

Stillwater Lift Bridge Repair Needs REPORT OF FINDINGS

STILLWATER LIFT BRIDGE (Mn/DOT Br. No. 4654 – Wis/DOT Br. No. B-55-919) over St. Croix River



For:
**Minnesota Department of Transportation
and
Wisconsin Department of Transportation**

By:
**HNTB Corporation
and
Hess Roise and Company**

September 3, 2003

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Repair Needs**

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FOR
STILLWATER LIFT BRIDGE
(Mn/DOT Br. No. 4654 – Wis/DOT Br. No. B-55-919)
Over the St. Croix River**

Stillwater, Minnesota / Houlton (St. Joseph Township), Wisconsin

September 3, 2003

This report presents a summary of repair needs identified through the evaluation of the bridge and documentation of the repair selection process. This report also documents public participation in the repair selection process and application of the Secretary of the Interior's Standards for Historic Preservation Projects.

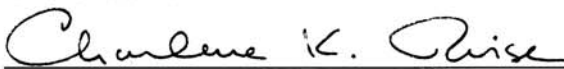
This report was prepared by HNTB Corporation in association with Hess Roise and Company.

I hereby certify that the technical aspects of this report were prepared by me or under my direct supervision and that I am a duly licensed professional engineer under the laws of the state of Minnesota.

Signed:  Reg. No. 17809

Printed Name: Richard M. Johnson Date: 9.3.03

I hereby certify that the historic preservation aspects of this report were prepared by me or under my direct supervision and that I am an historian that meets the Secretary of the Interior's Professional Standards.

Signed: 

Printed Name: Charlene K. Roise Date: 9.2.03

Stillwater Lift Bridge Repair Needs

Report of Findings

Stillwater Lift Bridge

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EXECUTIVE SUMMARY

This report presents a summary of repair needs identified through the evaluation of the Stillwater Lift Bridge and documentation of the repair selection process. This report also documents public participation in the repair selection process and application of the Secretary of the Interior's Standards for the Treatment of Historic Properties.

The Stillwater Lift Bridge is listed on the National Register of Historic Places due in large part to its historic significance as an example of a "Waddell and Harrington" vertical lift bridge. The bridge was also central in the development of the City of Stillwater, Lowell Park, and surrounding area, portions of which are also listed on the National Register of Historic Places as the Stillwater Commercial Historic District.

The 106th Congress allocated approximately \$5,000,000 for the repair of the Stillwater Lift Bridge. The bridge was inspected in 2002 for purposes of evaluating the existing condition of the bridge and determining potential repair needs. A list of repair needs and their associated estimated costs was developed as a result of the 2002 inspection and evaluation. The combined cost of all of the repair needs exceeds the allocated funds. The identified repair needs were presented to project stakeholders in the form of reports and subsequently discussed in a series of public meetings with stakeholders.

Several companion reports addressing inspection, evaluation, and repair options were prepared and served as a basis for discussion between interested parties.

Through facilitated collaboration with the project sponsor, stakeholders, engineer, and historian, repair recommendations were formulated to balance repair needs with historic preservation interests. Ultimately, a consensus was reached regarding which repairs are to be carried forward to construction. Repairs to be carried forward to construction are presented below in an abbreviated form:

The existing tender's house is intended to be repaired in-kind, to the extent possible, and remnants of the existing chain drive housing and hand brake will remain on the bridge for historic interpretation. Repair of the existing tender's house in-kind is subject to granting of an electrical code variance, which is anticipated. A supplemental electrical house, of visual makeup similar to the existing tender's house, will be constructed on the north side of the lift span immediately east of the existing tender's house.

The majority of the electrical components of the lift span drive system, which were installed in 1983, will be replaced. The electrical repairs include replacement of the drive motor and the distribution/controls system. A significant portion of the mechanical components of the lift span drive system will also be repaired or replaced. Mechanical components to be replaced include the lift span drive gears, reduction gears, motor brakes, wire rope take-up devices, and the wire ropes themselves. The existing traffic gates will be upgraded to traffic barriers.

The structural repairs include patching of spalled concrete, application of a concrete surface treatment, structural repairs of the lower chords of the trusses, strengthening of the floor beams, strengthening of the floor beam to truss connections, replacement of the stringers at each end of each truss, and repairs to the sidewalk support system, including replacement of the fascia stringers.

The existing concrete deck, constructed in 1972, will be replaced with a conventionally reinforced cast-in-place concrete deck with strip seals.

The pedestrian railing will be removed from the bridge, cleaned, repaired, galvanized, painted, and re-installed on the bridge. Repairs to the railing will include replacement of individual members of the railing and replacement of selected panels as a whole, in-kind, to the extent practical. The replacement railing panels will replicate the original railing panels, except rounded head bolts will be used in lieu of rivets as fasteners.

The bridge was originally equipped with ornamental lighting, which was subsequently removed in the 1980s. Ornamental lighting will not be replaced as part of the pending repair efforts.

As part of the pending repair efforts, the several stakeholders expressed the desire to have the bridge painted to the extent that funds allow. The bridge was originally painted green with the exception of the pedestrian railing, tender's house roof, and interior of the tender's house, which were painted with "aluminum paint." The details of the painting efforts (color, paint system, extent of painting) will be resolved during final design of the repairs, after more a refined cost estimate is completed and with additional input from stakeholders.

The historic significance of the bridge will be presented to the public for interpretation in some fashion yet to be determined. Options offered for consideration of the historic significance of the bridge during deliberations included presentation of a plaque, signage commemorating the bridge, and development of a historic interpretive area.

The funds provided by the 106th U.S. Congress for repair of the Stillwater Lift Bridge are substantial, yet insufficient to cover all of the structure's repair needs. Repair needs and options were evaluated by project stakeholders from a variety of perspectives to garner the greatest benefit from the available funds. The repairs selected to be carried forward to construction include electrical, mechanical, and structural repairs that are critical to extending the useful life of the bridge, as well as interpretive and aesthetic items that offer educational and psychological benefits that foster preservation of the bridge.

Given the scale of the repair efforts, they will have an effect under Section 106 guidelines. However, it appears that the effect should not be adverse if the repair plans are developed and implemented as described within this report. To ensure that the repairs conform to the

Secretary of the Interior's Standards, the Mn/SHPO, Wis/SHPO, Mn/DOT Cultural Resources Unit, and the Wis/DOT historian have participated in formalizing these repair recommendations and will be consulted during the final design process and be invited to review and comment on final repair plans and specifications throughout their development.

INTRODUCTION

This report documents the selection of repairs to be carried forward to construction, from a list of repair needs, and reasoning behind the selection of the repairs.

The States of Minnesota and Wisconsin acting through the Minnesota Department of Transportation (Mn/DOT and sponsor) engaged HNTB Corporation (engineer) to consider repairs of the Stillwater Lift Bridge (a.k.a. St. Croix River Bridge at Stillwater, Mn/DOT Br. No. 4654 and Wis/DOT Br. No. B-55-919). Specifically, HNTB was tasked with the following:

1. Evaluate the present condition of the bridge.
2. Establish and prioritize existing potential repair needs.
3. Render an opinion of probable repair cost.
4. Participate in selection of repair needs for the repair of the lift bridge through involvement with project stakeholders, consultation with a professional historian, application of the Secretary of Interior's Standards for the Treatment of Historic Properties, and consideration of urgency of the needs and the associated repair costs with respect to the allocated funds.
5. Project future maintenance needs and associated costs.
6. Develop a feasible construction scheme based on the selected repair needs.

Hess Roise and Company (historian), historical consultants, served in the capacity of historical counsel to apply the Secretary of Interior's Standards for the Treatment of Historical Properties to the evaluation of repair needs and selection of repairs to be addressed.

Consideration of repair needs generally followed a sequence of:

1. Evaluation of existing conditions.
2. Identification of potential repair needs.
3. Identification of repair options to address the repair needs.
4. Presentation of repair options to address repair needs to project stakeholders (stakeholders) in the form of a report of findings.

5. Deliberation and refinement of repair options to address repair needs through a series of facilitated deliberations with stakeholders.

Funding was made available for the repair of the Stillwater Lift Bridge by the 106th Congress of the United States in 2000. The level of funding available for repair is \$4,989,000. Due to funding limitations, the entire universe of repair needs was not identified, e.g. a localized structural repair was identified as a repair need to address isolated section loss due to corrosion, but replacement of the structural member in its entirety was not identified as a repair need. Additionally, those repair needs identified essentially competed for limited available funds. As such, not all repair needs identified were selected to be addressed.

Several companion reports have been developed in consideration of repairs to the bridge. These reports are germane to the selection of repair needs to be addressed and are identified below in chronological order.

1. *Tender's House Repair Initial Screening – Report of Findings*, dated January 21, 2003.
- 2a. *Structural Inspection and Preliminary Condition Evaluation – Report of Findings, Volume 1 of 2 – Narrative*, dated March 17, 2003.
- 2b. *Structural Inspection and Preliminary Condition Evaluation – Report of Findings, Volume 2 of 2 – Representative Photographs and Inspection Notes*, dated March 17, 2003.
- 3a. *Mechanical / Electrical Inspection and Evaluation – Report of Findings, Volume 1 of 2 – Narrative*, dated March 18, 2003.
- 3b. *Mechanical / Electrical Inspection and Evaluation – Report of Findings, Volume 2 of 2 – Representative Photographs and Inspection Notes*, dated March 18, 2003.
4. *Pedestrian Railing Repair Study – Report of Findings*, dated March 20, 2003.
5. *Deck Replacement Study – Report of Findings*, dated March 21, 2003.
- 6a. *Construction and Previous Repairs and Modifications, Volume 1 of 2 – Narrative and Specifications – Documentation*, dated March 31, 2003.
- 6b. *Construction and Previous Repairs and Modifications, Volume 2 of 2 – Construction Drawings – Documentation*, dated March 31, 2003.

7. *Repair Methods, Schedule and Probable Repair Costs – (Draft Revision 0) Report of Findings*, dated July 8, 2003.
8. *Maintenance Projections and Annualized Costs – Report of Findings*, dated August 6, 2003.

The term stakeholder is used within the context of this report to describe a collection of individuals or agencies that have a vested interest in the operation and/or preservation of the bridge. Representatives of the stakeholders were invited to participate in consideration of repairs to be addressed. The stakeholders include those identified below, presented in no particular order:

US Fish and Wildlife Services	Washington County, MN
US Corps of Engineers	St. Croix County, WI
US Coast Guard	St. Joseph Township, WI
National Park Service	City of Stillwater
Wis/DOT	Wis/DNR
Mn/DNR	Wis/SHPO
Mn/SHPO	Sierra Club
Advisory Council on Historic Preservation	Federal Highway Administration
Rivertown Restoration	Stillwater Lift Bridge Association
St. Croix River Association	Friends of the St. Croix
Stillwater Heritage Preservation Commission	National Trust for Historic Preservation
Mn/DOT	

Four facilitated, public meetings were held at the Stillwater City Hall to collaborate with stakeholders to reach a consensus on which repairs and repair options are to be carried forward to construction. (The reader's attention is directed to appendices A through D for minutes of the meetings.) Additionally, a public information meeting was held to inform the public of the Stillwater Lift Bridge repair project and to gather additional comments. The meeting dates and primary discussion subject were as follows:

- March 6, 2003 – Tender's House Repair Options
- April 3, 2003 – Tender's House Repair (Cont.), Deck and Pedestrian Railing Repair
- May 1, 2003 – Deck and Ped. Railing Repair (Cont.), Structural – Mech. & Electrical
- June 5, 2003 – Final Prioritization of Repair Needs
- July 10, 2003 – Public Information Meeting

At the time this report was published, a Web site had been established to provide the majority of the aforementioned reports, the construction schedule, and minutes of the four facilitated public meetings. The address of the website is:

www.dot.state.mn.us/metro/projects/liftbridge/index/html

Consideration of repair needs are presented in following sections and organized into categories of Tender's House, Mechanical and Electrical, Structural, Pedestrian Railing, Vehicular Deck Replacement, and Amenities. Presentation of each category is arranged in the following format:

- Initial Findings: A brief description of the evaluation findings, repair needs identified, and those repairs initially recommended to be completed.
- Stakeholder Input and Facilitated Deliberations: A succinct description of observations, comments, questions, and opinions expressed during deliberations.
- Facilitated Resolution: A concise narrative of the repair needs to be addressed and salient details of the repairs to be implemented.
- Historic Preservation Considerations: A considered opinion regarding application of the Secretary of Interior's Standards for the Treatment of Historic Properties to the repair needs.

HISTORICAL SIGNIFICANCE

In the early twentieth century, the St. Croix River was a barrier of some 1,800 feet in width between the booming county seat of Stillwater, Minnesota, on the west bank, and the community of Houlton, Wisconsin, to the east. A primitive pontoon swing bridge supplemented ferry service across the river in 1910, but it was quickly found to be inadequate as the states' population of cars and trucks mushroomed. Since the St. Croix was classified as a navigable river, a new bridge could not obstruct waterborne traffic. The Minnesota Department of Highways, which took the lead on building the replacement bridge, chose a vertical-lift span to maintain navigation. Department engineers designed the concrete-slab and fixed steel-truss spans composing the majority of the bridge. However, the lift span was a specialized undertaking requiring an experienced engineering firm. Ash, Howard, Needles, and Tammen of Kansas City, Missouri, won the competitive bid to produce the design.¹

In the early twentieth century vertical lifts joined swing spans and bascules as the three most popular movable-bridge types. Swing spans, which revolve in a horizontal plane around a vertical axis, require a substantial radius for maneuvering, often a problem in crowded urban settings. Furthermore, their piers constrict navigation channels. Space requirements are significantly less for bascules, which feature leaves that rise like a drawbridge. Engineers patented a number of variations on bascule design around the turn of the century. Vertical lifts also occupy relatively little area. The world's first modern, long-span, high-rise, vertical-lift bridge was erected on South Halsted Street in Chicago in 1894. The design was adapted from one proposed to cross the ship canal in Duluth, Minnesota, in 1892. The engineer was John Alexander Low Waddell, who was based in Kansas City, Missouri. His counterweighted, tower-and-cable, vertical-lift design won Duluth's competition, but construction of the innovative structure was ultimately rejected by the federal War Department. Soon thereafter, Chicago retained Waddell to design the South Halsted Street structure. However, the mechanisms were not perfected until 1907, when Waddell teamed up with engineer John Lyle Harrington. Harrington refined Waddell's original concept, and the resulting design became known by the names of its inventors. They produced some 30 "Waddell and Harrington" vertical-lift spans in the seven short years they were partners, and both remained active in the field after their firm dissolved. Harrington's new office, Harrington, Howard, and Ash, later evolved into Ash, Howard, Needles, and Tammen, the engineers of the Stillwater Lift Bridge.

The bridge's vertical-lift span is a seven-panel, riveted, through Parker truss measuring about 140 feet long. It is one of the structure's 10 spans, which extend for a total of about 1,060 feet. The lift span is accompanied by six similar, fixed truss spans, one to the west

¹ Details about the design and construction of the Stillwater Lift Bridge in this and subsequent paragraphs are taken from the National Register of Historic Places Registration Form for the Stillwater Lift Bridge completed by Jeffery A. Hess, Historical Consultant, in August 1988. The form is available at the State Historic Preservation Office, St. Paul.

and five to the east. Two concrete-slab spans form the western approach, terminating in a circular concourse at Stillwater's Lowell Park. A single steel beam span on the east end is reached by an earthen causeway. An ornamental metal railing edges the bridge's sidewalk, which is cantilevered from the southern (downstream) side of the trusses and approach spans. The railing once held ornamental cast-iron light standards, but most have been removed. The operator's house is attached to the outside of the northern truss of the vertical-lift span.

Since its construction, the Stillwater Lift Bridge has been a landmark in the area. The lift span is operated during the navigation season, which extends from mid-May to mid-October. The bridge continues to carry vehicular traffic across the St. Croix, connecting Wisconsin State Highway 64 and Minnesota State Highway 36. The concrete deck was rebuilt in 1973, followed by the east steel beam approach span in 1979. The gasoline engine that raised the lift span was replaced with an electric motor in 1980. Traffic gates have been modernized. Despite these and other minor changes, the bridge retains much of its historical integrity².

The Stillwater Lift Bridge was declared eligible for the National Register of Historic Places in 1987 and a nomination form was completed the following year. The bridge was officially listed in the National Register on June 2, 1989, for its significance in the area of engineering under Criterion C, which covers properties "that embody the distinctive characteristics of a type, period, or method of construction." Specifically, the bridge was cited as "a rare surviving example of vertical-lift highway bridge construction of the Waddell and Harrington type." It claimed significance statewide in both Minnesota and Wisconsin, which together once held six vertical-lift highway bridges built before World War II. At the time that the National Register nomination was written, three of those bridges had been demolished. Another has been lost since then – the bridge over the St. Croix River at Prescott, Wisconsin, designed by Harrington, Howard, and Ash and completed in 1923. Today, the Stillwater Lift Bridge's only companion is the Aerial Lift Bridge in Duluth, opened in 1905 and converted into a vertical lift in 1929-1930.

National Register nominations must include a "period of significance" for the nominated property. This is the year or years when a property has achieved and sustained the significance that qualifies it for the National Register. The period of significance often begins when the property was constructed – 1931, in the case of the Stillwater Lift Bridge. It could be argued that the bridge's period of significance should extend to the present day, since the bridge continues to serve its original purpose and retains its original design characteristics. National Register guidelines specify that properties must be at least 50 years old to qualify unless they are "exceptionally" significant. Hence, periods of significance are usually terminated arbitrarily 50 years prior to when the nomination is written, which explains why the currently defined period of significance for the Stillwater Lift Bridge ends in 1938.

² Reference Volumes 1 and 2 of *Construction and Previous Repairs and Modifications – Documentation*, dated March 31, 2003.

National Register nominations must also specify a boundary for the property. The Stillwater Lift Bridge boundary runs from abutment to abutment and does not include the west concourse. The concourse is contained, though, within the boundaries of the Stillwater Commercial Historic District. The District was listed in the National Register in 1992 as locally significant under Criterion A for its association with the area's early evolution and under Criterion C for its architectural distinction. Individual elements in an historic district are classified as either contributing or not contributing to the associations or qualities that make the district significant. Lowell Park and Pavilion, for example, which date from 1916, are contributing resources in the Stillwater Commercial Historic District; areas of the riverfront that were reconstructed in 1960 do not contribute to the District.

A more encompassing study of historic resources in Stillwater defined a larger National Register District, the Stillwater Cultural Landscape District. The bridge as a whole, and Lowell Park, are contributing elements to the Stillwater Cultural Landscape District, which has been determined eligible for the National Register as a result of a cultural resource investigation completed in 1999 related to the proposed construction of a river crossing in the area. When the Stillwater Lift Bridge was completed in 1931, the study explains, it "epitomized the vital importance of Stillwater to area farmers in two states, the need for an open St. Croix, and the persistence of Stillwater residents in obtaining a replacement bridge. In addition, the Lift Bridge, its design, and related landscaping were directly tied to the transformation of the waterfront for increased recreational use."³

The Stillwater Lift Bridge is of historical significance in its own right and in the larger context of the region it serves. The Secretary of the Interior has issued *Standards for the Treatment of Historic Properties* and related guidelines. Four treatment approaches are delineated: preservation, rehabilitation, restoration, and reconstruction. "Preservation" is to care for an existing, intact, historic property with routine maintenance. The "rehabilitation" treatment is used when more substantial work is required, sometimes involving the adaptation of an historic property to a new use. "Restoration" returns an altered property to its appearance at an earlier period, while "reconstruction" recreates an historic property that no longer exists. In the case of the Stillwater Lift Bridge, the rehabilitation treatment seems the most appropriate.

Since federal funds are supporting the bridge's rehabilitation, the proposed work is subject to review under Section 106 of the National Historic Preservation Act of 1966. The work should conform to the 10 standards for rehabilitation outlined by the Secretary of the Interior:⁴

³ Barbara J. Henning, "Cultural Resource Investigation, St. Croix River Bridge," August 1999, 33, prepared by Rivercrest Associates for Minnesota Department of Transportation.

⁴ The word "bridge" has been substituted for "building" where appropriate.

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the bridge and its site and environment.
2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.
3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other bridges, shall not be undertaken.
4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.
5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.
6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.
7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.
8. Significant archaeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.
9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

REPAIR NEEDS – TENDER’S HOUSE

Initial Findings:

The Tender’s House was inspected and evaluated as documented in a report previously cited on page 5. The deficiencies of the tender’s house are briefly described as follows:

- Non-compliance with codified safety requirements
- Limited physical space
- Restricted view of approach roadways and navigation channel
- Access to the tender’s house requires crossing of vehicular traffic
- Lack of current fire/life safety provisions
- Lack of personnel comfort amenities
- Deterioration of structure

Eight repair options were initially developed for consideration as follows:

Option 1 – Existing House / Renovation In-kind: The existing tender’s house would essentially be renovated without change to configuration or function. This is essentially the “do-nothing” or “no-action” alternative.

Option 2 – Existing House / Drive Gear Below Deck: The drive gear would be removed and placed below the deck to free up space, and the existing tender’s house would be renovated to accommodate the bridge tender and electrical cabinets.

Option 3 – Replacement House / Three Functions to Remain: The existing tender’s house would be replaced at the same location with a larger house that would accommodate the bridge tender, drive gear, and electrical cabinets.

Option 4 – Supplemental House / Mirror Image / Upstream: The existing tender’s house would be renovated to house only the drive gear and a new structure would be constructed on the north side of the lift span. The new structure would accommodate the electrical components and bridge tender.

Option 5 – Supplemental House / Downstream: The existing tender’s house would be renovated to house only the drive gear and a new structure would be constructed on the south side of the lift span to accommodate the tender and electrical components.

Option 6 – Supplemental House / Top of Lift Span: The existing tender’s house would be renovated to house only the drive gear and a new structure would be constructed on top of the lift span to accommodate the tender and electrical components.

Option 7 – Supplemental House / West Bank: The existing tender’s house would be renovated to house only the drive gear and a new structure would be constructed on the west bank to accommodate the tender and electrical components.

Option 8 – Supplemental House / Remote Location: The existing tender’s house would be renovated to house only the drive gear and a new facility would be constructed at a remote location, presumably miles away from the bridge, to accommodate the tender. An additional new structure would be required on the bridge, or on the west bank, to accommodate electrical equipment.

The options were evaluated prior to collaboration with the historian or stakeholders on a scale of 1 to 5 (1 = low performance, 5 = high performance) with respect to safety, historic preservation, reliability, maintenance, construction cost, operations, and constructibility. The ratings of the options were adjusted with weight factors (WF) in an effort to reflect the relative importance of the individual evaluation criterion. The resulting weighted ranking of the options is provided below.

Resulting Weighted Rankings

Option	Safety	Historic Preservation	Reliability	Maintenance	Construction Cost	Operations	Constructibility	Sum Weighted Total	Percent of Total
<i>WF</i>	25	25	15	5	20	5	5	100	<i>N.A.</i>
1	25	125	15	10	100	15	20	310	62%
2	50	125	15	10	80	15	20	315	63%
3	125	100	75	25	80	25	15	445	89%
4	125	75	75	25	80	20	15	415	83%
5	100	25	75	25	80	15	10	330	66%
6	100	25	75	25	60	15	5	305	61%
7	75	75	60	20	60	15	15	320	64%
8	25	75	30	15	20	5	15	185	37%

Option 3 was identified as the preferred option to be carried forward to deliberation.

Stakeholder Input and Facilitated Deliberations:

Facilitated deliberation with the sponsor, historian, stakeholders, and engineer resulted in the following questions, observations, comments, and/or opinions, paraphrased and presented in bullet form and in no particular order.

- An opinion was expressed that although historic preservation concerns were initially weighted 25 of 100 points with respect to historic preservation, the ratings of the options could not substitute for the application of the Secretary of Interior's Standards for the Treatment of Historic Properties. However, the published ratings did not effect the final decisions regarding selection of the preferred option to be carried forward because application of the Secretary of Interior's Standards for the Treatment of Historic Properties was being addressed through consultation with the historian and stakeholders.
- A majority opinion was reached that Option 1 was preferable to all other options from a historical preservation standpoint.
- Employment of Option 1 precluded any substantial repair of the mechanical and electrical system without violation of electrical related codified safety regulations.
- The authority having jurisdiction over electrical related codified safety regulations expressed concern with regard to granting a variance from codified safety regulations if other reasonable measures were available to preserve the intent of the codified safety regulations.
- Opinions were expressed that the Departments of Transportation are duty bound to protect the functional operation of the bridge as a trunk highway and maintain a serviceable lift bridge in accordance with federal regulations. As such, allowing only minor maintenance of the existing drive system was unacceptable.
- A majority opinion was reached that if Option 1 could not be carried forward; Option 4 was preferable to Option 3 because the existing tender's house would remain essentially intact.
- A minority opinion was expressed that Option 3 was superior to Option 4 for practical reasons.
- Opinions were expressed that repair of the tender's house under Option 4 was inconsequential when the bridge is considered as a whole and within the context of its historical setting. Furthermore, the majority of the viewing public would not recognize changes to the tender's house.

- A majority opinion was reached that if Option 1 could not be employed, Option 4 should be revised to the extent possible to minimize the visual impact of the supplemental electrical house associated with Option 4.
- Three variants of Option 4 were developed to minimize the length of the supplemental electrical house (Option 4A), minimize the width of the supplemental electrical house (Option 4B), and eliminate the electrical house completely and expose the electrical cabinets to the elements (Option 4C).
- Option 4C was deemed to compromise the safety of maintenance personnel and was dismissed.

Facilitated Resolution:

Through collaboration with the stakeholders, sponsor, engineer, and historian, the preferred tender's house repair option was changed from replacement of the existing tender's house with a larger structure (Option 3) to repairing the existing tender's house in-kind and construction of a supplemental electrical house (Option 4A) on the north (upstream) side of the lift span immediately east of the existing tender's porch.

The size of the supplemental electrical house will be as small as possible without compromising electrical safety codes. The architectural treatment of the supplemental electrical house will tend toward resemblance of the existing tender's house in material, shape, slope of roof, and color, without overt efforts to replicate the details of the existing tender's house or obfuscate its twenty-first century construction.

Construction of the supplemental electrical house will require the addition of structural members to support the structure. The structural members will consist of structural steel fashioned in a character similar to the original construction and attached at panel points of the lift span truss. The structural members will be fastened with contemporary bolts rather than rivets as was used in the original construction.

The tender's house is proposed to continue to serve as it was initially intended – to house the bridge tender and major components of the drive system. Installation of the new drive system components within the tender's house will require a variance of codified electrical safety regulations be granted by the authority having jurisdiction. The selection of this tender's house repair option is based on the assumption that such a variance will be granted, but will require additional review and ultimate approval by the Minnesota State Board of Electricity. The tender's house will be fitted with smoke detection, fire suppression, heating, ventilation, and air-conditioning for climate control of electrical components.

Historic Preservation Considerations:

Retaining the original tender's house is the preferred option in light of the Secretary of the Interior's Standards. This is particularly critical on the building exterior, which is visible to the public. If the rehabilitation proposes changes to the exterior (to the windows or roof, for example), the original plans for the tender's house should be used as guidance to replicate original characteristics. Significant interior features should also be retained when reasonable, although there is some latitude to allow for alterations needed to maintain a safe and functional workplace. (The original 1931 plans called for the exterior walls to be painted green to match the trusses; with the interior and roof finished with "aluminum" paint.)

In its current configuration, the tender's house has functional and structural deficiencies that could impair the continued operation of the lift span. Construction of a supplemental electrical house is proposed to address some of these problems. This structure will be similar to the tender's house in scale, mass, and materials, but the overall design will be different enough from the original house to be distinguishable as a new structure. Attaching the supplemental electrical house to the truss with bolts rather than rivets will further distinguish the new construction and make the alteration more easily removed if, at some point in the future, it is no longer needed.

The proposed rehabilitation of the tender's house and construction of the supplemental electrical house (Option 4A) appears to meet the Secretary of Interior's Standards for the Treatment of Historic Properties. The Minnesota and Wisconsin State Historic Preservation Offices (Mn/SHPO and Wis/SHPO) will be consulted during the design phase and should comment on the final plans.

REPAIR NEEDS – MECHANICAL and ELECTRICAL

Initial Findings:

The lift bridge was inspected in the fall of 2002 to ascertain the condition of the lift bridge and collect information to be used in the development of repair plans. The condition of the bridge was evaluated at a system and component level. The systems are considered to be support, balance, drive, distribution/control, interlock, navigation, traffic control, and machinery/tender's house. Components are considered to be elements of the systems, e.g. open gears and the main drive motor are components of the drive system.

The condition of the systems was evaluated with respect to their 2002 physical state compared to the as-built (new) condition. The condition of the systems and components was rated on the scale of 1 to 5 as follows: 1 = Excellent, 2 = Good, 3 = Fair, 4 = Poor, and 5 = Critical. System condition ratings and overall condition descriptions are provided below:

Support System: The support system was considered to be in **fair** (3) condition and generally functioning as designed. Prominent areas of wear and deterioration include the span guides and counterweight guides.

Balance System: The balance system was considered to be in **fair** (3) condition indicating wear noted and no longer functioning like new. The most salient concerns for the balance system are the condition of the counterweight wire ropes and the apparent need for supplemental ballast on the north side of the lift span to balance the lift span.

Drive System: The drive system was considered to be in **fair** (3) to **poor** (4) condition based on limited inspection indicating obvious deterioration and wear but having remaining useful life. On the mechanical side, the components of most concern are the open gear sets, pinions gears, chain drive, and operating rope take-up devices. On the electrical side, the eddy current clutch/brake is of concern because the component has routinely failed on multiple occasions and repair and replacement is time consuming.

Distribution/Control System: The distribution/control system was considered to be in **fair** (3) condition. The control system is dated and does not provide the reliability of contemporary technology. The system is not equipped with a redundant/auxiliary power source (required for newly constructed movable lift bridges), lighting protection, or transient voltage surge suppression system. The system also lacks effective lock-out/tag-out provisions and codified minimum clearances to electrical cabinets.

Interlock System: The condition of the existing interlock system was **good** (2) based on comparison to its as-built condition. However, the system is not interlocked with the control system to prevent lifting of the lift span prior to operating the traffic lights and closing the traffic gates.

Navigation Guidance System: The navigation guidance system was in **fair** (3) to **poor** (4) condition with the primary concern being the condition of several single lens navigation light assemblies.

Traffic Control System: The traffic control system was in **fair** (3) condition based on comparison to its as-built condition indicating obvious deterioration and wear with remaining useful life. The bridge is not equipped with resistance gates (physical barriers) to prevent errant vehicles from approaching the span in the open position as is required for newly constructed lift bridges.

Machinery/Tender's House: The machinery/tender's house was in **poor** (4) to **critical** (5) condition indicating significant deterioration and that the component is marginally functional in its present state in comparison to its as-built condition. The primary concern is the size of the structure, which is physically too small to house electrical and mechanical equipment in addition to operating and service personnel. The house lacks in several fire/life safety areas, including safe access requirements and fire detection/suppression systems.

Stakeholder Input and Facilitated Deliberations:

Component repair needs and their respective costs were established based on the findings of the evaluation. Suggested repair actions were established at the component level and presented to the stakeholders as indicated below.

Support System

Component	Recommended Disposition
Strike Plates	Include – Replacement
Live Load Shoes	Include – Replacement
Span Guides	Include – Repair
Counterweight Guides	Include – Repair
Span Locks	Exclude – Do Not Provide
Lift Span Access Ladders	Exclude – Do Not Provide
Lift Tower Ladders Repair	Include – Repair

Balance System

Component	Recommended Disposition
Counterweight Sheaves	Exclude – Do Not Provide
Counterweight Blocks	Include – Replacement
Counterweight Wire Ropes	Include – Replacement
Sheave Trunnion Bushings	Include – Replacement
Sheave Trunnion	Include – Inspection
Sheave Trunnion Shaft	Exclude – Do Not Provide
Counterweight Connections	Include – Replacement
Counterweight Concrete	Include – Repair

Drive System

Component	Recommended Disposition
Open Gears	Include – Replacement
New Enclosed Gears	Include – Replacement
Bearings	Include – Replacement
Couplings	Include – Replacement
Shafts	Include – Replacement
Hand Brake	Retain – Hist. Interpretation
Chain Drive	Retain – Hist. Interpretation
Operating Wire Ropes	Include – Replacement
New Up-haul Take-up Devices	Include – Replacement
Existing Up-haul Take-up Devices	Exclude – Do Not Repair
New Down-haul Take-up Devices	Include – Replacement
Existing Down-haul Take-up Devices	Exclude – Do Not Repair
Existing Deflection Sheaves	Include – Repair
New Deflection Sheaves	Include – Repair
Main Gear Reducer	Include – Replacement
Motor Brakes	Include – Replacement
Main Drive Motor	Include – Replacement
Operating Drums	Exclude – Do Not Provide
Eddy Current Clutch/Brake	Include – Replacement
Circuit Breakers	Include – Replacement
Auxiliary Gear Reducer	Include – Reuse
Auxiliary Drive Motor	Include – Reuse

Distribution / Control System

Component	Recommended Disposition
Motor Controls	Include – Replacement
Switch Gear	Include – Replacement
Wire & Cable	Include – Replacement
Conduit & Junction Boxes	Include – Replacement
Festoon Cables	Include – Replacement
Control Console	Include – Replacement
Portable Traffic Controls	Include – Replacement
Relay Control System	Exclude – Do Not Provide
New PLC Control System	Include – Replacement
Transformer	Include – Replacement
Power Supply System	Include – Replacement

Interlock System

Component	Recommended Disposition
Limit Switches	Include – Replacement

Navigation Guidance System

Component	Recommended Disposition
Single Lens Navigation Lights	Include – Replacement
Combination Navigation Lights	Include – Replacement
Radio Trans/Receiver	Exclude – Do Not Provide
Signage Lighting	Include – Replacement
Signage	Include – Replacement
Signage Support	Include – Replacement

Traffic Control System

Component	Recommended Disposition
New Traffic Barriers	Exclude – Do Not Provide
Traffic Gates	Include – Replacement
Traffic Lights / Bells / Gongs	Include – Repair
Traffic Gate Cabinets & Platforms	Include – Remove

Deliberation with the historian, stakeholders, sponsor, and engineer resulted in the following questions, observations, comments, and/or opinions, paraphrased and presented in bullet form and in no particular order.

- The cost of replacing the counterweight wire ropes was questioned based on the apparent material costs and an observation that the cost required to replace the same component on the Duluth Aerial Lift Bridge was significantly less. An explanation was provided that the cost of constructing false work to support both counterweights simultaneously was included in the cost for rope replacement and that accounts for much of the replacement cost. The Duluth Aerial Lift Bridge is designed to allow the counterweights to be supported from the lift towers. The Stillwater Lift Bridge lift-towers were not designed to support the counterweights unless they are suspended from the sheaves. This will be investigated in more detail during final design.
- The need to completely replace the wire, conduit, and junction boxes, and hence the cost, was questioned. An explanation was provided that a significant portion of this system is required to be replaced because the electrical cabinets are being moved and the traffic gates are being replaced. Due in large part to the cost of labor (design and construction), it was deemed more economical to completely replace these components rather than to dismantle and salvage portions of the existing components.
- The need to replace traffic gates with traffic barriers was questioned. An explanation was provided indicating that traffic barriers are a safety feature required by AASHTO Standards and they should be installed as part of a major repair project such as that being considered.
- A concern was expressed that it may not be structurally feasible to design and construct supports for traffic barriers if they are to be mounted in the same locations of the existing traffic gates.
- A concern was expressed that if the traffic barriers are supported by the superstructure of the bridge, the forces imparted on the superstructure through traffic barriers during impact from an errant vehicle may damage the superstructure itself.
- Opinions were expressed that the electrical cabinets and platforms on the south side of Spans 3 and 4 were not of original construction and detracted from the visual statement of the bridge. As such, they should be removed if possible.

Facilitated Resolution:

Through collaboration with the sponsor, stakeholders, engineer, and historian, the preferred mechanical and electrical repairs will be as initially recommended.

The support system repairs will include replacement of minor original steel plates.

The balance system repairs will include replacement of wire ropes that are not original material and will replace take-up devices with new components. The replacement of the take-up devices is perceived to be inconsequential to the visual character of the bridge.

The drive system repairs will include replacement of the drive motor and primary drive gears, couplings, shafts, and bearings. These components are located below the deck and generally not visible.

The distribution/control and interlock system repairs will result in the elimination of the conduits that protrude through the roof of the tender's house and replacement of other components of the surface mounted conduit as necessary.

Repair of the navigation guidance system will result in the removal of miscellaneous electrical cabinets attached to the south side of the pedestrian railing that were installed in 1953 and replacement of navigation lights that were installed in 1953 or later.

Repair of the traffic control system will include replacement of the 1983 traffic control gates with traffic barriers of a similar style and the elimination of traffic gate related electrical cabinets and platforms from the south side of Spans 3 and 5.

Historic Preservation Considerations:

One of the most significant features of the Stillwater Lift Bridge is the lift span. The mechanical and electrical systems that enable the span to be raised are an integral part of this feature, and proposals to alter or replace original materials in these systems must be carefully assessed. However, preservationists' desire to retain as much original material as possible must be tempered by physical and functional realities. Mechanical and electrical systems are subjected to repeated operation, often under harsh conditions. As a result, parts wear out or fail. For the lift span to continue to function, these parts must be fixed. Some of these components are repaired or replaced as part of routine maintenance; more replacement is justifiable when a major rehabilitation is undertaken. Repair and renovation in the decades since the bridge's construction have already caused the modification or loss of some original materials.

Some of the present recommendations for various components of the support, balance, drive, and distribution/control systems fall under the category of basic maintenance. Repairing span guides, counterweight guides, and lift-tower ladders, for example, is prudent to preserve the bridge's function and can be completed without significantly

altering the bridge's appearance. The same is sometimes true when worn parts, such as the strike plates and live load shoes, are replaced, assuming that the new versions are similar in appearance and function to the original condition of the elements that are removed. The great expense to replace the counterweight wire ropes puts this in the major rehabilitation category, but the justification is essentially the same as for the replacement of smaller deteriorated items. In addition, the present ropes replaced earlier ropes, so the material is not original to the bridge or installed during its period of significance.

Some components of the mechanical and electrical equipment have become obsolete due to advances in technology and changes in safety standards. The interlock system (or lack thereof) is an example of this type of obsolescence. When installed, the interlock system will provide increased safety with minimal disruption to the visual character of the bridge. Replacement of the eddy current clutch/brake will have the same benefit with negligible effect. The hand brake and chain drive are also slated for replacement. Each has a relatively prominent and unique component (the brake lever and the chain housing) that can remain in place, although no longer functional. These artifacts, as remainders of the equipment that has been replaced, will preserve original fabric and retain some of the bridge's history that might otherwise be forgotten.

The navigation guidance system and traffic control system have been modified over time and both are considered obsolete. Both systems are small in scale relative to the size of the bridge, but are visually prominent. Safety concerns justify the installation of new systems, but their design should be compatible with the design of the bridge and as understated as possible. The project sponsors should consult with the Mn/SHPO and Wis/SHPO when selecting and placing equipment and signage. Installation should be done in a manner that is reversible; i.e., if the equipment were removed, the bridge could be returned to its condition prior to the installation. Equipment and signage that are now on the bridge and are no longer needed should be donated for exhibit and conservation to the Washington County Historical Society, the St. Croix County Historical Society, the Minnesota Historical Society, the Wisconsin Historical Society, or the Minnesota Transportation Museum.

It should be noted that the proposed work does not include some items, most notably lift span access ladders, that would be required to be installed on a new lift bridge. As long as the historic Stillwater Lift Bridge can function safely without these items, which might be visually intrusive, their absence is commendable. Also, the proposed rehabilitation will remove wire, conduit, junction boxes, and platforms that are not historic and that presently detract from the bridge's appearance.

REPAIR NEEDS – STRUCTURAL

Initial Findings:

The lift bridge was inspected in 2002 to ascertain the condition of the bridge and collect information to be used in the development of repair plans as documented in separate reports. Based on the information collected during the inspection and engineering judgment, the condition of the bridge was evaluated. The condition of the bridge was evaluated at a system level (referred to as components in the structural inspection and evaluation report) and component level (referred to as elements in the structural inspection and evaluation report). The systems are considered to be the substructure, superstructure, sidewalk support system, deck, and railing. Components are considered to be sub-sets of the systems, e.g., piers and abutments are components of the substructure system.

The condition of the systems was evaluated with respect to its current physical state compared to the as-built (new) condition. The condition of the systems was rated on a scale of 0 to 9 as follows: 9 = Excellent, 8 = Very Good, 7 = Good, 6 = Satisfactory, 5 = Fair, 4 = Poor, 3 = Serious, 2 = Critical, 1 = Imminent Failure, and 0 = Failed. System condition ratings and evaluation observations are provided below:

Substructure: The substructure is rated in **poor** (4) condition primarily due to the advanced state of deterioration in the form of cracks and spalled concrete on Piers 3 to 8 and the apparent failure of the east abutment foundation.

Superstructure – Spans 1 and 2: These spans consist of a concrete slab and are rated **fair** (5) indicating primary structural elements are sound with minor deterioration.

Superstructure – Trusses: Spans 3 to 9 consist of fracture critical through trusses and are rated in **serious** (3) condition primarily because of the advanced section loss due to corrosion of members framing into the panel points of the lower chord as well as pack rust and deteriorated rivets of the lower chord connections.

Superstructure – Span 10: Span 10 consists of rolled beams and is considered to be in **good** (7) condition.

Sidewalk Support System: The sidewalk support system consists primarily of cantilevered trusses. The sidewalk support system is considered to be in **poor** (4) condition primarily due to the advanced section loss due to corrosion of the truss support connections.

Deck: The condition of the deck is considered to be in **poor** (4) condition due to the extent of deterioration in the form of cracks, spalls, and delamination of the vehicular deck.

Railing: The railing is considered to be in **serious** (3) condition because of the extent and advanced state of corrosion within the pedestrian railing and questionable structural support of the pedestrian rail posts.

Stakeholder Input and Facilitated Deliberations:

Component repair needs and their respective costs were established based on the findings of the evaluation. Suggested repair actions were established at the component level and presented to the stakeholders as indicated below.

Concrete Surface Treatment

Repair Item	Recommended Disposition
Concourse Retaining Walls	Include
West Abutment Wing Walls	Include
Concrete Slab Exposed Concrete & Fascia	Include
East Abutment	Include
Piers 1 & 2 Above Grade & Waterline	Include
West Concourse Railing	Include
Span 1 & 2 Concrete Railing	Include
Span 1 & 2 Concrete Railing Posts	Include

Substructure

Repair Item	Recommended Disposition
Conc. Repair - Piers 3 to 8 – Waterline Up & No Bearing Conc. Repaired	Include
Conc. Repair - Piers 3 to 8 – Waterline Up & Bearing Conc. Repaired	Exclude
Conc. Repair - Piers 3 to 8 – Waterline Down	Exclude
Underpin Concourse Retaining Walls	Exclude
Underpin West Abutment Wing Walls	Exclude
Underwater Inspection of Piers	Exclude
Underpin East Abutment	Exclude
Substructure Chloride Testing	Include – Inspection
Substructure Chloride Extraction	Exclude

Superstructure – Spans 1 & 2

Repair Item	Recommended Disposition
Mill & Overlay	Include

Superstructure – Truss Spans 3 to 9

Repair Item	Recommended Disposition
Clean & Paint Fixed Bearings	Exclude
Clean & Paint Expansion Bearings	Exclude
Retrofit Anchorages at Bearings	Include
Retrofit Selected Stringer to Floor Beams Connections	Include
Retrofit Selected Floor Beam to Truss Connections	Include
Retrofit Selected Floor Beams at Mid-Span	Include
Retrofit Selected Lower Chords	Include
Retrofit Truss Verticals	Exclude
Retrofit Truss Diagonal Members	Exclude
Straighten Selected Vertical Members	Include
Remove Lower Lateral Bracing – Except Lift Span	Include
Repair Lower Lateral Bracing	Include – Only on Lift Span
Replace Lower Connection Rivets with Bolts	Exclude
Test Rivets for Shear Capacity	Include – Indep. of Repair
Replace Stingers at Expansion Joints (Galvanized)	Include

Superstructure – Beam Span 10

Repair Item	Recommended Disposition
Replace Rolled Beams & Deck	Exclude
Partial Deck Replacement	Include
Mill & Overlay	Include

Sidewalk Support System

Repair Item	Recommended Disposition
Repair Bent Support Brackets	Include
Replace Upper Connection Gusset Plate	Include
Retrofit Intermediate Support Connections	Include
Replace 1998 Stringers	Exclude
Replace Fascia Stringers	Include

Deck Repair

Repair Item	Recommended Disposition
Replace Expansion Joints – Spans 3 to 9	Exclude
Replace Strip Seal S10	Include
Patch & Seal Pedestrian Deck	Exclude
Replace Pedestrian Deck Expansion Joints	Exclude

Railing Repair

Repair Item	Recommended Disposition
Retrofit South Truss with Rub-rail	Include
Repair North Truss Rub-rail	Include
Replace North Span 10 Rail with Ornamental Concrete Rail	Include

Facilitated deliberation with the historian, stakeholders, sponsor, and engineer resulted in the following questions, observations, comments, and/or opinions, paraphrased and presented in bullet form in no particular order.

- A question was asked if the concrete surface treatment was a cosmetic application or if it contributes to preservation of the concrete. The reply was that the surface treatment was primarily cosmetic, but did provide minor protection and sealing of the concrete surface.
- A question was asked if the concrete surface treatment will conceal cracks in the existing concrete. The reply was that existing cracks in the concrete will reflect through the surface treatment.
- An opinion was offered that concrete surface treatment detracts from historic preservation goals by virtue of the fact that faded color of the concrete and aged surface texture of the concrete is altered.

- An opinion was offered that concrete surface treatment does not detract from historic preservation goals because it enhances the visual appearance of the bridge by providing a uniform color and texture and relatively quickly assumes a naturally aged patina.
- An opinion was expressed that if the existing railing on the north side of Span 10 was to be replaced, it should be replaced with a design similar to that of the concrete railings on Spans 1 and 2.
- An opinion was expressed that rub-rail on the north truss should not be replaced with contemporary plate-beam guard railing.

Facilitated Resolution:

Through facilitated collaboration with the stakeholders, engineer, sponsor, and historian, the preferred structural repairs will be as recommended with the following provisions:

- The replacement railing on the north side of Span 10 is to be replaced with a concrete railing of similar character and proportions as the concrete railings on Spans 1 and 2 and guard railing will be attached to the concrete railing.
- The new rub-rail to be added to the inside of the south truss will be of similar character as the existing rub-rail on the inside of the north truss.

Historic Preservation Considerations:

Rehabilitation of structural elements includes both cosmetic and functional items. Treating exposed concrete surfaces will unify the appearance of railings and posts, retaining walls, wing walls, and the like, while providing a small measure of protection for these features. The “newer” appearance will undoubtedly appeal to the general public and might be one of the more easily understood outcomes of the rehabilitation project. Mn/SHPO and Wis/SHPO will be consulted regarding the color, brightness, texture, and other characteristics of the treatment.

The sidewalk is an important feature of the bridge. The rehabilitation will address deterioration of the support system, which would ultimately threaten the existence of the sidewalk if allowed to continue. Replacing fascia stringers will have both structural and cosmetic benefits. Even more important to the long-term preservation of the bridge are plans to replace/retrofit bent and rusted structural members and connections.

Some of the structural members on the south trusses have been damaged by passing vehicles. These trusses are not currently protected by rub-rails. Dents in the rub-rails on the north trusses show their effectiveness in deflecting vehicles, thereby avoiding or minimizing damage to the structure. The rehabilitation will install rub-rails on the south trusses matching the original design of the north rub-rails and repair or replace in-kind the damaged rub-rails on the north trusses. This “ounce of prevention” will have a minor visual impact that is more than compensated for by the protection the rub-rails provide to truss members.

The railing on the north side of the west approach (Span 10) is also inadequate to withstand contact with today's vehicles. The proposed rehabilitation will install an ornamental concrete rail matching the design of the railings on Spans 1 and 2. The Secretary's Standards caution against "changes that create a false sense of historical development." However, in this case, even though the east approach never had an ornamental concrete railing, the design appears at another location on the bridge. In fact, original plans for the bridge called for an ornamental concrete railing at the east as well as the west approaches; the one to the east was never installed. Since a more substantial railing is required, the proposed design is preferred over a modern concrete barricade or a historical design that was never associated with the bridge.

The proposed rehabilitation will remove most of the lower lateral bracing, a redundant feature given the presence of the concrete deck. The bracing catches river-borne debris during floods. Routine maintenance of the bracing is an ongoing expense, requiring funds that could be used more effectively for other bridge maintenance needs. The absence of the lower lateral bracing will be apparent only to boaters except on the lift span, where it will be retained and repaired.

The proposed repair will not fix some known problems, such as the unstable east abutment. The scope includes exploration of other potentially critical structural issues. The chloride level of the concrete substructure will be tested, as will the shear capacity of truss rivets. The budget, however, does not include funds to extract chloride if the concentration is high, a condition that would accelerate deterioration of the substructure, nor are there funds to replace the rivets with bolts if the capacity is inadequate. It is important that stakeholders are updated if known problems become significantly worse. They should also be informed of the results of the testing, which could have significant implications for options related to the bridge's long-term preservation.

REPAIR NEEDS – PEDESTRIAN RAILING

Initial Findings:

The railing was inspected in 2002 to ascertain its condition and collect information to be used in the development of repair plans. The pedestrian railing was considered to be in serious condition because of the extent and advanced state of corrosion within the pedestrian railing. In broad terms, 10% of the existing railing is considered to be in good condition, 50% in fair condition, and 40% in poor condition. Consideration of repair options was made in anticipation of implementation of repairs to selected features of the bridge. Four railing repair options were identified for consideration as described below:

Option 1 – Reconstruction: This option constitutes replacement of the railing in its entirety, in-kind to the extent possible. The replacement railing would be duplex coated (galvanized and painted).

Option 2 – Replacement with Contemporary Methods: This option constitutes replacement of the railing in its entirety, with contemporary fabrication methods and materials to emulate the existing railing. Again, the replacement railing would be duplex coated.

Option 3 – Blast Clean, Repair, and Paint: This option constitutes blast cleaning the existing railing in-place, replacement of selected elements of the railing with similar elements on-site, on an as-needed basis as determined by inspection, and repainting the entire railing.

Option 4 – Repair and Spot Paint: This option is essentially identical to Option 3 except the existing railing will not be blast cleaned, and only the repaired portions of the railing would be spot painted.

All of the options were evaluated by the engineer prior to consultation with the historian or stakeholders with respect to relative construction costs, maintenance, historic preservation, and appearance. Option 2 was deemed to be the single option that would accommodate replacement of ornamental lighting on the pedestrian railing newel posts because the light anchorages of the existing newel were covered with a steel plate welded in-place and observed to be severely corroded.

Options 1 and 2 ranked high with respect to reducing future maintenance needs and relatively low with respect to historic preservation. Of the two options, Option 1 was considered more consistent with the preservation goals than Option 2, primarily due to the historic preservation ranking.

Options 3 and 4 ranked high with respect to historic preservation and relatively low with respect to reducing future maintenance needs. Of the two options, Option 3 is considered more consistent with the repair goals than Option 4 primarily due to the maintenance

ranking. Options 1 and 3 were recommended to be carried forward for facilitated deliberation with stakeholders and ultimate selection of the preferred option.

Stakeholders' Input and Facilitated Deliberations:

Facilitated deliberation with the sponsor, historian, stakeholders, and engineer resulted in the following questions, observations, comments, and/or opinions, paraphrased and presented in bullet form and in no particular order.

- A majority opinion was reached that Option 2 was inconsistent with the Secretary of Interior's Standards for the Treatment of Historic Properties and should be removed from further consideration.
- A minority opinion was expressed that Option 2 should be employed based primarily on limiting future maintenance needs and the supposition that its visual appearance was consistent with the original railing.
- The findings of the report were challenged based on observations that a cursory visual inspection of the railing yielded only advanced deterioration in isolated locations.
- Opinions were expressed that blast cleaning the existing railing would result in the loss of what presently appears to be paint scale, but is actually advanced corrosion.
- A question was asked if the existing railing could be galvanized in place. The response was the railing could not be galvanized by the hot dipping method, which is the preferred method. It is possible that some commercial enterprises may claim to be able to galvanize the railing in place through spray application of zinc-rich paint or localized application of zinc. However, these processes are inherently inferior to hot-dip galvanizing.
- A minority opinion was expressed that Option 4 should be employed based primarily on limiting the initial repair cost.
- The ability to replicate the existing railing, under Option 1, to any degree of accuracy was questioned. The response was the existing railing could be replicated to a high degree of accuracy except rounded head bolts would be used in lieu of rivets.
- The assumption that the light anchorages of the existing newel posts were severely corroded and therefore unserviceable was challenged. Subsequent inspection revealed the original light anchorage to be apparently serviceable. The new information resulted in an observation that ornamental lighting could be installed on any of the pedestrian railing repair options.

- Opinions were expressed that Option 1 was inconsistent with the Secretary of Interior's Standards for the Treatment of Historic Properties by virtue of the fact that it resulted in removal of all of the original railing.
- Opinions were expressed that employment of Option 3 or 4 would result in significant maintenance efforts subsequent to repairs and extend through the ultimate demise of the railing.
- A question was asked if selected features of Option 1 and Option 3 could be combined to replace those portions of the railing that were in serious condition, yet preserve the majority of the original railing. As a result, what is referred to as Option 5 was developed. Option 5 consists of removing the railing from the bridge, blast cleaning the railing, duplex coating the railing, and re-installing of the railing.
- An opinion was expressed that a construction contractor will be unable to accurately price Option 5 during the bidding phase of the project due to the fact that the extent of the repairs to be made will not be known until the railing is cleaned. The response was that the construction contractor will be informed of what repairs to assume for bidding purposes. Adjustments to repair quantities will be made once the railing is cleaned. Any adjustments to repair quantities will result in changes to the repair costs.

Facilitated Resolution:

Through facilitated collaboration with the stakeholders, sponsor, engineer, and historian, the preferred pedestrian railing repair option was changed from either Option 1 or Option 3 during the initial findings to a previously undefined option, that being Option 5.

The existing railing will be removed from the bridge and cleaned by a combination of blast cleaning and acid bath (a normal galvanizing practice). Once the railing is cleaned, it will be inspected and repaired. Repairs are anticipated to require complete replacement of a small number of railing panels that will be replicated and replacement of individual elements of the railing. Once the railing is repaired, it will be duplex coated and re-installed.

Several cast iron newel posts are damaged in the form of broken anchorage flanges. Damaged newel posts will be repaired by attachment of steel weldments fastened to the newel post with bolts.

Historic Preservation Considerations:

The Secretary of the Interior's Standards call for retaining original materials when possible. Therefore, the preferred option for the bridge railing would be to reuse the original railing. This was tempered by concerns for long-term maintenance under the options initially

considered. It would seem shortsighted to select Option 3 or 4 if significant deterioration might be expected within a few years. Therefore, Option 5 was selected. By removing the railing and treating it in a shop setting, it will be refurbished to a nearly “good-as-new” condition. There is the potential for damage or the discovery of unanticipated deterioration during this process. The Mn/SHPO, Wis/SHPO, Mn/DOT, and Wis/DOT should be consulted if such problems are encountered. Paint should match the color scheme indicated on the original plans and specifications: the newel posts and lamp standards were green to match the trusses, while the railing panels were covered with aluminum paint. The Mn/SHPO, Wis/SHPO, Mn/DOT Cultural Resource Unit, and Wis/DOT’s historian should be consulted before plans to repair the pedestrian railing are finalized and constructed.

REPAIR NEEDS – VEHICULAR DECK REPLACEMENT

Initial Findings:

The original 1931 deck was a conventionally reinforced cast-in-place concrete deck. The original deck and its associated hardware (sliding plate joints, drainage scuppers) was removed and replaced in 1973. The vehicular deck was inspected in 2002 to ascertain its condition and collect information to be used in the development of repair plans. The condition of the vehicular deck is considered to be in poor condition due to the extent of deterioration in the form of cracks, spalls, and delamination. Four options were considered in anticipation of addressing the deck replacement as described below:

- Option 1 – Cast-in-place Deck on Conventional Forms
- Option 2 – Cast-in-place Deck on Stay-in-place Forms
- Option 3 – Segmental Pre-cast Deck Supported on Stringers
 - 3A: Bridge closed to traffic during construction
 - 3B: Bridge open to traffic during high traffic demand periods
- Option 4 – Segmental Pre-cast Quad-Tee Supported on Floorbeams
 - 4A: Bridge closed to traffic during construction
 - 4B: Bridge open to traffic during high traffic demand periods

Of the cast-in-place options, Option 1 was considered superior to Option 2 primarily because of its reduced weight and historic preservation considerations. Of the pre-cast options, Option 3 was considered superior to Option 4 primarily due to constructibility and historic preservation considerations.

Stakeholders' Input and Facilitated Deliberations:

Facilitated deliberation with the historian, stakeholders, sponsor, and engineer resulted in the following questions, observations, comments, and/or opinions, paraphrased and presented in bullet form and in no particular order.

- A minority opinion was expressed that Option 4 should be employed because it eliminates 11 lines of steel stringers, each about 1,000 feet long, that have required extensive maintenance in recent years. A counter opinion was expressed that removal of the stringers would be inconsistent with the Secretary of Interior's Standards for the Treatment of Historic Properties.
- A majority opinion was quickly reached that Option 2 was inferior to Option 1 from a technical and historic preservation standpoint.
- Information was presented to the stakeholders regarding potential additional federal demonstration funds for the pre-cast options. In general terms, the additional

demonstration funds would equalize the initial repair cost of the cast-in-place options and the pre-cast options. However, it was anticipated that the funds would not cover the additional costs of engineering, increased inspection efforts, and development of future reports.

- An opinion was expressed that employment of a pre-cast option would reduce the appeal of the repair contract to construction contractors because it would increase the already high level of sub-contracting that will be required to complete the repairs. The result may be limiting the pool of potential bidders to a few.
- Interest in re-use of the original 1931 deck drains was expressed in the interest of historic preservation. However, the original 1931 deck drains were discarded when the vehicular deck was replaced in 1973.
- Interest was expressed in the use of the pre-cast options that could be installed during the evening hours, thus allowing the bridge to remain open during the daytime hours to accommodate the normal high traffic demand periods. The benefit of this staged construction is diminished to some extent by the fact that the bridge will need to be closed to vehicular traffic for an extended period of time independent of which deck option is employed for mechanical and electrical repairs and because the cost of structural repairs would likely escalate if they were required to be completed during evening hours coincident with the deck replacement.
- A request was made that consideration be given to minimizing the noise imparted by vehicles on the bridge deck as a function of the deck surface texture and the type of expansion joints installed.

Facilitated Resolution:

Through facilitated collaboration with the stakeholders, sponsor, engineer, and historian, the preferred deck replacement option was resolved to be Option 1.

The existing deck will be replaced with a reinforced cast-in-place concrete deck constructed using conventional removable forms in a process similar that used to construct the original deck.

The existing expansion joints between the truss spans will be replaced with strip seals in conformance with Mn/DOT standard practice.

Historic Preservation Considerations:

The original vehicular and pedestrian decks were replaced in 1973 and 1998 respectively. Some components of historic properties, especially utilitarian structures, must be replaced to extend the life of the property as a whole. Such is the case with bridge decks, which are exposed to weather and subjected to heavy use. When a feature must be replaced, the

Standards call for the new feature to “match the old in design, color, texture, and, where possible, materials.” The proposed cast-in-place bridge deck (Option 1) conforms to this standard. The substitution of strip seals for sliding plate joints, which were included in the original design, will have minimal visual impact and will be more effective for maintaining the bridge. The sliding plate joints and deck drains that are now on the deck were installed in 1973, too recent to be of historical significance. The Mn/SHPO, Wis/SHPO, Mn/DOT Cultural Resource Unit, and Wis/DOT’s historian should be consulted before plans are finalized and repairs constructed.

REPAIR NEEDS – AMENITIES

Initial Findings:

The category of “amenities” (see list below) was used as a catch-all group of repair needs that did not fall neatly in previously described repair categories or items that were considered betterments. Germane to discussion regarding amenities are the following observations:

- The bridge was painted from the deck down to the bearings in 2002.
- Ornamental lighting is available in standard off-the-shelf configuration that emulates, but does not replicate, the original lighting or through a reconstruction of the original lighting.
- It is possible that the east abutment, east approach, and perhaps Pier 8 continue to settle due to compressible organic soils beneath the earthen causeway.
- Ornamental lighting should be considered a visual enhancement rather than functional lighting capable of illuminating the sidewalk to current standards.
- The existing roadway lighting, which is not historic, is anticipated to remain on the bridge and serve to some extent to illuminate the sidewalk.
- Mn/DOT intends to establish benchmarks to gauge the movement of the east abutment, east approach, and bridge independent of selection of the repair needs.

Stakeholders’ Input and Facilitated Deliberations:

Amenity repair needs and their respective costs were established and presented. Initial suggested repairs were established and presented to the stakeholders as indicated below.

Amenities

Repair Item	Initial Recommended Disposition	Final Disposition
Minor Bridge Roadway Lighting Repairs	Include	Include
Provide Off-the-shelf Ornamental Lighting	Exclude	Exclude
Replication of Ornamental Lighting	Include	Exclude
Closed Circuit TV System	Exclude	Include
South Truss Drainage Deflection	Include	Include
Bridge Movement Benchmarks	Include	Include
East Abut. & Approach Benchmarks	Include	Include
Paint Middle 3rd of Truss	Exclude	Exclude
Paint Truss from Deck Up	Exclude	Exclude
Paint Truss Completely	Exclude	Include to Extent Poss.
Approach High-Load Warning Device	Include	Include
Tender's House Fan	Include	Include
Tender's House Air Conditioning	Include	Include

Amenities

Repair Item	Initial Recommended Disposition	Final Disposition
Tender's House Heating	Include	Include
Tender's House Telephone	Include	Include
Longitudinal Construction of Deck	Include	Exclude
Deck Overlay	Exclude	Exclude

Facilitated deliberation with the sponsor, historian, stakeholders, and engineer resulted in the following questions, observations, comments, and/or opinions, paraphrased and presented in bullet form and in no particular order.

- An opinion was expressed that longitudinal construction of the deck was feasible from a technical standpoint, but likely not feasible from traffic operations standpoint. Therefore, longitudinal construction of the deck should not be employed.
- An opinion was expressed that closed circuit television (CCTV) should be employed for safety reasons associated with the bridge tender's inability to observe pedestrians when the lift span is in operation and the ability of pedestrians to climb over, under, or around the traffic barriers.
- An opinion was expressed that off-the-shelf ornamental lighting is preferred to replication of ornamental lights to limit the need for future maintenance and/or replacement of individual elements.
- Opinions were expressed that replication, to the extent possible, of the ornamental lighting was consistent with the Secretary of the Interior's Standards for Treatment of Historic Properties and is preferred to employment of off-the-shelf ornamental lighting.
- An opinion was expressed that the original ornamental lighting globes could not be replicated, but that a frosted glass globe very similar to the original could likely be procured.
- An opinion was expressed that if ornamental lighting was to be replaced, the light fixtures should replicate the intensity and color of the original ornamental lighting.
- A concern was expressed that employment of ornamental lighting would contribute to light pollution.
- Opinions were expressed that use of off-the-shelf ornamental lighting is inconsistent with the Secretary of the Interior's Standards for Treatment of Historic Properties. Therefore, not replacing the ornamental lights is preferred to replacement with off-the-shelf ornamental lights.

- The need to provide air conditioning for the tender's house was challenged based on the premise that ventilation would be provided and the tender is not confined to the tender's house.
- Opinions were expressed that painting of the bridge could restore community appreciation of the bridge, reduce future maintenance of the bridge, and generally improve the visual appearance of the structure.
- An opinion was expressed that the majority of paint related future maintenance needs was addressed when that portion of the bridge below the deck was painted in 2002.
- An observation was made that Mn/DOT will likely be required to paint the bridge in 2011 as a mitigation item related to the new St. Croix River Crossing project. An opinion was offered that allocation of additional funds to paint the bridge in its entirety could result in reduced costs. The cost savings would come in the form of elimination of the painting contractor's 2011 mobilization and traffic control.
- Opinions were expressed that some form of historical interpretation and public education of the significance of the bridge should be included in the repairs. This may include a plaque of sorts, a display of the original capstan, or other features.
- The use of the congressional authorized repair funds for development of historic interpretation was questioned and resolved that a nominal portion of the funds could likely be used for an interpretative sign and remain consistent with the intent of the 106th Congress.

Facilitated Resolution:

Through facilitated collaboration with the stakeholders, sponsor, engineer, and historian, it was resolved that the repair needs would be addressed as initially recommended with the following exceptions:

- Ornamental lighting would not be replaced on the bridge. Reasons contributing to the resolution are the long-term maintenance costs, the inability to replicate the original globes, the lack of a majority consensus regarding the employment of replication versus off-the-shelf ornamental lighting, and the felt need to conserve funds for painting of the bridge.
- The initial recommendation to construct the bridge deck in longitudinal halves for purposes of maintaining traffic was reversed presumably based on the opinion that staged construction is not feasible from a traffic operations standpoint and the felt need to conserve funds for painting.

- The bridge will be painted to the extent that available funding allows. The present opinion of probable construction cost indicates that funds will not be available to paint the bridge from the deck up. The extent of painting will be further evaluated with respect to the type of paint system to be employed and once the opinion of probable construction is refined during the final design of the repairs.
- While not explicitly discussed in detail with the stakeholders due to time limitations, CCTV will be installed. The CCTV is deemed to be a safety feature due to its ability to allow monitoring of vehicles and pedestrians movement during operation of the bridge.
- Facilitated resolution was reached that some form of historic interpretation in the form of a plaque and/or interpretive area will be incorporated into the repairs. A committee consisting of the stakeholders and sponsor will be formed to explore various options and develop a recommendation.

Historic Preservation Considerations:

The ornamental lighting that was originally installed on the bridge was an attractive amenity, but not a crucial feature of the bridge design. An off-the-shelf item in 1931, the lights today would have to be reproduced specifically for the bridge. It is feasible to get metal castings that are virtually identical to the originals. Selecting the appropriate globes would be more problematic, since those matching the original design are no longer manufactured. Similar globes are available, but they might not meet the Secretary of the Interior's Standards. In addition, maintenance costs for these unique fixtures would probably be high. The removal of the original lights from the bridge suggests that maintenance was previously a problem. Another alternative that was considered was to use generic reproduction light fixtures. This would clearly violate the Secretary's Standards. Yet another option would be to select a more contemporary design. It would be difficult, though, to find one that would be both "differentiated from the old" and compatible with the bridge's historic character. Given these circumstances, the decision not to replace the ornamental lighting appears to be prudent. The standards that survive should be retained, repaired, and cleaned as needed and painted green to match the original color scheme.

Metal truss bridges must be painted on a regular basis to protect structural members from environmental forces that cause deterioration. The portion of the Stillwater Lift Bridge that was most in need of painting, namely the area below the deck, was repainted in 2002. Painting the remainder of the bridge is not critical prior to 2011, when the current bridge owners anticipate turning the bridge over to new owners because a new river crossing would be in place. Assuming that the current owners would paint the bridge before relinquishing ownership, it is unnecessary to expend funds appropriated by the 106th Congress to paint the bridge. If the bridge were not painted at that time, deterioration would likely accelerate.

Finally, as with the concrete surface treatment, there is an aesthetic argument. The bridge will look better freshly painted (dark green, to match the original color scheme), assuming that the entire area above the deck was done. Painting only the middle third of the truss, on the other hand, would have the opposite effect leaving the bridge with a motley, unattractive appearance. If the entire area above the deck cannot be done, it would be best to wait until 2011. If sufficient funds are not available to paint the entire truss above the deck, the funds could be applied to other critical items.

If a closed-circuit TV is installed, the equipment should be mounted in as unobtrusive a location as possible and with minimal physical effect to the bridge. If the equipment were removed, the bridge should be able to be returned to its condition prior to the installation.

The Mn/SHPO, Wis/SHPO, Mn/DOT Cultural Resource Unit, and Wis/DOT's historian should be consulted before plans are finalized and repairs constructed.

FUTURE MAINTENANCE NEEDS

Initial Findings:

Future maintenance and repair projections are addressed under a separate report titled *Maintenance Projections and Annualized Costs*, dated August 6, 2003, as previously noted. In summary, the report concludes that additional structural repairs will need to be addressed in the 50 years following completion of the present repair. The structural repairs are anticipated to be of the same character as those described herein. The remaining most vulnerable structural aspects of the bridge are projected to be the pier concrete, the lower chord connections, the lower chords themselves, those portions of the truss web members located below the deck, and the deck itself.

Repairs to the mechanical and electrical aspects of the bridge are projected to be less significant than the structural aspects of the bridge. With the exception of the need to replace the operating and counterweight wire ropes and barring component failure such as sheave trunnion shaft failure, the mechanical and electrical aspects of the bridge are expected to remain serviceable beyond a 50-year period following completion of the present repair project.

Stakeholders' Input and Deliberations:

Due to the historic nature of the bridge, consideration of future repair needs of the bridge are anticipated to be discussed with stakeholders that have a vested interest in the bridge at that time, the bridge owner, a technical representative, and a historical representative.

Historic Preservation Considerations:

The future of the bridge is currently being discussed. Maintenance should be planned and conducted with the assumption that the long-term use of the bridge as a bridge—vehicular or otherwise—will continue.

CONCLUSION

Several repair needs were identified and various options to address the repair needs were developed and presented to the stakeholder. The estimated cost of addressing all of the repair needs identified exceeded the funds available for repair of the bridge. Through a facilitated collaboration of the stakeholders, sponsor, historian, and engineer, a consensus was reached regarding which repair needs are to be addressed in the near future. The repairs to be completed will address significant immediate repair needs of the bridge to extend its useful life for decades into the future provided appropriate maintenance is applied to the bridge.

While the funds provided by the 106th Congress for the repair of the Stillwater Lift Bridge are substantial, they are not sufficient to cover all of the structure's long-term maintenance needs. Repair options have been carefully weighed from a variety of perspectives to get the greatest benefit from the available budget. The final plan includes structural items that are critical to extending bridge life and interpretive and aesthetic items that offer educational and psychological outcomes to foster the bridge's preservation. Given the scale of the repairs, it will have an effect under Section 106 guidelines. It appears, though, that the effect should not be adverse if plans are developed as envisioned. To ensure that the project conforms to the Secretary of the Interior's Standards, the Mn/SHPO, Wis/SHPO, Mn/DOT Cultural Resources Unit, and the Wis/DOT historian should be consulted throughout the design process and be invited to review and comment on final plans and specifications.

The repair of the Stillwater Lift Bridge is being developed from the needs as identified within this report. A public letting of the repair contract is anticipated to occur in August of 2004 with the repair work being completed between summer of 2005 and summer of 2006. Provided in Appendix E are programming level costs of the selected repairs.

Appendix A

Public Meeting Minutes – March 6, 2003

Provided below is the public meeting agenda and the public meeting minutes. The meeting minutes are presented in **bold type** and meeting agenda presented without bold type.

**Stillwater's Lift Bridge
\$5M Repair Project
Tender's House Repair Options Meeting
3/6/03
9:00-12:00 at Stillwater City Hall**

Meeting Minutes

Prepared by Dan Enser of HNTB

Welcome and Introductions – Rick Arnebeck, Mn/DOT (allow 15 minutes)

\$5M Repair Project:

History of \$5M Repair Project – Todd Clarkowski, Mn/DOT (allow 3 minutes)
Agency/Stakeholder Kick-Off mtgs. completed

HNTB Scope of Work – Todd Clarkowski, Mn/DOT

Structural, Mechanical, Electrical Evaluation

Identify Rehab Needs & Costs:

Steel Repairs

Deck Replacement

Lift Span Motors and Cables

Tender's House Alternatives

Sidewalk Railing

Prioritize Needs

Develop Final Plans Based on Needs and Available Funding

Develop Future Maintenance Scenarios with Costs

Completion of HNTB Work by August 2003

Construction of \$5M Repair, Rehab & Restoration Project in 2004-5

Minutes:

- **Historic Lighting should be an item on the M/E Needs list.**
- **Closing of bridge during construction will depend on the Options chosen to take to final in the reports.**
- **Questioned of how long bridge was closed in 1973 during deck repairs. Not known.**
- **The concern of closing the bridge to River traffic was / is recognized.**

Goal of this Tender's House Repair Options Meeting – Todd Clarkowski, Mn/DOT

Minutes:

- **Narrow 8 options down to ideally 1 option to take forward to needs report and final design.**

Tender's House Repair Report – Rich Johnson, HNTB

Field Inspections, Evaluations, Options, and Recommendation contained in Report

Minutes:

- Was a “do nothing” option looked at by HNTB? No, essentially Option 1 due to NEC constraints.
- Does ADA Requirements apply? In RMJ's opinion, not for the tender – applies to public spaces of the bridge.
- Was DC current looked at? No. NEC does not differentiate in regard to clear requirements.
- In 1980 when gas motor changed out for electric, was waiver given by NEC back then? – Unknown, but believed that NEC's position would be to upgrade.
- What condition is the exterior of the Tender House in? A guess from visual inspection is that the majority is in good condition.
- Option 2 – Drive gear below deck our under tender house, would not encroach on vertical clear due to floor beam depth.
- Option 7 – Tender house on shore shall be set back 100 ft. This is where it was positioned in the graphics. Does not eliminate or enhance.
- Option 4 – Added house approx. ½ times the size of the existing tender house.
- Option 5 – new house on downstream side above sidewalk of equal mass as existing house.
- Option 3 – Size of new house approximately 8 ft x 20 ft
- Option 2 – If the motor placed below deck there is the issue of submersion and getting wet.
- If existing tender house remains there was the issue of interpretation.

Facilitation of Discussion of Tender's House Repair Options – Mike Hughes, Resolve Group discussion of issues related to Tender's House Repair Options
Recommendation of group for Tender's House**Minutes:****Unexamined Options**

- Leaving original should have been looked at. Possibly with gas motor reinstalled.
- Option looked at with new compact control items that would fit in the existing house.

Other Items/Materials, etc.

- Downscale size of components or relocate high voltage items that require larger clearance to preserve size of original tender house.
- Preserve as much historic fabric as possible.
- Option 3 – Where would existing tender house be relocated to? The park? Issues of interpretation and maintenance and would it be in the flood plane.
- Could sign be put up to foster public relations as to the history of the bridge and the repairs made?

Do Options fit HNTB's Criteria?

Option 1 –

- Group did not disagree and realizes fallbacks but might keep because it might look better later in terms of cost.
- Some felt Historical aspect should have been weighted heavier.

Option 2 –

- Some felt Historical aspect should have been weighted heavier.

Option 3 –

- Would not have rated this option as high on Historic preservation.
- House originally called on for two items (tender and gas motor). Now called on for three items (tender, electric motor, electric control).
- If the bridge is to last long and continue to carry traffic and people this option looks good.
- Can bridge handle additional weight? There is currently railroad track on lift span to keep it span heavy.
- Moving the house in Option 3 makes the house an artifact but no longer historic property.
- The small scale of the tender house in relation to overall bridge does not greatly affect the overall historic value of the bridge if done in smallest possible scale with correct fabric.

Option 4 –

- Keeps original house and adds on new one. Try to blend new to old.
- If new could be designed to Standards of the Interior there might be no adverse effects. But would it be “fake” history.
- Overall size of 4 compared to 3 explained as not much of a difference.
- Keeping the existing tender house shows the smallness of items used in the time the bridge was constructed.
- Smallest version of Option 4 was looked favorably upon.

Option 5 –

- Change in elevation was disliked.

Option 6 –

- Not bad from historic standpoint.

Option 7 –

- Would existing house stay on bridge?
- Issue of placing new house in Historic Park lower value of park?
- The location on shore might be in location where emergency flood walls are constructed.
- The structure would have to be substantial to stand up to flood conditions.
- Take off list.

Option 8 –

- **Are there any bridges with a remote tender like suggested? Unknown. Possibly some railroad bridges.**
- **Is there a historic problem if the tender not in the house. People converse with tender.**
- **Tender relied on for information regarding bridge operation and visibility / site lines.**
- **Take off list.**

Final comments and vote:

- **Coast Guard did not really care as long as vertical clear of lift span not changed or decreased.**
- **The main options were 4, 3, and 1. The group recommended Option 4A which is Option 4 while minimizing additional space requirements for 3 operations.**

OPTION TO TAKE TO FINAL:**Option – 4A**

- **This is a hybrid of Option 4 with a new house on the east side of the existing porch to house high voltage electrical and leaving existing house for drive gear. Low voltage electrical and tender.**
- **Look at reducing physical size of electrical cabinets.**
- **Look at moving high voltage to new house or external somewhere on lift span.**

Next Steps – Todd Clarkowski, Mn/DOT

Prioritization Meeting #2 for Deck Replacement Study & Pedestrian Railing Study

Mtg. #2 – April 3rd 9-12 @ Stillwater City Hall

Prioritization Meeting for Structural Inspection, Ratings, and Needs Reports & Mechanical & Electrical Inspection, Ratings, and Needs Reports

Mtg. #3 – May 1st, 9-12 @ Stillwater City Hall

Meeting #4 Complete Presentations and discussion of studies; Prioritize Improvements

Mtg. #4 – June 5, 9-12 @ Stillwater City Hall

Public Informational Meeting

Appendix B

Public Meeting Minutes – April 3, 2003

Provided below is the public meeting agenda, the public meeting minutes. The meeting minutes are presented in **bold type** and meeting agenda presented without bold type.

**Stillwater's Lift Bridge
\$5M Repair Project
Tender's House/Deck Repair/Pedestrian Railing Meeting
4/3/03
9:00-12:00 at Stillwater City Hall**

Meeting Minutes - Draft
By Dan Enser of HNTB

Welcome and Introductions – *Rick Arnebeck, Mn/DOT, Todd Clarkowski*

A. Lift Bridge Repair Project Development Update – Todd Clarkowski, Mn/DOT

- 1) Kickoff Meetings Completed
- 2) Monthly Progress Meetings
- 3) Prioritized Needs Meetings
- 4) Public Information Meeting
- 5) Final Plans – August, 2003
- 6) Contract Letting – August, 2004 – **Set back 1 year due to I-94 Bridge Redecking**

B. Tender's House Repair Findings – Rich Johnson and Gary Peters, HNTB

- 1) Option 4/1 – Review of Recommendations from Group at 3/6 Meeting
- 2) National Electrical Code Meetings with Electrical Engineers
- 3) National Electrical Code Definitions of Conditions 1, 2, and 3
- 4) Facilitation of Discussion of Tender's House Options 4 A, B, C – Mike Hughes, Resolve

Comments / Discussion Items

Proponent of Option 3 still likes Option 3 from previous meeting due to smaller size than Option 4A or 4B.

Use of Direct Current (DC) vs. Alternating Current (AC) was discussed without resolution. The premise was the application of DC would result in smaller electrical cabinets. HNTB was directed to provide brief statement addressing DC vs. AC as it relates the size of electrical cabinets.

No party in attendance voiced an opinion that Option 4B should be taken further.

Architectural Treatment – Consensus reached that architectural treatment should tend toward options 2 and 3 as outlined in presentation, closer to 3 than 2. The electrical house should not stand

out, but not look exactly like the existing house. Mn/DOT challenged to get outside lines / size / roof gable, etc. similar to existing house.

Dimension from live part to face of cabinet could vary.

Cabinets larger than the live parts it contains is required for ventilation in and around electrical components to dissipate heat.

A suggestion was made to consider moving an electrical cabinet to the end wall of Option 4A to eliminate a NEC working space violation.

Opinions were expressed that a shorter new building would be better from most views.

Opinions were expressed that the building size issue was blown out of proportion, there larger issues to tackle, and we might be focusing too much on the issue. Minor dimension variations not critical.

Opinions were expressed that the NEC specifies minimum clearances, and the minimum clearances should control over visual considerations. The premise was that one would not perceive a 2-ft difference in the size of the electrical house from 500 ft away.

The electrical cabinets on the platforms of the south side of Spans 3 and 5 house the traffic controls and may be removed when/if new system added.

Present traffic gate controls are DC.

Opinions were expressed that NEC specifications attempt to minimize requirements to the extent possible without compromising safety. Compromising the NEC specifications puts maintenance personnel in a bad situation.

Opinions were expressed that the role of historic preservation role is to apply the Secretary of the Interiors Standards within the technical standards for the need required and not to micromanage electrical work.

Opinions were expressed that adding a supplemental house does not, in and off itself, constitute an adverse affect if the work is in accordance with the Secretary of Interior's Standards.

Option 4C was rejected due to the need for messenger cables, platforms with railings and kick plates and to cabinets will be exposed to the elements and may need to be worked on in inclement weather.

Clarification between architectural treatments:

- 1) **Contemporary & Distinguishable** – The houses will not match the new house will stand out from the old house to show the different periods.
- 2) **Contemporary & Complimentary** – Materials do not necessarily match the existing. The new structure would be a utility type building similar to existing but still distinguishable.
- 3) **Vintage** – Same material, finish, detail, appointment as the existing tender’s house.

5) Recommendation of group for Tender’s House Repair
 Proceed with **Option 4A** and take into account safety, **NEC** guidelines while trying to minimize the size of the new building but also addressing object lines and architectural treatment that falls between **2) Contemporary & Complimentary** & **3) Vintage** as was outlined in the presentation. Needs are to be based on going forward with **Option 4A**.

C. Deck Replacement Study

- 1) Presentation of Report – Rich Johnson
- 2) Facilitation – Mike Hughes, Resolve

Comments / Discussion Items

Demonstration funds are available from federal gov. to state DOTs for applications of new technology. The funds are NOT currently ear marked for this project.

Options 3B and 4B open to traffic – i.e. night work or work during off peak hours.

Truck size is not a major concern for deck design due to tight stringer spacing.

There may be a visual difference due to joint or overlays in precast options, depending on finish of surface.

Cost clarification deducting demonstration funds (\$500,000) for precast options:

Option 1	\$450,000
Option 2	\$475,000
Option 3A	\$300,000
Option 3B	\$450,000
Option 4A	\$330,000
Option 4B	\$455,000

Closing of bridge to navigation traffic after Oct. 15 is contrary to existing USCG permit and will require USCG permission.

An opinion was expressed that the Stillwater Lumber Jack Days should control scheduling of the repairs.

Round drains could be used in any option.

Detour routes are 14 miles by way of Hudson or 21 miles by way of Osceola.

No attempt has been made to date to put costs on the detour and should be evaluated.

Rideability would be a reason to use demonstration funds for precast to find out if the rideability is an issue. Options 1 and 3 would still have joints at the end of each span.

Run off from deck drains to river would not be changed from current condition. Since size of bridge is not changed existing drainage is perpetuated and no attempt will be made to collect the run off for treatment.

Option 3 is estimated to be marginally more durable due to the post-tensioning keeping the concrete deck in compression.

The attachment of Option 3 to the stringers would be a good reason for use of demonstration funds.

A request for examples of precast decks in northern climates was made. Examples include I-287 Westchester Expressway in NY (information likely available via internet in the International Bridge Conference [IBC] 1997 or 1998 conference proceedings), State Route 39 outside of Springfield, Ill., I-264 Shawnee Expressway in Louisville, KY (bid as alternate to cast-in-place and ultimately not selected).

An opinion was expressed that the rideability of the new deck would be slightly better than the 1931 deck because it is assumed the 1931 due to improved construction methods and tolerances.

Not readily remembered if premium cost was used for night work for Option 3B or 4B.

Option 3B assumes structural repairs would be minimal so precast panels can be placed without having structural repairs on the critical path so could be open to traffic.

Option 1 would be a full closure but would allow for more extensive structural repairs.

An opinion was expressed that downtown Stillwater requires traffic from bridge to maintain economic viability. A statement was made suggesting that the last flood closure of the bridge resulted in a 45% drop in downtown business.

No additional compensation will be given to store owners as a result of the bridge closure. Mn/DOT typically works with the community to reduce impacts.

Demonstration funds are available for precast option only. There is no additional money.

A request was made to reduce or eliminate deck tinning to mitigate traffic noise.

An opinion was made that the precast concrete options would be a slightly lighter shade than older historic concrete.

A suggestion was made to request fed. Demonstration funds beyond the \$500k.

Recommendation of Group for Deck Replacement

Deck replace option recommendation deferred until additional information on structural and M&E needs was available – May 1 meeting.

D. Pedestrian Railing Study

- 1) Presentation of Report – Rich Johnson, HNTB
- 2) Facilitation – Mike Hughes, Resolve

Discussion on filigree and X railing panes. It is assumed there is nothing unique to the panes. This type of railing is seen on many other bridges.

A question was asked if the railing can be blast cleaned and galvanize on site? Response was no due to the need for elevated temperatures. Some party may claim that zinc paint is galvanizing.

A question was asked if Options 1 and 3 could be combined?
Response – yes.

An opinion was expressed that The Secretary of Interior's Standards would not allow Option 1 unless the ornamental lighting was reconstructed. If the lighting was not reconstructed, Option 3 is preferred from the historic point of view.

An opinion was offered that the cost of replacing the new lighting would be on the order of \$70k.

An opinion was expressed that Option 1 was preferred for the preservation of the entire bridge. Replacing the railing all at once would not burden Mn/DOT or the future owner. Sections of the existing railing could be used in Lowell or Pioneer Park.

Mn/DOT could, and likely would, issue a design exception for Option 1 to alleviate the sphere test criteria.

Opinions offered regarding Maintenance:

- If blasted and painted location would be discolored in approx. 1 yr.
- With the current budget cuts aesthetics would not be high on priority list.
- Maintenance personnel could not match the railing exactly if repairs needed for Options 3 & 4 but could for Option 2.
- Maintenance personnel like Option 1. Options 3 & 4 could be trouble.
- Blast cleaning in Option 3 could damage some items and replaced items would be noticeable.

Opinion offered: Even though the railing could be reused a lot of historic fabric would be lost. If the railing is going to be replaced in 25 years anyway why not just replace it now so it looks good.

Consensus was reached that the railing decision was more important or critical than the deck because it is highly visible.

Round bolt heads could be used on Option 1 to simulate rivet heads.

Span 10 Railing on North Side:

Ornamental railing is will not stop errant vehicle.

Could replicate the concrete balustrades shown on span 1 & 2 here.

Needs to be done regardless of railing option chosen.

3) Recommendation of Group for Railing Repair

Railing repair option recommendation deferred until additional information on structural and M&E needs was available – May 1 meeting.

E. Costs of Lift Bridge Repairs – Rich Johnson, HNTB

- 1) Tracking Mechanism
- 2) Prioritization Mechanism

Cost tracking and prioritization mechanism was presented with no subsequent discussion.

Next Steps – Todd Clarkowski, Mn/DOT

Meeting #3 – May 1, 2003 Presentation and Preliminary Discussion:

- Structural Inspection, Ratings, and Needs Reports;
- Mechanical & Electrical Inspection, Ratings, and Needs Reports

Meeting #4 – June 5, 2003 Complete Presentation and Discussion of Reports; Prioritize Improvements

Meeting #5 – Public Informational Meeting

Appendix C

Public Meeting Minutes – May 1, 2003

Provided below is the public meeting agenda, the public meeting minutes. The meeting minutes are presented in **bold type** and meeting agenda presented without bold type.

**Stillwater's Lift Bridge
\$5M Repair Project
Deck Repair/Pedestrian Railing/ Structural and Electrical & Mechanical Meeting
5/1/03
9:00-12:00 at Stillwater City Hall**

Meeting Minutes
By Dan Enser of HNTB

Welcome and Introductions – Todd Clarkowski, Mn/DOT

Review and Approve Minutes of April 3, 2003 Meeting – Dan Enser

Changes to April 3, 2003 Meeting Minutes:

- **Page 3 – second paragraph after deck option cost list, sentence should read “An opinion was expressed that the Stillwater Lumber Jack Days should NOT control scheduling of repairs.”**
- **Page 3 – Fourth paragraph after deck option cost list, sentence should read “Detour routes are 14 miles by way of Hudson and 21 miles by way of Osceola if these routes are used and will vary by individual.”**
- **Page 4 – Third comment from the end of the deck comment section. Comment should read “The request was made to reduce deck noise.”**

Update of Lift Bridge Repair Project Development – Todd Clarkowski, Mn/DOT
Minutes

- **Plans need to be on the shelf by the end of September 2003.**
- **I-94 Bridge re-decking is scheduled for summer of 2004 with estimated end of construction November 2004.**
- **Meeting scheduled for May 19, 2003, to discuss staging issues.**
- **At this point the best guess of letting this project is August 2004, but could change after defining needs list more and understanding staging issues better.**

Deck Replacement Option – Rich Johnson

1) **Post Report Observations**

Minutes

- **Options 3A & 3B are pre-cast.**
- **If the bridge is worked on with the lift span in the up position it will be supported on some kind of false work. It is estimated that wind or other loadings will not be a problem because the bridge was designed for this but can be investigated if this path is chosen.**

- High performance concrete may be used for the deck in Option 1 to account for no overlay.
- The overlay for option 3A / 3B will be some kind of polymer overlay (about 3/8" thick) and will not add as much dead load as a convention overlay
- Option 1 CIP deck can be constructed with full removal and replacement of deck (about 6 week duration if accelerated) which requires closure to vehicular traffic. Alternatively Option 1 could be replaced using longitudinal construction – removal and replacement of one longitudinal half (one side) at a time. Longitudinal construction leaves one narrow traffic lane (9 ft to 10 ft) and will add approx. \$15,000 to cost. Longitudinal construction would allow one-way vehicular traffic on the bridge during that time when the bridge is not closed due to the M&E repairs.
- The lift span needs to be shut down for a time for M/E repairs which will make the lift span inoperable. The bridge cannot be repaired in the down position after May 15 or prior to Oct. 16 because of the need to maintain boat traffic, which takes precedence over vehicles. Therefore, the M&E may be completed prior to May 15 and after Oct. 15 with the lift span raised, or removed.
- Mn/DOT sought demonstration funds from the federal government with a list of bridges the funding could be used on and got the funding. The funding is not ear-marked specifically for the Stillwater Lift Bridge. The article in regards to this misspoke. It is not the intent of this group to determine the disposition of the lift bridge.

D. Pedestrian Railing – Rich Johnson

1) Post Report Findings

Minutes

- Option 5 also assumes access from the bridge deck.
- If ornamental lighting is put on the bridge the visual effect will basically match that of the 1931 bridge with the exception of cobra-head lights that were installed over the roadway in the past.
- A mercury lamp could be used for the ornamental lighting to closer match the white light effects of the original lights.
- Railing repair Option 5 would not equal the minimum maintenance of Option 1 but would be close and would be significantly better than Options 3 or 4.
- Railing Option 1 has a more fixed cost than Option 5 so some contingency for Option 5 may be needed.
- It is possible that Option 5 newel post repairs could be used with Option 1 rail panel replacement.
- It is a possibility to take the individual pieces of the railing apart but it would be vary labor intensive. The pieces would be bolted back together but rivets could also be welded on.
- It is important from a historic point to retain at least some original material for comparison purposes.

E. Structural and Electrical & Mechanical Reports – Rich Johnson

1) Brief Overview

Minutes

- **No comments or questions**

F. Required Level 1 (Function and Codified Safety) Repairs – Rich Johnson

Repairs Defined

2) Remaining Funds

G. Potential Level 2 and 3 Repairs (Shopping List) – Rich Johnson

1) Repairs / Potential Actions / Priority/ Long-Term Consideration

Minutes

- **Survey monument and survey would be needed to determine if the east span is still moving.**
- **The lateral bracing would be removed because it is not serving its intended purpose.**
- **If the lower chord rivets were found to be insufficient another option would be to limit the live load on the bridge.**
- **If bridge movement due to flooding is an issue concrete lugs could be installed on the inside of the northern lower chord bearing.**
- **None of the proposed sidewalk bracket repairs would undo or redo previous repairs.**

H. Historic Preservation Observations – Charlene Roise

Level 1 Repairs

Level 2 and 3 Repairs

Deck Replacement

Pedestrian Railing Repair

Minutes

- **See attached for .pdf copy of power point presentation.**
- **Although the chain drive will be removed, the chain drive guard should be retained to document the existence of that mechanism.**
- **The capstan mechanism below the deck was removed when the auxiliary drive was installed. Mn/DOT might be able to locate capstan drive (turnstile) itself if for potential interpretive use.**
- **There are apparently no National Register-eligible archaeological sites in close proximity to the bridge, but archaeological issues should be considered for any contractor staging areas that are not directly adjacent to the bridge.**
- **A sign or other interpretation could be developed to explain of the historical significance of the bridge. It would have to be sited such that it does not impact the historic surroundings.**
- **Someone in the audience expressed the opinion that replication of the ornamental lights would retain the uniqueness of the historic lighting but it would be problematic for maintenance. Some members of the group felt it best to use nostalgic lights that would have readily available parts for maintenance.**
- **There are different "treatments" related to the Secretary of the Interior's Standards depending on the significance and function of the property.**

"Restoration" is appropriate for museum settings; "rehabilitation" is appropriate for a property like the Stillwater Lift Bridge, where the property is in use and must continue to function. More flexibility is allowed in interpreting the Standards when undertaking rehabilitation than when undertaking a restoration.

I. Repairs Deliberation – ~~Mike Hughes~~ (Robert Fischer)

- 1) Selection of Level 2 & 3 Repairs
- 2) Selection of Deck Replacement Option
- 3) Selection of Pedestrian Railing Repair Option

Minutes

- Information related to cost has been updated and is presented in the document titled Stillwater Lift Bridge Repair – Programming Level Opinion of Probable Construction Cost dated 4/30/03 in the lower left corner of the cover. Due to time constraints the document was not fully explained so included here is a quick overview.
 - Exhibit A – Summary of costs form Exhibit B.
 - Exhibit B – HNTB's opinion of what is needed to extend the life of the bridge and stay with in the federal funding limit. All needs are listed but only those with a 1, and the word yes, in the 2nd and 3rd columns, respectively, are included in total cost.
 - Exhibit C – Repair needs sorted by category. All costs shown.
 - Exhibit D – Repair needs sorted by cost.
- Column 4 in Exhibit B indicates the Priority Level associated with the repair. Priority of level 1 greater than level 2, which is greater than level 3
 - Level 1 – Needs required for the function of the bridge or codified safety requirements.
 - Level 2 – Needs determined to be functional upgrades or safety standards.
 - Level 3 – Needs determined as preventative maintenance, repairs or discretionary betterments.
- Column 5 in Exhibit B indicates the priority level of the need for each level. The higher the priority number the more it should be done.
 - Level 1 priority based on probability of occurrence vs. consequence.
 - Level 2 & 3 priority based on cost vs. benefit.
- Total amount of suggested needs in Exhibit D is approx. \$12 M. Some of the needs are either / or type items. Not including the overlap the estimated cost of all the needs was speculated to be \$8 M.
- Mn/DOT and Wis/DOT do not intend to bear the cost of maintenance after the lift bridge is turned over to a new owner, but this will ultimately depend on the terms of a pending agreement. It is the DOT's responsibility to provide a safe crossing. If a new bridge is in place that becomes the safe crossing. The traffic on the lift bridge may decline but this does not affect the proposed list of needs.
- Extending the life of the bridge is a major goal of historic preservation.

- **Mn/DOT and Wis/DOT do not intend to spend any more money than the allotted \$5 M.**

Next Steps – Todd Clarkowski, Mn/DOT

Minutes

- **Before the next meeting, the group should look at and discuss what was proposed, and what they feel is needed to allow the next meeting to be used for determining which needs the \$5 M will be used to address.**
- **The Project Memorandum (Categorical Exclusion) is being developed to addresses the NEPA, WEPA, MEPA, and other requirements and will be circulated to the affected agencies.**

Meeting #4 – Complete Presentations and Discussion of Studies; Prioritize Improvements

Meeting #5 – Public Informational Meeting

Appendix D

Public Meeting Minutes – June 5, 2003

Provided below is the public meeting agenda, the public meeting minutes. The meeting minutes are presented in **bold type** and meeting agenda presented without bold type.

**Stillwater's Lift Bridge
\$5M Repair Project
Prioritizing Needs Meeting
6/5/03
9:00-12:00 at Stillwater City Hall**

Meeting Minutes
By Dan Enser

I. 9:00 Welcome and Introductions – Rick Arnebeck, Mn/DOT

Focus of meeting is to prioritize the needs so the \$5 Million federal funding can be spent.

II. 9:05 Review and Approve Minutes of May 1, 2003 Meeting – Dan Enser, HNTB
Minutes

- **5-1-03 Stillwater Lift Bridge Meeting Minutes were approved.**

III. 9:10 Agenda Preview – Mike Hughes, RESOLVE

IV. 9:15 Summary of Previous Reports and Preliminary Items – Rich Johnson, HNTB
Summary of Historic Preservation Observations – Charlene Roise, Hess
Roise

Report and Prelim Item Minutes

- **Discussion of how the \$5 million worth of repairs extends the life of the lift bridge past the year 2010 and could affect decisions regarding eventual lift bridge removal. The \$5 million federal funding was specific for the Lift Bridge. An opinion was expressed that repairing the lift bridge to last until the year 2010 inherently extends the life of the bridge beyond the year 2010. It was decided to concentrate on spending the \$5 million for Lift Bridge Repairs and defer the lift bridge removal discussion to its appropriate venue.**
- **Question was asked if the concrete surface treatment item would prolong the structure's life or is it visual? This item includes patching a portion of the concrete surface and then coloring it. This item is mostly visual but gives a moderate amount of protection due to the patching.**
- **Question was asked why remove lower lateral bracing instead of replace? The deck can be used to take lateral loads. If the laterals are replaced they will need to be repaired and maintained and also could be damaged by flood water debris.**
- **Question was asked why is the conduit system being replaced and why can't we use the existing raceways? The major components of the conduit system are for the traffic gates and the drive / distribution control system. These systems are**

being replaced. It is impractical to reuse existing and more economical to install new conduit.

- Question was asked why is replacing the counter weight ropes on the Stillwater Lift Bridge is more expensive than it was to replace the counter weight ropes on the Duluth Aerial Lift Bridge when the Duluth bridge has longer ropes and more ropes? The Duluth Bridge has the capability to support the counter weights from the towers. The Stillwater Lift Bridge does not, so false work needs to be used to support the counterweights. A significant portion of the counterweight rope replacement is for false work.

Historic Preservation Minutes

- Numbers 3, 5, 6, 9, and 10 of the Secretary of the Interiors Standards for Repair shall be followed when repairing historical properties.
 - 3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other bridges, shall not be undertaken.
 - 5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.
 - 6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.
 - 9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
 - 10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.
- The new electric house shall not look exactly like the existing tender's house and should not look radically different. A middle ground should be found between the two. An industrial type building of the current year 2000 should be used.
- The original material of the ornamental railing shall be preserved to the extent possible.
- Miscellaneous elements of the lift bridge shall be replaced in kind, not off the shelf, to the extent possible.

**V. 9:25 Consensus Building on Expenditure of the \$5Million – Mike Hughes,
RESOLVE**

Consensus Building Minutes

- **Deck replacement Option 1 – Cast-in-place, shall be used for the deck replacement.**
- **Railing repair Option 5 – Remove, pickle, fix, galvanize, paint and re-install shall be used to repair the ornamental railing.**
- **Ornamental Lighting:**
 - This should be done appropriately by replacing in kind the exact lights that were originally on the bridge or not done at all.
 - It is thought that the castings and poles could be replicated but not the globes. The globes would be close but not exact.
 - By not using off the shelf items the future maintenance of the lights would be difficult.
 - Replacing the lights with a similar genre would not be replication of the kind that is required.
 - With approximately only 8 lights with frosted globes, does 360 degree light pollution become a concern?
 - Ultimately, Ornamental lighting was removed from the list of repairs to be addressed (item #124) and therefore makes \$96,000 available for other repairs.
- **Simultaneous Construction (Item #137) is the longitudinal deck construction and was removed from the list of repairs to be addressed and therefore make \$55,000 available for other repairs.**
- **Traffic Barriers:**
 - Item #63 for \$109,000.
 - 5-6 times a year some of the gate arms need to be replaced due to traffic hits, it is not known if anyone has actually drove into the river.
 - Even though the counter weights come down close to the deck they do not serve as barriers because of the transition time when the span is lifting.
 - When standards are revised, existing facilities are usually grandfathered in until such time that the structure undergoes a significant repair. At that time the structure needs to be brought up to standards.
 - The deck replacement in the 1970's address deck replacement, not traffic gates. As such, the project did not require updating the traffic gates to barriers.
 - The traffic barrier proposed has arms that lock in the middle when they come down.
- **Level and Priority Summary**
 - Level 1 – Needs required for the function of the bridge or codified safety requirements.
 - Level 2 – Needs determined to be functional upgrades or safety standards.
 - Level 3 – Needs determined as preventative maintenance, repairs or discretionary betterments.
 - Level 1 priority based on probability of occurrence vs. consequence.
 - Level 2 & 3 priority based on cost vs. benefit.
- **Counter Weight Ropes**
 - Last replaced in the 1970s.
 - Routine Maintenance only covers replacing if broken, oiling, and greasing.

- Mn/DOT does not have adequate forces to perform this activity, therefore it needs to be done by a contract.
- Mn/DOT only has the capability to replace the up-haul and down-haul ropes, not the counter weight ropes.
- Item 81 – Chloride Testing – Mn/DOT will perform tests.
- Item 98 – Rivet Shear Testing – Mn/DOT will perform tests.
- Items related to the chloride tests or rivets that have unknowns where the results of further tests may result in additional repair needs including the truss lower chord connections and the substructure concrete (piers).
- Painting Issue
 - Items below the deck were painted in the summer of 2002 with the idea that the bridge will be painted before it is turned over to a new owner in the future. This proposal was part of the previous mitigation package developed for the St. Croix River crossing project.
 - Original 1931 color was requested for paint color. Note, this may not match the color of the 2002 below deck painting so the entire bridge may need to be painted.
 - An opinion was expressed that from deterioration protection stand point the 2002 painting achieved this and the above deck painting is not required at this time.
 - An opinion was expressed to paint the bridge under this project due to having the bridge closed and the thought was it could save money in the future.
 - Painting will affect schedule and the length of time the bridge is closed to vehicle traffic.
- The surviving CAPSTAN items were provided to the City of Stillwater on 6-5-03 for safe keeping. It was reported that Washington County Historic Society wishes to take possession of.
- It was decided to allocate \$10,000 for a sign for historical interpretation.
- A group of people will be assembled by Mn/DOT to determine what will be on the sign and where it will be located.
- Final Decision on \$5 Million expenditures
 - The group used the Programming Level Opinion of Probable Construction Cost dated April 30, 2003, as a starting point.
 - It was noted that all costs are programming level / planning level costs and the accuracy will be refined during the upcoming design process. As costs are refined the Programming Level Opinion of Probable Construction Cost dated April 30, 2003, will be used as a guide to add or subtract items based on priority.
 - The Programming Level Opinion of Probable Construction Cost dated April 30, 2003. Consensus was reached to modify the needs as follows, \$189,000 Old Remaining Base Cost + \$96,000 Ornamental Lighting + \$55,000 Simultaneous Construction = \$340,000 New remaining Base Cost.
 - New Remaining Base Cost \$340,000 - \$10,000 Historic Interpretation Sign = \$330,000 Current Remaining Base Cost.
 - Current Remaining Base Cost to be spent on painting as much of the structure as possible. This may change dependent on the results of the chloride and rivet tests but left over funding could go towards painting.

VI. 11:45 Next Steps – Todd Clarkowski, Mn/DOT**- Needs Assessment Report from HNTB**

Includes applicability of the Secretary of the Interior's Standards. All needs, including which needs, are part of the \$5M Lift Bridge Repair project are documented here.

- Future Maintenance Report from HNTB

Maintenance scenarios of remaining needs are documented here. Mn/DOT and Wis/DOT's intent to pay for future maintenance will not be addressed in this report. This report will provide information about maintenance needs (item, cost) as it may concern the future owner of the lift bridge.

- Renovation Scheme Report from HNTB

Feasible Construction Methods (techniques, methods, timing) are documented here.

- Project Memorandum (Categorical Exclusion)

Developed by Mn/DOT and circulated to the agencies for review.

- Final Design (plans, specifications, estimate)

Delivered by HNTB by September 30, 2003.

- Letting Date

Letting in Aug 2004 for contractor lead time for construction in 2005 for construction beginning April 2005. Completion date in spring 2006.

- Approximate Timing/Staging of Construction

Bridge will be closed to vehicular traffic the end of July and to boat traffic for a period of time after October 16th. 24-hour notice to lift the bridge might not be possible after October 16th for a period of time yet to be determined.

- Public Informational Meeting

Information about the project will be presented. Public will be able to provide input at a public information meeting on Thursday, July 10th, from 4:00 PM to 8:00 PM at Stillwater City Hall.

A website has been set up for the project and can be accessed at the link below. Navigate through the site by clicking on the topics on the top left hand side of the web page. The reports and meeting minutes will be posted here along with the status of the project.
<http://www.dot.state.mn.us/metro/projects/liftbridge/index.html>

Appendix E

Programming Level Funding Allocations

Provided below is the programming level opinion of probable cost used during deliberations with project stakeholders to select repairs to be implemented.

Potential Needs Category	Base Cost
A Tender's House	\$ 198,900
Repair Item	Prob. Cost
1 Elect. House Support Frame	\$ 33,000
2 Elect. House	\$ 42,000
3 Paint M / E Platform	\$ 42,900
4 Repair Tender's House	\$ 65,000
5 Remote Traffic Light Switch	\$ 500
6 Fire/Smoke Detection	\$ 300
7 Fire Suppression	\$ 15,200
 B Mechanical & Electrical	 \$ 2,139,800
B1 Support System	\$ 28,700
Repair Item	Prob. Cost
8 Strike Plates	\$ 4,300
9 Live Load Shoes	\$ 800
10 Span Guides	\$ 12,500
11 Counterweight Guides	\$ 10,600
12 Install Span Locks	\$
13 Lift Tower Ladders Repair	\$ 500
14 Lift Span Access Ladders	\$
 B2 Balance System	 \$ 810,300
Ref. Repair Item	Prob. Cost
15 Counterweight Sheaves	\$
16 Counterweight Wire Ropes	\$ 768,000
17 Sheave Trunnion Bushings	\$ 24,000
18 Inspect Sheave Trunnions	\$ 3,000
19 Cntrwght.Conc. Rep. & B. Screens	\$ 15,300
20 Counterweight Blocks	\$
 B3 Drive System	 \$ 543,200
Ref Repair Item	Prob. Cost
21 Replace Open Gears	\$
22 Replace Gears with Enclosed Sets	\$ 195,300
23 Bearings	\$ 16,500
24 Couplings	\$ 10,100
25 Shafts	\$ 13,300
26 Hand Brake	\$ 800
27 Chain Drive	\$
28 Replace Operating Wire Ropes	\$ 94,500
29 Repair Up-haul Take-up Devices	\$
30 Replace Up-haul Take-up Devices	\$ 63,000

31	Repair Dwn-haul Take-up Devices	\$	
32	Replace Dwn-haul Take-up Dev.	\$	63,000
33	Repair Deflection Sheaves	\$	13,200
34	Replace Deflection Sheaves	\$	
35	Auxiliary Drive Motor	\$	
36	Replace Operating Drums	\$	
37	Main Gear Reducer	\$	3,200
38	Clean & Paint Aux.Gear Reducer	\$	
39	Replace Brakes	\$	25,400
40	Replace Main Drive Motor	\$	44,900
41	Repair Eddy Current Clutch/Brake	\$	
42	Replace Auxiliary Drive Motor	\$	

B4 Distribution/Control System **\$ 612,600**

Ref.	Repair Item	Prob. Cost
43	Motor Controls	\$ 60,400
44	Distribution System	\$ 27,900
45	Wire & Cable	\$ 258,500
46	Festoon Cable	\$ 32,400
47	Conduit	\$ 22,700
48	Junction Boxes	\$ 26,700
49	Control Console	\$ 28,400
50	Portable Traffic Controls	\$ 2,000
51	Relay Control System	\$
52	PLC Control System	\$ 143,500
53	Transformer	\$ 5,700
54	Circuit Breakers	\$ 4,400

B5 Interlock System **\$ 15,100**

Ref.	Repair Item	Prob. Cost
55	Limit Switches	\$ 15,100

B6 Navigation Guidance System **\$ 20,200**

Ref.	Repair Item	Prob. Cost
56	Single Lens Nav. Lights	\$ 6,600
57	Combination Nav. Lights	\$ 7,800
58	Signage Lighting	\$ 3,700
59	Radio Trans./Receiver	\$
60	Signage	\$ 800
61	Signage Support	\$ 1,300

B7 Traffic Control System **\$ 109,700**

Ref.	Repair Item	Prob. Cost
62	Repair Traffic Gates	\$
63	Install New Traffic Barriers	\$ 109,000
64	Remove Traffic Cab. & Platforms	\$ 700

C Structural		\$1,033,600
C1 Concrete Surface Treatment		\$ 89,800
Ref.	Repair Item	Prob. Cost
65	Concourse Retaining Walls	\$ 25,300
66	West Abutment Wing Walls	\$ 8,700
67	Conc. Slab & Fascia	\$ 3,100
68	East Abutment	\$ 22,900
69	Piers 1 & 2 Abv Grade/Waterline	\$ 14,000
70	West concourse Railing	\$ 9,700
71	Span 1 & 2 Concrete Railing	\$ 4,800
72	Span 1 & 2 Conc. Rail Posts	\$ 1,300
C2 Substructure		\$ 144,000
Ref.	Repair Item	Prob. Cost
73	Conc. P3 to 7-Wtrln Up-No Brg.	\$ 120,000
74	Conc. P3 to 7-Wtrln Up-Brg.	\$
75	Conc. P8-Wtrln Up - No Brg.	\$ 24,000
76	Conc. P8-Wtrln Up - Brg.	\$
77	Underpin Concourse Ret. Walls	\$
78	Underpin W. Abut. Wing Walls	\$
79	Underwater Inspection of Piers	\$
80	Conc. Repair-P3 to 8-Wtrln Dwn.	\$
81	Substructure Chloride Testing	\$
82	Substructure Chloride Extraction	\$
83	Underpin East Abutment	\$
C3 Superstructure – Conc. Spans 1 & 2		\$ 7,600
Ref.	Repair Item	Prob. Cost
84	Mill and Overlay	\$ 7,600
C4 Superstructure – Truss Spans 3 to 9		\$ 617,700
Ref.	Repair Item	Prob. Cost
85	Clean & Paint Fixed Bearings	\$
86	Clean & Paint Expansion Bearings	\$
87	Retrofit Anchor Rods - Exp. Brgs	\$ 17,600
88	Stringer to Floor Beams Conn.	\$ 300
89	Retrofit Flr. Bms to Truss Conn.	\$ 188,100
90	Retrofit Flr. Bms. - Mid-Span	\$ 76,900
91	Retrofit Lower Chords	\$ 126,800
92	Retrofit Verticals	\$
93	Retrofit Diagonal Members	\$
94	Straighten Verticals - S8 & S9	\$ 37,500
95	Remove Lower Lat. Bracing	\$ 55,000
96	Replace Lower Lateral Bracing	\$
97	Replace Rivets with Bolts	\$
98	Test Rivets for Shear Capacity	\$
99	Replace Strgrs @ Exp. Jts. & Galv.	\$ 115,500

C5 Superstructure – Beam Span 10 **\$ 9,000**

Ref.	Repair Item	Prob. Cost
100	Replace Rolled Beams & Deck	\$
101	Partial Deck Replacement	\$ 6,400
102	Mill & Overlay Span 10	\$ 2,600

C6 Sidewalk Support System **\$ 75,900**

Ref.	Repair Item	Prob. Cost
103	Repair Bent Support Brackets	\$ 8,400
104	Replace Upper Conn. Gusset Plate	\$ 16,000
105	Retrofit Intermediate Sup. Conn.	\$ 26,100
106	Replace 1998 Stringers	\$
107	Replace Fascia Strgrs/ Rev. Old	\$ 25,400

C7 Deck Repair **\$ 10,400**

Ref.	Repair Item	Prob. Cost
108	Replace Exp. Joints - S3 to S9	\$
109	Replace Strip Seal S10	\$ 10,400
110	Patch & Seal Ped. Deck	\$
111	Replace Ped. Deck Exp. Joints	\$

C8 Railing Repair **\$ 79,200**

Ref.	Repair Item	Prob. Cost
112	Retrofit South Truss with Rub-rail	\$ 57,500
113	Repair North Truss Rub-rail	\$ 15,200
114	Span 10 Ornamental Conc. Rail	\$ 6,500

D Pedestrian Railing **\$ 155,900**

Ref.	Repair Item	Prob. Cost
115	Ped. Railing Option 1	\$
116	Ped. Railing Option 3	\$
117	Ped. Railing Option 4	\$
118	Ped. Railing Option 5	\$ 155,900

E Deck Replacement **\$ 354,300**

Ref.	Repair Item	Prob. Cost
119	Option 1	\$ 354,300
120	Option 3A	\$
121	Option 3B	\$

F Amenities**\$ 373,910**

Ref.	Repair Item	Prob. Cost
122	Replace Bridge Lighting	\$ 4,800
123	Provide Off-the-shelf Orn. Lighting	\$
124	Provide Replication Orn. Lighting	\$
125	Closed Circuit TV System	\$ 5,600
126	So. Truss Drainage Deflection	\$ 14,200
127	Bridge Movement Benchmarks	\$
128	East Abut./Apr. Move. Bnchmrks	\$
129	Paint all Truss Members	\$
130	Paint Middle 3rd of Truss	\$
131	Paint Truss Above Deck	\$ 332,700 (1)
132	Approach High Load Warning Dev.	\$ 11,000
133	Tender's House Fan	\$ 600
134	Tender's House Air Conditioning	\$ 1,300
135	Tender's House Heating	\$ 1,300
136	Tender's House Telephone	\$ 100
137	Simultaneous Construction	\$
138	Deck Overlay	\$
138	Historic Plaque - Interpretation	\$ 10,000

G	Base Cost Sub-Total =	\$ 4,256,410
H	Inflation @ 5.0% =	\$ 212,821
I	Contingency @ 12.0% =	<u>\$ 510,769</u>
	Project Total:	<u>\$ 4,989,000</u>

(1) Painting of bridge to be provided as allowed by available funds

These opinions of construction cost are based on concepts without benefit of: 1) preliminary design and plans, 2) final design and plans, or 3) accurate quantities. Therefore, the opinions of probable cost are subject to change.

The cost of labor, equipment, and materials for construction are subject to market forces, including the bidding environment, which HNTB has no control over. The opinions of probable construction costs provided herein are made on the basis of engineering and construction experience and represent our best judgment as experienced design professionals. However, no warranty or guarantee is provided or implied that actual total project costs will not vary significantly from the opinions of cost presented herein.