UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 05506
UTILITY CROSSING, FORMERLY SARTELL STREET WEST
OVER THE
MISSISSIPPI RIVER
CITY OF SARTELL, BENTON/STEARNS COUNTY

JUNE 8, 2017
PREPARED FOR THE
MINNESOTA DEPARTMENT OF TRANSPORTATION
BY
COLLINS ENGINEERS, INC.
JOB NO. 63-9687
REPORT SUMMARY:

The substructure units inspected at Bridge 05506, Piers 2 and 3 and the East Abutment, were in overall poor condition with many areas of moderate to advanced deterioration. The limits of inspection included all submerged elements, up to the high water mark.

The upstream noses of Piers 2 and 3 exhibited severe scale with depths up to 8 inches, extending from 3 feet below the waterline to 4 feet above. The downstream noses of Piers 2 and 3 exhibited moderate to advanced scale with depths up to 4 inches, extending from the waterline up 4 feet. The concrete at the upstream and downstream noses of both piers exhibited freeze thaw damage, with up to 1 inch of concrete easily removed. The east and west faces of both piers typically exhibited moderate scale up to 2 inches deep, from the waterline up 4 feet. The west face of Pier 3 exhibited a 6 feet long x 6 inches high x up to 9 inches deep area of severe scale centered on the waterline. Vertical cracks, up to 3/8 inch wide above water and 1/16 inch wide below water, were noted on the east and west faces of Piers 2 and 3. These cracks typically extended from the top of the cap to the mudline. Pier 3 has a rectangular concrete repair apron around the entire perimeter of the pier, the top of the apron was approximately 4.7 feet below the waterline. A minor accumulation of branches was noted on the upstream nose of Pier 3 on top of the apron.

The channel bottom typically consisted of sand with intermittent cobbles up to 6 inches in diameter.

No previous sounding data for the channel was available for comparison. This report represents the first known underwater inspection of this bridge.

INSPECTION FINDINGS:

(A) The channel bottom typically consisted of sand and intermittent cobbles up to 6 inch diameter allowing 4 inches of probe rod penetration.

(B) Pier 3 has a rectangular concrete repair apron around the entire perimeter of the pier, the apron was approximately 4 feet from the edge of the pier on the east and west faces and was 5 to 6 feet offset from the upstream and downstream noses, the top of the apron was approximately 4.7 ft below the waterline, the concrete top surface was generally smooth and sound.
(C) Moderate scale, up to 3 inches deep, from waterline up 4 feet, south half of east abutment.

(D) Severe scale, up to 8 inches deep by 2 inches high, centered 1 foot above waterline at cold joint of repaired section at north half of East Abutment. Area was approximately 15 feet long, and had one exposed rebar with minor surface corrosion visible.

(E) Moderate to advanced scale, up to 4 inches deep, from waterline up 4 feet, downstream nose of Pier 2. Concrete exhibits freeze thaw damage with 1 inch of concrete easily removed.

(F) Moderate scale, up to 2 inches deep, from waterline up 4 feet, east and west faces of Pier 2. Concrete was generally sound.

(G) Severe scale, up to 8 inches deep, from 3 feet below waterline to 4 feet above at upstream nose of Pier 2. Concrete exhibits freeze thaw damage with 1 inch of concrete easily removed.

(H) Vertical crack, up to 3/8 inches wide above waterline and up to 1/16 inch wide below waterline. Vertical length extended full height from top of cap down to mudline and was observed at midpoint of the east and west faces of Pier 2.

(I) Moderate to advanced scale, up to 3 inches deep, from 3 feet below waterline to 3 feet above at the downstream nose of Pier 3. Concrete exhibits freeze thaw damage with 1 inch of concrete easily removed.

(J) Severe scale, up to 6 inches deep, from 3 feet below waterline to 4 feet above at upstream nose of Pier 3. Concrete exhibits freeze thaw damage with 1 inch of concrete easily removed.

(K) Steel plates on upstream nose extended below waterline to top of apron repair. The plates exhibited impact damage at the waterline and were deflected 2 inches over a length of 18 inches, 10 anchors at the plate edges were missing or not engaged due to concrete deterioration.

(L) Moderate scale, up to 2 inches deep, from waterline up 4 feet, east and west faces of Pier 3. Concrete was generally sound.

(M) Severe scale, 6 feet long x 6 inches high x up to 9 inches deep, centered at waterline at the west face of Pier 3.
(N) Vertical crack, up to 3/8 inches wide above waterline, extending from top of cap down to waterline, at the midpoint of the east and west faces of Pier 3.

(O) Light accumulation of timber debris consisting of 1 inch diameter branches was noted around the upstream nose of Pier 3, extending from the top of the apron repair up 1 foot.

RECOMMENDATIONS:

(A) Monitor noted areas of deterioration at Piers 2 and 3 and the East Abutment. If found to be progressing, repairs or an in-depth structural evaluation may be warranted.

(B) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of sixty (60) months.

Contractor: Collins Engineers, Inc.
Contract Job Number: 9687
1. **BRIDGE DATA**

   Bridge Number: 05506  
   Feature Intersected: Mississippi River  
   Facility Carried: Utility Crossing, formerly Sartell St. West  
   District: 3  
   County: Benton/Stearns  
   Bridge Description: The superstructure consists of three spans of steel pin-connected Camelback through truss. The West Abutment has been removed and the west most span has been partially deconstructed. The deck has been removed and replaced with a narrow timber catwalk with a modern chain-link fence on either side. The superstructure is supported by three reinforced concrete piers and an east abutment. The substructure units are numbered west to east and designated as Piers 1 through 3 and East Abutment. The bridge has been closed for public use since 1984 and only serves as a utility crossing.

2. **INSPECTION DATA**

   Professional Engineer/Team Leader: Cory Stuber, P.E.  
   Dive Team: Garrett Owens, P.E.  
   Date: 6/8/2017  
   Weather Conditions: Partly Cloudy, 75°F  
   Underwater Visibility: 1.5 feet  
   Waterway Velocity: 3.0 feet

3. **SUBSTRUCTURE INSPECTION DATA**

   Substructure Inspected: Piers 2, 3, and East Abutment  
   General Shape: Each pier consists of a rectangular reinforced concrete shaft with tapered noses founded on timber pile-supported rectangular concrete footing.  
   Maximum Water Depth at Substructure Inspected: 10.7 feet.
4. **WATERLINE DATUM**
   Water Level Reference: Bottom of pier cap at downstream end of Pier 2.
   Description: The waterline was approximately 8.8 feet below reference.
   
   Waterline Elevation = 73.7 feet

5. **NBIS CODING INFORMATION (Minnesota specific codes are used for 92B and 113)**
   Item 60: Substructure: Code 4
   Item 61: Channel and Channel Protection: Code 7
   Item 92B: Underwater Inspection: Code Y 48 06/2017
   Item 113: Scour Critical Bridges: Code F (Evaluation has not been made)
   Bridge is scour critical because abutment or pier foundation is rated as unstable due to observed scour at bridge site.
   
   _____ Yes  _____ X No

6. **STRUCTURAL ELEMENT CONDITION RATING (FOR ELEMENTS UNDERWATER ONLY)**

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<th>Item #</th>
<th>Element Description</th>
<th>Quantity</th>
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<td>885</td>
<td>Scour</td>
<td>1</td>
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7. UNDERWATER INSPECTION PROCEDURES

The routine underwater inspection of Bridge 05506 (Utility Crossing, formerly Sartell St. West over the Mississippi River) was completed on June 8, 2017. The underwater inspection was conducted from a 14 foot boat. The inspection was conducted by a team consisting of a PE-Diver with a valid MnDOT Team Leader certification, a backup diver and a dive tender. The inspection utilized commercial dive equipment and techniques (SSA and/or SCUBA) in accordance with OSHA regulations. Profiles were taken along the upstream and downstream faces of the bridge and around the periphery of substructure units to determine the presence, location, and area of scour.

The bridge elements inspected consisted of two reinforced concrete piers and one abutment. According to the bridge inventory or design drawings, Piers 2 and 3 were supported by rectangular footings founded on timber pilings. Inspection procedures followed FHWA guidance and the MnDOT Bridge and Structure Inspection Program Manual with channel bottom probing to search for foundations. The routine underwater inspection frequency is recommended to remain at a maximum of 60 months based on those findings and risk factors. Also, inspection procedures should continue to follow the above approach and standard guidance with 100% Level I and 10% Level II intensity effort.
Photo 1 - South Elevation, Looking North.

Photo 2 - North Elevation, Looking Southwest.
Photo 3 - East Abutment, Looking East.

Photo 4 - East Abutment, Looking East.
Photo 5 - West Shoreline and Pier 1, Looking Northwest.

Photo 6 - West Face of Pier 2, Looking East.
Photo 7 - Downstream Nose of Pier 2, Looking North.

Photo 8 - East Face of Pier 2, Looking West.
Photo 9 - Upstream Nose of Pier 2, Looking South.

Photo 10 - West Face of Pier 3, Looking East.
Photo 11 - Downstream Nose of Pier 3, Looking North.

Photo 12 - East Face of Pier 3, Looking West.
Photo 13 - Upstream Nose of Pier 3, Looking South.

Photo 14 - East Abutment Typical Concrete Condition, Looking Northeast.
Photo 15 - East Abutment Typical Concrete Condition (Close Up), Looking Northeast.

Photo 16 - Downstream Nose of Pier 2, Looking East.
Photo 17 - Upstream Nose of Pier 2, Looking Northeast.

Photo 18 - West Face of Pier 2 Crack, Looking East.
Photo 19 – Maximum Penetration at West Face of Pier 3, Looking East.

Photo 20 - Upstream Nose of Pier 3, Looking Southwest.
Photo 21 - Upstream Nose of Pier 3 (Close Up), Looking Southwest.
INSPECTION NOTES:

1. The channel bottom typically consisted of sand and intermittent cobbles up to 6 inches diameter allowing 4 inches of probe rod penetration.

2. Pier 3 has a rectangular concrete repair apron around the entire perimeter of the pier, the apron was approximately 4 feet from the edge of the pier on the east and west faces and was 5 to 6 feet offset from the upstream and downstream noses, the top of the apron was approximately 4.7 feet below the waterline, the concrete top surface was generally smooth and sound.

3. Moderate scale, up to 3 inches deep, from waterline up 4 feet, south half of east abutment.

4. Severe scale, up to 8 inches deep by 2 inches high, centered 1 foot above waterline at cold joint of repaired section at north half of East Abutment. Area was approximately 15 feet long, and had one exposed rebar with minor surface corrosion visible.

5. Moderate to advanced scale, up to 4 inches deep, from waterline up 4 feet, downstream nose of Pier 2. Concrete exhibits freeze thaw damage with 1 inch of concrete easily removed.

6. Moderate scale, up to 2 inches deep, from waterline up 4 feet, east and west faces of Pier 2. Concrete was generally sound.

7. Severe scale, up to 8 inches deep, from 3 feet below waterline to 4 feet above at upstream nose of Pier 2. Concrete exhibits freeze thaw damage with 1 inch of concrete easily removed.

8. Vertical crack, up to 3/8 inches wide above waterline and up to 1/16 inch wide below waterline. Vertical length extended full height from top of cap down to mudline and was observed at the midpoint of the east and west faces of Pier 2.

9. Moderate to advanced scale, up to 3 inches deep, from 3 feet below waterline to 3 feet above at the downstream nose of Pier 3. Concrete exhibits freeze thaw damage with 1 inch of concrete easily removed.

10. Severe scale, up to 6 inches deep, from 3 feet below waterline to 4 feet above at upstream nose of Pier 3. Concrete exhibits freeze thaw damage with 1 inch of concrete easily removed.

11. Steel plates on upstream nose extended below waterline to top of apron repair. The plates exhibited impact damage at the waterline and were deformed 2 inches over a length of 18 inches. 10 anchors on the plate edges were missing or not engaged due to concrete deterioration.

12. Moderate scale, up to 2 inches deep, from waterline up 4 feet, east and west faces of Pier 3. Concrete was generally sound.

13. Severe scale, 6 feet long x 6 inches high x up to 9 inches deep, centered at waterline at west face of Pier 3.

14. Vertical crack, up to 3/8 inches wide above waterline, extending from top of cap down to waterline, at the midpoint of the east and west faces of Pier 3.

15. Light accumulation of timber debris consisting of 1 inch diameter branches was noted around the upstream nose of Pier 3, extending from the top of the apron repair up 1 foot.

GENERAL NOTES:

1. Piers 2 and 3 and the East Abutment were inspected underwater.

2. At the time of inspection on June 8, 2017 the waterline was located approximately 6.8 feet below the bottom of the pier cap at the downstream end of Pier 2. This corresponds with a waterline elevation of 73.7 feet according to design drawings dated 1994.

3. Soundings indicate the water depth at the time of inspection and are measured in feet.

4. Soundings were taken parallel to the bridge at 1/4 point intervals between the substructure units.

Legend

- Sounding Depth From Waterline (6/8/17)
- Sounding Depth Not Previously Taken

Note:

- Timber Debris

All soundings based on 2017 waterline location.

TYPICAL END VIEW OF PIER 2 & 3

MINNESOTA
DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION
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CITY OF SARTELL

INSPECTION AND SOUNDING PLAN