

UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 36503

CR NO. 145

OVER THE

RAT ROOT RIVER

DISTRICT 1 - KOOCHICHING COUNTY



PREPARED FOR THE
MINNESOTA DEPARTMENT OF TRANSPORTATION

BY
COLLINS ENGINEERS, INC.

JOB NO. 3512 (CEI 17)

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected at Bridge No. 36503, the East and West Abutments and Piers 1 and 2, were found to be in good to satisfactory condition. The timber piles exhibited moderate amounts of checking, splintering, cracking and deterioration. The cross bracing members exhibited an increase in deterioration since the previous inspection with instances of significant loss of section and cracking. The channel bottom exhibited a light to moderate accumulation of timber debris, and appeared to be stable with no significant scour or appreciable changes since the previous inspection.

INSPECTION FINDINGS:

- (A) The timber piles were generally in satisfactory to good condition with moderate 1/8 to 1/4 inch wide splitting or checking.
- (B) The north end of the pile cap at the West Abutment was rotated to the west, reducing its bearing on the outer two piles to the north side by up to 50 percent.
- (C) Many of the cross bracing members of both piers were cracked and broken with a significant loss of section, all of which has compromised pile connection integrity.
- (D) A light to moderate accumulation of timber debris was observed along the channel bottom between the East Abutment and Pier 2, and along Piers 1 and 2.

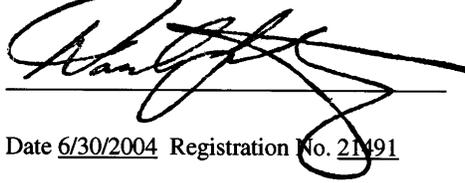
RECOMMENDATIONS:

- (A) The timber cross bracing members that exhibited cracking or loss of section should be repaired or replaced during routine maintenance.

- (B) Monitor the extent of the pile cap rotation at the West Abutment during future inspections and repair if bearing loss becomes excessive.
- (C) Monitor the extent of drift accumulation at the bridge during future inspections, and if found to be progressing, removal may be warranted at that time.
- (D) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

I hereby certify that this plan, specification, or 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.

Daniel G. Stromberg



A handwritten signature in black ink, appearing to read 'Dan G. Stromberg', is written over a horizontal line. Below the line, the date and registration number are printed.

Date 6/30/2004 Registration No. 21491

Respectfully submitted,

COLLINS ENGINEERS, INC.



A large, stylized handwritten signature in black ink, appearing to read 'Dan G. Stromberg', is written over a horizontal line.

Daniel G. Stromberg
Registered Professional
Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 36503

Feature Crossed: The Rat Root River

Feature Carried: CR No. 145

Location: District 1 - Koochiching County

Bridge Description: The superstructure consists of three spans of multiple timber stringers with a timber plank deck. The superstructure is supported by two timber pile abutments and two timber pile piers. The piers are numbered 1 and 2 from east to west.

2. INSPECTION DATA

Professional Engineer Diver: Daniel G. Stromberg
State of Minnesota, P.E., No. 21491

Dive Team: Michelle D. Koerbel, Matthew J. Lengyel

Date: August 25, 2002

Weather Conditions: Sunny, $\pm 85^{\circ}$ F

Underwater Visibility: ± 0.5 Feet

Waterway Velocity: ± 1 fps

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: East and West Abutments, and Piers 1 and 2.

General Shape: The abutments consist of seven ± 1 foot diameter timber piles with a square timber pile cap, timber lagging, and adjacent timber pile and lagging wingwalls. The piers consist of six ± 1 foot diameter timber piles with a square timber pile cap and timber cross bracing.

Maximum Water Depth at Substructure Inspected: Approximately 6.0 Feet.

4. WATERLINE DATUM

Water Level Reference: The top of the pile cap on the north end of the East Abutment.

Water Surface: The waterline was approximately 7.6 feet below reference.
Assumed Waterline Elevation = 92.4.

5. NBIS CODING INFORMATION (Minnesota specific codes are used for 92B and 113)

Item 60: Substructure: Code 6

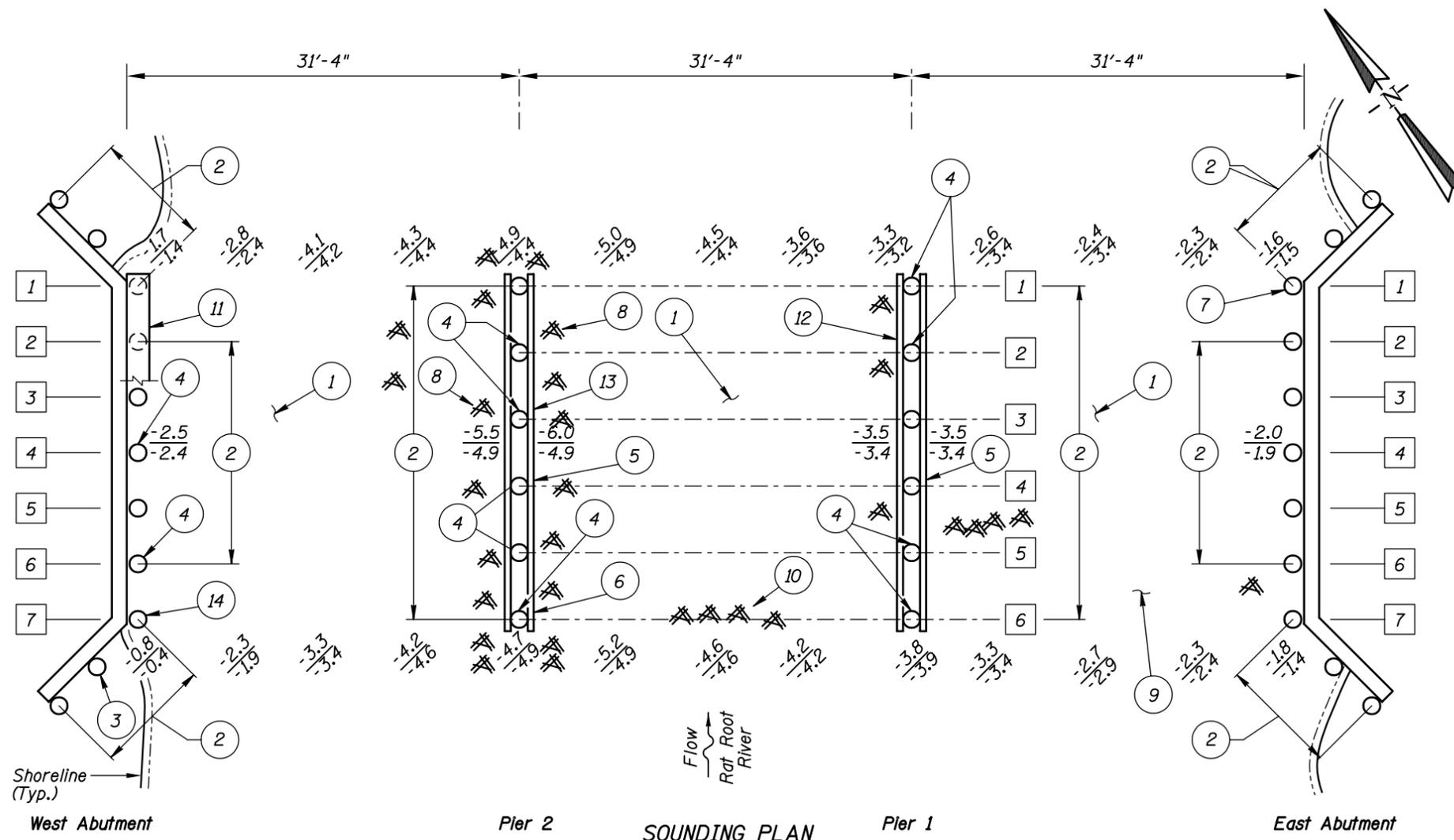
Item 61: Channel and Channel Protection: Code 7

Item 92B: Underwater Inspection: Code B/8/02

Item 113: Scour Critical Bridges: Code I/92

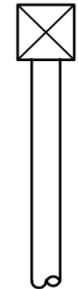
Bridge is scour critical because abutment or pier foundation is rated as unstable due to observed scour at bridge site.

_____ Yes X No



GENERAL NOTES:

1. The East and West Abutments, and Piers 1 and 2 were inspected underwater.
2. At the time of inspection, on August 25, 2002, the waterline was located approximately 7.6 feet below the top of the cap at the downstream end of the East Abutment. Since insufficient bridge elevation was available a reference elevation of 100.0 was assumed. Based on the assumed reference the waterline elevation was 92.4.
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.



TYPICAL END VIEW OF PIERS

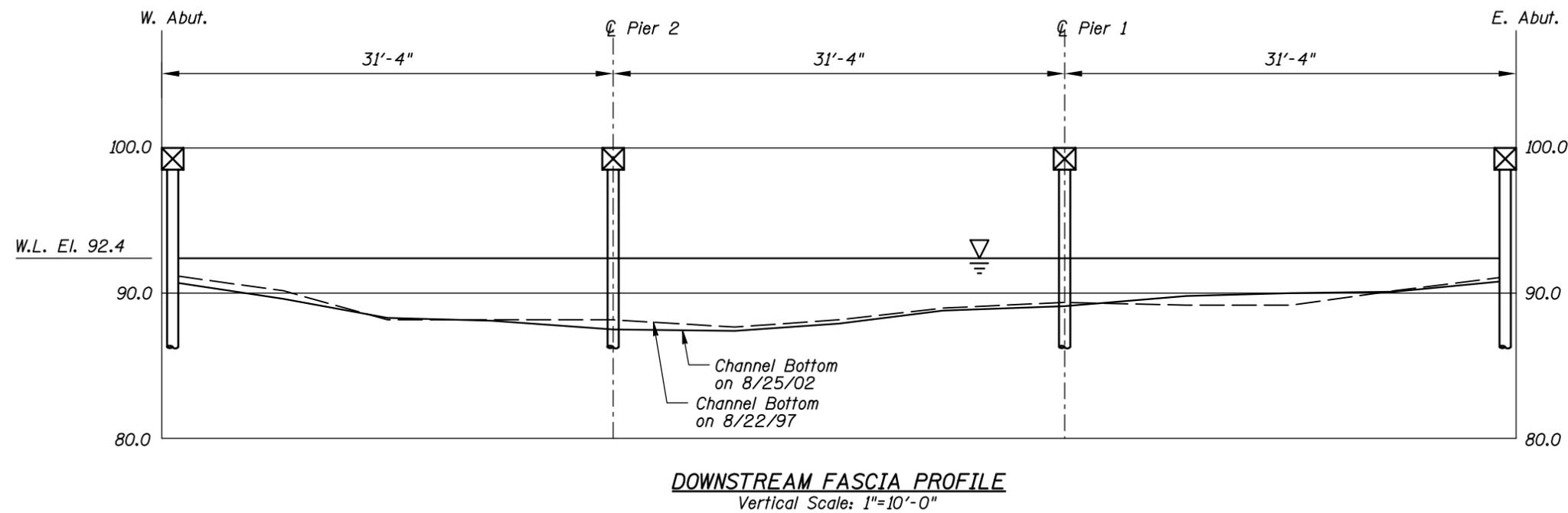
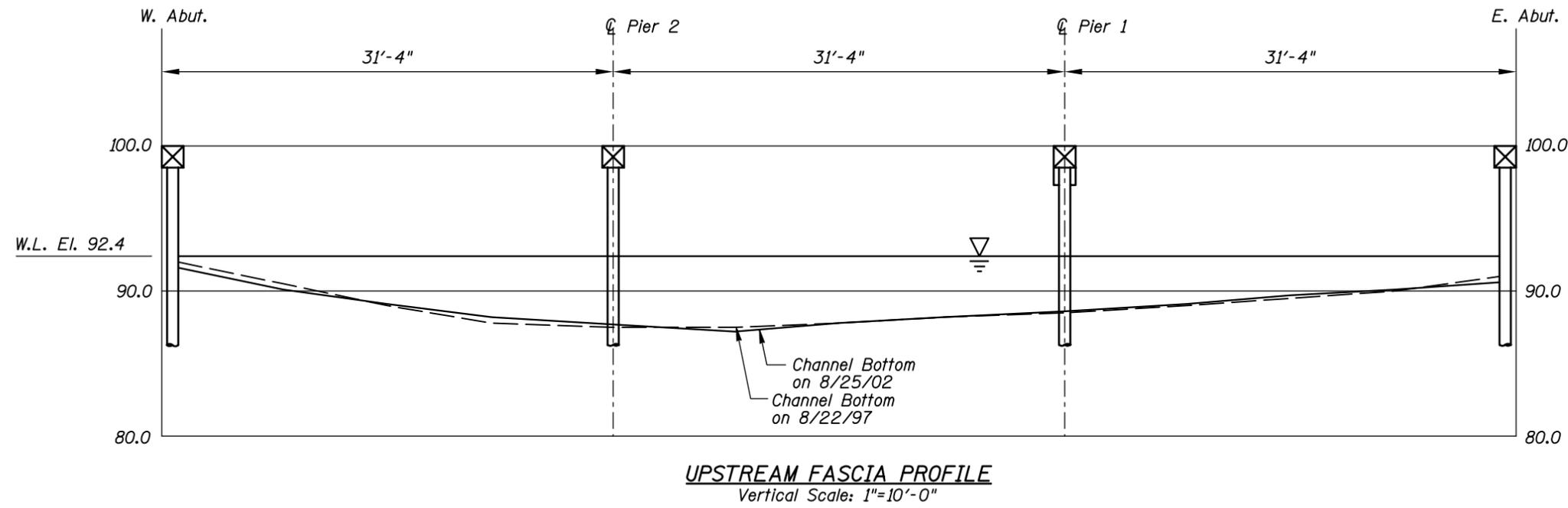
INSPECTION NOTES:

- | | |
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| <p>1 The channel bottom material consisted of soft silty clay with random rock, 1 foot in diameter and smaller, with 1 foot of probe rod penetration.</p> <p>2 All piles exhibited random checking 1/8 inch wide typical and 1/4 inch wide maximum unless otherwise noted.</p> <p>3 Timber pile with 1/2 inch wide crack from the top down 6 feet with 4 inches penetration.</p> <p>4 Timber pile from approximately 4 feet below the waterline or the mudline to 2 feet above the waterline exhibited a 10 inch wide to half the pile circumference wide area of splintering and delaminating with up to 1 inch penetration. (ice abrasion damage)</p> <p>5 Timber cross bracing missing section near waterline, up to 3 feet long, 3 inches deep, and 1 inch remaining timber to fastener, due to ice abrasion damage.</p> <p>6 Timber cross bracing exhibited up to 3 foot long split below fastener.</p> <p>7 Timber pile with 1 inch wide split from the top down 6 feet with penetration through 1/2 of the pile.</p> <p>8 Moderate timber drift accumulation from the waterline to the mudline was observed on the east side and upstream end of Pier 2. In addition, 1 to 2 feet of drift was observed on the channel bottom on the west side of Pier 2.</p> | <p>9 Light timber drift accumulation between East Abutment and Pier 1 hung up on cut off piles. In addition, light timber debris up to 6 inches in diameter was scattered around Pier 1.</p> <p>10 Light timber debris on the channel bottom was observed at the midspan between Piers 1 and 2 along the upstream fascia of the bridge.</p> <p>11 The pile cap over piles 1 and 2 was rotated slightly to the west, with some minor diagonal torsional cracking along the south side, and as a result cap was not bearing directly on up to 50 percent of the top of the piles.</p> <p>12 Half of the timber cross bracing was broken away and was missing. The section that was remaining and still attached was split and was no longer engaged to the fasteners of piles 1 and 2.</p> <p>13 Timber cross bracing had a 3 inch by 1-1/2 foot area of timber missing and the fastener from the pile was no longer engaged to the cross bracing.</p> <p>14 A 1/2 inch wide split with 4 inches of penetration, extending 3 feet down from the top of the pile.</p> |
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Legend

| | |
|------|-----------------------------------------|
| -2.0 | Sounding Depth from Waterline (8/25/02) |
| -5.2 | Sounding Depth from Waterline (8/22/97) |
| ○ | Timber Pile |
| ⊖ | Timber Pile |
| 5 | Pile Number Designation |
| ⚡ | Timber Debris |

| | | |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------|
| MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION | | |
| STRUCTURE NO. 36503 OVER THE RAT ROOT RIVER DISTRICT 1, KOOCHICHING COUNTY | | |
| INSPECTION AND SOUNDING PLAN | | |
| Drawn By: PRH | COLLINS ENGINEERS, INC. | Date: AUG. 2002 |
| Checked By: MDK | 300 W. WASHINGTON, STE. 600 CHICAGO, ILLINOIS 60606 (312) 704-9300 | Scale: NTS |
| Code: 35I200I7 | | Figure No.: 1 |



Note:
Refer to Figure 1 for General Notes.

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|------------------------------------------------------------------------------------|--------------------------------------------------------------------------|---------------------|
| MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION | | |
| STRUCTURE NO. 36503 OVER THE RAT ROOT RIVER DISTRICT 1, KOOSKICHING COUNTY | | |
| UPSTREAM AND DOWNSTREAM FASCIA PROFILES | | |
| Drawn By: PRH | COLLINS ENGINEERS, INC. | Date: AUG. 2002 |
| Checked By: MDK | 300 W. WASHINGTON, STE. 600 CHICAGO, ILLINOIS 60606 (312) 704-9300 | Scale: NTS (U.O.N.) |
| Code: 35I200I7 | | Figure No.: 2 |



Photograph 1. Overall View of the Structure, Looking West.



Photograph 2. View of Pier 1, Looking West.



Photograph 3. View of Pier 2, Looking South.



Photograph 4. View of Pile Cap Rotation at the West Abutment, Looking Southwest.



Photograph 5. View of Pile Cap Rotation at the East Abutment, Looking Southwest.



Photograph 6. View of Timber Drift at Pier 2, Looking West.



Photograph 7. View of Split in Timber Cross Bracing at Pier 1, Looking South



Photograph 8. View of Typical Delamination and Surface Softness Around Waterline at Upstream Pile of Pier 2, Looking East.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES
DAILY DIVING REPORT

INSPECTORS: Collins Engineers, Inc. DATE: August 25, 2002
ON-SITE TEAM LEADER: Daniel G. Stromberg, P.E.
BRIDGE NO: 36503 WEATHER: Sunny, ± 85° F
WATERWAY CROSSED: The Rat Root River
DIVING OPERATION: X SCUBA SURFACE SUPPLIED AIR
OTHER

PERSONNEL: Michelle D. Koerbel, Matthew J. Lengyel
EQUIPMENT: Scuba, U/W Light, Scraper, Lead Line, Probe Rod, Camera
TIME IN WATER: 3:15 P.M.
TIME OUT OF WATER: 4:00 P.M.
WATERWAY DATA: VELOCITY ± 1.0 fps
VISIBILITY ± 0.5 feet
DEPTH 6.0 Feet maximum at Pier 2

ELEMENTS INSPECTED: East and West Abutments and Piers 1 and 2

REMARKS: Overall, timber piles of all substructure units and planking of abutment backwalls and wingwalls were in good, sound and firm condition below water with random areas of up to 1/4 inch wide checking or splitting with related minor splintering. Most piles exhibited delaminating and minor section loss up to 1 inch deep at surfaces around the waterline due to ice abrasion. Above water, some of the pile checking and splitting was larger. Timber bracing members often had cracks and significant loss of section, at times affecting pile connections. Light to moderate drift accumulations were present along both piers, in and around the piles.

FURTHER ACTION NEEDED: X YES _____ NO

The timber cross bracing members that exhibited cracking or loss of section should be repaired or replaced during routine maintenance.

Monitor the extent of the pile cap rotation at the West Abutment during future inspections and repair if bearing loss becomes excessive.

Monitor the drift accumulations at the bridge during future inspections, and if found to be progressing, removal may be warranted at that time.

Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 36503
INSPECTORS Collins Engineers, Inc.
ON-SITE TEAM LEADER Daniel G. Stromberg, P.E. 21491
WATERWAY CROSSED The Rat Root River

INSPECTION DATE August 25, 2002
NOTE: USE ALL APPLICABLE CONDITION DEFINITIONS AS DEFINED IN THE MINNESOTA RECORDING AND CODING GUIDE INCLUDING GENERAL, SUBSTRUCTURE, CHANNEL AND PROTECTION, AND CULVERTS AND WALL DEFINITIONS TO COMPLETE THIS FORM.

CONDITION RATING

| UNIT REFERENCE NO. | UNIT DESCRIPTION | MAXIMUM DEPTH OF WATER | SUBSTRUCTURE | | | | | CHANNEL | | | | | GENERAL | | | | | | |
|--------------------|------------------|------------------------|--------------|----------------------------|----------|--------------|-----------------|--------------------------------------|-------|--------------------|-----------------------|----------------------|----------------------------------------|----------|-------|--------|-----------------|--------------------------------|-------|
| | | | PILING | COLUMNS, SHAFTS, OR FACES* | FOOTINGS | DISPLACEMENT | OTHER (BRACING) | OVERALL SUBSTRUCTURE CONDITION CODE* | SCOUR | EMBANKMENT EROSION | EMBANKMENT PROTECTION | OTHER (DRIFT/DEBRIS) | OVERALL CHANNEL & PROTECTION CONDITION | CONCRETE | STEEL | TIMBER | LOSS OF SECTION | PREVIOUS REPAIR OR MAINTENANCE | OTHER |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | East Abutment | 2.0' | 7 | N | N | 8 | N | 7 | 8 | 8 | N | 8 | 8 | N | N | 7 | 7 | N | N |
| | Pier 1 | 3.8' | 6 | N | N | 8 | 4 | 6 | 8 | N | N | 7 | 7 | N | N | 6 | 6 | N | N |
| | Pier 2 | 6.0' | 6 | N | N | 8 | 4 | 6 | 8 | N | N | 6 | 6 | N | N | 6 | 6 | N | N |
| | West Abutment | 2.5' | 7 | N | N | 6 | N | 6 | 8 | 8 | N | 8 | 8 | N | N | 7 | 7 | N | N |

*UNDERWATER PORTION ONLY

REMARKS: Overall, timber piles of all substructure units and planking of abutment backwalls and wingwalls were in good, sound and firm condition below water with random areas of up to 1/4 inch wide checking or splitting with related minor splintering. Most piles exhibited delaminating and minor section loss up to 1 inch deep at surfaces around the waterline due to ice abrasion. Above water, some of the pile checking and splitting was larger. Timber bracing members often had cracks and significant loss of section, at times affecting pile connections. Light to moderate drift accumulations were present along both piers, in and around the piles.

NOTES: ATTACH SKETCHES AS NEEDED, IDENTIFY REMARK BY REFERRING TO UNIT REFERENCE NO. AND REMARK NO. USE GENERAL SECTION TO IDENTIFY OVERALL PRESENCE OF SPALLS, CRACKS, CORROSION, ETC.