

# **Appendix C:**

## **Lime Bay Park Beach Restoration: Project Proposal**



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# The Victoria International Marina, Pocket Beach Nourishment Project

Restoration Report Prepared by:

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Peninsula Streams Society  
July 15<sup>th</sup>, 2021

*Peninsula* *Streams*

# Executive Summary

The Victoria International Marina Pocket Beach is located on the north shore of Victoria's Middle Harbour approximately 1.5 km west of the city's core, on southeastern Vancouver Island, British Columbia (48.427702, -123.383662). The heavily modified site is an important place within the Traditional Territories of the Lekwungen People. Peninsula Streams Society, in partnership with the City of Victoria, Ralmax, Salish Sea Industrial Services, and with support of the Songhees Nation and Esquimalt Nation, has identified the small pocket beach and shoreline as a strong candidate site for restoration and enhancement treatments. Taking a soft-shore approach, this project will see the eroding backshore graded, stabilized, and planted with native beach riparian and upland species. Non-native armoured rock and materials will be removed and the beach will be nourished with over 150 m<sup>3</sup> of a sand-gravel mix of small rock pebbles, pea gravel, and sand. These sediments are primarily suited to provide spawning habitat for surf smelt and potentially Pacific sand lance while helping to stabilize the backshore against erosion and coastal squeeze. Existing major public infrastructure upland, including a public walkway and large commercial residential buildings, will gain resiliency against erosion, sea-level rise, and storm surge flooding while users of the Songhees Walkway and residents of the surrounding community will also benefit from the increased aesthetic values of the enhancements to the beach and backshore. The project also has a large cultural component, providing opportunities to share and promote the rich indigenous history and use of what is a regionally important cultural heritage site for the Lekwungen People and shares similar goals and timeline with an upland Pole Raising Ceremony. Located on the doorstep of an urban center and championed by a local ENGO, the project will serve as a demonstration of these benefits of nature-based solutions and efficacies of shoreline restoration and enhancement.

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# 1. Site Assessment

## 1.1. Project Location

The Victoria International Marina (VIM) Pocket Beach Project Area (Figure 1.) is located on the north side of Victoria's Middle Harbour, immediately west of Victoria International Marina and within the southeastern boundary of the City of Victoria's Lime Bay Park approximately 1.5 km west of the City of Victoria's (CoV) core (48.427748, -123.383703). The site lies within the traditional territories of the Lekwungen People including the Songhees Nation and Esquimalt Nation, who have held a strong connection to this place from Time Immemorial, to this day. The site also lies within the Victoria Harbour Migratory Bird Sanctuary and the Greater Victoria Naturehood, two federally designated areas.

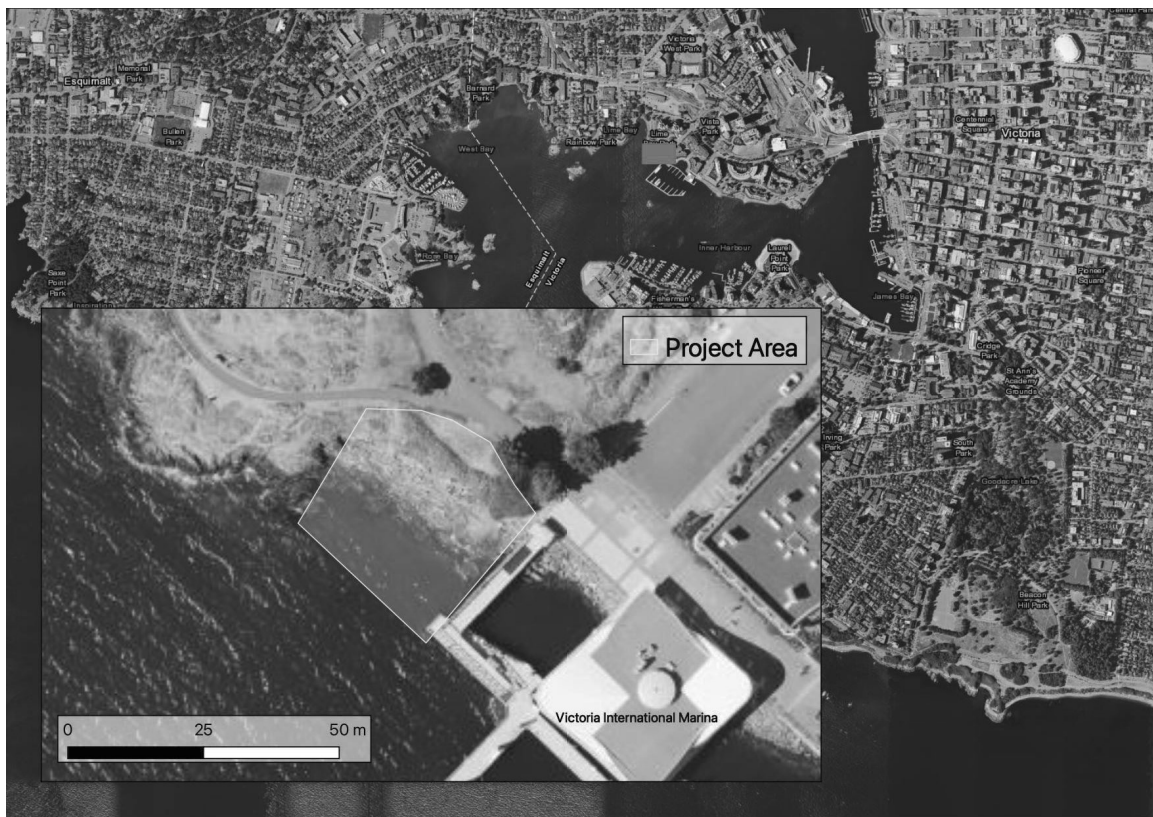


Figure.1) Project Area's Location within Victoria's Middle Harbour.

## 1.2. Historic Conditions

The VIM Pocket Beach was once part of a larger beach complex, heading a small peninsula separating two bays: Lime Bay to the west and what was formerly Mud Bay to its east. The complex supported numerous periods of pre and post-colonial settlement with relatively sheltered and productive shorelines and ideal conditions to launch and land watercraft such as traditional large Western redcedar (*Thuja plicata*) dugout canoes. At the base of the small peninsula (close to Songhees Dr.), there is a significant historic site of the Lekwungen People which includes a defensive trench embankment that was also buried with fill (mostly sawmill shake). More recently, the site was part of the Songhees Reserve established in 1853-1911, when both Mud and Lime Bays were used by Lekwungen residents as well as families of visiting nations. Visitors would camp on the beaches during the summer into the fall, participating in the local fishing, cannery, and trading economies (Marshall 2005). The trench and other important artifacts are part of a registered cultural resource site surveyed in the 1980s of local and regional significance and highlight a complex history of indigenous site-use and occupation pre and post-colonization (DcRu 123; Appendix 1).

A chronological review conducted by Chatwin Engineering in 2008 including aerial photographs from 1932 to 1997 and archival information identified the project area as part of a village site for the Songhees First Nations from 1853 to 1911. From 1911 to 1931, the area was occupied by a cedar shake mill and log booming ground. From 1932 to 1986, the Crown purchased the greater area for heavy industrial use including use as a coal yard, rail yard, city waste dump site, fuel storage depot, and log processing and log storage. From 1986 to 1998 Pacific National Investments Ltd. began phased development of the Royal Quays Condominiums, Waterfront Park, and seawall walkway (Chatwin Engineering 2008).

Historically, the shoreline was likely protected by productive forests of kelp and the bays rich in bivalve communities and eelgrass meadows (*Zostera* spp.) The conditions provided by the small pocket beach and surrounding bayed beach complex likely provided spawning habitats for species of forage fish including Pacific Herring (*Clupea pallasii*), sand lance (*Ammodytes personatus*), and Pacific surf smelt (*Hypomesus pretiosus*). While Mud Bay and Lime Bay were low energy, low gradient, small substrate beaches fed by steep, backshore bluffs, the project site was comparatively more exposed bedrock and smaller than the two bays (Marshall 2005). Through historic photo interpretation, a small rock finger feature offered some beach protection from wave action exposure. Despite this feature, the beach likely had similar biophysical characteristics to other small bedrock pocket beaches of equal fetch and aspect. Based on

occurrences and known preferences for obligate beach surf smelt, the site could be considered suitable spawning habitat for the obligate beach spawners (Quinn et al. 2012).

### 1.3. Current Conditions

Since the 1930s, large portions of Lime Bay and all of what was known as Mud Bay to its east were filled to facilitate harbour development and industries. Today, the site exists as a highly modified remnant of what was historically a much larger beach complex of cultural and ecological significance. The sand and gravel beaches of this complex, used by the Lekwungen people, visiting nations, and likely spawning forage fish, now lay buried below condominiums, grassed lawn, and engineered riprap, providing minimal value for people and nature (Figure 2).

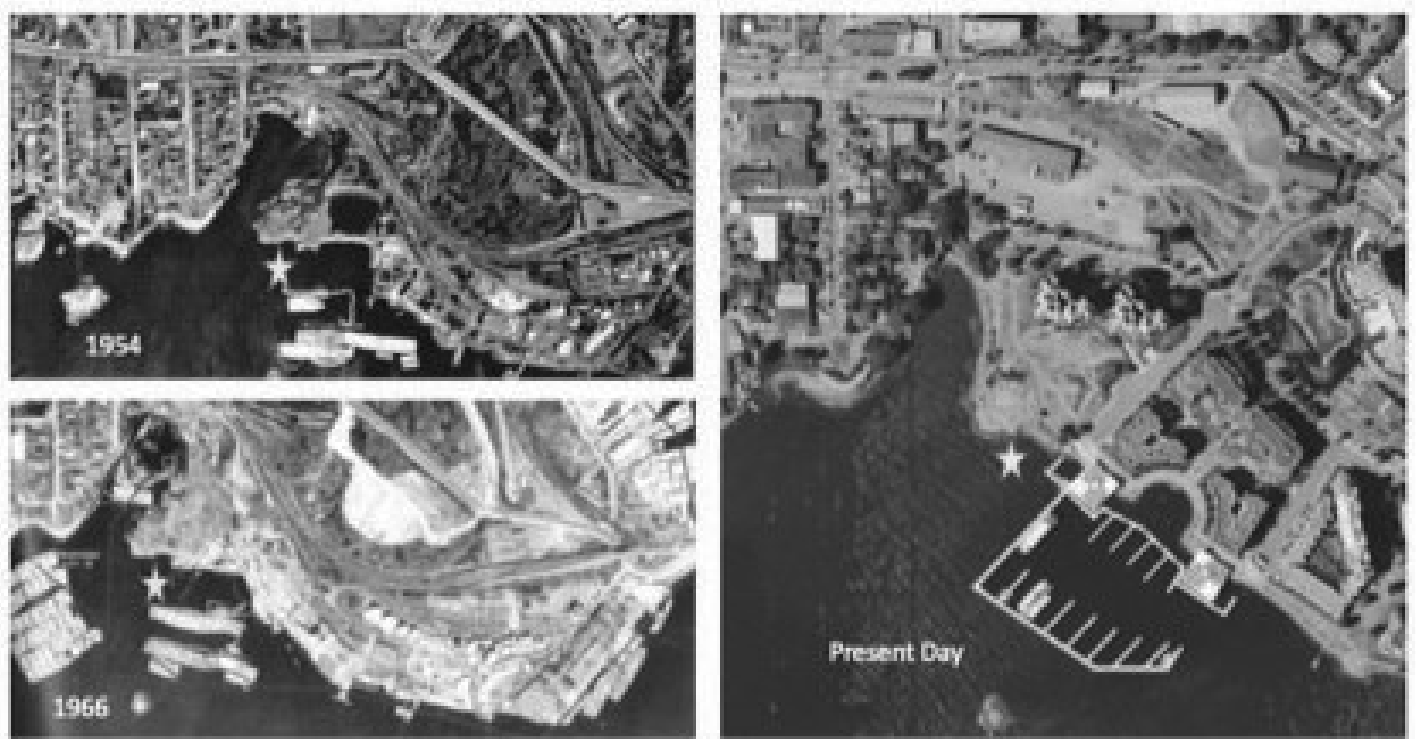


Figure 2.) Infilling and development of Lime and Mud Bays from 1954 (top left), 1966 (bottom left), to present-day (right) demonstrates the complete and partial filling of Mud and Lime Bays respectively. Star denotes the approximate location of the project site foreshore across time.

Located on the popular Songhees Walkway the small urban beach is one of high profile but with relatively little use and access. The beach has a southwestern aspect of approximately 50 km to the Olympic Peninsula though is otherwise quite protected. The existing grade of the beach is quite steep as indicated in the elevation profiles and bathymetry included (Appendix 2; 3). The biophysical conditions of the site for the **backshore**, **intertidal**, and **subtidal**, have been characterized below using a combination of site visits as well as environmental assessments completed in preparation for the VIM dredge works in 2018 (Chatwin Engineering 2008).

#### Backshore:

The observed backshore is a combination of grassed lawn topping anthropogenic fill of unknown depth and native bedrock. The bedrock shore extends ~10m from the western end towards the center of the beach while anthropogenic fill backs the beach for the remaining ~15 m. The backshore ecological value is rated low in regional inventories, with invasive species such as Himalayan blackberry (*Rubus armeniacus*), bindweed (*Convolvulus arvensis*), and English ivy (*Hedera helix*). Native species observed onsite include gumweed (*Grindelia stricta*), snowberry (*Symphoricarpos albus*), and Nootka rose (*Rosa nutkana*). The steep upland bank (~90 degrees) is collapsing due to erosive forces from combined forces of anthropogenic disturbance, Sea Level Rise, and increased storm surge. At the current rates of erosion, upland infrastructure including the Songhees Walkway is at risk. Public removal of boulders to create rock structures on the beach is further exacerbating erosion of this area and the hazard of collapse. Recent tree and brush removal works were carried out by the City of Victoria in preparation for the pole raising ceremony. This vegetation removal has likely worked to further destabilize the already mass wasting bank and City action is imminent. There is informal access to the beach via a rock pathway. While one tree remains onsite, very little vegetation serving cultural, physical, or ecological functions exists.

#### Intertidal:

The beach is currently cutting into the upland bank which is approximately 1m and experiencing mass wasting, with a beachhead slope of almost 90 degrees. The severe erosion of the upland bank has led to unsorted material in the upper intertidal zone of angular cobbles, gravels, and sands. These sediments become larger and more sorted towards the middle and lower intertidal until a uniform layer of fine sand and muds are established in the subtidal. On the upper east end of the beach, there is currently an informal rock 'throne' feature constructed from boulders and cobbles sourced from the eroding bank as well as large and small chunks of cement and asphalt. Some Large Wood Debris is present at the site but more and larger, buttressed wood would benefit the site. The majority of the beach is medium to large angled rocks that are suspected to be armoured. This rock is a common beach type in the harbour and provides

minimal complexity and diversity as a substrate with limited ecological function. Past surveys done before 2018 dredging works at VIM revealed low diversity and abundance of intertidal species.

Subtidal:

Subtidal classification has been identified as low ecological value with large deposits of anoxic organic sediments and 'muck' (Chatwin Engineering 2008). The Federally Endangered Northern Abalone was discovered in a nearby subtidal survey, however, occurrences are thought to be rare (Chatwin Engineering 2008). There is also a stormwater outflow located west of the site under the Victoria International Marina which has exhibited water quality in breach of Canadian Water Quality standards for some parameters. The site is located in one of the most polluted bodies of water on the BC Coast that is subject to both relic and contemporary pollution events from both point and nonpoint sources of contaminants. Anecdotal monitoring of recent dredging and piling works are suggested as improvements with scientific monitoring ongoing and results pending. The subtidal areas from VIM to Lime Bay offer a large opportunity for future restoration of intertidal and subtidal eelgrass and kelp forest communities.

#### 1.4. Desired Future Conditions

Nourishing beaches as a treatment for habitat enhancement, specifically for forage fish, have been carried out numerous times in Washington State and British Columbia, with design guidelines for beaches developed by Jim Johannessen and others in the *Marine Shoreline Design Guidelines* (Johannessen et al. 2014). In British Columbia, with assistance from Jim Johannessen, these guidelines have been incorporated by the BC Stewardship Center and their partners into the Green Shores for Shoreline Development Program. This project will be submitted for accreditation within the program in 2022-23 and will be delivered in accord with the Green Shores for Shoreline Development standards and principles.

Through the introduction of appropriately sized sediments and restoration of backshore processes, the site will offer enhanced habitats for surf smelt (*Hypomesus pretiosus*) and may also potentially provide suitable habitat for sand lance (*Ammodytes personatus*), both of which are fundamental to food chains in the Southern Salish Sea including key prey sources for adult salmon (Qualley et al. 2018). The regraded, stabilized, and planted backshore will also further protect local infrastructure through an increase in resiliency to sea-level rise and tidal surge flooding, as well as improve aesthetic and safe recreational use of the site. Restoration of the marine riparian vegetation will provide connectivity for other backshore areas of high ecological

value along the Songhees Walkway and provide rare urban habitat for species of pollinating insects and birds. Signage installation and stewardship opportunities to interpret and monitor this site are also beneficial to the residents of the City of Victoria, the Songhees Nation, and the Esquimalt Nation.

## 2. Project Goal and Objectives

### Project Goal

Taking a Green Shores for Shoreline Development approach to enhancement of the existing shoreline and beach conditions to:

- 1.) Improve suitability for select species of forage fish
- 2.) Increase resiliency to impacts of SLR and storm surge and;
- 3.) Promote cultural history and Lekwungen stewardship of the site

### Objectives

- 1.) Remove or repurpose armoured rock materials from the beach.
- 2.) Create a ~25 m long toe sill ~35cm high in the upper-lower intertidal (2 m CD) with repurposed boulders and cobble to promote sediment retention.
- 3.) Dig into the backshore ~3m to reduce the current gradient and stabilize the bank using large rock material and Large Wood Debris.
- 4.) Nourish 250 m<sup>2</sup> of the beach by back-filling the toe sill with 150 m<sup>3</sup> of a clean sand-gravel mix.
- 5.) Plant 250 m<sup>2</sup> of the backshore with a mix of marine riparian and woodland native plant species.
- 6.) Install interpretative signage highlighting the local ecology and cultural significance of the sight.
- 7.) Monitor beach for forage fish activity and maintain plantings.

## 3. Restoration Treatments

The approximate 150 m<sup>3</sup> of nourishment sediment will be composed of a mix of cleaned coarse sand to fine gravel. Approximately 45% will consist of sediment in the 0.15-5 mm range and approximately 55% will consist of heavier sand, pea gravel, and pebbles ranging from

approximately 13-38 mm. Based on availability, crushed oyster shells may also be introduced along with the benefits of this medium in intertidal ecosystems. Coarser material would be included to both mimic natural beach conditions in this area and to aid in the longevity of sediment in the project area. Large wood will be sourced and repurposed from other areas in the harbour where it is a nuisance and where it can be donated and delivered from other projects.

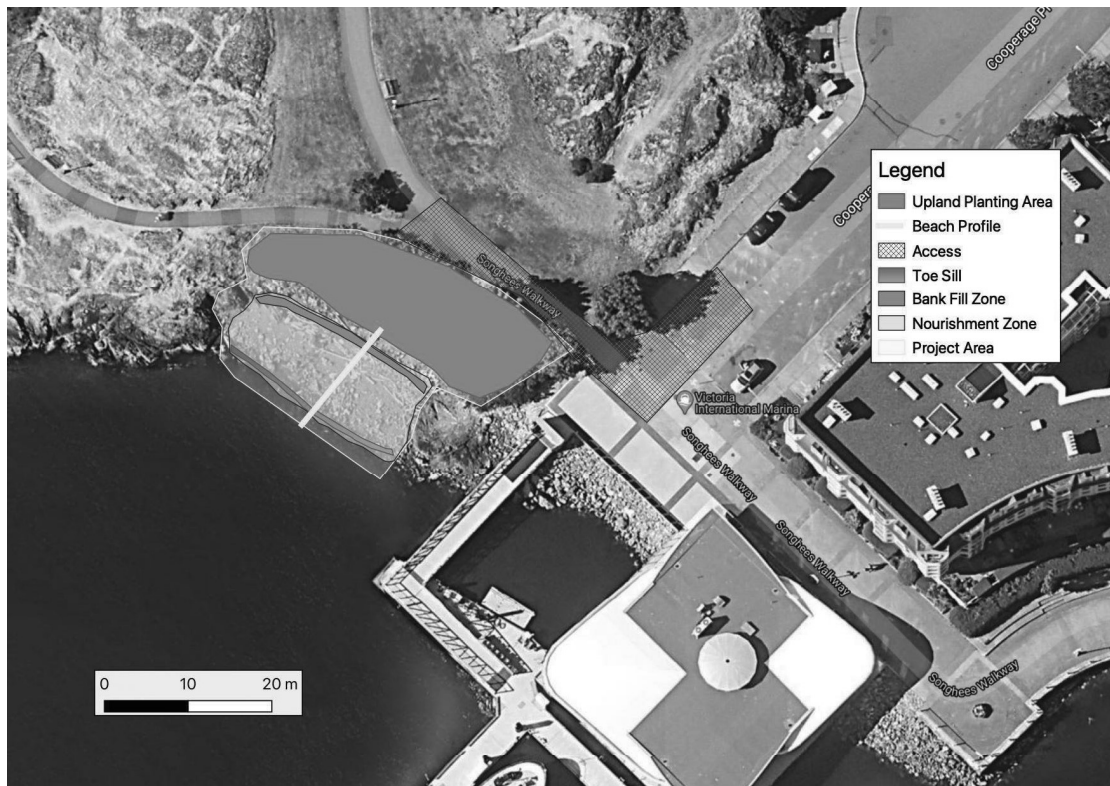


Figure 3.) Proposed Project layout including backshore planting and beach nourishment areas.

The proposed project will be accomplished in the following stages:

- Access to the beach will be established through the Songhees Walkway at the terminal end of Cooperage St. and an alternative detour and exclusion zone established for the public (CoV)
- Boulders and cobbles for the bank and toe sills will be sourced from the site and constructed using an excavator with biodegradable hydraulic and engine oil (PSS)

- Rock armour debris from the nourishment project area will be removed or strategically placed along with large woody debris, while asphalt, metal, and cement debris will be removed from the beach (PSS)
- Gravel sand mix will be delivered to the beach using a dump truck (PSS)
- Sediments will be distributed using excavator an excavator using opportunistic low tides for intertidal works (PSS)
- Restore access route areas to original conditions, including upland native beach riparian plantings (CoV)
- Install pest deterrents to help protect plantings and vegetation recovery (CoV)
- Pole raising and naming ceremony for beach
- Perform as-built topographic survey and ongoing project monitoring including forage fish surveys

#### 4. Monitoring Plan

The monitoring plan includes profile monitoring seasonally (winter and summer) using a laser level and stadia rod and transects. Elevations will be recorded every meter as well as photo documentation of sediment size. The benchmark at the end of Cooperage St. is used and transect start and cardinal direction currently used will be permanently established post works. Intertidal surveys have also been conducted and the benthic and epibenthic fauna and conditions will continue to be monitored. Forage fish egg surveys will be conducted as well as opportunistic beach seines and monitoring of citizen science observational networks such as iNaturalist.

#### 5. Maintenance Plan

The majority of ongoing plant maintenance of this project will be taken on by the City of Victoria however, plantings are prescribed based on natural occurrence and will require little maintenance beyond initial establishment. Stewardship groups such as the PSS will provide coordination of future opportunistic beach cleans, and invasive species removal events in good faith. The sediment will have an approximate minimum lifespan at which point re-supply of sediments will be required.



## 6. Permits and Approvals

PSS is in the process of obtaining all necessary permits and approvals below is a list of permits and approvals sought and their status as of July 28, 2021:

**Esquimalt Nation Support:** Chief Ron Thomas has provided support in the way of financing approval as a member of the Board of Directors of Salish Sea Industrial Services after a presentation of the project to the board in May 2021. A formal letter of support from the Esquimalt Nation is expected but outstanding.

**Songhees Nation Support:** Support was given by Councillor Karen Tunkara as a member of the Board of Directors for Salish Sea Industrial Services. A letter of formal support from the Songhees Nation is expected but outstanding.

**Transport Canada** as acting authority for Victoria Harbour is reviewing our application for Project Authorization and awaiting letters of support from the Esquimalt Nation and the Songhees Nation.

A Request for Review was submitted to the **Department of Fisheries and Oceans** and is currently being processed.

PSS is in communication with the **City of Victoria** Parks Department, with support given from Councillor Jeremy Loveday.

## 7. Public Outreach

Peninsula Streams is actively collaborating with the Victoria International Marina in their project stakeholder mapping for the VIM Welcome Pole Raising scheduled for September 30th, 2021. The partnership with the Songhees Nation and Esquimalt Nation, timeline, and goals of this project align well with the PSS Pocket Beach Project. Large synergies in logistics leading to cost savings can be achieved in this collaboration of project works. Working under the Green Shores for Shoreline Development will also require ongoing outreach and education around the project and PSS looks forward to further developing these opportunities with its Esquimalt Nation and Songhees Nation partners.

## 8. Project Budget

See Attached

## Literature Cited

Chatwin Engineering (2018). Victoria International Marina Project. *Environmental Assessment Report*.

Chow, C., Park, D., & Colonel, M. T. (2020). Assessment of Pacific sand lance (*Ammodytes hexapterus*) and surf smelt (*Hypomesus pretiosus*) spawning at the ecologically restored Jericho Beach.

Emmett, B., Blair, D. G., & Faghin, N. (2017). Green Shores: Using Voluntary Ratings and Certification Programs to Guide Sustainable Shoreline Development. In *Living Shorelines* (pp. 113-136). CRC Press.

Johannessen, J., MacLennan, A., Blue, A., Waggoner, J., Williams, S., Gerstel, W., ... & Shipman, H. (2014). Marine shoreline design guidelines.

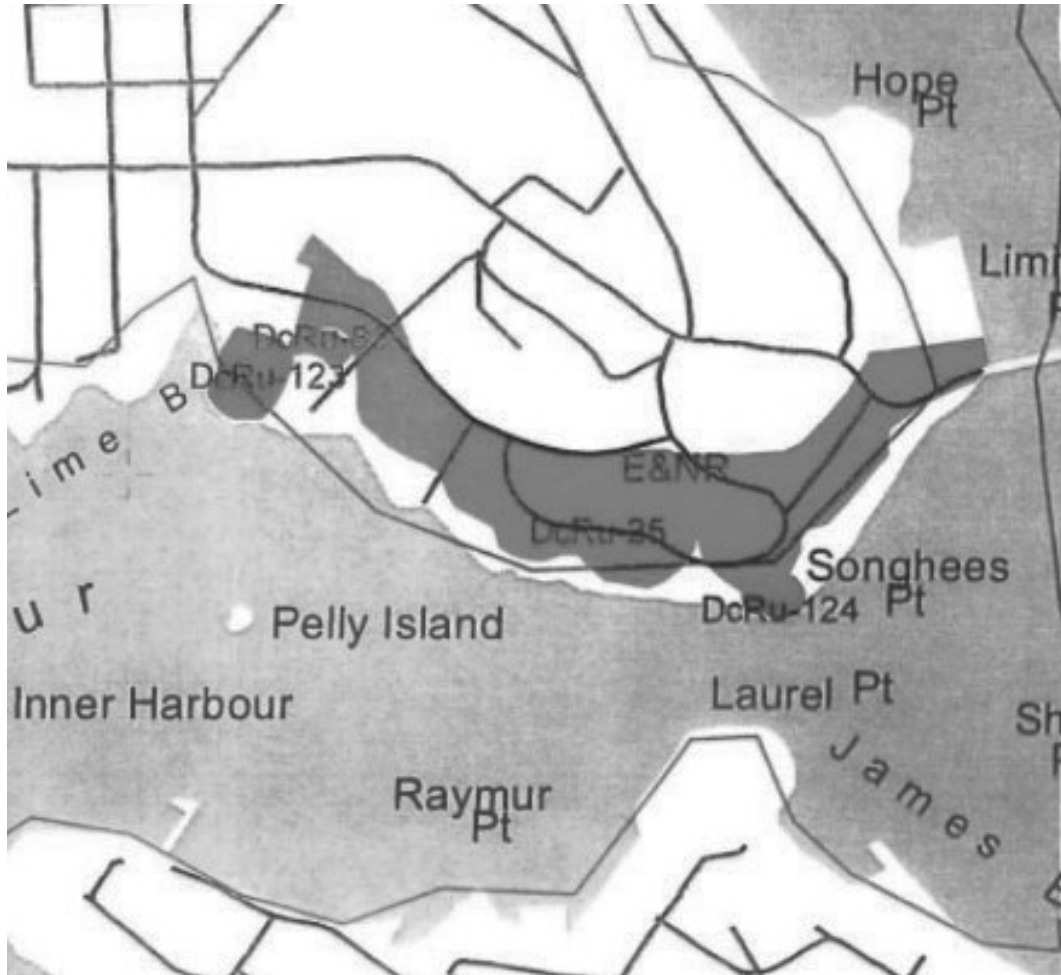
Marshall, D. P. (2005). Songhees Pictorial: A History of the Songhees People as Seen by Outsiders, 1790-1912. *The Canadian Historical Review*, 86(4), 724-725.

Qualley, J., Duguid, W., Innes, K., & Juanes, F. (2018). Using salmon to sample the Salish Sea: diets of recreationally harvested Chinook and Coho salmon as an ecosystem monitoring tool.

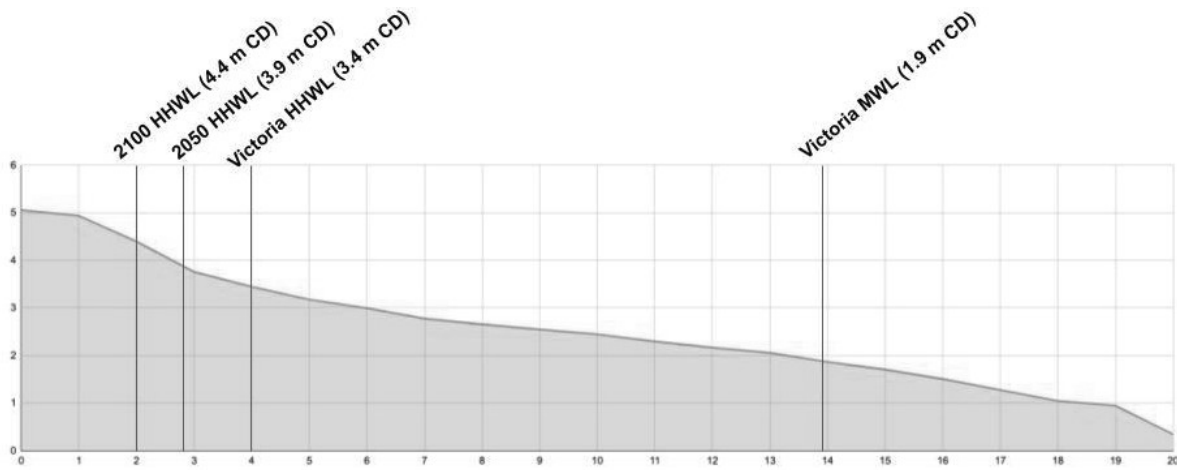
Quinn, T., Krueger, K., Pierce, K., Penttila, D., Perry, K., Hicks, T., & Lowry, D. (2012). Patterns of surf smelt, *Hypomesus pretiosus*, intertidal spawning habitat use in Puget Sound, Washington State. *Estuaries and Coasts*, 35(5), 1214-1228.

# Appendix

A1: Map of Cultural Resource DcRu 123

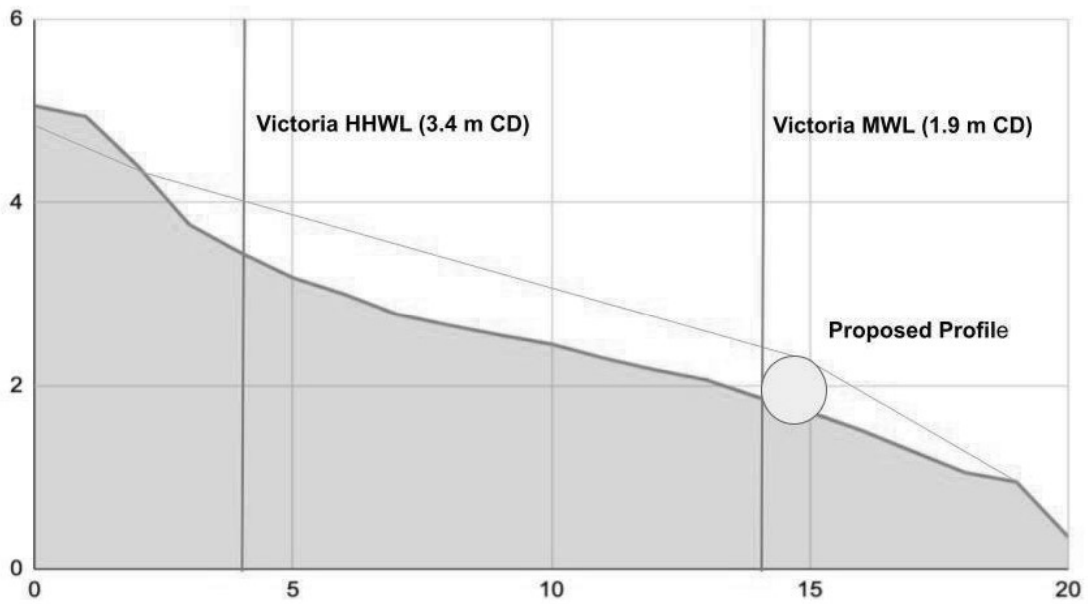


**A2 Site Elevational Profiles** (PSS: June 2021; *Proposed Profiles Subject to Engineer Review*)



MFLNRO Coastal Floodplain Mapping Guidelines and Specifications

Victoria, a 500-year (0.2-percent annual chance) magnitude storm surge of 1.3 m is recommended based on work by Ausensco Sandwell (2011a, b).



# A3 Site Bathymetry



**PROJECT LOCATION**

**LEGEND**

**GENERAL NOTES:**  
 SURVEY COMPLETED ON SEPTEMBER 10TH 2019 BY JRM CONSTRUCTION SURVEY DEPT.  
 SOUNDINGS HAVE BEEN REDUCED TO CHART DATUM  
 PROJECTION USED IS UTM ZONE 18 NORTH ON NAD83 AND CANADIAN GEOD HT 2.0.

**GRID:**  
 GRID: UTM ZONE 18 NORTH  
 EPOCH: 1982 EPOCH  
 ELEVATION: 1982 MEANS  
 PROJECTION: UTM ZONE 18 NORTH  
 DATUM: NAD 83  
 DATUM: CANADIAN GEOD HT 2.0

**ADDITIONAL NOTES/COMMENTS:**

**CLIENT:** PWSC  
**Public Works and Government Services Canada**

**LOCATION:**  
 LIME BAY, VICTORIA HARBOUR

**PROJECT DETAILS:**  
 LIME BAY CONDITION SURVEY  
 DESCRIPTION:  
 BATHYMETRIC CONDITIONS AT LIME BAY  
 GRID PROJECTIONS:  
 UTM ZONE 18 NORTH  
 ELEVATIONS ARE CHART DATUM

**DESIGN BY:** NA **DRAWN BY:** PB

**SCALE:** AS SHOWN  
**DATE:** 16TH SEPT 2019  
**DRAWING NO.:** XXX

**"BUILDING TO LAST"**

REV	DESCRIPTION	BY	DATE
001			2019-09-16

A4 Historic Photo of Mud Bay



**A5 Rhinoceros Auklet (a common visitor to the Victoria Harbour Migratory Bird Sanctuary) gorges on some forage fish of the Southern Salish Sea; just one of the hundreds of species reliant on these high energy prey.**



**A6 Looking East towards VIM (June 23)**





A7 Looking West (June 23)



**A8 Backshore West**



**A9 Backshore East**



**A10 Looking South from East End**





A11 Looking South at West End of Beach

