



**YUKON
ENERGY**



SOUTHERN LAKES SHORELINE EROSION MITIGATION EXAMPLES

JUNE 2014



**YUKON
ENERGY**

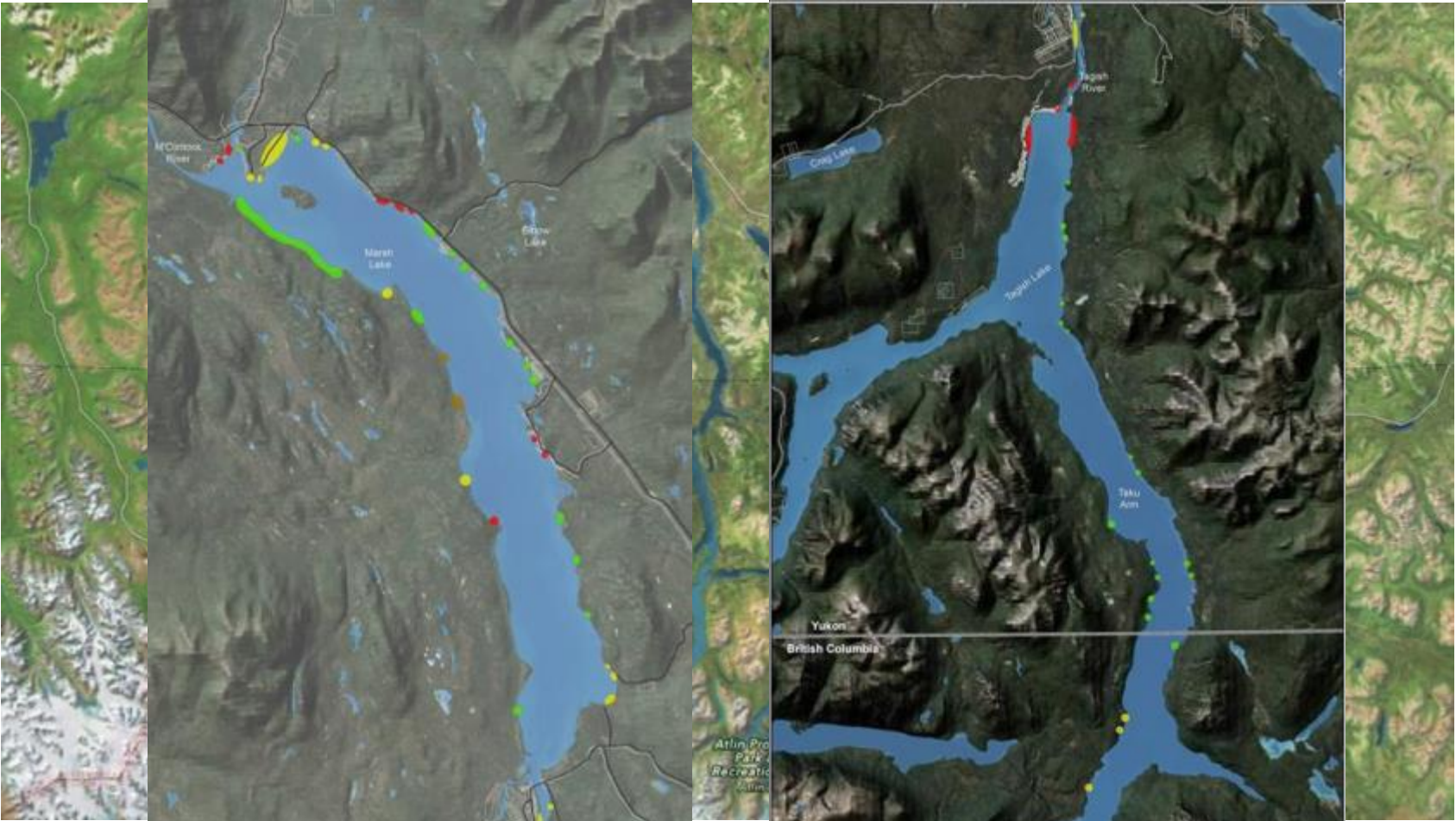
Presentation Overview

1. Erosion prone areas around Southern Lakes
2. Erosion mitigation options
3. Conceptual approach
4. Mitigation experience on Southern Lakes
5. Potential mitigation options and examples
6. Next steps



**YUKON
ENERGY**

Identified erosion prone areas on Marsh and Tagish lakes



Legend

- Accretion
- High
- Low
- Moderate

Waterbody

Roads

Land Parcel

Provincial Borders

HEMERA

Southern Lakes Enhanced Storage- Phase 1

Marsh Lake Erosion Analysis

1:50,000

Yukon Energy Corporation

1988-01-01 February 2014 HEMERA 2

Legend

- Accretion
- High
- Low
- Moderate

Waterbody

Roads

Land Parcel

Provincial Borders

HEMERA

Southern Lakes Enhanced Storage- Phase 1

Tagish Erosion Analysis

1:50,000

Yukon Energy Corporation

1988-01-01 February 2014 HEMERA 2



**YUKON
ENERGY**

Shoreline Erosion Mitigation Objectives of Conceptual Options

- Limit wave heights approaching the beach
- Break waves before the swash zone to limit run-up
- Protect the swash zone from wave erosion
- Stabilize and protect the backshore
- Promote development of riparian vegetation
- Allow for flexible adaptive design
- Accommodate incremental construction and limited access
- Be cost-effective and utilize natural materials



**YUKON
ENERGY**

Shoreline Erosion Mitigation Conceptual Options

- A range of erosion mitigation works are applicable to Southern Lakes sites based on shoreline, foreshore and backshore characteristics
- Key Issues:
 - Fine-grained sediment exposures require protection so they stabilize and revegetate
 - Bank toe require protection to prevent further bank collapse
 - Wave energy needs to be reduced without additional erosion



**YUKON
ENERGY**

Shoreline Erosion Mitigation Suggested Approach

Mitigation by “Shoreline Unit”

Identify adjacent lengths of shoreline based on the processes that result in erosion

- Multi-property approach
- Designed/engineered to address needs of that shoreline
- Can address natural historic and possible future erosion
- Consistent approach across a beachscape (function and aesthetics)
- Decreases the likelihood that mitigations in an area result in undesirable effects in adjacent areas



**YUKON
ENERGY**

Shoreline Erosion Mitigation Previous Work

- A range of shoreline erosion protection approaches have been used on Marsh Lake as well as other lakes and reservoirs in North America
- Examples:
 - Lake Winnipeg
 - Great Lakes
 - Lake of the Woods
- Erosion due to Sea Level Rise (SLR) and wave climate changes in coastal environments



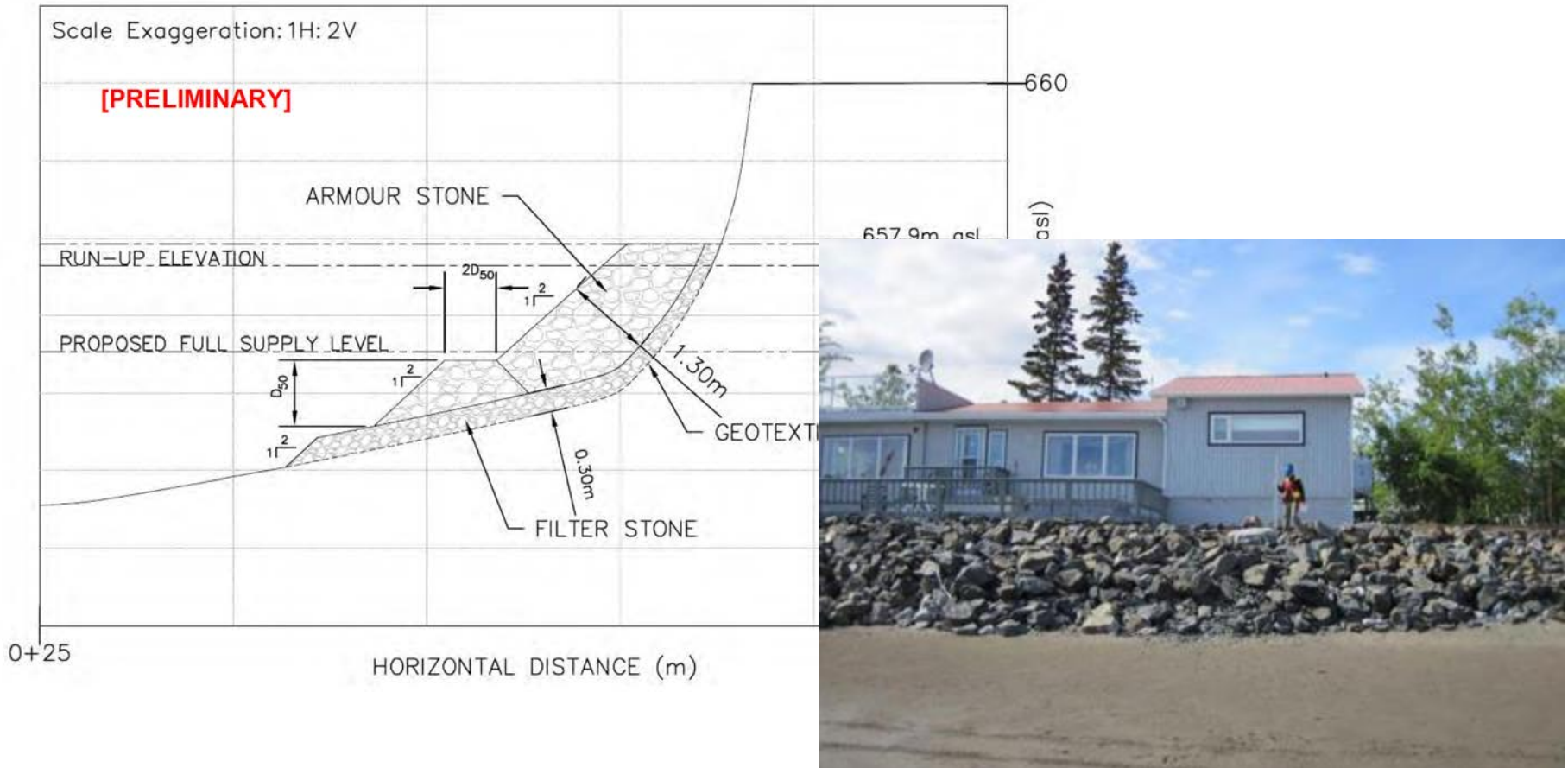
Shoreline Erosion Mitigation Previous Work

- Previous studies provided two alternative conceptual shoreline protection designs:
 1. Rock Protection:
armoured riprap shoreline similar to existing rock protection installed on Marsh Lake properties
 2. Bioengineered Protection:
a combination of structural and vegetation-based erosion protection



**YUKON
ENERGY**

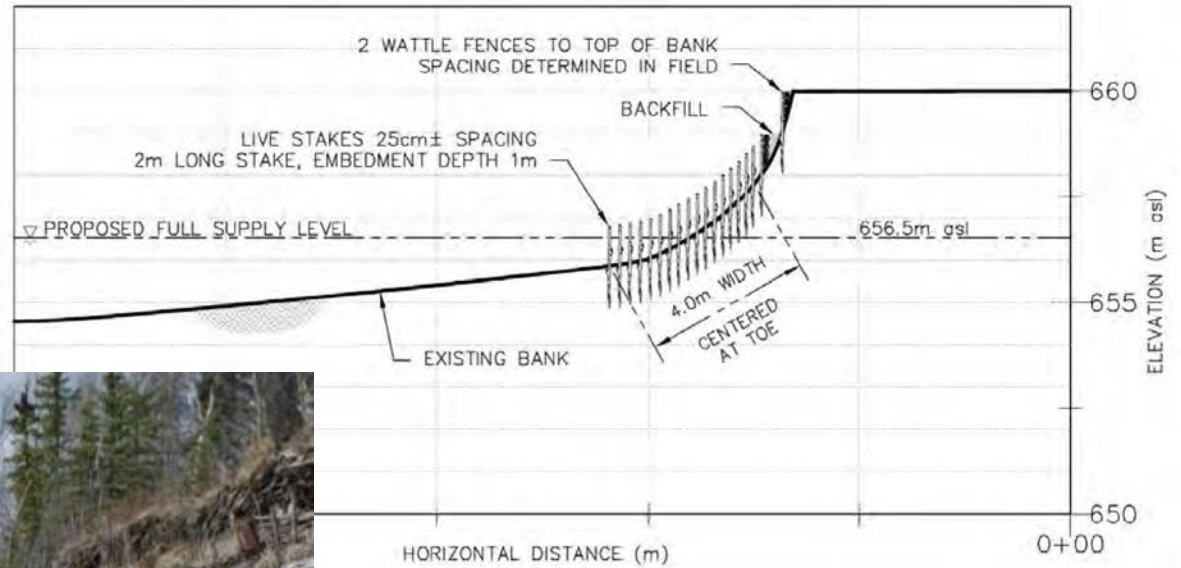
Shoreline Erosion Mitigation Previous Work





**YUKON
ENERGY**

Shoreline Erosion Mitigation Previous Work





**YUKON
ENERGY**

Shoreline Erosion Mitigation Conceptual Options

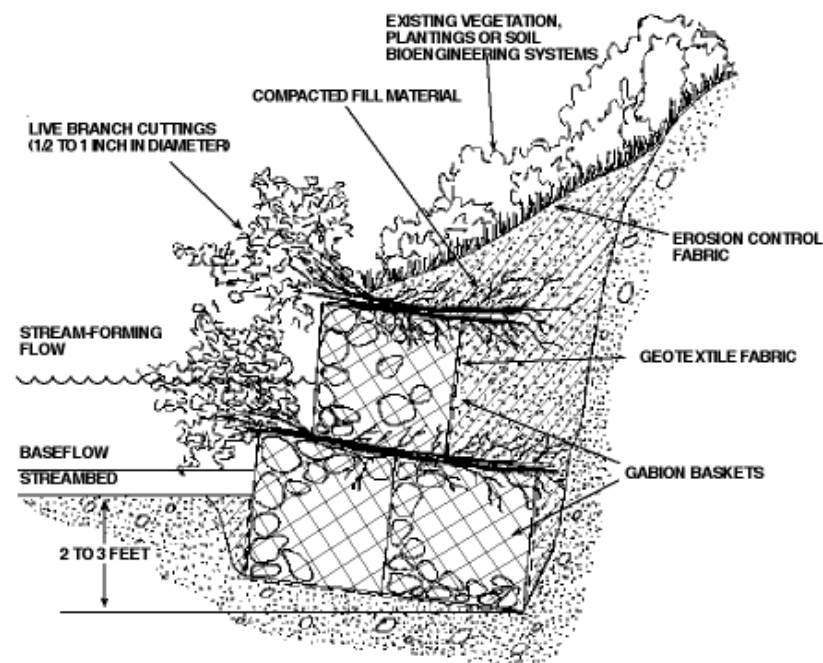


Armour Rock



**YUKON
ENERGY**

Shoreline Erosion Mitigation Conceptual Options

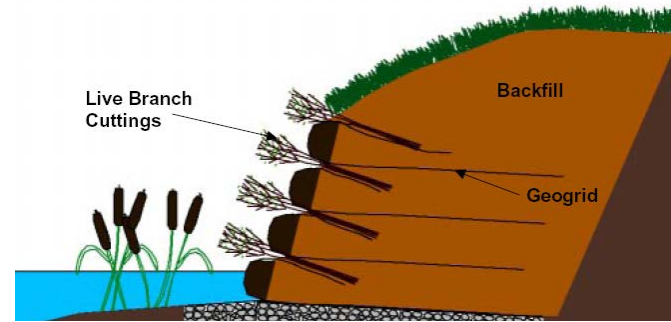
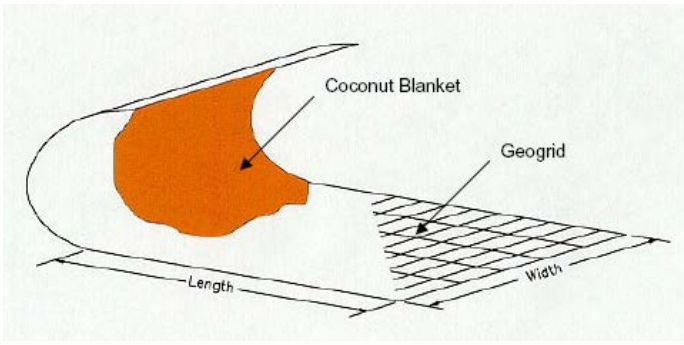


Gabions



**YUKON
ENERGY**

Shoreline Erosion Mitigation Conceptual Options

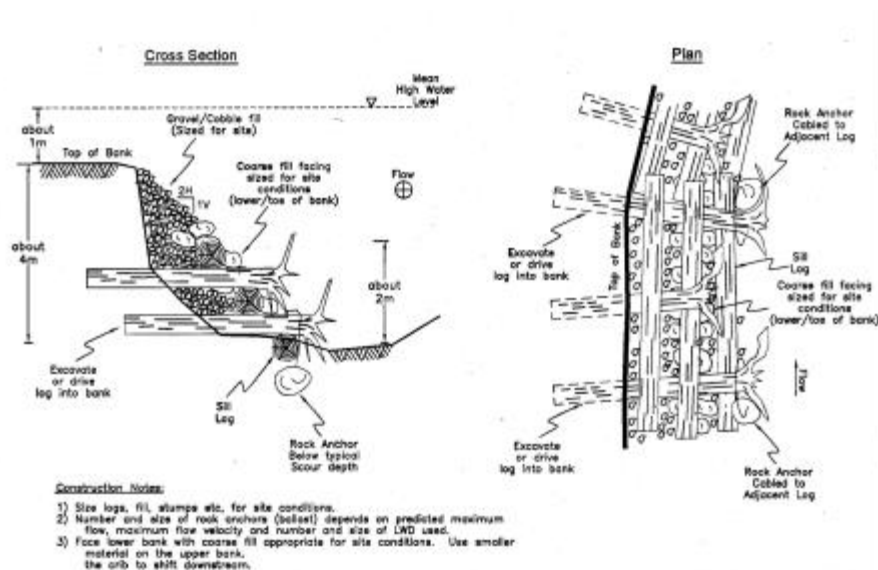


Soil Wraps and Geotextiles



**YUKON
ENERGY**

Shoreline Erosion Mitigation Conceptual Options



Wood Revetment



Shoreline Erosion Mitigation Conceptual Options



**YUKON
ENERGY**





Shoreline Erosion Mitigation Conceptual Options

**YUKON
ENERGY**





**YUKON
ENERGY**

Shoreline Erosion Mitigation Issues

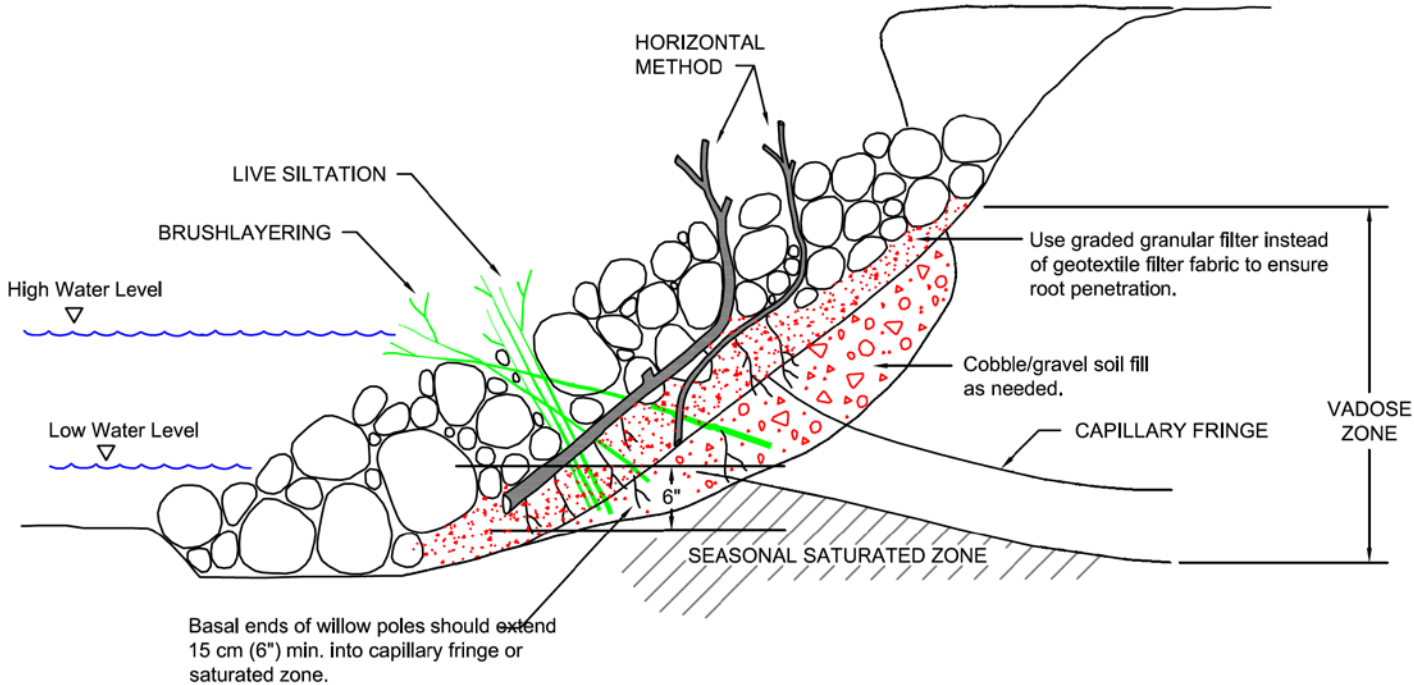


Vegetation-only Approach



**YUKON
ENERGY**

Shoreline Erosion Mitigation Conceptual Options



Bioengineering Hybrid Beach



**YUKON
ENERGY**

Southern Lakes Erosion Mitigation by Shoreline Unit - Suggested Next Steps

1. Confirm approach to resolve information gaps
2. Inspect existing shoreline erosion sites and review stabilization works
3. Identify shoreline units – based on physical processes
 - Site specific issues
 - Different mitigation requirements
 - Land owner issues and concerns
 - Includes foreshore and backshore areas



**YUKON
ENERGY**

Southern Lakes Erosion Mitigation by Shoreline Unit - Suggested Next Steps

4. Develop shoreline unit-specific protection concepts
 - Comprehensive shoreline sediment management approach
 - Toolbox of options based on best science and engineering
 - Use community-based approach to provide rationale and basis for preliminary design
5. Implementation – Post Assessment & Permitting
 - Design, assessment and funding of shoreline erosion protection projects by YEC
 - Installation and construction of the works by local contractors