

2016 UNDERWATER BRIDGE INSPECTION REPORT



BRIDGE # 7836 CR 737 over HELLEWEGS CREEK

DISTRICT: District 1

COUNTY: St. Louis

CITY/TOWNSHIP: NORTHLAND

STATE: Minnesota

Date of Inspection: 09/13/2016

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 units inspected below water at Structure No. 7836, Box 1 and Box 2 of the culvert, were found to be in fair condition with defects of only minor structural significance. The concrete surfaces were typically smooth and sound apart from numerous areas of poor concrete consolidation and associated concrete section loss, as well as a 3 foot band of heavy scaling on all of the culvert walls. There were also several larger areas of poor concrete consolidation and concrete section loss ranging in size from 1 square foot to 16 square feet, with penetrations ranging from 1 to 6 inches and exposed reinforcing steel present. The culverts were typically free of debris and the concrete floor was typically exposed throughout the length of both boxes.

INSPECTION FINDINGS

- (A) The culvert floor was typically clear of any debris or silt build up. There was a layer of silty sand and gravel allowing up to 3 inches probe rod of penetration covering a portion of the concrete apron at the upstream and downstream openings of Box 2.
- (B) The channel bottom material upstream and downstream of the culvert apron consisted of soft silt allowing a maximum probe rod penetration of 1 foot.
- (C) A band of heavy scaling, extending from the waterline to the culvert floor was observed on all exposed concrete walls. The scaling had a typical penetration of 1/2 inch with a maximum penetration of 1 inch on the east and west walls and 2 inches on the center wall.
- (D) The apron floor was flush with the channel bottom at the upstream and downstream openings of Box 1 with no vertical face exposure.
- (E) A diagonal crack was observed on the northwest wingwall with a maximum width of 1/4 inch.
- (F) An area of concrete section loss measuring 2 feet long and 6 inches high with a maximum penetration of 6 inches was observed 1 foot above the waterline near the midpoint of the west face of the center wall.
- (G) An area of concrete section loss measuring 1 foot long and 3 inches high with a maximum penetration of 3 inches was observed 0.5 feet above the waterline and 6 feet from the upstream opening on the west face of the center wall. One horizontal reinforcing bar was exposed with minor loss of section.
- (H) An area of poor concrete consolidation and concrete section loss was observed on the ceiling and east haunch of Box 1 at approximately 15 feet from the downstream opening. The area on the ceiling measured 4 feet long by 4 feet wide with a maximum penetration of 2 inches and the area on the haunch measured approximately 4 feet long by 3 inches high with a maximum penetration of 6 inches and one exposed reinforcing bar with no appreciable loss of section.
- (I) Areas of concrete section loss with up to 2 inches of penetration were observed on the top of the southwest wingwall and the south center wall extension.
- (J) An area of poor concrete consolidation and concrete section loss was observed on the ceiling and east haunch of Box 2 at approximately 15 feet from the downstream opening. The area on the ceiling measured 4 feet long by 4 feet wide with a maximum penetration of 2 inches and the area on the haunch measured approximately 4 feet long by 3 inches high with a maximum penetration of 3 inches and several exposed reinforcing bars with no appreciable loss of section.
- (K) An area of poor concrete consolidation and concrete section loss was observed at the midpoint of the ceiling at the downstream opening of Box 2. The area measured 1.5 feet long by 6 inches wide with a maximum penetration of 2 inches and one exposed reinforcing bar with no appreciable loss of section.
- (L) The concrete of the walls from 0.5 feet above the waterline to the ceiling and the concrete of the ceiling was generally smooth and sound except where otherwise noted. The ceiling and haunches had numerous random areas of poor concrete consolidation and associated areas of concrete section loss with up to 1 inch of penetration.

RECOMMENDATIONS

(A) The areas of concrete section loss and poor concrete consolidation with exposed reinforcing steel are not structural concerns at this time; however, they should be repaired to prevent further deterioration. The repairs should include removal of concrete to a minimum of 1 inch behind the reinforcing steel, cleaning and replacing reinforcing steel as required, and placing concrete designed to provide high durability with low permeability.

(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 #: 7836
Feature Intersected: HELLEWEGS CREEK
Facility Carried: CR 737
District: District 1
County: 069 - St. Louis
Bridge Description:

The culvert consists of two reinforced concrete culvert boxes designated as Box 1 and Box 2 from west to east.

2. INSPECTION DATA

Professional Engineer/Team Leader: Lukas Janulis
Inspection Diver: Lukas Janulis
Date of Underwater Inspection: 09/13/2016
Weather Conditions: Cloudy, 60°F
Underwater Visibility (feet): 2.0 feet
Waterway Velocity (ft/sec): None/Negligible

3. SUBSTRUCTURE INSPECTION DATA

Substructure(s) Inspected: Box 1 and Box 2.
General Shape:

The culvert consists of two reinforced concrete box barrels measuring 12 feet wide by 6 feet high and 32 feet long.

Maximum Water Depth at Substructure(s) Inspected (feet): 4.5 feet

4. WATERLINE DATUM

Water Level Reference: The top of the concrete apron at the upstream opening of Box 1.
Waterline Elevation (feet): 104.3 feet
Description: The waterline was approximately 4.3 feet above 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: 7
Item 62: Culvert: Code: 5
Item 92B: Underwater Inspection: Code: Y 48 09/16

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	66	LF		57	9	
885	Scour	1	LF	1			

UNDERWATER INSPECTION

INSPECTION PROCEDURES

The routine underwater inspection of Bridge 7836 (CR 737 over Hellewags Creek) was completed on September 13, 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 depth soundings were taken along the openings and along the length of the culvert to determine the presence, location, and area of scour.

The bridge elements inspected were the reinforced concrete culvert boxes. 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 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: 7836

CR 737 over HELLEWEGS CREEK

Date: 12/16/2016

+ GENERAL +	+ ROADWAY +	+ INSPECTION +																				
Agency Br. No. 188 Crew District 01 Maint. Area County 069 - St. Louis City Township 69053 - NORTHLAND Desc. Loc. 0.3 MI E OF JCT TH53 Sect., Twp., Range 26 - 053N - 17W Latitude 47 ° 2' 22.78 " Longitude 92 ° 27' 48.47 " Custodian 02 - County Highway Agency Owner 02 - County Highway Agency BMU Agreement Year Built 1938 MN Year Reconstructed FHWA Year Reconstructed MN Temporary Status Bridge Plan Location 3 - COUNTY Date Opened to Traffic On - Off System 0 - OFF Legislative District 05B Potential ABC 2 - N/A	Bridge Match ID (TIS) 0 Roadway O/U Key Route On Structure Route Sys 07 - CNTY Number 737 Roadway Name or Description CNTY 737 Level of Service 1 - MAINLINE Roadway Type 2 - 2-way traffic Control Section (TH Only) Reference Point 000+00.344 Detour Length 99.0 mi. Lanes ON 2 UNDER 0 ADT 5 YEAR 2003 HCA DT ADTT % Functional Class 09 - Rural - Local	Userkey 109 Structurally Deficient N Functionally Obsolete N Sufficiency Rating 81.3 Routine Inspection Date 05/18/2016 Routine Inspection Frequency 24 Inspector Name Janulis, Lukas Status A - Open																				
		+ NBI CONDITION RATINGS +																				
		Deck N Unsound Deck % Superstructure N Substructure N Channel 7 Culvert 5																				
		+ NBI APPRAISAL RATINGS +																				
		Structure Evaluation 5 Deck Geometry N Underclearances N Waterway Adequacy 8 Approach Alignment 8																				
		+ SAFETY FEATURES +																				
		Bridge Railing N - NOT REQUIRED GR Transition N - NOT REQUIRED Appr. Guardrail 0 - SUBSTANDARD GR Termini 0 - SUBSTANDARD																				
		+ IN DEPTH INSP. +																				
		<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;">Y/N</th> <th style="width: 15%; text-align: center;">Freq</th> <th style="width: 15%; 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></td> <td style="text-align: center;">60</td> <td style="text-align: center;">09/13/2016</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		60	09/13/2016	Pinned Asbly.				Spec. Feat.			
	Y/N	Freq	Date																			
Frac. Critical																						
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Pinned Asbly.																						
Spec. Feat.																						
		+ WATERWAY +																				
		Drainage Area (sq. mi.) Waterway Opening (sf.) 144 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 25.0 Inventory Rating 1 - H TRUCK 18.0 Posting VEH: SEMI: DBL: Rating Date 2/1/1991 Overweight Permit Codes A N - N/A B N - N/A C N - N/A																				
+ STRUCTURE +	+ RDWY DIMENSIONS +																					
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 W126D Barrel Length 33 Cantilever ID Number of Spans MAIN: 2 APPR: 0 TOTAL: Main Span Length 12.5 ft. Structure Length 26.6 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 0.50 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	If Divided NB-EB SB-WB Roadway Width 32.00 ft. ft. Vertical Clearance ft. ft. Max. Vert. Clear. ft. ft. Horizontal Clear. ft. ft. Lateral Clearance ft. ft. Appr. Surface Width 29.0 ft. Bridge Roadway Width 0.0 ft. Median Width On Bridge ft.																					
		+ MISC. BRIDGE DATA +																				
		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																				
		+ PAINT +																				
		Year Painted Unsound Paint % Painted Area sq. ft. Primer Type Finish Type																				
		+ BRIDGE SIGNS +																				
		Posted Load 0 - Not Required Traffic 0 - Not Required Horizontal 1 - Object Markers Vertical N - Not Applicable																				

MINNESOTA BRIDGE INSPECTION REPORT

12/27/2016

Inspector: CO Bridge

BRIDGE 7836 CR 737 OVER HELLEWEGS CREEK

County: St. Louis	Location: 0.3 MI E OF JCT TH53	Length: 26.6 ft.
City:	Route: 07 - CNTY 737 Ref. Pt.: 000+00.344	Deck Width: 0.0 ft.
Township: 69053 - NORTHLAND	Control Section:	Rdwy. Area/ Pct. Unsnd: sq. ft. / %
Section: 26 Township: 053N Range: 17W Maint. Area:		Paint Area/ Pct. Unsnd: sq. ft. / %
Span Type: 1 - Concrete 19 - Culvert (includes frame culverts)	Local Agency Bridge Nbr.: 188	Culvert: W126D
List:		Postings:
NBI Deck: N Super: N Sub: N Chan: 7 Culv: 5		
	Open, Posted, Closed: A - Open	
	MN Scour Code: E - CULVERT	

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	81.3

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	12/16/2016	66 LF	0	57	9	0
		Routine	05/18/2016	66 LF	0	57	9	0
Notes: [2016] Water within 1.5' of culvert top, unable to walk through. [2014] Area of honeycombing on center wall barrel on 4' in length with exposed reinforcement that has some section loss. Areas of moderate scale with some aggregate loss but no exposure of reinforcement. Reinforcement exposed at south end of barrel 2 and a small area at the north and of barrel 1. Exposed reinforcement has surface corrosion with some section loss. Honeycombing most of east half of top of barrel 1. pockets of honeycombing throughout barrels. No leaching on cold joint. [2013] Honeycombing at center wall fillet of each barrel. Minor to moderate scaling at wetted perimeter of both barrels. Moment cracking is present.								
800	Critical Deficiencies or Safety Hazards	Underwater	12/16/2016	1 EA	1	0	0	0
		Routine	05/18/2016	1 EA	1	0	0	0
Notes: [2016-2013] No critical deficiencies or safety hazards found during this inspection.								
870	Culvert End Treatment	Underwater	12/16/2016	2 EA	0	2	0	0
		Routine	05/18/2016	2 EA	0	2	0	0
Notes: [2016-2014] Tops of wing walls on south end disintegrating with no exposure of reinforcement. Some aggregate loss from moderate scale with no exposed reinforcement. [2013] Some cracks and spalling on the SW wing, moment crack in NW wing, and minor to moderate scaling at wetted perimeter.								
871	Roadway Over Culvert	Underwater	12/16/2016	1 EA	1	0	0	0
		Routine	05/18/2016	1 EA	1	0	0	0
Notes: [2016-2013] No signs of settlement or undermining. Gravel								
891	Other Bridge Signing	Underwater	12/16/2016	1 EA	1	0	0	0
		Routine	05/18/2016	1 EA	1	0	0	0
Notes: [2016-2013] No deterioration Culvert markers								
892	Slopes & Slope Protection	Underwater	12/16/2016	1 EA	1	0	0	0
		Routine	05/18/2016	1 EA	1	0	0	0
Notes: [2016-2013] No notable erosion. Slopes protected by vegetation.								
894	Deck & Approach Drainage	Underwater	12/16/2016	1 EA	1	0	0	0
		Routine	05/18/2016	1 EA	1	0	0	0
Notes: [2016-2013] No erosion from roadway drainage.								

BRIDGE 7836 CR 737 OVER HELLEWEGS CREEK

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
900	Protected Species	Underwater	12/16/2016	1 EA	1	0	0	0
		Routine	05/18/2016	1 EA	1	0	0	0

Notes: [2016] No evidence of protected species present.

General Notes: SLC District 5
 Inspected by: [2016] CG, RL, ES : [2014] CG, BH : [2013] BH, CG.
 [2014] Was able to walk through culvert.

58. Deck NBI:

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

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

36C. Appr Guardrail NBI: Culvert not long enough to get headwall out of clear zone ADT < 50.

36D. Appr Guardrail Terminal NBI: Culvert not long enough to get headwall out of clear zone ADT < 50.

59. Superstructure NBI:

60. Substructure NBI:

61. Channel NBI: [2016] Water regularly high due to beaver activity in area. Water was within 1.5' of culvert top.
 [2014] Some sediment deposited in culvert.

62. Culvert NBI: [2016 U/W] Areas of poor consolidation, heavy scaling, and concrete section loss present throughout.
 [2016] Water within 1.5' of culvert top.
 [2014] Area of honeycombing on center wall barrel on 4' in length with exposed reinforcement that has some section loss. Areas of moderate scale with some aggregate loss but no exposure of reinforcement. Reinforcement exposed at south end of barrel 2 and a small area at the north end of barrel 1. Exposed reinforcement has surface corrosion with some section loss. Honeycombing most of east half of top of barrel 1. pockets of honeycombing throughout barrels. No leaching on cold joint.
 [2013] Honeycombing at center wall fillet of each barrel. Minor to moderate scaling at wetted perimeter of both barrels. Moment cracking is present.

71. Waterway Adeq NBI: [2016] Water overtops approaches before bridge. During flooding of 2012 approaches were underwater. Event was greater than 500 year event.

72. Appr Roadway Alignment NBI: [2016-2014] Road flat and straight with no speed reduction.

Inventory Notes:

 Inspector's Signature

 Reviewer's Signature

Pictures



Photo 1 - Upstream Opening, Looking Southwest



Photo 2 - Downstream Opening, Looking North

Pictures



Photo 3 - Typical Concrete Condition (Box 1 Shown), Looking Northwest



Photo 4 - Spall along Bottom of the Downstream Headwall of Box 2, Looking North

Pictures



Photo 5 - Poor Concrete Consolidation Near Midpoint of Box 1, Looking East



Photo 6 - Poor Concrete Consolidation along Box 1 with Exposed Reinforcing Steel, Looking Up

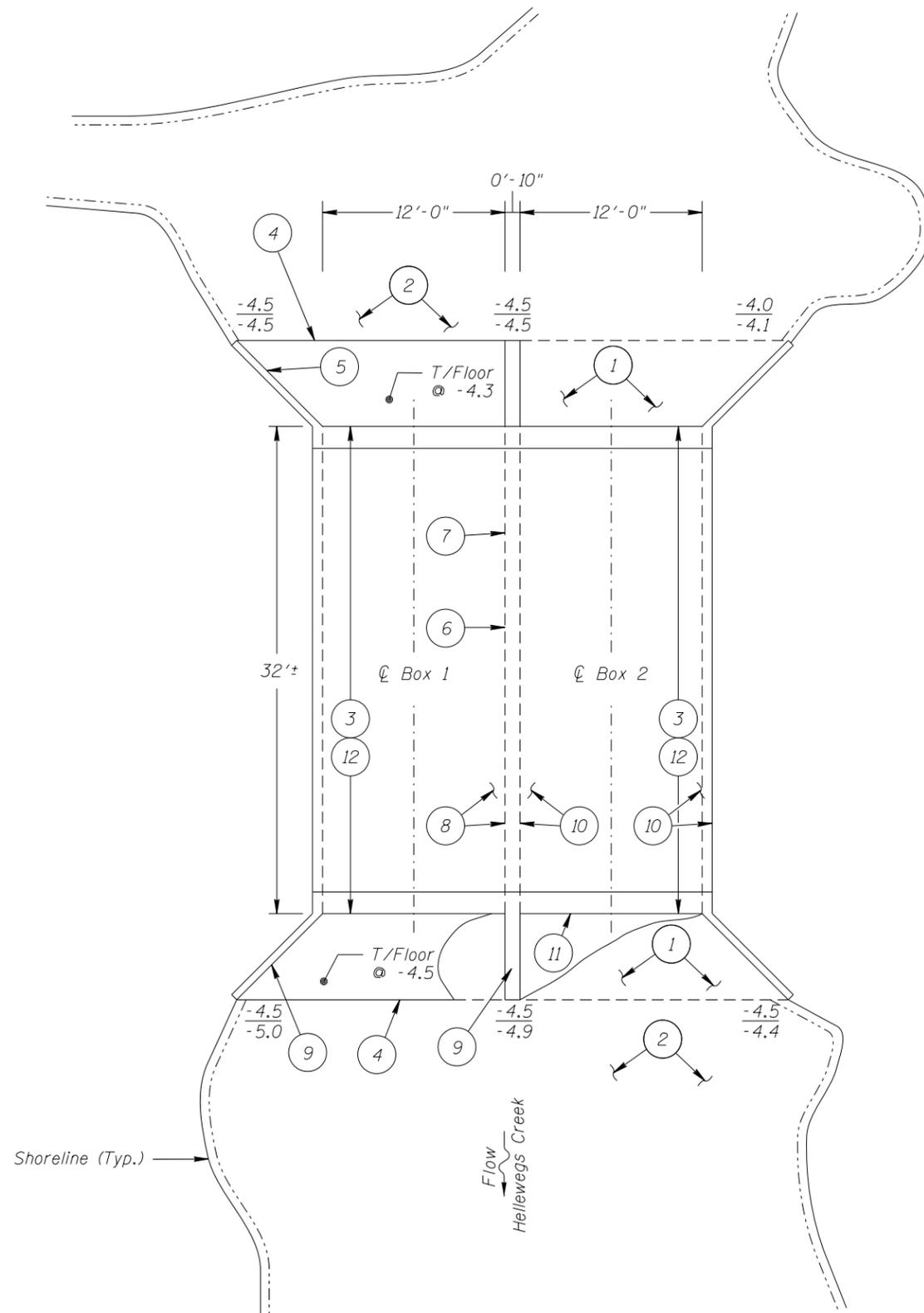
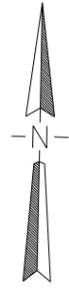
Pictures



Photo 7 - Poor Consolidation along the East Wall of Box 2, Looking East



Photo 8 - Concrete Cracks at Upstream Opening, Looking Southwest



SOUNDING PLAN

INSPECTION NOTES:

- 1 The culvert floor was typically clear of any debris or silt build up. There was a layer of silty sand and gravel allowing up to 3 inches probe rod of penetration covering a portion of the concrete apron at the upstream and downstream openings of Box 2.
- 2 The channel bottom material upstream and downstream of the culvert apron consisted of soft silt allowing a maximum probe rod penetration of 1 foot.
- 3 A band of heavy scaling, extending from the waterline to the culvert floor was observed on all exposed concrete walls. The scaling had a typical penetration of 1/2 inch with a maximum penetration of 1 inch on the east and west walls and 2 inches on the center wall.
- 4 The apron floor was flush with the channel bottom at the upstream and downstream openings of Box 1 with no vertical face exposure.
- 5 A diagonal crack was observed on the northwest wingwall with a maximum width of 1/4 inch.
- 6 An area of concrete section loss measuring 2 feet long and 6 inches high with a maximum penetration of 6 inches was observed 1 foot above the waterline near the midpoint of the west face of the center wall.
- 7 An area of concrete section loss measuring 1 foot long and 3 inches high with a maximum penetration of 3 inches was observed 0.5 feet above the waterline and 6 feet from the upstream opening on the west face of the center wall. One horizontal reinforcing bar was exposed with minor loss of section.
- 8 An area of poor concrete consolidation and concrete section loss was observed along the ceiling and east haunch of Box 1 at approximately 15 feet from the downstream opening. The area on the ceiling measured 4 feet long by 4 feet wide with a maximum penetration of 2 inches and the area on the haunch measured approximately 4 feet long by 3 inches high with a maximum penetration of 6 inches and one exposed reinforcing bar with no appreciable loss of section.
- 9 Areas of concrete section loss with up to 2 inches of penetration were observed along the top of the southwest wingwall and the south center wall extension.
- 10 An area of poor concrete consolidation and concrete section loss was observed along the ceiling and east haunch of Box 2 at approximately 15 feet from the downstream opening. The area on the ceiling measured 4 feet long by 4 feet wide with a maximum penetration of 2 inches and the area on the haunch measured approximately 4 feet long by 3 inches high with a maximum penetration of 3 inches and several exposed reinforcing bars with no appreciable loss of section.
- 11 An area of poor concrete consolidation and concrete section loss was observed at the midpoint of the ceiling at the downstream opening of Box 2. The area measured 1.5 feet long by 6 inches wide with a maximum penetration of 2 inches and one exposed reinforcing bar with no appreciable loss of section.
- 12 The concrete of the walls from 0.5 feet above the waterline to the ceiling and the concrete of the ceiling was generally smooth and sound except where otherwise noted. The ceiling and haunches had numerous random areas of poor concrete consolidation and associated areas of concrete section loss with up to 1 inch of penetration.

GENERAL NOTES:

1. Box 1 and Box 2 of culvert were inspected underwater.
2. At the time of inspection, on September 13, 2016, the waterline was located approximately 4.3 feet above the culvert floor of Box 1 at the upstream opening. Since insufficient elevation information was available, an elevation of 100.0 was assumed. This corresponds to a waterline elevation of 104.3.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.

Legend

- 3.0 Sounding Depth (9/13/2016)
- 2.5 Sounding Depth (9/27/2012)

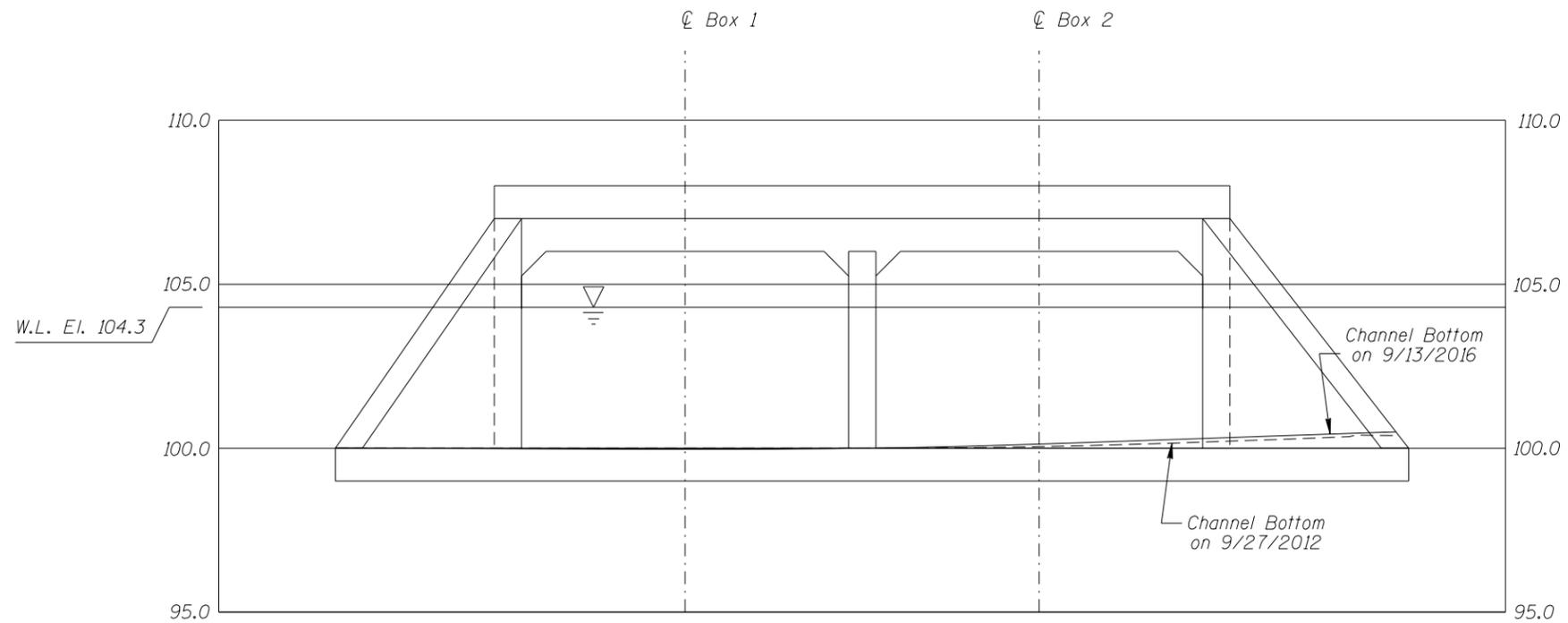
- 5 Inspection Note Number

MINNESOTA
DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

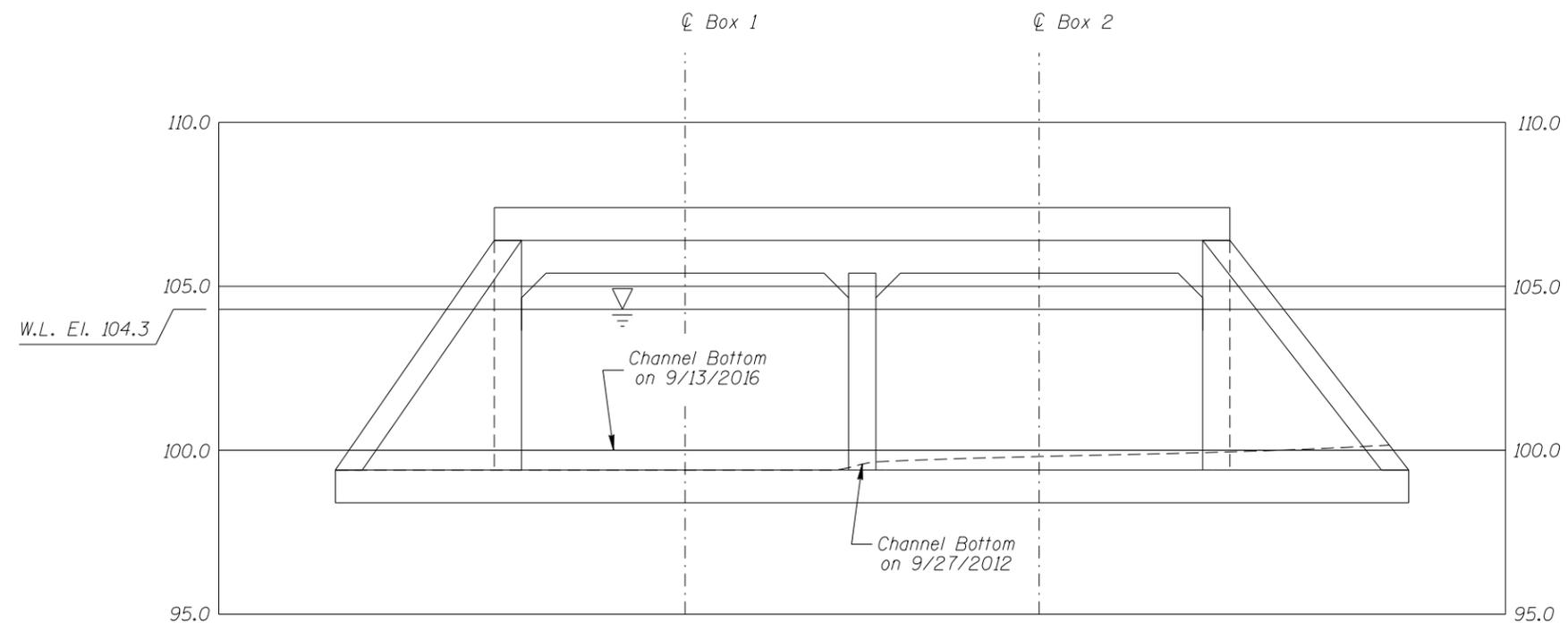
STRUCTURE NO. 7836
CR 737 OVER THE HELLEWEGS CREEK
DISTRICT 1, ST. LOUIS COUNTY

INSPECTION AND SOUNDING PLAN

DRAWN BY: ELN	COLLINS ENGINEERS <small>133 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	DATE: SEPT 13, 2016
CHECKED BY: LJ		SCALE: 1"=10'
CODE: 96877836		FIGURE NO.: 1



UPSTREAM OPENING PROFILE



DOWNSTREAM OPENING PROFILE

Note:
Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 7836 CR 737 OVER THE HELLEWAGS CREEK DISTRICT 1, ST. LOUIS COUNTY		
UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
DRAWN BY: ELN	COLLINS ENGINEERS <small>133 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	DATE: SEPT 13, 2016
CHECKED BY: LJ		SCALE: 1"=5'-0"
CODE: 96877836		FIGURE NO.: 2