
VDOT
Virginia Department of Transportation

I-95 AT NEABSCO CREEK – THE IMPORTANCE OF A GEOTECHNICAL INVESTIGATION

Southeastern Transportation Geotechincal Engineering Conference

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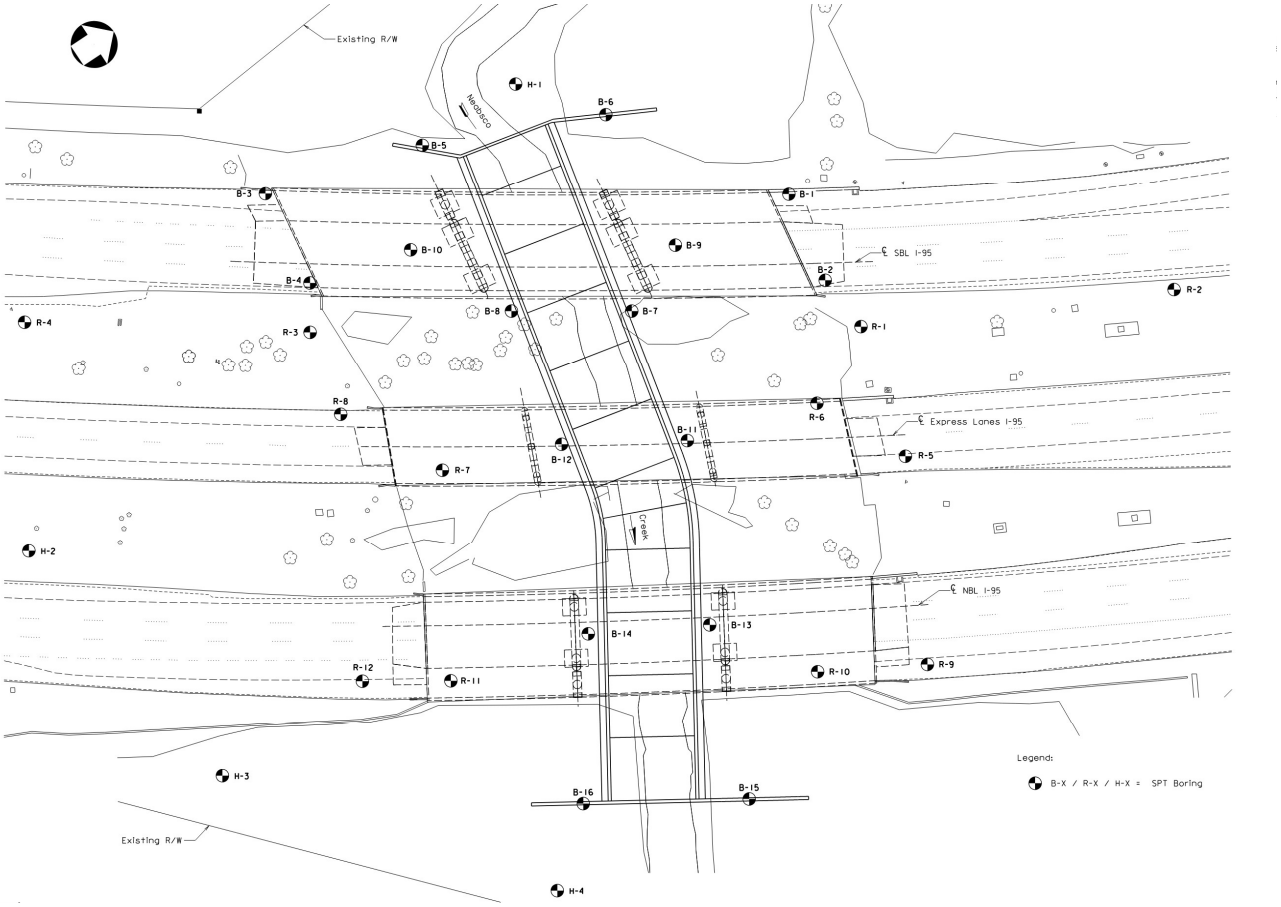
Project Location

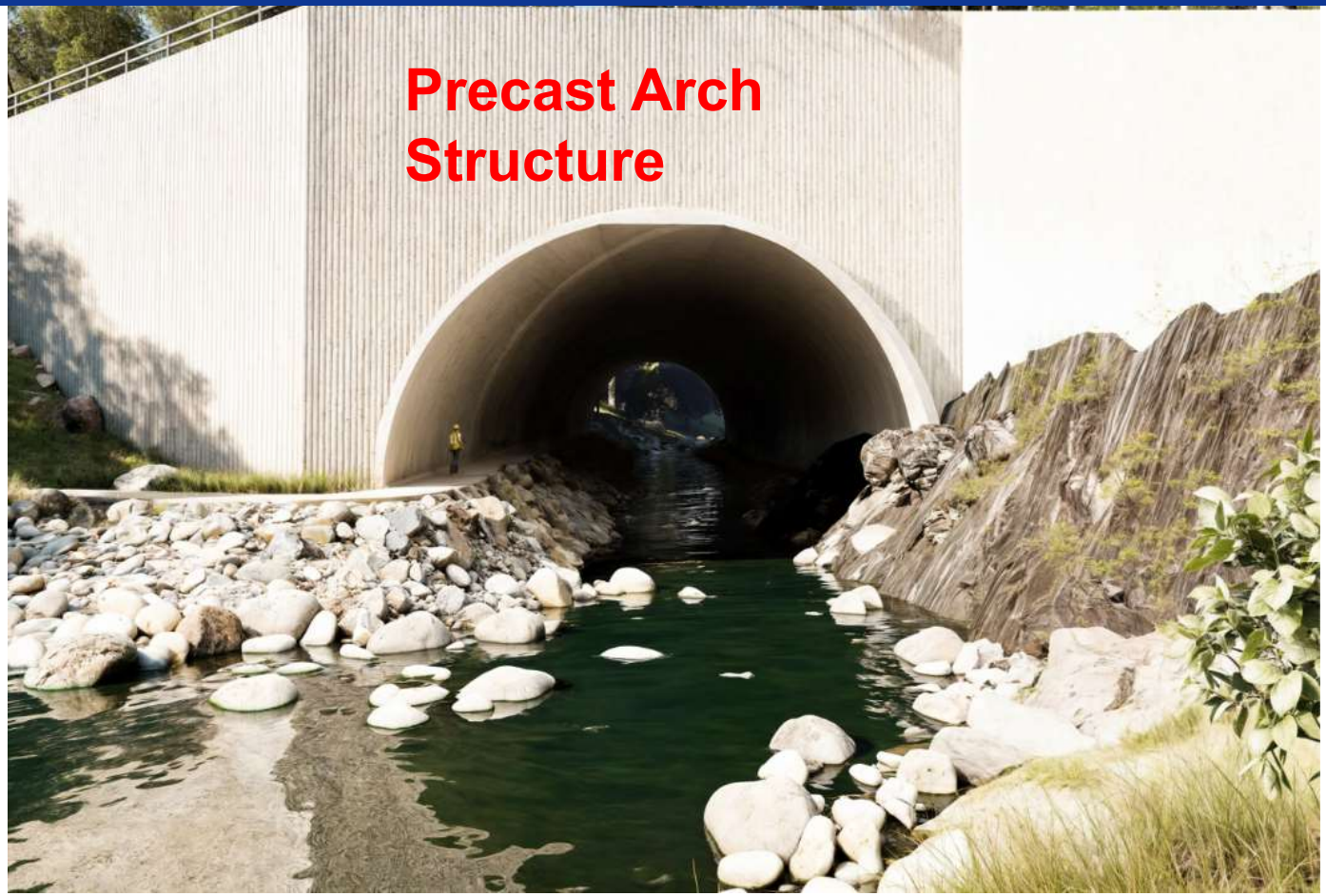
Background

- I-95 SB and NB Bridges completed in 1963
- Deck problems; multiple repairs
- I-95 HOV Bridge completed in 1996
- Phased replacement with open-bottom arch
- Easier for MOT and future maintenance
- Biggest arch structure in Virginia!

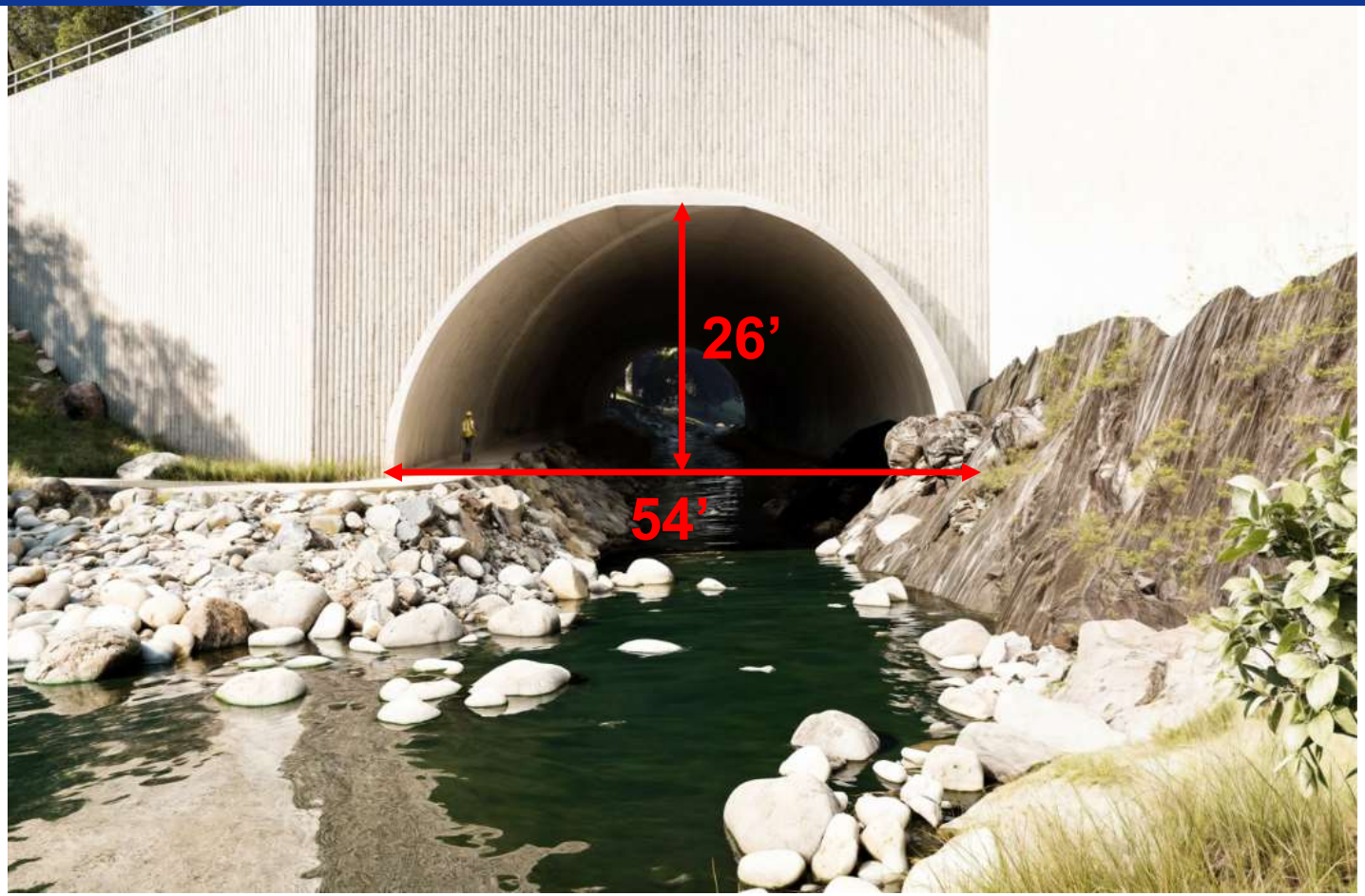
Proposed Precast Arch



Proposed Precast Arch



Proposed Precast Arch



Geology


Site
55
60
Ocs
SOq
Och
Ty
Kp
Qtlp
Qal
Ocg
Qsh
Qcc
Qts
Marumsco Woods
Fairfield Estates
SOq
Quantico Formation (Silurian and Ordovician)—Slate, gray to black, commonly very carbonaceous and pyritic, locally contains layers of graywacke, which in places are graded. Locally, quartzite forms thin discontinuous lenses at the base of the Quantico Formation. Most of these quartzitic lenses are quartz or feldspathic meta-arenite and metawacke. Horton and others (2010) reported a SHRIMP U-Pb zircon age of 448±4 Ma for a metavolcanic layer near the base of the Quantico Formation. U-Pb ages of detrital zircons from a stratigraphically higher quartzite include some that are as old as 440 Ma to as young as 427 Ma (Holm-Denoma and others, 2016)

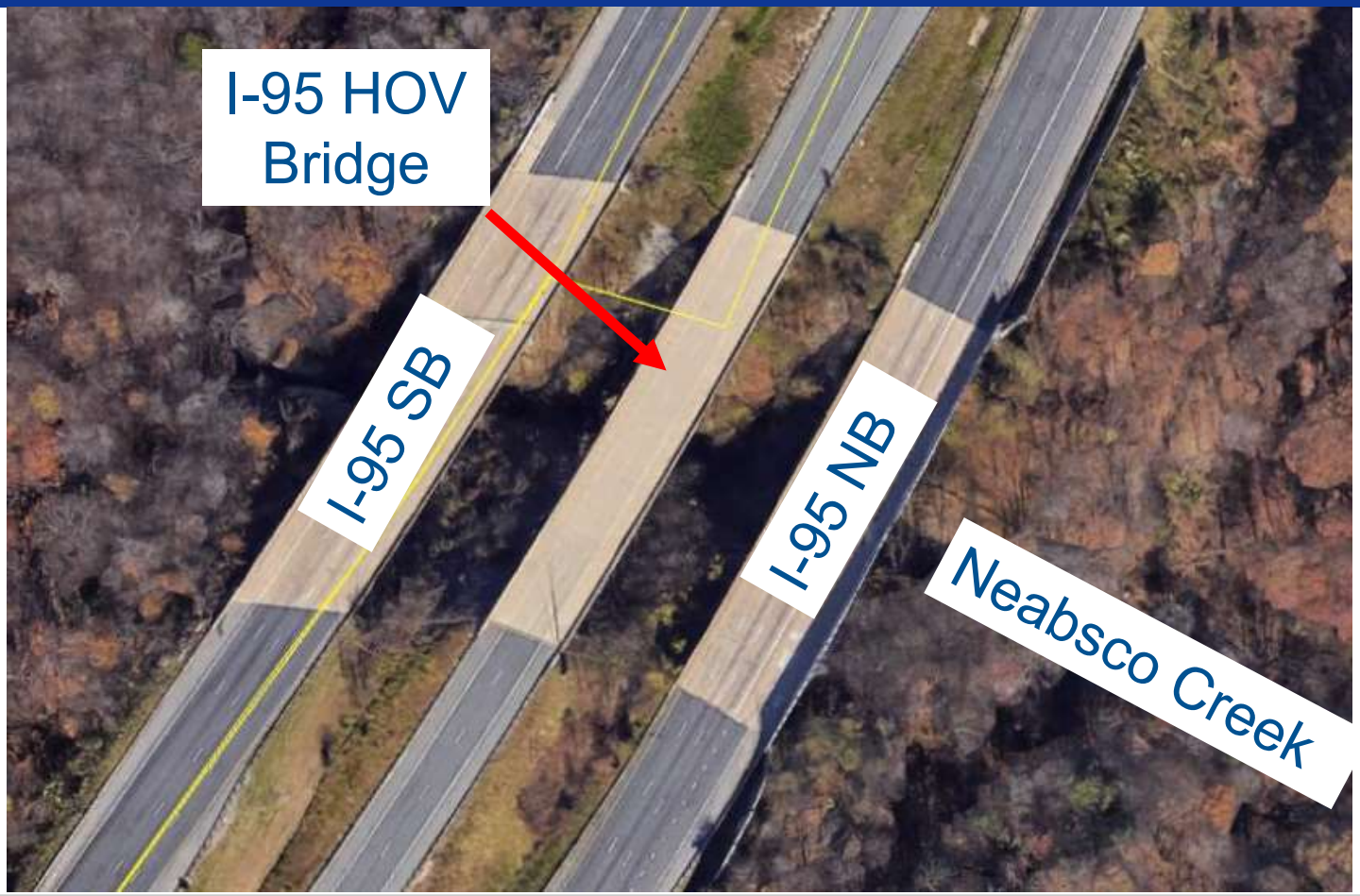
Geotechnical Challenges

- Steep slopes down to Neabsco Creek
- Bridges approx. 70’ to 80’ above creek
- Graphitic slate is highly variable and low strength
- Quartz veins hard on core bits
- Pyrite inclusions (chemical concerns)
- Difficult to access boring locations due to exposed rock
- Not allowed to use bridge deck for crane (poor condition)

Background – Historical Problems

- Slope failure during construction of I-95 HOV bridge
- Bridge was ready for opening to traffic
- Geotechnical investigation
- Steep/tall slope with graphitic soil fill over soft clay fill
- South abutment demolished and reconstructed
- Slope benched with geogrid/open graded stone
- Capped with low density cementitious fill (LDCF)
- First application of LDCF in Virginia

Project Location

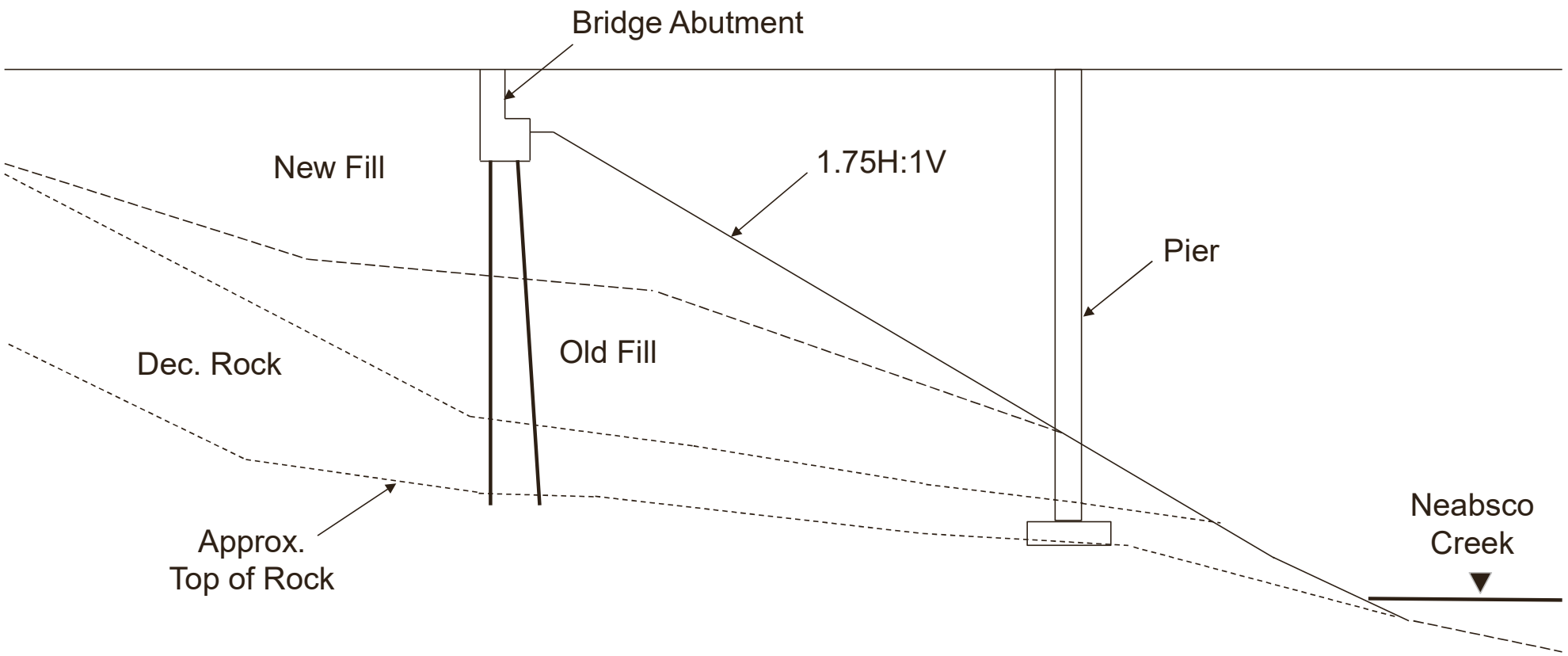


Slope Failure During Construction

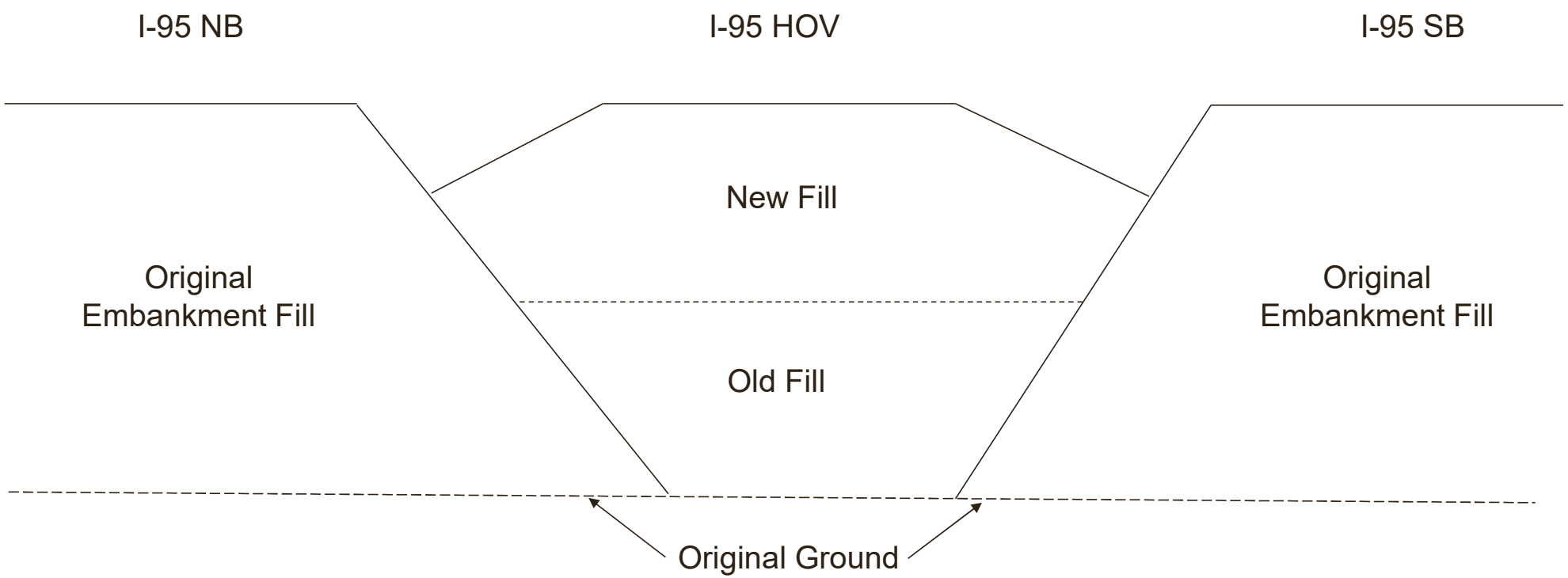
Geotechnical Investigation

Drilling Through Bridge Deck

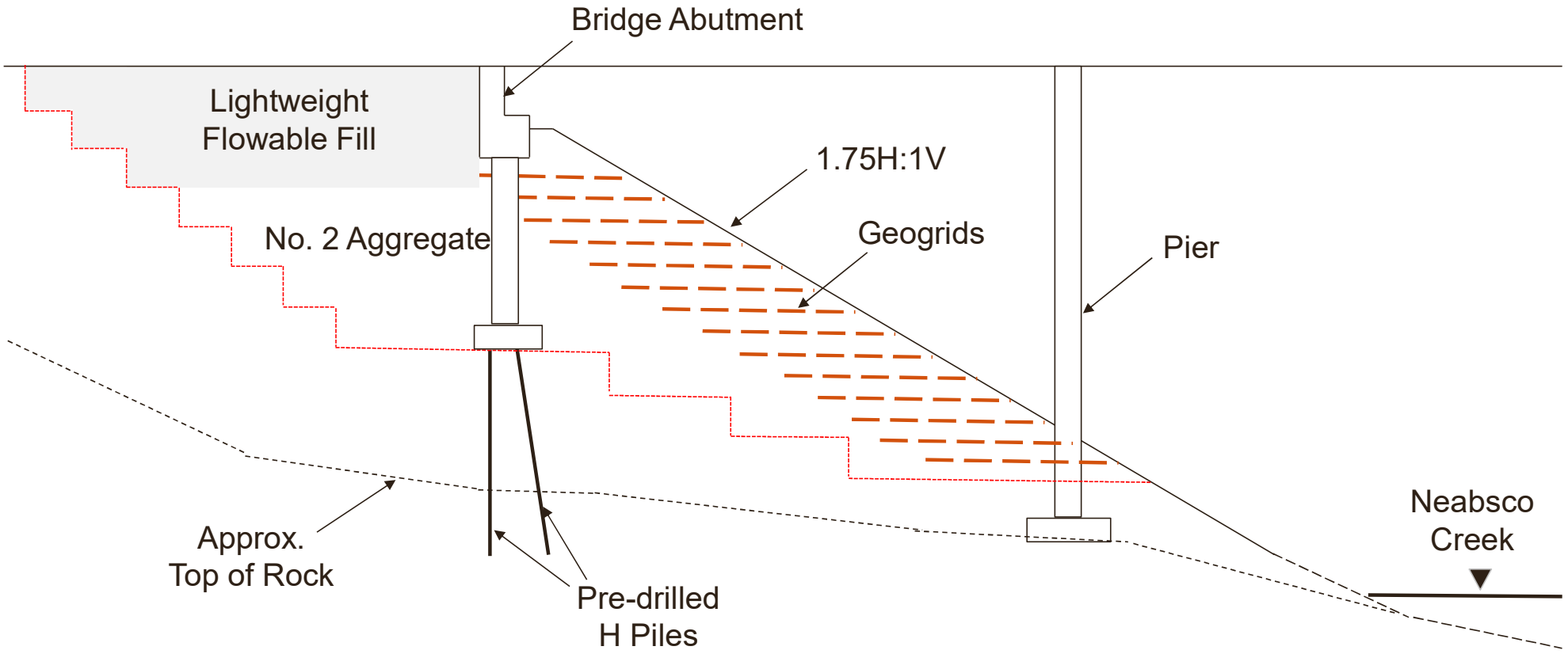
Subsurface Profile



Subsurface Cross-Section



Slope Repair



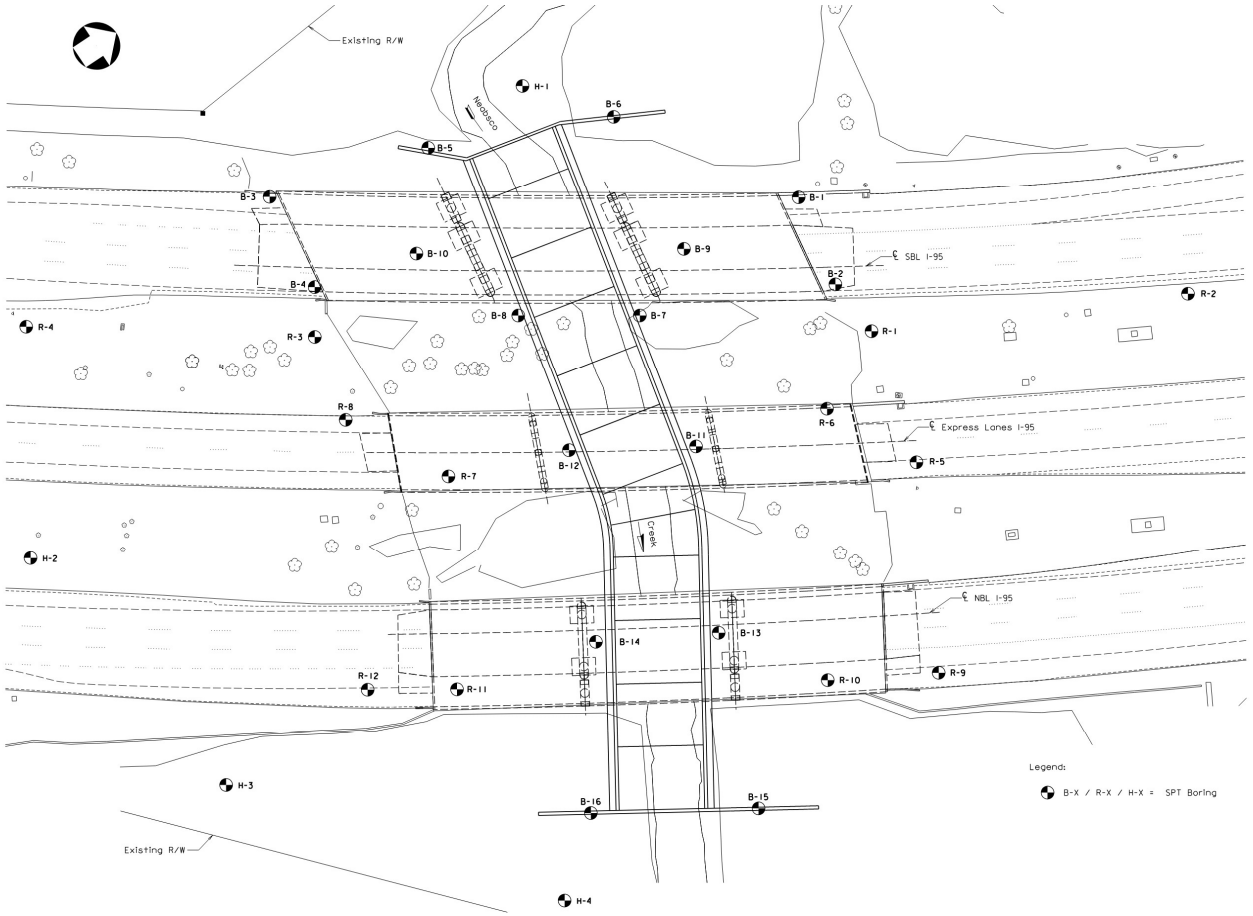
Bridge Deck Removal

Exposed Rock on Slope Face

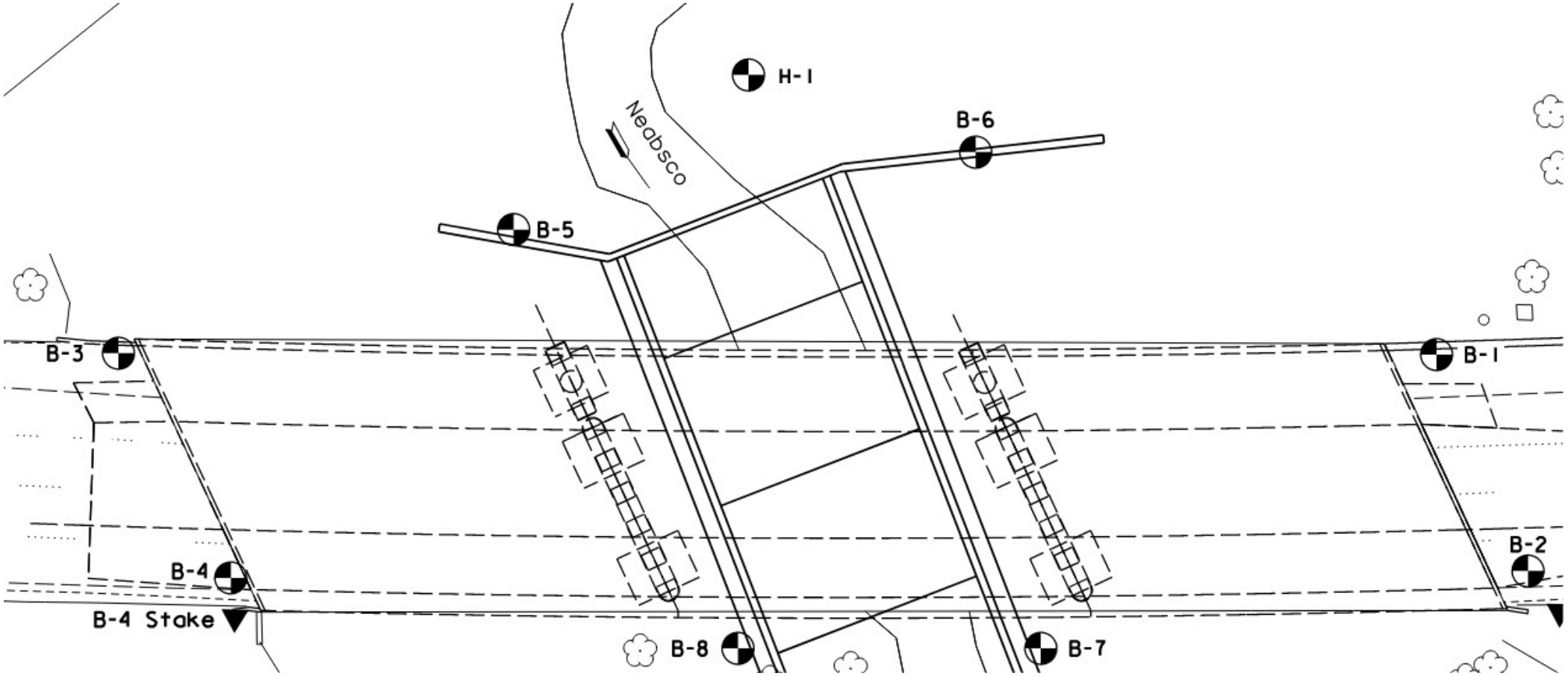
Benching Slope on South Abutment

Low Density Cementitious Fill (LDCF)

Back to the Present



Back to the Present



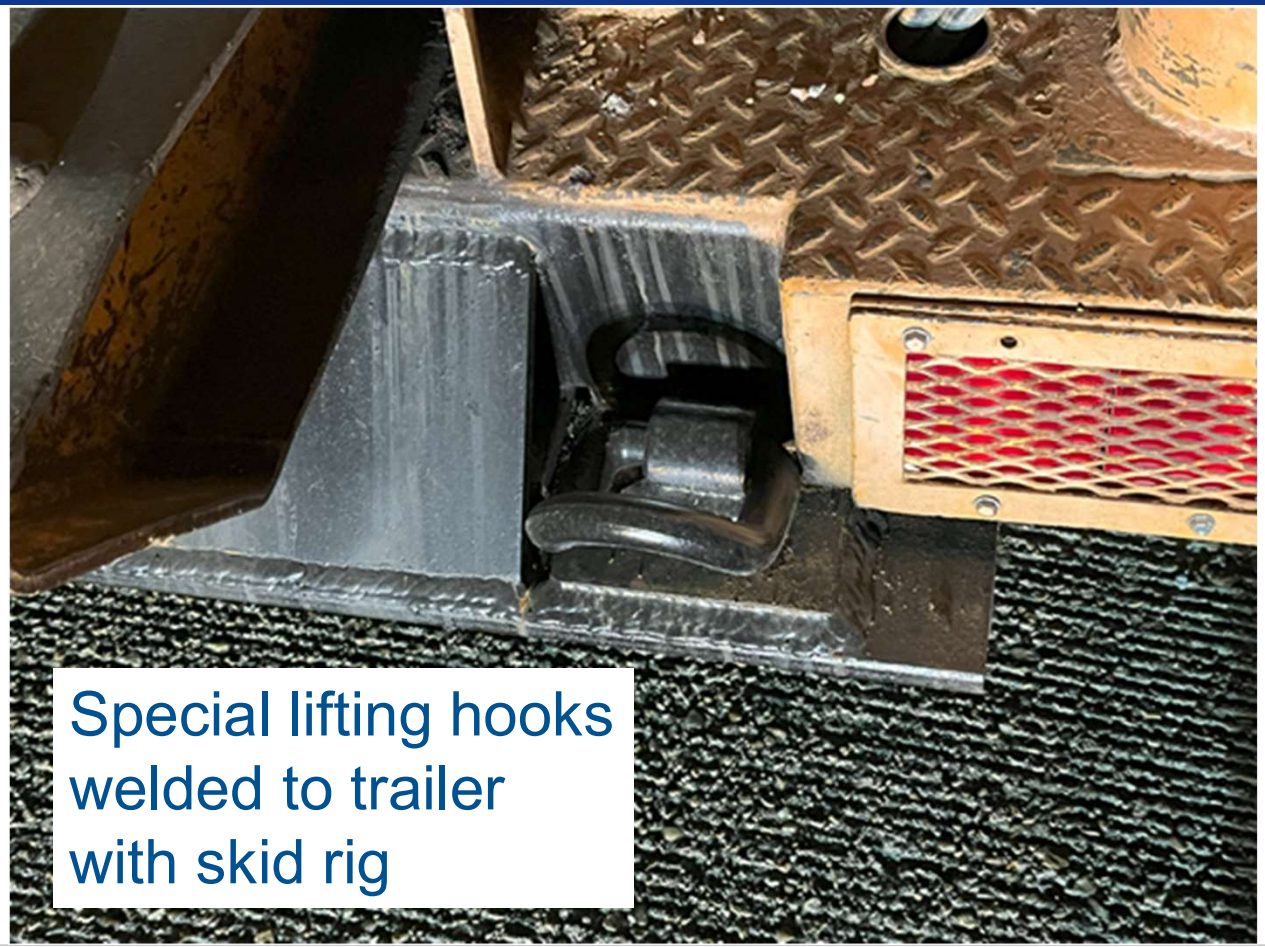
Scoured Rock

Scoured Rock

Dry Run at Manassas

- Met with Virginia Crane and Willow Spring
- Spreader bar recommended
- Make sure rig is in good operating order (replaced battery)
- Weld lift hooks to trailer

Equipment Modifications



Special lifting hooks welded to trailer with skid rig

Traffic Control Plan

- Double Lane closure on I-95
- Rest Area Accel. Lane closure
- Limited hours (10 pm to 5 am)
- Approval from TOC (LCAMs) and Traffic Operations
- Staging area for crane and tractor trailers (Rest Area)

Crane Set-Up

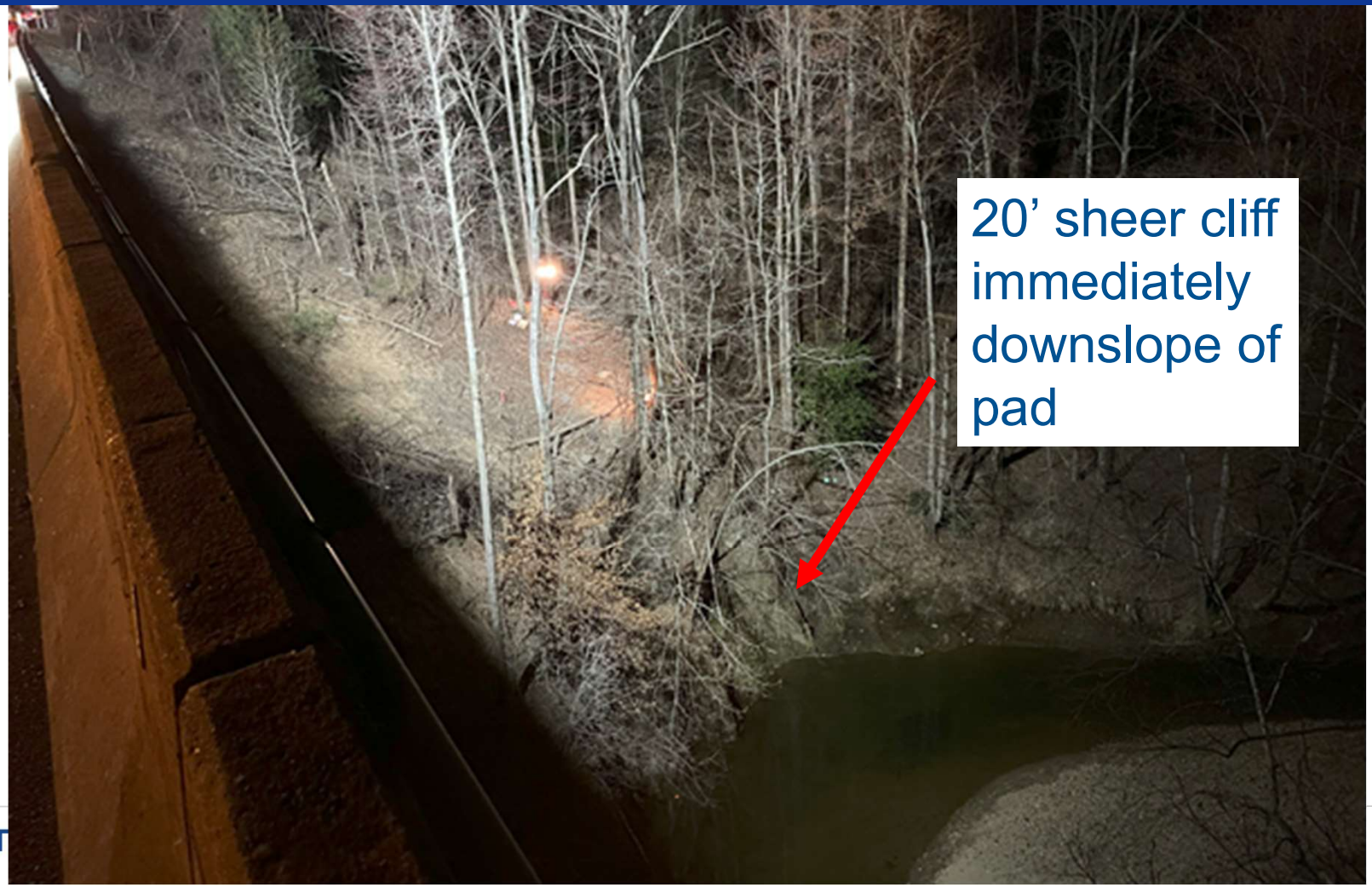
Crane Set-Up

Crane Set-Up

Pad Set-Up

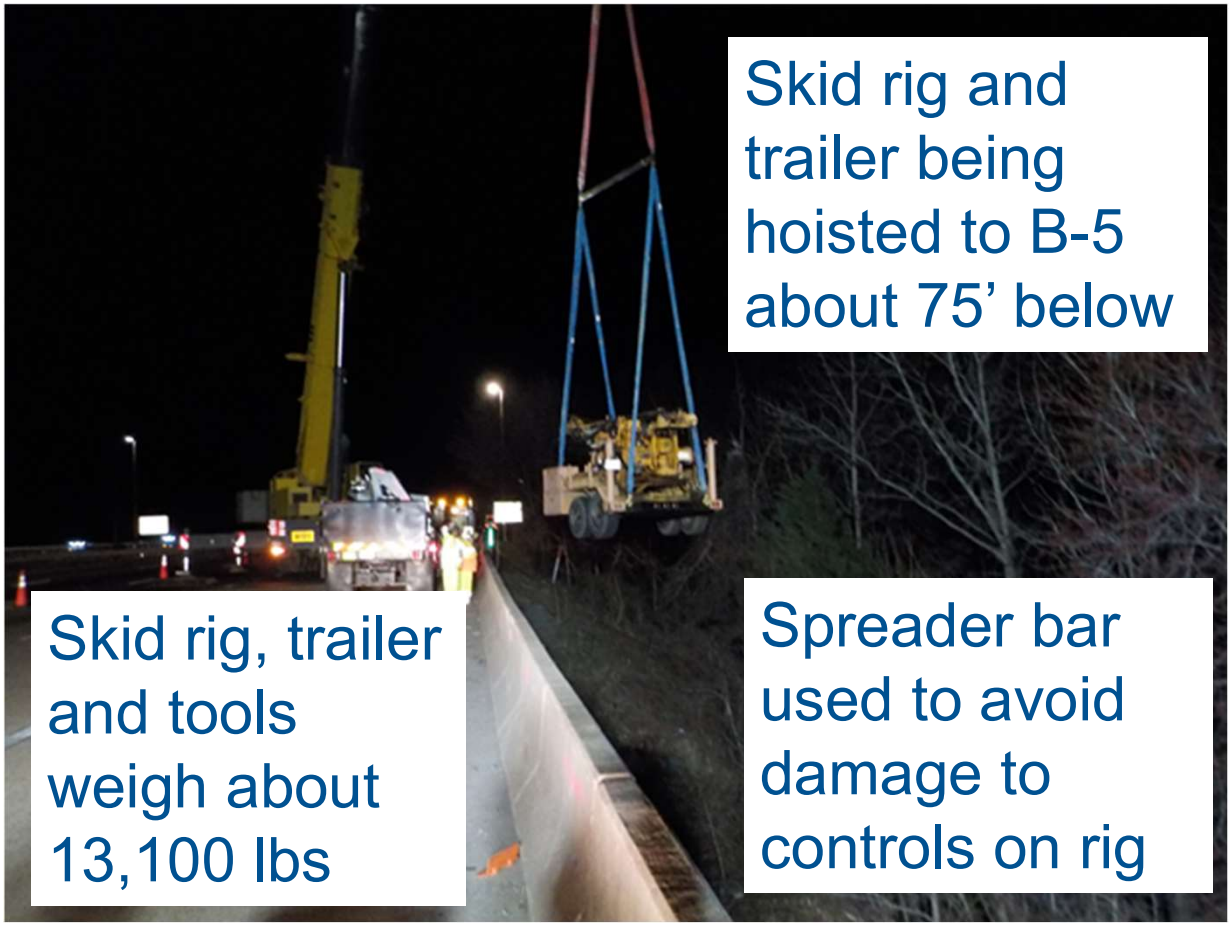
Pad Set-Up

Site Safety



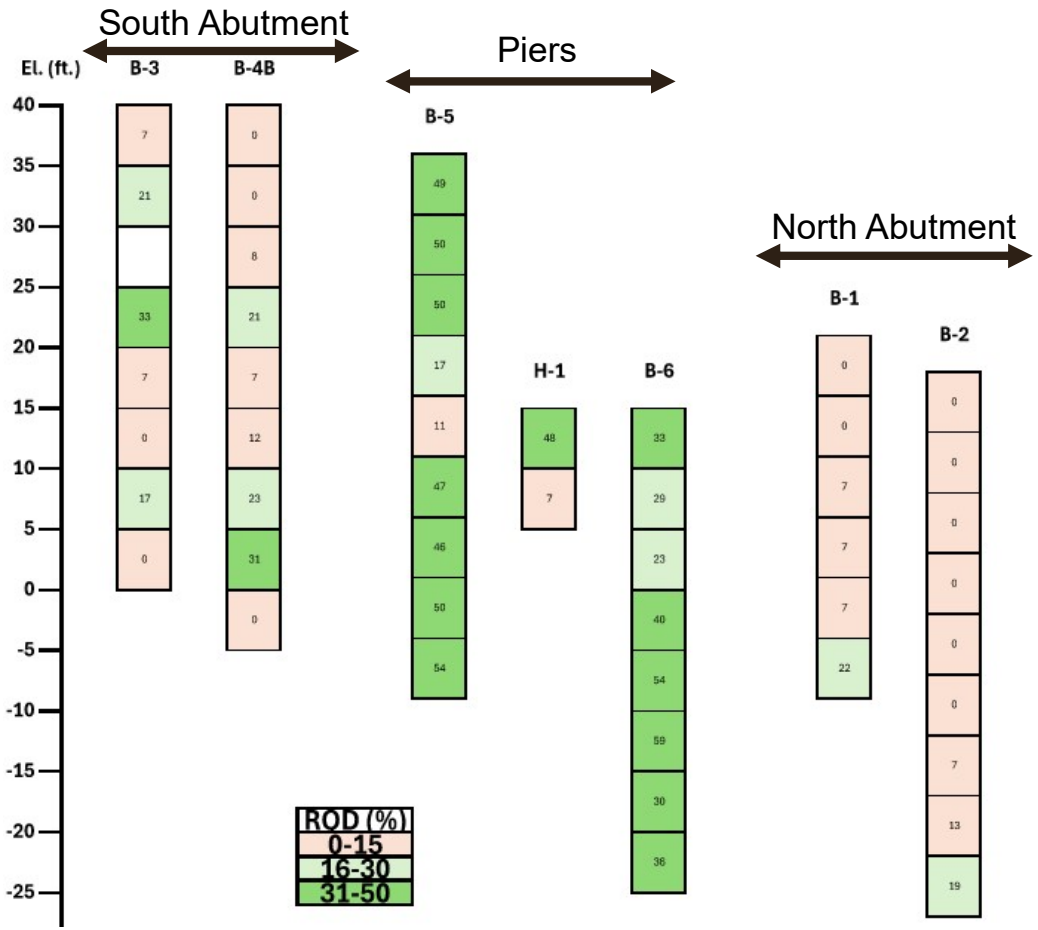
Site Safety

Crane Lift

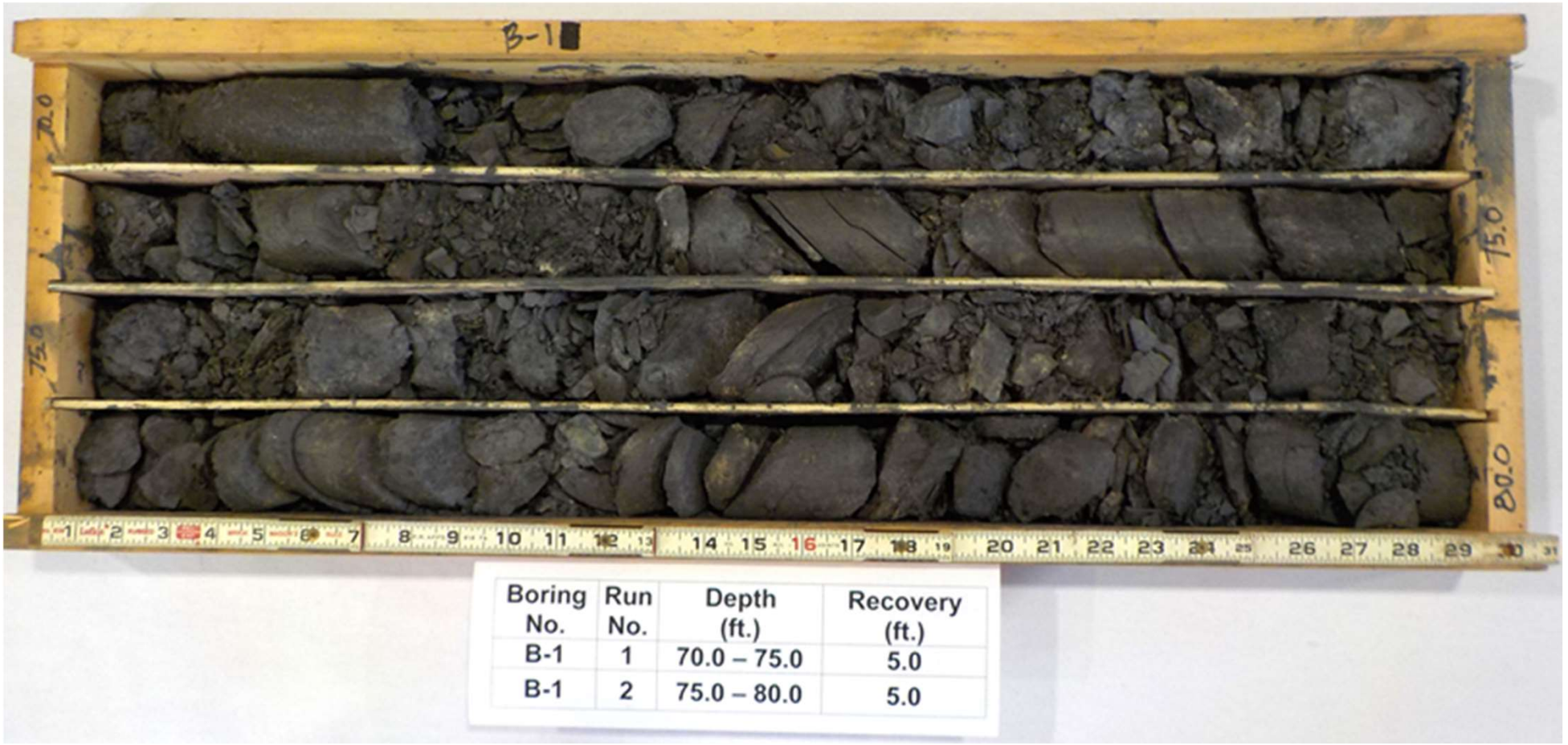

Skid rig and trailer being hoisted to B-5 about 75’ below
Skid rig, trailer and tools weigh about 13,100 lbs
Spreader bar used to avoid damage to controls on rig

Crane Lift

Rock Variability



Rock Core Photos



Boring No.	Run No.	Depth (ft.)	Recovery (ft.)
B-1	1	70.0 – 75.0	5.0
B-1	2	75.0 – 80.0	5.0

Rock Core Photos

Boring No.	Run No.	Depth (ft.)	Recovery (ft.)
B-5	1	13.3 – 18.3	4.6
B-5	2	18.3 – 23.3	5.0

Corrosive Soils

Test	Standard for Corrosive Environment	Result for B-5, Depth 1'-5' below Ground Surface
pH	<6.0	3.7
Resistivity	<3,000 ohm-cm	1,800 ohm-cm
Chlorides	>100 ppm	19 ppm
Sulfates	>200 ppm	288 ppm

Result – environment is corrosive; allow 0.1" sacrificial thickness for steel piles

Ref.: Structure & Bridge Manual, File No. 23.05

Current Design Status – Back to Bridge Widening!

Acknowledgements

Owner – Virginia Dept. of Transportation
VDOT Project Manager – Vicente Valeza, P.E.
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Transurban – I-95 Express Concessionaire

Questions?