TN TDOT Department of Transportation

2021 Underwater Bridge Inspection Report

Bridge ID Number: 90S23860001

SR353 (Bailey Bridge Road) over Nolichucky River

Log Mile 0.45

Washington County, Tennessee

Inspection Date: August 14th, 2021

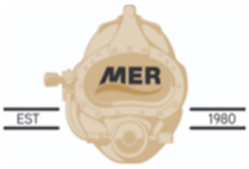
State Project Number: 99114-1250-94

On-System

Pin No.: 040087.05

Agreement Number E2149 Work Order 28

10/12/2021



MER Moran Environmental Recovery
COMMERCIAL DIVING DIVISION

Gresham Smith

Genuine Ingenuity

222 Second Avenue South / Suite 1400

Nashville, Tennessee 37201 / Phone 615.770.8100

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Section **Page Number**

Gresham Smith

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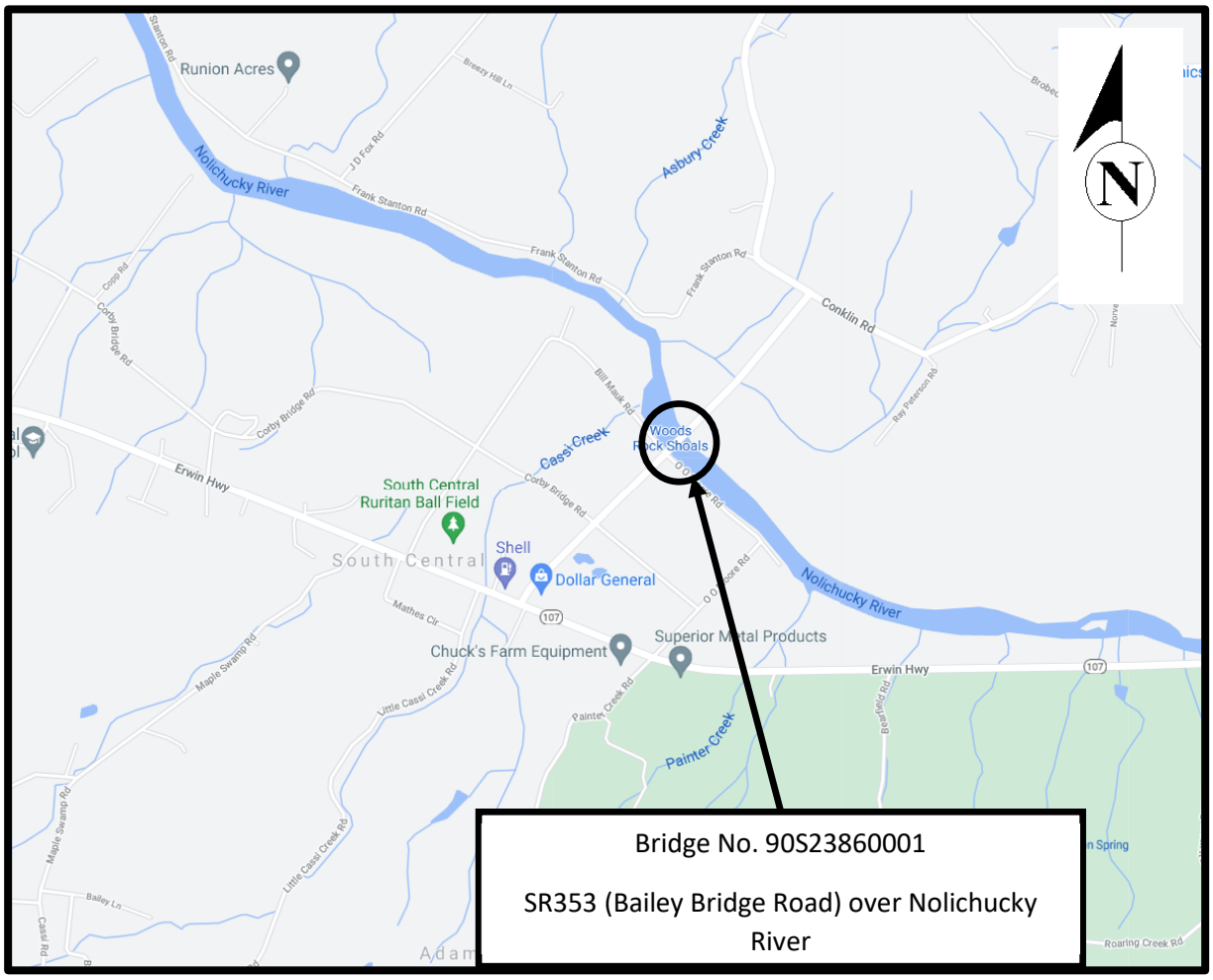
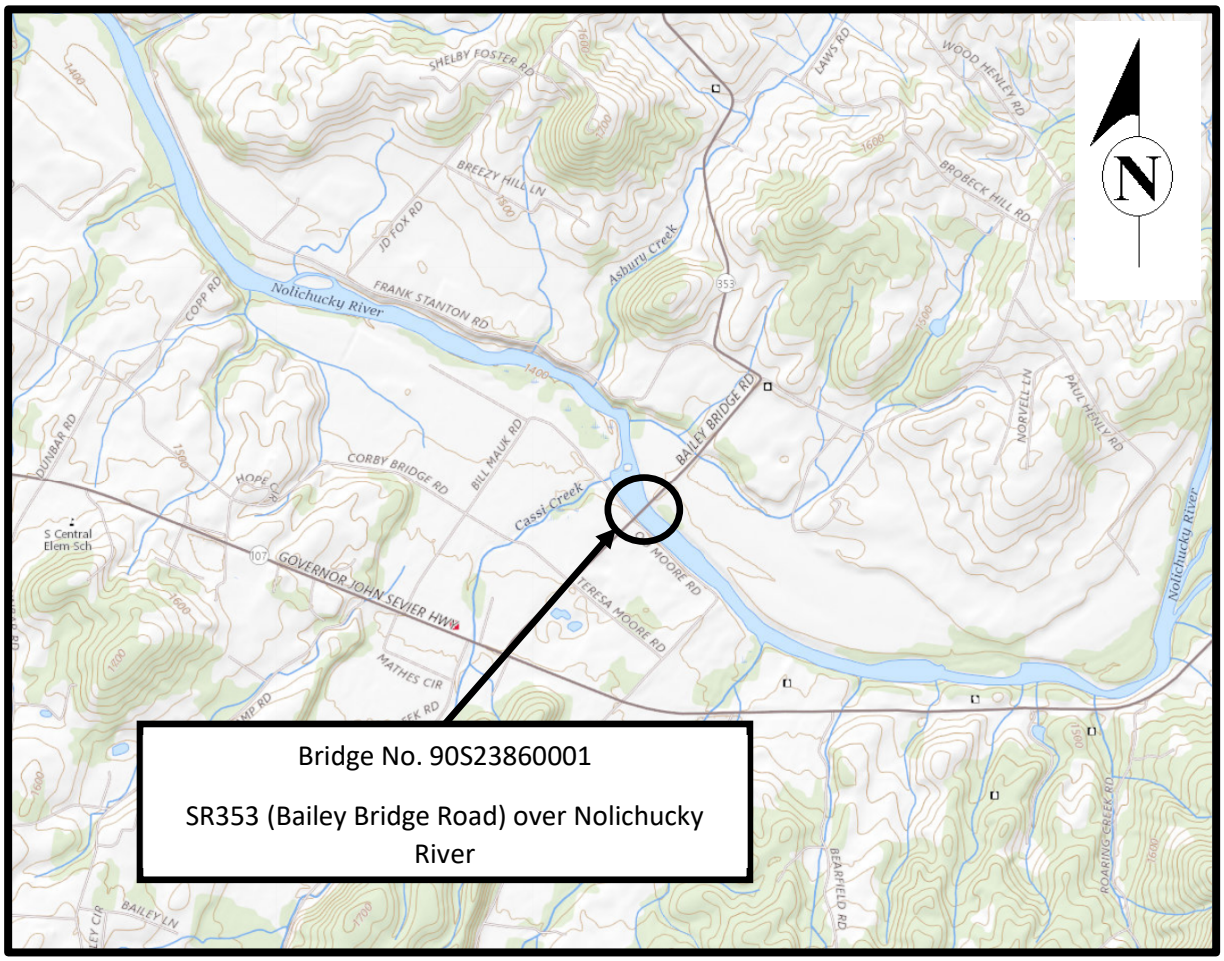
1.1 Location Map



1.2 Aerial Map

1.3 Topographic Map



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2.1 Introduction

This report contains the results of the underwater inspection performed by Gresham Smith on August 14th, 2021 of SR353 (Bailey Bridge Road) over Nolichucky River in Washington County, Tennessee. This report details the inspection procedures, inspection findings, and recommendations for repair of the bridge structure elements located within the waterway.

At the time of the inspection Pier No. 1, Pier No. 2, Pier No. 3, Pier No. 4, and Pier No. 5 were within the limits of the water and were inspected by diving. The piers consist of a concrete cap supported by two (2) concrete columns with a solid web wall between the columns. The foundations consist of concrete spread footings founded on piles.

2.2 Bridge and Inspection Data

County: Washington Bridge No.: 90S23860001 Date: 8/14/2021 Time: 8:00 am	Team Leader: Adam Davidson, P.E., NBI Diver: Jacob Quinteros Substructures: Pier No. 1 thru Pier No. 5

Bridge Description:

Route/Road:	Bailey Bridge Road / SR353
Crossing (Body of Water):	Nolichucky River
Year Constructed:	1958
Length of Bridge (according to plans):	354’-6”
Superstructure type:	9 Span, Concrete Tee-Beams
Substructure type:	Concrete Column with Solid Web Wall
Footing type:	Concrete Spread Footing Founded on Piles
Substructures in Water:	(5), Pier No. 1 thru Pier No. 5
Previous Underwater Inspection Date:	09/15/2016

Site Description:

Water Type:	Fresh Water Creek
Approx. Water Width:	222’ +/-
Max Water Depth:	8.6’
Streambed material:	Sand, Silt
Reference point:	Top of rail, Downstream side, @ Pier No. 5.
Vertical distance from reference point:	25.5’
Direction of Flow:	Southeast to Northwest

Inspection Team:
Team Leader: Adam Davidson, P.E., NBI
Additional Engineer: Andy Allsbrook, P.E.
Diver / Inspector: Jacob Quinteros
Tender / Diver: Kyle Rose
Additional Diver / Inspector: Will Dix
NBI: National Highway Institute bridge inspection team leader certification.

Equipment Used:
Probing rod, survey rod, wet suit, camera, diving gear, pneumo depth gauge

Site Visits:

No.	Date	Visibility	Current	Weather	Water Time
1	8/14/21	0’ to 4.0’	<1 knot +/-	73°F - Cloudy	1.5 Hr.

2.3 Inspection Procedures

Reason For Dive:
Water level at the time of inspection exceeded 3.5’ and the columns, web walls and footings were not visible from the water surface.

A Level I inspection was conducted on all accessible underwater structural elements to detect deterioration, deficiencies, or damages. A Level II inspection was conducted to further document any deficiencies detected by Level I inspections.

Pier Nos. 1 through 5 were inspected for signs of distress and deterioration including: movement, cracks, honeycombing, scaling, spalling, exposed rebar, collision damage, abrasion, and undermining.

Observations were made to verify as-built conditions were similar to plans and drawings provided by TDOT. Sketches of the substructure units were generated from the existing plans and the previous report. Vertical measurements were taken to verify the top of pier to water surface elevation.

Footings were inspected for scour, exposure, and deterioration. Soundings around each pier were measured and recorded at 10’-0” intervals from the faces and sides for a distance of 50’-0” as shown on the sounding sheet. The channel bottom material was determined and visible voids under or near pier footings were investigated.

Drift debris location and size was noted and photographed if found.

Dimensions of the pier footing and column shaft(s), as well as the distance from the top of pier to the top of footing(s) were determined. The water surface and the channel bed elevations were determined relative to the top of reference point. Stencils were used to paint the month and year of the inspection date onto or near Abutment No. 1 of the bridge.

2.4 General Conditions

This bridge in Washington County along SR353 (Bailey Bridge Road) over Nolichucky River was inspected by diving. Light scaling was noted on all piers, up to one-quarter (¼) inch depth from the channel bottom extending to eighteen (18) inches above the waterline. The streambed was sounded at ten (10) foot increments on all sides and is noted in Appendix B.

Pier No. 1:
A four (4) inch diameter popout with exposed rebar was observed on the south side of the downstream column. Light drift debris was observed on the upstream column. Light biological growth was noted with up to eighty (80) percent of surface coverage from the waterline to the channel bottom. The streambed material around Pier No. 1 consists of sand and silt, as well as rip-rap scattered around the upstream column. The footing was not exposed and no scour or undermining was found.

Pier No. 2:
Heavy drift debris was noted on the upstream column and south face of the pier, and extending from the upstream column across the south face of the web wall, consisting of large logs and additional small branches. The footing was exposed on the north side of the pier around the upstream column with no vertical exposure. No scour or undermining was noted. The streambed material around Pier No. 2 consists of sand and silt.

Pier No. 3:
Light drift debris was noted on the upstream column; a single twelve (12) foot log measuring five (5) inches in diameter was found. One minor spall approximately one (1) feet six (6) inches above the waterline on the south web wall was noted. Most of the footing was exposed on the north side of the pier and partially exposed on the south side of the pier. Up to ten (10) inches of vertical exposure was noted, but no undermining or scour was found. For approximate limits and locations of deficiencies, see Appendix C. The streambed material around Pier No. 3 consists of sand and silt.

Pier No. 4:
Light drift debris was observed at the upstream column consisting of a six (6) inch diameter log ten (10) feet in length. The footing was partially exposed in the middle of the web wall on the north side with no vertical exposure noted. No undermining or scour was noted. The streambed material around Pier No. 4 consists of sand and silt.

Pier No. 5:
Moderate drift debris was observed at the upstream column and wrapped around both the north and sides of the column, consisting of numerous large logs and small branches. The streambed material around Pier No. 5 is sand and silt. The footing was not exposed and no scour or undermining was noted.

3.1 Summary of Findings

All five (5) piers within the limits of the water at the time of the underwater inspection were in good to fair condition and no major deficiencies were noted. Drift debris and light scaling were typical. The footings were exposed on Pier Nos. 2, 3, and 4. Minor spalls were noted on Pier Nos. 1 and 3. No undermining or scour was noted.

The underwater substructure(s) inspected at the time of our site visit appeared to be in the following condition:

* Item 60 – Substructures: Suggested rating: NHI Code 5. The piers are in fair condition, drift debris, minor deterioration, and areas of footing exposure were found.

** Item 113 – Scour Critical: Suggested rating: NHI Code 4. Scour was not noted around any of the piers, however, several footings are exposed with up to ten (10) inches of vertical exposure and are susceptible to undermining and scour under the footings and into the piles.

*Denotes: NBI Condition Rating provided is only a recommendation. The actual condition rating for substructure (Item 60) is to be based on the entire substructure while this inspection and report focused on the underwater portions of the substructures.
**Denotes: NBI Condition Rating provided is only a recommendation and is based on field conditions. The actual condition rating for scour appraisal (Item 113) is to be made considering hydraulic, geotechnical, and structural features.

3.2 Recommendations

Pier No. 1, Pier No. 2, Pier No. 3, Pier No. 4, Pier No. 5:
Recommend removal of drift accumulation.

Pier No. 2, Pier No. 3, Pier No. 4:
Continue to monitor footing exposure for development of scour and undermining.

Appendix A: Photographs

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Photo 1: Upstream Elevation of Bridge

Photo 2: Downstream Elevation of Bridge

Photo 3: Looking Upstream from Bridge

Photo 4: Looking Downstream from Bridge

Photo 5: Pier No. 1 Looking Back

Photo 6: Pier No. 2 Looking Back At Drift Debris on Upstream Nose

Photo 7: Pier No. 3 Looking Back

Photo 8: Pier No. 4 Looking Forward

Photo 9: Pier No. 5 Looking Forward

Photo 10: Scaling at Waterline (Typ.)

Photo 11: Underwater Inspection Date on Abutment No. 1

Appendix B: Sounding Sketches

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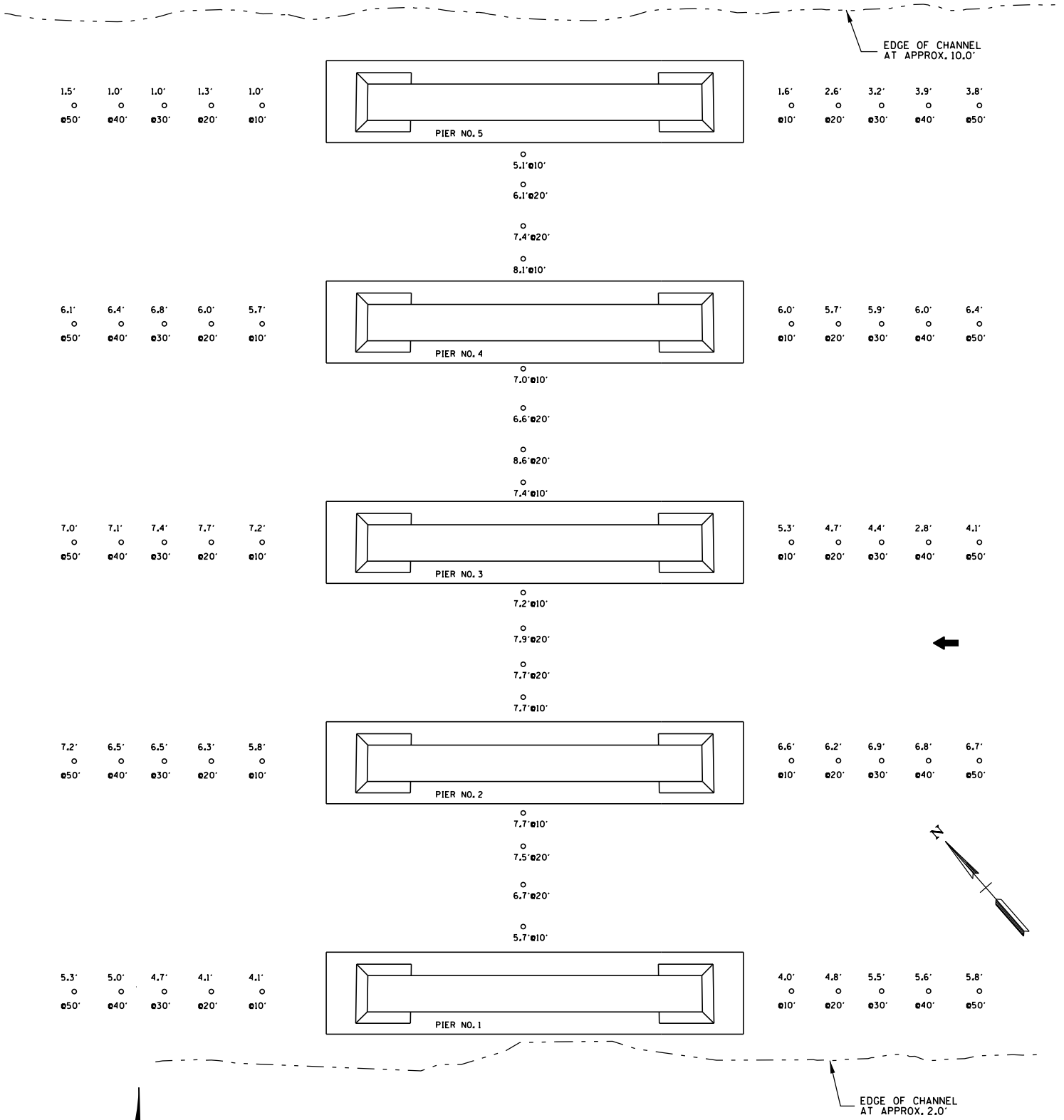

CHANNEL SOUNDING

LEGEND	
SYMBOL	ITEM
➡	DIRECTION OF FLOW

NOTE: ALL MEASUREMENTS SHOWN REFER TO DISTANCE FROM WATER SURFACE AT THE TIME OF THE INSPECTION UNLESS OTHERWISE NOTED.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE
90S23860001

SCALE: NONE

Appendix C: Substructure Sketches

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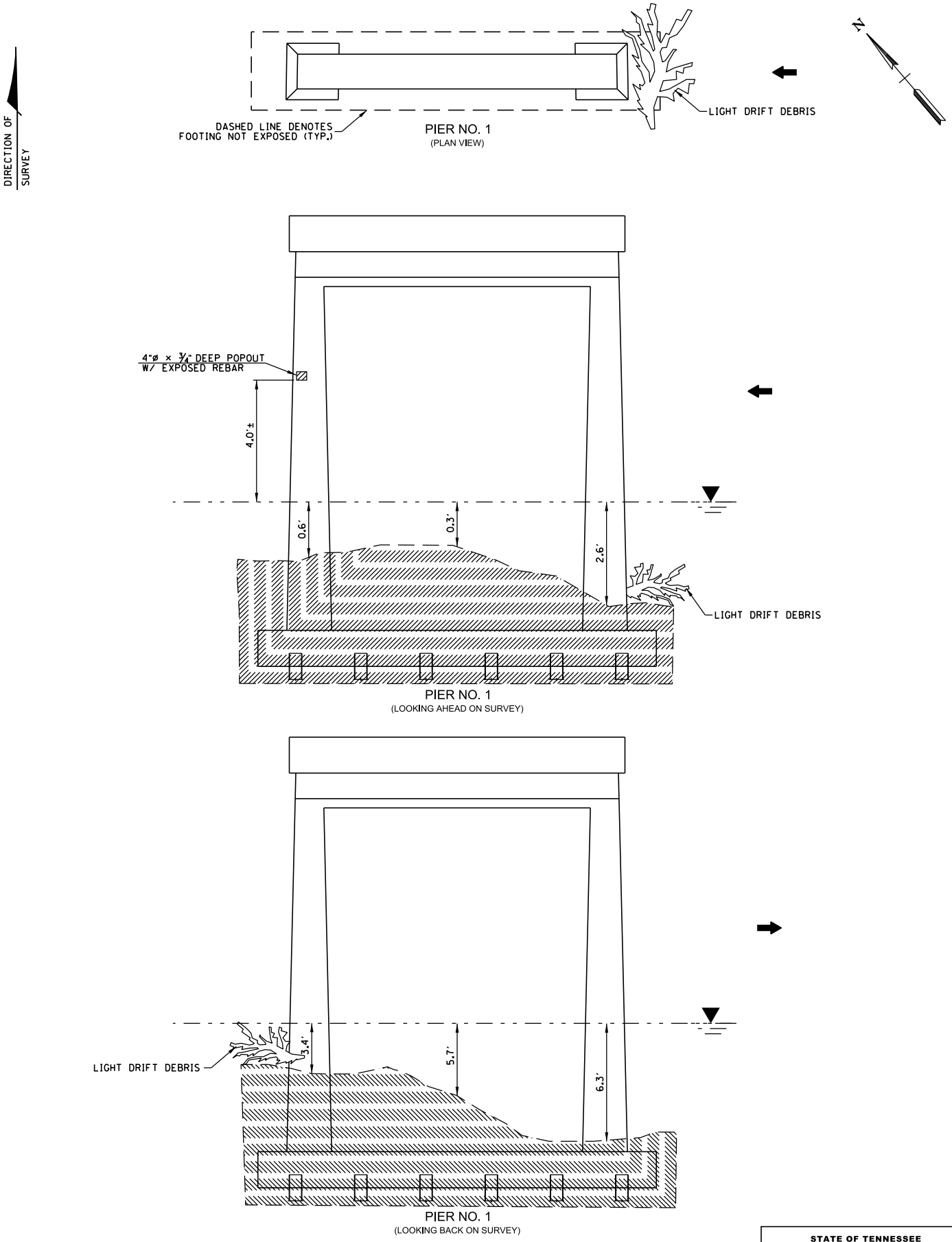
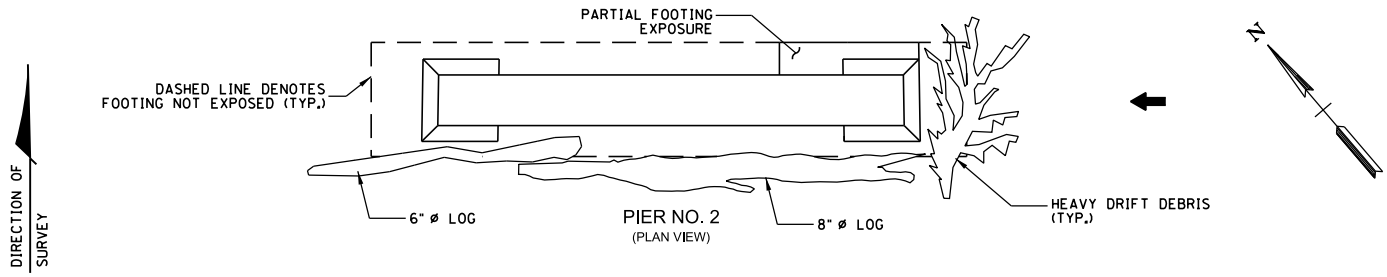


LEGEND	
SYMBOL	ITEM
	WATER SURFACE MARK AT TIME OF INSPECTION
	DIRECTION OF FLOW
	APPROX. BOTTOM OF CHANNEL

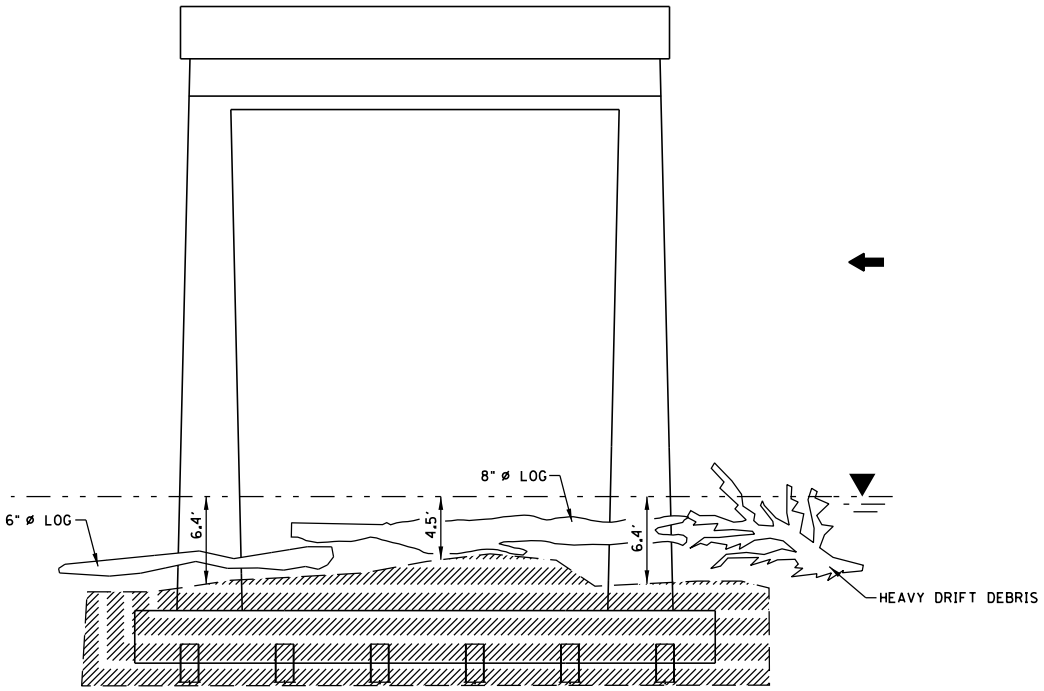
STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE 90S23860001

PIER NO. 1
SCALE: NONE



PIER NO. 2
(PLAN VIEW)



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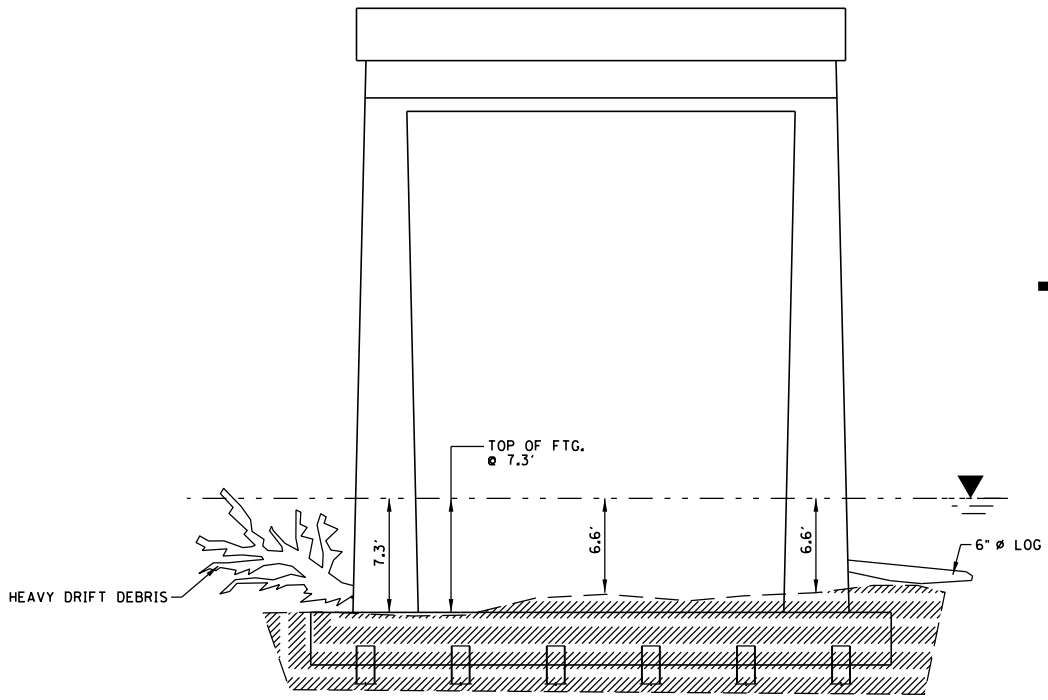
(LOOKING AHEAD ON SURVEY)



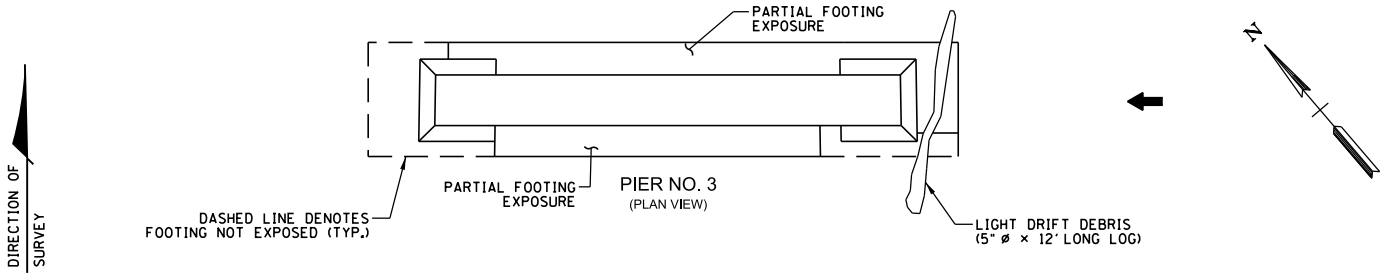
PIER NO. 2
(LOOKING BACK ON SURVEY)

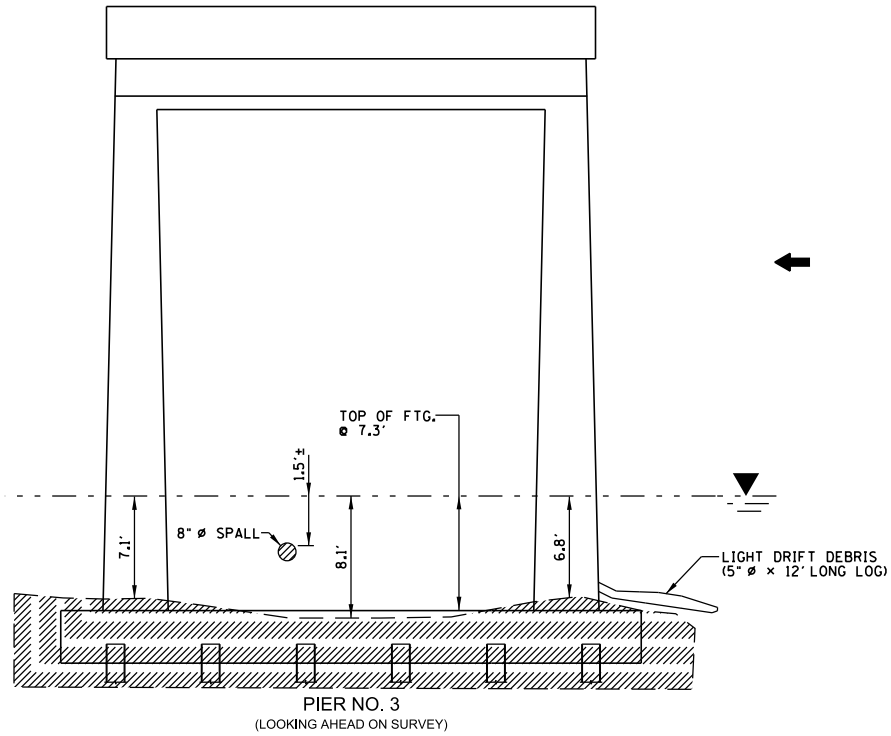
LEGEND	
SYMBOL	ITEM
	WATER SURFACE MARK AT TIME OF INSPECTION
	DIRECTION OF FLOW
	APPROX. BOTTOM OF CHANNEL

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE
90S23860001

PIER NO. 2
SCALE: NONE





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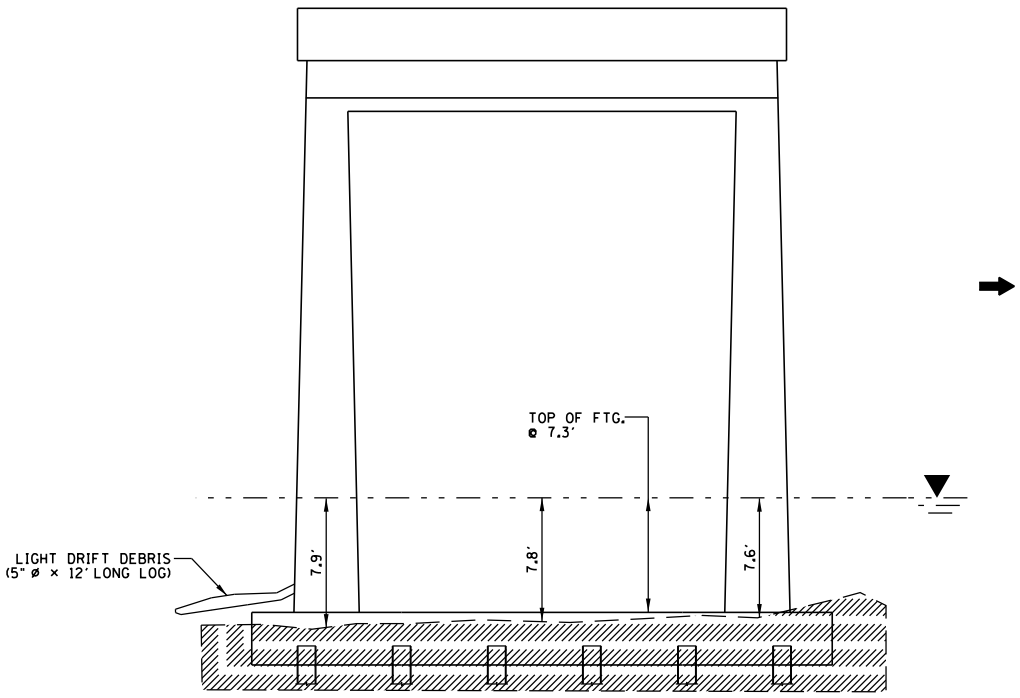


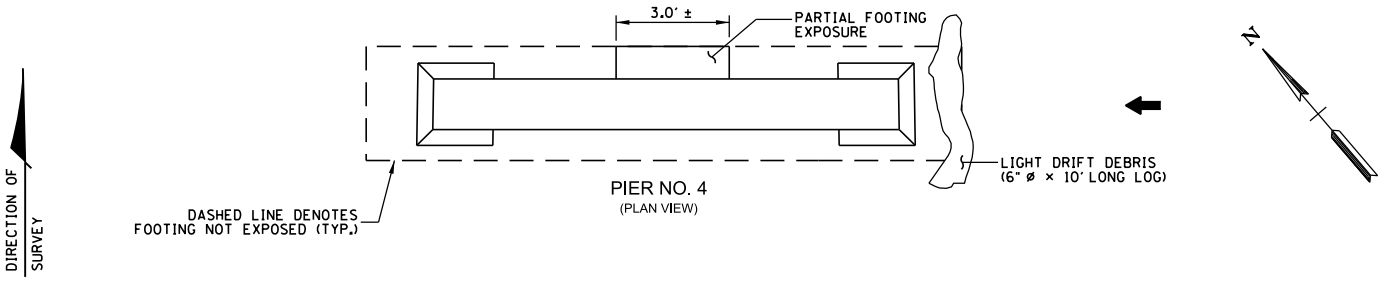
PIER NO. 3
(LOOKING BACK ON SURVEY)

LEGEND	
SYMBOL	ITEM
	WATER SURFACE MARK AT TIME OF INSPECTION
	DIRECTION OF FLOW
	APPROX. BOTTOM OF CHANNEL

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE
90S23860001

PIER NO. 3
SCALE: NONE



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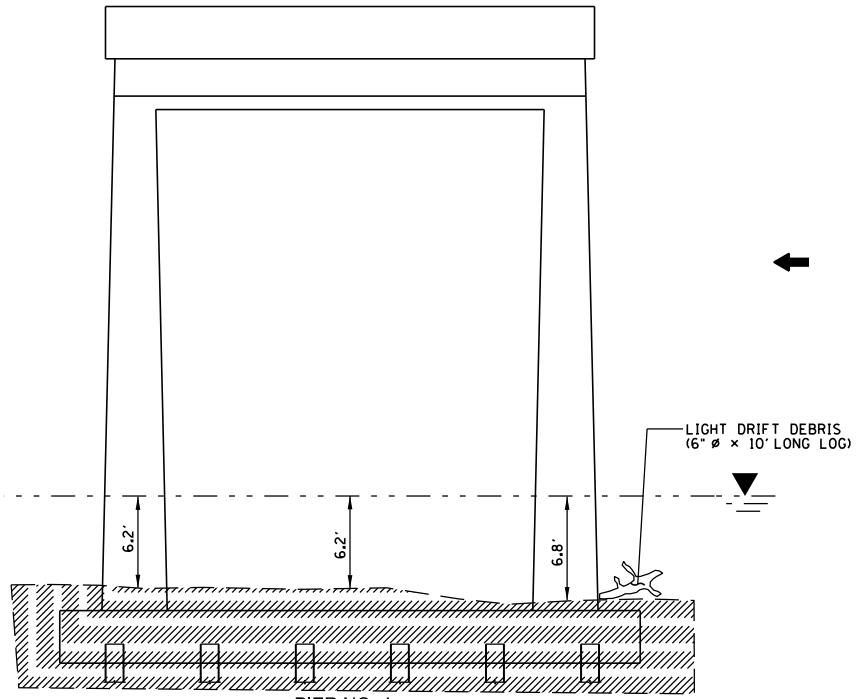
(PLAN VIEW)



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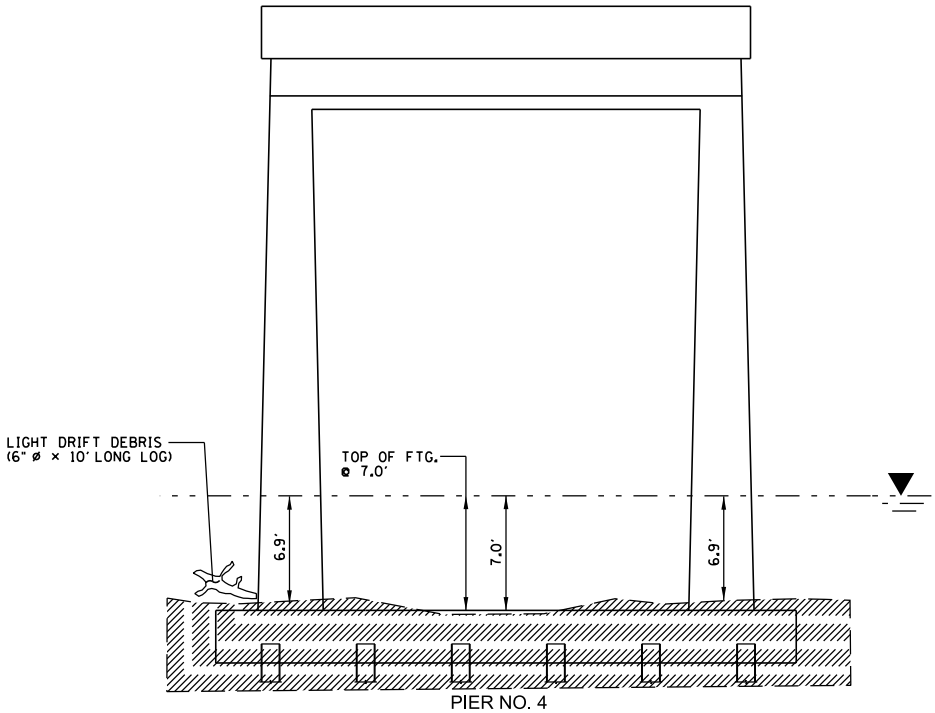


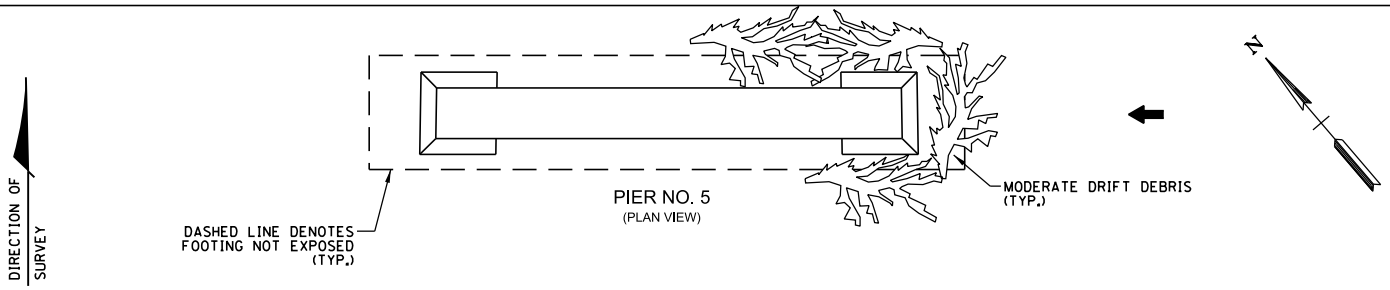
PIER NO. 4
(LOOKING BACK ON SURVEY)

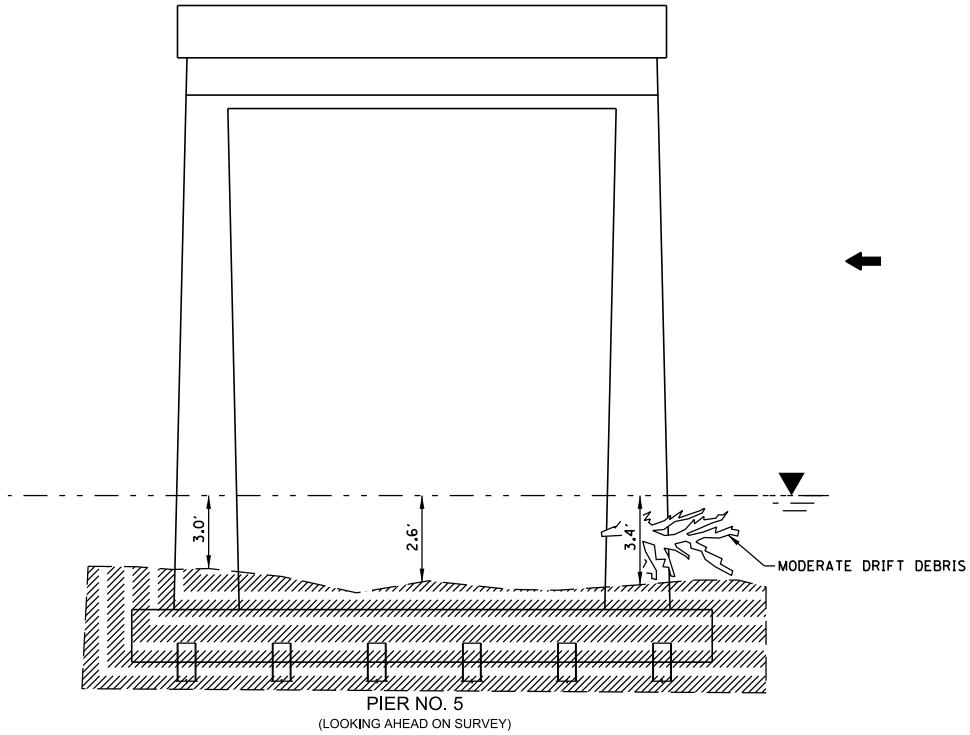
LEGEND	
SYMBOL	ITEM
	WATER SURFACE MARK AT TIME OF INSPECTION
	DIRECTION OF FLOW
	APPROX. BOTTOM OF CHANNEL

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE 90S23860001

PIER NO. 4
SCALE: NONE





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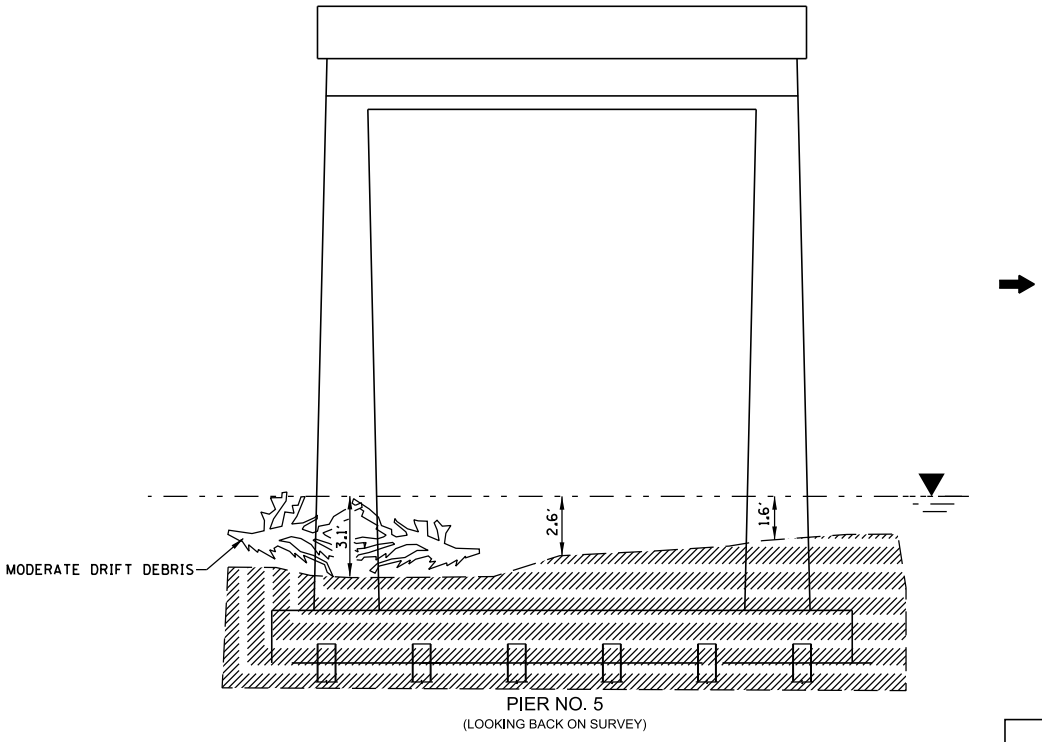

PIER NO. 5
(LOOKING BACK ON SURVEY)

LEGEND	
SYMBOL	ITEM
	WATER SURFACE MARK AT TIME OF INSPECTION
	DIRECTION OF FLOW
	APPROX. BOTTOM OF CHANNEL

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE
90S23860001

PIER NO. 5
SCALE: NONE

Appendix D: Inspection Team Qualifications

Gresham Smith

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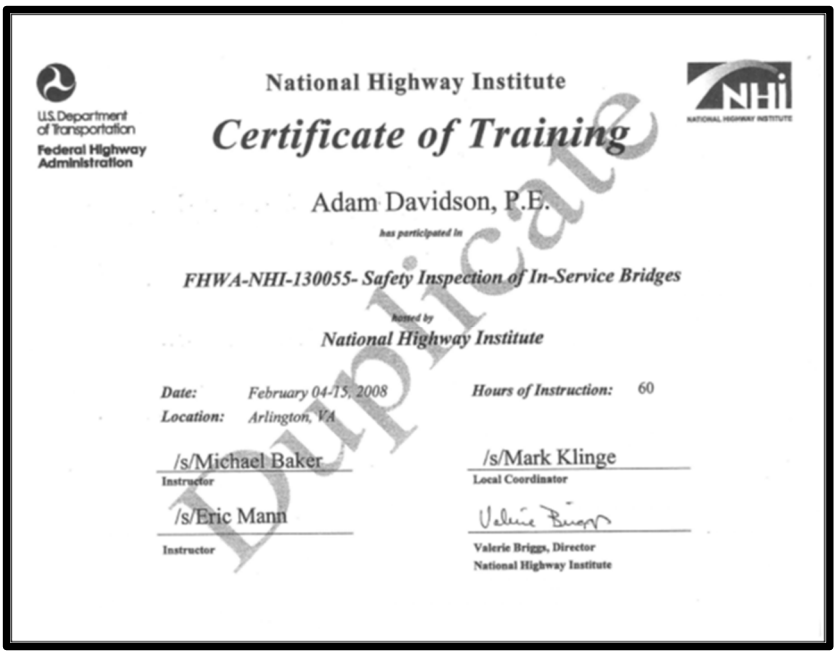


National Highway Institute

U.S. Department of Transportation
Federal Highway Administration

NHI NATIONAL HIGHWAY INSTITUTE

Certificate of Training

Adam Davidson, P.E.

has participated in

FHWA-NHI-130055- Safety Inspection of In-Service Bridges

hosted by

National Highway Institute

Date: February 04-15, 2008 *Hours of Instruction:* 60

Location: Arlington, VA

/s/Michael Baker
Instructor

/s/Mark Klinge
Local Coordinator

/s/Eric Mann
Instructor

Valerie Briggs, Director
National Highway Institute

Duplicate

Adam Davidson's NBIS Course Certification

National Highway Institute

U.S. Department of Transportation
Federal Highway Administration

NHI NATIONAL HIGHWAY INSTITUTE

Certificate of Training

ADAM S DAVIDSON

has participated in

FHWA-NHI-130053
Bridge Inspection Refresher Training

hosted by

Indiana Department of Transportation

Date: November 3-5, 2015 *Hours of Instruction:* 18

Location: Indianapolis, IN

Instructor

Local Coordinator

Instructor

Valerie Briggs, Director
National Highway Institute

Adam Davidson's NBIS Refresher Course Certification

Gresham Smith

Genuine Ingenuity

222 Second Avenue South / Suite 1400

Nashville, Tennessee 37201 / Phone 615.770.8100

U.S. Department of Transportation
Federal Highway Administration

National Highway Institute

Certificate of Training

William Dix

has participated in

FHWA-NHI-130091 Underwater Bridge Inspection

hosted by

Terracon Consultants, Inc.

Date: *June 05-08, 2018*
Location: *Rocky Hill, CT*

Hours of Instruction: 24

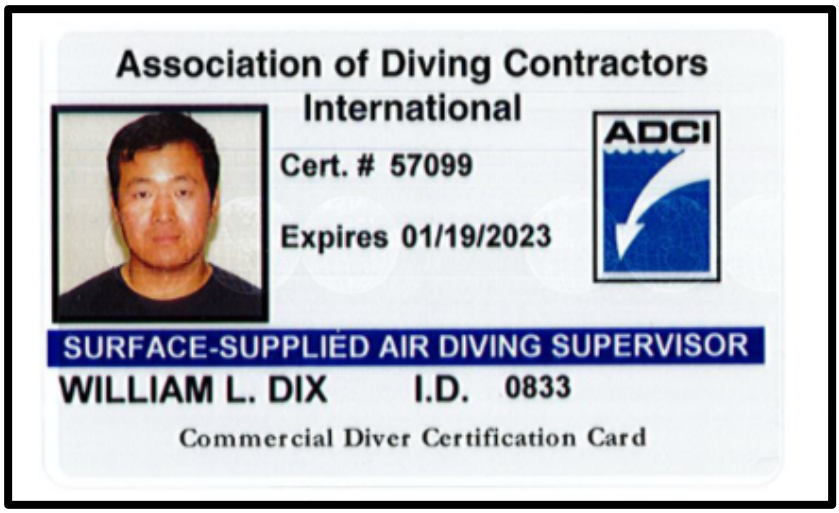
Instructor

Instructor

Local Coordinator

Valerie Briggs, Director
National Highway Institute

Will Dix's Underwater Bridge Inspection Course Certification



Will Dix's Dive Certification Card

U.S. Department of Transportation
Federal Highway Administration

National Highway Institute

Certificate of Training

NHI NATIONAL HIGHWAY INSTITUTE

Jacob Quinteros

has participated in

FHWA-NHI-130091 Underwater Bridge Inspection

hosted by

Collins Engineers, Inc.

Date: *December 10-13, 2018* ***Hours of Instruction:*** *24*

Location: *Newport News, VA*

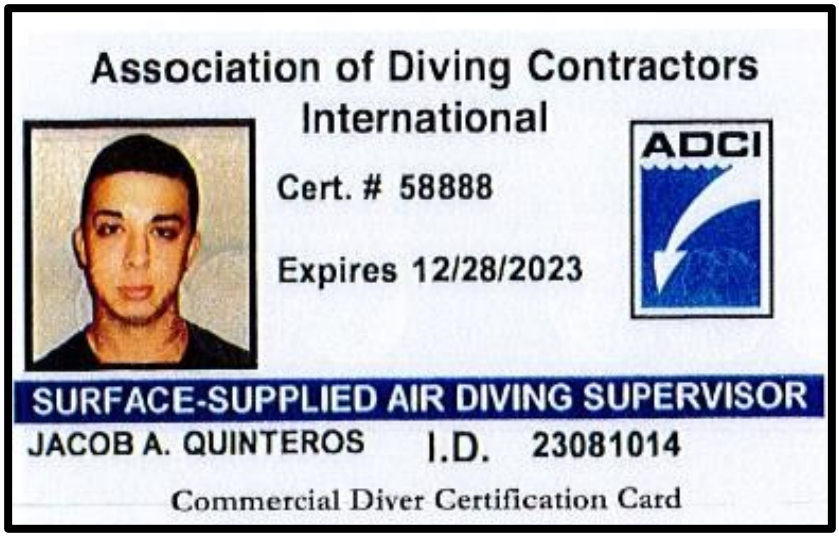
Instructor

Local Coordinator

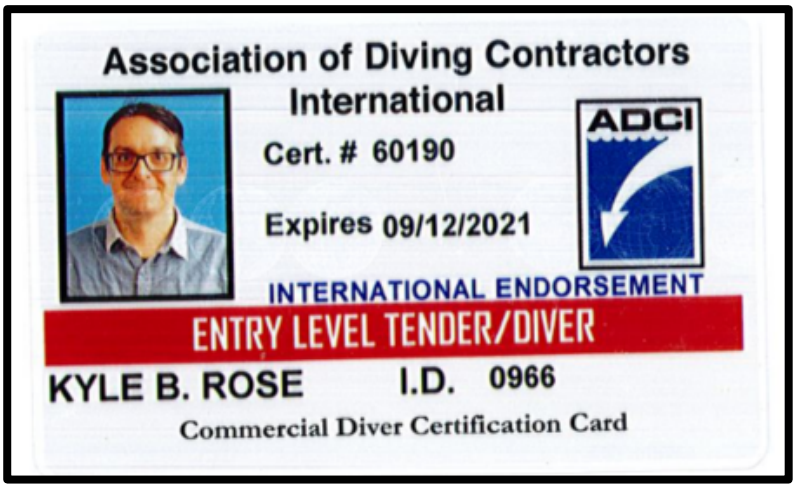
Instructor

Valerie Briggs, Director
National Highway Institute

Jacob Quinteros' Underwater Bridge Inspection Course Certification



Jacob Quinteros' Dive Certification Card



Kyle Rose's Dive Certification Card