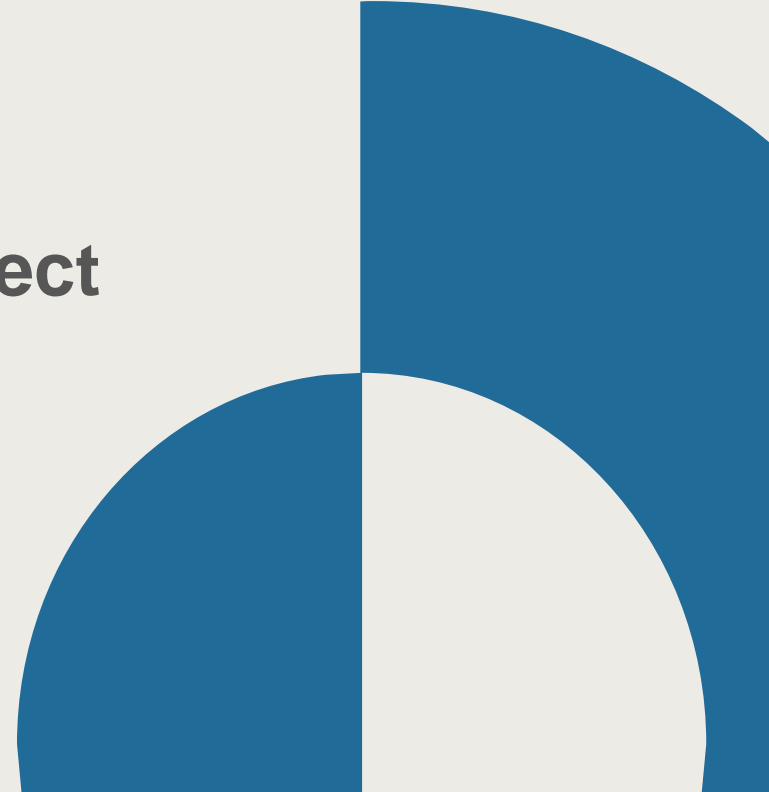


Point Hudson

Breakwater Improvement Project

Alternatives Assessment
November 22nd, 2019

DRAFT



Agenda

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Introduction

2

Design Objectives

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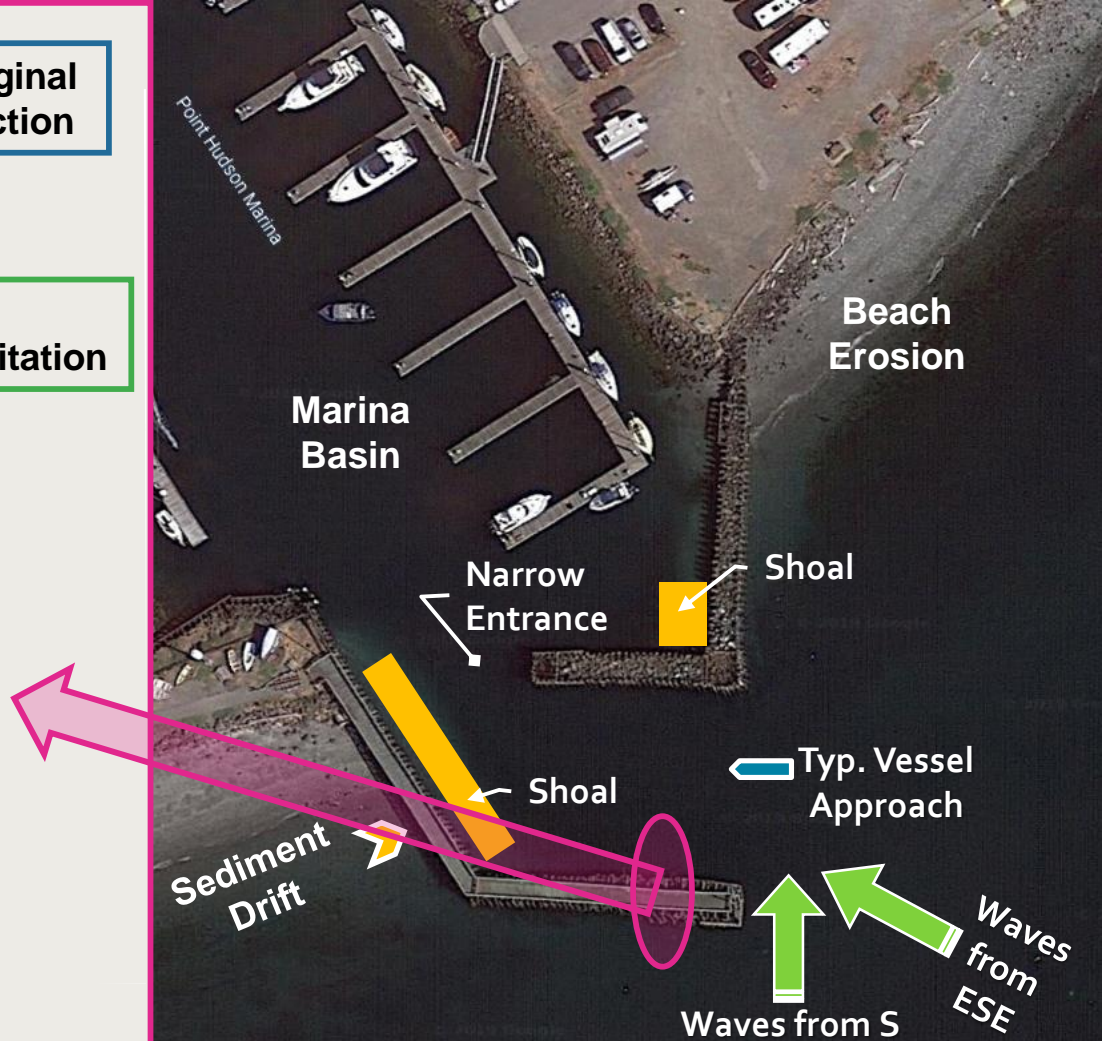
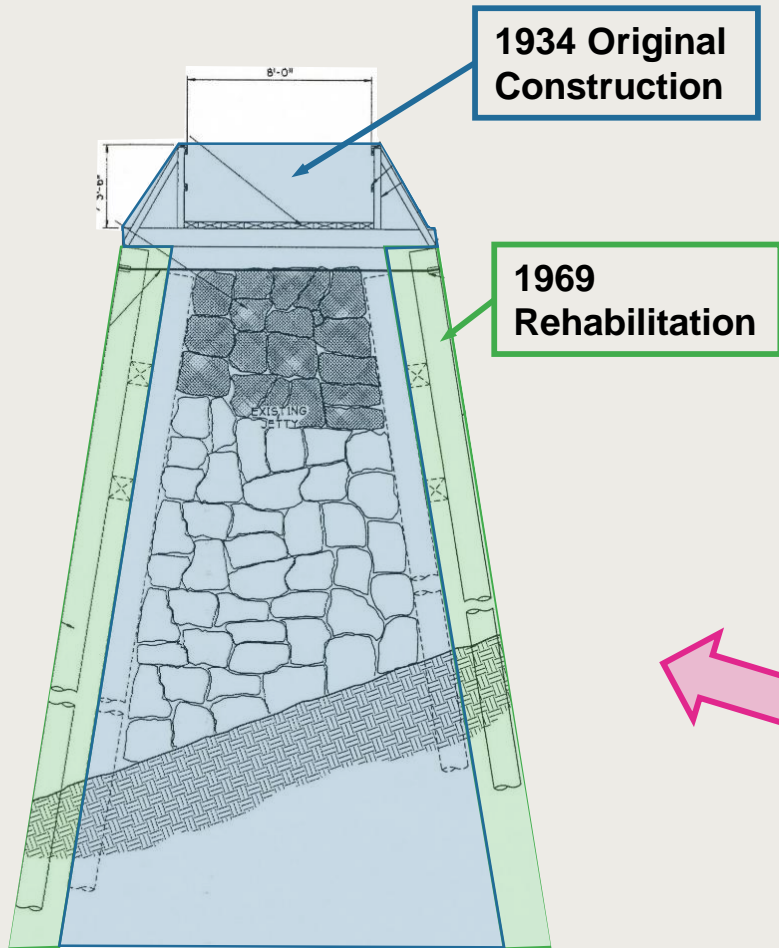
Alternative Assessment

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Questions



Introduction



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.

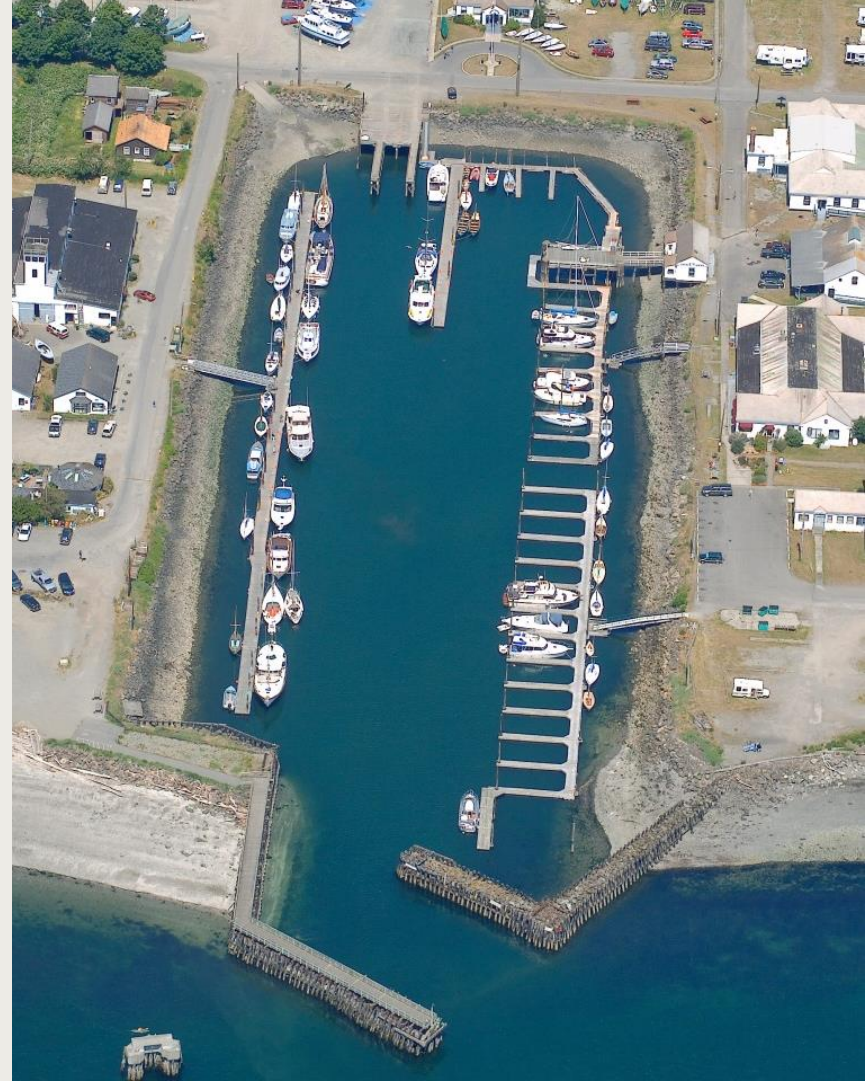


Design Objectives

Overview

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

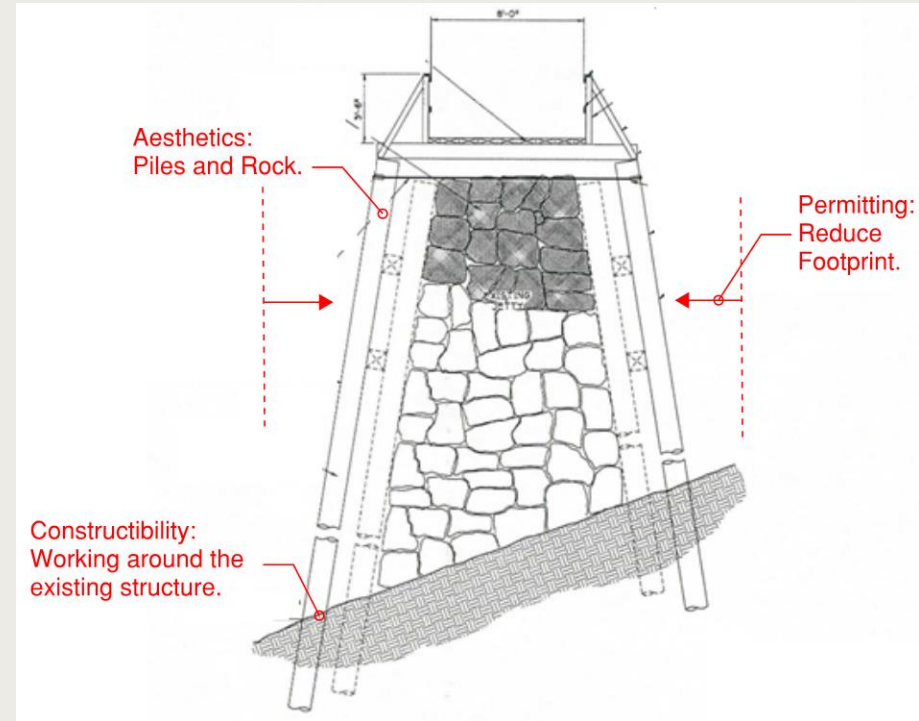
- Provides wave protection for the Point Hudson Marina for a minimum design life of 30 years.
- Responds to community concerns to maintain the aesthetic of the existing breakwater.
- Can be permitted, constructed and maintained.



Design Objectives

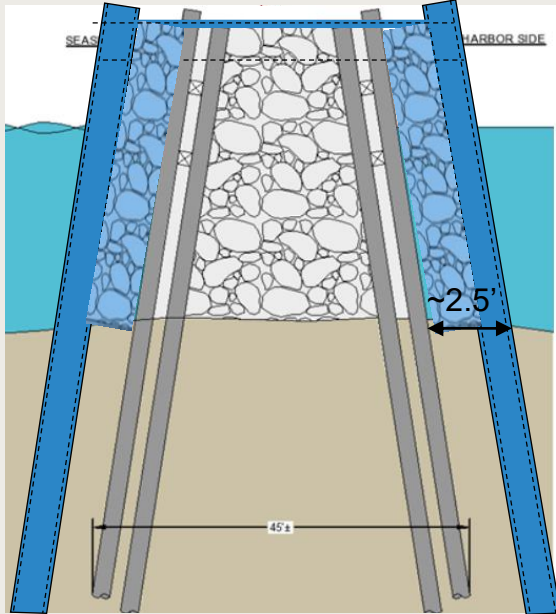
Considerations

- 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 designs that minimize capital and maintenance costs.

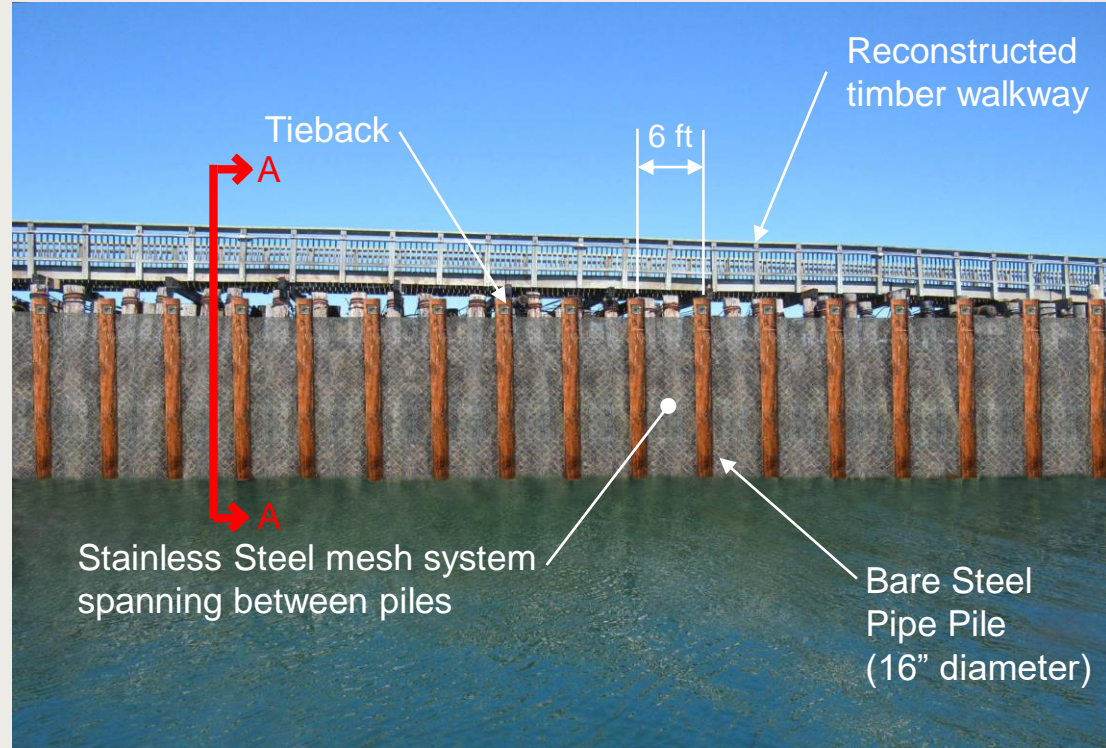


Selected Concept

Exterior Bare Steel Piles, Mesh Lagging System, and New Rock



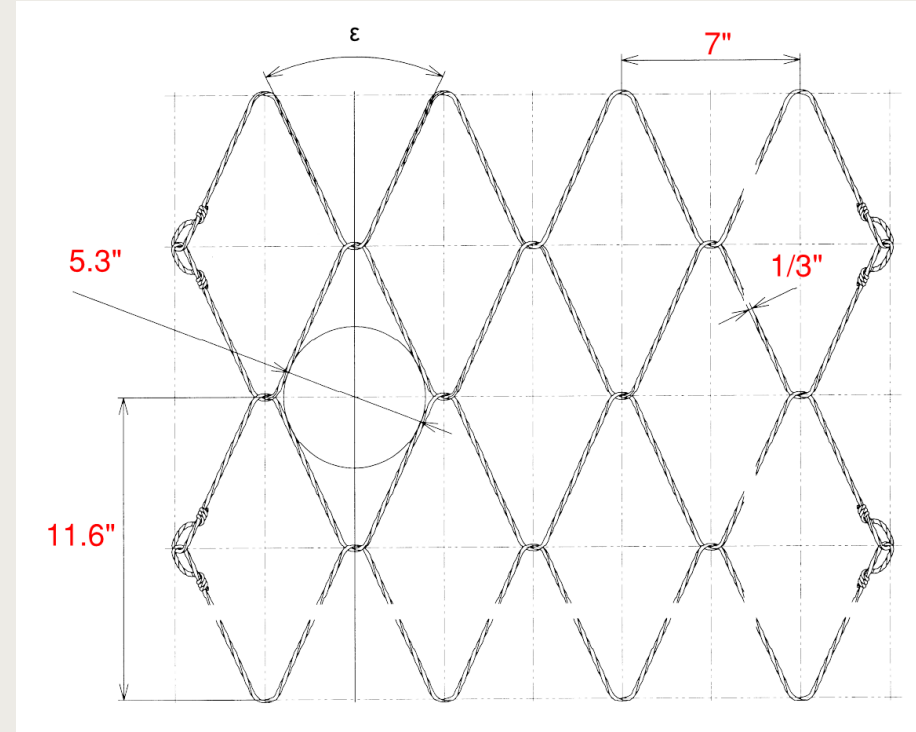
Section A-A



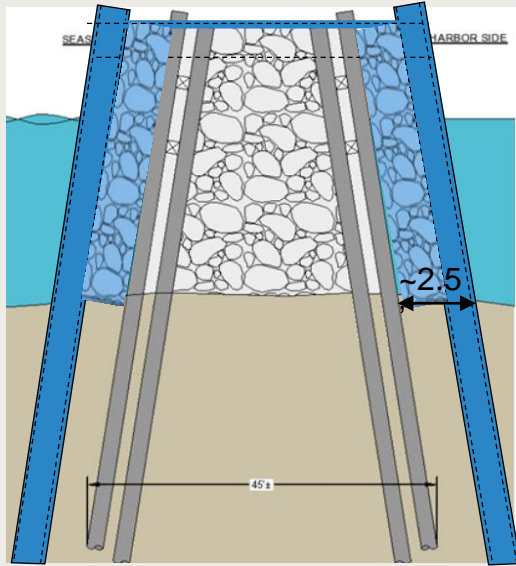
- Based on the objectives, this design concept was selected as the best alternative. Layout options include encapsulation or reconstruction but both options would look similar from the outside.

Mesh Lagging System

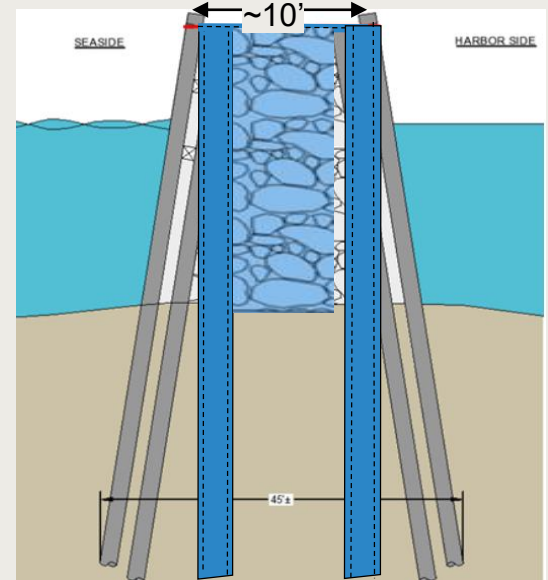
- Mesh would retain rock between piles for encapsulation options.
- May or may not be used for the reconstruction options.
- Mesh would be marine grade stainless steel to reduce maintenance and increase design life.



Encapsulation vs. Reconstruction



- Existing structure remains except for a few creosote timber piles removed for permitting.
- Piles driven in a batter outside of existing structure, expand footprint by 2.5 ft each side.
- Reduces demo costs but increases installation costs and offsite mitigation costs.
- Reduces navigation width in the navigation channel.



- Existing structure is completely removed including piles and rock.
- Piles driven plumb with new rock installed between the rows of piling.
- Self mitigating because of the reduction in footprint and creosote removal.
- Improves navigation channel width.



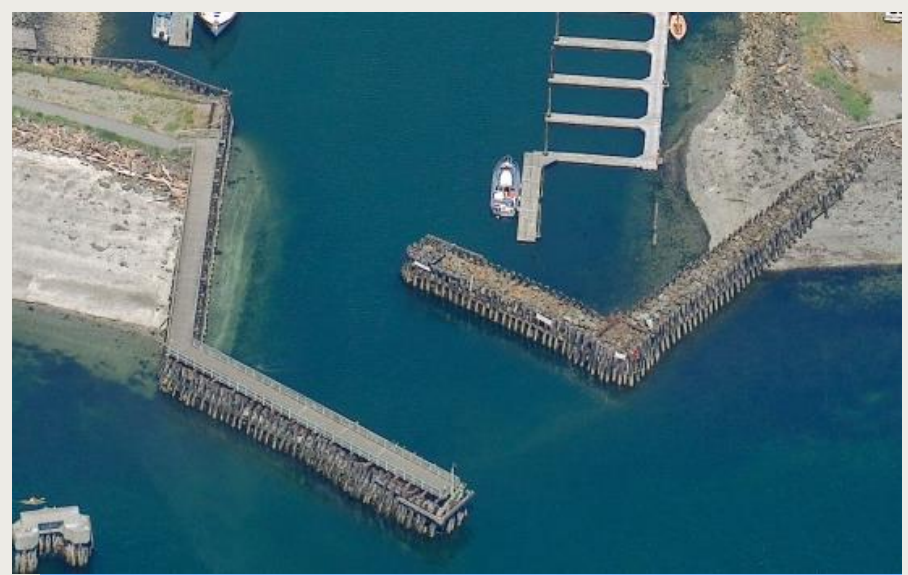
Layout Alternative Assessment

Layout Alternatives

Using the selected concept look at different layout alternatives and compare against objectives.

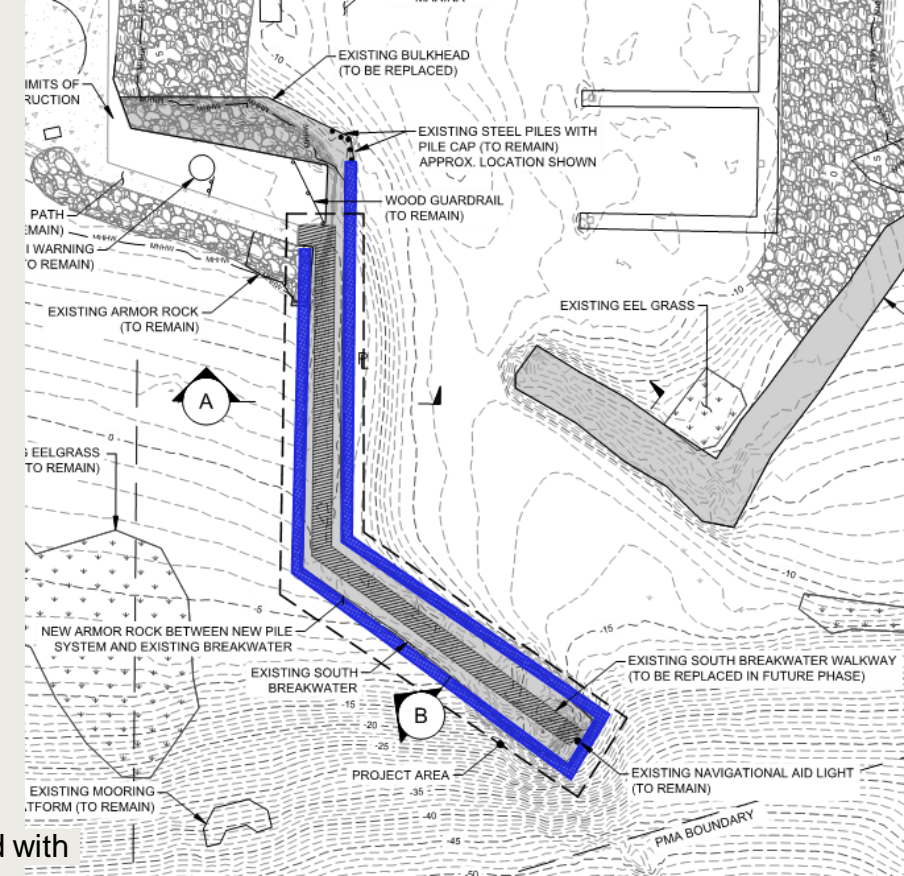
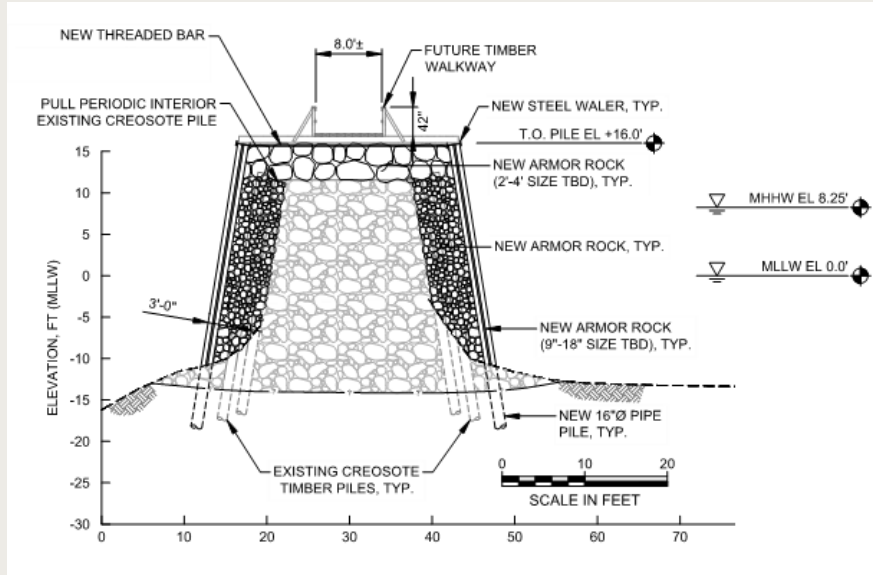
Considerations will be:

- Engineering
- Aesthetics
- Permitting
- Constructability
- Cost



Alternative 1

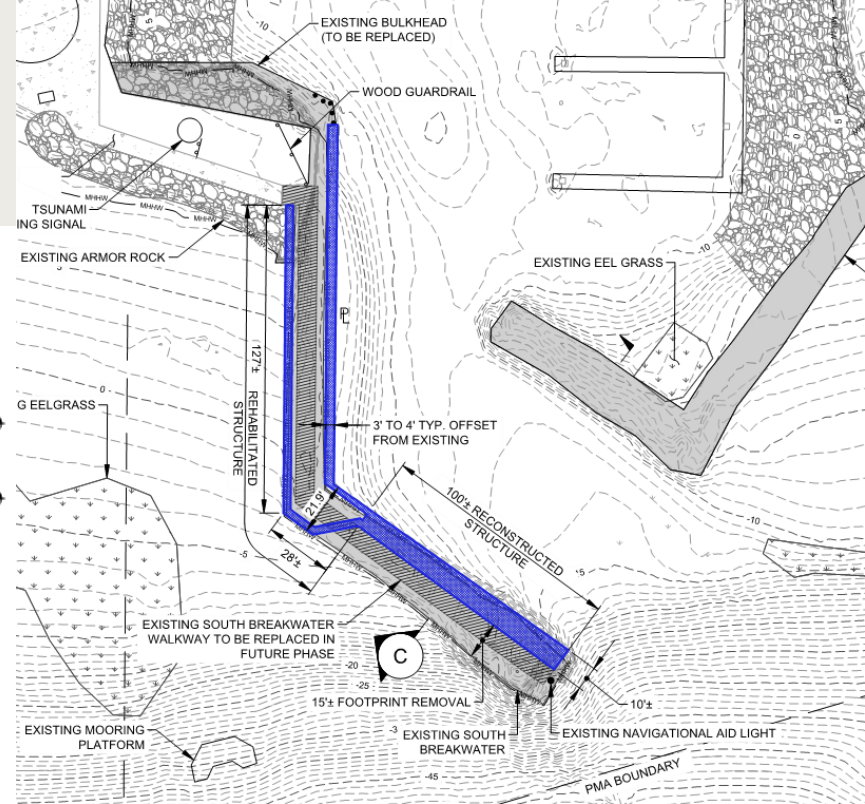
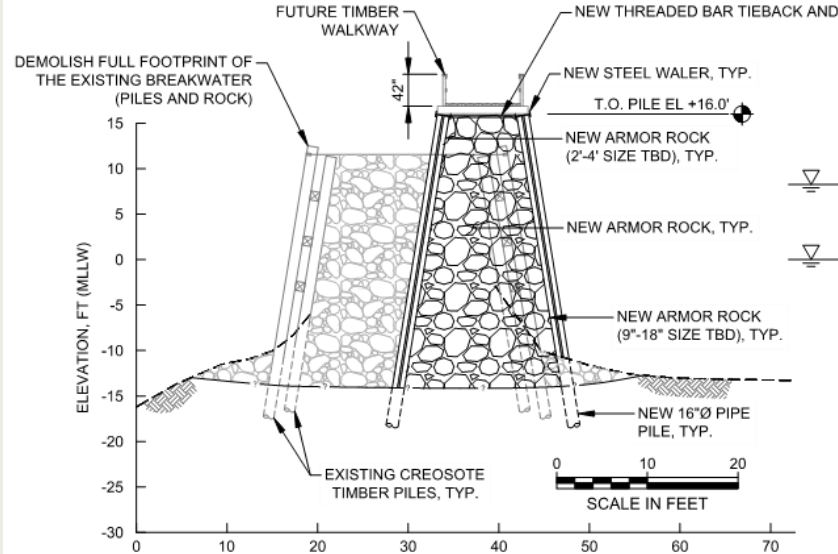
Full Length Encapsulation



- Entire length of the existing south breakwater leg is encapsulated with new piles, rock, and lagging.
- Large expansion of footprint.
- Offsite mitigation needed for expansion of area and remaining creosote.
- Narrows navigation channel width.

Alternative 2

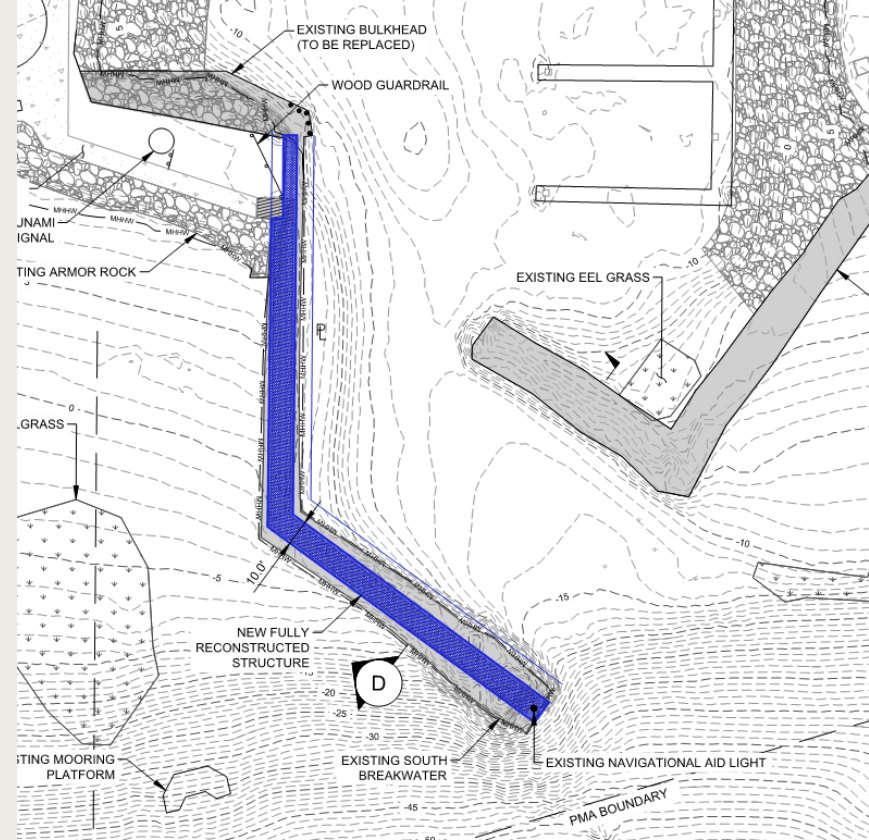
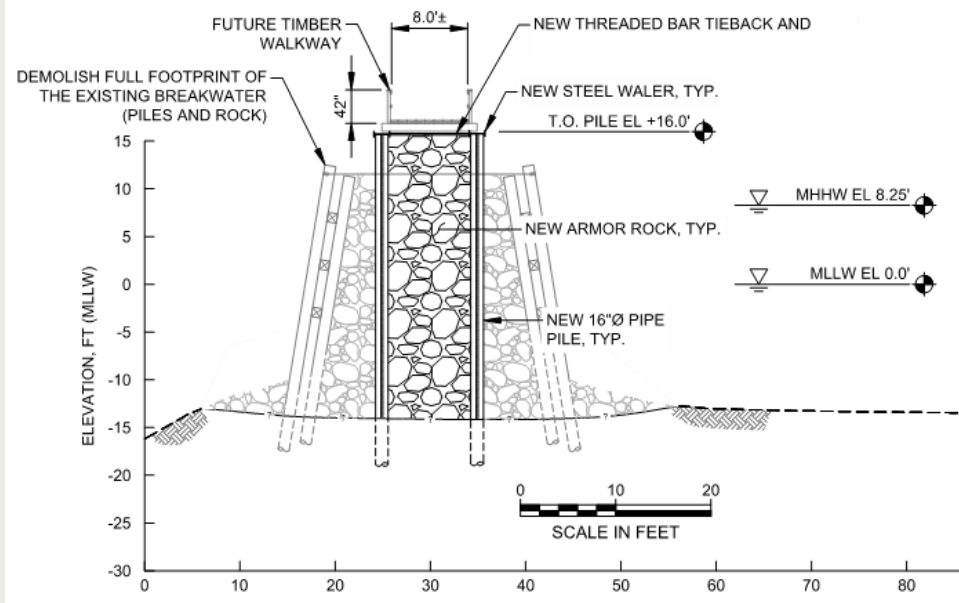
Partial Replacement with Encapsulation



- Partial length of the existing south breakwater leg removed and reconstructed and the remaining is encapsulated with new piles, rock, and lagging.
- Overall structure footprint is maintained, some creosote remains.
- Potentially self mitigating for area.
- Narrows navigation channel width.

Alternative 3

Full Replacement



- Entire length of the existing south breakwater leg is removed and reconstructed with new piles, rock, and lagging.
- Reduction in footprint, removal of creosote, reduction in environmental impacts.
- Self mitigating for area and creosote.
- Widens navigation channel.

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Other Considerations



- Mitigation. Complete removal of Quincy Street Dock needed as offsite mitigation for full length encapsulation option (Alternative 1).
- Partial removal may be needed for Alternative 2.

- Materials. Alternative materials will be considered for full replacement and reconstruction option (Alternative 3) including the use of composite piling with black HDPE sleeves at 3 ft centers.



Alternative Assessment

Summary

Category	Alternative 1	Alternative 2	Alternative 3
Description	<ul style="list-style-type: none">Existing structure remains and is encapsulated.	<ul style="list-style-type: none">Partial reconstruction and encapsulation.	<ul style="list-style-type: none">The entire leg to be reconstructed in a smaller footprint.
Engineering and Performance	<ul style="list-style-type: none">Challenging to design and construct around the existing structure.Reduced navigation	<ul style="list-style-type: none">Most complex and challenging. Additional maintenance.Partially reduced navigation	<ul style="list-style-type: none">Built from ground up with most control of end product.Improved navigation
Constructability	<ul style="list-style-type: none">Difficult to install new piles and rock around existing structure, risks of slow downs and issues.	<ul style="list-style-type: none">Very challenging and risky to demolish only part of the structure.	<ul style="list-style-type: none">Easiest to construct and control.Lowest risk but still challenging.
Permitting	<ul style="list-style-type: none">Expanded footprint.Offsite mitigation required.Creosote is still exposed to salt water.	<ul style="list-style-type: none">Footprint maintained.May be self mitigating.Creosote is still exposed to salt water.	<ul style="list-style-type: none">Reduced footprint, completely removes creosote piles.Would be self mitigating.Creosote completely removed.
Cost*	\$5.1M - \$5.6M <ul style="list-style-type: none">Includes \$500k for offsite mitigation.	\$5.4M - \$5.9M <ul style="list-style-type: none">Additional demo costsPossibly no mitigation costs.	\$5.1M - \$5.9M <ul style="list-style-type: none">Full demo costsNo mitigation costs.Potential for composite piles.

*Costs include engineering, permitting and construction management. Costs in 2019 dollars.

North Jetty

South Jetty alternatives will be similar for North Jetty improvements.

- North Jetty can be encapsulated or reconstructed as previously shown.
- Pros and Cons will be similar to the South Jetty Project.
- Mitigation (Quincy St. Dock) may not be available.
- Cost ranges from \$4.0M - \$4.5M (2019 dollars)
- Combined South and North project costs \$9.0M to \$10.4M (2019 dollars)



Questions?

