

# 2016 UNDERWATER BRIDGE INSPECTION REPORT



## BRIDGE # 88754 UT 8146 over ASH RIVER

DISTRICT: District 1

COUNTY: St. Louis

CITY/TOWNSHIP: T - 66 R - 20

STATE: Minnesota

Date of Inspection: 06/19/2016

Equipment Used:

Owner: Town or Township Highway Agency

Inspected By: Janulis, Lukas

Report Written By: Lukas Janulis

Report Reviewed By:

Final Report Date:



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## UNDERWATER INSPECTION

### REPORT SUMMARY

The substructure units inspected at Bridge No. 93454, the North and South Abutments, were found to be in satisfactory to poor condition below water, with some defects of structural significance. The timber piles and pile caps were typically sound with random splits or checks. Two locations had a gap between the pile cap and the top of the pile resulting in no pile bearing at both the North and South Abutments. Two piles, one at the North Abutment and one at the South Abutment, exhibited splits resulting in a separation of 25 percent of the pile cross section from the remaining pile. Both sections were fully bearing. The splits ranged in width from 3 inches at the top of the pile to 1 inch at the channel bottom. Gaps were observed, 6 to 8 inches wide, along the backwall and wingwall boards of the South and North Abutments resulting in a loss of backfill material with penetrations ranging from 6 inches at the North Abutment to 3 feet at the South Abutment and a typical penetration of 1 foot. A moderate accumulation of timber debris was observed throughout the channel and extended from the channel bottom to the waterline. The overall condition of the structure has not significantly changed since the previous underwater inspection.

### INSPECTION FINDINGS

- (A) The channel bottom material typically consisted of sandy gravel with a maximum probe rod penetration of 6 inches.
- (B) The timber piles and bent caps were typically sound with random checks up to 1/4 inch wide and 1/4 inch deep.
- (C) A 1 inch and 2 inch gap was observed between the pile and the pile cap resulting in no bearing at the southern Pile C of the North Abutment and the northern Pile A of the South Abutment respectively.
- (D) The southern Pile C of the South Abutment and the northern Pile C of the North Abutment exhibited splits resulting in 25 percent of the pile no longer being attached to other 75 percent of the pile. Both sections were load bearing separately. The split ranged from 3 inches wide at the pile cap to 1 inch wide at the channel bottom.
- (E) A gap, up to 8 inches wide, was observed between the timber backwall boards and both the wingwalls at the South Abutment. A loss of backfill material was observed with a maximum penetration of 3 feet and a typical penetration of 1 foot.
- (F) A 4 inch by 4 inch timber strut was observed bracing the south and north Pile C at the North Abutment.
- (G) A gap, up to 6 inches high, was observed between the channel bottom and the bottom wingwall boards at both wingwalls of the North Abutment. A loss of backfill was observed behind the boards with up to 6 inches of penetration.
- (H) A moderate timber debris accumulation, consisting of 1 foot diameter and smaller logs, was scattered throughout the channel and extended from the channel bottom to the waterline.

### RECOMMENDATIONS

- (A) The southern Pile C at the South and North Abutment, the northern Pile C at the North Abutment, and the northern Pile A of the South Abutment should be repaired to regain full structural integrity and proper load bearing of the timber piles. The repair should include jacketing or replacing the pile.
- (B) Fill the cavities behind the North Abutment and the South Abutment wingwalls with a suitable material (for instance, pumped lean concrete) and repair the gaps between the backwall and wingwall boards. Monitor the roadway and roadway slopes for any signs of further loss of backfill and settlement.
- (C) Consider removal of the timber debris from the channel.
- (D) Reinspect the submerged substructure 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 #: 88754  
Feature Intersected: ASH RIVER  
Facility Carried: UT 8146  
District: District 1  
County: 069 - St. Louis  
Bridge Description:

The superstructure consists of a timber deck supported by steel I-Beams. The superstructure is supported by two abutments consisting of ten 12 inch diameter timber piles in two rows, two 12 inch by 12 inch timber pile caps, and a timber backwall.

### 2. INSPECTION DATA

Professional Engineer/Team Leader: Lukas Janulis  
Inspection Diver: Lukas Janulis  
Date of Underwater Inspection: 06/19/2016  
Weather Conditions: Overcast, 70°F  
Underwater Visibility (feet): 2.0 feet  
Waterway Velocity (ft/sec): Negligible

### 3. SUBSTRUCTURE INSPECTION DATA

Substructure(s) Inspected: The North and South Abutments.

General Shape:

The North and South Abutments each consist of 10 timber 12 inch diameter piles in two rows. The rows are roughly 4 feet apart with a 12 inch by 12 inch timber beam (subcap) spanning between the top of the piles. A 12 inch by 12 inch timber pile cap sits at the midpoint of the timber beams. The backwall and wingwalls are comprised of 4 inch by 12 inch timber boards.

Maximum Water Depth at Substructure(s) Inspected (feet): 5.9 feet

### 4. WATERLINE DATUM

Water Level Reference: The top of the pile cap at the west end of the North Abutment  
Waterline Elevation (feet): 98.8 feet  
Description: The waterline was located approximately 1.2 feet below the reference.

### 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: 6  
Item 62: Culvert: Code:  
Item 92B: Underwater Inspection: Code: Y 48 06/2016

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
216	Timber Abutment	89	LF		43	44	2
228	Timber Piling	28	EA		24	2	2
235	Timber Pier Cap	49	LF			49	
885	Scour	1	EA	1			

## UNDERWATER INSPECTION

### INSPECTION PROCEDURES

The routine underwater inspection of Bridge 88754 (U.T. 8146 over Ash River) was completed on June 19, 2016. The underwater inspection was conducted from 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 in accordance with OSHA regulations. Channel bottom 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 timber abutments. According to the bridge inventory, the North and South Abutment are founded on timber piles supporting a timber cap. 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

12/13/2016

Inspector: CO Bridge

## BRIDGE 88754 UT 8146 OVER ASH RIVER

County: St. Louis	Location: 0.3 MI S OF JCT TH 53	Length: 25.0 ft.
City:	Route: 09 - UTWN 8146 Ref. Pt.: 001+00.459	Deck Width: 20.0 ft.
Township: 69107 - T - 66 R - 20	Control Section:	Rdwy. Area/ Pct. Unsnd: 474 sq. ft. / 10%
Section: 9 Township: 066N Range: 20W Maint. Area:		Paint Area/ Pct. Unsnd: sq. ft. / 100%
Span Type: 3 - Steel 2	Local Agency Bridge Nbr.: 818	Culvert: N/A
List:		Postings:
NBI Deck: 5 Super: 4 Sub: 4 Chan: 6 Culv: N		
	Open, Posted, Closed: A - Open	
	MN Scour Code: I - LOW RISK	

Appraisal Ratings - Approach: 8	Waterway: 9	Unofficial Structurally Deficient	Y
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	64.8

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
31	Timber Deck	Underwater	12/12/2016	500 SF	0	0	500	0
		Routine	06/23/2016	500 SF	0	0	500	0
Notes: [2016] Most of creosote has washed off of underside of deck. [2015] Deck starting to decay where exposed. Underside of deck is losing creosote.								
510 - Wearing Surfaces		Underwater	12/12/2016	474 SF	0	0	456	18
		Routine	06/23/2016	474 SF	0	0	456	18
Notes: [2016] Extensive cracking in bituminous indicated by creosote washing off underside of deck. [2015] Bituminous peeled off on east and west ends of deck. Gravel covering 80% of deck. [2014-2013] Bituminous cracking.								
107	Steel Open Girder/Beam	Underwater	12/12/2016	226 LF	0	0	224	2
		Routine	06/23/2016	226 LF	0	0	224	2
Notes: [2016] Hole in north end of beam 6 is 9" by 1". Hole in bottom flange in beam 3 south abutment. Section loss from flaking rust and pitting throughout bottom flange and bottom of web. [2015] Hole in north end of beam 6 web over abutment. Over half the beams have measurable section loss. Flaking rust is located mostly on bottom flange and lower part of web. [2014-2013] Beams are all rusting with measurable section loss at abutments. Some beams have section loss throughout. 30%+ section loss by abuts. Beams 2,3 & 4 from South, sheet rust bottom flange and web approx. 10'.								
515 - Steel Protective Coating		Underwater	12/12/2016	1125 SF	0	0	0	1125
		Routine	06/23/2016	1125 SF	0	0	0	1125
Notes: [2016] No paint present on beams. Surface corrosion and flaking rust throughout.								
216	Timber Abutment	Underwater	12/12/2016	91 LF	0	43	46	2
		Routine	06/23/2016	91 LF	0	43	46	2
Notes: [2016] Added 43 LF to abutment quantity to account for wingwalls. NE wing cap has extensive decay. West wings have backing boards separating with SW wing losing backfill through separations. [2015] Piles B5 and C3 need shims (1" to 1 1/8" gap). [2014-2013] S abut is pushing in. Piles sounded of decay, 4 piles either no bearing or split in half. North abut cap is bridged across CS4 piles C2 North and South. N wing rotting and movement. Rotting and pushing in.								
228	Timber Pile	Underwater	12/12/2016	28 EA	0	24	2	2
		Routine	06/23/2016	28 EA	0	19	3	6
Notes: [2016 U/W] A 1"-2" gap was observed between the pile and the pile cap at Pile C of the North Abutment and Pile A of the South Abutment. Large splits also present at Pile C of the South Abutment and North Abutment. [2016] Added 8 piles for wing piles. Wing piles have moderate weathering with some decay. [2015] Piles B5 and C3 need shims (1" to 1 1/8" gap). [2014-2013] Piles C2 (North and South) no bearing and split, C1 (South) split, E1 (North) no bearing. All other piles sounded of minor to moderate decay SW pile 1" gap, E. center 1/2" gap. 2 pile need shims.								

**BRIDGE 88754 UT 8146 OVER ASH RIVER**

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
235	Timber Pier Cap	Underwater	12/12/2016	49 LF	0	49	0	0
		Routine	06/23/2016	49 LF	0	0	49	0
Notes: [2016 U/W] Both caps were typically sound with only random checking up to 1/4 inch wide. [2016-2015] North and south caps have slight rotation. [2014-2013] Caps are growing vegetation on the ends. Lengths under deck are sound. Rotation and cracking.								
313	Fixed Bearing	Underwater	12/12/2016	18 EA	0	0	18	0
		Routine	06/23/2016	18 EA	0	0	18	0
Notes: [2016] Section loss present on all bearings. [2015-2013] All rusting.								
330	Metal Bridge Railing	Underwater	12/12/2016	49 LF	0	49	0	0
		Routine	06/23/2016	49 LF	0	49	0	0
Notes: [2016] Rail posts have surface corrosion throughout. [2015-2013] Vertical posts rusting. W-beam w/ Metal Posts.								
515 - Steel Protective Coating		Underwater	12/12/2016	264 SF	0	192	0	72
		Routine	06/23/2016	264 SF	0	192	0	72
Notes: [2016] Rail posts have surface corrosion throughout. Minor deterioration of w-beam galvanizing.								
800	Critical Deficiencies or Safety Hazards	Underwater	12/12/2016	1 EA	1	0	0	0
		Routine	06/23/2016	1 EA	1	0	0	0
Notes: [2016-2013] No critical deficiencies or safety hazards found during this inspection.								
823	Gravel Approach Roadway	Underwater	12/12/2016	2 EA	2	0	0	0
		Routine	06/23/2016	2 EA	2	0	0	0
Notes: [2016-2015] Graders have carried gravel on to deck making approaches and deck same height and correcting impact on bridge. [2014-2013] slightly lower than bridge deck. Traffic is impacting deck.								
881	Steel Section Loss	Underwater	12/12/2016	1 EA	0	0	0	1
		Routine	06/23/2016	1 EA	0	0	0	1
Notes: [2016] Hole in beam 6 getting bigger. Hole on bottom flange of beam 3 near south abutment. [2015] Hole in north end of beam 6 web over abutment. [2014-2013] Section loss by abuts and few beams throughout the length.								
884	Substructure Settlement & Movement	Underwater	12/12/2016	1 EA	0	1	0	0
		Routine	06/23/2016	1 EA	0	1	0	0
Notes: [2016-2013] 2 piles with no bearing. Minor rotation in caps. S abut. backings boards have separated and pushed inward.								
885	Scour	Underwater	12/12/2016	1 EA	1	0	0	0
891	Other Bridge Signing	Underwater	12/12/2016	1 EA	0	1	0	0
		Routine	06/23/2016	1 EA	0	1	0	0
Notes: [2016] SW delineator black stripes fading. [2015-2013] No notable deterioration. 4 Delineators.								
892	Slopes & Slope Protection	Underwater	12/12/2016	1 EA	0	1	0	0
		Routine	06/23/2016	1 EA	0	1	0	0
Notes: [2016] Some loss of material behind SW wing due to backing board separation. [2015-2013] No riprap. Soils have not washed from the abutments.								

**BRIDGE 88754 UT 8146 OVER ASH RIVER**

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
894	Deck & Approach Drainage	Underwater	12/12/2016	1 EA	0	1	0	0
		Routine	06/23/2016	1 EA	0	1	0	0
Notes: [2016-2015] Minor erosion behind all wings. Gravel on deck restricting drainage water flow, but drains remain open. [2014-2013] Eroding behind NW wing.								
895	Sidewalk, Curb, & Median	Underwater	12/12/2016	1 EA	0	0	1	0
		Routine	06/23/2016	1 EA	0	0	1	0
Notes: [2016] Extensive decay throughout curb. [2015] Curb starting to decay. [2014-2013] All curbs show mechanical wearing, splits and checks. NE curb tipped and split.								
900	Protected Species	Underwater	12/12/2016	2 EA	0	1	1	0
		Routine	06/23/2016	2 EA	0	1	1	0
Notes: [2016] Barn swallow nests present on east and west fascia. Bat droppings present on beam 2 near south abutment.								

General Notes: SLC District 3  
 Inspected by: [2016] CG, JD : [2015] CG, ZK : [2014] BH, CG : [2013] BH, JDO  
 [2015-2013] Went under with boat.  
 \*\*\*Bridge runs North and South\*\*\*

58. Deck NBI: [2016] Most of creosote has washed off of underside of deck.  
 [2015] Bituminous peel off east and west ends deck 80% covered in gravel  
 [2014-2013] Bituminous is cracking. Edges of timber deck is growing vegetation and the under deck is losing creosote.

36A. Brdg Railings NBI: Flexbeam with steel posts, substandard for all speeds.

36B. Transitions NBI: ADT 20 (2003). Bridge and roadway are the same width.

36C. Appr Guardrail NBI: ADT 20 (2003). Bridge and roadway are the same width.

36D. Appr Guardrail Terminal NBI: ADT 20 (2003). Bridge and roadway are the same width.

59. Superstructure NBI: [2016] Hole in beam 6 is 1" tall and 9" long. Hole in bottom flange of beam 3 south abutment.  
 [2015] Hole in north end of beam 6.  
 [2014-2013] Most beams have measurable section loss.

60. Substructure NBI: [2016-2013] S abut is pushing in. Piles sounded of decay, 4 piles either no bearing or is split in half.

61. Channel NBI: [2016 U/W] Moderate accumulation of timber debris scattered throughout the channel.  
 [2016-2015] Slow moving water. Inlet to Ash Lake.

62. Culvert NBI:

71. Waterway Adeq NBI: [2016-2015] Inlet to lake remote chance of overtopping.

72. Appr Roadway Alignment NBI: [2016-2015] No sight distance issues or speed reduction required.

Inventory Notes: [2015] Edit SIA header to show UT 8146 instead of Jacobs Rd.

Inspector's Signature

Reviewer's Signature

# Pictures



Photo 1 - East Fascia, Looking West



Photo 2 - West Fascia, Looking Northeast

# Pictures



Photo 3 - Pile C of North Abutment, Looking North



Photo 4 - Pile A of South Abutment, Looking West

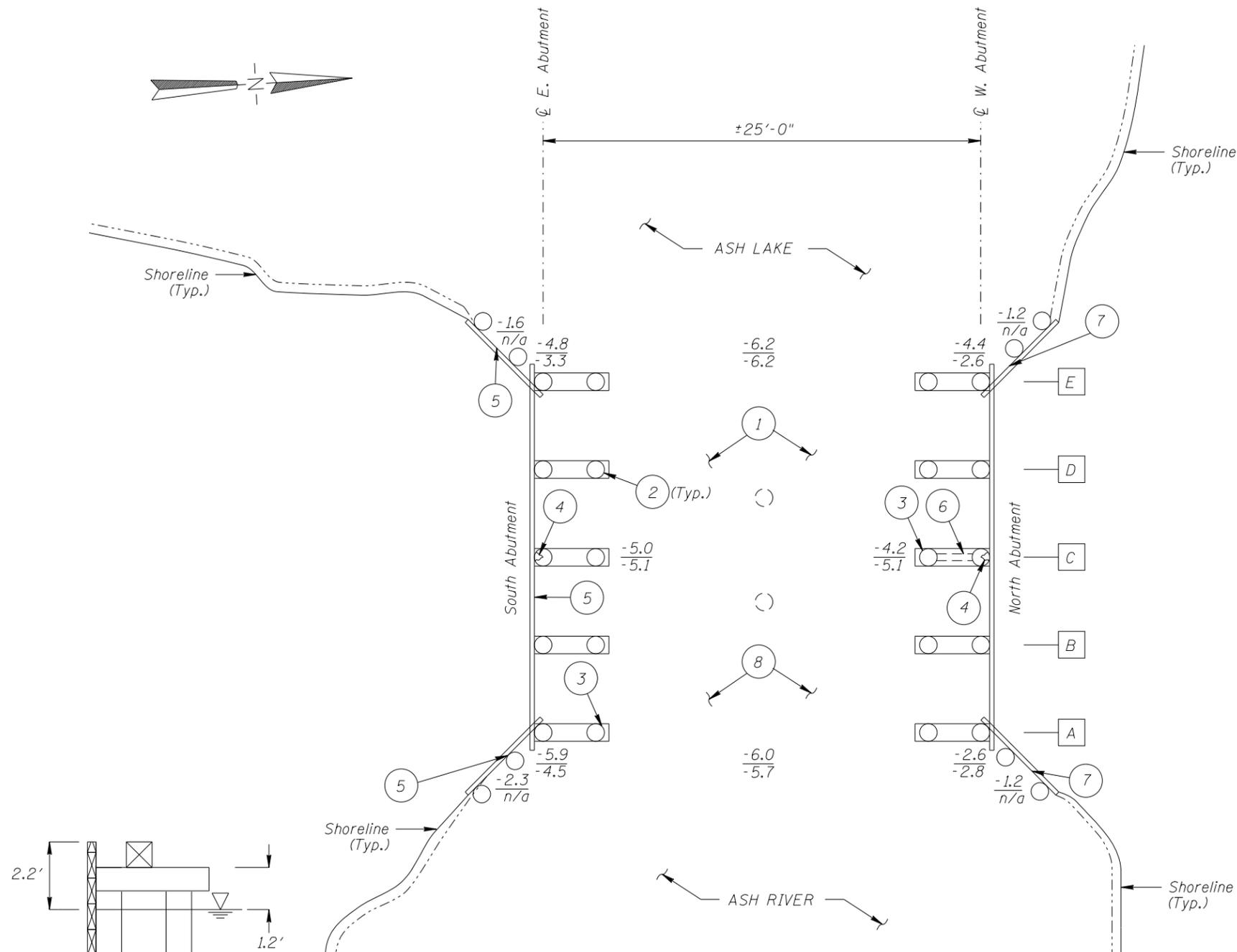
## Pictures



Photo 5 - Typical Pile Condition Near the Waterline, Looking North



Photo 6 - Gap in South Abutment Backwall Boards, Looking South



**INSPECTION NOTES:**

- 1 The channel bottom material typically consisted of sandy gravel with a maximum probe rod penetration of 6 inches.
- 2 The timber piles and bent caps were typically sound with random checks up to 1/4 inch wide and 1/4 inch deep.
- 3 A 1 inch and 2 inch gap was observed between the pile and the pile cap resulting in no bearing at the southern Pile C of the North Abutment and the northern Pile A of the South Abutment respectively.
- 4 The southern Pile C of the South Abutment and the northern Pile C of the North Abutment exhibited splits resulting in approximately a quarter of the pile cross section being detached from the pile. Both sections were load bearing separately. The split ranged from 3 inches wide near the top of the pile to 1 inch wide near the channel bottom.
- 5 A gap, up to 8 inches wide, was observed between the timber backwall boards and both the wingwalls at the South Abutment. A loss of backfill material was observed with a cavity behind the wall having a maximum penetration of 3 feet and a typical penetration of 1 ft.
- 6 A 4 inch by 4 inch timber strut was observed bracing the south and north Pile C at the North Abutment.
- 7 A gap, up to 6 inches high, was observed between the channel bottom and the bottom wingwall boards at both wingwalls of the North Abutment. A loss of backfill was observed behind the boards with up to 6 inches of penetration.
- 8 A moderate timber debris accumulation, consisting of 1 foot diameter and smaller logs, was scattered throughout the channel and extended from the channel bottom to the waterline.

**GENERAL NOTES:**

1. The South and North Abutments were inspected during the underwater inspection.
2. At the time of inspection on June 19, 2016, the waterline was located approximately 1.2 feet below the top of the pile cap at the west end of the North Abutment. Since elevation information was not available a reference elevation of 100.0 was assumed. Based on the assumed reference the waterline elevation was 98.8.
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 1/2 point intervals between the substructure units.

**Legend**

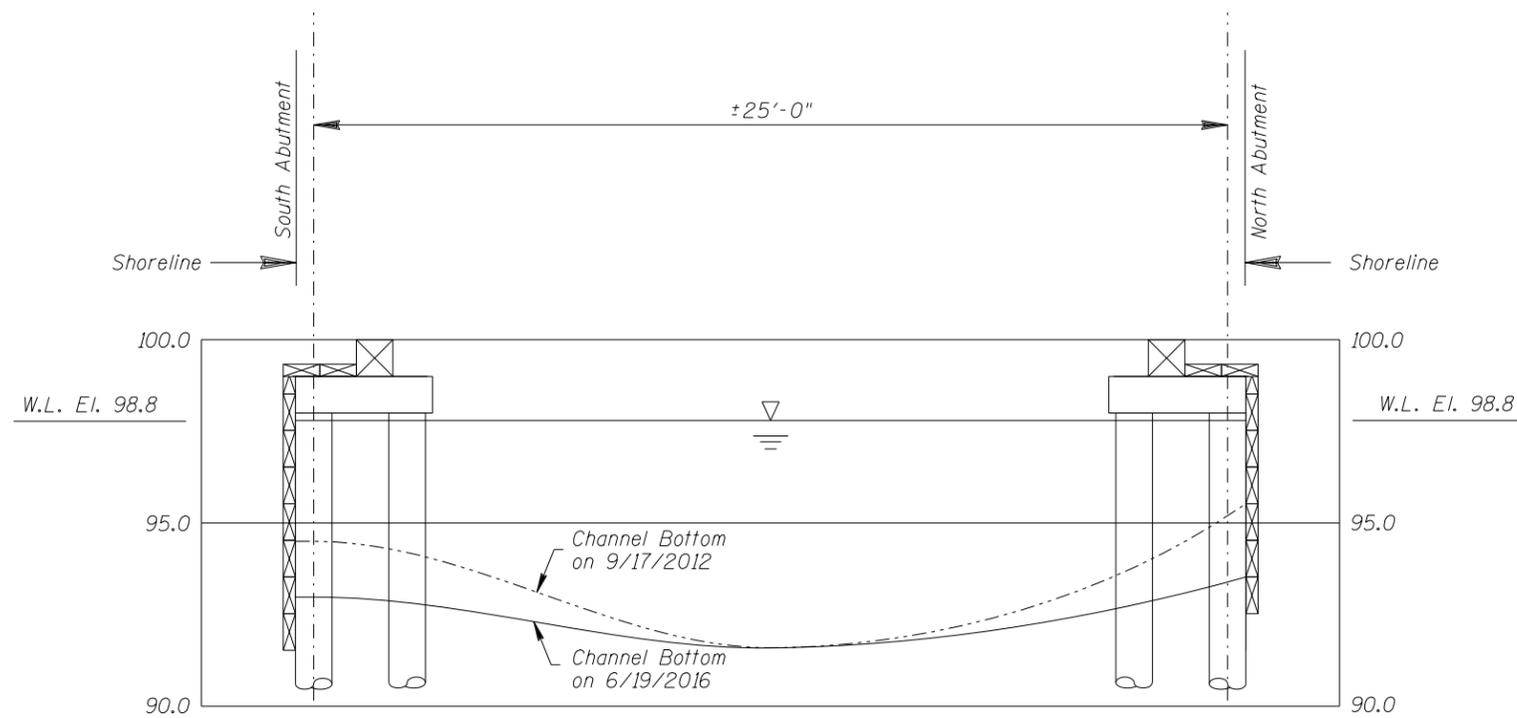
- 2.6 Sounding Depth from Waterline (6/19/2016)
- 2.8 Sounding Depth from Waterline (9/17/2012)
- A Pile Identification Designation
- 12-inch Diameter Timber Pile
- ⊙ 12-inch Diameter Abandoned Timber Pile
- 1 Inspection notes

**MINNESOTA  
DEPARTMENT OF TRANSPORTATION  
UNDERWATER BRIDGE INSPECTION**

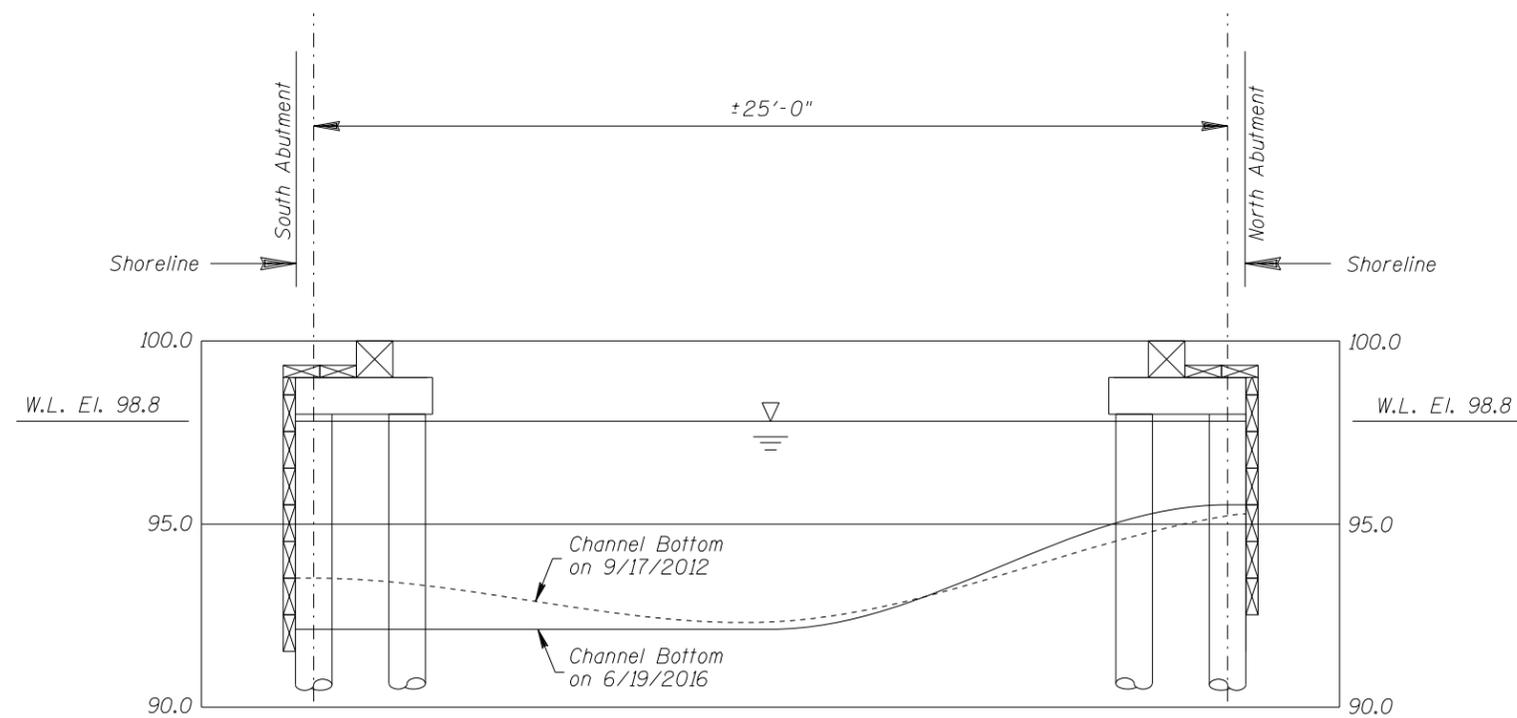
STRUCTURE NO. 88754  
OVER THE ASH RIVER  
DISTRICT 1, ST. LOUIS COUNTY

**INSPECTION AND SOUNDING PLAN**

DRAWN BY: MRS	<b>COLLINS ENGINEERS</b> 123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com	DATE: JUNE 19, 2016
CHECKED BY: LJ		SCALE: NTS
CODE: 968788754		FIGURE NO.: 1



WEST FASCIA PROFILE



EAST FASCIA PROFILE

Note:  
Refer to Figure 1 for General Notes.

<b>MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION</b>		
STRUCTURE NO. 88754 OVER THE ASH RIVER DISTRICT I, ST. LOUIS COUNTY UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
DRAWN BY: MRS	<b>COLLINS ENGINEERS</b> <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	DATE: JUNE 19, 2016
CHECKED BY: LJ		SCALE: 1"=5'-0"
CODE: 968788754		FIGURE NO.: 2