

UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. L9465

UTR NO. 9

OVER THE

EAST FORK OF THE RAPID RIVER

DISTRICT 1 - KOOCHICHING COUNTY



PREPARED FOR THE
MINNESOTA DEPARTMENT OF TRANSPORTATION

BY
COLLINS ENGINEERS, INC.

JOB NO. 5221 (CEI 21)

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected below water at Bridge No. L9465, Piers 1 through 4, were found generally to be in mostly satisfactory to somewhat poor condition. The weathering and 1/8 inch to 1 inch wide random checking and/or splitting observed on all timber piles has progressed since the previous inspection, but still has not appreciably compromised the structural integrity of the piles. A rather heavy accumulation of timber debris was observed along Piers 1 through 4 and in the channel between the piers. Since the previous inspection, the timber debris extent has increased considerably and has caused a restriction of the channel, which has in turn caused increased flow and erosion at the west bank. Otherwise, the channel bottom has remained mostly stable with no evidence of significant scour observed or significant changes since the last inspection.

INSPECTION FINDINGS:

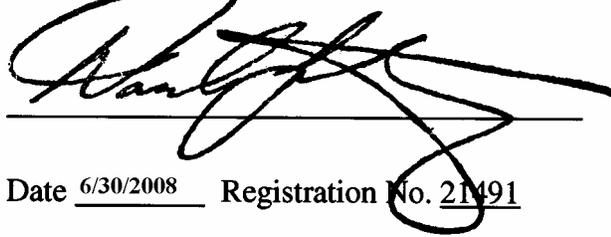
- (A) A very heavy accumulation of timber debris was observed along Piers 1 through 4 and in the channel upstream of the piers extending 40 feet upstream. The debris has restricted the channel flow, causing increased flow and an erosion pocket to form along the west bank. In addition, the drift has the potential to exert considerable lateral load on the bridge during a period of high flow.
- (B) In general, minor deterioration was observed on all timber piles and consisted of widespread weathering and 1/8 to 1/4 inch wide checking.
- (C) Above water, especially near their tops, random piles exhibited more significant checking and splitting up to 1 inch wide with a maximum penetration of half the pile diameter.
- (D) The cross-bracing at the upstream end of Pier 3 was heavily damaged and split and had no connection to the upstream pile. The first upstream pile of Pier 3 has been dislodged due to lateral loads coming from the timber debris.

RECOMMENDATIONS:

- (A) Remove the very heavy accumulation of timber debris at Piers 1 through 4 and between the spans to eliminate the potential for continued accumulation, scour influence, and excessive lateral loads on bridge.
- (B) Repair and replace the damaged cross-bracing and connection at upstream pile of Pier 3. Restore or replace the dislodged upstream pile at Pier 3 also.
- (C) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years. However, until timber debris can be removed closely monitor structure during and after any significant high flow event.

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

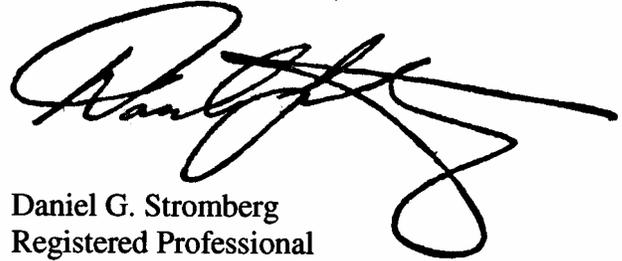


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Date 6/30/2008 Registration No. 21491

Respectfully submitted,

COLLINS ENGINEERS, INC.



A large, stylized handwritten signature in black ink, appearing to read 'Daniel 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: L9465

Feature Crossed: East Fork of the Rapid River

Feature Carried: UTR NO. 9

Location: District 1 - Koochiching County

Bridge Description: The bridge superstructure consists of five spans of timber deck and stringers. The superstructure is supported by two timber pile abutments and four timber pile piers. The piers are numbered 1 through 4 started from the east end of the bridge.

2. INSPECTION DATA

Professional Engineer Diver: Daniel G. Stromberg, P.E., S.E.

Dive Team: John J. Loftus, Valerie Roustan

Date: August 26, 2007

Weather Conditions: Sunny, 46° F

Underwater Visibility: None / Negligible

Waterway Velocity: None / Negligible

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: Piers 1 through 4.

General Shape: Each pier consists of a single row of five timber piles under a common pile cap and interconnected by timber cross bracing.

Maximum Water Depth at Substructure Inspected: Approximately 2.4 feet.

4. WATERLINE DATUM

Water Level Reference: The top of the pile cap at downstream end of Pier 3.

Water Surface: The waterline was approximately 12.6 feet below reference.
Waterline Elevation = 90.6.

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 5

Item 92B: Underwater Inspection: Code B/08/07

Item 113: Scour Critical Bridges: Code K/95

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

 Yes X No



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



Photograph 2. View of Pier 1 and Embankment, Looking East.



Photograph 3. View of Pier 2, Looking Southeast.



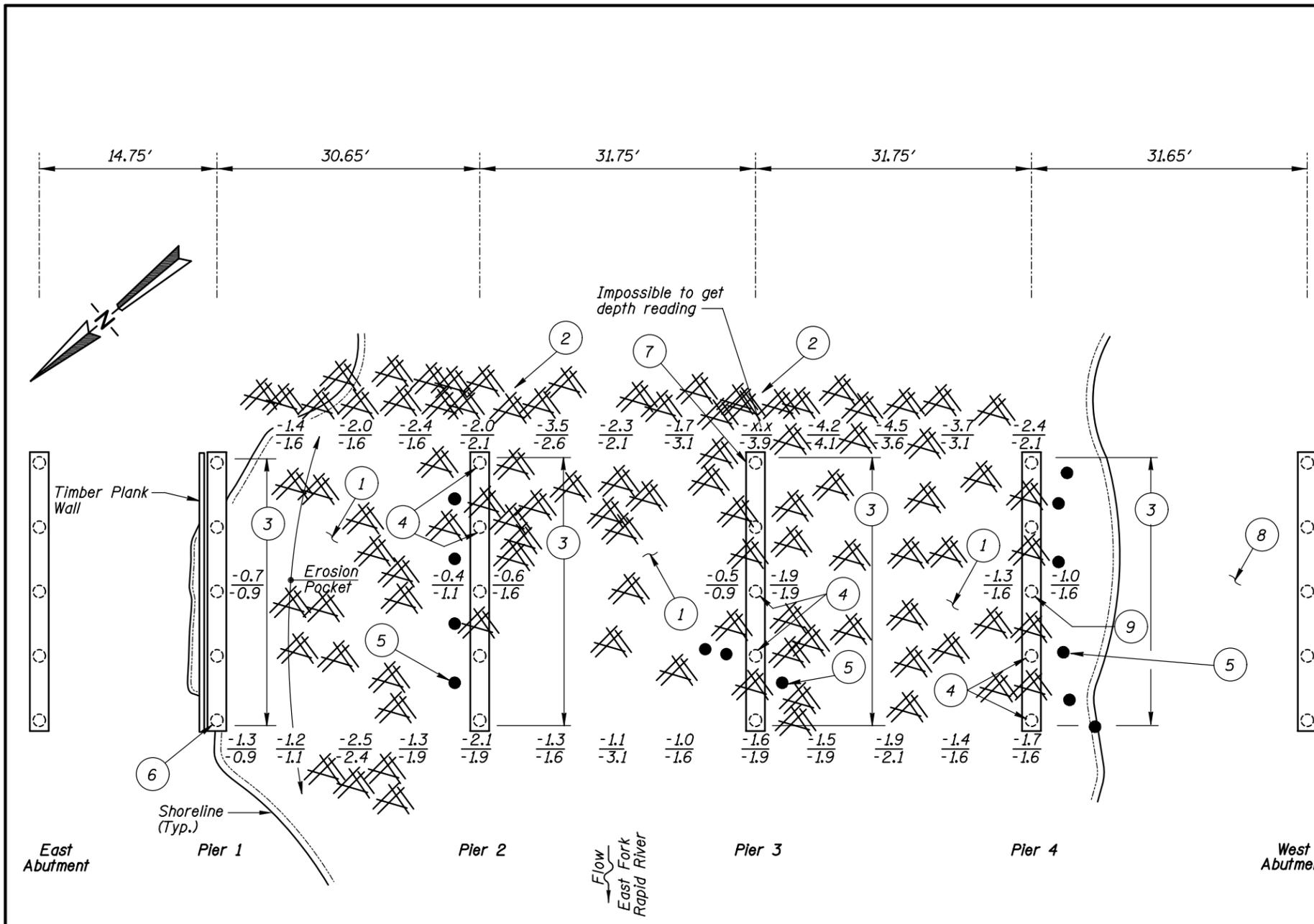
Photograph 4. View of Pier 3, Looking Southeast. Note Dislodged Upstream Pile.



Photograph 5. View of Pier 4, Looking Southeast.



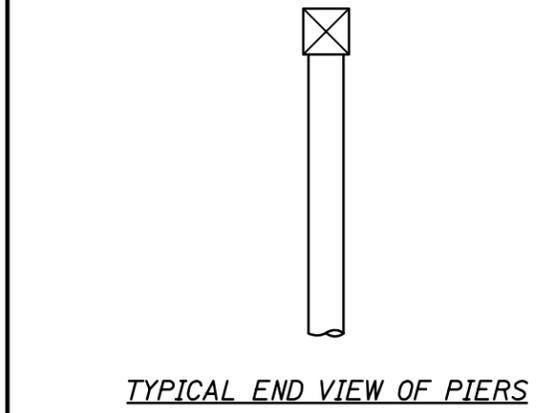
Photograph 6. View of the upstream pile of Pier 3 (dislodged), Looking East.



SOUNDING PLAN

East Abutment Pier 1 Pier 2 Pier 3 Pier 4 West Abutment

Flow
East Fork
Rapid River



Note:
All soundings based on 2007 waterline location.

Legend

-3.0	Sounding Depth (8/26/07)
-2.8	Sounding Depth (8/24/02)
○	Timber Pile
●	Old Cut-off Pile Left In Place
⊗	Timber Debris

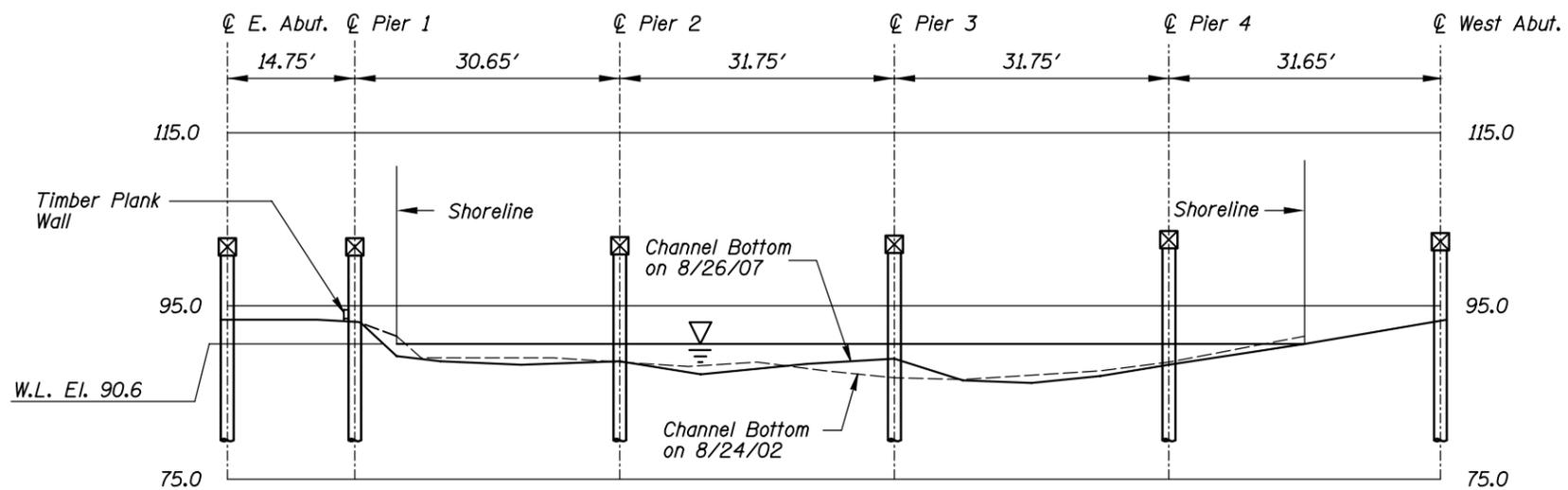
GENERAL NOTES:

1. Piers 1 through 4 were inspected underwater.
2. At the time of inspection on August 26, 2007, the waterline was located approximately 12.6 feet below the top of pier cap at downstream end of Pier 3. This corresponds to a waterline elevation of 90.6 feet.
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.

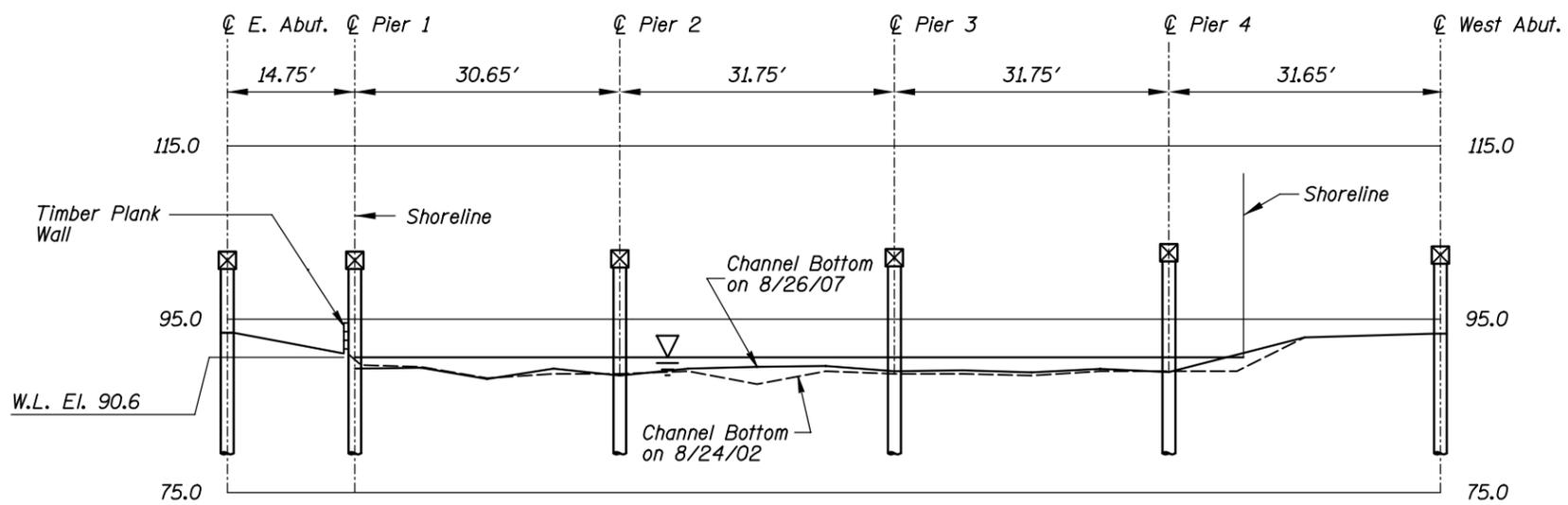
INSPECTION NOTES:

- 1 The channel bottom consisted of approximately 1 foot of soft organic material and twigs overlaying a firm silty clay with probe rod penetrations of 6 inches.
- 2 Very heavy accumulation of timber debris was observed along and between Piers 1 through 4, and in the channel upstream of the piers extending 40 feet upstream. The debris has restricted the channel flow causing increased flow and erosion pocket to form in the channel to the west of Pier 1. The debris extends from channel bottom up to 3 to 6 feet above the waterline (heaviest at Bent 3).
- 3 Minor deterioration was randomly observed on all timber piles consisting of weathering and 1/8 to 1/4 inch wide checking.
- 4 Above water, especially near their tops, indicated piles exhibited heavier checking and splitting from 1/2 to 1 inch wide with a maximum penetration of half the pile diameter.
- 5 Piles cut off above the waterline were observed typically extending 1 foot above the waterline with some extending up to the pile cap.
- 6 Moderate deterioration (splintering and delamination) along a 2 inch wide strip from channel bottom to 2 feet above waterline, with 1/2 inch penetration and another 1 inch of soft timber.
- 7 The cross bracing was heavily damaged and split and no longer connected to the upstream pile of Pier 3. The debris has dislodged first upstream pile, and now debris and pile are coming up against the second upstream pile of Pier 3.
- 8 Erosion of shoreline was observed along the west shoreline. However, the shoreline armour consisted of 3 feet diameter riprap was still in place along the shoreline.
- 9 At Bent 4, the middle pile showed a 1 inch wide check from 2 feet above waterline to the top of the pile.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. L9465 OVER THE EAST FORK OF THE RAPID RIVER DISTRICT 1, KOOCHICHING COUNTY		
INSPECTION AND SOUNDING PLAN		
Drawn By: RR	COLLINS ENGINEERS	Date: AUG. 2007
Checked By: MDK	<small>133 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Scale: NTS
Code: 52210021		Figure No.: 1



UPSTREAM FASCIA PROFILE



DOWNSTREAM FASCIA PROFILE

Note:
Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. L9465 OVER THE EAST FORK OF THE RAPID RIVER DISTRICT 1, KOOCHICHING COUNTY		
UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
Drawn By: RR	COLLINS ENGINEERS <small>123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: AUG. 2007
Checked By: MDK		Scale: 1"=20'
Code: 52210021		Figure No.: 2

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

INSPECTORS: Collins Engineers, Inc. DATE: August 26, 2007

ON-SITE TEAM LEADER: Daniel G. Stromberg, P.E., S.E.

BRIDGE NO: L9465 WEATHER: Sunny, 46° F

WATERWAY CROSSED: East Fork of the Rapid River

DIVING OPERATION: SCUBA SURFACE SUPPLIED AIR
 OTHER Wading also due to low water levels

PERSONNEL: John J. Loftus, Valerie Roustan

EQUIPMENT: Scuba, Scraper, Lead Line, Sounding Pole, Probe Rod, Camera

TIME IN WATER: 9:45 a.m.

TIME OUT OF WATER: 10:10 a.m.

WATERWAY DATA: VELOCITY None / Negligible

VISIBILITY None / Negligible

DEPTH 2.4 feet maximum at Pier 4

ELEMENTS INSPECTED: Piers 1 through 4

REMARKS: Timber piles and bracing of Piers 1 through 4 were in satisfactory condition with no defects of any structural significance below water. In general, the timber deterioration observed consisted of weathering and 1/8 inch to 1/4 inch wide checking. Above water especially near tops, the pile checking or splitting was up to 1 inch wide with penetration of up to 1/2 the pile diameter. The cross bracing at the upstream end of Pier 3 was heavily damaged and split and had no connection to the upstream pile, and the first upstream pile has been dislodged due to lateral loads coming from the timber debris. A very heavy accumulation of timber debris was present on the upstream side of Piers 1 through 4. The accumulations of timber debris were present from the channel bottom to 8 feet above the waterline around all of the piers and between the spans. There was an erosion pocket to the west of Pier 1 caused by flow being directed there by the drift restricting flow through the bridge. The drift also has the potential to exert considerable lateral loads on bridge piers during high flow event

FURTHER ACTION NEEDED: X YES NO

Remove the very heavy accumulation of timber debris at Piers 1 through 4 and between the spans to eliminate the potential for continued accumulation, scour influence, and excessive lateral loads on bridge.

Repair and replace the damaged cross-bracing and connection at upstream pile of Pier 3. Restore or replace the dislodged upstream pile at Pier 3 also.

Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years. However, until timber debris can be removed closely monitor structure during and after any significant high flow event.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. L9465
 INSPECTORS Collins Engineers, Inc.
 ON-SITE TEAM LEADER Daniel G. Stromberg, P.E., S.E.
 WATERWAY CROSSED East Fork of the Rapid River

INSPECTION DATE August 26, 2007
 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
	Pier 1	1.3'	6	N	N	9	7	6	6	6	N	5	5	N	N	6	N	N	N
	Pier 2	2.1'	6	N	N	9	7	6	8	N	N	5	5	N	N	6	N	N	N
	Pier 3	1.9'	4	N	N	9	4	4	8	N	N	5	5	N	N	4	N	N	N
	Pier 4	2.4'	6	N	N	9	7	6	8	7	8	5	5	N	N	6	N	N	N

*UNDERWATER PORTION ONLY

REMARKS: Timber piles and bracing of Piers 1 through 4 were in satisfactory condition with no defects of any structural significance below water. In general, the timber deterioration observed consisted of weathering and 1/8 inch to 1/4 inch wide checking. Above water especially near tops, the pile checking or splitting was up to 1 inch wide with penetration of up to 1/2 the pile diameter. The cross bracing at the upstream end of Pier 3 was heavily damaged and split and had no connection to the upstream pile, and the first upstream pile has been dislodged due to lateral loads coming from the timber debris. A very heavy accumulation of timber debris was present on the upstream side of Piers 1 through 4. The accumulations of timber debris were present from the channel bottom to 8 feet above the waterline around all of the piers and between the spans. There was an erosion pocket to the west of Pier 1 caused by flow being directed there by the drift restricting flow through the bridge. The drift also has the potential to exert considerable lateral loads on bridge piers during high flow event

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.