UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 6200109 (OTT-2-0667)
SR 2 OVER TURTLE CREEK
OTTAWA COUNTY, OH
DISTRICT 2

April 2020

Prepared for:

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

STATE OF OHIO
JOSHUA M. JOHNSON
E-76141
REGISTERED PROFESSIONAL ENGINEER

10/9/2020

Prepared by:

COLLINS ENGINEERS INC.

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Lexington, Kentucky 40511

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EXECUTIVE SUMMARY

Project: ODOT District 2 Underwater Bridge Inspections - 2020

Purpose of Project: To perform a detailed visual and tactile underwater investigation of scour critical bridges for District 2 of the Ohio Department of Transportation.

Inspection Team: Team Leader – Joshua Johnson, P.E. – Collins Engineers, Inc.
Team Member – Matthew Rogers, E.I.T. – Collins Engineers, Inc.
Team Member – Nicholas Lane – Collins Engineers, Inc.

Inspection Date(s): April 23, 2020

Water Visibility:	0 ft	***Water Velocity:***	0 ft/s
Water Temperature:	45 °F	***Weather:***	Overcast – 45 °F
Waterline Elevation:	575.6 ft	***Type of Boat:***	Kayak
Coordinates:	41.603648°N, -83.153179°W		
Access Location:	Public Access on Northwest Shore		
Dive Mode:	Surface Supplied Air		
Waterline Reference:	1.4 ft below the top of cap at the downstream nose of Bent 1.		
Maximum Depth at SSU:	10.1 ft – Downstream Nose of Bent 2		
Shoreline Conditions:	The west and east shorelines consisted of well-vegetated, well-protected, mild slopes with no signs of erosion.		

Summary of Findings:

- **Bent 1:**
  - The channel bottom material consisted of riprap up to 24 in. diameter with sand infill.
  - The submerged portions of the pier were sound and smooth with no defects observed.
  - Full-depth hairline crack were observed at the midpoint on the north, south, west, and east faces of the bent cap.
  - Typical steel condition exhibited light surface corrosion with pitting up to 1/32 in. deep.
- **Bent 2:**
  - The channel bottom material consisted of riprap up to 24 in. diameter with sand infill.
  - The submerged portions of the pier were sound and smooth with no defects observed.
  - Full-depth hairline cracks were observed at the midpoint on the north, south, west, and east faces of the bent cap.
  - Typical steel condition exhibited light surface corrosion with pitting up to 1/32 in. deep.

Summary of Recommendations:

- Monitor hairline cracking in Bents 1 and 2.

Underwater Inspection Coding:

NBI Ratings:

Item	Description	Coding	Condition
60	Substructure	7 – Good Condition	Hairline Cracks
61	Channel	8 – Very Good Condition	No Defects Observed
62	Culvert	N/A	
92B	UW Insp. Frequency	60 Months	
93B	Insp. Date	04 23 20	
113	Scour Critical Bridges	5 – Within Foundation Limits	Stable (Inspector Recommended)

AASHTO National Bridge Element (NBE) Ratings:

Element #	Description	Units	Total	Condition State			
				1	2	3	4
225	Steel Pile	EA	16	16	0	0	0
215	Reinforced Concrete Abutment	LF	90	90	0	0	0
234	Pier Cap, Reinforced Concrete	LF	80	80	0	0	0

Note: Ratings were developed using the FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges. The recommended ratings consider inspected elements located within the waterway and conditions existing below the water surface only. Additional consideration is necessary for the assignment of overall condition ratings for this bridge.

1.0 INTRODUCTION

1.1 Purpose and Scope

This report consists of the results of a detailed underwater investigation performed at the SR 2 Bridge over Turtle Creek in Ottawa County, OH. Collins Engineers, Inc. (Collins) conducted the underwater investigation for District 2 of the Ohio Department of Transportation (ODOT) on April 23, 2020. The primary purpose of the investigation was as follows:

- Determine the condition of the substructure components located in the water at the time of the inspection from the waterline to the channel bottom.
- Obtain channel bottom depth measurements along the bridge fascias, upstream and downstream of the bridge, and around the submerged substructure units.
- Obtain channel profile cross sections at the upstream and downstream fascias.
- Determine the condition of the shorelines in the vicinity of the structure.
- Obtain photographs of the bridge and any significant defects.

In addition, a brief inspection was made of areas that could be submerged during periods of high water. The following report includes a description of the structure, the method of investigation, a description of existing conditions, an evaluation and recommendations based on the conditions, inspection figures, and photographs.

1.2 General Description of the Structure

Structure No. 6200109 (OTT-2-0667) spans 111.9 ft, carrying SR 2 over Turtle Creek and is approximately 40 ft wide. The bridge superstructure is constructed of three prestressed concrete composite box beam spans. The roadway orientation of the longitudinal axis of the bridge is west to east. The substructure units are labeled as Abutments 1 and 2 and Piers 1 and 2. Existing record drawings were available at the time of the inspection. Refer to Figure 1 in Exhibit 1 for a Location Map of the bridge. Refer to Photographs 1 and 2 in Exhibit 2 for overall views of the bridge.

1.3 Method of Investigation

A detailed field inspection was conducted to determine the physical condition of the submerged bridge substructure units from the waterline to the channel bottom. A brief visual examination of the substructure units above the waterline was also made.

A three-person team consisting of a professional engineer-diver and team leader (Joshua Johnson, P.E.) an engineer-diver (Matthew Rogers, E.I.T.) and an engineer-technician (Nicholas Lane) conducted the underwater inspection. The inspection was conducted using surface supplied air diving equipment. During the inspection, the inspectors worked from a boat and a note taker in the boat recorded the inspection notes.

The underwater inspection consisted of a visual and tactile examination of the accessible surfaces of the substructure units from the waterline to the channel bottom with particular attention given to any observed areas of deterioration or apparent distress. Approximately 10 percent of the total area on the underwater surfaces of the substructure units was cleaned so that the condition could be more closely examined. Photographs were taken to document the general conditions and observed deficiencies. Underwater photographs could not be obtained due to poor water conditions. The type of channel bottom material, the presence or extent of scour, the presence or extent of riprap, the presence or extent of drift and debris, and the location of any foundation exposure or undermining were noted.

Channel bottom soundings were performed utilizing a telescoping survey rod, digital fathometer, and pneumofathometer. Soundings were collected at quarter points along the bridge centerline as well as at quarter points along the upstream and downstream fascias and 50 ft fascias. Additional soundings were collected adjacent to Piers 1 and 2 and at 10 feet intervals in-line with the piers, upstream and downstream, and the waterline was referenced to a known elevation on the bridge. A sounding plan was developed using the soundings and approximate location of the shorelines. Refer to Figures 2 through 5 in Exhibit 1 for the sounding plan and channel cross sections that show the channel limits and water depths around the structure.

2.0 EXISTING CONDITIONS

2.1 General Conditions

At the time of the inspection, the waterline of 6200109 (OTT-2-0667) was located approximately 1.4 ft below the top of cap at the downstream nose of Bent 1, which corresponds to a waterline elevation of 575.6 ft. During the inspection, the waterway was flowing at approximately 0 ft per second. The bridge pier skew was consistent with the channel alignment and does not require attention at this time. The west and east shorelines consisted of well-vegetated, well-protected, mild slopes with no erosion. Refer to Photographs 3 through 8 in Exhibit 2 for views of the shorelines near the structure.

2.2 Substructure Conditions

2.2.1 Bent 1

The channel bottom material consisted of riprap up to 24 in. diameter with sand infill. The submerged portions of the bent were sound and smooth with no defects observed. Full-depth hairline cracks were observed at the midpoint on the north, south, west, and east faces of the bent cap. Typical steel condition exhibited light surface corrosion with pitting up to 1/32 in. deep. Refer to Figure 6 in Exhibit 1 for detailed inspection notes of Bent 1. Refer to Photographs 11 and 12 in Exhibit 2 for views of Bent 1.

2.2.2 Bent 2

The channel bottom material consisted of riprap up to 24 in. diameter with sand infill. The submerged portions of the bent were sound and smooth with no defects observed. Full-depth hairline cracks were observed at the midpoint on the north, south, west, and east faces of the bent cap. Typical steel condition exhibited light surface corrosion with pitting up to 1/32 in. deep. Refer to Figure 7 in Exhibit 1 for detailed inspection notes of Bent 2. Refer to Photographs 13 through 15 in Exhibit 2 for views of Bent 2 and typical concrete condition at the waterline.

3.0 EVALUATION AND RECOMMENDATIONS

Overall, the inspected substructure units of Structure No. 6200109 (OTT-2-0667) were in good condition. A comparison of the soundings recorded during the previous inspection on June 23, 2015 and the soundings taken during this inspection revealed no significant change in the channel bottom profile in the vicinity of the structure. Although no channel deficiencies were observed, the channel bottom should continue to be monitored during future underwater inspections to verify that localized scour or overall channel degradation is not occurring and that the pier footings remain adequately embedded in the channel bottom.

The hairline cracks at Bents 1 and 2 are not structural concerns at this time. However, the cracks do provide a means for water infiltration and freeze-thaw damage. It is therefore recommended that these cracks be monitored during future underwater inspections. If further crack propagation or increased crack widths are observed, it may be necessary to repair the cracks by injection or patching with a repair material suitable for underwater applications.

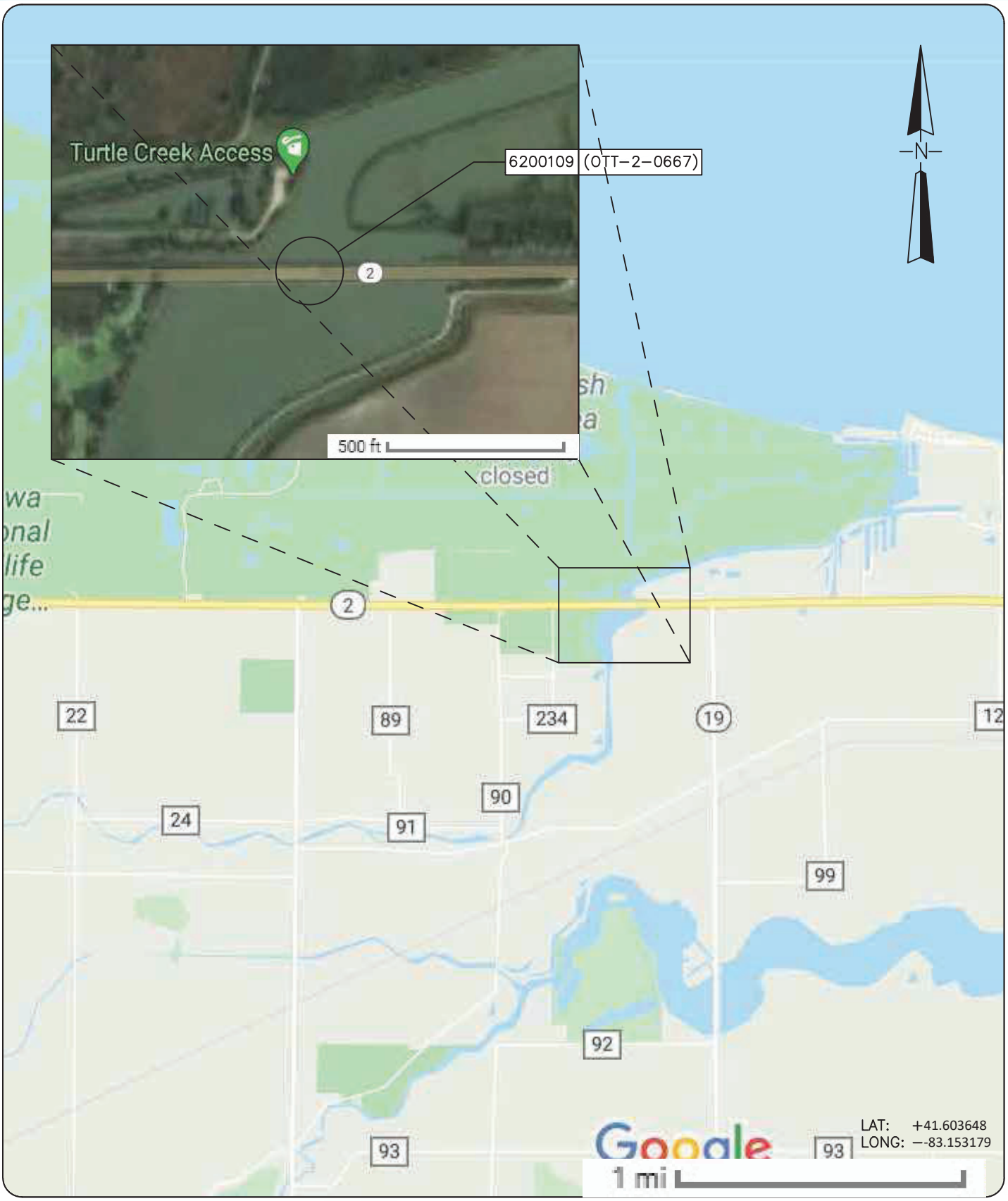
It is recommended that the submerged substructure units of Structure No. 6200109 (OTT-2-0667) be next inspected underwater at an interval not to exceed 60 months, no later than April 23, 2025.

Respectfully Submitted,
COLLINS ENGINEERS, INC.

Joshua Johnson, P.E.
Project Manager

Originated by:
Kevin Mitchell, E.I.T.

EXHIBIT 1 – FIGURES



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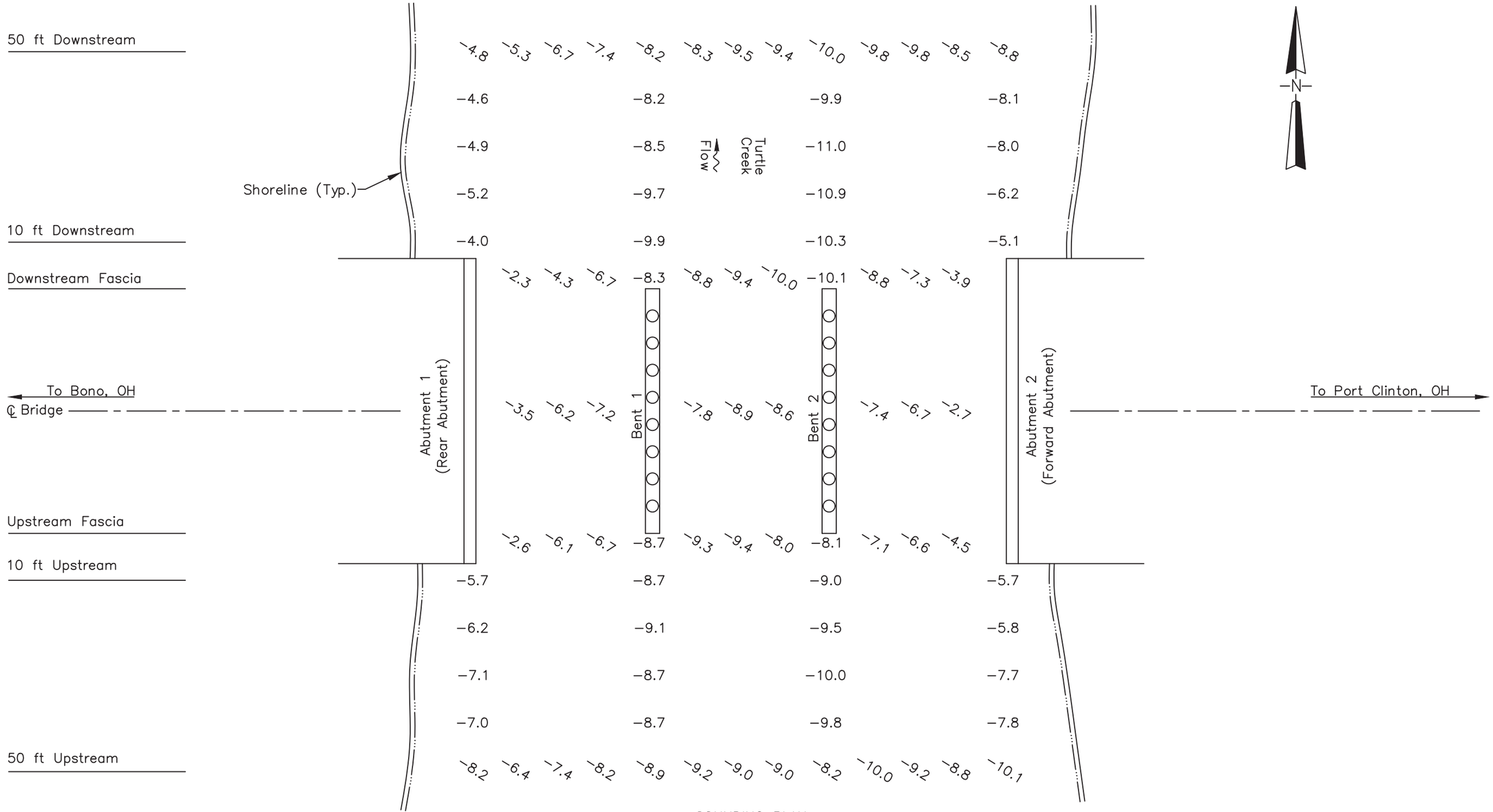
317 East Poe Rd.
Bowling Green, OH 45601
Phone: 419-353-8131

SR-2 OVER TURTLE CREEK
STRUCTURE NO. 6200109
(OTT-2-0667)
LOCATION MAP
OTTAWA COUNTY, OHIO

INSPECTED BY: MOR	CEI PROJECT: 55–12239.00
DRAWN BY: BLV	DATE: 23 APR 2020
CHECKED BY: JMJ	SHEET NO: 1



SOUNDING PLAN

GENERAL NOTES:

1. Abutments 1 and 2 and Bents 1 and 2 were inspected underwater. Substructure units are labeled according to available record drawings.
2. At the time of inspection on April 23, 2020, the waterline was located approximately 1.4 ft below Top of Cap at upstream nose of Pier 1 (EL. +577.0 ft). This corresponds with a waterline elevation of +575.6 ft.
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 the upstream and downstream fascias, at 10 ft intervals between the substructure units, and at 10 ft intervals in–line with the piers upstream and downstream up to 50 ft.

LEGEND

–2.7	Sounding Depth from Waterline (ft)
	Timber Debris

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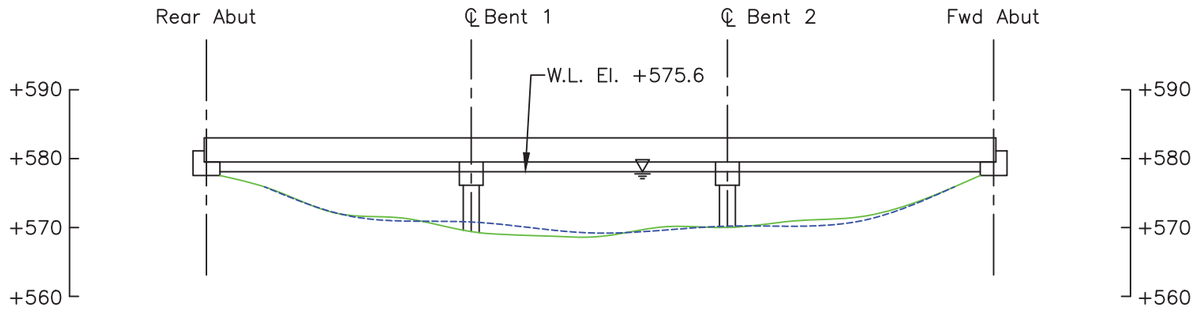
SR-2 OVER TURTLE CREEK
STRUCTURE NO. 6200109 (OTT-2-0667)
SOUNDING PLAN
OTTAWA COUNTY, OHIO

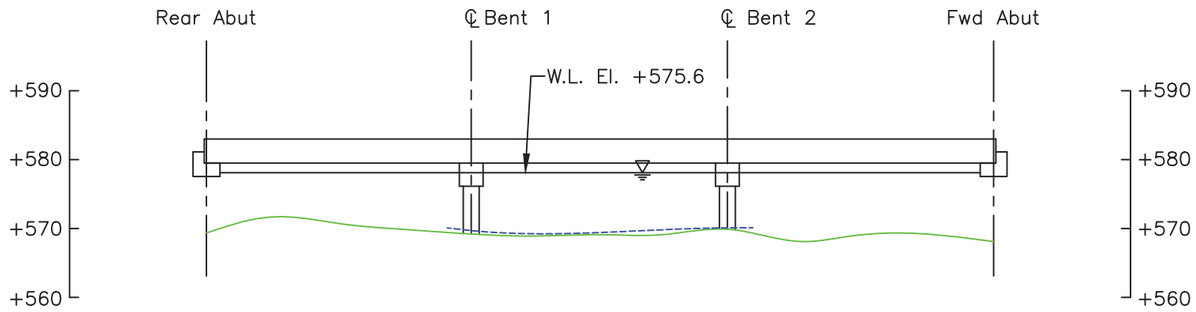
CEI PROJECT	55–12239.00
INSPECTED BY:	MOR
DRAWN BY:	BLV
CHECKED BY:	JMJ
DATE:	APR 2020
SHEET NO:	2

UPSTREAM FASCIA LOOKING DOWNSTREAM	
Location	Y(ft)*
A1	3.5
1/4	6.1
1/2	9.6
3/4	10.2
B1	12.2
1/4	12.8
1/2	12.9
3/4	11.5
B2	11.6
1/4	10.6
1/2	10.1
3/4	8.0
A2	3.5

*Profile taken from top of deck



CHANNEL CROSS SECTION
UPSTREAM FASCIA
(LOOKING DOWNSTREAM)



CHANNEL CROSS SECTION
50 FT UPSTREAM
(LOOKING DOWNSTREAM)

Note:

Footing elevations unknown due to unavailable record drawings.

LEGEND

- Approximate Channel Bottom – April 2020
- Approximate Channel Bottom – June 2015
- Approximate Channel Bottom – June 2010 (No Data)
- Timber Debris
- Water Surface
- +450 Elevation (ft)

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SR-2 OVER TURTLE CREEK
STRUCTURE NO. 6200109 (OTT-2-0667)
CROSS SECTIONS - UPSTREAM
OTTAWA COUNTY, OHIO

CEI PROJECT
55–12239.00

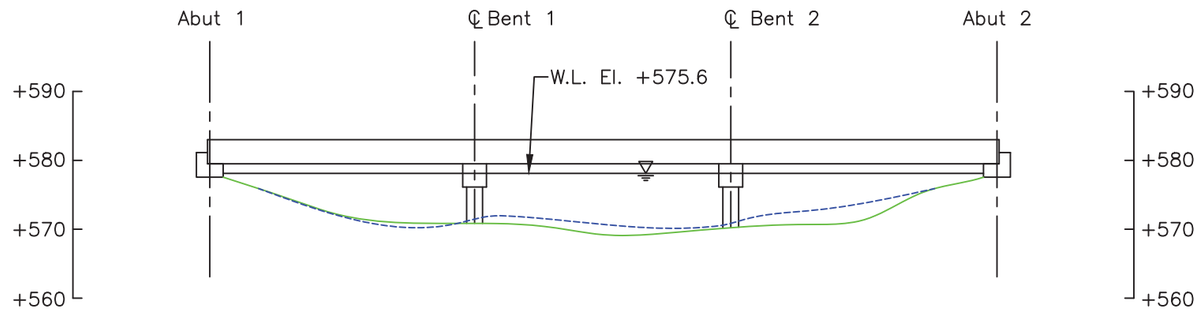
INSPECTED BY:
MOR

DRAWN BY:
BLV

CHECKED BY:
JMJ

DATE:
APR 2020

SHEET NO:
3



CHANNEL CROSS SECTION
STRUCTURE CENTERLINE
(LOOKING DOWNSTREAM)

Note:

Footing elevations unknown due to unavailable record drawings.

LEGEND

———	Approximate Channel Bottom – April 2020
- - - - -	Approximate Channel Bottom – June 2015
– – – – –	Approximate Channel Bottom – June 2010 (No Data)
	Timber Debris
	Water Surface
+450	Elevation (ft)

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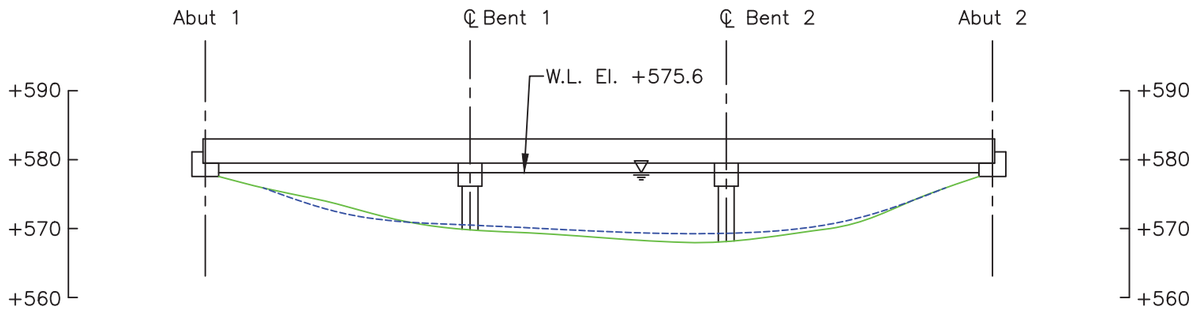
SR-2 OVER TURTLE CREEK
STRUCTURE NO. 6200109 (OTT-2-0667)
CROSS SECTIONS - CENTERLINE
OTTAWA COUNTY, OHIO

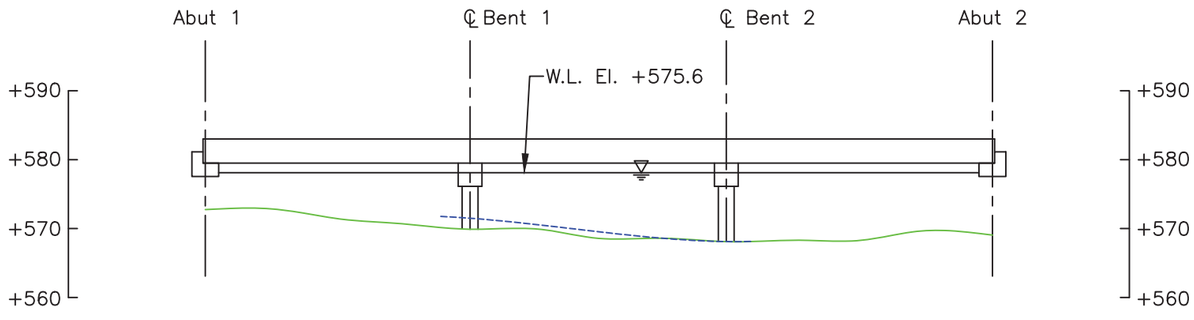
CEI PROJECT	55–12239.00
INSPECTED BY:	MOR
DRAWN BY:	BLV
CHECKED BY:	JMJ
DATE:	APR 2020
SHEET NO:	4

DOWNSTREAM FASCIA LOOKING DOWNSTREAM	
Location	Y(ft)*
A1	3.5
1/4	5.8
1/2	7.8
3/4	10.2
B1	11.8
1/4	12.3
1/2	12.9
3/4	13.5
B2	13.6
1/4	12.3
1/2	10.8
3/4	7.4
A2	3.5

*Profile taken from top of deck



CHANNEL CROSS SECTION
DOWNSTREAM FASCIA
(LOOKING DOWNSTREAM)



CHANNEL CROSS SECTION
50 FT DOWNSTREAM
(LOOKING DOWNSTREAM)

Note:

Footing elevations unknown due to unavailable record drawings.

LEGEND

- Approximate Channel Bottom – April 2020
- Approximate Channel Bottom – June 2015
- Approximate Channel Bottom – June 2010 (No Data)
- Timber Debris
- Water Surface
- +450 Elevation (ft)

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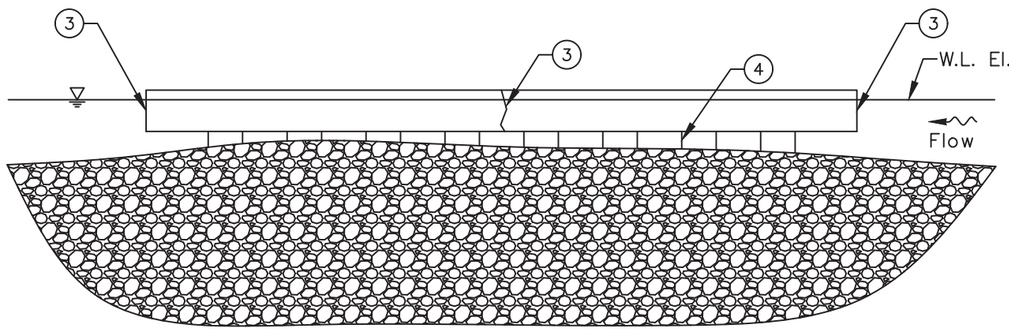
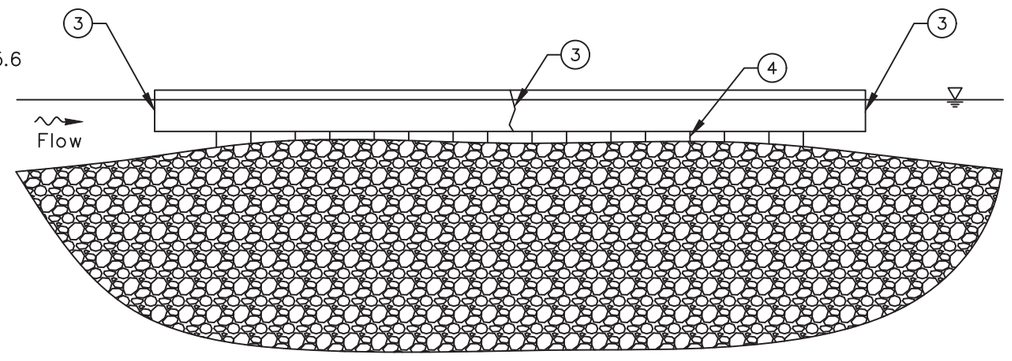
SR-2 OVER TURTLE CREEK
STRUCTURE NO. 6200109 (OTT-2-0667)
CROSS SECTIONS - DOWNSTREAM
OTTAWA COUNTY, OHIO

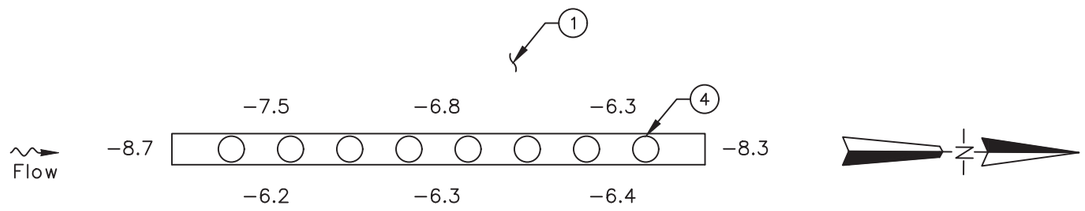
CEI PROJECT	55–12239.00
INSPECTED BY:	MOR
DRAWN BY:	BLV
CHECKED BY:	JMJ
DATE:	APR 2020
SHEET NO:	5



WEST ELEVATION
(LOOKING EAST)



EAST ELEVATION
(LOOKING WEST)



PLAN

INSPECTION NOTES:

1. The channel bottom material consisted of riprap up to 24 in. diameter with sand infill.
2. The submerged portions of the pier were sound and smooth with no defects observed.
3. Full–depth hairline cracks were observed at the midpoint on the north, south, west, and east faces of the bent cap.
4. Typical steel condition exhibited light surface corrosion with pitting up to 1/32 in. deep.

LEGEND

−2.7	Sounding Depth from Waterline (ft)
———	Approximate Channel Bottom – April 2020
	Timber Debris
	Water Surface

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SR-2 OVER TURTLE CREEK
STRUCTURE NO. 6200109 (OTT-2-0667)
BENT 1
OTTAWA COUNTY, OHIO

CEI PROJECT
55–12239.00

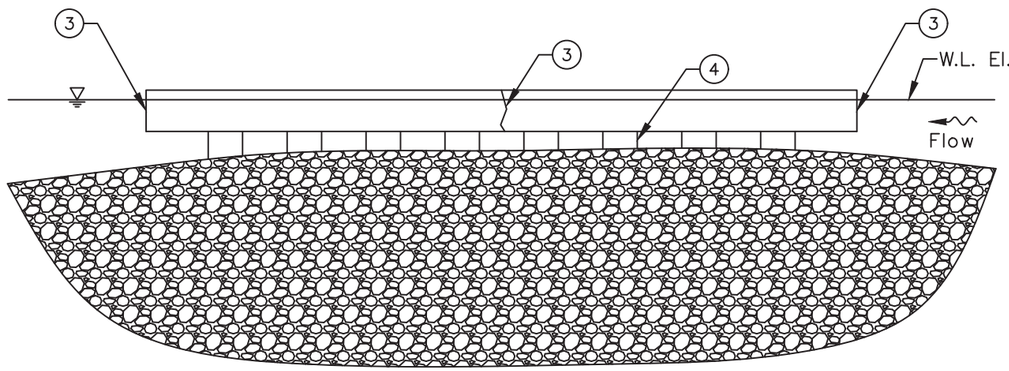
INSPECTED BY:
MOR

DRAWN BY:
BLV

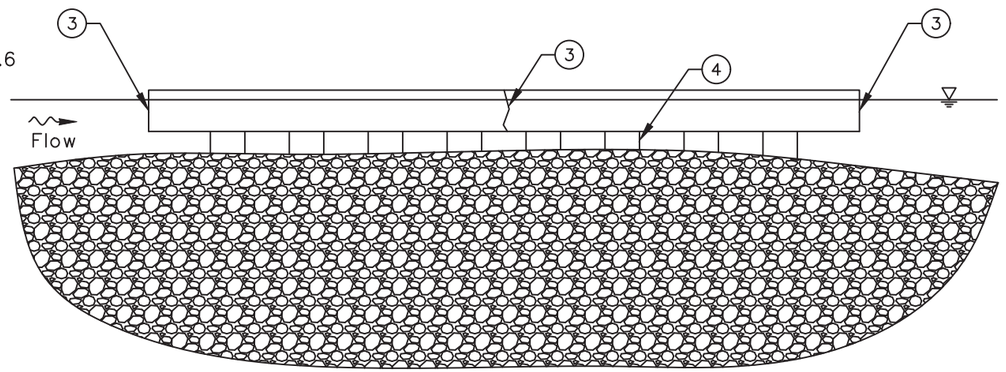
CHECKED BY:
JMJ

DATE:
APR 2020

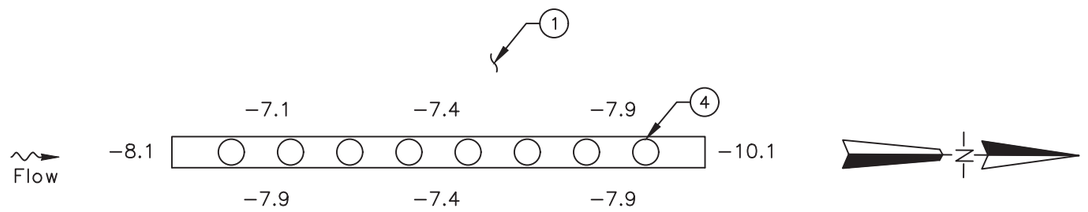
SHEET NO:
6



WEST ELEVATION
(LOOKING EAST)



EAST ELEVATION
(LOOKING WEST)



PLAN

INSPECTION NOTES:

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2. The submerged portions of the pier were sound and smooth with no defects observed.
3. Full−depth hairline cracks were observed at the midpoint on the north, south, west, and east faces of the bent cap.
4. Typical steel condition exhibited light surface corrosion with pitting up to 1/32 in. deep.

LEGEND

−2.7	Sounding Depth from Waterline (ft)
———	Approximate Channel Bottom − April 2020
	Timber Debris
	Water Surface

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STRUCTURE NO. 6200109 (OTT-2-0667)
BENT 2
OTTAWA COUNTY, OHIO

CEI PROJECT	55−12239.00
INSPECTED BY:	MOR
DRAWN BY:	BLV
CHECKED BY:	JMJ
DATE:	APR 2020
SHEET NO:	7

EXHIBIT 2 – INSPECTION PHOTOGRAPHS

Photograph No. 1: Overall View of Structure No. 6200109 (OTT-2-0667), Looking South.

Photograph No. 2: Overall View of Structure No. 6200109 (OTT-2-0667), Looking North.

Photograph No. 3: View of the East Embankment Upstream of the Structure, Looking Southeast.

Photograph No. 4: View of the East Embankment at the Structure, Looking Northeast.

Photograph No. 5: View of the East Embankment at the Structure, Looking Southeast.

Photograph No. 6: View of the East Embankment Downstream of the Structure, Looking Southeast.

Photograph No. 7: View of the West Embankment Upstream of the Structure, Looking Northwest.

Photograph No. 8: View of the West Embankment at the Structure, Looking Northwest.

Photograph No. 9: View of the West Embankment at the Structure, Looking Southwest.

Photograph No. 10: View of the West Embankment Downstream of the Structure, Looking Southwest.

Photograph No. 11: View of the East Face of Bent 1, Looking Southwest.

Photograph No. 12: View of the West Face of Bent 1, Looking Northeast.

Photograph No. 13: View of the East Face of Bent 2, Looking Southwest.

Photograph No. 14: View of the West Face of Bent 2, Looking Northeast.

Photograph No. 15: View of the Typical Concrete Condition at the Waterline, Looking North.

EXHIBIT 3 – UNDERWATER DIVE INSPECTION PROCEDURE CHECKLIST

Underwater Dive Inspection Procedure Checklist

Acceptable written procedures communicate to the next dive team what is necessary to ensure a safe and successful inspection. Each bridge requiring underwater dive techniques must have a unique written inspection procedure. The prior inspection report does not suffice for the required procedures. It is valuable to review the last inspection notes, but they do not serve the same purpose as a stand-alone inspection procedure.

This document shall be completed for all underwater dive inspections. This document shall be reviewed prior to performing the field work and it shall be updated when necessary.

I. Bridge Identification

a. Agency with Inspection Responsibility: ODOT DISTRICT 2

Dive Frequency: 60 months

SFN: 6200109 Bridge Number (County-Route-SLM-SD): OTT-2-0667

Superstructure Type	Main Span Type: PRESTRESSED CONCRETE COMPOSITE BOX BEAMS
	Approach Span: REINFORCED CONCRETE
Substructure Type	Abutment Type: REINFORCED CONCRETE
	Pier Type: REINFORCED CONCRETE BENTS
	Total Pier Count: 2
	Total Pier Count in water: 2
	Foundations: UNKNOWN
Feature Intersected	TURTLE CREEK

b. Photographs

Endview

Elevation

Underside

II. Office and Field Assessment

Prior to the inspection, obtain and review copies of the previous underwater inspection reports, routine inspection reports, scour and hydraulic information, and design plans in preparation of the inspection. Divers should pay particular attention given to any observed areas of deterioration, the channel conditions and factors that may accelerate material deterioration. Changes shall be noted in the inspection procedure. Site conditions should be reviewed prior to diving.

a. Channel Conditions

____Waterway features

____Rapid stream flows,

____Significant debris accumulation

____Constricted waterway openings

____Soft or unstable streambeds

____Meandering channels

____Other which may promote scour and undermining of substructure elements

____Navigable Waterway

____Flow Controls

b. Anticipated Water conditions which may affect the inspection

____Cold Water (Apprx. Temp____)

____Black water

____Rapid stream flows

____Near military facility

____Tribal fishing

____Water quality

____History of Log jams

c. Identify factors that may accelerate the deterioration of the bridge elements:

____Highly corrosive water

____Unprotected steel members

____Other

Risk Factor Narrative:

III. **Contacts Prior to Work**

District 2 Bridge Engineer: David Geckle, P.E.

Email: david.geckle@dot.ohio.gov – Phone: 419-373-4377

Point of contact for immediate action such as closing the bridge due to findings

Contact Bridge Owner ___14_____ (number) days before the proposed underwater inspection.

Special contracting and scheduling procedures prior to inspection, include recommended lead time

Entity	Contact Name and Title	Contact Phone	Lead Time
Coast Guard			
Property Owner			
Access Equipment			
Lake or River draw-down			
Canal dry time			
Tree removal			
Other:			
Other:			

IV. **Dive Team Shall Include the Following:**

Dive Team Narrative:

The dive team consisted of one Team Leader (NBIS, P.E., ADCI) and two Team Members (NBIS, UW, ADCI).

Example: The Bridge shall be investigated using a three-member dive team: one supervisor to monitor rack box and take notes, one diver, and one tender/standby diver. There shall be one NBIS Team Leader onsite at all times.

V. Site Information

Navigable waterway: Y / **N**

If Yes, waterway river point _____

Anticipated water visibility depth __0___ ft

Anticipated Dive depth _6.6__ ft

Anticipated current __0___ ft

Scour Critical (item 113): _5_____

POA in place: Y/**N**

Scour Monitoring devices present: Y/**N**

Verify the Scope of Services when work is contracted for the procedure for underwater elements that are not in water during an inspection.

Site Information Narrative:

The underwater inspection consists of a visual and tactile examination of the accessible surfaces of the substructure items in water. Additional items should reference the scope of services in the contract. For reference the following items are in water:

Item	Number of Units	Level of Inspection (1, 2 or 3) with Commentary
Piers and Number of Columns	2	100% LEVEL I 10% LEVEL II
Abutment	2	100% LEVEL I 10% LEVEL II
Culvert	N/A	
Scour Countermeasures	N/A	
Fenders or Dolphins	N/A	

Photographs should be taken, if water clarity permits, for typical conditions, conditions that have changed since last inspection and significant or noteworthy deficiencies. The type of channel bottom material, the presence or extent of scour, the presence or extent of riprap, the presence or extent of drift and debris, and the location of any foundation exposure or undermining shall be quantified. Include depth, length, height and location of deficiencies.

VI. **Equipment and Field Logistics**

a. The inspection should be conducted using:

____Chest waders

____Hip waders

_X__Diving equipment

____SCUBA (Note that ADCI Consensus Standards require communication systems be employed for both SCUBA and Surface-Supplied (whether air or mixed-gas) dive modes)

____SCUBA with communication

_X__Surface Supplied with communication

b. The channel bottom should be sounded utilizing

_X__Digital fathometer

_X__Telescoping survey rod

____ acoustic imaging

c. During the inspection, the divers should work from

____Shore

__X_Boat

____Either

The note taker should work alongside the dive team.

d. Access to the waterway should be obtained from the shore (north bank, southwest quadrant, driveway 30 yards north etc.)

PUBLIC ACCESS ON NORTHWEST SHORE

_____

e. The maximum depth of the channel is typically measured_____ feet from

30FT. DOWNSTREAM ON BENT 2

Reference Datum: 1.4FT. BELOW THE TOP CAP AT THE OWNSTREAM NOSE OF BENT 1.

Soundings should be dictated by the scope of work. When not detailed in the scope they should be repeated from the previous soundings. If neither exist then they need to be taken in a grid pattern between substructure units 100' upstream and 100' downstream.

VII. Inspection Procedure History

Created: COLLINS ENGINEERS Date: 09/25/2020

Updated By: _____ Date: _____

Updated By: _____ Date: _____

Updated By: _____ Date: _____

Updated By: _____ Date: _____

Updated By: _____ Date: _____

VIII. Other Narrative Not Included In Previous Sections