

Underwater Inspection Report



NC306 Ferry (South Terminal)

On

Pamlico Sound



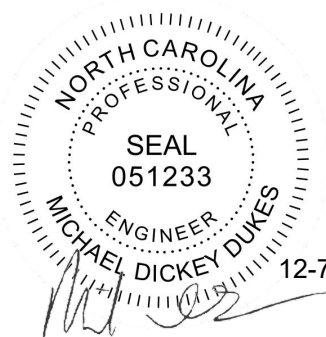
Bridge: 060321
Upstream Fascia

Developed by:



40 Concourse Way
Greer, SC 29650
(864) 595-8030

Aurora, North Carolina
November 2, 2023



12-7-2023



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1.0 INTRODUCTION

1.1 Scope of Inspection

A routine underwater inspection was performed by a dive team consisting of four ADCI certified commercial divers. A Level I visual and tactile inspection was performed at all steel H-piles, steel splash wall, steel retaining wall, and timber dolphins from the high watermark to the channel bottom. A Level II detailed inspection was performed among 10% of the steel substructure units using an ultrasonic thickness gauge to determine remaining thickness of the steel flanges and webs.

1.2 General Description of the Structure

Table 1: Bridge and Inspection Information

Date of Inspection:	November 2, 2023
Date of Design Plans:	Not Available
Length of Bridge:	90 ft.
Number of Spans:	3
SSUs Inspected:	Bent 2 and End Bent 2
Superstructure Type:	Steel Girders
Substructure Type:	Steel Piles
Foundation Type:	Steel Piles
Direction of Stationing:	South to North
Dive Method:	Surface-Supplied Air from Boat
Maximum Water Depth:	20.8 ft. @ End Bent 2, Pile 2
Weather:	Sunny, 60°F
Max Current Flow:	0 FPS
Inspection Team Leader:	Scott Rowe, PE
Inspection Team Members:	Wes Trescott, Steven Henry, Brandon Rot
High Watermark:	6 in. above waterline

Location Map

Coordinates: N 35.377114°, W 76.748372°



2.0 INSPECTION FINDINGS

2.1 Item 61: Channel

Based on the Underwater Inspection, NBI Item 61 condition rating is 8.

- The embankment appears stable and protected by a steel sheet pile bulkhead and riprap slope protection.
- Bent 2 and the sheet pile bulkhead beneath Span 2 are protected from ferry prop-wash by a steel sheet pile splash wall.
- The channel bottom primarily consists of silt and organic material.

2.2 Item 113: Scour

At End Bent 2, there are areas of local scour, up to 10 ft. deep, due to prop-wash from the ferry. Refer to Table 2 for the sounding measurements.

2.3 Item 60: Substructure

Based on the Underwater Inspection, the NBI Item 60 condition rating is 5 (Fair).

General Notes:



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- All inspected piles, extending from the waterline to channel bottom, have light marine growth, consisting of barnacles, up to 1/2 in. thick.
- Steel sheet pile bulkhead, extending from cap to channel bottom, have corrosion with pitting up to 1/16 in. deep.
- Steel sheet pile splash wall, from top of wall to 1 ft. below waterline, corrosion with pitting down to 1/16 in. remaining section (Photo 15).
- Piles have been repaired with steel repair plates since the previous underwater inspection. Refer to Table 3 for the locations and dimensions of the repair plates.

Bent 2:

- All piles, from cap to channel bottom, all flanges, corrosion with section loss. Refer to Table 4 for representative steel section measurements at Pile 4.
- All piles, from cap to channel bottom, protective coating is peeling.
- Pile 1, southeast flange, from waterline to cap, corrosion with section loss and knife edging, 0.232 in. remaining section (Photo 16).
- Pile 3, southwest flange, from waterline to cap, corrosion with section loss, 0.208 in. remaining section (Photo 17).

End Bent 2:

- All piles, from cross bracing to 1 ft. below waterline, all flanges, corrosion with up to 1/16 in. section loss. Refer to Table 4 for representative steel section measurements at Piles 2 and 3.
- All piles, along flange edges, isolated areas of section loss from construction damage, up to 3 in. high x 1/2 in. wide.
- Pile 2, southwest flange, from high watermark to channel bottom, corrosion with section loss, 0.335 in. remaining section (Photo 18).
- Pile 3, northeast flange, from waterline to cross bracing, corrosion with section loss and knife edging, 0.350 in. remaining section (Photo 19).
- Pile 3, northwest flange, from waterline to cross bracing, corrosion with section loss, 1/16 in. remaining at edge (Photo 20).
- Pile 4, northwest and southwest flanges, from 1.5 ft. above to 1 ft. below waterline, corrosion with section loss, 0.293 in. remaining section (Photo 21).



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- Pile 5, southwest and southeast flanges, from high watermark to channel bottom, corrosion with section loss, 0.325 in. remaining section.

Dolphins:

- All dolphin fenders, bottom 3 ft., decay, up to 100% loss (Photo 22).
- Dolphin 3, fenders, decay, full height, up to 100% loss (Photo 23).
- Dolphin 4, north and west quadrant, 1 ft. above waterline, steel cable wrap severed.
- Dolphin 5, fenders, decay, full height, up to 100% loss.
- Dolphin 9, east quadrant, 1 ft. above waterline, steel cable wrap severed.
- Dolphin 10, east quadrant, 1 ft. above waterline, steel cable wrap severed (Photo 24).

2.4 Repair Recommendations

- Clean and coat or encase all piles in Bent 2 and End Bent 2.
- Replace all decayed dolphin fenders.
- Replace severed steel cables at Dolphins 4, 9, and 10.



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Table 2: Ferry Terminal Soundings

Upstream Fascia	
SSU	Waterline to Channel Bottom (ft)
Bent 2, Pile 1	7.0
Splash Wall	18.3
End Bent 2, Pile 1	20.1
End Bent 2, Pile 3	16.6
End Bent 2, Pile 4	17.7
Dolphin 1	19.1
Dolphin 3	16.6
Dolphin 5	16.8
Dolphin 7	12.7
Dolphin 9	8.5

Downstream Fascia	
SSU	Waterline to Channel Bottom (ft)
Bent 2, Pile 4	5.7
Splash Wall	17.9
End Bent 2, Pile 2	20.8
End Bent 2, Pile 5	17.0
End Bent 2, Pile 6	15.9
Dolphin 2	17.8
Dolphin 4	14.7
Dolphin 6	15.0
Dolphin 8	14.7
Dolphin 10	12.8

Note: The numbers listed in this table represent depth and not elevations. The waterline elevation at the time of the readings was 1.8 based on the available USGS gage height. The soundings were taken on November 2, 2023 at 10:30.

Table 3: Repair Plate Locations

Bent	Pile	Location	Height (in.)	Width (in.)
Bent 2	1	N Flange	16	12
	1	SW Flange	18	6
	2	N Flange	20	12
	2	SW Flange	30	6
	2	SE Flange	21	6
	3	N Flange	17	12
	3	SE Flange	30	6
	4	N Flange	25	12
	4	SW Flange	24	6
	4	SE Flange	16	6
End Bent 2	1	SE Flange	32	6
	1	NW Flange	16	6
	1	SW Flange	31	6
	1	NE Flange	20	6
	2	SE Flange	11	6
	2	W Flange	20	12
	4	NW Flange	33	6
	4	NE Flange	33	6
	4	SW Flange	33	6
	5	NW Flange	36	6
	5	SW Flange	25	7

Note: The only repair plates noted in this table were those within the scope of the Underwater Inspection.

Table 4: Steel Thickness Measurements

Bent	Pile	Flange or Web	Depth Below Waterline (ft.)	Original Thickness (in.)	Remaining Section (in.)	Remaining Section (%)
Bent 2	1	SE Flange	0.0	0.515	0.232	45.0%
	3	SE Flange	0.0	0.515	0.208	40.5%
	4	SE Flange	0.0	0.515	0.380	73.8%
		SE Flange	5.7	0.515	0.485	94.2%
		Web	0.0	0.480	0.465	96.9%
		Web	5.7	0.480	0.468	97.6%
End Bent 2	2	SW Flange	0.0	0.515	0.335	65.0%
		NW Flange	10.4	0.515	0.492	95.5%
		SW Flange	20.8	0.515	0.442	85.8%
		Web	0.0	0.480	0.480	100.0%
		Web	10.4	0.480	0.473	98.6%
		Web	20.8	0.480	0.423	88.2%
	3	NE Flange	0.0	0.515	0.350	68.0%
		NE Flange	8.3	0.515	0.482	93.5%
		NE Flange	16.6	0.515	0.418	81.2%
		Web	0.0	0.480	0.475	99.0%
		Web	8.3	0.480	0.465	96.9%
		Web	16.6	0.480	0.418	87.2%
	4	SW Flange	0.0	0.515	0.293	57.0%
	5	SE Flange	0.0	0.515	0.325	63.1%

Note: Original steel thickness was taken from field measurements. All flange measurements were taken 1 in. from the edge of the flange using an ultrasonic thickness gauge. Three readings were taken in the field and the average was used to determine remaining steel thickness.

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Aurora Ferry Terminal on Pamlico River



Photo 1: Overall View Looking East



Photo 2: Overall View Looking West

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Photo 3: Upstream/West Fascia



Photo 4: Downstream/East Fascia

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Photo 5: Bent 2, North Face

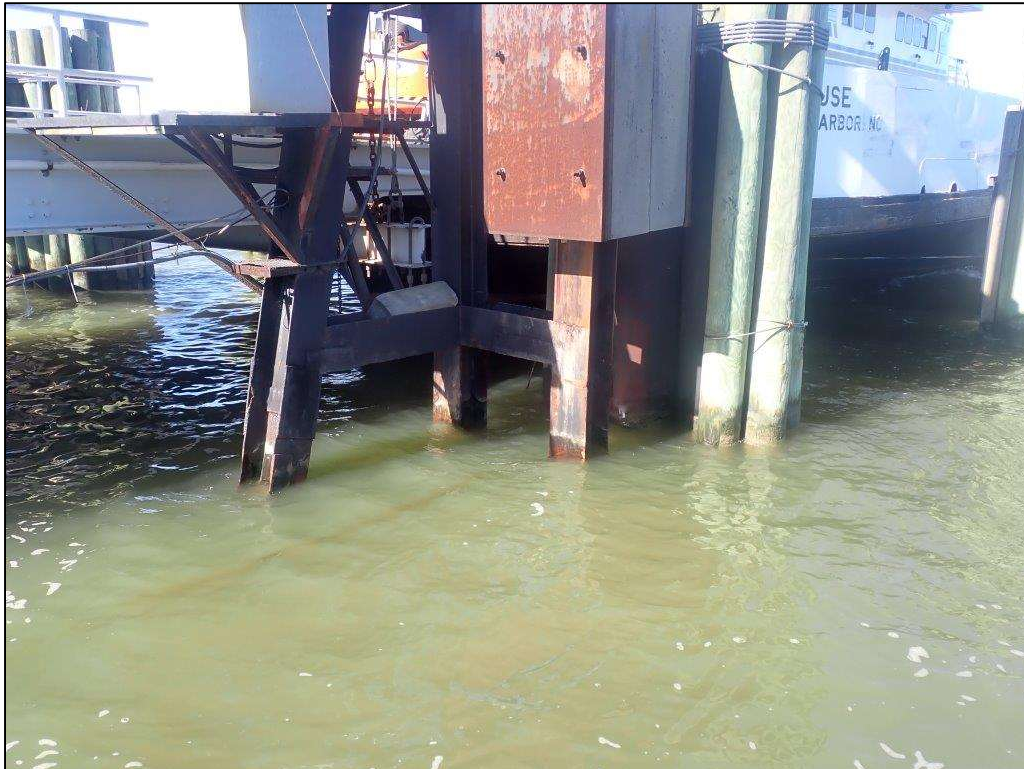


Photo 6: End Bent 2, East Gallow Shown

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Photo 7: Splash Wall Above Waterline



Photo 8: Typical Steel Sheet Pile Bulkhead

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Photo 9: Typical Dolphin, Dolphin 8 Shown



Photo 10: Typical Repair Plate, End Bent 2, Pile 2, Shown

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Photo 11: Typical Steel Pile Condition Above Waterline, End Bent 2, Pile 2



Photo 12: Typical Steel Pile Condition Below Waterline, End Bent 2, Pile 2

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Photo 13: Typical Timber Dolphin Condition Above Waterline, Dolphin 2

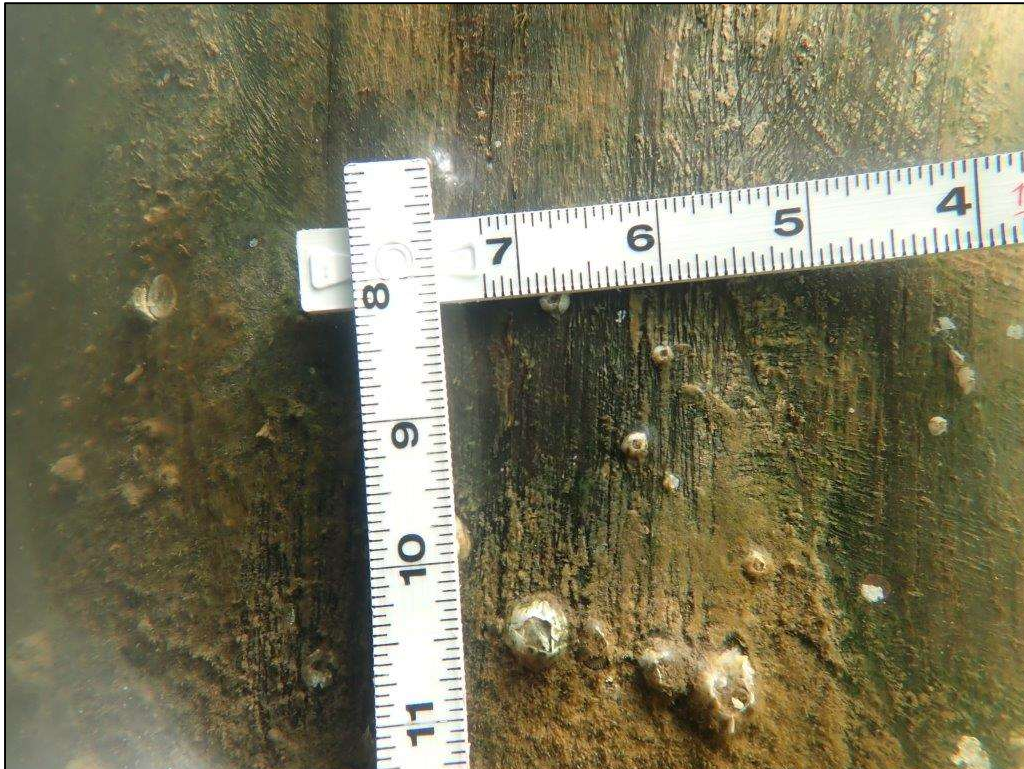


Photo 14: Typical Timber Dolphin Condition Below Waterline, Dolphin 2

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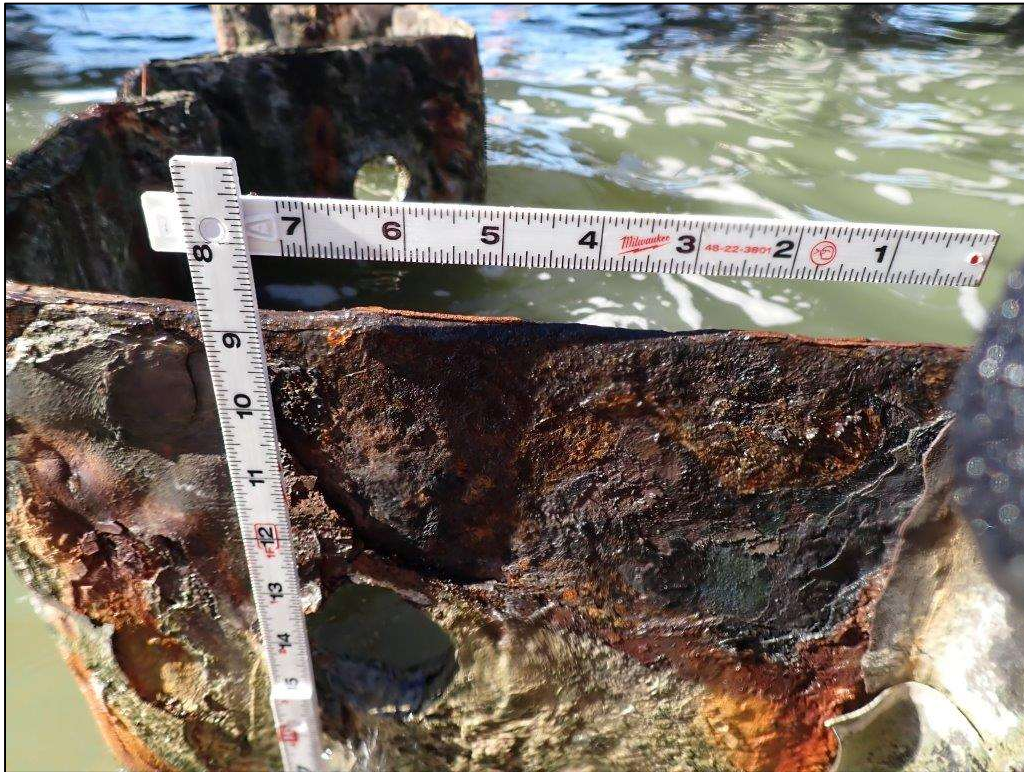


Photo 15: Typical Steel Splash Wall Condition Above Waterline



Photo 16: Bent 2, Pile 1, Southeast Flange, Knife Edging

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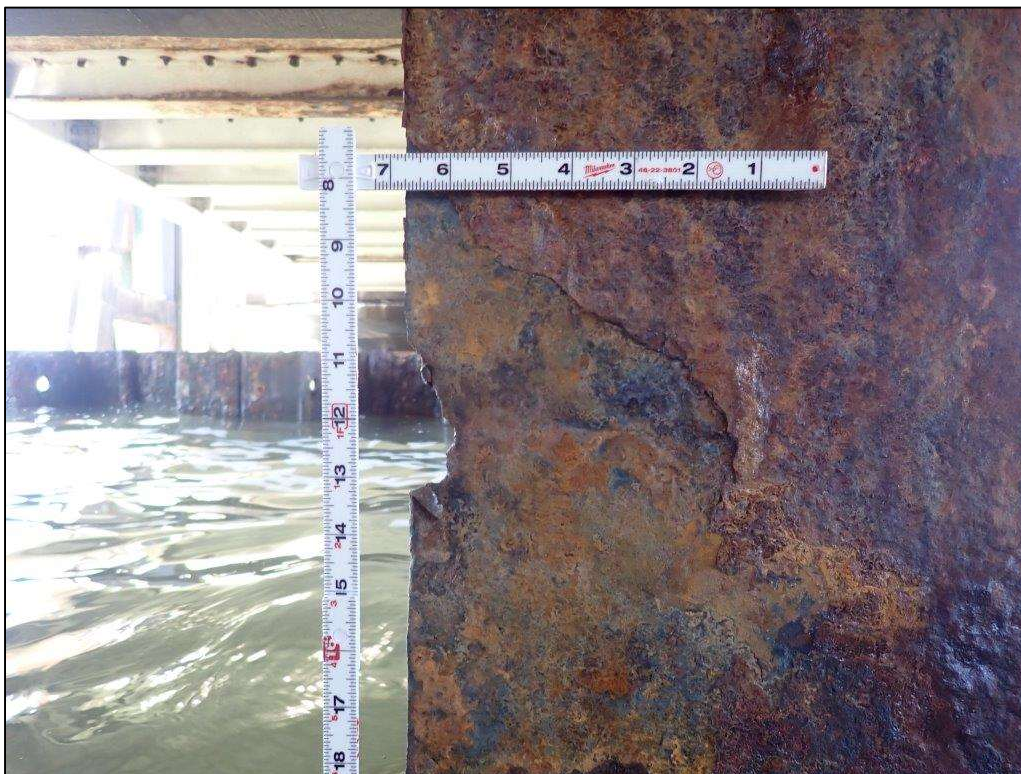


Photo 17: Bent 2, Pile 3, Southwest Flange, Section Loss



Photo 18: End Bent 2, Pile 2, Southwest Flange, Section Loss

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Photo 19: End Bent 2, Pile 3, Northeast Flange, Section Loss

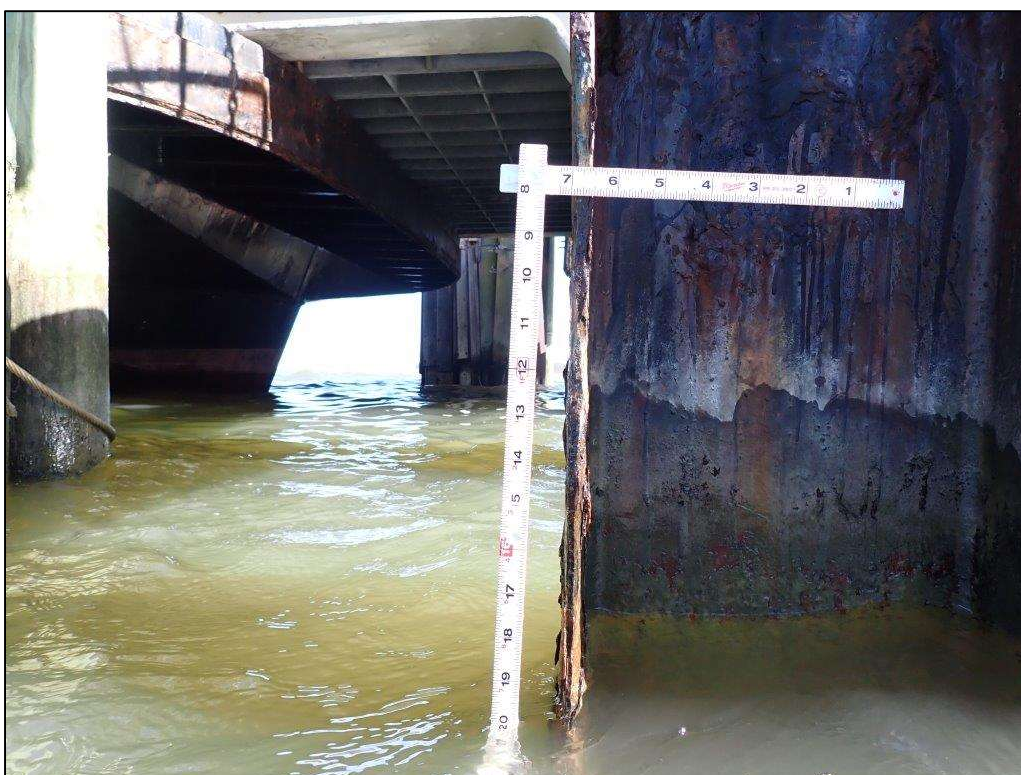


Photo 20: End Bent 2, Pile 3, Northwest Flange, Section Loss

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Photo 21: End Bent 2, Pile 4, Section Loss

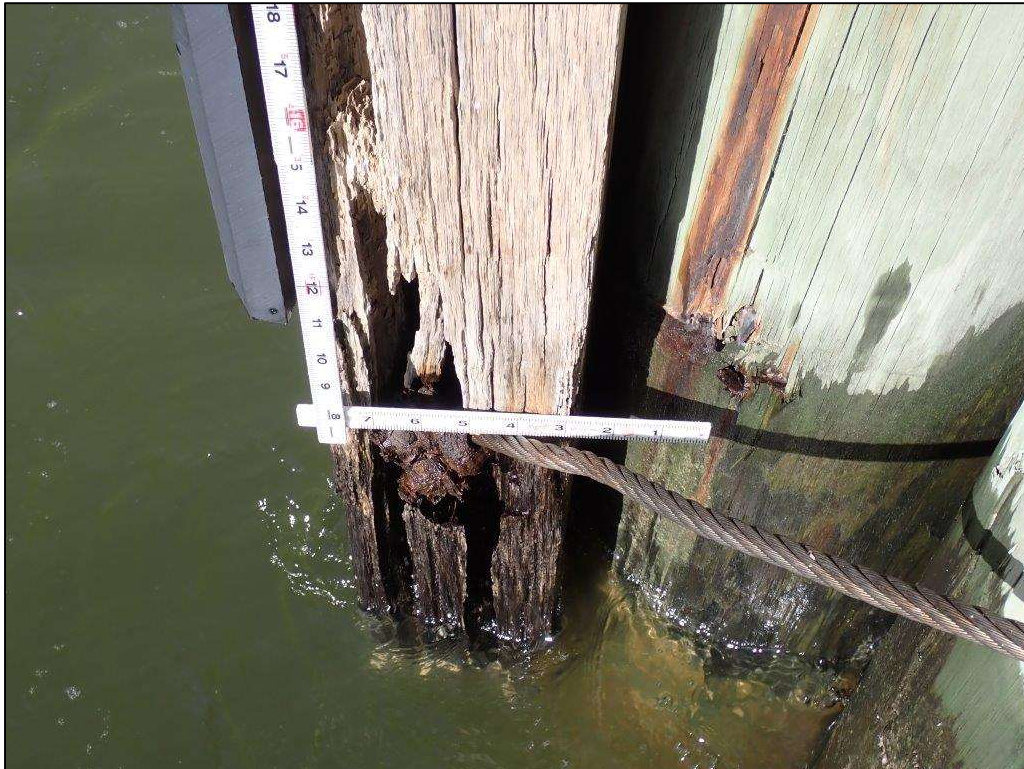


Photo 22: Dolphin Fenders, Typical Decay

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Photo 23: Dolphin 3, Fenders, Decay

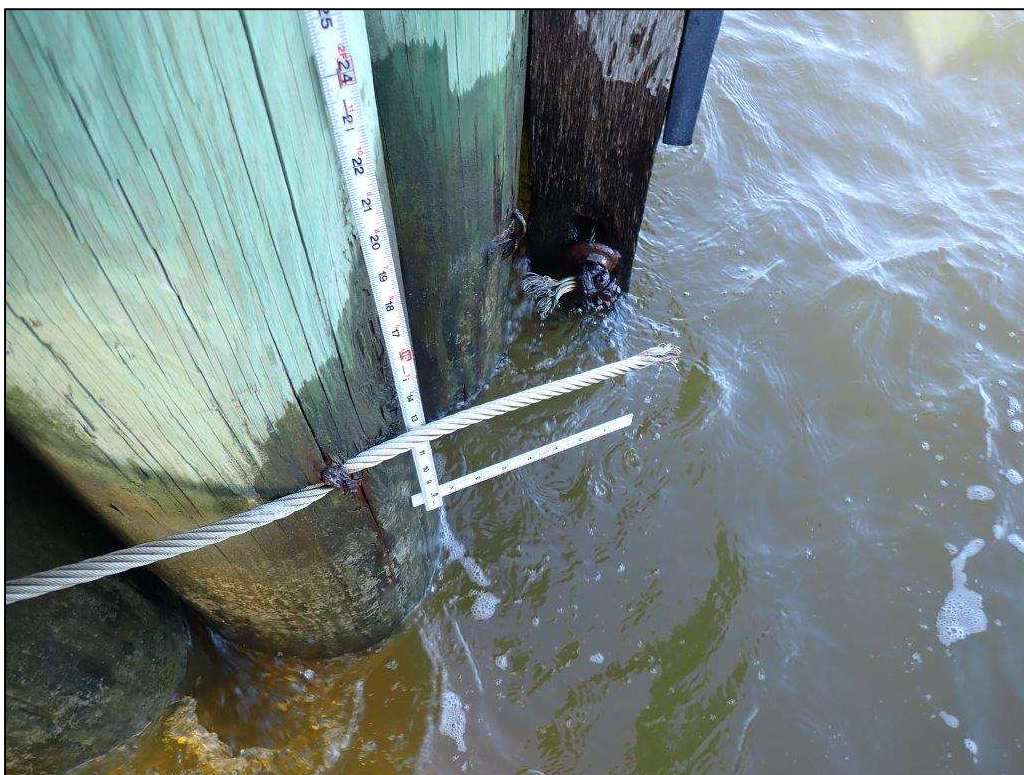


Photo 24: Dolphin 10, Steel Cable Severed