

NORTH WILLAPA BAY SHORELINE EROSION ASSESSMENT

Pacific County, WA

WILLAPA EROSION COMMUNITY ACTION NOW (WECAN)

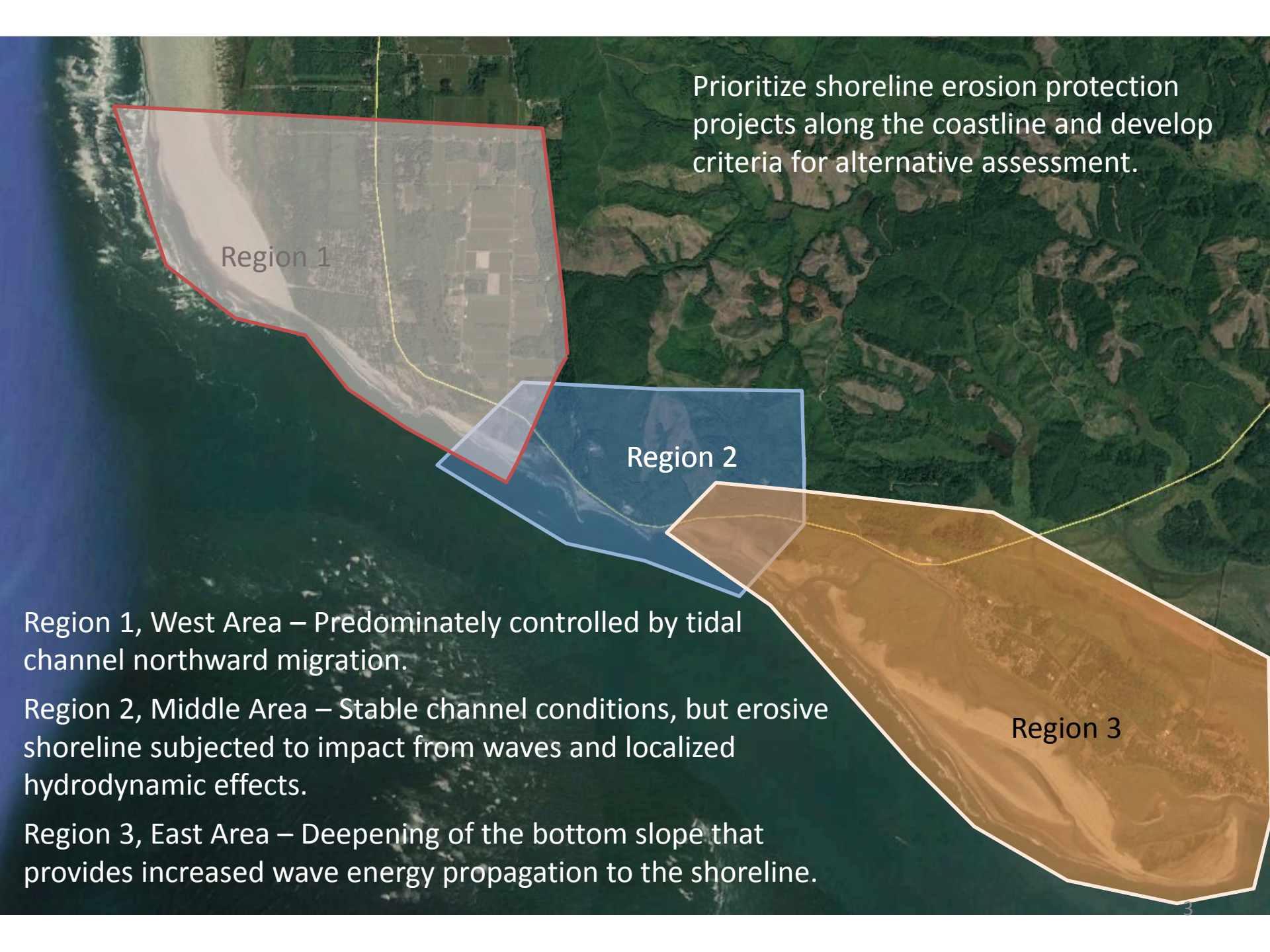
Study Results
November 16, 2016

Objective:

Conduct a pre-feasibility level engineering assessment of the project area utilizing existing data and studies to assist in formulating an understanding of current conditions, develop a range of potential erosion mitigation concepts to protect the identified critical areas, and identify next steps for project planning.

Summary from September 21, 2016 Meeting

- The coastal processes controlling shoreline erosion significantly differ along the coastline of North Willapa Bay. In order to adequately evaluate these shoreline erosion controlling processes and develop shoreline stabilization measures the entire coastline area is divided into three regions:
 - Region 1, West Area – Predominately controlled by tidal channel northward migration.
 - Region 2, Middle Area – Stable channel conditions, but erosive shoreline subjected to impact from waves and localized hydrodynamic effects.
 - Region 3, East Area – None-uniform redevelopment of the bottom slope that provides increased wave energy propagation to the shoreline.
- Shoreline erosion solutions shall address local (regional) conditions and controlling processes; thus, would differentiate along the North Willapa Bay shoreline. The path forward for developing a range of erosion mitigation concepts at each region is as follows:
 - Complete engineering assessment and develop a consensus on identified coastal processes.
 - Prioritize shoreline erosion protection projects along the coastline and develop criteria for alternative assessment.
 - Develop feasible shoreline stabilization alternatives



Prioritize shoreline erosion protection projects along the coastline and develop criteria for alternative assessment.

Region 1

Region 2

Region 3

Region 1, West Area – Predominately controlled by tidal channel northward migration.

Region 2, Middle Area – Stable channel conditions, but erosive shoreline subjected to impact from waves and localized hydrodynamic effects.

Region 3, East Area – Deepening of the bottom slope that provides increased wave energy propagation to the shoreline.

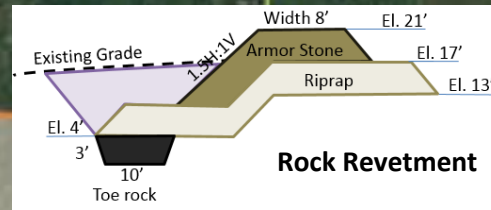
Criteria for Shoreline Erosion Protection Scenarios

- Area-Object
 - SR-105
 - Cranberry bogs
 - Tribal lands
 - Private lands
- Durability
 - Short-term (10-20 years)
 - Long-term (>20)
- Environmental Aspects
 - Coastal wetlands protection
 - Snowy plover habitat enhancement and protection
- Coastal Flood Protection
- Coastal Resilience Aspects
- Navigation
- Other

Important Notes to be Considered Upon Reading the Following Slides

- The current study is a pre-feasibility level study and did not include any design work.
- All drawings presented further are typical engineering solutions that were developed previously by others (USACOE and DOT) for other projects and/or different areas. These drawings and some details of these solutions were used herein to develop conceptual-level construction cost estimates.
- Once the specific location of the shoreline erosion project and the designed requirements are identified, standard engineering analysis and design (preliminary and final) shall be completed as part of project implementation.
- Upon preliminary and final design, the type and dimensions of the shoreline erosion protection measures discussed below will be optimized and if needed, modified. The construction cost at the end of this engineering process may differ significantly from that presented below.

Example: Region 1, Scenario 1

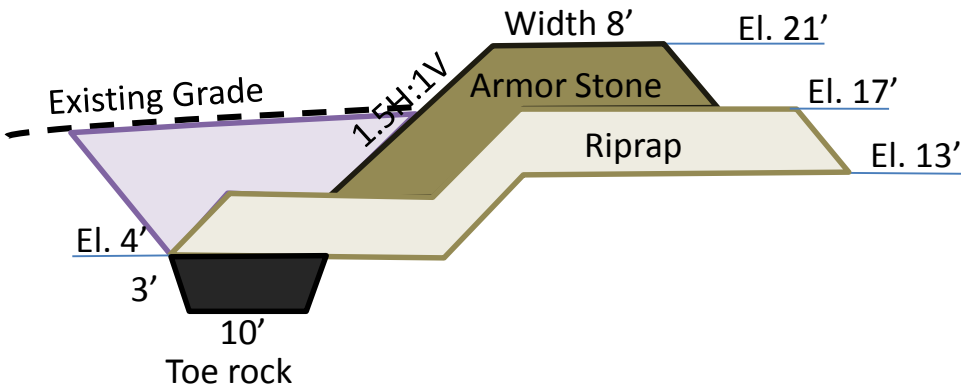


Region 1

Criteria Applied

- Area - Object
 - SR-105
 - Cranberry bogs
- Durability
 - Long-term

Region 1 – Scenario 1 (Rock Revetment, typical design by USACE)



Construction Cost Estimates ~ \$10M

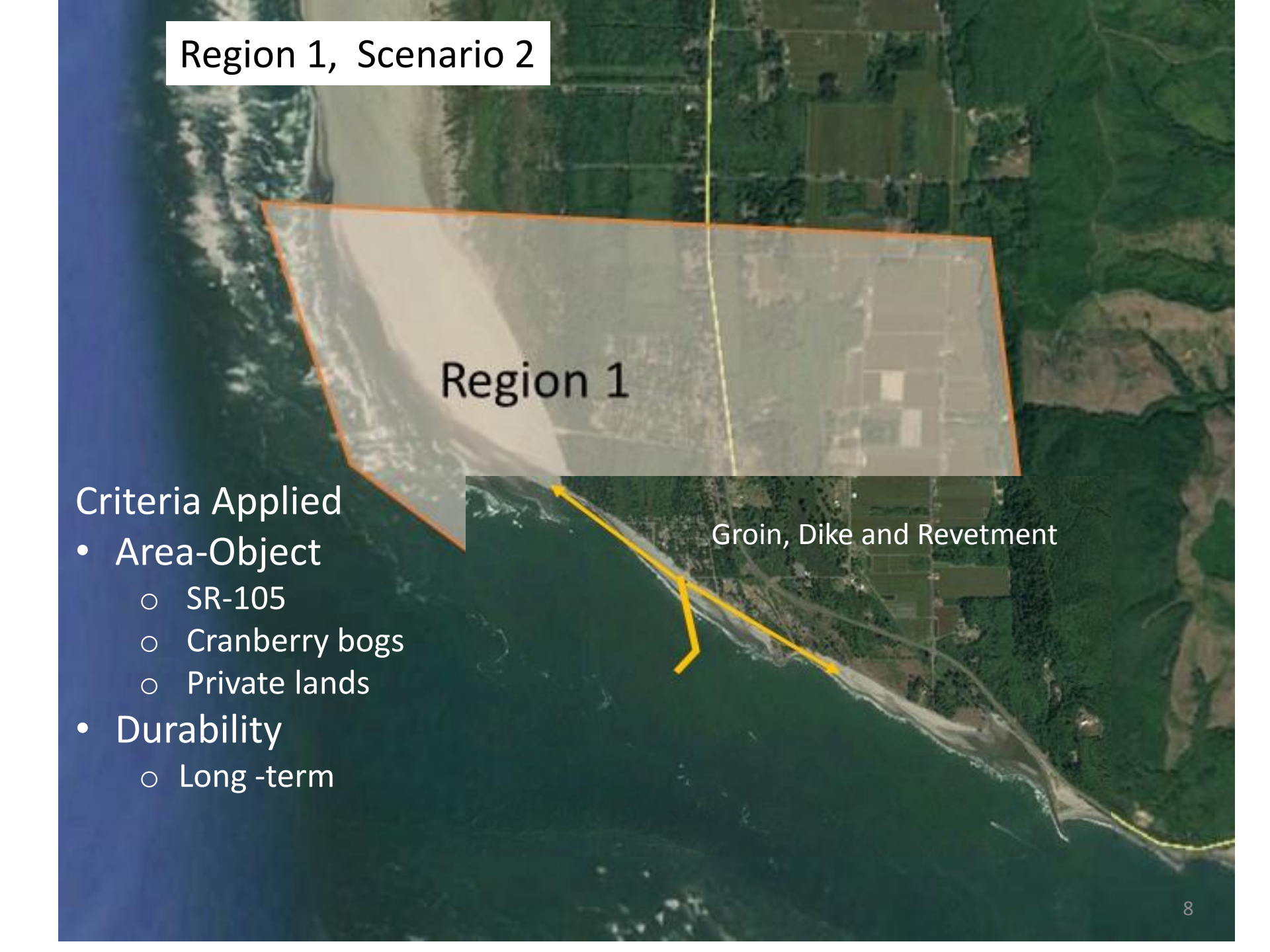
Assumptions:

- Rate and pattern of erosion as determined up to date
 - Length of protection = 8,000 ft
- No contingencies
- Based on current prices that is a subject to change with time
- Does not include design and permitting efforts
- Does not include tax and bonds
- Does not include mitigation, if requires
- Does not include modifications to the tidal gate



Region 1, Scenario 2

Region 1



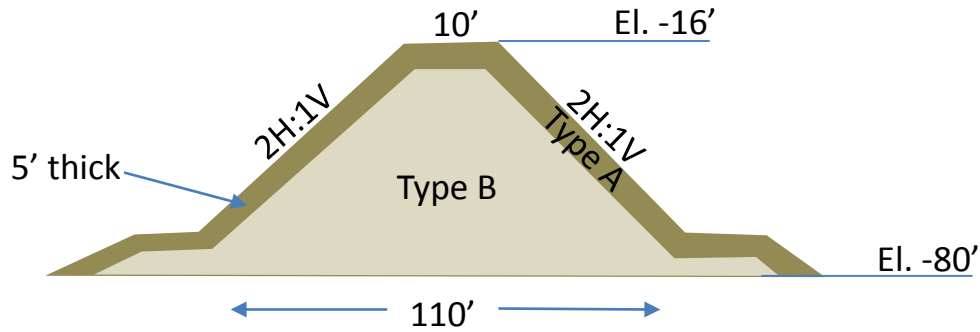
Groin, Dike and Revetment

Criteria Applied

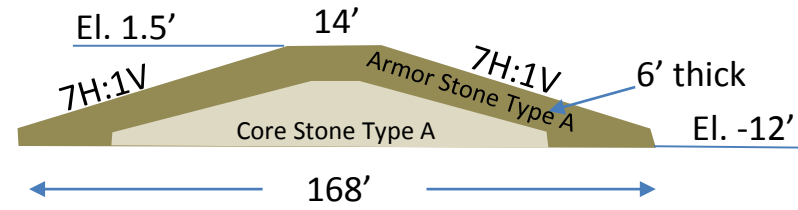
- Area-Object
 - SR-105
 - Cranberry bogs
 - Private lands
- Durability
 - Long -term

Region 1 – Scenario 2

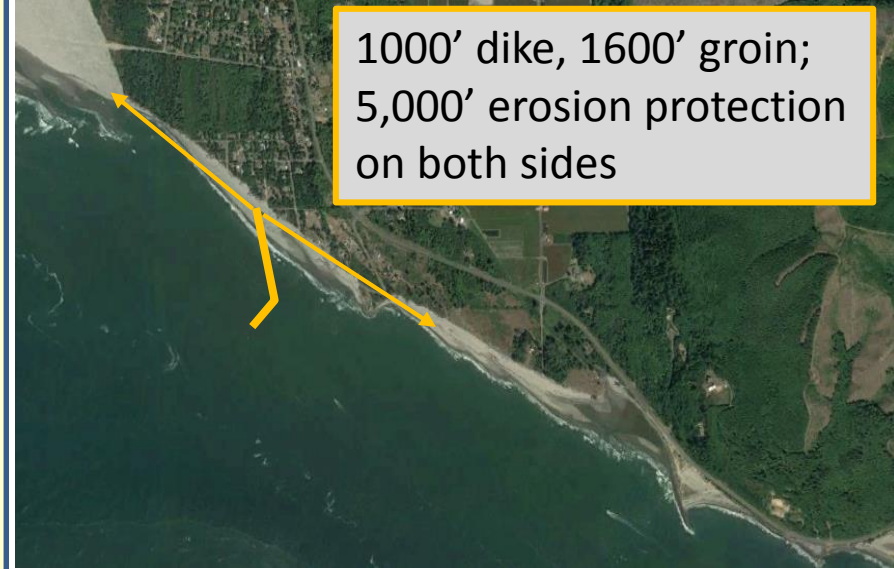
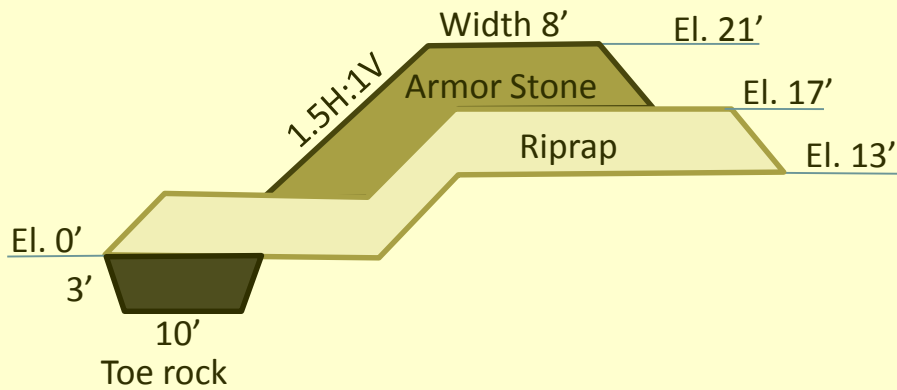
Dike Cross-section



Groin Cross-section



Vladimir why is this here?



Region 1 – Scenario 2

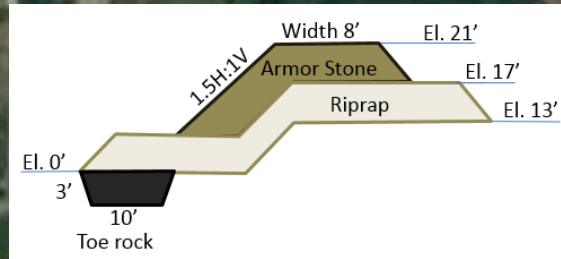
Construction Cost Estimates ~ \$34M

Assumptions:

- Length of groin = 1,600 ft
- Length of dike = 1,000 ft
- Length of revetment = 10,000 ft
- No contingencies included
- Based on current prices that is a subject to change with time
- Does not include design and permitting efforts
- Does not include tax and bonds
- Does not include mitigation, if requires

Region 2, Scenario 1 Rock Revetment on SR-105

Region 1



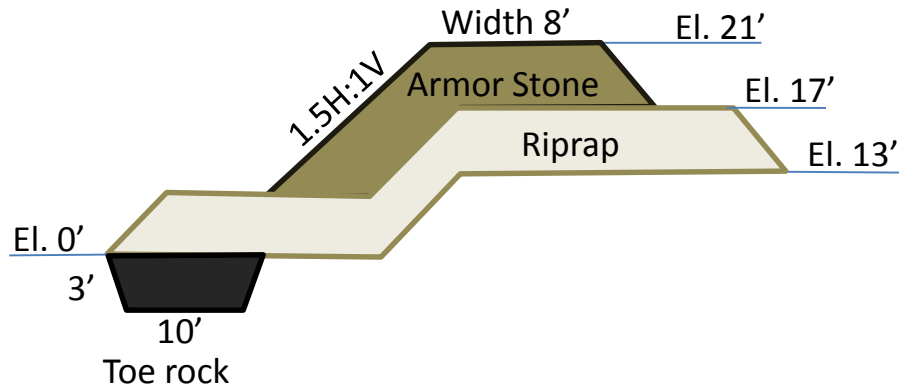
Criteria Applied

- Area - Object
 - SR-105
 - Cranberry bogs
- Durability
 - Long-term



Existing Groin and Dike
rehabilitation

Region 2 – Scenario 1



Construction Cost Estimates ~ \$14 M

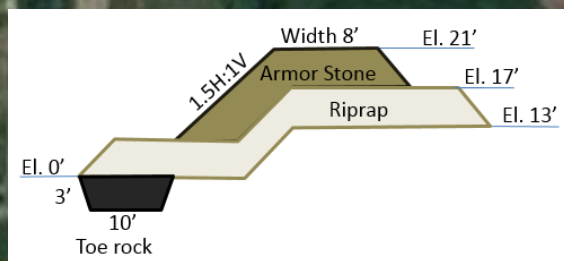
Assumptions:

- Length of protection = 7,000 ft
- Include rehabilitation of existing groin and dike
- No contingencies
- Based on current prices that is a subject to change with time
- Does not include design and permitting efforts
- Does not include tax and bonds
- Does not include mitigation, if requires
- Does not include modifications to the tidal gate

Region 2, Scenario 2

Rock revetment on shoreline

Region 1



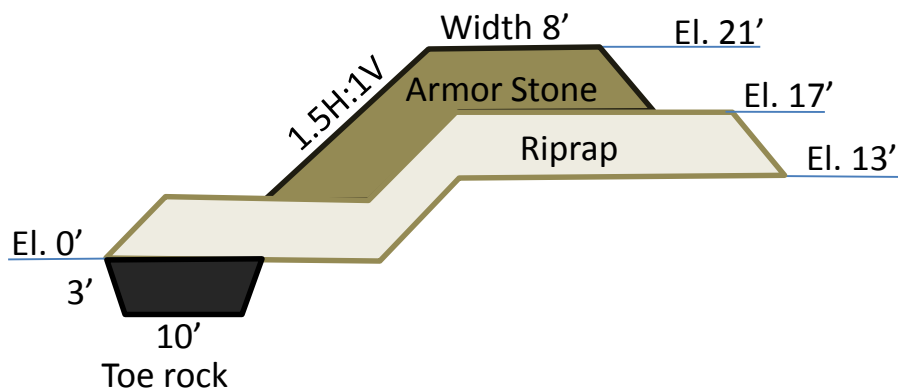
Criteria Applied

- Area - Object
 - SR-105
 - Cranberry bogs
 - Private property
- Durability
 - Long-term



Region 3

Region 2 – Scenario 2

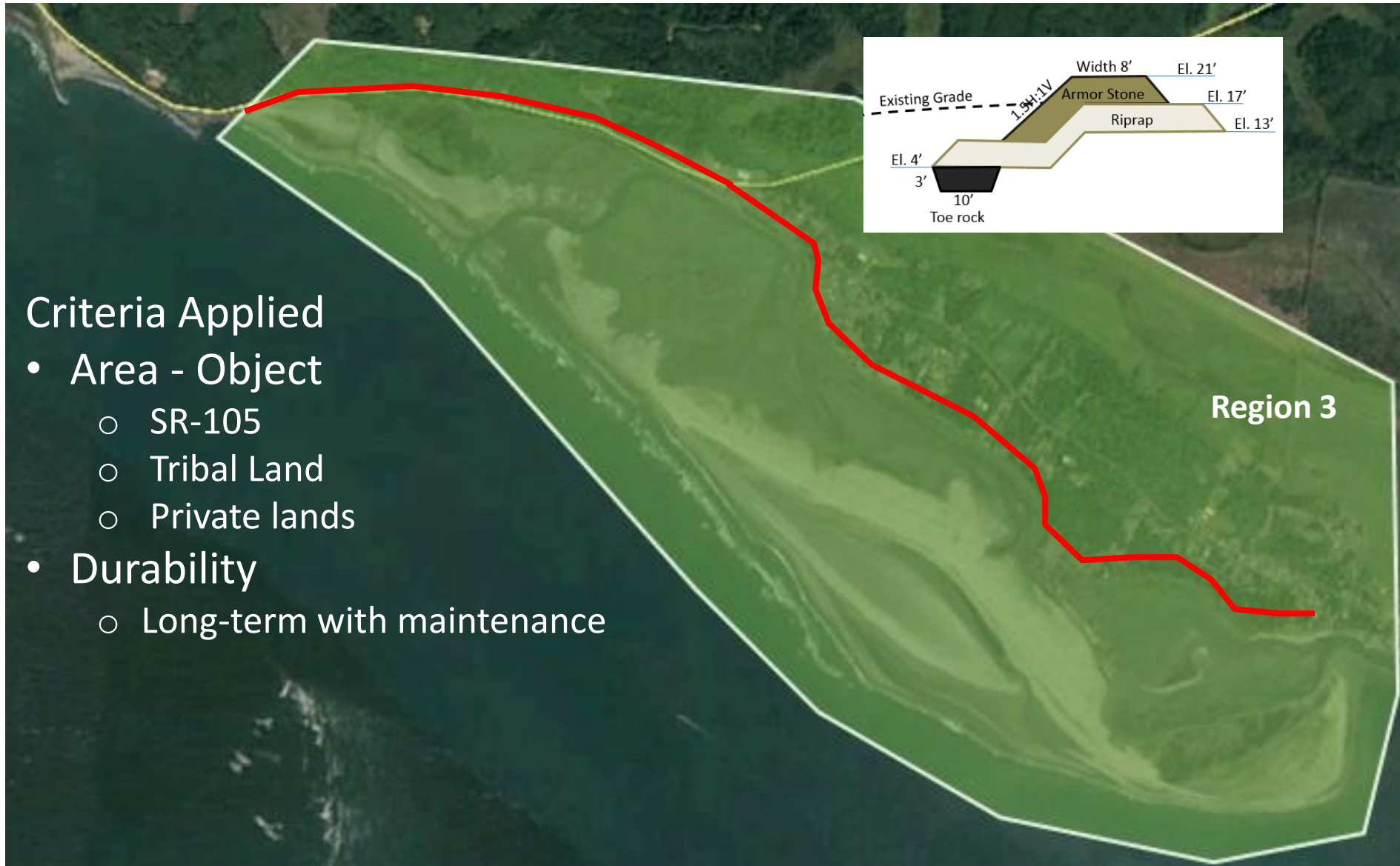


Construction Cost Estimates ~ \$14 M

Assumptions:

- Length of protection = 7,000 ft
- Include rehabilitation of existing groin and dike
- No contingencies
- Based on current prices that is a subject to change with time
- Does not include design and permitting efforts
- Does not include tax and bonds
- Does not include mitigation, if requires
- Does not include modifications to the tidal gate

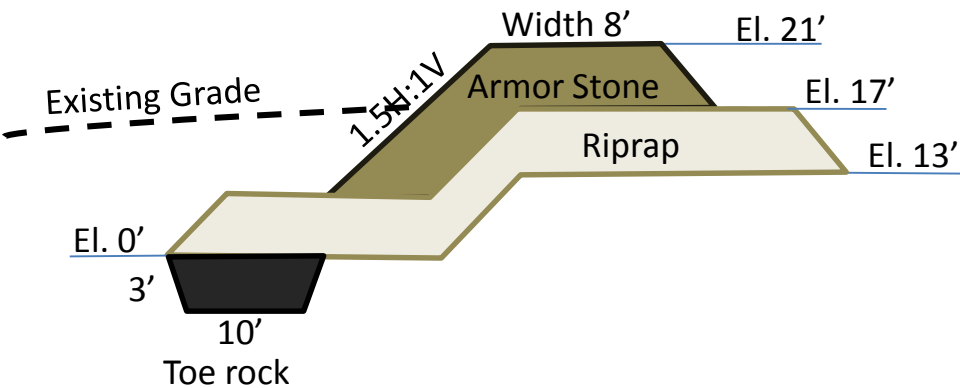
Region 3, Scenario 1: Rock revetment



Criteria Applied

- Area - Object
 - SR-105
 - Tribal Land
 - Private lands
- Durability
 - Long-term with maintenance

Region 3 – Scenario 1



Construction Cost Estimates ~\$22 M

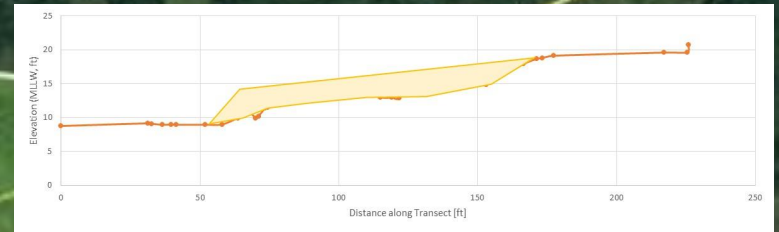
Assumptions:

- Length of protection = 20,000 ft
- No contingencies
- Based on current prices that is a subject to change with time
- Does not include design and permitting efforts
- Does not include tax and bonds
- Does not include mitigation, if requires

Region 3, Scenario 2: Beach Nourishment

Criteria Applied

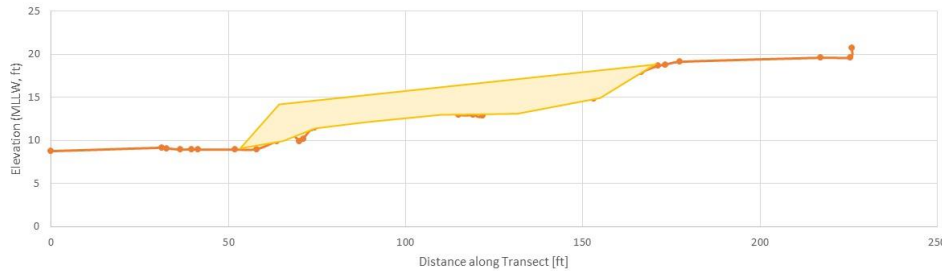
- Area - Object
 - SR-105
 - Tribal Land
 - Private lands
 - Potential for snowy plover habitat
- Durability
 - Long-term with maintenance



Region 3

Note: Cost estimates are based on current criteria and durability

Region 3 – Scenario 2



Construction Cost Estimates ~\$ 10 M

Assumptions:

- Length of protection = 20,000 ft
- Maintenance every 10 years
- No contingencies
- Based on current prices that is a subject to change with time
- Does not include design and permitting efforts
- Does not include tax and bonds
- Does not include mitigation, if requires

Region 3, Scenario 3: Dynamic Revetment

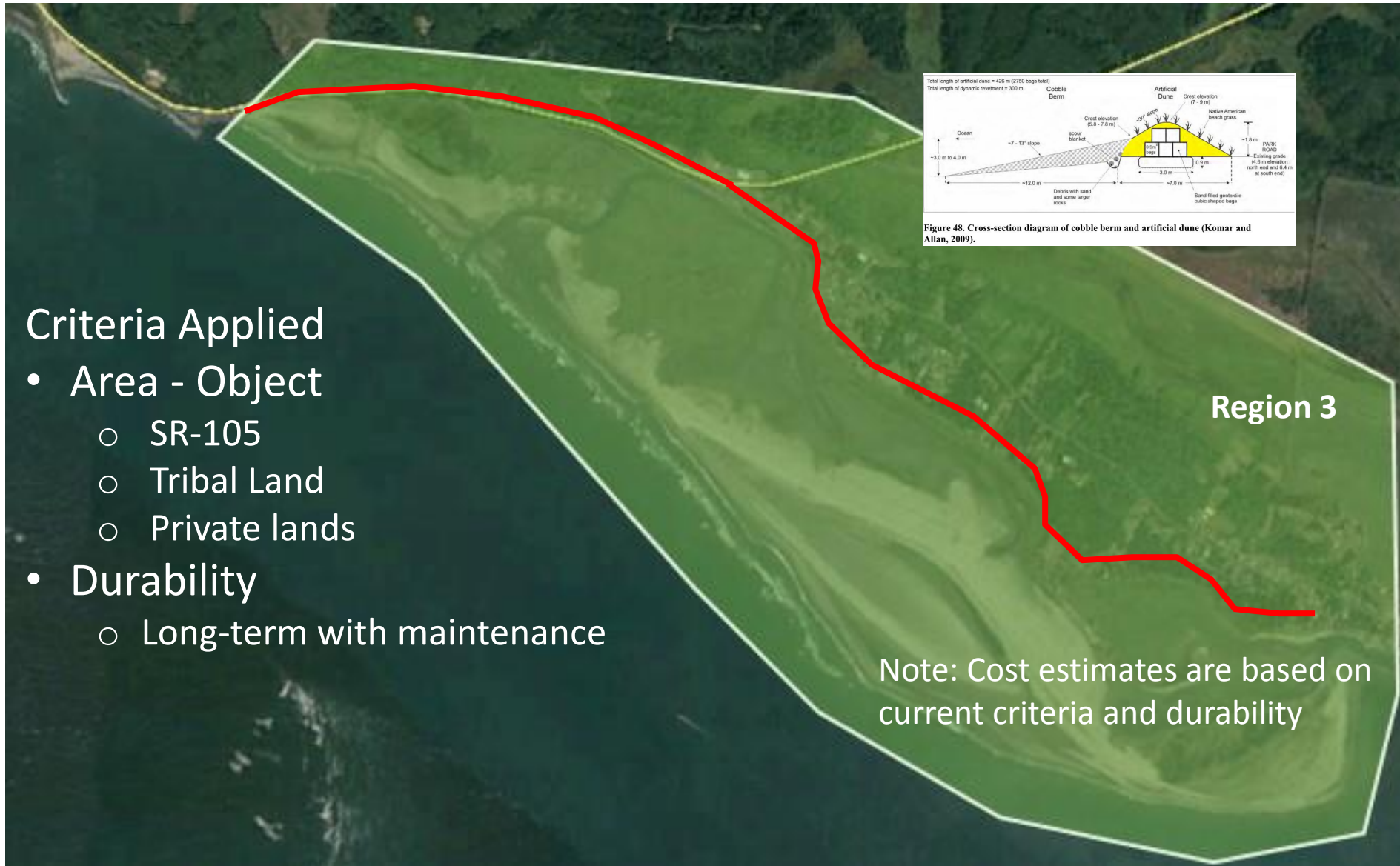


Figure 48. Cross-section diagram of cobble berm and artificial dune (Komar and Allan, 2009).

Criteria Applied

- Area - Object
 - SR-105
 - Tribal Land
 - Private lands
- Durability
 - Long-term with maintenance

Note: Cost estimates are based on current criteria and durability

Region 3 – Scenario 3

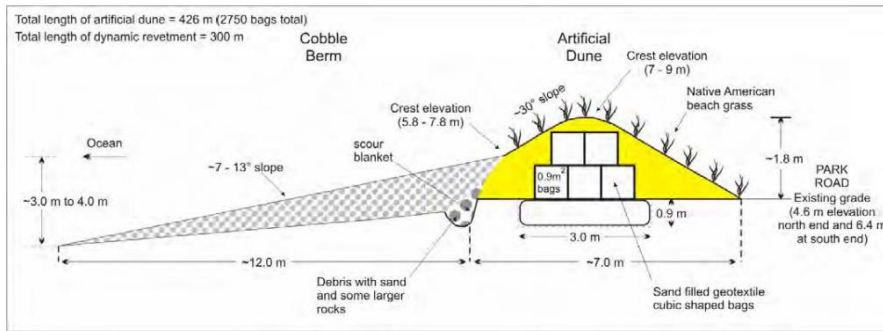


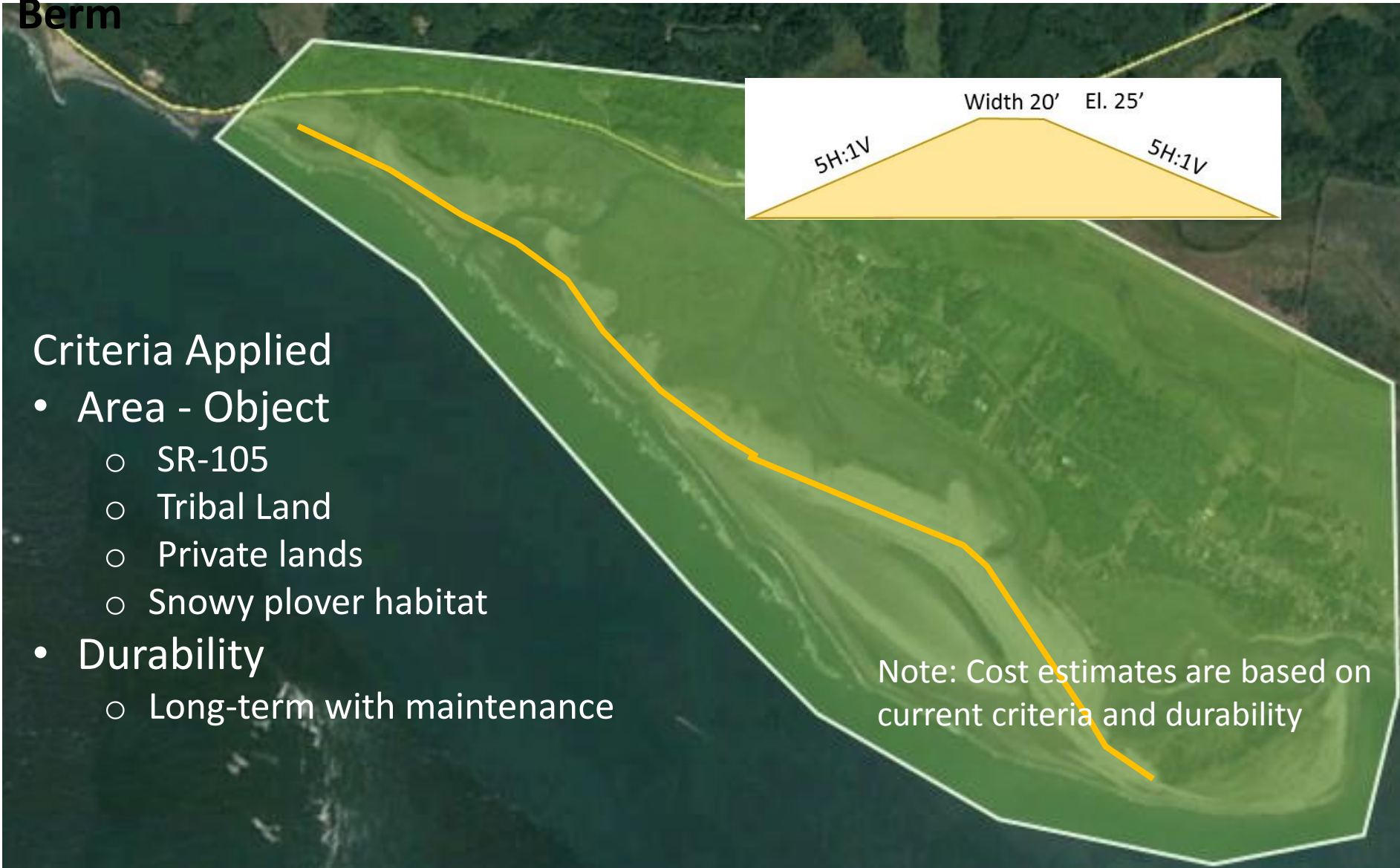
Figure 48. Cross-section diagram of cobble berm and artificial dune (Komar and Allan, 2009).

Construction Cost Estimates ~\$ 33 M Assumptions:

- Length of protection = 20,000 ft
- Maintenance every 10 years
- No contingencies
- Based on current prices that is a subject to change with time
- Does not include design and permitting efforts
- Does not include tax and bonds
- Does not include mitigation, if requires

Region 3, Scenario 4:

Berm

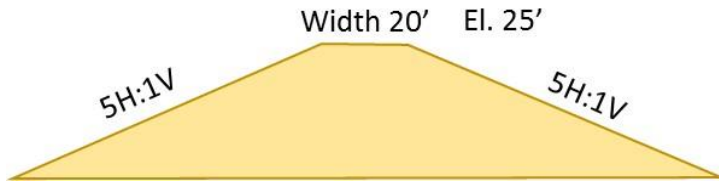


Criteria Applied

- Area - Object
 - SR-105
 - Tribal Land
 - Private lands
 - Snowy plover habitat
- Durability
 - Long-term with maintenance

Note: Cost estimates are based on current criteria and durability

Region 3 – Scenario 4



Construction Cost Estimates ~\$10 M

Assumptions:

- Length of protection = 14,000 ft
- Maintenance every 5 years
- No contingencies
- Based on current prices that is a subject to change with time
- Does not include design and permitting efforts
- Does not include tax and bonds
- Does not include mitigation, if requires

Cost Estimate Summary*

Region	Scenario	Criteria	Total Cost
1	1: Buried rock revetment	SR-105, cranberry bogs	\$ 10 mil
1	2: Dike/Groin	SR-105, private lands, cranberry bogs	\$ 34 mil
2	1: Rock revetment on SR-105	SR-105, cranberry bogs	\$ 14 mil*
2	2: Rock revetment on shoreline	SR-105, cranberry bogs, private lands	\$ 14 mil*
3	1: Rock revetment	SR-105, tribal lands, private lands	\$ 22 mil
3	2: Beach nourishment (10 years frequency of maintenance)	SR-105, tribal lands, private lands, potential for snowy plover habitat	\$ 10 mil
3	3: Dynamic revetment	SR-105, tribal lands, private lands	\$ 33 mil
3	4: Berm (5 years frequency of maintenance)	SR-105, tribal lands, private lands, snowy plover habitat	\$ 10 mil

Cost estimates:

- Are based on the specified criteria and durability
- Applicable for current shoreline conditions
- Include mobilization/demobilization
- Are based on current prices that are subject to change

Cost estimates do not include:

- Design and permitting efforts
- Tax and bonds
- Mitigation, if requires
- Contingencies

***Please read this table in conjunction with Slide #5**