Keystone Environmental
Knowledge-Driven Results

Green Shores Principles
Waterfront Landing North Park

1500 Highway 99
Squamish, BC

Prepared for: Squamish Lands LP

Project No.12022
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1. GREEN SHORES DESIGN ELEMENTS

Section 10.12(g) of the OCP states "wherever possible, apply Green Shores™ principles in their planning and design" of shoreline projects.

Green Shores™ provides science-based tools and best practices to help people minimize the impacts of new developments and restore shoreline ecosystem function of previously developed sites (Stewardship Centre for BC). Green Shores™ requirements are similar to Section 34.5 "General Guidelines" and 34.8 "Aquatic Guidelines (Marine Shoreline)" of the OCP, which identify best management practices that should be incorporated into the project design, where possible. The District of Squamish does not require the foreshore of this project to be Green Shore certified, only to incorporate Green Shores™ principles into the park design.

The Green Shores™ for coastal development credits and ratings guide has two classes of principles: prerequisites and credits (Table 1).

Table 1 Examples of Green Shore Principles

ID	Name	Examples
P1	Siting of Permanent Structures	15 m setback for buildings from natural boundary
P2	Conservation of Critical or Sensitive Habitats	No net loss of critical or sensitive habitat
P3	Riparian Zone Protection	5 m of protection along natural boundary for 50% of shoreline length
P4	Conservation of Coastal Sediment Processes	Sediment transport process maintained for 50 years
P5	On-Site Environmental Management Plan	Prepare EMP
C1	Site Design with Conservation of Shore Zone	Creation of a park with naturalized areas.
C2	Shore Friendly Public Access	Access points to foreshore, but away from naturalized areas.
C3	Redevelopment of Contaminated Sites	Cleaning up a contaminated site to provincial or federal criteria.
C4	Climate Change Adaptation Plan	Identify natural boundary from 50 years of sea level rise and either avoid building below or design lower structures to accommodate flooding in the future
C5	Rehabilitation of Coastal Habitats	Based on the percentage of the shoreline that is rehabilitated and if sensitive or critical habitat is created.
C6	Rehabilitation of Coastal Sediment Processes	Removal of hard structures or addition of beach nourishment materials.
C7	Enhanced Riparian Zone Protection	Either obtaining an additional 5m of shoreline width or increasing the natural shoreline length beyond 50%.

C8	Light Pollution Reduction	Follow LEED standards to reduce lighting.
C9	Integrated Stormwater Planning and Design	Groundwater infiltration 75% or more
C10	Innovation	Exceed Green Shore principles by over 50% or new designs.
C11	Outreach and Public Education	Signage program and coastal stewardship program or outreach program.

It is not a Green Shores™ requirement to include all the principles as there are many factors that are used to assess which principles are appropriate for use in a project. The following section describes which of the Green Shores™ principles are being incorporated into the Park design.

2. ENVIRONMENTAL IMPROVEMENTS TO WATERFRONT PARK

A Qualified Environmental Professional ("QEP") from Keystone Environmental led the park design as it relates to adding Green Shores™ design elements. Design elements that have been incorporated into the design include:

2.1 Design Element #1: Backshore Vegetation Planting

- Planting approximately 313 m of shoreline adjacent to the natural boundary of the Mamquam Blind Channel. On average, the shoreline vegetation will be 8 m wide and cover an area of 3,452 m^2.
- Existing shrubs and trees in this area will be retained where design grade changes are not required by the District of Squamish to meet flood protection requirements. Some areas of the backshore area will need to be raised up to 1 m above existing grade, as identified on the landscape architect design cross-sections (i.e., the perimeter trail will be at 3.0 m GD; the HWM is at 2.2 m GD), and have up to a 2:1 horizontal to vertical slope. These areas will be replanted with native species at a 1 m density.
- Planting will occur between a perimeter trail and the natural boundary. A pallet of suitable native plants has been identified on the landscape architect drawings. This includes a mix of plant species that meet Green Shores™ requirements including deciduous, coniferous and berry producing plants.
- The design team has also considered that there is a balance between planting berry species for habitat improvements, and attracting bears to the park. These are reflected in the parks planting plan and will be discussed with the District environmental staff to determine the optimal balance.

2.2 Design Element #2: Conservation and Shoreline Ecology

Under Green Shores™, critical or sensitive habitats should be conserved or replaced on-site such that there is no-net-loss. Critical and sensitive habitats onsite have been documented by Keystone Environmental in a detailed site bio-inventory of the Park, which will be provided for the District of Squamish to review as part of the development permit application. A net increase in habitat function will be achieved by conducting the following:

- Backshore vegetation: The proposed park plan will maintain an average width of 8 m of natural vegetation (3,452 m^2) between the outer park trail and the existing natural boundary of the Mamquam Blind Channel. Planting will be conducted using native plants in order to create a natural shoreline.
- Upper intertidal vegetation:
  - The outer shoreline is 370 m long adjacent the proposed Waterfront Landing park. The majority of the upper intertidal (321 m linear length / 2,695 m^2) has a variety of aquatic plants growing below the natural boundary (e.g. *Carex lyngbyei*) that provide natural erosion protection to the proposed park area and provide fish habitat. This area is located on Crown land and will be conserved as a natural feature.
  - The most southern shoreline of the park has a small strip (252 m^2) of perimeter marsh

that will be temporarily or permanently altered to create the perched beach, associated open space area, and shoreline protection if required. Planting of intertidal plants may be incorporated into shoreline protection features (e.g. between stone) where possible.

- Middle intertidal vegetation: The project will result in a net increase in rockweed habitat in order to provide increased potential opportunities for herring spawning in the middle to lower intertidal. This will be accomplished by adding specially placed stone at elevations suitable for rockweed colonization at the southern end of the park. Locally sourced stone will be used, which provides excellent attachment points for rockweed and is visually appealing.

A Letter of Advice or similar documentation will be obtained from Fisheries and Oceans Canada (DFO) for works located below the HWM of 2.2m GD in order to ensure that there is no net loss of ecological function for fish and fish habitat.

2.3 Design Element #3: Flood Protection

The park has been designed to accommodate various grade requirements to meet provincial dyke standards, District of Squamish flood control standards and sea level rise:

- All trails will be above 2.6m GD to ensure they are above the existing HWM. These trails will be designed to be flood resistant to minimize maintenance in the event of flooding. The landscape architect will use materials such as bound aggregate to hold trail material in place. Loose materials like mulch will not be used.
- A bike skills park and play park are included in the park design. They will be constructed at an elevation of 3.5m GD to offer increased flood protection.
- The upper trail will be located at 4.53m GD in order to meet provincial dyke standards and be consistent with the OCP flood protection requirements. This will protect buildings located 15 m or more away from flooding in the future.

3. GREEN SHORES PRINCIPLES AND CREDITS FOR THE PARK DESIGN

The design components are provided for each Green Shores™ prerequisite and credit.

3.1 P1: Siting of Permanent Structures

Park features that will be located within 15 m from the natural boundary include park trails, benches, grass and naturally vegetated areas. The playground, skills bike course, and upper trial will be further than 15 m from the natural boundary. Buildings are not proposed within the park.

3.2 P2: Conservation of Critical or Sensitive Habitats

The proposed works will conserve the majority of the Mamquam Blind Channel shoreline. The perimeter marsh, located along the west side of the park, will be retained in its natural state. A Letter of Advice or similar approval from DFO will be obtained for any works below the High Water Mark, if required, to confirm there is a net increase in fish and fish habitat values.

3.3 P3: Riparian Protection Zone

The total length of the shoreline is 420 m (excluding the inner marsh, which is located inside the park). The total length of shoreline that will retain at least 5 m of vegetation is 313 m. Therefore, over 75% of the shoreline meets these criteria. This exceeds the requirement to have 5 m of vegetation for at least 50% of the shoreline.

3.4 P4: Conservation of Coastal Sediment Processes

There is erosion at the base of the existing marsh and at the HWM along the outer shoreline of the Mamquam Blind Channel. During a site visit by coastal engineers from Tetra Tech, the project team was advised that shoreline protection would not be required along the outer shoreline. Therefore, the current design is to leave the outer foreshore in its current natural state. This will allow for the natural coastal sedimentation processes to take place.

The south of the park begins to transition from green space to shoreline infrastructure (e.g., perched beach, boardwalk). A coastal engineer will be retained to complete the shoreline design at these locations. Keystone Environmental will work with the design team to incorporate Green Shores™ principles, where possible.

3.5 P5: On-Site Environmental Management Plan

Prior to construction of the park, Keystone Environmental will prepare an Environmental Management Plan (“EMP”) that meets these requirements. The EMP will include mitigation measures for the protection of the environment during construction.

3.6 C1: Site Design with Conservation of Shore Zones

Green Shores™ awards credits to projects that create public parks, with higher value awarded to those with a greater naturalized component. The District of Squamish has suggested that approximately one third of the park be naturalized. Currently, the park design is at 28% natural areas and includes 5,750 m^2 of marsh, shoreline shrub and tree vegetation separated from public use by the perimeter trail. This area may be increased prior to development permit submission.

3.7 C2: Shore Friendly Public Access

Established public access points have been proposed. The access points will be located to keep the public out of the existing or newly created marshes and naturalized areas. The weir, rocky terrace on south end of the park, and boardwalk and outer perimeter trail will act as controlled access points. Shore access points will be identified on the landscape architect drawings. If necessary, measures may be incorporated to direct public away from environmentally sensitive areas.

3.8 C3: Re-Development for Contaminated Sites

The site had historically been used as a saw mill and wood waste dump site. The proponent has been active over the past four years at removing sunken barges, vessels, and creosote treated piles. Keystone Environmental has obtained a Certificate of Compliance from the provincial government, which includes the park area.

3.9 C4: Climate Change Adaptation Plan

The elevation of the park structures and infrastructures (play structures, bike skills area, bridges, asphalt paths) are at or above 3.5 m GD, which is the minimum elevation specified by District of Squamish. Cross-sections of park elements are identified on the landscape architect drawings. Any areas of the park (e.g. secondary trails made stone benches) that are lower than 3.5 m GD are being purposely designed to be able to withstand flooding and being submerged under water without damage or requirements for excessive maintenance.

3.10 C5: Rehabilitation of Coastal Habitat

Works are not proposed on the outer foreshore of the Mamquam Blind Channel. A detailed planting plan will be prepared to identify where planting will occur and how it can be incorporated to enhance the shoreline.

3.11 C6: Rehabilitation of Coast Sediment Processes

Works are not currently proposed on the outer foreshore along the Mamquam Blind Channel.

3.12 C7: Enhanced Riparian Zone Protection

As stated in P3, the total length of the shoreline is 420m (excluding the inner marsh, which is located inside the park). The total length of shoreline that will retain at least 5m of vegetation is 313 m. Therefore, over 75% of the shoreline meets these criteria. This results in an additional 15% of shoreline enhanced or protected, resulting in additional Green Shores™ value.

The park design package includes a native plan planting pallet for the backshore area. A balance between the habitat enhancement benefits of using berry species versus the bear aware initiatives in Squamish will be considered when providing the final planting plan to the District. The proposed park plan will maintain an approximate average width of 8 m of natural vegetation (3,452 m^2) between the outer park trail and the existing natural boundary of the Mamquam Blind Channel.

3.13 C8: Light Pollution

Trails in the park if required will be illuminated with lighting systems that will ensure light sources are close to the ground and only allow for the minimally required brightness of the asphalt primary park trails. The secondary trails, play structures and bike skills area will not be illuminated at night. This will decrease negative effects of having continuous illumination within the riparian areas.

3.14 C9: Integrated Stormwater Planning and Design

Much of the park area is permeable, comprising of grass lawns, shrubs, trees, and wetlands. A stormwater management plan will be prepared by a professional engineer. The park area (from the natural boundary of the Mamquam Blind Channel to the designated inland property lines) and excluding the inner marsh is approximately 15,500 m^2. By contrast, the open space area is approximately 1,000 m^2 (i.e., percentage of average annual rainfall event to be captured on site of 93%). This exceeds Green Shores™ requirements of 75% to 90%.

3.15 C10: Innovation

Works are not currently proposed on the foreshore along the Mamquam Blind Channel, and it may be difficult to double the criteria of any one Green Shores™ principle.

3.16 C11: Outreach and Public Education

A signage program will be implemented for the park. This will be conducted through a separate process to the development permit submission. As the park will be operated by the District of Squamish, they will determine if public outreach programs in the park will be conducted.

4. SUMMARY

The Park is expected to include Green Shores™ principles from all five of the prerequisite categories and five to seven of the available 11 credit categories. This is the equivalent to a Bronze to Silver rating, which is a very high standard and represents the commitment of the Project team to providing environmentally-friendly infrastructure in the District of Squamish.

5. LIMITATIONS

Findings presented in this report are based upon: (i) reviews of available documentation, and (ii) observations of the project area and surrounding lands. The conclusions and recommendations documented in this report have been prepared in a manner consistent with that level of care and skill normally exercised by other members of the environmental science profession, practicing under similar circumstances in the area at the time of the performance of the work.

This report has been prepared solely for the internal use of Squamish Lands LP pursuant to the agreement between Keystone Environmental Ltd. and Squamish Lands LP. By using this letter report Squamish Lands LP agrees that they will review and use the letter report in its entirety. Any use which other parties make of this letter report, or any reliance on or decisions made based on it, are the responsibility of such parties. Keystone Environmental Ltd. accepts no responsibility for damages, if any, suffered by other parties as a result of decisions made or actions based on this letter report.

Keystone Environmental Ltd. would like to thank Squamish Lands LP for this opportunity and trust the information in this letter report is sufficient for their current needs. If you require clarification of any part of this letter report, please contact the undersigned.

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