WEDA DREDGING SUMMIT & EXPO 2014

Dredging and Subaqueous Sand Cap Installation within a Confined Canal of Fine Grained Sediments

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Agenda

- Project Summary
- Site Conditions
- Design
- Construction
- Post Construction Inspection
- Summary/Conclusions

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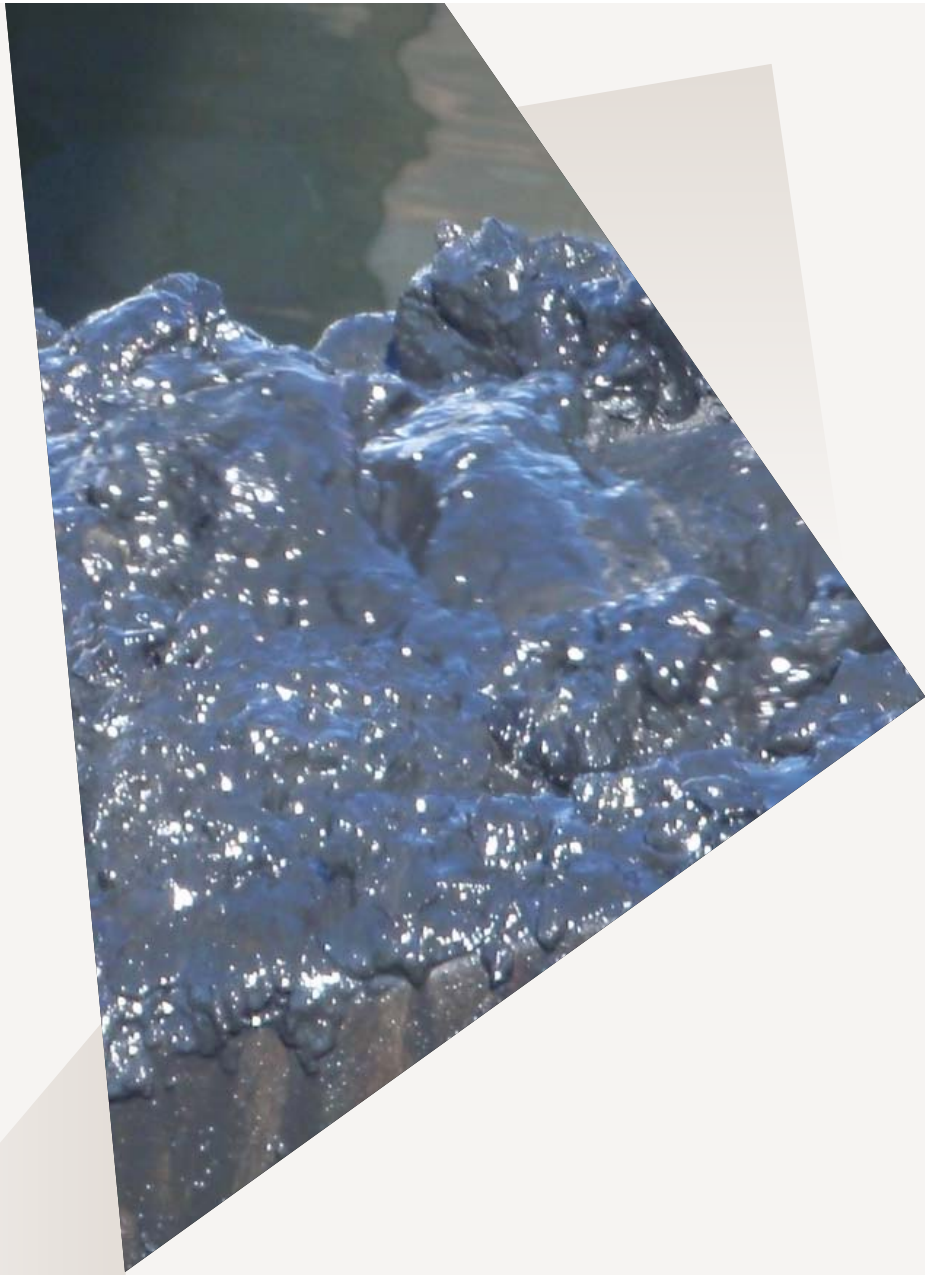
Project Summary

- Remediation of Contaminated Sediments
  - Objectives
    - Mitigate the risk for ecological exposure to contaminants
    - Mitigate the migration of contaminants
    - Preserve open water and minimize filling
  - Vertical Containment
    - Underling native clay layer
    - Subaqueous sand cap
  - Horizontal Containment
    - Bulkhead
    - Low perm fill



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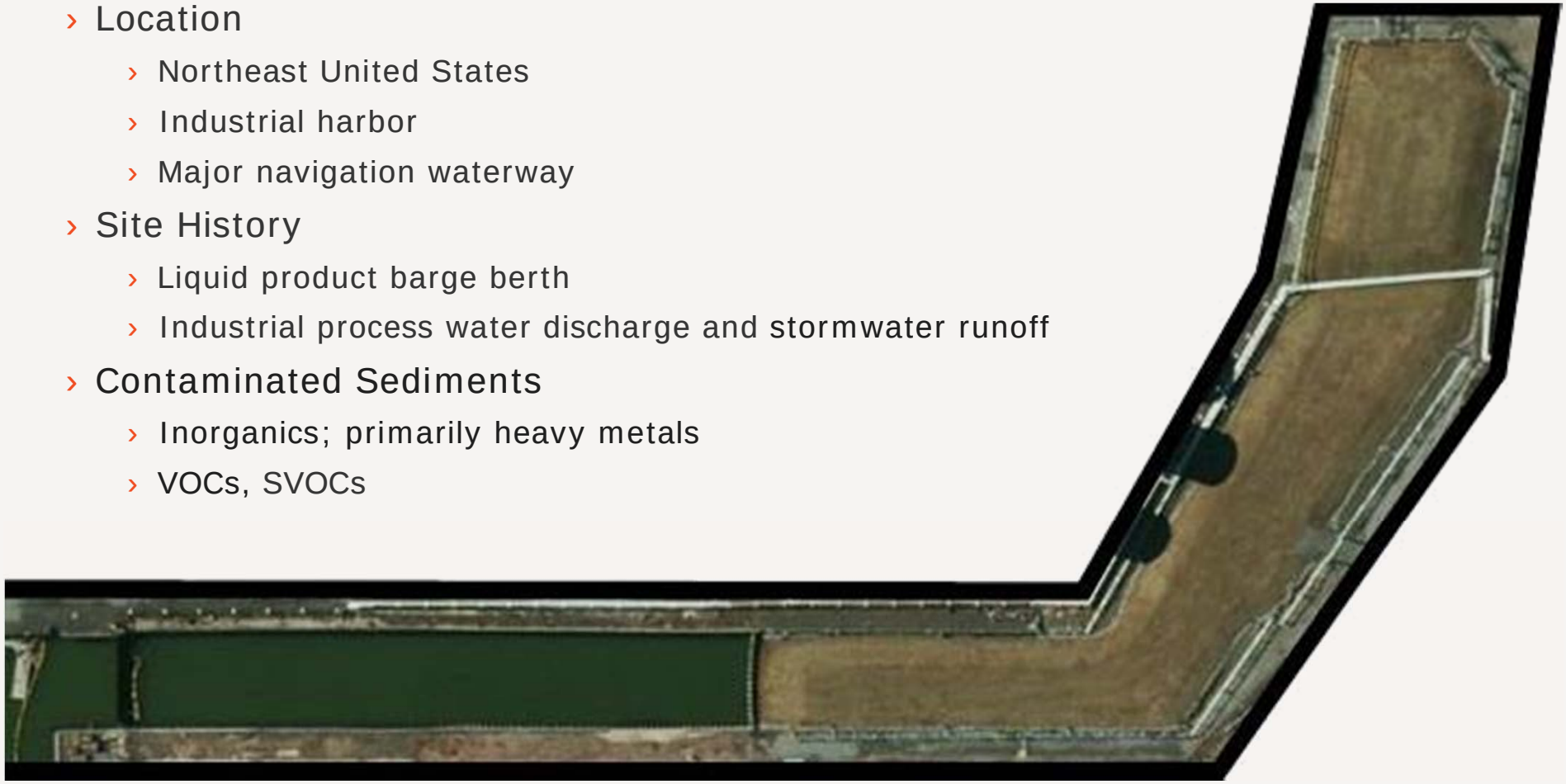
Site Conditions

- Location
  - Northeast United States
  - Industrial harbor
  - Major navigation waterway
- Site History
  - Liquid product barge berth
  - Industrial process water discharge and stormwater runoff
- Contaminated Sediments
  - Inorganics; primarily heavy metals
  - VOCs, SVOCs



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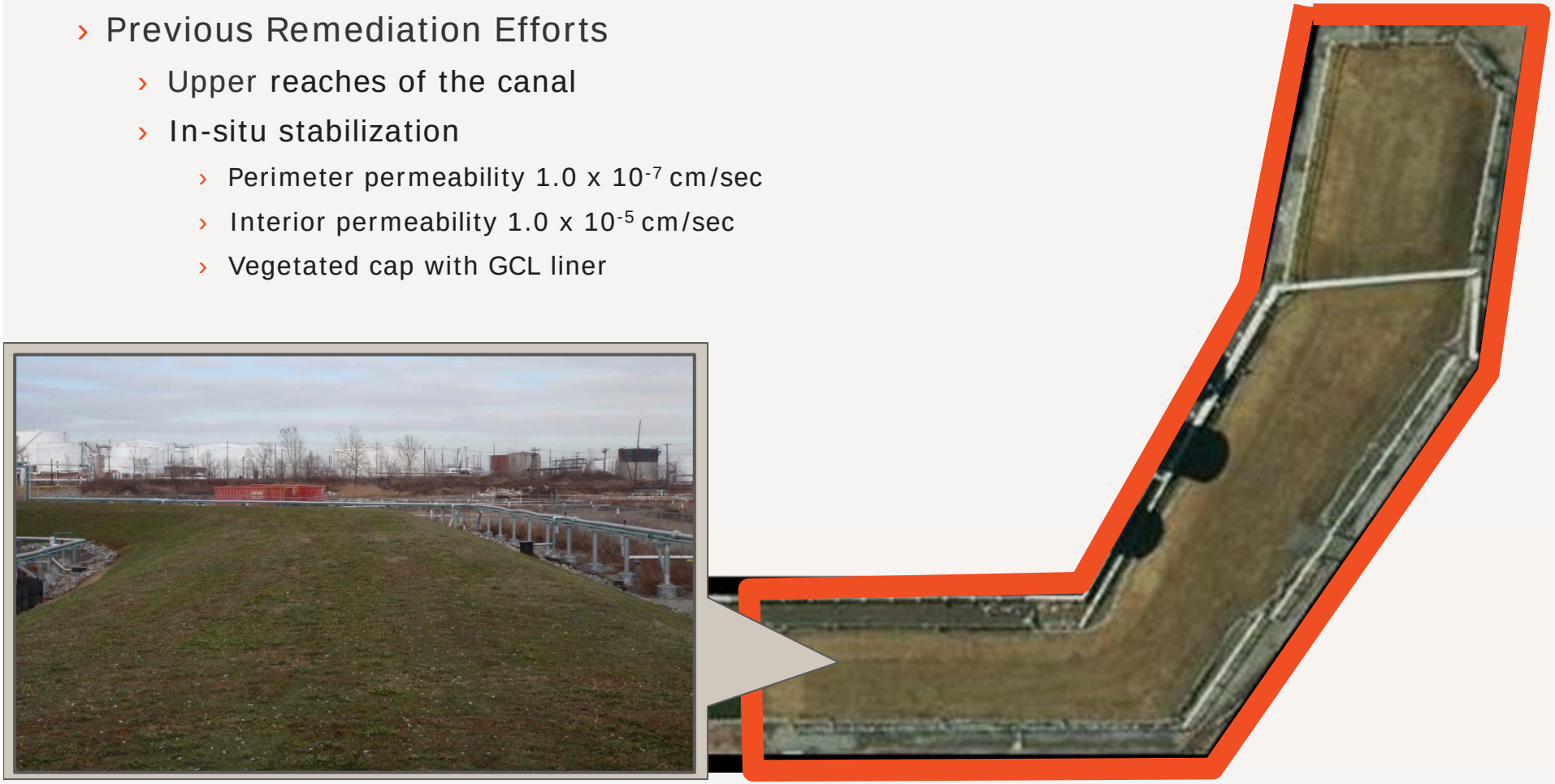
Site Conditions

- Previous Remediation Efforts
  - Upper reaches of the canal
  - In-situ stabilization
    - Perimeter permeability 1.0 x 10^{-7} cm/sec
    - Interior permeability 1.0 x 10^{-5} cm/sec
    - Vegetated cap with GCL liner



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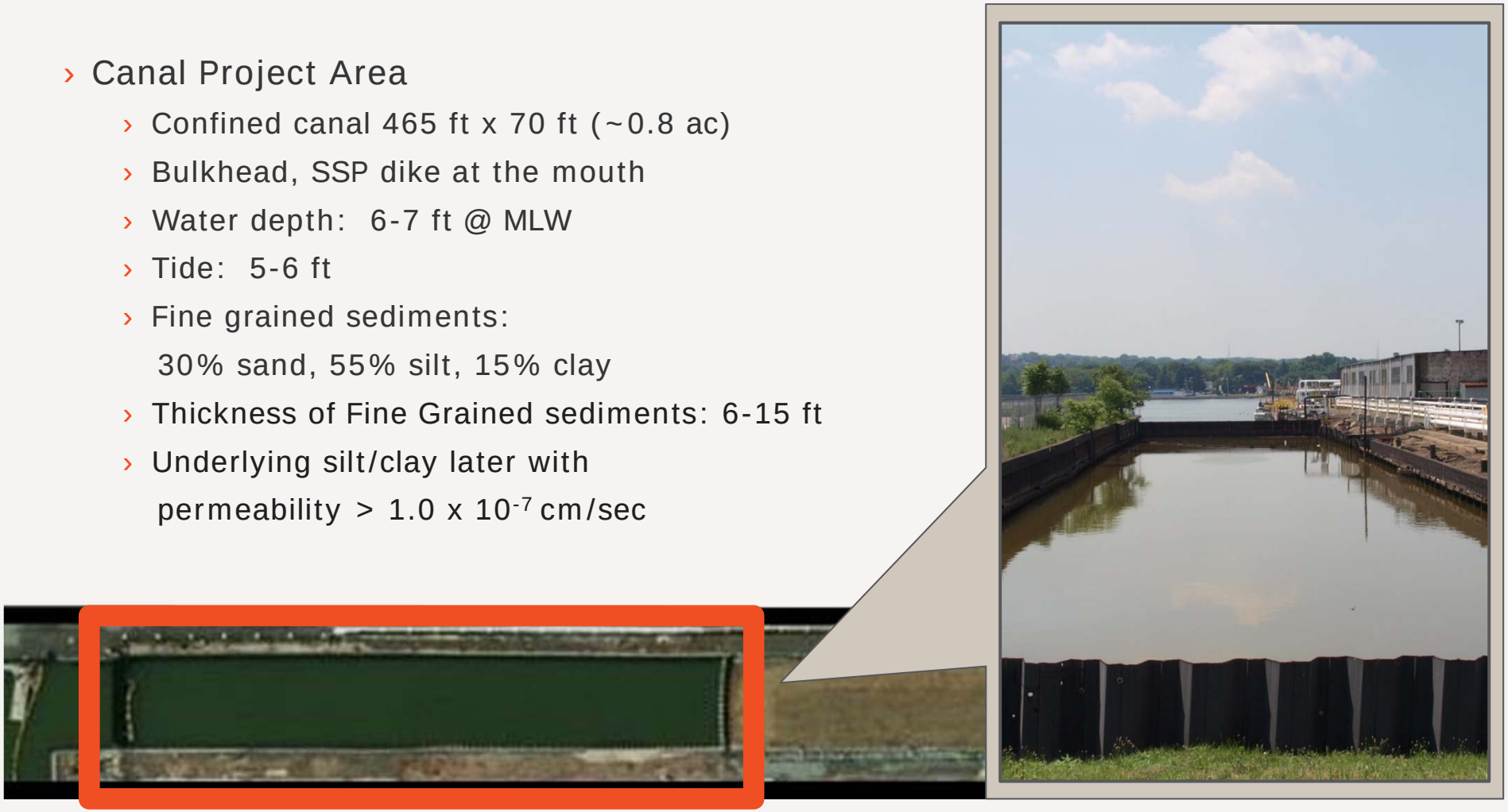
Site Conditions

- Canal Project Area
  - Confined canal 465 ft x 70 ft (~0.8 ac)
  - Bulkhead, SSP dike at the mouth
  - Water depth: 6-7 ft @ MLW
  - Tide: 5-6 ft
  - Fine grained sediments:
    30% sand, 55% silt, 15% clay
  - Thickness of Fine Grained sediments: 6-15 ft
  - Underlying silt/clay later with
    permeability > 1.0 x 10^{-7} cm/sec



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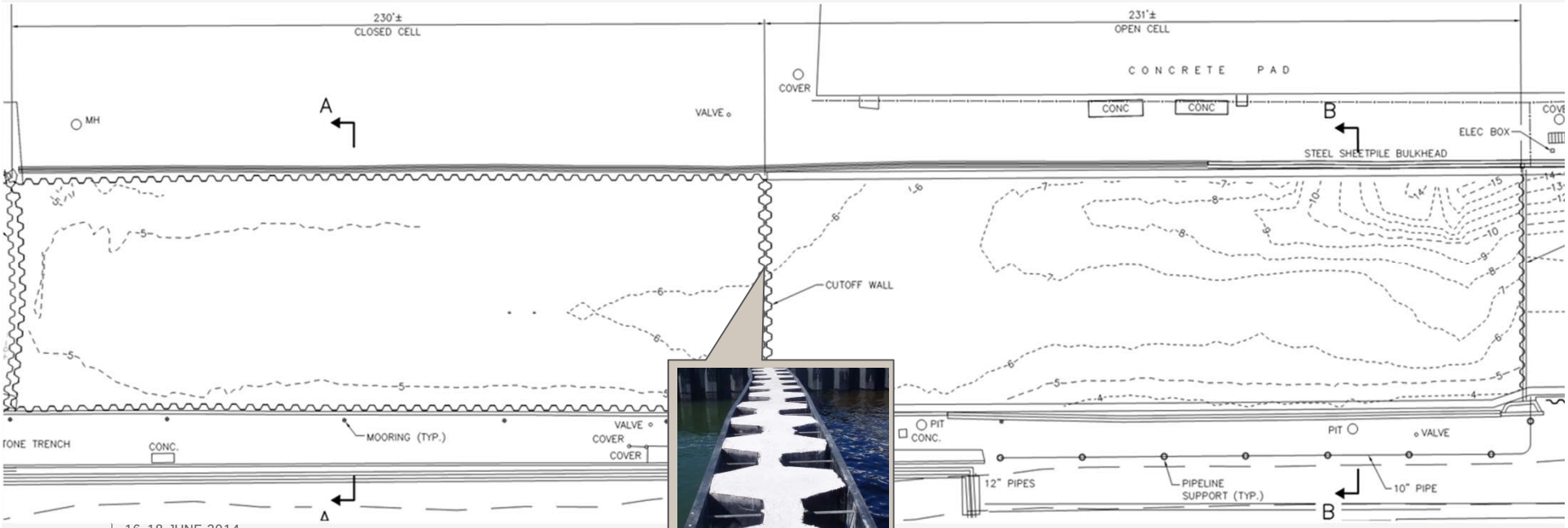
DESIGN

Design Concept

- Closed Cell (~0.4 ac)
  - ISS stabilization
  - Fill to grade with dredged material and on-site soils
  - Geosynthetic liner
  - Vegetated soil cover
- Open Cell (~0.4 ac)
  - Subaqueous containment cap
  - Dredge to maintain existing ML elev
  - Return to open water



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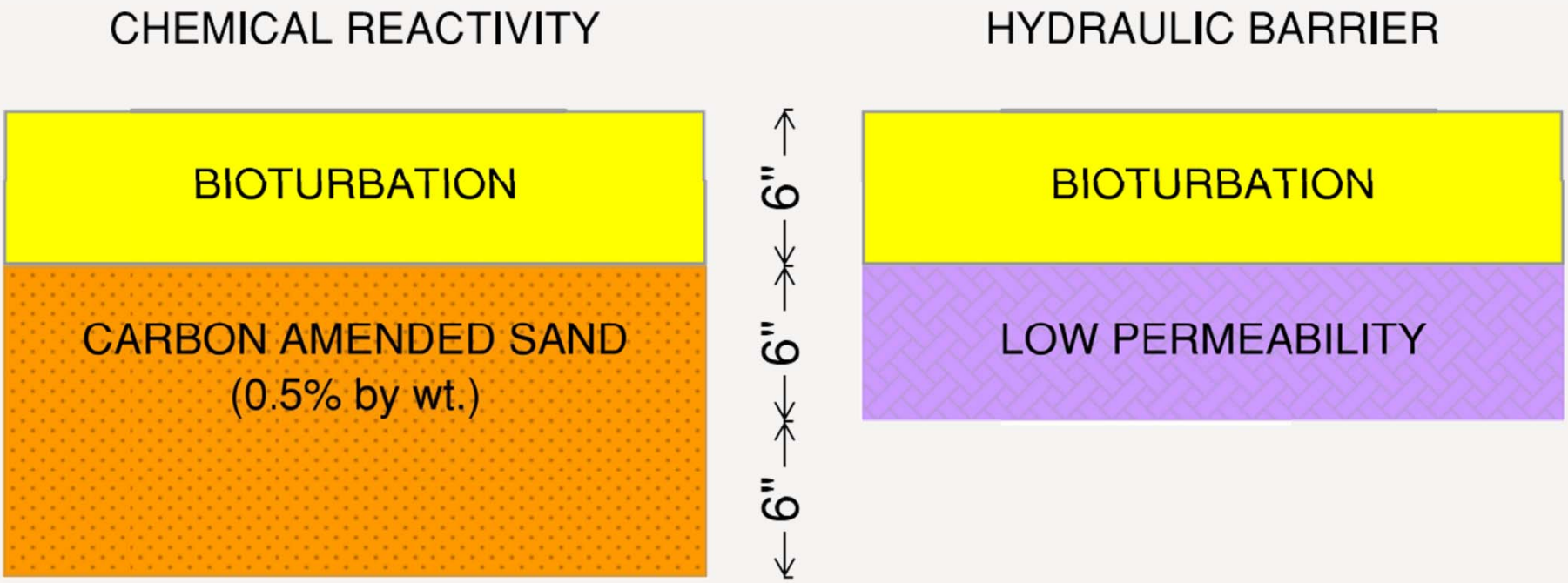
OPEN CELL DESIGN

Subaqueous Cap

- Design Objective:
  - Physical barrier – Habitat layer; marine sand
  - Chemical barrier
- Cap Design:
  - Habitat layer
  - Low permeability layer or chemically reactive layer



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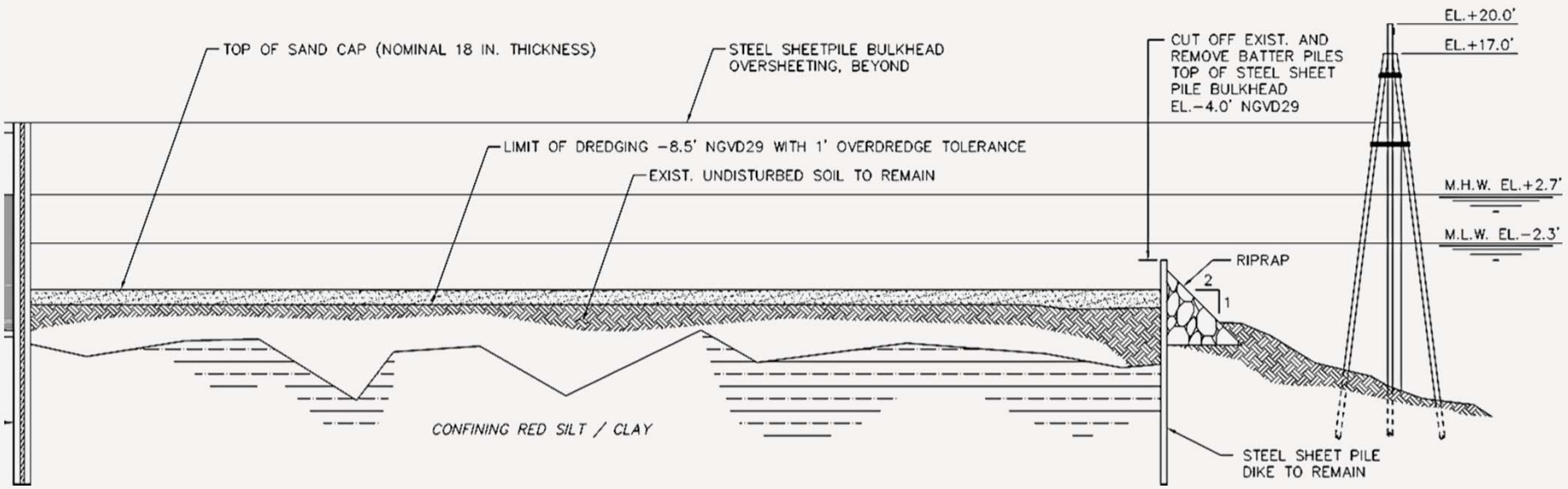
Dredge Template

- Design Objective:
  - Maintain existing “water depths at MLW”
  - Limit dredging volume
- Dredging Design:
  - -8.5 ft NGVD29 (-6.2' ft MLW)
  - 1 ft overdredge tolerance



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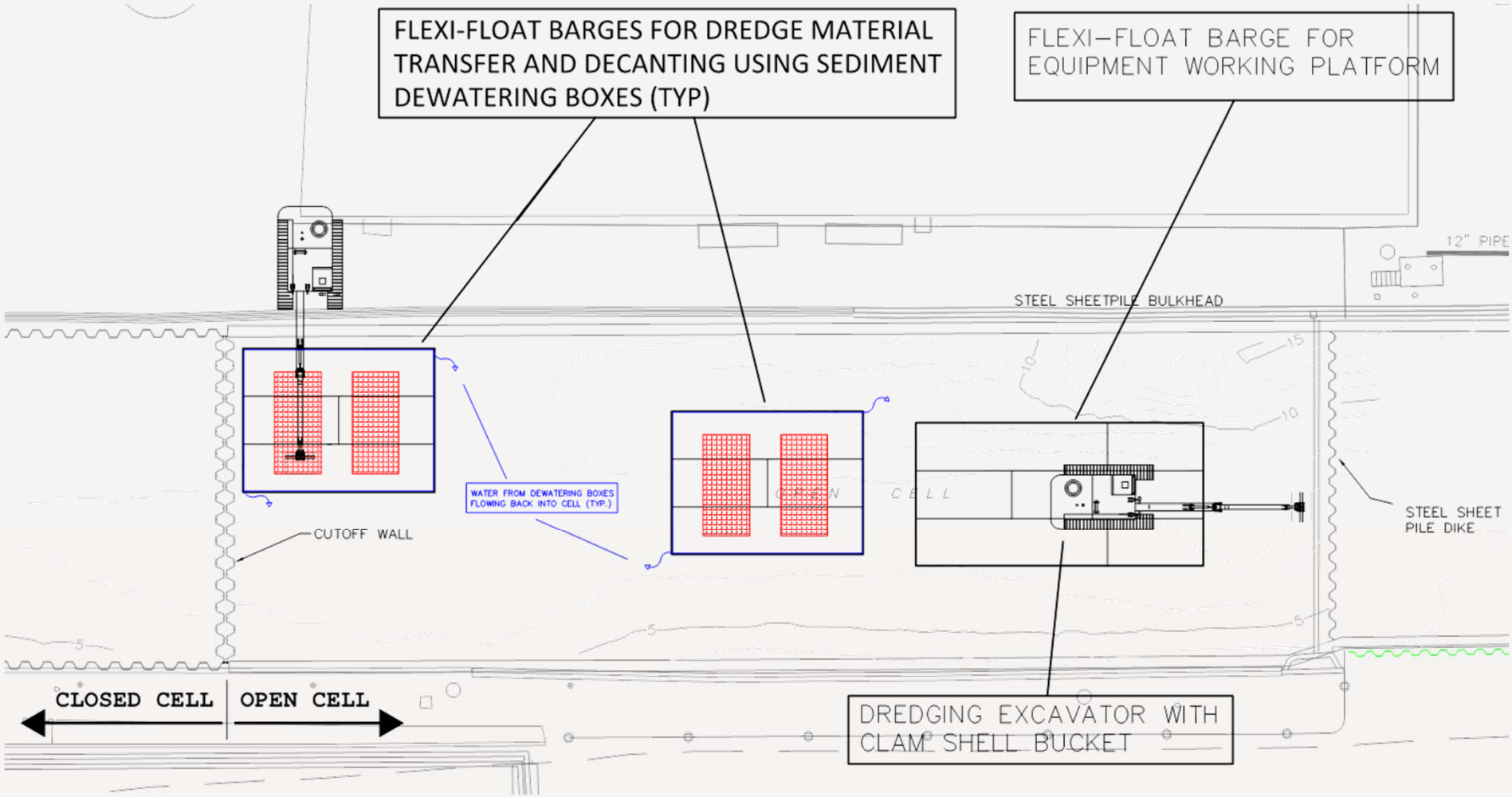
OPEN CELL CONSTRUCTION

Equipment Plan



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OPEN CELL CONSTRUCTION

Mechanical Dredging

- 1,700 CY Dredged
- All Dredged Material Beneficially Used On-Site

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Carbon Amended Sand

- 200 Ton Batches
- Design Requirement: 0.5% Carbon by wt.
- Contractor Mix Design: 1.0% Carbon by wt.

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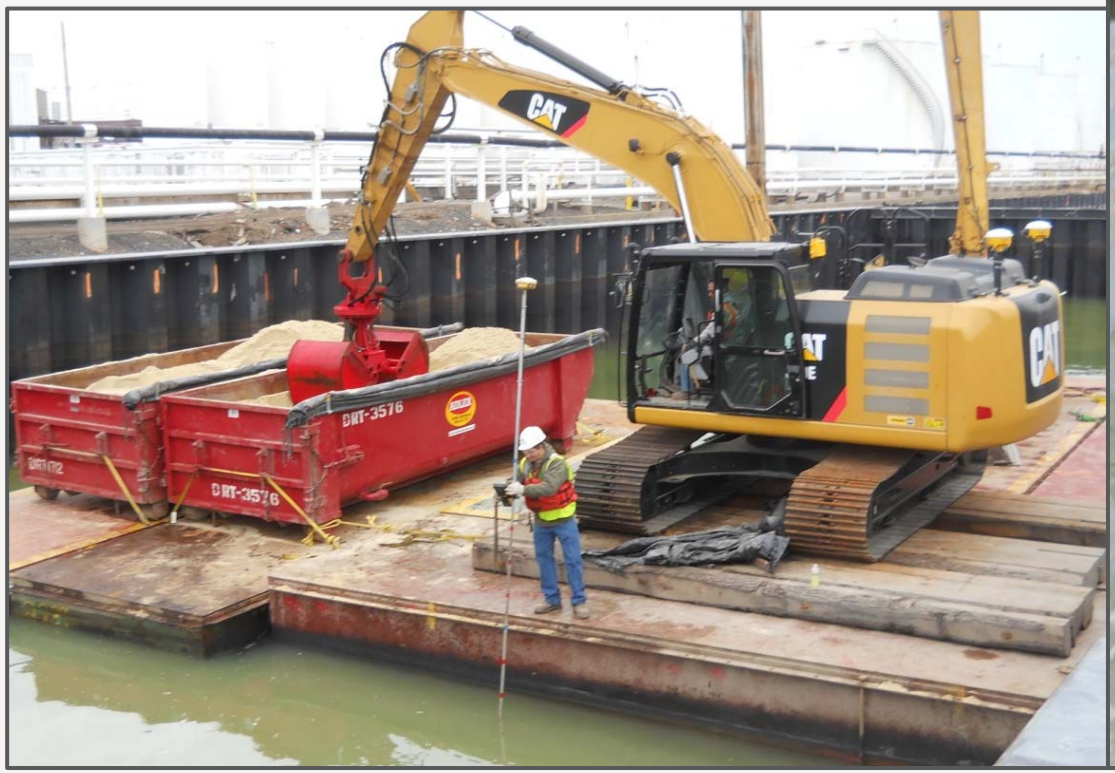
Cap Installation

- 17,250 sqft
- One Sacrificial Lift
- Three Carbon Amended Sand Lifts



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Survey and Verification

- Progress Survey
  - RTK GPS measurement
- Final Verification
  - Sediment cores
    - 23 locations
    - Locations identified by RE
    - Vibracore with 3" Lexan tube
  - Hydrographic survey
  - Dive inspection

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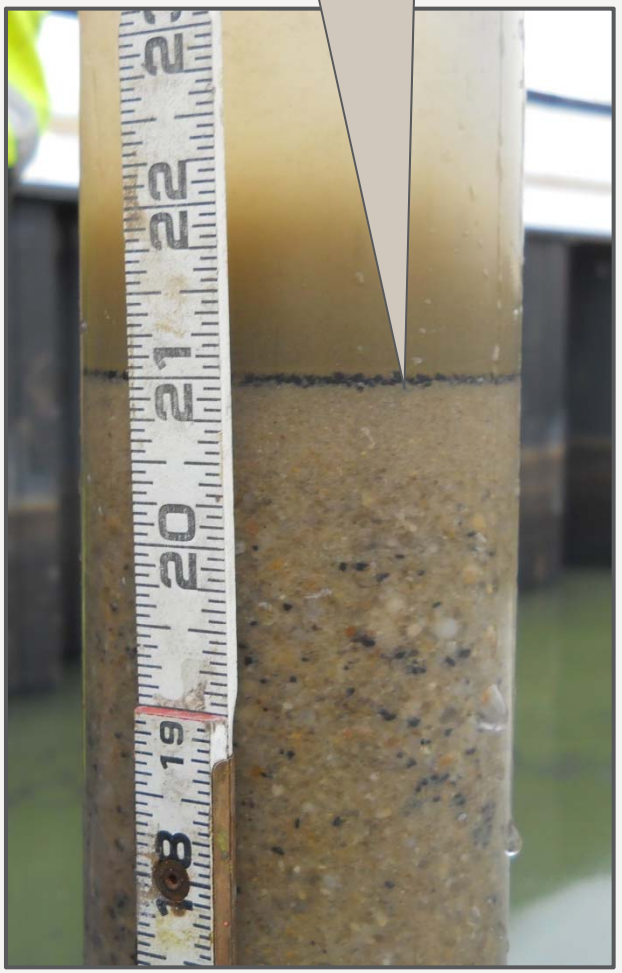
Sediment Cores

Mixing Layer

Carbon Layer



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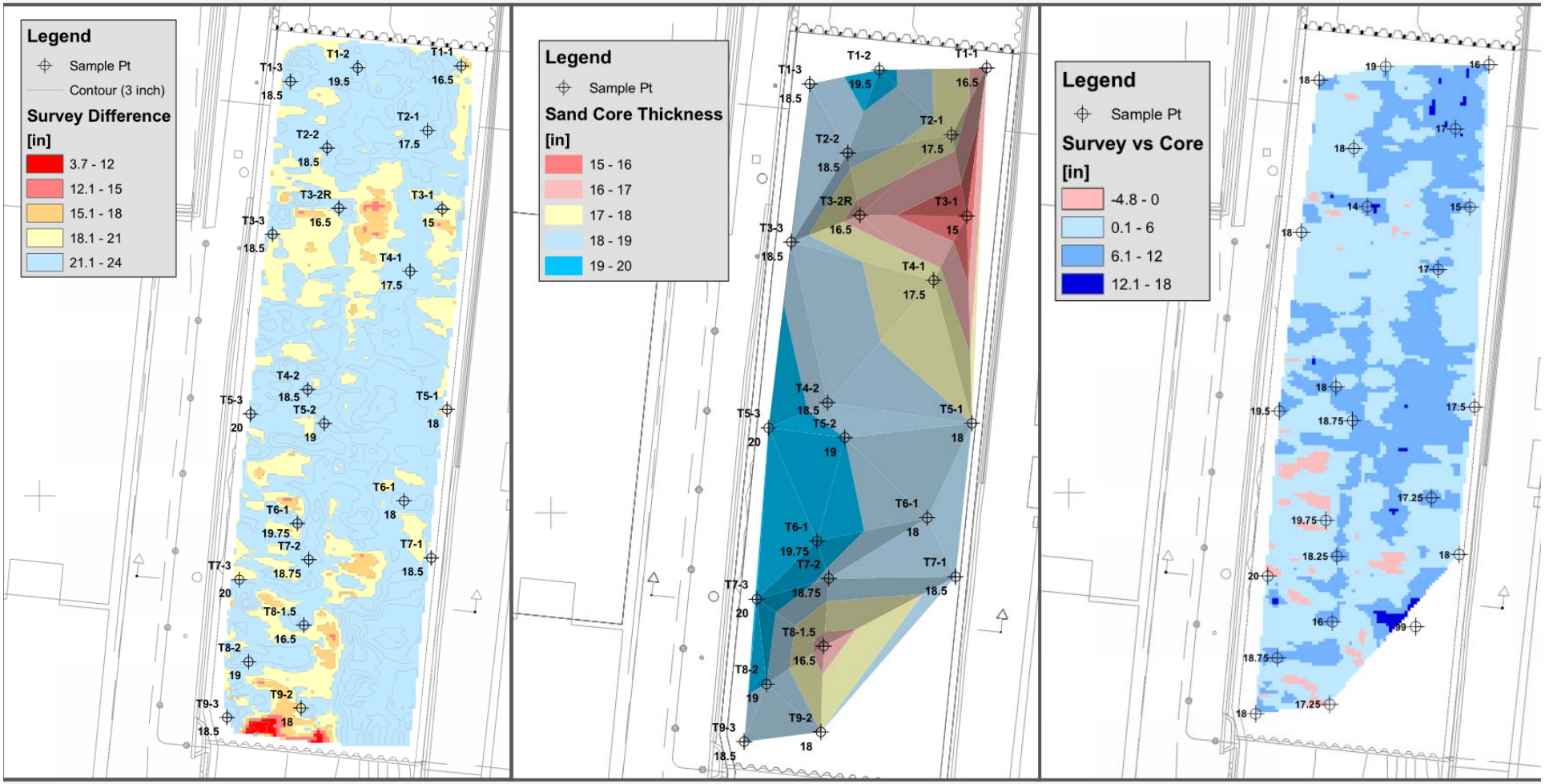
Hydrographic Survey/Core Verification

› Surveys identified non-satisfactory areas. Additional cap material added.



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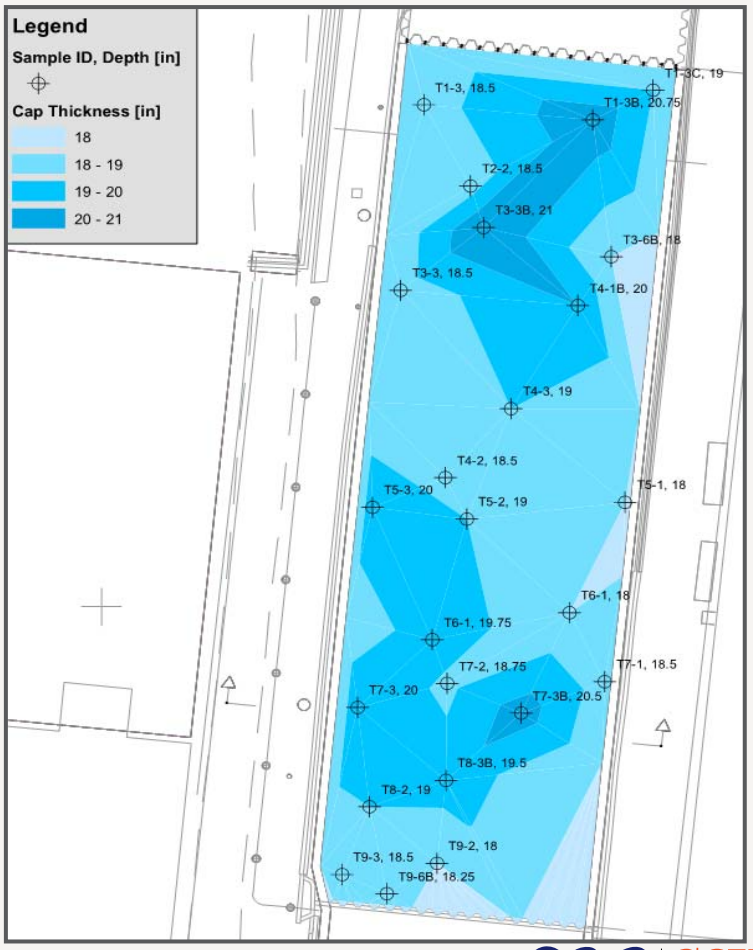
OPEN CELL CONSTRUCTION

Cap Completed

› Cap elevation verified and accepted

› Min thickness verified and accepted



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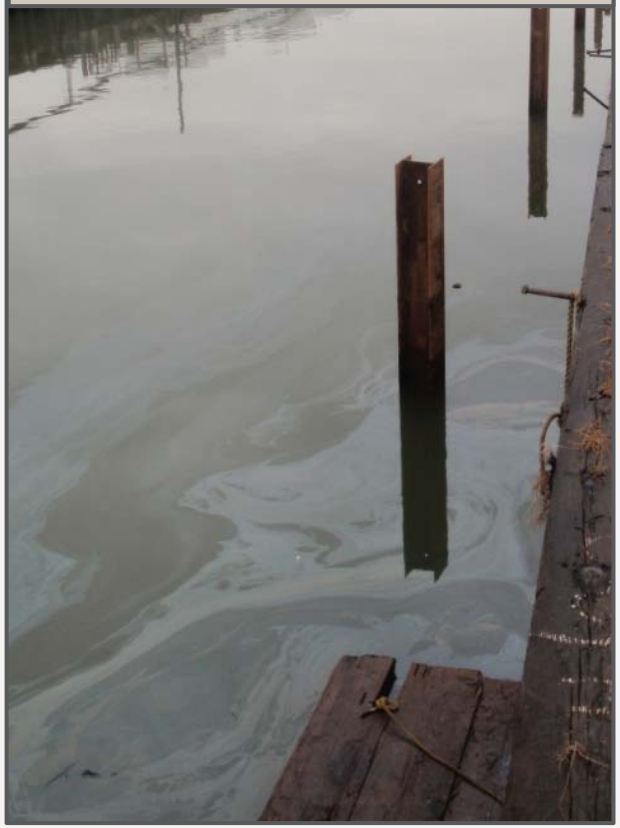
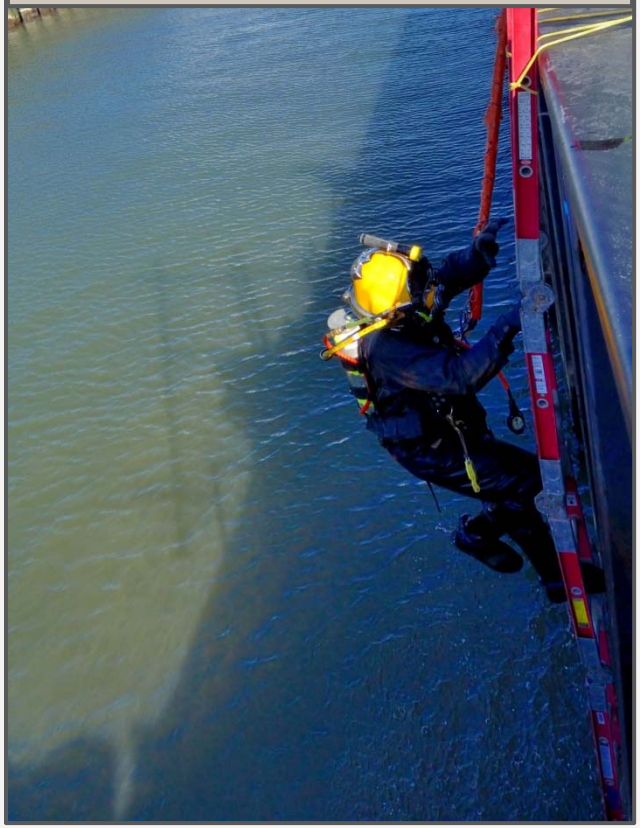
POST CONSTRUCTION

Dive Inspection

Pre-Construction Surface Sheen



Post-Construction Surface Water



SSP Bulkhead and Cap Interface

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Summary/Conclusion

- **Dredged 1,700 CY, 23 Days, ~$215/CY**
- **Placed 18"Subaqueous Sand Cap, 21 Days, ~$40/SF**
- **Mitigated the ecological risk and potential migration of contaminated sediments through a subaqueous cap to preserve open water**
- **Utilized innovative equipment and placement techniques to minimize mixing and eliminate mudwaving**

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