# WSDOT Bridge 17.7 Widening:

## Complex bridge relocation featuring the impact of previous construction methods on retrofitting (or widening)

Presented by Nic Arens, P.E.

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# About GeoEngineers

- Founded in 1980
- Employee-owned
- Earth science and engineering firm
- 400+ personnel
- 20 offices nationwide
- People centric culture:
  - Client focused
  - Technical excellence
  - We love what we do!

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# I-405 Renton to Bellevue Design-Build


- Funding: $705 million
- Flatiron-Lane JV
- 14-miles of improvement and 12-miles of Express Toll Lanes
- >40 bridge replacements/retrofits
- AADT ≈ 125,000 to 185,000 (2021)
- Current Status: Under construction

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"Travelers on Interstate 405 between Renton and Bellevue experience one of the state's WORST commutes."

Washington State Department of Transportation

Posted by u/equalmotion Lower Queen Anne 28 days ago

1.5k

Media And on the 8th day, the Lord created the S-Curves and constant construction.

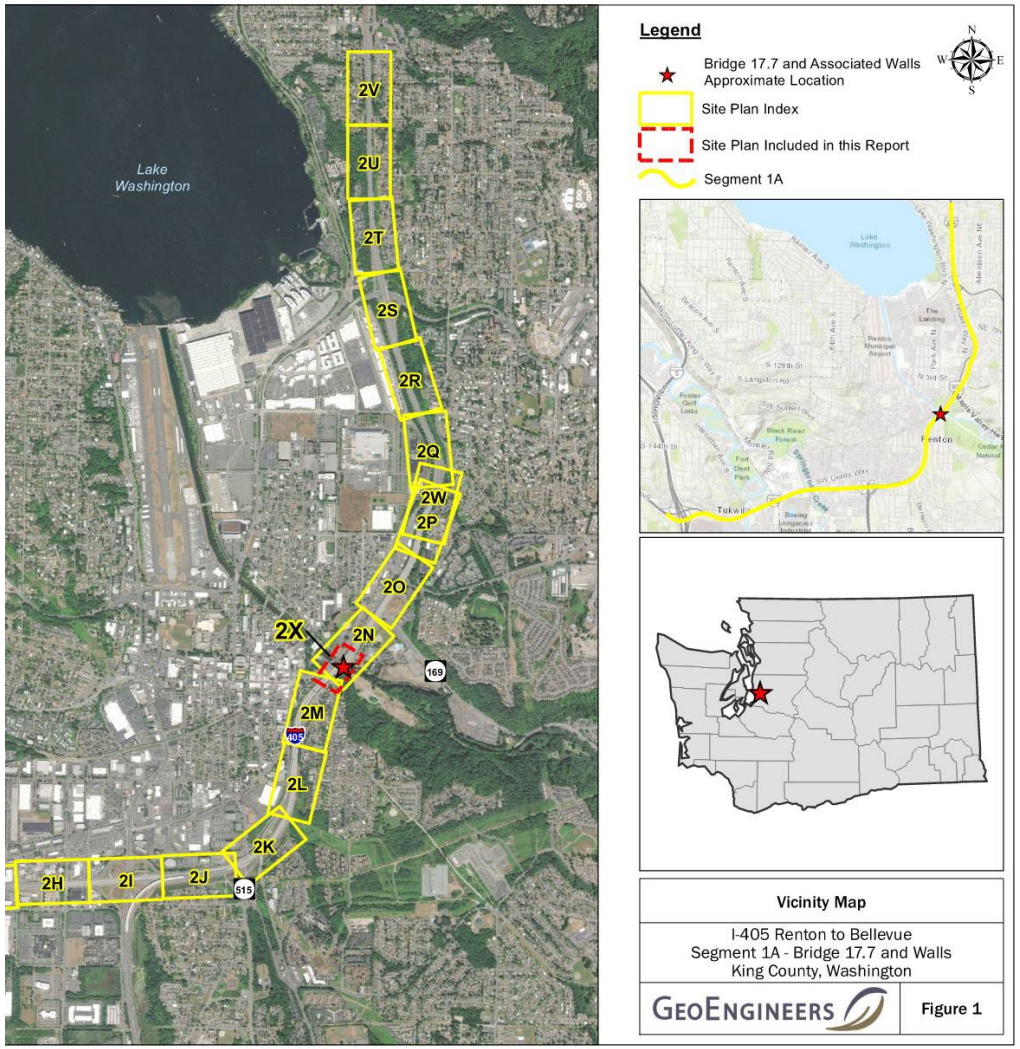

39 Comments Award Share Save ...

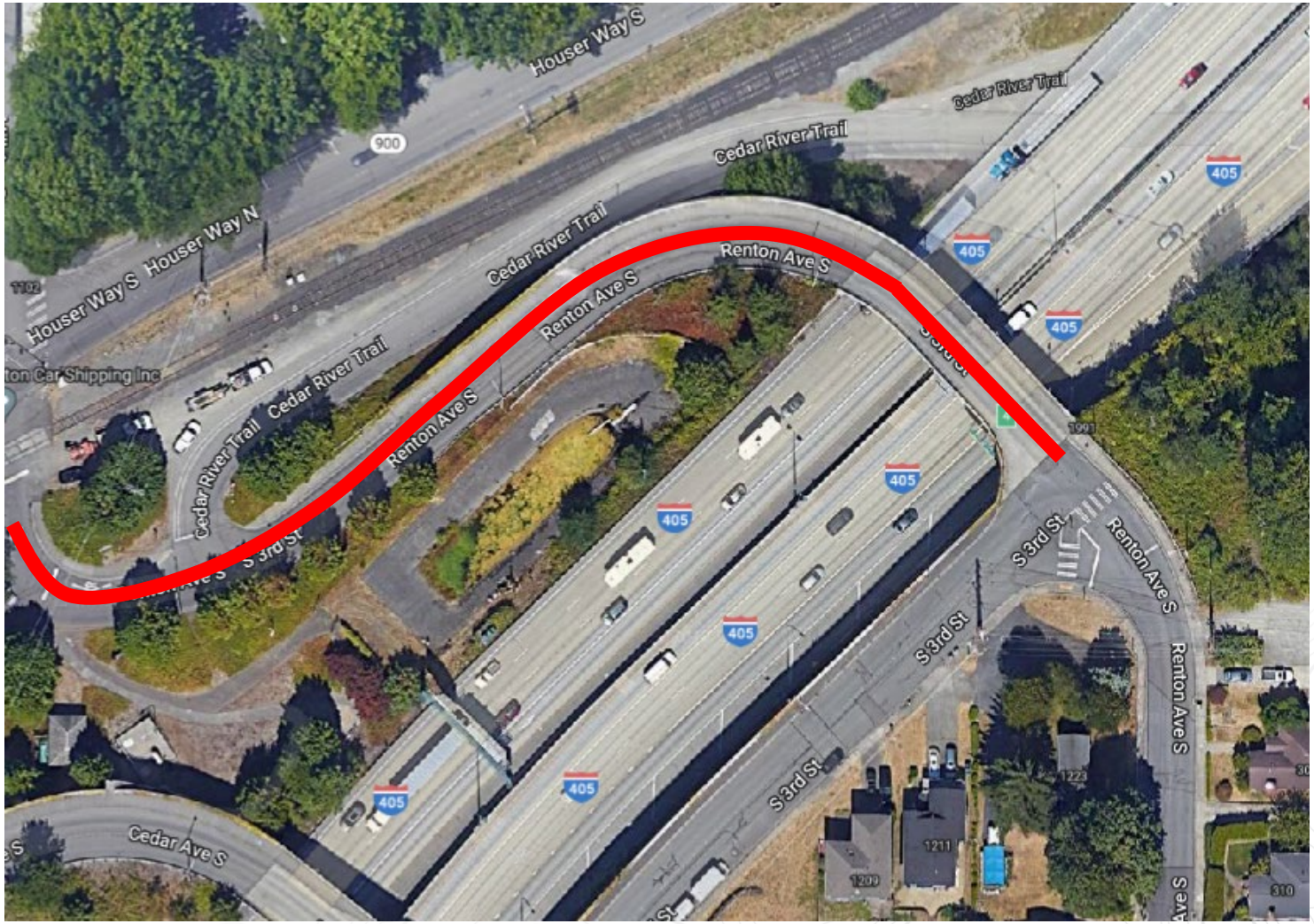
I-405 RENTON TO BELLEVUE DB

"Treat yourself like I-405 and NEVER stop working on yourself, no matter how inconvenient it is for everyone else."

- Karl Terzaghi (probably)

# Bridge 17.7 – Location

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EXISTING BRIDGE DESIGN


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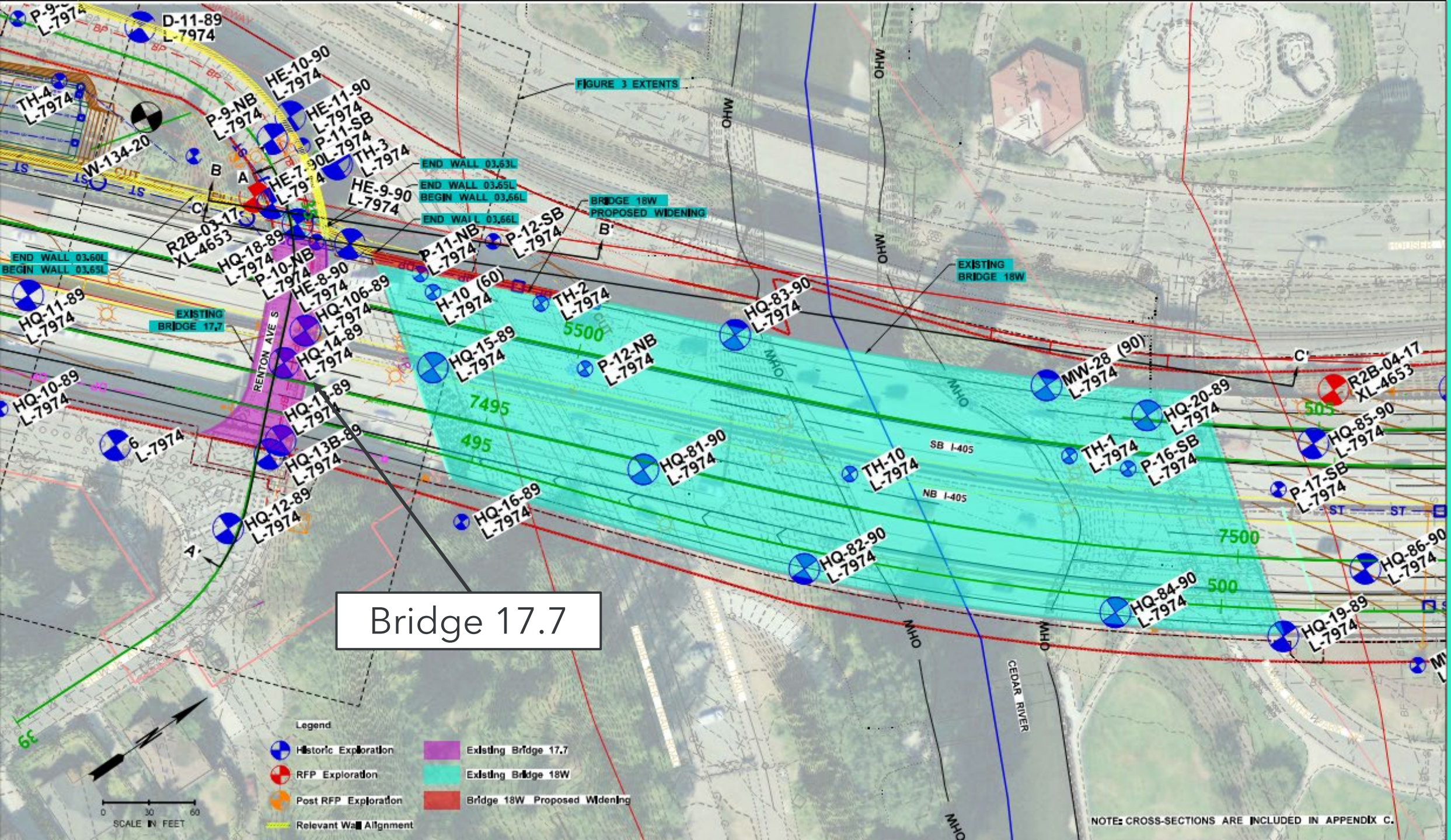



SUBSURFACE CONDITIONS


FLATTEN THE S-CURVES (1990)

# Historical Grading – 1990

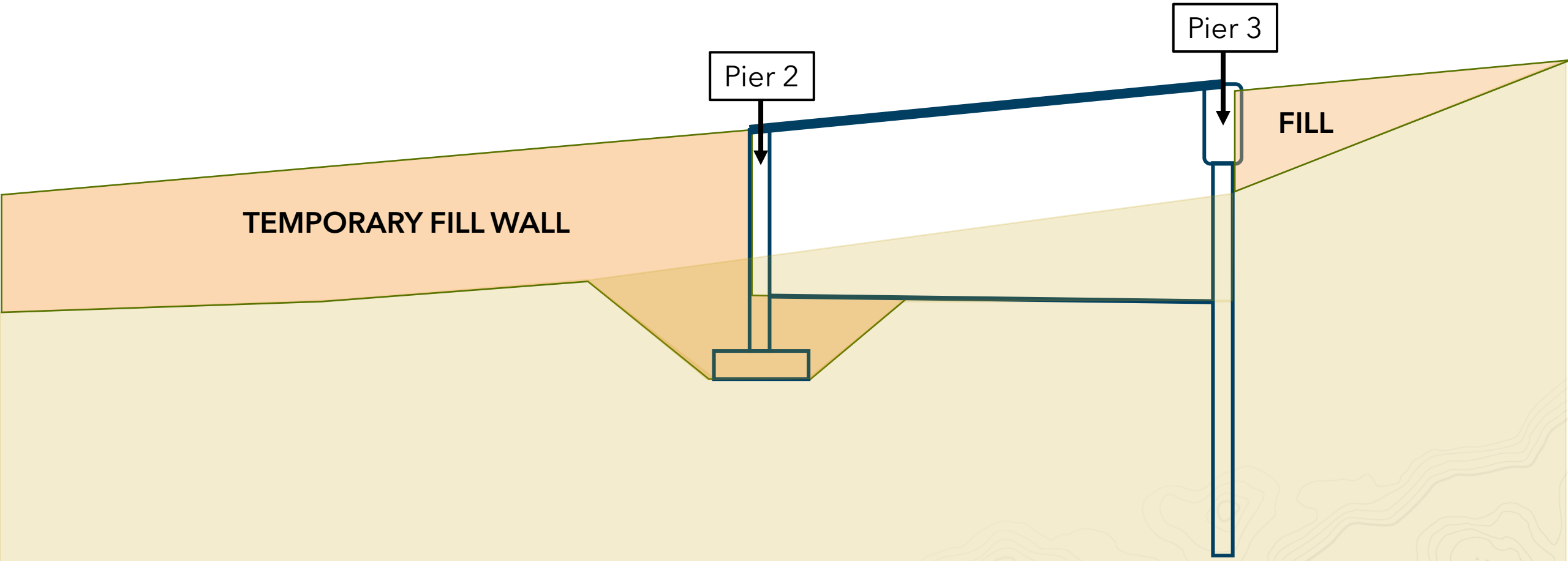
Pier 1

Pier 2

Pier 3

I-405

# Bridge Construction – 1991

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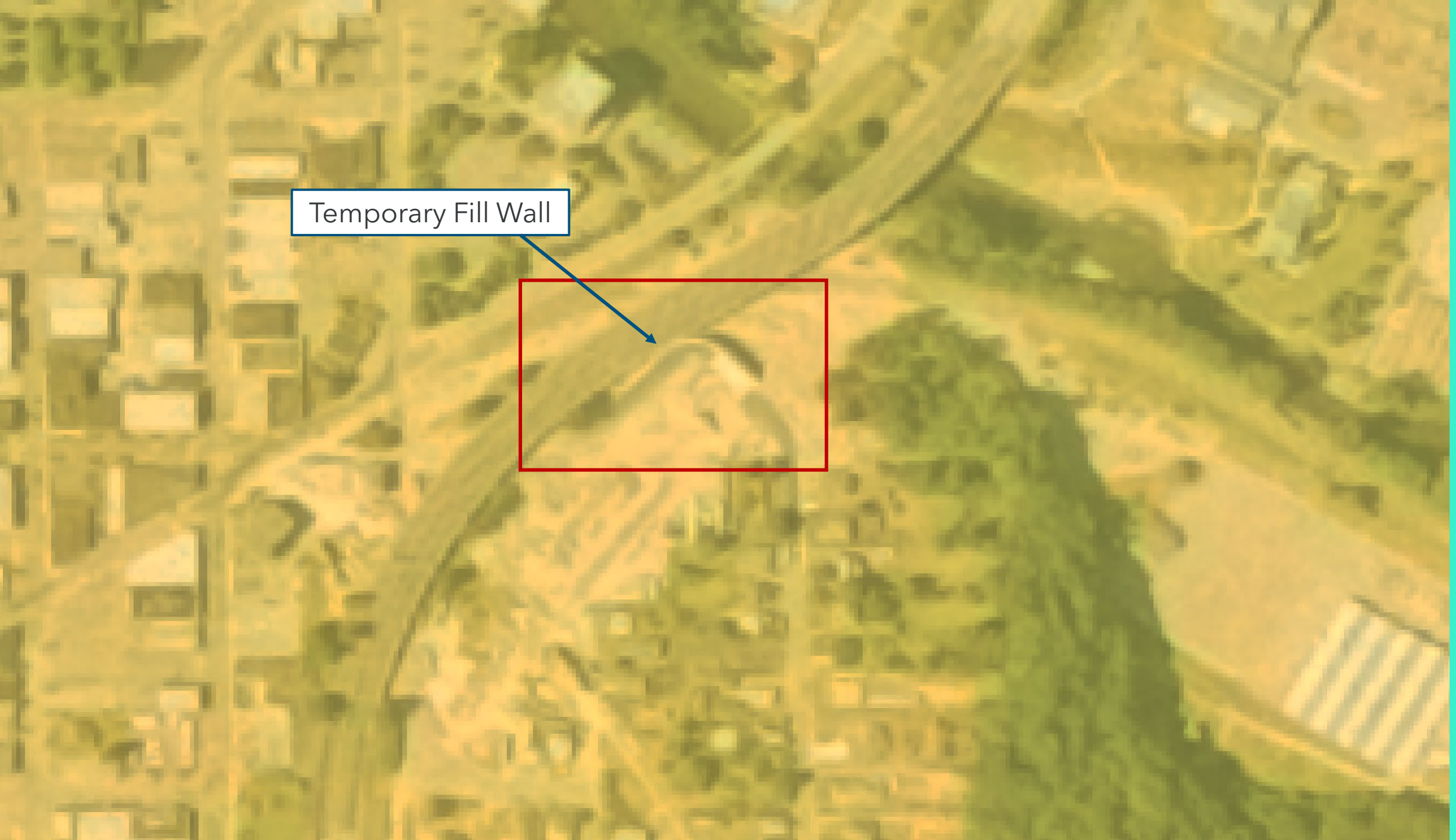
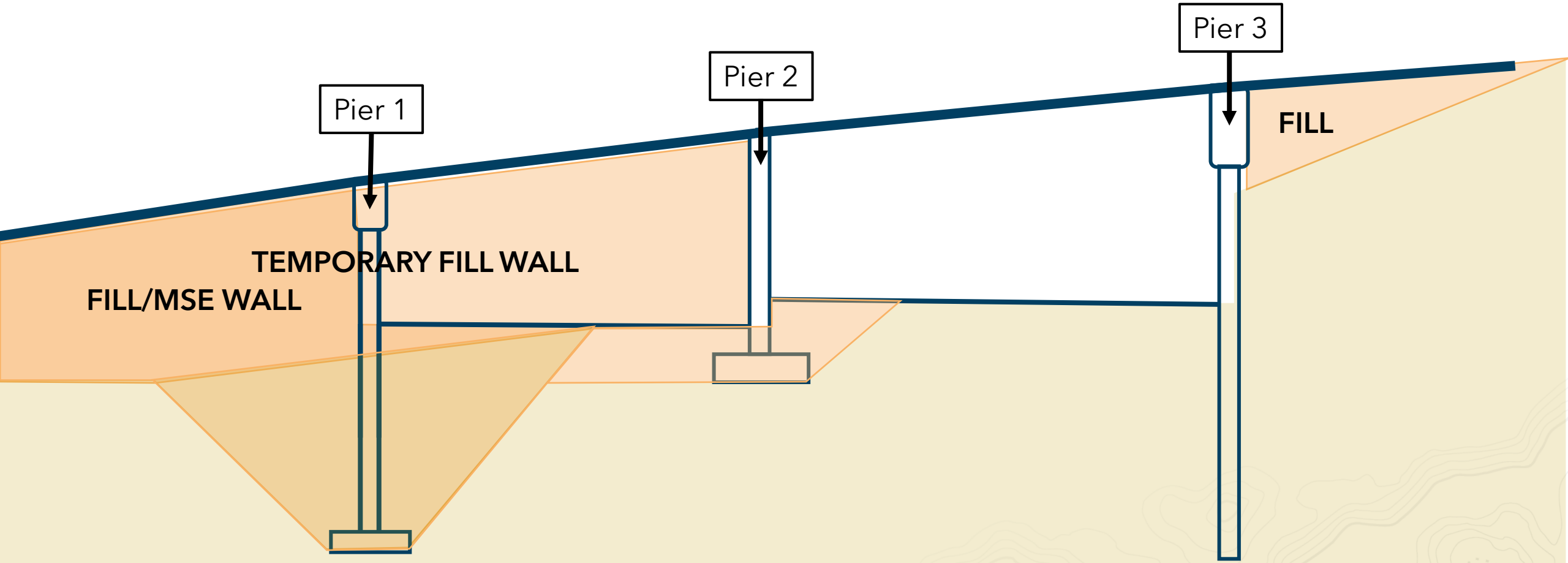



EXISTING BRIDGE CONSTRUCTION (1991)

# Bridge Construction – 1992

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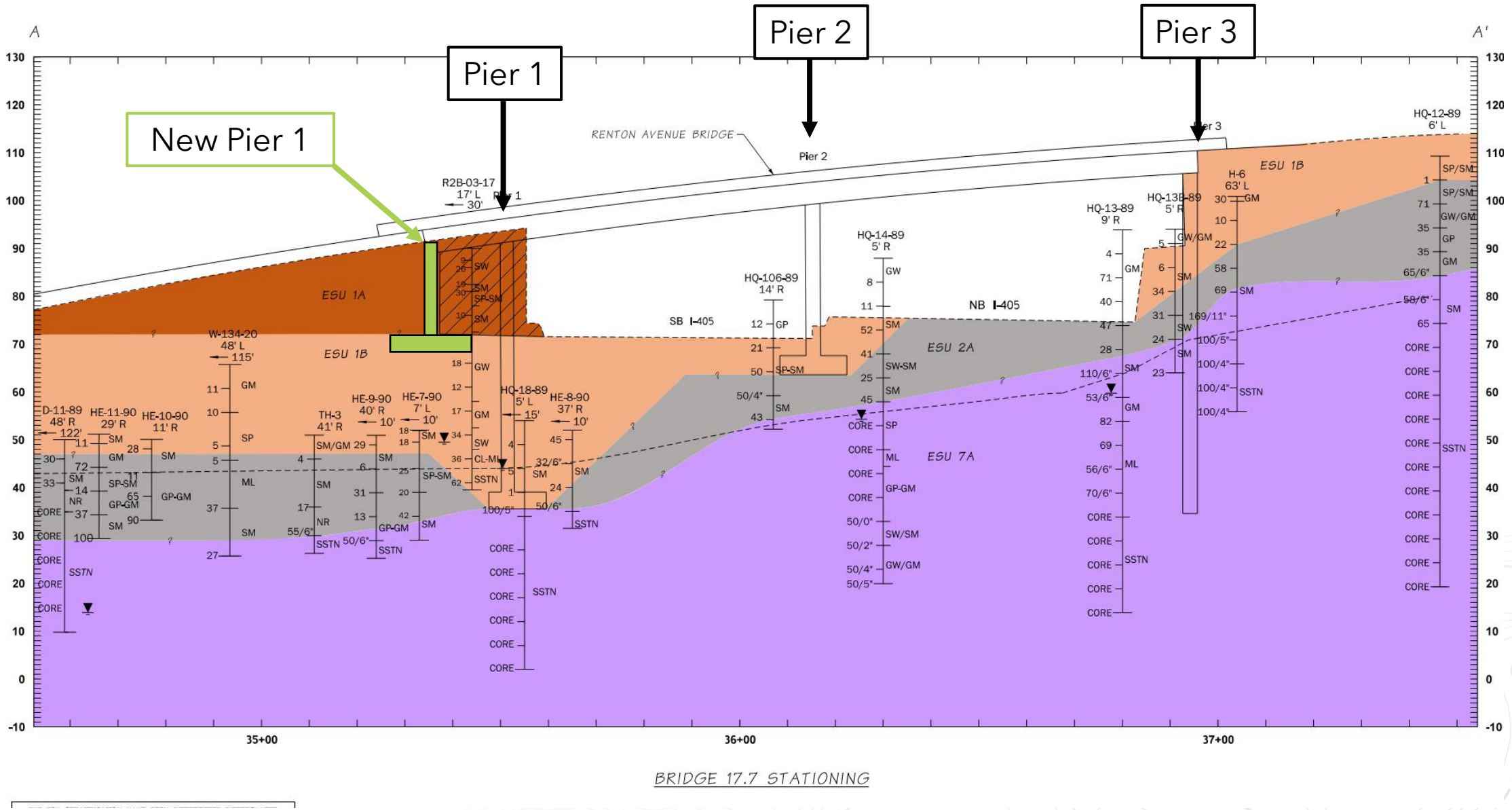
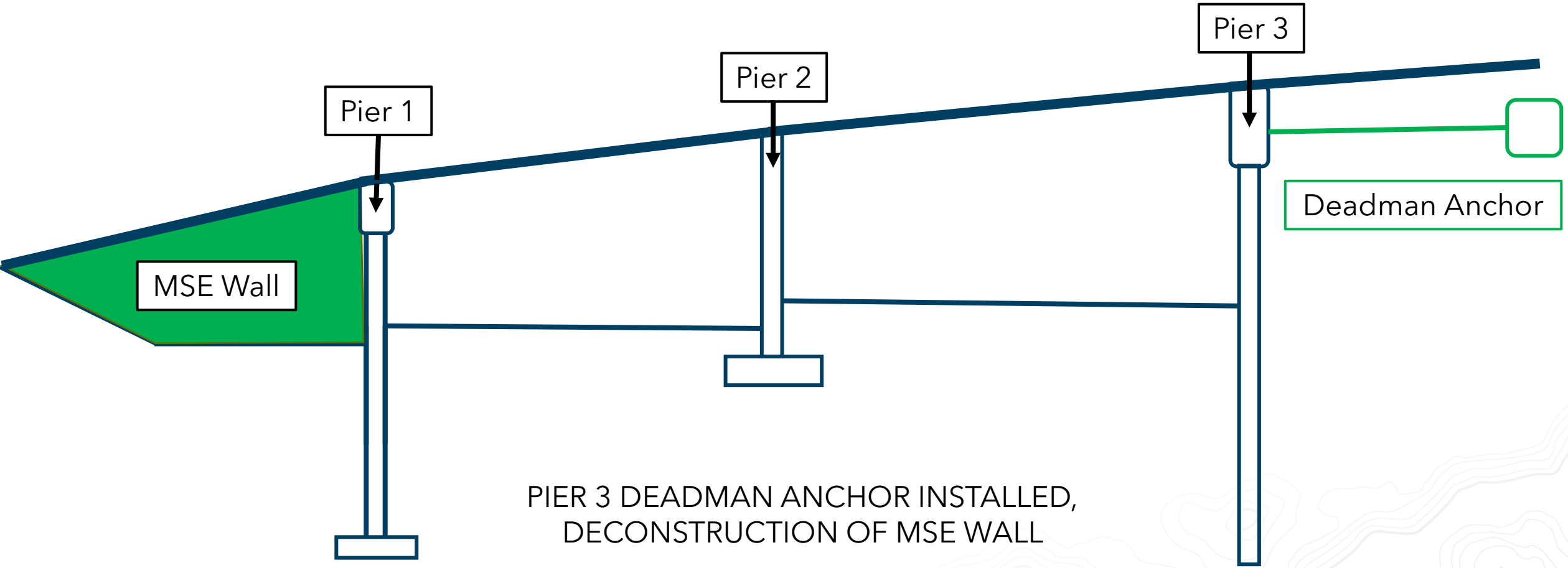
# Subsurface Conditions



# Bridge 17.7 Delicate Construction Sequence




PIER 3 DEADMAN ANCHOR INSTALLED,
DECONSTRUCTION OF MSE WALL

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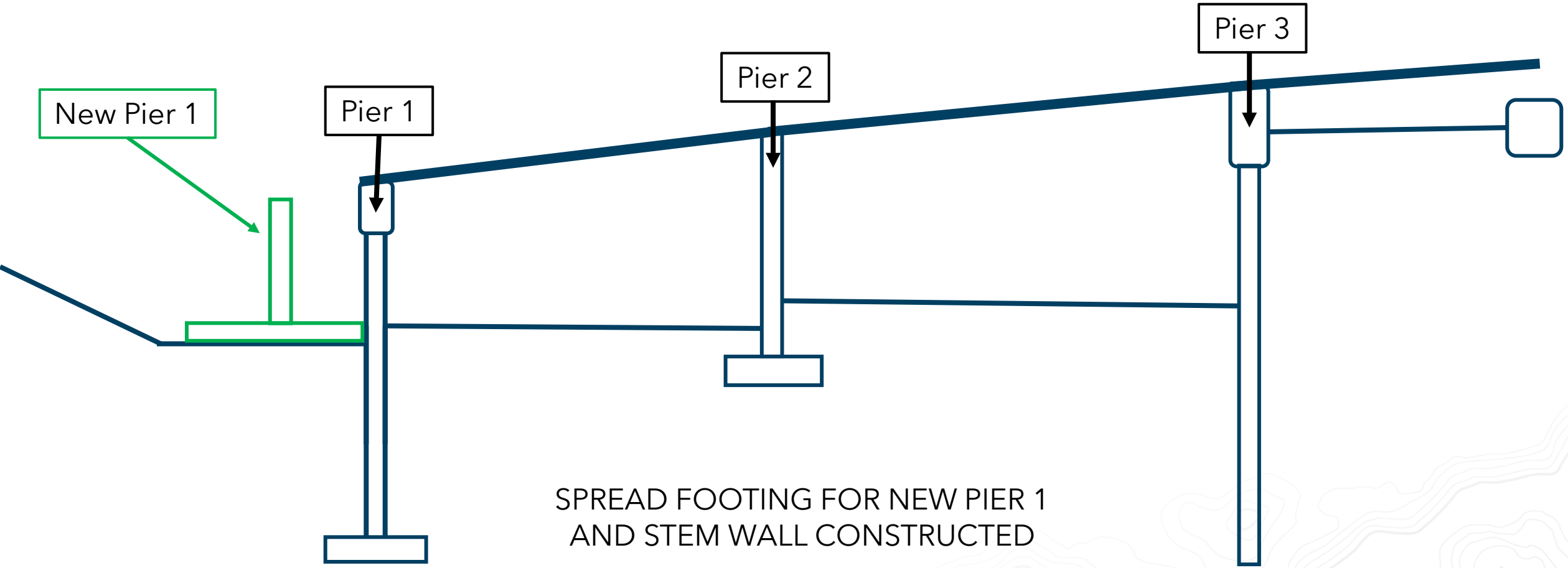
# Bridge 17.7 Delicate Construction Sequence

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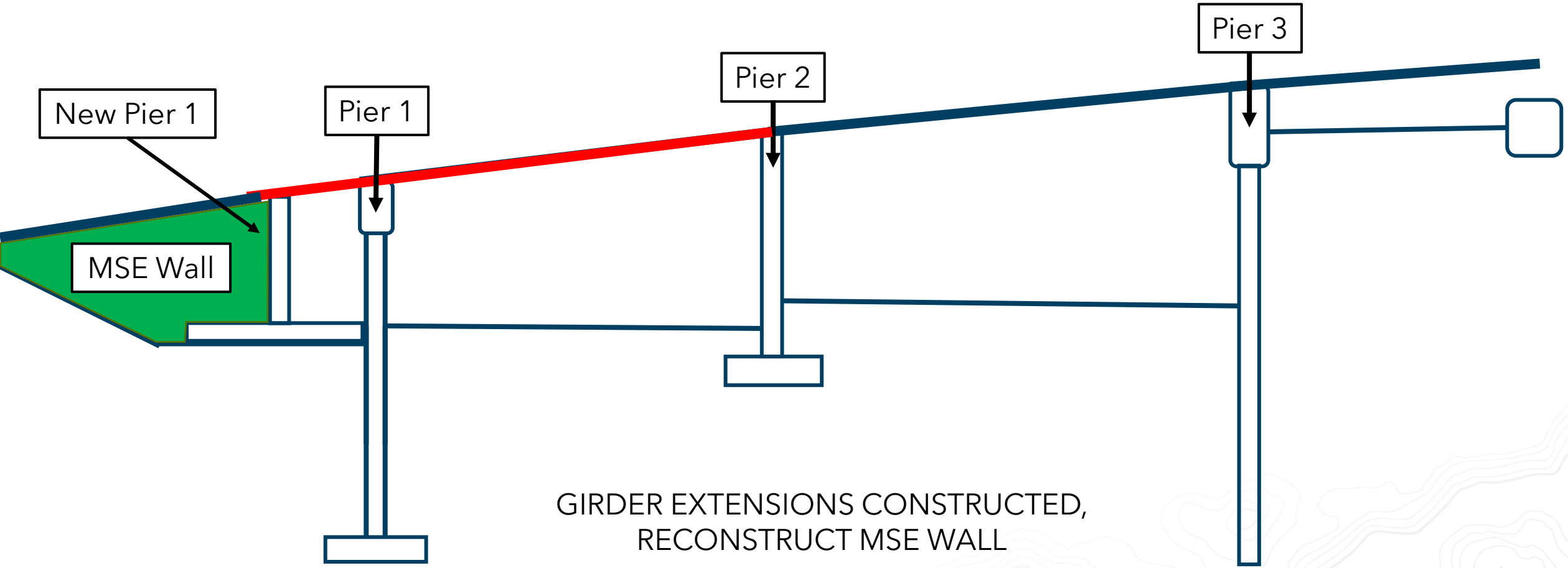
# Bridge 17.7 Delicate Construction Sequence

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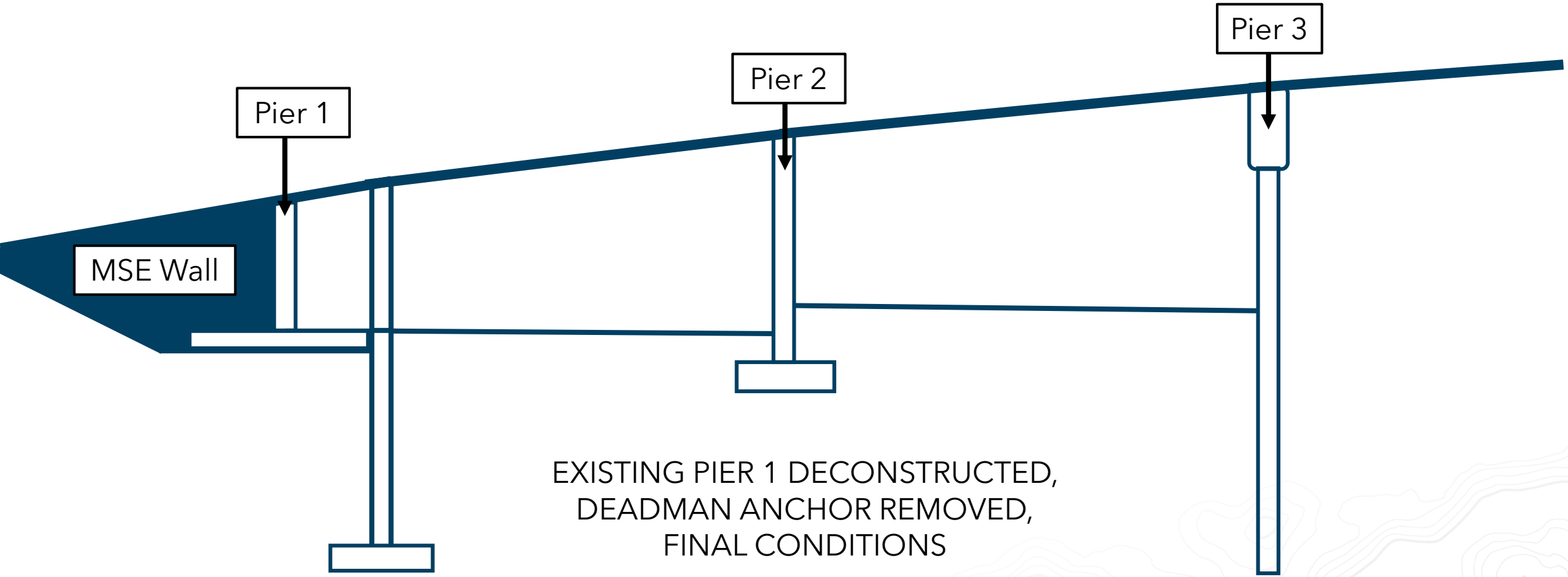


EXISTING PIER 1 DECONSTRUCTED,
DEADMAN ANCHOR REMOVED,
FINAL CONDITIONS

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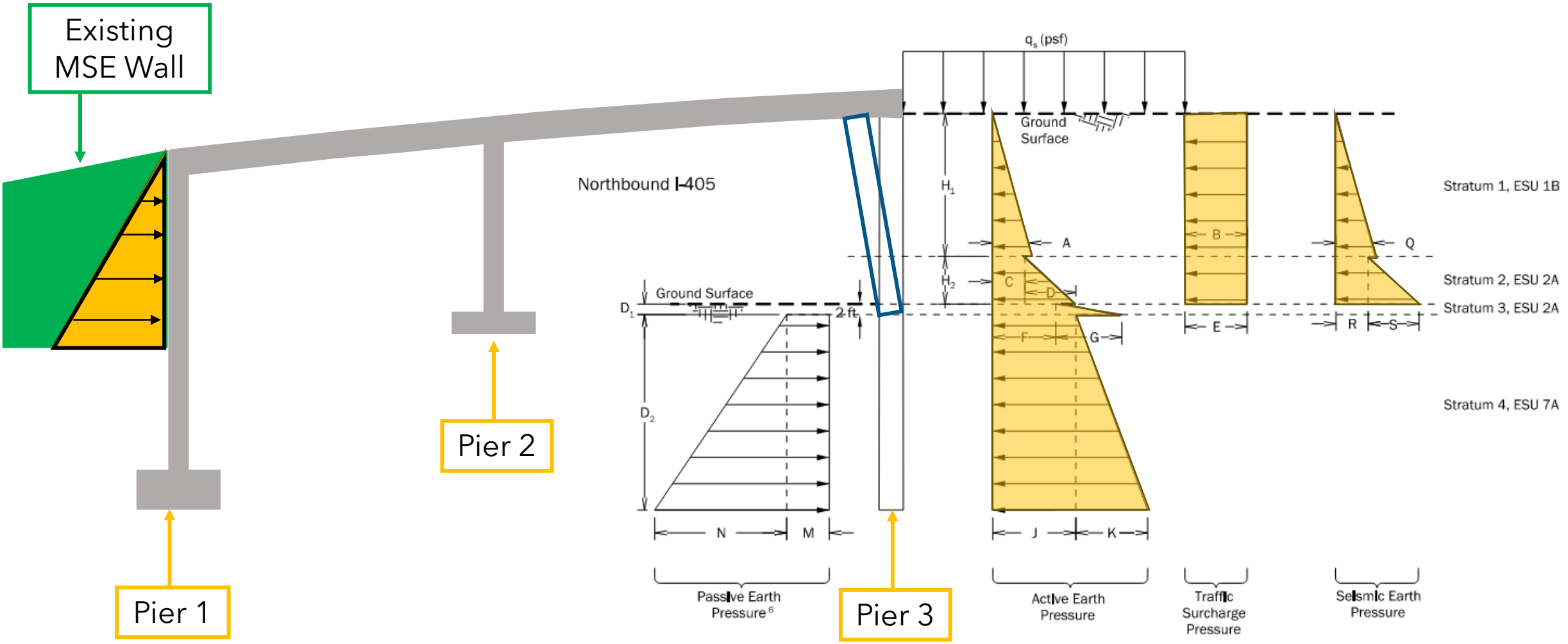
# Complication #2 – Locked in Loads at Pier 3



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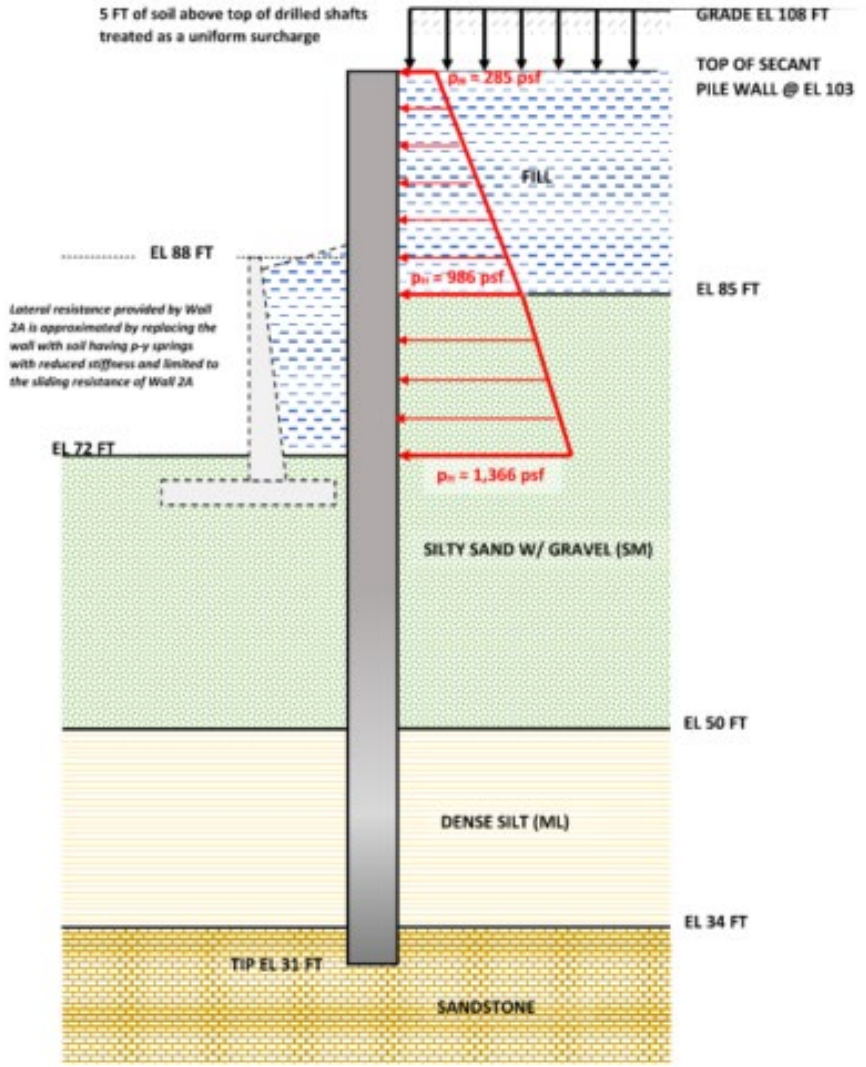
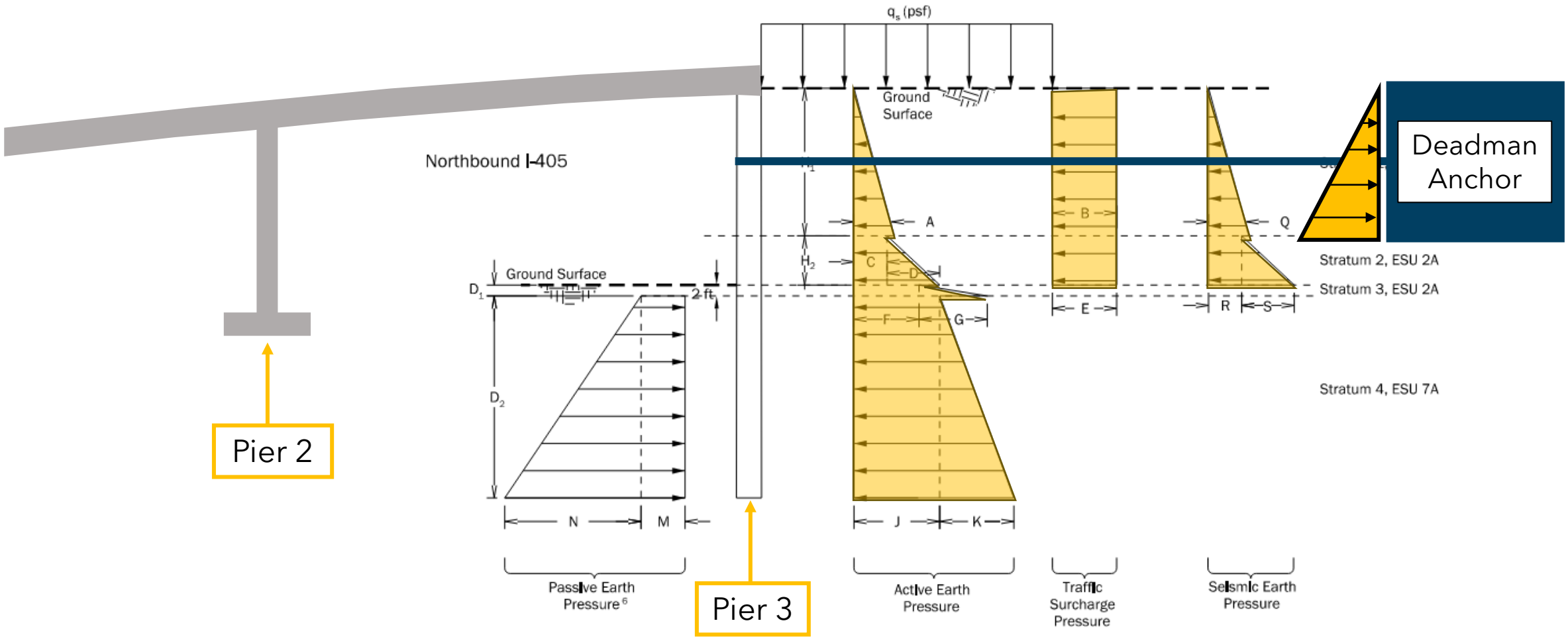


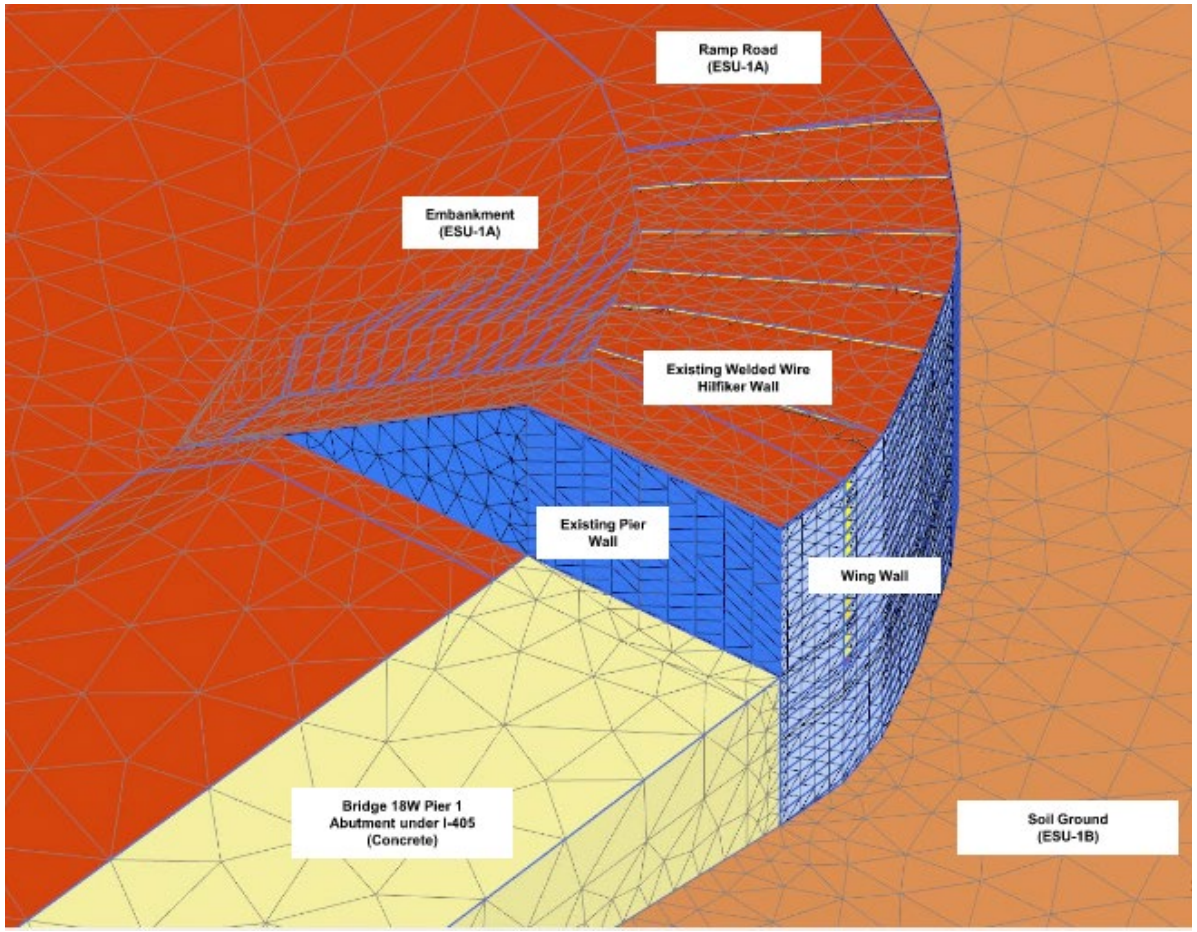

**Idealized profile of secant pile wall and subsurface conditions for analysis. Lateral earth pressures shown are unfactored and include active, surcharge, and live load surcharge.**

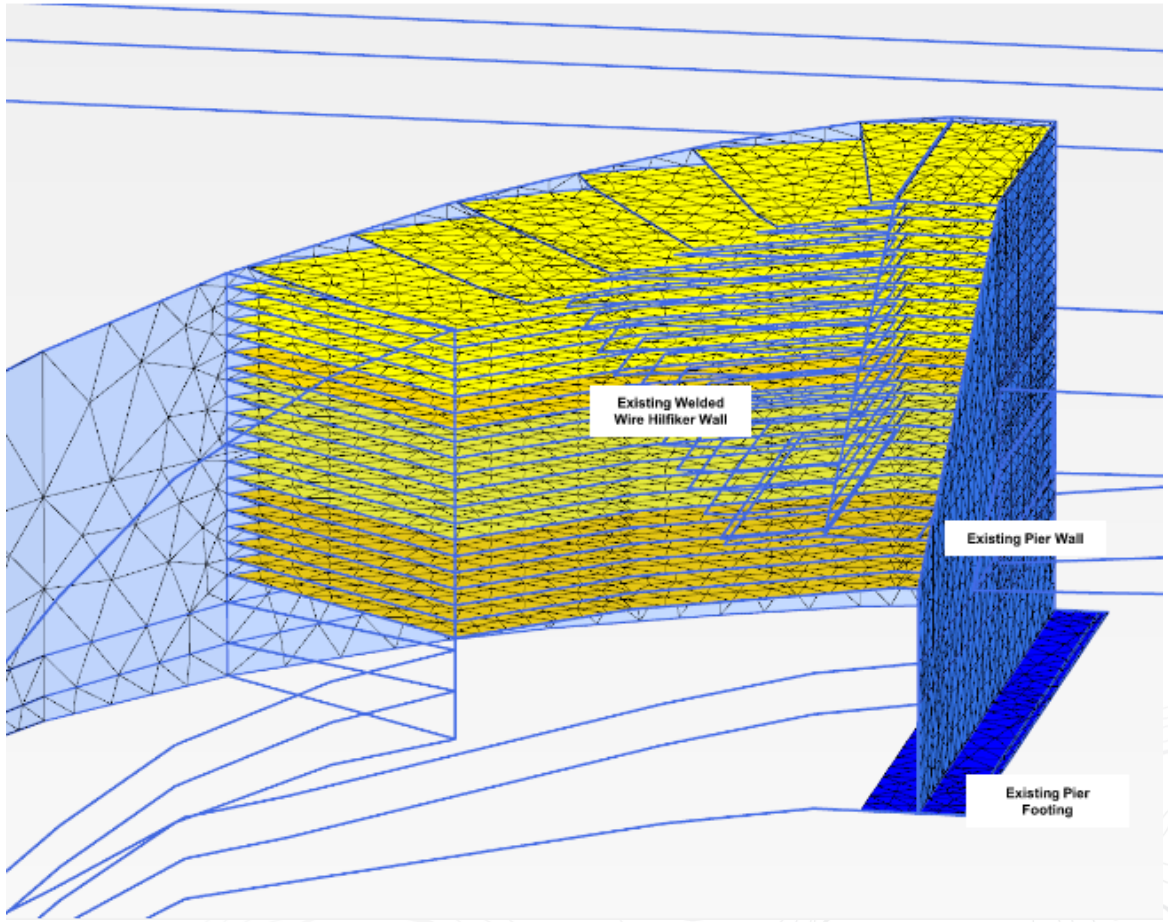
| Load Combination | Lateral Displacement (in.) |
|---|---|
| Service I | 5.80 |
| Extreme | 5.01 |

# Complication #2 – Locked in Loads at Pier 3



# Complication #3 – FEM




EXISTING CONDITIONS

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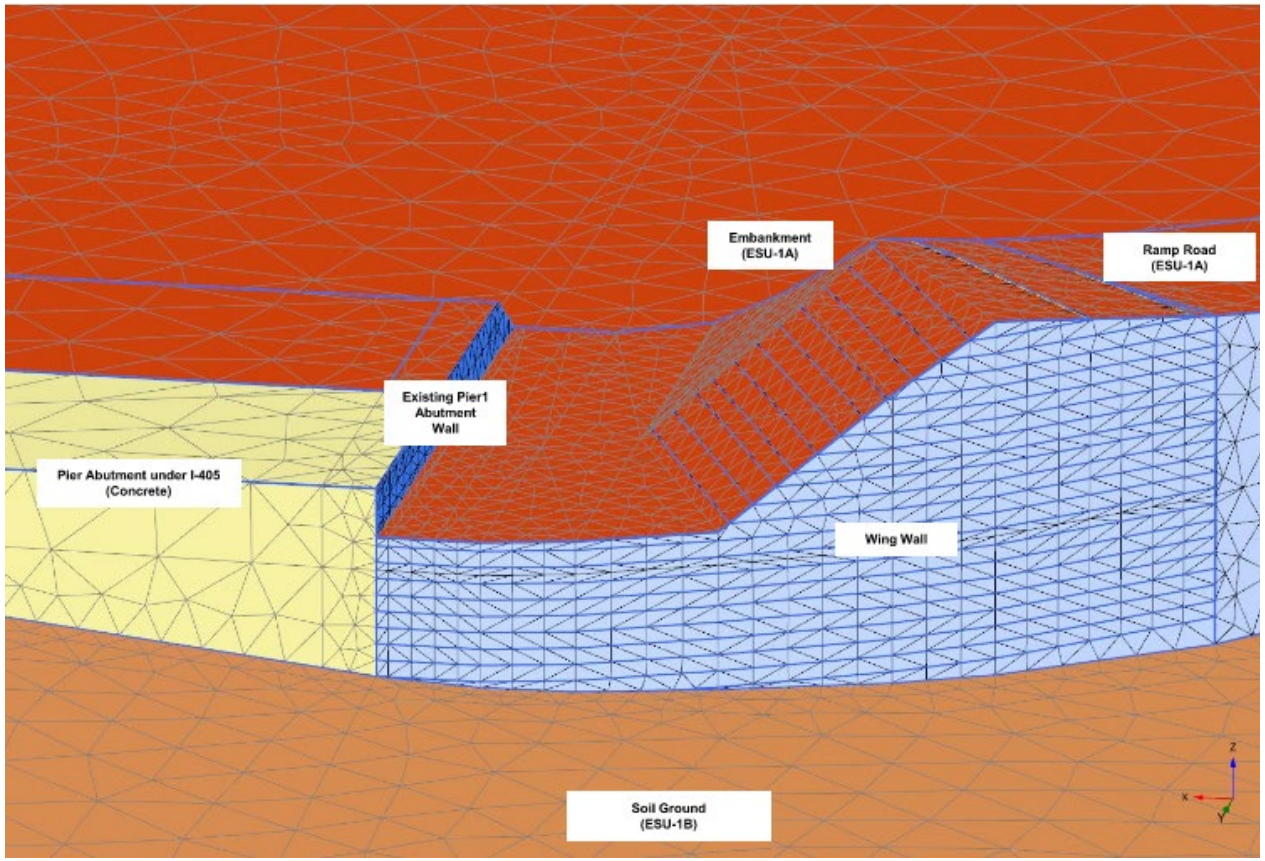
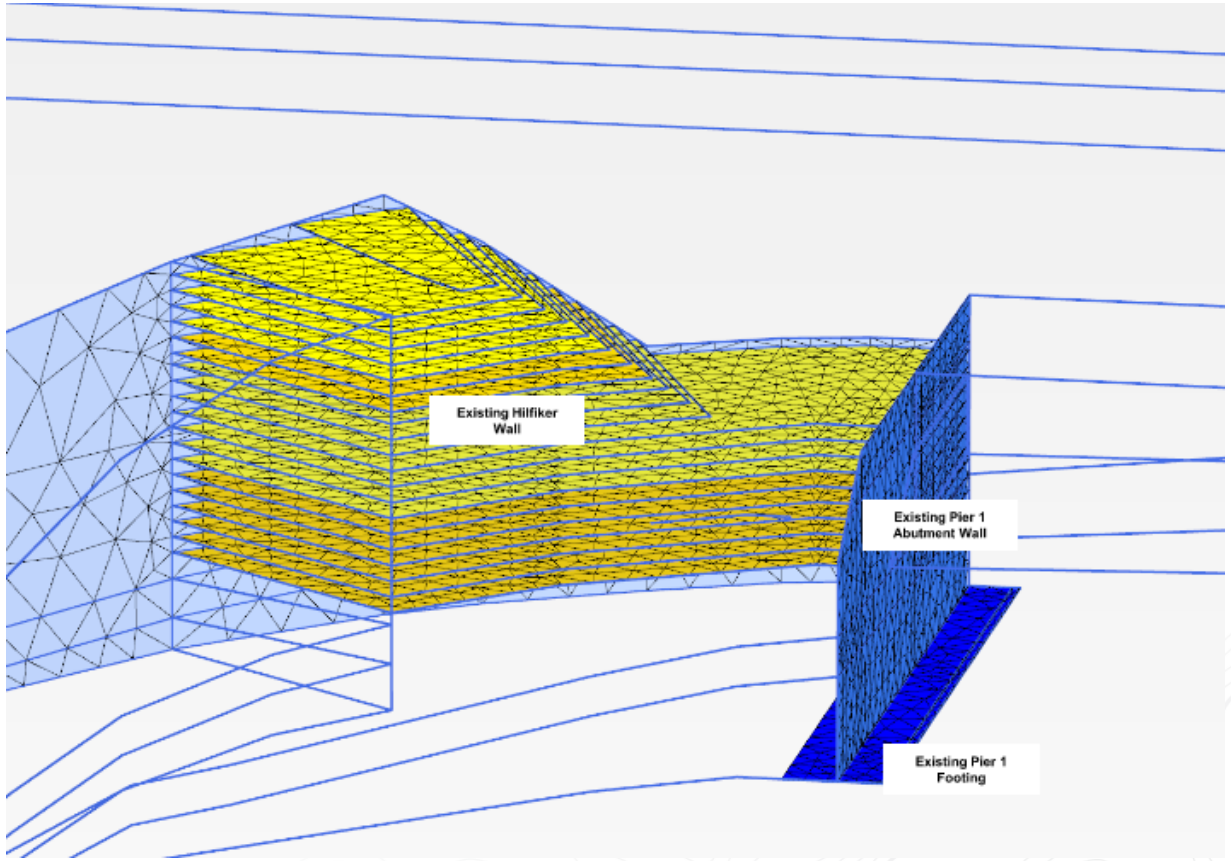
# Complication #3 – FEM




EXCAVATION CONDITIONS

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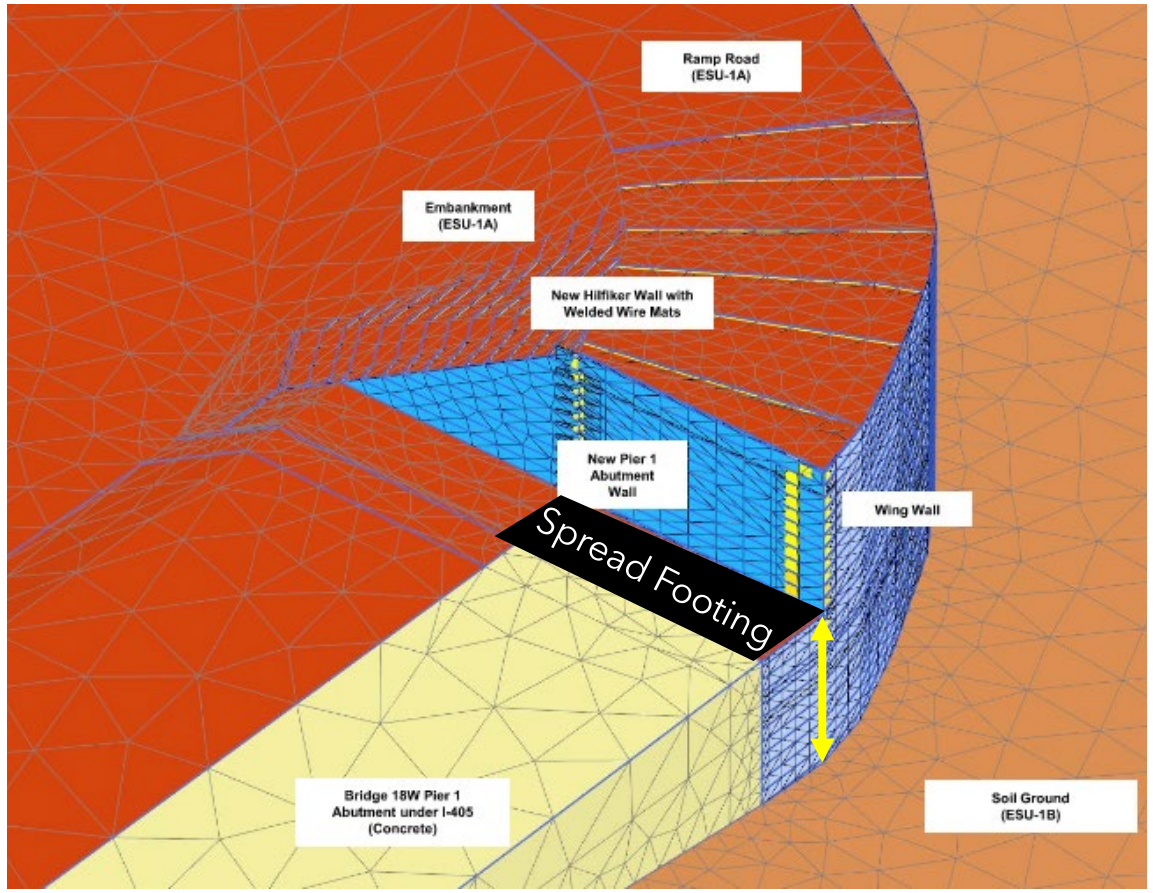
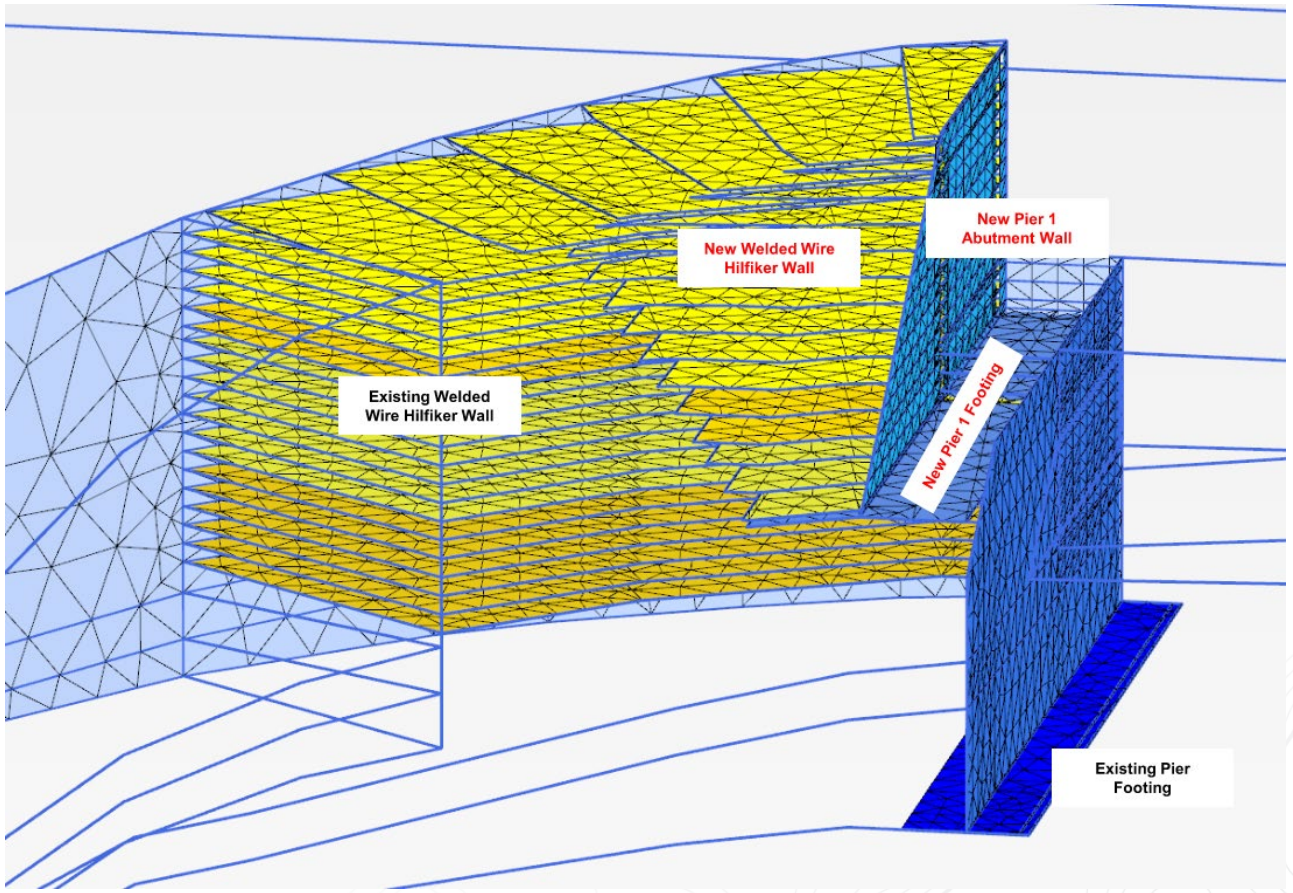
# Complication #3 – FEM




NEW PIER 1 CONDITIONS

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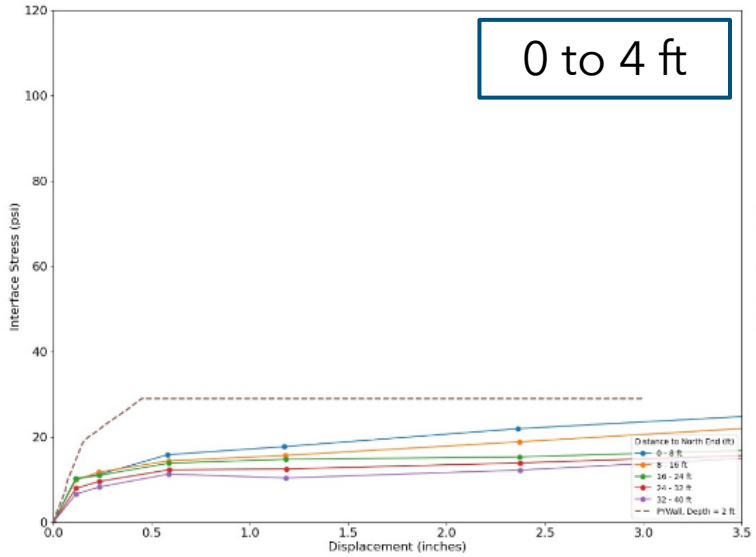
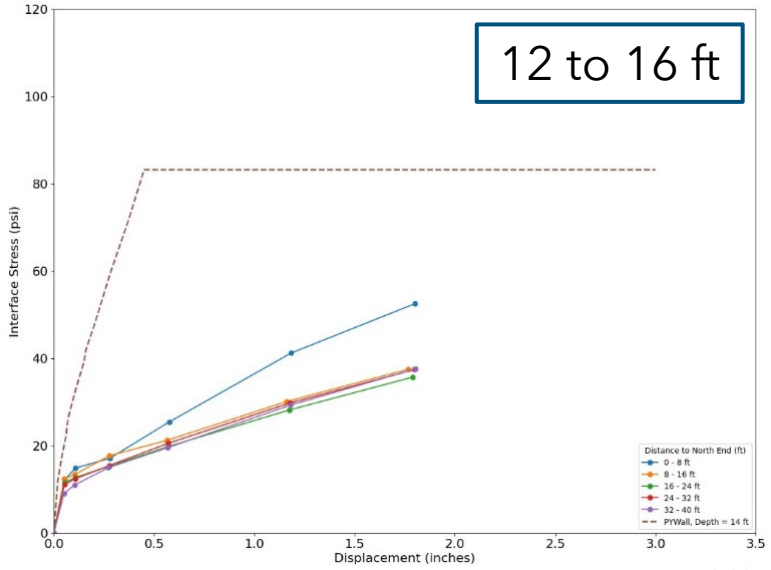
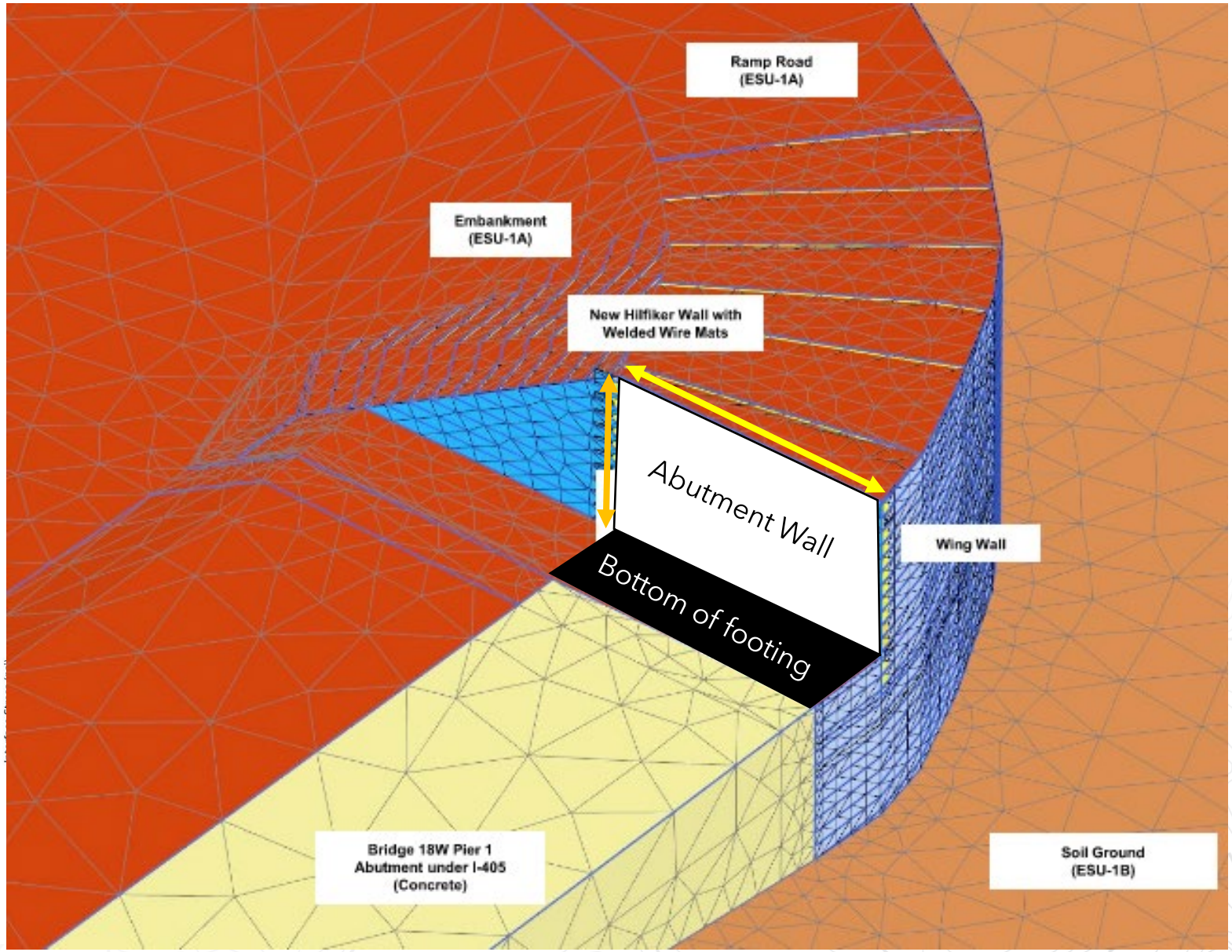
# Complication #3 – FEM Spring Results



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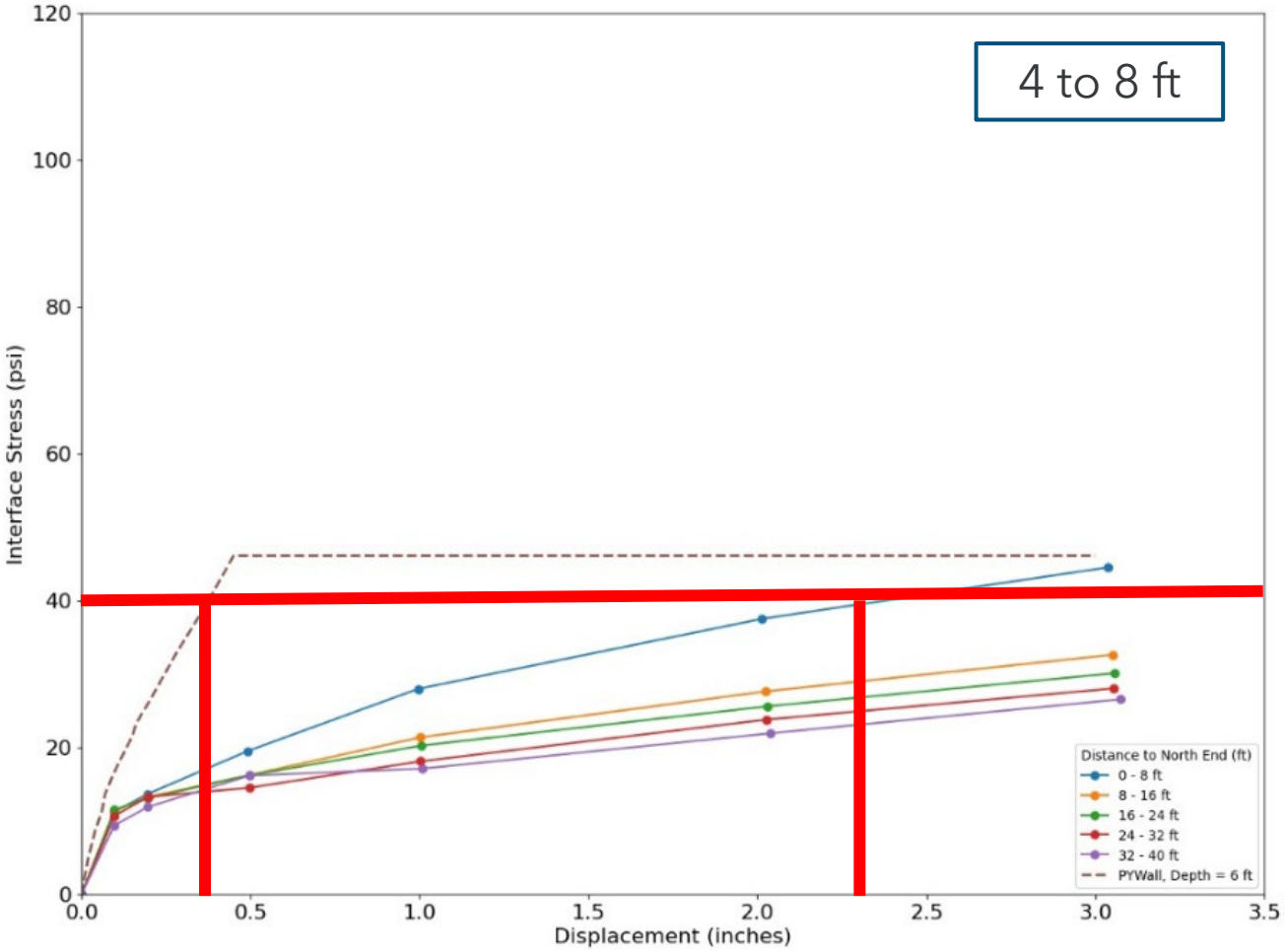
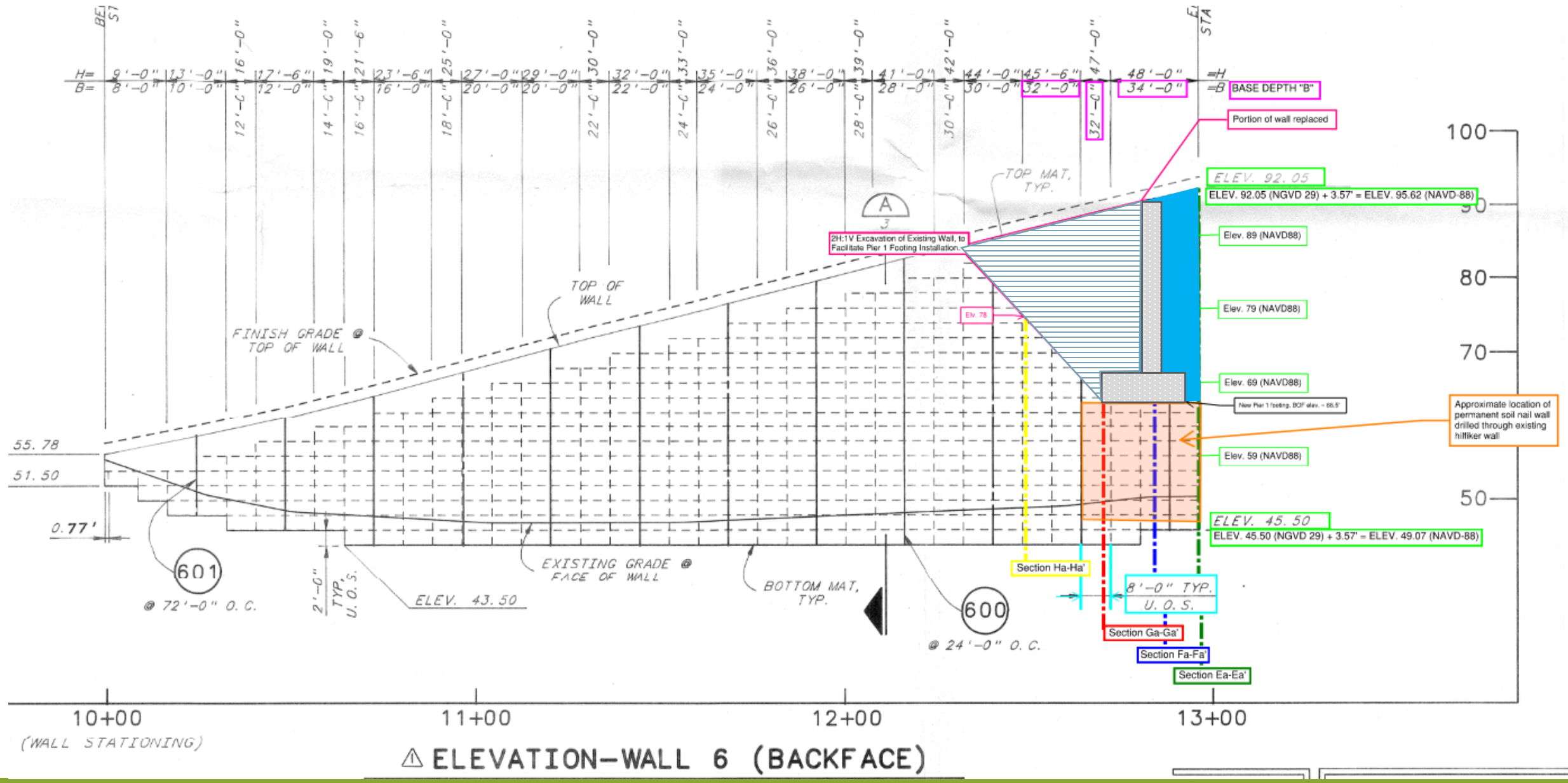
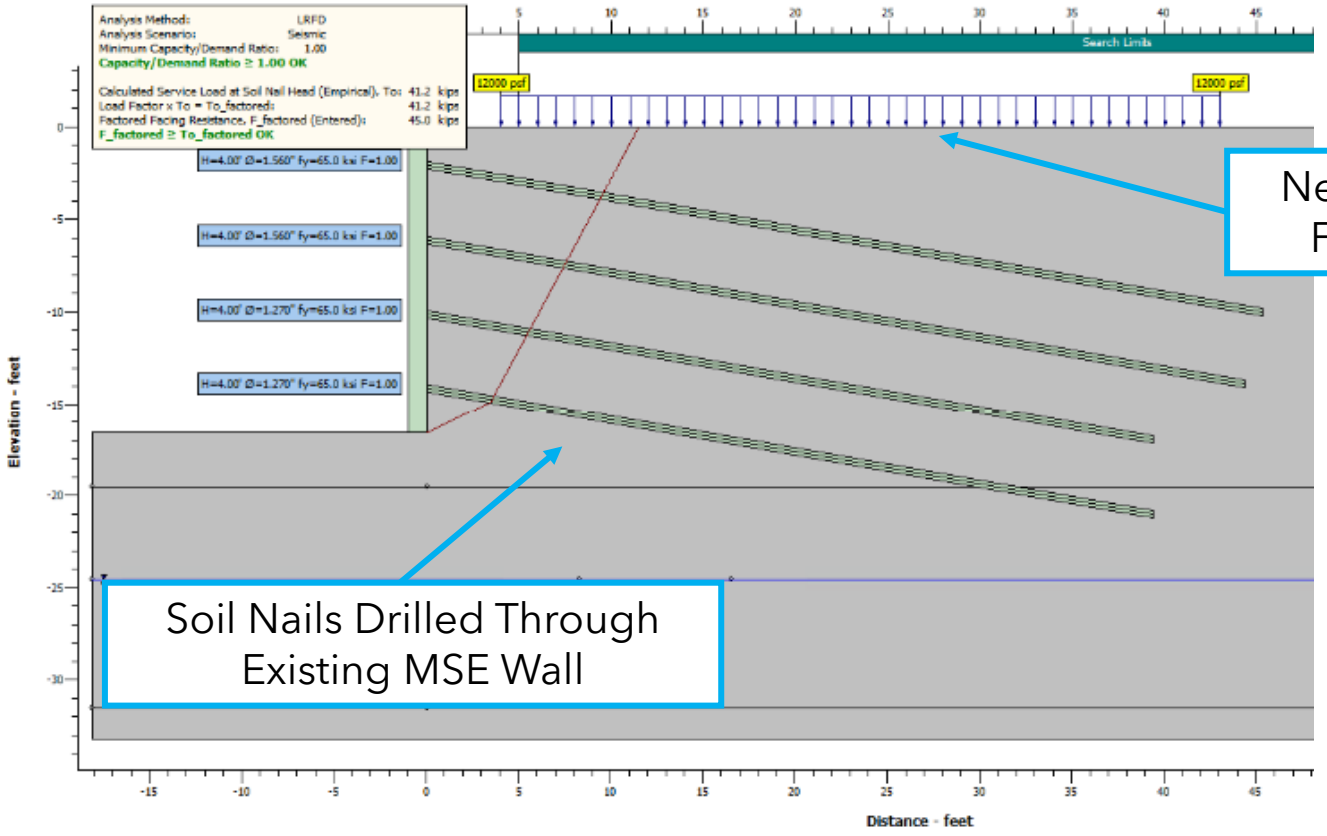



| Interface Stress **40 psi** | Displacement (in.) | Difference |
|---|---|---|
| Pywall | 0.4 | **≈400%** |
| FEM | > 2.0 | |

# Complication #4 – Pier 1 Bearing on Existing MSE Wall

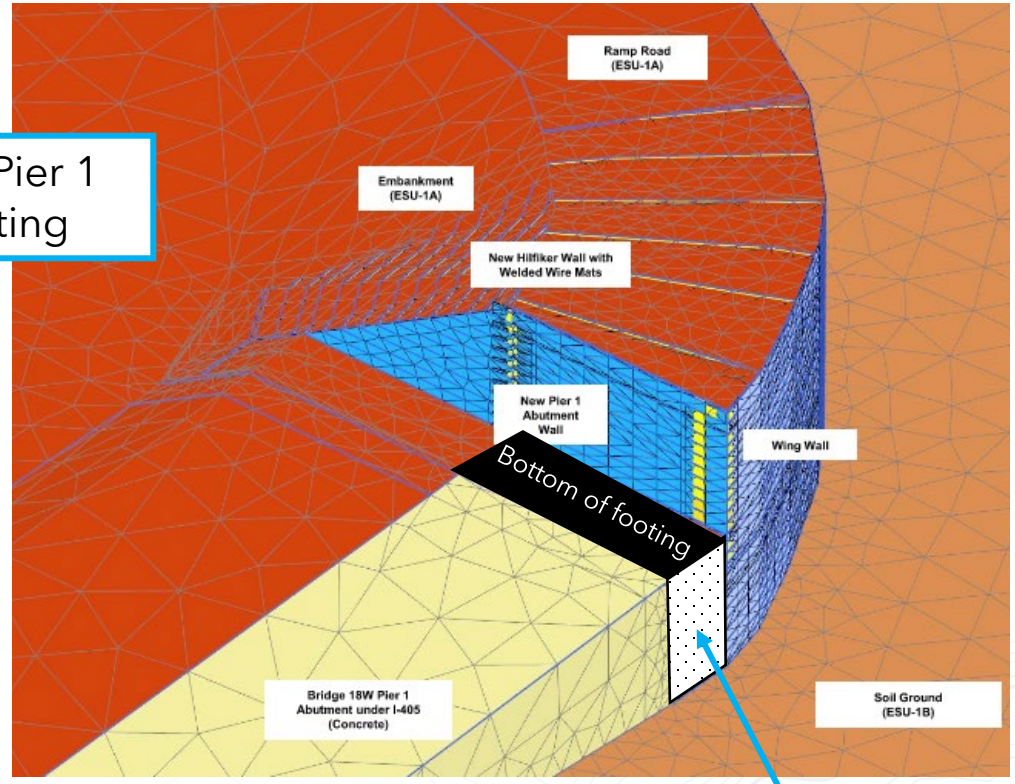


# Bridge 17.7 Complication #4 – Pier 1 Bearing on Existing MSE Wall




New Pier 1 Footing

Soil Nails Drilled Through Existing MSE Wall




Soil Nails Drilled Through Existing MSE Wall

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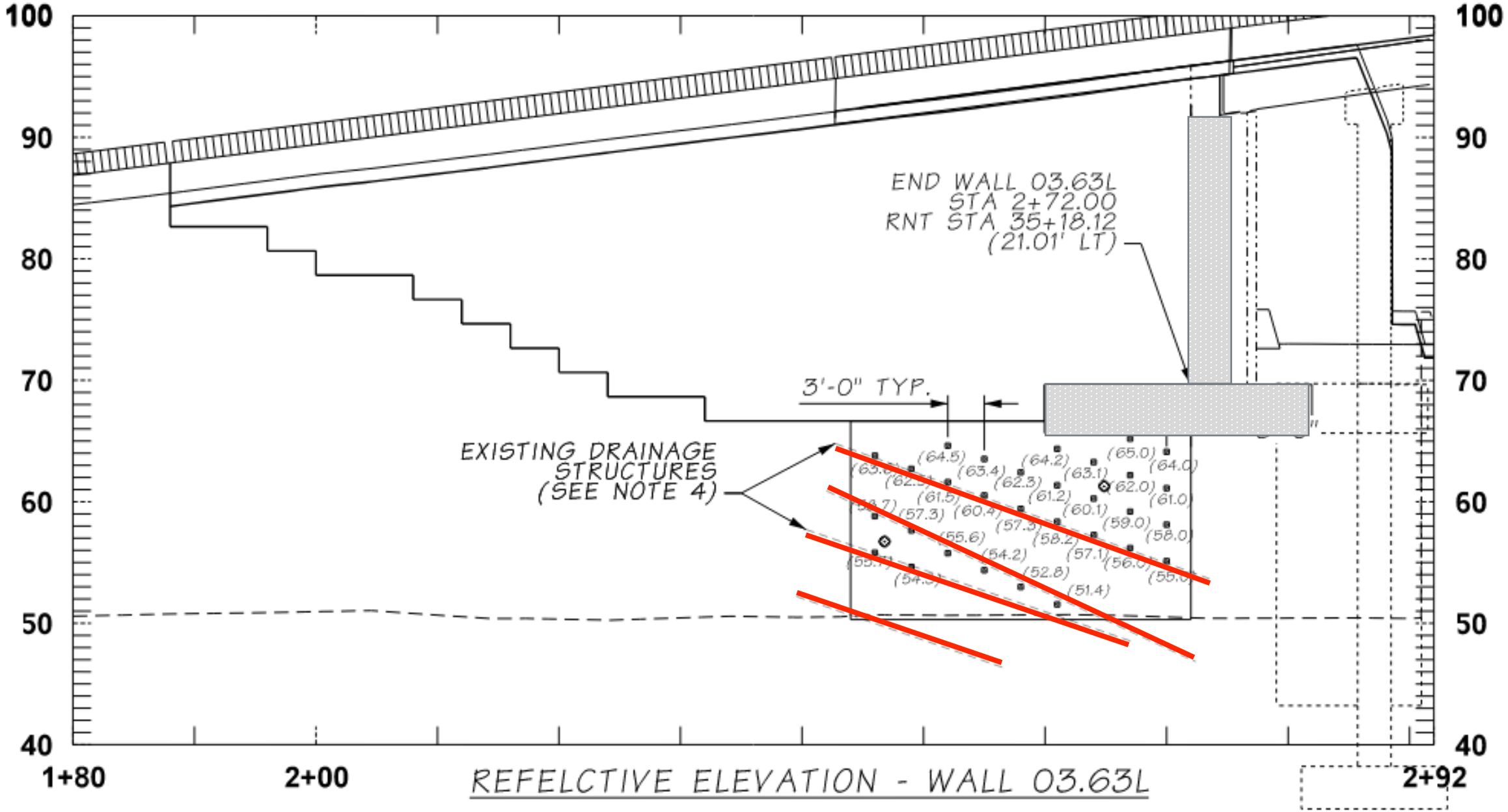
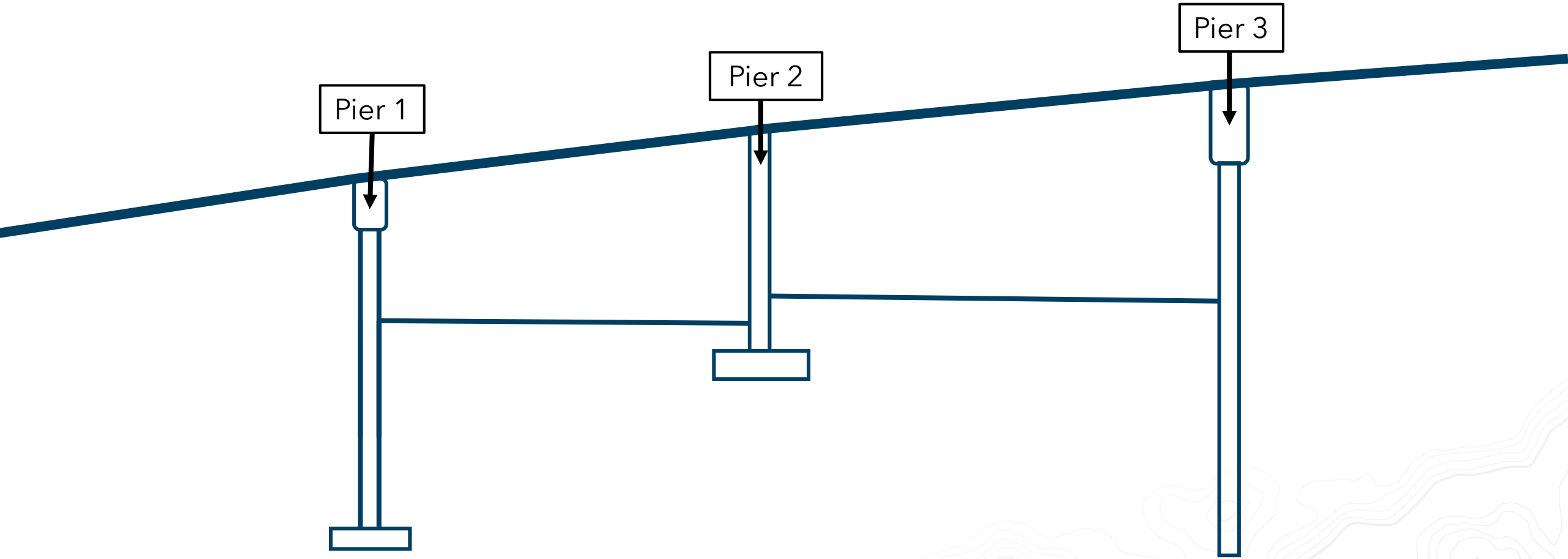
# Complication #5 – Soil Nail Wall Layout




SOIL NAIL WALL

# Bridge 17.7 – Existing Conditions

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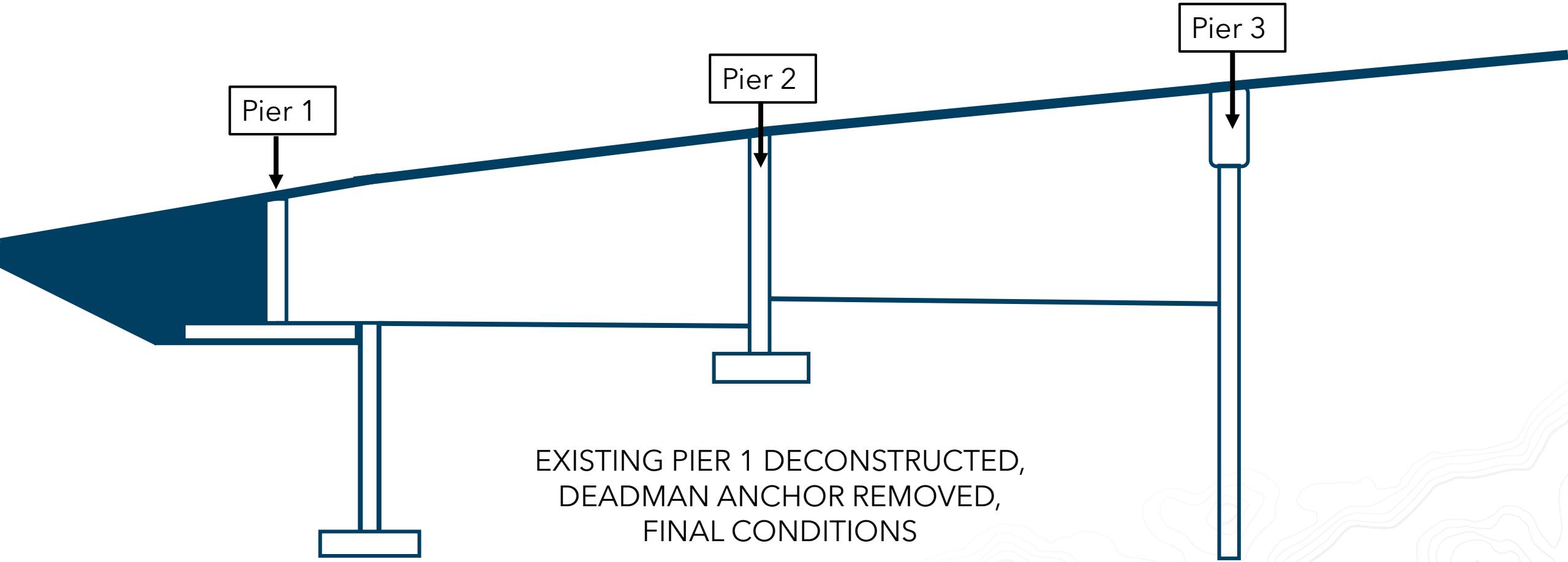
# Bridge 17.7 – Final Design




EXISTING PIER 1 DECONSTRUCTED,
DEADMAN ANCHOR REMOVED,
FINAL CONDITIONS

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contact info

QUESTIONS