

ADOPTED GOALS AND OBJECTIVES

Based on input received at public meetings, interviews, and the local knowledge of Advisory Committee members, the following goals and objectives were adopted to guide the work performed on this 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 businesses, and attraction of new businesses to the region**
3. **Draw more traffic and commerce into the Upper Ohio Valley**
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**
7. **Ensure that the cross-river transport network from Wheeling north to Steubenville is sufficiently robust to carry all weights and sizes of commercial vehicles**

OBJECTIVES

Goal #1 - Maintain and enhance transportation capacity, safety and reliability for existing businesses, their employees, and all residents

- Provide alternative and redundant routes for truck traffic
- Alleviate congestion and maintain an acceptable minimum Level of Service (LOS) to enhance shipment of goods and movement of employees
- Accurately measure constraints of roadways and strive to upgrade river crossings and connecting roadways to at least current minimum standards for geometry

Goal #2 - Provide enhanced access for expansion and retention of businesses, and attraction of new businesses to the region

- Evaluate transportation improvements and alternatives for their ability to serve existing and potential future development sites
- Evaluate transportation improvements that can better tie together the BHJ region with adjacent economic market areas
- Prioritize improvements in transportation facilities and cross-river travel that can serve targeted economic development objectives for the BHJ region

Goal#3 - Draw more traffic and commerce into the Upper Ohio Valley

- Develop transportation system improvements that will provide greater interconnection with surrounding regions, states, municipalities, and marketplaces
- Build an efficient and effective transportation network that will become a regional strength and draw additional traffic and customers into the Steubenville-Weirton marketplace

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

- Consider access to rail and river port facilities as a locational criteria for transportation improvements and cross-river travel routes

Goal #5 - Enhance Emergency Management Options to Provide Alternative Routes in Case of Flood, Natural Disaster or Accident

- Redundancy of the transportation network and cross-river linkages during times of accident, flooding or other natural disaster should be a planning criteria for new major investments in infrastructure
- Roadway design standards for new travel facilities should account for the weight and size of vehicles expected to travel during times of emergency and at all other times

Goal #6 - Improve travel times throughout the region

- Establish minimum desirable Levels of Service and adequate standards for roadway and bridge design
- Establish time of travel as a critical planning criteria for prioritizing capital improvements

Goal #7 - Ensure that the cross-river transport network from Wheeling north to Steubenville is sufficiently robust to carry all weights and sizes of commercial vehicles

- Establish planning criteria for the larger tri-state region in concert with the states of Ohio, West Virginia, and Pennsylvania to ensure that improvements in the Steubenville-Weirton area help enhance and optimize the larger transportation network for all modes

BRIDGE CONDITION ANALYSIS

MARKET STREET BRIDGE

Description

The Market Street Bridge spans over the Ohio River at Steubenville, Ohio, and is approximately 1,800 feet long. The West Virginia Department of Transportation is responsible for maintaining the bridge. It consists of two girder-approach spans (32 feet each), three through-truss spans (112 feet each) and a suspension bridge (324 feet, 700 feet, 274 feet) to span over the main river channel. The cross-section includes a two-lane roadway and a pedestrian walkway. The roadway carries an average of 9,200 vehicles per day based on Ohio Department of Transportation traffic data. The west end of the bridge extends into downtown Steubenville.

History

The original structure was erected in 1904 and was designed to carry two lanes of traffic and/or trolleys. Several rehabilitation projects have occurred to the bridge during its history.

In 1941, the original timber deck was removed and replaced with a "Neeld" floor and steel plate sidewalk. In addition, the cable anchors were modified, the stiffening trusses were replaced, and the towers were reinforced as part of the rehabilitation.

In 1953, the Neeld floor system was replaced with a 5-inch, I-Beam-Lok (open grid-type) floor, and the truss system was strengthened.

In 1981, a \$5 million rehabilitation was performed on the Bridge. A new open-grid deck floor was installed, the majority of the floor stringers were replaced, floor beams were strengthened, a new roadway lighting system installed, and the entire Bridge was repainted. The cross bracing in the suspension span towers was also modified. Repairs to Pier Nos. 2, 3, and 4 were made as well as Bent Nos. 5, 6, and 7.

Condition Evaluation

The most recent inspection reports (1991 and 1995) were reviewed to determine the condition of the structure.

The Bridge is currently posted for 5 tons based upon information provided in the 1995 Interim Inspection Report. The 1981 rehabilitation increased the rating from 3 tons to 15 tons. At some point after the 1981 work, the Bridge was re-analyzed, and it was determined that the holes in the suspension span towers (to accommodate the pedestrian walkway) reduced the rating to its current 5 tons. This low posting limits the structure to automobile and light truck traffic.

The roadway width is 20'-8", which does not meet current roadway geometric standards for lane and shoulder requirements. Widening of the Bridge would not be feasible because of the width limitations imposed by the suspension span stiffening trusses.

The stringers and floor beams are in fair condition, a result of the open-grid deck permitting debris to accumulate on these members. The fracture-critical main cables rub against the stiffening trusses, resulting

in excessive wear. The pin-connected eyebars used for the stiffening truss bottom chords and the main cable anchorages exhibit pack rust and section loss.

Department of Transportation Survey

As part of this Study, Modjeski & Masters, Inc. contacted the West Virginia Department of Transportation to discuss the history, current condition, and future plans for the Market Street Bridge. District personnel confirmed the past work indicated above had been performed on the Bridge. They would like to increase the current posted rating from the current 5 tons to a 15-ton rating. Although no repair contracts have been planned for the immediate future, \$800,000 has been placed in a reserve account for renovation of the Bridge. It is anticipated that a contract would not be issued until at least 2003/2004. The Bridge is not considered historic, so funding is not available from that source.

Site Visit

As part of the Bridge assessment, a site visit was conducted on Tuesday, January 18, 2000, to gain familiarity with the structure prior to providing a summary on its condition. A brief meeting at Brooke-Hancock-Jefferson Metropolitan Planning Commission's (BHJ) offices was held with representatives from both the BHJ and the West Virginia Department of Transportation prior to the site visit to discuss the current condition of the Bridge. The Bridge was walked from end-to-end using the pedestrian walkway on the downstream side. Observations of the Bridge's existing condition were limited to

those areas visible from the walkway. The following is a summary of that visit:

- The steel open-grid roadway deck is in good condition, although rounding of the skid-resistant grooves in the main support bars was noted.
- The hole in the main tower to permit pedestrian access, and which supposedly controls the structure rating, was viewed. It appears as though the hole is in the fascia plate only, which is connected with tack welds to the main tower columns.
- The main cables touch the stiffening truss at the main span centerline. Portions of the stiffening truss have been coped out to relieve interference.
- The paint system is in fair condition, although the primer is beginning to bleed through.
- A significant amount of automobile traffic was noted crossing the Bridge during the visit both into and out of Steubenville.

Recommended Repairs

Significant rehabilitation of the existing structure would be required in order to meet today's traffic load demands. If rehabilitation were to be considered a viable alternative for the Bridge, the following items, at a minimum, would be included:

- Strengthen the suspension span towers to increase the Bridge's rating to 15 tons.
- Repair welded details used for previous repairs.
- Remove pack rust and repaint the towers.
- Strengthen to permit emergency vehicles (for example, fire trucks) to safely cross the structure.
- Retrofit suspected fatigue-prone field welds used on the stiffening trusses during previous renovations.
- Retrofit the stiffening truss to eliminate interference with the main cables.
- Inspect and repair main cable and suspender ropes. Clean and re-caulk cable bands.
- Contain, clean, prime and repaint the (suspected) lead-based paint system on the towers and superstructure.
- Perform concrete repairs (shotcrete/epoxy injection) to Abutment No. 2 and the Ohio Anchorage.

Cost Estimate

As part of this Phase One Study, a cost estimate was developed based upon the repairs noted above. These cost estimates were based upon information provided in the inspection reports and the Department survey only. Contract plans were not available for determining repair quantities. This estimate is based solely on the limited sketches and photographs provided in the inspection reports. The costs included in this estimate are based upon repairs that will extend the service life of the Bridge minimally. Its load-carrying capacity will be slightly improved, but the deficient roadway geometrics will not be improved. The estimated cost of maintenance rehabilitation for the Market Street Bridge is \$5.6 million. A detailed cost estimate is included in the Appendix of this report.

Summary

Given the age of the Market Street Bridge, the remaining service life is nearing its end. Rehabilitation will slow its rate of deterioration, but the Bridge will remain deficient in terms of both roadway geometrics and load-carrying capacity. With a structure of this type and age, concerns will continue to exist over the integrity of the main cables, cable anchorages and the supporting piers. The costs included in the estimate do not account for these unknowns. The current funding reserve for future repairs will not be sufficient to extend its service life for the long-term. The Owner will have difficulty securing additional repair funds, given the age, condition and structural capacity of the Bridge.

FORT STEUBEN BRIDGE

Description

The Fort Steuben Bridge spans over the Ohio River just north of Steubenville, Ohio, and is approximately 1,585 feet long. The Ohio Department of Transportation is responsible for maintenance of the structure. It consists of four-deck girder approach spans (60 to 90 feet in length each) and a suspension bridge (283-, 688- and 283-foot spans) that crosses over the main river channel. The cross-section includes two traffic lanes and a pedestrian walkway. The roadway carries an average of 6,000 vehicles per day (1996), of which approximately 17% is heavy truck traffic.

History

The original structure was erected in 1928.

In 1972, the Bridge underwent a major rehabilitation during which many fatigue-prone weld details were used to connect strengthening plates to various truss chords and diagonals. Review of inspection reports indicates that no cracks were found in the welds, strengthening plates, or base metal of any of the fatigue-prone details, with the exception of the suspender rope protection beams. It is suspected that the repaired members were in service (under load) when the strengthening plates were added.

In addition, the deck was replaced with a 4-1/4 -inch concrete-filled steel-grid deck. In order to accommodate the new deck, the existing stringers were re-spaced, and a new centerline stringer was added. During this time, the superstructure was painted.

In 1986, the entire structure was painted again, and in 1996, the cable-related portions, which include the main suspension cables, suspenders, spreader brackets, and suspender sockets, were painted.

In 1992, a high performance rubberized asphalt wearing surface was installed.

In 1998, emergency repairs were performed to the approach girder bearings.

Condition Evaluation

Currently, this structure is appraised to be in poor condition. Deterioration of the suspension-span stringers, caused by leaking deck deflection joints, governs the appraisal rating. The Level of Service is low because of the narrow roadway and the fact that the bridge terminates into a T-intersection on the Ohio side of the structure.

The bridge is currently not posted, but is limited to 100-percent of the Ohio legal loads at the operating level of stress. Permit loads are not permitted on the structure.

The wearing surface of the suspended span is in poor condition and requires resurfacing. Inadequate stiffening of the steel grid and patching of holes was indicated in the inspection reports. Other floor system components, which include the concrete-filled grid deck, curbs, sidewalk, railing, deck joints and drainage scuppers, are in fair to good condition with some deficiencies. The original stringers that were repositioned resulted in additional holes in the floorbeams, thus

reducing the load-carrying capacity of the member and increasing the areas for potential corrosion to occur.

The structural metalwork of the approach girders, stiffening truss, floor beams, and towers are in fair to good condition. Rating values were not provided; therefore, areas of overstress could not be assessed.

Main cables, suspenders, cable bands, and anchor chain are in fair to good condition. Typical pack rust at the eyebar interfaces and missing caulk along the bottom of the anchor chain is common.

Substructure items, which include the abutments and piers, are in fair to good condition. Random cracking and areas of delaminated concrete is noted in the inspection reports.

The paint system currently is in poor condition. Most of the paint damage is located under the deck and is due to roadway leakage. The newer paint that was applied to the cable-related portions in 1996 is in generally good condition.

Department of Transportation Survey

As part of this Study, Modjeski & Masters, Inc. contacted the Ohio Department of Transportation to discuss the history, current condition, and future plans for the Fort Steuben Bridge. District personnel confirmed the past work performed on the Bridge. A construction contract will be let for bid this spring, and will include repair of stringers, deflection joints, deficient deck areas, and a new asphalt wearing surface. The estimated cost for the contract is approximately \$300,000. Two

additional repair contracts have also been proposed: for FY 2003, a complete coat of epoxy paint will be added (Estimated Cost - \$620,000); for FY 2005, the steel grid deck will be replaced (Estimated Cost - \$2,300,000). Funding for the painting and redecking has not been secured.

Supposedly, there is an agreement made with local agencies that if the cost to maintain the Bridge exceeded \$200,000 per year, the Bridge would be closed down. The Bridge is not considered historically significant, so funding from this reserve is not available.

Site Visit

As part of the Bridge assessment, a site visit was conducted on Tuesday, January 18, 2000, to gain familiarity with the structure prior to providing a summary on its condition. A brief meeting at BHJ offices was held with representatives from both the BHJ Metropolitan Planning Commission and the Ohio Department of Transportation, prior to the site visit, to discuss the current condition of the Bridge. The Bridge was walked from end-to-end using the pedestrian walkway on the downstream side. Observations of the Bridge's existing condition were limited to those areas visible from the walkway. The following is a summary of that visit:

- The roadway-wearing surface is beginning to delaminate from the concrete-filled grid. Deterioration of the concrete fill was also noted in some locations.
- The deck deflection joints were in poor condition.
- The sidewalk has numerous patches with a non-skid epoxy-wearing surface.
- The paint system is in fair condition.
- A large number of pigeons were seen roosting on the Ohio tower and the adjacent main cables.
- The majority of the traffic using the structure during the site visit were trucks destined for the industrial facilities in Weirton.

Recommended Repairs

If renovation were a viable option, the following repairs would, at a minimum, be required:

- Retrofit fatigue-prone details from previous renovations.
- Repair or replace deteriorated floor system components, which would include the grid deck, stringers and floor beams.
- Install new deck wearing surface.
- Clean and re-caulk the cable bands.
- Clean, prime and repaint the structure.

Cost Estimate

As part of this Phase One Study, a cost estimate was made based upon the repairs noted above. The cost estimate was developed from information provided in the inspection reports and the Department survey only. Contract plans were not available for determining repair quantities. This estimate is based upon the limited sketches and photographs provided in the inspection reports. The cost estimate is based upon the repairs that will slow the rate of deterioration and maintain its current load-carrying capacity. No improvements will be made to the roadway geometrics. The estimated cost to perform the repairs is \$4.0 million. A detailed cost estimate is included in the Appendix of this report.

Summary

The service life of this Bridge is nearing its end. Costly repairs will be required in order to extend the Bridge's remaining service life. More importantly, the fact that the structure is a suspension bridge eliminates the possibility of widening the roadway, with no increase in traffic capacity. Given the age of the structure, there will be a continuing concern over the integrity of the main cables, cable anchorages and main piers. No costs are included in the estimate for these unknowns. With a newer alternative crossing nearby (Veterans Memorial Bridge), major repairs and the needed funding for this Bridge will be difficult to justify. Although plans and estimated budgets for repairs have been established by the Owner, no source of funding has been secured at this time.

VETERANS MEMORIAL BRIDGE

Description

The Veterans Memorial Bridge crosses the Ohio River between Weirton, West Virginia and Steubenville, Ohio. The structure is a cable-stayed bridge, with an 820-foot forespan and 688-foot backspan, and a total bridge length, including approach spans, of 1,965 feet. A single concrete tower supports the forespan and the backspan. The Ohio and West Virginia Departments of Transportation share ownership and maintenance costs for the structure. The Bridge was opened in May 1990, and carries four through-traffic lanes

and two acceleration/ deceleration lanes for the ramp structures adjacent to the Bridge.

History

The structure has been functioning problem-free since its opening with the exception of concrete panels replaced at the tower shortly after opening.

Condition Evaluation

The only deficiencies noted in the most recent inspection reports are routine maintenance items typically associated with cable-stayed bridges.

Recommended Repairs

None, other than routine maintenance of the cables and supporting assemblies.

Department of Transportation Survey

No formal survey was conducted with the Department, since the Bridge is essentially new, and no significant deficiencies were noted in the inspection reports.

Cost Estimate

No cost estimate for repairs were developed, since the first appreciable cost (redecking) would fall beyond the life expectancy of the Market Street and Fort Steuben Bridges.

Summary

The Veterans Memorial Bridge provides an efficient river crossing for traffic in the immediate area.

PROPOSED NEW BRIDGE

As part of this preliminary study, Modjeski & Masters, Inc. has developed preliminary costs for a new Ohio River bridge crossing within the study area. Based upon the topography and existing roadway network, costs for three variations were developed including a short, medium, and long structure across the Ohio River.

The preliminary cost estimate is based on the plan area for each alternative. That is, we have assumed a four-lane divided highway with shoulders (82-foot total width), and a structure overall length scaled from a regional roadway map. The profile of the new Bridge is unknown at this time, so definitive heights for piers cannot be estimated.

The approach spans are assumed to be multi-girder structures, and the main span is a tied-arch structure (similar to the newer crossings in the Wheeling, West Virginia area). Costs are based on square foot averages for these structure types. No costs are included for approach roadway construction necessary to connect to the existing traffic network, nor any allowance included for right-of-way acquisition, relocation of utilities, resolution of environmental, historic or archeological issues, or unique foundation problems that may be encountered at the selected location for the new Bridge.

The estimated cost for each variation (main bridge and approach structures only) is presented below:

Short Structure	\$39.6 Million
Medium Structure	\$43.6 Million
Long Structure	\$77.1 Million