

# 2017 UNDERWATER BRIDGE INSPECTION REPORT



## **BRIDGE # 58524 TWP 605 over KETTLE RIVER**

**DISTRICT:** District 1

**COUNTY:** Pine

**CITY/TOWNSHIP:** KETTLE RIVER

**STATE:** Minnesota

**Date of Inspection:** 09/23/2016

**Equipment Used:**

**Owner:** Town or Township Highway Agency

**Inspected By:** Stromberg, Dan

**Report Written By:** Dan Stromberg

**Report Reviewed By:**

**Final Report Date:**



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## UNDERWATER INSPECTION

### REPORT SUMMARY

The substructure units inspected at Bridge No. 58524, Piers 1 and 2, were found to be in good condition with no defects of structural significance below water. The steel shells of the piers exhibited 70% to 100% loss of coating from the channel bottom to 4 feet above the waterline. Additionally, from 1 foot below the waterline to the channel bottom, corrosion with negligible loss of section was observed. A minor timber debris accumulation was noted at Pier 2 at the waterline. Overall, the channel bottom configuration appeared to be in stable condition with no notable scour depressions observed.

### INSPECTION FINDINGS

- A. Channel bottom material consisted of sand and gravel allowing no probe rod penetration.
- B. Channel bottom material consisted of cobbles up to 6 inches in diameter with sand infill allowing no probe rod penetration.
- C. Timber debris consisting of a 10 inch diameter log located at the waterline extended along the east side of Pier 2 from 3 feet upstream of the upstream nose to the midpoint of the pier.
- D. Surface area of the steel shell encasement of all piles exhibited 70% to 100% coating loss from 4 feet above the waterline to the channel bottom.
- E. Steel encasement of all piles exhibited corrosion with negligible loss of section from 1 foot below the waterline to the channel bottom.

### RECOMMENDATIONS

- (A) Monitor timber debris accumulation at Pier 2. If timber debris accumulation increases in size or extent removal may be warranted at that time to reduce excessive lateral loads on the pier, limit further debris accumulation, and reduce the likelihood of channel bottom degradation resulting from obstructed flow.
- (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 #: 58524  
Feature Intersected: KETTLE RIVER  
Facility Carried: TWP 605  
District: District 1  
County: 058 - Pine

#### Bridge Description:

The superstructure consisted of three spans of multiple concrete beams supporting a reinforced concrete deck. The superstructure is supported by two reinforced concrete abutments and two steel shell pile (CIP) bent piers. The substructure units are designated as West Abutment, Pier 1, Pier 2 and East Abutment from west to east.

### 2. INSPECTION DATA

Professional Engineer/Team Leader: Garrett R. Owens  
Inspection Diver: Garrett R. Owens  
Date of Underwater Inspection: 09/23/2016  
Weather Conditions: Sunny, 60°F  
Underwater Visibility (feet): 3 feet  
Waterway Velocity (ft/sec): 1.0 ft/sec

### 3. SUBSTRUCTURE INSPECTION DATA

Substructure(s) Inspected: Piers 1 and 2

#### General Shape:

Piers 1 and 2 are steel shell pile (CIP) bents consisting of a single line of six piles under a concrete cap.

Maximum Water Depth at Substructure(s) Inspected (feet): 4.8 feet

### 4. WATERLINE DATUM

Water Level Reference: The top of the pier cap at the south end of Pier 1.  
Waterline Elevation (feet): 1015.6 feet  
Description: The waterline was located approximately 14.0 feet below the 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 09/2016

Item 113: Scour Critical Bridge:

Code: I

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

Yes

No

(Mark your selection with an X)

6. STRUCTURAL ELEMENT CONDITION RATING

ELEM #	Element Description	Quantity	Unit	Conditions			
				CS1	CS2	CS3	CS4
225	Steel Pile	12	EA		12		
885	Scour	1	EA	1			

## UNDERWATER INSPECTION

### INSPECTION PROCEDURES

The routine underwater inspection of Bridge 58524 (TWP 605 over Kettle River) was completed on September 23, 2016. The underwater inspection was conducted from the shore. The inspection was conducted by a team consisting of a Professional Engineer Diver with a valid MnDOT Team Leader certification, a backup diver and 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 steel shell pile (CIP) bent piers. According to design drawings, the inspected substructure units are designated as Piers 1 and 2 from west to east. Inspection procedures followed FHWA guidance and the MnDOT Bridge and Structure Inspection Program Manual with channel bottom probing to search for foundations. The maximum routine underwater inspection frequency is recommended to remain at 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 BRIDGE INSPECTION REPORT

01/25/2017

BRIDGE 58524 TWP 605 OVER KETTLE RIVER

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County: Pine	Location: 0.5 MI W OF JCT CSAH 61	Length: 183.7 ft.
City:	Route: 08 - TWNS 605 Ref. Pt.: 002+00.264	Deck Width: 35.3 ft.
Township: 58017 - KETTLE RIVER	Control Section:	Rdwy. Area/ Pct. Unsnd: 5877 sq. ft. / %
Section: 10 Township: 044N Range: 20W Maint. Area:		Paint Area/ Pct. Unsnd: sq. ft. / %
Span Type: 5 - Prestressed Concrete 2 -	Local Agency Bridge Nbr.: T53	Culvert: N/A
List: Stringer/Multi-beam or Girder		Postings:
NBI Deck: 7 Super: 8 Sub: 7 Chan: 6 Culv: N		
	Open, Posted, Closed: A - Open	
	MN Scour Code: 1 - LOW RISK	
Appraisal Ratings - Approach: 8 Waterway: 8		Unofficial Structurally Deficient N
Required Bridge Signs - Load Posting: 0 - Not Required	Traffic: 0 - Not Required	Unofficial Functionally Obsolete N
Horizontal: 1 - Object Markers	Vertical: N - Not Applicable	Unofficial Sufficiency Rating 100.0

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ELEM					QTY	QTY	QTY	QTY
NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	CS 1	CS 2	CS 3	CS 4

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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	01/23/2017	6485 SF	6485	0	0	0
		Routine	11/02/2016	6485 SF	6485	0	0	0
Notes: 2016: 6' LONG CRACK WITH EFFLORESCENCE BETWEEN 3RD AND FOURTH GIRDER OF EAST SPAN NEAR ABUTMENT. ALSO CRACK BETWEEN SOUTH AND 2ND GIRDER OF WEST SPAN NEAR ABUTMENT.								
510 - Wearing Surfaces		Underwater	01/23/2017	5878 SF	5878	0	0	0
		Routine	11/02/2016	5878 SF	5878	0	0	0
Notes: Top of Concrete Deck with Epoxy Reinforcement Notes: 2016: TWO SURFACE CRACKS IN DECK, ONE 8 ft. IN NORTHEAST CORNER AND ONE 13 ft. IN SOUTHWEST CORNER RUNNING FROM END OF DECK AT APPROX. 45 deg. ANGLE. FEW HAIRLINE TRANSVERSE AND LONGITUDINAL CRACKS IN DECK. 4"x4' CHIP IN EAST END OF DECK AT CENTERLINE. ALMOST ALL OF TINED SURFACE WORE SMOOTH.								

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
109	Prestressed Concrete Open Girder/Beam	Underwater	01/23/2017	732 LF	732	0	0	0
		Routine	11/02/2016	732 LF	732	0	0	0
Notes: 2016: one 19" horizontal crack from the north side of beam 1 over west abutment running along top haunch. crack is very fine. No distress noted in remainder of beams.								
215	Reinforced Concrete Abutment	Underwater	01/23/2017	114 LF	114	0	0	0
		Routine	11/02/2016	114 LF	114	0	0	0
Notes: 2016: 3 HAIRLINE CRACKS IN WEST ABUTMENT AND 4 HAIRLINE CRACKS IN EAST ABUTMENT.								
2014 WATER LEACHING ONTO ABUTMENT CAPS THROUGH END DIAPHRAGM ON SOUTH CORNER OF EAST ABUTMENT AND NORTH AND SOUTH END OF WEST ABUTMENT. CRACK IN END DIAPHRAGM AT SOUTH BEAM LOCATION OF WEST ABUTMENT.								
2016: NO SIGN OF LEACHING AT INSPECTION								
Wingwall notes: 2016 NO DISTRESS NOTED.								
2016 LARGE ACCUMULATION OF DEBRIS WASHED UP AT NORTH CORNER OF WEST ABUTMENT, SEE PICTURE.								
225	Steel Pile	Underwater	01/23/2017	12 EA	0	12	0	0
		Routine	11/02/2016	12 EA	0	12	0	0
Notes: 2016: Piling have surface rust on lower portions of piling.								
515 -	Steel Protective Coating	Underwater	01/23/2017	708 SF	424	0	100	184
		Routine	11/02/2016	708 SF	424	0	100	184
Notes: 4.19 SF area per 1' of pile. 2016: water level 11.3' below bottom of pier caps. rust\primer footage measured above water line.								
Pier 1 has average of 4' per pile rust stained and 2' per pile paint loss to primer. Also 8"x7.3' area on north pile of surface rust. 105 SF CS4, 50SF CS3 remainder good condition.								
Pier 2 has average of 3' per pile rust stained and 2' per pile paint loss to primer. Also 6"x8.3' area on north pile of surface rust. 79 SF CS4, 50SF CS3 remainder good condition.								
234	Reinforced Concrete Pier Cap	Underwater	01/23/2017	76 LF	76	0	0	0
		Routine	11/02/2016	76 LF	76	0	0	0
Notes: 2016 NO DISTRESS NOTED.								
301	Pourable Joint Seal	Underwater	01/23/2017	68 LF	68	0	0	0
		Routine	11/02/2016	68 LF	68	0	0	0
Notes: JOINTS OVER PIERS. 2016 SOME OF THE JOINT MATERIAL DETERIORATING.								
311	Movable Bearing	Underwater	01/23/2017	8 EA	8	0	0	0
		Routine	11/02/2016	8 EA	8	0	0	0
Notes: BEARING PLATE, CURVED PLATE AND PINTLE ON ELASTOMERIC BEARING PAD. 2016 NO DISTRESS NOTED.								

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	01/23/2017	16 EA	16	0	0	0
		Routine	11/02/2016	16 EA	16	0	0	0
Notes: BEARING PLATE, CURVED PLATE AND PINTLE ON ELASTOMERIC BEARING PAD WITH ANCHOR RODS. 2016 NO DISTRESS NOTED.								
331	Reinforced Concrete Bridge Railing	Underwater	01/23/2017	369 LF	369	0	0	0
		Routine	11/02/2016	369 LF	369	0	0	0
Notes: 2016: north rail has 14 vertical cracks minor staining and south has 12. 1- 8' long crack in north rail with staining. Areas of longitudinal cracks in south rail. Minor hits scrapes to rail, overall still good condition.								
800	Critical Deficiencies or Safety Hazards	Underwater	01/23/2017	1 EA	1	0	0	0
		Routine	11/02/2016	1 EA	1	0	0	0
Notes: 2016: No critical structural deficiencies or serious safety hazards are present on this structure.								
822	Bituminous Approach Roadway	Underwater	01/23/2017	2 EA	0	2	0	0
		Routine	11/02/2016	2 EA	0	2	0	0
Notes: 2016: West approach low with some cracking and deterioration, East approach is quite low.								
855	Secondary Members (Superstructure)	Underwater	01/23/2017	1 EA	1	0	0	0
		Routine	11/02/2016	1 EA	1	0	0	0
Notes: GALVANIZED STEEL DIAPHRAGMS AND CONCRETE END DIAPHRAGMS. 2016 No distress to steel diaphragms. Crack with delamination area at beam 1 in west abutment diaphragm.								
883	Concrete Shear Cracking	Underwater	01/23/2017	1 EA	1	0	0	0
		Routine	11/02/2016	1 EA	1	0	0	0
Notes: 2016: none noted.								
891	Other Bridge Signing	Underwater	01/23/2017	1 EA	0	1	0	0
		Routine	11/02/2016	1 EA	0	1	0	0
Notes: 2016: Southeast delineator twisted, others fine.								
892	Slopes & Slope Protection	Underwater	01/23/2017	1 EA	0	1	0	0
		Routine	11/02/2016	1 EA	0	1	0	0
Notes: SOME RIPRAP MISSING ON BOTH ABUTMENT SLOPES. SOME WASHING BEHIND BOTH EAST WINGWALLS AND SOUTHWEST WINGWALL. 2016 SAME CONDITION								
894	Deck & Approach Drainage	Underwater	01/23/2017	1 EA	0	1	0	0
		Routine	11/02/2016	1 EA	0	1	0	0
Notes: 2016: outer 16" of deck gutter filled with sand, drains plugged.								
899	Miscellaneous Items	Underwater	01/23/2017	1 EA	1	0	0	0
		Routine	11/02/2016	1 EA	1	0	0	0
Notes: POSSIBLE 12" SCOUR HOLE AT EACH PIER UPSTREAM PILE.								
900	Protected Species	Underwater	01/23/2017	1 EA	1	0	0	0
		Routine	11/02/2016	1 EA	1	0	0	0
Notes: 2016 none noted								

General Notes: INSPECTOR - TODD LINDSTROM

STREAM BED WAS PROBED ON 6-25-2012 DURING HIGH WATER EVENT. ELEVATIONS SHOW NO SCOUR OF STREAM BED.

58. Deck NBI: 2016: TWO SURFACE CRACKS IN DECK, ONE 8 ft. IN NORTHEAST CORNER AND ONE 13ft. IN SOUTHWEST CORNER RUNNING FROM END OF DECK AT APPROX. 45 deg. ANGLE. FEW HAIRLINE TRANSVERSE AND LONGITUDINAL CRACKS IN DECK.  
4"x4' CHIP IN EAST END OF DECK AT CENTERLINE.

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
ALMOST ALL OF TINED SURFACE WORE SMOOTH.								
36A.	Brdg Railings NBI:							
	36B. Transitions NBI:							
36C.	Appr Guardrail NBI:							
	36D. Appr Guardrail Terminal NBI:							
59.	Superstructure NBI:	2016: one 19" horizontal crack from the north side of beam 1 over west abutment running along top haunch. crack is very fine. No distress noted in remainder of beams.						
60.	Substructure NBI:	2016 concrete abutments and pier caps in good condition. Rusting of the bottom 3-4 feet (above waterline) of the pier piling.						
61.	Channel NBI:	2016: CHANNEL BANKS ERODING AND SOME LOSS OF TREES. DOWNED TREE\DEBRIS PILES AT NORTH SIDE BETWEEN EAST PIER AND EAST ABUTMENT						
62.	Culvert NBI:							
71.	Waterway Adeq NBI:	2016 approaches overtopped in high water event.						
	72. Appr Roadway Alignment NBI:	2016: approaches fine						

Inspector's Signature

Reviewer's Signature

# Pictures



Photo 1 - Overall View of Upstream Fascia, Looking Southeast



Photo 2 - Overall View of Downstream Fascia, Looking Northeast

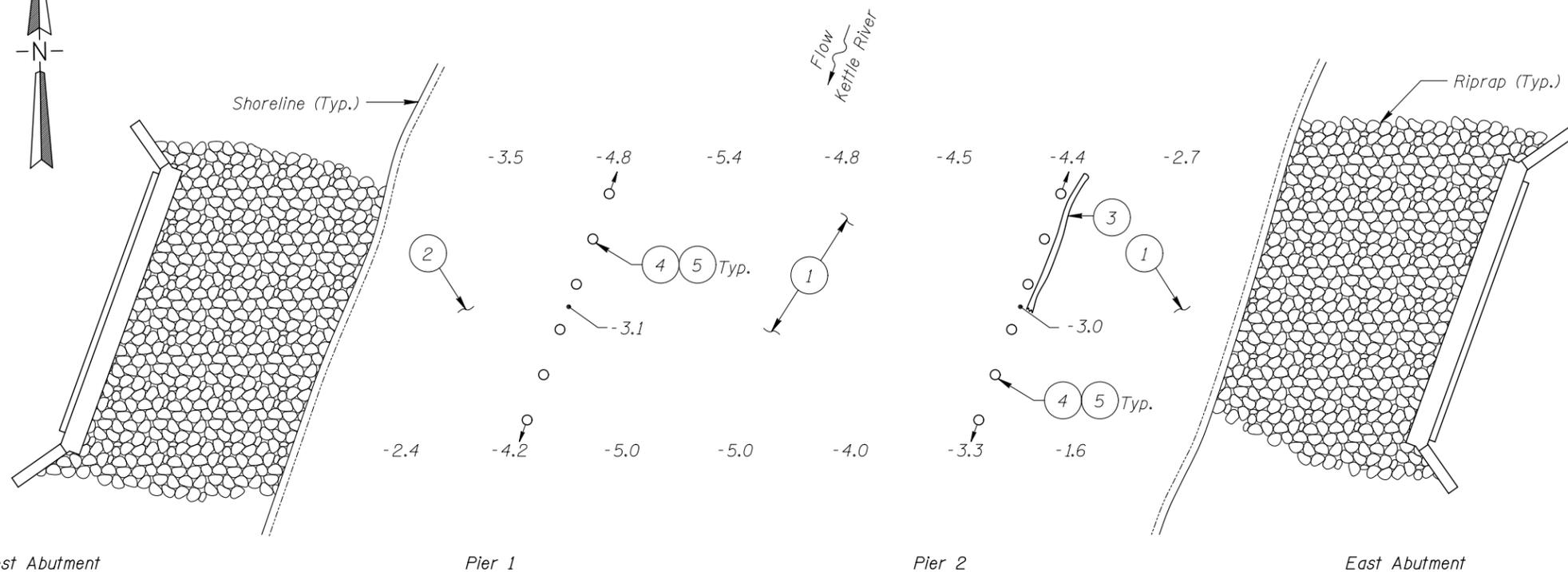
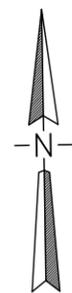
# Pictures



Photo 3 - View of Pier 1, Looking Southeast



Photo 4 - View of Pier 2, Looking West



INSPECTION NOTES:

- ① Channel bottom material consisted of sand and gravel allowing no probe rod penetration.
- ② Channel bottom material consisted of cobbles up to 6 inches in diameter with sand infill allowing no probe rod penetration.
- ③ Timber debris consisting of a 10 inch diameter log located at the waterline extended along the east side of Pier 2 from 3 feet upstream of the upstream nose to the midpoint of the pier.
- ④ Surface area of the steel shell encasement of all piles exhibited 70% to 100% coating loss from 4 feet above the waterline to the channel bottom.
- ⑤ Steel encasement of all piles exhibited corrosion with negligible loss of section from 1 foot below the waterline to the channel bottom.

SOUNDING PLAN

GENERAL NOTES:

1. Piers 1 and 2 were inspected underwater.
2. At the time of inspection on September 23, 2016, the waterline was located approximately 14.0 feet below the top of pier cap at downstream end of Pier 1. This corresponds to the waterline elevation of 1015.6 based on bridge design plans dated June 1, 1995.
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.

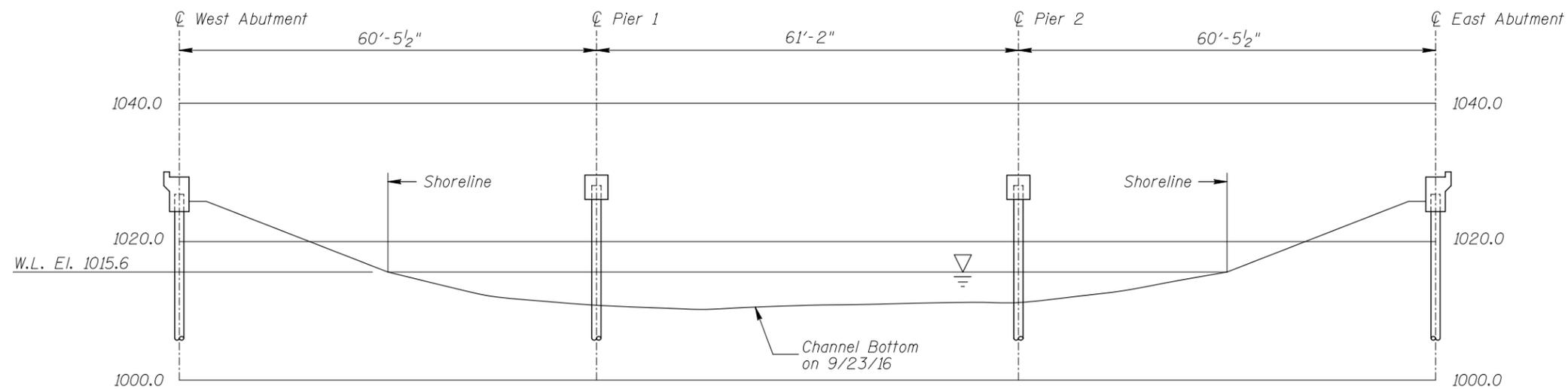
Legend

- 3.0 Sounding Depth from Waterline (9/23/16)
- 16"φ C.I.P. Concrete Pile
- ◐ 16"φ C.I.P. Concrete Battered Pile

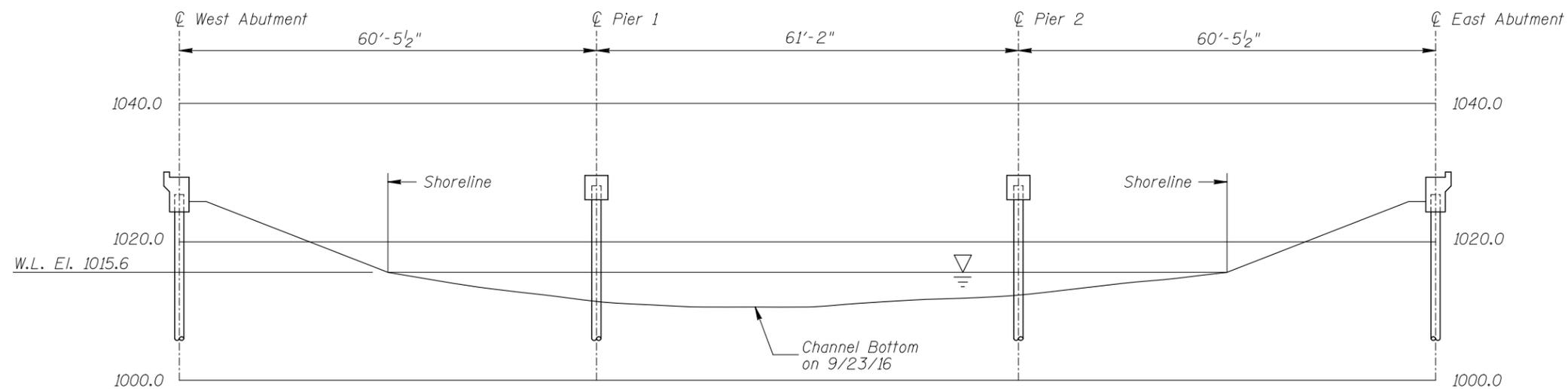


TYPICAL END VIEW OF PIERS

<b>MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION</b>		
STRUCTURE NO. 58524 TWP 605 OVER THE KETTLE RIVER DISTRICT 1, PINE COUNTY		
<b>INSPECTION AND SOUNDING PLAN</b>		
Drawn By: PRH	<b>COLLINS ENGINEERS</b>	Date: SEPT., 2016
Checked By: DGS	<small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Scale: NTS
Code: 968758524		Figure No.: 1



UPSTREAM FASCIA PROFILE



DOWNSTREAM FASCIA PROFILE

Note:  
Refer to Figure 1 for General Notes.

<b>MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION</b>		
STRUCTURE NO. 58524 TWP 605 OVER THE KETTLE RIVER DISTRICT 1, PINE COUNTY		
<b>UPSTREAM AND DOWNSTREAM FASCIA PROFILES</b>		
Drawn By: PRH	<b>COLLINS ENGINEERS</b> <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: SEPT., 2016
Checked By: DGS		Scale: NTS
Code: 968758524		Figure No.: 2