Proposed Ohio River Bridge: Transitioning from Planning to NEPA and Navigation Modeling

September 17, 2013

Presented by:
Perry Keller, WVDOT
Amy Staud and Matt Bunner, HDR
Upper Ohio Valley Bridge System

- Former Location of Fort Stueben Bridge (Demolished in February 2012)
- Market Street Bridge
- US 22 (Veteran’s Memorial Bridge)

Study Area:
- Brilliant
- Wellsburg
- Pittsburgh
- Cleveland
- Akron
- Youngstown
- Marietta

Job No.: 10038
Date: 3-29-12
Exhibit: 1-1
Planning a Bridge – A Brief History

January 1993
First mention
of new bridge

Fred Van Kirk, Commissioner/WV State Highway Engineer, states "We will consider the possibility of a new transriver crossing at Wellsburg, as well as other sites, during the study of West Virginia Route 2".

The study purpose was "to identify a site for the new Ohio River crossing common to Near Wellsburg, WV".

Conclusions:
1. Free stress and Market Street Bridges are beyond their design life.
2. A situation with only one river crossing would create a major traffic hazard.
3. The existing system lacks flexibility and redundancy in travel options.

FPBH Year 2015 Transportation Plan was adopted May 1994

BHJ 2020 Transportation Plan was adopted January 1994

In 2005, $18 million was appropriated to plan, design and construct New Ohio River Bridge, south of Wellsburg, Brooke County

August 2005

Notice to Proceed given to HDR Engineering, for preparation of an Environmental Assessment and Design Study May 2008

Technical studies performed by HDR
Winter 2008/ Spring 2009

Alternatives 1, 2, 3, 4, 5, 6, 7 developed.

Additional technical studies to be performed by HDR
Fall 2009/ Winter 2009

FONS/ Signed Fall 2013

Preliminary and Final Design, Right-of-Way Acquisition

New Bridge

Construction

Traffic

Market Street Bridge scheduled to close should it still be in service

3. Improvements near the US 22 Veterans Bridge.
2. Construct a new bridge, south of Wellsburg.
3. Construct a new bridge in Steubenville.

November 2005

WVDOT advertised for Letters of Interest related to a phased study and design contract including environmental and location work

October 2008

Public Workshops

June 2009

Draft Design Report Submitted to WVDO

September 2009

Public Workshops

Summer 2012

• Approved Environmental Assessment ready for public and agency review and comment

• Public Workshops

Predetermined Alternative B is the Preferred Alternative.
Planning a Bridge – A Brief History

The plan identified the construction of a new Ohio River Bridge crossing between Franklin and Wellsville as a primary project.

The plan stated that a new crossing would "serve to alleviate much of the congestion currently realized on State Route 2 through Franklin and Wellsville."

The BHJ Year 2015 Transportation Plan was adopted May 1994.


Plan recommended:
- Implement a study to determine best location and accurate costs
- Pursue a dedicated source of funding and funding options for the project

The BHJ study was to identify an appropriate crossing location.

BHJ executes an agreement to complete Phase I Needs Analysis for the Upper Ohio Valley Bridge System Study
- September 1999

Work on Phase I Upper Ohio Valley Bridge System Study begins June 2000.

Conclusions:
1. Fort Steuben and Market Street Bridges are beyond their design life
2. A situation with only one river crossing would create a major safety hazard
3. The existing system lacks flexibility and redundancy in travel options

BHJ submits bridge system study scope of work and advertising statement to WVDOT.

March 1999

May 2000

Phase I Upper Ohio Valley Bridge System Study Final Report is adopted by BHJ

The study purpose was to identify a site for the new Ohio River crossing somewhere near Wellsville, WV.

- September 1999
- May 2000

First mention of new bridge

September 1997

BHJ requested WVDOT to initiate “Bridge Location Study”.

First Van Kirk, Commissioner/WV State Highway Engineer, states: “We will consider the possibility of a new crossing at Wellvillage, as well as other sites during the study of West Virginia Route 2.”

Conclusions:
1. Improvements near the US 22 Veterans Bridge.
2. Construct a new bridge, south of Wellsville
3. Construct a new bridge in Steubenville.

Preferred Alternative B as the Preferred Alternative.

Presented Alternative B as the Preferred Alternative.
Planning a Bridge – A Brief History

The plan identified the construction of a new Ohio River Bridge crossing between Follksburg and Weilburg as a primary project.

The plan stated that a new crossing would “serve to alleviate much of the congestion currently realized on State Route 1 through Follksburg and Weilburg”.

The BHU Year 2013 Transportation Plan was adopted May 1994.

The BHU 2020 Regional Transportation Plan was adopted January 1998.

The study purpose was “to identify a site for the new Ohio River crossing commuter near Weilburg, WV”

First mention of new bridge

First Van Kirk, Commissioner/VW State Highway Engineer, states “We will consider the possibility of a new crossing site near Weilburg, as well as other sites, during the study of West Virginia Route 1”. September 1997 BHU requested WVDOT to initiate “Bridge Location Study.”

March 1999 BHU submits Bridge System Study scope of work and advertising statement to the WVDOT

May 2000 Phase I Upper Ohio Valley Bridge System Study Final Report is adopted by BHU

September 2003 Phase II Brooke-Hancock-Jefferson Regional Bridge System Study Phase II Final Report completed

September 2003

Phase II Brooke-Hancock-Jefferson Regional Bridge System Study Phase II Final Report completed

The Phase II study was used to identify and evaluate all locations and alternatives, and ultimately suggest an appropriate river crossing location.

BHJ executes an agreement to complete Phase I Needs Analysis for the Upper Ohio River Needs and Location Study September 1999

Work on Phase II Brooke-Hancock-Jefferson Regional Bridge System Study begins June 2000

In 2005, $18 million was appropriated to plan, design and construct new Oh Oakland River Bridge, south of Weilburg, Brooke County August 2005

Past

Present

Future

Conclusions:
1. Improvements near the US 22 Veterans Bridge.
2. Construct a new bridge, south of Weilburg.
3. Construct a new bridge in Steubenville.

Alternatives 2, 4, and 7 cannot sustain.

New Bridge

Open To

Traffic

Market Street Bridge scheduled to close should it still be in service

Alternatives 2, 4a, and 7 cannot sustain.

Public Workshops

Prevented Alternative B as the preferred Alternative.

Conclusions:
1. Improvements near the US 22 Veterans Bridge.
2. Construct a new bridge, south of Weilburg.
3. Construct a new bridge in Steubenville.

HDR

Conclusions:
1. Fort Steubenville and Market Street Bridges are beyond their design life.
2. A situation with only one river crossing would create a major safety hazard.
3. The existing system lacks flexibility and redundancy in travel options.

HDR

Conclusions:
1. Improvements near the US 22 Veterans Bridge.
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HDR

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HDR
Planning a Bridge – A Brief History

In 2005, $18 million was appropriated to plan, design and construct New Ohio River Bridge, south of Wellsburg, Brooke County. August 2005
Phase I – Upper Ohio Valley Bridge System Study

**Purpose**

Analyze and Determine the need for a new Ohio River Bridge – Between just north of the Fort Steuben Bridge to southern end of Brooke County.
Phase I – Upper Ohio Valley Bridge System Study

The Study is an outgrowth of the BHJ 2020 Regional Transportation Plan

*Their number one priority*
Conclusions and Determination of Need

1. The existing bridges can carry both current and projected traffic volumes.

2. Two of the three bridges (Market Street and Fort Steuben) are beyond their design life.

3. Both older bridges will require significant renovation to continue operating for any extended period of time.

4. Even with renovation abrupt closure of one or both older bridges is possible, if key structural components fail.
Conclusions and Determination of Need

5. A situation with only one river crossing would create a major safety hazard.

6. The concentration of all river crossing capacity in a small geographic area limits flexibility within the system.

7. The adopted Goals and Objectives are not satisfied with any bridge out of service.
Phase I – Upper Ohio Valley Bridge System Study

Basis for Finding of Need

1. The impending closure of existing crossing capacity will cause failures in the system.

2. The existing system lacks flexibility and redundancy in travel options.
Phase I – Upper Ohio Valley Bridge System Study

Goals

1. Maintain and enhance transportation capacity, safety and reliability for existing businesses, their employees and all residents;

2. Provide enhanced access for expansion and retention of business, and attraction of new business to the region;

3. Draw more traffic and commerce into the Upper Ohio Valley;
Phase I – Upper Ohio Valley Bridge System Study

Goals

4. Develop linkages to high capacity inter-modal transportation by strengthening the connections to river ports and railroads;

5. Enhance emergency management options to provide alternative routes in case of flood, natural disaster or accident;

6. Improve travel times throughout the region; and

7. Ensure that the cross-river transport network from Wheeling north to Steubenville is sufficiently robust to carry all weights and sizes of vehicles.
Conclusions – If both the Fort Steuben and Market Street Bridges were to be closed, there would be nearly double the amount of traffic on the Veterans Memorial Bridge.

- While the bridge can accommodate the increased volume, the ramp system cannot.

- If the Veterans Memorial Bridge is closed due to traffic accidents or inspections, the traffic on the other two bridges will exceed capacity.

- If only one of these bridges remains open to traffic, the impact of closures of the Veterans Memorial Bridge will be even more severe.
Conclusions – If both the Fort Steuben and Market Street Bridges were to be closed, there would be nearly double the amount of traffic on the Veterans Memorial Bridge.

• Also, at times when the Bridge is closed due to accidents or inspection, the nearest existing Ohio River crossing is at such a distance that the Weirton/Steubenville area that the impact on local traffic would be seriously impacted, essentially cutting the two cities off from one another.
Purpose

To determine the most suitable system of bridges in the study area considering the regional benefits from, and the cost of providing such a system.
Phase II – BHJ Regional Bridge System Study

Need Assessment

The proposed improvements will serve the Ohio River crossing travel desires for the BHJ region over the next 25 years. They prepare the community for the eventual end of the service life for both the Market Street Bridge (constructed 1904) and the Fort Steuben Bridge (constructed 1928).
Phase II – BHJ Regional Bridge System Study

Evaluation Criteria

1. Vehicle Hours of Travel (VHT)
2. Vehicle Miles of Travel (VMT)
3. Total Travel Time (Million Person Hours/yr)
4. Average Travel Times
5. Percent of System at each Level of Service (LOS)
6. Probability of Minimizing Potential Environmental Impacts
7. Estimated Vehicle Emissions (tons/yr)
8. Potential Annual Accidents
Phase II – BHJ Regional Bridge System Study

Evaluation Criteria

9. Potential for Improved Emergency Response
10. Potential for Alternative River Crossings
11. Capital Cost
12. Reduction in Total Users Cost
13. B/C Ratio
14. Technical Feasibility
15. Fiscal Likelihood
16. Potential Land Use Impacts
17. Ability to Maximize Accommodations of Heavy and Large Vehicles
18. Potential for Improved Access to Existing Industrial Sites
19. Potential for Improved Access to Future Industrial Sites
## MEASURES

<table>
<thead>
<tr>
<th>Mobility</th>
<th>Base Scenario</th>
<th>Southern Scenarios</th>
<th>Vets, New South of Wellsburg</th>
<th>Vets, New Between Follansbee and Wellsburg</th>
<th>Vets, New Market in Exist. Location</th>
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Phase II – BHJ Regional Bridge System Study

First Priority

- Construct Roadway and Intersection Capacity Improvements
- Realign and improve Freedom Way/Birch Intersection
- Improve Alignment and Widen the intersection of Freedom Way/WV 2 and related WV approaches
- Improvement of Freedom Way including Upgrade and/or Widening of the Existing three lanes
- Improve and Widen University/SR 7 Intersection and Related Ohio Approaches
- Provide Safety Improvements on Veterans Memorial Bridge ramps in Ohio
Phase II – BHJ Regional Bridge System Study

Second Priority

- Construct a New Ohio River Bridge, south of Wellsburg
- Prepare Engineering and Environmental Studies to Establish a Specific Location for the New Bridge and configuration of Roadway Connections to WV 2 and SR 7
Phase II – BHJ Regional Bridge System Study

Third Priority

• Construct a New Ohio River Bridge

• Prepare Engineering and Environmental Studies to Establish a Specific Alignment Location and Impact on WV 2, SR 7 and the Existing Street System in the Steubenville Central Business District.
Planning a Bridge – A Brief History

The plan identified the construction of a new Ohio River Bridge crossing between Follksburg and Weitsburg as a primary project.

The plan stated that a new crossing would “serve to alleviate needs of the community currently served on State Route 2 through Follksburg and Weitsburg.”

The BHJ Year 2015 Transportation Plan was adopted May 1994.


The study purpose was “to identify a site for the new Ohio River crossing somewhere near Weitsburg, WV.”

First mention of new bridge.

First Ali Kirk, Commissioner WV State Highway Engineer, states: “We will consider the possibility of a new crossing occurring at Weitsburg, as well as other sites, during the study of West Virginia Route 2.”

January 1993

September 1997

BHJ requested WVDOT to initiate “Bridge Location Study.”

BHJ submitted Bridge System Study scope of work and advertising statement to the WVDOT.

March 1999

May 2000

BHJ executes an agreement to complete Phase I Needs Analysis for the Upper Ohio River Needs and Location Study September 1999.

Phase I was a study done to determine the need for a new Ohio River Bridge crossing within a defined study area, which extends from just north of the Fort Stilwell Bridge at Stilwell, Ohio to the southern boundary delineated by the southern end of Kanawha County, West Virginia.

BHJ executed an agreement to complete Phase I Needs Analysis for the Upper Ohio River Needs and Location Study September 1999.

Plan recommended: Implement a study to determine best location and accurate costs.

Pursue a dedicated source of funding and funding options for the project.


The study scope was to identify a site for the new Ohio River crossing somewhere near Weitsburg, WV.

The Phase II study was used to identify specific locations and alter options and ultimately suggest an appropriate river crossing location.

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In 2005, $18 million was appropriated to plan, design, and construct New Ohio River Bridge, south of Weitsburg, Brooke County August 2005.

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October 2008

Public Workshops.

November 2005

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June 2009

Draft Design Report Submitted to WVDOT

September 2009

Public Workshops

Summer 2012

* Approved Environmental Assessment ready for public and agency review and comment

Public Workshops

Proceeded Alternative B as the preferred Alternative.


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Conclusions:

1. Fort Stevens and Market Street Bridges are beyond their design life.
2. A situation with only one river crossing would create a major safety hazard.
3. The existing system lacks flexibility and redundancy in travel options.

Conclusions:

1. Improvements near the US 22/Veterans Bridge.
2. Construct a new bridge, south of Weitsburg.
3. Construct a new bridge in Stilwell.

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Conclusions:

1. Improvements near the US 22/Veterans Bridge.
2. Construct a new bridge, south of Weitsburg.
3. Construct a new bridge in Stilwell.
Transitioning to NEPA

Objectives and Goals

• **Maintain and enhance** transportation capacity, safety and reliability

• Provide **enhanced access** for expansion and retention of **businesses** and attraction of new businesses to the region

• Draw **more traffic and commerce** into the Upper Ohio Valley

• Develop **linkages to high capacity inter-modal transportation** by strengthening the connections to river ports and railroads

• **Enhance emergency management options** to provide alternative routes in case of flood, natural disaster, or accident

• **Improve travel times** throughout the region

• Ensure that the cross-river transport network from Wheeling north to Steubenville is sufficiently robust to **carry all weights and sizes** of commercial vehicles.
Transitioning to NEPA

**BHJ GOALS AND OBJECTIVES**

- Maintain and enhance transportation capacity, safety and reliability
- Draw more traffic and commerce into the Upper Ohio Valley
- Develop linkages to high capacity inter-modal transportation by strengthening the connections to river ports and railroads
- Improve travel times throughout the region
- Ensure that the cross-river transport network from Wheeling north to Steubenville is sufficiently robust to carry all weights and sizes of commercial vehicles.
- Enhance emergency management options to provide alternative routes in case of flood, natural disaster, or accident
- Provide enhanced access for expansion and retention of businesses and attraction of new businesses to the region
- Draw more traffic and commerce into the Upper Ohio Valley
- Ensure that the cross-river transport network from Wheeling north to Steubenville is sufficiently robust to carry all weights and sizes of commercial vehicles.

**PURPOSE AND NEED**

- Improve Access and Flexibility of the Regional Transportation System
- Enhance Regional Safety (Mobility)
- Stimulate Economic Growth and Development
Early Alternatives Development

1,000’ Clearance

700’ Clearance

1,000’ Clearance
2009 Cost Estimate
Alternative 2 → $118.9M
Alternative 4a → $125.4M
Alternative 7 → $78.3M
Back to the Drawing Board

• Alternative with narrowest navigational clearance (and lowest cost) now in question

• Navigational clearance for Alternatives 2 & 4a both required 1,000 clearance

• ODOT suggested looking into Seamen’s Church Institute’s capabilities for river navigation simulation modeling
Why Does Navigational Clearance Matter During NEPA?

(700’ + 500’)*(50’)*($200 PER SF) = $12M FOR APPROACHES

(700’)*(50’)*($700 PER SF) = $25M FOR MAIN SPAN

TOTAL BRIDGE COST ABUT. TO ABUT. = $37M
Why Does Navigational Clearance Matter During NEPA?

\[(500' + 400') \times (50') \times ($200 \text{ PER SF}) = $9M \text{ FOR APPROACHES}\]

\[(1000') \times (50') \times ($1000 \text{ PER SF}) = $50M \text{ FOR MAIN SPAN}\]

TOTAL BRIDGE COST ABUT. TO ABUT. = $59M
Comparing Costs

- 1900’ Total Bridge Length is Constant
- 700’ Main Span – $37M
- 1000’ Main Span - $59M
- Main Span Length Increase of 300’ (42%) Results in Bridge Cost Increase of 60%
Bridge Cost vs. Main Span Length

- Exponential Relationship
- Determining Correct Main Span is Critical
- Main Span Length is Driven by Required Navigational Clearance
Navigational Clearance

- Bridge vs. Barge – Not Good for Bridge
Navigational Clearance

• What is Required for Safe Navigation
• USCG
  – Historically Based on a Synthesis of Best Available Information
  – Geometry of Site
  – Opinion of River Interests
• What is Better?
  – Actual Simulation of the River at the Project Site
  – Topography, Hydraulics, River Characteristics
  – Realistic Barge Configurations and Operators
  – Variable Bridge “Openings” and Pier Locations
Seamen’s Church Institute

- Initial Mission – Ministering to River Mariners
- Later – Education and Training
- Finally – River Modeling and Simulations
Seamen’s Church Institute

• Assembles a site-specific visual database of the study area.
• Creates a 3D visual representation of the site and proposed alternatives.
• Vessel models used in the simulation have realistic hydrodynamic properties and perform and maneuver like their real-world counterparts.
Seamen’s Church Institute

• Ship pilots can perform various maneuvers within a virtual environment, navigating through proposed site alternatives.
• Pilots can test navigability through multiple situations, taking into account variables such as currents, day or night situations, fully-loaded or empty barges, etc.
• After each run, captains and pilots debrief, commenting on the ease or difficulty of the scenario and the safety margins that could be expected with new construction in the area.
Seamen’s Church Institute

• Sample Video
  – Pilot Preparation
  – Simulation
  – Debrief
Seamen’s Church Institute

- Determine Reasonable and Safe clearances
- Get Buy-in from the USCG, Agencies and River Interests
- Then the USCG Sets Project Navigational Requirements Based on SCI results.
Modeling Cost / Benefit

- Prior to Modeling, an Option with Many Other Benefits had a Very High Relative Cost
- At this Location, Navigation Clearance was Reduced from 1000’ to 800’
- This Option Became the Preferred Alignment

- Modeling and Simulation Cost ~ $110,000
- Potential Project Savings of ~ $25M

“The simulator answers every question and puts us in a good position to determine location. The simulator is so realistic, you can almost get seasick”
– Greg Bailey, 2011
Alternatives Post-Modeling

1,000’ Clearance
Now
800’ Clearance

700’ Clearance
Now
1,000’ Clearance

1,000’ Clearance
Now
Not Recommended
### 2013 Cost Estimate
- Alternative 2 → $97.5M
- Alternative 2B → $125.5M
- Alternative 8 → $99.5M
- Alternative 8B → $129M