

UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 3575

FORD PARKWAY

OVER THE

MISSISSIPPI RIVER

CITY OF ST. PAUL, RAMSEY COUNTY



OCTOBER 30, 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 at Bridge No. 3575, Piers 7 through 9, were found to be in good to satisfactory condition with no defects of structural significance observed. Footing exposure was observed around the upstream portion of Piers 8 and 9. In addition, minor undermining was observed at the northeast corner of Pier 8. The extent of footing exposure has reduced slightly as compared to the previous underwater inspection. Aside from some localized areas of scour around Piers 8 and 9, the channel bottom around the substructure units appeared stable with evidence of concrete rubble/construction debris placement around the piers during the most recent superstructure rehabilitation.

INSPECTION FINDINGS:

- (A) Overall, the concrete of all piers exhibited light to moderate scaling around the perimeter of the piers, with random section losses (1 to 3 inches of penetration typical), from 2 feet above to 2 feet below the waterline. Concrete repair patches were evident above the waterline throughout the pier surfaces.
- (B) An area of spalled concrete, measuring 2 feet by 2 feet with 2 inches of penetration, at 3 feet below the waterline was observed on the east face of Pier 9.
- (C) The footing was exposed around the upstream portion of Pier 8 and along the upstream face of Pier 9. Timber formwork was encountered along the footings of Piers 8 and 9. The exposed portion of the footing exhibited widespread heavy scaling with 1 to 2 feet of penetration and a maximum vertical face exposure of 6 feet (full height) at Pier 8. No vertical face exposure was present at Pier 9 as the channel bottom sloped up to the top of the footing.
- (D) The footing at the northeast corner of Pier 8 was undermined, with a cavity measuring 3 feet long by 1 foot high with up to 1 foot of horizontal penetration.

- (E) A void was found in the side of the footing, measuring 2 feet in diameter with 3 feet of penetration, located at the northeast corner of Pier 8.
- (F) Areas of silty sand deposition (infilling) were located at the downstream ends of Piers 8 and 9 covering the footings. Elsewhere around the piers, the channel bottom material consisted of gravel and sand and was typically covered by scattered construction debris and concrete rubble.

RECOMMENDATIONS:

- (A) Monitor footing exposures at Piers 8 and 9 and undermining at Pier 8 during future underwater inspections for further vertical face exposure and/or undermining. The extent of footing exposure/undermining does not appear to be structurally significant at this time since the piers are founded on deep driven caissons (as per bridge plans).
- (B) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of sixty (60) months.

Respectfully submitted,

Inspection Team Leader:

WSB and Associates



Barritt Lovelace
Registered Professional Engineer
Bridge Safety Inspection Team Leader

COLLINS ENGINEERS, INC.

Daniel G. Stromberg
Registered Professional
Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 3575

Feature Crossed: Mississippi River

Feature Carried: Ford Parkway

Location: City of St. Paul, Ramsey County

Bridge Description: The superstructure consists of eleven spans of various configurations. The three main spans over the river each consist of a 300 foot long open spandrel, reinforced concrete arch. The reinforced concrete deck is supported by intermediate concrete pedestals cast into the arches. The arches are supported at the piers, which are supported by footings founded on multiple concrete caissons (Piers 8 and 9) or by spread footing (Pier 7).

2. INSPECTION DATA

Professional Engineer/Team Leader: Barritt R. Lovelace, P.E. (WSB)

Dive Team: Lukas Janulis, P.E, Brad Robinson (WSB)

Date: October 30, 2012

Weather Conditions: Partly Cloudy, 60°F

Underwater Visibility: 3.0 feet

Waterway Velocity: Negligible/None

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: Piers 7, 8, and 9.

General Shape: The piers consist of two rectangular reinforced concrete columns which intersect the arches at a common rectangular concrete footing (pier base). Pier 7 is supported by a rectangular spread footing. Piers 8 and 9 are supported by a rectangular footing founded on four large diameter concrete caissons.

Maximum Water Depth at Substructure Inspected: Approximately 28.5 feet.

4. WATERLINE DATUM

Water Level Reference: Bench mark on south end of Pier 9.

Water Surface: The waterline was approximately 5.3 feet below reference.

Waterline Elevation = 724.7.

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

Item 60: Substructure: Code 6

Item 61: Channel and Channel Protection: Code 6

Item 92B: Underwater Inspection: Code B/10/12

Item 113: Scour Critical Bridges: Code N/96

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

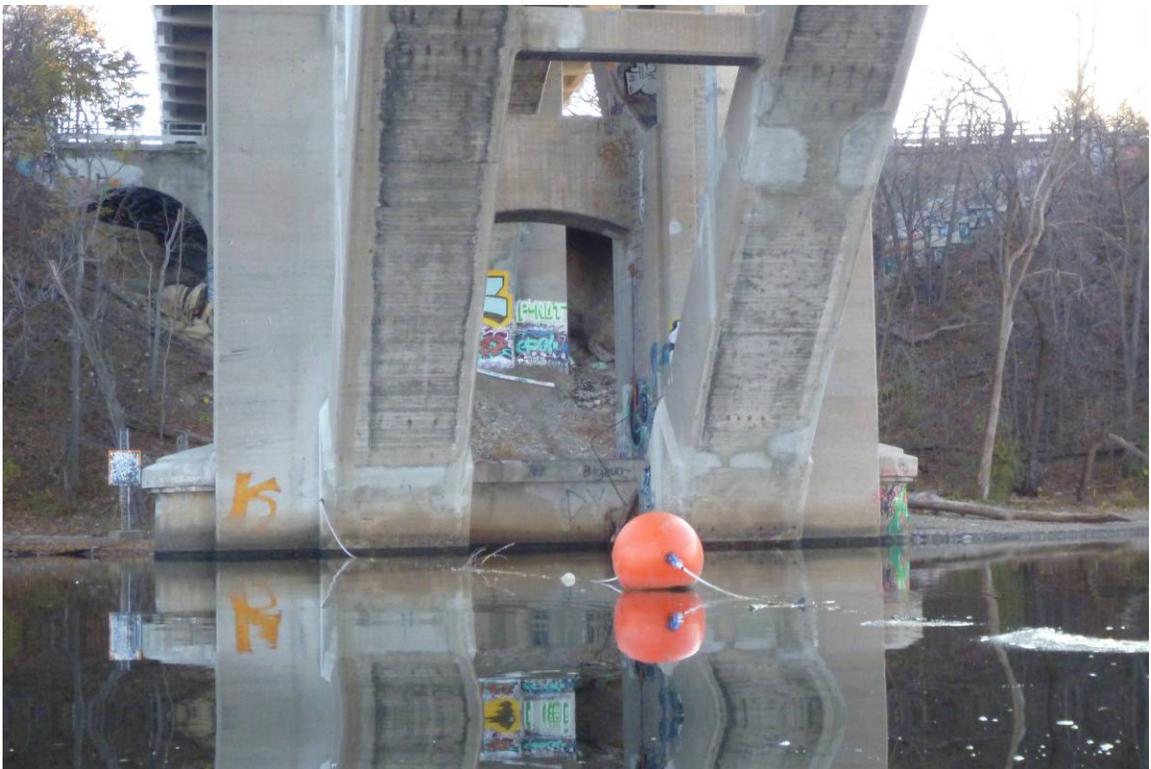
 Yes X No

6. STRUCTURAL ELEMENT CONDITION RATING

Item #	Element Description	Quantity	Unit	Conditions				
				1	2	3	4	5
210	Reinforced Concrete Pier Wall	280	LF	270	10			
361	Scour Smart Flag	1	EA	1				
220	Reinforced Concrete Footing	2	EA	1	1			
985	Slope and Slope Protection	1	EA	1				



Photograph 1. Overall View of the Bridge, Looking Southwest.



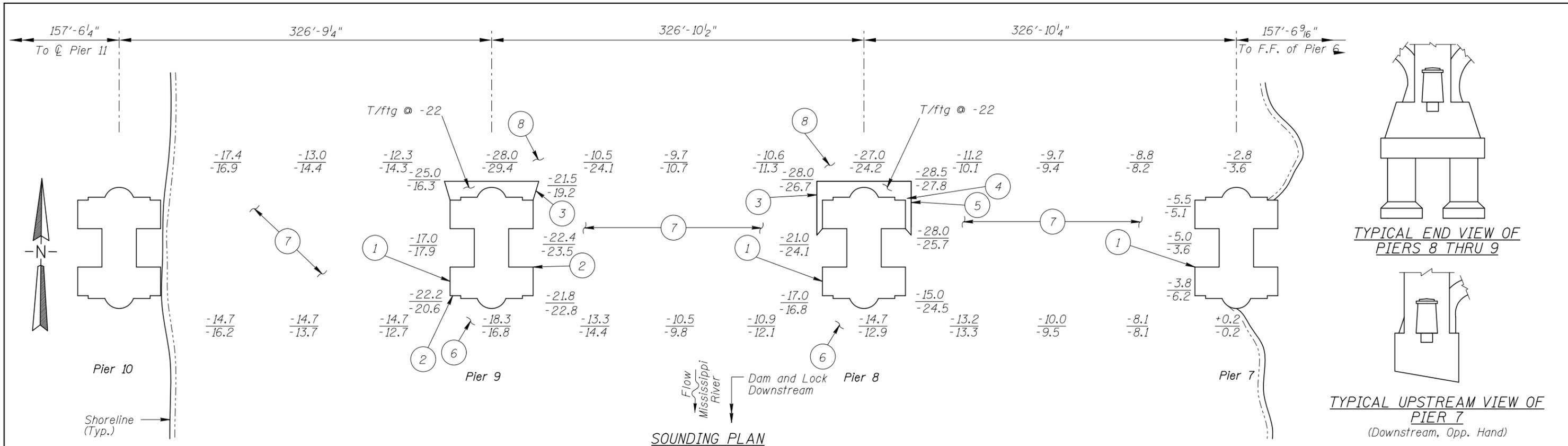
Photograph 2. View of Pier 7, Looking East.



Photograph 3. View of Pier 8, Looking West.



Photograph 4. View of Pier 9, Looking East.



GENERAL NOTES:

- Piers 7, 8 and 9 were inspected underwater.
- At the time of inspection on October 30, 2012, the waterline was located approximately 5.3 feet below the Bench Mark reference joint of El. 730.0 at the downstream end of Pier 9. This corresponds with a waterline elevation of 724.7 based on the reference.
- Soundings indicate the water depth at the time of inspection and are measured in feet.
- Soundings were taken parallel to the bridge at 1/4 point intervals between the substructure units.

INSPECTION NOTES:

- Overall, the concrete was in good to satisfactory condition with light to moderate scaling around the perimeter of the piers, with random areas of section loss (1 to 3 inches of penetration typical), from 2 feet above to 2 feet below the waterline.
- An area of concrete was spalled, 2 feet by 2 feet with 2 inches of penetration, at 3 feet below the waterline.
- The footing was exposed around the upstream third of Pier 8 and along the upstream face of Pier 9. Timber formwork was encountered along the footings of Piers 8 and 9. The exposed portion of the footings exhibited widespread heavy scaling with 1 to 2 feet of penetration and a maximum vertical face exposure of 6 feet (full height) at Pier 8. No vertical face exposure at Pier 9.
- The footing at the northeast corner of Pier 8 was undermined, with a cavity measuring 3 feet long by 1 foot high with up to 1 foot of horizontal penetration.
- A void was found in the side of the footing, measuring 2 feet in diameter with 3 feet of penetration, located at the northeast corner of Pier 8.
- Areas of silty sand deposition (infilling) were located at the downstream ends of Piers 8 and 9 covering the footings.

INSPECTION NOTES: (con't.)

- The channel bottom consisted of gravel and sand with scattered concrete rubble, reinforcing steel and riprap around the substructure units. The concrete rubble had protruding reinforcing steel and appeared to have been placed / dropped as part of bridge rehabilitation.
- Localized scour depressions were observed around the upstream end of Piers 8 and 9 with typical depths of 5 to 10 feet, and concrete rubble with protruding reinforcing steel was found on the base of the scour depression.

Legend

- 2.0 Sounding Depth (10/30/12)
- 5.2 Sounding Depth (10/18/07)

Note:

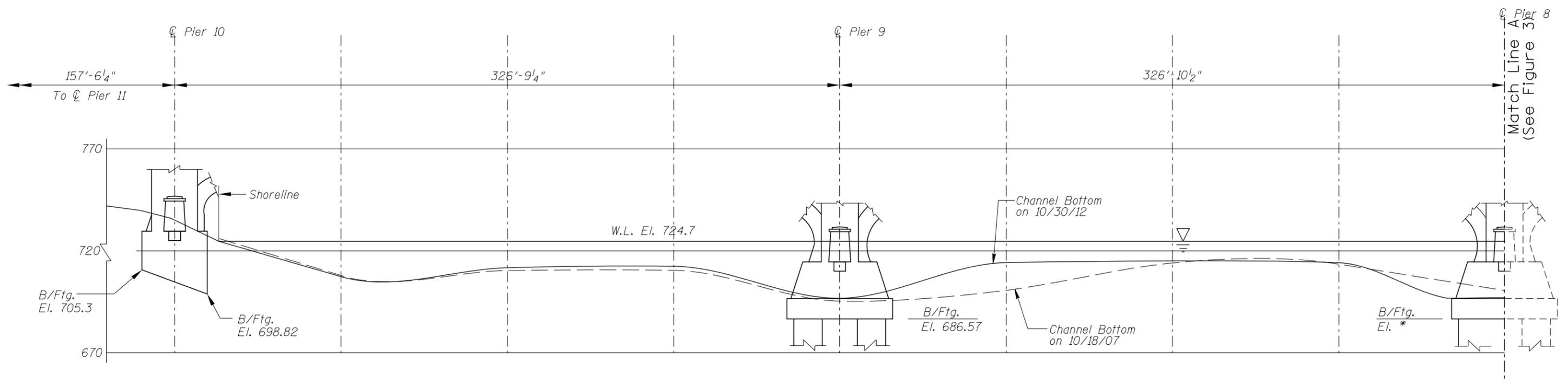
All soundings based on 2012 waterline location.

**MINNESOTA
DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION**

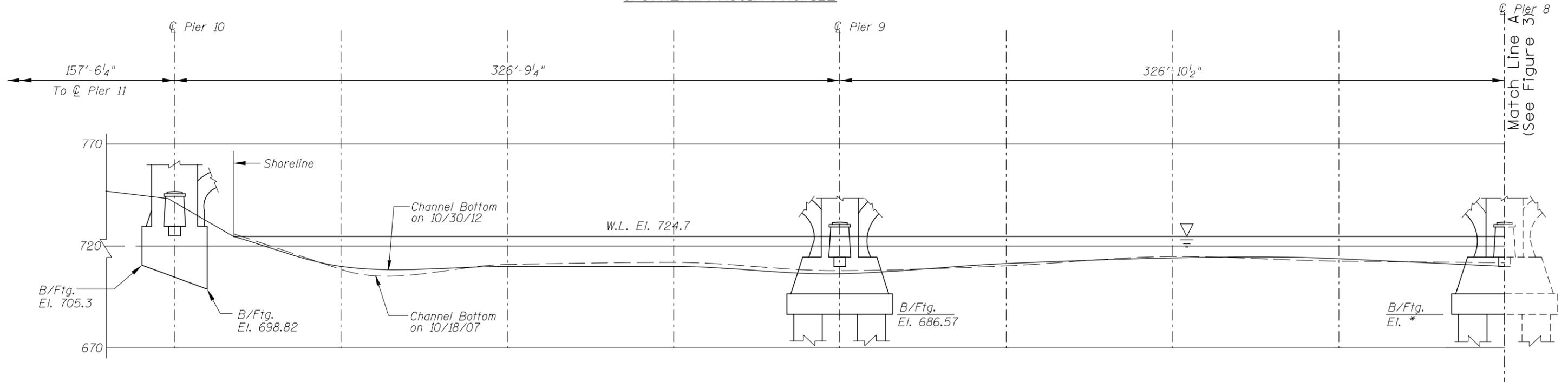
STRUCTURE NO. 3575
OVER THE MISSISSIPPI RIVER
CITY OF ST. PAUL, RAMSEY COUNTY

INSPECTION AND SOUNDING PLAN

Drawn By: CRE	COLLINS ENGINEERS <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: OCT. 2012
Checked By: LJ		Scale: NTS
Code: 74233575		Figure No.: 1



UPSTREAM FASCIA PROFILE

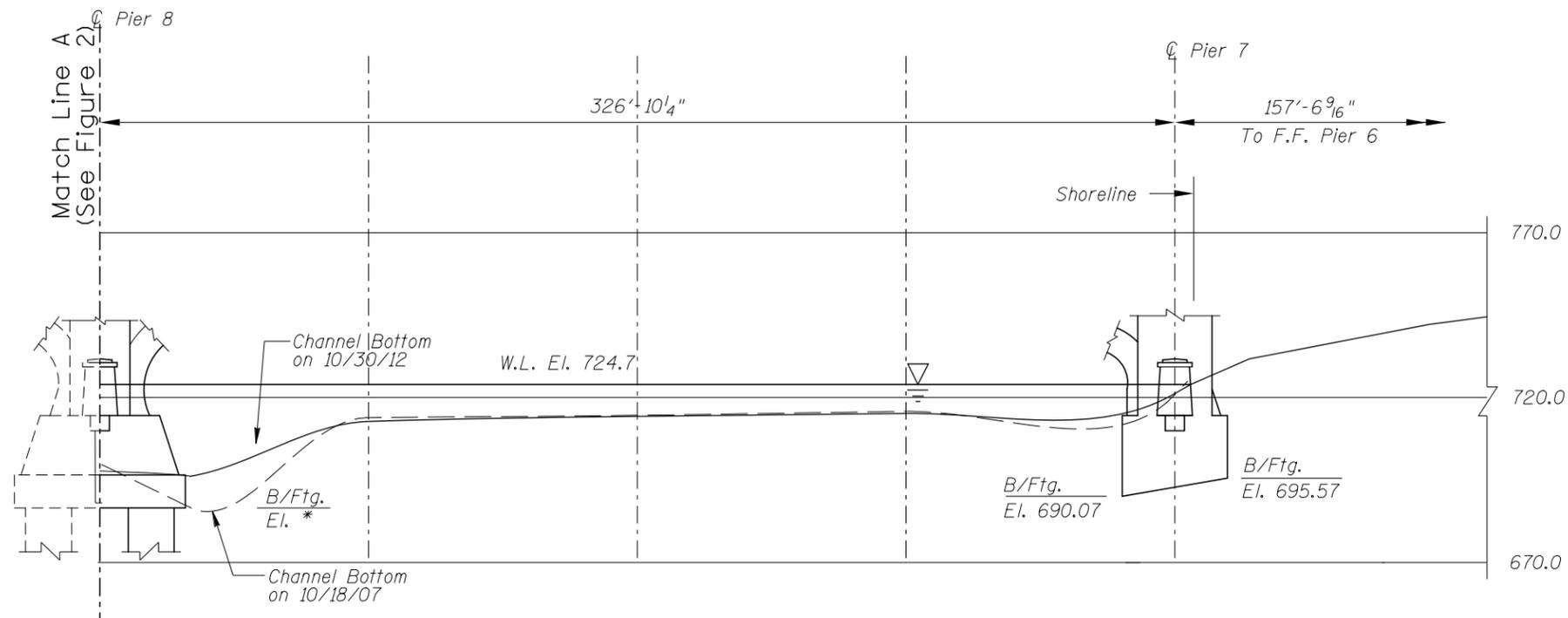


DOWNSTREAM FASCIA PROFILE

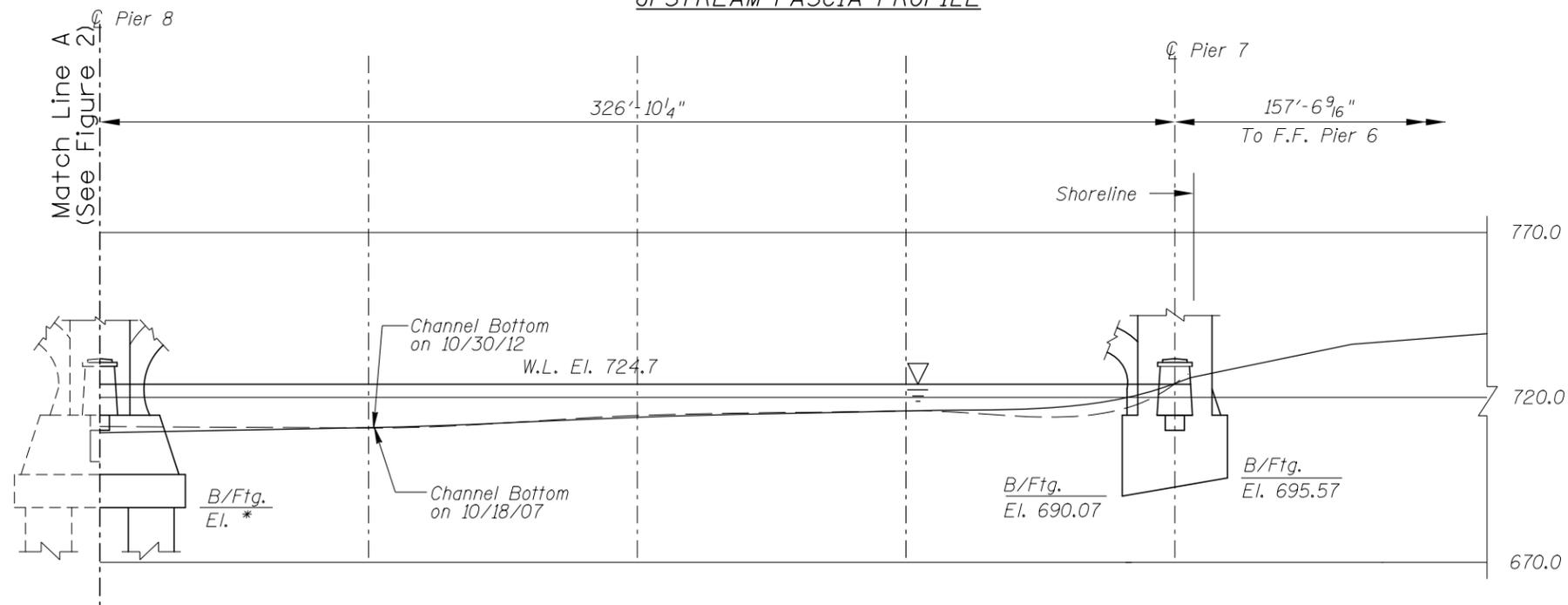
* The bottom of footing elevation noted on the Design Plans does not correspond to the soundings and/or undermining detected at the time of the underwater inspection.

Note:
Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 3575 OVER THE MISSISSIPPI RIVER CITY OF ST. PAUL, RAMSEY COUNTY		
UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
Drawn By: CRE	COLLINS ENGINEERS <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: OCT. 2012
Checked By: LJ		Scale: 1"=50'
Code: 74233575		Figure No.: 2



UPSTREAM FASCIA PROFILE



DOWNSTREAM FASCIA PROFILE

* The bottom of footing elevation noted on the Design Plans does not correspond to the soundings and/or undermining detected at the time of the underwater inspection.

Note: _____
Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 3575 OVER THE MISSISSIPPI RIVER CITY OF ST. PAUL, RAMSEY COUNTY		
UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
Drawn By: CRE	COLLINS ENGINEERS <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: OCT. 2012
Checked By: LJ		Scale: 1"=50'
Code: 74233575		Figure No.: 3

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

INSPECTORS: Collins Engineers, Inc. DATE: October 30, 2012

ON-SITE TEAM LEADER: Barritt R. Lovelace, P.E. (WSB)

BRIDGE NO: 3575 WEATHER: Partly Cloudy, 60°F

WATERWAY CROSSED: Mississippi River

DIVING OPERATION: SCUBA SURFACE SUPPLIED AIR
 OTHER

PERSONNEL: Lukas Janulis, P.E, Brad Robinson (WSB)

EQUIPMENT: Commercial Scuba, Probe Rod, Lead Line, Sounding Pole, U/W Light, Scraper, 14' Boat, Camera

TIME IN WATER: 9:30 a.m.

TIME OUT OF WATER: 10:25 a.m.

WATERWAY DATA: VELOCITY Negligible/None

VISIBILITY 3.0 feet

DEPTH 28.5 feet maximum at Pier 8

ELEMENTS INSPECTED: Piers 7, 8, and 9

REMARKS: Overall, Piers 7 through 9, were found to be in good to satisfactory condition with no defects of structural significance observed. Footing exposure was observed around the upstream portion of Piers 8 and 9. In addition, minor undermining was observed at the northeast corner of Pier 8. The extent of footing exposure has reduced slightly as compared to the previous underwater inspection. Aside from some localized areas of scour around Piers 8 and 9, the channel bottom around the substructure units appeared stable with evidence of concrete rubble/construction debris placement around the piers during the most recent superstructure rehabilitation.

FURTHER ACTION NEEDED: YES NO

Monitor footing exposures at Piers 8 and 9 and undermining at Pier 8 during future underwater inspections for further vertical face exposure and/or undermining. The extent of footing exposure/undermining does not appear to be structurally significant at this time since the piers are founded on deep driven caissons (as per bridge plans).

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. 3575
 INSPECTORS Collins Engineers, Inc.
 ON-SITE TEAM LEADER Barritt R. Lovelace, P.E. (WSB)
 WATERWAY CROSSED Mississippi River

INSPECTION DATE October 30, 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, OR FACES*	FOOTINGS	DISPLACEMENT	OTHER	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
	Pier 7	5.5'	N	7	N	8	N	7	N	7	7	N	7	7	N	N	N	N	N
	Pier 8	28.5'	N	7	6	8	N	6	6	N	N	6	6	7	N	N	N	N	N
	Pier 9	28.0'	N	7	7	8	N	7	6	7	7	7	6	7	N	N	N	N	N

*UNDERWATER PORTION ONLY

REMARKS: Overall, Piers 7 through 9, were found to be in good to satisfactory condition with no defects of structural significance observed. Footing exposure was observed around the upstream portion of Piers 8 and 9. In addition, minor undermining was observed at the northeast corner of Pier 8. The extent of footing exposure has reduced slightly as compared to the previous underwater inspection. Aside from some localized areas of scour around Piers 8 and 9, the channel bottom around the substructure units appeared stable with evidence of concrete rubble/construction debris placement around the piers during the most recent superstructure rehabilitation.

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.