

**Repair Methods, Schedule
And
Probable Repair Costs**

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**

December 2, 2003

Repair Methods, Schedule and Probable Repair Costs

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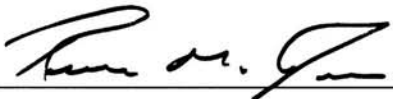
Stillwater, Minnesota / Houlton (St. Joseph Township), Wisconsin

December 2, 2003

This report presents the findings of HNTB's consideration of feasible methods to repair the Stillwater Lift Bridge and the associated feasible repair schedule. Also presented is a programming level opinion of repair costs.

The document should not be considered as the final product, or conclusion, of historic preservation considerations. Application of the Secretary of Interior's Standards for Historic Preservation Projects was applied as described within this document.

I hereby certify that this report was 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: 12.2.03

Repair Methods, Schedule and Probable Repair Costs

Report of Findings

Stillwater Lift Bridge

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EXECUTIVE SUMMARY

This report presents recommendations for the \$5M repair project, feasible methods to complete the repairs of the Stillwater Lift Bridge that were selected during project deliberations completed through July 2003, the associated scheduling of the repairs, the impact of the repairs on traffic and the probable cost of the repairs as defined within this report. The lift bridge is a vertical lift bridge commissioned in 1931 and is listed in the National Register of Historic Places. Application of the Secretary of the Interior's Standards for Historic Preservation Projects was considered throughout the project development and is presented in a previous report titled *Stillwater Lift Bridge Repair Needs, Report of Findings*, dated September 3, 2003.

The repairs to be made to the Stillwater Lift Bridge are summarized below. Additional detail is provided in the above cited report.

Tender's/Electrical House: The existing tender's house will be repaired in-kind and a new supplemental electrical house will be added to the lift-span.

Mechanical and Electrical (M&E) Support System: The lift-span and counterweight guides will be repaired and strike plates and live load shoes replaced.

M&E Balance System: The sheave trunnion bushings and counterweight wire ropes will be replaced and counterweights repaired.

M&E Drive System: The repair will essentially result in replacement of the majority of the drive system.

M&E Distribution/Control System & Interlock System, Navigation Guidance System, and Traffic Control System: The repairs will essentially replace the motor controls, switch gear, the majority of wire and conduit and junction boxes, as well as the control console, relay control system, festoon cables, transformer and power supply system.

Substructure: The repair includes the patching of concrete spalls, filling of concrete cracks, application of a concrete surface treatment, as well as providing expansion bearing device anchorages.

Superstructure - Spans 1 and 2: The repairs will consist of resurfacing the deck and concrete repairs.

Superstructure – Trusses: Selected portions of the lower chord will be repaired, vertical members damaged by vehicular impact will be straightened. Floor beams will be strengthened and several stringers replaced.

Superstructure – Span 10: A concrete barrier will be constructed and strip seal replaced.

Sidewalk Support System: The existing fascia stringer will be replaced and original 1931 stringers removed. Several elements of the support system will be repaired.

Deck: The deck and expansion joints will be replaced.

Pedestrian Railing: The pedestrian railing will be removed, repaired, galvanized and painted, then re-installed.

Painting: A portion of the bridge may be painted if allowed by available funding.

Several circumstances external to the repair of the lift bridge, control or influence, the repair schedule as described below:

I-94 @ Hudson Bridge Re-decking: Repair of this bridge precludes repair of the lift bridge in 2004.

Community Events: The lift bridge and the area surrounding the bridge are used throughout the year for community events.

High Water: The water elevation of the St. Croix River tends to rise from mid March to late April or early May at the project site. It is advantageous to complete the repairs in the absence of high water events.

Temperature: Seasonal temperature fluctuations make it desirable to complete the majority of the repairs between mid April and mid October.

Marine traffic: Federal regulations and previous discussion indicate marine traffic may be interrupted during the normal navigation season for up to 3 consecutive days commencing on a Monday and concluding on a Wednesday. Additionally, marine traffic will be allowed to be interrupted for a period of weeks during the non-navigation season.

Vehicular and Pedestrian Traffic: It is desirable to limit the duration that the bridge is closed to pedestrian and vehicular traffic as a matter of public convenience and limiting impacts on the local economy.

Repair of the lift bridge can be categorized into those repairs that can be completed without closing the bridge to pedestrian, vehicular and marine traffic (non-intrusive), and those repairs which require closing the bridge to traffic (intrusive). The duration of time needed to complete the intrusive repairs is estimated to be 10 consecutive weeks.

Substantial repair of the M&E components of the lift bridge will require the bridge to be closed to pedestrian and vehicular traffic and could likely be completed in 10 weeks. Secondary M&E repairs will be required subsequent to substantial completion of the mechanical and electrical repairs.

Painting of the bridge will require the bridge to be closed to pedestrian and vehicular traffic. It is desirable from a safety and operational stand-point to close the bridge to marine traffic while the lift-span and lift-towers are being painted.

The repair contractor will need to be allowed to occupy limited real estate and shoreline near the repair site from mid May through late November of 2005. The repair

contractor will also need to be allowed to occupy the approach roadway on the east end of the project while the bridge is closed to traffic.

The estimated cost of the selected repairs is equal to the funds available, with limited painting of the bridge.

Consideration of the above resulted in the following conclusions:

- The bridge repairs will be substantially completed in 2005.
- Non-intrusive structural repairs will commence in June and be completed by in late October of 2005.
- Intrusive structural, mechanical and electrical repairs will be completed simultaneously and commence in mid August and be completed in late October 2005.
- Secondary repairs will be completed from late October to early December 2005.
- Final repairs and site restoration will be complete in May of 2006.
- The bridge will be closed to vehicular and pedestrian traffic from mid August to late October 2005.
- Infrequent and limited durations of closure to vehicular and pedestrian traffic will be required in November and December of 2005 and April and May of 2006.
- The repair contractor will be allowed to close the bridge to marine traffic during the navigation season for up to a 3 day period in August or September of 2005.
- The repair contractor will be allowed to close the bridge to marine traffic after the navigation season for 8 weeks in late October through early December of 2005.
- HNTB recommends that if there are sufficient funds to allow for limited painting, that the lift-span and lift-towers be painted in 2005 coincident with the intrusive repairs.
- HNTB recommends that if portions of the bridge other than the lift-span and lift-towers are to be painted, they be painted in April and/or May of 2006 and the bridge be closed to vehicular and pedestrian traffic for up to 5 consecutive weeks depending on the extent of painting.
- The repair contractor will be allowed to occupy limited real estate near the repair site to facilitate repair operations.
- There may be sufficient funds to complete the structural, mechanical and electrical repairs of the bridge previously selected. There are insufficient funds to paint the entire lift bridge.

Specific details of the repairs and associated costs are subject to change pending completion of the final repair design and construction documents.

INTRODUCTION

The States of Minnesota and Wisconsin acting through the Minnesota Department of Transportation (Mn/DOT) have engaged HNTB Corporation to evaluate the present condition 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), to establish potential repair needs and to determine a repair strategy based on urgency of needs, the associated repair costs, and available funding.

The Stillwater Lift Bridge was commissioned in 1931 and includes a span-drive vertical lift span fashioned after designs developed by J.A.L. Waddell and J.L. Harrington. The structure consists of a total of ten spans - two concrete slab spans, one vertical lift-span, six riveted steel fracture critical through-truss fixed spans, and one rolled beam jump span. The lift bridge was nominated for inclusion and subsequently listed in the National Register of Historic Places.

This report documents HNTB's consideration of feasible methods to complete previously selected repairs the Stillwater Lift Bridge, the associated repair schedule and impacts on pedestrian, vehicular and marine traffic. This report also documents refinements in the programming level opinion of probable repair costs.

Identification of a feasible method or repair and a feasible repair schedule were developed in the interest of managing the scope of the repair project and communicating anticipated repair activities with project stakeholders. The construction documents for the repairs will not require the repair contractor to utilize the method(s) and precise schedule identified within this report. Rather, the construction documents for the repairs will place limits on the repair contractor's operations based on the findings of this report. The limitations will require the repair operations to conform to the boundary conditions of the feasible method(s) to repair the bridge, overall repair schedule and limits of work as defined within.

Several companion reports have been developed in consideration of repairs to the bridge. These reports are germane to the methods of repair, repair schedule and repair costs and are identified below in chronological order.

- *Tender's House Repair Initial Screening – Report of Findings*, dated January 21, 2003.
- *Structural Inspection and Preliminary Condition Evaluation – Report of Findings, Volume 1 of 2 – Narrative* dated March 17, 2003.

- *Structural Inspection and Preliminary Condition Evaluation – Report of Findings, Volume 2 of 2 – Representative Photographs and Inspection Notes* dated March 17, 2003.
- *Mechanical / Electrical Inspection and Evaluation – Report of Findings, Volume 1 of 2 – Narrative* dated March 18, 2003.
- *Mechanical / Electrical Inspection and Evaluation – Report of Findings, Volume 2 of 2 – Representative Photographs and Inspection Notes* dated March 18, 2003.
- *Pedestrian Railing Repair Study – Report of Findings*, dated March 20, 2003
- *Deck Replacement Study – Report of Findings*, dated March 21, 2003.
- *Maintenance Projections and Annual Costs – Report of Findings*, dated August 6, 2003.
- *Stillwater Lift Bridge Repair Needs – Report of Findings*, dated September 3, 2003

This report is organized as follows:

Repairs Defined: A brief summary of the repairs selected to be carried forward to construction based on urgency of the need and available funding.

Repair Methods & Schedule Considerations: Presentation of circumstances external to the repair effort that influence the feasible methods of completing the repairs and/or the sequence (schedule) of the repairs as well as conclusions drawn from those considerations.

Feasible Repair Methods: Presentation of feasible methods to complete repairs and conclusions drawn.

Repair Schedule: Presentation of a feasible sequence of repair activities with due consideration of schedule constraints and repair methods and resulting impacts on vehicular, pedestrian and marine traffic.

Limits of Work: Presentation of anticipated real estate and shoreline needs, and duration of the needs, of the repair contractor to complete the repairs.

Opinion of Probable Repair Costs: Presentation of a programming level opinion of probable repair costs in terms of the repair contractor's bid prices to complete the work.

Conclusions: A summary of conclusions drawn from the above mentioned considerations which will be carried forward into development of construction documents for the repair efforts.

Appendices: Details of information presented within the body of the report.

Within the context of this report the term “intrusive” is used to identify those repairs which require the bridge to be closed to pedestrian, vehicular and/or marine traffic. Conversely, “non-intrusive” is used to identify those repairs which can be accomplished without closing the bridge to traffic.

A more in-depth application of the Secretary of Interior’s Standards for Historic Preservation Projects has taken place at public meetings with the State Historic Preservation Offices (SHPO) of Minnesota and Wisconsin, the Cultural Resources staff of the Minnesota and Wisconsin Departments of Transportation, and local preservation groups. The results of those discussions were taken into consideration as the repair options were selected. A narrative discussion that integrates the Secretary’s Standards as they apply to the proposed repair options and to the overall preservation of the lift bridge property appears in the *Stillwater Lift Bridge Repair Needs, Report of Findings*, dated September 3, 2003. This work was completed by a historian that meets the Secretary of Interior’s Professional Standards, in collaboration with the lead consulting engineer.

Provided in Figure 1 on the following page is the configuration of the Stillwater Lift Bridge and nomenclature. Provided in Figure 2 on page 7 is a schematic representation of selected mechanical and electrical components.

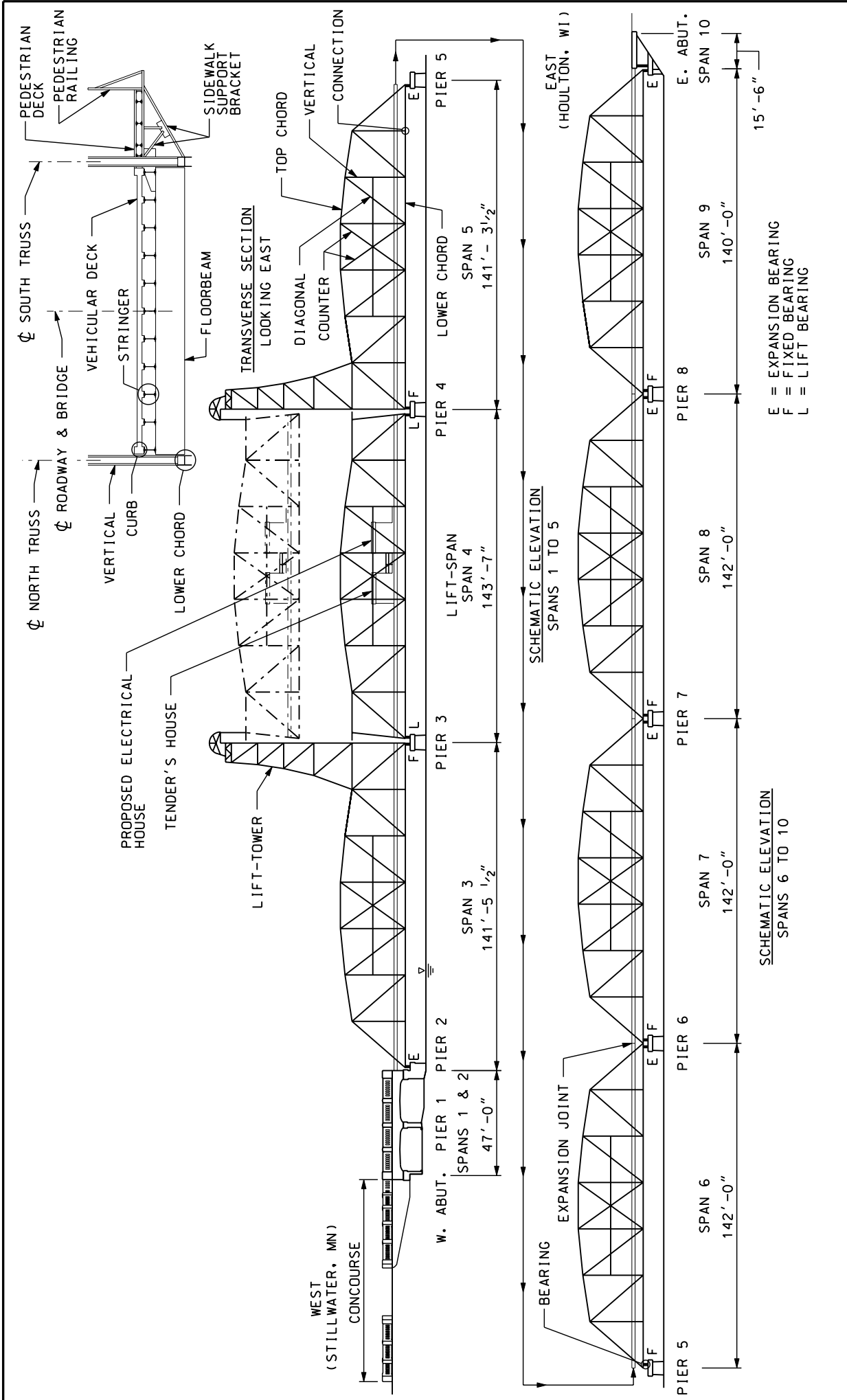


FIGURE 1
 STILLWATER LIFT BRIDGE
 REPAIR METHODS,
 SCHEDULE AND COSTS

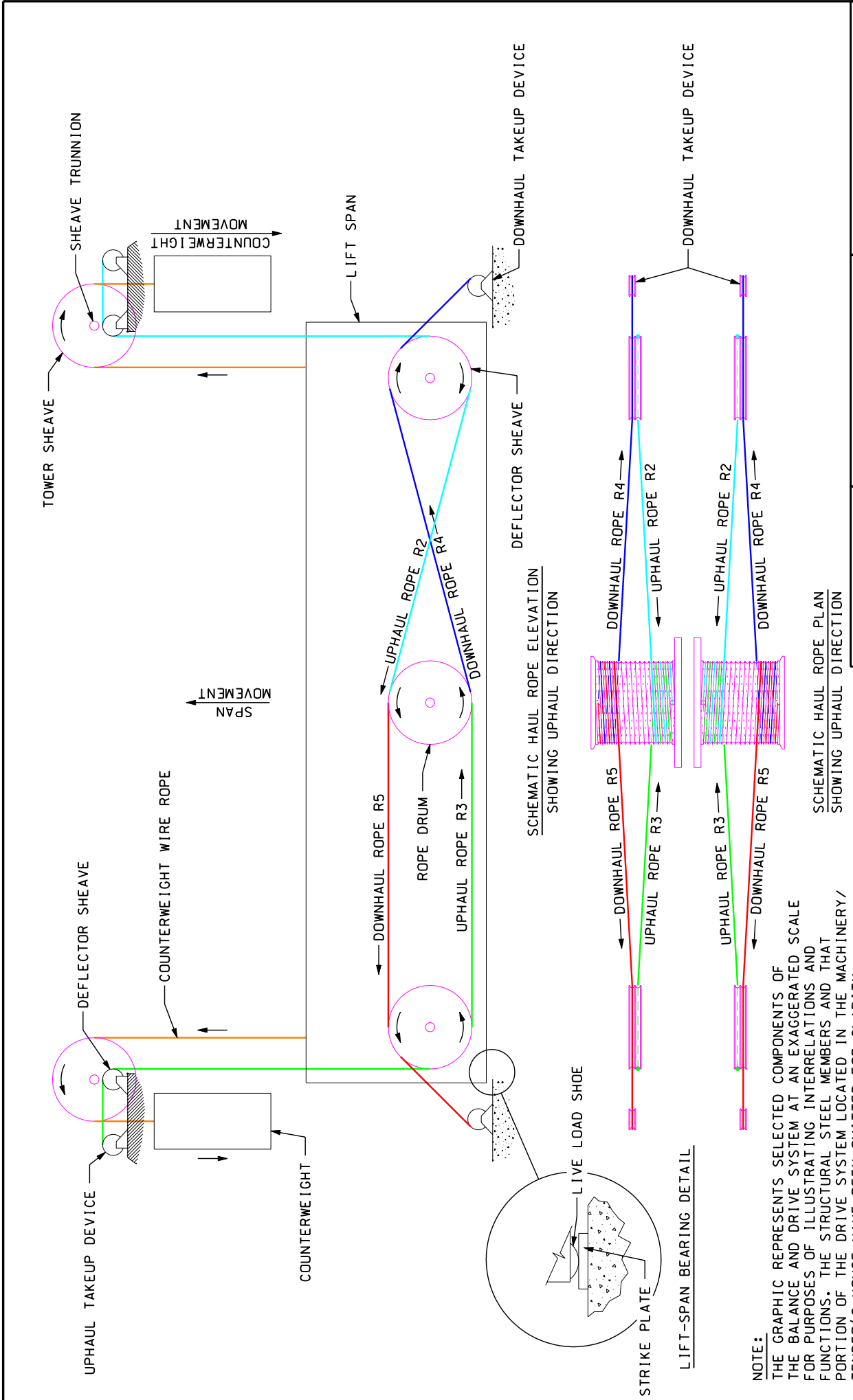


FIGURE 2
SELECTED MECHANICAL
AND ELECTRICAL COMPONENTS

STILLWATER LIFT BRIDGE
REPAIR METHODS,
SCHEDULE AND COSTS



REPAIRS DEFINED

Several repairs of the Stillwater Lift Bridge were selected to be carried forward to construction. The selection process and reasoning behind the selection of the repairs is documented in a report titled: *Stillwater Lift Bridge Repair Needs – Report of Findings*, dated September 3, 2003. Provided below is a brief description of the repairs to be implemented in the near future.

Tender's/Electrical House: The existing tender's house will be repaired in-kind, blast cleaned and painted. A new electrical house will be constructed of similar materials with architectural treatment similar to the existing tender's house. The electrical and tender's house will be fitted with heating, ventilation and air-conditioning (HVAC) as well as a smoke detection system.

Mechanical and Electrical (M&E) Support System: The repair of the support system will include refurbishing the span guides, counterweight guides, strike plates and live load shoes.

M&E Balance System: The repair of the balance system will include replacement of the sheave trunnion bushings, the counterweight wire ropes, and repair of the counterweight. The existing sheave trunnion shaft is anticipated to be inspected and reused, with only required polishing of the bearing surface.

M&E Drive System: The repair will essentially result in replacement of the majority of the drive system. The only elements of the drive system to be reused are the auxiliary drive motor and auxiliary gear reducer (installed in 1997) and the existing operating drums.

M&E Distribution/Control System & Interlock System, Navigation Guidance System, and Traffic Control System: The repairs will essentially replace the motor controls, switch gear, the majority of wire and conduit and junction boxes, as well as the control console, relay control system, festoon cables, transformer and power supply system.

Substructure: The repair includes the patching of concrete spalls, filling of concrete cracks and application of a concrete surface treatment.

No foundation stabilization measures are planned to be employed. It is anticipated that little or no additional differential settlement will occur on the west abutment and concourse. However, the east abutment and possibly Pier 8 will be monitored for movement (settlement / translation / rotation).

Superstructure - Spans 1 and 2: The repairs will consist of resurfacing the deck as well as concrete repairs, application of a concrete surface treatment.

Superstructure – Trusses: The repair of the trusses include: retrofitting selected portions of the lower chord to address advanced section loss due to corrosion, straightening of selected vertical members damaged by vehicular impact, removal of the lower lateral bracing except for the lift-span, replacement of stringers at the ends of each truss, retrofitting the floor beams to improve structural capacity, and retrofitting the anchorage of the trusses to the substructure units.

Superstructure – Span 10: Repairs to Span 10 will consist of removal of a portion of the deck to allow construction of a concrete barrier and removal and replacement of the existing strip seal. The repairs will also include resurfacing of the deck after the barrier and strip seal are constructed as well as concrete surface repairs and concrete surface treatment.

Sidewalk Support System: The repair will include removal of two lines of original 1931 stringers which were abandoned in-place, replacement of the fascia stringer in-kind, repair of selected upper connection gusset plates, and retrofitting of intermediate rail post connection.

Deck: The repair will include: replacement of the existing deck on Spans 3 to 9 with a cast-in-place concrete deck and replacement of the expansion joints with strip-seal joints.

Pedestrian Railing: The repair will include removal of the railing, blast cleaning the railing, removal of remaining corrosion by submersion in acid, repair and replacement of individual members, galvanizing, painting and reinstallation.

Painting: The bridge, or a portion of the bridge, will be painted. The extent of the painting will be controlled by the funds remaining once those structural, mechanical and electrical repairs identified above have been accounted for.

REPAIR METHODS AND SCHEDULE CONSIDERATIONS

The methods of completing the repairs and repair schedule are influenced by several constraints or circumstances external to the repair project as described below. A meeting was held to communicate and deliberate the constraints. In attendance were representatives of the City of Stillwater, Greater Stillwater Chamber of Commerce, US Coast Guard, Wis/DOT, and Mn/DOT.

I-94 @ Hudson Bridge Re-Decking: Two high-level parallel bridges provide vehicular crossing of the St. Croix River near Hudson, Wisconsin on I-94. The deck of the westbound bridge is planned to be replaced during the 2004 construction season. Replacement of the deck will require both eastbound and westbound I-94 traffic to be placed on the eastbound bridge, thus limiting the capacity and thereby increasing traffic congestion. Closing of the Stillwater Lift Bridge during this same time period to accommodate repairs would detour traffic through Hudson and increase the volume of traffic in what is anticipated to be an already congested area.

Conclusion: Repair of the Stillwater Lift Bridge will be scheduled such that the bridge does not need to be closed to vehicular traffic during the 2004 construction season.

Community Events: Various organizations hold annual events on, or near, the Stillwater Lift Bridge. These events include Lumberjack Days held in late July, and art festivals held in May and early October. The presences of the construction equipment, marine equipment and repair contractor on-site facilities may impact these community events.

Conclusion: The anticipated repair schedule and repair activities will be made public to allow organizers of community events to plan events with knowledge of the planned repairs efforts. Community events will not control the repair schedule.

High Water: The water (pool) elevation of the St. Croix River typically fluctuates with seasons, and often varies from year to year. It is desirable to complete repairs to the river pier concrete when the pool elevation is relatively low to expose a significant portion of the pier above the waterline. It is also desirable to complete those repairs which require access from the water with marine equipment when the pool elevation is relatively low to provide adequate vertical clearance below the bridge.

The pool elevations of the St. Croix River over a 5-year period were reviewed to determine pool elevation trends. Information was collected from the U.S. Corps of Engineers Prescott, WI gauge because that information was readily available. The pool elevation in Stillwater is believed to be similar to that of Prescott. Review of the

information suggests that the river tends to raise starting in mid March, crest in April or May, and decline in June and July. The information also suggests there is a significant variation in the pool elevation from year to year.

A vertical clearance (freeboard) of 14.5 feet (consisting of 7-foot working space and a maximum 7.5-foot draft from work barge) between the bottom of the bridge and pool elevation was established as a desirable height to allow marine access and to expose river pier concrete for repairs. Review of the 5-year average Prescott pool elevations with respect to a desirable 14.5 foot freeboard indicates a potential for high water starting in late March through mid July. This information is presented in graphic form in Figure 3 on page 13 of this report.

Conclusion: The period of time between late March and mid July is considered to have a potential for high water events which may impede, but not prevent, repairs which require access from the water with marine equipment, and repair of the river pier concrete.

Temperature: The ambient temperature at the Stillwater site varies with seasons and from year to year. Temperatures in excess of 40 degrees Fahrenheit are necessary to complete normal painting operations. Temperatures of 36 degrees and rising are customarily required for placement of concrete without consideration of cold weather. Concrete can be placed in temperature below 36 degrees, but there is an increase in cost depending on several factors. Installations of mechanical and electrical components, as well as structural steel repairs are less sensitive to temperature than concrete and paint. The period of time between April 15 and October 15 (construction season) is considered to be the preferred construction season during which repairs can be completed with the least temperature related affects. With the possible exception of painting, the repairs can be completed after October 15 and prior to April 15 but at an increased cost. The increase in cost is directly related to seasonal as well as daily temperatures.

Provided in Figure 4 on page 13 are monthly average normal low and record low temperatures for Minneapolis, MN over the past 30 years.

Conclusion: It is desirable to complete the repairs during the normal construction season from April 15 through October 15 if at all possible for reasons of economy.

Figure 3: High Water Potential

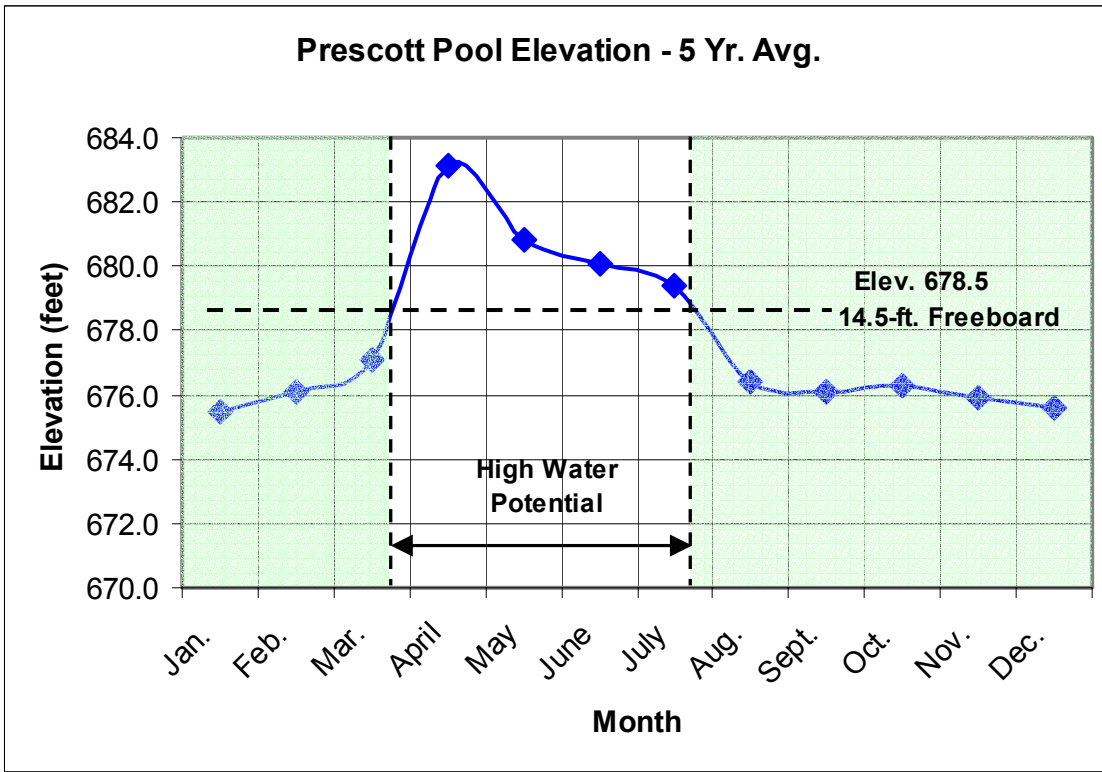
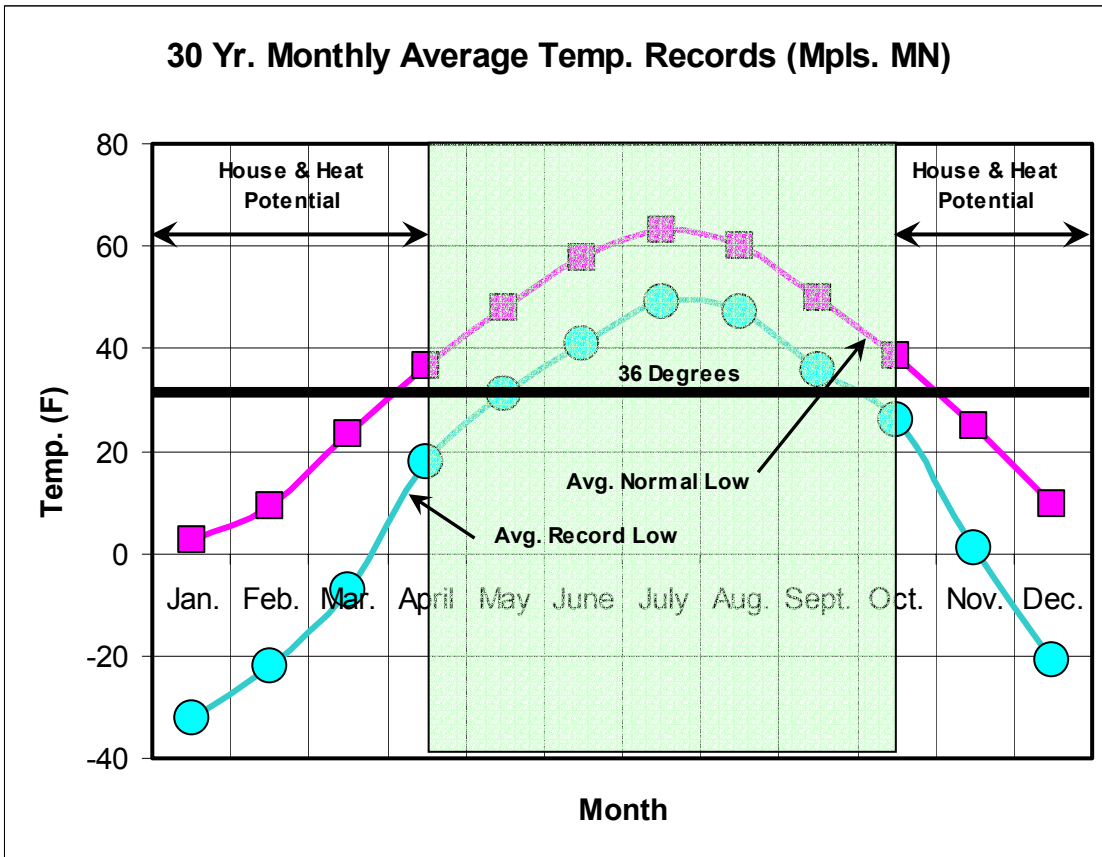


Figure 4: 30 Year Average Monthly Normal and Record Low Temperatures



Marine Traffic: The lifting schedule to accommodate marine traffic is governed by federal regulations and a previously negotiated timetable. Presently the lift bridge operates under a schedule approved by the U.S. Coast Guard (USCG) as described below.

May 15 through October 15 - Weekdays (Monday through Friday)

8:00 A.M.	2:30 P.M.
9:00 A.M.	4:00 P.M.
10:00 A.M.	5:30 P.M.
11:00 A.M.	6:30 P.M.
11:30 A.M.	7:00 P.M.
12:00 NOON	7:30 P.M.
12:30 P.M.	8:00 P.M.
1:00 P.M.	8:30 P.M.
1:30 P.M.	9:00 P.M.
2:00 P.M.	9:00 P.M.
2:30 P.M.	10:00 P.M.
	10:01 P.M. Through 7:59 A.M. – Upon 2 Hour Notice

May 15 through October 15 - Weekends and Federal Holidays

8:00 A.M.	6:00 P.M.
8:30 A.M.	7:00 P.M.
9:00 A.M.	8:00 P.M.
10:00 A.M.	8:30 P.M.
11:00 A.M.	9:00 P.M.
12:00 NOON	9:30 P.M.
1:00 P.M.	10:00 P.M.
2:00 P.M.	10:30 P.M.
3:00 P.M.	11:00 P.M.
4:00 P.M.	11:30 P.M.
5:00 P.M.	12:00 Midnight
	12:01 P.M. Through 7:59 A.M. – Upon 2 Hour Notice

October 16 through May 14 Inclusive – Upon 24 Hour Notice

Repair of the Stillwater Lift Bridge will require deviation from the existing lifting schedule. Deviations from the lifting schedule require approval of the USCG and coordination with marine traffic (by the USCG). Previous discussions with the USCG indicated that the lift-span may be closed to marine traffic during the navigation season for three days, provided the days are Monday, Tuesday and Wednesday. Additionally, closing the lift-span to marine traffic outside the navigation season for weeks is acceptable.

Conclusion: The repair of the Stillwater Lift Bridge will be completed to the extent possible with no more than a 3 day interruption to marine traffic during the navigation season. Closing the lift-span to marine traffic outside of the navigation season for weeks is acceptable.

Vehicular & Pedestrian Traffic: The Stillwater Lift Bridge is heavily used for interstate vehicular traffic and to a lesser extent for pedestrian traffic. The estimated average daily traffic on the bridge is 15,100 vehicles per day (1998). Traffic on the bridge travels through the Stillwater Historic District. As such, closure of the bridge to roadway traffic will eliminate a significant number of vehicles from historic Stillwater, and presumably reduce commercial activity within the historic district. In the interest of reducing the cost and inconvenience of the motoring public as well as reducing the impact on commercial ventures, it is desirable to minimize the duration that the bridge is closed to vehicular and pedestrian traffic.

Due the nature of the repairs to be made to the lift bridge, it is not possible to complete all of the repairs without closing the bridge to vehicular and pedestrian traffic. At a minimum, replacement of the bridge deck will require the bridge to be closed for a 10-week period. However, a significant portion of the structural repairs to the bridge can be made while vehicular and pedestrian traffic is maintained. The time period following Lumberjack Day could offer a reduction of inconveniences expected to occur as a result of the repairs.

Conclusion: The duration that the bridge is closed for intrusive repairs will be limited to that which the repairs can be reasonably completed without undue increase in the cost of the repairs – anticipated to be a 10-week period.

Poor Bidding Period: Those individuals that work in the construction industry often schedule their work around the construction season and work long hours during the construction season without taking time off for relaxation and recreation. At the conclusion of the construction season it is not uncommon for these individuals to take an extended period of time off for recreation and relaxation. For this reason, the time period between the last week in November and the second week in January may be considered a poor bidding period because many in the construction industry are unavailable. Because the repair of the Stillwater Lift Bridge is a relatively small construction project, and because it involves several different trades, it is considered important to advertise the project while the construction industry is active, so to speak.

Conclusion: It is desirable, but not a necessity, to advertise and let the Stillwater Lift Bridge repair project at some time other than late November to early January.

Zebra Mussels: Zebra mussels are small freshwater mollusks which are not native to the St. Croix River. Zebra mussels are considered objectionable from an ecological standpoint. They often attach themselves to submerged portions of marine equipment and can spread with the transportation of the marine equipment. Zebra mussels propagate in the summer months when the water temperature exceeds 50 degrees

Fahrenheit. The Mn/DOT Ecological Department indicated in a June 2003 telephone conversation that the St. Croix River from the confluence with the Mississippi River through the City of Stillwater has been declared infected with zebra mussels. However, it is still advantageous to limit the unintentional transportation and proliferation of large populations of zebra mussels.

Conclusion: Consideration should be given to ways and means of mitigating the introduction of large populations of zebra mussels to the repair project site through transportation of marine equipment. A decontamination protocol has been established with the US Fish and Wildlife Service to accomplish this.

FEASIBLE STRUCTURAL REPAIR METHODS

Structural repairs are considered to be those repairs independent of the mechanical and electrical components of the bridge. Non-intrusive structural repairs include substructure concrete repairs, repair of the lower chords, strengthening of the floorbeams, removal of the lower lateral bracing and repair of the sidewalk stringers. To accomplish these repairs while vehicular traffic is maintained on the bridge, the repairs will need to be accomplished primarily from marine equipment such as barges, pontoons and tug boats.

Intrusive repairs include replacement of the vehicular and transition decks, repair of the floor beam to truss connections, straightening of bent verticals, installation of a rub-rail on the south truss, replacement of stringers, and construction of the concrete barrier on the north side of Span 10. It is anticipated that these intrusive repairs can be accomplished within 10 consecutive weeks after closing the bridge to vehicular traffic.

It is anticipated that the pedestrian railing cannot be repaired within the 10-week closure for intrusive repairs.

Conclusion: The lift bridge will be closed to pedestrian and vehicular traffic for a period of 10-weeks to complete intrusive repairs. The contractor will be allowed additional time to complete non-intrusive repairs. In the interest of maintaining pedestrian traffic on the bridge while non-intrusive repairs are being completed, a temporary pedestrian railing (chain link fence) will be installed when the existing railing is removed for repair.

FEASIBLE MECHANICAL & ELECTRICAL REPAIR METHODS

Repair of the mechanical and electrical components of the bridge will require the bridge to be taken out of service and therefore is considered intrusive to pedestrian, vehicular traffic and to some extent marine traffic. It is desirable to complete these repairs during the normal warm weather construction season. Marine traffic must be maintained during the repair efforts as previously presented. Three feasible methods of completing the mechanical and electrical repairs in a non-intrusive manner to marine traffic have been developed and are presented below.

I. Raise Lift-Span: The lift-span could be raised to the fully open position for an extended period of time and repaired. With the lift-span in the fully raised position, marine traffic would be free to utilize the navigation channel.

The lift-span would be supported in the fully open position by falsework. The falsework would likely consist of two large diameter steel pipes placed between the strike plates and live load shoes and suitably braced in both the longitudinal and transverse directions. Once the falsework was in place the lift-span would be tied down in some fashion with cables to prevent up-lift from wind and repair activities. Once the lift-span is secured in the raised position, the counterweights would be in the lowered position. In the lowered position the counterweights would be raised (by a matter of inches) by jacks to allow replacement of the counterweight cables and sheave trunnion bushings.

Demolition of the vehicular deck with the lift-span in the fully open position could be completed by allowing the demolished concrete to fall into barges placed below the lift-span. The barges would be fitted with a sand bed to mitigate impact damage from falling concrete. Completing the repairs with the lift-span in the fully open position would require materials and equipment to be lifted to the lift-span and likely require a working platform to be suspended below the lift-span.

Provided on page 21 in Figure 5 is a conceptual representation of the method used to support the lift-span in the fully open position.

II. Remove Lift-Span: The lift-span could be removed from its position between the lift-towers and repaired at a remote location. With the lift-span removed, marine traffic would be free to utilize the navigation channel.

Removal of the lift-span would require the counterweights to be supported in the up position by falsework. The falsework would be nestled within the lift-tower and bear on the deck of Spans 3 and 5. Therefore, the deck replacement of Span 3 and 5

would need to be completed either prior to, or subsequent to, placement of the counterweight falsework. Once the counterweights are supported, the span guides can be removed, counterweight ropes disconnected and lift-span removed.

Removal of the lift-span could be accomplished with barges and falsework. Falsework supported on barges, partially filled with water, would be positioned beneath the lift-span. Once in position, the water within the barges would be pumped out thus raising the barges and providing the lifting force to support the lift-span. Once waterborne, the lift-span would be removed from the navigation channel and moored remote from the navigation channel, at a location yet to be determined. Repair of the lift-span would be completed in its remote location.

Provided on page 22 in Figure 6 is a conceptual representation of the method used to support the counterweight in the up position. Provided on page 23 in Figure 7 is a conceptual representation of the method used to support the lift-span for removal.

III. Remove Fixed Span: One of the fixed spans, presumably Span 6, could be removed to allow passage of marine traffic in a re-aligned navigation channel. With the fixed span removed, marine traffic would be free to utilize the re-aligned navigation channel.

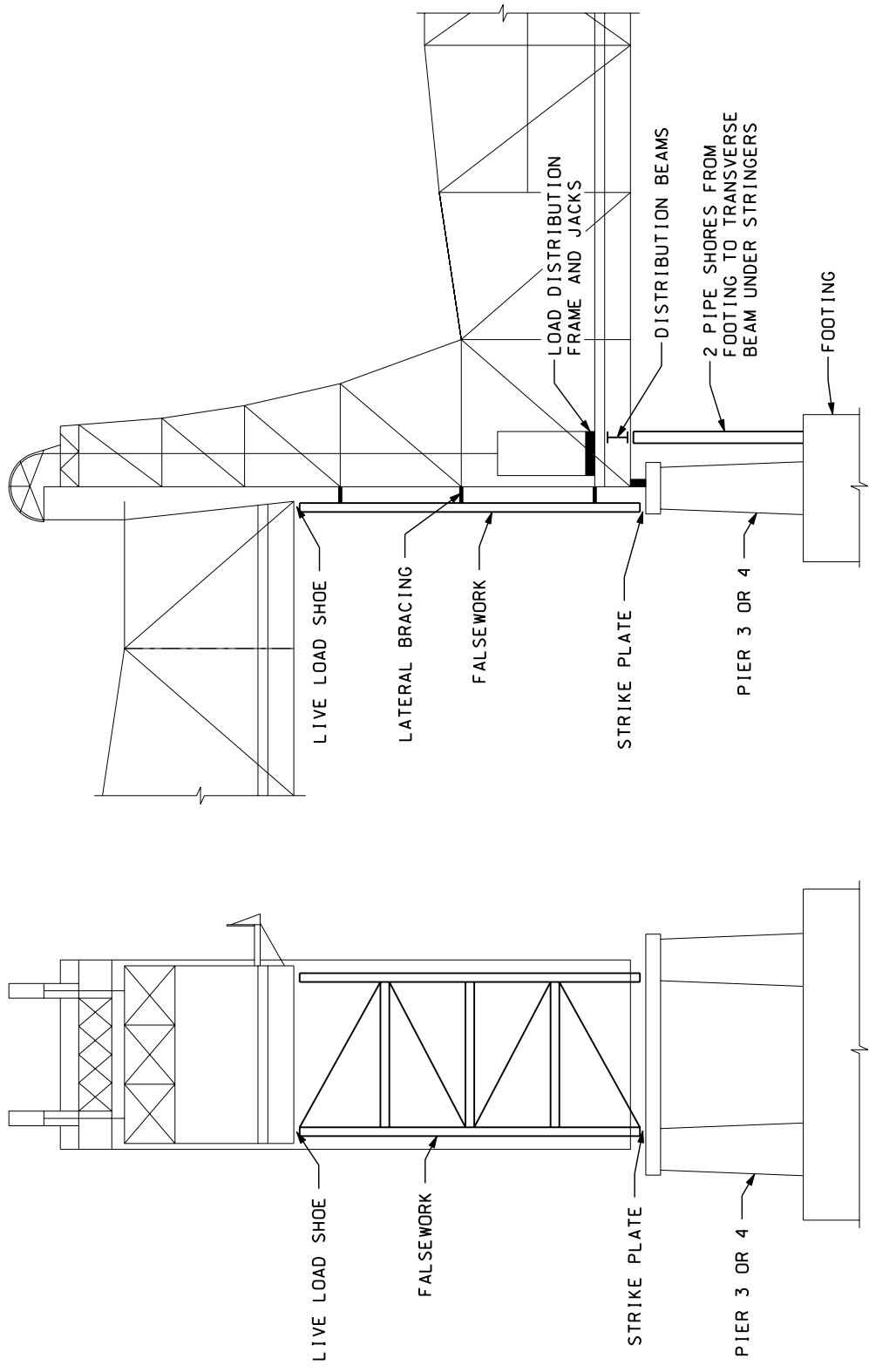
The lift-span would be repaired in place, in the lowered position once the truss of Span 6 was removed and the navigation channel temporarily re-aligned. The counterweights would need to be supported by falsework as previously described to allow replacement of the counterweight ropes and sheave bushings. The truss of Span 6 would be removed in a fashion similar to that previously described for the lift-span. Once waterborne, the truss of Span 6 would be moored at a remote location. Temporary navigation lights would be required on Piers 3, 4, 5 and 6 as well as navigation markers.

The three methods of repairing the mechanical and electrical components of lift bridge while maintaining marine traffic were evaluated with respect to cost and ease of repair. While repairing the lift-span in the fully open position is deemed to be feasible, it presents challenges and concerns. The challenges and concerns include, but are not limited to: 1) repair activities would likely block the navigation channel for hours at a time on a semi-regular basis, 2) completing the repairs in the fully open position presents challenges in the form of access and communication, and 3) suspending a work platform beneath the lift-span would compromise the USCG regulated vertical clearance of navigation channel and may be insufficient for local marine vessels during high-water events, 4) the 1930 construction documents are silent with regard to the wind loads considered in the design of the lift towers, 5) this option appears to provide

no economic or other advantages over other available options and 6) this option appears to provide Mn/DOT with greater risk and no benefit over other options.

Removal of a fixed span would be less complicated than removing the lift-span and cost about the same amount. Removal of the lift-span would provide a working platform beneath the lift-span in the form of barges that would likely improve access for completing the repairs. It is likely some contractors would prefer to remove the fixed span, while others would prefer to remove the lift-span.

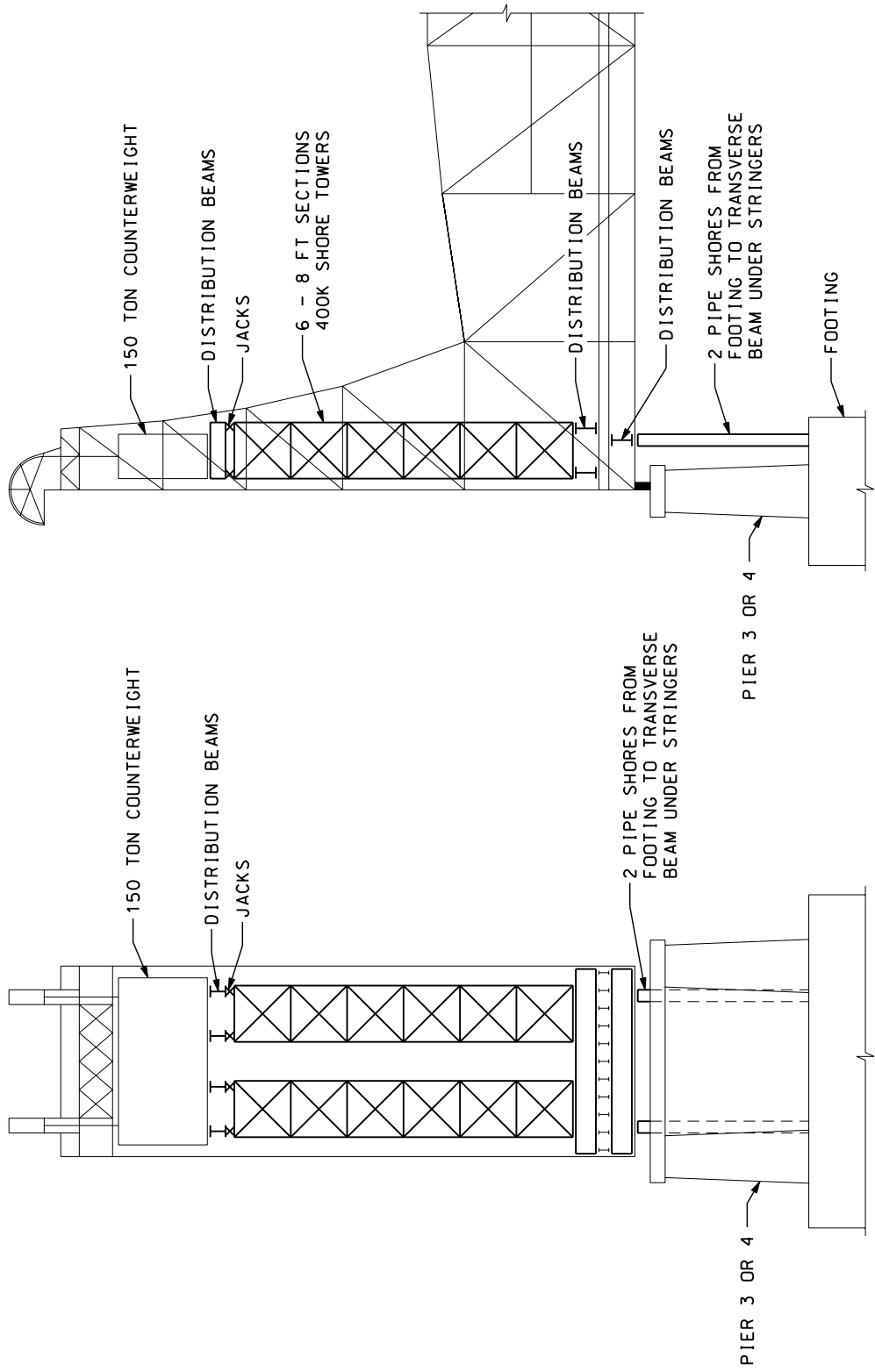
Conclusion: Removal of a fixed span truss or the lift-span truss is preferred to repairing the lift-span in the fully open position. Raising the lift span to the fully open position will not be offered to the contractor as a means of maintaining marine traffic within the construction documents. The contract documents for repair of the lift bridge will not specify contractor's means and methods, but will place limitations on the contractor's operations. A feasible method of completing the repairs will be depicted in concept within the contract documents and used to develop opinions of probable repair costs during final design of the repairs. The feasible repair method will be removal of the lift-span.



SCHMATIC FALSEWORK SIDE ELEVATION

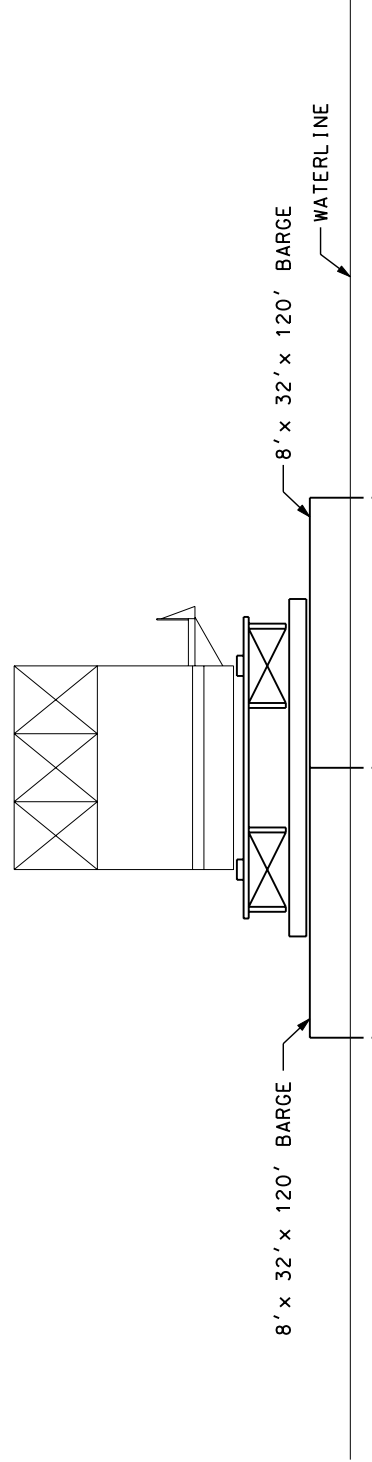
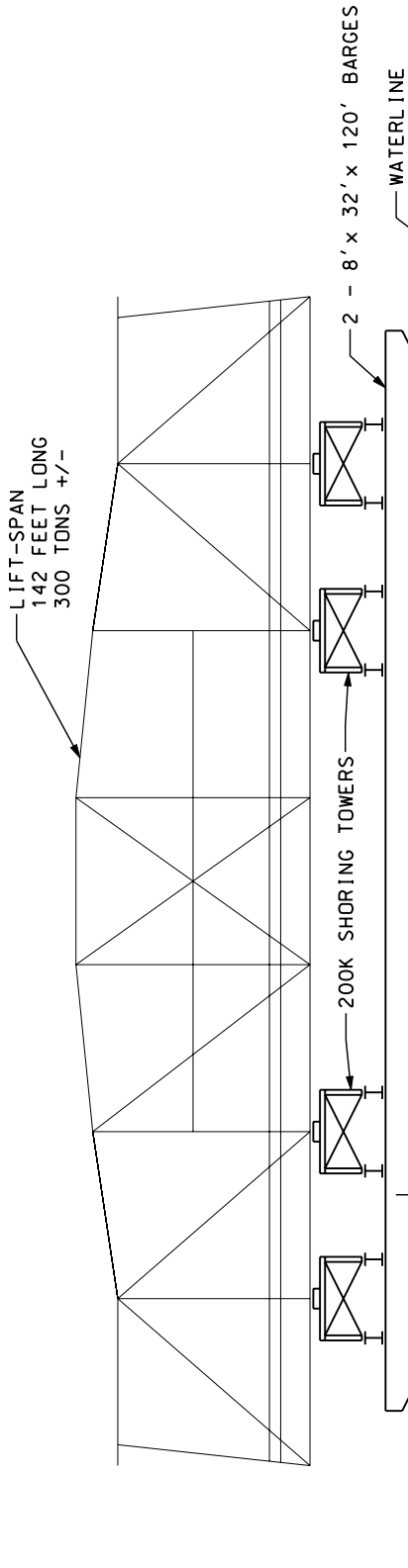
SCHMATIC FALSEWORK FRONT ELEVATION





SCHEMATIC FALSEWORK SIDE ELEVATION

SCHEMATIC FALSEWORK FRONT ELEVATION



FEASIBLE PAINT REPAIR METHODS

Painting the bridge can be accomplished by employment of a conventional three coat system which requires blast cleaning. Painting will require containment during the cleaning process and access to elevated portions of the bridge with power-lift equipment operating from the deck. The bridge must be closed to vehicular and pedestrian traffic during the painting operations.

It is feasible to install a containment system on the lift-span and lift-towers and paint these elements while maintaining operation of the lift bridge to accommodate marine traffic. However, because of the moving parts, and need to suspend the containment system below the lift-span, it is desirable to close the bridge to marine traffic while this portion of the bridge is being painted.

Conclusion: The means and methods of containment and providing access are independent of which type of paint system is used. The bridge will need to be closed to pedestrian and vehicular traffic while the bridge is being painted. It is desirable, but not required, to close the bridge to marine traffic while the lift-span and lift-towers are being painted for reasons of safety and convenience.

REPAIR SCHEDULE

Based on previously presented information and the understanding that the bridge, or portions of the bridge may be painted as funds allow, a feasible repair schedule was developed and is presented below.

Structural, Mechanical & Electrical Repairs:

The Stillwater Lift Bridge repairs will be made in 2005 to avoid simultaneous closure of river crossings at Hudson and Stillwater. Cold weather concerns call for the repairs to be completed during the normal construction season – April 15 to October 15. Consideration of the potential for high water events suggests the repairs should be completed in the latter part of the normal 2005 construction season.

Final connections, adjustments and shake down of the mechanical and electrical components require the bridge to be in the lowered position and inoperable for a period of about two weeks. It is necessary to schedule these repair activities to commence when the navigation season ends on October 15 to avoid interruption of marine traffic during the navigation season.

Repair of the intrusive structural components is estimated to require a 10-week period. In the interest of minimizing the closure of the bridge to vehicular traffic, the majority of the mechanical and electrical repair will be completed coincident with the intrusive structural repairs. Therefore, the conclusion of the 10-week intrusive repair period must coincide with the end of the navigation season – October 15, 2005. The 10-week intrusive repair period must start in mid-August of 2005 to coincide with October 15 conclusion of the navigation season.

Various mechanical and electrical repair components are required to be custom made because of their specialized application. The design and manufacture of the custom components requires months of what may be referred to as lead time, and must precede the electrical and mechanical repairs. A minimum lead time of 6 months is required, and a 9 month lead time is desirable. The lead time is considered to commence once the contractor has been given notice to proceed.

Notice to proceed is preceded by a 4 to 6 week award period, which is in turn preceded by the bid letting, which is in turn preceded by an advertising period. It is undesirable to advertise the repair project during the poor bidding period.

Consideration of providing an adequate lead time and avoiding the poor bidding period requires the project to be advertised, let and awarded in the latter part of calendar year 2004.

Based on the above limitations and considerations, a conceptual repair schedule was developed. In general terms, the conceptual repair schedule is as follows:

- Advertise repair project to potential bidders: July 16 to August 27, 2004.
- Bid Letting: August 27, 2004.
- Award repair project: August 27 to October 8, 2004.
- Notice to proceed: October 8, 2004.
- Pre-repair activities (Lead Time): October 8, 2004 to June 3, 2005.
- Non-intrusive repairs: June 6 to August 15, 2005.
- Intrusive structural repairs: August 15 to October 23, 2005
- Mechanical and electrical repairs: August 15 to December 9, 2005
- Final completion and site restoration: May 2006

This repair schedule results in the following closure of the bridge:

- Closure to pedestrian and vehicular traffic: August 15 to October 23, 2005.
- Potential closure to marine traffic: August 22 to August 24, 2005.
- Closure to marine traffic: October 16 to December 9, 2005.
- Isolated closure to veh. and/or ped. traffic: October 16 to December 9, 2005.
- Isolated closure to veh. and/or ped. traffic: April 17 to May 5, 2006.

The sequence of events and overall duration of activities is not anticipated to change, but specific dates are subject to change as detailed information is made available.

Painting Repairs:

Based on information available during selection of the repairs to be carried forward to construction, it appears there will be insufficient funds to paint the entire bridge. However localized painting and spot painting are anticipated to be included as part of the repair project. Once final design of the repairs is completed a more accurate opinion of probable repair cost will be made. The refined opinion of probable repair cost will be used as a basis to resolve the extent of the bridge to be painted.

The 2005 mechanical and electrical repairs provide a unique opportunity to paint the lift-span and lift-towers while the marine traffic is maintained. Painting the lift-span and lift-towers simultaneously with the 2005 mechanical and electrical repairs would eliminate the potential for conflicting marine traffic and painting needs at a later date. It is HNTB's recommendation that painting the lift-span and lift-towers be given a higher priority than painting other portions of the bridge, and that these elements be painted in 2005, if adequate funding is available.

When and if the bridge is painted in its entirety, it is desirable to restore the bridge to its original 1931 colors, which are a dark shade of green with “aluminum paint” applied to the pedestrian railing and roof of the tender’s house. Because the bridge is not anticipated to be painted in its entirety as part of the repairs, those portions of the bridge to be painted will be painted to match the existing color of the bridge (charcoal gray) with the exception of the pedestrian railing, roof of the tender’s house and new electrical house, which will be painted a color similar to “aluminum paint”.

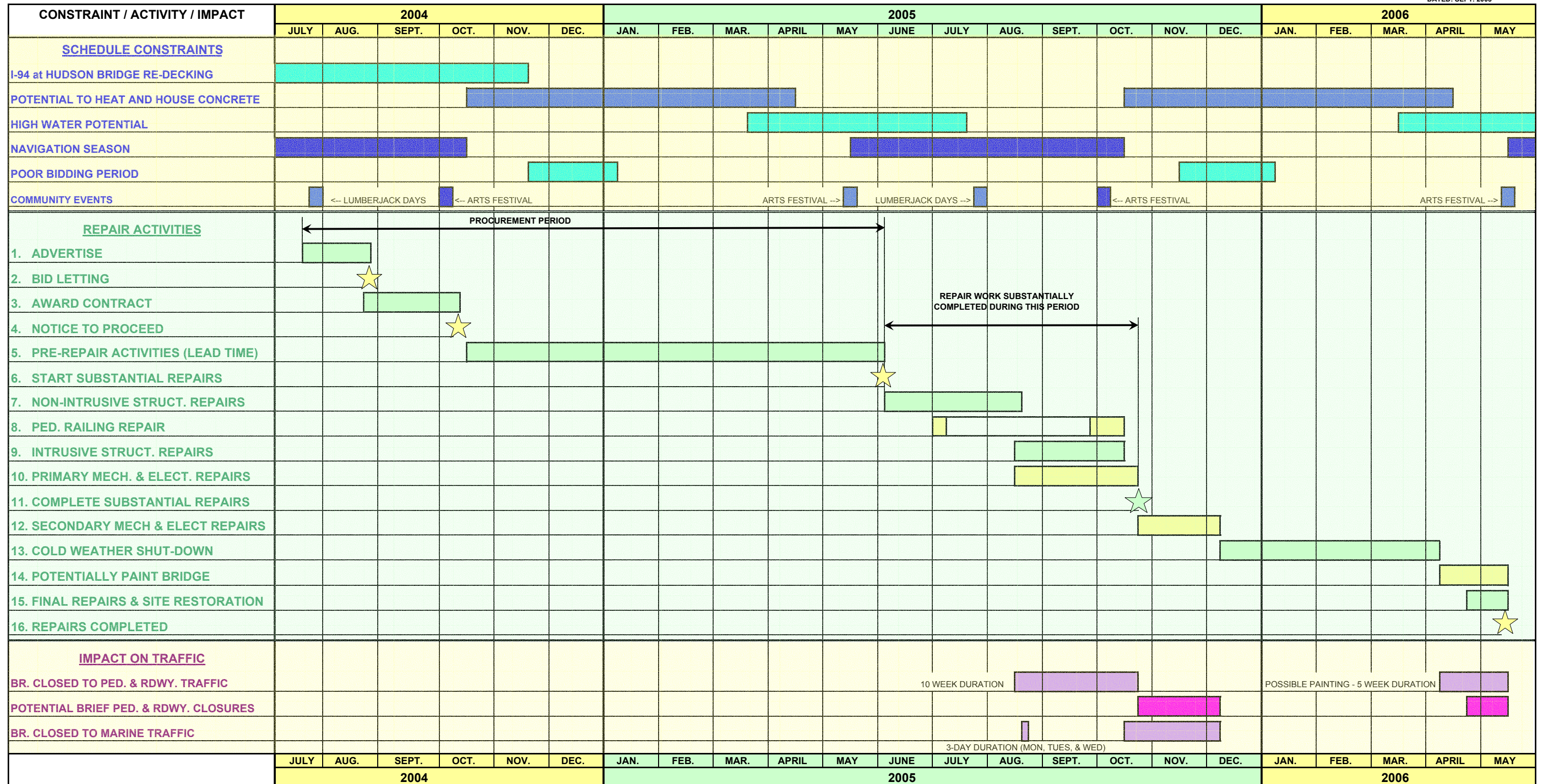
As previously mentioned, painting the remainder or other portions of the bridge will require the bridge to be closed to pedestrian and vehicular traffic. It is desirable to paint the bridge subsequent to completion of the other repairs to reduce the need for touch-up and spot painting. Painting the bridge (other than the lift-span and lift-towers) in 2005 after other repairs have been made would extend the duration that the bridge is closed to vehicular and pedestrian traffic, and likely expose the painting operations to unsuitable temperatures. For these reasons, if the bridge is painted it should be completed in the spring of 2006. This painting could be completed coincident with final completion and clean-up of the other repairs.

If funds allow painting the lift-span and lift-towers in 2005, painting other portions (entire bridge assumed) of the bridge will result in closure of the bridge to pedestrian and vehicular traffic for 5 consecutive weeks from April 10 to May 12, 2006.

Provided on the following page in Figure 8 is a graphic presentation of the sequence of repair activities, selected schedule constraints and resulting impacts on traffic. Provided in Appendix A and B are Gantt charts representing a condensed 2005 feasible repair schedule and a 2005 detailed feasible repair schedule, respectively.

STILLWATER LIFT BRIDGE REPAIR
CONCEPTUAL SCHEDULE CONSTRAINTS & REPAIR SCHEDULE & TRAFFIC IMPACT

DATED: SEPT. 2003



NOTE: CONCEPTUAL PROJECT SCHEDULE SUBJECT TO REVISION.

SELECTED REPAIR ACTIVITY DESCRIPTIONS

- 5. PRE-REPAIR ACTIVITIES (LEAD TIME): SHOP DRAWINGS, COORDINATION, FABRICATION OF SPECIALTY MECHANICAL AND ELECTRICAL COMPONENTS.
- 7. NON-INTRUSIVE STRUCTURAL REPAIRS: THOSE STRUCTURAL REPAIRS WHICH CAN BE COMPLETED WITHOUT CLOSURE OF BRIDGE TO ROADWAY, PEDESTRIAN AND NAVIGATION TRAFFIC.
- 9. INTRUSIVE STRUCTURE REPAIRS: THOSE STRUCTURAL REPAIRS WHICH REQUIRE THE BRIDGE TO BE CLOSED TO ROADWAY AND PEDESTRIAN TRAFFIC.
- 10. PRIMARY MECH. & ELECT. REPAIRS: MAJOR REPAIRS TO THE LIFT-SPAN, AND LIFT-SPAN ELECTRICAL AND MECHANICAL COMPONENTS.
- 12. SECONDARY MECH. & ELECT. REPAIRS: ADJUSTMENTS AND SHAKE-DOWN OF LIFT-SPAN REPAIRS.

FIGURE 8
REPAIR PROJECT SCHEDULE

LIMITS OF WORK

The contractor will need to be granted access to the Stillwater Lift Bridge and limited portions of the surrounding area for purposes of delivery, storage and staging of material, material laydown, field office space, employee parking, storage of construction equipment and mooring of marine equipment. The areas used for these purposes are referred to simply as staging areas. Due to their temporary nature and purpose, staging areas are typically considered unattractive.

Staging areas for the contractor's use are proposed, as depicted on the following page in Figure 9, for the following:

1. Field offices and employee parking located on the west side of the St. Croix River, north of the lift bridge and south of a privately owned marina.
2. Haul roads for delivery of materials on the west bank of the St. Croix River immediately adjacent to the flood walls and levee.
3. Mooring areas located on the east side of the St. Croix River, north of STH 64/35 and on the west side of the St. Croix River, south of the lift bridge site.
4. Material delivery, laydown and storage areas located within existing right-of-way of the west concourse and east earthen causeway during those period of time when the lift bridge is closed to vehicular and pedestrian traffic.
5. Material delivery, laydown and storage area located on the west side of the St. Croix River, south of the lift bridge.

Conclusion: The contractor will be allowed to use limited portions of land surrounding the Stillwater Lift Bridge as staging areas. The staging areas will include portions of the approach roadway once vehicular traffic is removed from the bridge. To the extent possible and necessary, the staging areas will be delineated by temporary chain link fence and/or temporary plastic safety fence and/or barricades. The proposed staging areas are subject to approval of respective property owners.

Figure 9: Staging Areas



OPINION OF PROBABLE REPAIR COSTS

Opinions of probable repair costs (programming level) cost, developed during the conceptual design phase of the project development are presented below. Additional cost detail is presented in Appendix C. All costs are presented in 2003 U.S. dollars and represent the cost a construction contractor will bid for the repair work through a competitive bidding process. The opinion of probable repair costs will be refined as the design of the repairs is completed.

<u>Repair</u>	<u>Cost</u>
Tender's & Electrical House	\$ 129,900
Mechanical & Electrical – Support Sys.	28,700
Mechanical & Electrical – Balance Sys.	732,300
Mechanical & Electrical – Drive Sys.	543,200
Mechanical & Electrical – Dist./Control Sys.	612,600
Mechanical & Electrical – Interlock Sys.	15,100
Mechanical & Electrical – Nav. Guide. Sys.	20,200
Mechanical & Electrical – Traffic Control Sys.	109,700
Structural – Concrete Surface Treatment	90,540
Structural – Substructure	144,000
Structural – Superstructure – Spans 1 & 2	6,900
Structural – Superstructure – Truss Spans 3 to 9	637,700
Structural – Superstructure – Span 10	5,500
Structural – Sidewalk Support System	75,900
Structural – Deck Repair	10,400
Structural – Railing Repair	65,500
Pedestrian Railing	225,800
Deck Replacement	443,000
Amenities	<u>\$ 403,922</u>
Sub-Total	\$4,300,862
Inflation @ 5%	215,043
Contingency @ 11%	<u>473,095</u>
Projected Total Repair Costs	\$4,989,000

The cost cited for amenities includes roughly \$350,000 for painting some portion of the bridge. It is anticipated that this level of funding will be insufficient to paint the bridge in its entirety. The programmed cost for painting is roughly 21%, 45% and 158% of the estimated cost to paint the entire bridge, paint the bridge from the deck up, and paint the middle (horizontal) third of the bridge.

The opinions of probable repair costs are based on information presently available, anticipated repair effort, method of repairs and schedule as presented herein and based on engineering judgment and construction experience. The cost of labor, equipment and materials are subject to market forces which HNTB has no control over. These opinions represent HNTB's best judgment as experienced qualified professionals, familiar with bridges. However, no warranty or guarantee is provided, or implied, that the actual cost of repairs will not vary significantly from the opinions of cost presented herein.

CONCLUSIONS

The repairs of the Stillwater Lift Bridge can be completed with conventional construction equipment (including marine equipment) and the regional work force.

Various project activities will be completed in the calendar years of 2004, 2005 and 2006. The majority of the repair activities will be completed in 2005 to accommodate repairs of an I-94 bridge near Hudson. The project will be initiated with procurement activities in 2004. Lead time will commence in late 2004 and continue through August of 2005. Non-intrusive repairs will commence in June and be completed by mid August of 2005. Intrusive repairs will commence in mid August and be substantially completed in late October of 2005. The contractor will be allowed to make final completion of repairs and site restoration in April and May of 2006.

The contractor will be allowed to occupy limited portions of real estate and shoreline for staging operations on both the east and west end of the project from late May to mid November of 2005.

The bridge will be closed to pedestrian and vehicular traffic from August 15 through October 23 of 2005. Additional infrequent and short-term (hours) closure of the bridge to vehicles and/or pedestrians may be required in November and December of 2005 and April and May of 2006.

The bridge will be allowed to be closed to marine traffic for a three day period (Monday, Tuesday and Wednesday) during the normal navigation season in August of 2005. The bridge will also be closed to marine traffic during the off-season from October 16 through December 9, 2005. Resumption of opening the bridge on 24-hour notice would resume on November 8, 2005.

The anticipated cost of the repairs is \$4,989,000 – the amount authorized for the bridge repair by the 106th U.S. Congress. This cost includes roughly \$350,000 for painting some portion of the bridge. The funds programmed for painting are anticipated to be insufficient to paint the bridge in its entirety.

If sufficient funds are available, it is proposed that the lift-span and lift-towers be given first priority for painting and painted during the 2005 repair work. Any additional painting of the bridge will be accomplished in April and/or May of 2006 and will require closure of the bridge to vehicle and pedestrian traffic for a period of up to 5 weeks, depending on the extent of painting.

Appendix A

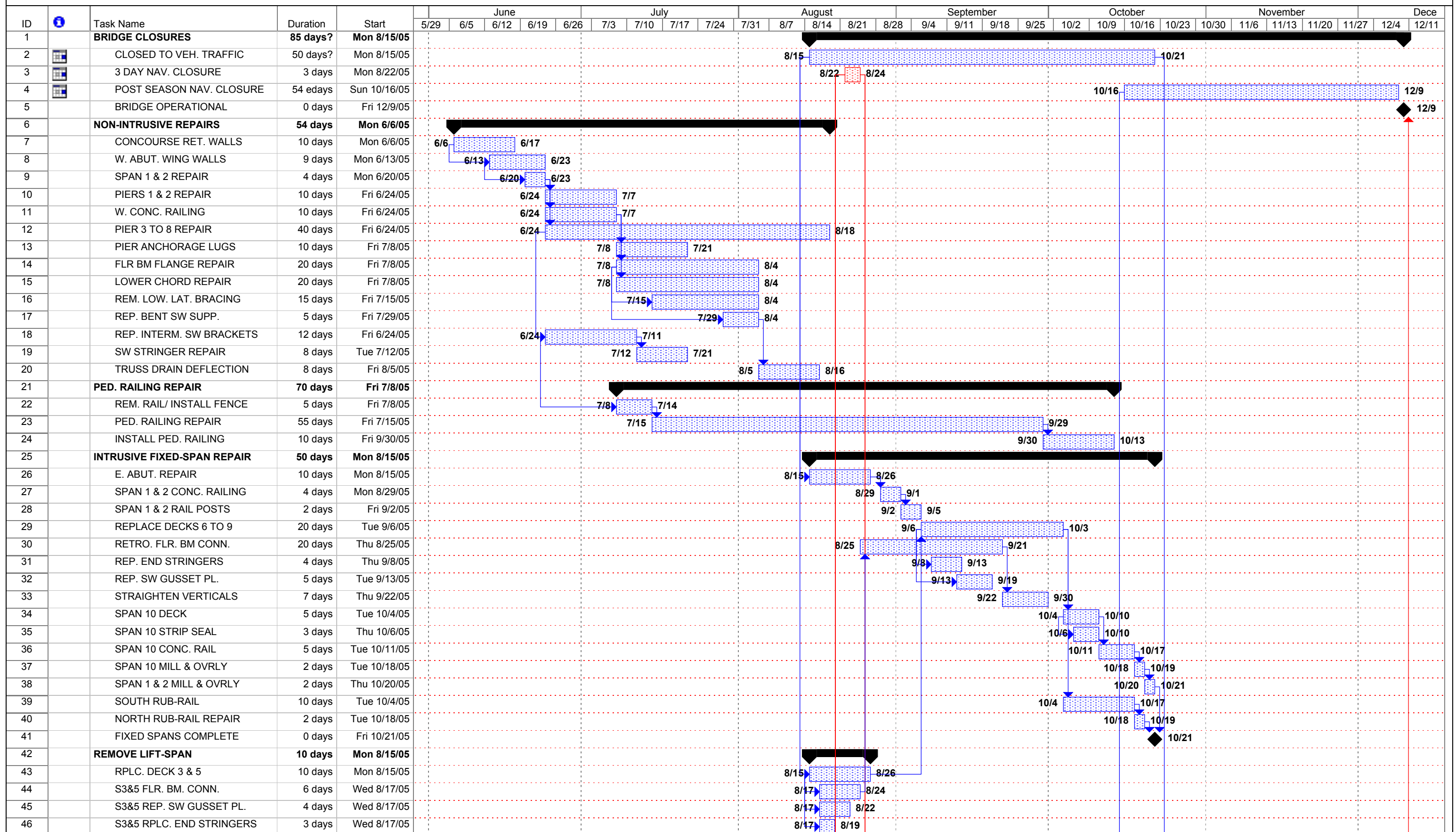
Simplified 2005 Feasible Repair Schedule

Provided on the following page is a simplified Gantt chart representing a feasible repair schedule for the 2005 repair work. Omitted for clarity are 2004 procurement events, lead time and 2006 repair work. The reader's attention is directed to Figure 8 – *Repair Project Schedule* for 2004 and 2006 repair activities.

Appendix B

Detailed 2005 Feasible Repair Schedule

Provided on the following two pages is a detailed Gantt chart representing a feasible repair schedule for the 2005 repair work. Omitted for clarity are 2004 procurement events, lead time and 2006 repair work. The reader's attention is directed to Figure 8 – Repair Project Schedule for 2004 and 2006 repair activities.



Appendix C

Probable Repair Costs

Provided on the following page is HNTB's programming level opinion of probable repair costs developed during the conceptual design phase of the project. These costs represent an opinion of the costs paid to a construction contractor to complete the repairs of the Stillwater Lift Bridge as described within this report under the feasible schedule presented within this report.

A Tender's House

Repair Item	Prob. Cost
Elect. House Support Frame	\$ 21,900
Elect. House	\$ 26,000
Paint M / E Platform	\$ 35,000
Repair Tender's House	\$ 31,000
Remote Traffic Light Switch	\$ 500
Fire/Smoke Detection	\$ 300
Fire Suppression	\$ 15,200

Category Sub-Total: \$ 129,900

B Mechanical & Electrical**B1 Support System**

Repair Item	Prob. Cost
Strike Plates	\$ 4,300
Live Load Shoes	\$ 800
Span Guides	\$ 12,500
Counterweight Guides	\$ 10,600
Lift Tower Ladders Repair	\$ 500
	\$ 28,700

B2 Balance System

Repair Item	Prob. Cost
Counterweight Wire Ropes	\$ 350,000
Shoring for Counterweights	\$ 160,000
Float Lift Span	\$ 180,000
Replace Sheave Trunnion Bushings	\$ 24,000
Inspect Sheave Trunnions	\$ 3,000
Cntrwght.Conc. Rep. & B. Screens	\$ 15,300
	\$ 732,300

B3 Drive System

Repair Item	Prob. Cost
Replace Gears with Enclosed Sets	\$ 195,300
Bearings	\$ 16,500
Couplings	\$ 10,100
Shafts	\$ 13,300
Hand Brake	\$ 800
Replace Operating Wire Ropes	\$ 94,500
Replace Up-haul Take-up Devices	\$ 63,000
Replace Down-haul Take-up Devices	\$ 63,000
Repair Deflection Sheaves	\$ 13,200
Main Gear Reducer	\$ 3,200
Replace Brakes	\$ 25,400
Replace Main Drive Motor	\$ 44,900
	\$ 543,200

B4 Distribution/Control System

Repair Item	Prob. Cost
Motor Controls	\$ 60,400
Distribution System	\$ 27,900
Wire & Cable	\$ 258,500
Festoon Cable	\$ 32,400
Conduit	\$ 22,700
Junction Boxes	\$ 26,700
Control Console	\$ 28,400
Portable Traffic Controls	\$ 2,000
PLC Control System	\$ 143,500
Transformer	\$ 5,700
Circuit Breakers	\$ 4,400
	\$ 612,600

B5 Interlock System

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

B6 Navigation Guidance System

Repair Item	Prob. Cost
Single Lens Nav. Lights	\$ 6,600
Combination Nav. Lights	\$ 7,800
Signage Lighting	\$ 3,700
Signage	\$ 800
Signage Support	\$ 1,300
	\$ 20,200

B7 Traffic Control System

Repair Item	Prob. Cost
Install New Traffic Barriers	\$ 109,000
Remove Traffic Cab. & Platforms	\$ 700
	\$ 109,700

Category Sub-Total: **\$ 2,061,800****C Structural****C1 Concrete Surface Treatment**

Repair Item	Prob. Cost
Concourse Retaining Walls	\$ 25,300
West Abutment Wing Walls	\$ 8,700
Concrete slab exposed concrete, fascia	\$ 3,800
East Abutment	\$ 22,900
Piers 1 & 2 above grade / waterline	\$ 14,000
West concourse Railing	\$ 9,700
Span 1 & 2 Concrete Railing	\$ 4,840
Span 1 & 2 Concrete Railing Balustrades	\$ 1,300
	\$ 90,540

C2 Substructure

Repair Item	Prob. Cost
Conc. Repair-P3 to 7-Wtrln Up-No Brg.	\$ 120,000
Conc. Repair-P8-Wtrln Up- No Brg.	\$ 24,000
	\$ 144,000

C3 Superstr. - Conc. Spans 1 & 2

Repair Item	Prob. Cost
Mill and Overlay	\$ 6,900
	\$ 6,900

C4 Superstr. - Truss Spans 3 to 9

Repair Item	Prob. Cost
Retrofit Anchor Rods - Exp. Brgs	\$ 17,600
Retrofit Stringer to Floor Beams Conn.	\$ 300
Retrofit Flr. Bms to Truss Conn.	\$ 188,100
Retrofit Flr. Bms. - Midspan	\$ 108,100
Retrofit Lower Chords	\$ 158,500
Straighten Verticals - S8 & S9	\$ 8,500
Remove Lower Lat. Bracing	\$ 39,100
Replace Strgrs @ Exp. Jts. & Galv.	\$ 117,500
	\$ 637,700

C5 Superstr. - Beam Span 10

Repair Item	Prob. Cost
Partial Deck Replacement	\$ 3,200
Mill & Overlay Span 10	\$ 2,300
	\$ 5,500

C6 Sidewalk Support System

Repair Item	Prob. Cost
Repair Bent Support Brackets	\$ 8,400
Replace Upper Conn. Gusset Plate	\$ 16,000
Retrofit Intermediate Sup. Conn.	\$ 26,100
Replace Fascia Strgrs/ Rev. Old	\$ 25,400
	\$ 75,900

C7 Deck Repair

Repair Item	Prob. Cost
Replace Strip Seal S10	\$ 10,400
	\$ 10,400

C8 Railing Repair

Repair Item	Prob. Cost
Retrofit South Truss with Rub-Rail	\$ 57,500
Repair North Truss Rub-Rail	\$ 1,500
Span 10 Ornamental Conc. Rail	\$ 6,500
	\$ 65,500

Category Sub-Total: \$ 1,036,440

D Pedestrian Railing

Repair Item	Prob. Cost
Ped. Railing Option 5	\$ 225,800

\$ 225,800

E Deck Replacement

Repair Item	Prob. Cost
Option 1	\$ 443,000

\$ 443,000

F Amenities

Repair Item	Prob. Cost
Replace Bridge Lighting	\$ 4,800
Closed Circuit TV System	\$ 5,600
So. Truss Drainage Deflection	\$ 14,200
Paint Bridge as Funds Allow	\$ 355,022
Approach High Load Warning Dev.	\$ 11,000
Tender's House Fan	\$ 600
Tender's House Air Conditioning	\$ 1,300
Tender's House Heating	\$ 1,300
Tender's House Telephone	\$ 100
Historic Interpretation	\$ 10,000

Category Sub-Total: \$ 403,922

G Base Cost Sub-Total = \$ 4,300,862

H Inflation @ 5.0% \$ 215,043

I Contingency @ 11.0% \$ 473,095

J Project Total: \$ 4,989,000

These opinions of repair cost are based on concepts without benefit of: 1) preliminary design & plans, 2) final design & 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 repair 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.

Appendix D Aerial Photograph – Lift-Bridge Repair Project Site

Provided below for general information is an aerial photograph of the repair project site and surrounding area. North is generally to the left, downstream direction of the St. Croix River to the right, Wisconsin to the top, and Minnesota to the bottom of the photograph.

