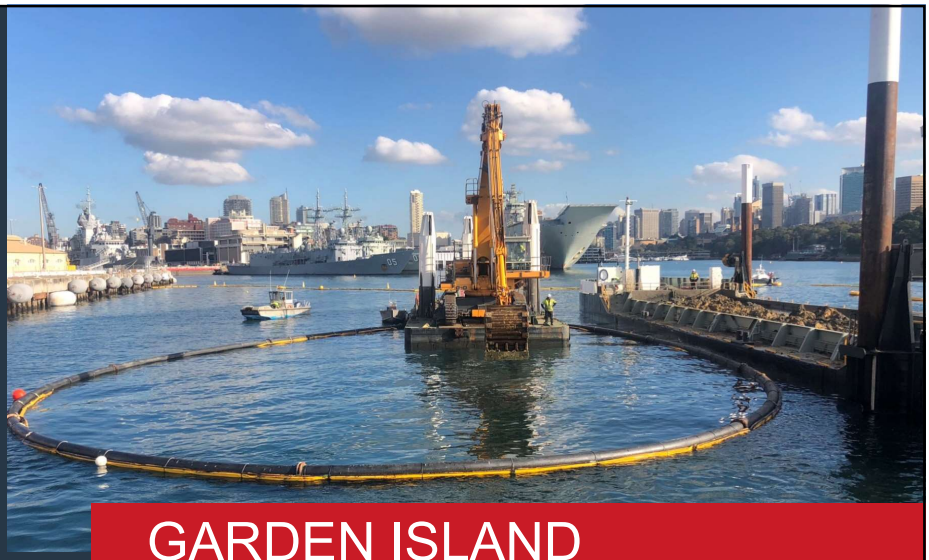

PROJECT CASE STUDY

Justin Sayer
Project Manager-Dredging
Birdon

GARDEN ISLAND CONTAMINATED DREDGING & DISPOSAL

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Executive Summary & Project Background

3

Provide a fully functioning and future proofed wharf, at the northern end of Garden Island (East) that would meet the berthing and maintenance requirements for the forecast growth of current and future-planned vessels

Birdon's Role

- Dredging of Berthing Pocket for these future vessels at Garden Island Naval Base. This included the dredging and disposal, of contaminated materials
- This minimized Birdon's footprint on the project, as well as the handling process
- Birdon's methodology ultimately utilized a proprietary polymer to treat the contaminated material treat material for disposal on shore
- Led to increased efficiency and cost effectiveness when compared to traditional methods

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Dredging Works

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Key Problem

Dredging and Disposal of Contaminated Materials

- 18,500m3 of contaminated materials (made ground/marine fill)
- Environmental regulations and expectations have changed for the better
- Requires a much more intricate approach to the dredging and disposal of contaminated materials

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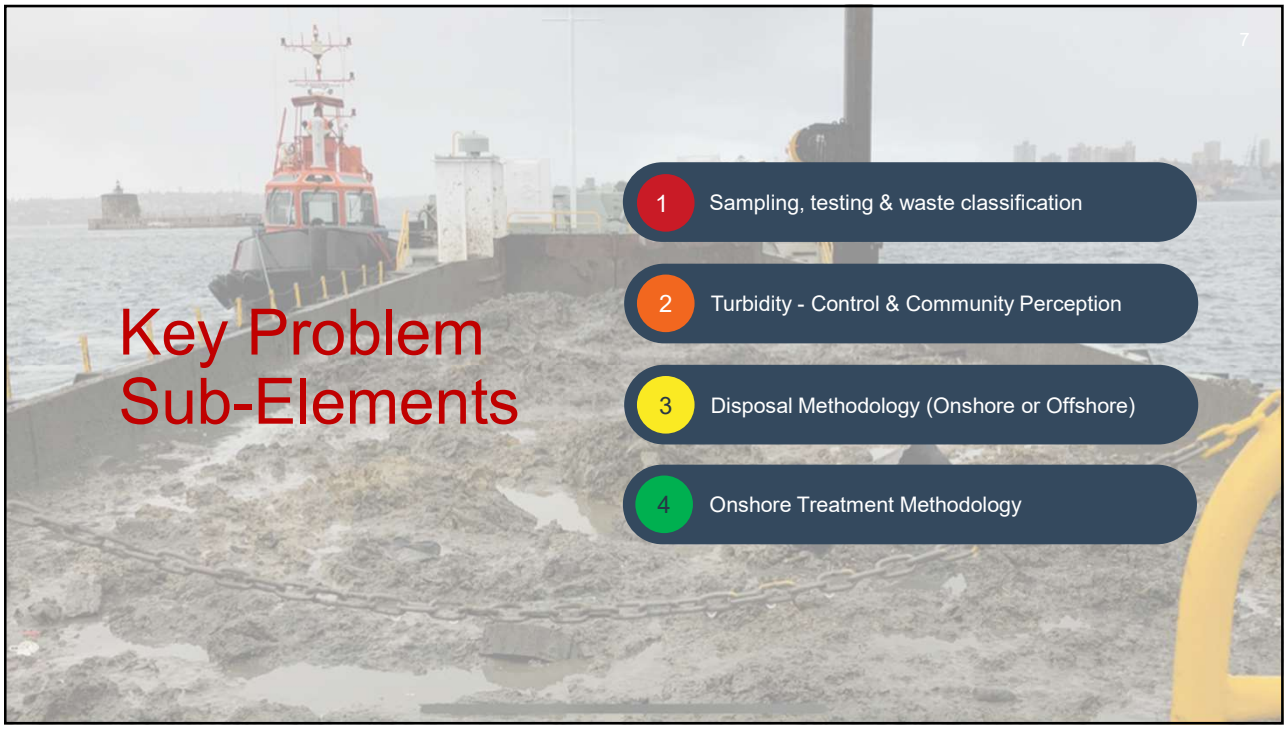
7
Key Problem Sub-Elements
1
Sampling, testing & waste classification
2
Turbidity - Control & Community Perception
3
Disposal Methodology (Onshore or Offshore)
4
Onshore Treatment Methodology

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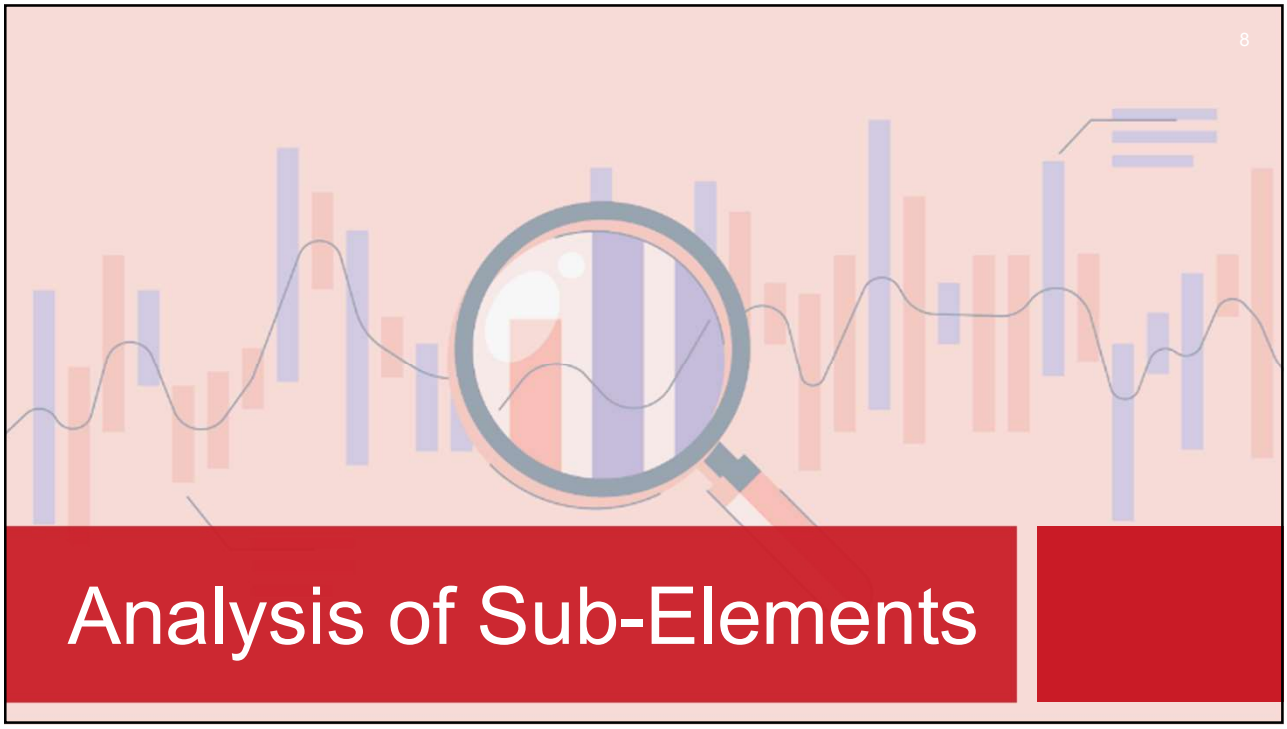
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Analysis of Sub-Elements

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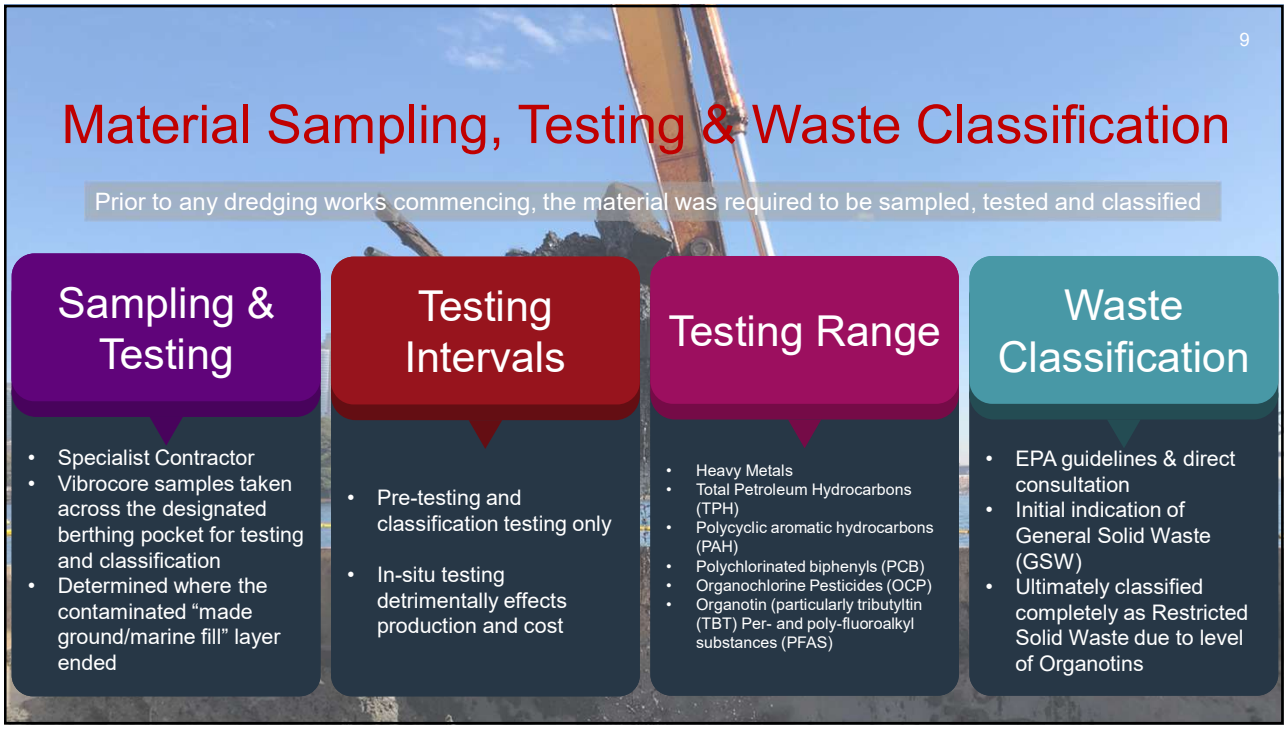
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Material Sampling, Testing & Waste Classification
Prior to any dredging works commencing, the material was required to be sampled, tested and classified
Sampling & Testing
• Specialist Contractor
• Vibrocore samples taken across the designated berthing pocket for testing and classification
• Determined where the contaminated "made ground/marine fill" layer ended
Testing Intervals
• Pre-testing and classification testing only
• In-situ testing detrimentally effects production and cost
Testing Range
• Heavy Metals
• Total Petroleum Hydrocarbons (TPH)
• Polycyclic aromatic hydrocarbons (PAH)
• Polychlorinated biphenyls (PCB)
• Organochlorine Pesticides (OCP)
• Organotin (particularly tributyltin (TBT) Per- and poly-fluoroalkyl substances (PFAS)
Waste Classification
• EPA guidelines & direct consultation
• Initial indication of General Solid Waste (GSW)
• Ultimately classified completely as Restricted Solid Waste due to level of Organotins

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Turbidity - Control & Community Perception
Controls
• Review of Environmental Factors
• Environmental Management Plan
• Primary Silt Curtain
• Secondary "Global" Silt Curtain
• Daily Water Quality Monitoring
• Flora and Fauna Observations
• Records & Reporting
Managing Community Perception
• Community Consultation & Notification
• Letterbox Information Drops
• Community Enquiries Register
• Direct Communication With EPA
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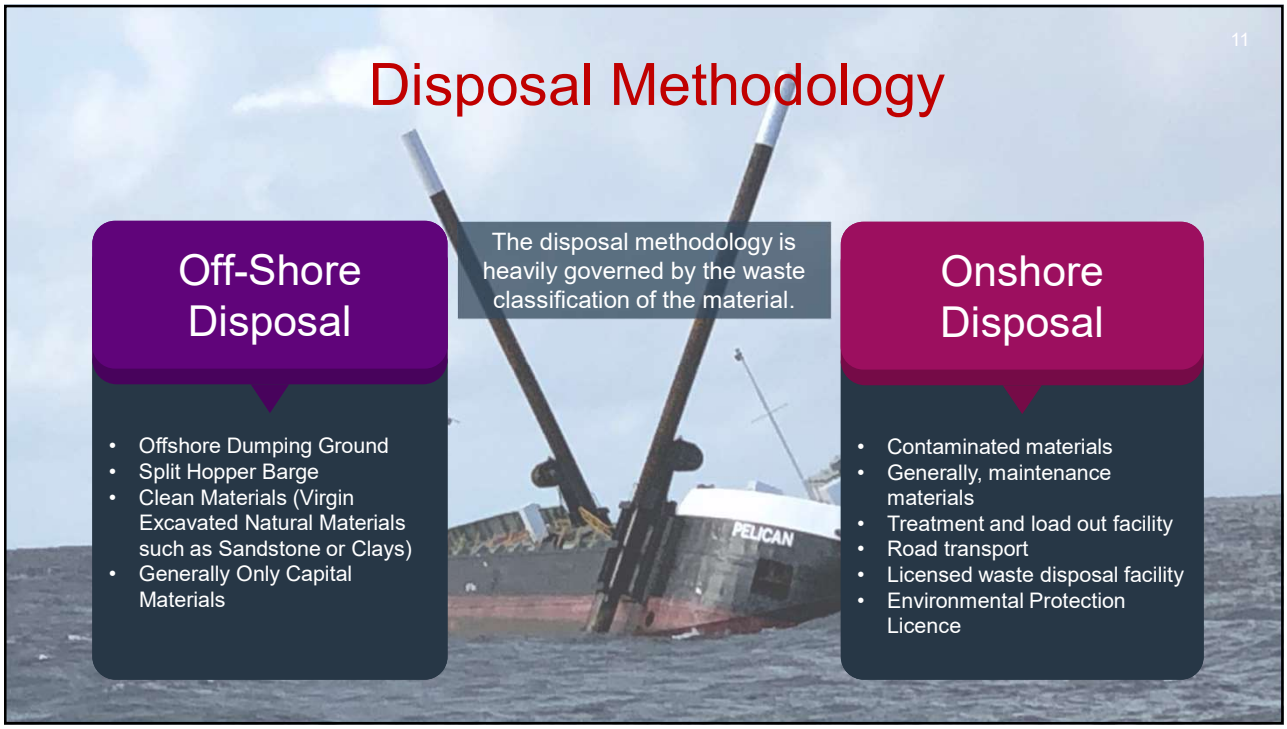
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Disposal Methodology
Off-Shore Disposal
Offshore Dumping Ground
Split Hopper Barge
Clean Materials (Virgin Excavated Natural Materials such as Sandstone or Clays)
Generally Only Capital Materials
The disposal methodology is heavily governed by the waste classification of the material.
Onshore Disposal
Contaminated materials
Generally, maintenance materials
Treatment and load out facility
Road transport
Licensed waste disposal facility
Environmental Protection Licence
PELICAN

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Onshore Disposal Treatment Methodologies
There are several onshore disposal treatment options available to the industry, including:
1. Removal of Supernatant Water & Drying
2. Cement Based Additive
3. Polymer Based Additive

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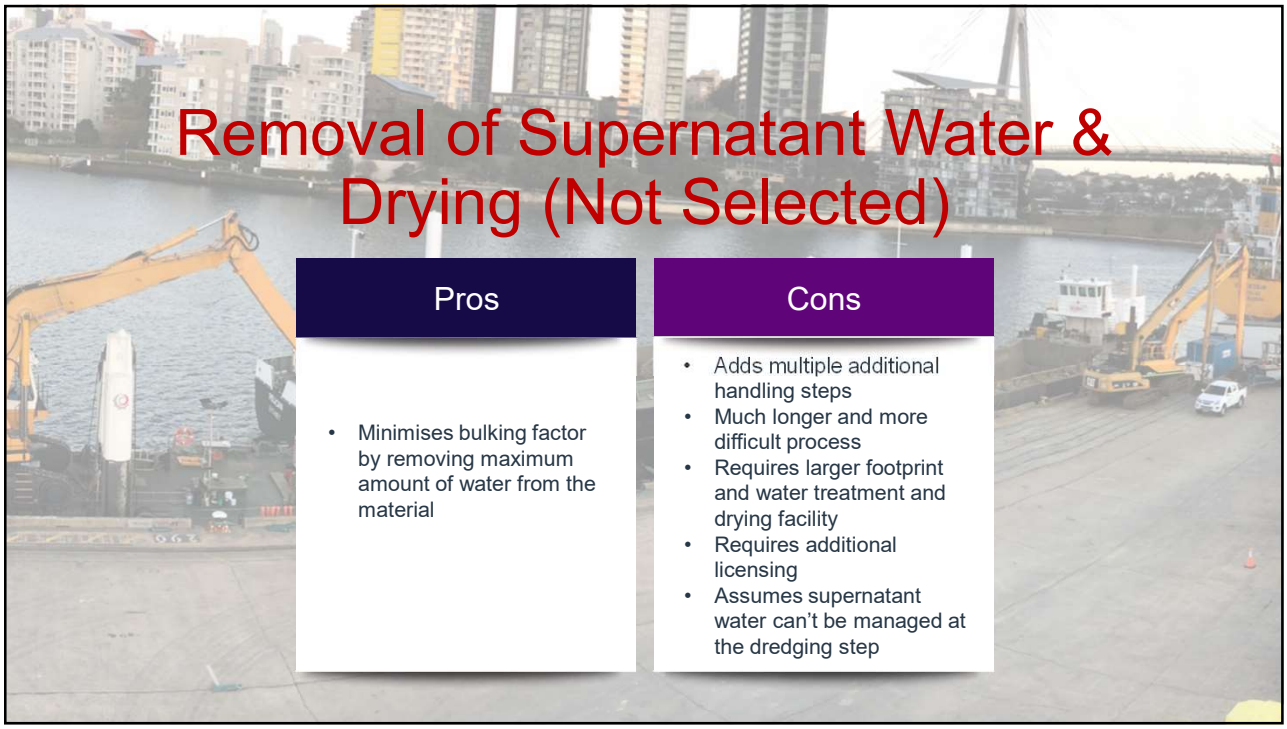
Removal of Supernatant Water & Drying (Not Selected)
Pros
Minimises bulking factor by removing maximum amount of water from the material
Cons
Adds multiple additional handling steps
Much longer and more difficult process
Requires larger footprint and water treatment and drying facility
Requires additional licensing
Assumes supernatant water can't be managed at the dredging step

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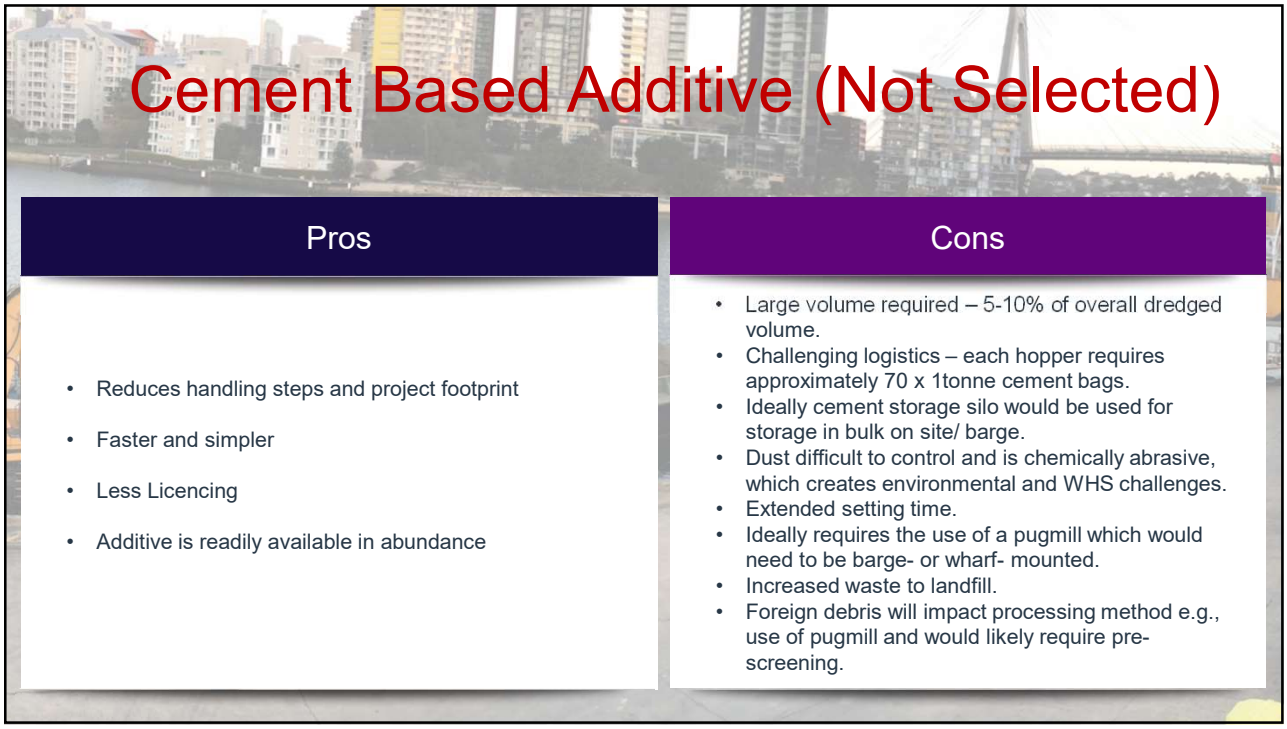
Cement Based Additive (Not Selected)
Pros
Reduces handling steps and project footprint
Faster and simpler
Less Licencing
Additive is readily available in abundance
Cons
Large volume required – 5-10% of overall dredged volume.
Challenging logistics – each hopper requires approximately 70 x 1tonne cement bags.
Ideally cement storage silo would be used for storage in bulk on site/ barge.
Dust difficult to control and is chemically abrasive, which creates environmental and WHS challenges.
Extended setting time.
Ideally requires the use of a pugmill which would need to be barge- or wharf- mounted.
Increased waste to landfill.
Foreign debris will impact processing method e.g., use of pugmill and would likely require pre-screening.

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Proprietary Polymer Based Additive (Selected)

Pros	Cons
• Minimal volume required - Less than 1.5% of overall dredged volume. • Minimal logistics – each hopper requires approximately 10 x 1 tonne polymer bags, which can be delivered and dispensed in bulker bags. • Minimal dust. • Reduced setting time. • Mixing can commence during dredging process with minimal equipment, which allows for increased production rate. • Reduced waste to landfill. • Simple processing method – (note: successful in 2010-2011 campaign despite encountering a significant amount of foreign debris (including cables, ladders and significant amounts of other large items)).	• Longer lead time on supply; hence, requires earlier program consideration

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Onshore Disposal Treatment Methodologies Summary

	Project Footprint	Treatment Duration	Licensing Requirements	Simplicity & Handling	Additive Volume	Additive Leadtime	Tonnes to Landfill	Overall Cost	Overall Rating (1 = Best)
Supernatant Water Removal & Drying					✓	✓	✓		3
Cement Additive	✓		✓	✓		✓			2
Proprietary Polymer Additive	✓	✓	✓	✓	✓		✓	✓	1

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Conclusion
The outlined dredging and disposal (inc. treatment) methodology for the contaminated material was proven to be an environmentally friendly option, as well as a more efficient and cost-effective alternative to traditional contaminated dredging & disposal methodologies.

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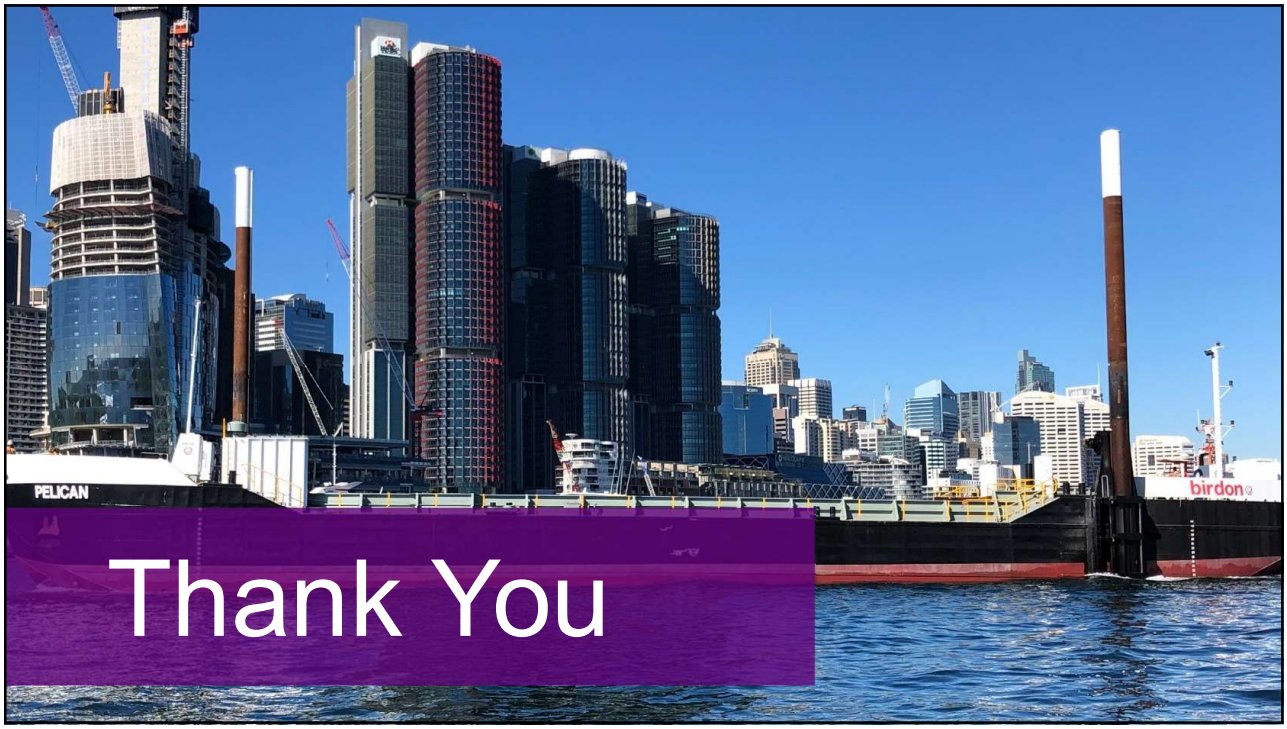
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Thank You

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