

UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. L6106

CR 180

OVER THE

BOG CREEK

ST. LOUIS COUNTY



SEPTEMBER 17, 2012

PREPARED FOR THE

MINNESOTA DEPARTMENT OF TRANSPORTATION

BY

COLLINS ENGINEERS, INC.

JOB NO. 7423

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected below water at Structure No. L6106, the East and West Abutments and Bent 1, were overall in poor condition. Several of the piles at the abutments exhibited up to 33 percent loss of section. In addition, the interior piles at all substructure units were generally in worse condition with softer external timber conditions. Otherwise, timber of the piles, pile extensions, pile caps, and sill was typically sound with random splitting or checking up to 1/2 inch wide and 3 inches deep. Both abutments were displacing out towards the channel, resulting in the sill rotating and a percentage of bearing loss on the piles.

INSPECTION FINDINGS:

- (A) The channel bottom material consisted of cobbles, gravel, and sand with a maximum probe rod penetration of 18 inches
- (B) The timber of Piles A and G of the East and West Abutments and Bent 1 and the pile caps were typically sound with random splits or checks. The splits were a maximum of 1/2 inch wide and 3 inches deep.
- (C) The timber of Piles B, C, D, E, and F of the East and West Abutments and Bent 1 were typically in fair condition allowing an awl penetration of 1/2 inch. Random splits or checks were observed with a maximum width of 1/2 inch and up to 3 inches deep.
- (D) The west face of Pile E of the East Abutment exhibited approximately 25 percent loss of section.
- (E) Pile E of the West Abutment exhibited approximately 25 percent loss of section.
- (F) Pile D of the West Abutment exhibited approximately 33 percent loss of section.
- (G) Pile G of the East Abutment had a 1 inch gap on the west side of the pile between the top of the pile and the bottom of the pile cap.

- (H) The timber of the sill and the pile extensions at the West Abutment and Bent 1 were in fair condition with random splits or checks up to 3/4 inch wide.
- (I) The pile extension at Piles B, C, D, E, and F of the East Abutment exhibited splitting typically 1.5 inches deep.
- (J) The sill at the West Abutment was displacing out towards the channel and has rotated towards the west. As a result, the piles were only bearing on approximately 10 percent of the top surface area. A 1/2 inch to 3/4 inch gap was observed between the top of the pile and the bottom of the sill on the east face. The backwall consists of rough cut 2" x 4" boards stacked flatwise. The wall is rotating similarly to the cap, sill and pile extensions.
- (K) The East Abutment was displacing out towards the channel and has rotated towards the east. As a result, only 1 inch on the east sides of the piles was bearing. A 1/2 inch to 1.5 inch wide gap was observed between the top of the piles and the bottom of the sill on the west face. The pile cap has shifted 1 inch to the east and appears to be a result of the loss of backfill behind the abutment. Backfill was observed mounded up to 2 feet high to the west of the abutment. The backwall consists of rough cut 2" x 4" boards stacked flatwise. The wall is rotating similarly to the cap, sill and pile extensions.
- (L) Although outside the scope of the underwater inspection it was observed that the steel girders exhibited heavy corrosion with appreciable loss of section.

RECOMMENDATIONS:

- (A) Repairs, such as pile replacement or structural jacketing, should be considered for Piles D and E of the West Abutment and Pile E of the East Abutment to restore full load carrying capacity of the piles. Monitor the splitting and timber decay (exterior softness) on all other piles and consider repairs if conditions worsen.
- (B) Shim all piles on the East and West Abutments as soon as possible to restore full bearing. Closely monitor the rotation/displacement of the backwall, sill, and piles until an above water inspection and/or further analysis can determine the necessary repairs and/or posting of the bridge for a maximum load limit.
- (C) The inspection of the submerged substructure units of Structure No. L6016 can most likely be accomplished in the future without using a dive team. To conduct the underwater inspection, a properly equipped and qualified inspector will have to perform the inspection during a period of low water and low flow. As channel bottom contours and water depths can change abruptly, it is recommended that lead line soundings of water depth be taken along the upstream and downstream fascias to determine whether a wading inspection is possible prior to beginning the inspection. If conditions are unsafe for inspection by wading, then an underwater inspection with the use of a dive team will be required.
- (D) The steel girders exhibited heavy corrosion with appreciable loss of section, and therefore, an above water inspection should be conducted to assess the section losses and determine the necessary repairs.

- (E) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of sixty (60) months.

Inspection Team Leader:



Nicholas R. Triandafilou, P.E.

Respectfully submitted,

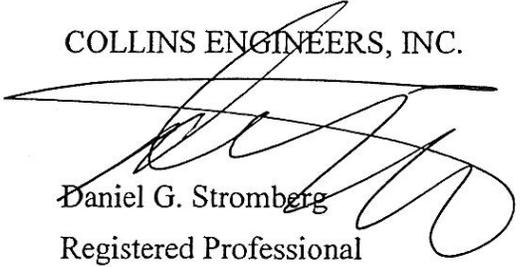
PROFESSIONAL ENGINEER

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Daniel G. Stromberg

Date 6/30/14 License # 21491

COLLINS ENGINEERS, INC.



Daniel G. Stromberg

Registered Professional

Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: L6106

Feature Crossed: Bog Creek

Feature Carried: CR 180

Location: St. Louis County

Bridge Description: The superstructure consists of a timber deck supported by steel beams. The superstructure is supported by two timber abutments and a timber pile bent.

2. INSPECTION DATA

Professional Engineer Diver: Nicholas R. Triandafilou, P.E.

Dive Team: Marc B. Parker, Clayton Brookins

Date: September 17, 2012

Weather Conditions: Cloudy, 55°F

Underwater Visibility: 2.0 feet

Waterway Velocity: None/Negligible

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: The East and West Abutments and Bent 1

General Shape: The superstructure consists of a timber deck supported by steel I-beams. The superstructure is supported by two timber abutments and a timber pile bent. Each abutment and Bent 1 consists of seven 12 inch diameter timber piles labeled A through G from south to north. A timber sill cap bears on Piles B, C, D, E, and F. 12 inch by 12 inch pile extensions are in place on the sill over the piles. A pile cap bears on Piles A and G and pile extensions B, C, D, E, and F.

Maximum Water Depth at Substructure Inspected: Approximately 1.5 feet.

4. WATERLINE DATUM

Water Level Reference: The top of the pile cap above Pile G of Bent 1.

Water Surface: The waterline was approximately 4.7 feet below reference.
Assumed Waterline Elevation = 95.3 feet.

5. NBIS CODING INFORMATION (Minnesota specific codes are used for 92B and 113)

Item 60: Substructure Condition: Code 4

Item 61: Channel and Channel Protection: Code 6

Item 92B: Underwater Inspection: Code B/09/12

Item 113: Scour Critical Bridges: Code K/12

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

Yes No

6. STRUCTURAL ELEMENT CONDITION RATING

Item #	Element Description	Quantity	Unit	Conditions				
				1	2	3	4	5
206	Timber Piles	21	EA	0	7	14	0	n/a
216	Timber Abutments	49	LF	0	24	25	0	n/a
361	Scour	1	EA	1	0	0	n/a	n/a
985	Slopes and Slope Protection	1	EA	0	1	0	n/a	n/a
360	Settlement	1	EA	0	0	1	n/a	n/a



Photograph 1. Overall View, Looking North.



Photograph 2. View of the East Abutment, Looking Southeast.



Photograph 3. View of Bent 1, Looking Southeast.



Photograph 4. View of the West Abutment, Looking Northwest.



Photograph 5. View of the Typical Timber Pile Condition at the Waterline, Looking East.



Photograph 6. View of Typical Splitting in Pile Extension, Looking East.



Photograph 7. View of Pile E of the East Abutment with Timber Section Loss, Looking Southeast.



Photograph 8. View of Pile D of the West Abutment with Timber Section Loss, Looking Southwest.



Photograph 9. View of Pile E of the West Abutment with Timber Section Loss, Looking West.



Photograph 10. View of the Timber Sill Rotation and Backwall Heaving/Displacement at the East Abutment, Looking South.



Photograph 11. View of Mounded Up Sediment and Backfill Material at the East Abutment, Looking South.



Photograph 12. View of the Timber Sill Rotation and Backwall Heaving at the East Abutment, Looking South.

INSPECTION NOTES:

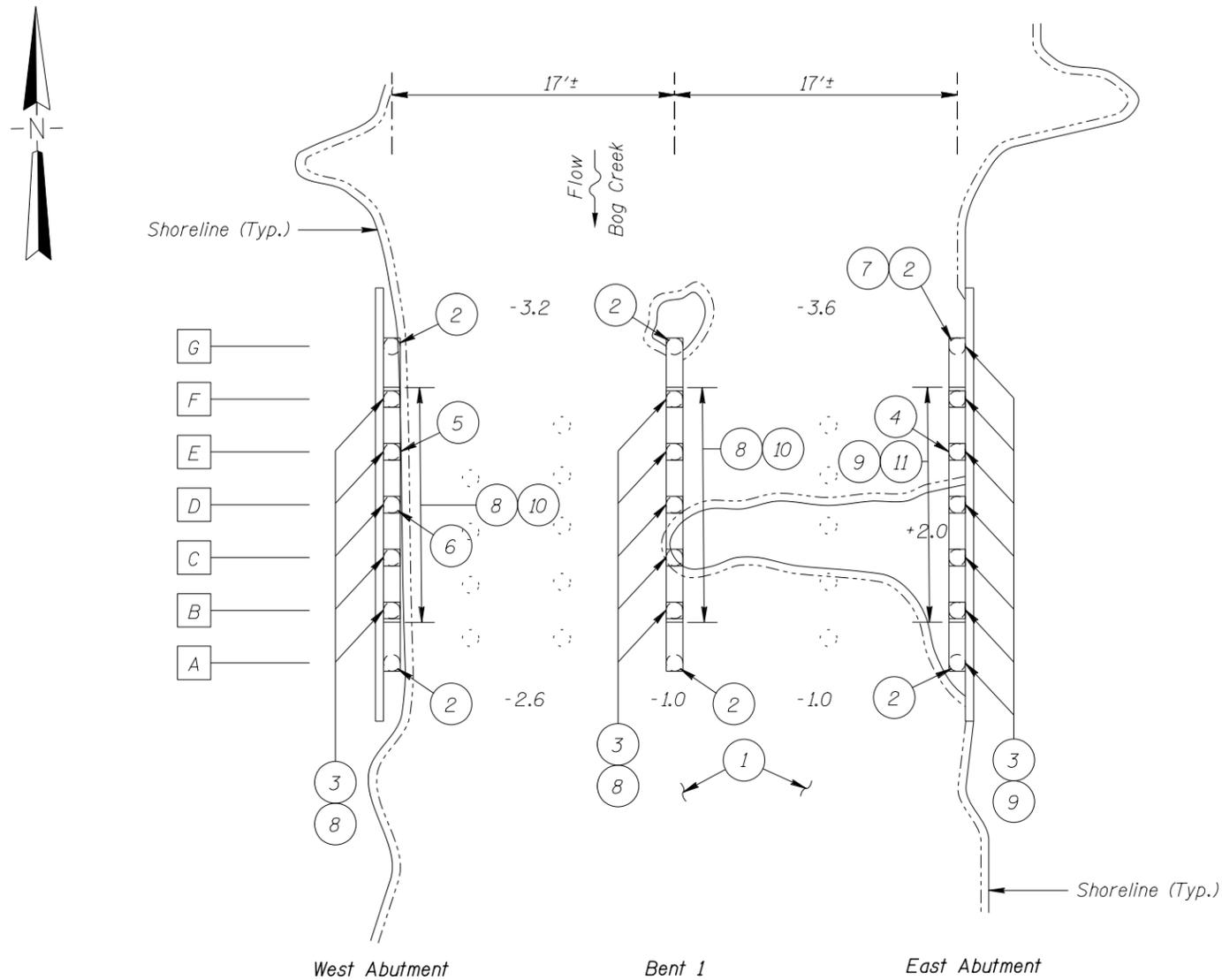
- 1 The channel bottom material consisted of cobbles, gravel, and sand with a maximum probe rod penetration of 18 inches
- 2 The timber of Piles A and G of the East and West Abutments and Bent 1 and the pile caps were typically sound with random splits or checks. The splits were a maximum of 1/2 inch wide and 3 inches deep.
- 3 The timber of Piles B, C, D, E, and F of the East and West Abutments and Bent 1 were typically in fair condition allowing an awl penetration of 1/2 inch. Random splits or checks were observed with a maximum width of 1/2 inch and up to 3 inches deep.
- 4 The west face of Pile E of the East Abutment exhibited approximately 25 percent loss of section.
- 5 Pile E of the West Abutment exhibited approximately 25 percent loss of section.
- 6 Pile D of the West Abutment exhibited approximately 33 percent loss of section.
- 7 Pile G of the East Abutment had a 1 inch gap on the west side of the pile between the top of the pile and the bottom of the pile cap.
- 8 The timber of the sill and the pile extensions at the West Abutment and Bent 1 were in fair condition with random splits or checks up to 3/4 inch wide.
- 9 The pile extension at Piles B, C, D, E, and F of the East Abutment exhibited splitting typically 1.5 inches deep.
- 10 The sill at the West Abutment was displacing out towards the channel and has rotated towards the west. As a result, the piles were only bearing on approximately 10 percent of the top surface area. A 1/2 inch to 3/4 inch gap was observed between the top of the pile and the bottom of the sill on the east face. The backwall consists of rough cut 2" x 4" boards stacked flatwise. The wall is rotating similarly to the cap, sill and pile extensions.
- 11 The East Abutment was displacing out towards the channel and has rotated towards the east. As a result, only 1 inch on the east sides of the piles was bearing. A 1/2 inch to 1.5 inch wide gap was observed between the top of the piles and the bottom of the sill on the west face. The pile cap has shifted 1 inch to the east and appears to be a result of the loss of backfill behind the abutment. Backfill was observed mounded up to 2 feet high to the west of the abutment. The backwall consists of rough cut 2" x 4" boards stacked flatwise. The wall is rotating similarly to the cap, sill and pile extensions.
- 12 Although outside the scope of the underwater inspection it was observed that the steel girders exhibited heavy corrosion with appreciable loss of section.

GENERAL NOTES:

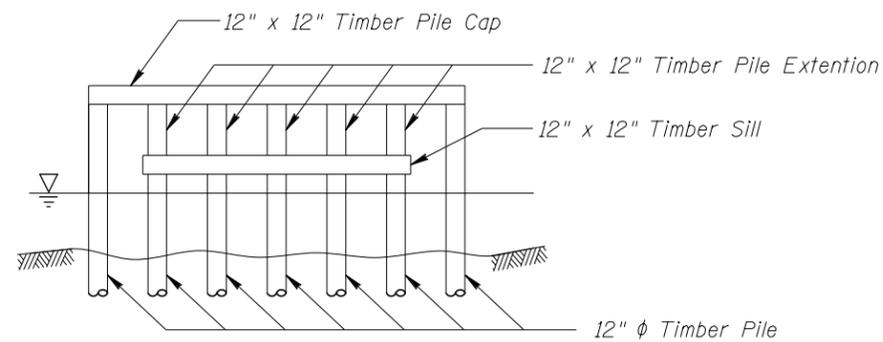
1. Bent 1 and the East and West Abutments were inspected underwater.
2. At the time of inspection on September 17, 2012, the waterline was located approximately 4.7 feet below the top of the bent cap at Pile G of Bent 1. Since insufficient elevation information was available, an elevation of 100 was assumed. This corresponds to a waterline elevation of 95.3.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.

Legend

- 2.5 Sounding Depth from Waterline (9/17/12)
- 12" ϕ Timber Pile
- 12" x 12" Timber Pile Extention
- ⋯ Abandoned Timber Pile
- A Pile Identification Designation

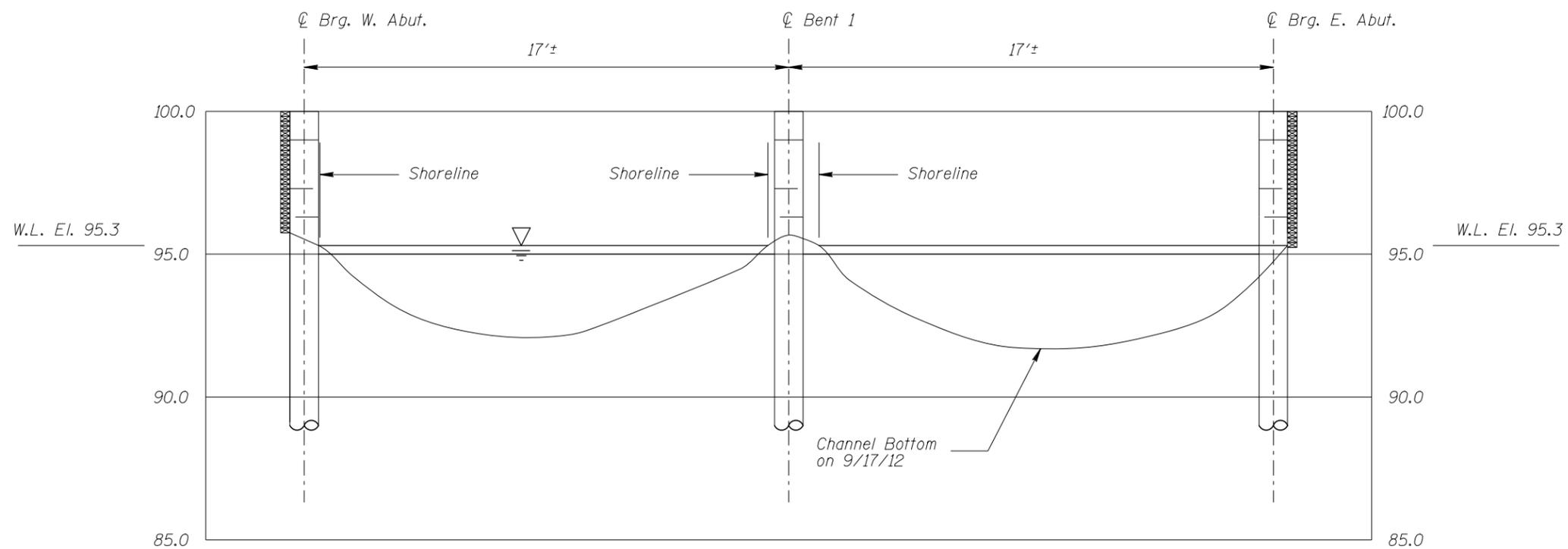


SOUNDING PLAN

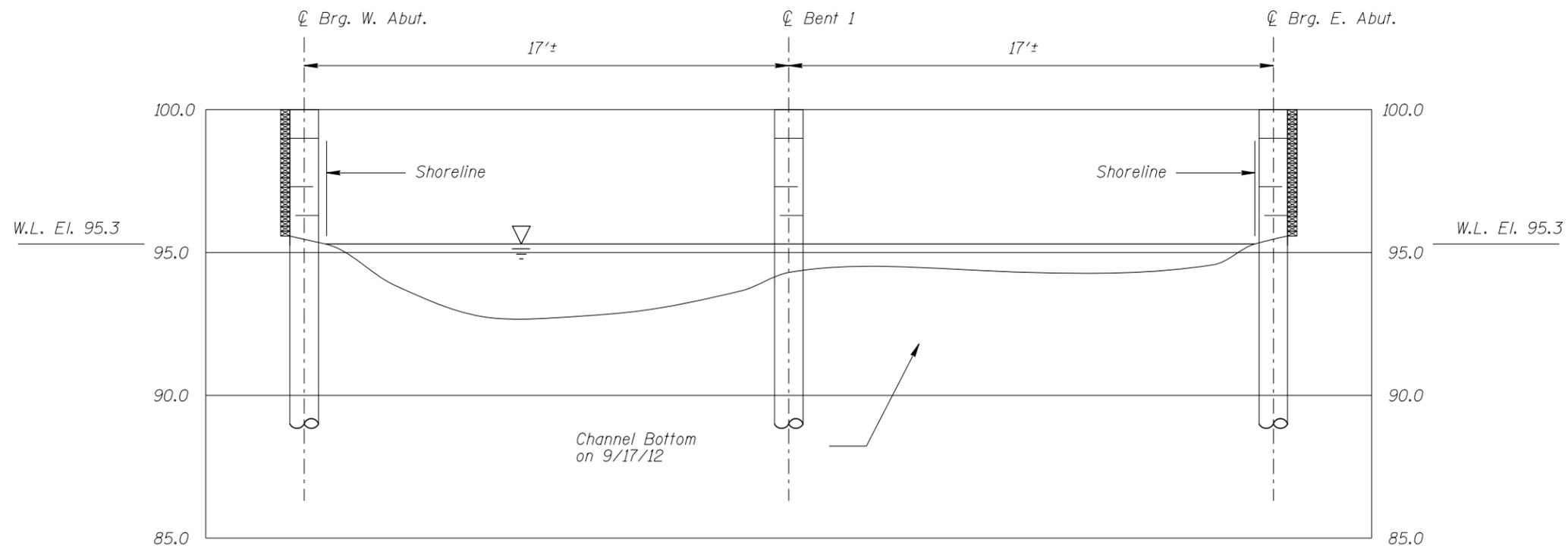


TYPICAL ELEVATION VIEW

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. L6106 CR 180 OVER THE BOG CREEK ST. LOUIS COUNTY		
INSPECTION AND SOUNDING PLAN		
Drawn By: MBP	COLLINS ENGINEERS	Date: OCTOBER 2012
Checked By: LJ	<small>123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Scale: 1"=10'
Code: 7423L6106		Figure No.: 1



UPSTREAM FASCIA PROFILE



DOWNSTREAM FASCIA PROFILE

Note:
Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. L6106 CR 180 OVER THE BOG CREEK ST. LOUIS COUNTY		
UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
Drawn By: MBP	COLLINS ENGINEERS <small>123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: OCTOBER 2012
Checked By: LJ		Scale: 1"=5'
Code: 7423L6106		Figure No.: 2

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES
DAILY DIVING REPORT

INSPECTORS: Collins Engineers, Inc. DATE: September 17, 2012

ON-SITE TEAM LEADER: Nicholas R. Triandafilou, P.E.

BRIDGE NO: L6106 WEATHER: Cloudy, 55° F

WATERWAY CROSSED: Bog Creek

DIVING OPERATION: SCUBA SURFACE SUPPLIED AIR
 OTHER

PERSONNEL: Clayton Brookins, Marc B. Parker

EQUIPMENT: Commercial Scuba, Sounding Pole, Hand Tools, Camera, Underwater Light

TIME IN WATER: 9:40 A.M.

TIME OUT OF WATER: 10:10 A.M.

WATERWAY DATA: VELOCITY None/Negligible

VISIBILITY 2.0 feet

DEPTH 1.5 feet maximum at Bent 1

ELEMENTS INSPECTED: The East and West Abutment and Bent 1

REMARKS: Overall, the East and West Abutments and Bent 1, were overall in poor condition. Several of the piles at the abutments exhibited up to 33 percent loss of section. In addition, the interior piles at all substructure units were generally in worse condition with softer external timber conditions. Otherwise, timber of the piles, pile extensions, pile caps, and sill was typically sound with random splitting or checking up to 1/2 inch wide and 3 inches deep. Both abutments were displacing out towards the channel, resulting in the sill rotating and a percentage of bearing loss on the piles.

FURTHER ACTION NEEDED: X YES NO

Repairs, such as pile replacement or structural jacketing, should be considered for Piles D and E of the West Abutment and Pile E of the East Abutment to restore full load carrying capacity of the piles. Monitor the splitting and timber decay (exterior softness) on all other piles and consider repairs if conditions worsen.

Shim all piles on the East and West Abutments as soon as possible to restore full bearing. Closely monitor the rotation/displacement of the backwall, sill, and piles until an above water inspection and/or further analysis can determine the necessary repairs and/or posting of the bridge for a maximum load limit.

The inspection of the submerged substructure units of Structure No. L6016 can most likely be accomplished in the future without using a dive team. To conduct the underwater inspection, a properly equipped and qualified inspector will have to perform the inspection during a period of low water and low flow. As channel bottom contours and water depths can change abruptly, it is recommended that lead line soundings of water depth be taken along the upstream and downstream fascias to determine whether a wading inspection is possible prior to beginning the inspection. If conditions are unsafe for inspection by wading, then an underwater inspection with the use of a dive team will be required.

The steel girders exhibited heavy corrosion with appreciable loss of section, and therefore, an above water inspection should be conducted to assess the section losses and determine the necessary repairs.

Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of sixty (60) months.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. L6106
 INSPECTORS Collins Engineers, Inc.
 ON-SITE TEAM LEADER Nicholas R. Triandafilou, P.E.
 WATERWAY CROSSED Bog Creek

INSPECTION DATE September 17, 2012

NOTE: USE ALL APPLICABLE CONDITION DEFINITIONS AS DEFINED IN THE MINNESOTA RECORDING AND CODING GUIDE INCLUDING GENERAL, SUBSTRUCTURE, CHANNEL AND PROTECTION, AND CULVERTS AND WALL DEFINITIONS TO COMPLETE THIS FORM.

CONDITION RATING

UNIT REFERENCE NO.	UNIT DESCRIPTION	MAXIMUM DEPTH OF WATER	SUBSTRUCTURE						CHANNEL					GENERAL					
			PILING	COLUMNS, SHAFTS AND PIERS	FOOTINGS	DISPLACEMENT	OTHER (SILL CAP AND BACKWALL)	OVERALL SUBSTRUCTURE CONDITION CODE*	SCOUR	EMBANKMENT EROSION	EMBANKMENT PROTECTION	OTHER (DRIFT/DEBRIS)	OVERALL CHANNEL & PROTECTION CONDITION	CONCRETE	STEEL	TIMBER	LOSS OF SECTION	PREVIOUS REPAIR OR MAINTENANCE	OTHER
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	East Abutment	Dry	4	4	N	4	4	4	N	6	6	N	6	N	N	4	5	5	N
2	Bent 1	1.5'	5	5	N	7	5	5	N	N	N	N	7	N	N	5	N	5	N
3	West Abutment	Dry	4	4	N	4	4	4	N	6	6	N	6	N	N	4	5	5	N

*UNDERWATER PORTION ONLY

REMARKS: Overall, the East and West Abutments and Bent 1, were in poor condition. Several of the piles at the abutments exhibited up to 33 percent loss of section. In addition, the interior piles at all substructure units were generally in worse condition with softer external timber conditions. Otherwise, timber of the piles, pile extensions, pile caps, and sill was typically sound with random splitting or checking up to 1/2 inch wide and 3 inches deep. Both abutments were displacing out towards the channel, resulting in the sill rotating and a percentage of bearing loss on the piles.

NOTES: ATTACH SKETCHES AS NEEDED, IDENTIFY REMARK BY REFERRING TO UNIT REFERENCE NO. AND REMARK NO. USE GENERAL SECTION TO IDENTIFY OVERALL PRESENCE OF SPALLS, CRACKS, CORROSION, ETC.