

Sunapee 44438A

NH Route 11 Slope Stabilization Project

ACEC Presentation
April 16, 2026

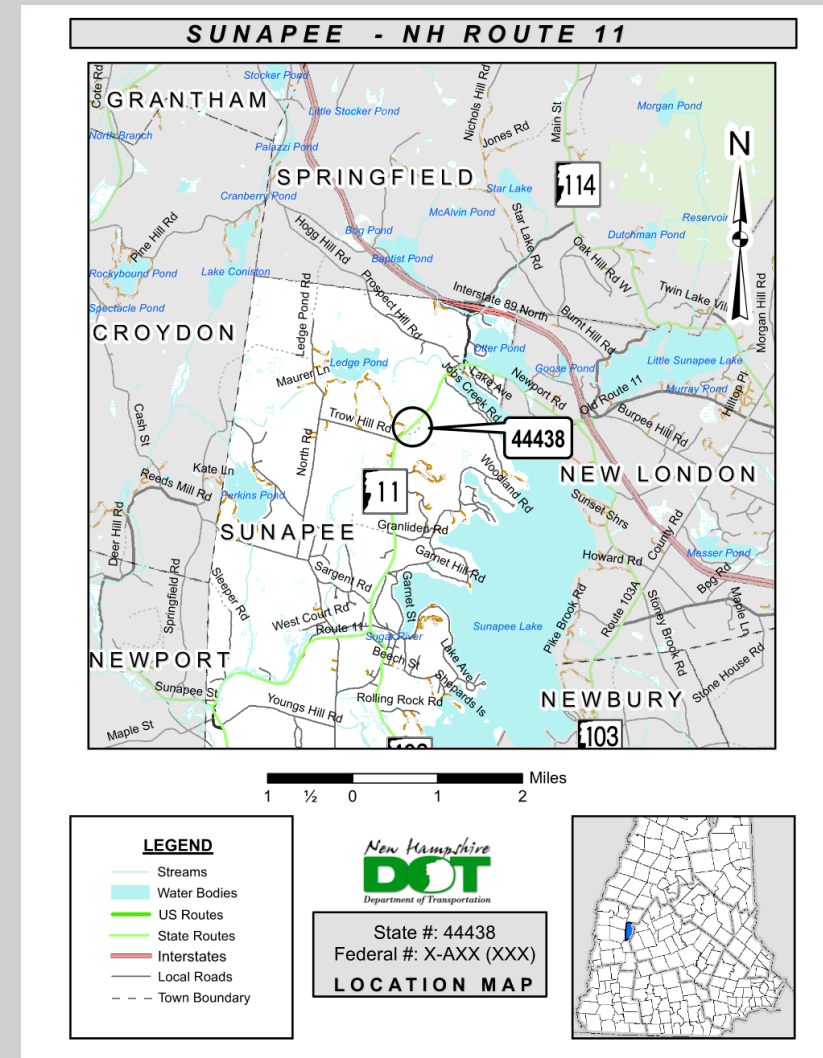
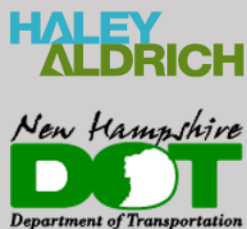


Introductions and Project Location

Presenters:

Curtis Morrill – NHDOT

Erin Force – Haley & Aldrich



NH Route 11 Failure

June 28, 2023



July 13, 2023



HALEY
ALDRICH

New Hampshire
DOT
Department of Transportation

NH Route 11 Failure

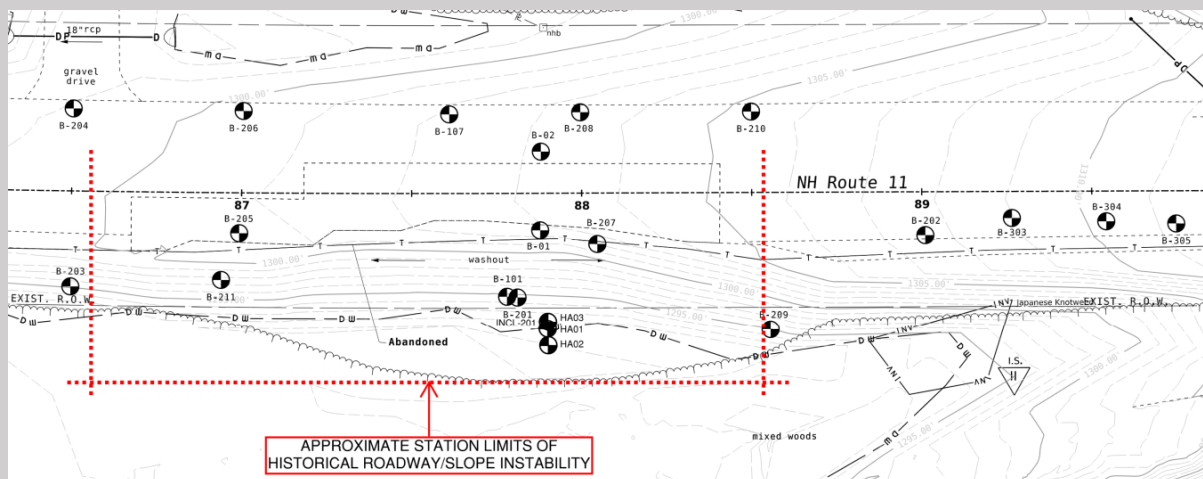


Project Background

- As-builts
 - 1938 – NH 11 built in current location
 - 1984 – NH 11 widened to the west for truck climbing lane
- DOT Actions
 - Multiple paver shim treatments to address ongoing settlement.
 - 2019 M&R Preliminary Investigation
 - June/July 2023 Failure – Northbound lane closed; traffic shifted
 - M&R led initial investigation response.
 - Haley & Aldrich contracted to finish alternative analysis and final design

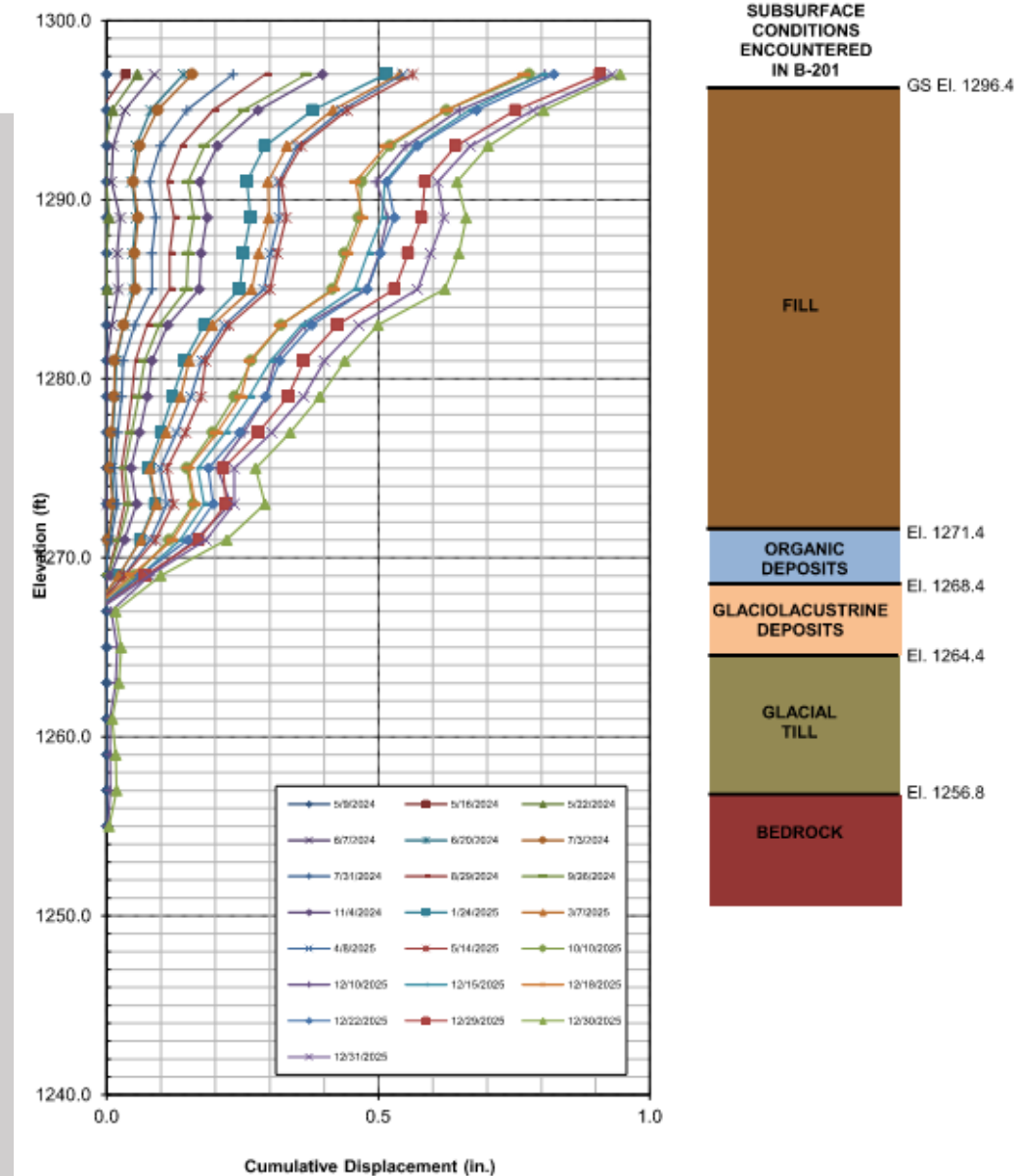
Subsurface Characterization

- 11 test borings by NHDOT (2019 and 2023)
- 3 hand augers by NHDOT (2019)
- Geophysical survey by Hager-Richter Geoscience (2023)
- 15 test borings by Haley & Aldrich (2024 and 2025)
- 1 inclinometer by Haley & Aldrich (2024)



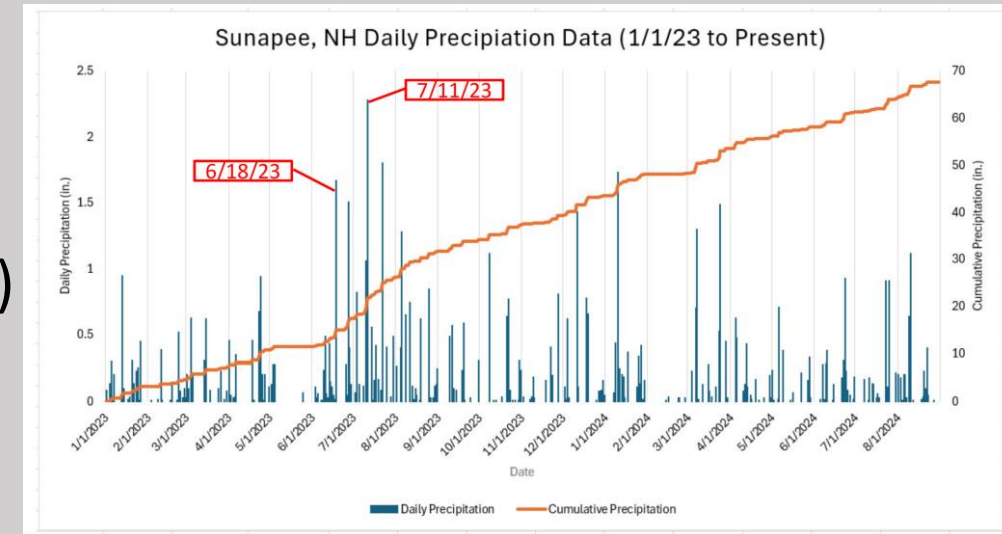
Subsurface Conditions

- Asphalt (0.5 - 4.0 ft)
- In-situ fill (8 - 26 ft)
- Organic deposits (2 - 14 ft)
- Glaciofluvial deposits (4 - 10 ft)
- Glaciolacustrine deposits (1 - 5 ft)
- Glacial till (1 - 25 ft)
- Bedrock (encountered 21 to 41 ft below ground surface)



Potential Causes of Roadway Instability

- Considered:
 - Historic project information
 - Precipitation
 - Photographs (before and after failure)
 - Subsurface conditions
 - Inclinometer data
 - Global stability evaluations
- On-going lateral creep and shallow global stability failure surfaces in the in-situ fill materials
- Fill soils were likely not placed and compacted in engineered lifts during original construction
- Possible voids in rock fill

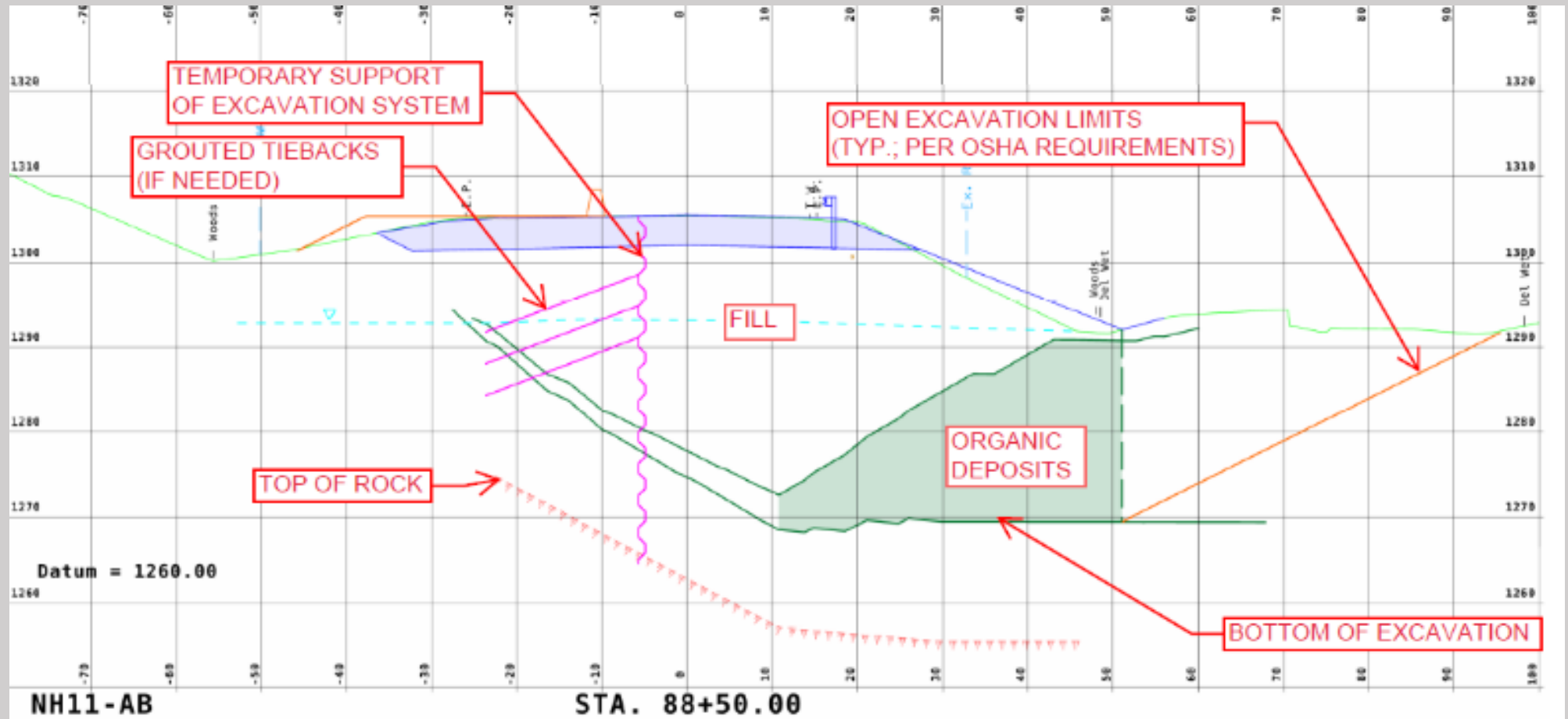


Alternatives Review

- Roadway Realignment
- Reinforced Soil Slope
- Grout Injection (Ground Improvement)
- Over-Excavate & Replacement
- Column Supported Embankment
- Preferred Alternative –
 - Reinforcing/Stabilization Piles

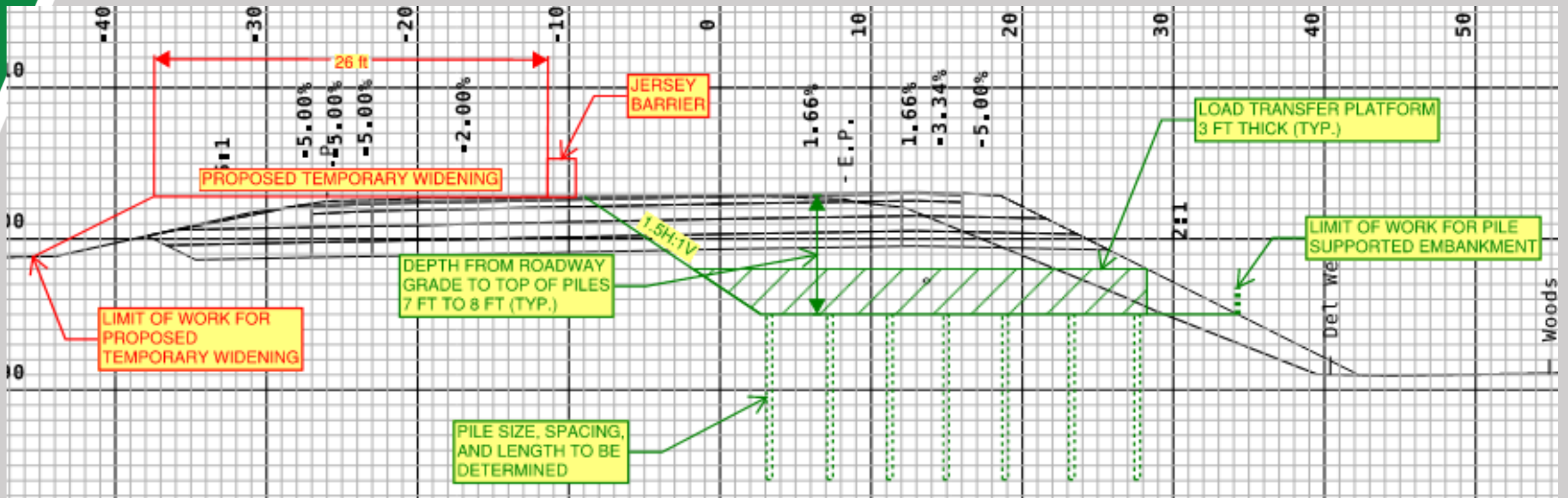
	Remedial Alternatives				
	Reinforced Soil Slope	Ground Improvement by Grout Injection	Over-Excavate and Replacement	Column Supported Embankment	Reinforcing/Stabilization Piles
Lateral Creep and Shallow Global Instability	addresses stability of fill material, does not extend into organic deposits	does not sufficiently mitigate stability in fill or organic deposits	removes loose fill and organic deposits	removes upper portion of loose fill; intercepts failure surfaces within the fill and organic deposits	intercepts failure surfaces within the fill and organic deposits
Settlement Mitigation ¹	does not mitigate potential settlement below the fill, refer to Note 1	improves the stiffness of the fill and organic deposits, refer to Note 1	removes the fill and organic deposits	extends through the fill and organic deposits	does not mitigate potential settlement within or below the fill, refer to Note 1
Wetland Impacts	some wetland impacts at toe of slope	possible breakout of grout into wetlands	requires a cut slope within the wetland	minor wetland impacts	minor wetland impacts
Recommended Alternative ²	no	no	no	no	yes
Rough Order of Magnitude Cost Estimate ³	moderate	low	high	high \$1.5 to \$2 million	moderate \$0.75 to \$1.25 million

Alternative – Remove and Replace Unsuitable



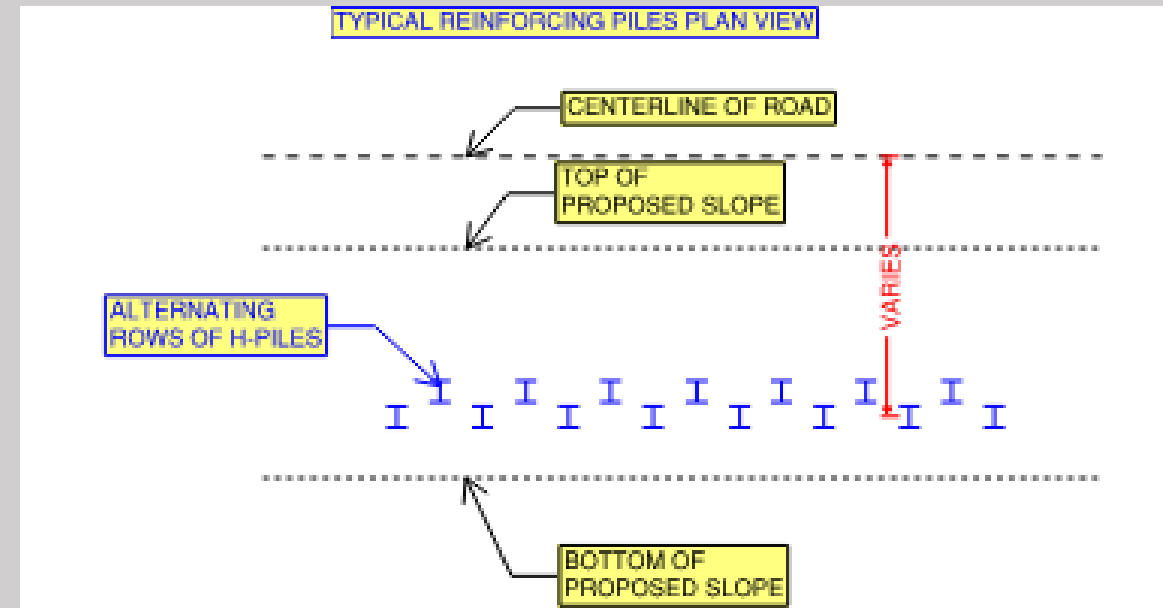
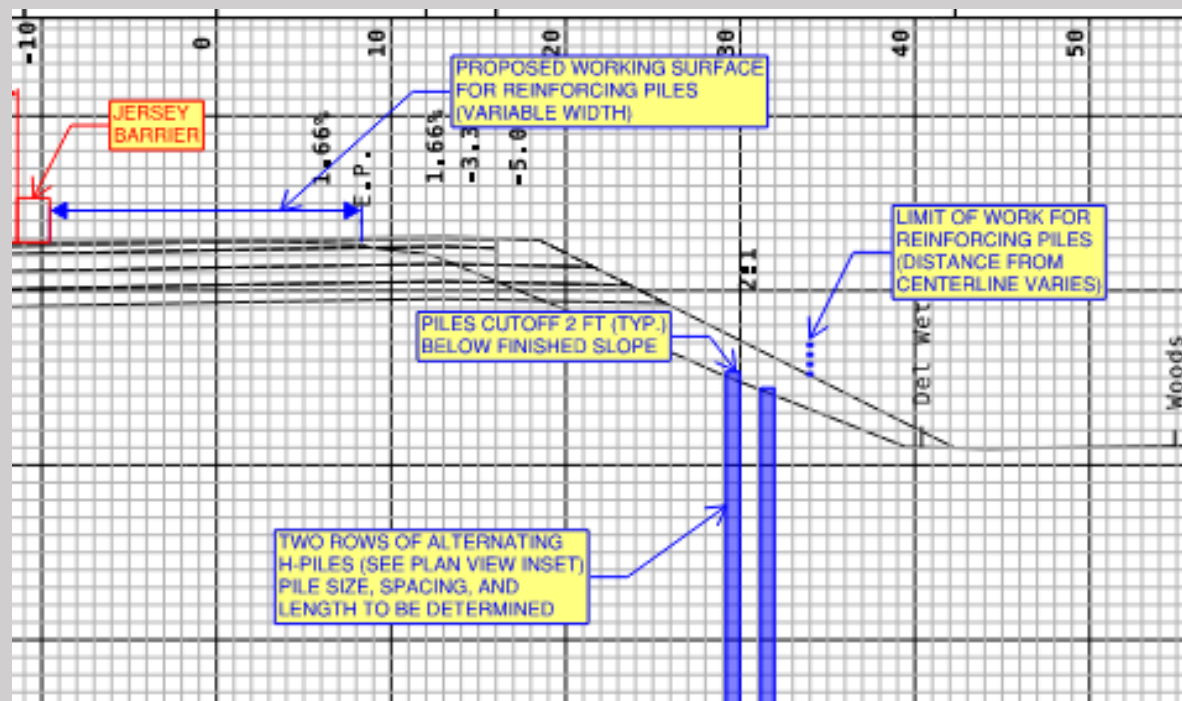
Alternative - Column Supported Embankment

- Support options include timber piles, steel H-piles, and rigid inclusions



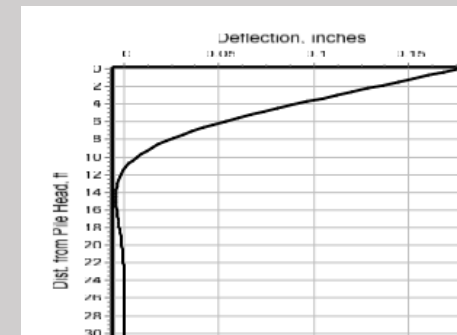
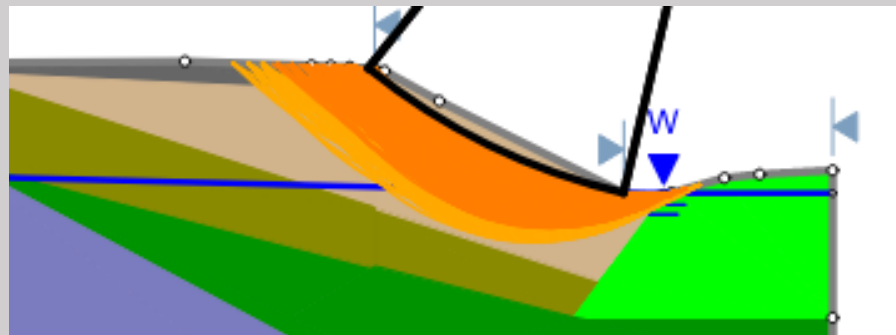
Reinforcing/Stabilization Piles (Recommendation)

- Mitigate lateral creep and shallow global instability in fill
- Heavy-duty stabilization fabric over roadway subgrade to mitigate potential loss of ground in the fill



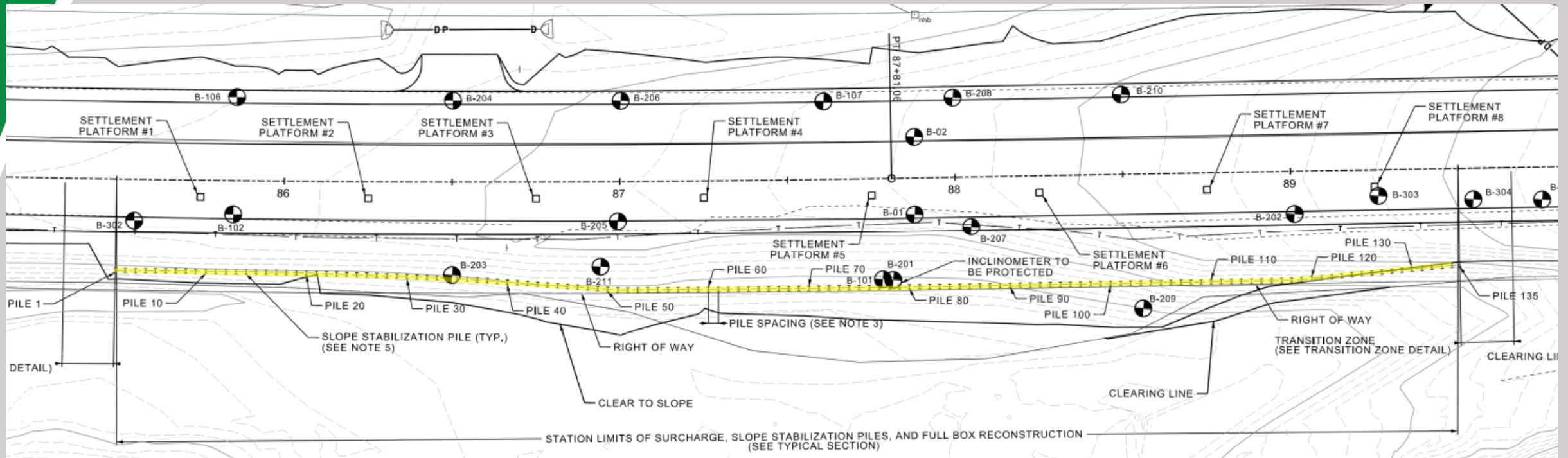
Reinforcing/Stabilization Pile Design

- Perform global stability evaluations without reinforcing elements (using Slide software)
- Determine stabilizing force required to increase the factor of safety to minimum required (static 1.5, seismic 1.0)
- Perform lateral pile evaluations with the stabilizing force applied to piles (using LPILE software)
- Evaluate the size and spacing of the reinforcing elements to resist the minimum stabilizing force and achieve lateral fixity

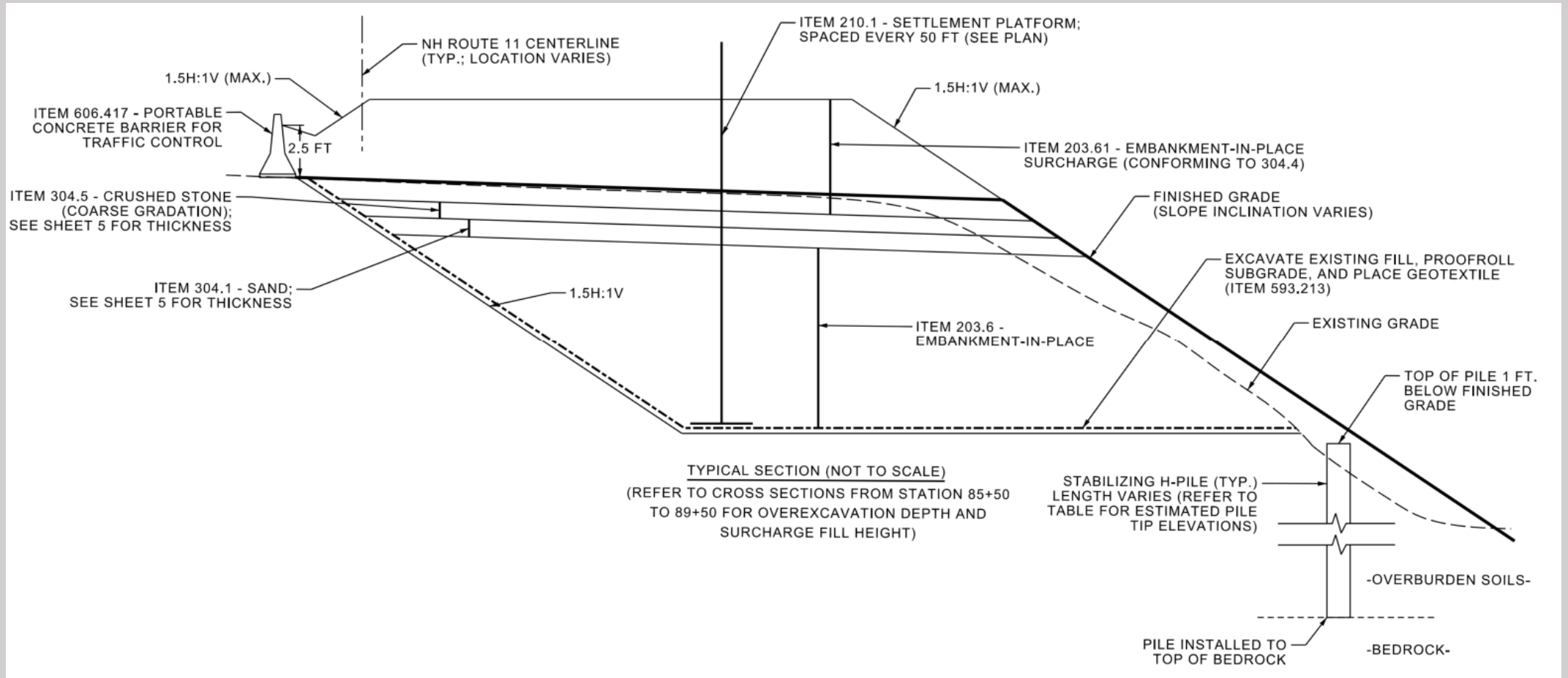


Reinforcing/Stabilization Pile Design

- HP12x53 piles with driving shoes
- 3 ft center to center



Reinforcing/Stabilization Pile Detail



Construction

- Project Advertised for Construction on June 3, 2025
- Completion Date – October 30, 2026
- Construction Cost - \$2.9M
- Contractor: Casella Construction
- Pile Contractor: H.B. Fleming



Construction



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Questions?

