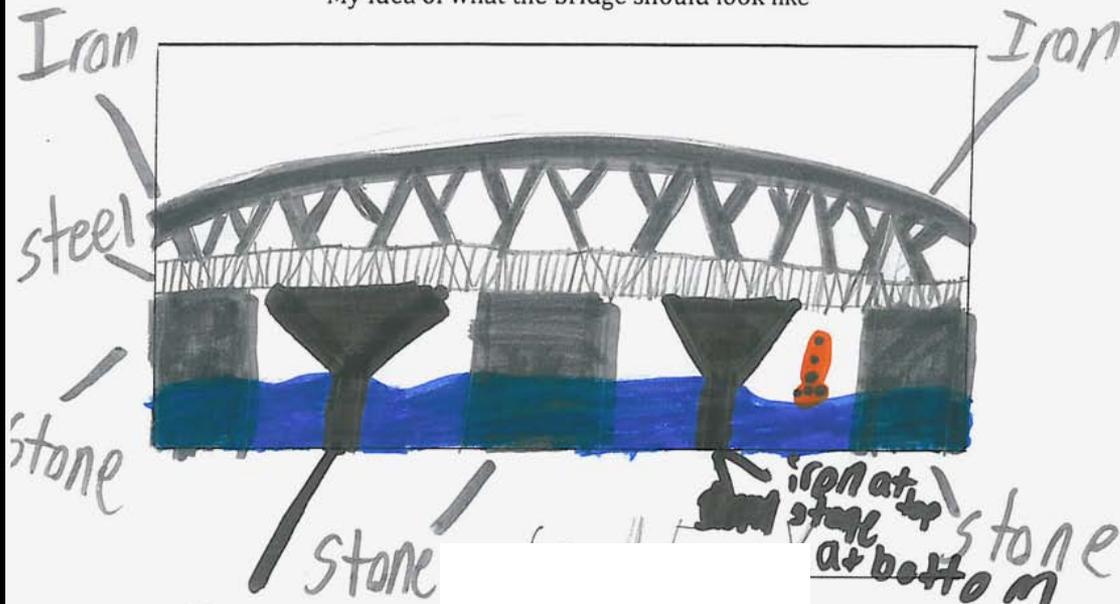
My idea of what the bridge should look like



Madison needs a new bridge because

The one currently standing is old and CAN <sup>only</sup> take 70-30 chance to collapse if the weight limit is broke.

My idea of what the bridge should look like



Iron at top,  
stone at bottom. Same for other.  
= buoy (b-oo-ee)



# Design Team

- **Burgess & Niple**
  - Design Management
  - Truss Pier Modifications
  - Approaches
  - Temporary ramps/bridges
  - Inspection access
- **Buckland & Taylor**
  - Truss Design
  - Temporary Piers for Truss
- **HC Nutting/Terracon – Geotechnical**
- **RWDI – Wind Review**



## INDOT Design Build Process

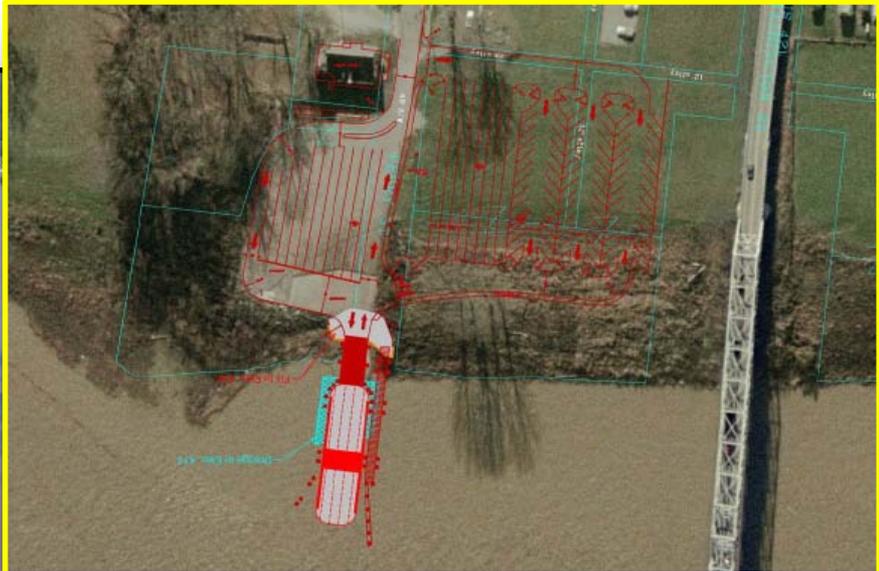
- **“30 %” plans with bid documents**
- **Develop plans to “Field Check Plans”(40%)**
- **Turn in plans one week prior to bid opening for pass/fail scoring**
- **If pass, then bid is opened**
- **Two (maximum) confidential “innovation” meetings with INDOT during bidding process**
- **“Cost Reduction Incentive (CRI)”**



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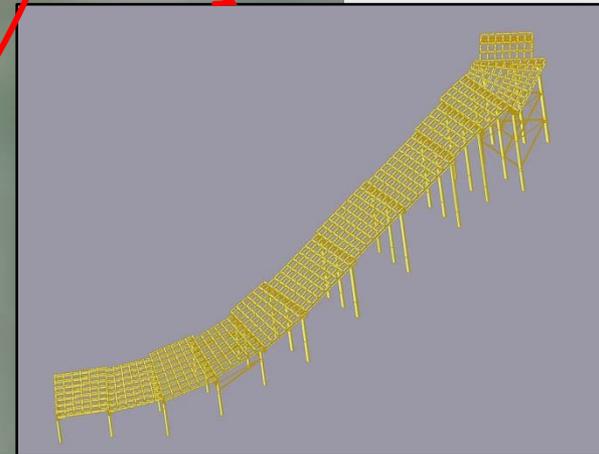
# The IDEA



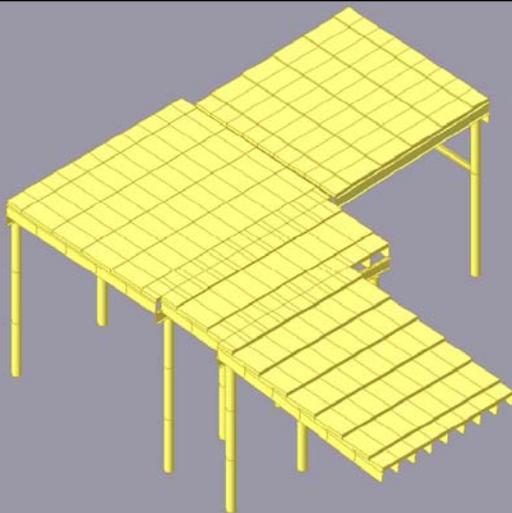
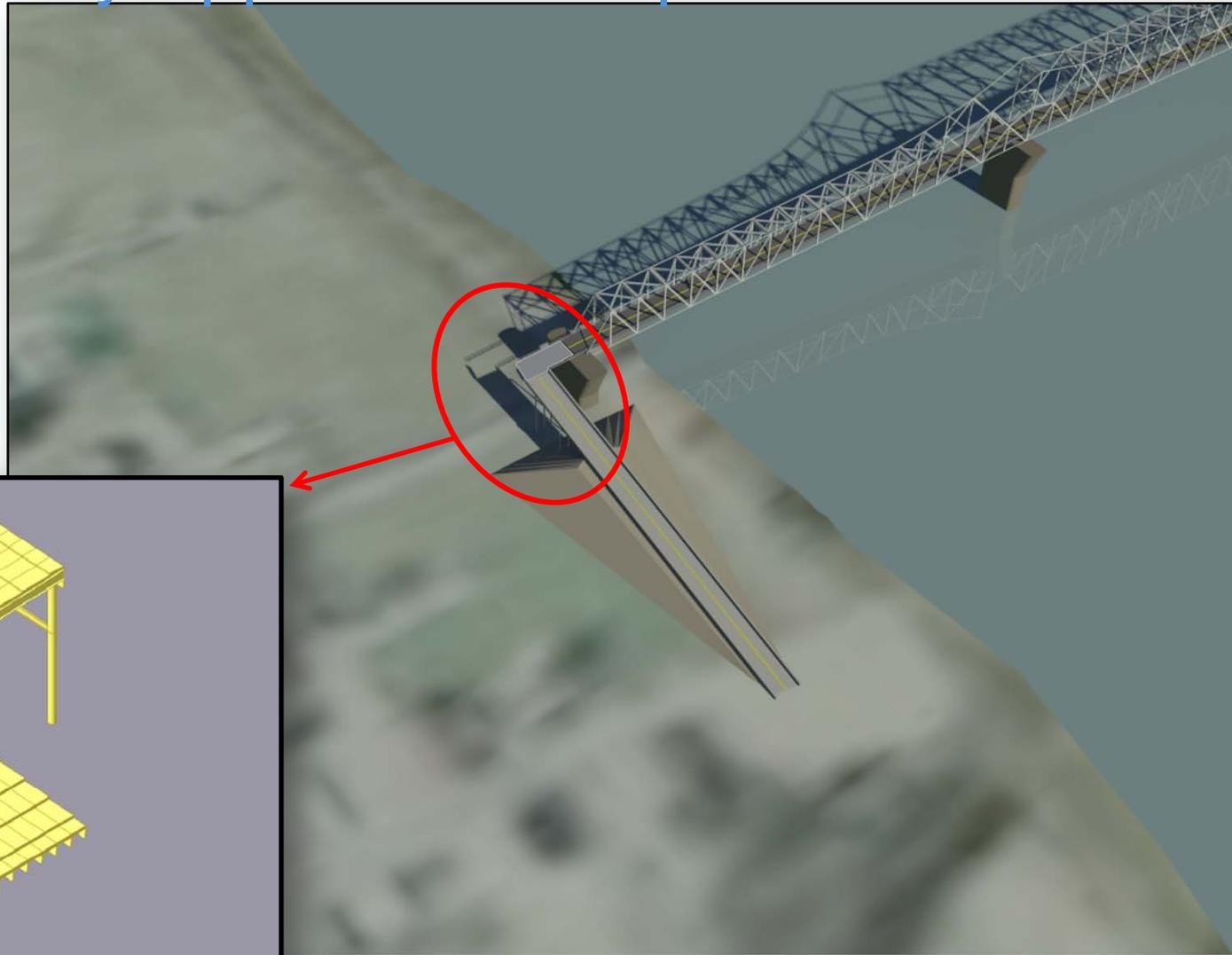
Ferry Service



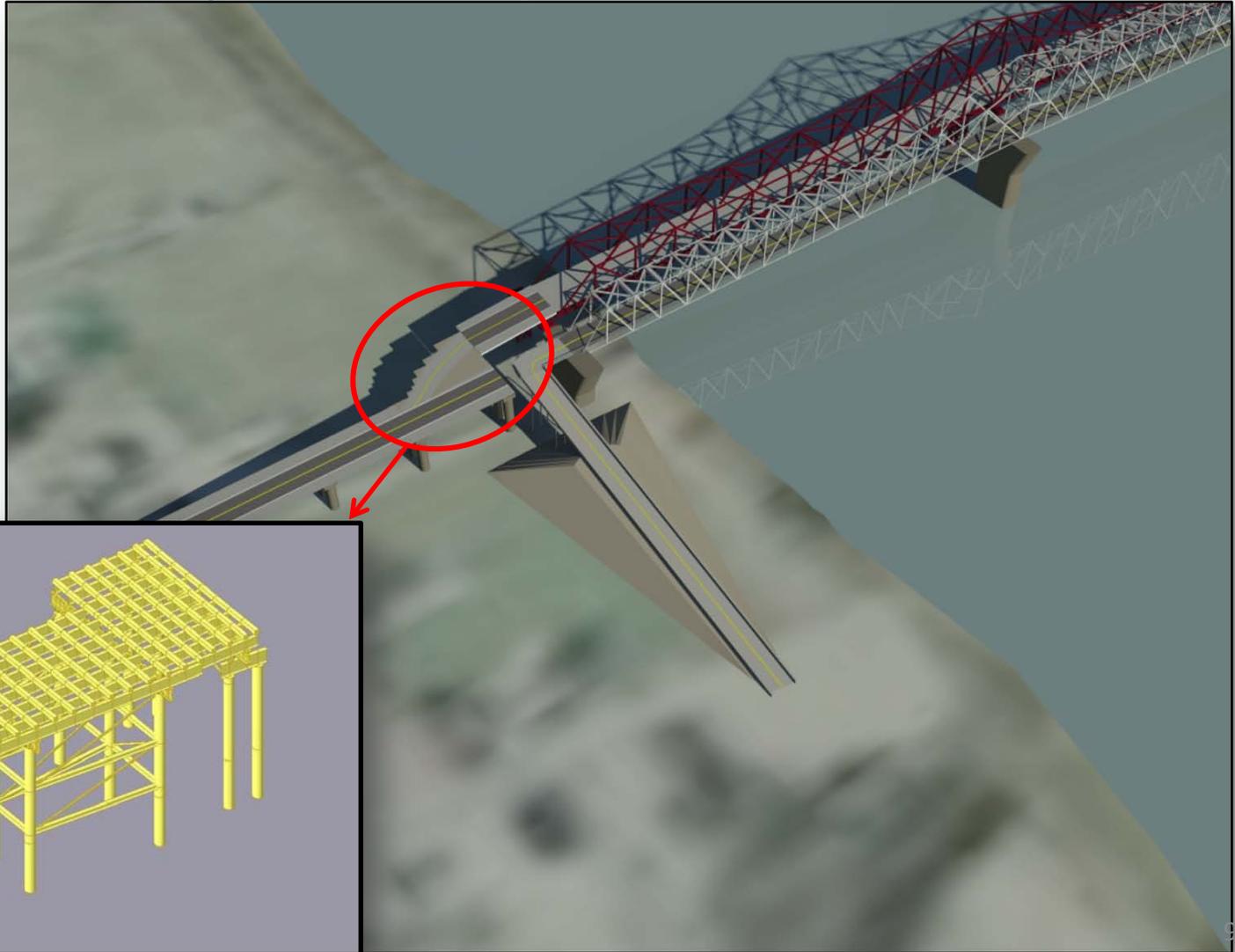
# Temporary Approach Ramps - IN



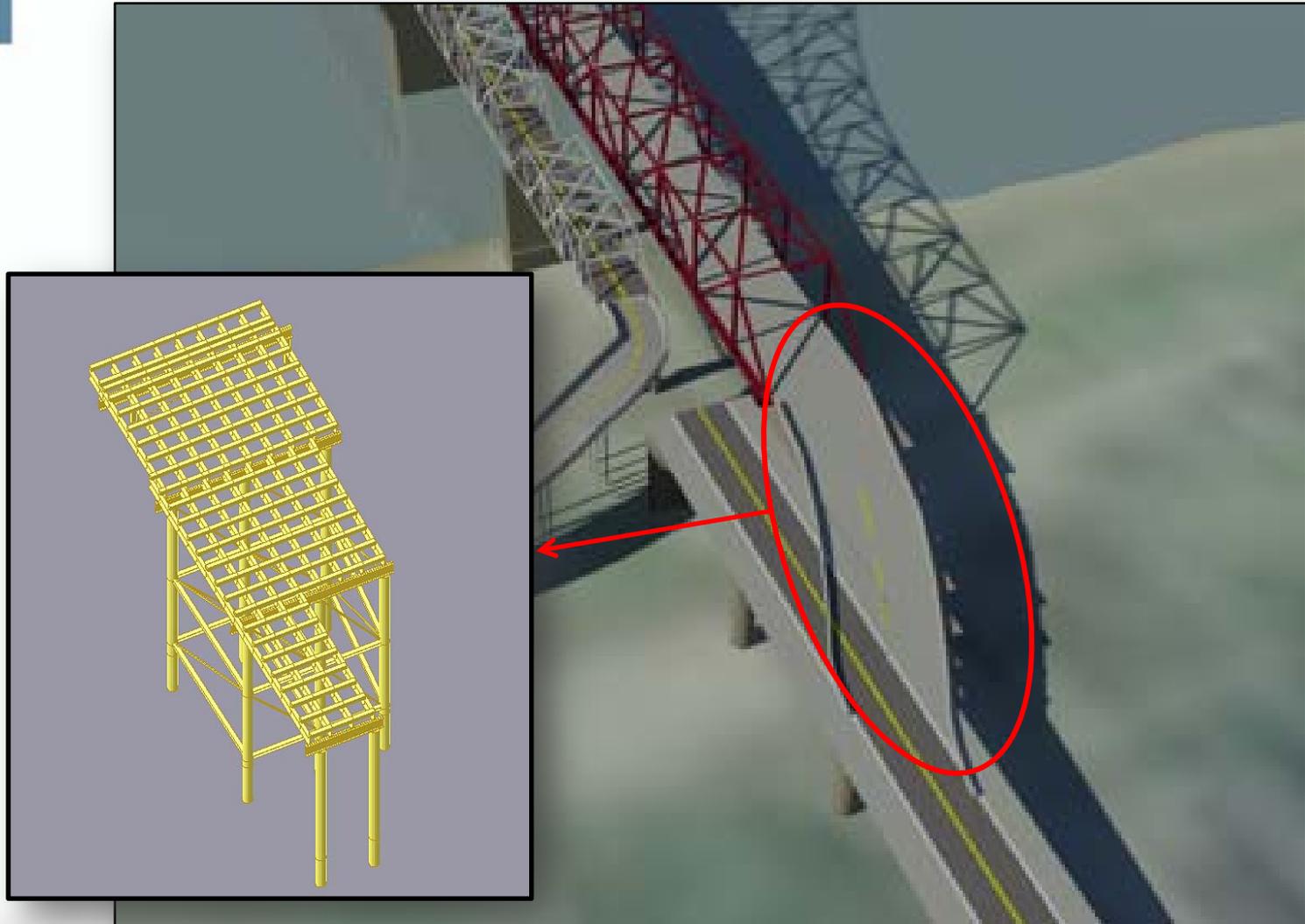
# Temporary Approach Ramps – KY



# Temporary Tie-in Spans – KY



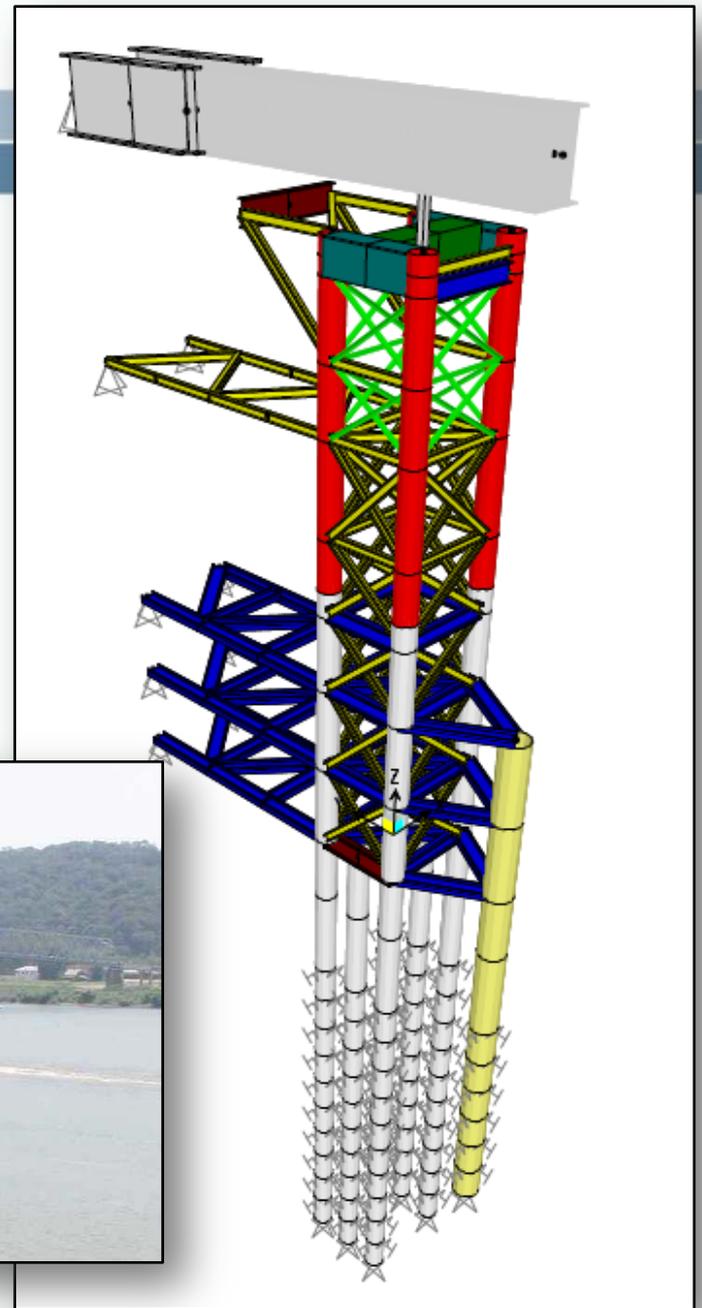
# Temporary Tie-in Spans – IN





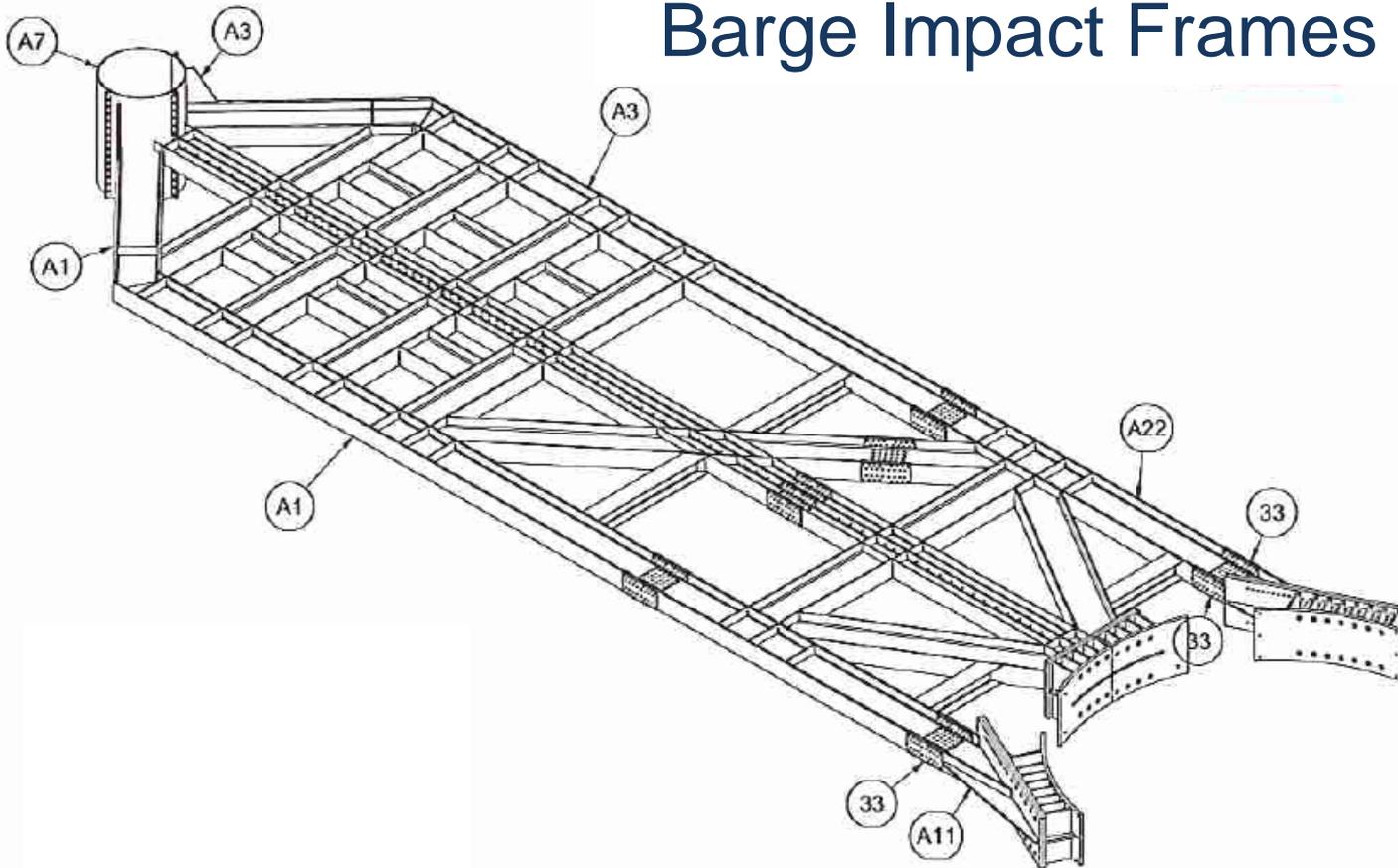


# Temporary Piers



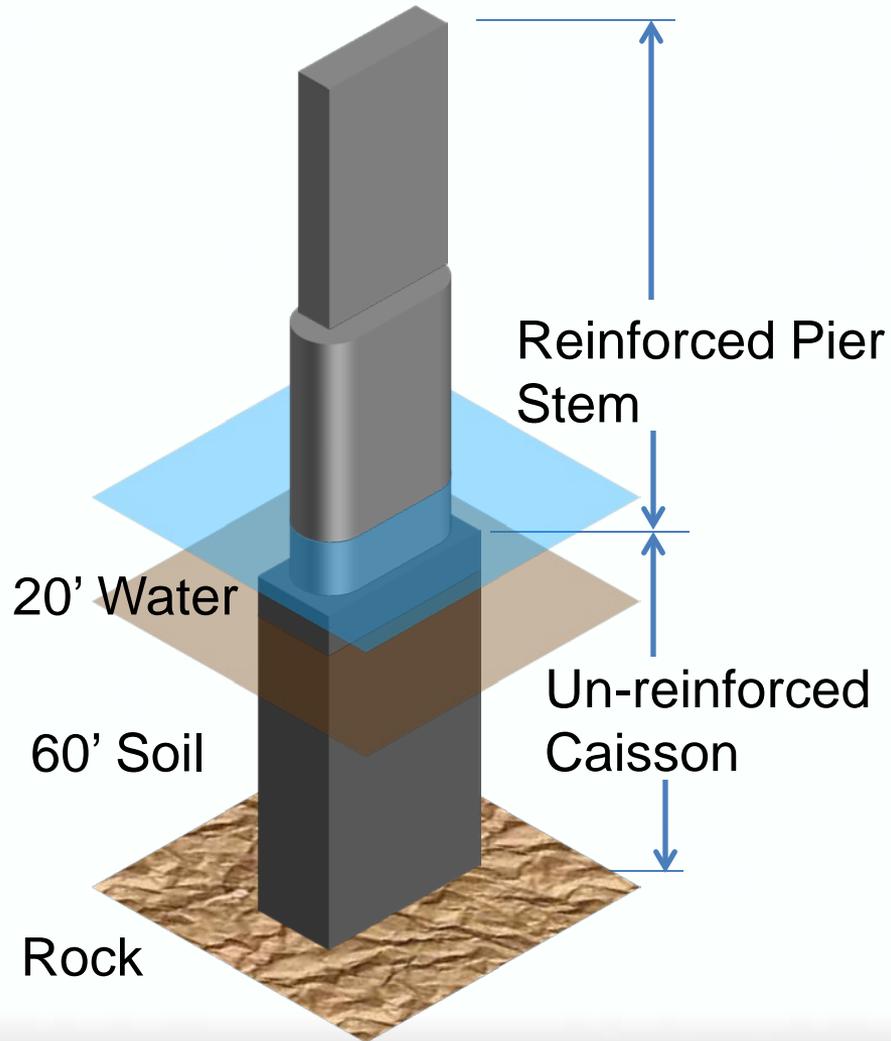
# Temporary Piers

## Barge Impact Frames

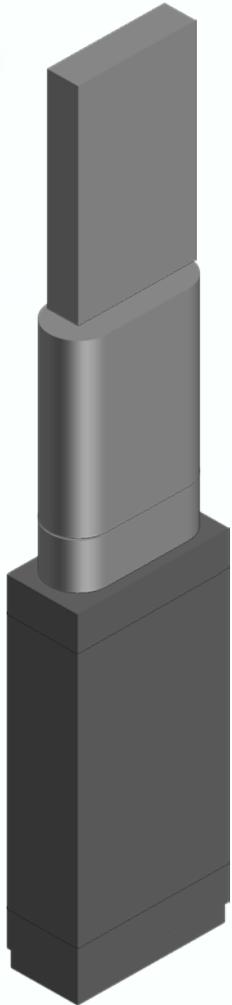


# Pier Strengthening

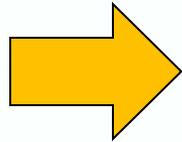
Existing Pier



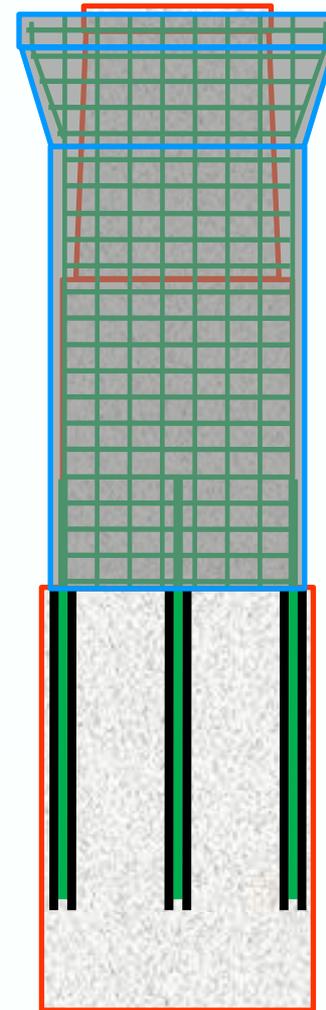
# Pier Strengthening



Existing



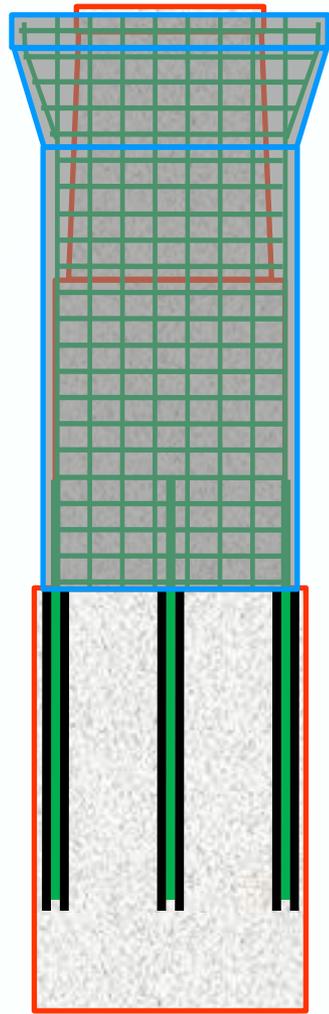
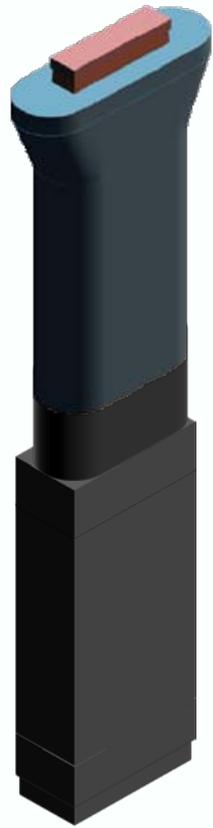
Proposed



Reinforcing



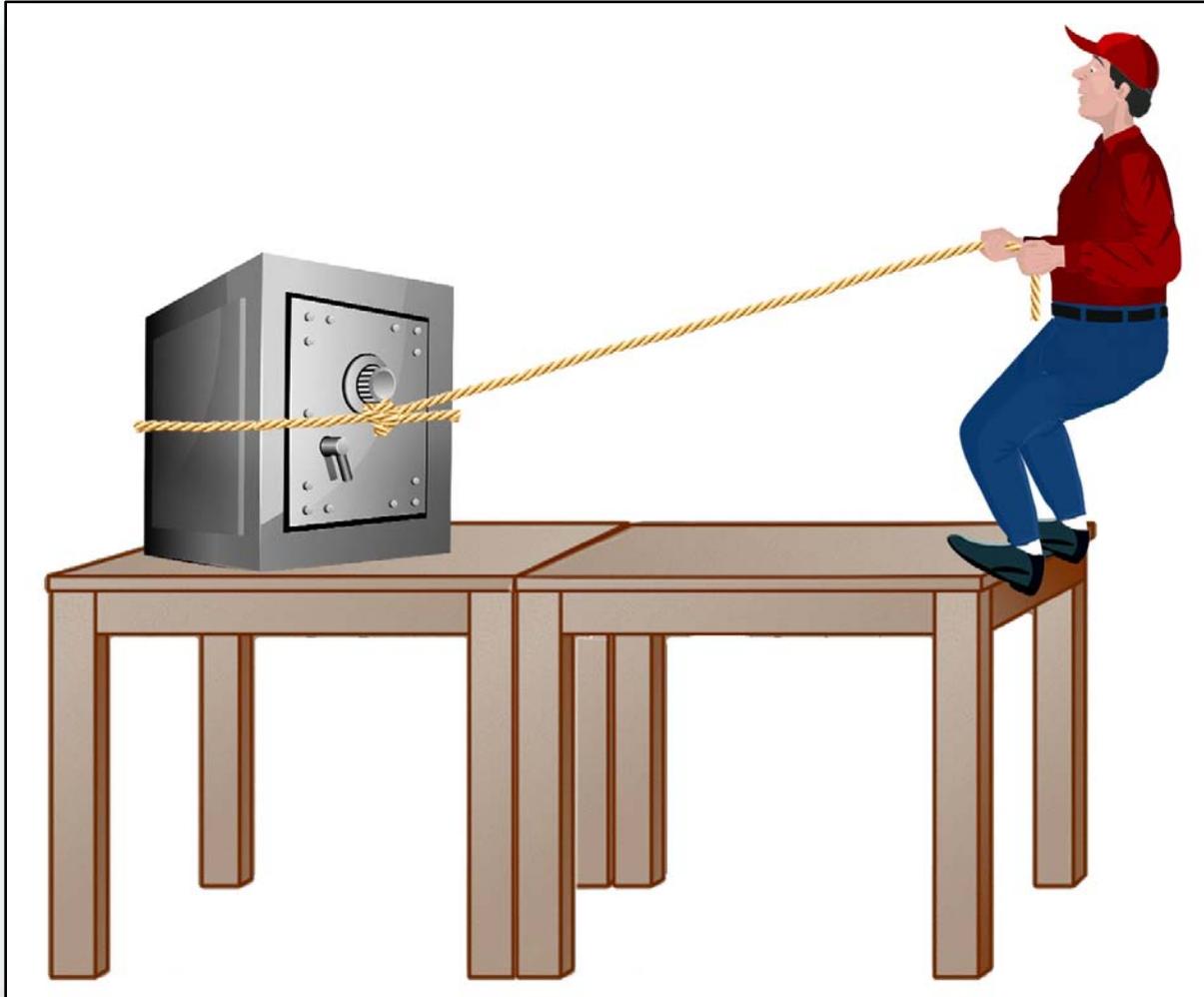
# Pier Strengthening



# Pier Strengthening



# Truss Sliding







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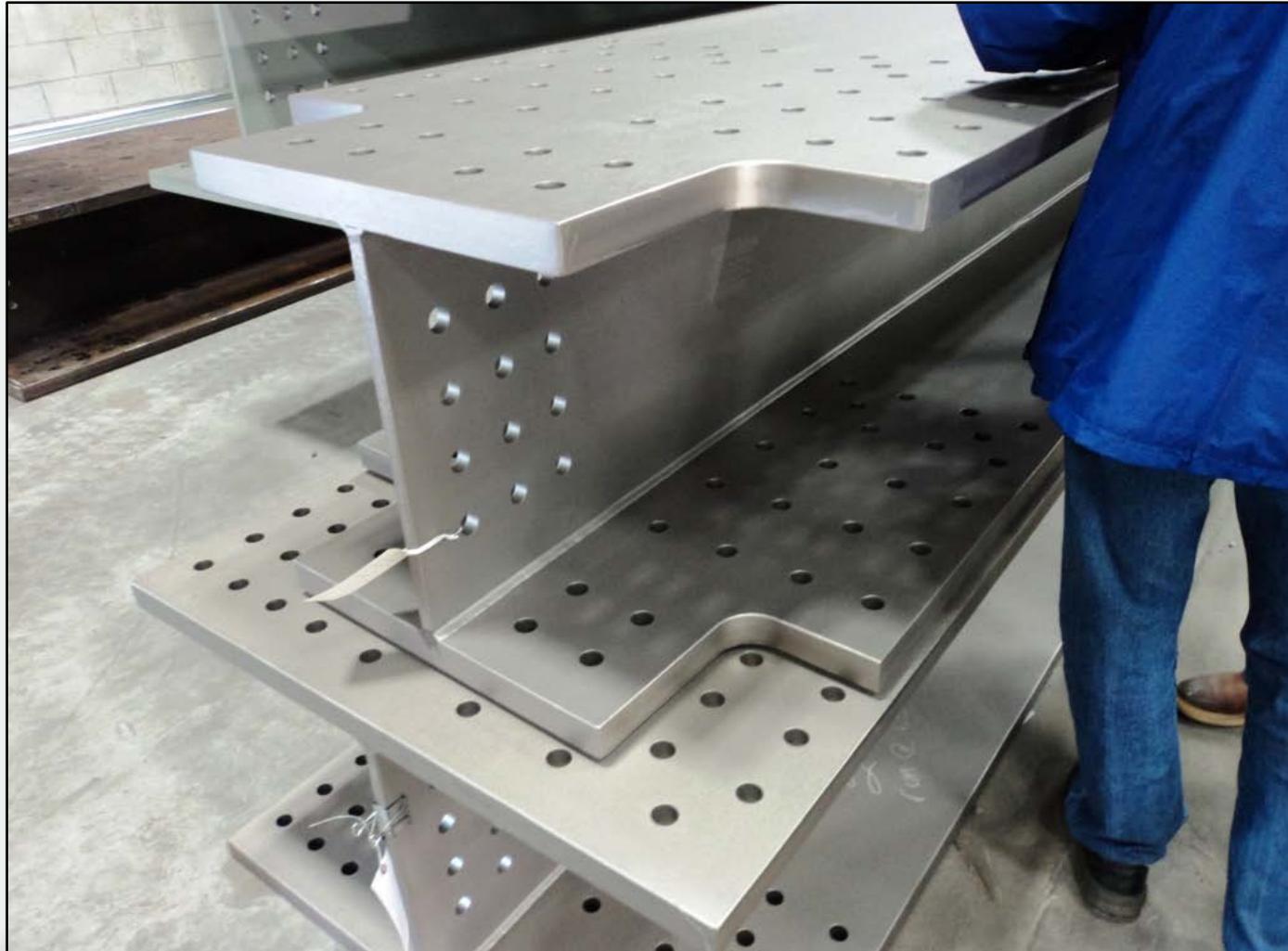
# Truss Fabrication



# Truss Fabrication



# Truss Fabrication



# Truss Fabrication



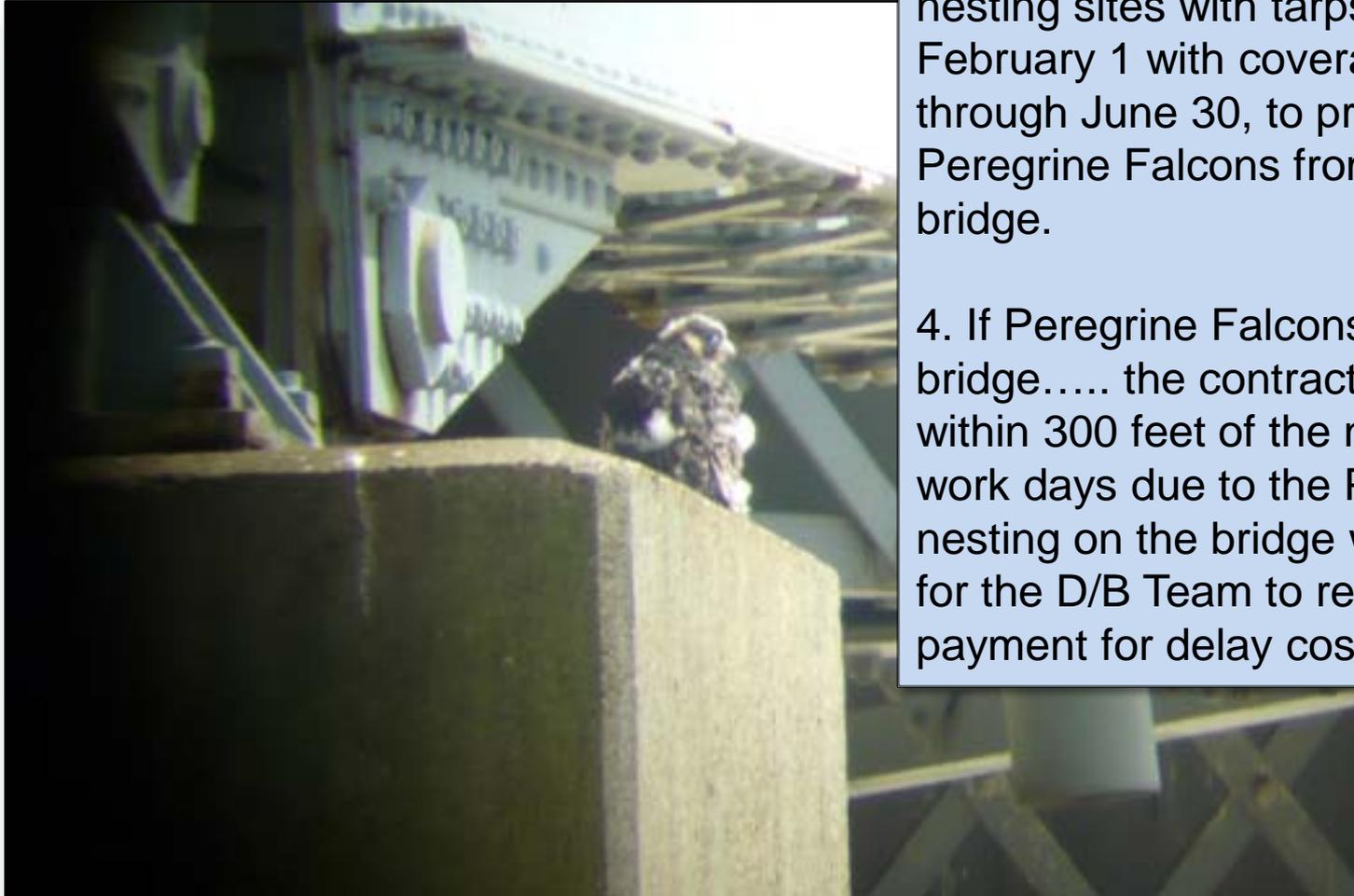
# Truss Fabrication





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## The Falcons



“3. During each year of construction, the Contractor shall cover all potential nesting sites with tarps..... prior to February 1 with coverage maintained through June 30, to prevent the Peregrine Falcons from nesting on the bridge.

4. If Peregrine Falcons nest on the bridge..... the contractor shall not work within 300 feet of the nest.....Any loss of work days due to the Peregrine Falcons nesting on the bridge will not be a basis for the D/B Team to request additional payment for delay costs. “



# The Falcons



“ Lucky “





# Questions?



[www.miltonmadisonbridge.com](http://www.miltonmadisonbridge.com)