

UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. L0885
TWP NO. 970
OVER THE
OTTER TAIL RIVER
DISTRICT 4 - OTTER TAIL COUNTY



PREPARED FOR THE
MINNESOTA DEPARTMENT OF TRANSPORTATION
BY
COLLINS ENGINEERS, INC.
JOB NO. 5221 (CEI 64)

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected at Bridge No. L0885, the East and West Abutments, and the Center Pier, were in fair to poor condition. Since the 1997 inspection, the bridge has been closed to vehicular traffic and is only used as a pedestrian walkway. Both abutments exhibited several cracks and areas of section loss with sections of exposed reinforcing steel. The Center Pier exhibited widespread coating failure and light surface corrosion. In addition, the Center Pier was visibly settling toward the north and the south caisson's steel shell exhibited a 1/4-inch gap below water due to a missing rivet. The channel bottom appeared stable with no evidence of significant scour and no appreciable changes since the previous inspection.

INSPECTION FINDINGS:

- (A) The south caisson of the Center Pier had a rivet missing below water, causing a 1/4-inch-wide by 1-foot-long gap in the steel caisson shell. Additionally, one steel cross brace between the two caissons was bent out-of-plane. It was also observed that the Center Pier has overall settled noticeably towards the north.
- (B) The Center Pier caissons exhibited 100 percent coating failure and minor surface corrosion from 1 foot above the waterline to the channel bottom.
- (C) The West Abutment breastwall exhibited random vertical hairline to 1/16 inch wide cracking and widespread moderate to heavy scaling with some exposed reinforcing steel.

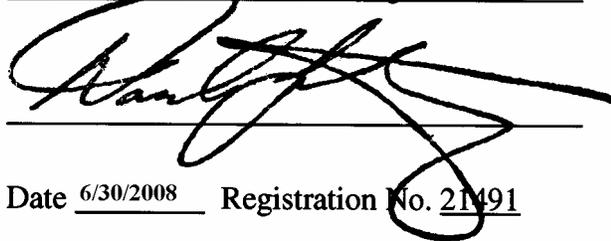
- (D) The East Abutment breastwall exhibited vertical cracking up to 1/2 inch wide and three spalled areas with some exposed reinforcing steel. The spalls were each no larger than 3 square feet in area and located near the ground line.
- (E) A horizontal crack with a maximum width of 3/4 inch extended the full length of the South Wingwall of the East Abutment at 4.5 feet above the ground line.

RECOMMENDATIONS:

- (A) It is recommended that the bridge remain closed to vehicular traffic. Monitor the settlement rate of the Center Pier during future inspections, preferably at a minimum interval of one (1) year during above water inspections. If settlement is continuing and is adversely affecting the stability of the structure, measures to stabilize the bridge may be warranted.
- (B) Reinspect the submerged substructure units underwater at the normal maximum recommended (NBIS) interval of five (5) years; unless the above water inspection reveals significant changes that would warrant an earlier underwater inspection.

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.

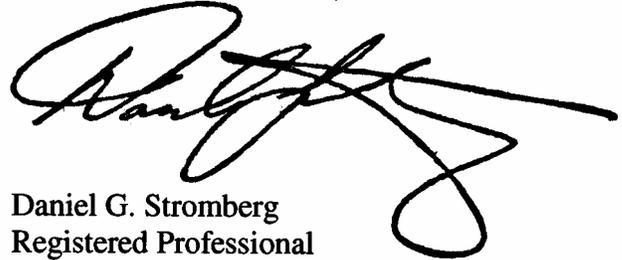
Daniel G. Stromberg



Date 6/30/2008 Registration No. 21491

Respectfully submitted,

COLLINS ENGINEERS, INC.



Daniel G. Stromberg
Registered Professional
Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: L0885

Feature Crossed: Otter Tail River

Feature Carried: TWP No. 970

Location: District 4 - Otter Tail County

Bridge Description: The superstructure consists of two steel pony truss spans supporting a timber deck. The superstructure is supported by two reinforced concrete abutments and a center pier consisting of two steel shell caissons. The abutment foundation information was not available, and no design drawings were provided. The bridge is oriented in an east/west direction, and a dam is located approximately 20 feet downstream.

2. INSPECTION DATA

Professional Engineer/Team Leader: Daniel G. Stromberg, P.E., S.E.

Dive Team: Denis Redzic, Valerie Roustan

Date: September 17, 2001

Weather Conditions: Cloudy, 62°F

Underwater Visibility: 8.0 feet

Waterway Velocity: 3.0 f.p.s.

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: West and East Abutments, and Center Pier

General Shape: The Center Pier consists of two concrete filled steel shell caissons tied together with two horizontal steel diaphragms, one each above and below water, and two steel turnbuckle cross bracing rods. The reinforced concrete abutments each consist of a breastwall and two wingwalls. Stone masonry retaining walls extend from the north wingwalls along both banks.

Maximum Water Depth at Substructure Inspected: Approximately 8.0 feet.

4. WATERLINE DATUM

Water Level Reference: The top of the steel cap on the north caisson of the Center Pier.

Water Surface: The waterline was approximately 6.0 feet below the reference.

Assumed Waterline Elevation = 94.0.

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 8

Item 92B: Underwater Inspection: Code B/09/07

Item 113: Scour Critical Bridges: Code I/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 Southeast.



Photograph 2. View of East Abutment, Looking Northeast.



Photograph 3. View of Horizontal Crack in Southeast Wingwall, Looking East.



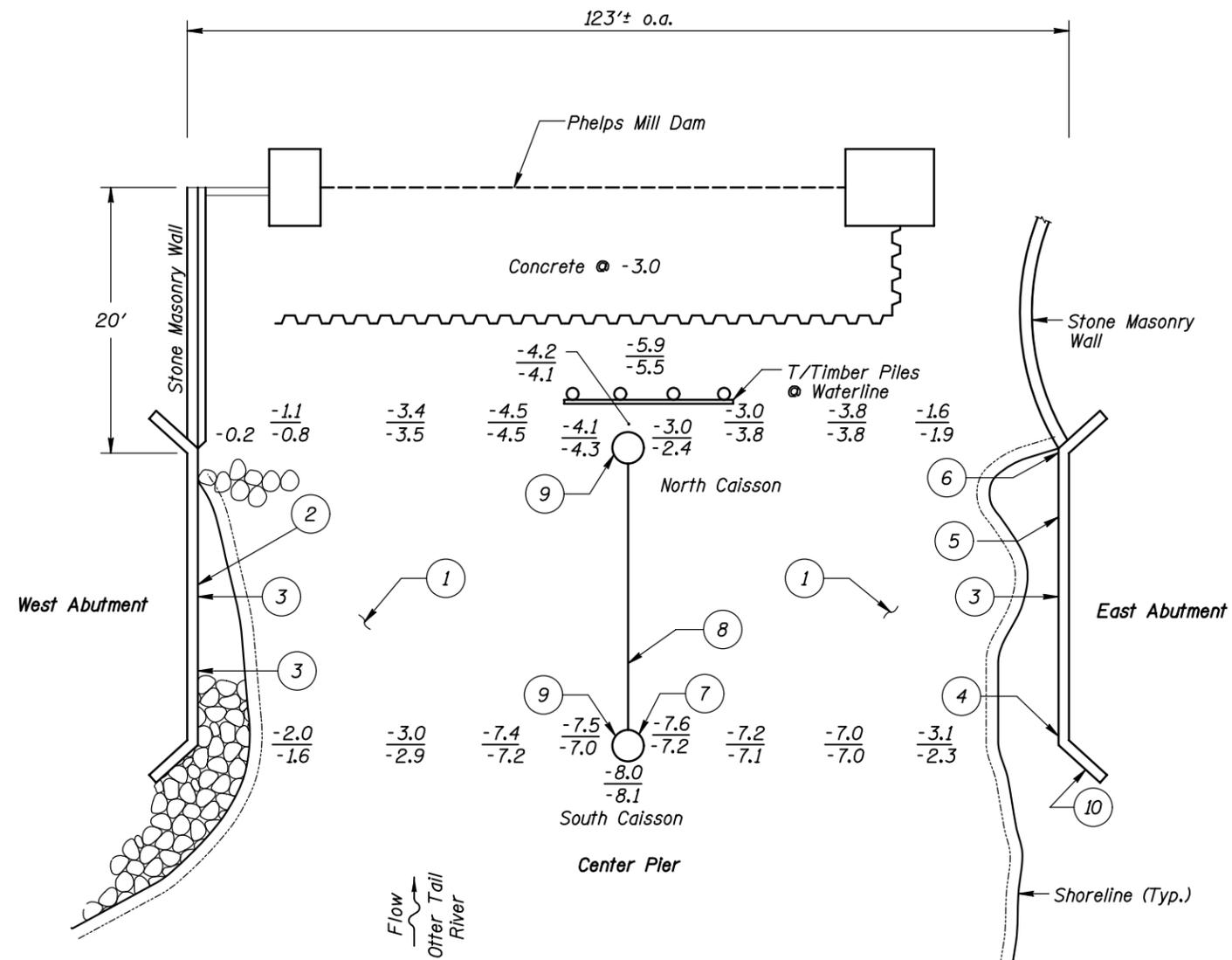
Photograph 4. View of the Center Pier, Looking Northeast.



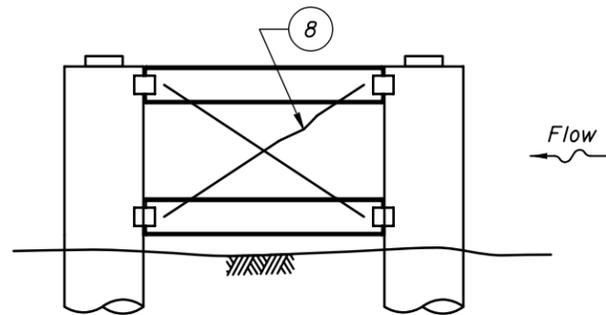
Photograph 5. View of the West Abutment, Looking Northwest.



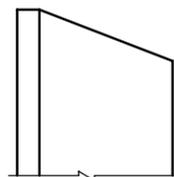
Photograph 6. View of Scaling and Exposed Rebar at the south corner of the West Abutment, Looking Northwest.



SOUNDING PLAN



TYPICAL ELEVATION OF CAISSONS



TYPICAL END VIEW OF ABUTMENTS

GENERAL NOTES:

1. The West Abutment and the Center Pier were inspected underwater. Since the East Abutment (dry for this inspection) can also be submerged at times, it was also inspected.
2. At the time of inspection on September 17, 2007, the waterline was located approximately 6.0 feet below the top of the steel cap on the downstream caisson at the Center Pier. Since insufficient bridge elevation information was available a reference elevation of 100.0 was assumed. Based on the assumed reference, the waterline elevation was 94.0.
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 material consisted of sandy gravel and scattered 12 inch diameter riprap with 1 to 4 inches of probe rod penetration.
- 2 Approximately 50 percent of the abutment breastwall was covered with 1 inch deep scaling with some areas of exposed reinforcing steel.
- 3 Vertical crack, hairline to 1/16 inch wide, was present extending the full abutment height.
- 4 Vertical crack, 1/2 maximum width, was present extending the full abutment height. In addition, a spall, 1.5 feet wide by 2 feet high with 3 inches of penetration was present at the groundline.
- 5 Vertical crack, 1/16 inch maximum width, was present extending the full abutment height. In addition, a 10 inch diameter spall with 2 inches of penetration was present at the groundline.
- 6 Vertical crack, 1/2 inch maximum width, was present extending the full abutment height. Two spalls with exposed reinforcing steel were also present. One spall was 1.5 feet high by 1.5 feet wide with 6 inches of penetration and was at the groundline. The other spall was 0.5 feet high by 1 foot wide with 2 inches of penetration and was 2.5 feet above the groundline.
- 7 Missing rivet at 11.5 feet below the top of the caisson, causing a 1/4 inch wide by 1 foot long gap in the steel caisson shell.
- 8 Cross bracing extending from the top of the south caisson to the bottom of the north caisson exhibited a minor vertical bend/distortion.
- 9 Both caissons of the Center Pier exhibited 100 percent of coating failure and minor surface corrosion from 1 foot above the waterline to the channel bottom. Overall, the Center Pier also exhibited a detectable differential settlement to the north.
- 10 A horizontal crack, 3/4 inch maximum width, extended the length of wingwall 4.5 feet above the groundline.

Legend

- 2.0 Sounding Depth (9/17/07)
- 5.2 Sounding Depth (10/29/02)

Riprap

Note:

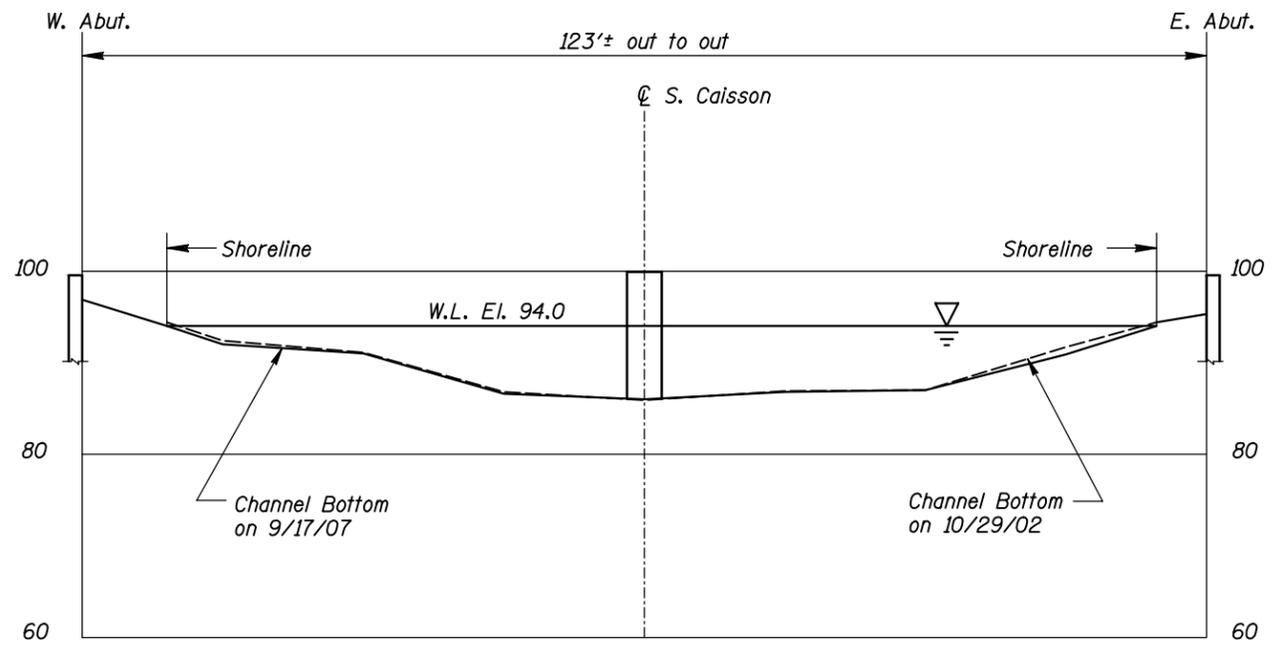
All soundings based on 2007 waterline location.

**MINNESOTA
DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION**

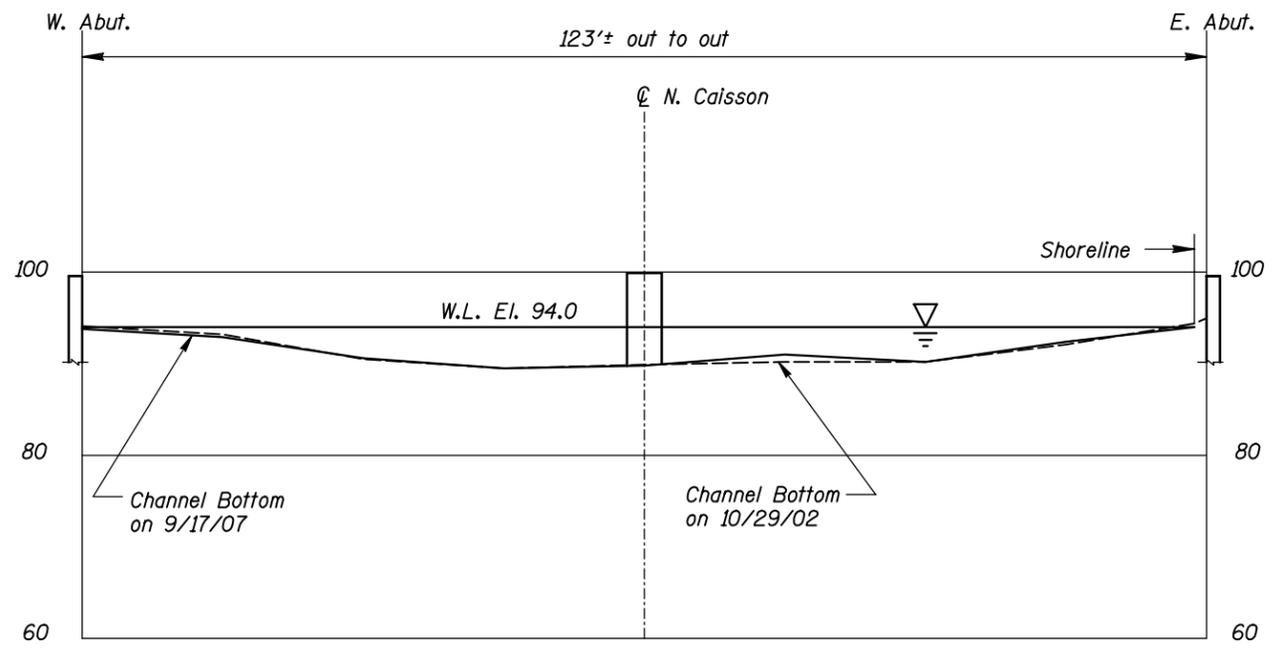
STRUCTURE NO. L0885
OVER THE OTTER TAIL RIVER
DISTRICT 4, OTTER TAIL COUNTY

INSPECTION AND SOUNDING PLAN

Drawn By: PRH	COLLINS ENGINEERS	123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com	Date: SEPT. 2007 Scale: NTS Figure No.: 1
Checked By: MDK			
Code: 52210064			



UPSTREAM FASCIA PROFILE
Vertical Scale: 1"=20'-0"



DOWNSTREAM FASCIA PROFILE
Vertical Scale: 1"=20'-0"

Note:
Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. L0885 OVER THE OTTER TAIL RIVER DISTRICT 4, OTTER TAIL COUNTY		
UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
Drawn By: PRH	COLLINS ENGINEERS <small>123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: SEPT. 2007
Checked By: MDK		Scale: NTS (U.O.N.)
Code: 52210064		Figure No.: 2

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

INSPECTORS: Collins Engineers, Inc. DATE: September 17, 2007

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

BRIDGE NO: L0885 WEATHER: Cloudy, 62°F

WATERWAY CROSSED: Otter Tail River

DIVING OPERATION: SCUBA SURFACE SUPPLIED AIR
 OTHER

PERSONNEL: Denis Redzic, Valerie Roustan

EQUIPMENT: Scuba, U/W Light, Scraper, Sounding Pole, Lead Line, Probe Rod, Camera

TIME IN WATER: 3:20 p.m.

TIME OUT OF WATER: 3:50 p.m.

WATERWAY DATA: VELOCITY 3.0 f.p.s.

VISIBILITY 8.0 feet

DEPTH 8.0 Feet maximum at the Center Pier

ELEMENTS INSPECTED: East Abutment, West Abutment, and Center Pier

REMARKS: Since the 1997 inspection, the bridge has been closed to vehicular traffic and is only used as a pedestrian walkway. The steel surfaces of the Center Pier exhibited 100 percent coating failure and minor surface corrosion from 1 foot above the waterline to the channel bottom. One rivet was missing from the south caisson, resulting in a 1/4- inch-wide gap in the steel shell, and one of the steel turnbuckle cross-bracing rods was bent out of the plane. Overall, the Center Pier was settling unevenly toward the north. The settlement was readily detectable, and was the reason for the overall poor rating for the pier. Both abutments were in satisfactory to fair condition, exhibiting cracks, moderate to heavy scaling, and spalls with exposed reinforcing steel. The channel bottom appeared stable with no evidence of significant scour or appreciable changes since the previous inspection.

FURTHER ACTION NEEDED: YES NO

It is recommended that the bridge remain closed to vehicular traffic. Monitor the settlement rate of the Center Pier during future inspections, preferably at a minimum interval of one (1) year during above water inspections. If settlement is continuing and is adversely affecting the stability of the structure, measures to stabilize the bridge may be warranted.

Reinspect the submerged substructure units underwater at the normal maximum recommended (NBIS) interval of five (5) years; unless the above water inspection reveals significant changes that would warrant an earlier underwater inspection.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. L0885
 INSPECTORS Collins Engineers, Inc.
 ON-SITE TEAM LEADER Daniel G. Stromberg, P.E., S.E.
 WATERWAY CROSSED Otter Tail River

INSPECTION DATE September 17, 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 RODS)	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
	West Abutment	0.2'	N	6	N	7	N	6	8	8	8	N	8	6	N	N	6	N	N
	Center Pier	8.0'	N	5	N	4	5	4	8	N	N	N	8	5	5	N	7	N	N

*UNDERWATER PORTION ONLY

REMARKS: Since the 1997 inspection, the bridge has been closed to vehicular traffic and is only used as a pedestrian walkway. The steel surfaces of the Center Pier exhibited 100 percent coating failure and minor surface corrosion from 1 foot above the waterline to the channel bottom. One rivet was missing from the south caisson, resulting in a 1/4- inch-wide gap in the steel shell, and one of the steel turnbuckle cross-bracing rods was bent out of the plane. Overall, the Center Pier was settling unevenly toward the north. The settlement was readily detectable, and was the reason for the overall poor rating for the pier. Both abutments were in satisfactory to fair condition, exhibiting cracks, moderate to heavy scaling, and spalls with exposed reinforcing steel. The channel bottom appeared stable with no evidence of significant scour or appreciable changes since the previous inspection.

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.