



Photo courtesy of Heath Moffatt

# Phase 1B Esquimalt Graving Dock Waterlot Remediation Design and Construction Challenges



Public Works and  
Government Services  
Canada

Travaux publics et  
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Canada

Dan Berlin, Anchor QEA, LLC

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# Presentation Overview

- Esquimalt Graving Dock (EGD) site description and background
- Phase 1B description and objectives
- Challenges
  - Remedial design
  - Construction tendering
  - Construction implementation
- Project performance



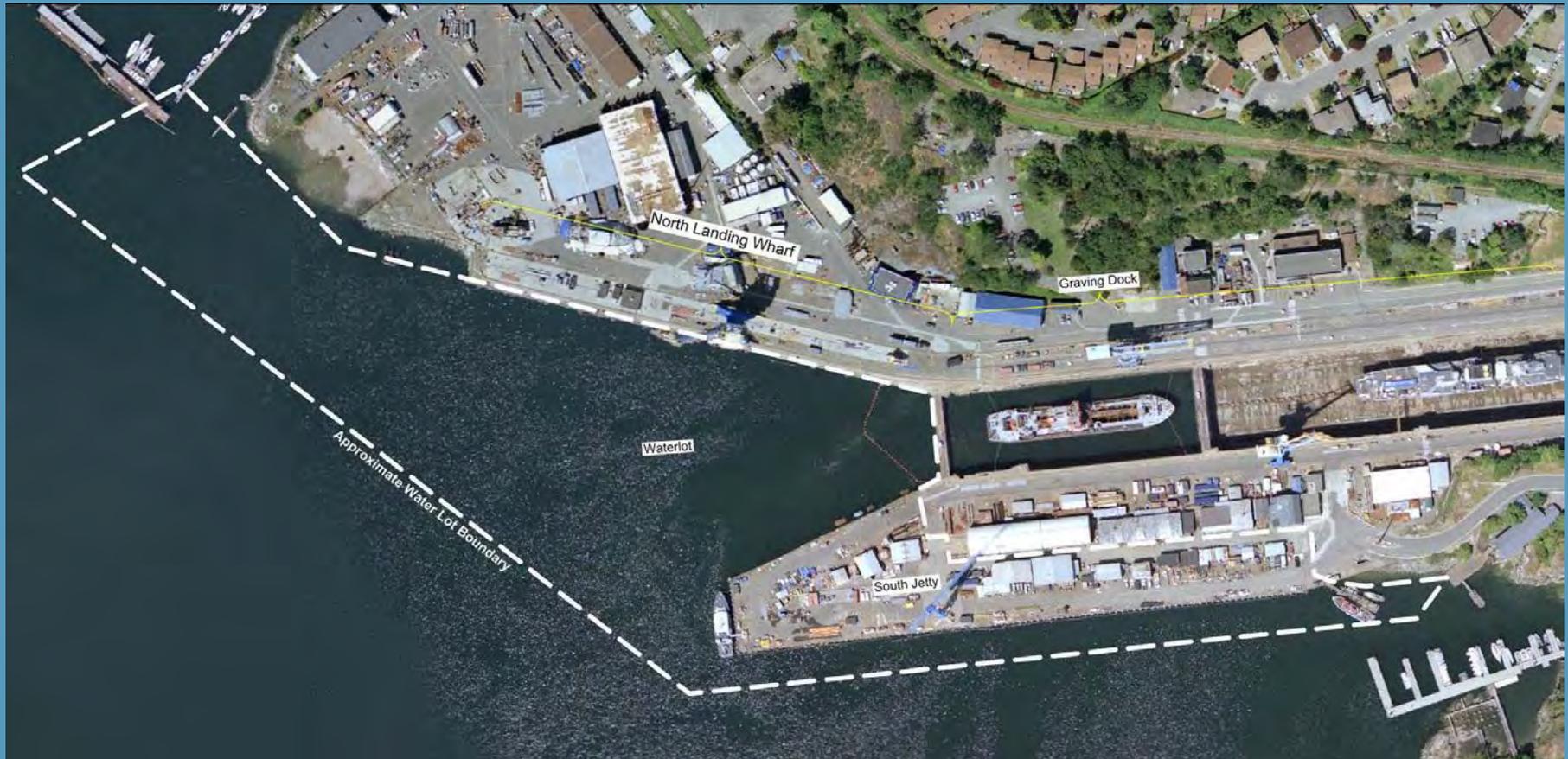
# Site Description and Background



DND – Department of National Defence

EGD – Esquimalt Graving Dock

# Site Description and Background (cont.)



# Site Description and Background (cont.)



# Active Shipyard/Graving Dock Facility

- More than 50 vessel calls per year



# Phase 1A – Under-pier Erosion Protection System



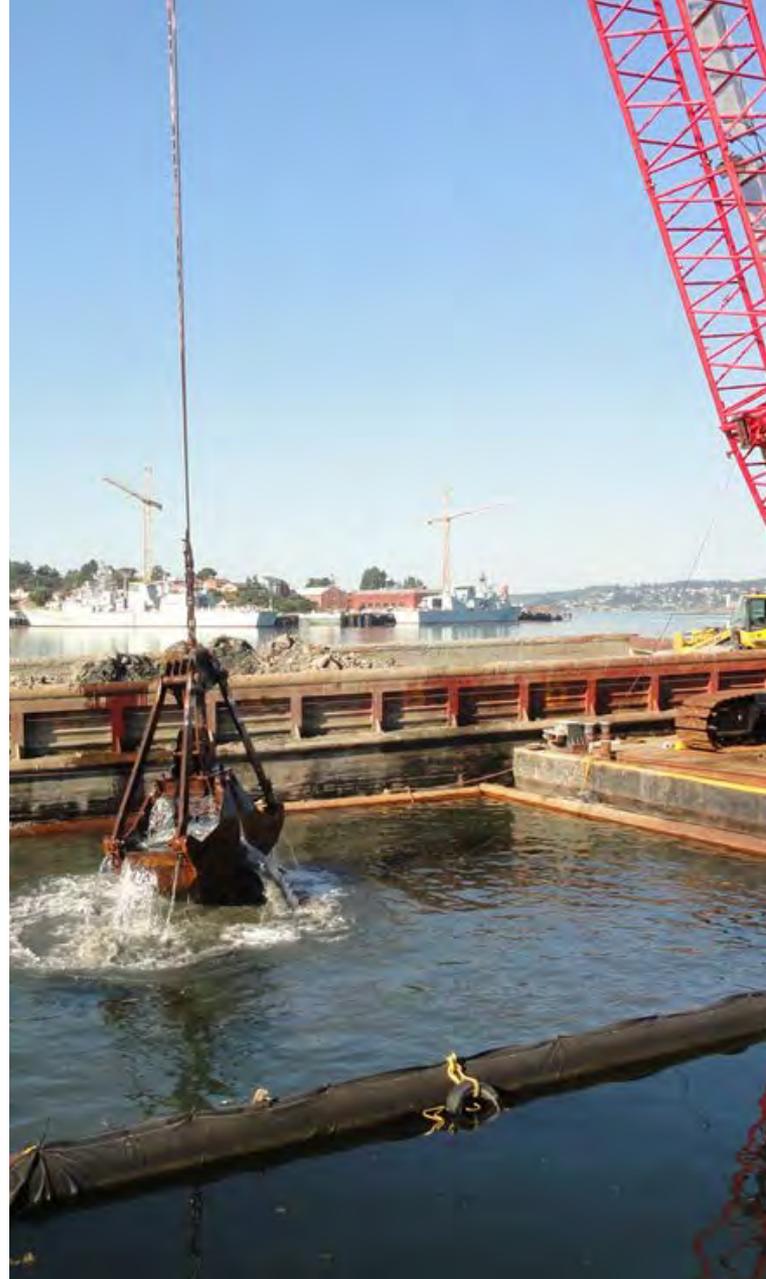
- Sheetpile wall prevents resuspension and transport of contaminated under-jetty sediment into Phase 1B area
- Constructed November 2012 to April 2013

# Phase 1A – Under-pier Erosion Protection System (cont.)

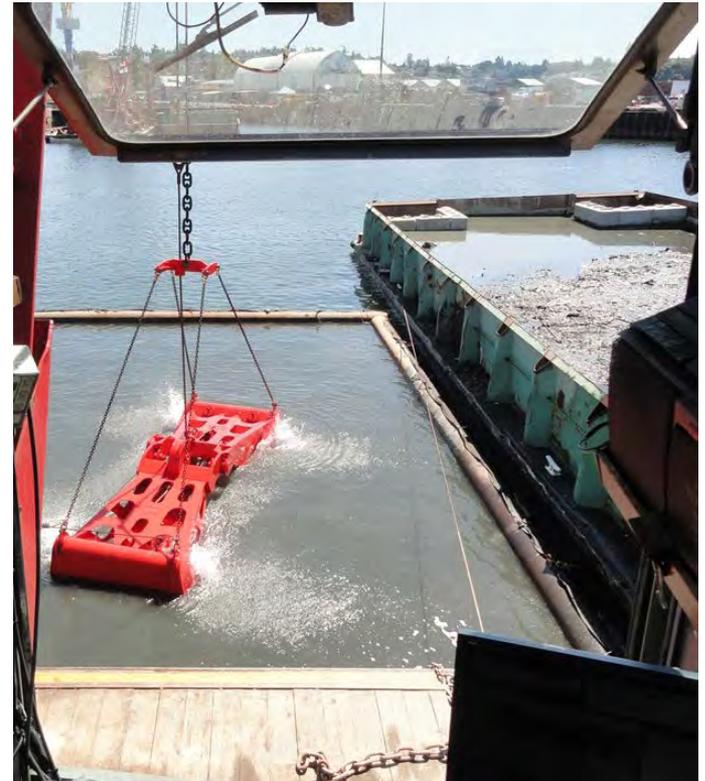


# Phase 1B – Open-water Dredging

- Dredging and disposal
  - 145,600 cubic meters (m<sup>3</sup>)
- In-water slope armouring
  - 22,800 m<sup>3</sup>
- Residuals management cover placement
  - 45,000 m<sup>3</sup>
- Structure demolition and temporary relocations
- Construction June 2013 to March 2014



# Phase 1B – Open-water Dredging (cont.)



# Phases 1C and 2

- Phase 1C – Habitat compensation
  - Offsets impacts of alteration and isolation of under-pier habitat
  - Construction of new intertidal marsh fish habitat
- Phase 2 – Under-pier remediation
  - 40,000 m<sup>3</sup> of contaminated sediment removal
  - October 2015 through October 2016



# Key Phase 1B Objectives

- Remove maximum contamination practicable
  - Reduce federal financial liability and establish baseline
  - Reduce risks to human health and the environment
  - Meet federal and provincial standards
- Schedule
  - Minimize disturbance to operations
  - Complete in 10 months by March 2014
- Ensure high level of certainty in project outcome
  - Conservative, practical, and constructible design
  - Proven technologies
  - Qualified contractors

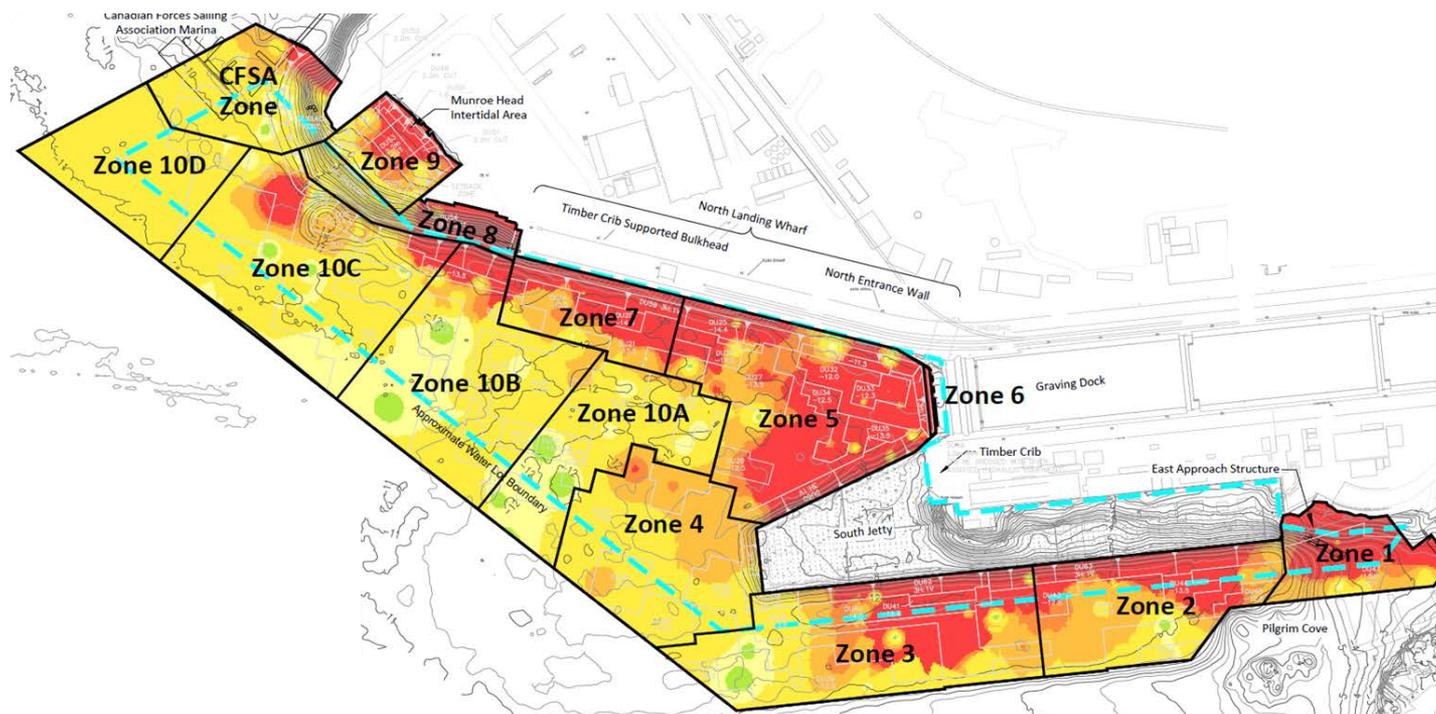
# Design Challenges

- Development of remedial dredge design
- Dredge residuals management
- Construction sequencing and operations needs
- Water quality criteria and best management practices (BMPs)
- Geotechnical and structural restrictions



# Remedial Dredge Design

- Construction sequencing to remove “hotter” contamination areas first
- Operational considerations



# Remedial Dredge Prism Design

- Dredge design considerations

Removal Scenario	Removal Volume (m <sup>3</sup> )	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%

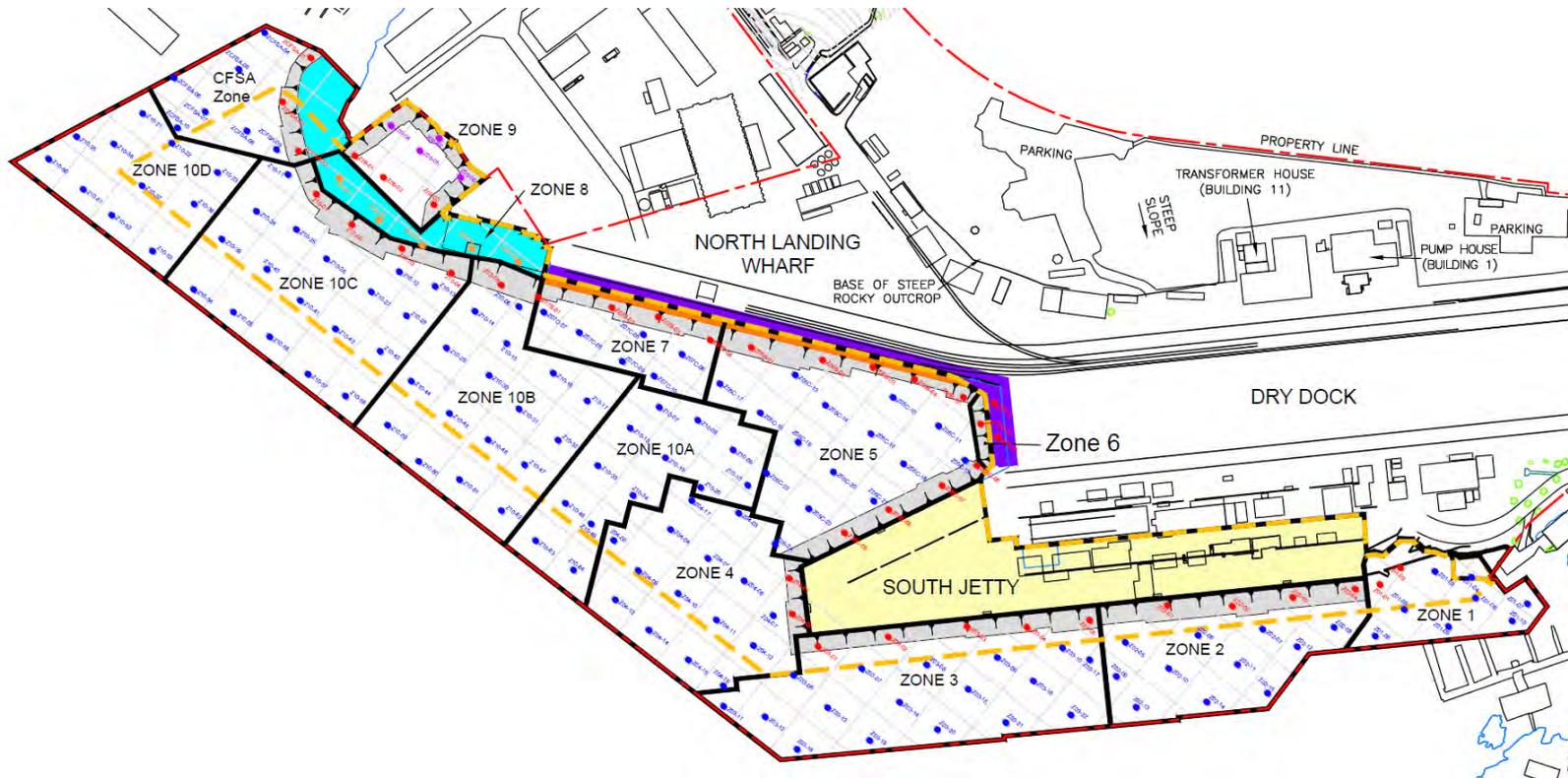
Notes:

\* Selected design criteria

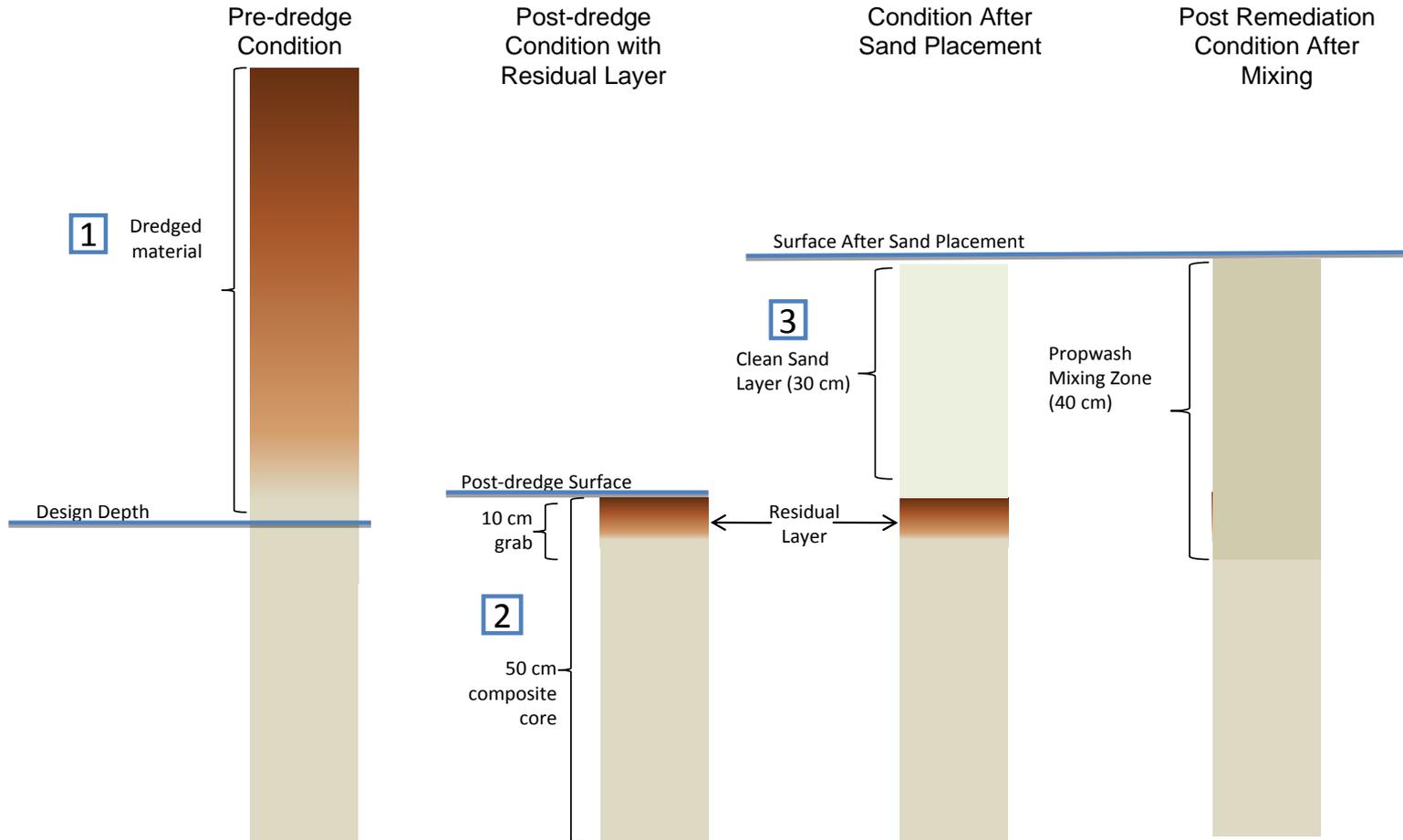
m = meter; m<sup>3</sup> = cubic meter; OD = overdredge

# Confirmatory Sampling

- Residuals management strategy included in design
  - Contingency actions during construction



# Residuals Management at EGD

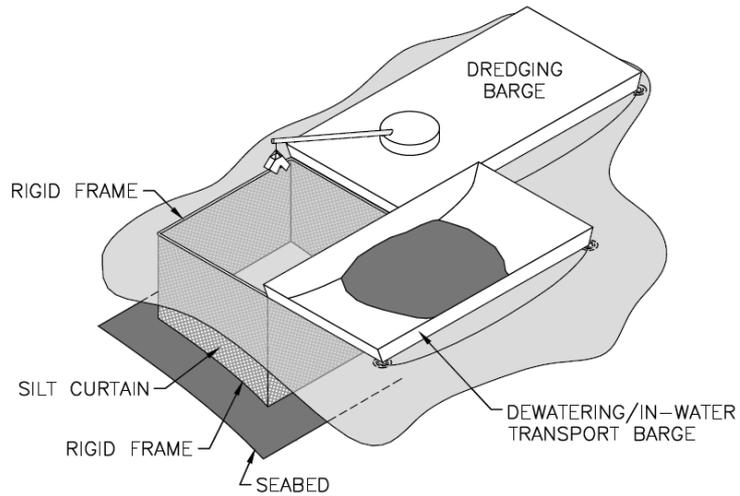




# Water Quality Monitoring

- Intensive water quality monitoring as part of comprehensive environmental monitoring program
  - Monitor turbidity
  - Assess total suspended solids from dredging
  - Confirm field results through laboratory analysis

# Silt Curtain



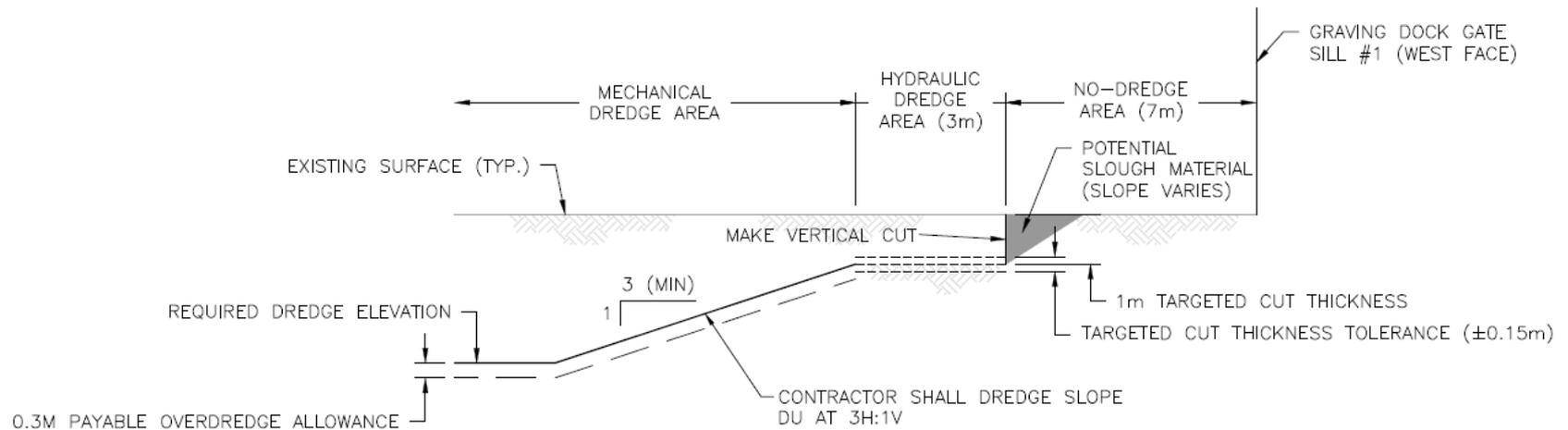
# Integrating Geotechnical and Structural Restrictions

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



# Integrating Geotechnical and Structural Restrictions (cont.)

- Graving dock sill



# Construction Tendering Challenges

- Limited pool of potentially qualified contractors
  - Develop qualification criteria
    - Contaminated sediment dredging greater than 40,000 m<sup>3</sup>
    - In-water slope armoring
    - Silt curtains and projects requiring Environmental Management Plans
    - Active marine site
    - Land transport and landfill disposal greater than 20,000 m<sup>3</sup>
  - Contracting strategy
    - Single Design-Bid-Build contract
    - Public tender
  - Balance cost competitiveness vs. risk

# Key Construction Challenges



- Construction impacts on EGD operations
  - Operations takes precedence over construction
  - Booking schedule changes
  - Limited on-site staging area
  - DND facility coordination
- Contractor schedule changes
- Residual management cover placement after dredging is complete

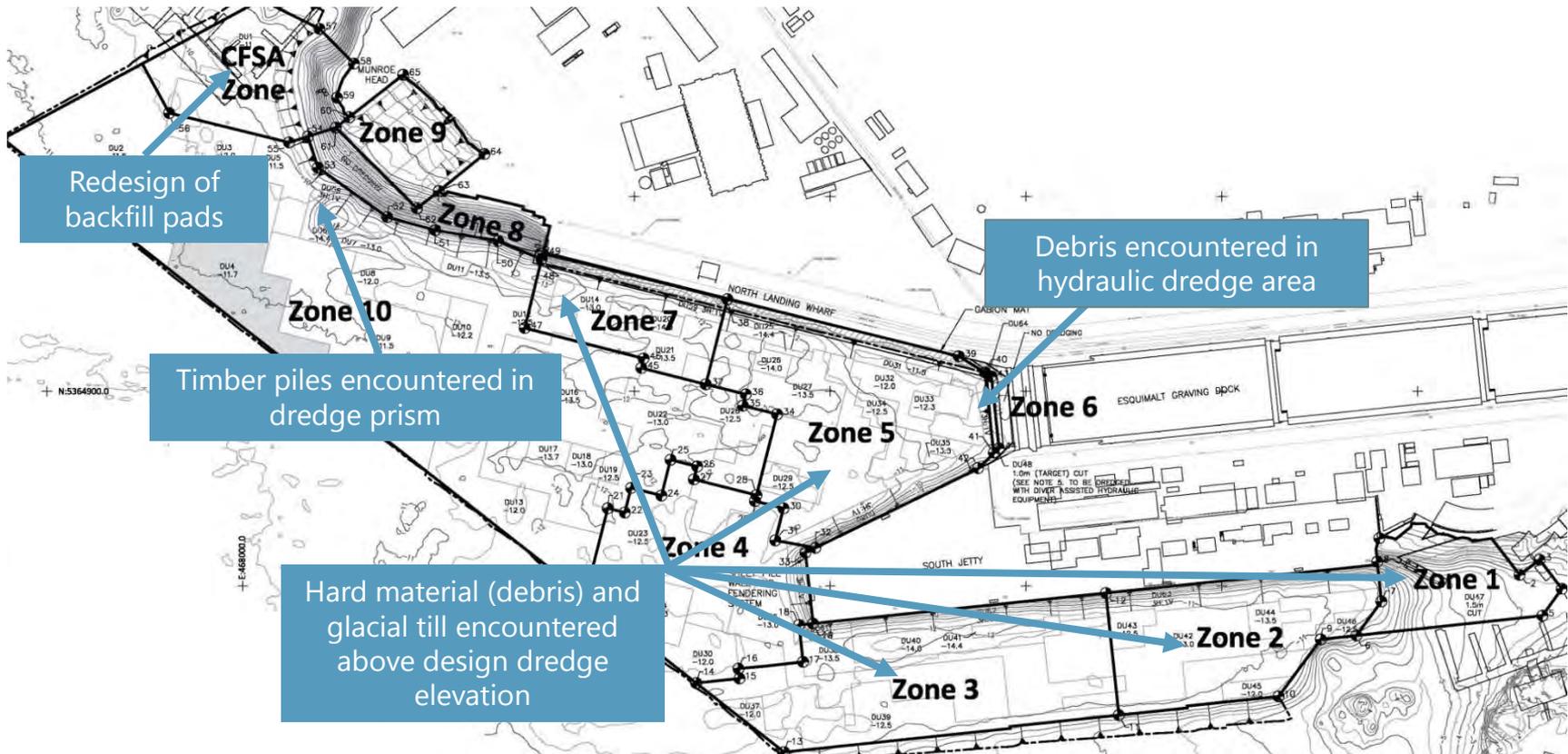
# Key Construction Challenges (cont.)

- Contractor experience with large-scale sediment remediation
  - Achieve tight design tolerances
  - Offload facility production rate
  - Diver-assisted hydraulic dredging



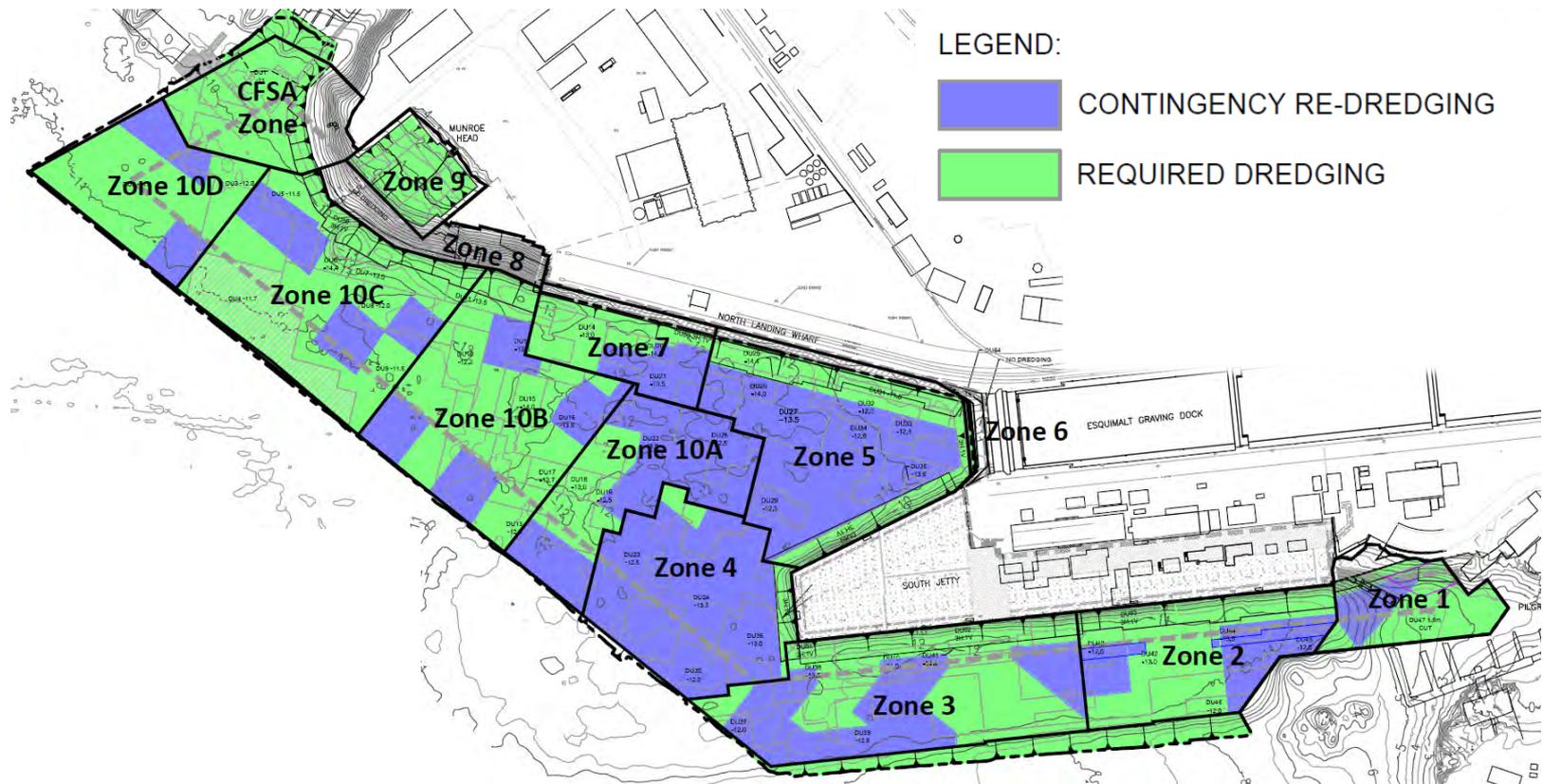
# Key Construction Challenges (cont.)

- Remove maximum contamination practicable
  - Unanticipated subsurface conditions



# Key Construction Challenges (cont.)

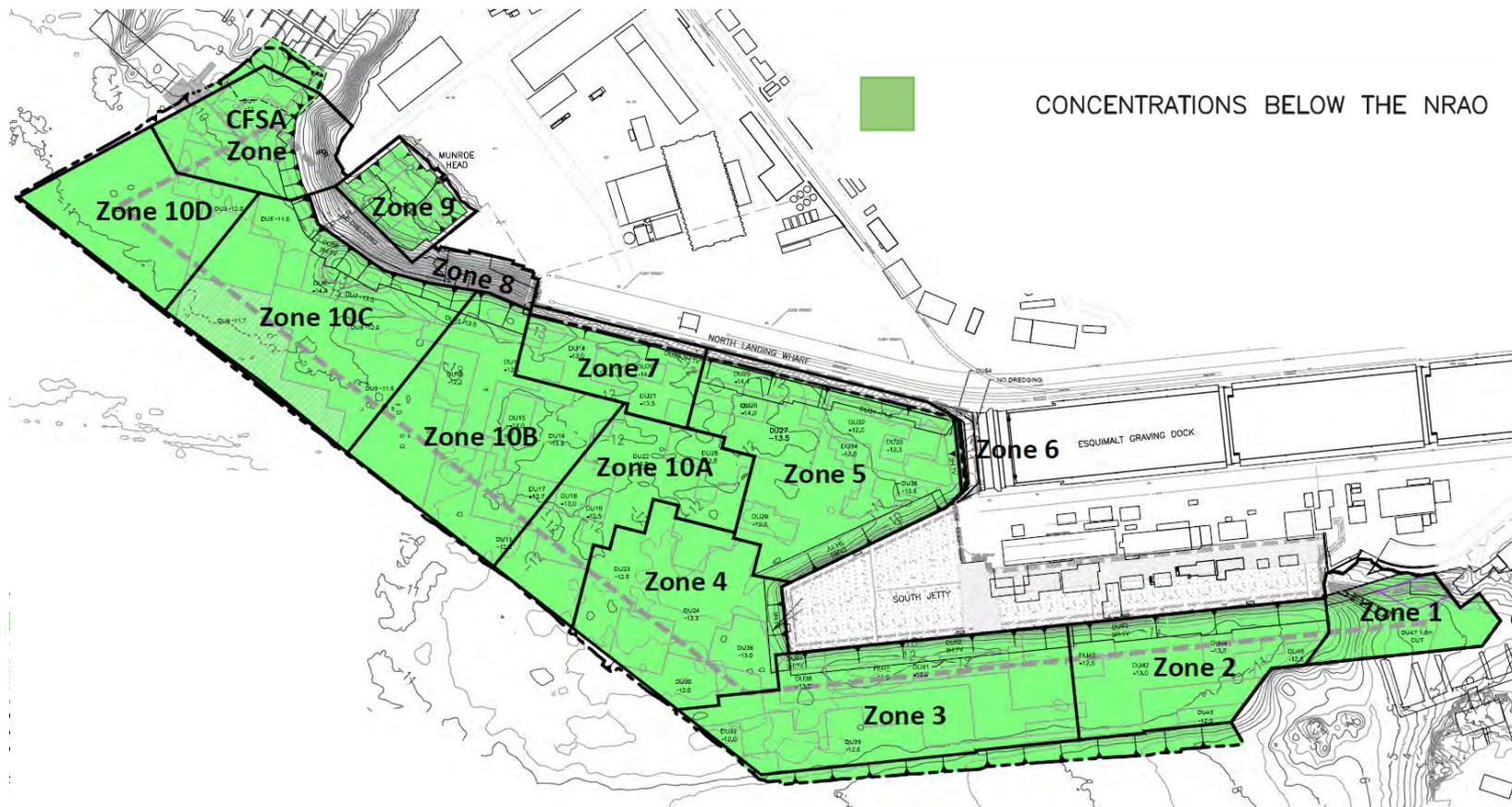
- Remove maximum contamination practicable
  - Missed inventory and residuals contingency dredging





# Project Performance (cont.)

- Post-cover mixed concentration



# Lessons Learned

- Plan for dredge residuals with sequencing, BMPs, and contingency actions
- Select qualified contractor using criteria that balance cost-competitiveness and risk
- Incorporate risk-based contingency into project cost estimate
- On-site construction management staff
  - Reinforce objectives of the cleanup
  - Minimize impact to operations
  - Support adaptive management



# Questions

- Dan Berlin, [dberlin@anchoragea.com](mailto:dberlin@anchoragea.com)

