



# Earth Retention is a Team Sport Progressive Protein

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[haywardbaker.com](http://haywardbaker.com)



# Speaker

- **Phillip Gallet, P.E. – Project Manager**
  - Grew up in a soils lab
  - 8 Years at Hayward Baker Inc, Dallas/Ft. Worth to Denver, CO





**Goal: Zero Injuries**

*All accidents  
are preventable*

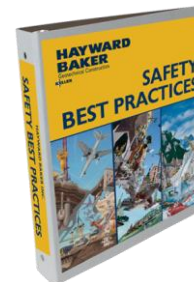
*No repeat  
occurrences*

*Safety  
Standards*

*Job site Daily Task Analysis  
Meeting to review safety issues  
related to the day's tasks.*

*All Incidents investigated,  
corrective actions implemented  
and shared in the Weekly  
Safety Update for awareness.*

*Safety  
Standards  
Document*





THINK SAFE

WORK SAFE

GO HOME SAFE



# Don't be this guy!

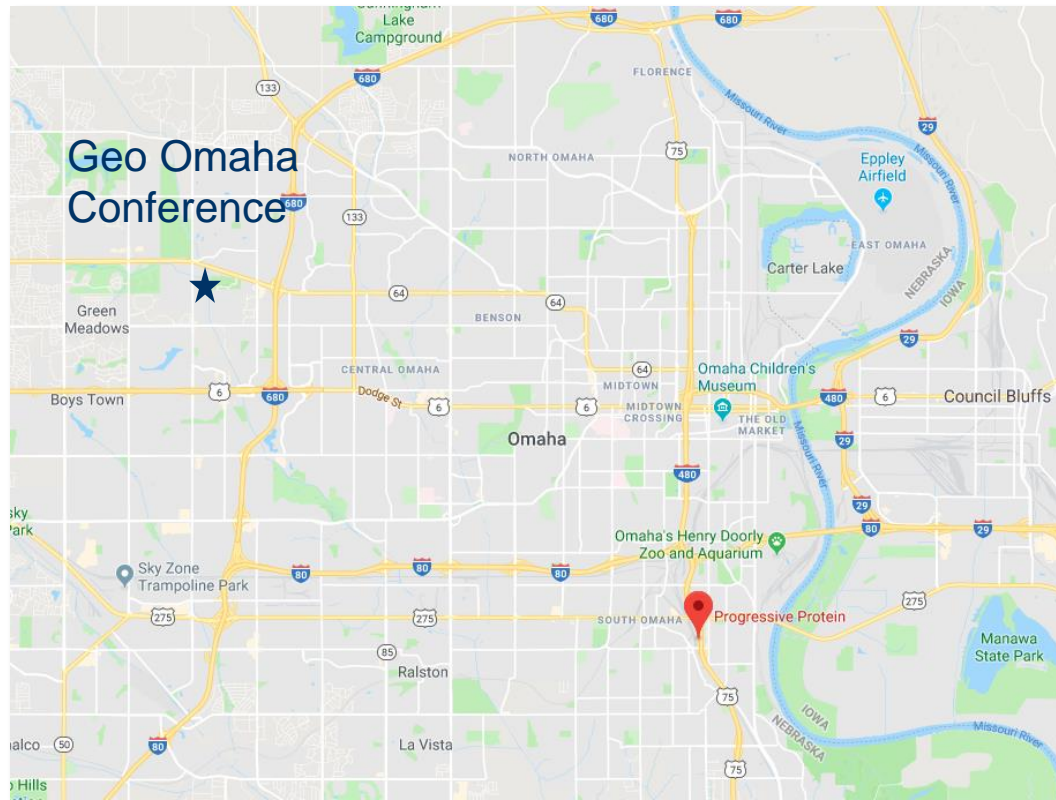


# Progressive Protein

- Originally Built in 1920's ~ 1930's?
- Additions / Reservations have been made as process is modified



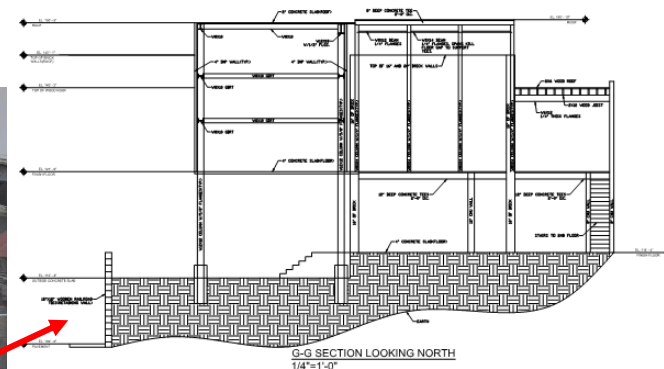








# Proposed addition includes removal of existing wood crib wall

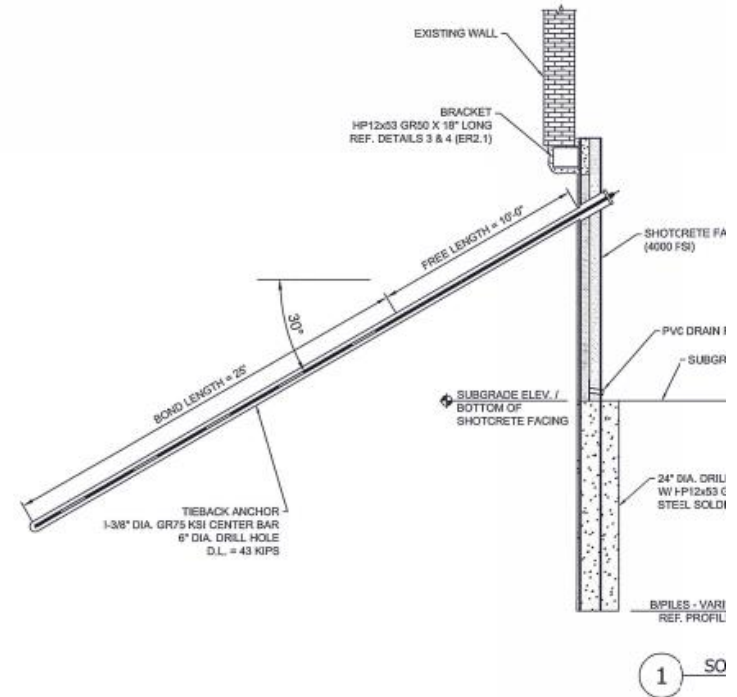
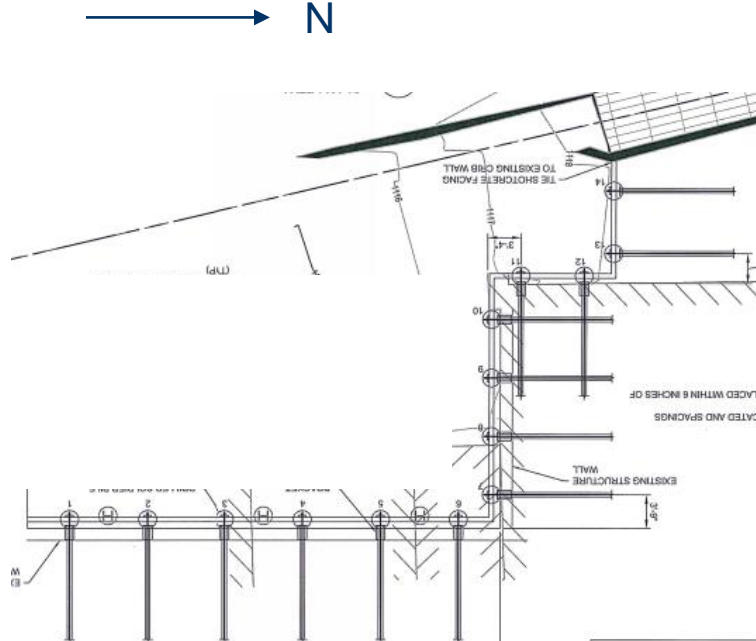


# Initial Scope

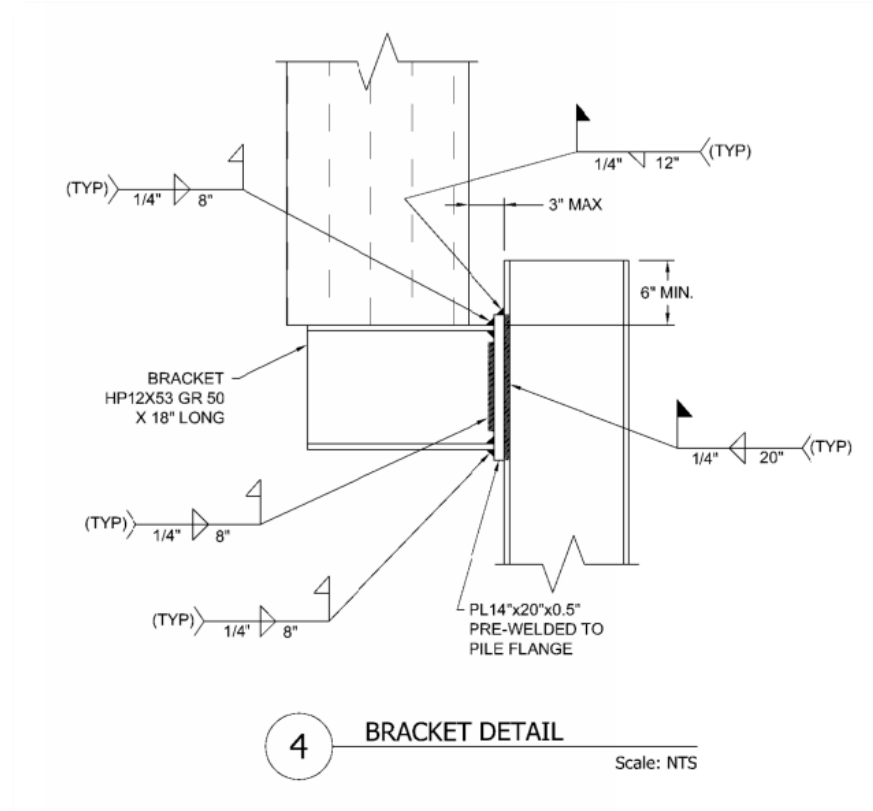
- Underpin existing structure
- Provide permanent earth retention for 17ft excavation
- Remove existing wood crib wall



# Design for Anchored Soldier Pile Wall



# Underpinning Bracket



# Problem #1

What are these counterforts doing here?

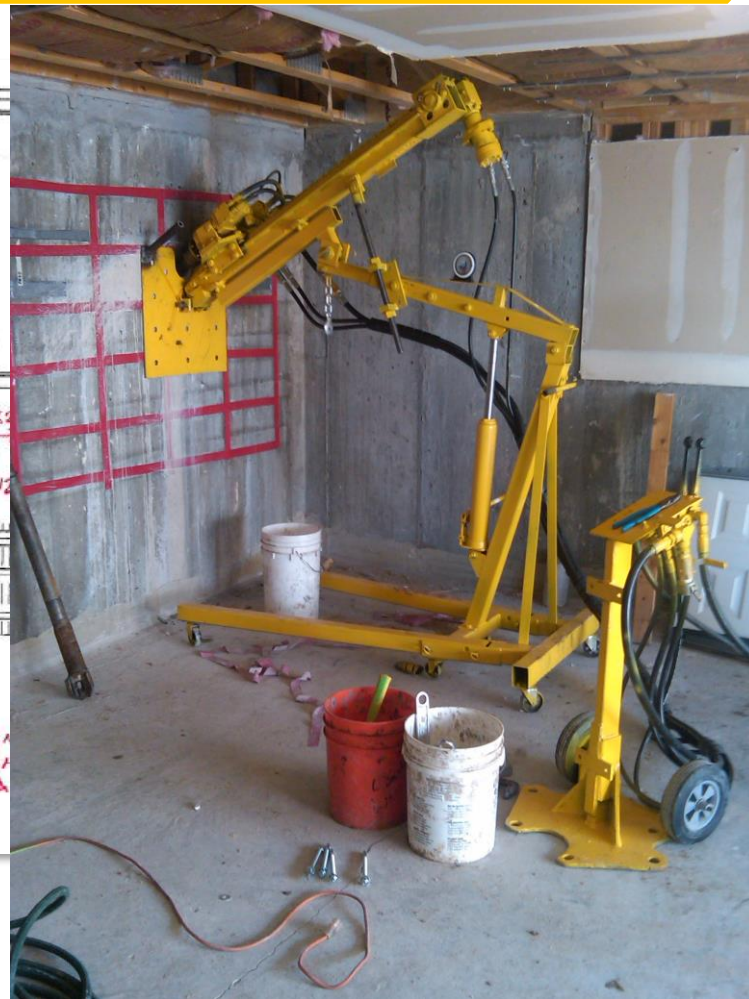
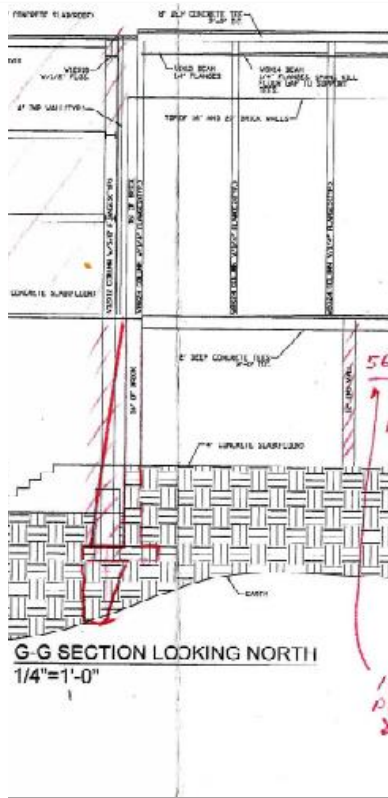
- 1<sup>st</sup> round of demolition uncovered unexpected counterforts





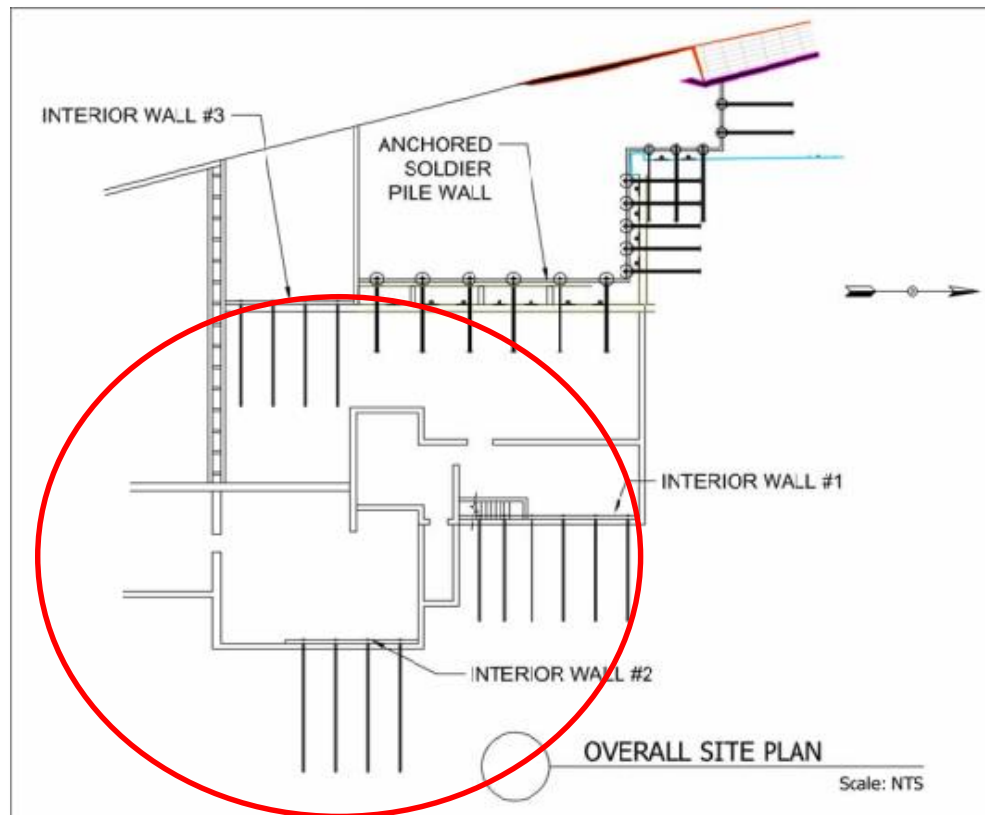
## Changes that Counterforts required:

1. Add tie-backs to inside structure
2. Soldier Beams can no longer support wall – Add micropiles

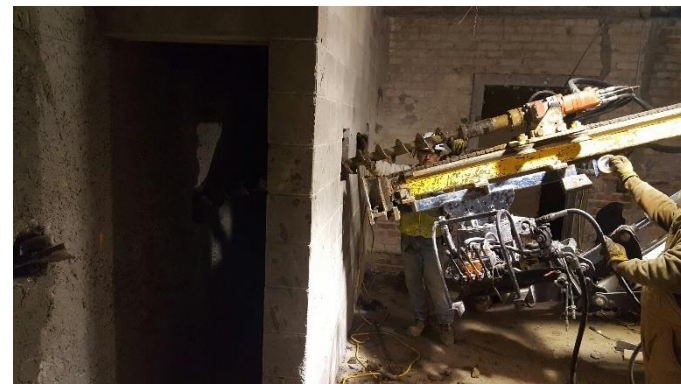
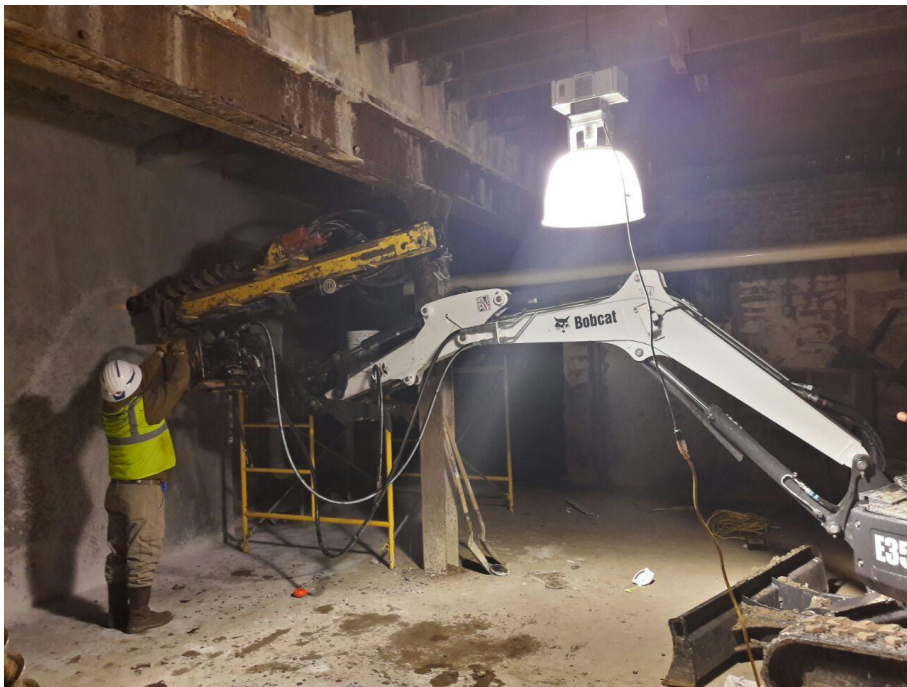


# Interior Tie-backs

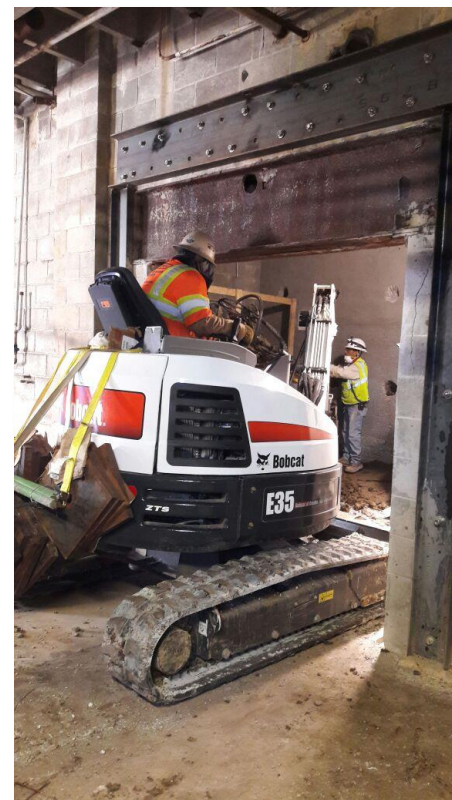
- To address lateral load imbalance HBI installed Tie-Backs inside the structure



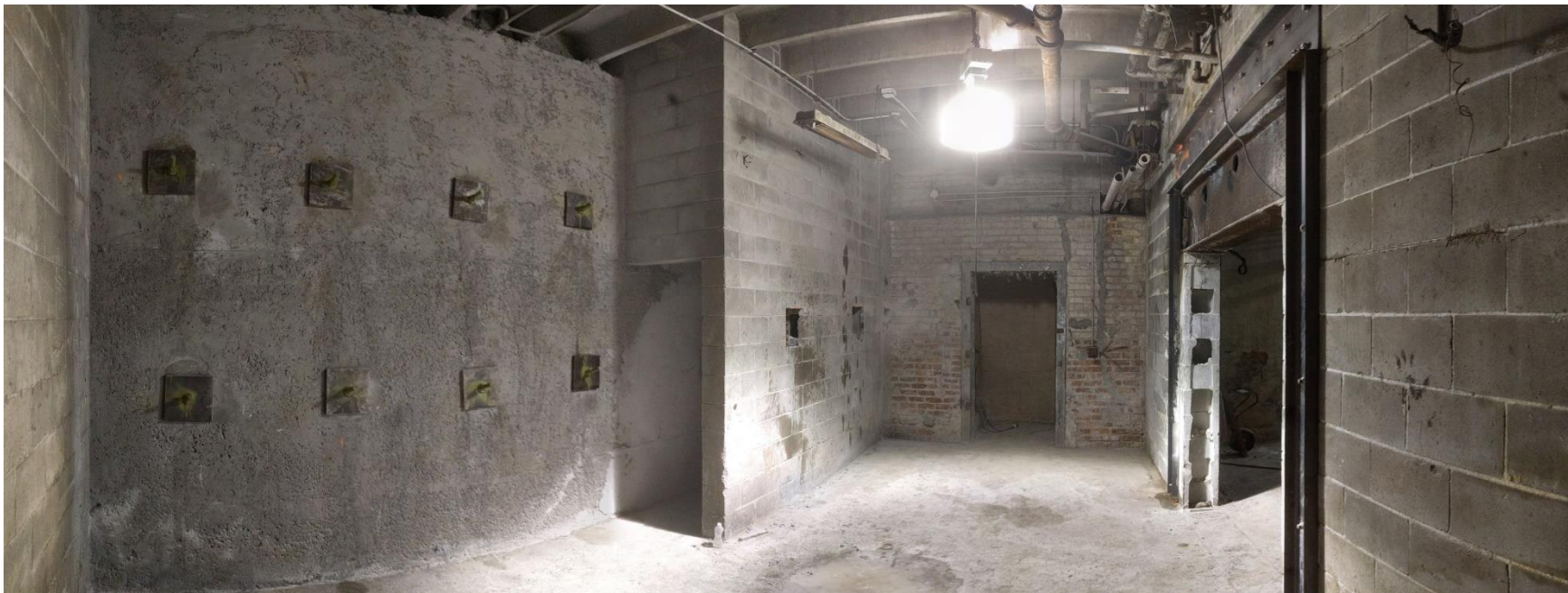
# Tight Access: No Problem



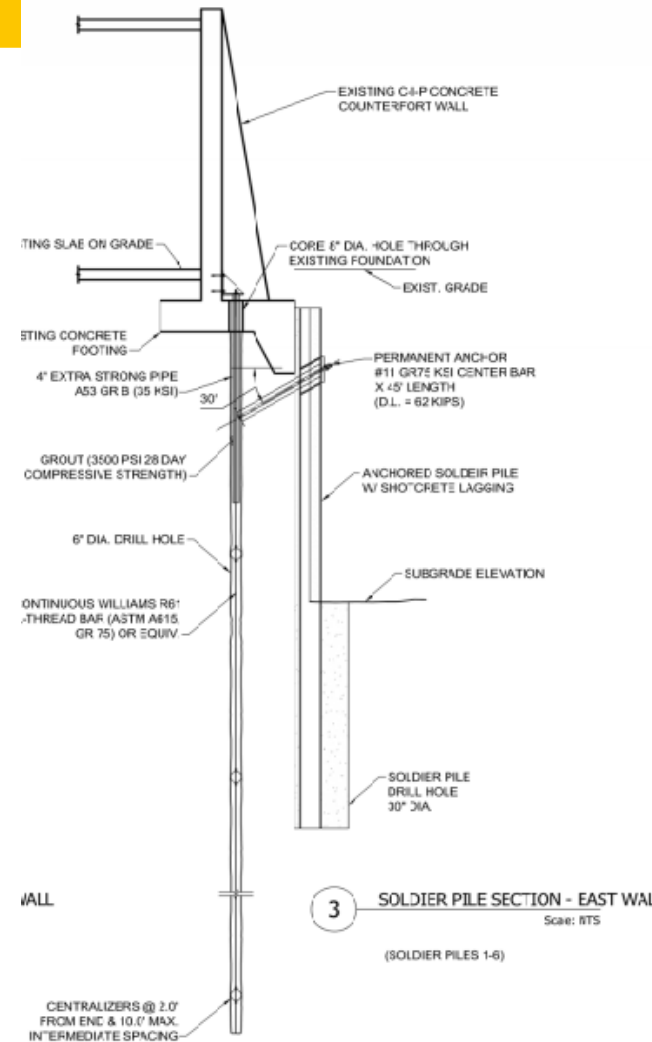
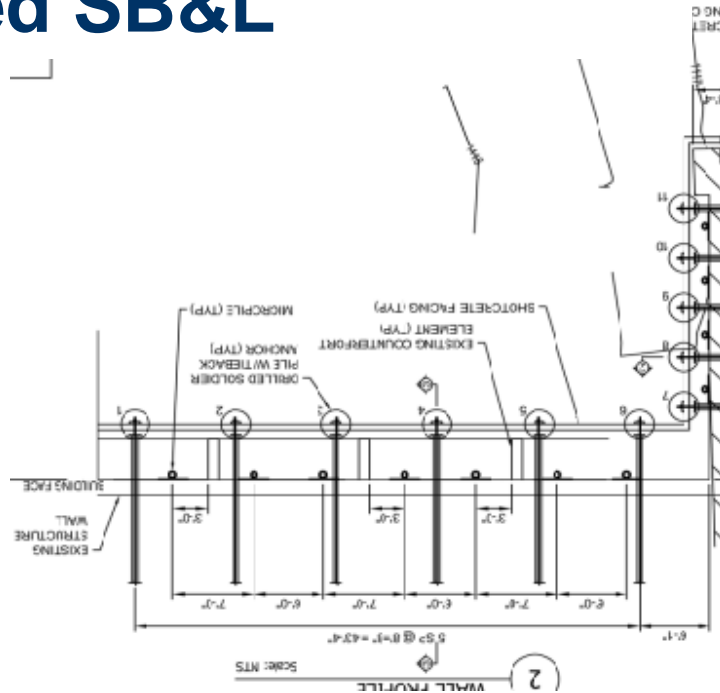
- Soil Nails installed to handle lateral imbalance
- Installed in as little as 9ft headroom with mini-excavator mounted drill





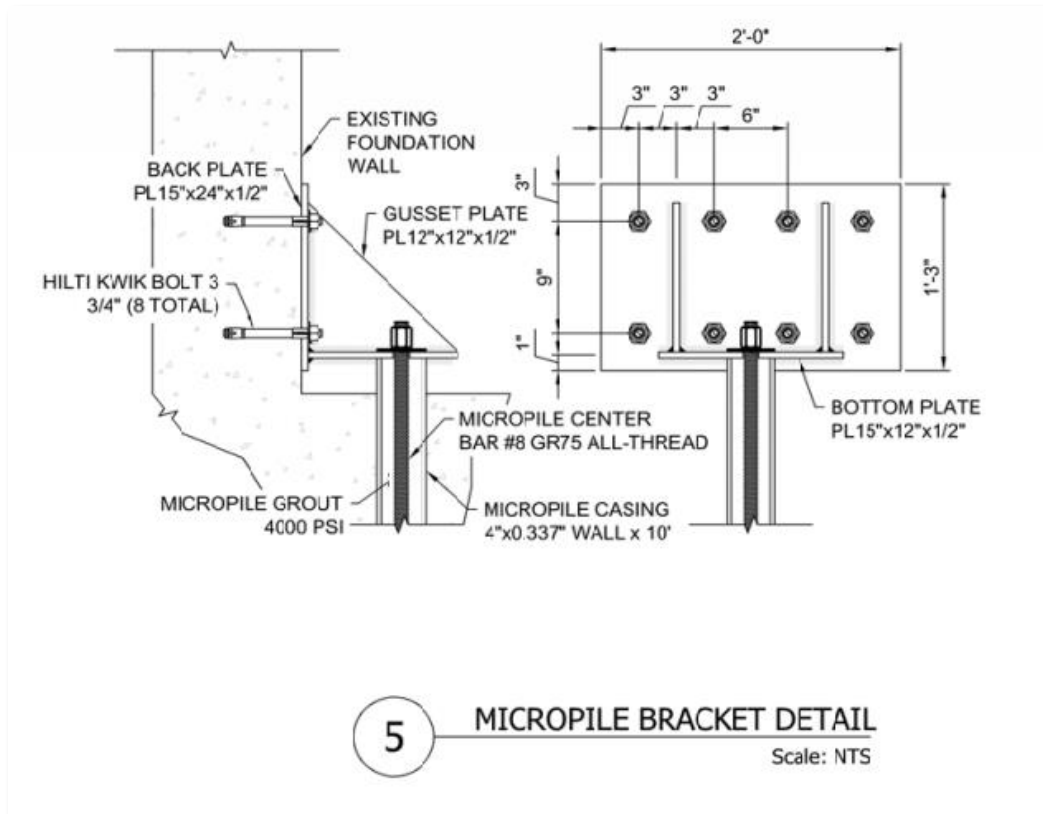


# Modifying East Wall Anchored SB&L



# Micropiles

- Soldier Beams could no longer brace the footing
- Installed micropiles to underpin existing footing



# Micropiles

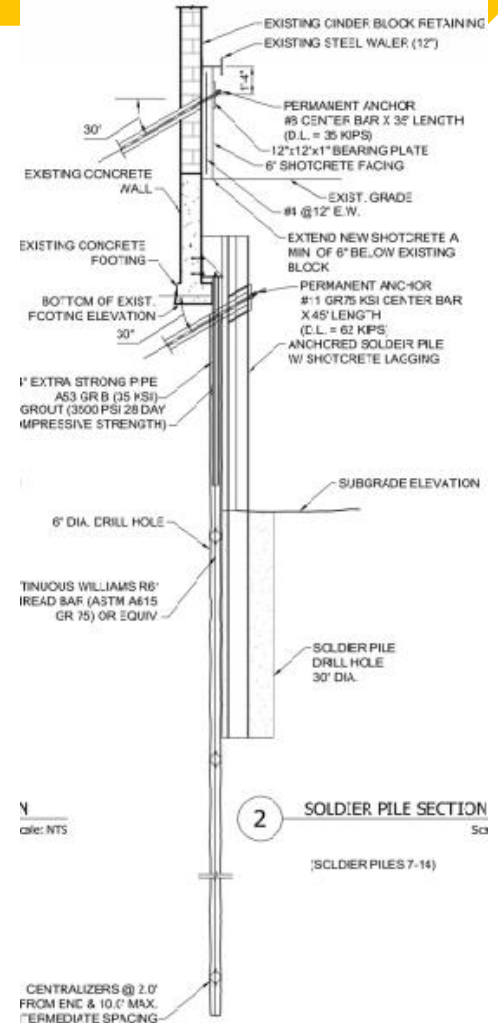
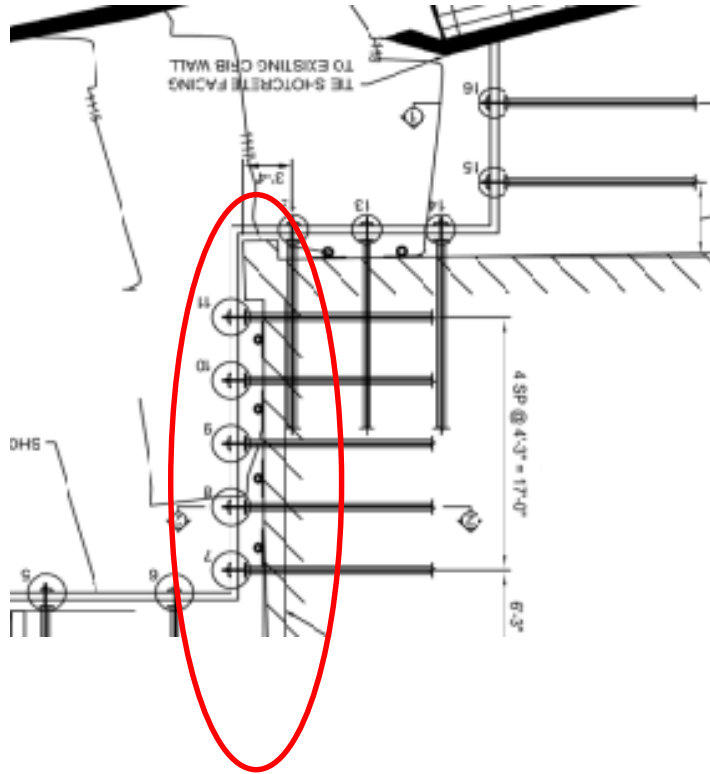
- Soldier Beams could no longer brace the footing
- Installed micropiles to underpin existing footing



# Drilling the Soldier Piles



# North Wall Started to move during initial excavation



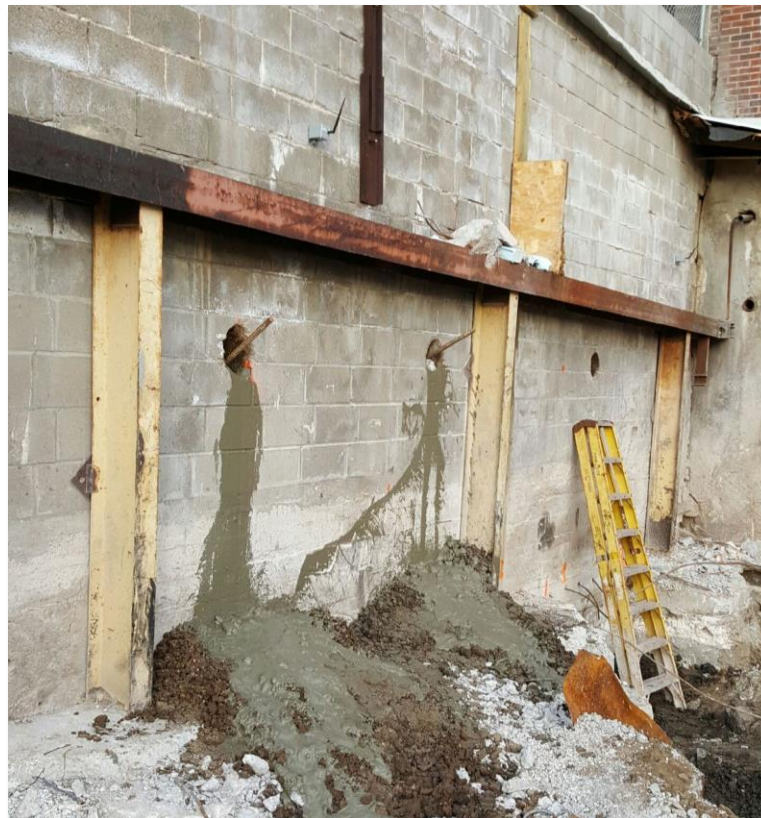
# Failing wall with soil on backside

- Five (5') feet of soil with slab stressing existing wall
- Wall previously fixed
- Started to move during initial excavation
- Installed tilt monitoring



# Anchors to support wall

- Installed through CMU wall into fill material
- Shotcrete lagging between installed anchors



# Installed Anchors and Micropiles



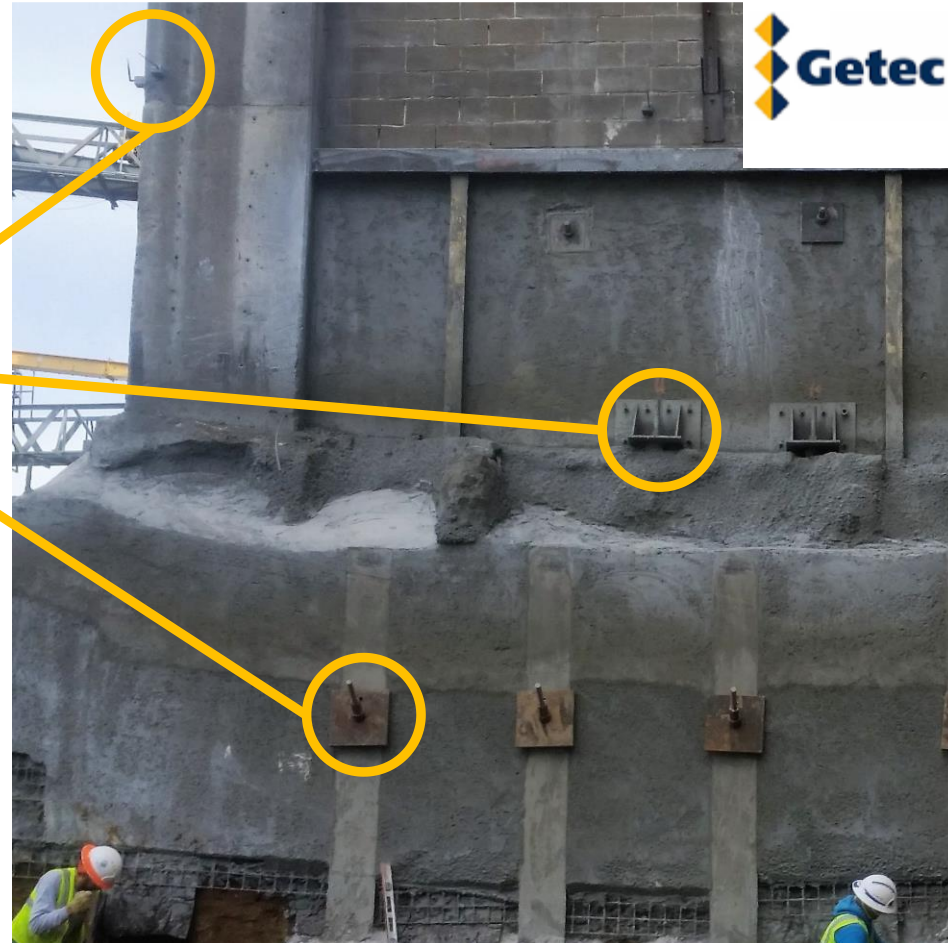
# Real Time Monitoring

- Getec (now Geo-Instruments) installed tilt monitors for real-time monitoring

Tilt Monitors

Micropiles

Anchors

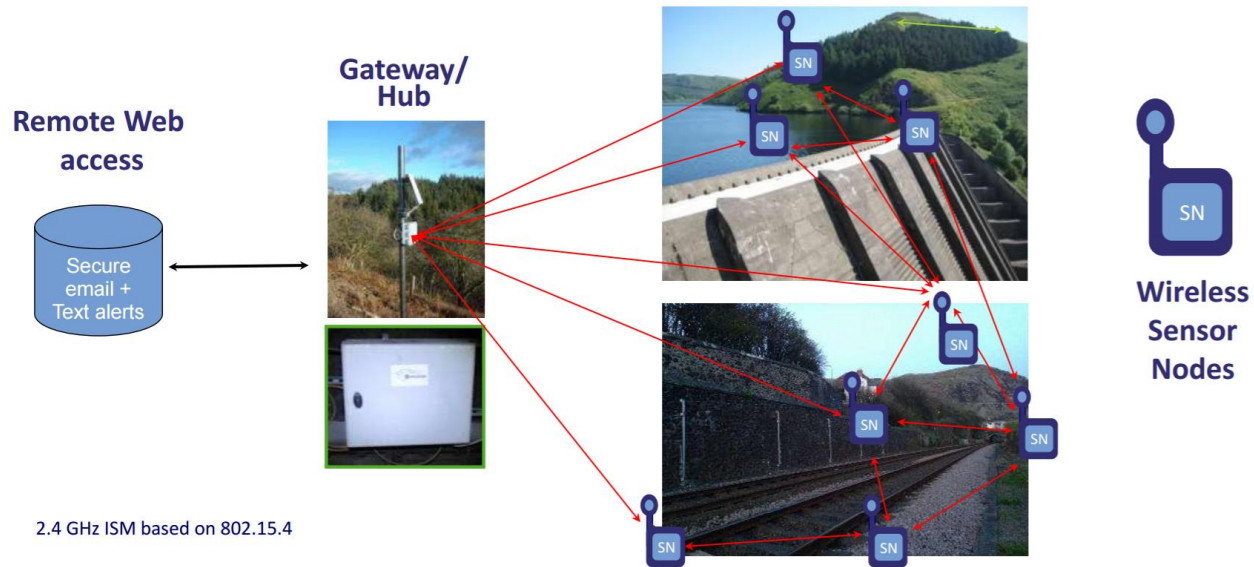


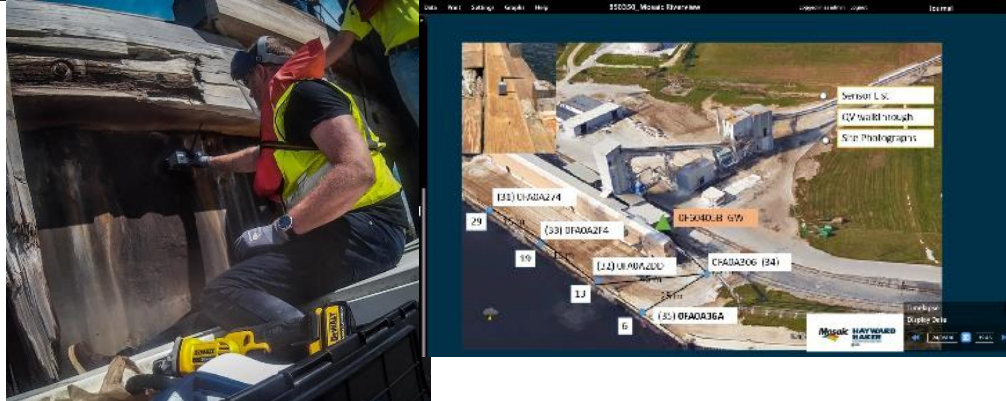
# Wireless Biaxial Tilt Nodes



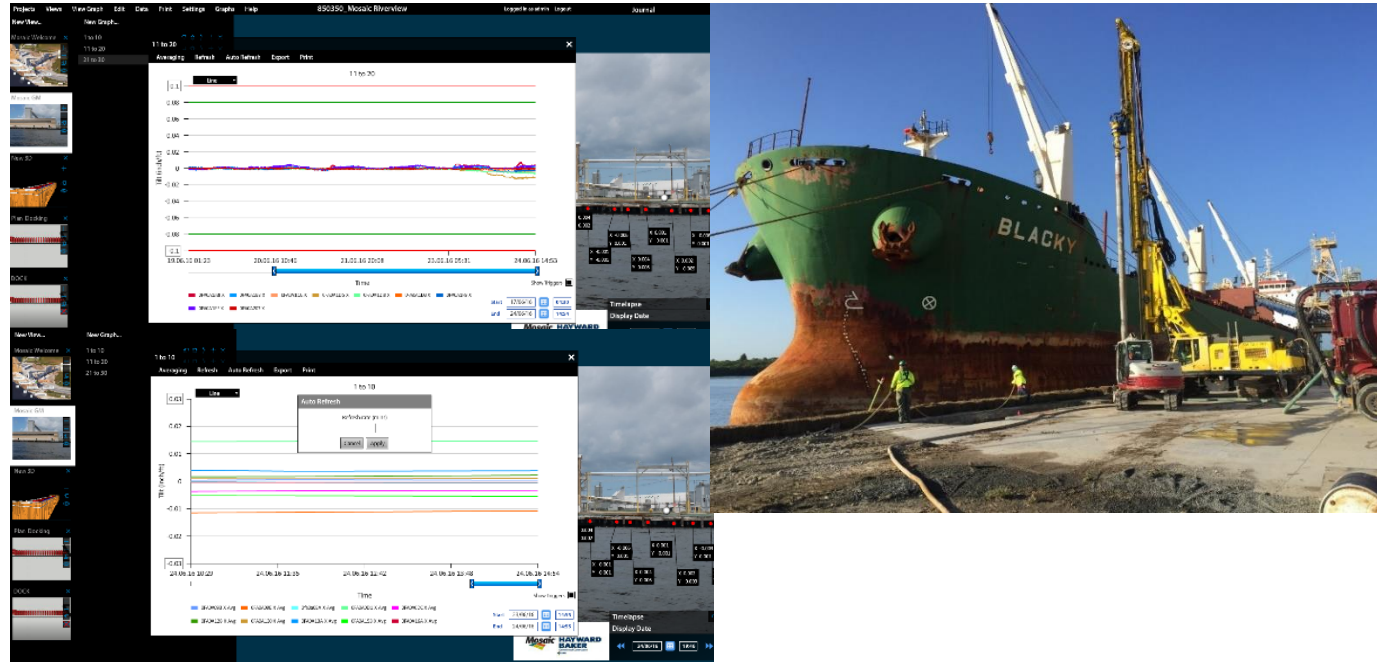
- Integrated dual axis tilt sensor
- Extremely low noise performance
- Resolution of  $0.001^\circ$  (0.018mm/m) and repeatability of  $\pm 0.003^\circ$  (0.053mm/m)
- 12 -15 years battery life, including when acting as a relay node within the mesh communications network
- Integrated temperature sensor
- Waterproof to IP66 / IP67 / IP68
- Up to 300m range using a mesh network

# Mesh Networks





# Auto refresh 1 min & 10 sec alarm

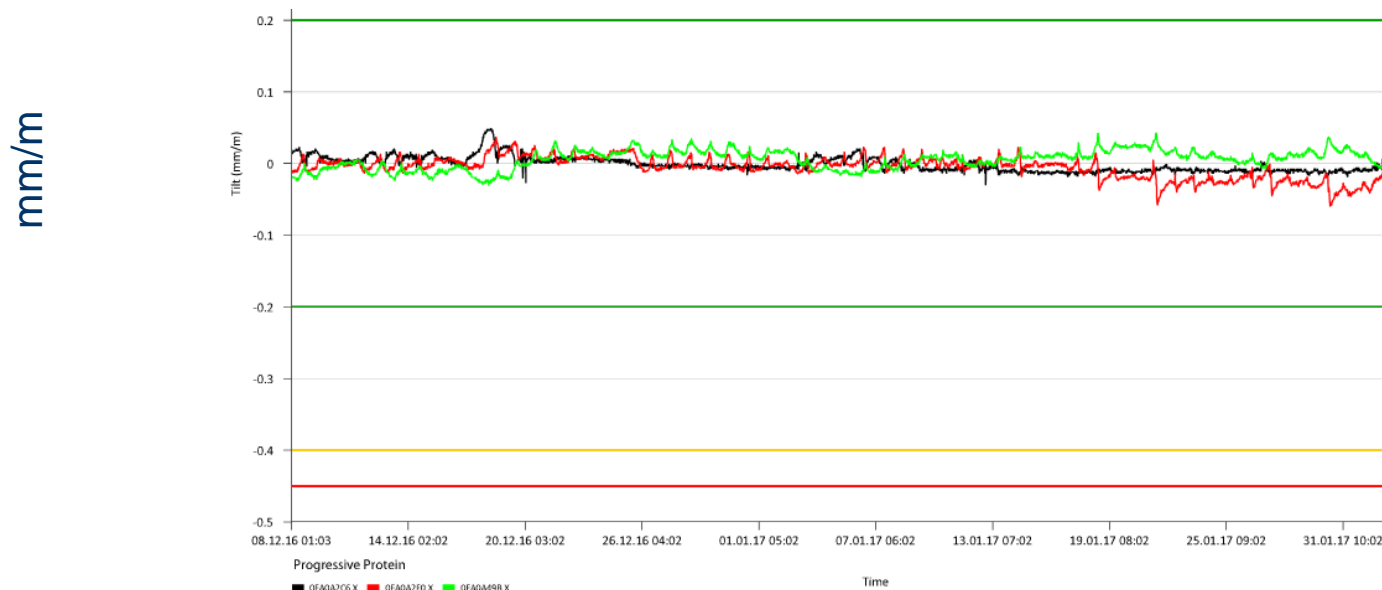


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# Progressive Protein Monitoring – East Wall



# Stressing

- Limited access stressing

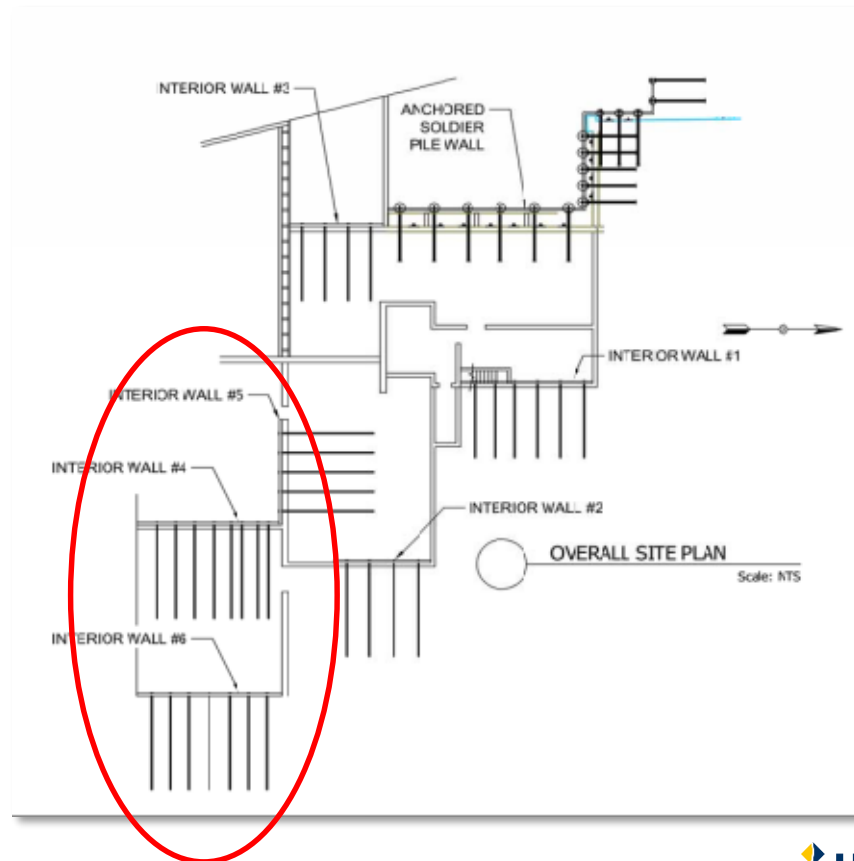






# Additional Work

- Can you brace the walls so we can remove a floor?
- After completing excavation we moved to more internal work



# Installing at Wall #4



# Challenges

- Winter work
- Limited Access
- Not a pleasant working environment – Smelled bad



# Summary

- Great team effort!
- Team dealt with everchanging scope due to older structure



**Thank you!**

**Questions?**

