WEDA 33 & TAMU 44

ANCHOR QEA

Challenges of Sediment Remediation and Residuals Management at Esquimalt Graving Dock Vancouver Island, BC

Dan Berlin, (Anchor QEA, LLC)
Andrew Mylly, B.Sc., EP, PMP (Public Works and Government Services Canada)
Tom Wang, P.E. (Anchor QEA, LLC)

August 28, 2013

Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

Presentation Overview

- Site Description and Background
- Site Remediation Challenges
- Sediment Re-suspension and Residuals
- Residuals Management at Esquimalt Graving Dock (EGD)
  - Dredge prism design considerations
  - Confirmation testing for contingency re-dredging
  - Placement of residuals management cover material
  - Best management practices
- Summary

Site Description and Background

Site Description and Background

Site Description and Background

LEGEND:

- Remediation Area
- Waterlot Boundary
- Phase 1 Remediation Area
- Phase 2 Remediation Area

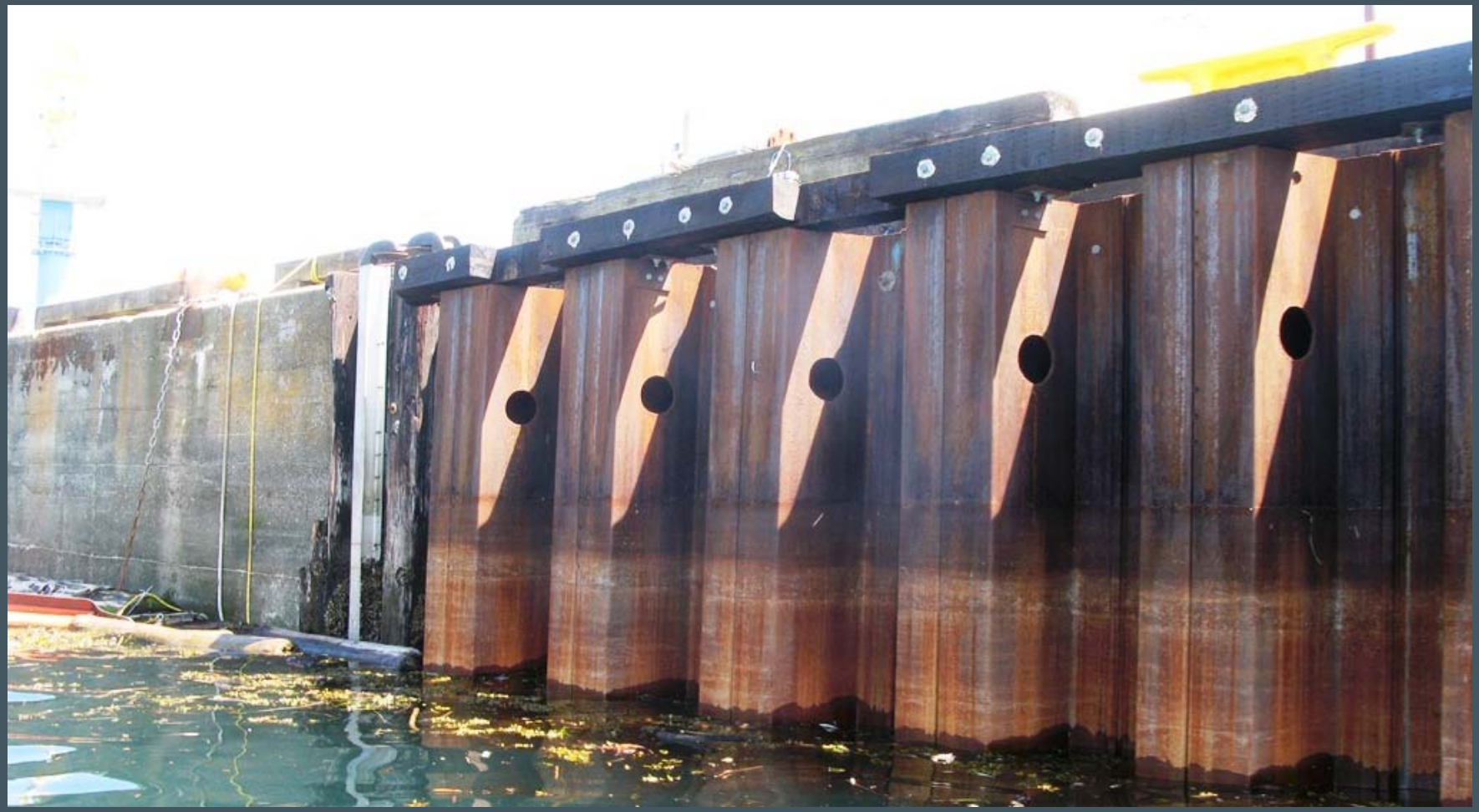
0 60
Scale in Meters

SOURCE: Google 2011.

Phase 1A – Underpier Erosion Protection System

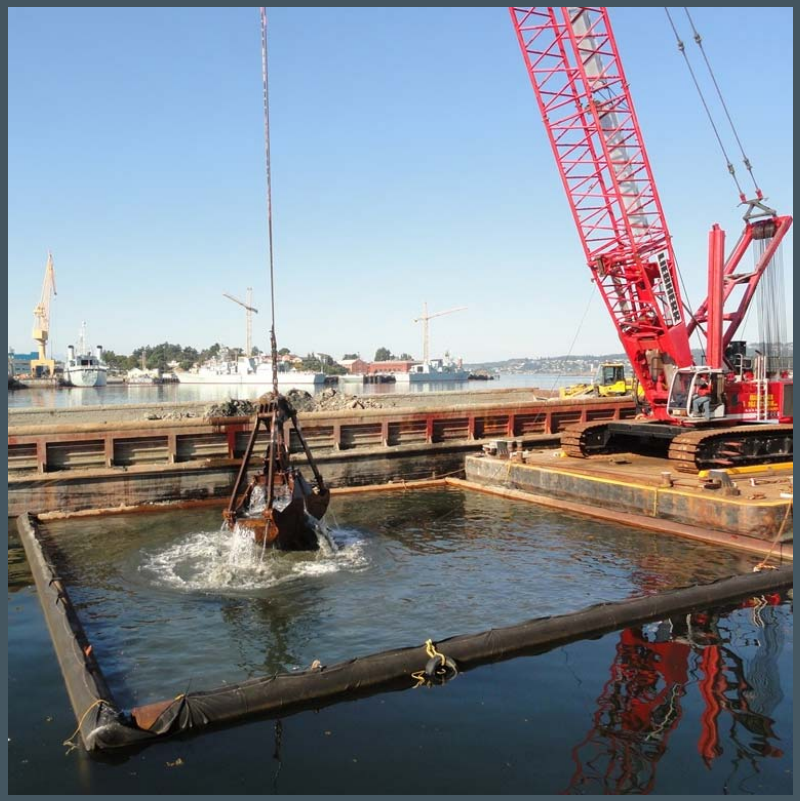
- Sheetpile wall prevents resuspension and transport of contaminated under-jetty sediment into Phase 1B area
- Constructed November 2012 to April 2013

Phase 1A – Underpier Erosion Protection System

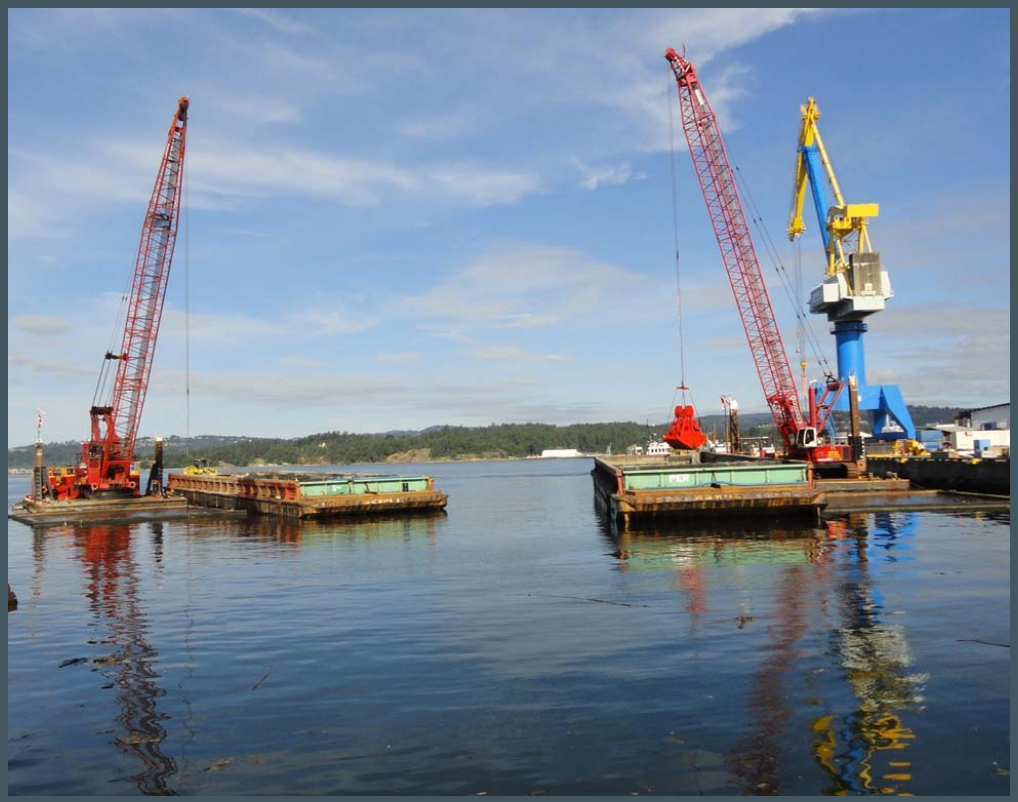


Phase 1B – Open-water Dredging

- Dredging and disposal
  - 150,000 m^3
- In-water slope armoring
  - 25,000 m^3
- Residuals management cover placement
  - 45,000 m^3
- Structure demolition/ temporary relocations
- Construction June 2013 to March 2014



Phase 1B – Open-water Dredging



Phases 1C and 2

- Phase 1C – Habitat Compensation
  - Offsets impacts of alteration and isolation of underpier habitat
- Phase 2 – Underpier Remediation
  - 40,000 m^3 of contaminated sediment removal
  - Conducted in parallel with jetty reconstruction in next 10 years

Site Remediation Challenges

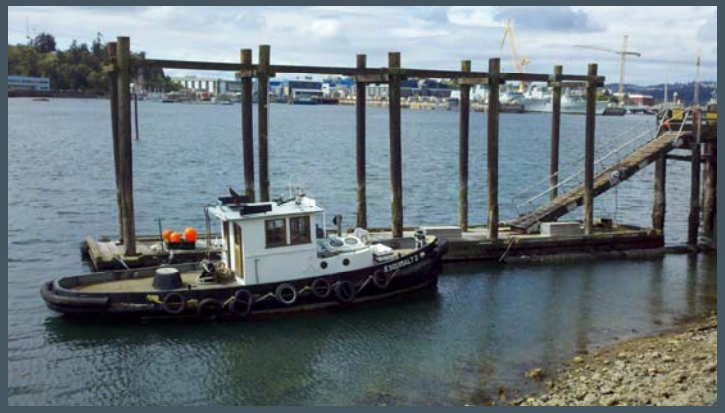
- Active shipyard/graving dock facility
  - More than 50 vessel calls per year

Site Remediation Challenges

- Work adjacent to existing structures
  - Requirements for dredging setback/offsets

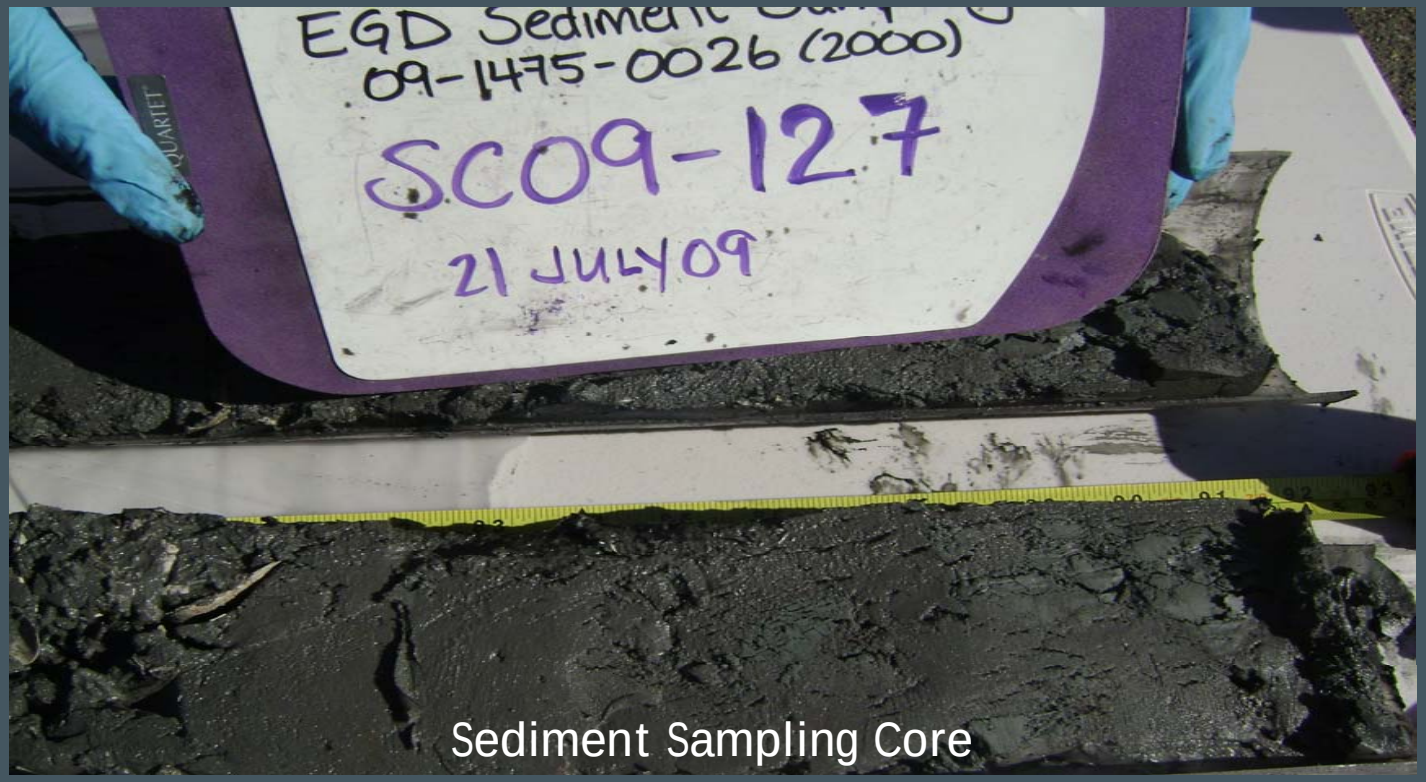
Site Remediation Challenges

- Demolition/re-location of structures
  - Access to site areas



Site Remediation Challenges (Phase 1B)

- Soft, fine-grained sediments
  - Increased potential for dredge residuals



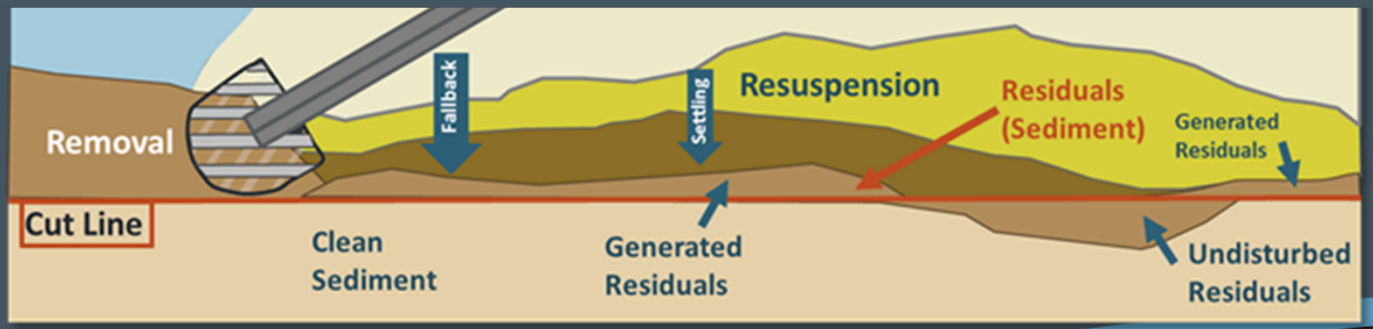
Sediment Sampling Core

Sediment Re-suspension and Residuals

- Residuals defined
- Why are residuals important to the remedial process?
- Dredge residuals Conceptual Site Model
- Other residuals sources

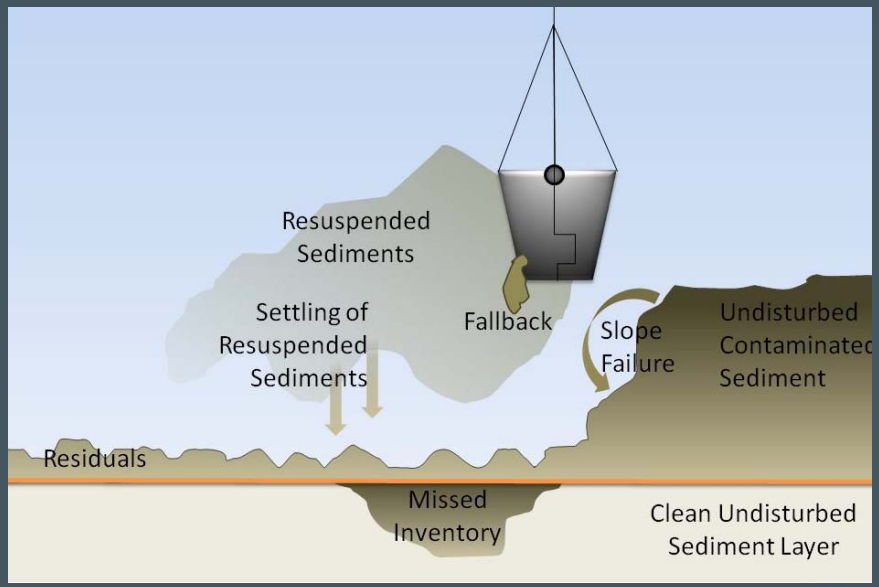
Sediment Re-suspension and Residuals

- Generated residuals
  - Generated residuals are contaminated sediments disturbed but not removed by dredging
  - Mass and concentration of contaminated sediment remaining in the vicinity of the dredge area
  - Physical limitations (e.g., bedrock and side slopes)
  - "Fallback," sloughing, displacement, and settling of suspended solids



Sediment Re-suspension and Residuals

- Undisturbed residuals (i.e., missed inventory)
  - Contaminated sediments uncovered as a result of dredging
  - Incomplete sediment characterization or design



Sediment Re-suspension and Residuals

- Why are residuals important to the remediation process?
  - Residuals will occur, so plan ahead
    - Many early cleanups learned lesson the hard way
  - Understanding residuals is important to manage remaining liability and risks
  - Informs selection of a cleanup remedy
  - Informs confirmation sampling approach and implementation of contingency actions

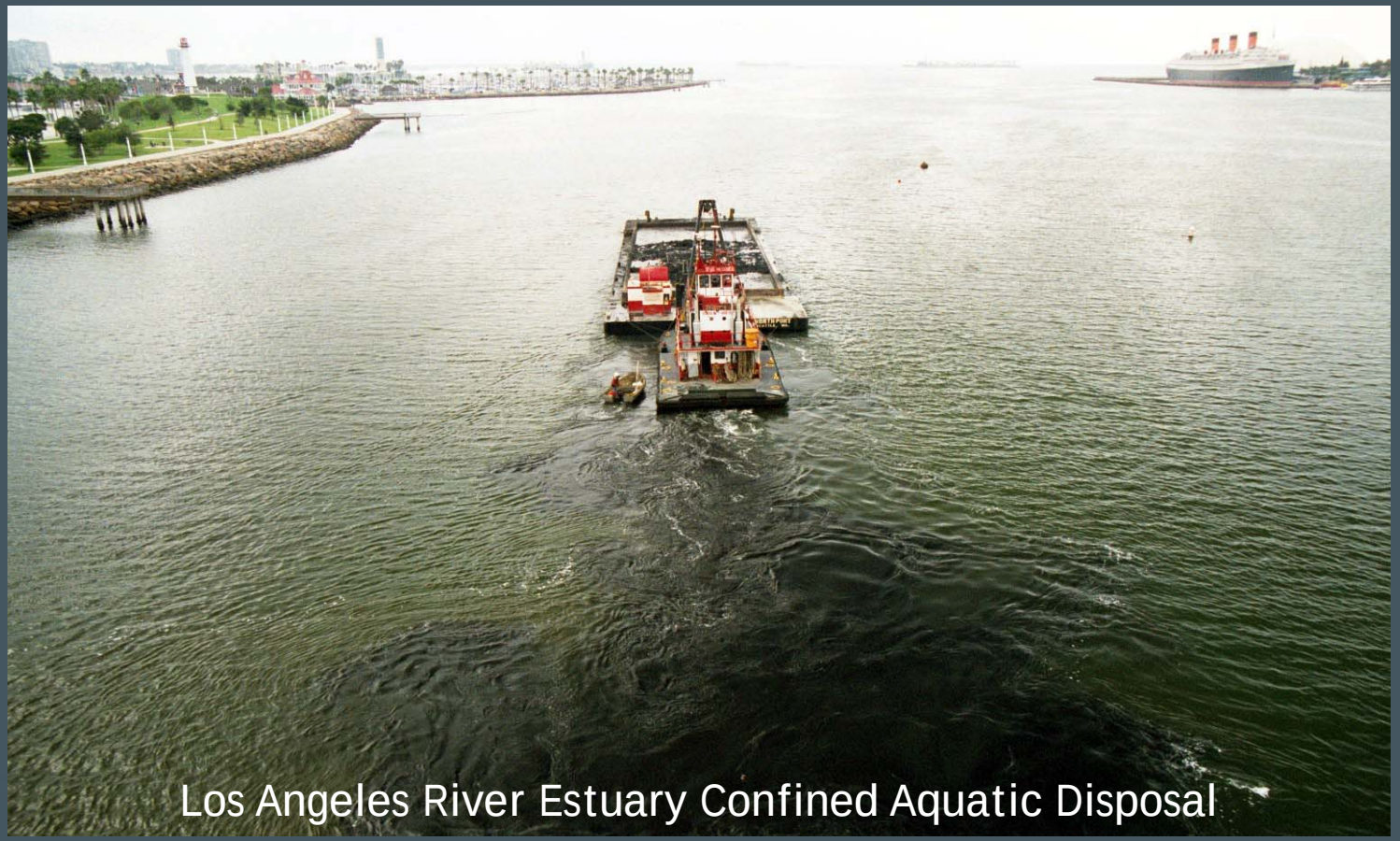
Sediment Re-suspension and Residuals

- Other residuals sources

Photos not from EGD Waterlot

Sediment Re-suspension and Residuals

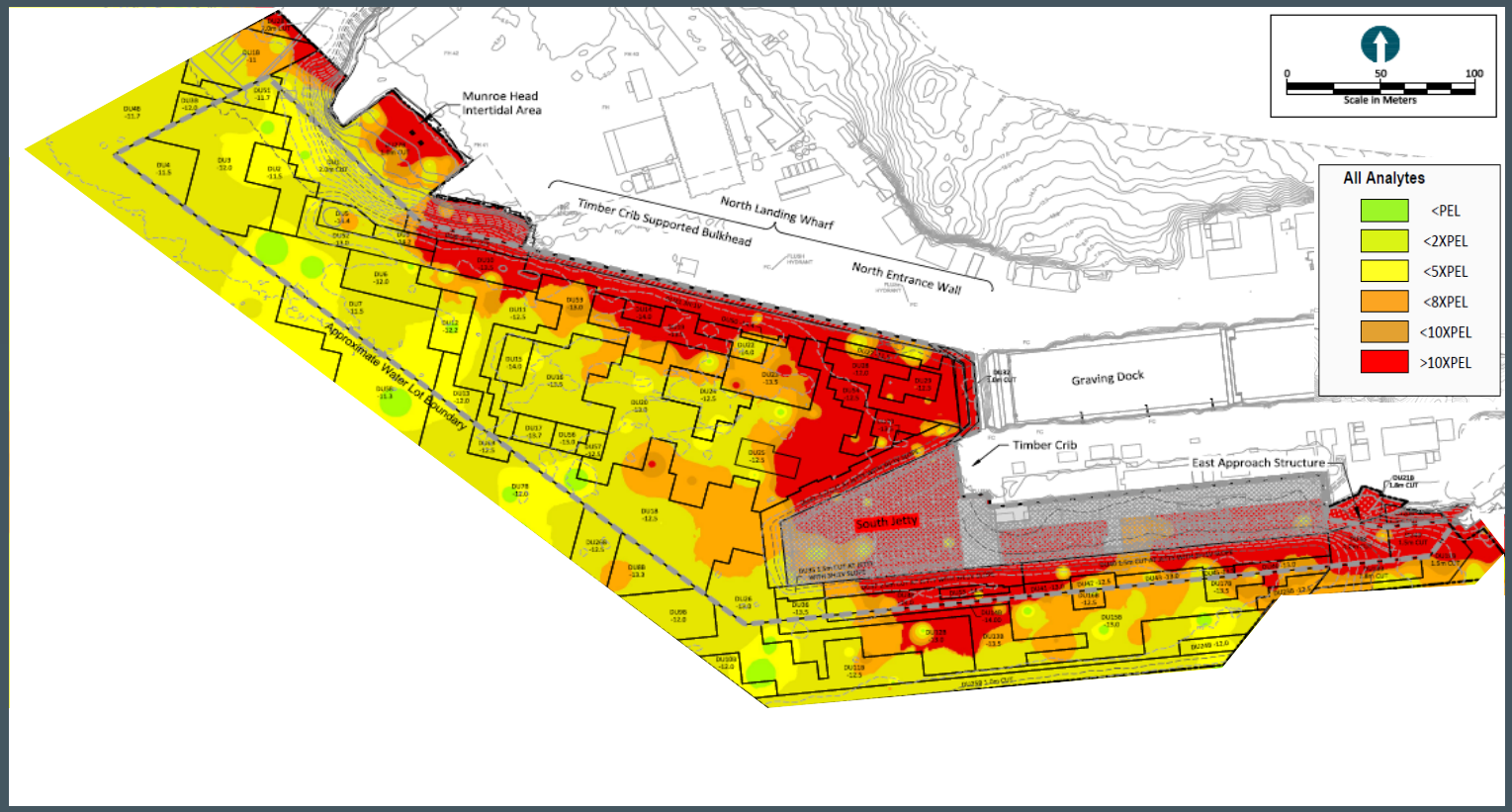
- Other residuals sources



Los Angeles River Estuary Confined Aquatic Disposal

Residuals Management at EGD

- Dredge design considerations



Legacy contaminants (metals, TBT, PAHs, and PCBs)

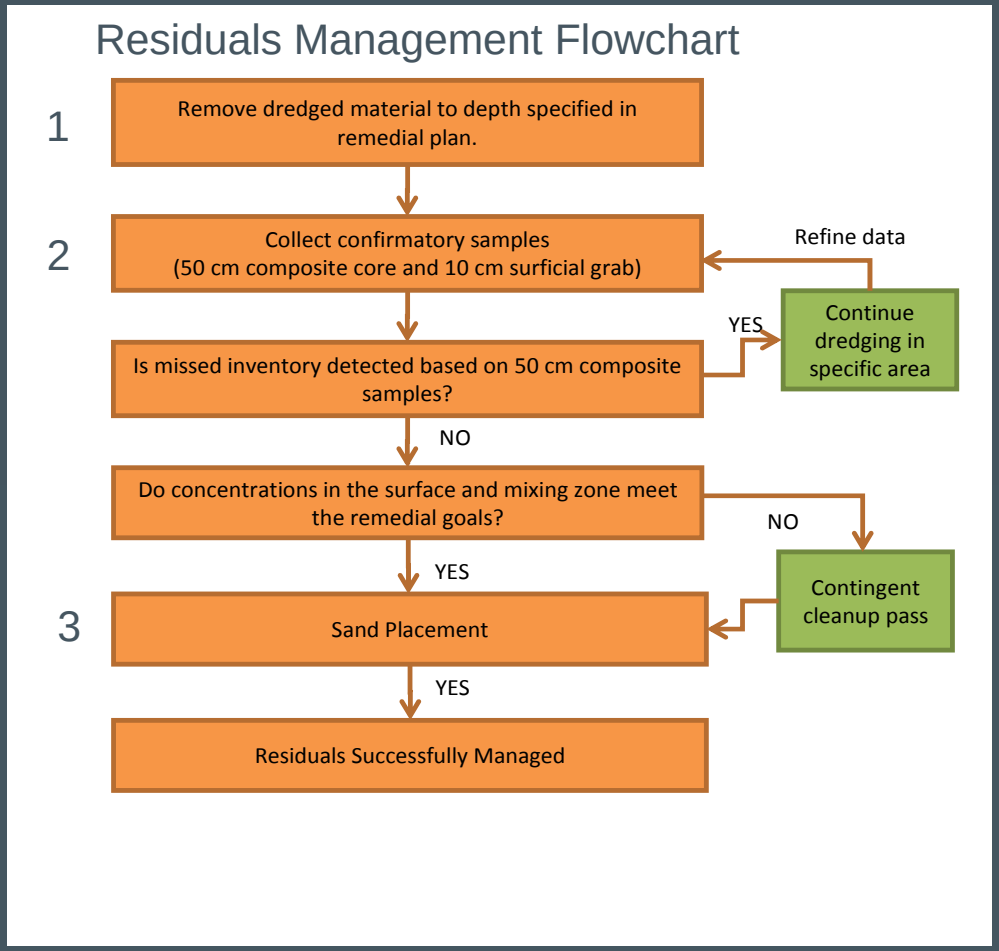
Residuals Management at EGD

- Dredge design considerations

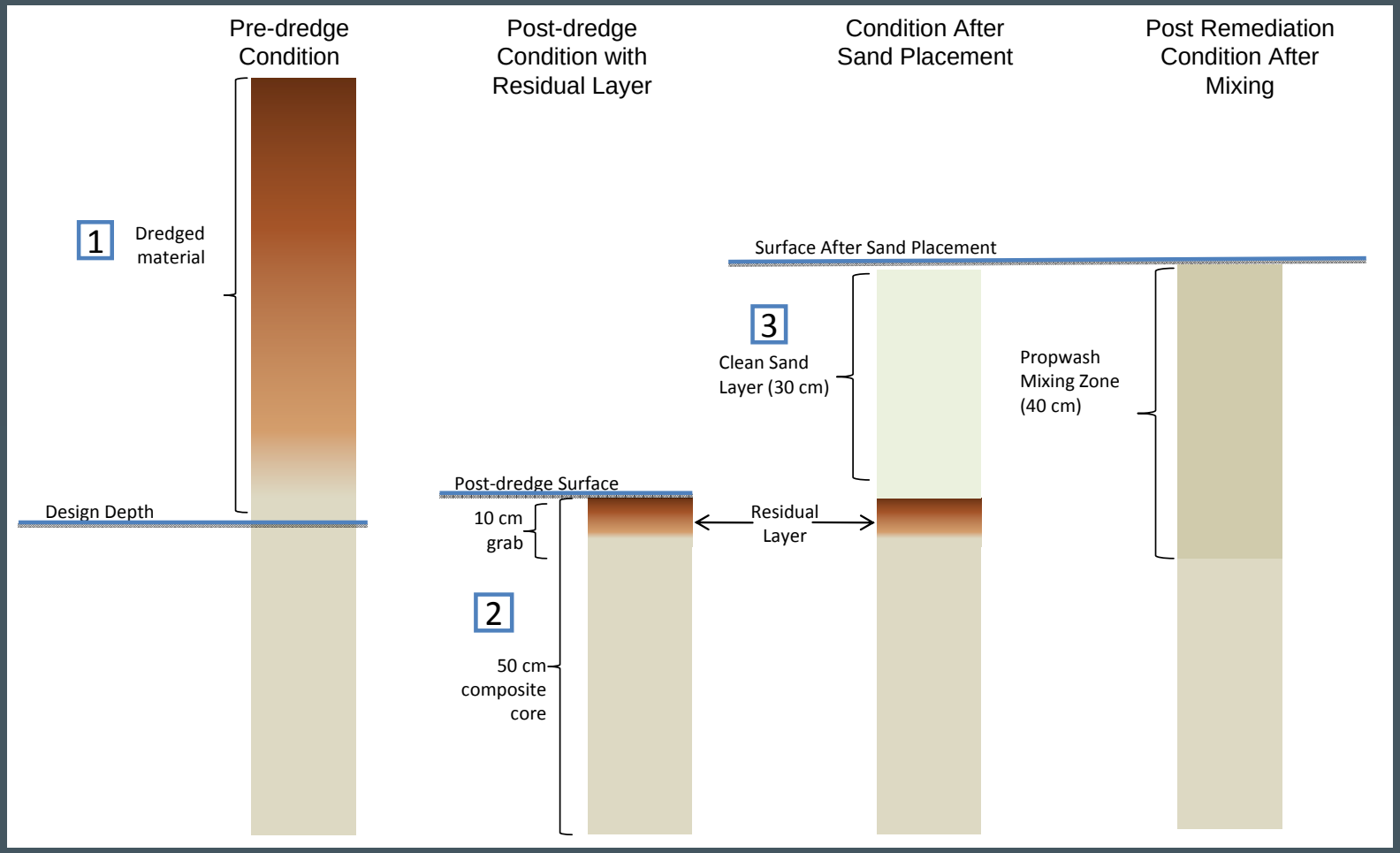
Removal Scenario	Removal Volume, m^3	Confidence Level
Contaminated Neatline (no OD)	71,250	50%
Contaminated Neatline + 0.3 m OD	98,444	70%
Contaminated Neatline + 0.5 m OD	116,573	85%
Dredge Prism Design (no OD)	117,336	90%
Dredge Prism Design + 0.3 m OD	*149,630*	*94%*
Dredge Prism Design + 0.5 m OD	162,658	99%

Residuals Management at EGD

- Confirmation testing for contingency re-dredging
- Placement of residuals management cover material

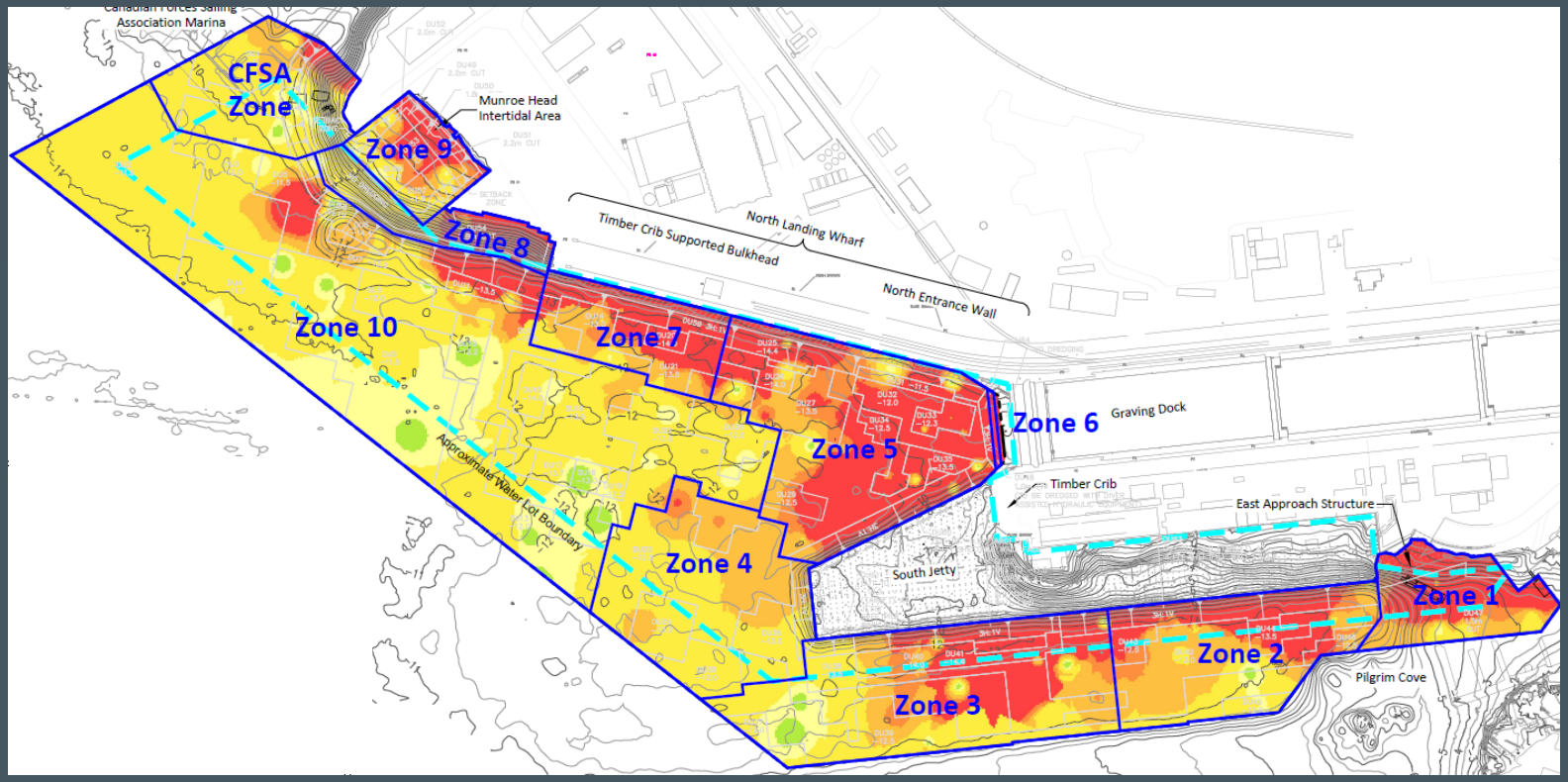


Residuals Management at EGD



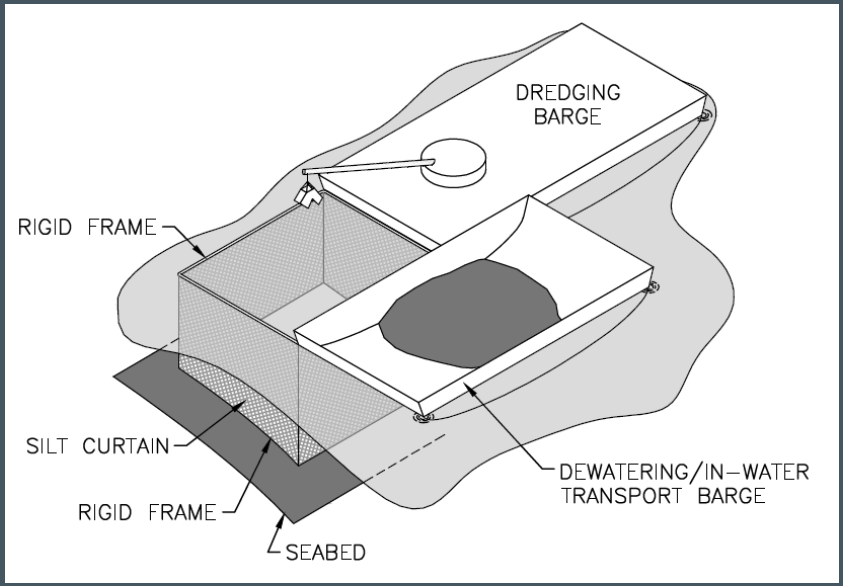
Residuals Management at EGD – Best Management Practices (BMPs)

- Construction sequencing to remove “hotter” contamination areas first



Residuals Management at EGD - BMPs

- Silt curtain – 5 m

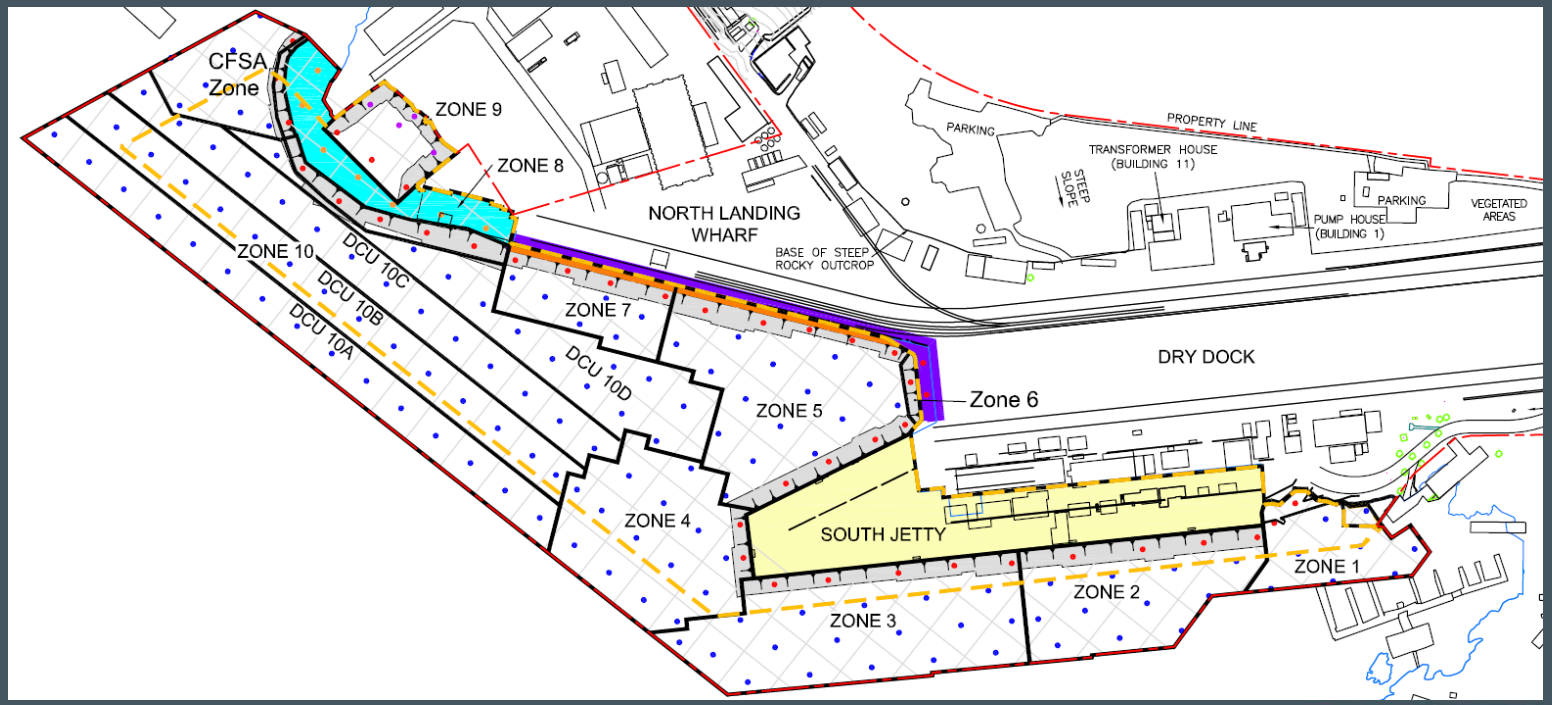


Residuals Management at EGD - BMPs

- Intensive water quality monitoring program
  - Field turbidity monitoring
  - Assess Total Suspended Solids from dredging
  - Allow faster responsiveness in the field

Confirmatory Sampling

- Residuals management strategy included in design
  - Prepared for contingency actions during construction



Summary

- Residuals will occur at EGD site
  - Soft sediment (and bedrock) at EGD site increase need for residuals management
  - Sloughing at project boundaries and Dredge Unit boundaries will generate residuals
- Consider residuals in remedial design
  - Confirmation testing for identification of surface residuals and/or missed inventory
  - Bid items for management of residuals

Summary

- Consider contingency options in construction
  - Re-dredging for removal of surface and subsurface residuals
  - Placement of residuals management cover

Questions?