



# ENVIRONMENTAL & MARINE BIOPHYSICAL ASSESSMENT

360 ARBUTUS AVE  
DUNCAN, BC

PREPARED FOR:

SOMENOS CONSTRUCTION  
6401 GENOA BAY RD  
DUNCAN, BC V9L 5Y3

AND

MUNICIPALITY OF NORTH COWICHAN  
7030 TRANS-CANADA HWY  
DUNCAN, BC V9L 6A1

CORVIDAE PROJECT #2023-147  
JANUARY 2024



6526 WATER STREET, SOOKE, BC

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**CAVEAT**

This Environmental Assessment and Marine Biophysical Assessment (EA and MBA) has been prepared with the best information available at the time of writing, including the Municipality of North Cowichan Official Community Plan, communications with the client and regulators, a site visit, review of site plans and design drawings and other documentation relevant to the project. This report has been developed to assist the project in remaining in compliance with relevant environmental regulations, acts and laws pertaining to the project and to identify and mitigate the expected impacts of the project.



# 1 INTRODUCTION

Corvidae Environmental Consulting Inc. (Corvidae) was retained by Somenos Construction Ltd. (Somenos) to complete an Environmental Assessment (EA) and Marine Biophysical Assessment (MBA), for the proposed development at 360 Arbutus Ave (project location referred to as the Site) located off Maple Bay in Duncan, B.C (PID: 000-296-449, Lot 1, Plan VIP 34591, latitude 48.82126° N, longitude -123.58980° W). The Site, located within the Municipality of North Cowichan, is approximately 0.75 acres (0.3 ha) in size and is zoned as Rural Residential (R-1). The foreshore area is zoned as Private Residence Water Zone (W1).

This assessment is crucial for understanding the ecological health of the Site and informing decision-making processes to protect the marine and terrestrial environment during development.

The purpose of this report is to:

- Describe the biophysical conditions of the Site;
- Assess any project-related effects on the environment;
- Prescribe measures to mitigate any potential effects to terrestrial and marine habitat; and
- Satisfy the federal *Fisheries Act* and *Species at Risk Act* requirements.

This report provides an assessment on the environmental conditions of the Site, potential impacts of proposed development, and recommendations on the protection of environmentally sensitive features and methods to minimize environmental impacts.

## 1.1 PROJECT DESCRIPTION

The homeowners are proposing the following improvements to the property:

- Renovate the existing house (interior and exterior), including the decks.
  - On the southeast side of the existing home, facing the waterfront, there are two existing decks that are adjacent to each other. The deck that is covered would likely be replaced with concrete and the deck that is exposed would likely be replaced with vinyl or an open deck material.
- Stormwater drainage improvements to alleviate previous flooding issue.
  - The property is steeply sloped southwest towards the ocean. Somenos notified Corvidae of previously flooding issues where surface water overwhelmed the existing infrastructure and flooded into the house. Ryzuk Geotechnical (Ryzuk) was onsite on November 17<sup>th</sup> to conduct a geotechnical inspection of the existing stormwater network onsite and discuss upgrades to prevent future flooding. Ryzuk will be preparing a geotechnical report to outline the proposed stormwater upgrades to the Site. Upgrades discussed onsite include installing new catch basins and California drains, reshaping the driveway, installing a 12-16" HDPE pipe underneath the house where an existing drainage ditch runs, and rerouting where this drainage ditch discharges to the foreshore ~2 m east to help alleviate slope creep issues. Somenos also expressed interest in stabilizing an approximately 3 m length bank along the foreshore with a boulder wall with geotextile and drain rock in behind that would be less than 2 m in height. The area shows signs of slope creep and minor erosion as two drainages flow through the area and groundwater also seeps out of the bank.



- Driveway repair.
- Landscaping.
  - Limited vegetation is present within the foreshore area due to the rocky terrain. Above the existing stairwell is a dense patch of Rocky Mountain Juniper. The owners are interested in replacing the juniper with other native species that are more aesthetically-pleasing.
- Waterfront access – repair or rebuild beach stairs, minor repair to gazebo and pour of a concrete pad above the highwater mark. Future development may include a mooring buoy and as well as a dock, if the moratorium on foreshore leases has been lifted.
  - The owners would like to repair/replace and extend the stairs within the foreshore area to connect to the new decking. The existing stairs are concrete and narrow and would likely be replaced with wider, stone stairs that resemble the foreshore stairs of the neighbouring residence.
  - A cast-in-place concrete pad would be required for a future ramp to attach to a future dock. The concrete pad would be located on the rock outcropping, approximately 2 meters above the highwater mark. The size of the pad is expected to be 2 m x 2 m x 0.5 m thick, to be confirmed by the dock designer/engineer.

The Site location and project features are illustrated in Figures 1 and 2.





Site Location and Environmental Features

- Property Boundary
- Parcel Boundary



0 15 30 60 Meters  
 Project: 2800 Kingsley Road | Sources: Cowichan Valley Regional District

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



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 COR-2023-149

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|--------|-------------------|
| 0      | December 19, 2023 |
|        |                   |
|        |                   |

Figure 1



## 1.2 REGULATORY FRAMEWORK

This environmental assessment is designed to comply with the provisions set out in the Municipality of North Cowichan Bylaw No. 3900 – North Cowichan Official Community Plan (OCP), Schedule A, and for compliance with the provisions for environmental protection contained in the following relevant legislation:

### Municipal

- Municipality of North Cowichan Zoning Bylaw No. 2950 (2023).
- Municipality of North Cowichan Bylaw No. 3900, Schedule A: Section 10 – Development Permit Areas (2022):

#### DPA 3: Natural Environment

*In accordance with the provision of Section 488 (1)(a) of the Local Government Act, all lands within the boundaries of Municipality of North Cowichan are designated a development permit area for the protection of the natural environment, its ecosystems and biodiversity.*

The Natural Environment Development Permit (DPA-3) applies to:

##### Marine Riparian Areas

*Any development within a 30-metre horizontal distance of the high water mark of the ocean.*

*The objectives of designating a development permit area for the protection of the natural environment are:*

- Protect the natural environment, its ecosystems, habitat and biological diversity from potential development impacts.
- Restore lost or degraded ecosystems and ecosystem functions.
- Promote and encourage ecological resilience in the natural environment to respond to climate change.
- Protect against flooding, erosion and sea level rise in ways that preserve environmental, cultural and recreational values.

#### DPA 4: Hazard Lands

*In accordance with the provision of Section 488 (1)(b) of the Local Government Act, lands shown on Map 6 – Natural Hazard Area and Map 7 - Steep Slopes (& Scenic Character) are designated a development permit area for protection from hazardous conditions.*

*The Hazard Lands Development Permit Areas (DPA-4) applies to:*

- Steep slopes over 20%, measured over a minimum horizontal distance of 10 metres as identified on Map 7 - Steep Slopes (& Scenic Character).
- Lands vulnerable to wildfire hazard risk and identified as having a "high" or "extreme" fire hazard rating on Map 6 - Natural Hazard Areas.
- Lands on flood plains.
- Coastal lands vulnerable to flooding and sea level rise.



Objectives for DPA-4 are:

- Protect people, property and the natural environment from the consequences of development on land that is potentially hazardous.
- Identify and mitigate hazards while protecting and enhancing environmentally sensitive areas.
- Promote development that is appropriate for steep slope areas by respecting terrain, maintaining natural vegetation and drainage patterns.
- Inform landowners of potential hazards and require development and property maintenance that is resilient to hazard risk.

Development Permit Areas that overlap the Site are illustrated in Figure 2.

## Provincial

The foreshore along the property is zoned Private Residence Water Zone (W1). According to the W1 zone, a dock or wharf is permitted use, however, there is currently a moratorium on new private moorage applications on southeastern Vancouver Island and the southern Gulf Islands. The moratorium has been extended to August 22, 2025. Once the moratorium is lifted, future development may include a mooring buoy and potentially a dock. The foreshore information contained in this report may be used as a Marine Biophysical Assessment (MBA) for future application for construction of a mooring buoy and dock.

For the beach stairs, building stairs on Crown foreshore would require a Licence of Occupation from the Province, which is avoidable provided the owners repair/rebuild the stairs within the property line.

For work on the foreshore or offshore, the plans will likely need to be reviewed by the Department of Fisheries and Oceans (DFO) to make sure it aligns with best management practices for minimizing impacts to fish and fish habitat. The Fisheries Act prohibits any work or undertaking that results in the harmful alteration, disruption or destruction (HADD) of fish habitat.

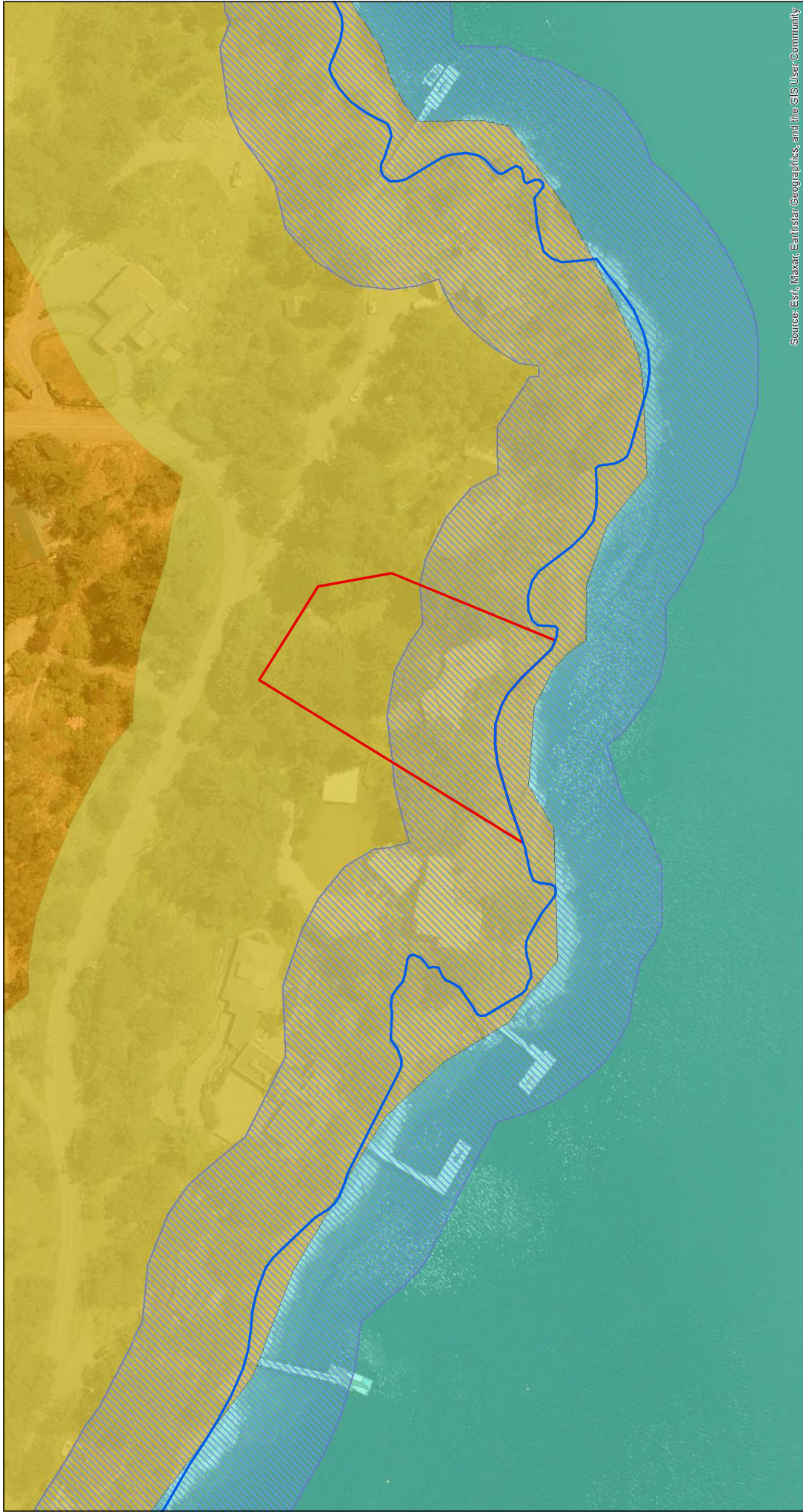
The property is situated in Area 18 – Cowichan. Works below the highwater mark should occur during the least risk work window for Area 18. The summer window is July 1 – October 1 and the winter window is December 1 – February 15.

Applicable documents that will provide helpful information in the planning phase include:

- Best Management Practices for Docks [4-0\\_bmps\\_docks\\_marine.pdf \(gov.bc.ca\)](#)
- Projects near water [Projects near water \(dfo-mpo.gc.ca\)](#)

A Qualified Environmental Professional (QEP) should be consulted for the future foreshore works to aid in the application process and ensure all activities are permitted and in compliance with all environmental policies.





**Development Permit Areas**

- DPA 4 - Natural Hazard
- - Coastal SLR
- DPA 4 - High Fire Hazard
- DPA 3 - Riparian

- DPA 1 - Marine
- Property Boundary
- Guidelines
- DPA 4 - Natural Hazard
- High Fire Hazard



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

|   |                                  |
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|   | <b>Date</b><br>December 18, 2023 |
| <b>Figure 3</b>                                 |                                  |

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## PROVINCIAL

- Wildlife Act (1996)
- Invasive Species Council of BC
- *Weed Control Act* (1996, current as of October 2016)

## FEDERAL

### **Migratory Birds Convention Act (1994)**

The purpose of this Act is to implement the Convention by protecting and conserving migratory birds — as populations and individual birds — and their nests. A person must not engage in any of the following activities unless they have a permit that authorizes them to do so, or they are authorized by these Regulations to do so:

- (a) capture, kill, take, injure or harass a migratory bird or attempt to do so;
- (b) destroy, take or disturb an egg; and
- (c) damage, destroy, remove or disturb a nest, nest shelter, eider duck shelter or duck box.

### **Species at Risk Act (SARA) (2002)**

The Species at Risk Act (SARA 2022) prohibits the killing, harm, harassment, and capture of a species listed on Schedule 1 of SARA as Extirpated, Endangered, or Threatened as per Sections 32 of SARA. Additional provisions are contained in SARA that prohibit the damage or destruction of the residence of one or more individuals listed on Schedule 1 of SARA (Section 33). The destruction of critical habitat of a listed species as identified in the recovery strategy or action plan for that species is prohibited under Section 58(1) of SARA.

### **Fisheries Act (2019)**

Marine development projects have the potential to affect fish and fish habitat. The Department of Fisheries and Oceans Canada (DFO) is responsible for the protection and management of fish habitats under the authority of the Fisheries Act and Species at Risk Act and may request plans, specifications, and environmental assessments specific to marine projects.

The Fisheries Act governs fisheries in Canada and provides a framework for:

- The management and control of fisheries.
- The conservation and protection of fish and fish habitat, as well as preventing pollution.

The fish and fish habitat protection provisions apply to all fish and fish habitat throughout Canada. Fish habitat is defined as “water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply, and migration areas”. There is a risk-based approach applied by DFO when evaluating work impact in fish habitat. Harmful, alteration, disruption, or destruction (HADD) is defined as any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat’s capacity to support one or more life processes of fish. The goal of the fish and fish habitat protection policy statement is



provide a framework for the conservation and protection of fish and fish habitat. Proponents of work activities taking place in or near water that may harmfully impact fish or fish habitat are expected to:

- Understand the types of harmful impacts their work or activities are likely to cause.
- Take measure to avoid harmful impacts, including following relevant standards, codes of practice, or regulations.
- Request an exception (Authorization Concerning Fish and Fish habitat Protection regulations) to the section 34.4 and 35 prohibitions when it is not possible to avoid harmful impacts to fish and fish habitat.

### 1.3 DEVELOPMENT PERMIT AREAS

Two (2) Development Permit Areas (DPAs) will be addressed in this report, including DPA 3: Natural Environment, and DPA 4: Hazard Lands as described in the Municipality of North Cowichan Official Community Plan (Bylaw No. 3900) and Section 10: Development Permit Areas (North Cowichan 2023).

DPA 3: Natural Environment is triggered by the subcategory Marine Riparian Areas which requires a development permit for any development within a 30-metre horizontal distance of the high water mark of the ocean.

DPA 4: Hazard Lands applies to the Site as the Site is steeply sloped towards the shoreline and may also be classified coastal lands vulnerable to flooding and sea level rise. The property is also classified as a High Fire Hazard Area as per Map 6 of the OCP. However, the scope of the project should pose little risk of fire provided best management practices are followed in regards to machinery operation and fuel management.

Development generally excluded from the requirement for a development permit includes:

- Subdivisions for park, lot line adjustment or parcel consolidation.
- Planting of trees, shrubs or ground cover for slope and soil stabilization, habitat improvement, erosion control and beautification.
- Construction within a building that does not require exterior alteration.
- Structural alterations to legal or legal non-conforming buildings and structures within the existing footprint and building envelope.
- Building envelope remediation and/or replacement of exterior finishes where the exterior appearance is maintained;
- Temporary works authorized by a temporary use permit.
- The replacement or alteration of existing signs that are in full compliance with the Sign Bylaw.



## 2 SCOPE OF WORK

Corvidae completed an environmental assessment for the Site. The environmental assessment documented the ecological features on the Site. Background information was reviewed, including applicable databases. During the assessment, the following features were documented in this report:

- Areas of sensitivity, including aquatic ecosystems and riparian areas.
- Areas of terrestrial and marine habitat and biodiversity values.
- Plant communities and plant species on site.
- Potential wildlife presence and wildlife habitat.
- Soil types and terrain.
- Surface water flow patterns.

Following the field assessment, the biophysical features were mapped, and buffer areas have been identified. Mitigations to minimize the impacts of the proposed development on the environment have been provided in Section 6.

## 3 METHODS

### 3.1 DESKTOP REVIEW

Baseline biophysical conditions were compiled by reviewing the best available data and information including existing reports for the area and conducting searches of online provincial and federal databases:

- BC Conservation Data Centre (BC CDC 2023a and 2023b).
- BC Habitat Wizard (Province of BC 2023).
- Aerial photographs of the Site (Google Earth 2023).
- North Cowichan mapping system and database (North Cowichan 2023).
- Bylaw No. 4270 – Municipality of North Cowichan Official Community Plan (No. 3900).

### 3.2 FIELD ASSESSMENT

To classify biophysical features of the project site, assess potential dock locations and drainages throughout the property, a field assessment of the Site was performed by two QEP's from Corvidae. The Site was examined through direct observation, photographs, and underwater digital drop camera surveys. The assessment occurred on November 17<sup>th</sup>, 2023, between 1030 and 1400 hrs PST. There was a 3.2-meter ebb tide at the time of the assessment. The weather was sunny with no cloud cover and the water visibility was good along the foreshore but the seafloor was not visible a few meters offshore due to a drop off in the rock shelf.

## 4 ENVIRONMENTAL SITE ASSESSMENT

Corvidae completed a site visit on November 17<sup>th</sup>, 2023, to delineate the high water mark (HWM) and perform a biophysical assessment of the terrestrial and marine environment onsite. Site photographs are included as Appendix A.



## 4.1 CLIMATE AND BIOGEOCLIMATIC ZONE

The site is in the Pacific Marine Ecozone<sup>1</sup> within the Coastal Douglas-fir moist maritime (CDFmm) biogeoclimatic subzone<sup>2</sup>. This subzone is restricted to low elevation ranges from sea level to approximately 150 m. The mean annual temperature is 9.2°C to 10.5°C.<sup>3</sup> Average temperature ranges from 2°C to 23°C, average annual precipitation is 565.0 mm with the highest amount of rain occurring in November (102.1 mm).

## 4.2 TERRAIN AND SOILS

Soils in the CDF biogeoclimatic zone, generally derived from morainal, colluvial, and marine deposits, are typically Brunisols, grading with increased precipitation to Humo-Ferric Podzols (Pojar et al. 1991).

Using the BC Soil Information Finder Tool (BC SIFT), soil classification of the site was determined through desktop review. Due to the Site being highly disturbed by historical clearing and development, the soil surrounding the house footprint as well as the areas developed with fill is deemed ANTHROPOGENIC (BC SIFT, 2018). The northern extent of the property within the less disturbed, vegetated areas, the soil is comprised of 60% well-drained sandy loam (RUMSLEY soil association) and 40% undifferentiated bedrock.

The Site was steeply sloping towards the ocean (south) with a significant rock shelf with cobbles between the shore and foreshore area.

## 4.3 VEGETATION

Dry forests in the CDFmm zone are typically dominated by Douglas-fir, arbutus, and western redcedar. Grand fir and shore pine may also be present. Salal (*Gaultheria shallon*), dull Oregon-grape (*Mahonia nervosa*), ocean spray (*Holodiscus discolor*), baldhip rose (*Rosa gymnocarpa*), and red huckleberry (*Vaccinium parvifolium*) are common in the shrub layer. Bracken fern (*Pteridium aquilinum*), snowberry (*Symphoricarpos* spp.), grasses, and pacific sanicle (*Sanicula crassicaulis*) are common in the herb layer. Oregon beaked moss (*Eurhynchium oregonum*), step moss (*Hylocomium splendens*), and electrified cat's-tail moss (*Rhytidiadelphus triquetrus*) dominate the well-developed moss layer (Nuszdorfer et al. 1991).

Vegetation on the Site largely comprised of landscaped areas comprised of native and ornamental shrubs. Stands of mature trees remain within the northern extent of the property. Most of the southern extent of the Site, including the housing footprint, has been historically disturbed and cleared of vegetation for development of the housing structure. Various moss and lichen species were present on

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<sup>1</sup> Commission for Environmental Cooperation (CEC), North American Environmental Atlas. Accessed October 2023. Available:

[http://www.cec.org/files/atlas/?z=4&x=115.9314&y=44.7489&lang=en&layers=landcover2015Is%2Cterecoreg1%2Cpolbound\\_s&opacities=0%2C100%2C100&labels=true](http://www.cec.org/files/atlas/?z=4&x=115.9314&y=44.7489&lang=en&layers=landcover2015Is%2Cterecoreg1%2Cpolbound_s&opacities=0%2C100%2C100&labels=true)

<sup>2</sup> British Columbia Ministry of Environment (MoE), Biogeoclimatic Ecosystem Classification Program: Moist Marine Coastal Douglas Fir Subzone. Accessed October 2023. Available at:

[https://www.for.gov.bc.ca/hre/becweb/Downloads/Downloads\\_SubzoneReports/CDFmm.pdf](https://www.for.gov.bc.ca/hre/becweb/Downloads/Downloads_SubzoneReports/CDFmm.pdf)

<sup>3</sup> Nuszdorfer, F., Klinka, K., Demarchi, D. (1991) Chapter 5: Coastal Douglas-fir Zone. Ecosystems of British Columbia. Accessed October 2023. Available at: <https://www.for.gov.bc.ca/hfd/pubs/Docs/Srs/Srs06/chap5.pdf>.



the rock shelf along the shoreline. Three (3) invasive species were recorded during the site visit (see Table 1).

**Table 1. Vegetation Observed on Site During Field Visit, November 17<sup>th</sup>, 2023.**

| Common Name                    | Scientific Name                              | BC Provincial Status <sup>1</sup> | SARA Schedule 1 Status <sup>2</sup> |
|--------------------------------|--|-----------------------------------|-------------------------------------|
| <b>Terrestrial</b>             |  |                                   |                                     |
| Sword fern                     | <i>Polystichum munitum</i>                   | Yellow                            | --                                  |
| Garry oak                      | <i>Quercus garryana</i> var. <i>garryana</i> | Yellow                            | --                                  |
| Red maple                      | <i>Acer rubrum</i>                           | Exotic                            | --                                  |
| Common juniper                 | <i>Juniperus communis</i>                    | Yellow                            | --                                  |
| Scouler's Willow               | <i>Salix scouleriana</i>                     | Yellow                            | --                                  |
| Himalayan blackberry           | <i>Rubus armeniacus</i>                      | <b>Invasive</b> ; Exotic          | --                                  |
| Western hemlock                | <i>Tsuga heterophylla</i>                    | Yellow                            | --                                  |
| Flaky juniper                  | <i>Juniperus squamata</i>                    | Exotic                            | --                                  |
| Yellow iris                    | <i>Iris pseudacorus</i>                      | <b>Invasive</b> ; Exotic          | --                                  |
| Douglas-fir                    | <i>Pseudotsuga menziesii</i>                 | Yellow                            | --                                  |
| Norway spruce                  | <i>Picea abies</i>                           | --                                | --                                  |
| Lodgepole pine                 | <i>Pinus contorta</i> var. <i>latifolia</i>  | Yellow                            | --                                  |
| Lily-of-the-valley             | <i>Maianthemum dilatatum</i>                 | Yellow                            | --                                  |
| White ash                      | <i>Fraxinus americana</i>                    | Exotic                            | --                                  |
| Evergreen spindle              | <i>Euonymus japonicus</i>                    | Exotic                            | --                                  |
| Japanese cherry                | <i>Prunus</i>                                | Exotic                            | --                                  |
| Arbutus                        | <i>Arbutus menziesii</i>                     | Yellow                            |                                     |
| Tall Oregon-grape              | <i>Mahonia aquifolium</i>                    | Yellow                            | --                                  |
| Monkey puzzle tree             | <i>Araucaria araucana</i>                    | Exotic                            | --                                  |
| Rose campion                   | <i>Silene coronaria</i>                      | Exotic                            | --                                  |
| Spurge laurel                  | <i>Daphne laureola</i>                       | <b>Invasive</b> ; Exotic          | --                                  |
| <b>Marine</b>                  |  |                                   |                                     |
| Bull kelp (washed up on shore) | <i>Nereocystis</i>                           | --                                | --                                  |
| Spearleaf stonecrop            | <i>Sedum lanceolatum</i>                     | --                                | --                                  |
| Gumweed spp.                   | <i>Grindelia</i> spp.                        |                                   |                                     |
| Dovefoot geranium              | <i>Geranium molle</i>                        | Exotic                            | --                                  |

<sup>1</sup> BC CDC 2023a,

<sup>2</sup> Government of Canada 2023

## 4.4 WILDLIFE

The forested habitat found in the CDF biogeoclimatic zone is home to many wildlife species. Black-tailed deer, black bear, cougar are the most common large mammals in this zone on Vancouver Island. Many bird species occur in this zone, including pileated woodpecker, yellow-bellied sapsucker, hairy woodpecker, downy woodpecker, Steller's jay, raven, chestnut-backed chickadee, brown creeper, winter wren, varied thrush, Hutton's vireo, black-headed grosbeak, and white-crowned sparrow. Several amphibians can occur in wet and moist habitats in this zone such as western toad, Pacific treefrog, northern red-legged frog and western red-backed salamander (Pojar et al. 1991).



Many bird species were audibly and visually detected onsite during the field assessment. Various marine species or signs of activity onsite were recorded such as a harbour seal and river otter scat. No species at risk were observed during the site visit. A complete list of wildlife visually and audibly observed is listed in Table 2.

**Table 2. Wildlife observed during field visit**

| Common Name                | Scientific Name            | BC Provincial Status <sup>1</sup> | SARA Schedule 1 Status <sup>2</sup> |
|----------------------------|----------------------------|-----------------------------------|-------------------------------------|
| Red-tailed hawk            | <i>Buteo jamaicensis</i>   | Yellow                            | --                                  |
| Chestnut-backed chickadee  | <i>Poecile rufescens</i>   | Yellow                            | --                                  |
| Pacific rock crab (shells) | <i>Cancer productus</i>    | --                                | --                                  |
| River otter (scat)         | <i>Lontra canadensis</i>   | Yellow                            | --                                  |
| Belted kingfisher          | <i>Megaceryle alcyon</i>   | Yellow                            | --                                  |
| Seagull                    | <i>Larus occidentalis</i>  | --                                | --                                  |
| Great blue heron           | <i>Ardea herodias</i>      | Fanninni spp                      | SC                                  |
| Steller's Jay              | <i>Cyanocitta stelleri</i> | Yellow                            | --                                  |
| Harbour seal               | <i>Phoca vitulina</i>      | Yellow                            | --                                  |
| Song sparrow               | <i>Melospiza melodia</i>   | Yellow                            | --                                  |
| Northern flicker           | <i>Colaptes auratus</i>    | Yellow                            | --                                  |
| Bufflehead                 | <i>Bucephala albeola</i>   | Yellow                            | --                                  |
| Spotted towhee             | <i>Pipilo maculatus</i>    | Yellow                            | --                                  |
| Warbling vireo             | <i>Vireo gilvus</i>        | Yellow                            | --                                  |
| Common raven               | <i>Corvus corax</i>        | Yellow                            | --                                  |
| Anna's hummingbird         | <i>Calypte anna</i>        | Yellow                            | --                                  |
| Brown creeper              | <i>Certhia americana</i>   | Yellow                            | --                                  |

<sup>1</sup> BC CDC 2023a

<sup>2</sup> Government of Canada 2023

Marine fauna and flora observed using drop camera and shore assessment was very limited due to the rock shelf substrate. See Table 3 for the few species observed.

**Table 3. Marine flora and fauna observed during field visit**

| Common Name           | Scientific Name          |
|-----------------------|--------------------------|
| Common acorn barnacle | <i>Balanus glandula</i>  |
| Pacific Oyster        | <i>Crassostrea gigas</i> |

## 4.5 SPECIES AT RISK

A query of BC CDC iMap and BC Habitat Wizard tools yielded occurrences of 2 terrestrial species at risk and 2 ecosystems at risk within a 500 m radius of the Site (BC CDC 2023b). Species are listed in Table 4 and the location of occurrences in relation to the Site is provided in Figure 2.

A query of the Fisheries and Oceans Canada species at risk distribution map yielded 15 marine species at risk that have the potential to occur in proximity to the project (Table 4). The occurrence level of these species was all ranked as low which is defined as understanding the species habitat associations suggest unlikely to occur at site with regularity.



None of the species at risk were detected during the field assessment. Vegetative, aquatic, and topographical characteristics of the Site do not support the biophysical attributes required for the species listed in Table 4 to occupy the area.

**Table 4. Species at risk with the potential to occur at or near the site.**

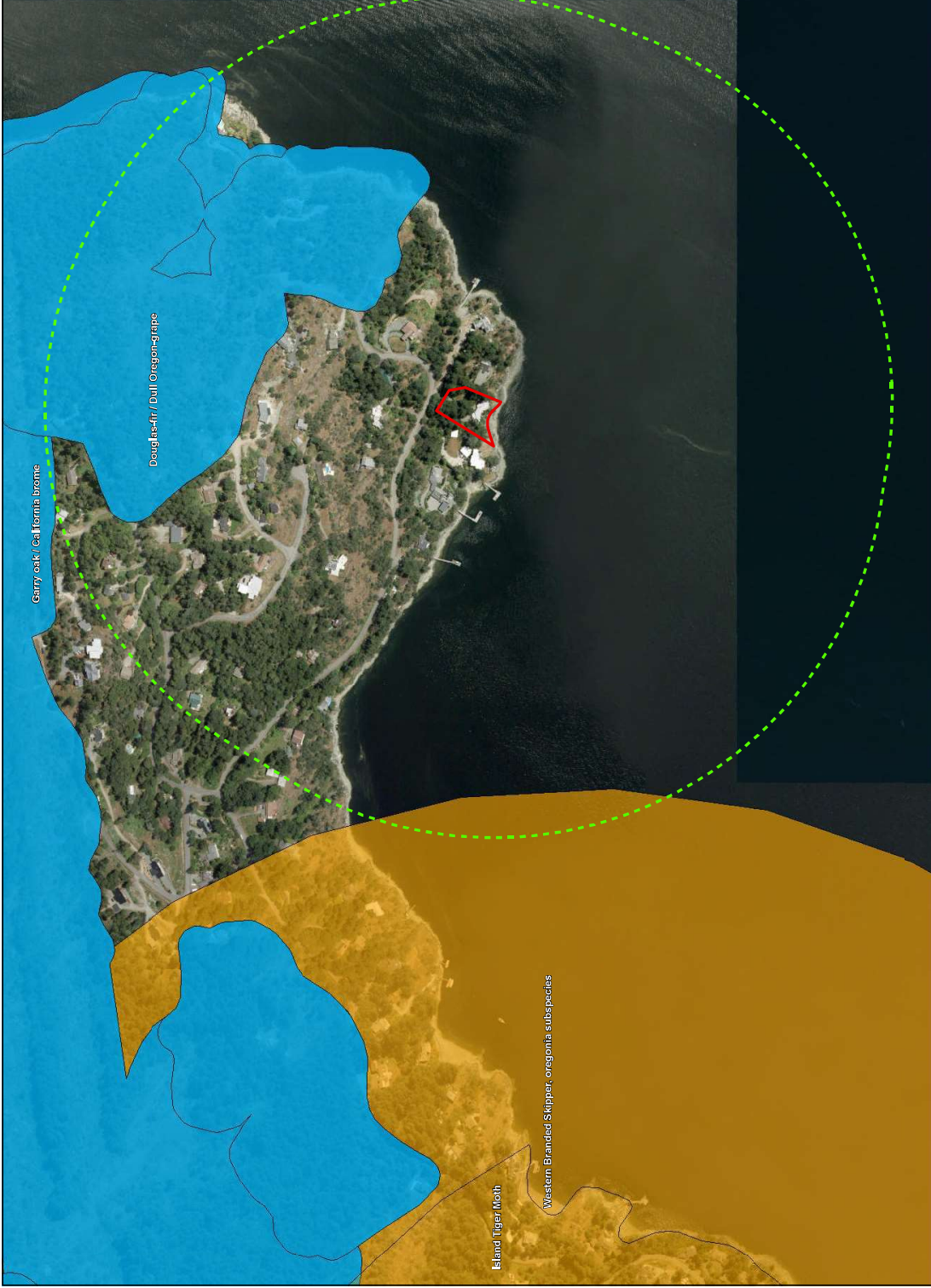
| Common Name   | Species Name  | BC Provincial Status <sup>1</sup> | SARA Schedule Status <sup>2</sup> | Likelihood to occur at the site |
|---|---|-----------------------------------|-----------------------------------|---------------------------------|
| <b>Terrestrial (* indicates ecosystem)</b>                    |   |                                   |                                   |                                 |
| Island tiger moth   | <i>Apantesis complicata</i>                           | Red                               | --                                | Low                             |
| Ermine, <i>anguinae</i> subspecies                            | <i>Mustela richardsonii anguinae</i>                  | Blue                              | --                                | Low                             |
| Douglas-fir / Dull Oregon-grape*                              | <i>Pseudotsuga menziesii</i> / <i>Mahonia nervosa</i> | Red                               | --                                | Low                             |
| Garry oak / California brome*                                 | <i>Quercus garryana</i> / <i>Bromus carinatus</i>     | Red                               | --                                | Low                             |
| <b>Marine</b>   |   |                                   |                                   |                                 |
| Basking Shark   | <i>Cetorhinus maximus</i>                             | --                                | Endangered                        | Low                             |
| Bluntnose Sixgill Shark                                       | <i>Hexanchus griseus</i>                              | --                                | Special Concern                   | Low                             |
| Grey Whale  | <i>Eschrichtius robustus</i>                          | --                                | Special Concern                   | Low                             |
| Green Sturgeon  | <i>Acipenser medirostris</i>                          | Blue                              | Special Concern                   | Low                             |
| Harbour Porpoise  | <i>Phocoena phocoena</i>                              | Blue                              | Special Concern                   | Low                             |
| Humpback Whale  | <i>Megaptera novaeangliae</i>                         | Yellow                            | Special Concern                   | Low                             |
| Killer Whale (Northeast Pacific Offshore population)          | <i>Orcinus orca</i>                                   | Red                               | Threatened                        | Low                             |
| Killer Whale (Northeast Pacific Southern Resident population) | <i>Orcinus orca</i>                                   | Red                               | Endangered                        | Low                             |
| Leatherback Sea Turtle  | <i>Dermochelys coriacea</i>                           | Red                               | Endangered                        | Low                             |
| Longspine Thornyhead  | <i>Sebastolobus altivelis</i>                         | --                                | Special Concern                   | Low                             |
| Northern Abalone  | <i>Haliotis kamtschatkana</i>                         | Red                               | Endangered                        |                                 |
| Rougheye Rockfish type I                                      | <i>Sebastes sp. type I</i>                            | --                                | Special Concern                   | Low                             |
| Rougheye Rockfish type II                                     | <i>Sebastes sp. type II</i>                           | --                                | Special Concern                   | Low                             |
| Yelloweye Rockfish  | <i>Sebastes ruberimus</i>                             | --                                | Special Concern                   | Low                             |
| Steller Sea Lion  | <i>Eumetopias jubatus</i>                             | Blue                              | Special Concern                   | Low                             |
| Tope (Soupfin Shark)  | <i>Galeorhinus galeus</i>                             | --                                | Special Concern                   | Low                             |

<sup>1</sup> BC CDC 2023a

<sup>2</sup> Government of Canada 2023

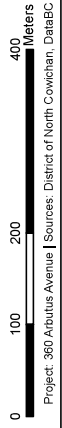
<sup>3</sup> Government of Canada; Fisheries and Oceans Canada. 2023.





Species and Ecosystems at Risk within the Vicinity of the Site

- Species at Risk**
- Property Boundary
  - 500 m area around property boundary
  - Ecological Community
  - Invertebrate Animal



Sources: Esri, Maxar, Earthstar, GeoGraphics, and the GIS User Community

| Rev. #  | Date              |
|---|-------------------|
| 0   | December 18, 2023 |
|   |                   |
|   |                   |
|   |                   |
| <b>CORVIDAE</b><br>ENVIRONMENTAL CONSULTING INC |                   |
| Corvidae Project No.<br>COR-2023-147            |                   |
| <b>Figure 4</b>                                 |                   |

## 5 POTENTIAL ENVIRONMENTAL EFFECTS

Potential environmental impacts of the proposed house renovations, stormwater drainage improvements, driveway repair, replacement of beach stairs, slope stabilization, repair to gazebo, landscaping and installation of a mooring buoy and dock are the following:

- Erosion
- Slope destabilization
- Degradation of the 30 m riparian marine buffer
- Loss of wildlife habitat
- Debris and pollutants entering the foreshore and marine waters
- Loss of marine habitat and harm to marine species

The implementation of the mitigation measures recommended below in Section 6 will reduce or eliminate these potential environmental effects.

## 6 RECOMMENDED ENVIRONMENTAL PROTECTION MEASURES

The mitigation measures provided in this report are designed to protect sensitive ecosystems and were developed in accordance with:

- Municipality of North Cowichan OCP: Schedule A (North Cowichan, 2022),
- Procedures for Mitigating Impacts on Environmental Values (Environmental Mitigation Procedures) (BC Ministry of Environment [MOE] 2014a),
- Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia (Government of BC 2014),
- Environmental Best Management Practices for Urban and Rural Land Development in British Columbia (BC Ministry of Water, Land and Air Protection 2004), and
- Best Management Practices – Marine Dock Construction and Maintenance Guidelines.

### VEGETATION REMOVAL AND LANDSCAPING

No standing trees shall be removed without a permit as they provide habitat for nesting and roosting birds as well as small mammals. Vegetation serves to protect steep slopes from erosion and flooding as water is absorbed through root systems throughout the soil. Landscaping with native plants is recommended. Any vegetation removed within the 30 m riparian marine buffer must be replaced with native vegetation of the same volume at a 1:1 ratio. A list of recommended native vegetation for this area and biogeoclimatic zone is provided in Table 5.



**Table 5. Native vegetation recommended during landscaping**

| Species               | Scientific Name                               |
|-----------------------|---|
| Bigleaf maple         | <i>Acer macrophyllum</i>                      |
| Shore pine            | <i>Pinus contorta</i> var. <i>contorta</i>    |
| Common snowberry      | <i>Symphoricarpos albus</i>                   |
| Red flowering currant | <i>Ribes sanguineum</i>                       |
| Baldhip rose          | <i>Rosa gymnocarpa</i> var. <i>gymnocarpa</i> |
| Oceanspray            | <i>Holodiscus discolor</i>                    |
| Sea blush             | <i>Plectritis congesta</i>                    |

No vegetation removal shall occur during the Migratory Bird Window to prevent potential disturbance to nesting birds. The Migratory Bird Window is from March 1<sup>st</sup> to August 31<sup>st</sup>.

### CONSTRUCTION DEBRIS

Construction debris and waste generated from the proposed development must be kept above the highwater mark, and as far away from the foreshore and sloped bank as possible. Construction debris and waste should be placed directly into bins for disposal rather than placed on the ground to avoid materials from being carried away by wind or water. The bins should be fitted with lids to prevent material from blowing out of the bins due to wind and the bins should be emptied when 90% full to prevent overflow.

### MARINE AND FORESHORE DEVELOPMENT

The marine foreshore, offshore and backshore area should be a minimal-disturbance area. If beach stairs and gazebo are to be repaired and a dock and mooring buoy will be installed, the following recommendations must be followed:

#### BEACH STAIRS, GAZEBO AND CONCRETE PAD

Disturbance to the 30 m marine riparian buffer will be minimized to the extent possible.

All works must occur 'in the dry', above the waterline.

For the beach stairs, building stairs on Crown foreshore would require a Licence of Occupation from the Province, which is avoidable provided the owners repair/rebuild the stairs within the property line.

Measures to control all debris from repairments to stairs and gazebo must be in place.

No changes to the existing footprint of the gazebo are permitted.

Any uncured concrete or water that has come in contact with uncured concrete must be disposed of outside of the 30 m riparian and marine buffer and away from drainage areas as uncured concrete and cementitious water are toxic to fish. Similarly, formwork for the cast-in-place concrete pad will be sealed to prevent any spillage or leaking of uncured concrete into the foreshore and water below. The pour would be done at the same time as other concrete pour(s) related to the house renovations for efficiency.



The concrete pour shall be monitored closely and any excess material will be removed and properly disposed of.

Although the concrete pad would be located within the 30 m marine riparian zone, no loss of vegetation is expected as the area is a rocky outcrop with little to no vegetation.

#### *DOCK AND MOORING BUOY*

Regarding the future potential for installation of a mooring buoy and a dock, these activities could have the potential to negatively affect aquatic life and fish habitat. The documents provided in Section 1.2 Provincial of this report should be consulted during the design phase to avoid causing a HADD which is prohibited under the Fisheries Act. If the HADD of fish habitat or death of fish is observed, the proponent is required to report to DFO immediately through the DFO Pacific Observe, Record, and Report phone line at 1 800 465 4336. A Qualified Environmental Professional (QEP) should be consulted for the future foreshore works to aid in the application process and ensure all activities are permitted and in compliance with all environmental policies.

In-water work should be timed to occur within DFO's least risk work windows to avoid adverse effects on fish and aquatic species. Timing window of least risk for DFO Fisheries Management Area 18: Cowichan, are:

- Summer Window: July 1<sup>st</sup> – October 1<sup>st</sup>
- Winter Window: December 1<sup>st</sup> – February 15<sup>th</sup>

Corvidae recommends the dock design be environmentally-friendly to cause the least amount of environmental impact possible. One example of this would be a floating dock rather than one secured into the seabed with piles.

A mobile dock means a dock with movable walkway and float used in lakes with seasonally fluctuating water levels, that can be readily moved away from the natural boundary as lake levels decrease, such that the required depth of water for boat moorage is achieved (Ministry of Forests, 2022). Any dock establishment granted permission by the Province of British Columbia must follow the Marine Dock Construction and Maintenance Guidelines – Best Management Practices document. Since the foreshore does not supply suitable habitat for marine species, there is no habitat loss to be expected by installing a mobile floating dock.

If piles are to be installed, if possible, piles should be installed with a vibratory hammer rather than impact pile driving to minimize underwater noise. A Marine Mammal Observer (MMO) will likely be required to monitor the pile installation works to protect marine mammals from the negative impacts of loud underwater noise during construction. Additional mitigation measures are listed in Section 1.2 Provincial in this report.

#### **EROSION AND SEDIMENT CONTROL AND SLOPE STABILIZATION**

The primary focus of erosion and sediment control planning is erosion control; if there is no erosion then there is no sediment. Erosion control is far more cost effective to implement and manage than sediment control.

General best management practices for ESC (erosion and sediment control) onsite include:



- Any ground disturbance within the 30 m riparian and marine buffer should be conducted during dry weather.
- Any material excavated from the 30 m riparian and marine buffer will be placed as far as possible from the foreshore.
- Erodible soils and stockpiles should be covered when not in use, particularly during rain and wind events, and stabilized as soon as possible to prevent erosion and weed propagation. Exposed soils and stockpiles can be covered using tarps, polyethylene sheeting or a suitable equivalent.
- Any works below the highwater mark must occur 'in the dry' and remain isolated until completion. Sediment fencing or a seine net would be suitable materials to isolate the stairs and shrub removal area adjacent to the highwater mark.
- New drainage pathways must be complete and stabilized prior to flows being directed to them.
- Regularly inspect and maintain the erosion and sediment control measures during all activities.
- Keep the erosion and sediment control measures in place until all disturbed ground has been permanently stabilized with native plant revegetation.

The ~4 m x 2 m foreshore area proposed to be stabilized with a boulder wall <2 m in height with geotextile fabric and drain rock in behind should be designed by an engineering company. The slope stabilization works should occur during the least risk work window for fish, and will occur 'in the dry', above the waterline. If the works cannot be completed in a single low tide event and high tide will inundate the work area, the site must be isolated using sediment fencing or a seine net on the marine side to prevent trapping marine species within the work zone.

## 7 CONCLUSION

The potential environmental impacts of the proposed developments at 360 Arbutus Avenue have been presented in this report. Implementation of the mitigation measures recommended in this report, including marine foreshore and buffer protection through the implementation of best management practices and erosion and sediment control measures will minimize potential environmental impacts associated with the proposed project.

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## 8 REFERENCES

- B.C. Conservation Data Centre. 2014. Conservation Status Report: *Mustela richardsonii anguinae*. B.C. Ministry of Environment. Available: <https://a100.gov.bc.ca/pub/eswp/>. Accessed: May 2023.
- British Columbia Conservation Data Centre (CDC). 2023a. BC Species and Ecosystems Explorer. B.C. Ministry of Environment. Victoria, B.C. Available: <http://a100.gov.bc.ca/pub/eswp/>. Accessed: November 2023.
- British Columbia Conservation Data Centre (CDC). 2023b. CDC iMap [web application]. Available at: <https://maps.gov.bc.ca/ess/hm/cdc>. Accessed: November 2023.
- British Columbia Ministry of Environment (MOE). 2014a. Procedures for Mitigating Impacts on Environmental Values (Environmental Mitigation Procedures) Version 1.0.
- British Columbia Ministry of Environment (MOE). 2014b. Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia. Available at: <https://www2.gov.bc.ca/gov/content/environment/natural-resourcestewardship/naturalresource-standards-and-guidance/best-managementpractices/develop-with-care>.
- British Columbia Ministry of Environment. 2004. *Environmental Best Management Practices for Urban and Rural Land Development*
- British Columbia Ministry of Environment. 2006. Guidelines for Reduced Risk Instream Work Windows. Available at: [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/working-around-water/work\\_windows\\_low\\_main.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/working-around-water/work_windows_low_main.pdf). Accessed: May 2023.
- British Columbia Ministry of Environment. 2009. *A User's Guide to Working In and Around Water*.
- British Columbia Ministry of Environment. 2014b. Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia. Available at: <https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/natural-resource-standards-and-guidance/best-management-practices/develop-with-care>.
- British Columbia Soil Information Finder Tool. 2023. BC SIFT. Available at: <https://governmentofbc.maps.arcgis.com/apps/MapSeries/index.html?appid=cc25e43525c5471ca7b13d639bbcd7aa>. Accessed: November 2023.
- Coastal Invasive Species Committee. 2022. Priority Invasive Plants. Available at: <https://www.coastalisc.com/priority-invasive-plants/>. Accessed: November 2023.
- Department of Fisheries and Oceans Canada (DFO). 2023. British Columbia Marine/Estuarine Timing Windows for the Protection of Fish and Fish Habitat – South Coast and Lower Fraser Areas. Area 18 – Cowichan. Accessible at: <https://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/bc-s-eng.html#area-18>
- Government of British Columbia. 2016. Aurora LNG. Assessment of Potential Environmental Effects: 4.10 Marine Mammals. Accessible at: <http://projects.eao.gov.bc.ca>
- Government of British Columbia. 2023. Appendix A: Marine Dock Construction and Maintenance Guidelines – Best Management Practices. Accessible at: [4-0\\_bmps\\_docks\\_marine.pdf \(gov.bc.ca\)](#)



- Government of Canada. 2018. General nesting periods of migratory birds. Available at: <https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html>. Accessed: November 2023.
- Government of Canada. 2023. Species at Risk Public Registry. Available at: <https://www.canada.ca/en/environment-climate-change/services/species-risk-publicregistry.html>. Accessed: November 2023.
- Ministry of Forests. 2022. Provincial General Permission for the Use of Crown Land for Private Moorage. Government of B.C. Accessible at: [private\\_moorage\\_general\\_permission.pdf](private_moorage_general_permission.pdf) (gov.bc.ca)
- Municipality of North Cowichan. 2022. Municipality of North Cowichan Official Community Plan. Bylaw 3900 Schedule "A". Accessible at: <https://www.northcowichan.ca/media/290>
- Municipality of North Cowichan. 2023. Zoning Bylaw 1997 No. 2950. Accessible at: <https://www.northcowichan.ca/media/252>
- Province of British Columbia. 2023. Habitat Wizard. Available at: <http://maps.gov.bc.ca/ess/hm/habwiz/>. Accessed: November 2023.



## APPENDIX A – SITE PHOTOGRAPHS

**Photo 1. North-facing view of existing house. November 17<sup>th</sup>, 2023.**



**Photo 2. Southeast-facing view of the house and driveway. November 17<sup>th</sup>, 2023.**



**Photo 3. East-facing view of shoreline off Maple Bay. November 17<sup>th</sup>, 2023.**



**Photo 4. West-facing view of shoreline off Maple Bay. November 17<sup>th</sup>, 2023.**



**Photo 5. Looking southwest at the north side of the house where the existing stormwater drains discharge underneath the house, below the wooden cribbing. November 9<sup>th</sup>, 2023.**



**Photo 6. Stormwater drainage perpendicular to the north side of the house, facing east. November 17<sup>th</sup>, 2023.**



**Photo 7. Stormwater drain, perpendicular to the north side of the house. November 17<sup>th</sup>, 2023.**



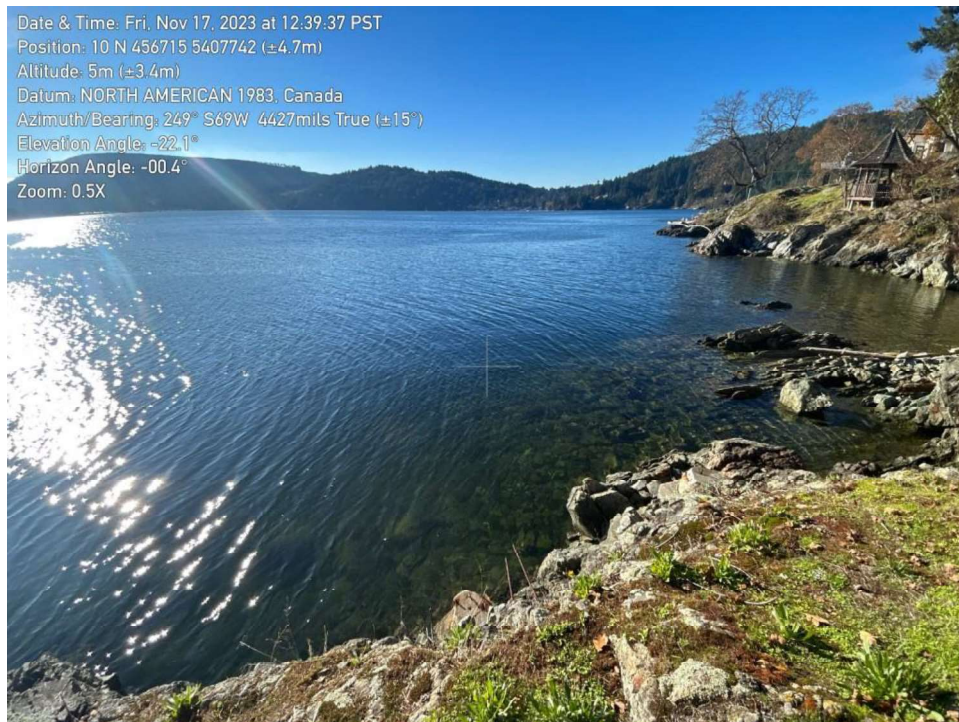
**Photo 8. North-facing view of driveway, looking towards Arbutus Ave. November 17<sup>th</sup>, 2023.**



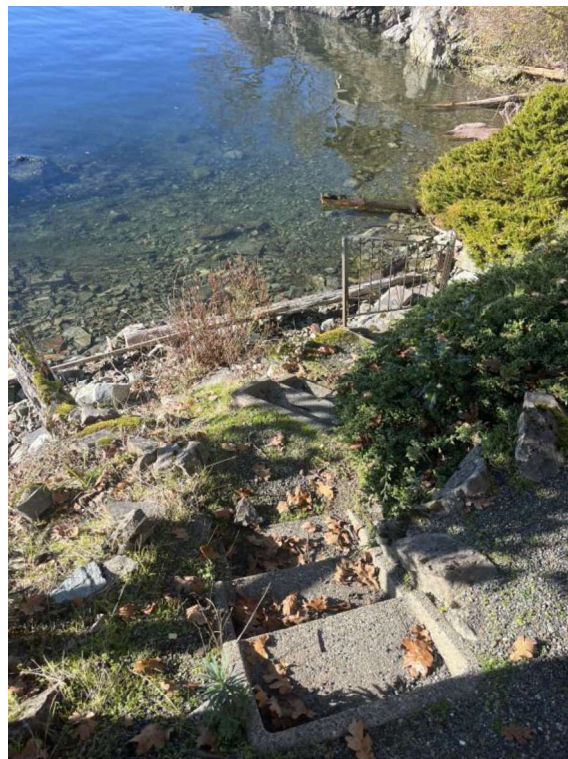
**Photoset 9. Looking north at drainage channel downslope of Arbutus Ave and upslope of the house, on west side of driveway. November 17<sup>th</sup>, 2023.**



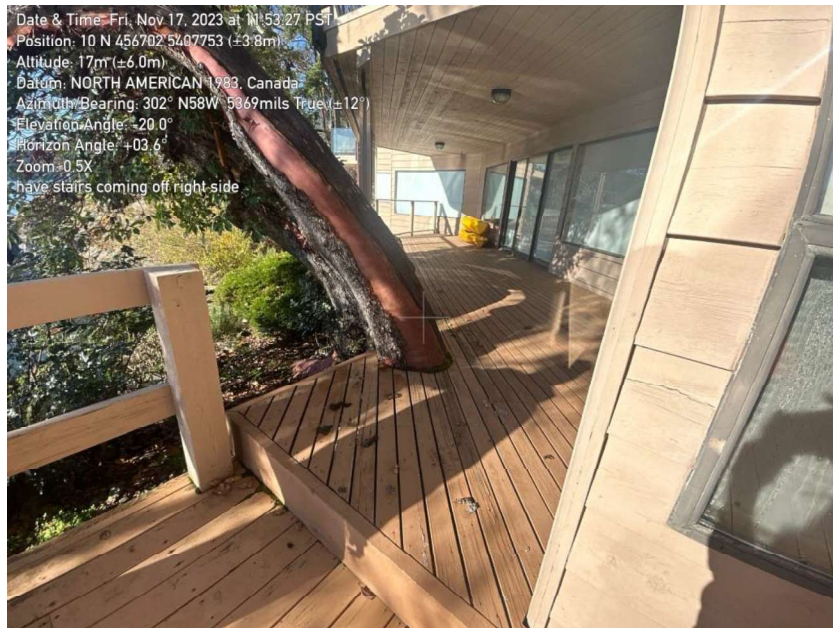
**Photo 10. Southwest view of offshore area, comprised of a rock shelf with some cobbles in the western corner and few marine species. November 17<sup>th</sup>, 2023.**



**Photo 11. Southwest-facing view of existing beach stairs and juniper vegetation. November 17<sup>th</sup>, 2023.**



**Photo 12. Northwest-facing view of deck. November 17<sup>th</sup>, 2023.**



**Photo 13. Drainage/culvert alongside west side of house from driveway. November 17<sup>th</sup>, 2023.**



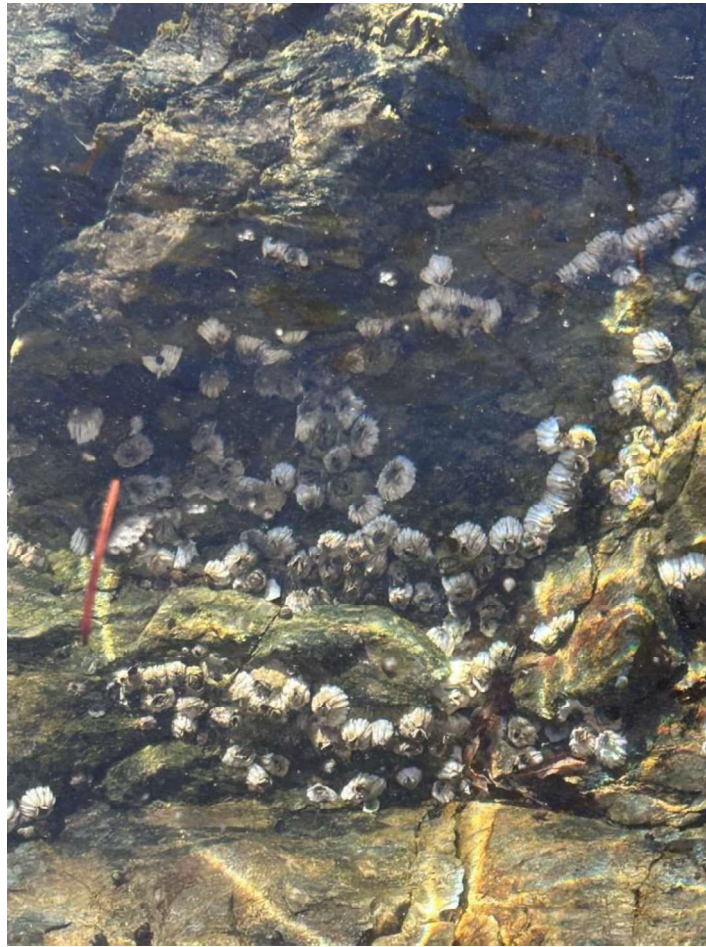
**Photo 14. Crawl space underneath house and deck, on southwest corner of house. Currently a drainage channel that flows underneath the house (blue arrow) is proposed to be piped. November 17<sup>th</sup>, 2023.**



**Photo 15. Southwest-facing view of foreshore area. November 17<sup>th</sup>, 2023.**



**Photo 16. Drop camera footage of acorn barnacles.**



**Photo 17. West-facing view of backshore area. November 17<sup>th</sup>, 2023. See culvert outlet (circled in red), drainage pathway that surfaces beneath house (shown in blue) and gutter drainage all collecting in one area compiled with groundwater seepage that is causing slope creep in the area circled in green. A seawall ~3 m long comprised of boulders with geotextile and drain rock in behind is proposed to stabilize the area from future erosion.**

