

CSX Transportation Inc.
Underwater Inspection of Structures in the Northeast Region



2008 UNDERWATER BRIDGE INSPECTION REPORT

**Bridge No. CA 26.4 over Lee Hall Reservoir
Including Weir and Stone Embankment
Newport News, Virginia**

Huntington Division / Peninsula Subdivision


Inspection Date: July 9, 2008

Prepared By

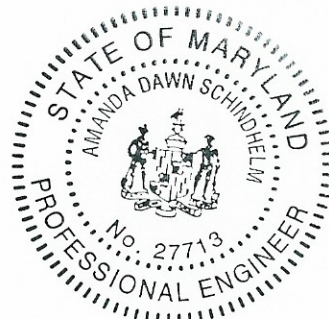


This is to certify that M&N Engineering and Diving Services, Inc. has completed the underwater inspection of the bridge and verified the accuracy of this report. No responsibility is accepted for the existence of latent defects.

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 27713, Expiration: 7/12/10.



Amanda Schindhelm, PE



8/18/08
Date

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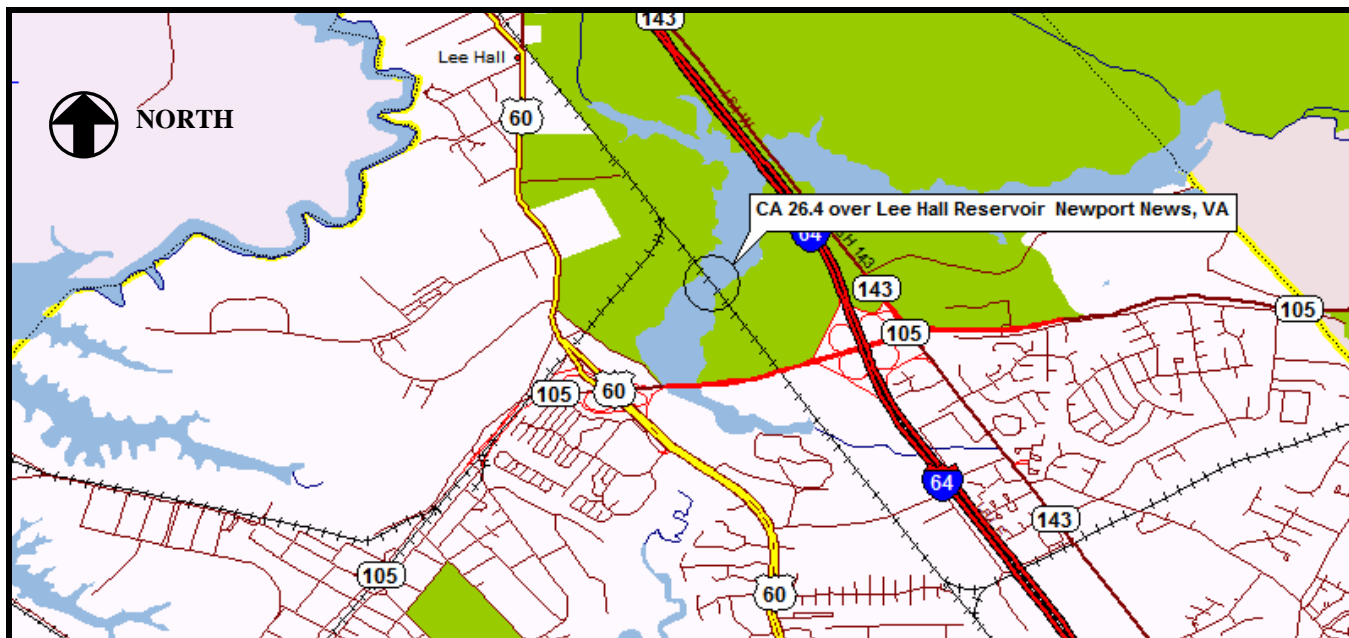
Appendix A – Bridge Plans and Field Sketches

Appendix B – CSX Reference Plans

UNDERWATER INSPECTION REPORT

BRIDGE NO. CA-26.4 OVER LEE HALL RESEVOIR

LOCATION MAP



DESCRIPTION

Bridge: Bridge No. CA 26.4 carries the CSX freight rail line over Lee Hall Reservoir in Newport News, Virginia and is part of the Huntington Division and the Peninsula Subdivision. The arch culvert is 58' long and spans a distance of 15'. The brick masonry and concrete culvert is constructed on a timber pile substructure. A concrete weir owned by Newport News Waterworks Commission is located at the upstream end of the culvert.

Waterway: The stream flows from North to South. The streambed consists of organic material deposited on mud and sand.

History and Posting: The original date of construction of the culvert is 1941, based on plans created by Newport News Waterworks Commission and provided by CSX. The structure is not currently posted for load or speed.

Orientation: The approaches and abutments are designated East and West. The headwalls and stone embankments are designated North and South.

INSPECTION PROCEDURE

Inspection Date: The underwater inspection was conducted on July 9, 2008.

Inspection Operations: The inspection team consisted of a 3-person dive crew experienced in underwater inspection and included a registered Professional Engineer for direction and supervision. All inspection team

members were employees of M&N Engineering and Diving Services, Inc. Diving operations were conducted from the shore using SCUBA.

Inspection Limits: The culvert was fully submerged at the time of the inspection. All portions of the culvert substructure, from the high water mark to the bottom of the channel, were visually inspected where possible. Tactile examinations were performed as required to obtain other structural data. There was zero underwater visibility during the inspection.

Inspection Access: The structure was accessed from the Northeast Channel Bank from a timber access walkway for the weir.

INSPECTION FINDINGS

Timber Culvert Substructure

The timber culvert substructure consists of 3x10 timber planking on 12x12 longitudinal and transverse timber caps supported by timber piles. The following summarizes the inspection findings. (Refer to the Field Sketches in Appendix A for further details.)

The timber culvert substructure is in satisfactory condition. The timber deck and accessible timber caps are in good condition with up to 3/8" ice pick penetration. The accessible 12x12 timber caps have minor to moderate wear with minor section loss. Water depths to the top of the timber deck at the upstream and downstream ends of the culvert are typically 13.6'. Water depths at the gaps between the timber deck members are up to 17.4'. Less than 5% of the 3x10 longitudinal timber deck planks remain within the culvert. There is a large pile of disconnected 3x10 timber planks immediately downstream of the structure. The vertical timber sheeting at the downstream end of the timber substructure is mostly missing. The downstream face of the timber substructure could not be accessed due to the large pile of timber deck planks. The timber deck at the upstream end of the culvert is flush with the invert of the weir structure.

Headwalls and Wingwalls

The culvert headwalls and wingwalls consist of brick masonry and concrete construction supported on a timber pile substructure. The following summarizes the inspection findings. (Refer to the Field Sketches in Appendix A for further details.)

The culvert headwalls and wingwalls are in satisfactory to critical condition. Both headwalls and the North Wingwalls exhibit honeycombing up to 2" deep with exposed large aggregate along the pour joints. The South Wingwalls exhibit honeycombing up to 4" deep on the inside face and up to 6" deep on the outside faces along the pour joints. The concrete along the pour joints can be removed by hand on both headwalls and all of the wingwalls. The South Wingwalls were built to overhang the brick masonry below. This, combined with the extensive section loss due to honeycombing, has compromised the stability of the wingwalls. There is a vertical crack up to 2 1/2" wide in the North Headwall extending from the top of the cap to the top of the voussoir stones. The crack is widest at the bottom. A 1' high band of missing mortar exists at the waterline throughout both headwalls and all of the wingwalls.

Culvert

The single cell culvert consists of a brick-lined arch on concrete abutments. The following summarizes the inspection findings. (Refer to the Field Sketches in Appendix A for further details.)

The culvert is in satisfactory condition. Approximately 5' from the South Headwall, there is a crack extending from the bottom of each abutment and around the full circumference of the arch. The crack is up to 2" wide at the top in the brick masonry and up to 1" wide at the bottom of both abutments. Approximately 20' from the North Headwall, there is a second crack extending from the bottom of each abutment and around the full circumference of the arch. The crack is up to 4" wide at the top in the brick masonry and up to 1" wide at the bottom of both abutments. Due to the width of this crack at the apex of the arch, there is a potential for loss of fill; however, no loss of fill was observed by the diver. The brick masonry is generally in good condition with very little loss of mortar. Less than 5% of the longitudinal 3x10 timber deck planks remain on the invert inside of the culvert.

Weir

The weir structure is constructed of concrete and steel sheetpile walls. The following summarizes the inspection findings. (Refer to the Field Sketches in Appendix A for further details.)

The weir is in satisfactory condition. The outside face of the steel sheetpile weir walls have up to 50% section loss throughout due to corrosion. The inside face of the steel sheetpile weir walls have a 1' high band of 60-70% section loss at the high waterline with some near perforations. There is up to 50% section loss throughout the remaining surfaces of the inside faces of the steel sheetpile walls. The downstream face of the concrete weir wall has a band of heavy scale with exposed large aggregate from 1' above the high waterline to the waterline. The concrete invert and apron of the weir structure were roughly poured.

Stone Embankment

The stone embankment is armored with riprap and extends to the shoreline to the east and west of the culvert. A slope failure has occurred approximately 90' to 200' to the west of the centerline of the culvert. Soundings were taken on 10' intervals from the west weir wall at 10', 15', 20' and 25' north of the North Headwall extending to 200' west of the weir. (Refer to the Sounding Data for further details.) Based on the soundings, the slope failure area below the waterline extends from approximately 100' to 200' west of the weir. The failure is centered at approximately 130' west of the weir. The sounding data was extended to 40' north of the North Headwall in this location in order to show the steep nature of the slope in this area.

Although it is possible that the slope failure was caused by potential loss of fill into the culvert, it is highly unlikely due to the depth of the fill versus the distance between the failure area and the culvert. Based on the steep slope of the embankment below the waterline as well as the material on the channel bottom, the slope failure is more likely due to sloughing action of the slope. Cross sections of the stone embankment have been created from the sounding data in the failure area and are provided on Sheet 5 in Appendix A. In comparison with the cross sections taken in 2003, it should be noted that the shoreline has changed, which indicates further movement of the stone embankment slope since the 2003 survey.

Channel

There is very little silt deposition on the invert of the culvert. The invert of the weir structure has up to several feet of deposition of silt and organic material. The channel bottom upstream of the weir structure and downstream of the culvert consists of silt and organic material, which is characteristic of the reservoir. A large pile of the 3x10 timber planks from the invert within the culvert are located in a pile immediately downstream of the culvert. Otherwise, there is no debris accumulation in the culvert or along the headwalls and wingwalls. Numerous vertical timber piles are located within the weir structure and protrude approximately 0.4' above the waterline. These piles are outside of the primary flow path (see Sounding Data Sheet 1 and Appendix A, Sheet 4). For further details of the channel profile, refer to the Sounding Data Sheets.

COMPARISON TO PREVIOUS INSPECTION REPORT

No previous underwater inspection report was available for comparison.

RECOMMENDATIONS

The following repairs are recommended for the underwater structural elements of Bridge CA 26.4. Consultation from an experienced marine contractor or M&N for appropriate and durable construction repairs is also recommended during any rehabilitation planning.

Description	Priority
1. Seal the cracks in the North Headwall and the culvert with epoxy.	Medium
2. Stabilize the South Wingwalls.	High



Photo 1
North (Upstream) Headwall



Photo 2
South (Downstream) Headwall



Photo 3
Looking North (Upstream)



Photo 4
Looking South (Downstream)



Photo 5
South Elevation of Weir (Looking Northwest)



Photo 6
North Elevation of Weir



Photo 7
Vertical Crack in North Headwall, Also Note Heavy Honeycombing



Photo 8
Voids in Northwest Wingwall at Masonry to Concrete Transition



Photo 9
Elevation of Southwest Wingwall, Note Heavy Honeycombing



Photo 10
South Elevation of Concrete Weir Wall (Note Scale Throughout)



Photo 11
West Elevation of East Steel Sheet Pile Weir Wall



Photo 12
Typical Pitting at Waterline in Steel Sheet Pile Weir Wall



Photo 13
Typical Pitting at Waterline in Steel Sheet Pile Weir Wall



Photo 14
Looking West into the Weir Showing Timber Piles Within Weir

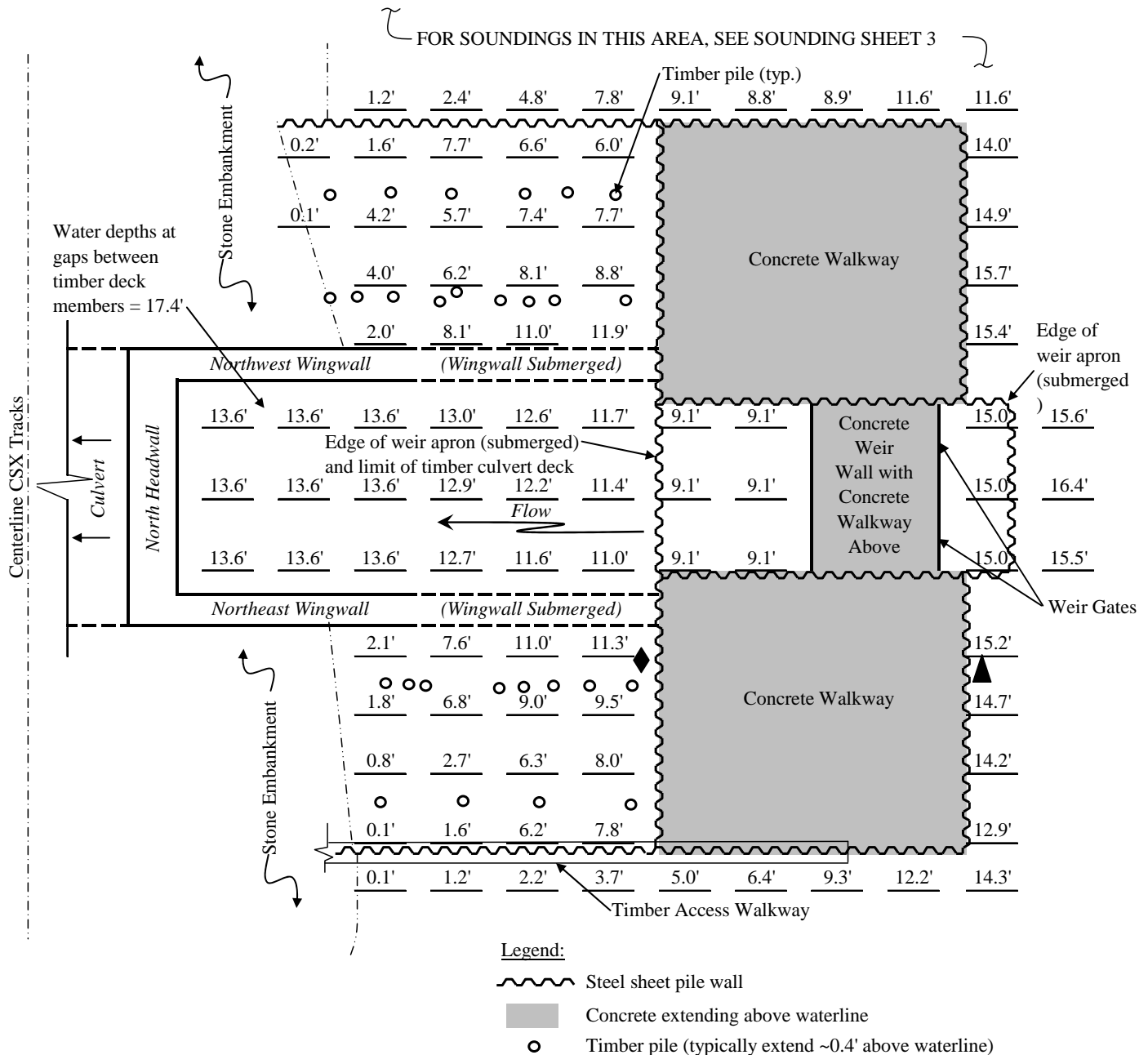
SOUNDING SHEET

Bridge No.: CA-26.4 over Lee Hall Reservoir
 Date of Insp.: July 9, 2008
 Inspectors: MDH, ADS, EO

Sheet No. : 1 of 3
 ▲ Datum: Top of sheet pile wall to WL = 1.9'
 ◆ Datum: Top of sheet pile wall to WL = 3.6'



Dist. from Headwall: Face 5' 10' 15' 20' 25' 30' 35' 40' 45' 50'



UPSTREAM END OF CULVERT AND WEIR

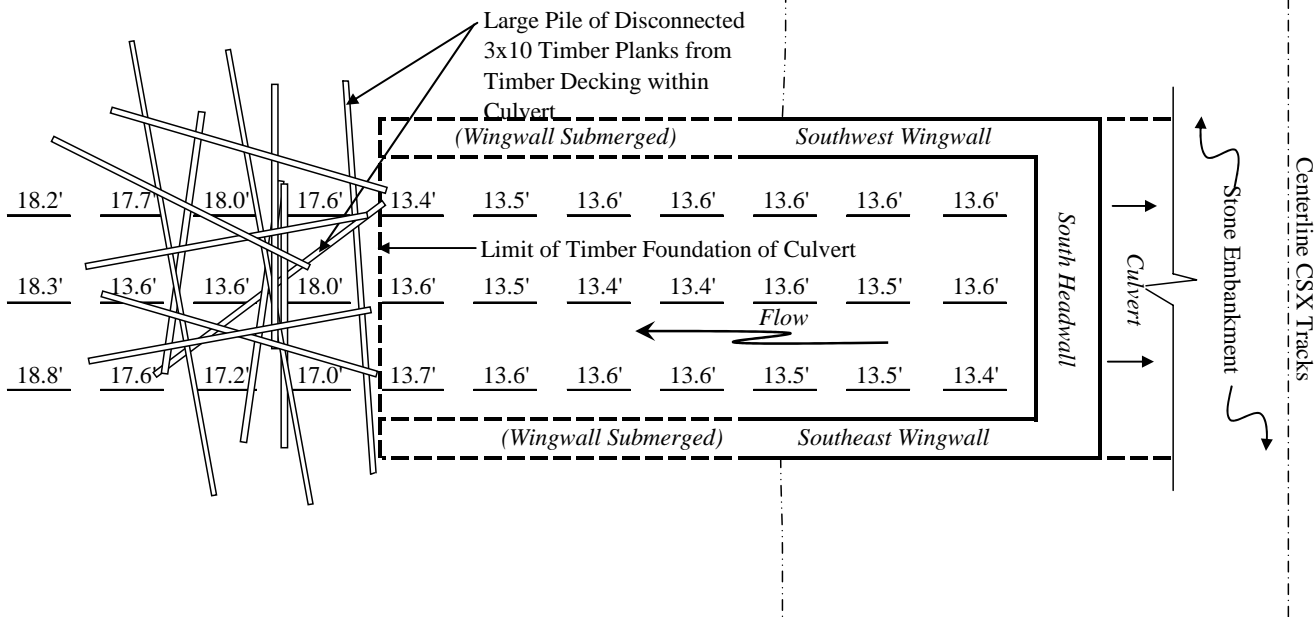
SOUNDING SHEET

Bridge No.: CA-26.4 over Lee Hall Reservoir
 Date of Insp.: July 9, 2008
 Inspectors: MDH, ADS, EO

Sheet No. : 2 of 3
 Datum: Refer to Sounding Sheet 1



50' 45' 40' 35' 30' 25' 20' 15' 10' 5' Face :Dist. from Headwall

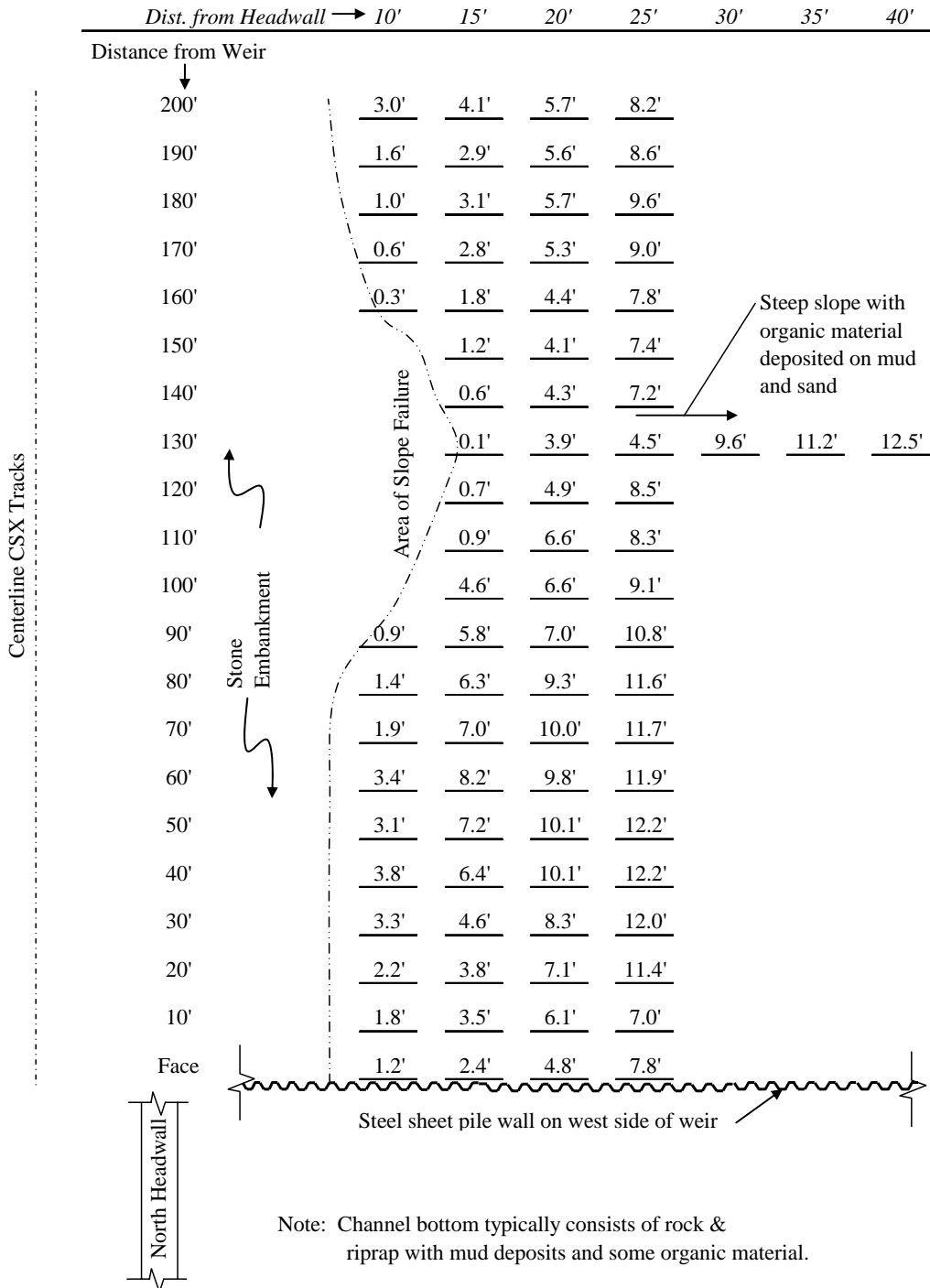
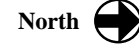


DOWNSTREAM END OF CULVERT

SOUNDING SHEET

Bridge No.: CA-26.4 over Lee Hall Reservoir
 Date of Insp.: July 9, 2008
 Inspectors: MDH, ADS, EO

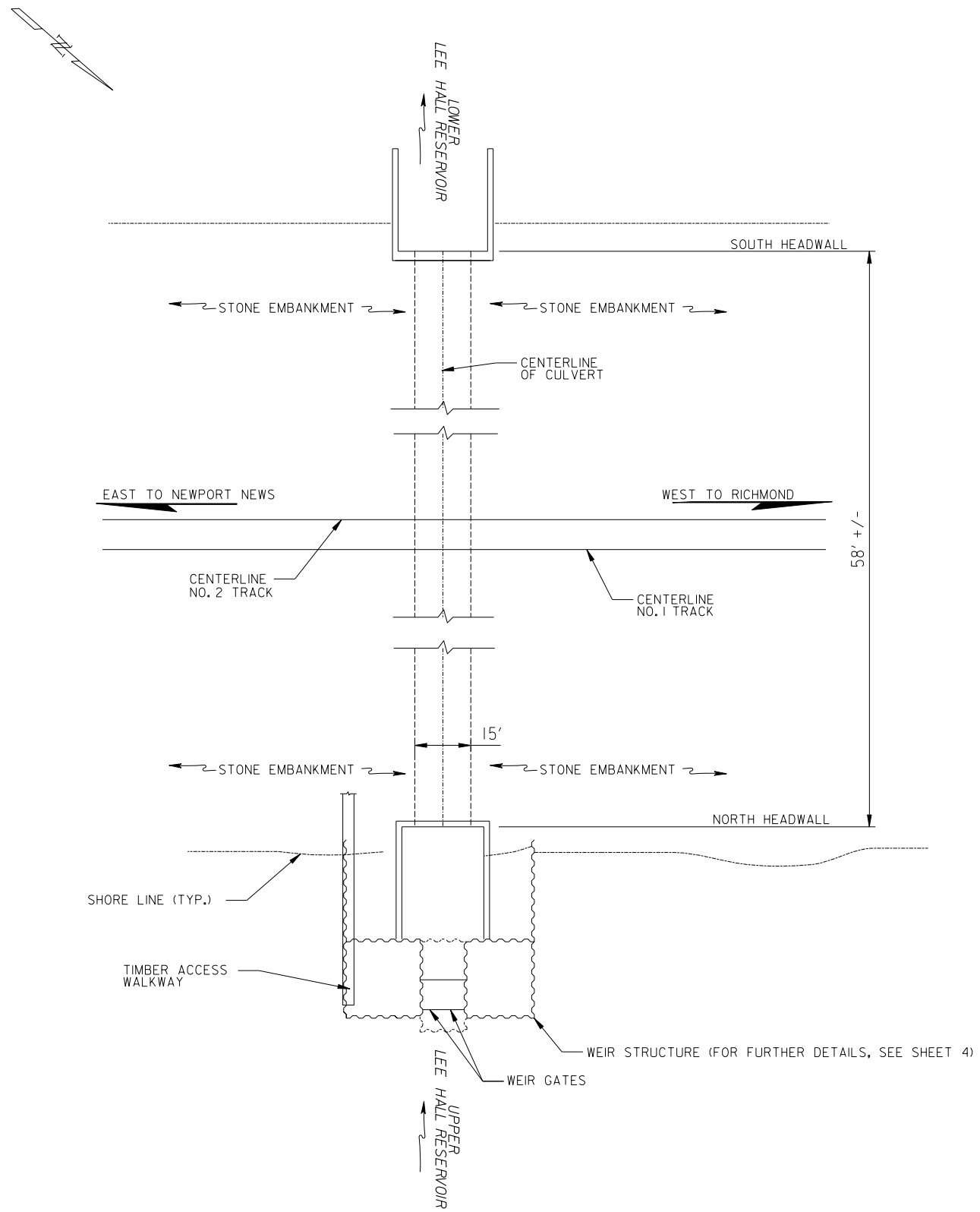
Sheet No. : 3 of 3
 Datum: Refer to Sounding Sheet 1



Note: Channel bottom typically consists of rock & riprap with mud deposits and some organic material.

WEST OF NORTH HEADWALL

Appendix A Bridge Plans & Field Sketches



GENERAL PLAN

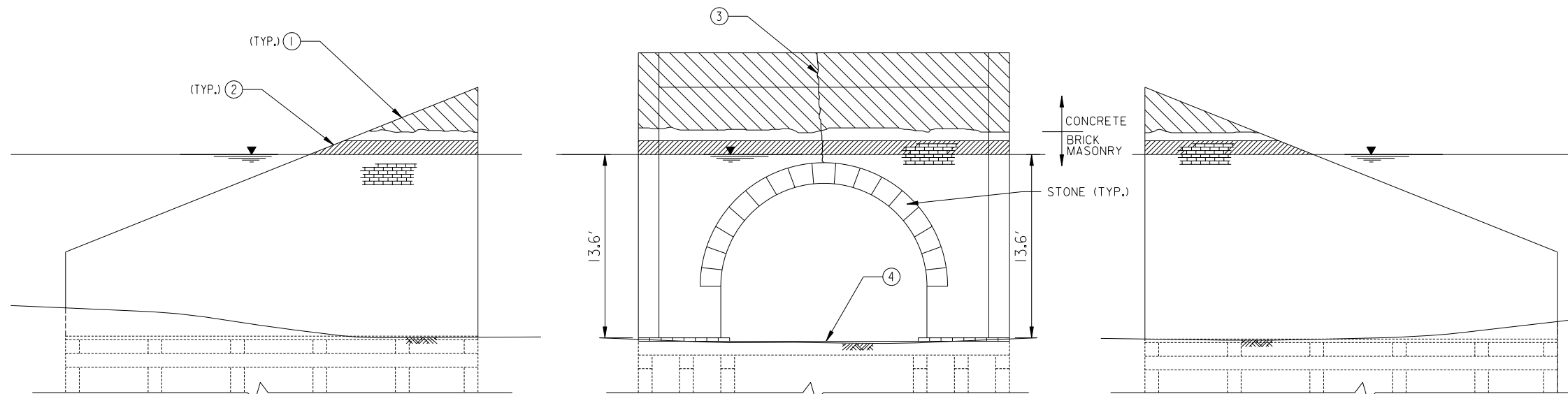
NOTES:

1. EXISTING DIMENSIONS, TYPES AND LOCATIONS OF FOUNDATIONS ARE BASED ON PLANS PROVIDED BY CSX.
2. THE ORIGINAL DATE OF CONSTRUCTION WAS 1941, BASED ON PLANS PROVIDED BY CSX.

2008 UNDERWATER BRIDGE INSPECTIONS

BRIDGE AT M.P. CA26.4 CROSSING LEE HALL RESERVOIR GENERAL PLAN			
NEWPORT NEWS		VIRGINIA	
DIVISION:	HUNTINGTON	SUBDIVISION:	PENINSULA
SCALE:	1" = 40'	VAL. SEC.	DRAWING NO.
INSP. DATE:	7/9/08	V-68	CA26.4-1
DESIGN:	ADS	22	
DRAWN:	ADS		
CHECKED:	NRZ		

Engineering and Diving Services
2318 BEL AIR ROAD, SUITE B-2 • FALLSTON, MD 21047
 CADD FILE: CA26.4DI.DGN



NORTHEAST WINGWALL

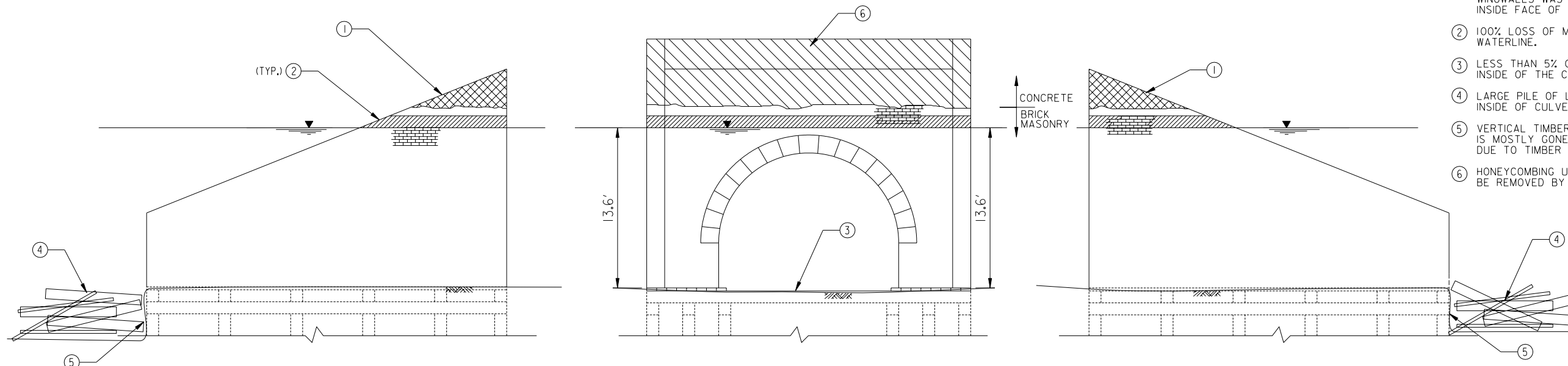
NORTH HEADWALL

NORTHWEST WINGWALL

INSPECTION FINDINGS - NORTH HEADWALL AND NORTH WINGWALLS

NORTH HEADWALL CONDITION RATING IS 4 - POOR.
 NORTH WINGWALLS CONDITION RATING IS 4 - POOR.

- ① HONEYCOMBING UP TO 2" DEEP ALONG POUR JOINTS. CONCRETE CAN BE REMOVED BY HAND.
- ② 100% LOSS OF MORTAR IN A 1' HIGH BAND AT THE HIGH WATERLINE.
- ③ VERTICAL CRACK UP TO 2 1/2" WIDE EXTENDING FROM TOP OF CAP TO TOP OF VOUSSOIR STONES. CRACK IS WIDEST AT BOTTOM.
- ④ LESS THAN 5% OF 3X10 LONGITUDINAL TIMBER PLANKS REMAIN INSIDE OF THE CULVERT.



SOUTHWEST WINGWALL

SOUTH HEADWALL

SOUTHEAST WINGWALL

INSPECTION FINDINGS - SOUTH HEADWALL AND SOUTH WINGWALLS

SOUTH HEADWALL CONDITION RATING IS 6 - SATISFACTORY.
 SOUTH WINGWALLS' CONDITION RATING IS 2 - CRITICAL.

- ① HONEYCOMBING UP TO 4" DEEP ON INSIDE FACE OF WINGWALLS AND UP TO 6" DEEP ON OUTSIDE FACE OF WINGWALLS ALONG POUR JOINTS. CONCRETE CAN BE REMOVED BY HAND. CONCRETE PORTION OF WINGWALLS WAS BUILT TO OVERHANG THE BRICK MASONRY ON THE INSIDE FACE OF THE WINGWALLS.
- ② 100% LOSS OF MORTAR IN A 1' HIGH BAND AT THE HIGH WATERLINE.
- ③ LESS THAN 5% OF 3X10 LONGITUDINAL TIMBER PLANKS REMAIN INSIDE OF THE CULVERT.
- ④ LARGE PILE OF LOOSE 3X10 TIMBER PLANKS FROM TIMBER DECKING INSIDE OF CULVERT.
- ⑤ VERTICAL TIMBER SHEETING AT SOUTH END OF TIMBER SUBSTRUCTURE IS MOSTLY GONE. TIMBER SUBSTRUCTURE COULD NOT BE ACCESSED DUE TO TIMBER DEBRIS.
- ⑥ HONEYCOMBING UP TO 2" DEEP ALONG POUR JOINTS. CONCRETE CAN BE REMOVED BY HAND.

2008 UNDERWATER BRIDGE INSPECTIONS

CSX ENGINEERING DEPARTMENT
 TRANSPORTATION

BRIDGE AT M.P. CA 26.4
 CROSSING LEE HALL RESERVOIR
HEADWALL & WINGWALL ELEVATIONS

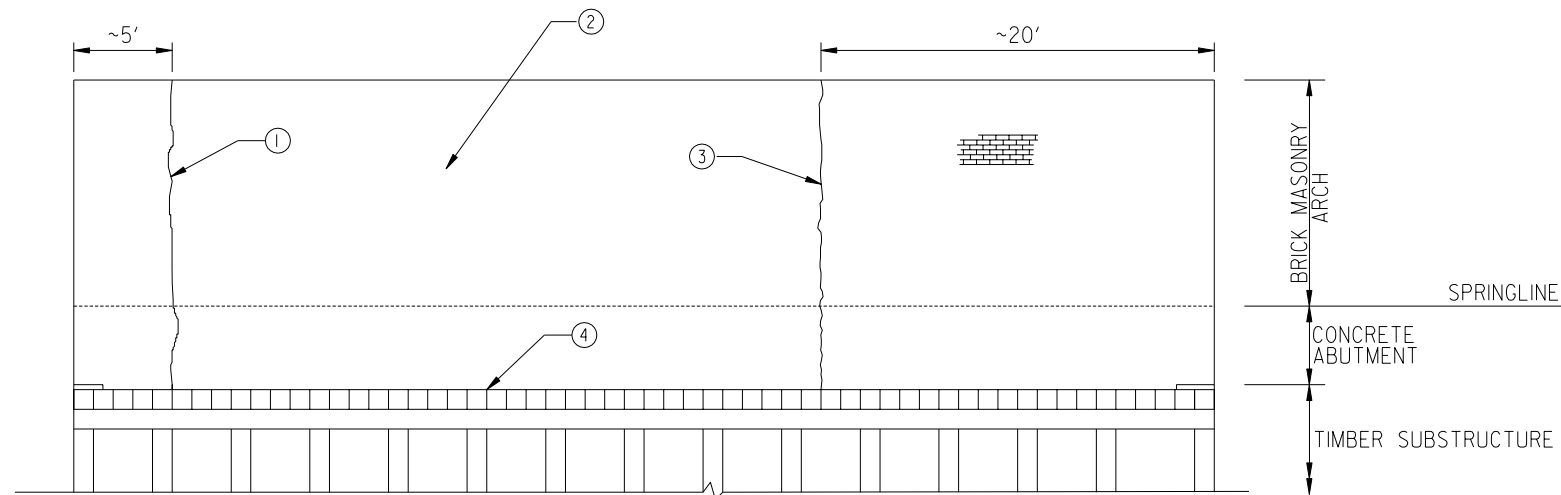
NEWPORT NEWS CITY VIRGINIA

DIVISION: HUNTINGTON SUBDIVISION: PENINSULA

M&N
 Engineering and Diving Services
 2316 BEL AIR ROAD, SUITE B-2 • FALLSTON, MD 21047

SCALE: 1" = 10'	VAL. SEC. V-68	DRAWING NO. CA26.4-2
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DRAWN: ADS		
CHECKED: NRZ		

CADD FILE: CA26.4D2.DGN

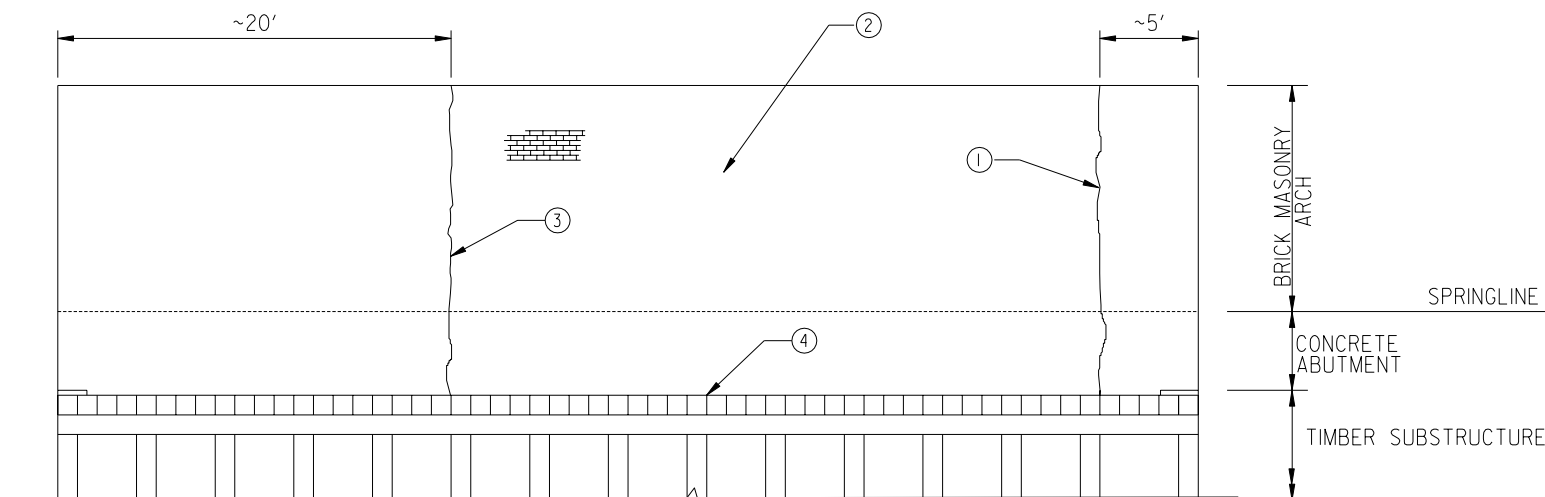


ELEVATION - WEST ABUTMENT
NOTE: CULVERT IS FULLY SUBMERGED

INSPECTION FINDINGS - WEST ABUTMENT

WEST ABUTMENT CONDITION RATING IS
6 - SATISFACTORY.

- ① FULL HEIGHT CRACK 2" WIDE AT TOP OF CULVERT ARCH IN THE BRICK MASONRY AND 1" WIDE AT THE BOTTOM OF BOTH ABUTMENTS.
- ② BRICK MASONRY INTRADOS IN GOOD CONDITION WITH VERY LITTLE LOSS OF MORTAR.
- ③ FULL HEIGHT CRACK 4" WIDE AT TOP OF CULVERT ARCH IN THE BRICK MASONRY AND 1" WIDE AT THE BOTTOM OF BOTH ABUTMENTS.
- ④ LESS THAN 5% OF THE LONGITUDINAL TIMBER 3X10 PLANKS REMAIN INSIDE OF THE CULVERT.



ELEVATION - EAST ABUTMENT
NOTE: CULVERT IS FULLY SUBMERGED

INSPECTION FINDINGS - EAST ABUTMENT

EAST ABUTMENT CONDITION RATING IS
6 - SATISFACTORY.

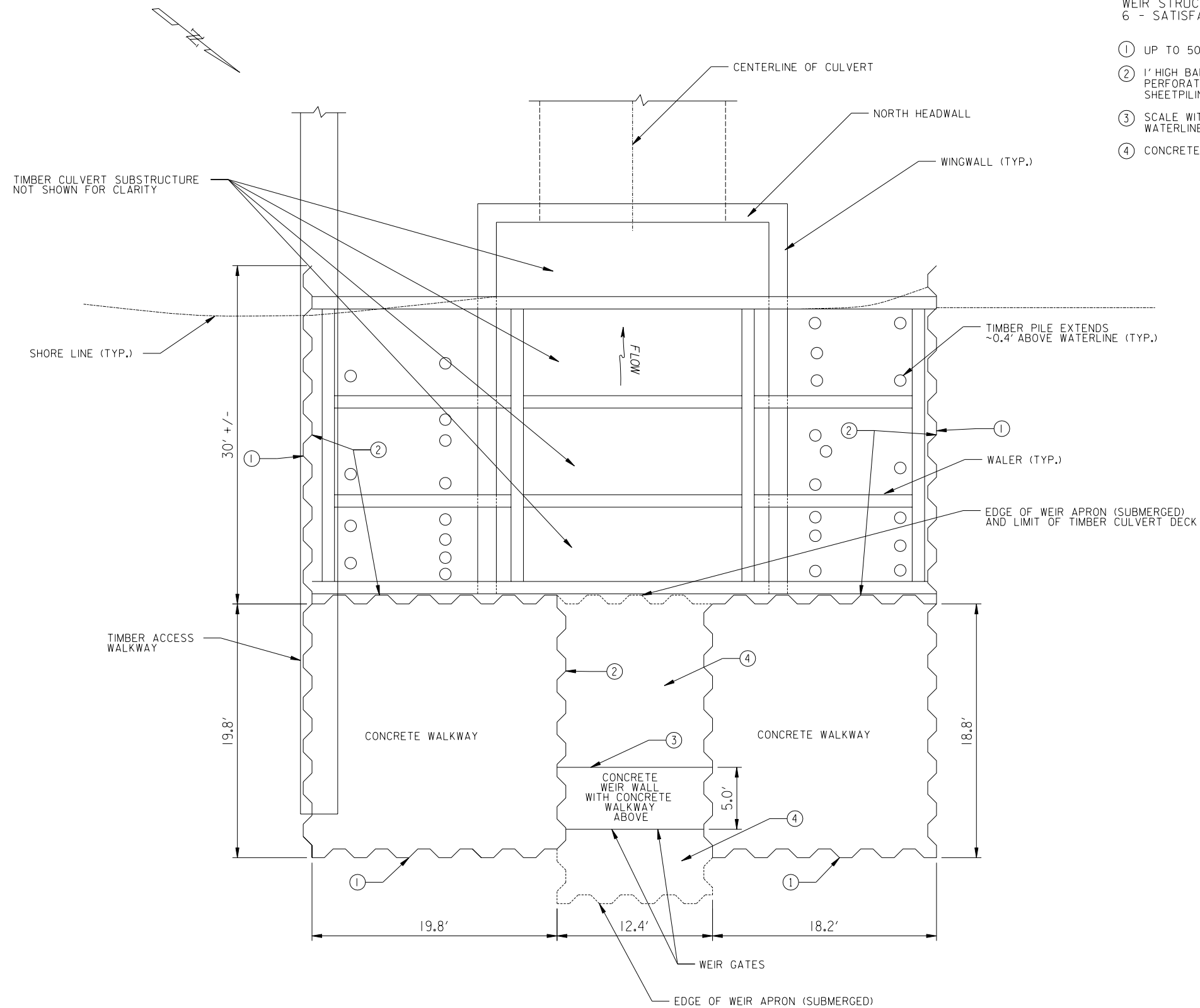
- ① FULL HEIGHT CRACK 2" WIDE AT TOP OF CULVERT ARCH IN THE BRICK MASONRY AND 1" WIDE AT THE BOTTOM OF BOTH ABUTMENTS.
- ② BRICK MASONRY INTRADOS IN GOOD CONDITION WITH VERY LITTLE LOSS OF MORTAR.
- ③ FULL HEIGHT CRACK 4" WIDE AT TOP OF CULVERT ARCH IN THE BRICK MASONRY AND 1" WIDE AT THE BOTTOM OF BOTH ABUTMENTS.
- ④ LESS THAN 5% OF THE LONGITUDINAL TIMBER 3X10 PLANKS REMAIN INSIDE OF THE CULVERT.

NOTE:
FOR HEADWALL AND WINGWALL ELEVATIONS, SEE SHEET 2.

2008 UNDERWATER BRIDGE INSPECTIONS

		BRIDGE AT M.P. CA 26.4 CROSSING LEE HALL RESERVOIR ABUTMENT ELEVATIONS	
		NEWPORT NEWS CITY NEWPORT NEWS VIRGINIA	
DIVISION:	HUNTINGTON	SUBDIVISION:	PENINSULA
SCALE:	1" = 10'	VAL. SEC.	DRAWING NO.
INSP. DATE:	7/9/08	V-68	CA26.4-3
DESIGN:	ADS	22	
DRAWN:	ADS		
CHECKED:	NRZ		

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CADD FILE: CA26.403.DGN



PLAN VIEW OF WEIR STRUCTURE

INSPECTION FINDINGS - WEIR STRUCTURE

WEIR STRUCTURE CONDITION RATING IS
6 - SATISFACTORY.

- ① UP TO 50% SECTION LOSS THROUGHOUT THE OUTSIDE FACE OF THE STEEL SHEETPIILING.
- ② 1' HIGH BAND OF 60-70% SECTION LOSS AT THE HIGH WATERLINE WITH SOME NEAR PERFORATIONS. UP TO 50% SECTION LOSS ELSEWHERE ON INSIDE FACE OF THE STEEL SHEETPIILING.
- ③ SCALE WITH EXPOSED LARGE AGGREGATE FROM 1' ABOVE THE HIGH WATERLINE TO THE WATERLINE ON THE WEIR WALL.
- ④ CONCRETE INVERT AND APRON OF WEIR ROUGHLY POURED.

2008 UNDERWATER BRIDGE INSPECTIONS

CSX ENGINEERING DEPARTMENT
TRANSPORTATION

BRIDGE AT M.P. CA26.4
CROSSING LEE HALL RESERVOIR

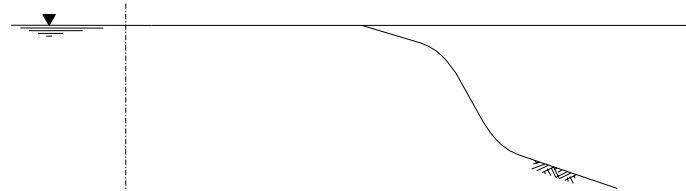
PLAN VIEW OF WEIR

NEWPORT NEWS

DIVISION: HUNTINGTON SUBDIVISION: PENINSULA

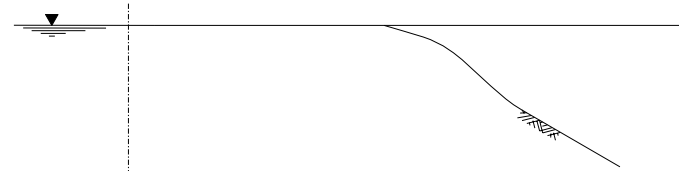
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Engineering and Diving Services
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CADD FILE: CA26.4D4.DGN



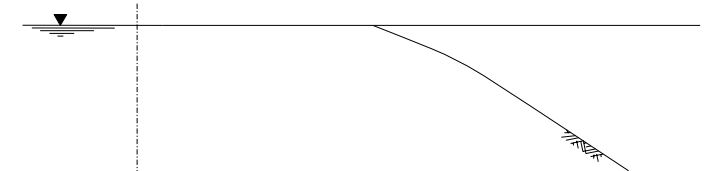
**1+91
LOOKING WEST**

0' 5' 10' 15' 20' 25'
NORTH HEADWALL



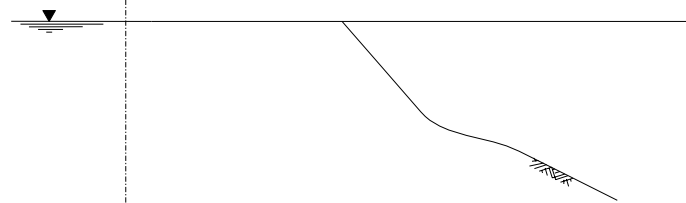
**1+60
LOOKING WEST**

0' 5' 10' 15' 20' 25'
NORTH HEADWALL



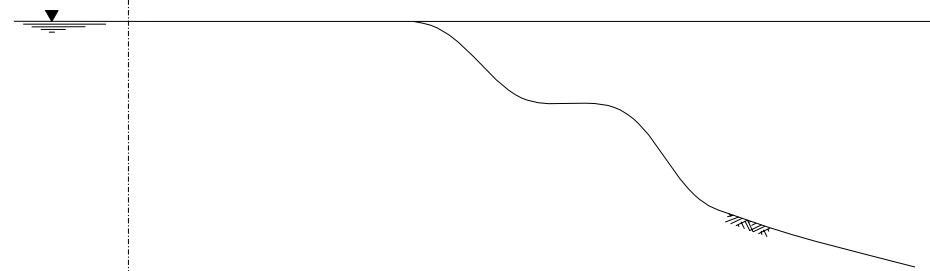
**1+50
LOOKING WEST**

0' 5' 10' 15' 20' 25'
NORTH HEADWALL



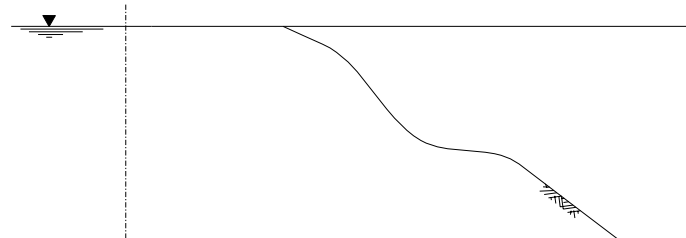
**2+00
LOOKING WEST**

0' 5' 10' 15' 20' 25'
NORTH HEADWALL



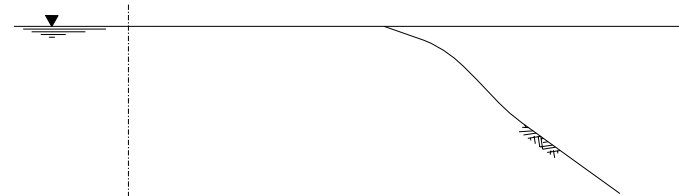
**1+70
LOOKING WEST**

0' 5' 10' 15' 20' 25'
NORTH HEADWALL



**2+10
LOOKING WEST**

0' 5' 10' 15' 20' 25'
NORTH HEADWALL



**1+81
LOOKING WEST**

0' 5' 10' 15' 20' 25'
NORTH HEADWALL

NOTES:

1. SECTIONS CHOSEN TO MATCH THOSE ON PLANS PROVIDED BY CSX DATED 7/24/03.
2. IT IS ASSUMED THAT STATION 3+00 IS LOCATED AT THE WEST WEIR WALL.
3. SECTIONS PROGRESS TO WEST IN DECREASING SURVEY STATIONS.
4. LOCATION OF SHORELINE HAS CHANGED SINCE THE 2003 SURVEY.

2008 UNDERWATER BRIDGE INSPECTIONS

CSX ENGINEERING DEPARTMENT TRANSPORTATION	
BRIDGE AT M.P. CA26.4 CROSSING LEE HALL RESERVOIR CHANNEL CROSS SECTIONS	
NEWPORT NEWS VIRGINIA	
DIVISION: HUNTINGTON	SUBDIVISION: PENINSULA
SCALE: 1" = 10'	VAL. SEC. V-68
INSP. DATE: 7/9/08	DRAWING NO. CA26.4-5
DESIGN: ADS	
DRAWN: ADS	
CHECKED: NRZ	

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CADD FILE: CA26.4D5.DGN

Appendix B CSX Reference Plans