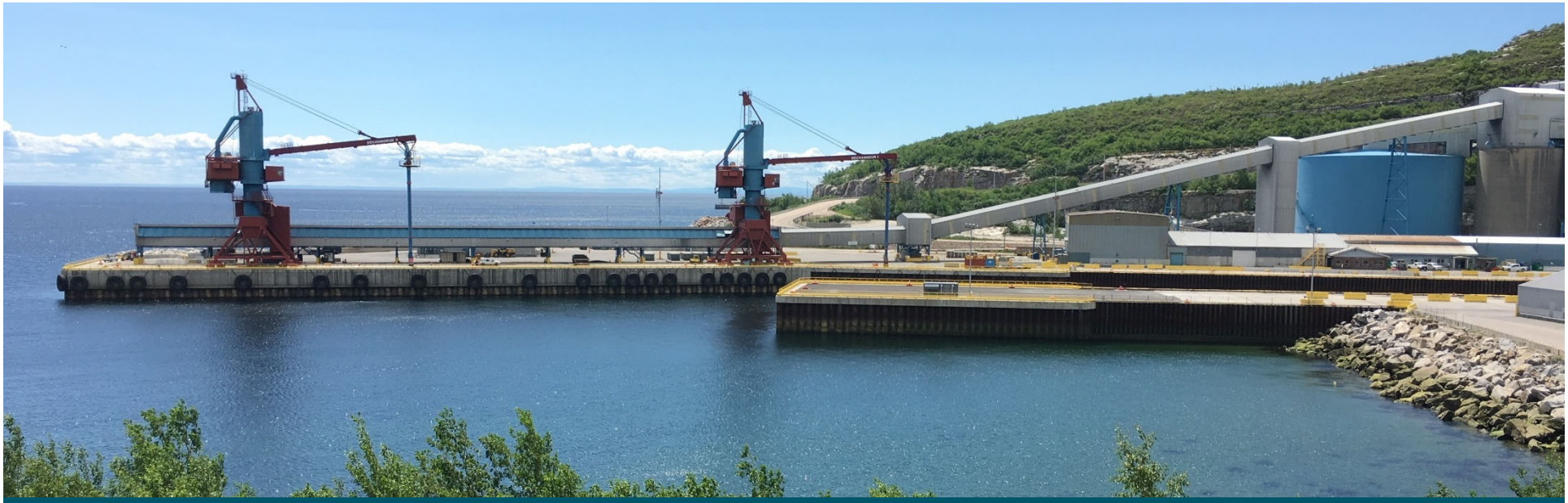

Beneficial Use of an Abandoned Slip for Confined Space Disposal of Contaminated Sediment

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Patrice Dubé and Jean-Pierre Barry (Alcoa)

February 12, 2019


Baie-Comeau
QUEBEC, CANADA
Quebec City
Ottawa
Montreal
Toronto
New York

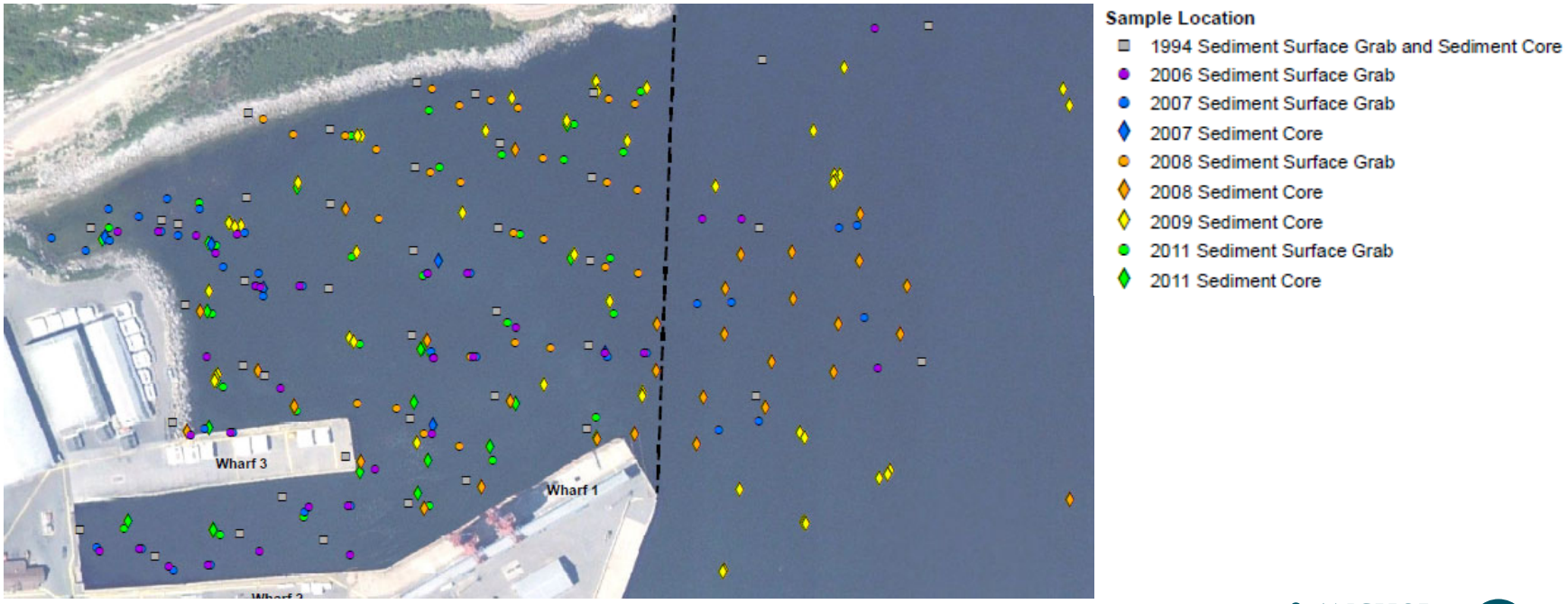

St. Lawrence River
Baie des Anglais
Anse du Moulin (ADM)

- **Problem:** Facility was dealing with major/costly issues
  - The wharf was in need of major repair
  - Contaminated sediments required remediation in the Anse du Moulin
- **Solution:** Seek alternatives to combine rehabilitation of the wharf with the sediment remediation project


Deteriorated Wharf
Emergency Phase 1 Wharf Repairs
Phase 2 Wharf Repair
ANSE DU MOULIN
BAIE DES ANGLAIS
Wharf 3
Wharf 1
Wharf 2

Environmental Investigations and Evaluations

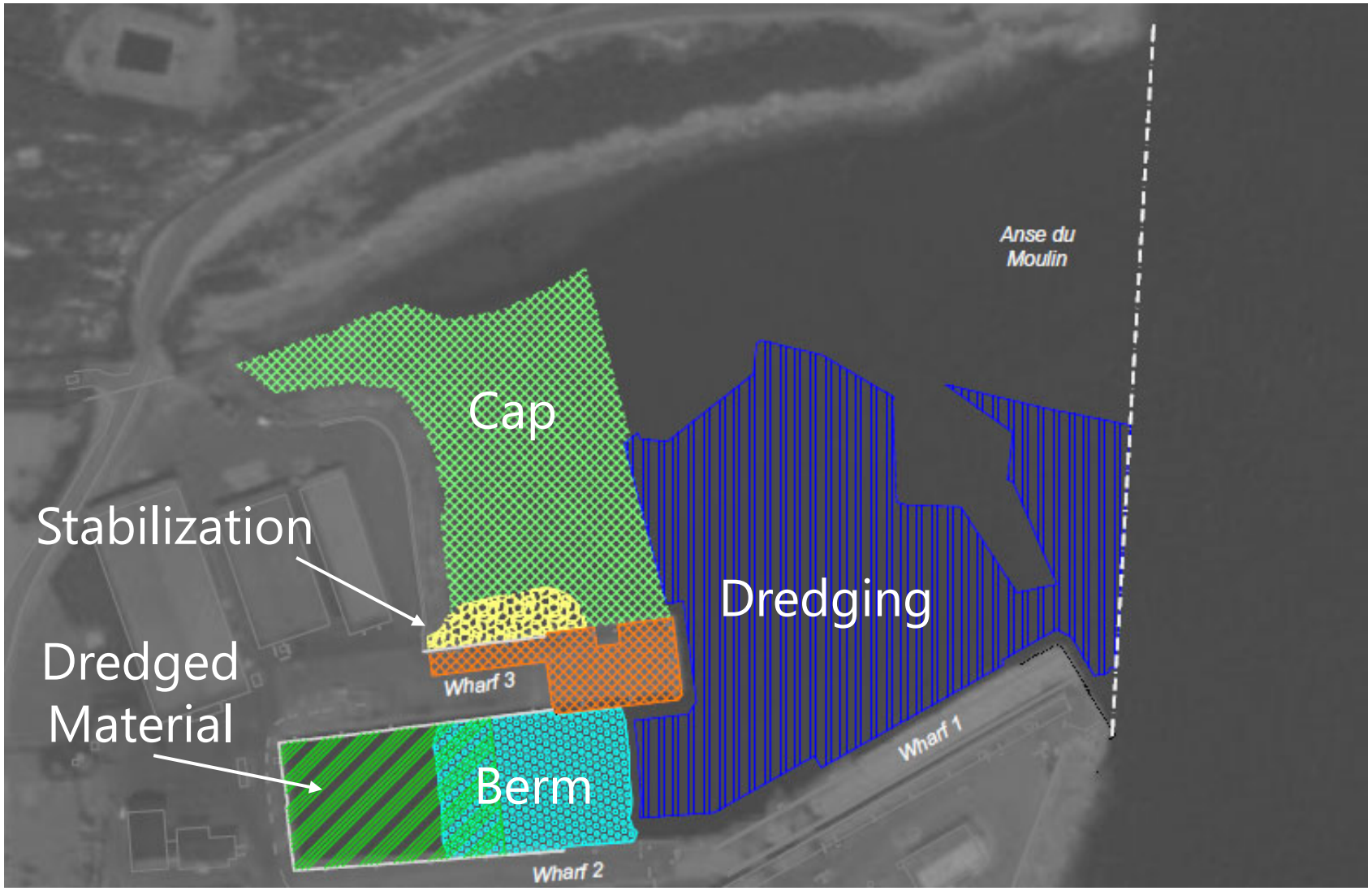
- Testing of sediment, sediment porewater, surface water, and biota (1980s to 2015)
- Primary COCs: PAHs and PCBs
- Localized areas of high COC concentrations
- Risk assessments concluded unacceptable environmental risk



Remedial Objectives

- Reduce impact of PAHs/PCBs on aquatic organisms
- Limit potential migration of contaminated sediments
- Provide a long-term solution to sediment contamination
- To the extent possible, combine sediment remediation with upgrading marine waterfront facilities

Selected Sediment Remedy



Agency Involvement

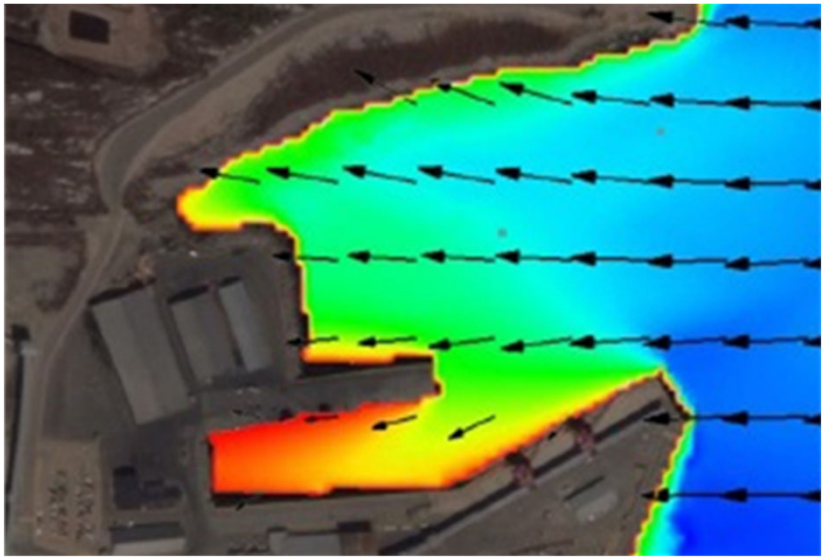
- Ministère du Dèveloppement Durable, de l'Environnement et des Parc (MDDEP) – Lead Agency
- Environmental investigations/assessments
- Alternatives Analysis (AA)
- Environmental and Social Impact Assessment Study (ESIA)
- Certificate of Authorization (COA)
- Oversight during construction

Challenges

Aggressive Schedule

Climate

Vessels at Wharf



Marine Mammals

Aging Wharf

100-yr Design Wave

Wharf 3 Stabilization

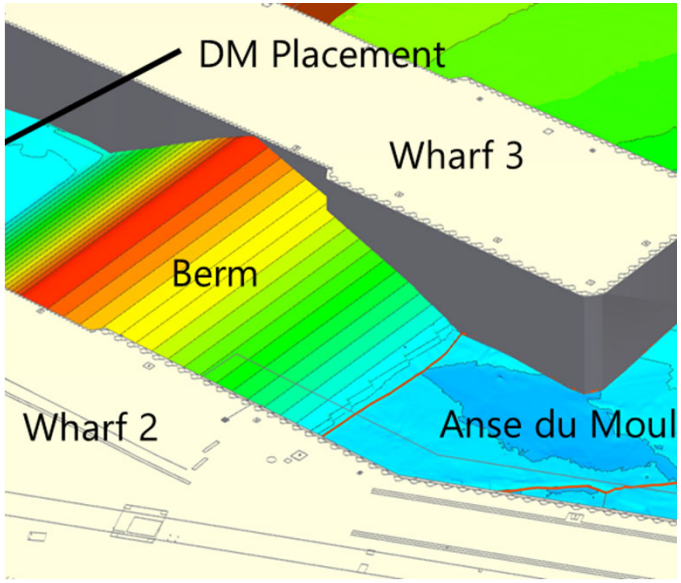
- Stone revetment to stabilize unrepaired wharf wall
- Constructed early to increase Wharf 3 access

Before

After

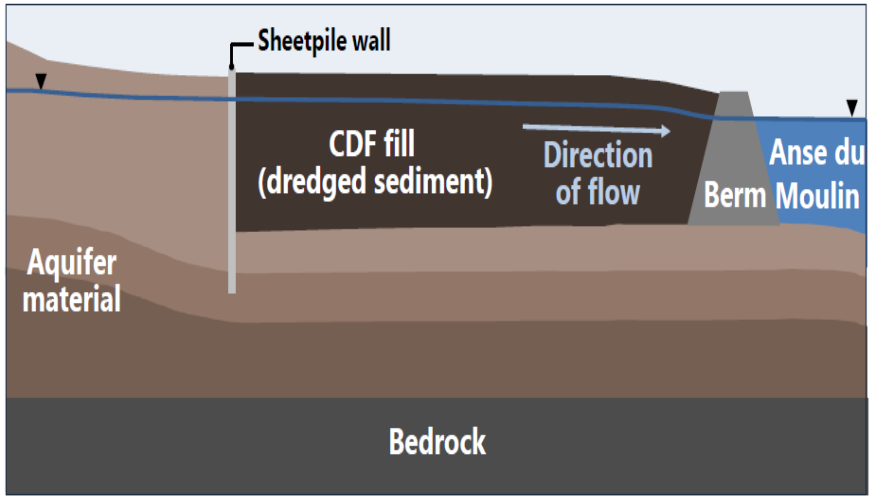
Containment Cell (CDF) Berm

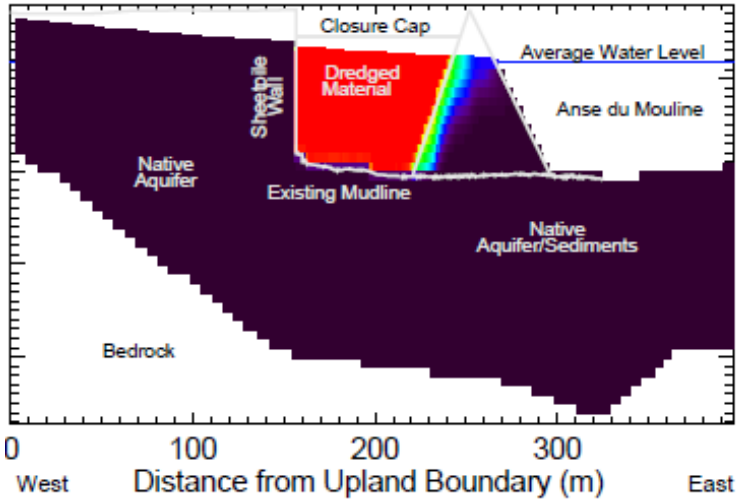
- 4-layer aggregate berm
- 17 meters tall (51 feet)
- ~48,000 cy of sand and stone
- Reinforced unrepaired wharf walls
- Restricted access zone
- Constructed mostly from water



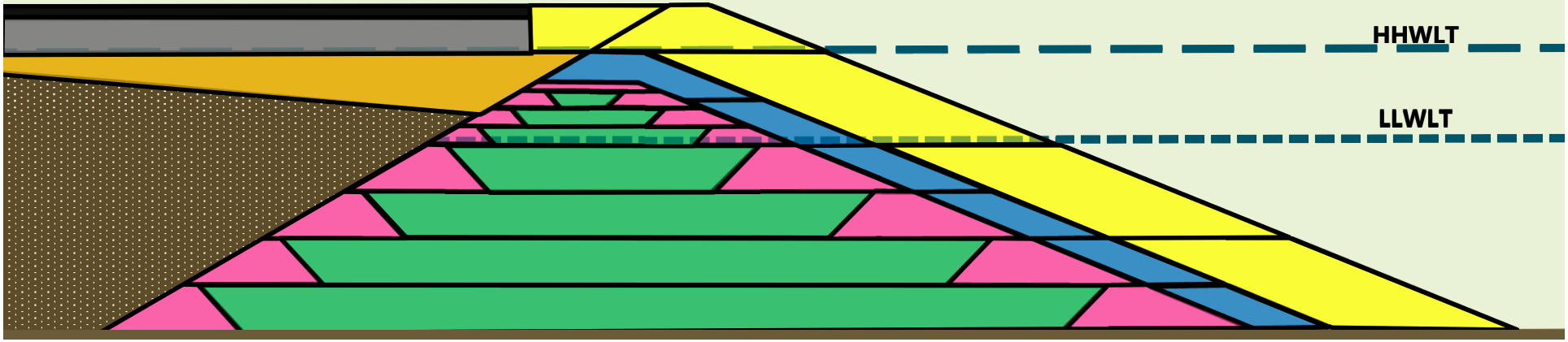
CDF Berm Engineering Evaluations

- Geotechnical investigations
- Ground improvement assessment
- Erosion protection/wave analysis
- Structural assessments
- Chemical fate and transport modeling



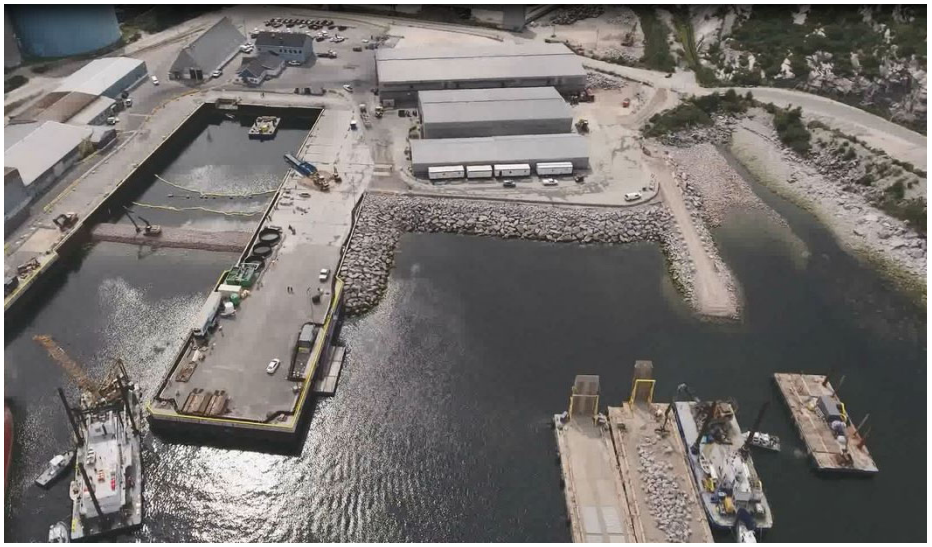


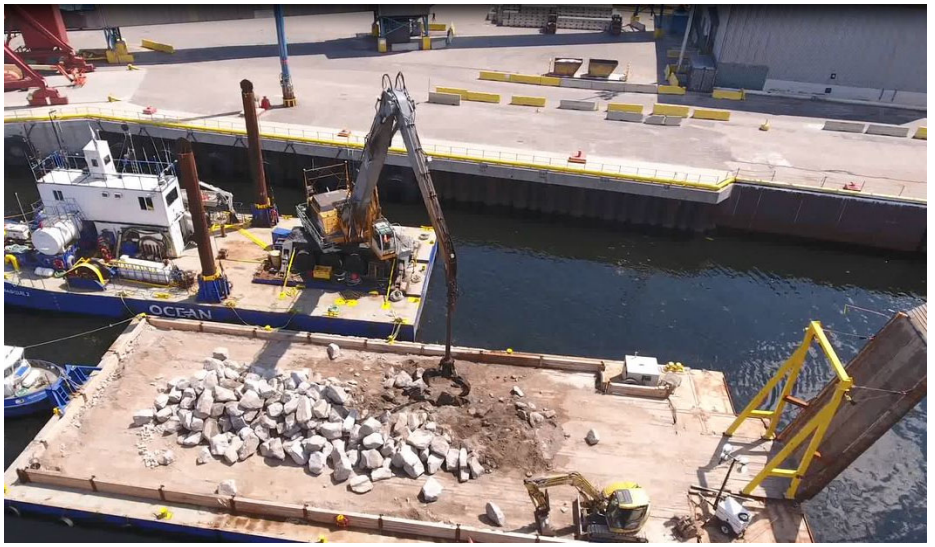
CDF Berm – Construction Sequence

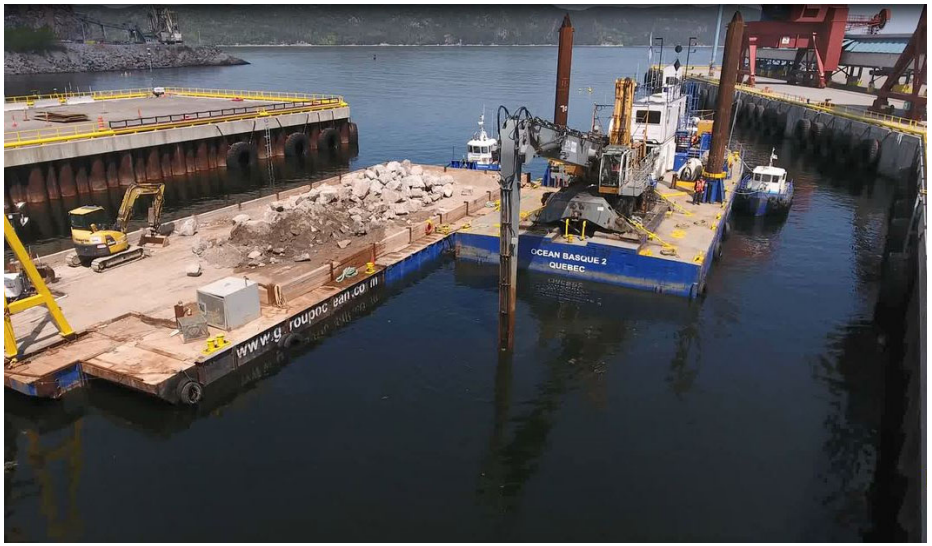


- Armor Stone Layer
- Under Armor Stone Layer
- Training Terrace/Filter Stone
- Berm/Core (Sand/Gravel)
- Dredged Sediment
- Interim Cover (Imported Sand)
- Final Cover
- Asphalt Pavement

CDF Berm Under Construction

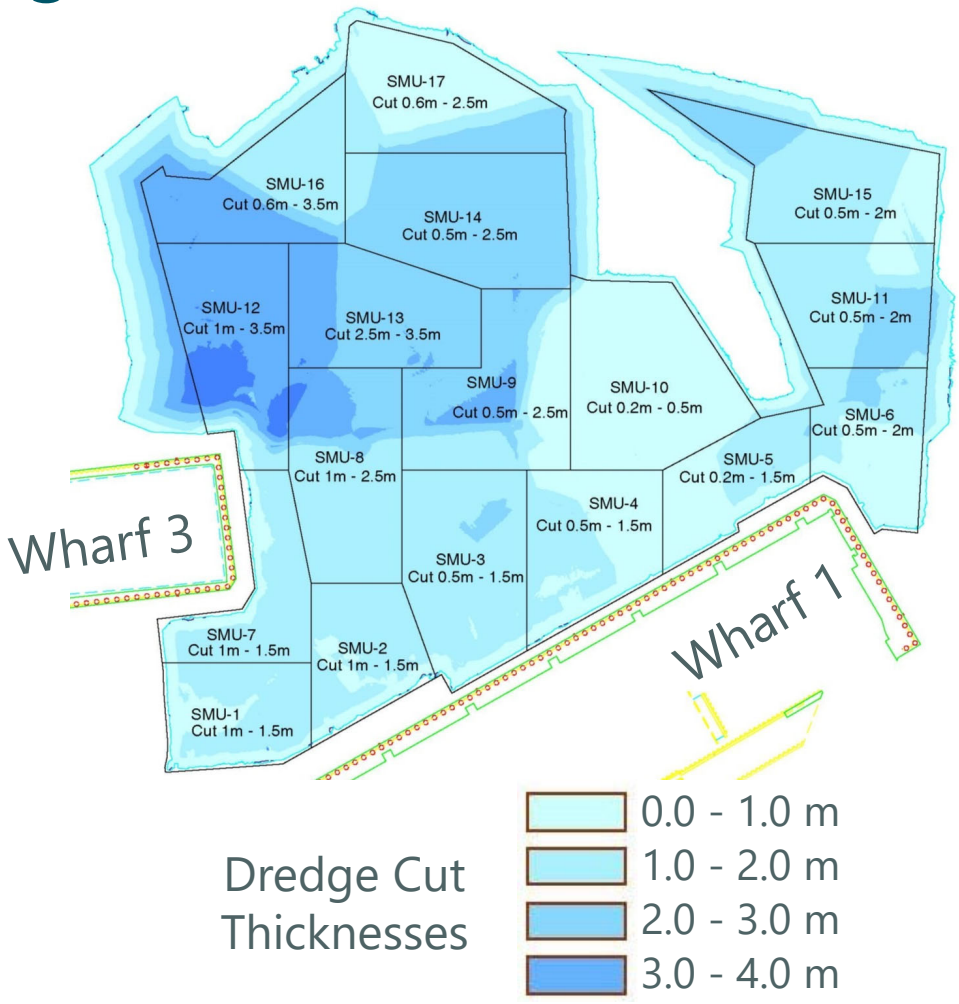




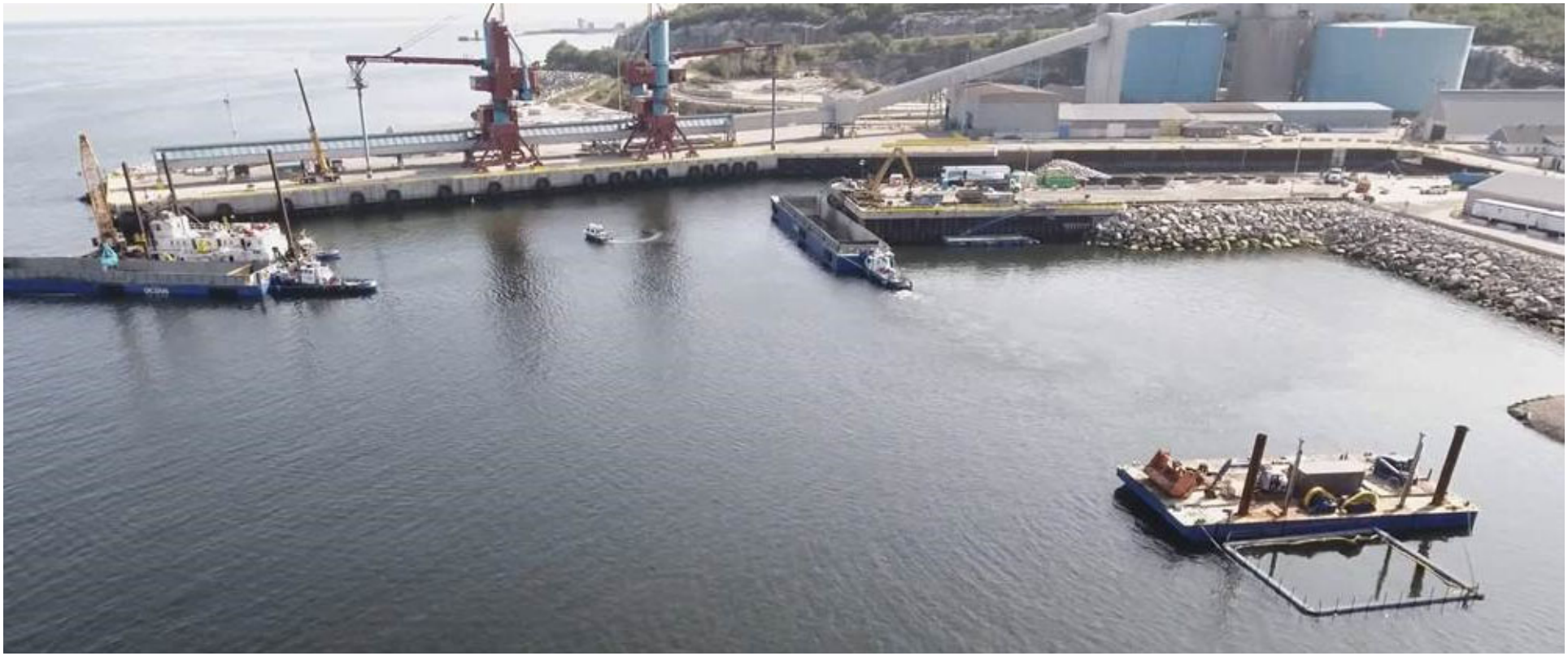


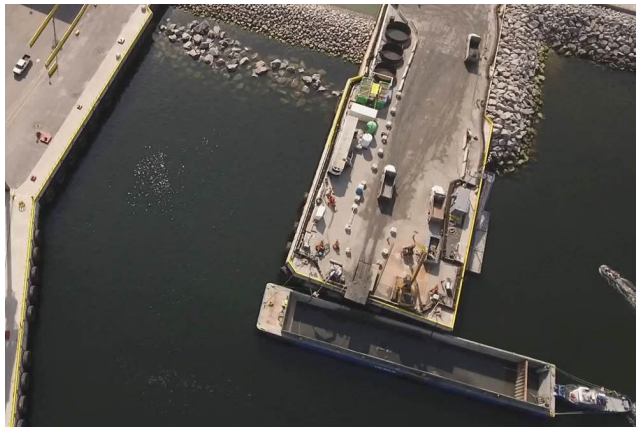
Dredging and Backfilling

- ~72,000 cy, 7 acres
- Mechanical dredging
- Moon-pool curtain
- Barge transport to wharf
- Water treatment
- 15-cm backfill layer after dredging
- Water quality monitoring



Dredging and Backfilling





Containment Cell Closure

- Interim sand cover placed over dredged sediment
- Asphalt cap constructed after consolidation (~1 year)
- Future vehicle parking/light material laydown

Project Successes

- Significant cost savings (on-site disposal and combined remedy)
- Beneficial use of the inactive slip
- Design/contractor procurement in single year
- Agency approval in less than 4 months
- Pre-design investigations reduced project uncertainty
- Most construction in a single season

Questions/Discussion