Point Hudson

Breakwater Improvement Project

Selected Alternative
Feb 12th, 2020

DRAFT

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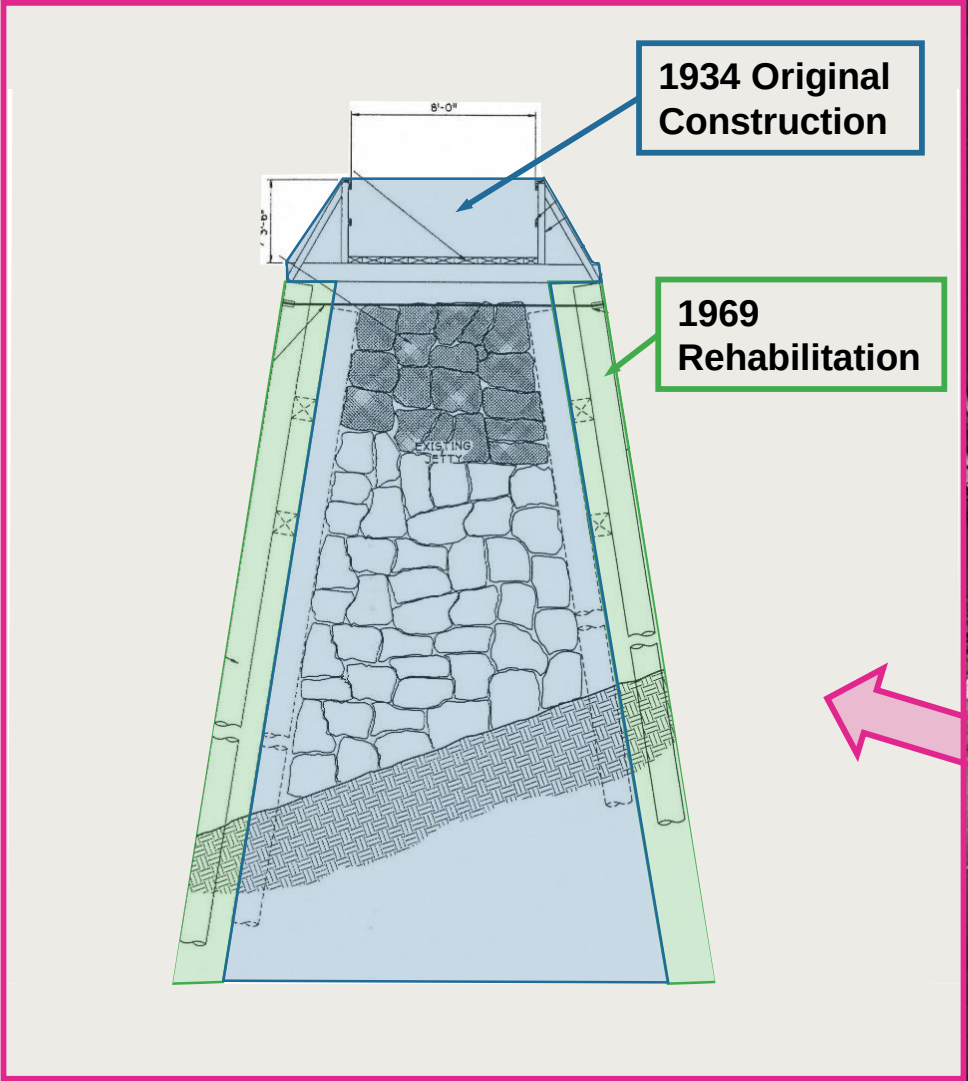
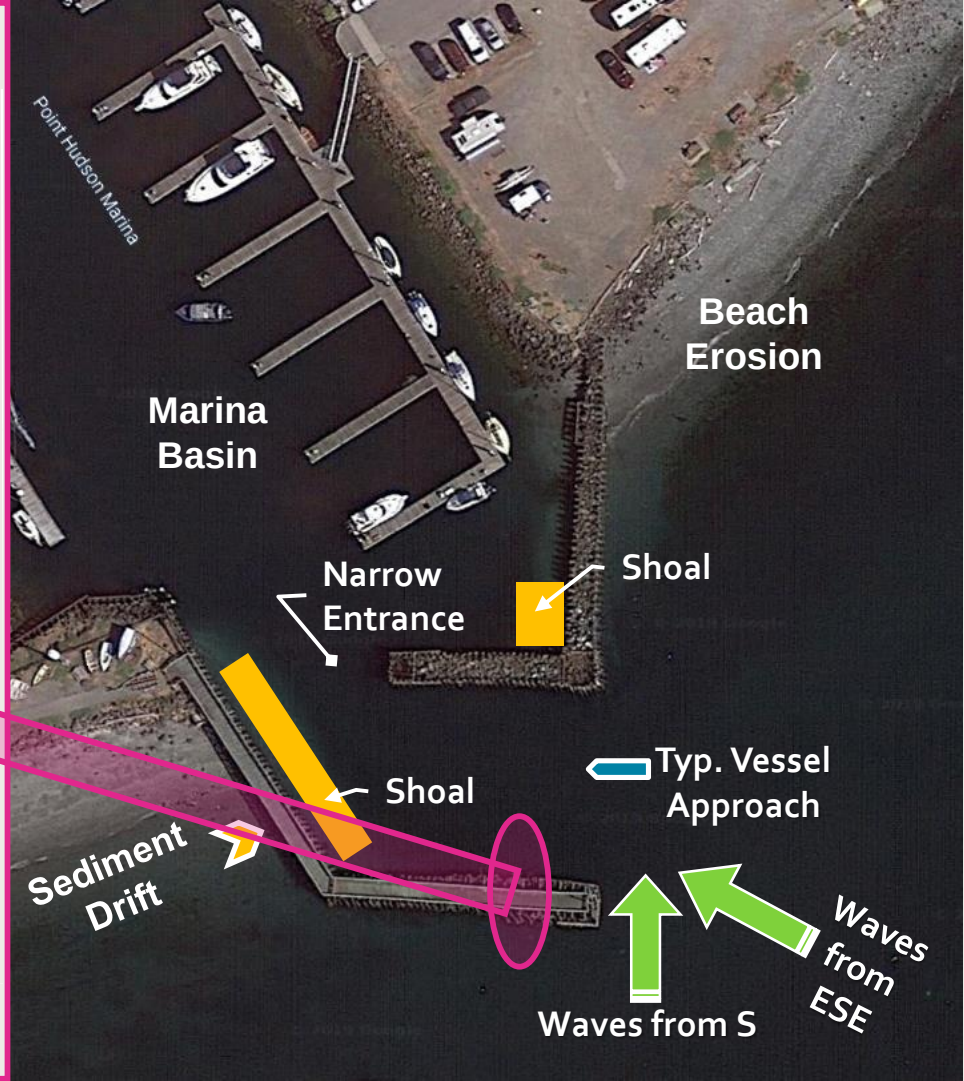
Introduction & Assessment


1934 Original Construction
1969 Rehabilitation
8'-0"
EXISTING


Point Hudson Marina
Marina Basin
Beach Erosion
Narrow Entrance
Shoal
Shoal
Typ. Vessel Approach
Sediment Drift
Waves from ESE
Waves from S

Introduction

Existing Condition

Timber piles, walers, cable tiebacks, and armor rock are at or beyond useful life. Stability of the overall structural system is compromised.

- The most advanced structural deterioration was observed at the end of the south breakwater.
- Voids in the riprap reduce the system's wave protection capability.

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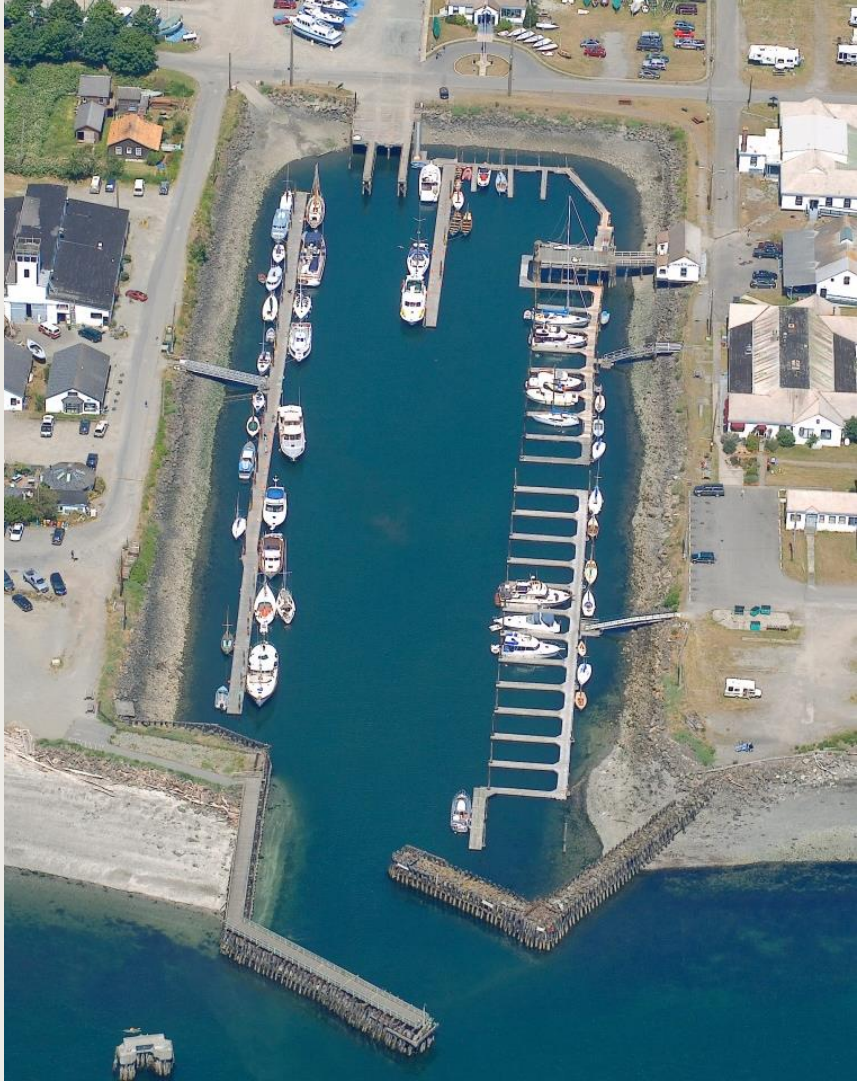
Design Objectives & Alternatives

Design Objectives

Overview

The guiding objectives are to provide a breakwater rehabilitation/replacement design that:

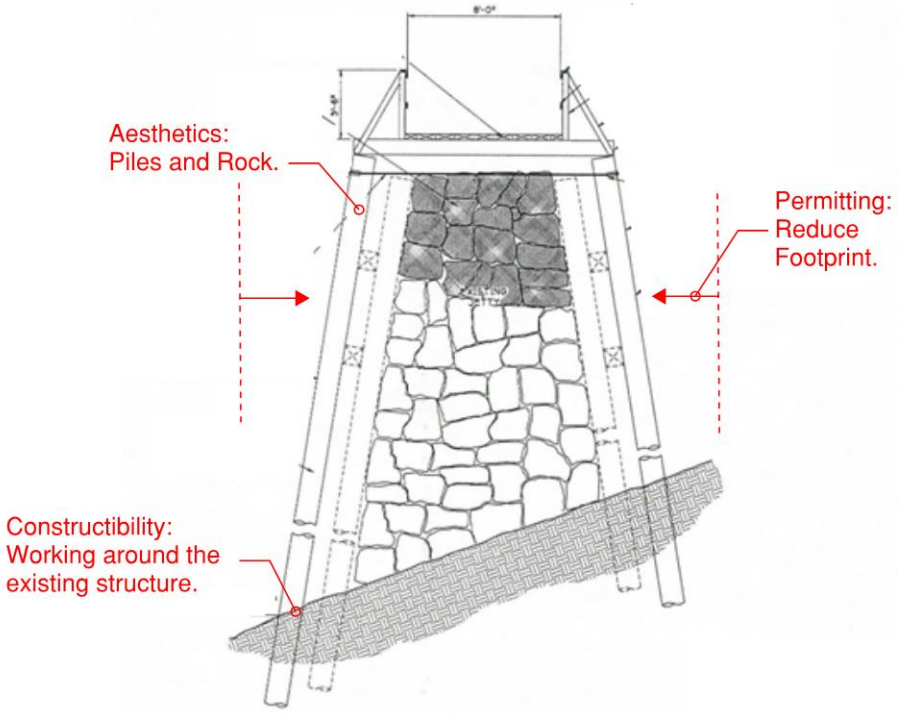
- Provides wave protection for the Point Hudson Marina for a minimum design life of 30 years.
- Responds to community concerns to maintain the aesthetic of the existing breakwater.
- Can be permitted, constructed and maintained.



Design Objectives

Considerations

- **Engineering.** Protect the existing marina and the Port operations against wind waves and vessel waves for at least the next 30 years. Considers navigation channel impacts.
- **Aesthetics.** Similar in appearance to the existing breakwater (rocks and piles) using modern materials.
- **Permitting.** Remove creosote and reduce footprint of the breakwater to minimize offsite mitigation requirements.
- **Constructability.** Minimize risks to the Port from potential cost overruns, delays, errors, and obstacles during construction.
- **Cost.** Cost efficient design that minimizes capital and maintenance costs.



Design Alternatives

Evaluation

- Several Alternatives were considered and evaluated using the design objectives and then presented to the stakeholders.

Category	Alternative 1	Alternative 2	Alternative 3
Description	• Existing structure remains and is encapsulated.	• Partial reconstruction and encapsulation.	• The entire leg to be reconstructed in a smaller footprint.
Engineering and Performance	• Challenging to design and construct around the existing structure. • Reduced navigation.	• Most complex and challenging. Additional maintenance. • Partially reduced navigation	• Built from ground up with most control of end product. • Improved navigation
Constructability	• Difficult to install new piles and rock around existing structure, risks of slow downs and issues.	• Very challenging and risky to demolish only part of the structure.	• Lowest risk but still challenging.
Permitting	• Most challenging, requiring mitigation.	• Would likely require some mitigating.	• Seeks to be self mitigating.

- After review of the different alternatives, stakeholders selected Alternative 3 as their preferred alternative with some additional input.

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Selected Breakwater Design

Breakwater Design

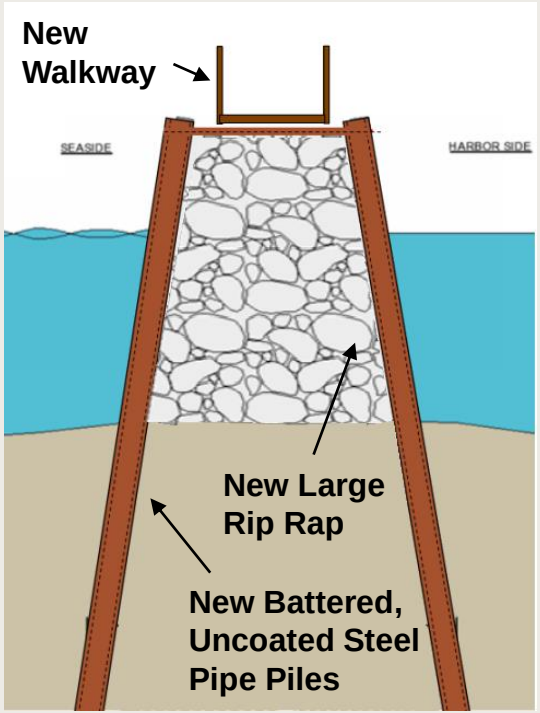
Stakeholder Input

In addition to selecting Alternative 3 as the preferred design, the stakeholders presented the following suggestions and guidance:

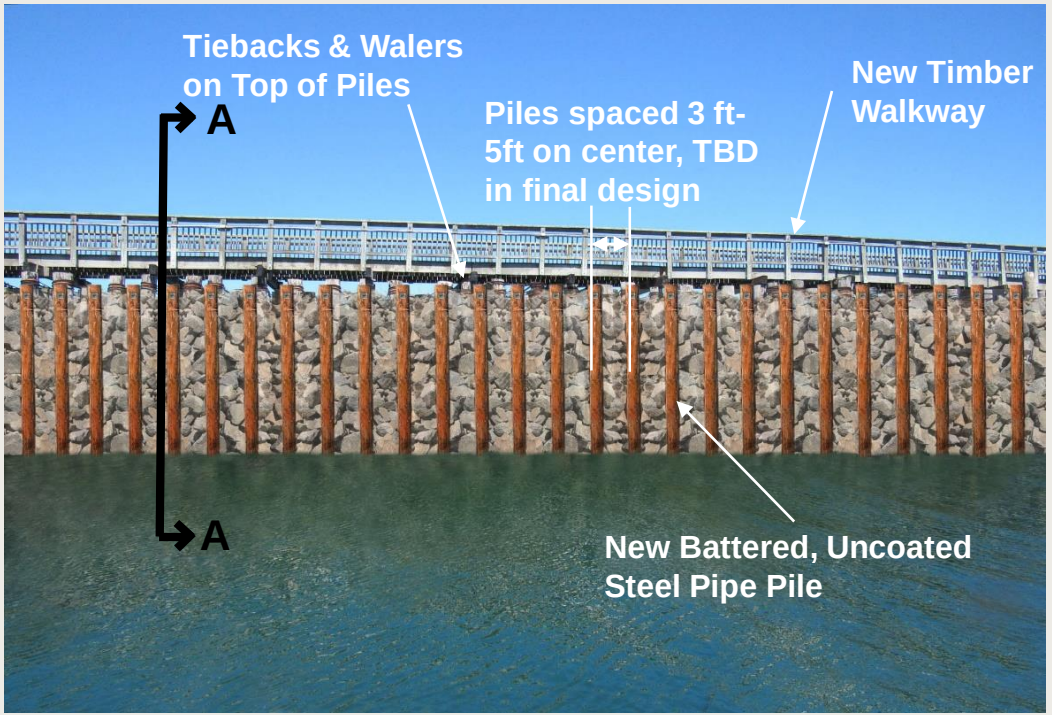
Category	Alternative 3
Pile	• Piles should be closely spaced similar to existing • Piles should be uncoated steel pipe piles with sacrificial corrosion thickness, no composite piles • Piles should be battered to match existing aesthetics • Piles should be supported with tie rod cross-ties and potential walers
Breakwater Core	• Large high quality riprap (granite) • No mesh for rock containment
Walkway	• Design and system should allow for installation of walkway on top of the south breakwater • End of walkway waterside should incorporate a wider turnaround and look out area
Permitting	• North and south breakwaters should be designed and permitted together

Breakwater Design

Selected Cross-Section and Elevation



Section A - A



Elevation View

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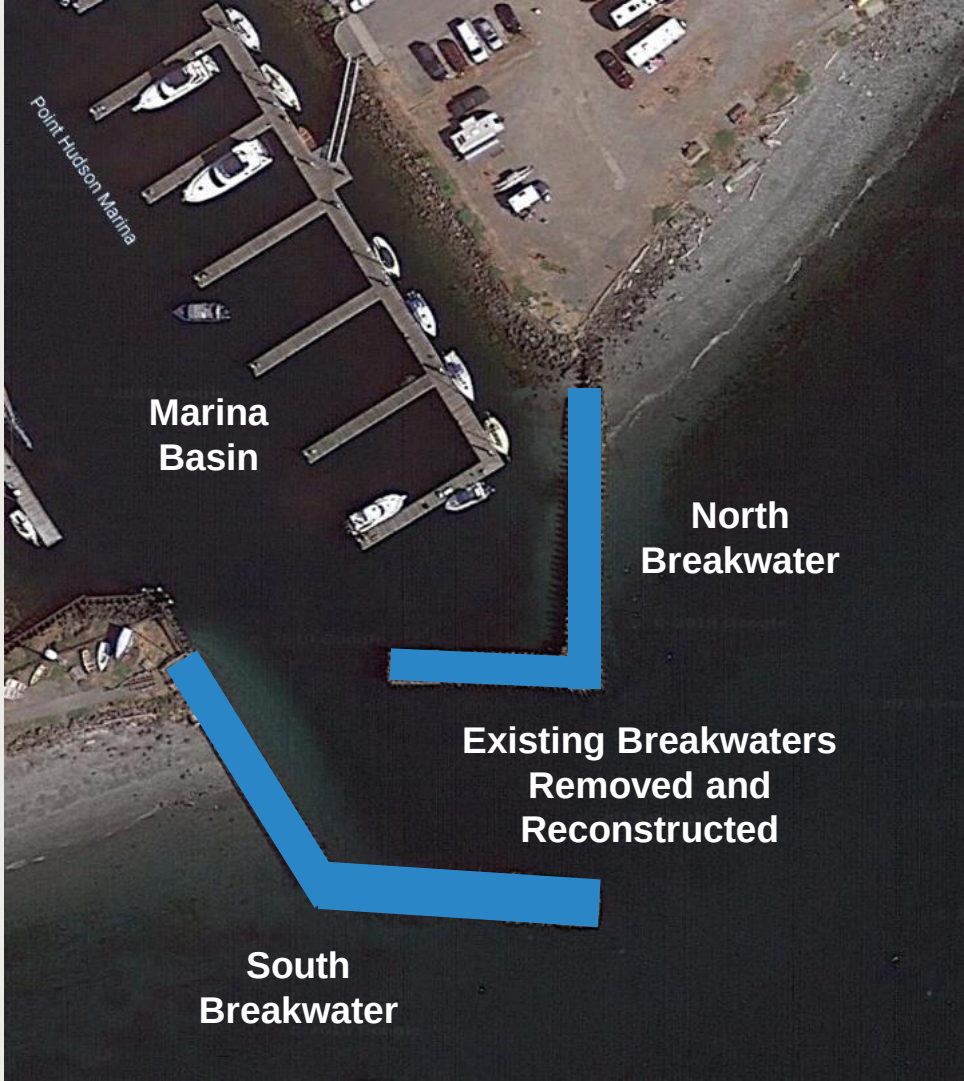
Phasing and Cost

Phasing

North and South Breakwaters

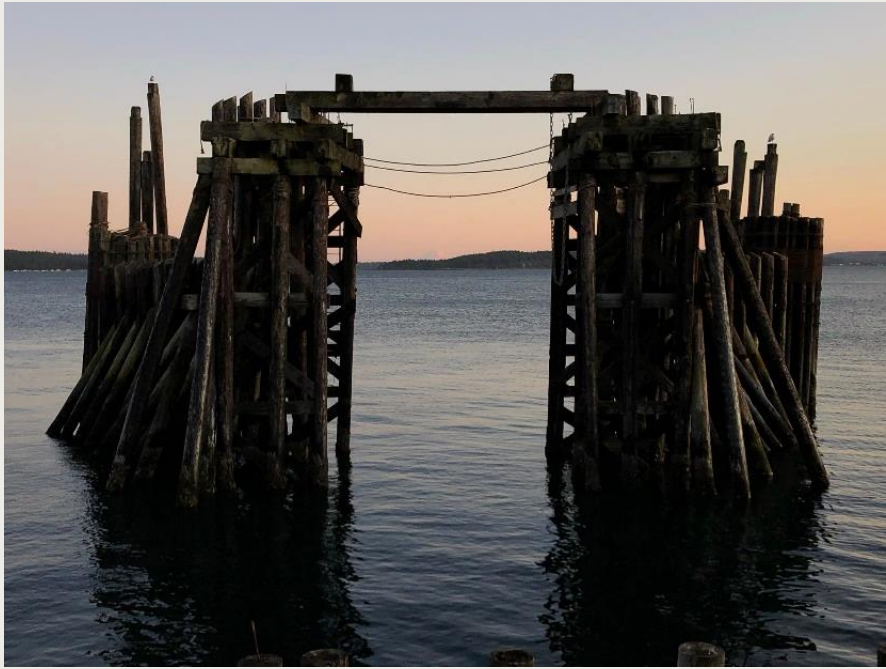
- **Condition.** North breakwater in slightly better condition than the south. Therefore, replacement of the south breakwater should occur before the north breakwater.
- **Construction Schedule.** South breakwater to be replaced winter of 2021 (dependent on permitting). North breakwater to be replaced a few years after completion of the south.
- **Demolition.** Demolish both structures and remove all existing creosote piles, timber, rock, and cables down to the mudline.
- **Footprint.** The new breakwater constructed within similar footprint as the existing.
- **Walkway.** Walkway to be added on top of south breakwater.



Mitigation and Cost

Considerations

- **Environmental Impact Mitigation.** Upon permit review, agencies may still require some mitigation. Mitigation options include using plumb piles vs. batter, reducing breakwater footprint further, and/or incorporating the Quincy St. Dock creosote pile removal.
- **Replacement Cost.** $5.5M to $6.5M (South), TBD (North). Replacement cost of north breakwater will be slightly less than the south, but depends on actual time of construction relative to corresponding inflation factors.



Next Steps

- **Design Refinement.**
  - Permitting Outreach
  - Coastal Assessment of new design
  - Refined breakwater width and footprint
  - Refined pile size and spacing
  - Refined coastal loading and protection
  - Batter vs Plumb piles
  - Architectural considerations
- **Preliminary Design/ Permitting**
- **Final Design**

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Questions?