



Photo courtesy of Heath Moffatt

# Esquimalt Graving Dock Waterlot Remediation Mega-Site (Phase 1B): Design, Contracting, and Construction Challenges



Public Works and  
Government Services  
Canada

Travaux publics et  
Services gouvernementaux  
Canada

Presented by

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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.)



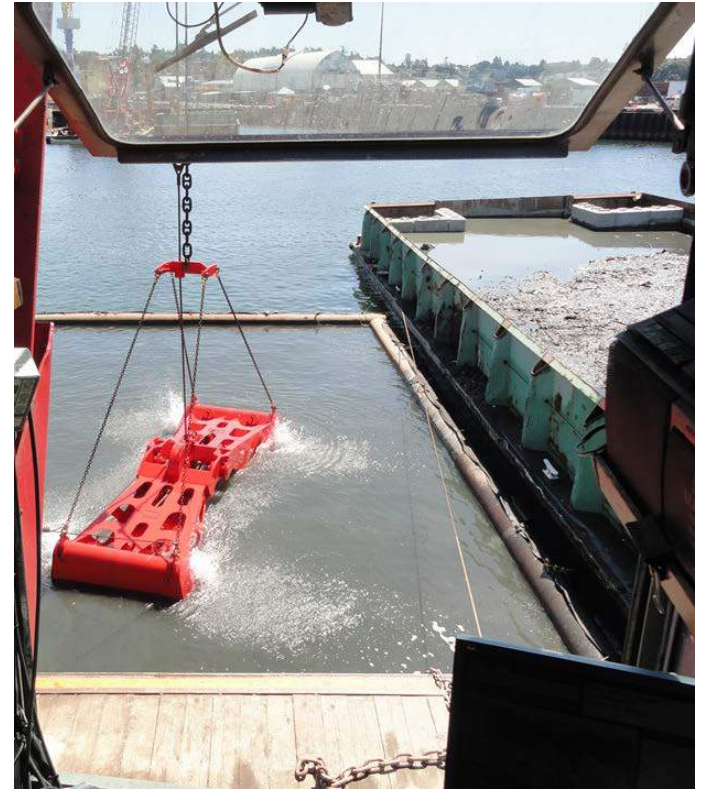


# Phase 1B – Open-Water Dredging

- Dredging and disposal
  - 145,600 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
  - Anticipated for Summer 2015





# Key Phase 1B Objectives

- Remove maximum contamination practicable
  - Reduce Government of Canada financial liability
  - Establish baseline conditions for future operations
  - Meet federal and provincial standards
  - Reduce risks to human health and the environment
  - Achieve Federal Contaminated Sites Action Plan objectives





# Key Phase 1B Objectives (cont.)

- Schedule
  - Minimize disturbance to operations
  - Complete by March 2014
- Ensure high level of certainty in project outcome
  - Conservative, practical, and constructible design
  - Proven technologies
  - Qualified contractors



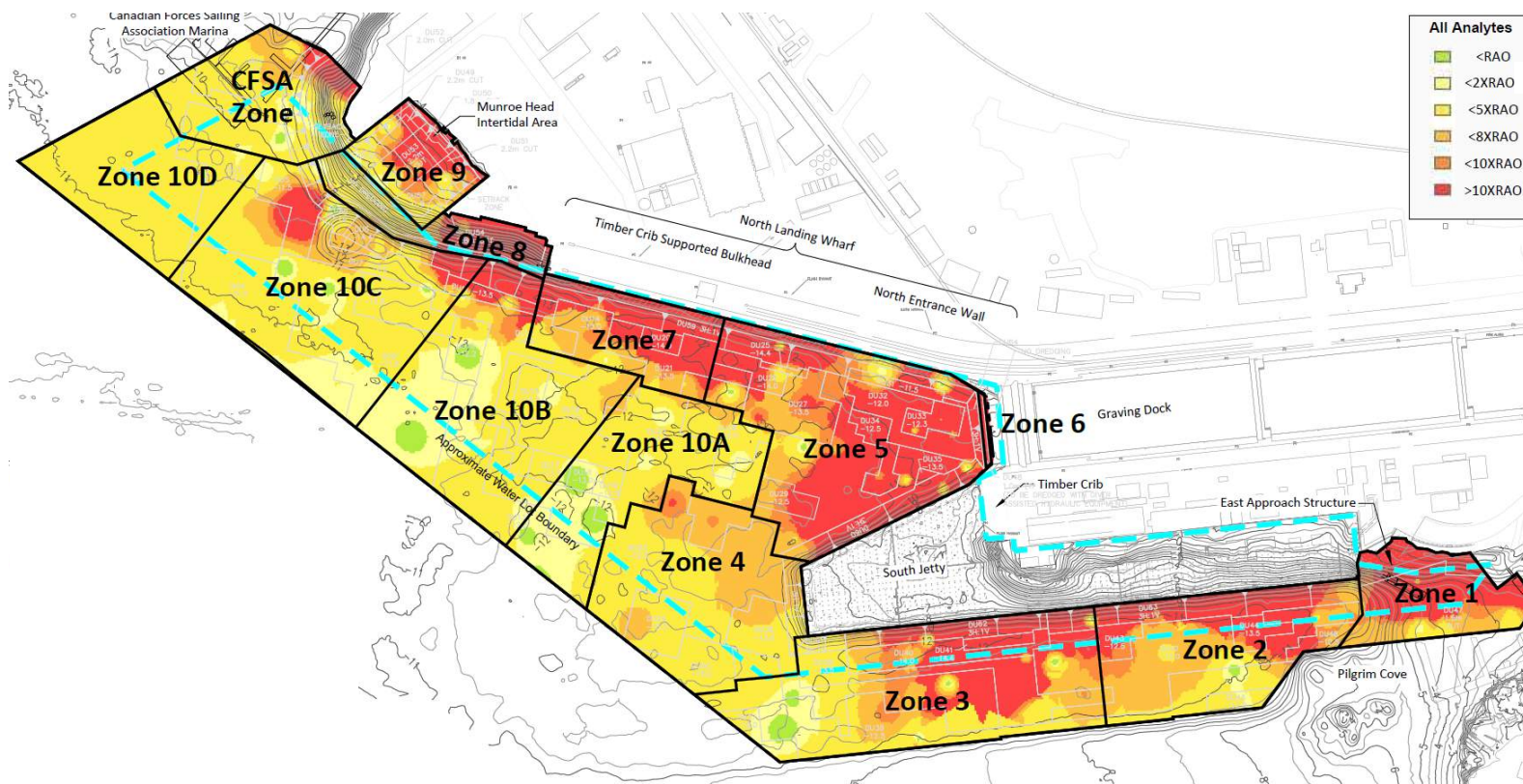
# Design Challenges

- Development of remedial dredge prism
- Dredge residuals management
- Construction sequencing and operations needs
- Best management practices (BMPs)
- Geotechnical and structural restrictions
- Balancing use of performance vs. prescriptive specifications



# Development of Remedial Dredge Prism

- Dredge design considerations



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

# Development of Remedial Dredge Prism (cont.)

- 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%

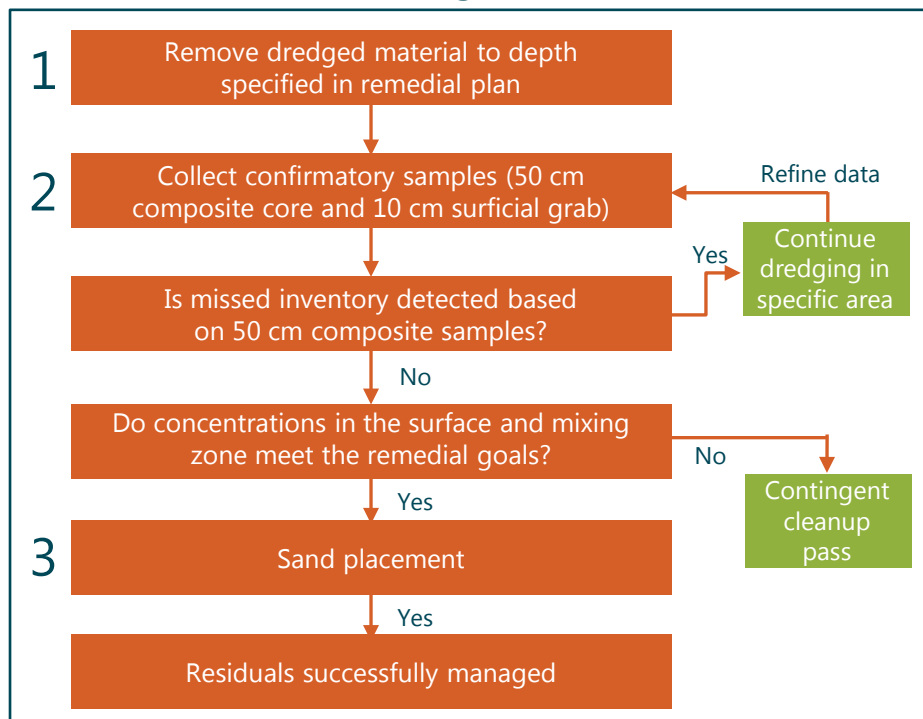
\* Selected design criteria



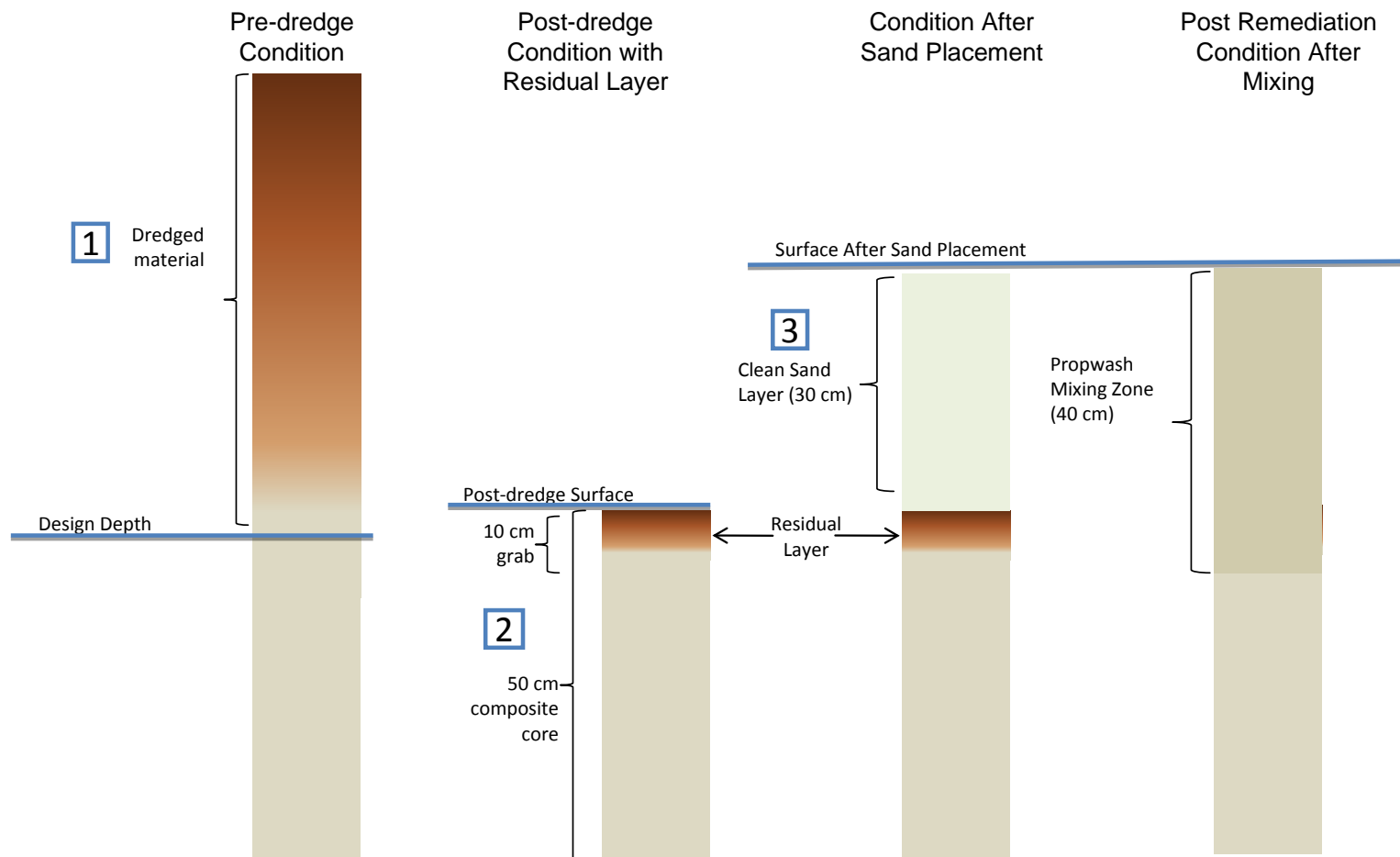
# Residuals Management at EGD

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

Residuals Management Flowchart

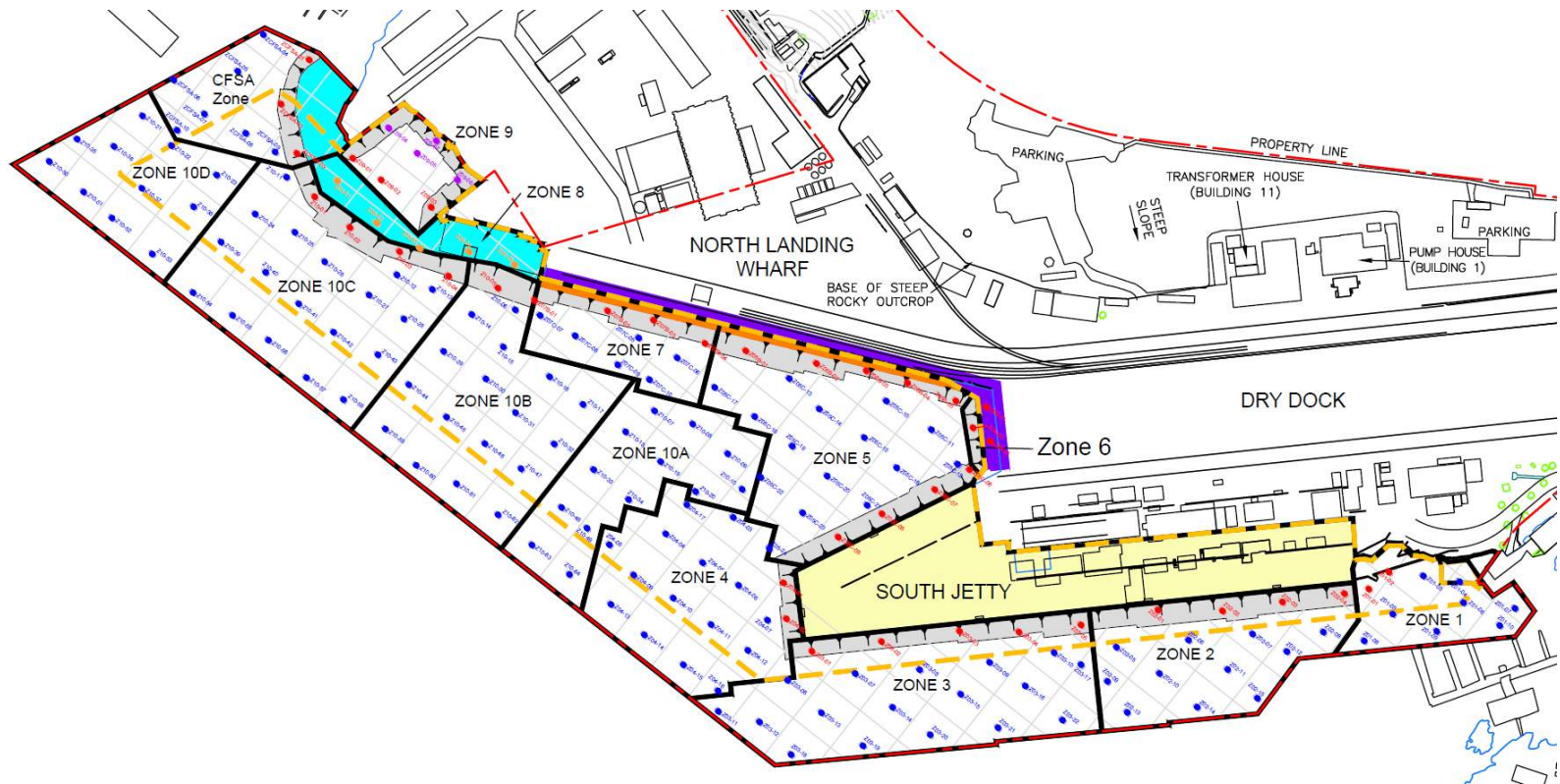


# Residuals Management at EGD (cont.)



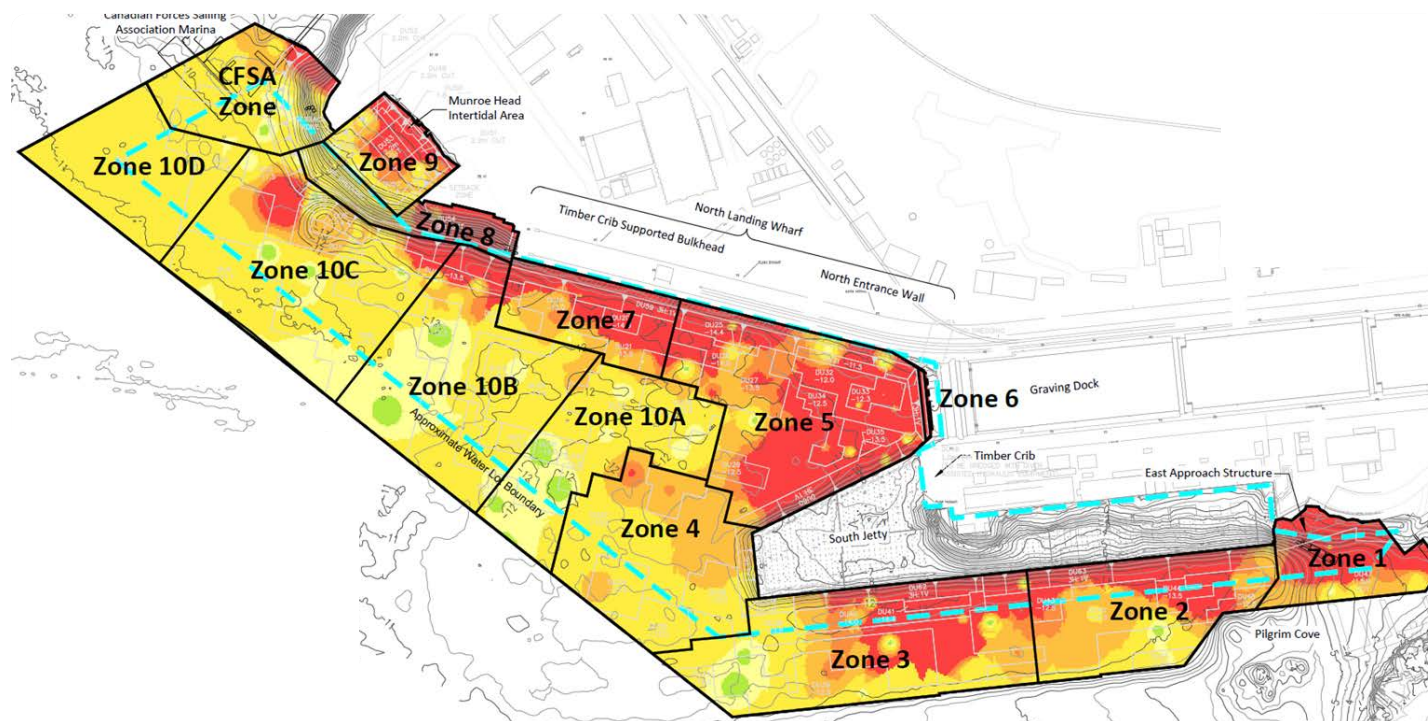
# Confirmatory Sampling

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



# Construction Sequencing

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

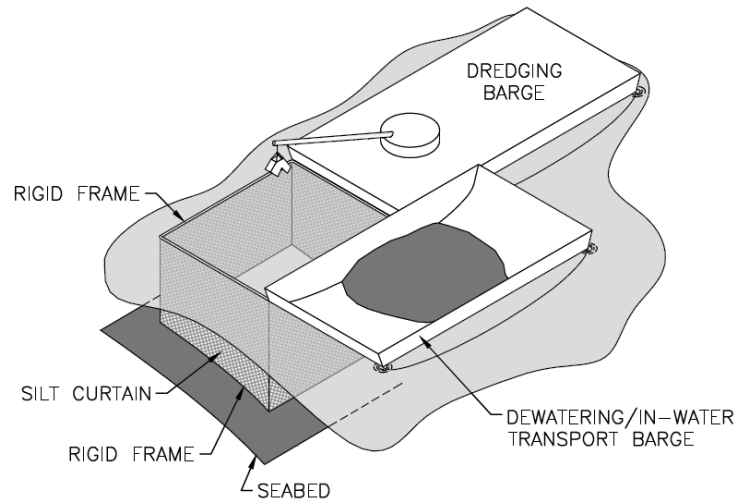




# Water Quality Monitoring

- Intensive water quality monitoring as part of comprehensive environmental monitoring program
  - Field turbidity monitoring
  - Assess total suspended solids from dredging
  - Allow faster responsiveness in the field
  - Laboratory analysis to confirm field results

# Silt Curtain



# Integrating Geotechnical and Structural Restrictions

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



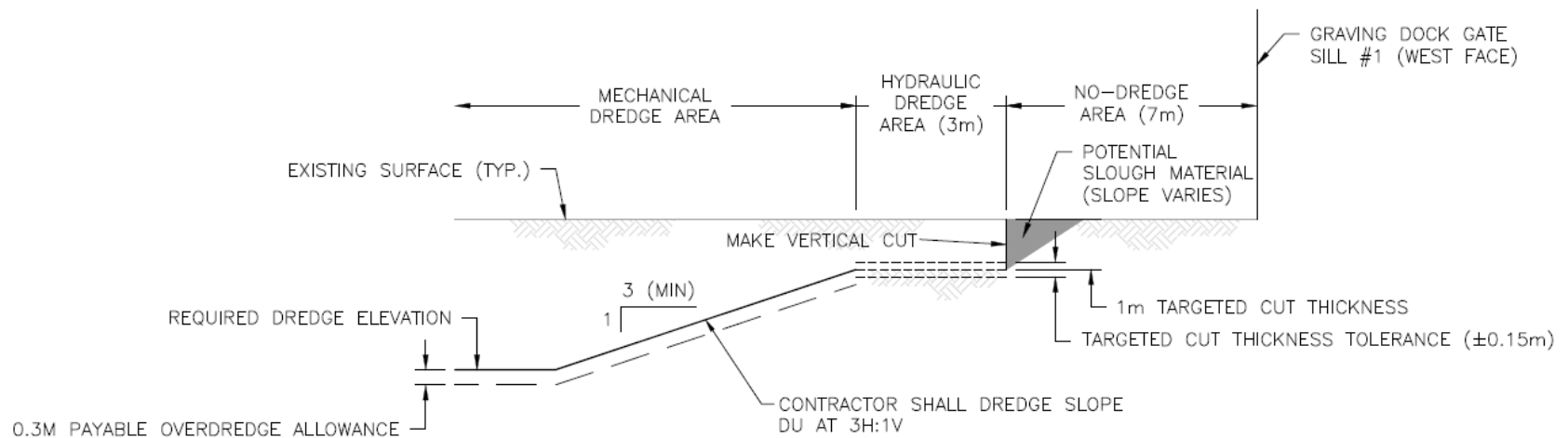
# Integrating Geotechnical and Structural Restrictions (cont.)





# Integrating Geotechnical and Structural Restrictions (cont.)

- Graving dock sill





# Performance-Based vs. Prescriptive-Based Specifications

- Performance-based specifications
  - Achieving required dredge prism
  - Environmental compliance
    - Silt curtain usage
    - Water quality
  - Placement of in-water slope armour and backfill material
  - Transport and disposal





# Performance-Based vs. Prescriptive-Based Specifications (cont.)

- Prescriptive-based specifications
  - Operational considerations
  - Construction sequencing
    - Fisheries and Oceans Canada (DFO) work windows
  - Work near structurally sensitive areas
  - Quality control
    - Surveying
    - Reporting
  - Transport and disposal



# Construction Tendering Challenges

- Limited pool of potentially qualified contractors
  - Develop invitation to tender qualification criteria
    - Contaminated sediment dredging > 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 > 20,000 m<sup>3</sup>
  - Contracting strategy
    - Single Design-Bid-Build contract
    - Public tender
  - Balance cost competitiveness vs. risk



# Key Pre-Construction Challenges

- Pre-construction submittal requirements
  - Landfill disposal and offload facility permits
  - Construction Work Plan
  - Environmental Protection Plan
  - Quality Control Plan
- Public communication and outreach
- Design team responsibilities
  - Construction Quality Assurance Plan
  - Environmental Management Implementation Plan
  - Confirmatory Sediment Sampling Plan



# 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

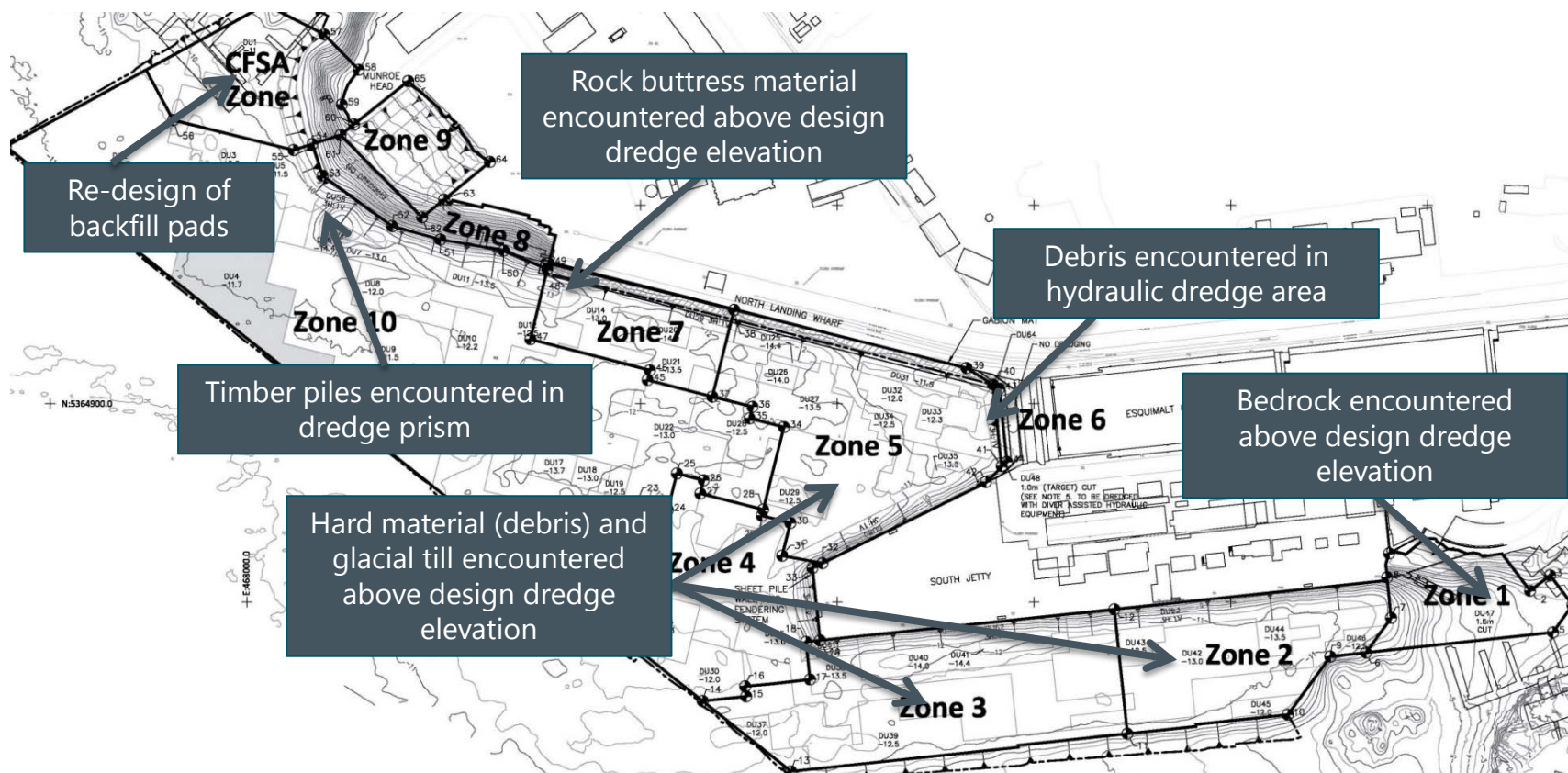
# Key Construction Challenges (cont.)

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



# Key Construction Challenges (cont.)

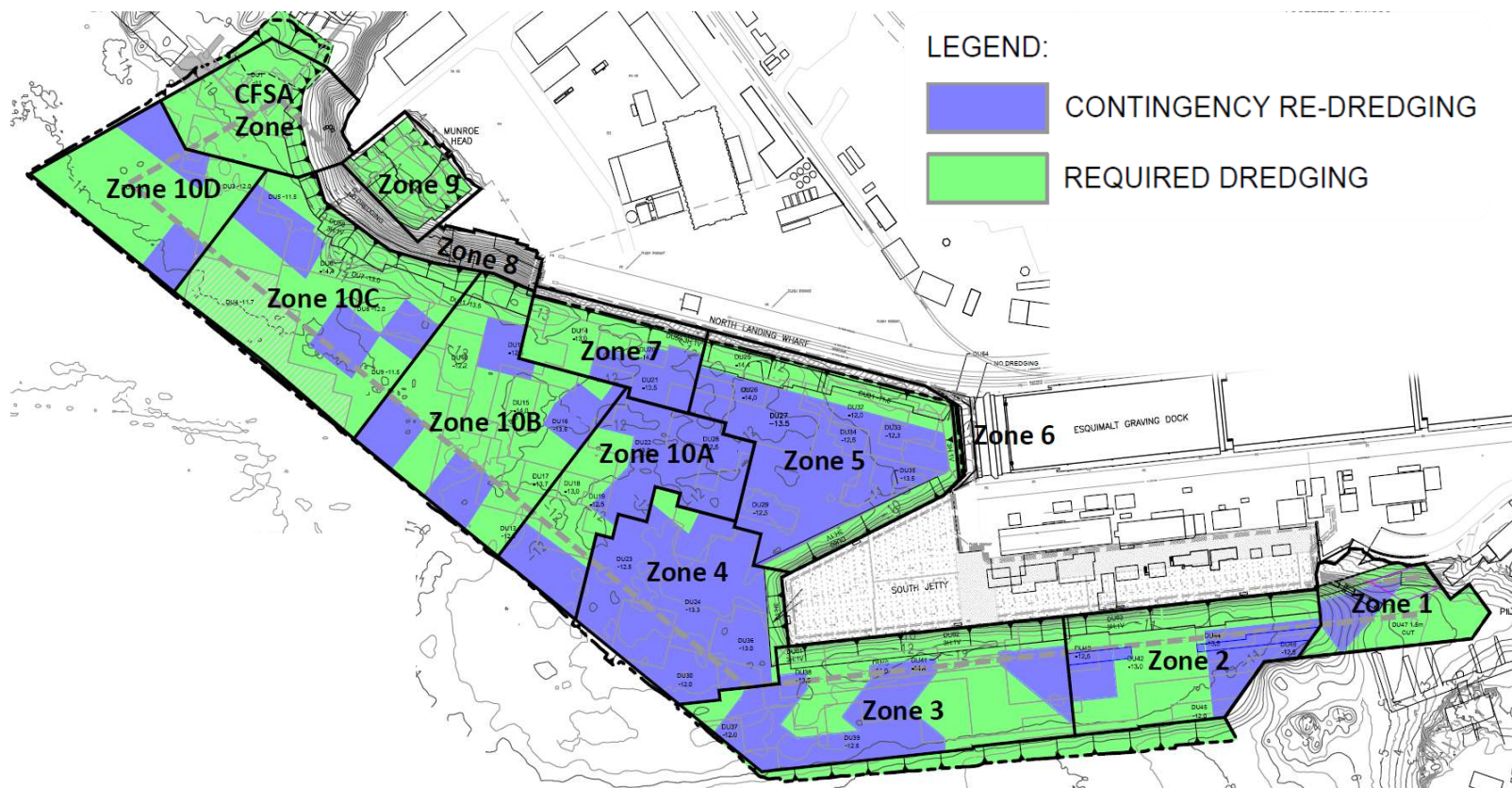
- Remove maximum contamination practicable
  - Unanticipated subsurface conditions





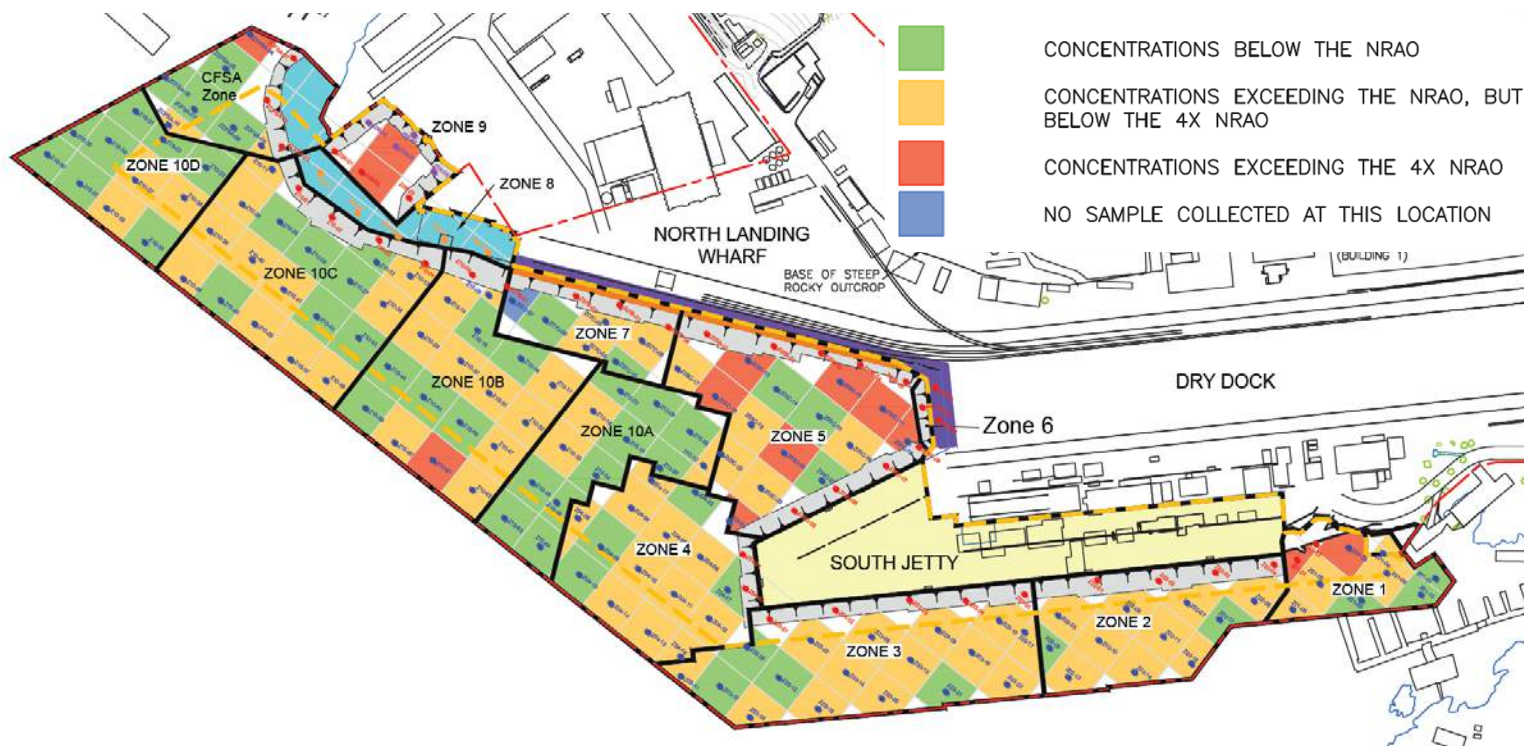
# Key Construction Challenges (cont.)

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



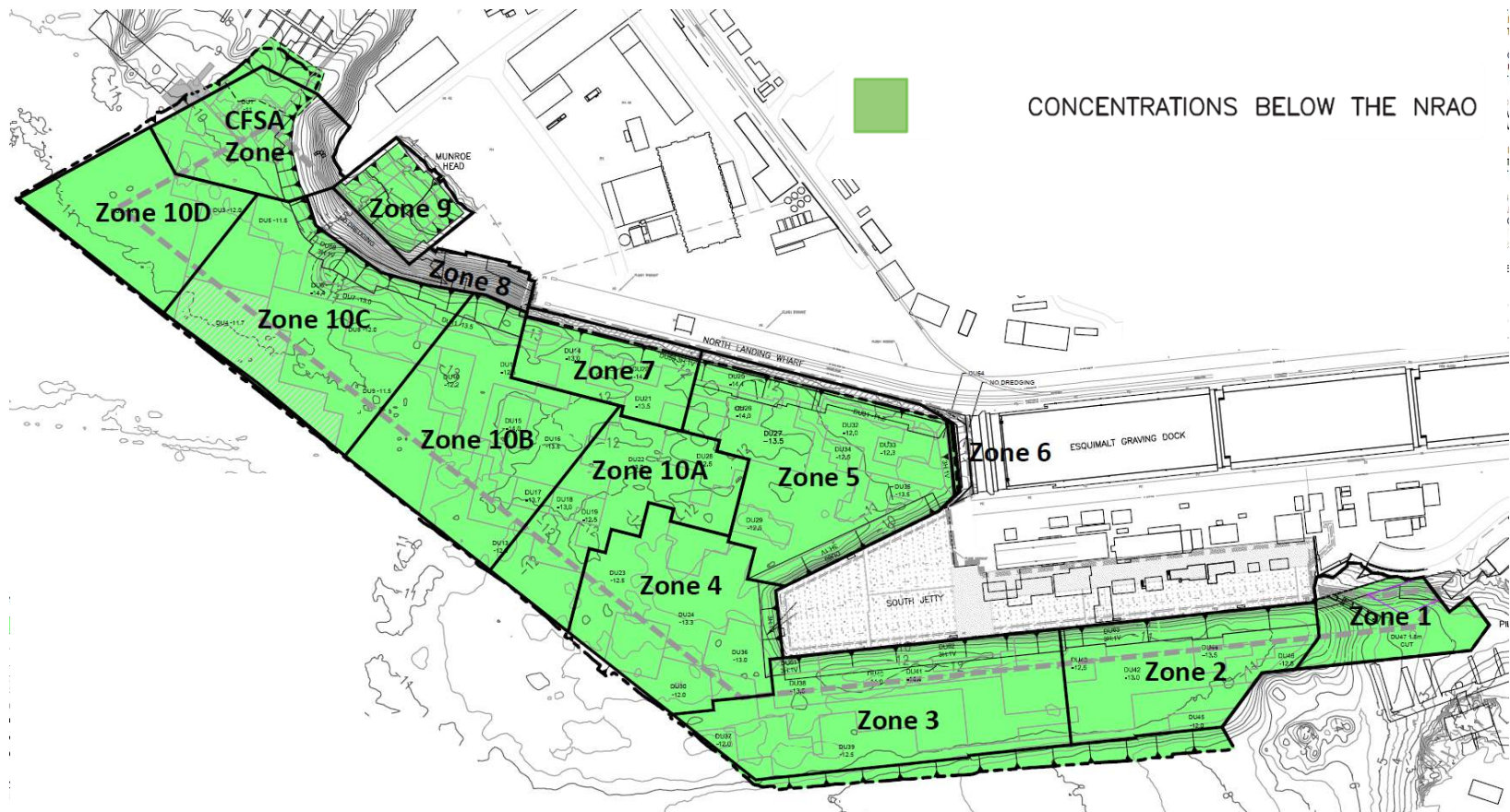
# Project Performance

- Work completed on schedule in March 2014
- Maximum contaminant removal – 145,600 m<sup>3</sup>
- Confirmatory results



# Project Performance (cont.)

- Predicted post-cover mixed concentration





# Lessons Learned

- Develop specifications to address risk and minimize claim potential
  - Allow contractor flexibility in means and methods
  - Be prescriptive where operational needs govern
- Plan for dredge residuals with sequencing, BMPs, and contingency actions
- Select qualified contractor using criteria that balance cost-competitiveness and risk
- Minimize impact to operations through communication and adaptive management



# Questions/Discussion



Photo courtesy of Heath Moffatt

