TRANS MOUNTAIN EXPANSION PROJECT

Shoreline Existing Conditions Data Report

EAO Condition 39

May 11, 2023

TRANSMOUNTAIN

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TABLE OF CONCORDANCE

The Table of Concordance describes how this Report addresses British Columbia Environmental Assessment Office (BC EAO) Condition 39.

BC EAO Condition	Location in Report
BC EAO Condition 39: Shoreline Existing Conditions Data Report	
a) Identification of existing guidelines and objectives that have been established for the recovery of spilled product, including those from jurisdictions other than British Columbia.	Section 4.2
b) Description of the baseline pre-spill conditions of the shore 500 metres on either side of a point on the shore closest to the following locations, identified in the Trans Mountain Expansion Project, an Application pursuant to section 52 of the National Energy Board Act, December 2023, Volume 8A Marine Transportation: a) English Bay (location B); b) Roberts Bank (Location C); c) Strait of Georgia (Location D); d) Arachne Reef (Location E); e) Strait of Juan de Fuca (south of Race Rocks) (Location G); and f) Buoy J (Location H)	Section 2.3 Section 3
c) The following information for each location: a) Geographical location and context including: i. Maps and Photographs ii. Land ownership iii. Indigenous traditional and cultural uses b) Nearby water bodies and water withdrawal locations c) Abundance of typical, sensitive, and at-risk flora and fauna species in the location d) Soil, water, and sediment characteristics e) Dominant current and wind direction f) Past and present land-uses (e.g., commercial, agriculture, industry) g) Infrastructure	Section 3
d) Description of how the information referred to in paragraph c) was collected, including the methods of collection, specific locations and timing of collection.	Section 2

ACKNOWLEDGMENT

The geographic extent of this Existing Shoreline Conditions Report extends from English Bay in the Port of Vancouver to “Buoy J” at the entrance to the Strait of Juan de Fuca and covers the internationally established marine vessel traffic corridors and the waters and lands closely adjoining this corridor. This area is also known as the Salish Sea.

In the spirit of respect, Trans Mountain honours and acknowledges the shared territories of the Coast Salish peoples, the Nuu-chah-nulth people, and the many Indigenous communities of the Salish Sea and Juan de Fuca Strait, located in Canada and the United States, who continue unique cultural practices as well as steward and protect the Salish Sea ecosystem including the shorelines, the ocean, and its watersheds.

The marine Indigenous communities Trans Mountain engaged with as part of informing traditional ecological knowledge aspects of the Existing Shoreline Conditions Report are listed in Appendix 1.

EXISTING SHORELINE CONDITIONS STUDY

EAO Condition 39

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May 2023

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1 Introduction

As defined by the amendment to Trans Mountain's BC Environmental Assessment Certificate (EAC) issued by the Province of British Columbia (the Province) on February 24, 2022, Trans Mountain must prepare an Existing Shorelines Condition Report and submit to the Province within 18 months (August 2023) as Condition No. 39.

Polaris Applied Sciences was retained to prepare a report containing shoreline baseline data for shoreline areas closest to spill scenario locations modeled along the marine shipping route and submitted in the Project application. The Province listed the specific scenario locations for the purpose of this study (Figure 1) as:

- English Bay (Location B)
- Roberts Bank (Location C)
- Strait of Georgia (Location D)
- Arachne Reef (Location E)
- Strait of Juan de Fuca (south of Race Rocks) (Location G); and
- Buoy J (Location H)

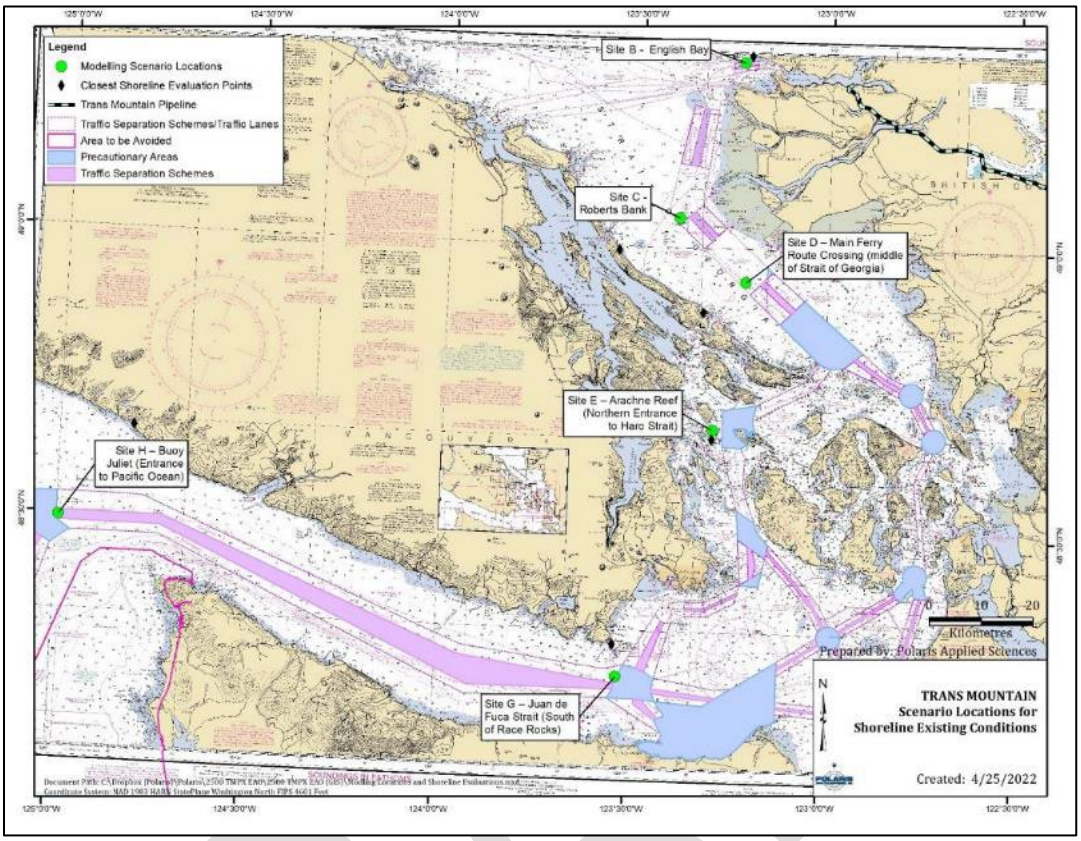

Figure 1. Scenario locations and shoreline points studied.

The objective stated in the condition is "for the purpose of assisting product recovery and restoration in the event of a ship-sourced marine spill." As indicated in Condition 39 language, the report must outline pre-spill shoreline conditions for 500m each side of the shoreline point closest to the noted locations. Shoreline sites closest to these locations (Figure 1) were:

- Location B – West Vancouver (Erwin Park)
- Location C – Northeastern Galiano Island
- Location D – Eastern Gossip Island
- Location E – North Comet Island
- Location G – Race Rocks
- Location H – Tsusiat Point

Required components of the shoreline characterization include maps, land ownership, nearby water bodies, past and present land use, soil, water and sediment characteristics, and Indigenous traditional and cultural uses. Details about predominant current and wind direction as well as wildlife abundance are also to be included.

To complete the report, Trans Mountain must engage with federal and provincial ministries, marine Indigenous groups, and coastal local governments within eight (8) regional districts.

2 Methodology

To prepare this report, data was collected through a variety of methods including literature and database searches, field site reconnaissance and consultation. Existing information sources include but are not limited to BC Ministry of Environment land and coastal geodatabases, coastal sensitivity atlases (BC, Environment and Climate Change Canada) and Western Canada Marine Response Corporation geographic response plans.

2.1 Workshops and Engagement

As part of the engagement process, Trans Mountain held a series of in person and virtual workshops to explain the EAO Conditions and to seek input from Indigenous and coastal communities and other stakeholders. Workshops were held between April and June 2022 as follows:

- Local Indigenous marine workshop, Victoria — 3 May
- Local Indigenous marine workshop, Nanaimo — 9 May
- Local Indigenous marine workshop, Vancouver — 17 May
- Local government marine workshop, Burnaby — 31 May and 2 June

Other engagement opportunities were provided with Indigenous groups, coastal local governments, and applicable government authorities. A summary of engagement for this report is available in Appendix 1.

2.2 Existing Data Sources

A thorough data search was conducted to identify shoreline and nearshore spatial data sets from existing data sources. Five main sources of data were utilized:

- Government of the Province of British Columbia through the website of the BC Data Catalogue[1] and iMapBC[2].
- Federal Government of Canada (Department of Fisheries and Oceans, DFO and Environment and Climate Change Canada, ECCC) through the Open Government Data Portal[3].
- The BC Conservation Foundation through the BC Marine Conservation Analysis[4].
- Western Canadian Marine Response Corporation and Coastal Response Program through their Coastal Mapping Program[5].

[1] (https://catalogue.data.gov.bc.ca/)
[2] (https://maps.gov.bc.ca/ess/hm/imap4m/)
[3] (https://search.open.canada.ca/en/od/?q=&collection=fgp&collection=geogratis&organization=aafc-aac)
[4] (https://bcmca.ca/maps-data/browse-or-search/)
[5] http://coastalresponse.ca/coastal-mapping/

- Race Rocks Ecological Reserve website[6] (Race Rocks site only)

The key data sets for current shoreline conditions include physical shoreline data, ecological shoreline and nearshore data, protected areas, and human use data. All data identified and reviewed are show in Annex A.

Wind roses showing historical wind speed and direction were downloaded for locations near each site from https://windhistory.com/.

Nearshore surface current roses were developed by TetraTech using modelled surface currents. The model used provided a resolution of 975 meters which is coarse but still provides a general understanding of the nearshore currents.

2.3 Field Surveys

Fields surveys were conducted at five out of the six shoreline locations (Locations B, C, D, E, and H) during the week of September 5th, 2022. This week was chosen because of forecasted low, daytime tides present at the sites that exposed the full intertidal zone for the assessment. An attempt was made to access each site at the low tide for the day, but at least within two hours either side of the low tide.

Shoreline at Locations D, E and H were accessed via landing craft, while at Locations B and C the field teams were able to access the shoreline by foot from the backshore. Five hundred meters on either side of the identified shoreline point were walked on foot with the field personnel assessing the intertidal zone, supratidal zone, and backshore where feasible. The total 1000 meters comprised the shoreline "segment" that was surveyed. In this segment the field teams documented:

- shoreline substrate in the intertidal zone and supratidal zone;
- coastal character and backshore use(s);
- ecological resources observed on the shoreline and nearshore (e.g., seal haulout, mussels, kelp, etc.);
- human use and infrastructure observed on the shoreline, backshore, and nearshore (e.g., private houses, kayakers, buildings, mooring buoys, etc.);
- cultural/traditional resources and uses;
- access points along the shoreline and backshore;
- dominant debris observed along the shoreline; and
- and other unique observations of the area.

Additionally, the field teams collected representative photographs of the shoreline and backshore during their assessment. Photographs included closeup and wide angles of the shoreline, backshore,

[6] https://racerocks.ca/home/

resources, and any other significant features observed during the survey. Example photographs for each site are show in Section 3 with additional photograph records in Annex B.

Indigenous groups traditionally associated with each of the shoreline sites were presented with the opportunity to join the field surveys and participate in the data collection activities. A Kwikwetlem First Nation representative was present for Location B, a Tseycum First Nation representative was present for Location C, D, and E, and Ditidaht First Nation representatives provided information before the survey and were also present during the survey at Location H. Indigenous representatives provided valuable information including whether the sites were current traditional harvesting sites, what types of organisms would be collected and used from the sites, and other potential uses for the sites.

Location G (Race Rocks) is a Provincial Ecological Reserve and as such requires a permit to visit and conduct scientific "research". While the permit application process was started with BC Parks it was projected to take 60 to 140 days to complete. The surveys and this report were scheduled to be completed before then due to ideal weather and tide conditions. For that reason, field surveys were not completed at Location G and observations for this site below are based on existing data, the Race Rocks Ecological Reserve website, Google Earth™ images, and input from an Indigenous representative.

3 Results

3.1 Location B – West Vancouver

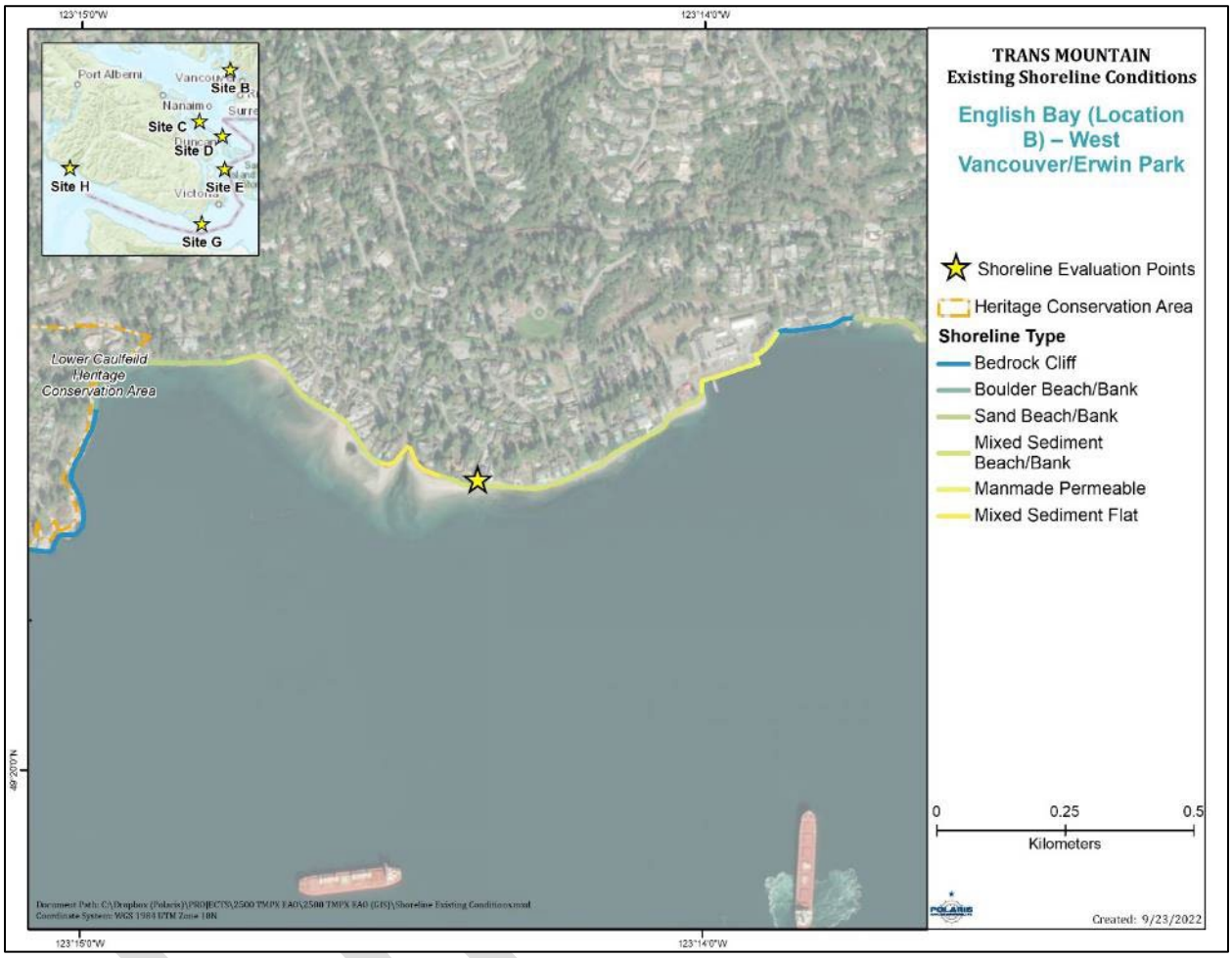

Figure 2. Location B - West Vancouver shoreline site and existing data.

Figure 2 shows the Location B – West Vancouver site with the available existing spatial data. Shoreline data are from the shoreline mapping effort conducted by ECCC in 2017, which show the upper intertidal zone consisting of mixed sediment beach/bank and mixed sediment flat near the mouth of Cypress Creek. Shorezone Bioband data indicate the presence of black lichen and dune grass.

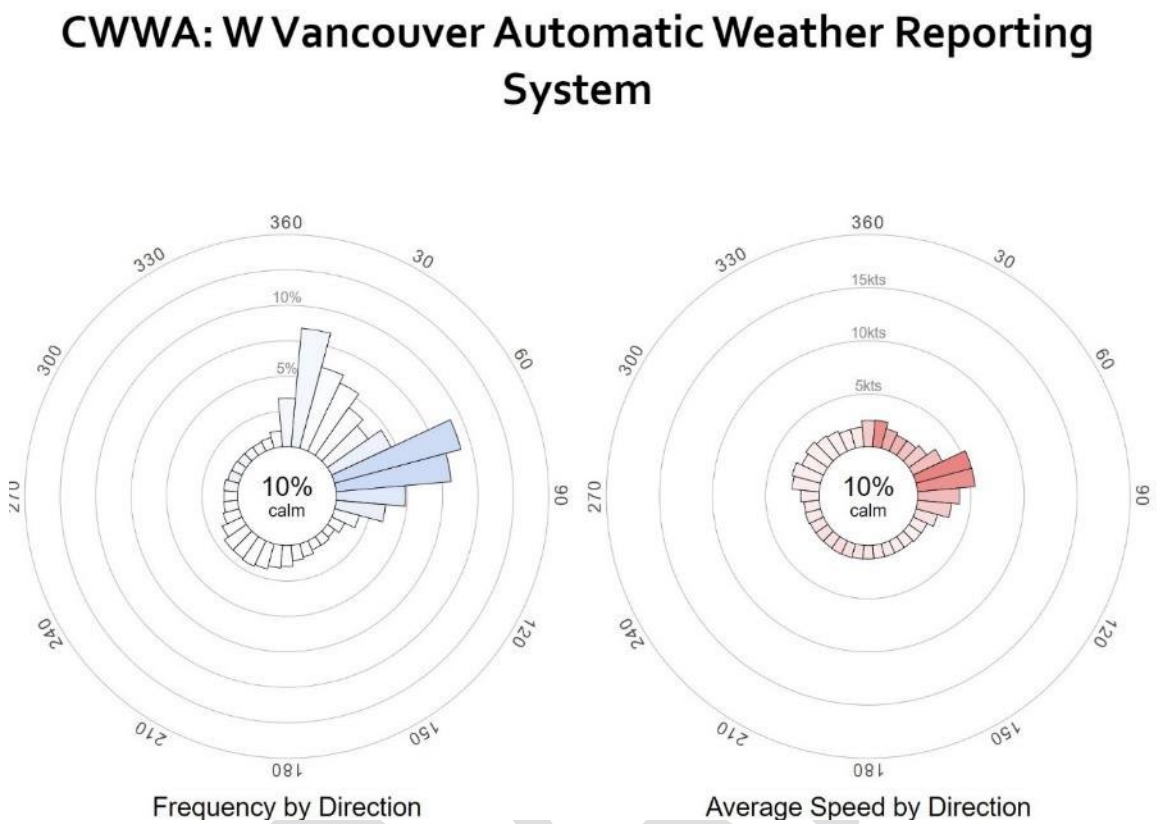

Figure 3. Wind data for West Vancouver (https://windhistory.com/station.html?CWWA).

Predominant wind direction for the year is from the North and Northeast with average wind speeds from those directions being 5 kts or less (Figure 3).

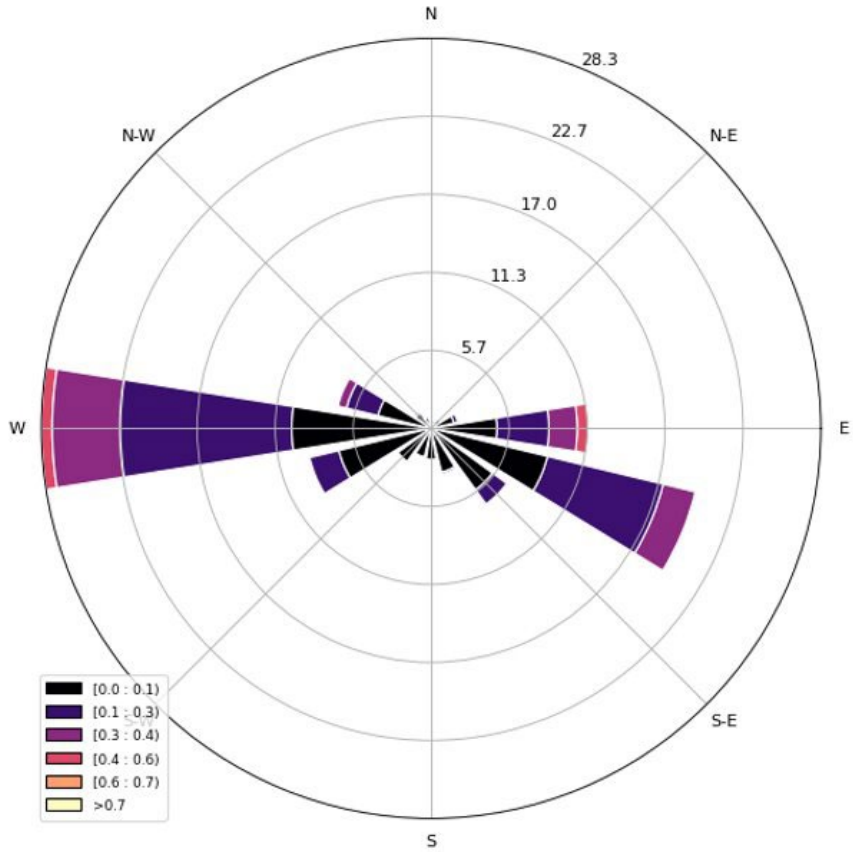

Figure 4. Current rose for Location B, showing modelled nearshore currents speed (m/s) and direction.

Predominant current direction is to the West with most current speeds 0.4 m/s or less (Figure 4).

Figure 5. Photographs from Location B. Sand/pebble/cobble beach looking west (left); pebble/cobble flat looking west (right).

The field assessment survey found a mixed sediment beach (sand/pebble/cobble, occasional boulders) to the east of the creek mouth with a mixed sediment flat (pebble/cobble, occasional boulder) to the west (Figure 5).

The shoreline site falls within West Vancouver and encompasses both Erwin Park and Stearman Beach. This shoreline is a high public use area with park user, dog walkers, and kayakers/stand-up paddleboarders accessing the intertidal and supratidal zones. The backshore is filled with private homes throughout the length of the shoreline segment. Large commercial vessels are anchored just offshore and there are private vessel mooring buoys nearshore.

Ecological resources observed include seals offshore, barnacles, mussels, clams (horseshoe, others), fucus, oysters, red algae, oyster catchers, and cockles.

While no specific traditional/cultural uses were known at this shoreline there are clam gardens that are tended and harvested in this area.

Access to the beach from the backshore is limited to just a couple of foot access points due to private houses. Most of the debris consisted of large woody debris, kelp/seaweed, and some plastics/garbage.

The relatively recent mapping of the shoreline (ECCC, 2017) is accurate although the mixed sediment flat appears to extend further west than just the mouth of Cypress Creek. There are organisms in the intertidal that could have been documented in the Shorezone Biobands data such as barnacles, mussels, fucus, and red algae.

3.2 Location C - Northeast Galiano Island

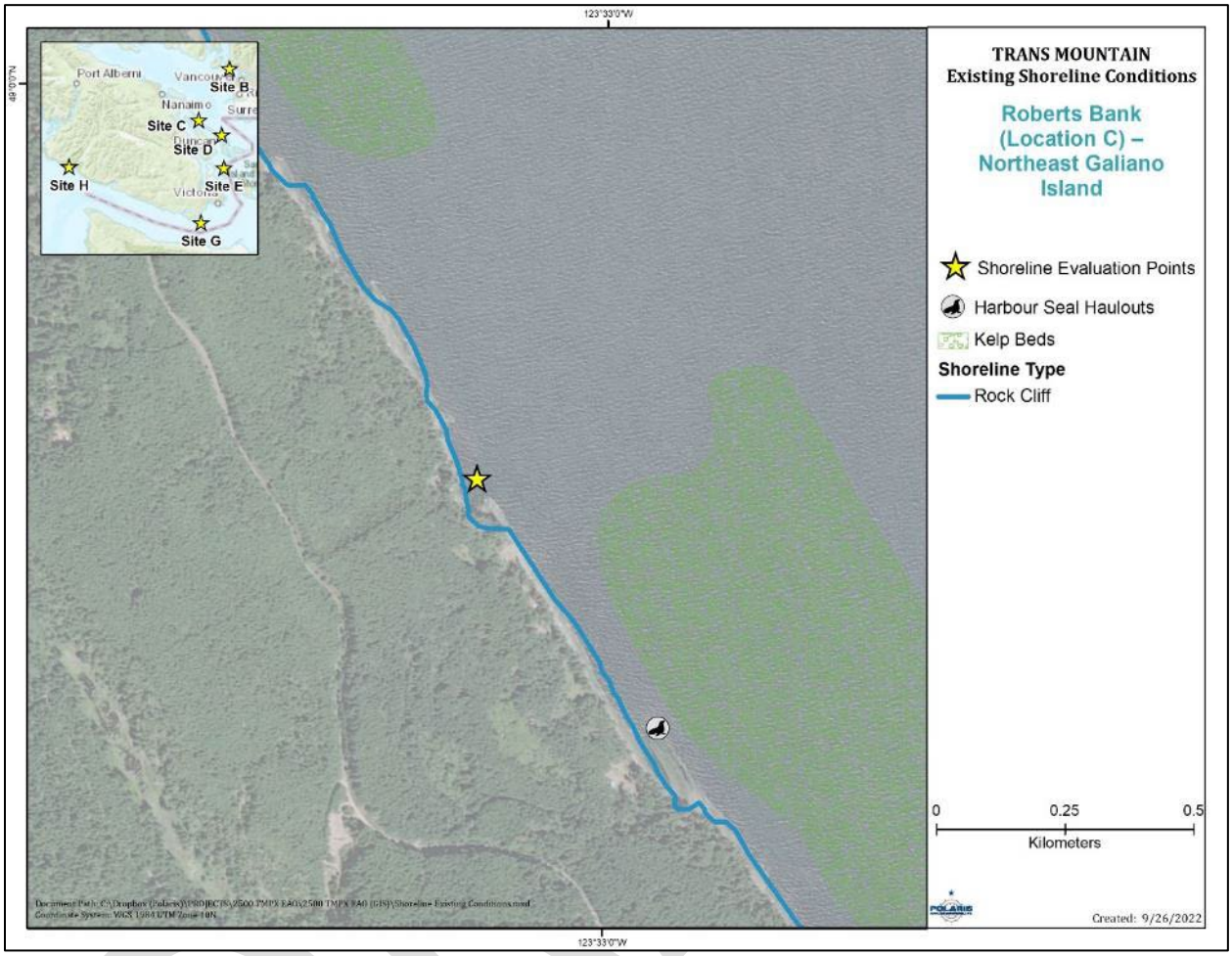

Figure 6. Location C – Northeast Galiano Island shoreline site and existing data.

Figure 6 shows the Location C – Northeast Galiano Island site with the available existing spatial data. Shoreline data are from the Shorezone mapping effort available from the BC Data Catalogue, which show the shore type consisting of rock cliff. Kelp beds are documented just offshore, and Shorezone Bioband data also indicate the presence of barnacles, blue mussels, fucus, red algae, bull kelp, soft brown kelps, and green algae.

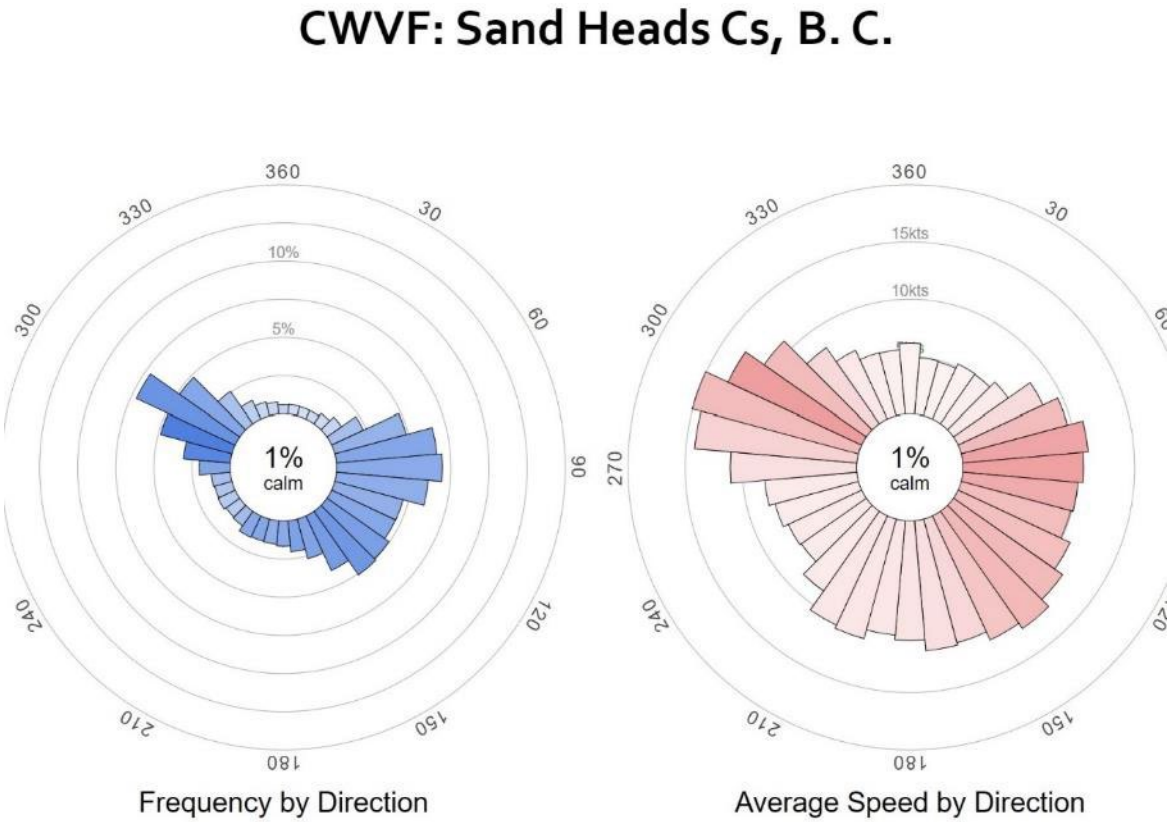

Figure 7. Wind data for Sands Head Cs, the closest wind data site on the Strait of Georgia to Location C (approx. 23 km to the East) (https://windhistory.com/station.html?CWVF).

Predominant wind direction for the year is from the Northwest and East with average wind speeds from those directions being 15 and 10 kts, respectively (Figure 6).

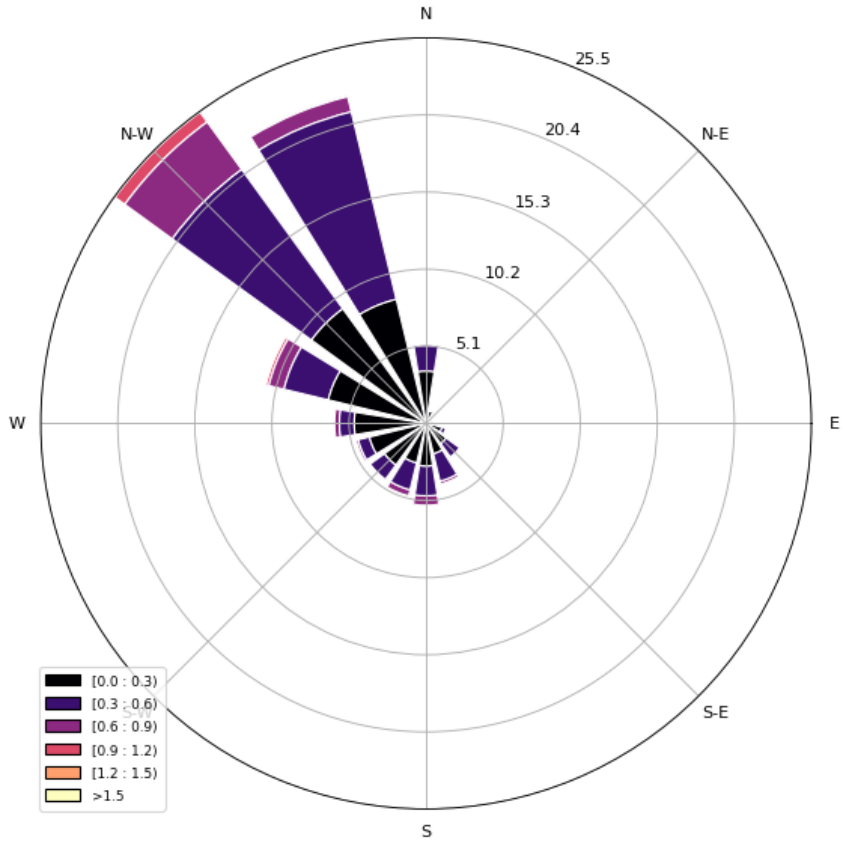

Figure 8. Current rose for Location C, showing modelled nearshore currents speed (m/s) and direction.

Predominant current direction is to the Northwest and North-Northwest with most current speeds 0.6 m/s or less (Figure 8).

Figure 9. Photographs from Location C. Bedrock ramp/platform with occasional boulder beach looking NW (left); small sand/pebble pocket beach looking NW (right).

The field assessment survey found a bedrock ramp/platform with occasional boulder beach in the intertidal zone throughout most of the shoreline surveyed (Figure 9). There was a small (~40m long) sand/pebble beach near the actual shoreline evaluation point (Figure 9). The supratidal zone consisted of bedrock ramp/cliff (<10 m) and the backshore was a vegetated/wooded hill.

There are a few private cabins and houses in the backshore and a local municipal park with foot access to the beach.

Ecological resources observed included barnacles, fucus, mussels, heron, and green algae.

While no specific traditional/cultural uses were known at this shoreline the First Nations representative indicated that crabbing was likely not common at this site, although offshore fishing might be.

Access to the beach from the backshore is limited to foot access from the local park present at the southern end of the site, and from the private homes and cabins in the backshore. Alongshore access was difficult although possible along the entire shoreline segment. Most of the debris observed consisted of large woody debris.

The Shorezone mapping lists rock cliff as the Shore type and rock ramp (> 30m) as the Coastal Class. Ramp or platform is more accurate for the upper intertidal zone along this specific shoreline. In general, the organisms documented in the Shorezone Biobands data align with field observations.

3.3 Location D - Eastern Gossip Island

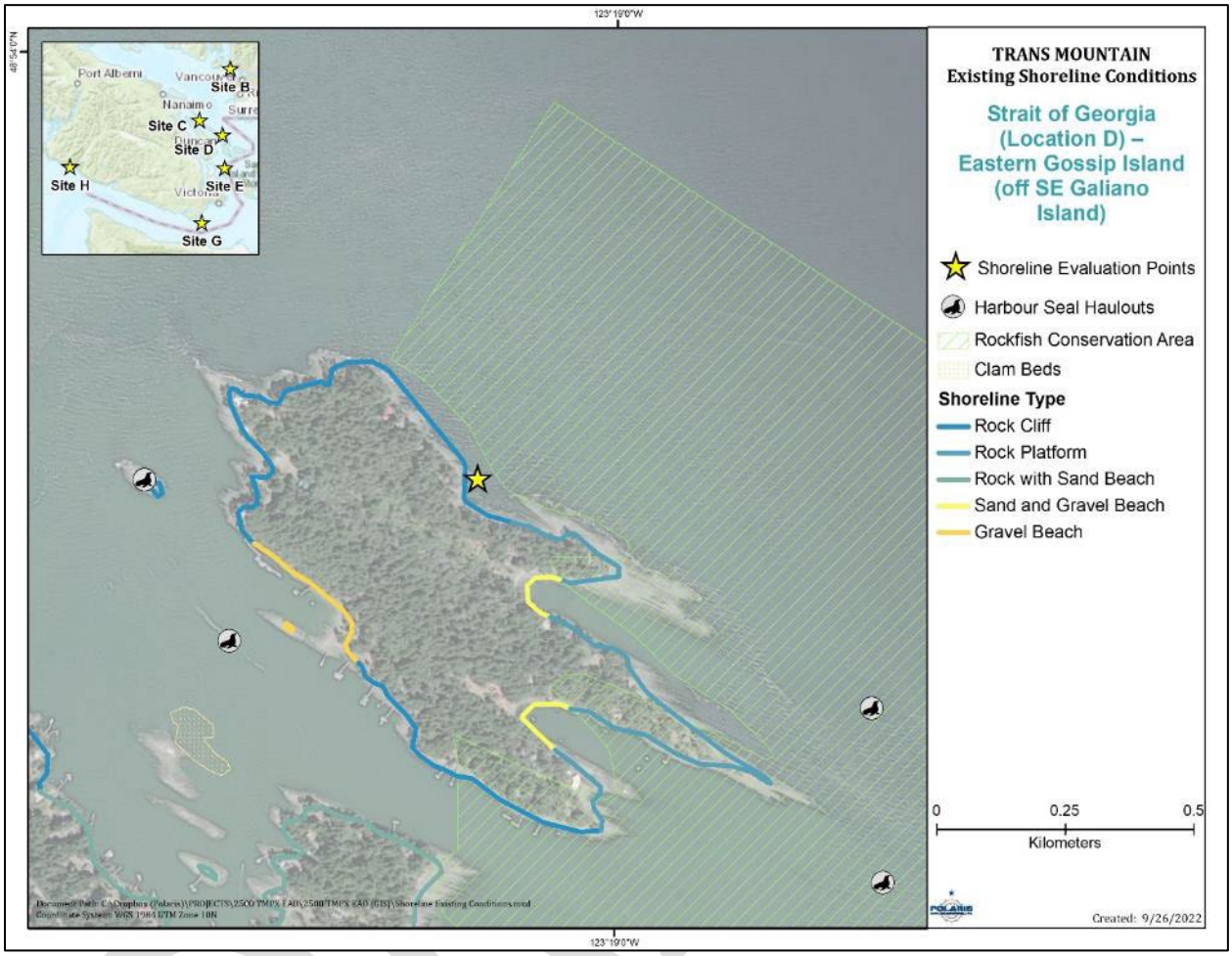

Figure 10. Location D – Eastern Gossip Island shoreline site and existing data.

Figure 10 shows the Location D – Eastern Gossip Island site with the available existing spatial data. Shoreline data are from the Shorezone mapping effort available from the BC Data Catalogue, which show the shore type consisting predominantly of rock cliff, rock platform, and rock with a sand and gravel beach at the very southern end of the shoreline. Shorezone Bioband data indicate the presence of barnacles, blue mussels, bull kelp, red algae, soft brown kelps, and green algae.

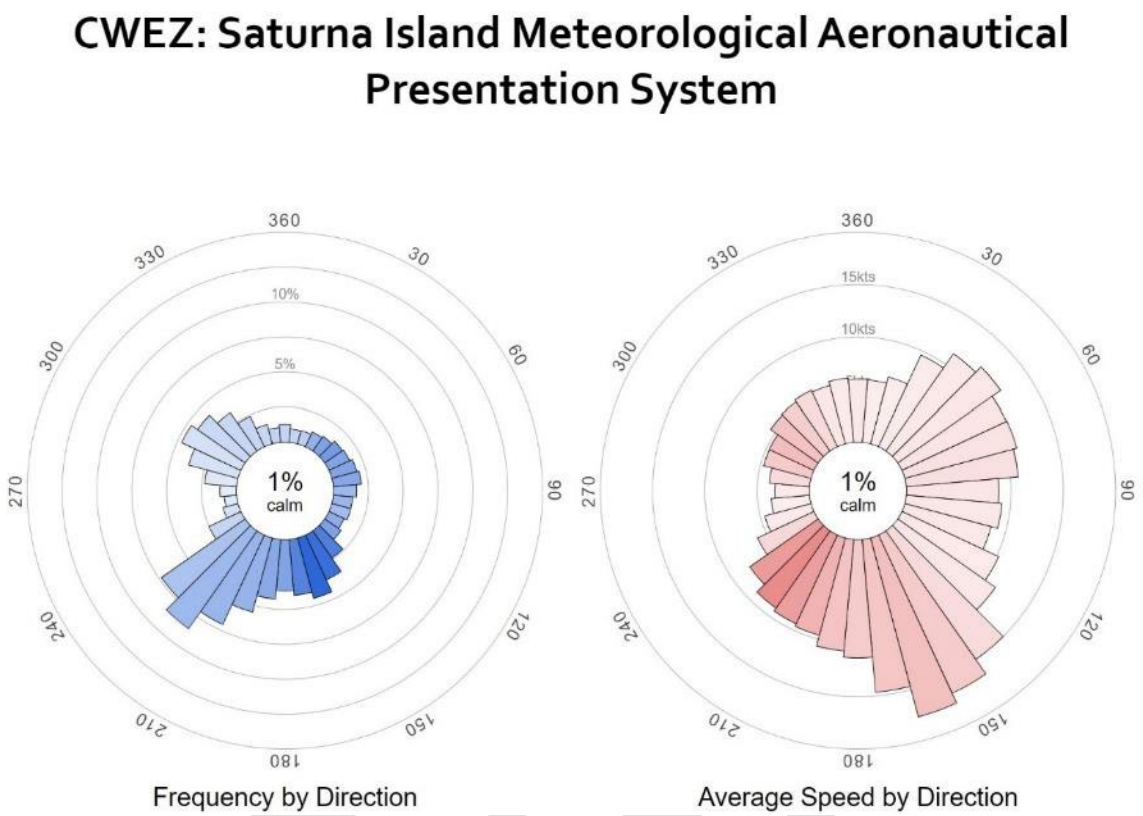

Figure 11. Wind data for Saturna Island, the closest wind data site on the Strait of Georgia to Location D (approx. 23 km to the Southeast) (https://windhistory.com/station.html?CWEZ).

Predominant wind direction for the year is from the Southwest with average wind speeds from that direction being <10 kts (Figure 11).

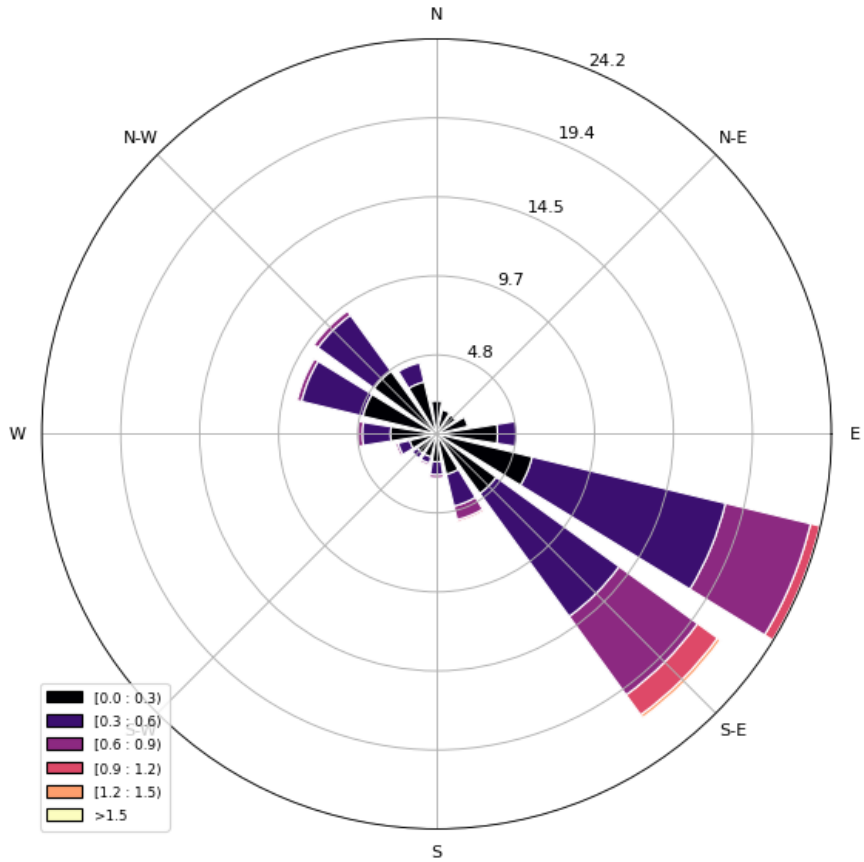

Figure 12. Current rose for Location D, showing modelled nearshore currents speed (m/s) and direction.

Predominant current direction is to the East-Southeast and Southeast with most current speeds 0.6 m/s or less (Figure 12).

Figure 13. Photographs from Location D. Bedrock ramp/platform with occasional boulder beach looking NW (left); small mud/sand pocket beach/cove on southern end of shoreline segment (right).

The field assessment survey found a bedrock cliff/ramp/platform with occasional boulder beach in the intertidal zone throughout most of the shoreline surveyed (Figure 13). There was a small (~20m long) pebble/cobble beach near the actual shoreline evaluation point along with a larger mud/sand beach/flat at the very southern end of the shoreline segment (Figure 13). The supratidal zone consisted of bedrock ramp/cliff (<10 m) and the backshore was a vegetated/wooded hill. The backshore is a wooded/vegetated hill with cabins and houses along the entire length of the shoreline segment.

There are private homes and cabins along the entire length of shoreline surveyed.

Ecological resources observed included mussels, barnacles, fucus, an otter, a heron, and the mud flats at the southern end had oysters and clams.

While no specific traditional/cultural uses were known at this shoreline the First Nations representative indicated that fishing and crabbing was possible, as was harvesting clams and oysters in the flat at the southern end.

Access to the beach from the backshore is limited to foot access from the private homes and cabins in the backshore. Alongshore access was possible along the entire shoreline segment. Most of the debris observed consisted of large woody debris.

The Shorezone mapping is relatively accurate as bedrock cliff and ramp were the predominate upper intertidal zone shoreline.

3.4 Location E - North Comet Island

Figure 14. Location E – North Comet Island shoreline site and existing data.

Figure 14 shows the Location E – North Comet Island site with the available existing spatial data. Shoreline data are from the Shorezone mapping effort available from the BC Data Catalogue, which show the shore type consisting of a variety of types including rock cliff, rock sand and gravel beach, rock with gravel beach, sand and gravel beach, sand and gravel flat, and gravel flat. Shorezone Bioband data indicate the presence of barnacles, fucus, dune grass, bull kelp, red algae, soft brown kelps, Salicornia, sedge, surf grass, green algae, Verrucaria, and eelgrass. Other data sources indicate offshore kelp beds and a seal haulout.

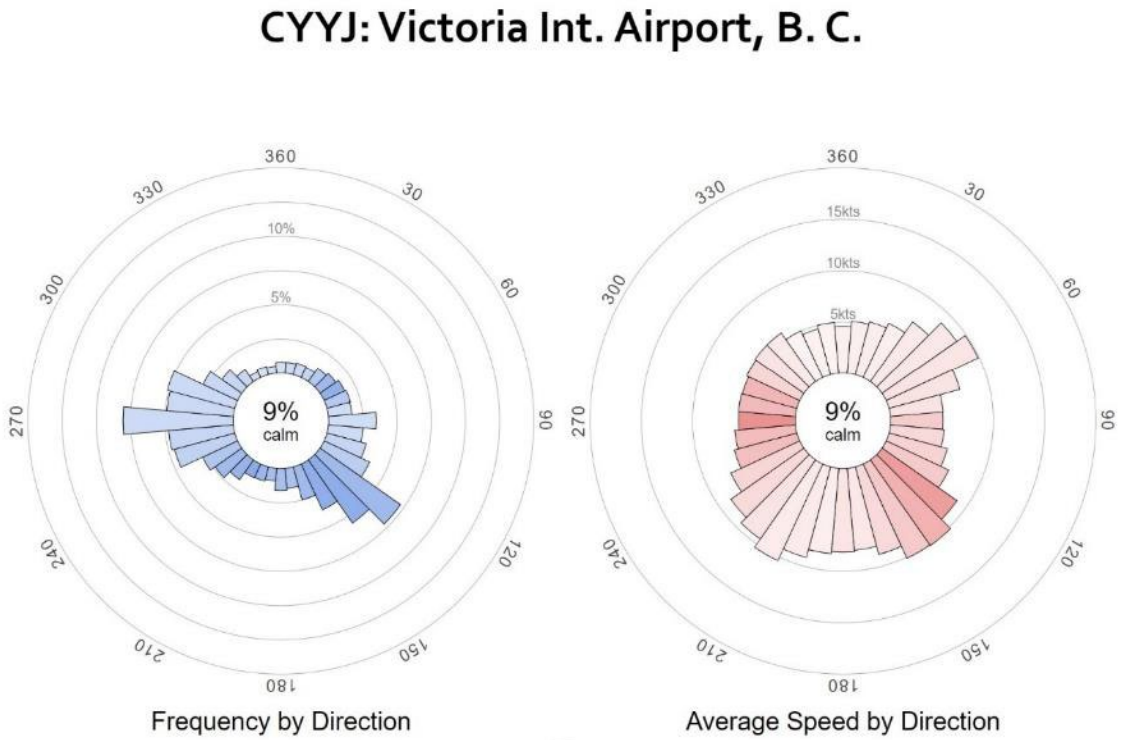

Figure 15. Wind data for Victoria Int. Airport, the closest wind data site to Location E (approx. 10 km to the West) (https://windhistory.com/station.html?CYYJ).

Predominant wind direction for the year is varied with slightly more frequent winds from the West and the Southeast, with average wind speeds from those directions being <10 kts (Figure 15).

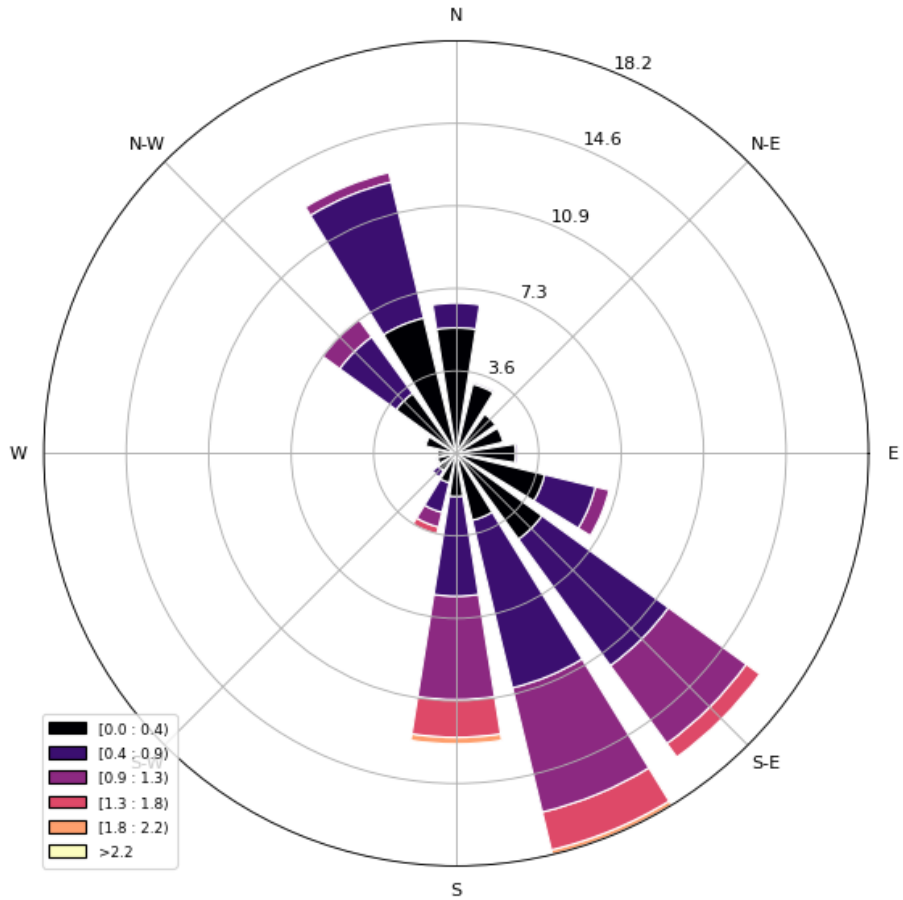

Figure 16. Current rose for Location E, showing modelled nearshore currents speed (m/s) and direction.

Predominant current direction is to the East-Southeast (including South and Southeast) with most current speeds 1.3 m/s or less (Figure 16).

Figure 17. Photographs from Location E. Pebble beach leading bedrock ramp/platform with occasional boulder headland, looking East (left); bedrock platform with boulders looking NE (right).

The field assessment survey found a wide variety of shoreline types including a long pebble/cobble beach and bedrock cliffs on the North side of the island. The South side contained a sand beach, pebble and pebble/cobble beaches broken up by bedrock ramps/platforms with boulders. Figure 17 shows a pebble beach on the South side of the island (left) and a bedrock platform with boulders on the East side of the island (right). The supratidal zone was largely bedrock ramp/cliff with some of the pocket beaches being pebble/cobble. The backshore is mostly a wooded/vegetated hill, with a low vegetated dune in the middle "pinch" point of the island.

There are two houses on the west end of the island with a boat dock. A single crab float was observed on the Northeast end of the island.

Ecological resources observed included barnacles, kelp beds, fucus, a few oysters at the pebble/cobble beach on the northside of the island, starfish and seals offshore.

While no specific traditional/cultural uses were known at this shoreline the First Nations representative indicated harvesting urchins and octopus could be done at this location.

Access to the beach from the backshore is possible on the West side of the island but limited on the East end due to heavy vegetation. Alongshore access was possible except for the Northeast end of the island which was all bedrock cliffs. Most of the debris observed consisted of large woody debris with some plastic/garbage in the collection areas of the pocket beaches.

The Shorezone mapping was relatively accurate and appeared to capture the high variability of the shoreline on this small island. Shorezone Biobands also were in agreement with observations, along with visible kelp beds offshore and seals in the nearshore.

3.5 Location G - Race Rocks

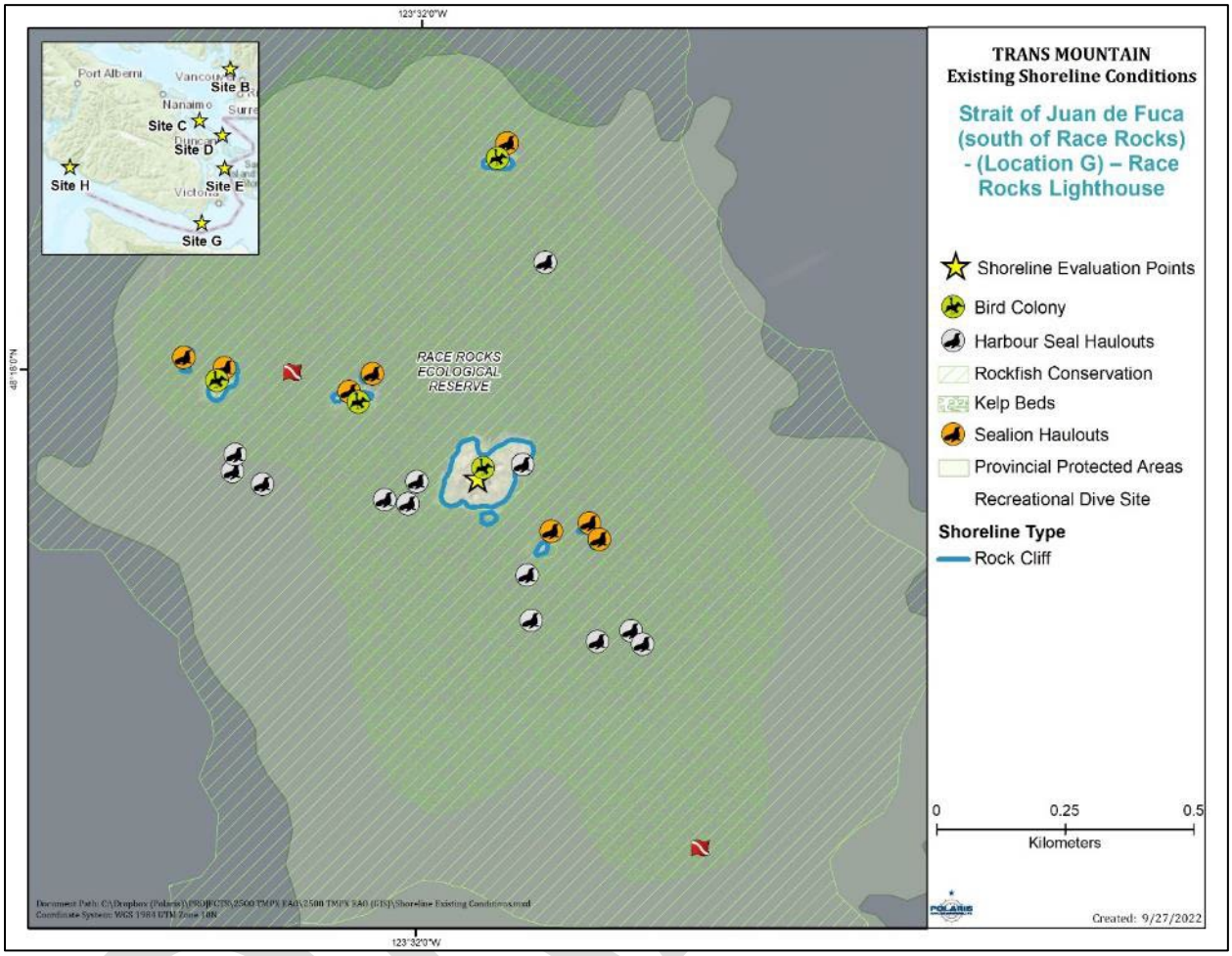

Figure 18. Location G – Race Rocks shoreline site and existing data.

Figure 18 shows the Location G – Race Rocks site with the available existing spatial data. Shoreline data are from the Shorezone mapping effort available from the BC Data Catalogue, which show the shore type consisting of rock cliff. Shorezone Bioband data indicate the presence of barnacles, dark brown kelps, fucus, bull kelp, red algae, surf grass, and Verrucaria. Other data sources indicate offshore kelp beds and multiple seal and sealion haulouts. The Race Rocks Ecological Reserve (RRER) website (https://racerocks.ca/home/) provides more details on ecological resources documented and studied at the site, but not in a spatial format for mapping.

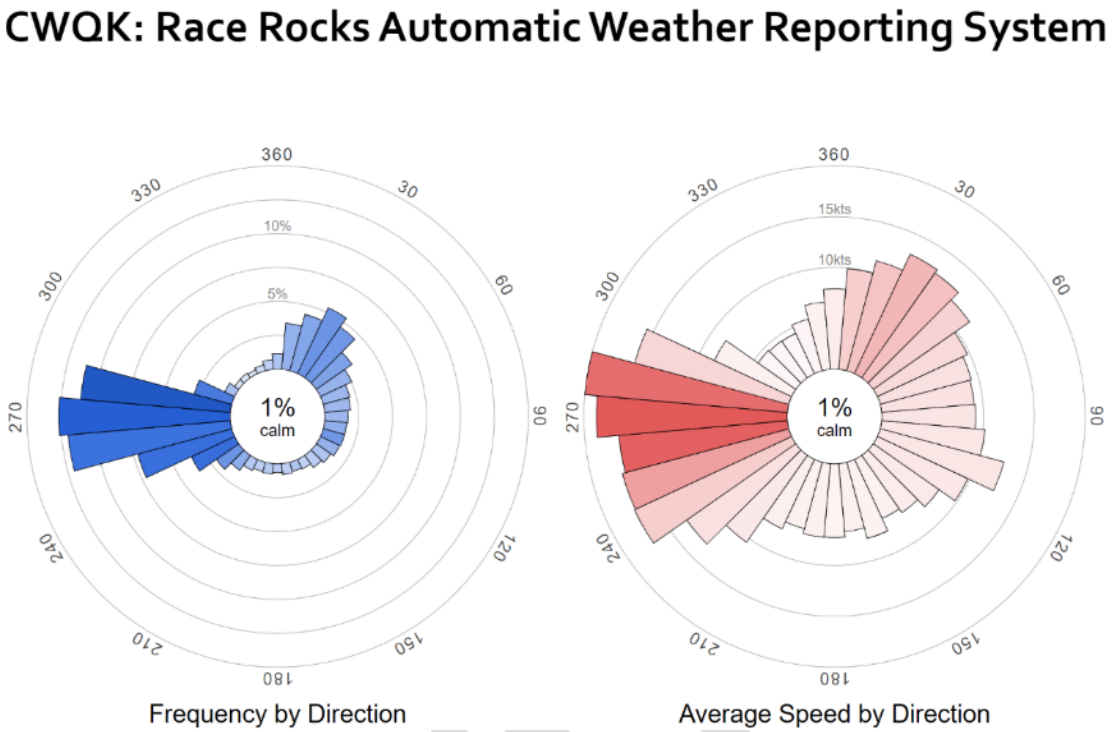

Figure 19. Wind data for Location G (https://windhistory.com/station.html?CWQK).

Predominant wind direction for the year is from the West with average wind speeds from that direction between 15 and 20 kts (Figure 19).

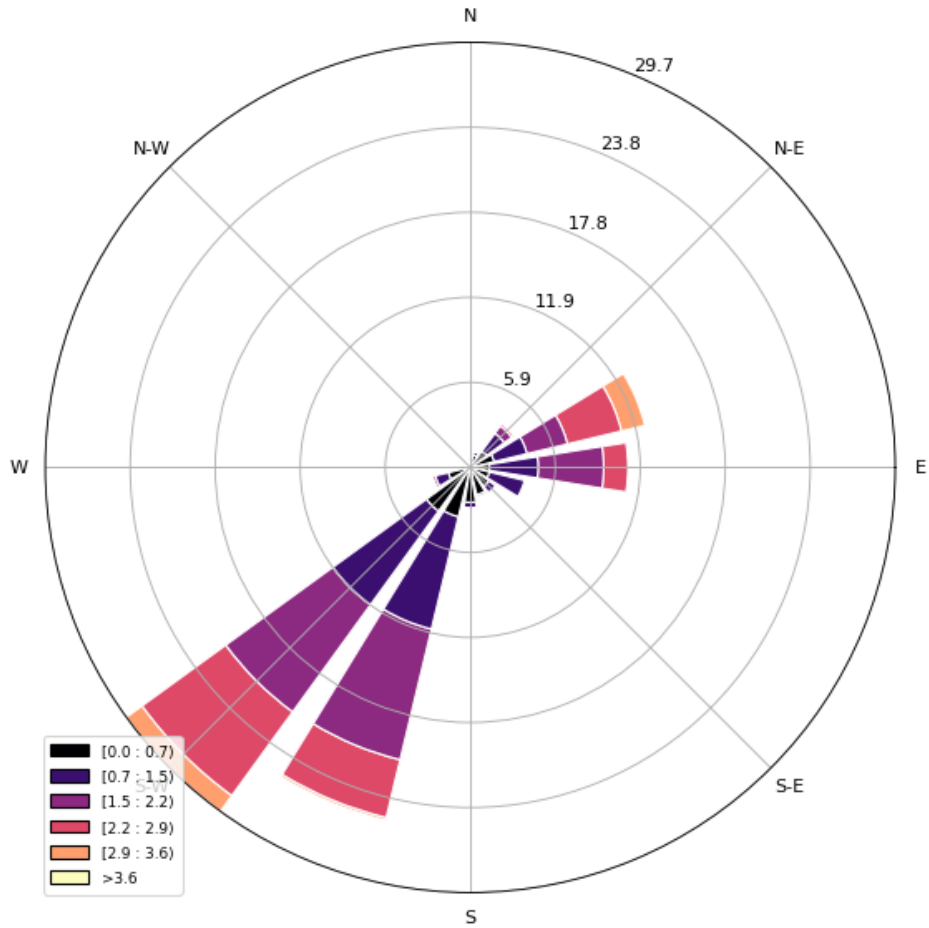

Figure 20. Current rose for Location G, showing modelled nearshore currents speed (m/s) and direction

Predominant current direction is to the Southwest and South-Southwest with most current speeds 2.9 m/s or less (Figure 20).

Figure 21. Photographs from Location G. Photographs from https://racerocks.ca/home/.

Field surveys were not conducted at Race Rocks due to the long lead time in acquiring a "research" permit from BC Parks to access the Ecological Reserve. Information detailed below comes from reviewing the existing data available, Google Earth, the RRER website, and a First Nations representative.

The shoreline at Race Rocks, specifically Great Race Rock, appears to be mostly bedrock cliff, ramp, and platform, possibly with some small pocket pebble/cobble beaches. Bedrock cliffs and ramps are observable in Figure 21 which show some example photographs from the Race Rocks Ecological Reserve website. The backshore appears to be mostly bedrock with some vegetation.

An active lighthouse along with several other buildings are present. Pearson College UWC conducts research and teaches classes at the site. Whale and sightseeing boats frequent the waters around Great Race Rock and are visible from photographs on the Race Rocks website and on Google Earth.

As mentioned before, Race Rocks is a BC Parks Ecological Reserve which are "areas selected to preserve representative and special natural ecosystems, plant and animal species, features and phenomena. Scientific research and educational purposes are the principal uses of ecological reserves"[7]. A wide variety of ecological resources are documented, tracked, and studied at the site. This documentation includes a weekly animal census, annual bird counts, and an entire list of species ever documented with photos/videos since 2000 (https://racerocks.ca/race-rocks-animals-plants/taxonomy-image-gallery/). Additional research conducted at the site can also be found on the RRER website. The extensive use of the site as a haulout location by pinnipeds is documented on the website and visible on Google Earth.

This area has historically been used by First Nations for harvesting food, as documented on the Race Rocks website, and a First Nations representative indicated that fishing is common in the waters around the site. Burial mounds/cairns have been researched and documented on Great Race Rock.

A helicopter pad is located near the lighthouse.

Based on the available data, and without visiting Race Rocks, the Shorezone mapping appears to be relatively accurate. The detailed observation of the flora and fauna on the Race Rocks website and other research conducted by Pearson College provides the most thorough documentation of the ecological resources present compared to any of the other sites visited.

[7] https://bcparks.ca/eco_reserve/

3.6 Location H - Tsusiat Point

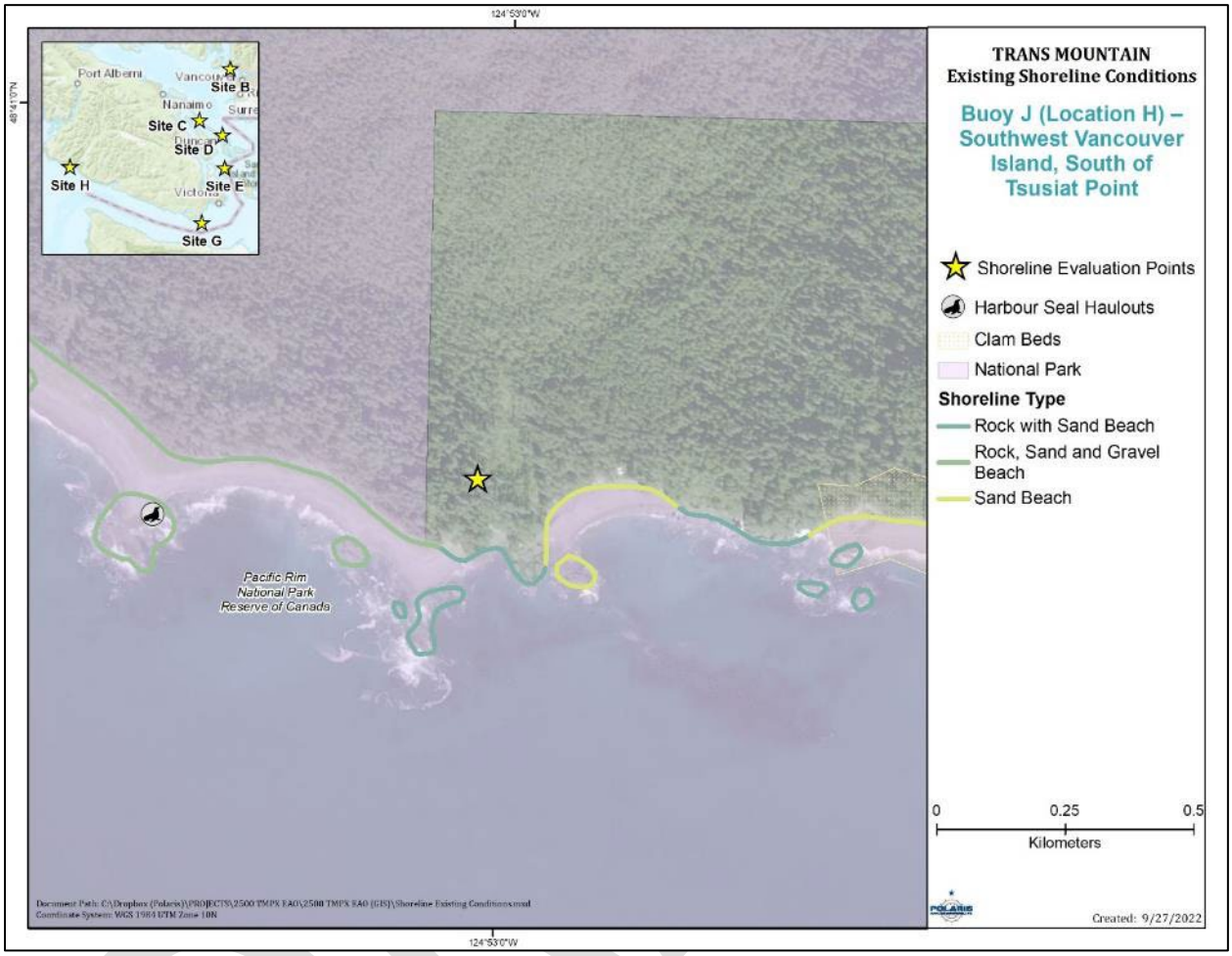

Figure 22. Location H – Tsusiat Point shoreline site and existing data.

Figure 22 shows the Location H – Tsusiat Point site with the available existing spatial data. Shoreline data are from the Shorezone mapping effort available from the BC Data Catalogue, which show the shore type consisting of rock sand and gravel beach, rock with sand beach, and sand beach. At least part of the surveyed area falls within the Pacific Rim National Park Reserve. Shorezone Bioband data indicate the presence of barnacles, dark brown kelp, fucus, blue mussels, bull kelp, giant kelp, Salicornia, surf grass, and Verrucaria. Other data sources indicate a seal haulout and clam bed just to the East.

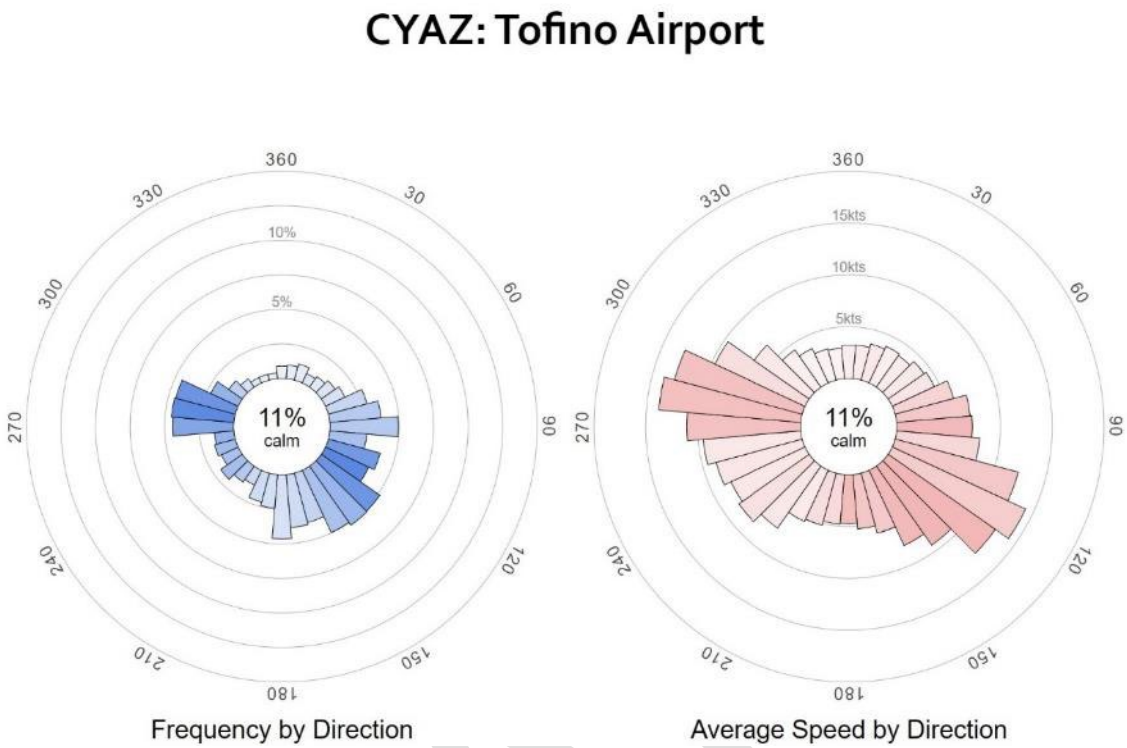

Figure 23. Wind data for Tofino, the closest wind data site on the outer coast to Location G (approx. 90 km to the West) (https://windhistory.com/station.html?CYAZ).

Predominant wind direction for the year is varied with slightly more frequent winds from the West and the Southeast, with average wind speeds from those directions being 10 to 14 kts (Figure 23).

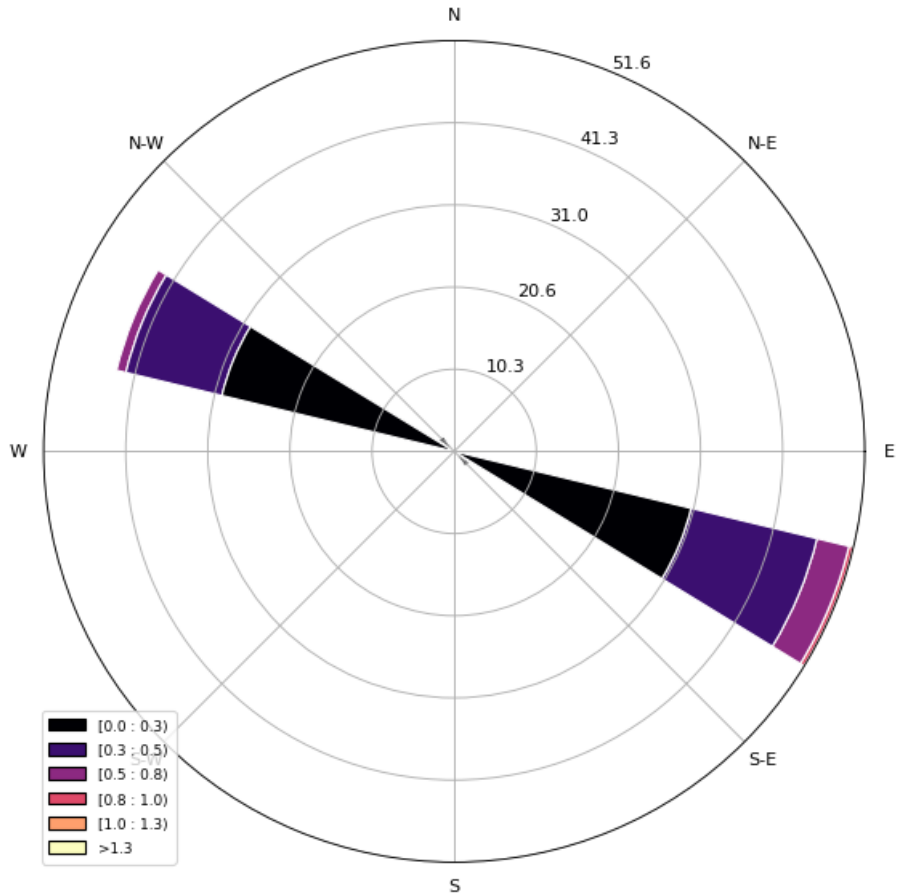

Figure 24. Current rose for Location H, showing modelled nearshore currents speed (m/s) and direction.

Predominant current direction is generally split between the East-Southeast and West-Northwest with most current speeds 0.5 m/s or less (Figure 24).

Figure 25. Photographs from Location H. Sand/pebble beach with bedrock platforms in the lower intertidal zone, looking West (left); sand beach with bedrock platforms in the lower intertidal zone, looking West (right).

The field assessment survey found a wide sand/pebble beach on the Western end of the shoreline segment and a sand beach on the Eastern end of the segment (Figure 25). Bedrock platforms were present in the lower intertidal zone sporadically throughout the survey area. The supratidal zone was largely mixed sediment beach with a couple of bedrock cliffs that bisected the segment. The backshore is vegetated beach dunes and wooded hill.

The entire shoreline is backed by the West Coast Trail which is a 75km trail running from Port Renfrew to Bamfield. Hikers were observed on the beaches around and at shoreline site. The Tsuquanah Patrol cabins are located in the backshore along with some rustic camping platforms and other infrastructure.

Ecological resources observed included bull kelp, large mussel, limpets, urchin (shells), anemones, sealion, and seals. Offshore rafts of seabirds and a whale were observed.

The Tsoxwkwa:da Village historical site has been documented and is present in the backshore near the current location of the patrol cabins. Discussions with First Nations representatives at the patrol cabins indicated that shoreline in this area is used for the harvesting of limpets, clams, and urchins. Dungeness crab is caught all along the coast and long lining for halibut and other ground fish occurs ~2/3 km offshore at the kelp line.

Access to the beach from the water side via vessel is possible but calm winds and low swell are required for safety. Access from the backshore is possible at selected locations from the West Coast Trail, one of these locations being the patrol cabin site. Alongshore access is not possible at higher tides due to bedrock cliffs. Debris on the shoreline consisted of small and large woody debris with some plastic/garbage.

The Shorezone mapping was relatively accurate although the bedrock platforms in the lower intertidal zone are not captured well in the data. Shorezone Biobands data generally agreed with observations.

The kelp beds in the nearshore were not captured in the existing data although they were observed during the surveys and are visible in Google Earth.

4 Discussion

At the time of a spill emergency in coastal waters of BC, or even a substantial threat of a spill, an Incident Management System (IMS) or Incident Command System (ICS) is established per established plans (Responsible Party, RP, plan; Response Organization (RO) response plan) or WCMRC Plan; CCG Marine Oil Pollution Plan; Greater Vancouver Integrated Response Plan, GVIRP). The response management organization utilizes a standard approach to address the many critical issues that start with an incident and evolve through time. IMS or ICS is a standardized on-site management system designed to enable effective, efficient incident management by integrating a combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure (see more details on ICS at ICS Canada.)

4.1 Shoreline Response and the Incident Management System – Responsibilities and Process

Under the Incident Management System (IMS) of spill response, while the initial response to any marine based spill is focused on controlling the source and containing and/or removing floating oil, the shoreline response often demands a greater requirement of resources, effort, and costs. The shoreline component of the response if often more visible, time consuming, and under more scrutiny from responding agencies and the public. Typically, planning and resources are not dedicated to the shoreline response until after oil has become stranded along the shoreline. This delay can often require a rush, and pressure, to quickly staff and support the infrastructure necessary to begin the shoreline response (e.g., Shoreline Response Branch in Operations, treatment resources, Shoreline Cleanup Technique (SCAT) Program, etc.). Additionally, while shoreline treatment planning traditionally is the responsibility of the Environmental Unit (Figure 26), the development of treatment strategies and tactics falls to both the Planning and Operations Sections. A purely operational response can result in increased impacts to the shoreline, increased response costs, and limited communications or miscommunications between the SCAT Program and Operations. Recent incidents have shown, however, that the inclusion of a Shoreline Response Program (SRP) into the IMS at the start of a response can help to address the planning, preparation, training, and response management for the shoreline component.

The objectives and primary functions of the SRP are to (from IPIECA, 2020):

- focus an appropriate level of management and response resources on the shoreline treatment components at the start of the response and, if possible, before oil reaches a threatened shoreline, and maintain span of control through to completion of the SRP;
- manage a SCAT programme as an integral part of the SRP, and liaise with the Operations Section through the SCAT-OPS Liaison process to ensure that STRs are understood and appropriately implemented; and

- manage the inspection of treated shoreline segments, preferably with stakeholder involvement, and manage the removal of approved segments from the response.

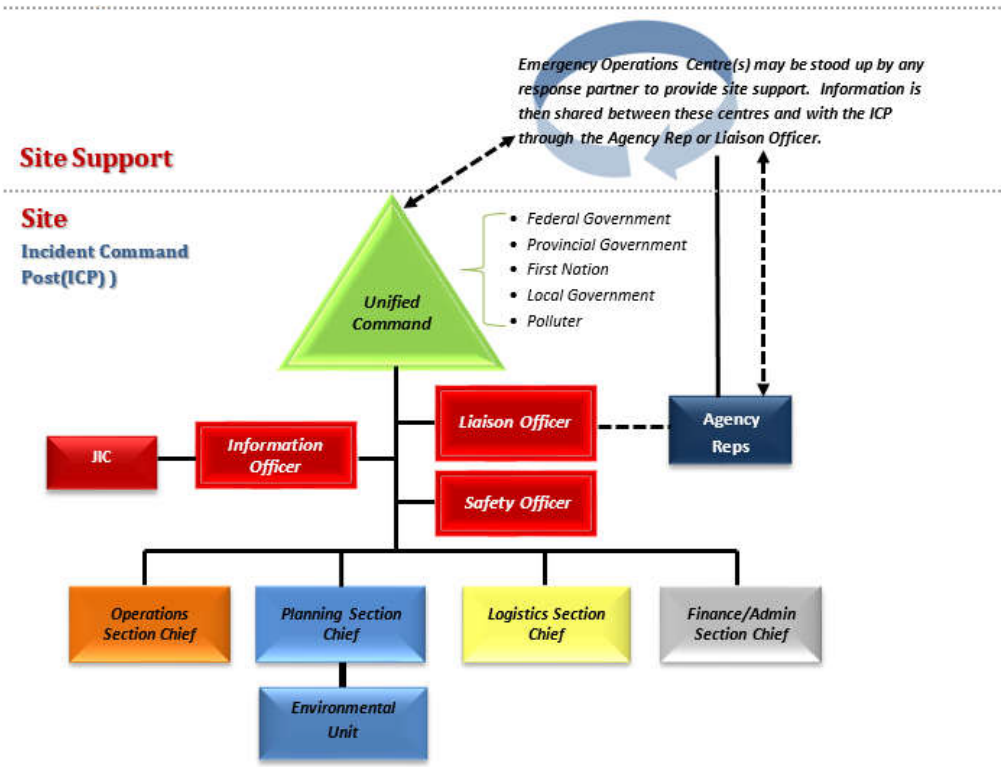

Figure 26 Overview of the ICS Organization (from GVIRP 2021)

As outlined in the Greater Vancouver[8] and Juan de Fuca[9] Integrated Response Plans, the Environmental Unit's (EU) recommendations inform operations and tactics and are brought forward through the Planning Section as part of the Incident Action Plan, and for this reason the SRP should be integrated into the IM within the EU, with the SRP Manager reporting directly to the EU Leader. This allows the SRP to provide overall support and planning to the EU on all shoreline response issues with the key focus areas being to work with members of the IMT, manage the systematic SCAT process, and to recommend strategic plans for the shoreline response. Detailed SRP activities include the creation of the SCAT Program and processing of the resulting SCAT data which are then used to develop shoreline treatment objectives, priorities, clean-up options, constraints, treatment end-point criteria. Shoreline Treatment Recommendations (STRs) are prepared for shoreline sections from these activities and the Environmental Unit reviews and obtains approval for the STRs. The SRP works closely with the Operations Section to make sure the STRs are feasible and properly implemented by the treatment

[8] https://publications.gc.ca/collections/collection_2022/mpo-dfo/Fs154-50-2021-eng.pdf
[9] https://publications.gc.ca/collections/collection_2020/mpo-dfo/Fs154-46-2020-eng.pdf

crews in the field. By providing these products and working closely with the shoreline treatment personnel, the SRP also becomes the connection between the Environmental Unit and Operations Sections improving communication and coordination between the two.

Like all roles within the IMS, the SRP is flexible and scalable. Small scale incidents may have an SRP Manager as a member of a SCAT Field Survey Team and coordinating with the Environmental Unit Leader. As the size of an incident and the number of SCAT Teams increases, additional support personnel will be required including SCAT Data Managers, SCAT Program Managers, STR Managers, and SCAT-OPS Liaisons. The SCAT teams typically will consult with existing information sources, land owners, and land managers on shoreline conditions and characteristics early in a response. While in the field, the SCAT teams verify the background information, if that is available, and also document existing and changing conditions during shoreline response activities.

4.2 Existing Sources of Information and Relevance

One aspect of this report is an assessment of how complete and up to date the existing information sources are relative to what was documented in the field. Considerations during any emergency response are assessing (a) the level confidence in the information that forms the basis of response planning and (b) determining what additional data needs to be collected in real-time. Only limited shoreline features (mostly physical) can be established as from a single dated survey. The key findings from the field surveys relative to existing data are noted in the following.

- In general, the shoreline data were fairly good, the mixed sediment flat extends further to the west at Location B (West Vancouver), and the shoreline is closer to bedrock ramp than bedrock cliff at the Northern Galiano site, but over all the Shorezone data was relatively accurate. The Shorezone data is a valuable source of information during a spill response and, at the very least, provides an initial appreciation of the shorelines potentially affected, which of course would allow for planning of ground surveys and selection of treatment tactics options to be chosen and refined.
- For ecological resources, the Shorezone Bioband data aligned reasonably well with field observations and usually provided more detail than the field teams observed. Location B (West Vancouver) was the only site not documented with Shorezone Bioband data, and many organisms observed during the field visit should have been captured in those data. Other currently available ecological data was sparse with the most relevant data for the surveyed areas being nearshore kelp beds and pinniped haulout areas. The kelp bed layer was accurate at some sites but missing at Location H (Tsusiat Pt.). The pinniped haulout layers should be considered a very general location for the presence of pinnipeds and not exact locations.
- The Race Rocks Ecological Reserve website is a great source of information about that specific location and the research and work being done there. The website would likely not be a tool used during a response, but it does provide a picture of the current condition of the site and could be used as a baseline for post-incident studies.

4.3 Consultation and Real-time Baseline Conditions

As stated in the GVIRP (CCG, 2021), one of the roles of the Environmental Unit Leader is to facilitate discussions in the EU between all participants, stimulate collaboration and strive for reaching a consensus so that recommendations and technical advice can be given to Unified Command for their consideration and approval in a timely manner. Participants in that process include government agencies, Indigenous groups, the polluter, and subject matter experts with direct local knowledge or mandates in resource management, human health, environmental and archeological protection. The joint coordination and input from these participants is fundamental in setting shoreline protection and cleanup priorities and in understanding sensitivities (ecological, cultural, and socio-economic) in consideration of shoreline treatment and cleanup targets (endpoints). Formulating shoreline cleanup plans, shoreline type-specific cleanup targets, and assessing cleanup completion during the SCAT inspection process are basic expected steps in the Response Phase. After meeting cleanup targets, continued monitoring typically takes place in coordination to ensure continued natural attenuation of any residual oil and recovery of the shoreline to conditions similar to those prior to oiling. These latter activities are part of the Recovery Phase, and knowledge of pre-spill shoreline conditions and natural variability are important in assessing recovery.

5 Conclusions and Recommendations

This study provides background information on six sites identified by the Province as part of the BCEAO Condition 39. While Trans Mountain is not an official participant in ship-source spills, the company has undertaken, and continues to undertake, engagement with Indigenous and coastal communities, landowners and other stakeholders with respect to spill preparedness. The existing information available to the response community regarding BC shorelines is robust, well organized, and readily available for consultation and use during oil spill response exercises and actual responses. As with any response, real-time conditions must be assessed and considered in developing shoreline treatment recommendations. Measures of the recovery of a shoreline following an oil spill event and cleanup will benefit from a knowledge base and understanding of pre-existing conditions, natural seasonal variability, and long-term changes that typify the shore.

6 References and Bibliography

CCG 2021, Greater Vancouver Integrated Response Plan for Marine Pollution Incidents, 130pp. https://publications.gc.ca/collections/collection_2022/mpo-dfo/Fs154-50-2021-eng.pdf

CCG, 2020. Juan de Fuca Integrated Response Plan for Marine Pollution Incidents. 38pp. https://publications.gc.ca/collections/collection_2020/mpo-dfo/Fs154-46-2020-eng.pdf

ECCC, 2018. Shoreline Cleanup Assessment Technique (SCAT) Manual - Third Edition. Environment and Climate Change Canada, Ottawa, ON. http://publications.gc.ca/site/eng/9.855598/publication.html

ECCC, A Field Guide to Oil Spill Response on Marine Shorelines. Environment and Climate Change Canada, Ottawa, ON, 223 p., 2016. http://publications.gc.ca/pub?id=9.820227&sl=0

IPIECA, 2016. A guide to oiled shoreline assessment (SCAT) surveys. https://www.ipieca.org/resources/good-practice/a-guide-to-oiled-shoreline-assessment-scat-surveys/

IPIECA-IOGP, Shoreline Response Programme Guidance. A technical support document to accompany the IPIECA-IOGP guidance on oiled shoreline assessment and shoreline clean-up techniques. IOGP Report 635, IPIECA and IOGP, London UK, 74 p., 2020. https://www.ipieca.org/resources/good-practice/shoreline-response-programme-guidance/

Sergy, G. and Owens, E. 2007. Guidelines for Selecting Shoreline Treatment Endpoints for OSR. Emergencies Science and Technology Division, Environment Canada, Ottawa, ON, 30p. http://www.shorelinescat.com/Documents/Manuals/Environment%20Canada%202007%20Endpoint%20Guidelines.pdf

ANNEXES

A. Key Data Sets Accessed and Reviewed

Data Set	Date	Source	Data Set	Date	Source
Physical/Ecological			***Physical/Ecological***		
Shorezone Physical Units	up to 2020	1	Bird Colonies	2004 updated	2
Shoreline mapping (Burrard Inlet)	2017	4	***Protected Areas***		
Shorezone Biobands	up to 2020	1/7	BC Parks, Ecological Reserves and Protected Areas	up to 2021	1
Clam beds	2004	2	National Parks	2017	2
Index site surveys for Olympia oysters	2009 to 2017	4	Oceans Act Marine Protected Areas	2010 updated as needed	4
Shellfish water classification program	2021	4	***Human Use***		
Eelgrasses	2004	2	Fish processor tenures	2008 to 2019	1
Eelgrass	2010	3	Shellfish Hatcheries	2004	1
Kelp beds	2004	2	BC diving sites	2011 updated as needed	4
Bull kelp beds	2010	3	BC marine industrial sites	2011 updated as needed	4
Giant kelp beds	2010	3	BC marine navigational hazards	2011 updated as needed	4
Harbour seal haulouts	2004	2	BC marine kayaking destinations	2011 updated as needed	4
Harbour seal counts and haulouts	1966 to 2019	4	BC marine kayaking routes	2011 updated as needed	4
Stellar sea lion counts/haulouts	1971 to 2013	4	Coastal BC boat launches	2011 updated as needed	1
Sealion haulouts	2004	2	Tourism/recreation/marinas	2011	3
Marine mammal counts	2010	3	Heritage conservation areas	2019	2
Herring spawning	2004	2	Historic environment spatial layer	2017	2
Herring spawning	2009	3	***Administrative boundaries***		
Pacific Herring spawn index	1951 to 2021	4	First Nations treaty lands	2016	2
Herring permanent spawn transects	1960 to 2018	4	Parcel map - crown/municpal/private	various	2
Habitat based est. of salmon productivity	2010	3	***Shoreline Protection***		
Pacific Salmon Conservation Units	2007 to 2020	4	Onwater/Shoreline Protection	2019 to 2021	5
Birds staging areas - flats	2009	3	***Race Rocks Information***		
Important areas for cetaceans in W. Van. Island	2008/ 2009	4	Race Rocks Ecological Reserve website		6

Sources:

1. BC Data Catalogue
2. iMapBC
3. BC Marine Conservation Analysis
4. Open Government Data Portal
5. WCMRC Coastal Mapping Program
6. Race Rocks Ecological Reserve website
7. Coastal and Oceans Resources

B. Photo Records and Links

Photograph	Date/Time	Latitude	Longitude	Caption
Site B - West Vancouver				
Site B_101.jpg	2022-09-11 11:23:00 PDT	49.339790	-123.233340	Itz looking w
Site B_102.jpg	2022-09-11 11:23:46 PDT	49.339783	-123.233359	Looking east
Site B_103.jpg	2022-09-11 11:24:09 PDT	49.339772	-123.233412	Fisheries and ocean Canada
Site B_104.jpg	2022-09-11 11:26:02 PDT	49.339539	-123.233655	Looking west
Site B_105.jpg	2022-09-11 11:26:35 PDT	49.339521	-123.233703	Waterline looking inshore
Site B_106.jpg	2022-09-11 11:27:27 PDT	49.339435	-123.234091	Mussels
Site B_107.jpg	2022-09-11 11:28:27 PDT	49.339365	-123.234491	Sutz looking offshore vessel
Site B_108.jpg	2022-09-11 11:29:42 PDT	49.339262	-123.234659	Boulders litz
Site B_109.jpg	2022-09-11 11:31:42 PDT	49.339198	-123.234990	Seawall Backshore
Site B_110.jpg	2022-09-11 11:33:48 PDT	49.338928	-123.235321	L/m itz
Site B_111.jpg	2022-09-11 11:37:03 PDT	49.338616	-123.236004	Looking e
Site B_112.jpg	2022-09-11 11:37:39 PDT	49.338690	-123.236041	Storm drain?
Site B_113.jpg	2022-09-11 11:38:13 PDT	49.338653	-123.236139	Looking w
Site B_114.jpg	2022-09-11 11:38:44 PDT	49.338573	-123.236251	M/u itz
Site B_115.jpg	2022-09-11 11:40:33 PDT	49.338532	-123.236712	Sutz looking offshore
Site B_116.jpg	2022-09-11 11:42:19 PDT	49.338187	-123.237632	Looking east
Site B_117.jpg	2022-09-11 11:43:56 PDT	49.338179	-123.238169	Clam shell
Site B_118.jpg	2022-09-11 11:44:58 PDT	49.338171	-123.238757	Erwin park
Site B_119.jpg	2022-09-11 11:45:51 PDT	49.338130	-123.238937	Looking west
Site B_120.jpg	2022-09-11 11:46:43 PDT	49.338104	-123.239379	Boulders, Backshore, lwd
Site B_121.jpg	2022-09-11 11:48:28 PDT	49.338060	-123.240389	Looking east
Site B_122.jpg	2022-09-11 11:50:43 PDT	49.338206	-123.241158	At creek looking off shore
Site B_123.jpg	2022-09-11 11:51:16 PDT	49.338224	-123.241204	Creek mouth
Site B_124.jpg	2022-09-11 11:52:21 PDT	49.338401	-123.241528	Creek
Site B_125.jpg	2022-09-11 11:55:45 PDT	49.338363	-123.241677	Looking west
Site B_126.jpg	2022-09-11 11:53:59 PDT	49.338371	-123.242064	Pools in u/s tz
Site B_127.jpg	2022-09-11 11:59:46 PDT	49.338636	-123.242807	Park users
Site B_128.jpg	2022-09-11 12:03:33 PDT	49.338708	-123.243085	Looking west
Site B_129.jpg	2022-09-11 12:05:26 PDT	49.338793	-123.243318	Small creek
Site B_130.jpg	2022-09-11 12:07:21 PDT	49.339455	-123.244086	Looking west
Site B_131.jpg	2022-09-11 12:07:46 PDT	49.339517	-123.244140	Looking east
Site B_132.jpg	2022-09-11 12:12:34 PDT	49.340066	-123.244524	Sand pebble flat
Site B_133.jpg	2022-09-11 12:15:08 PDT	49.340128	-123.244933	Looking east
Site B_134.jpg	2022-09-11 12:15:28 PDT	49.340182	-123.244834	
Site B_135.jpg	2022-09-11 12:28:07 PDT	49.338379	-123.240842	More natural dune Backshore
Site B_201.jpg	2022-09-11 11:46:34 PDT	49.339777	-123.233270	Along shore east, end of survey area
Site B_202.jpg	2022-09-11 11:21:05 PDT	49.339726	-123.233305	Along shore West
Site B_203.jpg	2022-09-11 11:22:09 PDT	49.339710	-123.233355	Mussels

Photograph	Date/Time	Latitude	Longitude	Caption
Site B_204.jpg	2022-09-11 11:23:15 PDT	49.339704	-123.233306	LITZ wear
Site B_205.jpg	2022-09-11 11:24:39 PDT	49.339600	-123.233453	Built backshore
Site B_206.jpg	2022-09-11 11:26:37 PDT	49.339704	-123.233665	
Site B_207.jpg	2022-09-11 11:29:48 PDT	49.339469	-123.234940	Mussels
Site B_208.jpg	2022-09-11 11:36:23 PDT	49.339222	-123.235803	Along shore West
Site B_209.jpg	2022-09-11 11:37:38 PDT	49.339138	-123.236060	Embedded oyster
Site B_210.jpg	2022-09-11 11:40:53 PDT	49.338458	-123.236330	Along shore west
Site B_211.jpg	2022-09-11 11:43:49 PDT	49.338564	-123.237766	Field of mussels
Site B_212.jpg	2022-09-11 11:46:17 PDT	49.338582	-123.239127	Kelly fish?
Site B_213.jpg	2022-09-11 11:47:35 PDT	49.338161	-123.238850	Mussels and oysters
Site B_214.jpg	2022-09-11 11:50:08 PDT	49.338759	-123.239805	Along shore east
Site B_215.jpg	2022-09-11 11:49:55 PDT	49.337905	-123.240359	Along shore west
Site B_216.jpg	2022-09-11 11:52:29 PDT	49.338943	-123.241496	River outflow
Site B_217.jpg	2022-09-11 11:53:34 PDT	49.338841	-123.240762	Ducks
Site B_218.jpg	2022-09-11 12:10:36 PDT	49.338900	-123.240184	Black birds with red beak Oyster Catcher
Site B_219.jpg	2022-09-11 12:10:17 PDT	49.339441	-123.241027	Gulls
Site B_220.jpg	2022-09-11 12:10:14 PDT	49.339070	-123.241347	Along shore
Site B_221.jpg	2022-09-11 12:03:37 PDT	49.338669	-123.243408	Pebble beach east
Site B_222.jpg	2022-09-11 12:07:22 PDT	49.338865	-123.243993	Canadian geeses
Site B_223.jpg	2022-09-11 12:15:57 PDT	49.340490	-123.244996	Along shore east
Site B_224.jpg	2022-09-11 12:28:42 PDT	49.338204	-123.240468	Along shore west
Site B_225.jpg	2022-09-11 12:28:59 PDT	49.338203	-123.240427	Along shore east
Site C - Northeast Galiano Island				
Site C_101.jpg	2022-09-08 08:41:42 PDT	48.989366	-123.549935	Start, looking N
Site C_102.jpg	2022-09-08 08:47:45 PDT	48.989636	-123.550248	Intertidal, looking east
Site C_103.jpg	2022-09-08 08:51:06 PDT	48.990037	-123.550588	Looking nw
Site C_104.jpg	2022-09-08 08:51:34 PDT	48.990217	-123.550650	Looking se
Site C_105.jpg	2022-09-08 08:55:24 PDT	48.990812	-123.551096	Itz, fucus, algae, mussels
Site C_106.jpg	2022-09-08 08:55:47 PDT	48.990821	-123.551082	Itz looking north
Site C_107.jpg	2022-09-08 08:57:55 PDT	48.990833	-123.551094	Sutz, Backshore looking n
Site C_108.jpg	2022-09-08 09:00:45 PDT	48.991710	-123.552119	Tide pool in u/m itz
Site C_109.jpg	2022-09-08 09:01:41 PDT	48.991994	-123.552233	Cabins/rvs in backshore
Site C_110.jpg	2022-09-08 09:04:10 PDT	48.992490	-123.553022	Pocket pebble beach, looking n
Site C_111.jpg	2022-09-08 09:06:31 PDT	48.992719	-123.553710	Pocket pebble/sand beach looking s
Site C_112.jpg	2022-09-08 09:08:21 PDT	48.992943	-123.553895	Working, looking n
Site C_113.jpg	2022-09-08 09:10:07 PDT	48.993336	-123.554051	Looking n
Site C_114.jpg	2022-09-08 09:12:42 PDT	48.994090	-123.554279	Tidepool/mussels
Site C_115.jpg	2022-09-08 09:13:07 PDT	48.994161	-123.554136	Looking N, itz
Site C_116.jpg	2022-09-08 09:13:46 PDT	48.994157	-123.554117	Looking back at p/s cove, cabins in backshore
Site C_117.jpg	2022-09-08 09:18:03 PDT	48.995178	-123.555107	Itz, looking n

Photograph	Date/Time	Latitude	Longitude	Caption
Site C_118.jpg	2022-09-08 09:18:28 PDT	48.995180	-123.555017	Itz looking s
Site C_119.jpg	2022-09-08 09:24:16 PDT	48.996313	-123.556416	North end looking n
Site C_120.jpg	2022-09-08 09:24:54 PDT	48.996334	-123.556413	North end looking s
Site C_121.jpg	2022-09-08 09:25:45 PDT	48.996340	-123.556385	Itz looking east
Site C_122.jpg	2022-09-08 09:31:28 PDT	48.994938	-123.555016	Itz looking e
Site C_123.jpg	2022-09-08 09:31:49 PDT	48.994861	-123.554874	Backshore looking s
Site C_124.jpg	2022-09-08 09:44:20 PDT	48.990353	-123.550678	Lower tide, pebble/Cobble Beach between offshore platforms
Site C_201.jpg	2022-09-08 08:42:00 PDT	48.989352	-123.549874	Along shore
Site C_202.jpg	2022-09-08 08:44:10 PDT	48.989313	-123.549913	Gulls
Site C_203.jpg	2022-09-08 08:46:47 PDT	48.989460	-123.550092	Mussels
Site C_204.jpg	2022-09-08 08:49:19 PDT	48.989964	-123.550220	Along short
Site C_205.jpg	2022-09-08 08:51:22 PDT	48.989885	-123.550263	Wood debris
Site C_206.jpg	2022-09-08 08:53:36 PDT	48.990471	-123.550659	Small fish
Site C_207.jpg	2022-09-08 08:56:02 PDT	48.990914	-123.551123	Bedrock structure
Site C_208.jpg	2022-09-08 09:00:22 PDT	48.991733	-123.552046	Crab
Site C_209.jpg	2022-09-08 09:04:00 PDT	48.992030	-123.552138	Along shore
Site C_210.jpg	2022-09-08 09:08:03 PDT	48.993119	-123.553725	Sure C and pocket beach
Site C_211.jpg	2022-09-08 09:11:53 PDT	48.994106	-123.554219	Oyster
Site C_212.jpg	2022-09-08 09:14:38 PDT	48.994288	-123.554319	Tidal pool
Site C_213.jpg	2022-09-08 09:18:12 PDT	48.994278	-123.554452	Along shore
Site C_214.jpg	2022-09-08 09:19:42 PDT	48.995194	-123.555097	Baby crab
Site C_215.jpg	2022-09-08 09:24:55 PDT	48.996402	-123.556399	Survey team
Site C_216.jpg	2022-09-08 09:25:16 PDT	48.996402	-123.556365	Along shore
Site C_217.jpg	2022-09-08 09:25:36 PDT	48.996415	-123.556339	Along shore
Site C_218.jpg	2022-09-08 09:44:24 PDT	48.990317	-123.550660	Survey Team
Site C_219.jpg	2022-09-08 09:44:42 PDT	48.990316	-123.550632	Outcrop
Site D - Eastern Gossip Island				
Site D_101.jpg	2022-09-07 09:49:34 PDT	48.894630	-123.324084	North start
Site D_102.jpg	2022-09-07 09:51:54 PDT	48.894590	-123.323736	Itz
Site D_103.jpg	2022-09-07 09:55:01 PDT	48.894454	-123.323138	Looking s
Site D_104.jpg	2022-09-07 09:55:24 PDT	48.894417	-123.323088	Looking n
Site D_105.jpg	2022-09-07 09:57:54 PDT	48.894097	-123.322481	Back shore homes
Site D_106.jpg	2022-09-07 09:58:36 PDT	48.894025	-123.322367	Mussel shells
Site D_107.jpg	2022-09-07 10:03:38 PDT	48.893002	-123.321118	North
Site D_108.jpg	2022-09-07 10:05:05 PDT	48.892690	-123.320669	South
Site D_109.jpg	2022-09-07 10:10:07 PDT	48.891996	-123.320302	North
Site D_110.jpg	2022-09-07 10:10:30 PDT	48.891968	-123.320257	South
Site D_111.jpg	2022-09-07 10:11:09 PDT	48.891926	-123.320143	Itz
Site D_112.jpg	2022-09-07 10:11:35 PDT	48.891910	-123.320005	Foot access from back shore
Site D_113.jpg	2022-09-07 10:15:19 PDT	48.891576	-123.318129	Looking north

Photograph	Date/Time	Latitude	Longitude	Caption
Site D_114.jpg	2022-09-07 10:15:48 PDT	48.891602	-123.318074	P/c beach in cove
Site D_115.jpg	2022-09-07 10:18:55 PDT	48.891128	-123.316580	Looking north
Site D_116.jpg	2022-09-07 10:19:18 PDT	48.891079	-123.316440	South
Site D_117.jpg	2022-09-07 10:19:50 PDT	48.891081	-123.316416	West back into southern cove
Site D_118.jpg	2022-09-07 10:24:31 PDT	48.890744	-123.317487	Southern cove
Site D_119.jpg	2022-09-07 10:25:07 PDT	48.890747	-123.317501	Southern cove, Oyster shells
Site D_120.jpg	2022-09-07 10:25:40 PDT	48.890753	-123.317655	Southern cove looking north
Site D_201.jpg	2022-09-07 09:48:03 PDT	48.894633	-123.324035	
Site D_202.jpg	2022-09-07 09:48:17 PDT	48.894683	-123.323969	
Site D_203.jpg	2022-09-07 09:48:29 PDT	48.894677	-123.323970	
Site D_204.jpg	2022-09-07 09:50:24 PDT	48.894402	-123.323788	
Site D_205.jpg	2022-09-07 09:51:21 PDT	48.894634	-123.323799	
Site D_206.jpg	2022-09-07 09:52:31 PDT	48.894533	-123.323319	
Site D_207.jpg	2022-09-07 09:56:03 PDT	48.894566	-123.323066	
Site D_208.jpg	2022-09-07 09:53:47 PDT	48.894189	-123.323296	
Site D_209.jpg	2022-09-07 09:55:01 PDT	48.894458	-123.322977	
Site D_210.jpg	2022-09-07 09:55:15 PDT	48.894415	-123.322650	
Site D_211.jpg	2022-09-07 09:56:22 PDT	48.894246	-123.322422	
Site D_213.jpg	2022-09-07 09:57:18 PDT	48.894140	-123.322304	
Site D_214.jpg	2022-09-07 09:57:45 PDT	48.894125	-123.322317	Rocky Intertidal, mussels and birds
Site D_215.jpg	2022-09-07 09:58:51 PDT	48.894103	-123.322297	Opened mussels
Site D_216.jpg	2022-09-07 10:03:42 PDT	48.893565	-123.321673	RI
Site D_217.jpg	2022-09-07 10:07:04 PDT	48.892691	-123.320534	Otter
Site D_218.jpg	2022-09-07 10:08:45 PDT	48.892715	-123.320493	Point location of site D
Site D_219.jpg	2022-09-07 10:09:47 PDT	48.892505	-123.320624	Historic tar
Site D_220.jpg	2022-09-07 10:10:04 PDT	48.892359	-123.320521	Historic tar
Site D_221.jpg	2022-09-07 10:12:38 PDT	48.892352	-123.320521	Tar, weathered and hard
Site D_222.jpg	2022-09-07 10:15:31 PDT	48.891665	-123.318316	Clam
Site D_223.jpg	2022-09-07 10:17:11 PDT	48.891708	-123.317760	
Site D_224.jpg	2022-09-07 10:20:11 PDT	48.891133	-123.316441	
Site D_225.jpg	2022-09-07 10:20:24 PDT	48.891149	-123.316481	
Site D_226.jpg	2022-09-07 10:24:07 PDT	48.890782	-123.317696	Oyster and clams
Site D_227.jpg	2022-09-07 10:34:11 PDT	48.889514	-123.321968	
Site E - North Comet Island				
Site E_101.jpg	2022-09-07 11:37:02 PDT	48.670198	-123.299966	Looking east
Site E_102.jpg	2022-09-07 11:41:59 PDT	48.669954	-123.299834	East
Site E_103.jpg	2022-09-07 11:43:00 PDT	48.669826	-123.299817	Northern cove
Site E_104.jpg	2022-09-07 11:44:13 PDT	48.669627	-123.299591	North
Site E_105.jpg	2022-09-07 11:48:48 PDT	48.670190	-123.298406	Looking west in north cove
Site E_106.jpg	2022-09-07 11:54:36 PDT	48.669325	-123.298869	South Beach looking west

Photograph	Date/Time	Latitude	Longitude	Caption
Site E_107.jpg	2022-09-07 11:55:12 PDT	48.669283	-123.298834	South Beach looking east
Site E_108.jpg	2022-09-07 11:58:31 PDT	48.668860	-123.297940	Looking east
Site E_109.jpg	2022-09-07 12:00:18 PDT	48.669006	-123.297610	South side, sand beach
Site E_110.jpg	2022-09-07 12:02:27 PDT	48.669070	-123.296746	Southern sand beach looking west
Site E_111.jpg	2022-09-07 12:06:50 PDT	48.668671	-123.295604	
Site E_112.jpg	2022-09-07 12:08:32 PDT	48.668784	-123.295233	East end looking north
Site E_113.jpg	2022-09-07 12:11:09 PDT	48.669019	-123.295427	East end looking north
Site E_114.jpg	2022-09-07 12:15:09 PDT	48.669323	-123.294629	East end looking north
Site E_115.jpg	2022-09-07 12:23:47 PDT	48.669581	-123.294609	Looking west, crab pot
Site E_116.jpg	2022-09-07 12:30:21 PDT	48.670172	-123.294390	
Site E_117.jpg	2022-09-07 12:30:44 PDT	48.670278	-123.294535	
Site E_118.jpg	2022-09-07 12:31:11 PDT	48.670408	-123.294952	
Site E_119.jpg	2022-09-07 12:32:27 PDT	48.670805	-123.296544	
Site E_120.jpg	2022-09-07 12:32:45 PDT	48.670825	-123.296835	
Site E_201.jpg	2022-09-07 11:36:53 PDT	48.670262	-123.300033	Harbor Seals
Site E_202.jpg	2022-09-07 11:37:43 PDT	48.670192	-123.299936	
Site E_203.jpg	2022-09-07 11:38:13 PDT	48.670140	-123.299979	Intertidal and backshore
Site E_204.jpg	2022-09-07 11:41:39 PDT	48.670076	-123.299970	
Site E_205.jpg	2022-09-07 11:41:49 PDT	48.669926	-123.299938	
Site E_206.jpg	2022-09-07 11:42:54 PDT	48.669989	-123.299833	Oysters
Site E_207.jpg	2022-09-07 11:44:53 PDT	48.669994	-123.299805	
Site E_208.jpg	2022-09-07 11:50:25 PDT	48.670014	-123.298748	Bayou
Site E_209.jpg	2022-09-07 11:54:38 PDT	48.669880	-123.298227	Along Shore
Site E_210.jpg	2022-09-07 11:55:13 PDT	48.669352	-123.298921	Along shore
Site E_211.jpg	2022-09-07 11:56:15 PDT	48.669265	-123.298883	Lower intertidal
Site E_212.jpg	2022-09-07 11:57:58 PDT	48.669140	-123.298675	Rocky Intertidal
Site E_213.jpg	2022-09-07 11:58:36 PDT	48.668796	-123.298230	Rocky intertidal
Site E_214.jpg	2022-09-07 12:00:55 PDT	48.669010	-123.297516	
Site E_215.jpg	2022-09-07 12:02:53 PDT	48.669036	-123.297399	Cove beach
Site E_216.jpg	2022-09-07 12:05:24 PDT	48.668961	-123.296747	Crab
Site E_217.jpg	2022-09-07 12:06:28 PDT	48.668782	-123.296282	Across Shore
Site E_218.jpg	2022-09-07 12:10:34 PDT	48.669001	-123.295305	Large kelp bed
Site E_219.jpg	2022-09-07 12:15:05 PDT	48.669253	-123.294594	Star fish
Site E_220.jpg	2022-09-07 12:30:02 PDT	48.669866	-123.294243	Across shore
Site E_221.jpg	2022-09-07 12:30:43 PDT	48.670019	-123.294393	Across shore
Site H - Tsusiat Point				
Site H_101.jpg	2022-09-10 09:35:02 PDT	48.676724	-124.890565	Northern 500m start, looking s
Site H_102.jpg	2022-09-10 09:35:43 PDT	48.676723	-124.890562	Bedrock platform in litz
Site H_103.jpg	2022-09-10 09:36:15 PDT	48.676697	-124.890454	Pebble beach itz
Site H_104.jpg	2022-09-10 09:36:52 PDT	48.676617	-124.890269	Mussels on bedrock platform

Photograph	Date/Time	Latitude	Longitude	Caption
Site H_105.jpg	2022-09-10 09:37:21 PDT	48.676597	-124.890231	Bedrock platform
Site H_106.jpg	2022-09-10 09:38:45 PDT	48.676595	-124.889954	At waterline looking to backshore
Site H_107.jpg	2022-09-10 09:39:41 PDT	48.676591	-124.889122	Itz looking n
Site H_108.jpg	2022-09-10 09:40:28 PDT	48.676679	-124.888850	Sutz looking s
Site H_109.jpg	2022-09-10 09:42:13 PDT	48.676651	-124.888101	Trail markers
Site H_110.jpg	2022-09-10 09:43:51 PDT	48.676433	-124.887427	Sutz/Backshore looking n
Site H_111.jpg	2022-09-10 09:44:46 PDT	48.676217	-124.887103	Bedrock platforms
Site H_112.jpg	2022-09-10 09:46:38 PDT	48.675688	-124.886680	Limpets
Site H_113.jpg	2022-09-10 09:47:52 PDT	48.675470	-124.886169	Itz looking n
Site H_114.jpg	2022-09-10 09:50:20 PDT	48.675291	-124.885225	Plastic
Site H_115.jpg	2022-09-10 09:51:10 PDT	48.675283	-124.885158	Looking s
Site H_116.jpg	2022-09-10 09:52:19 PDT	48.675297	-124.884194	Mussels
Site H_117.jpg	2022-09-10 10:00:25 PDT	48.676806	-124.887064	Backshore trail access
Site H_118.jpg	2022-09-10 10:05:45 PDT	48.676049	-124.883784	Pocket beach inaccessible at tide
Site H_119.jpg	2022-09-10 10:13:23 PDT	48.677644	-124.880565	Cabin
Site H_120.jpg	2022-09-10 10:18:41 PDT	48.676011	-124.881467	Southern headland to cove
Site H_121.jpg	2022-09-10 10:20:44 PDT	48.675758	-124.882183	Rocky headland to South of cove
Site H_122.jpg	2022-09-10 10:21:55 PDT	48.675778	-124.882177	Sand beach to south
Site H_123.jpg	2022-09-10 10:22:53 PDT	48.675883	-124.882053	Seacaves in sutz
Site H_124.jpg	2022-09-10 10:23:34 PDT	48.676097	-124.881872	Sand Backshore, creek, huts
Site H_125.jpg	2022-09-10 10:24:18 PDT	48.676347	-124.881478	Looking s
Site H_126.jpg	2022-09-10 10:25:11 PDT	48.676354	-124.880794	Looking s
Site H_127.jpg	2022-09-10 10:25:48 PDT	48.676402	-124.880414	Itz intertidal
Site H_128.jpg	2022-09-10 10:26:41 PDT	48.676718	-124.879936	Sutz looking n
Site H_129.jpg	2022-09-10 10:27:59 PDT	48.676683	-124.879725	Rocky cliff Backshore southern end looking s
Site H_130.jpg	2022-09-10 10:28:47 PDT	48.676589	-124.879271	Itz looking out to sea
Site H_131.jpg	2022-09-10 10:30:06 PDT	48.676468	-124.878262	Looking n
Site H_132.jpg	2022-09-10 10:30:30 PDT	48.676416	-124.878083	Looking s
Site H_133.jpg	2022-09-10 10:31:22 PDT	48.676305	-124.877257	South end looking n
Site H_134.jpg	2022-09-10 10:32:58 PDT	48.676402	-124.878589	Looking n
Site H_201.jpg	2022-09-10 09:29:58 PDT	48.676517	-124.888549	Tracks in sand
Site H_202.jpg	2022-09-10 09:31:38 PDT	48.676508	-124.888654	Survey start
Site H_203.jpg	2022-09-10 09:32:16 PDT	48.676585	-124.890443	Mussels
Site H_204.jpg	2022-09-10 09:32:48 PDT	48.676593	-124.890447	Intertidal life
Site H_205.jpg	2022-09-10 09:33:35 PDT	48.676606	-124.890573	Along shore east
Site H_206.jpg	2022-09-10 09:36:18 PDT	48.676634	-124.890629	Shellfish
Site H_207.jpg	2022-09-10 09:37:35 PDT	48.676543	-124.890668	Intertidal
Site H_208.jpg	2022-09-10 09:40:52 PDT	48.676445	-124.888748	Along shore west
Site H_209.jpg	2022-09-10 09:40:45 PDT	48.676446	-124.888738	Along shore east
Site H_210.jpg	2022-09-10 09:41:28 PDT	48.676370	-124.888511	West cost trail markers, recreational

Photograph	Date/Time	Latitude	Longitude	Caption
Site H_211.jpg	2022-09-10 09:44:20 PDT	48.676401	-124.888190	Rocky outcrop looking west
Site H_212.jpg	2022-09-10 09:45:39 PDT	48.675655	-124.886964	Rocky outcrop looking south east
Site H_213.jpg	2022-09-10 09:47:08 PDT	48.675631	-124.886556	Mussels and birds
Site H_214.jpg	2022-09-10 09:48:24 PDT	48.675617	-124.886428	Sea lion
Site H_215.jpg	2022-09-10 10:06:08 PDT	48.676123	-124.883481	Pocket beach, photo from trail
Site H_216.jpg	2022-09-10 10:13:55 PDT	48.677498	-124.880014	Cabin
Site H_217.jpg	2022-09-10 10:16:33 PDT	48.676808	-124.880391	Backshore access
Site H_218.jpg	2022-09-10 10:26:17 PDT	48.676596	-124.880329	Along shore west
Site H_219.jpg	2022-09-10 10:26:40 PDT	48.676549	-124.880295	Along shore South east
Site H_220.jpg	2022-09-10 10:26:59 PDT	48.676560	-124.880238	Cabins
Site H_221.jpg	2022-09-10 10:30:35 PDT	48.676399	-124.878243	Along shore west
Site H_222.jpg	2022-09-10 10:31:00 PDT	48.676374	-124.878125	Along shore east