



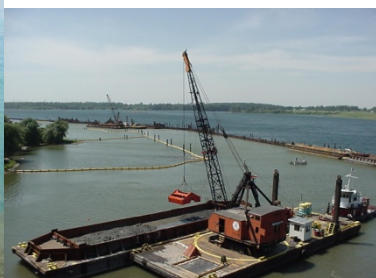
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Sharing Our Harbour

The Construction and Vision of Randle Reef



Roger Santiago
Head, Sediment Remediation Unit
Environment and Climate Change Canada

March 22, 2017

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Randle Reef Sediment Remediation Project

Hamilton Harbour, Lake Ontario



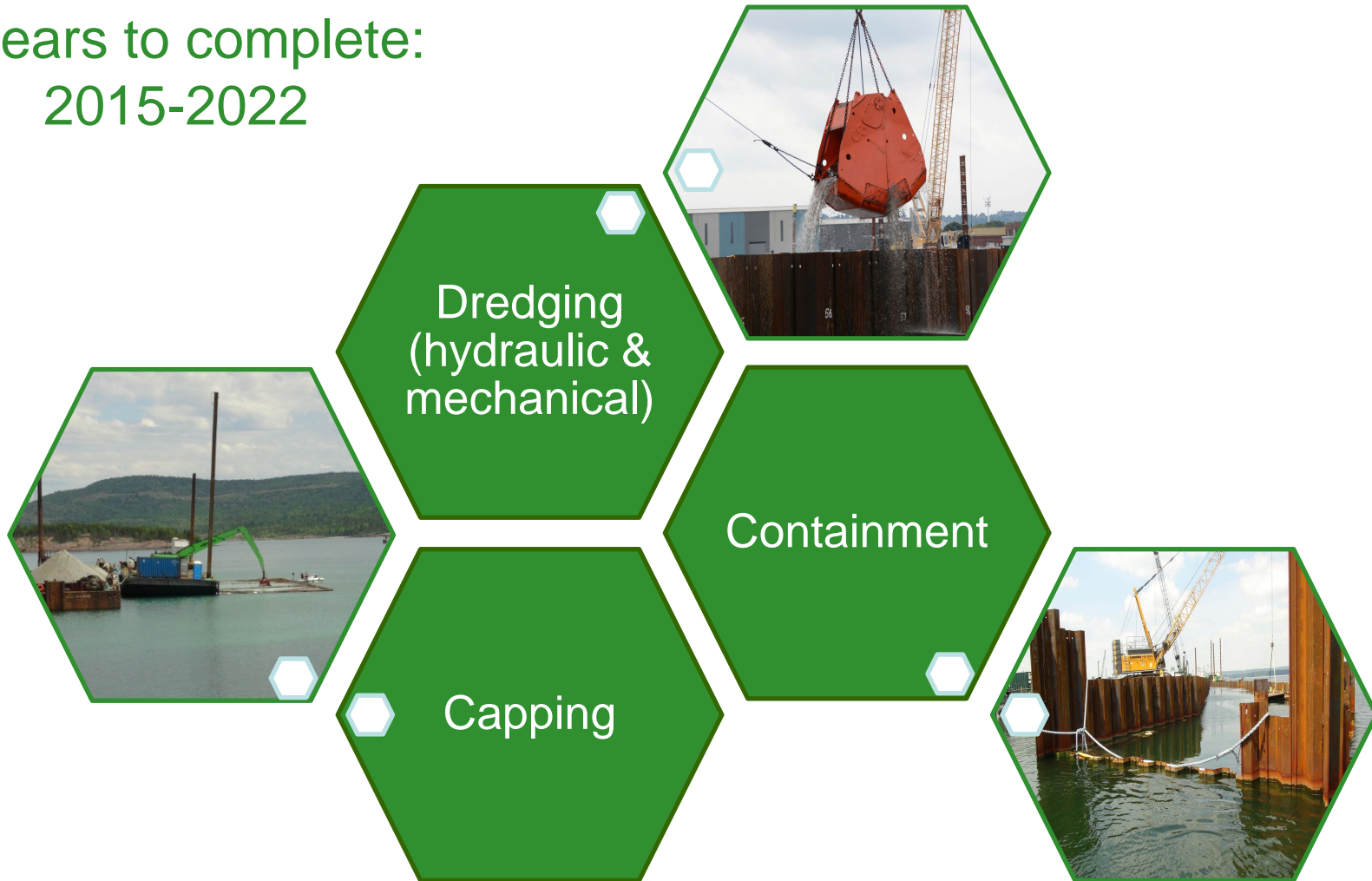
Randle Reef Site Specifics



- Impacted by historic operation of coal gasification plant and steel operations;
- Approximately 695,000 m³ of contaminated sediment (PAHs & metals); and
- Average total PAH concentration near 5,000 ppm with peaks over 73,000 ppm.
- **Site Area:** ~60 ha (148 acres)
- **Depth of Water:** Ranges from ~4 m to 12 m
- **Sediment Depth:** Ranges from ~0.1 m to >3 m

Remedial Approach

8 years to complete:
2015-2022

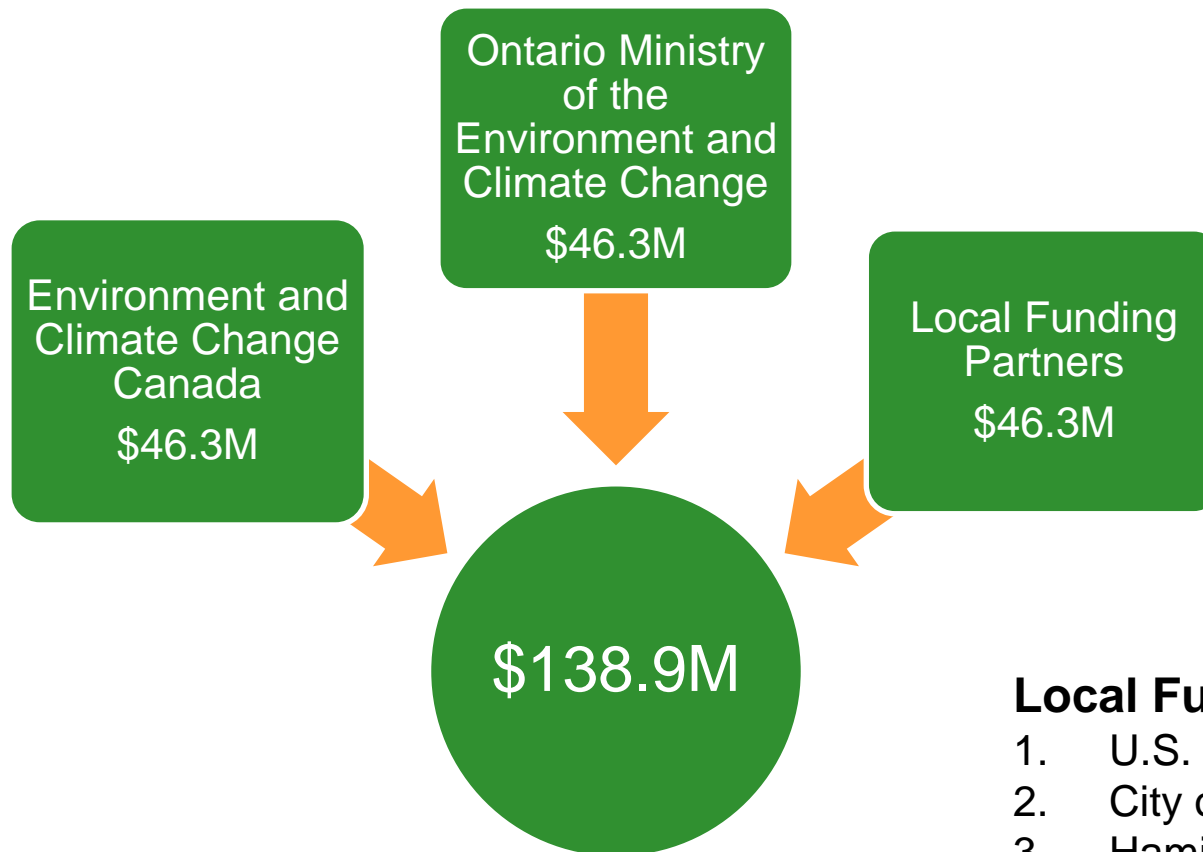


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Project Funding



Local Funding Partners:

1. U.S. Steel Canada
2. City of Hamilton
3. Hamilton Port Authority
4. City of Burlington
5. Region of Halton

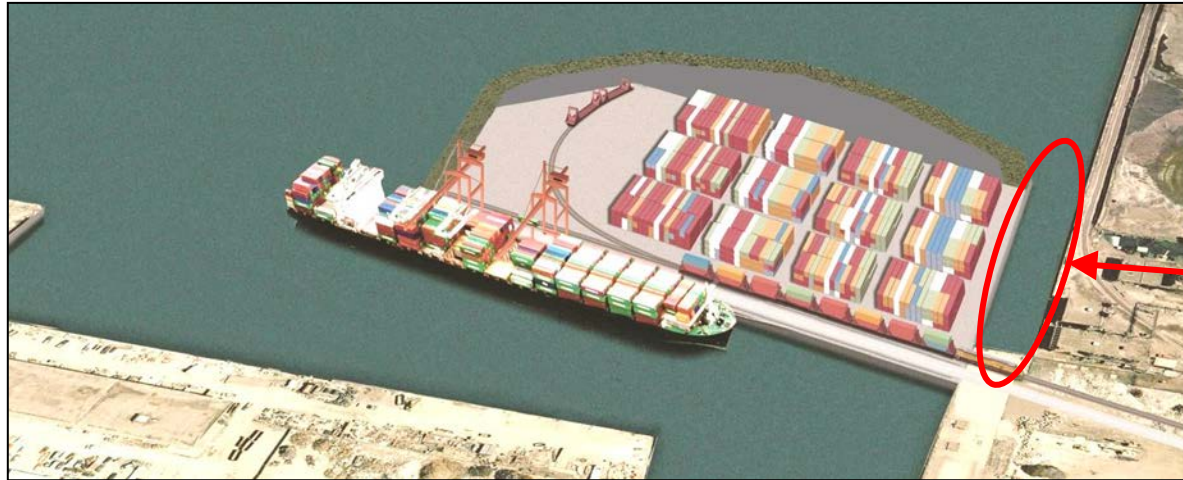


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Project Components



U.S.
Steel
Channel

- Construct a 6.2 hectare Engineered Containment Facility (ECF) over the most highly contaminated sediment (**140,000 m³ in-situ**);
- Using a combination of hydraulic and mechanical dredging, remove **445,000 m³** and place within ECF;
- Thin Layer Capping of **105,000 m³** of marginally contaminated sediment
- Cap U.S. Steel Intake/Outfall Channel sediments **5,000 m³**
- Cap ECF and construct a port facility.
- Total sediment management of **695,000 m³**



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Construction Components

1. **S-1** Pier 15 Re Construction **2015**;
2. **S-1** Installation of double steel sheetpile walls (ECF structure) **2016 & 2017**;
3. **S-1** Mechanical dredging between ECF walls **2016 & 2017**;
4. **S-2** Production dredging and thin layer backfill **2018 & 2019**;
5. **S-2** Capping in U.S. Steel Channel **2019**; and
6. **S-3** Installation of ECF cap **2020-2022**.



Raw Steel Production & Transportation

ECF anchor wall sheet pile was fabricated at a roll forming mill in Cambridge, Ontario.

Cambridge
Nanticoke

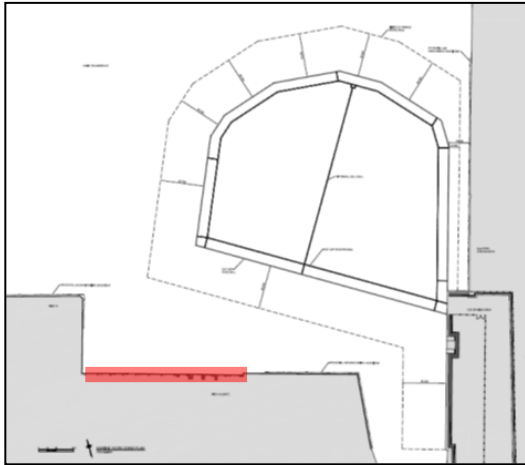
Raw steel for the project was produced at U.S. Steel Canada's Lake Erie Works in Nanticoke.

The length of the ECF face wall sheet pile required fabrication at a roll forming mill in Iuka, Mississippi

Iuka



Stage 1: Pier 15 Reconstruction



Wall Reconstruction



Photo Courtesy of Riggs Engineering



Photo Courtesy of Riggs Engineering



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Complete Pier 15 Rehabilitation

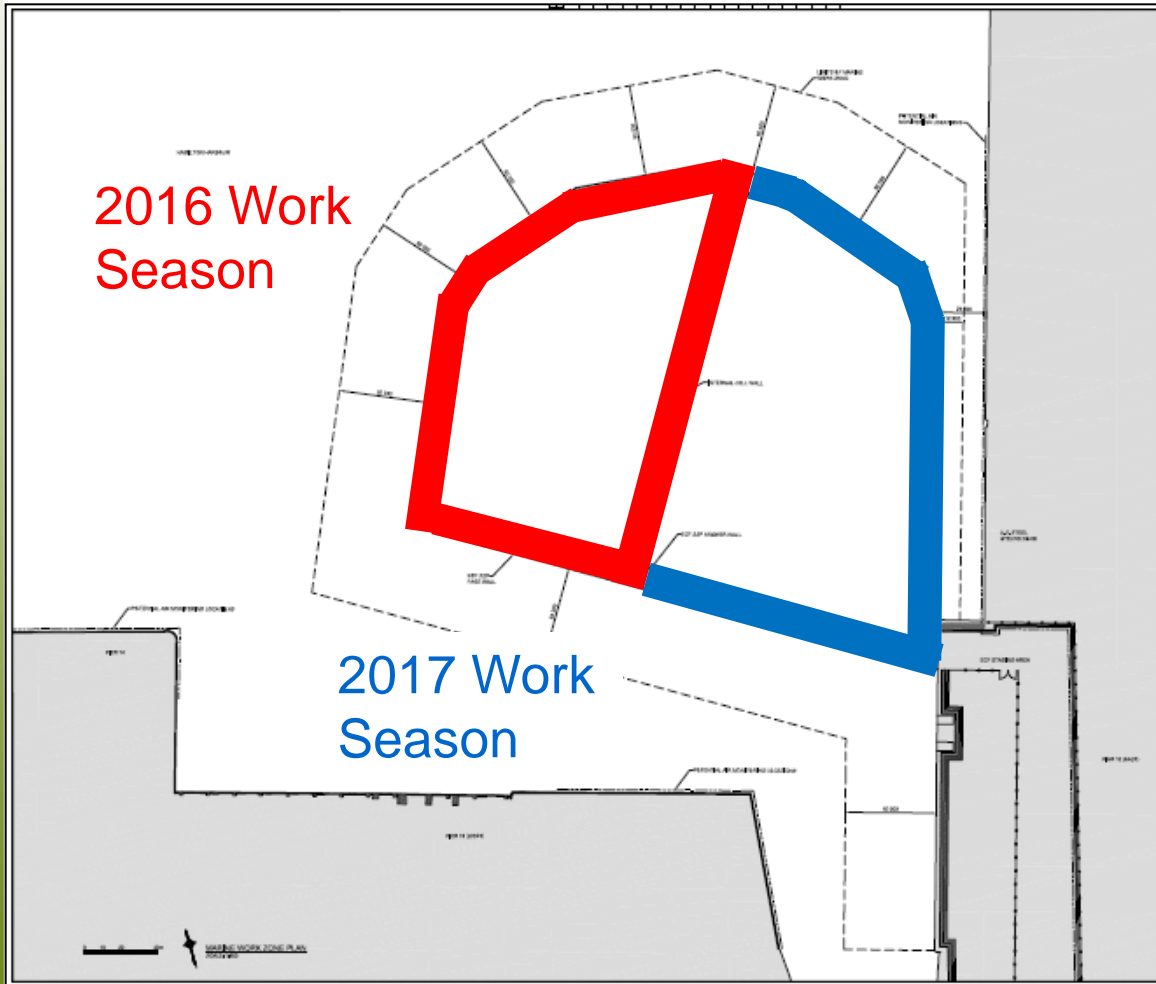


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Stage 1 ECF Construction



Start of Sheet Pile Wall Installation

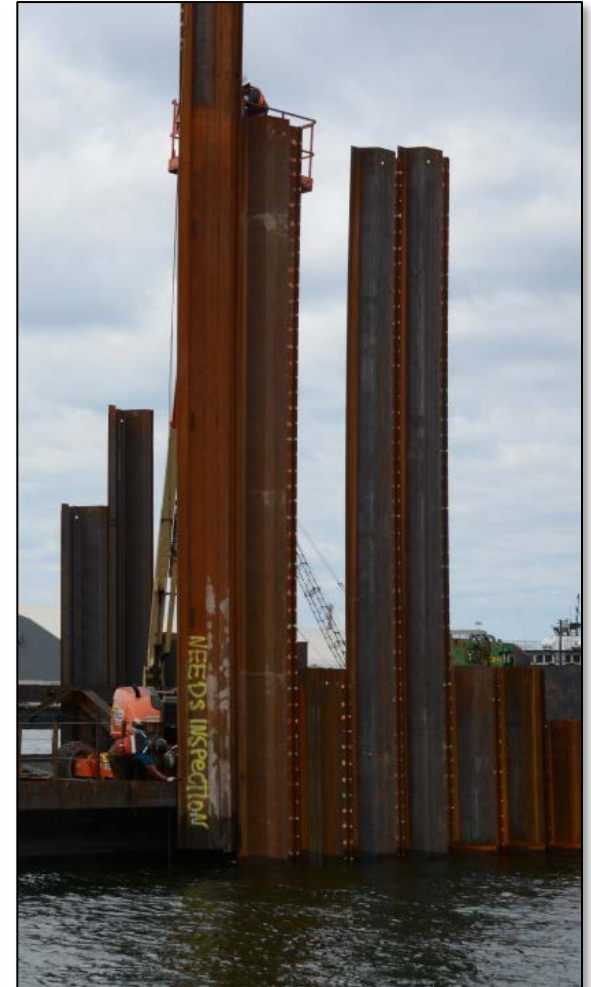


Photo Courtesy of Birmingham Foundation Solutions



Photo Courtesy of Birmingham Foundation Solutions

Threading Sheet Pile



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Installing Sheet Pile



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Photo Courtesy of Riggs Engineering

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Installing Sheet Pile

Vibrohammer



Impact Hammer

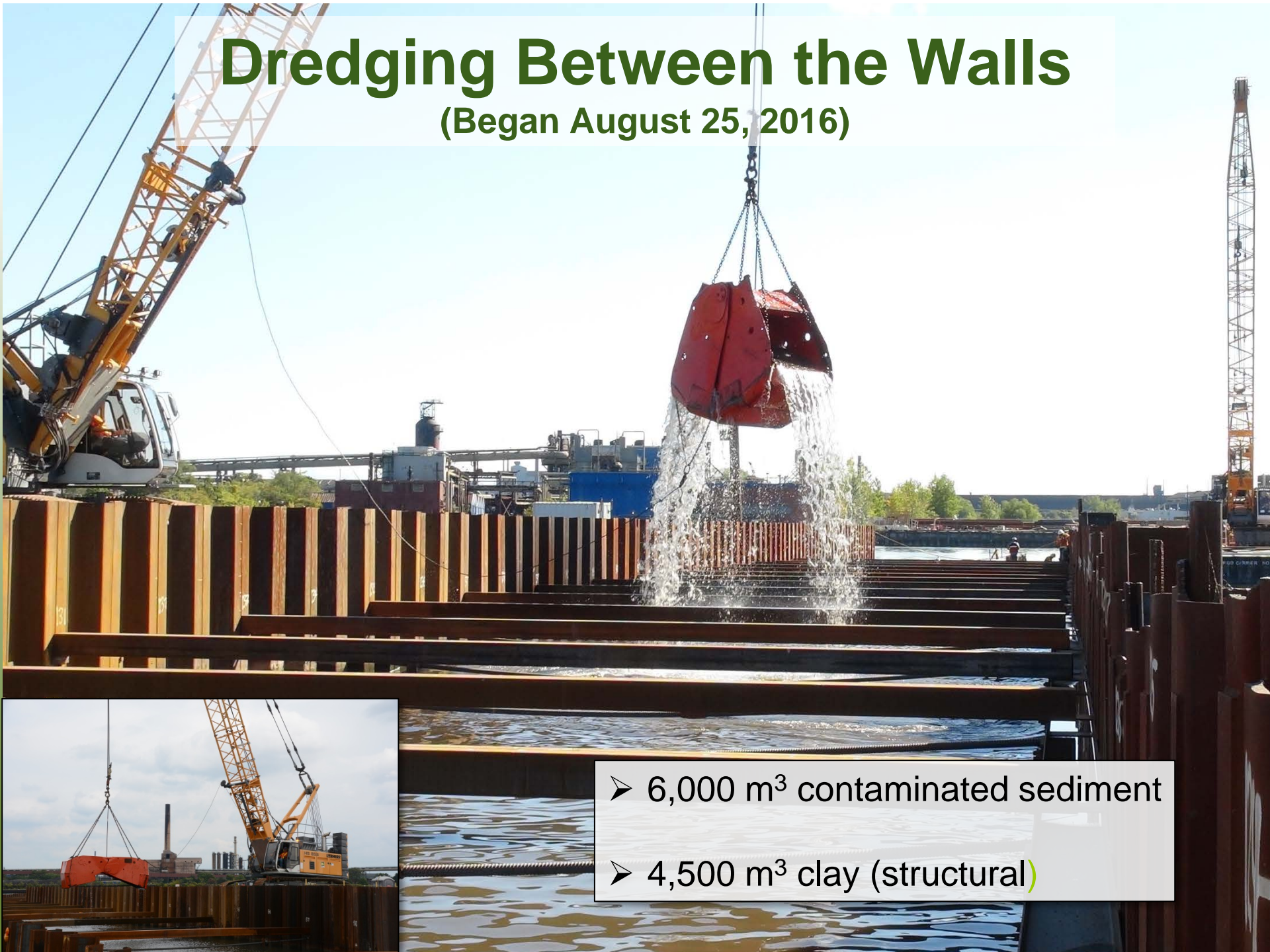


Photo Courtesy of Riggs Engineering

Photo Courtesy of Riggs Engineering

Dredging Between the Walls

(Began August 25, 2016)



- 6,000 m³ contaminated sediment
- 4,500 m³ clay (structural)

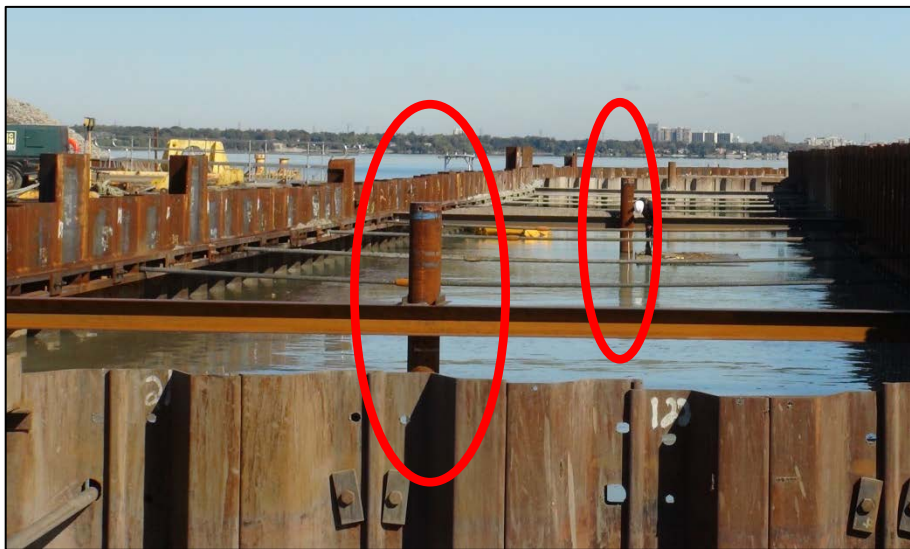
Installation of Monitoring Well Casings



Before
installation

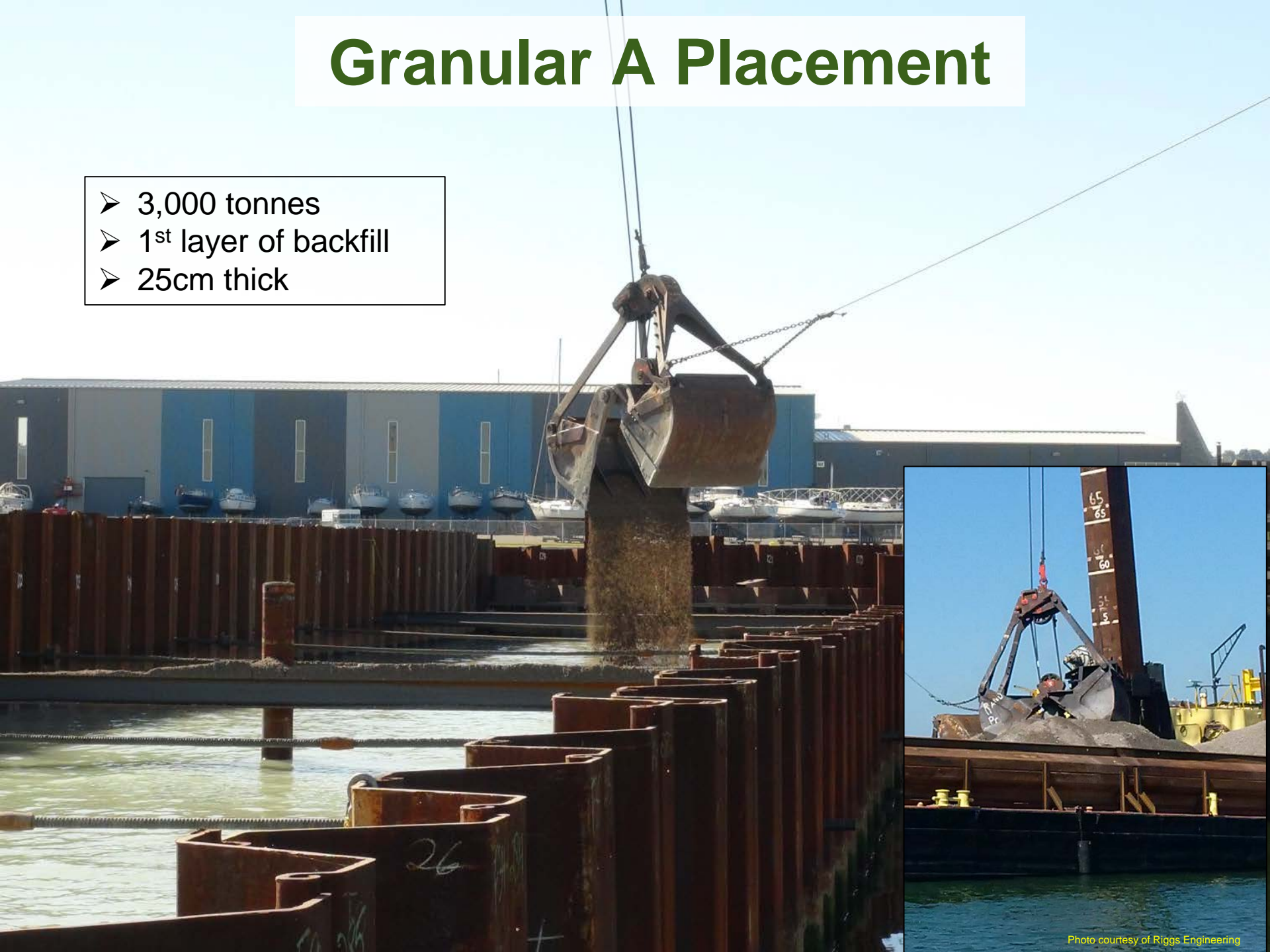


After installation



Granular A Placement

- 3,000 tonnes
- 1st layer of backfill
- 25cm thick



Quarry Rock Fill

➤ 70,000 tonnes placed in 2016

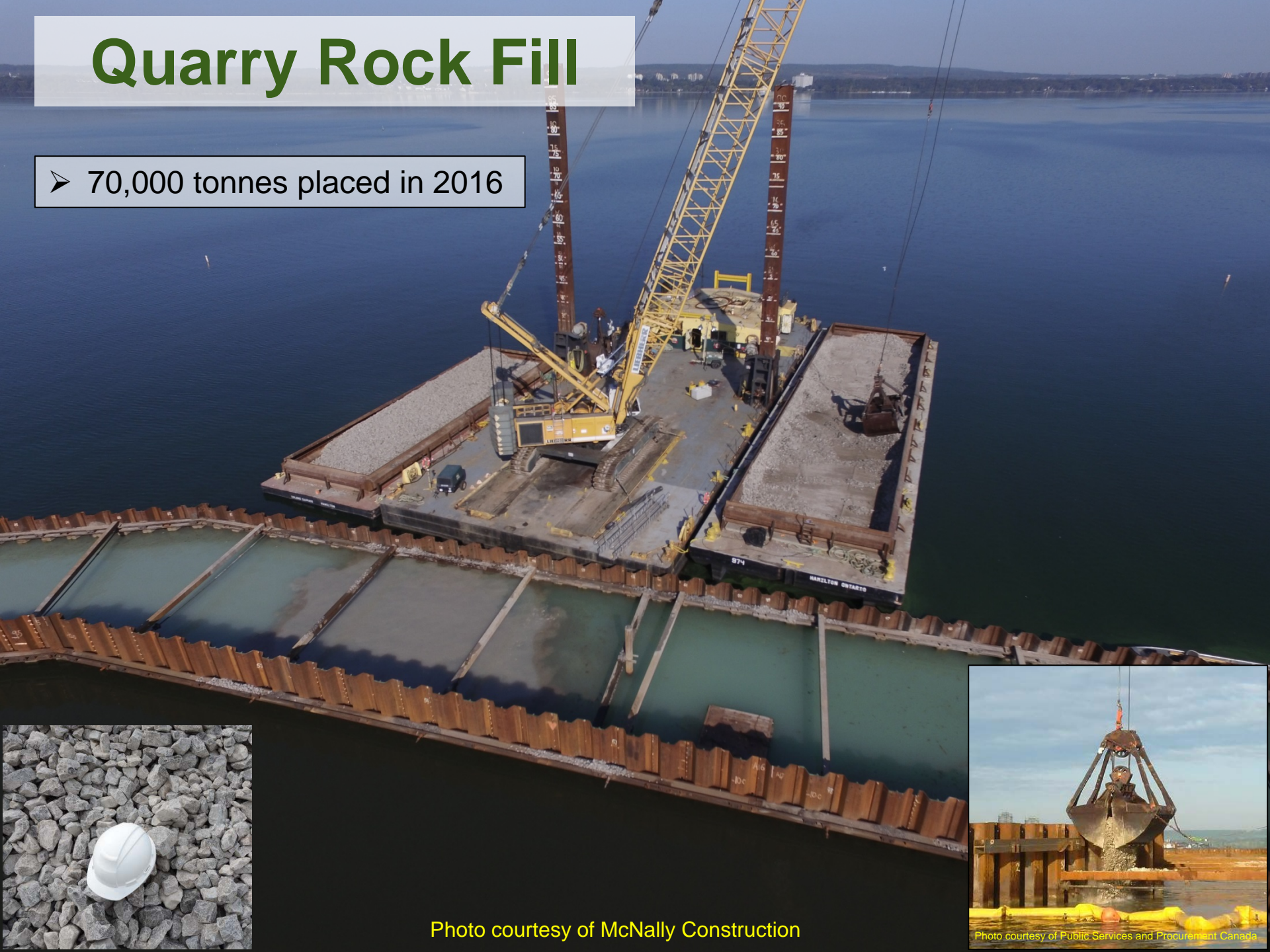


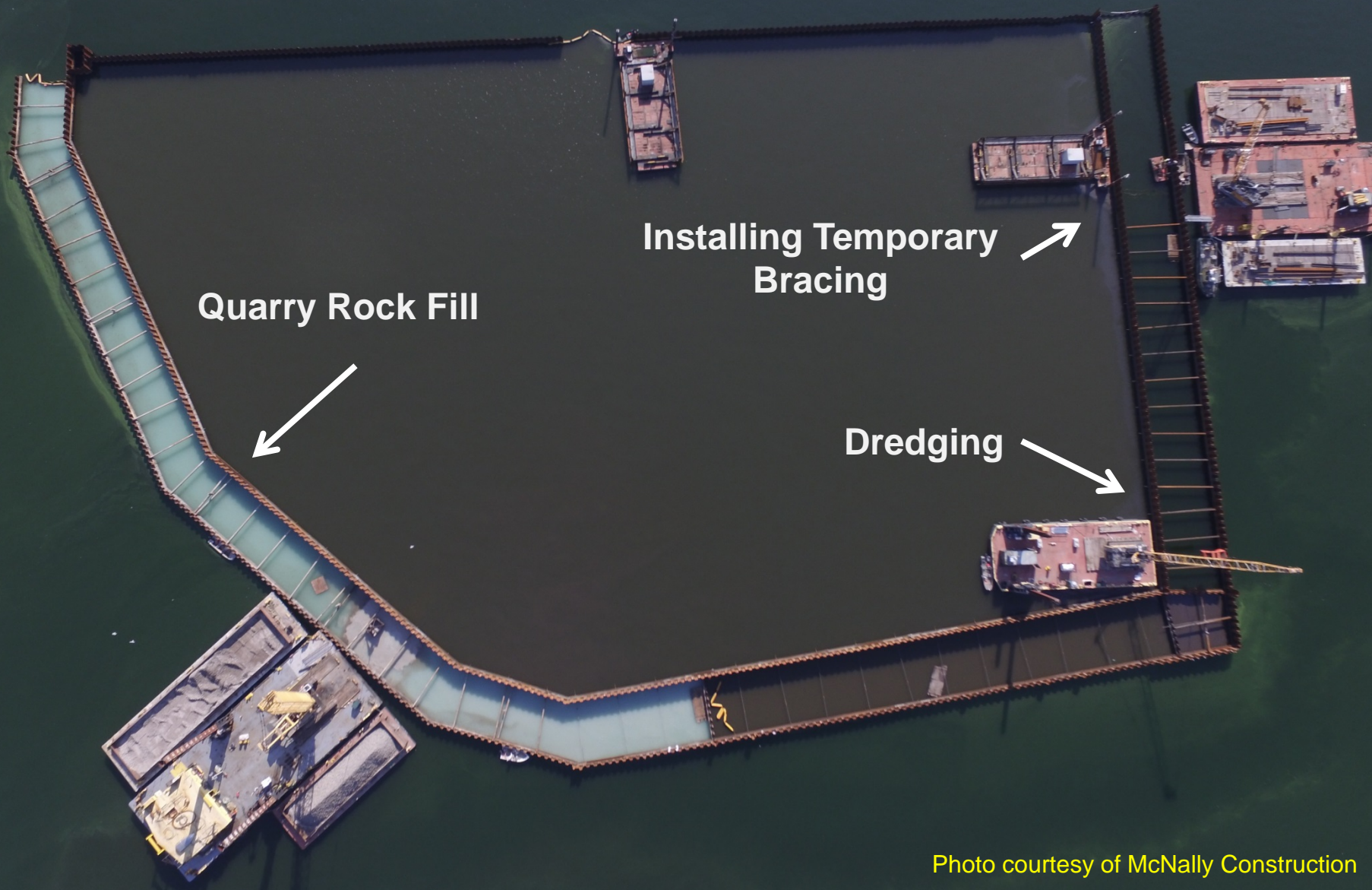
Photo courtesy of McNally Construction



Photo courtesy of Public Services and Procurement Canada

Dredging & Backfill Between the Walls

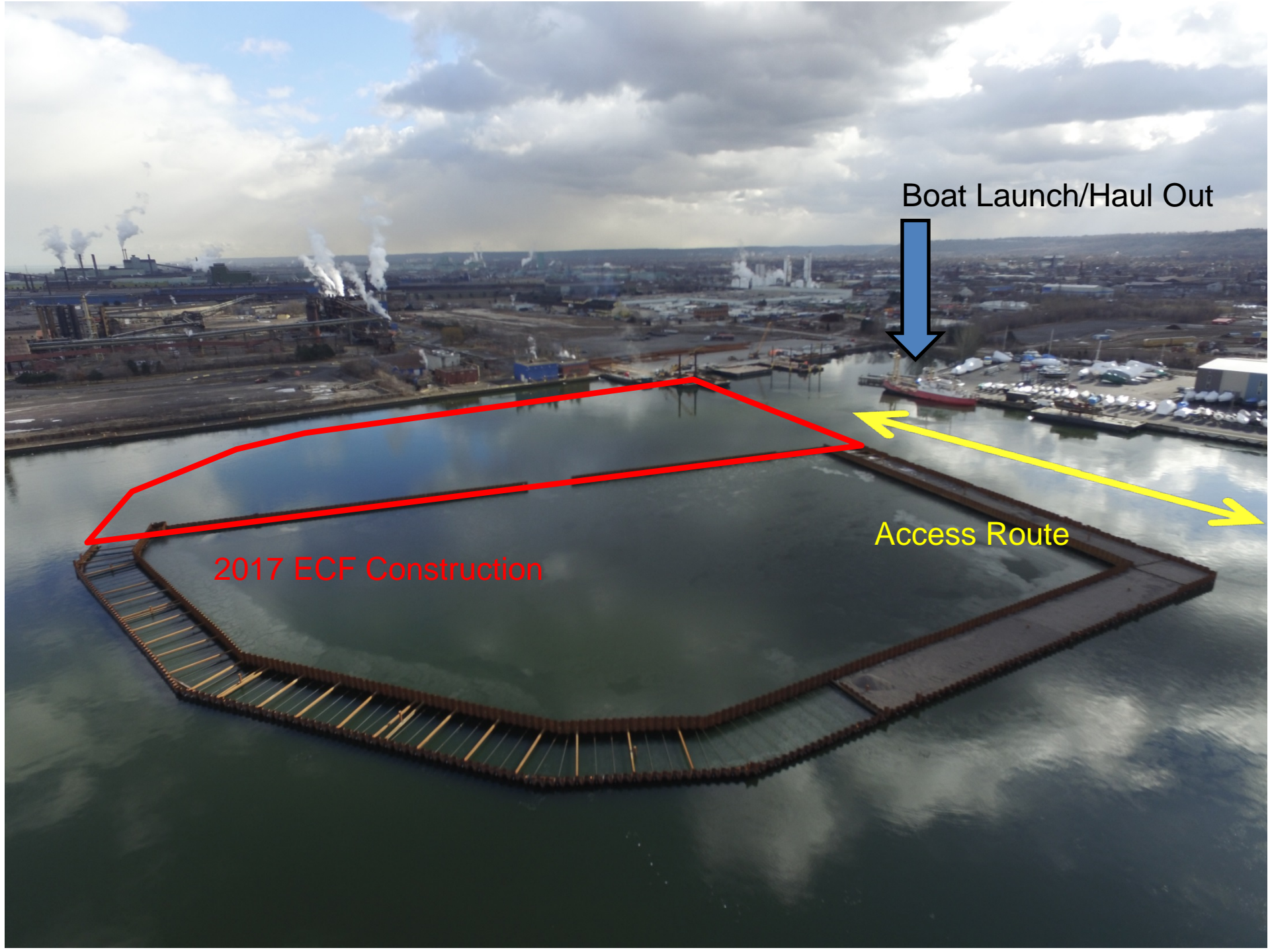
(Oct 6, 2016)



Quarry Rock Fill

Installing Temporary
Bracing

Dredging

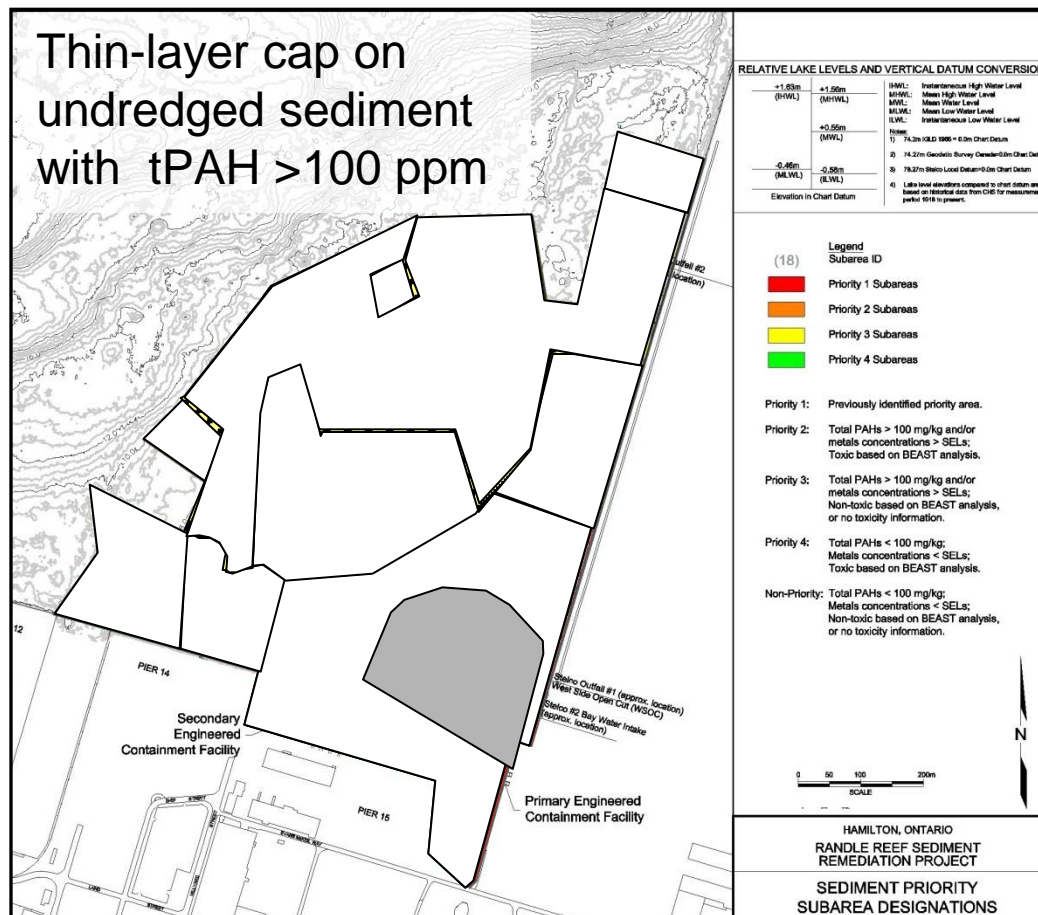


Boat Launch/Haul Out

Access Route

2017 ECF Construction

Stage 2: Dredging/Capping Sequence



Dredge area boundary

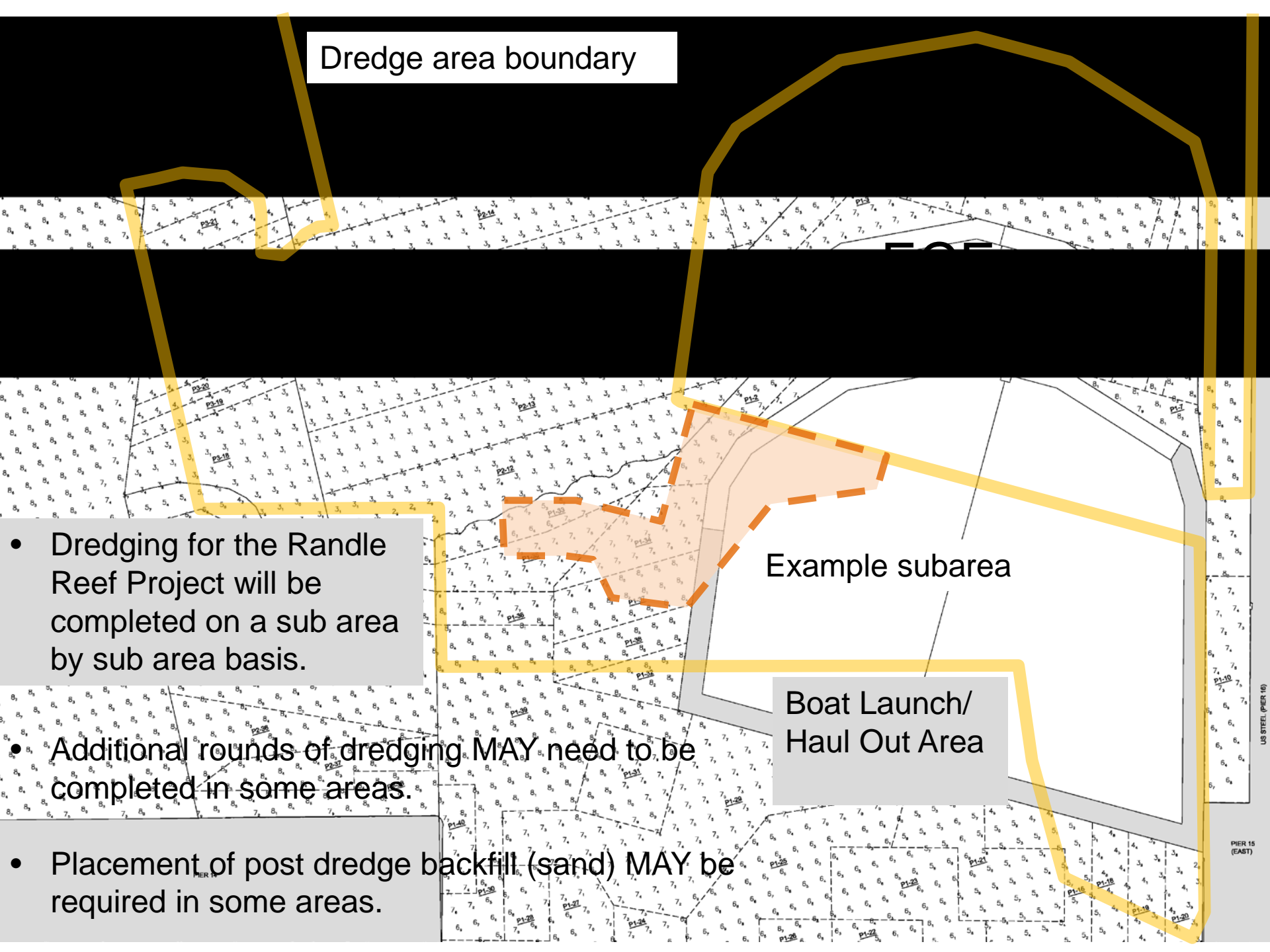
- Dredging for the Randle Reef Project will be completed on a sub area by sub area basis.

- Additional rounds of dredging MAY need to be completed in some areas.

- Placement of post dredge backfill (sand) MAY be required in some areas.

Example subarea

Boat Launch/
Haul Out Area



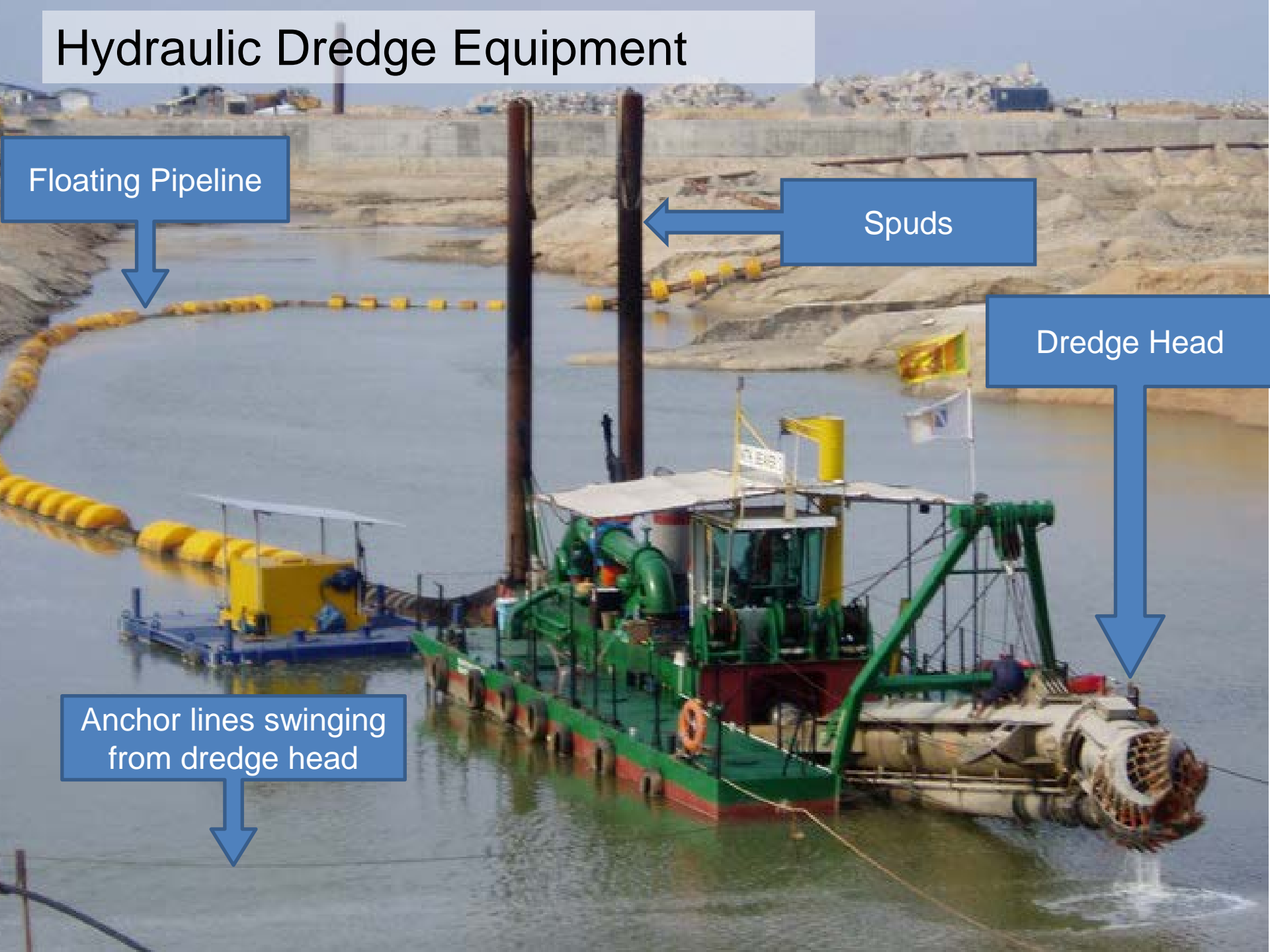
Hydraulic Dredge Equipment

Floating Pipeline

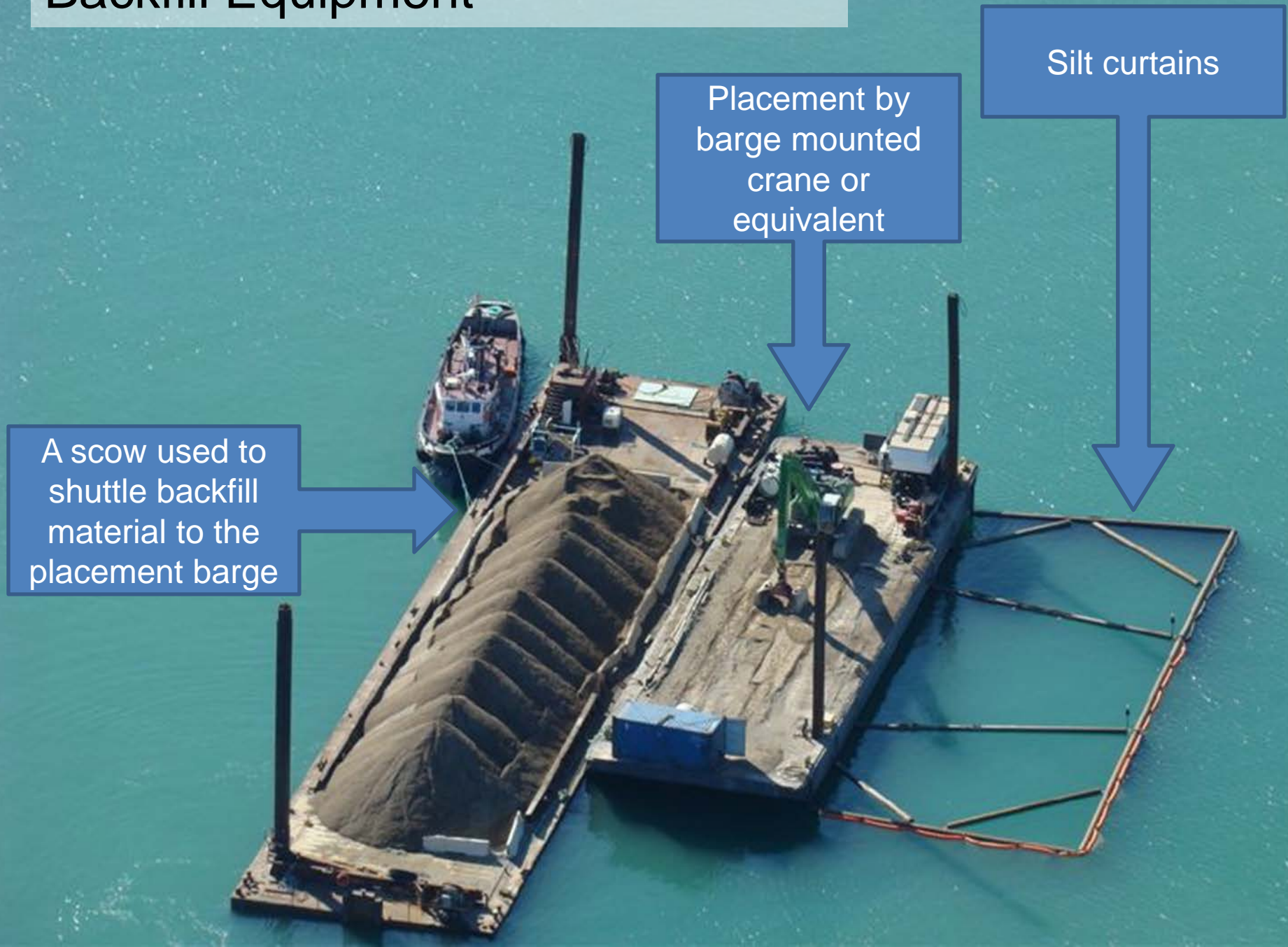
Spuds

Dredge Head

Anchor lines swinging
from dredge head



Backfill Equipment







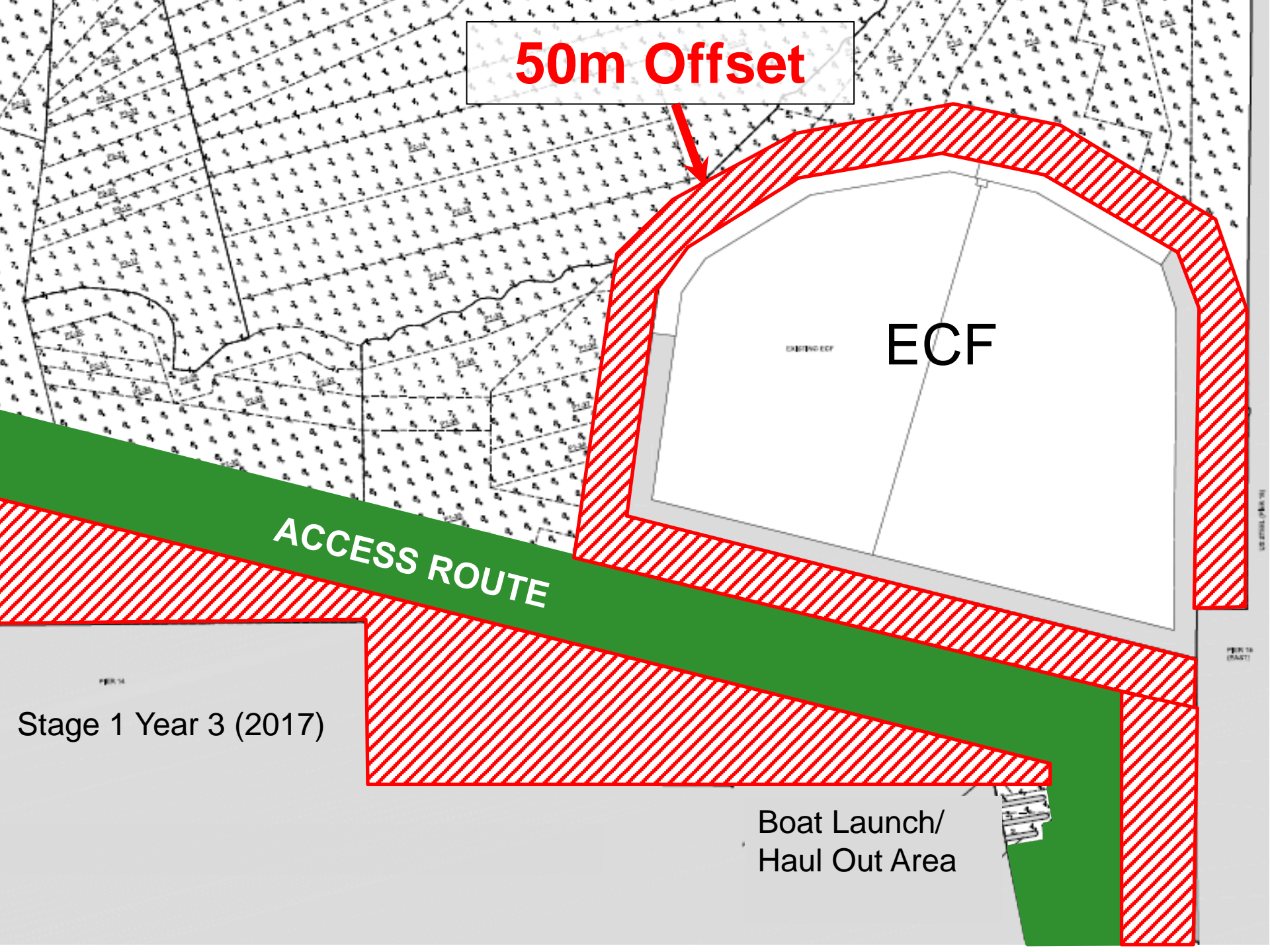
50m Offset

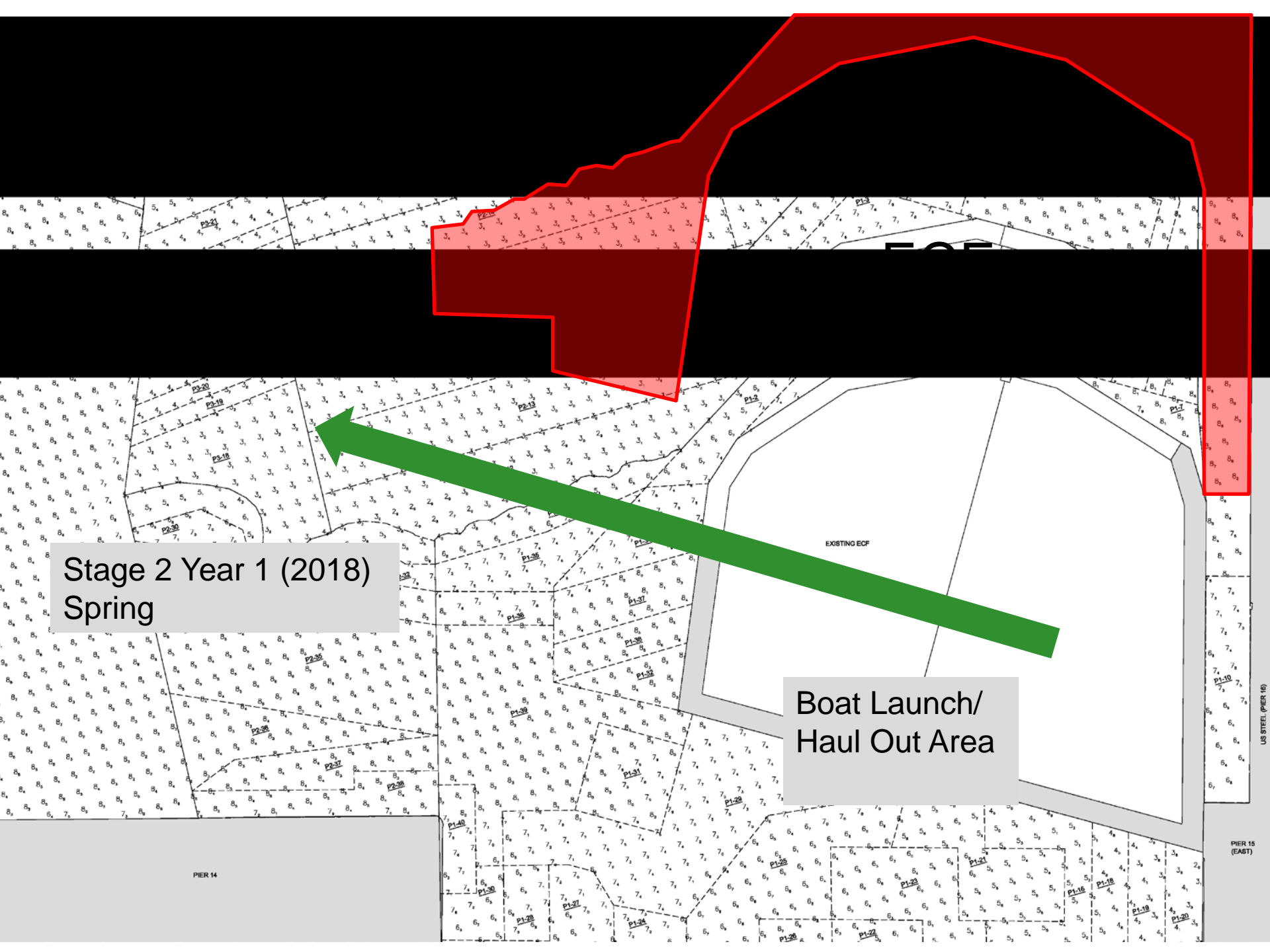
ECF

ACCESS ROUTE

Boat Launch/
Haul Out Area

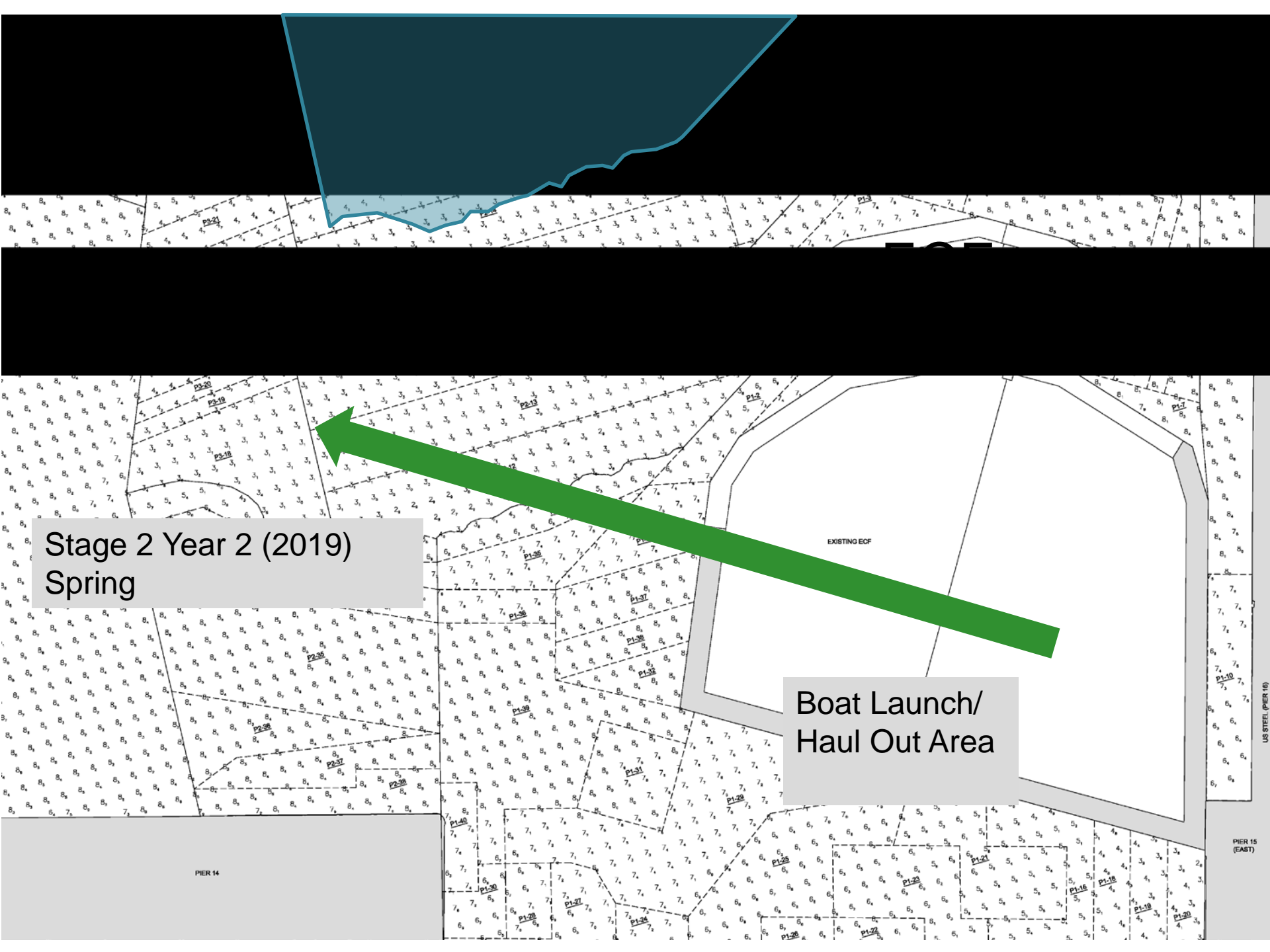
Stage 1 Year 3 (2017)





Stage 2 Year 1 (2018)
Spring

Boat Launch/
Haul Out Area



Stage 2 Year 2 (2019)
Spring

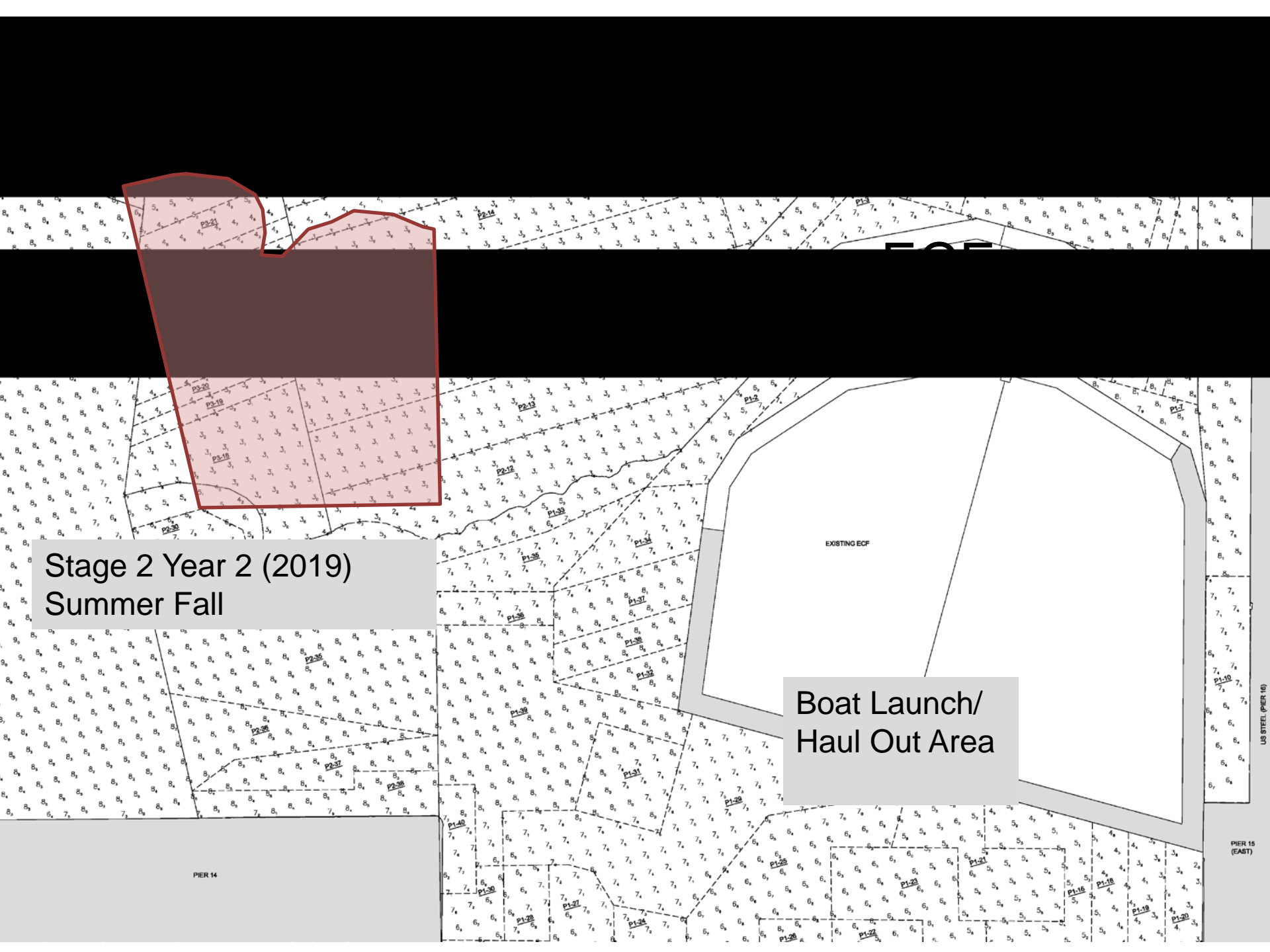
Boat Launch/
Haul Out Area

PIER 14

EXISTING ECF

PIER 15
(EAST)

US STEEL (PIER 16)

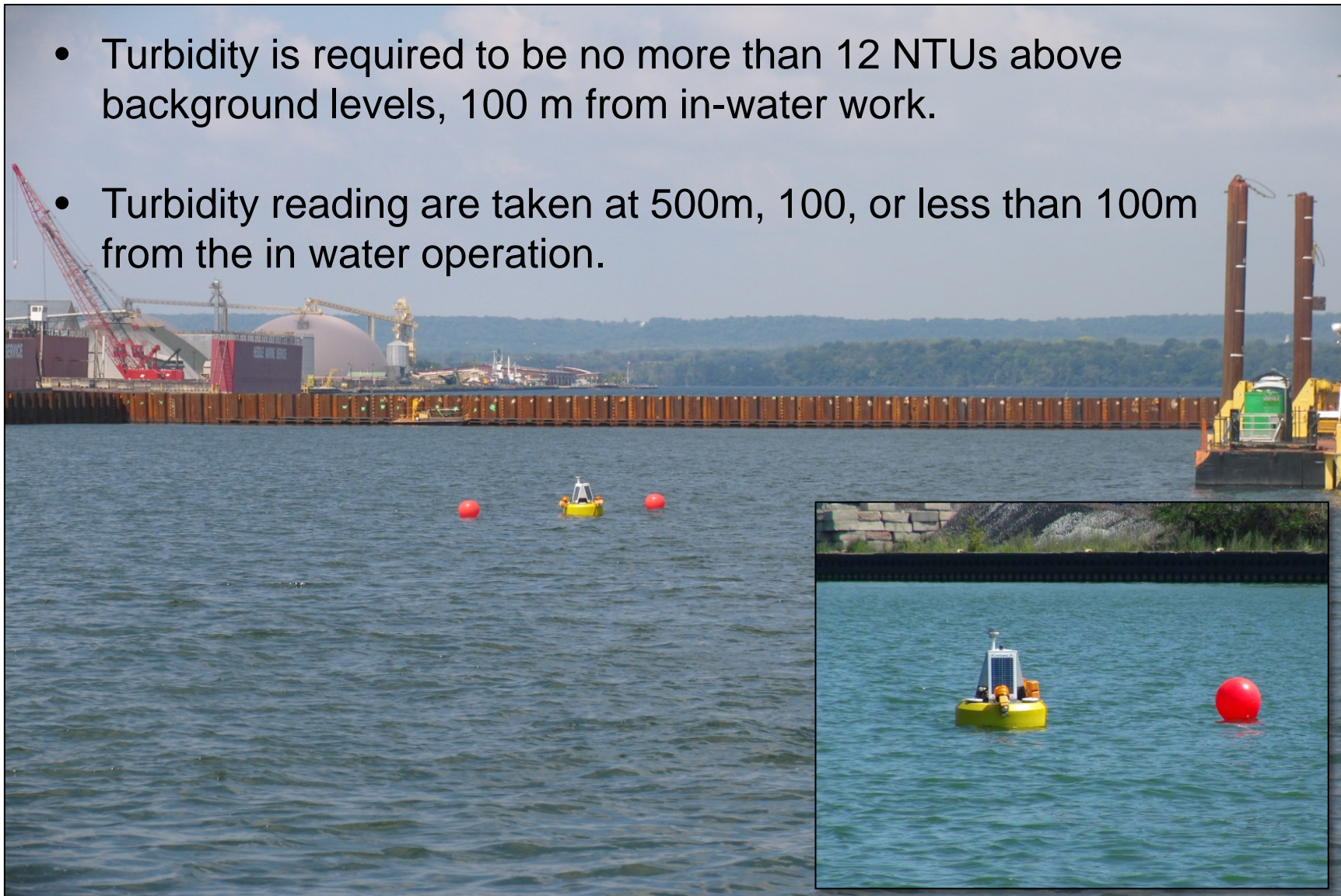


Stage 2 Year 2 (2019)
Summer Fall

Boat Launch/
Haul Out Area

Water Quality Monitoring - Turbidity

- Turbidity is required to be no more than 12 NTUs above background levels, 100 m from in-water work.
- Turbidity readings are taken at 500m, 100, or less than 100m from the in water operation.

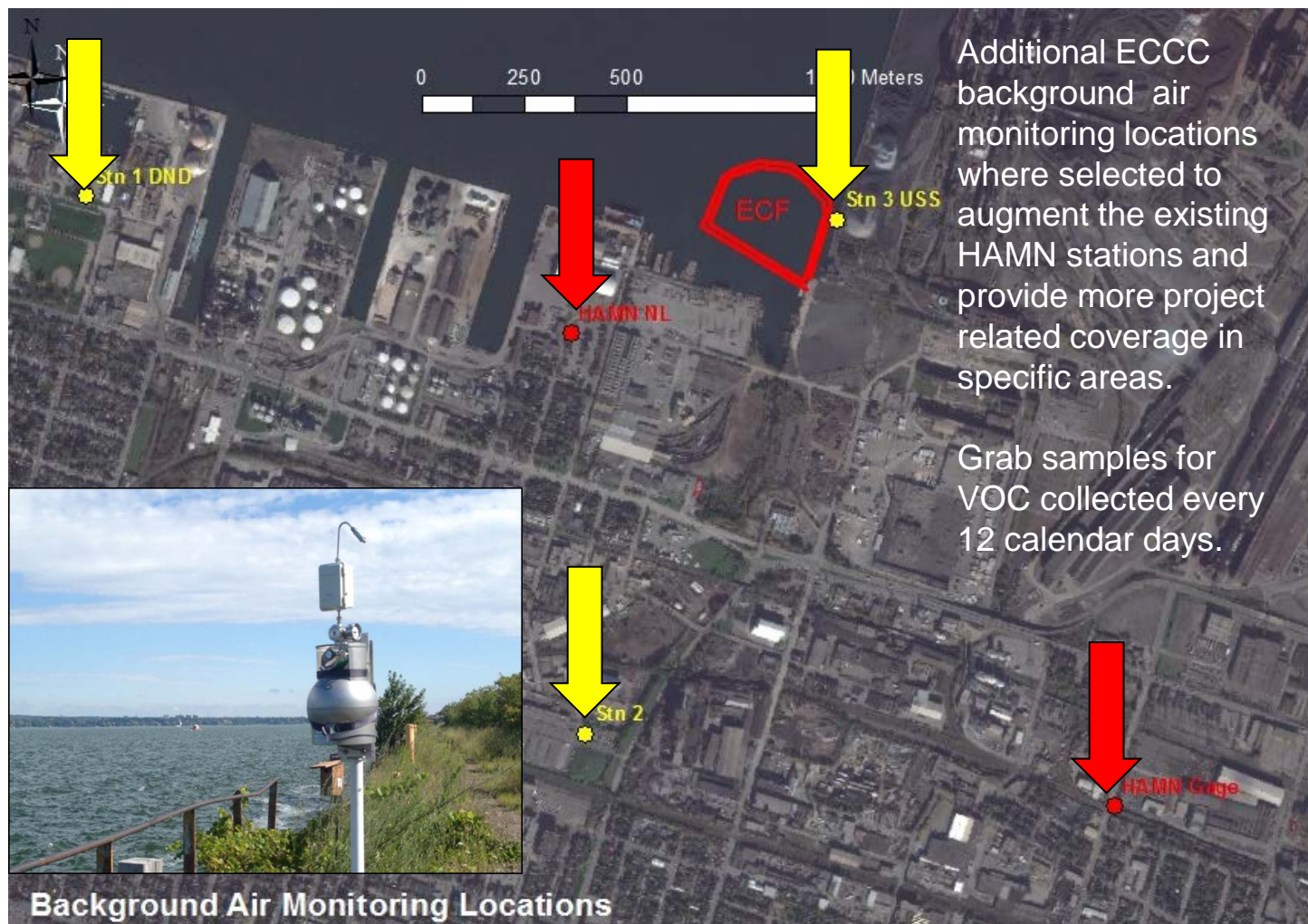


Randle Reef Air Monitoring Programs

- **Background Air Monitoring:** This has been conducted in 2014 and 2015 by Environment Canada to establish an accurate account of current air quality conditions around the Randle Reef site. Background air monitoring will continue on thorough implementation of the project.
- **Project Air Monitoring:** This will take place during project activities and will be conducted by the project air specialist. Both constant real time monitoring and periodic grab samples are included.
- **Contractor Health and Safety Monitoring:** The construction contractor will monitor air quality within the confines of the work area to ensure the safety of workers on the site.
- **Odour Monitoring:** This will be conducted by the project air specialist. Baseline odours will be established. Complaints will trigger odour and air quality sampling.

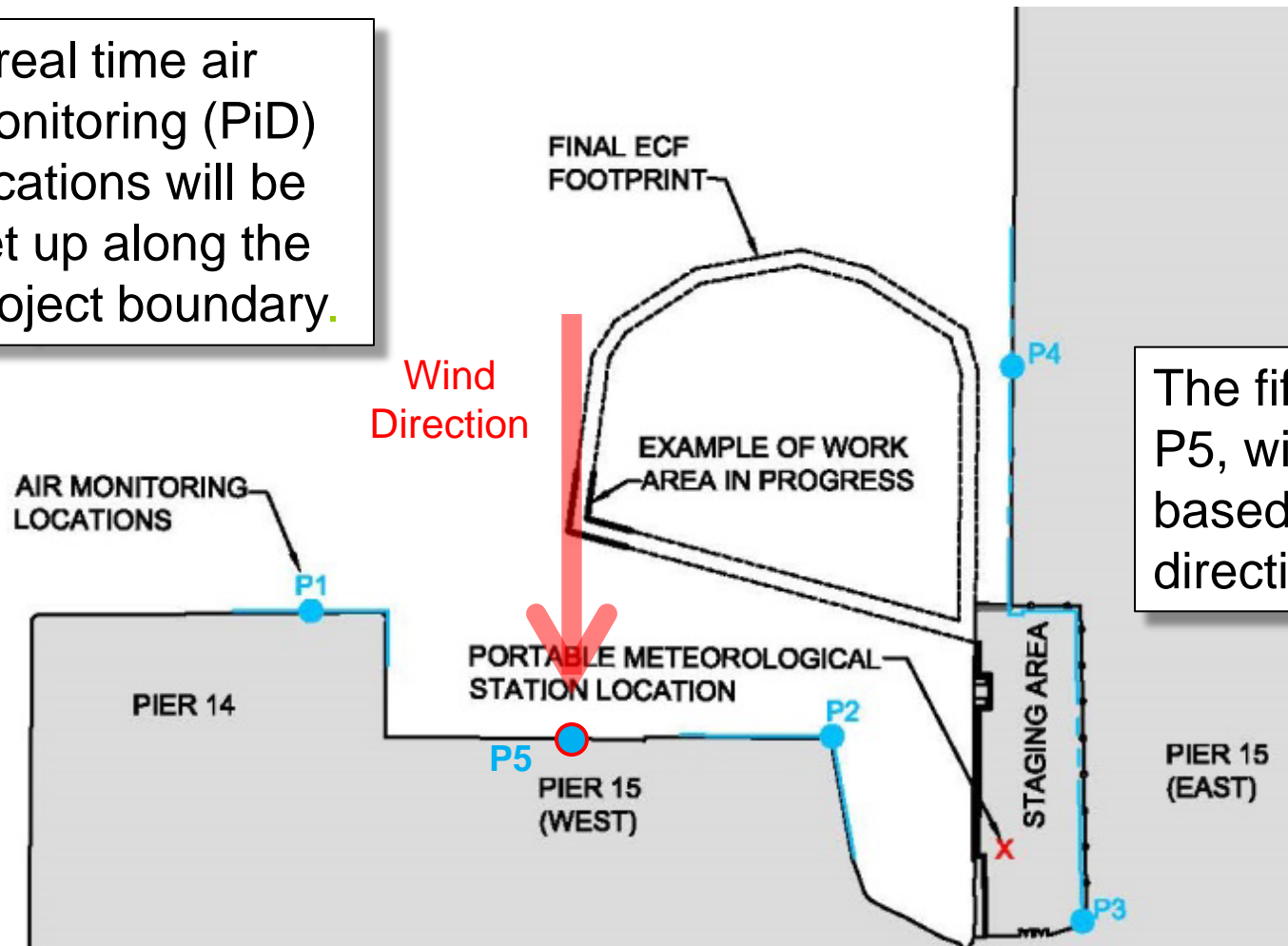


Background Air Monitoring



Air Monitoring Program

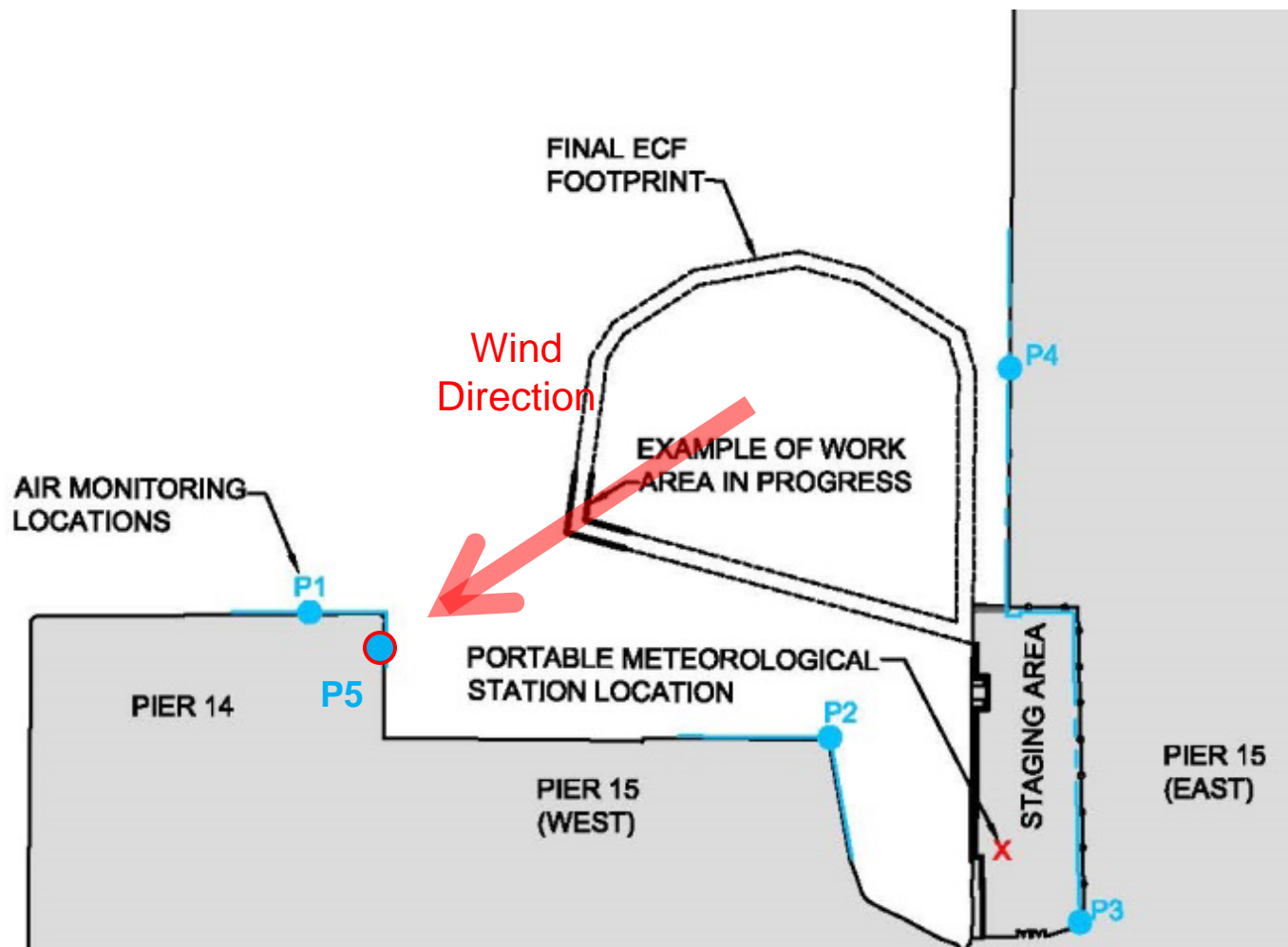
5 real time air monitoring (PiD) locations will be set up along the project boundary.



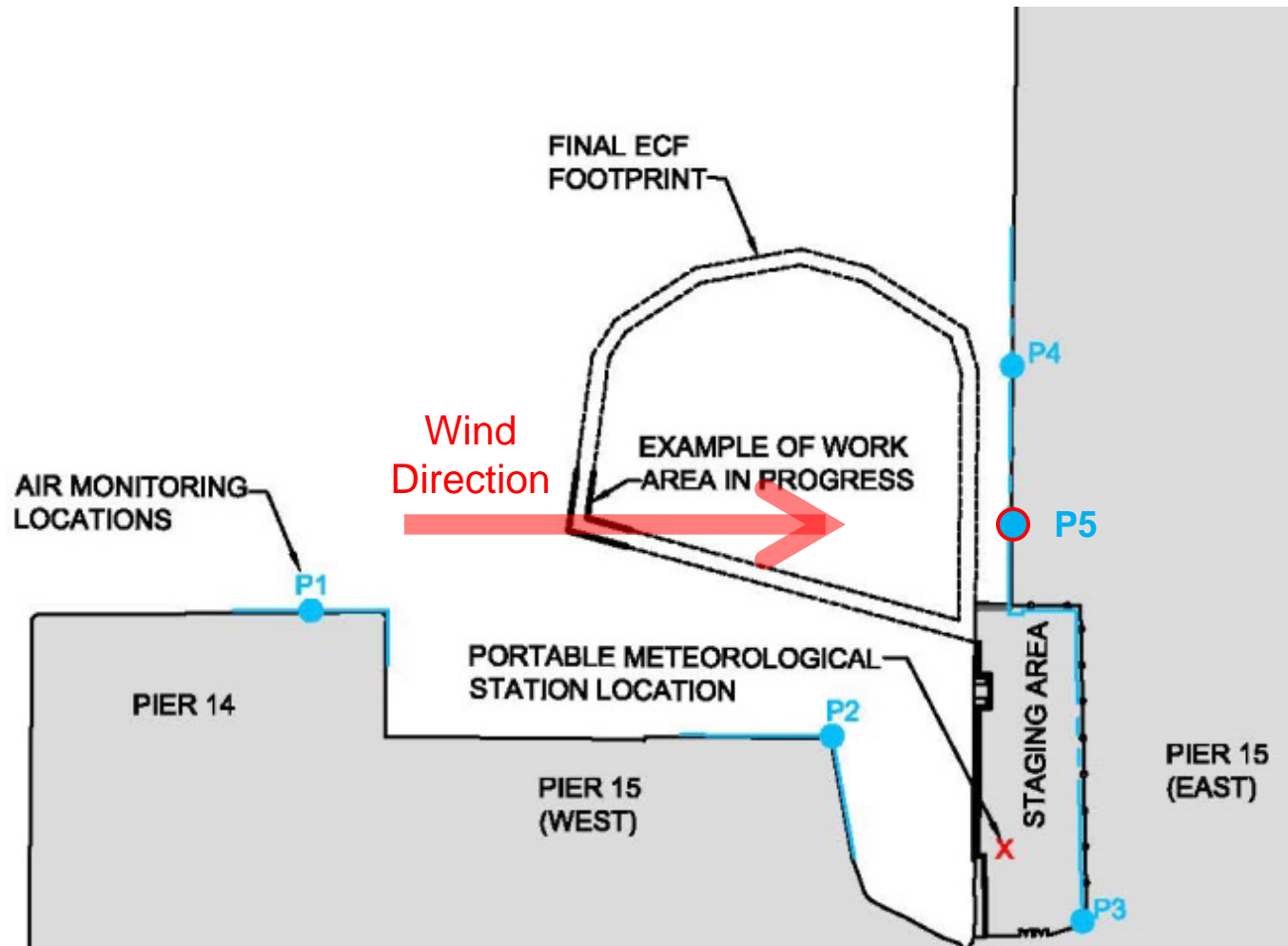
The fifth location P5, will shift based on wind direction.



Air Monitoring Program



Air Monitoring Program



Environmental Monitoring - Air

PID monitoring station



Tedlar bag sample being taken



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Construction Schedule

Stage 1

- ECF Construction
- 2015 to 2017

Stage 2

- Dredging
- 2018 to 2019

Stage 3

- Capping & Consolidation
- 2020 to 2022



General Inquiries

- If you have questions or concerns regarding this project, please contact Environment and ClimateChange Canada's Public Inquiries Centre toll-free at **1-800-668-6767**.
- You can also obtain further information about the project by visiting www.randlereef.ca.
- In the event of an environmental emergency, please call the Ontario Ministry of the Environment and Climate Change's Spills Action Centre 24-hour toll-free number at **1-800-268-6060**.
- Randle Reef Animation:
<https://www.youtube.com/watch?v=Tng5wCHDVjs>



Acknowledgements



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Hamilton



The Steel Company of Canada



Public Works and
Government Services
Canada

Travaux publics et
Services gouvernementaux
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The End



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