2017 UNDERWATER
BRIDGE INSPECTION REPORT

BRIDGE # 33506
CSAH 8 over KNIFE RIVER

DISTRICT: District 3 **COUNTY:** Kanabec **CITY/TOWNSHIP:** KNIFE LAKE

STATE: Minnesota

Date of Inspection: 04/06/2017

Equipment Used:

Owner: County Highway Agency

Inspected By: Stuber, Cory

Report Written By: Cory Stuber

Report Reviewed By:

Final Report Date:

TABLE OF CONTENTS

UNDERWATER INSPECTION

REPORT SUMMARY

The substructure units inspected at Bridge No. 33506, Piers 1 and 2, were found to be in good to satisfactory condition with no defects of structural significance observed. However, the protective coating/paint system has failed from two feet above the waterline extending to the channel bottom. A severe timber and garbage debris accumulation was observed between the south shoreline and Pier 1. Garbage includes a large corrugated steel pipe with a steel box attached. Pier 2 has one large 16 inch diameter timber log caught on the upstream nose and extending halfway into the main channel. The channel bottom around the substructure units appeared stable, and no scour depressions were observed. This report represents the initial underwater inspection for this structure.

INSPECTION FINDINGS

(A) Overall, the steel of the H-piles of both piers was sound, while the paint system has failed from two feet above the waterline to the channel bottom.

(B) Severe timber debris, up to 1 foot diameter, and garbage have accumulated between Pier 1 and the south shoreline. Garbage includes a large corrugated steel pipe with a steel box attached.

(C) Submerged log, up to 16 inches in diameter, observed from the upstream nose of Pier 2 extending halfway into the main span channel.

(D) Channel bottom material consisted of cobbles, up to 2 feet in diameter.

RECOMMENDATIONS

(A) Monitor the timber debris accumulation at both Piers during future inspections, and if found to be increasing to a more detrimental extent, removal operations may become warranted at that time.

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

Contractor: Collins Engineers, Inc.

Contractor Job Number: 9687

UNDERWATER INSPECTION

1. BRIDGE DATA

Bridge #: 33506

Feature Intersected: KNIFE RIVER

Facility Carried: CSAH 8

District: District 3

County: 033 - Kanabec

Bridge Description:

The superstructure consists of three spans. The reinforced concrete deck rests upon steel beams supported on two pile bent piers and two reinforced concrete abutments. The pile bents consist of reinforced concrete pier caps supported by steel H-piles with steel cross-bracing. The substructure units are designated as the South Abutment, Piers 1 and 2, and the North Abutment respectively.

2. INSPECTION DATA

Professional Engineer/Team Leader: Cory Stuber, P.E.

Inspection Diver: Cory Stuber, P.E.

Date of Underwater Inspection: 04/06/2017

Weather Conditions: Sunny, 55°F

Underwater Visibility (feet): 3

Waterway Velocity (ft/sec): 0.5

3. SUBSTRUCTURE INSPECTION DATA

Substructure(s) Inspected: Piers 1 and 2

General Shape:

The bent piers consist of a reinforced concrete pier cap supported by five steel H-piles and steel cross bracing.

Maximum Water Depth at Substructure(s) Inspected (feet): 4.2

4. WATERLINE DATUM

Water Level Reference: The top of the pier cap on the downstream end of Pier 1.

Waterline Elevation (feet): 176.7

Description: The waterline was approximately 11.1 feet below reference.

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 62: Culvert: Code:

Item 92B: Underwater Inspection: Code: Y 48 04/2017

Item 113: Scour Critical Bridge: Code: N

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

[ ] Yes [X] No (Mark your selection with an X)

6. STRUCTURAL ELEMENT CONDITION RATING

ELEM #	Element Description	Quantity	Unit	Conditions			
				CS1	CS2	CS3	CS4
202	Steel Column	10	EA		10		
885	Scour	1	EA	1			

UNDERWATER INSPECTION

INSPECTION PROCEDURES

The routine underwater inspection of Bridge 33506 (CSAH 8 over the Knife River) was completed on April 6, 2017. The underwater inspection was conducted from shore. The inspection was conducted by a team consisting of a PE-Diver with a valid MnDOT Team Leader certification and a dive tender. Due to waterway conditions at the time of inspection, the inspection could be accomplished by wading 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 pile bent piers. According to the bridge inventory or design drawings, Piers 1 and 2 were founded on five steel H-piles. 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 efforts.

Minnesota Structure Inventory Report

Bridge ID: 33506 **CSAH 8 over KNIFE RIVER** Date: 05/12/2017

+GENERAL+

Agency Br. No.		**Crew**	
District	03	**Maint. Area**	
County	033 - Kanabec		
City			
Township	33010 - KNIFE LAKE		
Desc. Loc.	0.4 MI S OF JCT CR 88		
Sect., Twp., Range	10 - 040N - 24W		
Latitude	45 ° 58 ' 29.25 "		
Longitude	-93 ° 19 ' 44.41 "		
Custodian	02 - County Highway Agency		
Owner	02 - County Highway Agency		
BMU Agreement			
Year Built	1967		
MN Year Reconstructed			
FHWA Year Reconstructed			
MN Temporary Status			
Bridge Plan Location	3 - COUNTY		
Date Opened to Traffic			
On - Off System	1 - ON		
Legislative District	08B		
Potential ABC	2 - N/A		

+STRUCTURE+

Service On	1 - Highway		
Service Under	5 - Waterway		
Main Span Type	4 - Steel Continuous		
Main Span Design	01 - Beam Span		
Main Span Detail			
Appr. Span Type			
Appr. Span Design			
Appr. Span Detail			
Skew	30	RIGHT	
Culvert Type			
Barrel Length			
Cantilever ID			

Number of Spans

MAIN: 3 **APPR:** 0 **TOTAL:**

Main Span Length	41.5	**ft.**
Structure Length	111.5	**ft.**
Deck Width (Out-to-Out)	32.7	**ft.**
Deck Material	1 - Concrete Cast-in-Place	
Wear Surf Type	1 - Monolithic Concrete	
Wear Surf Install Year		
Wear Course/Fill Depth	0.00 **ft.**	
Deck Membrane	0 - None	
Deck Rebars	0 - None	
Deck Rebars Install Year		
Structure Area (Out-to-Out)	3646	**sq. ft.**
Roadway Area (Curb-to-Curb)	3358	**sq. ft.**

Sidewalk Width	**50A. Lt**	0.00 **ft.**	**50B. Rt**	0.00	**ft.**
Curb Height	**Lt**	0.75 **ft.**	**Rt**	0.75	**ft.**
Rail Type	**Lt**	42	**Rt**	42	

+ROADWAY+

Bridge Match ID (TIS)	0		
Roadway O/U Key	Route On Structure		
Route Sys	04 - CSAH	**Number**	8
Roadway Name or Description	CSAH 8		
Level of Service	1 - MAINLINE		
Roadway Type	2 - 2-way traffic		
Control Section (TH Only)			
Reference Point			
Detour Length	5.0 **mi.**		
Lanes	**ON** 2	**UNDER**	0
	ADT 347	**YEAR**	2008
HCADT		**ADTT**	**%**
Functional Class	07 - Rural - Major Collector		

+RDWY DIMENSIONS+

If Divided	**NB-EB**	**SB-WB**
Roadway Width	30.10 **ft.**	**ft.**
Vertical Clearance	**ft.**	**ft.**
Max. Vert. Clear.	**ft.**	**ft.**
Horizontal Clear.	**ft.**	**ft.**
Lateral Clearance	**ft.**	**ft.**

Appr. Surface Width	28.0	**ft.**
Bridge Roadway Width	30.1	**ft.**
Median Width On Bridge		**ft.**

+MISC. BRIDGE DATA+

Structure Flared	0 - No flare
Parallel Structure	N - No parallel structure
Field Conn. ID	4 - Bolted
Abutment Foundation (Material/Type)	1 - CONC
	3 - FTG PILE
Pier Foundation (Material/Type)	3 - STEEL
	4 - PILE BENT
Historic Status	5 - Not eligible

+PAINT+

Year Painted	1967
Unsound Paint %	
Painted Area	**sq. ft.**
Primer Type	1 - Lead - non 3309
Finish Type	F - - Phenolic Resin Alum

+BRIDGE SIGNS+

Posted Load	0 - Not Required
Traffic	0 - Not Required
Horizontal	1 - Object Markers
Vertical	N - Not Applicable

+INSPECTION+

Userkey	73
Structurally Deficient	N
Functionally Obsolete	N
Sufficiency Rating	94.2
Routine Inspection Date	11/18/2015
Routine Inspection Frequency	24
Inspector Name	Stuber, Cory
Status	A - Open

+NBI CONDITION RATINGS+

Deck	5	**Unsound Deck %**	5
Superstructure	7		
Substructure	6		
Channel	7		
Culvert	N		

+NBI APPRAISAL RATINGS+

Structure Evaluation	6
Deck Geometry	6
Underclearances	N
Waterway Adequacy	8
Approach Alignment	8

+SAFETY FEATURES+

Bridge Railing	0 - SUBSTANDARD
GR Transition	1 - MEETS STANDARDS
Appr. Guardrail	1 - MEETS STANDARDS
GR Termini	1 - MEETS STANDARDS

+IN DEPTH INSP.+

	Y/N	**Freq**	**Date**
Frac. Critical			
Underwater			04/06/2017
Pinned Asbly.			
Spec. Feat.			

+WATERWAY+

Drainage Area (sq. mi.)			
Waterway Opening (sf.)	1164		
Navigation Control	0 - No nav. control on		
Pier Protection			
Nav. Clr. (ft.)	**Vert.** 0.0	**Horiz.**	0.0
Nav. Vert. Lift Bridge Clear. (ft.)			
MN Scour Code	N - STBL - LIM	**Year**	

+CAPACITY RATINGS+

Design Load	4 - H 20	
Operating Rating	2 - HS TRUCK	27.2
Inventory Rating	2 - HS TRUCK	16.2
Posting	**VEH:**	**SEMI:** **DBL:**
Rating Date	04/08/2015	

Overweight Permit Codes

A N - N/A **B** N - N/A **C** N - N/A

BRIDGE 33506 CSAH 8 OVER KNIFE RIVER

County: Kanabec
City:
Township: 33010 - KNIFE LAKE
Section: 10 Township: 040N Range: 24W
Span Type: 4 - Steel Continuous 2 - Stringer/Multi-beam or Girder
List:
NBI Deck: 5 Super: 7 Sub: 6 Chan: 7

Location: 0.4 MI S OF JCT CR 88
Route: 04 - CSAH 8 Ref. Pt.: 006+00.400
Control Section:
Maint. Area:
Local Agency Bridge Nbr.:
Culv: N
Open, Posted, Closed: A - Open
MN Scour Code: N - STBL - LIM SCOUR

Length: 111.5 ft.
Deck Width: 32.7 ft.
Rdwy. Area/ Pct. Unsnd: 3358 sq. ft. / 5%
Paint Area/ Pct. Unsnd: sq. ft. / %
Culvert: N/A
Postings:

Appraisal Ratings - Approach: 8 Waterway: 8
Required Bridge Signs - Load Posting: 0 - Not Required Traffic: 0 - Not Required
Horizntal: 1 - Object Markers Vertical: N - Not Applicable

Unofficial Structurally Deficient N
Unofficial Functionally Obsolete N
Unofficial Sufficiency Rating 94.2

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
12	Reinforced Concrete Deck	Underwater	04/06/2017	3646 SF	3646	0	0	0
		Migrated Values		3646 SF	3646	0	0	0
	Notes: SE end rebar exposed, spalling w/ efforvecence.							
	510 - Wearing Surfaces	Underwater	04/06/2017	3358 SF	3022	0	336	0
		Migrated Values		3358 SF	3022	0	336	0
	Notes: Top of Concrete Deck with Uncoated Rebar Notes: Numerous areas of cracks & delaminations. Delaminations have been patched w/ Bit. 2015: Most of the patches for delaminations are gone. Due to deck condition, recommend repairs to deck.							
107	Steel Open Girder/Beam	Underwater	04/06/2017	430 LF	377	53	0	0
		Migrated Values		430 LF	377	53	0	0
	Notes: Rusted area on girder NW bridge end. Remainder in good condition. 2015: Some Peeling & beginning to rust.							
	515 - Steel Protective Coating	Underwater	04/06/2017	999 SF	876	0	116	7
		Migrated Values		999 SF	876	0	116	7
	Notes: [2016] Migrator assumed quantity of 999 SF and estimated the condition states.							
202	Steel Column	Underwater	04/06/2017	10 EA	0	10	0	0
		Migrated Values		10 EA	0	10	0	0
	Notes: Lower portion of columns rusting. They need to cleaned up & repainted. Easterly 4 columns or N. pier have impact damage.							
	515 - Steel Protective Coating	Underwater	04/06/2017	999 SF	0	0	999	0
		Migrated Values		999 SF	0	0	999	0
	Notes: [2016] Migrator assumed quantity of 999 SF and estimated the condition states.							
215	Reinforced Concrete Abutment	Underwater	04/06/2017	109 LF	99	10	0	0
		Migrated Values		109 LF	99	10	0	0
	Notes: [2016] Migrator added 40 LF to abutment quantity to account for wingwalls (CS1:30 CS2:10 CS3:0 CS4:0). Several vert. hairline cracks each abut. Water leaking thru at SE & NE corners. Wingwall notes: No change. 2015: Spall @ end SW WW.							
234	Reinforced Concrete Pier Cap	Underwater	04/06/2017	69 LF	69	0	0	0
		Migrated Values		69 LF	69	0	0	0
	Notes: No change.							

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
313	Fixed Bearing	Underwater	04/06/2017	20 EA	16	4	0	0
		Migrated Values		20 EA	16	4	0	0
	Notes: (Counted 10 fixed bearings) 2015: Pack rust SE, NE,& SW bearings, also 2nd in from SE.							
330	Metal Bridge Railing	Underwater	04/06/2017	223 LF	0	223	0	0
		Migrated Values		223 LF	0	223	0	0
	Notes: No change. 2015: Corrosion on bottom portion of all railings.							
	515 - Steel Protective Coating	Underwater	04/06/2017	999 SF	999	0	0	0
		Migrated Values		999 SF	999	0	0	0
	Notes: [2016] Migrator assumed CS1 and a quantity of 999 SF.							
800	Critical Deficiencies or Safety Hazards	Underwater	04/06/2017	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
	Notes: NO CRITICAL FINDINGS OBSERVED DURING THE LAST INSPECTION. None.							
810	Concrete Decks - Cracking & Sealing	Underwater	04/06/2017	0 LF	0	0	0	0
		Migrated Values		0 LF	0	0	0	0
	Notes: Numerous areas of cracks & delaminations. 2015: Moderate size cracks & moderate density.							
822	Bituminous Approach Roadway	Underwater	04/06/2017	2 EA	2	0	0	0
		Migrated Values		2 EA	2	0	0	0
	Notes: 2015: Cracks in Bit. next to Br. ends need repair.							
855	Secondary Members (Superstructure)	Underwater	04/06/2017	4 EA	0	4	0	0
		Migrated Values		4 EA	0	4	0	0
	Notes: 2015: Item for Pier Bracing. Some areas of peeling & rust.							
880	Impact Damage	Underwater	04/06/2017	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
	Notes: No change.							
883	Concrete Shear Cracking	Underwater	04/06/2017	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
	Notes: Use this element to monitor the presence of shear cracking on concrete elements. Pay particular attention to the concrete pier caps.							
885	Scour	Underwater	04/06/2017	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
	Notes: None.							
891	Other Bridge Signing	Underwater	04/06/2017	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
	Notes: Signs Required: Horizontal Clearance SE delineator is damaged. 2015: All guardrail markers & delineators are inplace & in good cond.							
892	Slopes & Slope Protection	Underwater	04/06/2017	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
	Notes: Both slopes need riprap, severe erosion. 2015: No undermining.							

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
893	Guardrail	Underwater	04/06/2017	1 EA	0	1	0	0
		Migrated Values		1 EA	0	1	0	0
	Notes: SE end had traffic impact, and has been repaired. 2015: NW end has impact damage 24', 4 posts twisted, plastic spacers broke,& railing bent.							
894	Deck & Approach Drainage	Underwater	04/06/2017	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
	Notes: 2015: Good cond.							
895	Sidewalk, Curb, & Median	Underwater	04/06/2017	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
	Notes: Numerous cracks & staining on both sides. 2015: Minor spalling around drains.							
900	Protected Species	Underwater	04/06/2017	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
	Notes: Use this element to track the presence of protected species living on this structure.							

General Notes: PONTIS inspection comments -1999 - Structure remains in good condition. Slab has superficial cracks, but no structural problems. Underside of slab ha efflourescence in less than 2% of surface. Remove debris from south pier. Riprap is needed on abutment slopes. Old abutment piling and concrete exposed due to loss of riprap. Both piers need to have h-piling and sway braces painted. Concrete abutments & concrete pier caps in good condition. No cracks or deterioration. 2001 inspection - No change in structures condition. All steel should be painted. All concrete should have a new pearl gray finish applied to it. Also riprap abutment slopes. 2003 inspection - Superficial cracks in slab; but no problems structurally. Efflourescence in less than 2% of slab. All concrete is sound and could have a new pearl gray finish applied to it. Abutments and pier caps are solid, no cracks. Both piers need painting. Remove excess gravel from slab. Riprap is needed on both abutment slopes. 2005 - Abutment and pier concrete members are in good condition. Pier caps are okay. Both piers need to be brushed and re-painted. The concrete slab has popouts throughout. The superficial cracks in slab remain the same. Riprap is needed on both abutment slopes. Signs are okay. Remove debris from south pier. NE anchor bolt assmbly is corroded but still functioning as intended. 2007 inspection - No change from previous inspection. Unable to inspect for scour at this time. Will complete inspection in spring after iceout and forward infor to MN/DOT at that time. 8-5-08 Minor scour at SW pier. Will continue to monitor. 2009 - Pop outs in concrete slab have been patched with bituminous material. All other concrete is sound. Less than 2% efflourescence underside of slab. Riprap needed on both abutment slopes. Remove debris from south pier. ET guardrail in good condition. Signs okay.
2011 - Pop-outs in deck slab have been patched. Found cracks in deck underside that are more evident this year with efflourescence from them. The southeast corner under the deck slab has some concrete loss exposing a rusted rebar in the under side deck. Abutments and pier concrete are in good condition. Steel bearing pads on the abutments are corroded. Riprap is needed on abutment slopes. Some debris on south side of pier one should be removed. Pier steel needs repainted. Deck drains, railings, guardrail, and signs are in good condition. No scour present at the time of inspection. South expansion joint is missing steel angle iron in the middle.
2013 - Same as 2011. Except no debris S. side pier one. See notes for each element.
2015: Several Items added or deleted per recommendation of 2014 NBIS comp. report. Br. is in good cond. with the exception of deck. Lots of cracks spalls & delaminations. See the list we've compiled. Easterly 4 piling on N. pier have impact damage @ base.

58. Deck NBI: No change.
2015: Numerous areas of cracks & delaminations.

36A. Brdg Railings NBI:

36B. Transitions NBI:

36C. Appr Guardrail NBI:

36D. Appr Guardrail Terminal NBI:

59. Superstructure NBI: No. change.

60. Substructure NBI: No change.
[2017] Underwater Inspection - Moderate paint failure and surface corrosion on steel H-piles.

61. Channel NBI: No change.

62. Culvert NBI:

71. Waterway Adeq NBI: No change

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
72.	Appr Roadway Alignment NBI:	No change.						

Inspector's Signature

Reviewer's Signature

Pictures

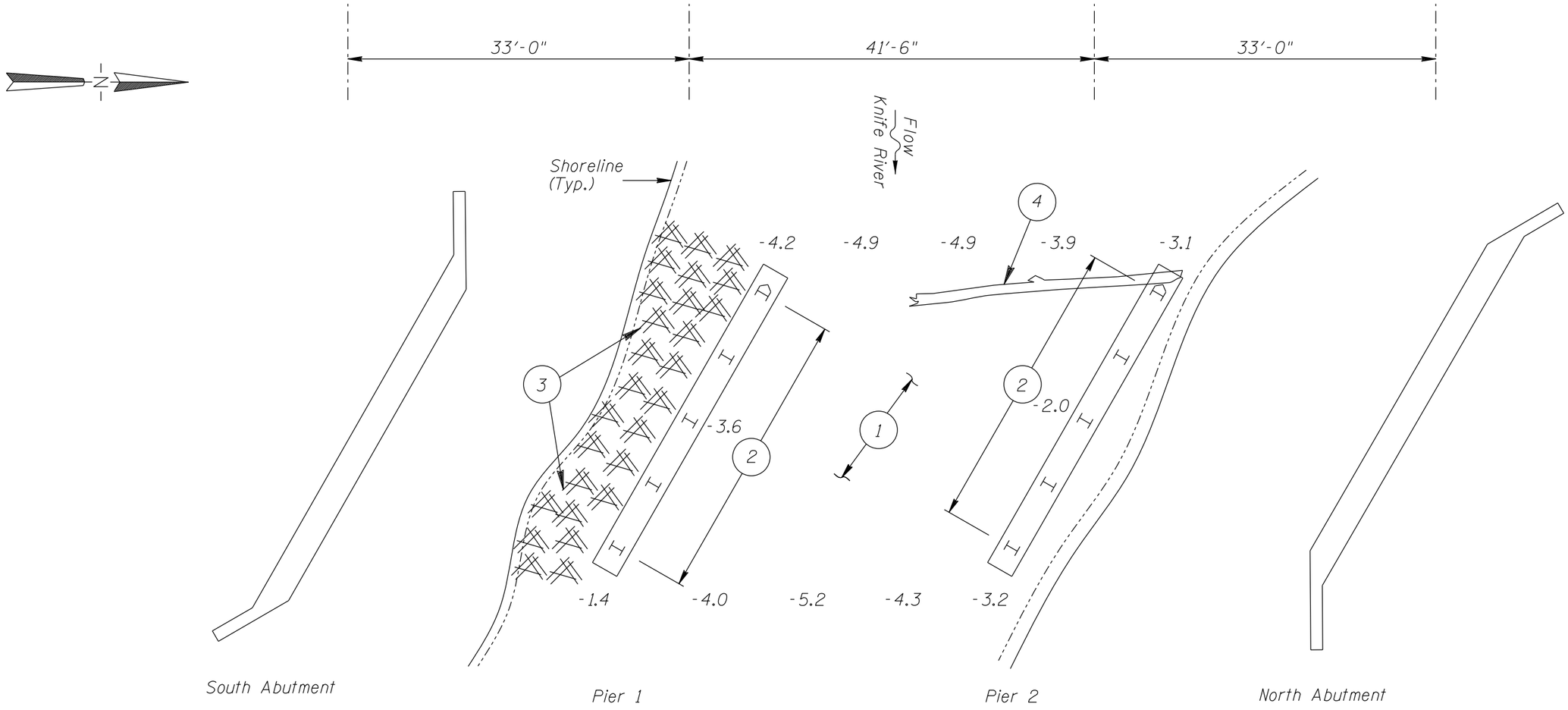
Photo 1 - East Elevation Looking Northwest

Photo 2 - Pier 1 Looking Northwest

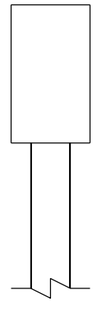
Pictures

Photo 3 - Pier 1 Looking South

Photo 4 - Pier 2 Looking South



SOUNDING PLAN



TYPICAL END VIEW OF PIERS

GENERAL NOTES:

1. Piers 1 and 2 were inspected underwater.
2. At the time of inspection on April 6, 2017 the waterline was located approximately 11.1 feet below the top of the pier cap at the downstream end of Pier 1. This corresponds with a waterline elevation of 176.7 feet based on design drawings from 1966.
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. Channel bottom material consisted of cobbles, up to 2 feet in diameter.
2. Steel H-piles typically exhibited paint system failure from 2 feet above the waterline to the channel bottom.
3. Heavy timber debris, up to 1 foot diameter, and garbage have accumulated between Pier 1 and the south shoreline. Garbage includes a large corrugated steel pipe with a steel box attached, photos included in inspection report.
4. Submerged log, up to 16 inches in diameter, observed from the upstream nose of Pier 2 extending halfway into the main span channel.

Legend

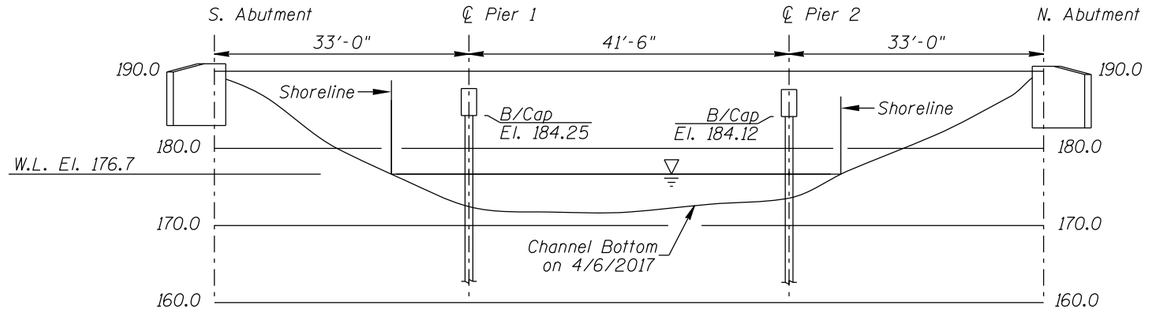
-6.2	Sounding Depth from Waterline (4/6/2017)
I	H-pile
	Timber Debris
	Timber Log

MINNESOTA
DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

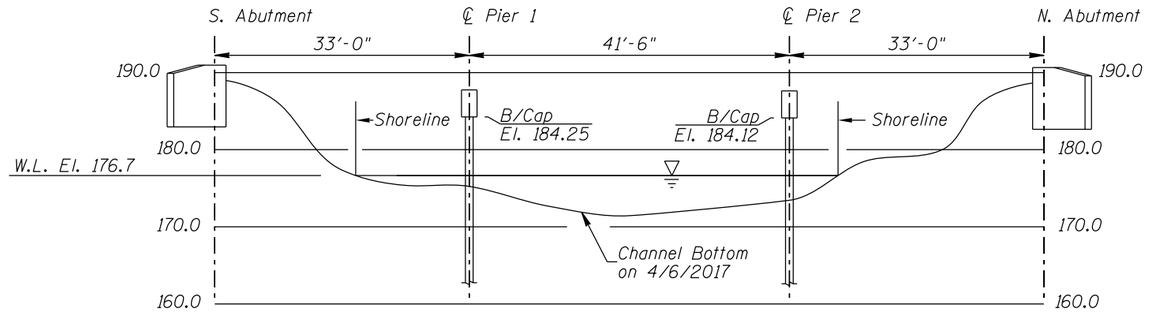
STRUCTURE NO. 33506
OVER THE KNIFE RIVER
DISTRICT 3, KANABEC COUNTY

INSPECTION AND SOUNDING PLAN

Drawn By: JMF	COLLINS ENGINEERS, INC. 1599 Selby Avenue Suite 206 St. Paul, MN 55104 (651) 646-8502 www.collinsengr.com	Date: APRIL 2017
Checked By: CRS		Scale: NTS
Code: 63-9687		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. 33506
OVER THE KNIFE RIVER
DISTRICT 3, KANABEC COUNTY

INSPECTION AND SOUNDING PLAN

Drawn By: JMF	COLLINS ENGINEERS 1599 Selby Avenue Suite 206 St. Paul, MN 55104 (651) 646-8502 www.collinsengr.com	Date: APRIL 2017
Checked By: CRS		Scale: 1"=20'
Code: 63-9687		Figure No.: 1