

2016 UNDERWATER BRIDGE INSPECTION REPORT



BRIDGE # 88631 CR 958 over STREAM

DISTRICT: District 1

COUNTY: St. Louis

CITY/TOWNSHIP: LINDEN GROVE

STATE: Minnesota

Date of Inspection: 06/22/2016

Equipment Used:

Owner: County 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 unit inspected at Structure No. 88631, a single concrete box culvert, was found to be in satisfactory to fair condition with only minor defects of structural significance below water. Several vertical cracks with efflorescence, up to 1/8 inch wide, were observed extending from the channel bottom to the culvert ceiling. Areas of concrete section loss were associated with the cracks measuring up to 2 inches wide with 1 inch of penetration. A longitudinal 1/32 inch wide crack was observed along the bottom of both haunches. Apart from the above deficiencies, the remaining concrete surfaces were generally smooth and sound. A small area of the top of the concrete apron was exposed at the upstream end of the culvert. No vertical apron toe exposure was observed. Scattered timber debris consisting of branchy material was observed throughout the culvert. Minor erosion was present behind the southeast and southwest side of the headwall. The condition of the concrete and areas of defects have not significantly increased since the previous inspection.

INSPECTION FINDINGS

- (A) The channel bottom material consisted of soft silt with a maximum probe rod penetration of 1 foot.
- (B) Apart from the below deficiencies, the concrete of the culvert was typically smooth and sound.
- (C) Voids with efflorescence (1/2 inch diameter holes) were observed throughout the culvert spaced at approximately 5 feet on center, at 3 feet above the waterline on both walls. The voids appeared to be formed.
- (D) Several vertical cracks with efflorescence, up to 1/8 inch wide, were observed on both walls of the culvert extending from the channel bottom to the ceiling at the upstream end, near the midpoint, and the downstream end of the culvert. The cracks had associated areas of concrete section loss up to 2 inches wide with 1 inch of penetration.
- (E) A longitudinal crack was observed along the bottom of the haunch on both sides of the culvert. The cracks were up to 1/32 inch wide and extended the entire length of the culvert.
- (F) A 3 foot diameter area of apron was exposed at the upstream end of the culvert. Only the top of the apron was exposed, no vertical exposure was observed.
- (G) All four wingwalls exhibited random vertical cracks with efflorescence extending from the channel bottom to the top of the wingwall. The cracks had a maximum width of 1/16 inch.
- (H) Scattered timber debris, consisting of small branches, was observed throughout the culvert length.
- (I) There were two areas of minor erosion behind the south headwall measuring approximately 2 feet deep and 3 feet long.

RECOMMENDATIONS

- (A) Monitor the vertical cracks and associated areas of concrete section loss during future underwater inspections.
- (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 #: 88631
Feature Intersected: STREAM
Facility Carried: CR 958
District: District 1
County: 069 - St. Louis
Bridge Description:

The culvert consists of a reinforced concrete single box culvert.

2. INSPECTION DATA

Professional Engineer/Team Leader: Lukas Janulis
Inspection Diver: Lukas Janulis
Date of Underwater Inspection: 06/22/2016
Weather Conditions: Overcast, 70°F
Underwater Visibility (feet): 1.0 feet
Waterway Velocity (ft/sec): None/Negligible

3. SUBSTRUCTURE INSPECTION DATA

Substructure(s) Inspected: Concrete Box Culvert
General Shape:

The culvert consists of one reinforced concrete box barrel measuring 10 feet wide by 8 feet high and 54 feet long.

Maximum Water Depth at Substructure(s) Inspected (feet): 5.3 feet

4. WATERLINE DATUM

Water Level Reference: The bottom of the south headwall.
Waterline Elevation (feet): 95.4 feet
Description: The waterline was located approximately 4.6 feet below the reference.

5. NBIS CODING INFORMATION

(Minnesota specific codes are used for 92B and 113)

Item 60: Substructure: Code:
Item 61: Channel and Channel Protection: Code: 5
Item 62: Culvert: Code: 5
Item 92B: Underwater Inspection: Code: Y 48 06/2016

Item 113: Scour Critical Bridge:

Code: E

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
241	Concrete Culvert	52	LF		42	10	
870	Culvert End Treatment	2	EA		2		
885	Scour	1	EA	1			

UNDERWATER INSPECTION

INSPECTION PROCEDURES

The routine underwater inspection of Bridge 88631 (C.R. 958 over Stream) was completed on June 22, 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 (SSA and/or SCUBA) in accordance with OSHA regulations. Channel bottom profiles were taken along the upstream and downstream openings of the culvert to determine the presence, location and area of scour.

The bridge element inspected was the concrete box culvert. 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 Structure Inventory Report

Bridge ID: 88631

CR 958 over STREAM

Date: 09/08/2016

+ GENERAL +	+ ROADWAY +	+ INSPECTION +																				
Agency Br. No. 689 Crew District 01 Maint. Area County 069 - St. Louis City Township 69042 - LINDEN GROVE Desc. Loc. 1.3 MI E OF JCT TH73 Sect., Twp., Range 25 - 062N - 20W Latitude 47 ° 50 ' 2.25 " Longitude 92 ° 50 ' 30.94 " Custodian 02 - County Highway Agency Owner 02 - County Highway Agency BMU Agreement Year Built 1946 MN Year Reconstructed FHWA Year Reconstructed MN Temporary Status Bridge Plan Location 0 - NO PLAN Date Opened to Traffic On - Off System 0 - OFF Legislative District 06A Potential ABC 2 - N/A	Bridge Match ID (TIS) 0 Roadway O/U Key Route On Structure Route Sys 07 - CNTY Number 958 Roadway Name or Description CNTY 958 Level of Service 1 - MAINLINE Roadway Type 2 - 2-way traffic Control Section (TH Only) Reference Point 001+00.300 Detour Length 4.0 mi. Lanes ON 2 UNDER 0 ADT 35 YEAR 2003 HCA DT ADTT % Functional Class 09 - Rural - Local	Userkey 109 Structurally Deficient N Functionally Obsolete N Sufficiency Rating 75.8 Routine Inspection Date 10/22/2015 Routine Inspection Frequency 24 Inspector Name Janulis, Lukas Status A - Open																				
	+ RDWY DIMENSIONS +	+ NBI CONDITION RATINGS +																				
	If Divided NB-EB SB-WB Roadway Width 24.00 ft. ft. Vertical Clearance ft. ft. Max. Vert. Clear. ft. ft. Horizontal Clear. ft. ft. Lateral Clearance ft. ft. Appr. Surface Width 24.0 ft. Bridge Roadway Width 0.0 ft. Median Width On Bridge ft.	Deck N Unsound Deck % Superstructure N Substructure N Channel 5 Culvert 5																				
+ STRUCTURE +	+ MISC. BRIDGE DATA +	+ NBI APPRAISAL RATINGS +																				
Service On 1 - Highway Service Under 5 - Waterway Main Span Type 1 - Concrete Main Span Design 13 - Box Culvert Main Span Detail Appr. Span Type Appr. Span Design Appr. Span Detail Skew 0 Culvert Type W1010 Barrel Length 54 Cantilever ID Number of Spans MAIN: 1 APPR: 0 TOTAL: Main Span Length 10.0 ft. Structure Length 11.7 ft. Deck Width (Out-to-Out) 0.0 ft. Deck Material N - Not Applicable Wear Surf Type 8 - Gravel Wear Surf Install Year Wear Course/Fill Depth 2.00 ft. Deck Membrane N - Not Applicable (applies Deck Rebars N - Not Applicable (no deck) Deck Rebars Install Year Structure Area (Out-to-Out) 0 sq. ft. Roadway Area (Curb-to-Curb) sq. ft. Sidewalk Width 50A. Lt 0.00 ft. 50B. Rt 0.00 ft. Curb Height Lt 0.00 ft. Rt 0.00 ft. Rail Type Lt NN Rt NN	Structure Flared 0 - No flare Parallel Structure N - No parallel structure Field Conn. ID Abutment Foundation (Material/Type) N - N/A Pier Foundation (Material/Type) N - N/A Historic Status 5 - Not eligible	Structure Evaluation 5 Deck Geometry N Underclearances N Waterway Adequacy 8 Approach Alignment 7																				
	+ PAINT +	+ SAFETY FEATURES +																				
	Year Painted Unsound Paint % Painted Area sq. ft. Primer Type Finish Type	Bridge Railing N - NOT REQUIRED GR Transition N - NOT REQUIRED Appr. Guardrail 0 - SUBSTANDARD GR Termini 0 - SUBSTANDARD																				
	+ BRIDGE SIGNS +	+ IN DEPTH INSP. +																				
	Posted Load 0 - Not Required Traffic 0 - Not Required Horizontal 0 - Not Required Vertical N - Not Applicable	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">Y/N</th> <th style="text-align: center;">Freq</th> <th style="text-align: center;">Date</th> </tr> </thead> <tbody> <tr> <td>Frac. Critical</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Underwater</td> <td style="text-align: center;">Y</td> <td style="text-align: center;">60</td> <td style="text-align: center;">06/22/2016</td> </tr> <tr> <td>Pinned Asbly.</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Spec. Feat.</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Y/N	Freq	Date	Frac. Critical				Underwater	Y	60	06/22/2016	Pinned Asbly.				Spec. Feat.			
	Y/N	Freq	Date																			
Frac. Critical																						
Underwater	Y	60	06/22/2016																			
Pinned Asbly.																						
Spec. Feat.																						
		+ WATERWAY +																				
		Drainage Area (sq. mi.) Waterway Opening (sf.) 100 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 E - CULVERT Year																				
		+ CAPACITY RATINGS +																				
		Design Load 0 - Other/Unknown Operating Rating 1 - H TRUCK 18.0 Inventory Rating 1 - H TRUCK 13.0 Posting VEH: SEMI: DBL: Rating Date 2/1/1991 Overweight Permit Codes A N - N/A B N - N/A C N - N/A																				

MINNESOTA BRIDGE INSPECTION REPORT

10/24/2016

Inspector: CO Bridge

BRIDGE 88631 CR 958 OVER STREAM

County: St. Louis	Location: 1.3 MI E OF JCT TH73	Length: 11.7 ft.
City:	Route: 07 - CNTY 958 Ref. Pt.: 001+00.300	Deck Width: 0.0 ft.
Township: 69042 - LINDEN GROVE	Control Section:	Rdwy. Area/ Pct. Unsnd: sq. ft. / %
Section: 25 Township: 062N Range: 20W Maint. Area:		Paint Area/ Pct. Unsnd: sq. ft. / %
Span Type: 1 - Concrete 19 - Culvert (includes frame culverts)	Local Agency Bridge Nbr.: 689	Culvert: W1010
List:		Postings:
NBI Deck: N Super: N Sub: N Chan: 5 Culv: 5		
	Open, Posted, Closed: A - Open	
	MN Scour Code: E - CULVERT	
Appraisal Ratings - Approach: 7 Waterway: 8		Unofficial Structurally Deficient N
Required Bridge Signs - Load Posting: 0 - Not Required	Traffic: 0 - Not Required	Unofficial Functionally Obsolete N
Horizontal: 0 - Not Required	Vertical: N - Not Applicable	Unofficial Sufficiency Rating 75.8

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
241	Reinforced Concrete Culvert	Underwater	09/08/2016	52 LF	0	42	10	0
		Migrated Values		52 LF	0	42	10	0
	Notes: [2015] Cracks at ends of barrels along joint with wings that are 0.030" to 0.050" with delamination starting. Form tie holes in walls leaching. Cracking with leaching south end of east wall. [2013] Moderate scaling throughout barrel with several vertical cracks in barrel. Some cracking and leaching in walls. Open 1/4" at bottom SW.							
800	Critical Deficiencies or Safety Hazards	Underwater	09/08/2016	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
	Notes: [2015-2013] No critical findings during this inspection.							
870	Culvert End Treatment	Underwater	09/08/2016	2 EA	0	2	0	0
		Migrated Values		2 EA	0	2	0	0
	Notes: [2015] Cracking of 0.03" to 0.05" along culvert and wing joints that are full depth of wing. Delamination along cracks. 0.05" diagonal crack on NW wing. Minor spalling on south headwall. [2013] Moderate scaling throughout barrel. Minor to moderate cracking in all 4 wings.							
871	Roadway Over Culvert	Underwater	09/08/2016	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
	Notes: [2015] No signs of settlement or undermining. [2013] Well maintained. Gravel.							
885	Scour	Underwater	09/08/2016	1 EA	1	0	0	0
891	Other Bridge Signing	Underwater	09/08/2016	1 EA	0	0	1	0
		Migrated Values		1 EA	0	0	1	0
	Notes: [2015-2013] No culvert markers present.							
892	Slopes & Slope Protection	Underwater	09/08/2016	2 EA	0	2	0	0
		Migrated Values		2 EA	0	2	0	0
	Notes: [2015] Culvert barrel exposed starting 13' from centerline on north and south ends due to slope erosion. Up to 3' of material missing behind wings (when standing behind SE wing, top of wing at waist). [2013] Moderate erosion behind all wings cause from roadway drainage.							

BRIDGE 88631 CR 958 OVER STREAM

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	09/08/2016	2 EA	0	2	0	0
		Migrated Values		2 EA	0	2	0	0
Notes: [2015] Culvert barrel exposed starting 13' from centerline on north and south ends due to slope erosion. [2013] Moderate erosion behind all wings from roadway drainage.								
900	Protected Species	Underwater	09/08/2016	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: SLC District 3
 Inspected by: [2015] CG, TM : [2013] JRS, JDO
 No Guardrail.
 [2015] Beaver dam 225' north of culvert.

58. Deck NBI:

36A. Brdg Railings NBI: No rail attached to culvert.

36B. Transitions NBI: No rail attached to culvert. No transition required.

36C. Appr Guardrail NBI: Culvert barrel exposed starting 13' from centerline, on north and south end, due to erosion, causing traffic hazard inside of clear zone for ADT < 50. No guardrail present.

36D. Appr Guardrail Terminal NBI: Culvert barrel exposed starting 13' from centerline, on north and south end, due to erosion, causing traffic hazard inside of clear zone for ADT < 50. No guardrail present.

59. Superstructure NBI:

60. Substructure NBI:

61. Channel NBI: [2015] Beaver dam 225' to the north blocking channel. Damage to stream banks due to regularly high water.

62. Culvert NBI: [2015-2013] Moderate scaling throughout barrel with several vertical cracks.

71. Waterway Adeq NBI: [2015] Culvert half full of water due to beaver activity. Possible culvert fills with water when Little Fork river floods. Low point in roadway to the east that would over top before roadway over culvert.

72. Appr Roadway Alignment NBI: [2015] Hill to west affecting sight distance. No speed reduction required.

Inventory Notes:

 Inspector's Signature

 Reviewer's Signature

Pictures



Photo 1 - Upstream Opening, Looking North



Photo 2 - Downstream Opening, Looking South

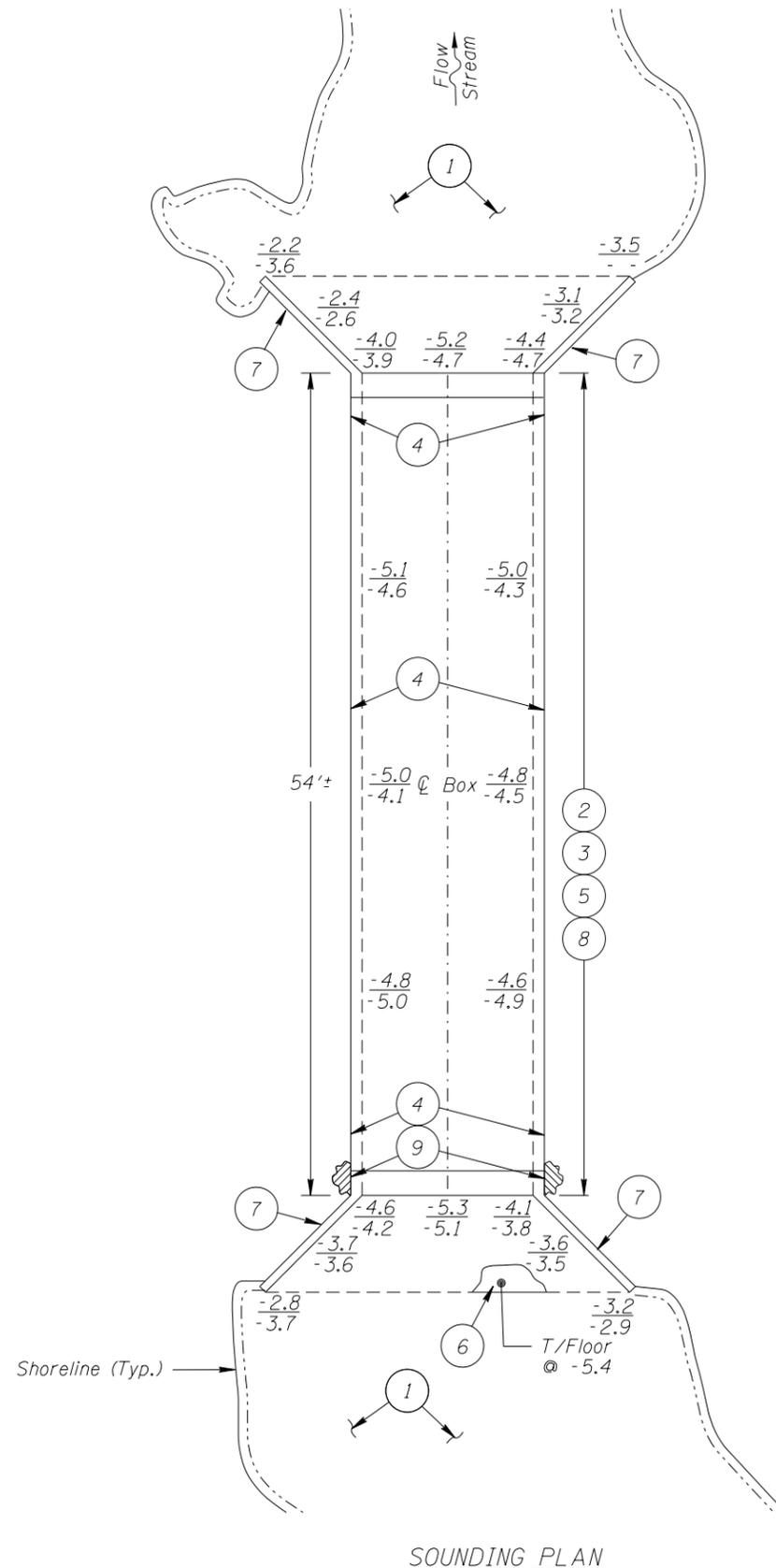
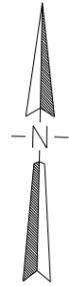
Pictures



Photo 3 - Typical Vertical Cracking, Looking West



Photo 4 - Typical Wingwall Cracking (Southeast Shown), Looking Northeast



GENERAL NOTES:

1. The concrete box culvert was inspected underwater.
2. At the time of inspection, on June 22, 2016, the waterline was located approximately 4.6 feet below the bottom of the south headwall. Since insufficient elevation information was available, an elevation of 100.0 was assumed. This corresponds to a waterline elevation of 95.4.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.

INSPECTION NOTES:

- ① The channel bottom material consisted of soft silt allowing a maximum probe rod penetration of 1 foot.
- ② The concrete of the culvert was typically smooth and sound unless noted otherwise.
- ③ Voids with efflorescence ($\frac{1}{2}$ inch ϕ holes) were observed throughout the culvert spaced at approximately 5 feet on center, at 3 feet above the waterline on both walls. Voids appeared to be formed.
- ④ Vertical cracks with efflorescence, up to $\frac{1}{8}$ inch wide, were observed on both walls of the culvert extending from the channel bottom to the ceiling at the upstream end, near the midpoint, and the downstream end of the culvert. The cracks had areas of associated concrete section loss up to 2 inches wide with 1 inch of penetration.
- ⑤ A longitudinal crack was observed along the bottom of the haunch on both sides of the culvert. The cracks were up to $\frac{1}{32}$ inch wide and ran the entire length of the culvert.
- ⑥ A 3 foot diameter area of the apron was exposed at the upstream end of the culvert. Only the top of the apron was exposed, no vertical exposure was observed.
- ⑦ All four wingwalls exhibited random vertical cracks with efflorescence extending from the channel bottom to the top of the wingwall. The cracks had a maximum width of $\frac{1}{16}$ inch.
- ⑧ Scattered timber debris, consisting of small branches, was observed throughout the culvert length.
- ⑨ There were two areas of minor erosion behind the south headwall measuring approximately 2 feet deep and 3 feet long.

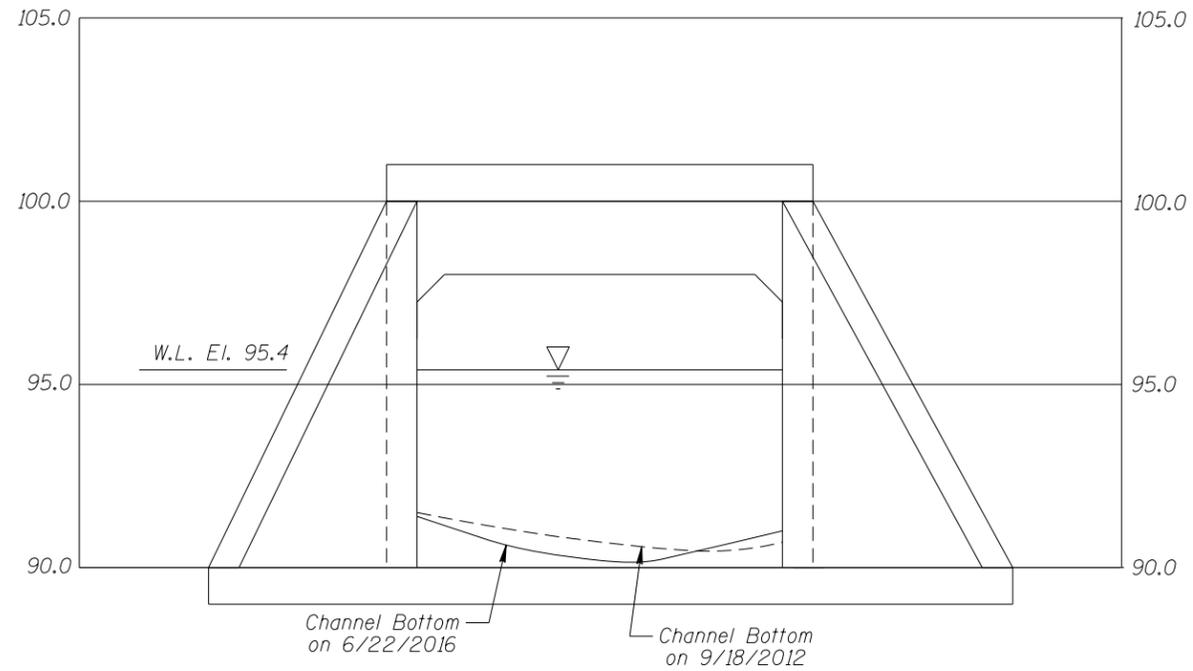
Legend

- 0.4 Sounding Depth from Waterline (6/22/2016)
- 0.4 Sounding Depth from Waterline (9/18/2012)
- Area of Erosion

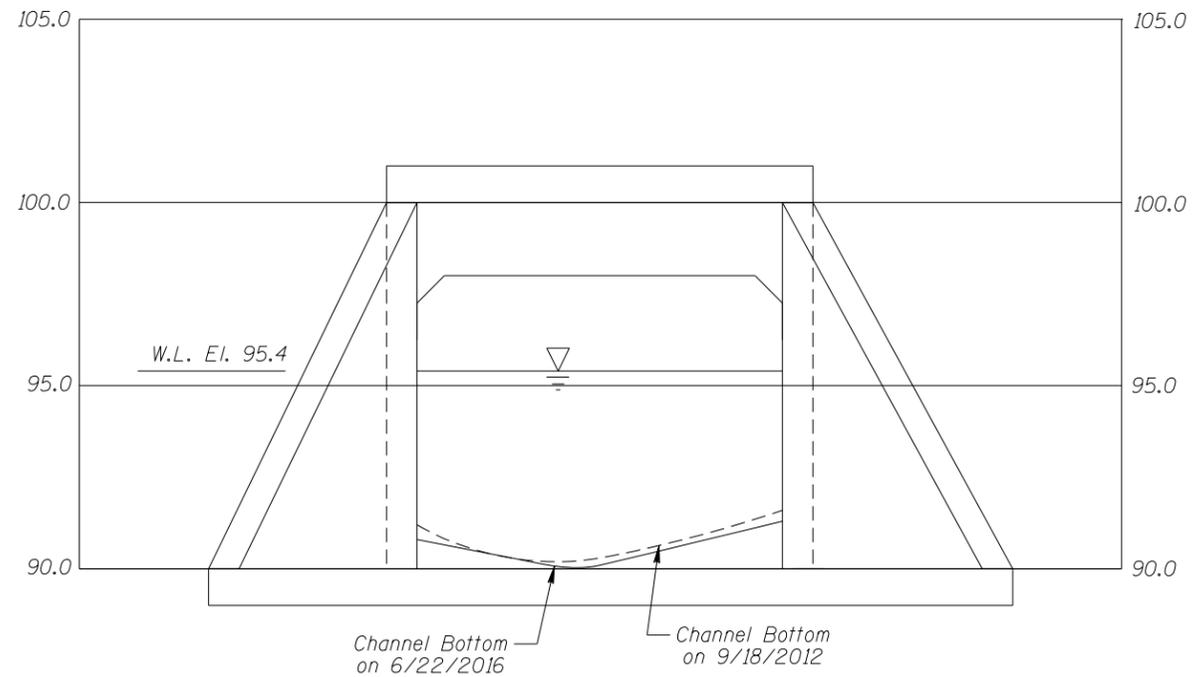
Note:

All soundings are based on 2016 waterline location.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 88631 CR 958 OVER A STREAM DISTRICT 1, ST. LOUIS COUNTY		
INSPECTION AND SOUNDING PLAN		
DRAWN BY: PRH	COLLINS ENGINEERS	Date: JUNE 22, 2016
CHECKED BY: LJ		Scale: N.T.S.
Code: 968788631		Figure No.: 1
<small>133 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>		



DOWNSTREAM OPENING PROFILE



UPSTREAM OPENING PROFILE

Note: _____

Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 88631 CR 958 OVER A STREAM DISTRICT 1, ST. LOUIS COUNTY UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
DRAWN BY: MBP CHECKED BY: LJ Code: 96878863I	COLLINS ENGINEERS	<small>133 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small> DATE: JUNE 22, 2016 SCALE: 1"=5'-0" FIGURE NO.: 2