Drainage Assessment for the Proposed Walk-In Campground Development in Tribune Bay Provincial Park, Hornby Island, BC.



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1. Introduction

In advance of a proposed walk-in campground development, Pacificus Biological Services Ltd. (Pacificus) was retained by Onsite Engineering Ltd. (Onsite) on behalf of BC Parks to conduct a drainage assessment of watercourses in Tribune Bay Provincial Park on Hornby Island, BC. The proposed walk-in campground will be constructed on BC Parks land within the eastern portion of a newly acquired land parcel at 5305 Shields Road (PID: 009-651-438), and extend into the existing day-use recreational park located immediately northward of this lot (PID: 009-651-314) (Figure 1).

The following report provides a summary of watercourses identified during the drainage assessment and also documents any environmentally sensitive areas (ESAs) located within the influence of the proposed campground development. Setback recommendations for the identified watercourses and ESAs are also provided within the context of applicable regulations (Table 1, Figure 5). Figures 4 provides an overview of identified watercourses, ESAs and fish accessibility where applicable while Figure 5 outlines the recommended setbacks in relation to the footprint of the proposed campground development.

1.1 Proposed Campground Development

The proposed footprint for the walk-in campground is located within the eastern portion of a newly acquired land parcel at 5305 Shields Road (PID: 009-651-438) and along the southern extent of Tribune Bay Park on Hornby Island, BC (PID: 009-651-314) (Figure 1). The newly acquired land parcel fronts the foreshore of Tribune Bay and is bordered by Ostby Road to the west, Shields Road to the south and Tribune Bay park to the north. Immediately south of the subject lot is the existing Tribune Bay campsite at 5200 Shields Road, which was also acquired by BC Parks.

The preliminary campground design has a proposed footprint of approximately 23 acres within a perimeter of 1534m. It includes a total of 52 walk in campground sites that will be accessible from an existing trail network that will be upgraded (Figure 1). The trail network will resurfaced and extended adjacent to Shields Road. A total of 3 services centers with 30m exclusion zones will also be constructed along with a parking lot accessed from a one-way road (Photo 2-3). The parking lot will constructed adjacent to a service center along the eastern portion of the proposed campground footprint and be accessed from Shields road via a new one-way road (Figure 1).

1.2 Project Scope

The objective of the drainage assessment was to identify existing watercourses within the influence of the proposed campground development including streams, ditch lines, wetlands and non-classified drainages. Fish accessibility was also assessed by determining connectivity to fish bearing watercourses. A desktop review of databases for existing fisheries records, ESAs as well as Provincial and/or Federally listed species within the influence of the subject lot was also conducted. Lastly, prescriptions for recommended setbacks are provided within the context of applicable regulations.

The scope of the drainage assessment covered in this report includes the following:

1. Complete an inventory of existing drainages and ESAs within the influence of the proposed walk-in campground development and provide confirmation of potential fish accessibility and habitat utilization.
2. Identify the overarching environmental regulatory requirements that are applicable to the proposed development (Federal, Provincial, Municipal).
3. Provide recommendations for appropriate setbacks (if any) for watercourses and ESAs identified within the influence of the proposed development. Setback recommendations are based on applicable regulations as well Develop with Care (2014) guidelines[1].
4. Provide detailed mapping of identified watercourses and ESAs including direction of flow, potential fish accessibility as well as recommended setbacks in relation to the development footprint to inform the planning phase of the proposed development.
5. Provide a Construction Environmental Management Plan (CEMP) and Erosion and Sediment Control Plan (ESCP) to ensure that integrity of ecologically sensitive values are maintained and that *harmful alteration, disruption and destruction (HADD)* of fish and/or fish habitat is prevented under the *Federal Fisheries Act* (Appendix 1).

2. Regulatory Framework

2.1 Municipal Regulatory Framework

Within the municipal regulatory framework, BC Parks is exempt from the *Island Trust Act* which enacts the *Hornby Island Official Community Plan* (OCP: Bylaw no. 149, 2014)[2].

2.2 Provincial Regulatory Framework

Provincially, the Tribune Bay Provincial Park lands area exempt from the *Riparian Area Protection Regulation* (RAPR)[3]. However, the *Park Act*, the *Protected Areas of British Columbia Act*, the *Environment and Land Use Act*, the *Ecological Reserve Act* and related regulations define the legal parameters within which protected areas (BC Parks) must be managed[4].

The proposed campground development is also subject to the *Water Sustainability Act (WSA)*. Under Section 106(2)(b)(ii) of the *WSA*, it is a general offence to make changes in and about a stream without lawful authority. Accordingly, any changes in and about a stream (CIAS) will require approval under the *WSA*[5]. This includes work or activity, regardless of location, that may modify the nature of a stream or the flow of water in a stream. The WSA definition of “stream"

[1] Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia. Develop with Care 2014 - Province of British Columbia (gov.bc.ca); Accessed March 24th, *2023.*
[2] Island Trust Hornby Island Official Community Plan, Bylaw No. 149, 2014. https://islandstrust.bc.ca/document/hornby-island-ocp-bylaw-149/ Accessed March 22nd, 2023.
[3] Riparian Area Protection Regulation. BC Reg 178/2019. BC Reg 178/2019 | Riparian Areas Protection Regulation | CanLII
[4] BC Parks Protected Area Management Planning Process Manual. November 2016 (Version 2); Insert Park Picture Here (gov.bc.ca)/ Accessed March 24th, 2023.
[5] Water Sustainability Act (WSA). SBC 2014 Chapter 15. Water Sustainability Act (gov.bc.ca).

includes swamp, marsh, and fen wetlands as well as natural streams. CIAS is defined as the following:

a. Any modification to the nature of a stream, including any modification to the land, vegetation and natural environment of a stream or the flow of water in a stream; or
b. Any activity or construction within a stream channel that has or may have an impact on a stream or a stream channel.

For further information about permitting under WSA, refer *to A User's Guide for Changes In and About a Stream in British Columbia*[6].

2.3 Federal Regulatory Framework

Federally, fish bearing watercourses remain subject to the *Fisheries Act*, which prohibits the death of fish by means other than fishing and the *harmful alteration, disruption, or destruction of fish habitat (HADD),* under *subsections 34.4(1) and 35(1*). Accordingly any instream works associated with the proposed development may be subject to a DFO *Request for Review*[7]. Project Review Application Forms (PRAF) and additional information can be found at DFO Habitat Management Website "Working Near Water" at http://www.pac.dfo-mpo.gc.ca/habitat/index-eng.htm. Lastly, instream works associated with crossing installations, would need to abide by the Reduced Risk Work Window for the South Coast Region[8].

Lastly, the proposed campground development will need to be compliant with the *Wildlife Act* and *Migratory Birds Convention Act*. As such, vegetation clearing will need to adhere to breeding bird timing windows to avoid disturbance to vegetation that would impact wildlife[9]. This act requires there be no disturbance to the nests or eggs of migratory birds without a permit. To comply with the Migratory Birds Convention Act, works with the potential to disrupt trees/vegetation should not be undertaken during the Regional Migratory Bird Nesting Window from March 12th to August 11th[10]; unless a breeding bird survey completed by a qualified environmental professional (QEP), concludes there is a high probability that no nests are present in the immediate vicinity of the area to be cleared. Refer to the detailed Construction Environmental Management Plan (CEMP) in Appendix 1 for additional guidance.

[6] A User's Guide for Changes In and About a Stream in British Columbia. wsa-cias-users_guide.pdf (gov.bc.ca). Accessed February 26th, 2024.

[7] DFO Request for Review: Request a review of your project near water: Step 2. Understand the project review process (dfo-mpo.gc.ca). Accessed February 26th, 2024.

[8] Ministry of FLNRO. Terms and Conditions for Changes in and about a Stream (Vancouver Island & Gulf Island). Terms and Conditions For Changes In And About A Stream Specified By Ministry of Forests, Lands and Natural Resource Operations Habitat Officer, West Coast Region (Vancouver Island & Gulf Islands) (gov.bc.ca). Accessed February 26th, 2024.

[9] Wildlife Act; https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/96488_01#section34; Accessed March 24th, 2023.

[10] Government of Canada, Nesting periods. https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html (accessed January 16th, 2024)

3. Desktop Review of Study Area

Relevant Municipal, Provincial and Federal resources and databases were consulted prior to site surveys in order guide field assessment activities. The desktop review included a search of relevant databases for the existence of ESAs, watercourses as well as species/communities at risk.

3.1 Biogeoclimatic Zone

The subject properties are located within the Coastal Douglas Fir moist maritime biogeoclimatic subzone unit (*CDFmm*) which is a relatively rare zone within British Columbia, occupying only 0.25% of the province[11]. The Coastal Douglas Fir (CDF) biogeoclimatic zone is restricted to low-elevation (<150m) coastal areas in the rainshadow of Vancouver Island. This zone has a Mediterranean climate characterized by warm, dry summers and mild, wet winters with sites intermediate in soil moisture and soil nutrient conditions. Mature forests on zonal sites are dominated by Douglas-fir *(Pseudotsuga menziesii*), with salal (*Gaultheria shallon*) dull Oregon-grape (*Berberis nervosa*), and Oregon beaked-moss *(Kindbergia oregana*) dominating the forest floor[12].

3.2 BC Conservation Data Center (CDC) and Species at Risk

A search of Provincial databases (BC Species and Ecosystem Explorer, CDC iMap)[13] was conducted for Species at Risk and listed communities on the subject lot. The southeast portion of the Tribune Bay lot was identified as Douglas Fir/dull Oregon-grape Ecological Community which is Red listed in BC according to the BC Conservation Data Center database (Figure 4).[14] A search of Species at Risk listed under the federal *Species at Risk Act* (SARA)[15] revealed no results.

3.3 Hornby Island Official Community Plan

BC Parks is exempt from the *Island Trust Act* which enacts the Hornby Island Official Community Plan (OCP: Bylaw no. 149, 2014)[16]. However the OCP was referenced for potential Environmentally Sensitive Areas or Riparian Development Permit Areas (DPAs) that may affect development. Schedule E of the OCP identified no Riparian Development Areas (DPA No. 6) within the subject lot (Figure 2). However, Schedule D1 which outlines the Environmentally Sensitive Areas on Hornby Island identified a wetland area on the property, covering approximately 75% of the Tribune Bay Provincial Park footprint (Figure 3). The wetland received

[11] Island trust; Hornby Island Official Community Plan, Bylaw No. 149, 2014. HO_BL_149_OCP_BASE_2014_CONS_2022_06_06.pdf (islandstrust.bc.ca)/Accessed February 6th, 2024

[12] Chapter 5: Coastal Douglas-fir Zone by F.C. Nuszdorfer, K. Klinka, and D.A. Demarchi. Chapter-5-Coastal-Douglas-fir.pdf (cdfcp.ca). Accessed January 18th, 2024.

[13] BC Species and Ecosystem Explorer; BC Species & Ecosystems Explorer - Province of British Columbia (gov.bc.ca); Accessed January 30th, 2024.

[14] BC Conservation Data Center, CDC imap; Conservation Data Centre (gov.bc.ca); Accessed February 6th, 2024.

[15] Government of Canada, 2002. Species at Risk Act.

[16] Island Trust Hornby Island Official Community Plan, Bylaw No. 149, 2014. https://islandstrust.bc.ca/document/hornby-island-ocp-bylaw-149/ Accessed February 6th, 2024.

a *5WN:sp RV6/RV5* designation which translates to: 50% of the lot coverage being a wetland with the remainder of lot coverage composed of mature and young forest with Western Red cedar/Vanilla-leaf association.[17]

3.4 Fisheries Databases

A search of fisheries databases including the Fisheries Inventory Data Query (FIDQ)[18] and Habitat Wizard[19] reported no streams within the influence of the proposed walk-in campground development. Provincial fisheries databases documented the presence of Beulah Creek (*WSC: 905-125800-80800*) which flows southeastern direction, approximately 365m southwest from the proposed development footprint. No records of fish were documented within Beulah Creek.

4. Methodology

A total of three field visits were on conducted on March 16th, 2023, January 7th, 2024 and February 8th, 2024 by Jo Gagnon, BSc., and Brittany Blanchard (BBRM) of Pacificus. The objective of the first field examination (March 16th, 2023) was to conduct a drainage assessment within the newly acquired parcel at 5305 Shields Road where the campground development was originally proposed. The results of this assessment resulted in the creation of a revised walk-in campground survey boundary (Figure 1). This resulted in two additional field examinations being required to assess existing drainages within the influence of the new walk-in campground footprint (Figure 1).

The field assessments were conducted on foot and covered an area of approximately 45 acres. An iPad with a georeferenced map was utilized for orientation, mapping and photography. A clinometer, tape measure and notebook were used to collect qualitative and quantitative data in the field. An auger was also utilized for soil sampling associated with the wetland delineation. Water levels on the dates of examination ranged from moderate to high.

The objective of the field assessments were to:

a) Identify watercourses as well as ESAs within the influence of the subject campground development via field examination;
b) Delineate the natural boundary of wetlands as per accepted Provincial methodology;
c) Determine fish accessibility as well potential fish utilization by establishing fish connectivity to known fish bearing watercourses or as required, via accepted fish sampling methods including fish trapping and/or electrofishing.

While BC parks is exempt from the Provincial *Riparian Area Protection Regulation* (RAPR)[20] the field assessments were conducted as per standards guided by detailed methodology for RAPR

[17] BC Ministry of Environment; Island Trust, Hornby Island Sensitive Ecosystem Mapping Airphoto 2001; Hornby.pdf (islandstrust.bc.ca)/ Accessed February 6th, 2024.
[18] BC. Fisheries Inventory Data Query. Fish Inventories Data Queries (gov.bc.ca). Accessed February 6th, 2024.
[19] BC Habitat Wizard. Habitat Wizard (gov.bc.ca). Accessed February 6th, 2024.
[20] Riparian Area Protection Regulation. BC Reg 178/2019. BC Reg 178/2019 | Riparian Areas Protection Regulation | CanLII

outlined in the *Technical Assessment Manual*.[21] This included walking the property in the immediate development area, as well as any areas affiliated with identified watercourses to assess connectivity to fish bearing watercourses.

4.1 Wetland Delineation

Wetland Delineation was conducted as per recommended Provincial guidelines. Identification of wetlands followed the process outlined in Chapter 3 "Procedures for site description" in *Wetlands of British Columbia: A Guide to Identification*[22]. As per the guidebook, wetland delineation was determined by evaluating the presence of wetland indicators in vegetation, soils, and hydrology.

The Province of British Columbia is currently working to provide guidance on wetland delineation but in the absence of a protocol, wetland specialists on the west coast of BC use the *Corps of Engineers Wetland Delineation Manual* and refer to the regional supplements as applicable to the area which best describes the area of interest such as the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0).* In addition, *The Alberta Wetland Identification and Delineation Directive (Government of Alberta, Water Conservation. 2015, No. 4)* is an accepted publication by the Province of British Columbia.

Wetland delineation was also consistent with RAPR methodology as outlined in *Section 3.8.2.2 Technical Assessment Manual*. The technical manual states that from an ecological perspective, either an abundance of hydrophytes or hydric soil conditions is generally sufficient to indicate a wetland ecosystem (soil and vegetation indicators). It also reports that the boundary or high water mark (HWM) of the wetland is identified by changes in vegetation structure, loss of obligate hydrophytes, and absence of wetland soil characteristics.

4.1.1 Soil Indicators

Wetland soils are subhydric or hydric and have one or more of the following features that reflect anaerobic soil conditions[23]:

- Peaty organic soil horizons greater than 40 cm thick.
- Non-sandy soils with blue-grey gleying within 30 cm of the surface.
- Sandy soils with predominant mottles within 30 cm of the surface or blue-grey matrix.
- Hydrogen sulphide (rotten egg smell) in upper 30 cm.

To this end, Auger soil samples were taken as required to confirm the loss of hydric soils and delineate the natural boundary of the wetland polygons.

[21] Ministry of FLNRO; Fish and Aquatic Branch. RAPR Technical Assessment Manual. November 2019. V.1.1. Riparian Areas Regulation (gov.bc.ca). Accessed December 20th, 2024.
[22] MacKenzie, W.H. and J.R. Moran. 2004. Wetlands of British Columbia: a guide to identification. Res. Br., B.C. Min. For., Victoria, B.C. Land Management Handbook. No. 52.
[23] Riparian Area Protection Regulation. BC Reg 178/2019. BC Reg 178/2019 | Riparian Areas Protection Regulation | CanLII

4.1.2 Vegetation Indicators

Repeated flooding or soil saturation can promote anaerobic conditions within a day or two and provide favorable conditions for the establishment of wetland plants. Wetland plants are water tolerant, or hydrophytic, and are adapted to the stressful conditions of saturated, anaerobic soils and periodic inundation.

As a supplement to the presence of hydric soils, the wetland boundary can usually be delineated as the point at which the abundant species in the outermost plant community are **made up of less than 50% facultative wetland or obligate wetland species[24].** Facultative wetland species are species that occur in wetlands 67% to 99% of the time and obligate wetland species occur in wetlands >99% of the time. As per *The Alberta Wetland Identification and Delineation Directive (Government of Alberta, Water Conservation. 2015, No. 4,* an abundant species is a plant species with 20 percent of more areal cover in the survey area.

[24] Government of Alberta. 2015. *Alberta Wetland Identification and Delineation Directive.* Water Policy Branch, Alberta Environment and Parks. Edmonton, Alberta.

Figures

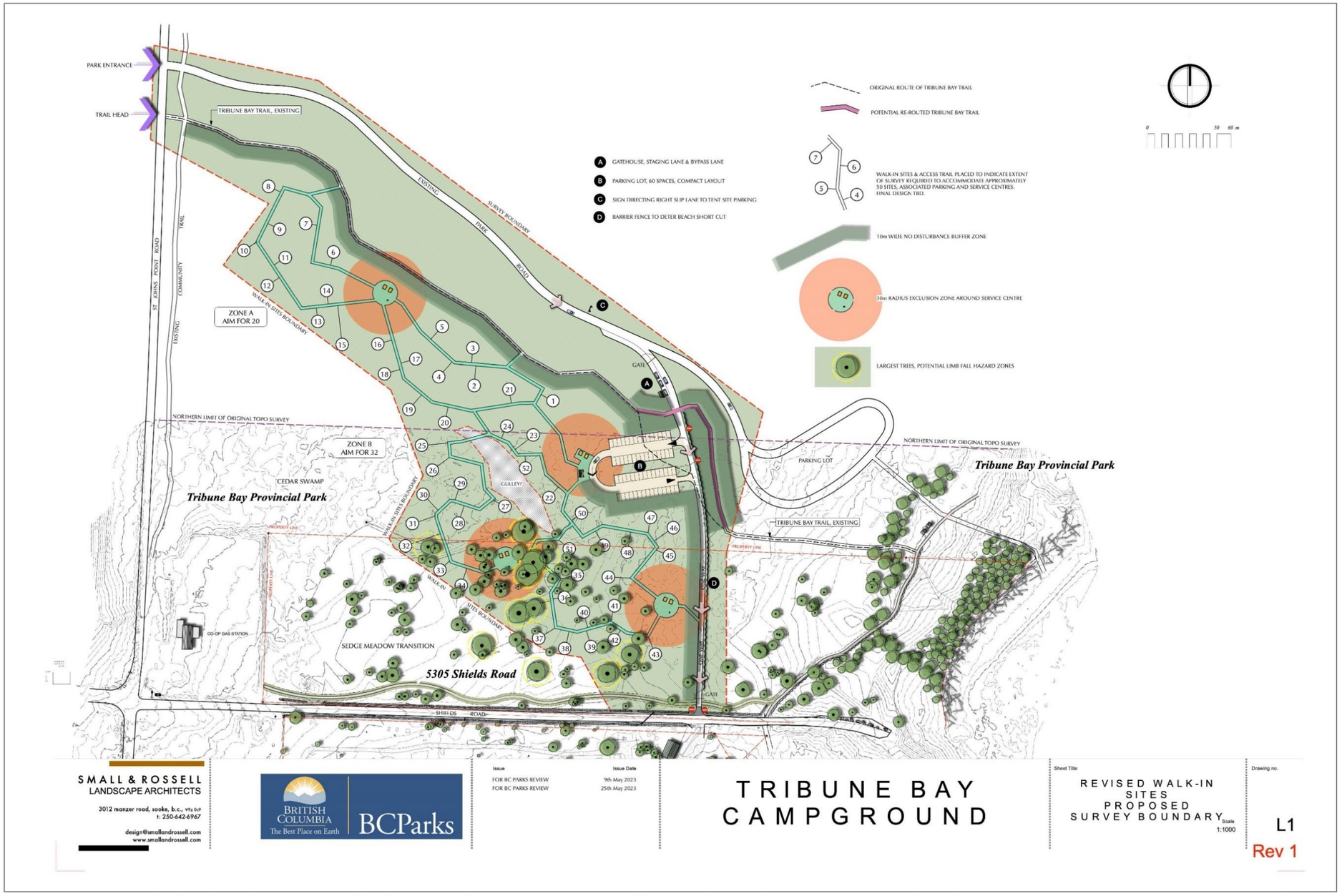


Figure 1. Proposed walk in campground footprint located in Tribune Bay Provincial Park on Hornby Island, BC. The site layout includes service centers, the proposed one-way road providing access to proposed parking as well as the proposed walk-in campground sites (52 total).

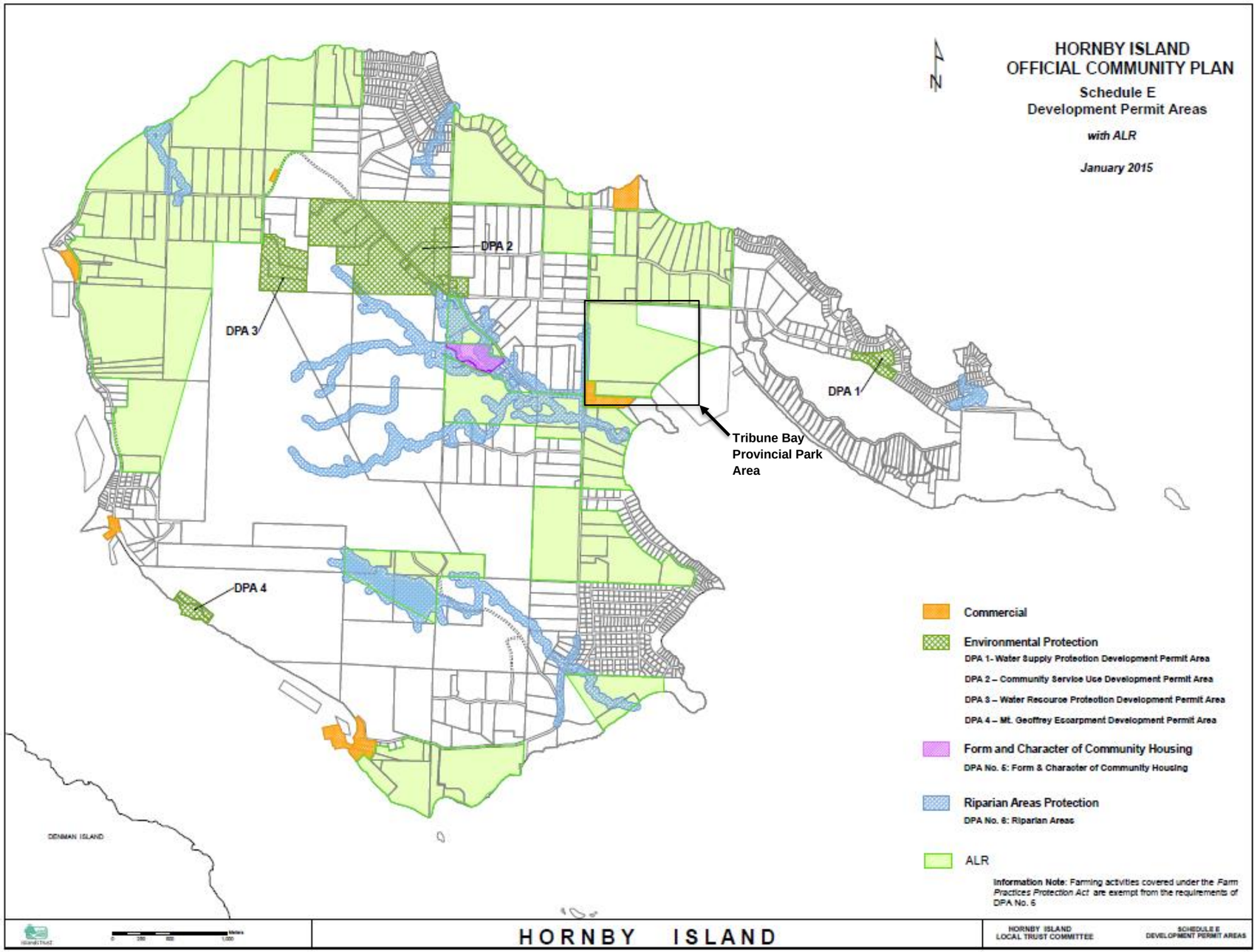


Figure 2. Island Trust Official Community Plan (OCP) Schedule E which maps the Development Permit Areas associated with the subject lot at 5305 Shields Road (none located within the proposed development).

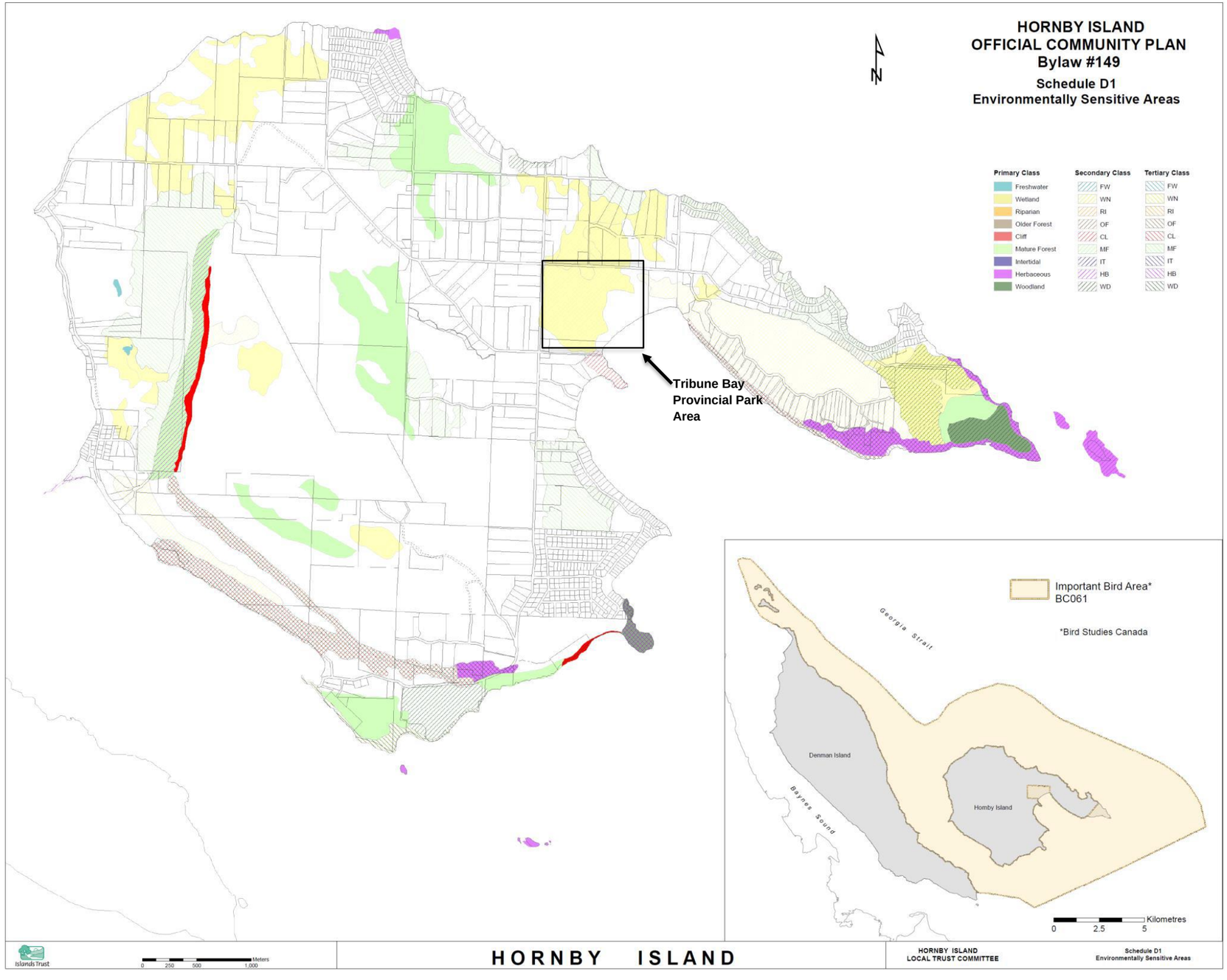


Figure 3. Island Trust Hornby Island Official Community Plan (OCP) Schedule D1 which maps Environmentally Sensitive Areas (ESAs) associated with the subject lot at 5305 Shields Road (wetland area identified in yellow).

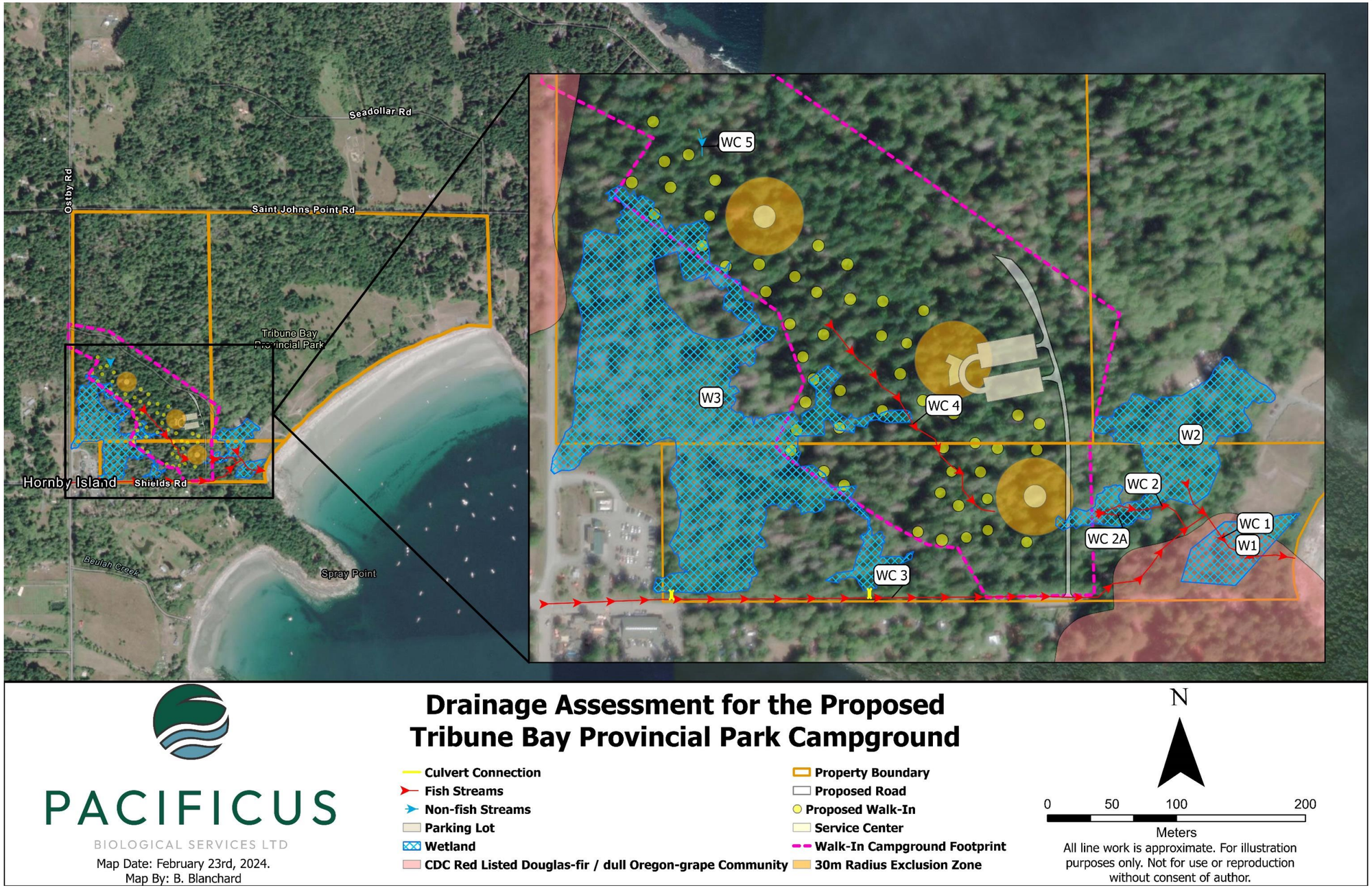


Figure 4. Overview map of drainages identified within the influence of the proposed walk in campground in Tribune Bay Provincial Park, Hornby Island, BC. A total of 5 watercourses and 3 wetland polygons that are part of a wetland complex were identified within the influence of the proposed development. Fish accessible watercourses are delineated in red while non fish accessible are delineated in blue. Also shown is the direction of flow, proposed campground footprint (pink dashed outline) as well as wetland areas (blue cross hatch polygons).

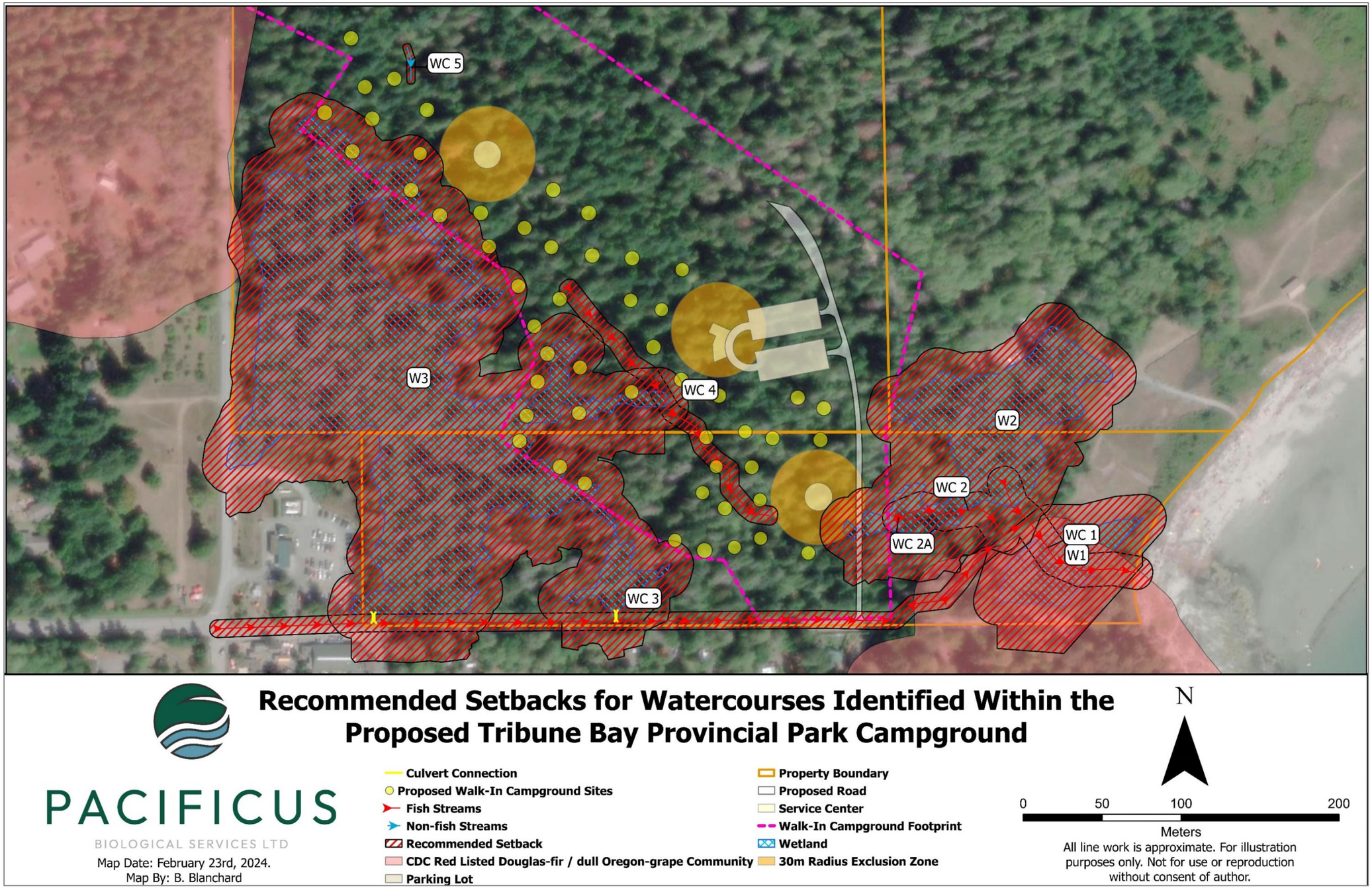


Figure 5. Recommended setbacks for watercourses identified within the proposed walk in campground footprint. Setbacks are outlined in Table 1 and are consistent with those prescribed in RAPR technical manual.

5. Drainage Assessment Results

A total of 5 watercourses including 2 streams (Watercourse 1 and 2) and 3 ditches (Watercourse 3 and 5) were identified within the influence of the proposed campground (Figure 4). In addition, a wetland complex comprised of 3 wetland polygons was identified within the influence of the proposed development (W1-3: Photos 4-6). As detailed in the previous section, the confirmed presence of a wetland complex is consistent with the *Island Trust* ESA mapping outlined in Schedule D1 of the Hornby Island OCP (Figure 3). The following is a description of the identified watercourses within the influence of the proposed development:

Watercourse 1 (Stream)

Watercourse 1 flowed in a southeastern direction within the eastern portion of newly acquired land parcel at 5305 Shields Road before draining directly into Tribune Bay (Figure 4). The assessment commenced at the confluence of Tribune Bay where unimpeded fish passage from the ocean was observed (Point of Commencement (POC): 0+000m; 10U, 384346 m E, 5486701 m N). The stream was assessed upstream for approximately 440m to a point where the channel lost stream defining characteristics. At this point, the watercourse sourced from Wetland 2 approximately 285m east boundary of the proposed campground footprint (Point of Termination (POT): 0+440m; 10U, 384025 m E, 5486946 m N). The stream was also observed to flow within the wetland 1 polygon from 0+095m to 0+260m. A single reach was identified within the assessed portion of the watercourse and the following information was gathered:

Reach 1

The average channel width was 1.5m and the gradient ranged from 0-3%. Substrate was primarily composed of organics, fines and small gravels while channel morphology consisted of riffle-run-pool (Photo 7). Habitat values ranged from poor to moderate with some instream cover providing potential rearing habitat in the form of pools, undercut banks and functional large woody debris. The channel ranged from confined to moderately confined and flow was seasonal in nature.

Reach 1 of Watercourse 1 was contained within a natural channel and determined to have potential fish habitat. As such, it met the definition of a stream under RAPR. **Based on the classification as a stream, a setback of 10m is recommended for Reach 1 of Watercourse 1 (Figure 5).** This is consistent with the Streamside Enhancement Protection Area (SPEA) setback that would be prescribed under RAPR methodology. All banks of Reach 1 of Watercourse 1 consisted of mature trees and vegetation that are currently performing the natural features, functions and conditions of riparian vegetation. Provided that the recommended setback is maintained along the north and south banks of Stream 1, there should be no loss or degradation of function.

Watercourse 2 (Stream)

Watercourse 2 flowed in a southeastern direction within the eastern portion of the newly acquired land parcel (5305 Shields Road) before draining directly into Watercourse 3 (Figure 4). The

assessment commenced at the confluence of Watercourse 3 where unimpeded connectivity from the left wetted bank (LWB) was observed (POC: 0+000m; 10U, 384022 m E, 5486802 m N). The stream was assessed upstream for approximately 315m to a point where the channel lost stream defining characteristics as it sourced from Wetland 2 adjacent to the eastern boundary of the proposed development (POT: 0+315m; 10U, 384025 m E, 5486946 m N). A single reach was identified within the assessed portion of the watercourse and the following information was gathered:

Reach 1

The average channel width was 1.0m and the gradient ranged from 1-3%. The reach was characterized by a moderately confined channel with ephemeral flow and substrate primarily composed of organics. Habitat values were assessed as being poor with limited spawning and rearing opportunities.

Based on the unimpeded connectivity to a fish bearing watercourse (Watercourse 3), Reach 1 of Watercourse 2 was determined to be fish accessible. Reach 1 of Watercourse 2 was contained within a natural channel and met the definition of a stream under RAPR. **Based on the classification as a stream, a setback of 10m is recommended on all banks of Reach 1 of Watercourse 2 (Figure 5).** This is consistent with the SPEA that would be prescribed under RAPR methodology. All banks of Reach 1 of Watercourse 2 consisted of mature trees and vegetation that are currently performing the natural features, functions and conditions of riparian vegetation. Provided that the recommended setback is maintained along the north and south banks of Watercourse 2, there should be no loss or degradation of function.

Watercourse 2A (Stream)

Watercourse 2A was a distributary channel of Watercourse 2 that flowed in an eastern direction outside of the proposed campground footprint. The assessment commenced at the confluence of Wetland 2 where stream defining characteristics were lost, including channelization, the presence of alluvial deposits and consistent scouring (POC: 0+000m; 10U, 383824 m E, 5486854 m N). The assessment proceeded upslope for approximately 65m to the confluence of Watercourse 2 (POT: 10U, 382760 m E, 5486857 m N). A single reach was identified within the assessed portion of the watercourse and the following information was gathered:

Reach 1

An average width and gradient of 1.1m and 1% were recorded within Reach 1 of Watercourse 2A respectively. The channel was poorly confined with substrate composed of organics and isolated pockets of fines. Fish utilization potential was assessed as being poor with ephemeral flow characteristics observed and an absence of suitable rearing and spawning habitat. **Based on the classification as a stream, a setback of 10m is recommended on all banks of Reach 1 of Watercourse 2A (Figure 5).** This is consistent with the setbacks prescribed for RAPR applicable streams that have surface flow connectivity to fish habitat.

Watercourse 3 (Ditch)

Watercourse 3 flowed in an eastern direction as a road side anthropogenic linear ditch on the north side of Shields road before entering a culvert and draining northeast adjacent to the Tribune Bay trail (Figure 4). The assessment commenced at the confluence of Watercourse 1 where unimpeded connectivity from the LWB was observed (POC: 0+000m; 10U, 381226 m E, 5487122 m N). The assessment proceeded upstream for approximately 2065m to the intersection of Otsby Road where the ditch line flowed away from the influence of the proposed campground development (POT: 2+065m; 10U, 381226 m E, 5487122 m N). Two reaches were identified within the assessed portion of the watercourse and the following information was gathered:

Reach 1

At the POC, unimpeded fish accessibility from Watercourse 1 was observed. The average channel width within this reach was approximately 1.2m while gradient ranged from 0-2%. Substrate was primarily composed of fines and organics (Photo 9). The channel was moderately confined and flow was ephemeral in nature. Habitat values were assessed as being low with limited rearing pools and no suitable spawning gravels observed.

The watercourse flowed as a man-made linear ditch line west of the existing tribune bay trail for approximately 110m to a point where the feature flowed through a culvert at the intersection of Shields Road. This defined the end of the reach. Reach 1 of Watercourse 3 was completely contained within a man-made ditch line and did not form part of a natural drainage pattern or have any headwaters. **Based on the classification as a fish accessible ditch, a setback of 5m is recommended on all banks of Reach 1 of Watercourse 3 (Figure 5).** This is consistent with setbacks prescribed for RAPR applicable ditches that are determined to be fish accessible.

Reach 2

Reach 2 of Watercourse 3 commenced at the intersection of Shields Road (0+110m) and proceeded for approximately 1955m to the intersection of Otsby Road. The average channel width and gradient were 1.4m and 1% respectively. The ditch line was partially vegetated with substrate primarily composed of organics and fines. A well confined channel with ephemeral flow characteristics was observed. Habitat values were assessed as being poor with limited rearing and spawning opportunities observed.

Reach 2 of Watercourse 3 met the definition of a ditch under RAPR as it was completely contained within a man-made linear road side ditch and did not form part of a natural drainage (Photo 8). **Based on the classification as a fish accessible ditch, a setback of 5m is recommended on the north banks of Reach 2 of Watercourse 3 (Figure 5).** This is consistent with setbacks prescribed for RAPR applicable ditches that are determined to be fish accessible. The north bank of Reach 2 of Watercourse 3 consisted of trees and vegetation that are currently performing the natural features, functions and conditions of riparian vegetation while the south bank consists of manicured grass and pavement adjacent to Shields Road. Provided that the recommended setback is maintained along the north of Watercourse 3, there should be no loss or degradation of function.

Watercourse 4 (Ditch)

Watercourse 4 flowed in a southeastern direction within the proposed campground development. The assessment commenced immediately west of a proposed service center (30m exclusion zone) where the channel dissipated into intact forest floor (POC: 0+000m; 10U, 383453 m E, 5486880 m N) (Figure 4). The assessment proceeded upstream for approximately 770m to a point where the ditch line ceased to exist and intact forest floor was observed upslope. A single reach was identified within the assessed portion of the watercourse and the following information was gathered:

Reach 1

The average channel width and gradient within Reach 1 of Watercourse 4 were 1.8m and 0% respectively. The channel was well confined with ephemeral flow characteristics. While fish utilization potential was determined to be poor, seasonal pooling was observed throughout the feature. The watercourse was determined to be an antrhopogenic linear ditch line that did not form part of a historic drainage pattern and did not have headwaters. The ditch line had surface flow connectivity to Wetland 3 (W3) at 0+425m and as such was determined to be an RAPR applicable ditch (Figure 4).

Based on the classification as a fish accessible ditch, a setback of 5m is recommended on all banks of Reach 1 of Watercourse 4 (Figure 5). This is consistent with setbacks prescribed for RAPR applicable ditches that are determined to be fish accessible. The western and eastern banks of Reach 1 of Watercourse 4 consisted of mature trees and vegetation that are currently performing the natural features, functions and conditions of riparian vegetation. Provided that the recommended setback is maintained along the banks of Watercourse 4, there should be no loss or degradation of function.

Watercourse 5 (Ditch)

Watercourse 5 was an isolated drainage that flowed in a southern direction for approximately 80m before dissipating into intact forest floor. The assessment commenced at (POC: 0+000m, 10U, 382629 m E, 5487967 m N) where channelization emerged and proceeded upslope to a point where the system sourced from seepage flow (POT: 0+080m; 10U, 382624 m E, 5488049 m N) (Figure 4). A single reach was identified within the assessed portion of the watercourse and the following information was gathered:

Reach 1

At the POC, the channel dissipated into intact forest floor with no connectivity to fish bearing watercourses observed. The average channel width and gradient were 1.2m and 1% respectively. The system flowed as a anthropogenic linear ditch line that did not form part of a natural drainage and did not have headwaters (Photo 10). The channel was well confined with ephemeral flow characteristics. Habitat values were assessed as being poor with substrate primarily composed of organics.

Based on the absence of surface flow connectivity to fish habitat, Reach 1 of Watercourse 5 was not RAPR applicable. Due to its classification as a non-fish bearing ditch line, **a setback of 2m is recommended on all banks of Reach 1 of Watercourse 5 (Figure 5).**

Wetland Complex

Schedule D1 of the Hornby Island OCP documents the presence of a wetland area (ESA), covering approximately 75% of the Tribune Bay Provincial Park footprint (Figure 3). Field examination confirmed the presence of a wetland complex consisting of 3 wetland polygons. As per definitions outlined in the *Wetlands of British Columbia: A Guide to Identification*[25]; a wetland complex consists of two or more wetland communities occurring in close proximity in the same system and influenced or linked by the same moisture and nutrient regimes.

Wetland areas 1, 2 and 3 (W1-3) were determined to be fish accessible based on the presence of surface flow connectivity to fish habitat. Wetland polygon 1 (W1) had surface flow connectivity to Watercourse 1 while Wetland polygon 2 (W2) had surface flow connectivity to Watercourse 2 (Figure 4). Wetland polygon 3 (W3) was observed to have surface flow connectivity to the Shield Road ditch line (Watercourse 3) via newly installed crossing structures associated with the Tribune Bay trail extension. W1, W2 and W3 had areas of 0.7 acres, 2.1 acres and 8.2 acres respectively. Accordingly, the total area of the wetland complex identified within the assessment portion of Tribune Bay Provincial Park was approximately 11 acres (Figure 4).

The wetland complex was considered to be a 'wet meadow' that met the criteria of a wetland based on the presence of hydric soils and hydrophytic vegetation as per accepted methodology detailed in the previous section. Wetlands are defined as sites dominated by hydrophytic vegetation where soils are water-saturated for a sufficient length of time such that excess water and resulting low soil oxygen levels are principal determinants of vegetation and soil development.

Dominant vegetation within the wetland complex consisted of obligate hydrophytic vegetation including slough sedges (*Carex obnupta*) and common horsetails (*Equisetum arvense*). Facultative hydrophytic vegetation included salmon berry (*Rubus spectabilis*) and Red alders (*Alnus rubra).* Bracken ferns (*Pteridium aquilinum*), snowberry (*Symphoricarpos albus*) as well as isolated patches of invasive European Holy (*Ilex aquifolium*) were also observed within these areas in percentages below the 50% threshold for obligates and facultative vegetation (see methodology section).

The wetland complex was determined to be an ESA under the *Island Trust*, Hornby Island OCP and should be protected during development. Recommended setbacks for the wetland complex are consistent with RAPR methodology for features that have surface flow connectivity to fish habitat. **Setbacks of 15m on the east, west and north banks and 30m on the south bank are recommended for the wetland polygons W1-W3.** The riparian vegetation along the banks of the wetland complex are primarily composed mature trees and native vegetation that are currently performing the natural features, functions and conditions of riparian vegetation. Provided that the

[25] MacKenzie, W.H. and J.R. Moran. 2004. Wetlands of British Columbia: a guide to identification. Res. Br., B.C. Min. For., Victoria, B.C. Land Management Handbook. No. 52.

recommended setback is maintained along the banks of the wetland complex, there should be no loss or degradation of function.

Table 1. Identified watercourses within the influence of the proposed walk-in campground development and associated classification (fish or non-fish accessible).

Drainage	Classification	RAPR Applicable*	Recommended Setback
Reach 1, Watercourse 1 (Stream)	Fish Accessible	Yes	10m on all banks
Reach 1, Watercourse 2 (Stream)	Fish Accessible	Yes	10m on all banks
Reach 1, Watercourse 2A (Stream)	Fish Accessible	Yes	10m on all banks
Reach 1, Watercourse 3, (Ditch)	Fish Accessible	Yes	5m on all banks
Reach 2, Watercourse 3, (Ditch)	Fish Accessible	Yes	5m on all banks
Reach 1, Watercourse 4 (Ditch)	Fish Accessible	Yes	5m on all banks
Reach 1, Watercourse 5 (Ditch)	Not Fish Accessible	No	2m on all banks
Wetland Areas 1-3	Fish Accessible	Yes	15m (East, West, North Banks); 30m South Banks

**While Tribune Bay Provincial Park is exempt RAPR, the assessment adhered to RAPR methodology and recommended setbacks are consistent with those prescribed in RAPR Technical Manual.*

6. Recommendations

6.1 Recommended Setbacks

Sensitive ecosystems are designated as such due to their rarity and their fragility to disturbance[26]. Accordingly, all recreation facilities should be so located and of such scale that they do not stress the ecology of these areas. The identified watercourses and wetland complex should be protected during the development of the proposed walk-in campground through the establishment of appropriate setbacks. Table 1. provides a summary of recommended development setbacks. While BC Parks is exempt from the RAPR, these setbacks are consistent with those prescribed in RAPR methodology. Specific setbacks were not outlined in the Hornby Island OCP (Bylaw no. 149, 2014) enacted by the Island Trust Act which BC Parks is also exempt from.

[26] Sensitive Ecosystems Inventory, East Vancouver Island and Gulf Islands 1993-1997. Volume 2, Conservation manual / Michael McPhee [et al.]. 2000.

As currently layout, the proposed campground currently encroaches on the wetland setback of approximately 20 of the 52 proposed walk in sites. A small portion of the 30m exclusion zone associated with service center #1 at the southeast portion of the development footprint also encroaches on the wetland setback associated with W2. We recommend that the proposed infrastructure be moved north in order to avoid overlapping with the recommended setback areas. As mentioned, prescribed setbacks for these features are consistent with RAPR methodology as determined to be appropriate on the basis of professional opinion.

6.2 Proposed One-Way Road Construction

The proposed one-way road on the southeastern portion of the proposed campground development currently encroaches on a 30m section of the W2 wetland polygon. As much as practicable, the proposed road layout should be realigned outside of the wetland area. If this cannot be feasibly achieved, a *Section 11 WSA change approval* will need to be submitted prior to the commencement of the road construction. The installation of an embedded corrugated metal pipe (ECMP) or open bottom structure is recommended at this location. Although fish utilization potential was determined to be poor, the crossing location was determined to be fish accessible and as such, fish passibility should be maintained. See Appendix 1 for a detailed CEMP and additional installation guidance.

6.3 Additional Recommendations

We recommend that a hydrologist should be retained by BC Parks to assess the potential impact of the proposed development on the natural hydrological regime of the subject lot. Moreover, a stormwater management plan should be created by a certified engineer as per the Ministry of Environment "*Stormwater Management Guidebook" (2002*)[27]. The publication outlines the importance of maintaining the pre-development infiltration and drainage regimes which will need to be considered in the planning and development process.

Lastly, a construction environmental management plan (CEMP) has been developed and appended to this report outlining recommended mitigation measures intended to protect the features, functions and conditions of identified watercourses and environmental sensitive areas.

Provided that the recommendations outlined in this report are adhered to, we do not anticipate that the proposed walk in campground development will result in the death of fish and/or harmful alteration, disruption or destruction of fish or fish habitat under the Fisheries Act. Provided that the CEMP outlined in Appendix 1 is adhered to we anticipate that the natural features, functions and conditions that support fish life processes in the identified riparian areas will be maintained and protected.

[27] Ministry of Water, Land and Air Protection. Stormwater Management; A Guidebook for BC; May 2002. https://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=7591

Photos



Photo 1. December 7th, 2023. Proposed one-way road right of way flows through wetland area 2 (W2) for approximately 30m. An OBS or ECMP will need to be installed at this location and a WSA change approval will need to be submitted prior to the commencement of works if the current road location is retained.



Photo 2. December 7th, 2023. Proposed service center (1) and parking lot area confirmed to be located within upland forest with no drainages observed within the proposed footprint.



Photo 3. December 7th, 2023. Proposed service center (3) along the northern extent of the campground footprint consisted of an upland forest with no drainages observed within the proposed footprint and 30m exclusion zone.



Photo 4. March 16th, 2023. Wetland area 2 (W2) primarily composed of slough sedge (obligate hydrophytes) and immature Red alders (facultative hydrophytes) as well as hydric soils.



Photo 5. March 16th, 2023. Wetland Area 3 (W3) primarily composed of obligate hydrophytes including slough sedge and common horsetails as well as facultative obligates including salmon berry and Red alders.



Photo 6. February 8th, 2024. W3 at the southwestern portion of the lot within 5305 Shields Road dominated by common horsetails (obligate hydrophyte) as well as Red alders (facultative hydrophyte).



Photo 7. February 8th, 2024. Watercourse 1 consisted of a confined channel with seasonal flow and substrate primarily composed of fines and organics.



Photo 8. March 16th, 2023. Reach 2, Watercourse 3 flowed as a roadside linear ditch line adjacent to the north side of Shields Road.



Photo 9. March 16th, 2023. Reach 1, Watercourse 3 veered northeast adjacent to the Tribune Bay trail before confluencing with Watercourse 1.



Photo 10. February 8th, 2024. Watercourse 5 flowed southeast as a anthropogenic linear ditch line within the influence of the proposed walk-in campground footprint.

APPENDIX 1: Construction Environmental Mitigation Plan (CEMP) and Erosion and Sediment Plan (ESCP) for the Proposed Walk-In Campground Development in Tribune Bay Provincial Park, Hornby Island, BC.

The proposed walk-in campground will be constructed on BC Parks land within the eastern portion of a newly acquired land parcel at 5305 Shields Road (PID: 009-651-438) and extend into the existing day-use recreational park located immediately northward of the lot (PID: 009-651-314) (Figure 1). The preliminary campground design has a proposed footprint of approximately 23 acres within a perimeter of 1534m. It includes a total of 52 walk in campground sites that will be accessible from an existing trail network that will be upgraded (Figure 1). The trail network will resurfaced and extended adjacent to Shields Road. A total of 3 services centers with 30m exclusion zones as well as a parking lot accessed from a new one-way road will also be constructed. The parking lot will constructed adjacent to a service center at the eastern portion of the development and from Shield Road via the new one-way road.

The following CEMP and ESCP outline the recommended mitigation measures that should be implemented during the construction of the proposed walk-in campground. Provided that these area adhered to we do not anticipate that the proposed development will result in the death of fish and/or harmful alteration, disruption or destruction (HADD) of fish and fish habitat.

GENERAL

- This CEMP should be reviewed by all sub-contractors conducting works as part of the proposed walk in campground construction in Tribune Bay Provincial Park.
- The environmental monitor (EM) is to be notified at least 3 days prior to the commencement of construction works in order to conduct a walk-through of the site. The objective of the visit will be to confirm the proper demarcation of setback areas and verify that sediment, and erosion control measures are in place where required.
- Erosion and sediment control supplies (e.g. silt fencing, geotextile fabric, straw bales, silt curtains, pumps etc.) should be available on-site to be utilized as needed.
- Works during periods of heavy precipitation should be avoided as much as practicable to prevent the downstream discharge of sediment.
- An EM will need to oversee the structure installation associated with the one-way road construction if the current design is retained and the right of way crosses wetland area 2 as currently mapped (Figure 4-5).

TIMING

The timeline for the proposed construction phase has not been determined. However, once works are initiated, efforts should be made to complete the construction in a timely and efficient manner. The crossing installation required as part of the one-way road construction should be conducted in during low flows within the reduced risk timing windows for the area (June 15 – September 15).

FENCING AND SETBACK DEMARCATION

- A qualified environmental professional (QEP) will need to delineate the natural boundary (high water mark) of identified drainages prior to the commencement of construction works.
- Areas designated as recommended setbacks will need to be identified in the field by a qualified land surveyor. These will need to be flagged and have temporary fencing installed at the setback boundary prior to works occurring. Setbacks are to be measured from the natural boundary of watercourses as identified by the QEP.
- The EM will need to verify that high visibility temporary fencing has been correctly installed prior to the commencement of construction. If silt fencing is utilized then it can provide the dual duty of tree protection measures and sediment control
- Good materials for these barriers include orange snow fencing erected with 2x4's or rebar upright supports, or modular steel construction site fencing. If silt fencing is utilized, then it can provide the dual duty of encroachment prevention and sediment control.
- No works can occur within the setback area and all vegetation within setbacks must be maintained and remained undisturbed.

MACHINERY AND EQUIPMENT

General guidelines pertaining to machinery and equipment are as follows:

- All machinery and equipment should arrive on-site in good working condition, free of any leaks and/ invasive species.
- Machinery that is resulting in excessive exhaust fumes and/or noise should be repaired or replaced, as necessary.
- All refueling and/or maintenance of machinery should occur a minimum of 30m from any waterbody, where practicable.
- Any machinery that is not in use should be turned off to help maintain the air quality in the surrounding areas.
- All equipment on-site should have an appropriately sized spill kit on board and in an accessible location.
- laden materials, which is considered impacted materials. All materials excavated are intended for re-use on site, as directed by the contractor and EM.

EROSION AND SEDIMENT CONTROL PLAN (ESCP)

Sediment discharges to a watercourse or waterbody have the potential to result in the *death of fish and the harmful alteration, disruption, or destruction of fish habitat (HADD),* which are prohibited under *subsections 34.4(1) and 35(10) of the Fisheries Act*. Watercourse 1-3 were determine to have surface flow connectivity to the ocean and as such all efforts should be taken to prevent the discharge of sediment to downstream fish habitat. The erosion and sediment control plan (ESCP) aims to provide recommendations and mitigation measures to prevent erosion and the downstream transport of sediment to fish bearing watercourses.

In order to avoid the introduction of sediment into any waterbody during all phases of the work, undertaking or activity and prevent adverse effects to the aquatic environment including *HADD*, a variety of measures and strategies to manage erosion and sediment will need to be implemented during the project works. These include but are not limited to the following:

- Consideration for potential erosion and sediment control measures will be taken into account in the layout and design of project activities.
- Works will be completed in a timely manner so as to avoid prolonged disturbances to the area and minimize the release of sediment or mobilization of sediment into downslope watercourses.
- Working during periods of heavy precipitation should be be avoided, if possible. Rainwater flows will be diverted away from open construction sites (via pumps, sandbags etc.)
- Erosion and sediment control materials will be readily available and on site prior to the commencement of work. These will be installed surrounding the work site, as required to minimize the dispersal of sediments and avoid releasing sediments into downslope watercourses. The materials should include, but are not limited to the following:
    - Silt fencing and erosion control matting (tarps, geotextile filter fabric, matting, silt curtains, seeding, etc.).
    - Water pumps, sandbags, straw bales and hand tools (shovel and rakes).
- Specific erosion and sediment control measures to be implemented on site as part of the ESCP plan could include but are not limited to the following:
    - Silt fencing with j-hooks should be installed where necessary to prevent sediment discharge to downstream watercourses.
    - Any areas disturbed adjacent to wetland areas should be covered with straw and mulch and re-vegetated with native grasses free of invasive species to prevent erosion as soon as practicable.
    - Stockpiles must be covered with plastic or polyethylene to prevent transport of sediment into the downstream fish habitat including the marine environment.
- In the event that erosion and sediment control structures or materials are utilized, ensure that the materials are installed properly by the contractor in order to achieve proper mitigation.
- Regular monitoring, maintenance, and repair of sediment control systems will be undertaken by the contractor in order to maintain the functionality and effectiveness of these systems.
- Sediment control measures will be removed only after any sediment plume within has dissipated, as confirmed by visual observations and by turbidity monitoring data. BC Approved Water Quality Guidelines should be followed (Table 2: BC MOE, 2021).[28]

[28] MOE; 2021. Water Quality; Ambient water quality guidelines (criteria) for Turbidity suspended and benthic sediments; bc_env_turbidity_waterqualityguideline_overview.pdf (gov.bc.ca).

- Any groundwater being diverted will be monitored to ensure it complies with the provincial turbidity guidelines for freshwater and marine aquatic life (Table 2: *BC MOE 2021*).
- Surplus trenched material, if any, will be removed from the site and disposed of at an appropriate offsite location.
- Excavated material and stockpiles will be removed from site or placed in a stable area (away from any waterbodies) to prevent run off.
- If necessary, heavy machinery will be utilized to texture exposed slopes in order to minimize erosion and sedimentation.
- Following construction, topsoil will be replaced and seeded with native vegetation to prevent erosion and sediment discharge.
- The contractor is to ensure that town streets are kept clean and free of equipment and materials at all times during the construction period.
- If any sediment or mud is tracked onto any paved surfaces (both onsite and offsite) it should be removed immediately with shovels, sweepers, vacuuming and/or other approved means in such a way as to leave the paved surface free of any sediment or mud. Under no circumstances shall sediment or mud be removed from paved surfaces by flushing or disposed in any stormwater drainage systems.

WATER QUALITY

Project works will occur in the vicinity of a wetland complex which has been classified as an ESA by the Hornby Island OCP. Accordingly, all potential sources of turbidity should be prevented through the implementation of mitigation measures outlined in the previous section. Measures to prevent the creation of turbidity and avoid the transport of sediment-laden water into aquatic environments should include, but are not limited to the following:

- Identifying potential sources of sediment before work activities take place; if possible, diverting or pumping silt-laden water to a vegetated topographic depression for biofiltration or utilizing water treatment equipment to filter out sediment.
- Utilizing sediment and erosion control measures to divert or re-divert silt-laden water away from aquatic environments.

In the event that sediment-laden water is discharged into an aquatic environment or stormwater drainage, an EM should be retained to monitor and record turbidity levels throughout the activity. This monitoring will be undertaken using a turbidity meter to ensure that runoff does not exceeds the BC Approved Water Quality Guidelines (Table 2; *BC MOE 2021*). The EM will monitor turbidity according to the following protocols:

- A minimum of two sampling locations will be established: one located at the point of discharge and one located upstream of the site (control). The control monitoring site will help establish the background turbidity levels; the construction-related increase in turbidity can be determined by calculating the net change in turbidity between the two sites.

- Turbidity levels will be measured frequently when water is being discharged into the aquatic environment.
- The EM will use the turbidity data to determine the potential for negative impacts to aquatic life using the criteria outline in the province's Approved Water Quality Guidelines (Table 2; *BC MOE 2021*)
- The EM will be responsible for altering and/or halting the works, or other activities, that are contributing to excessive sediment loading into the aquatic environment.

Table 2. Provincial Water Quality Guidelines for turbidity (BC MOE 2021).

Water Use	Turbidity
Aquatic Life (Fresh, Marine, Estuarine)	Change from background of 8 NTU at any one time for a duration of 24 hours in all waters during clear flows or in clear waters.
	Change from background of 2 NTU at any one time for a duration of 30 days in all waters during clear flows or in clear waters.
	Change from background of 5 NTU at any time when background is 8-50 NTU during high flows or in turbid waters.
	Change from background of 10% when background is >50 NTU at any time during high flows or in turbid waters.

**NTU = Nephelometric Turbidity Units*

PROTECTION OF ESAS/FISH AND AQUATIC HABITAT

The proposed development will take place in the upland environment and in the vicinity of a wetland complex. Walk in campgrounds are proposed which will be accessible via trail network. The impact of these works should be relatively minimal. However a one-way road construction is proposed to provide access to a parking lot. Three service centers are also proposed within the campground footprint. While the project is not anticipated to have a significant impact on fish and/or aquatic habitat, construction works will need to be conducted with consideration of the identified drainages and ESA (wetland complex). Measures to be implemented to protect identified fish accessible drainages and wetland habitat should include but are not be limited to the following:

- Careful planning and staging will be implemented such that work can be completed in a timely manner.
- Works adjacent to waterbodies will largely occur during periods of dry weather; working during inclement weather conditions (i.e. heavy precipitation, strong winds) will be avoided.
- The worksite will be isolated using sediment and erosion control measures, as directed by the EM, to ensure that no sediment-laden water enters the marine environment.
- Any groundwater being diverted will be monitored to ensure it complies with the provincial turbidity guidelines for freshwater and marine aquatic life (Table 2: *BC MOE 2021*).
- All refueling and/or maintenance of equipment will be undertaken away from any waterbody (at least 30m, where possible) to minimize the risk of deleterious substances entering the aquatic environment.

- The EM will conduct regular site visits throughout the project to provide on-going advice with respect to the mitigation of potential impacts to fish and/or aquatic habitat.

TREE PROTECTION

- Clearing activities in proximity to setbacks areas should be protected through the following measures as outlined in the RAPR Technical Assessment Manual[29]:

Construction best practices for protection of trees in the SPEA:

- As deemed necessary by an arborist, tree protection zone must be identified and flagged in the field prior to ground works. The tree protection zone will extend a minimum of 2m from the base of mature trees in the vicinity of the setback boundaries, extending to the drip line of larger trees.
- A physical barrier should be erected to protect trees. The location of this barrier will vary based on the size and location of the trees on the site but it should provide for the majority of the tree's root system to be undisturbed by the construction activities.
- Communicate tree protection plans to everyone involved in the project. Write damage clauses into any service contract to provide financial penalties to any contractors who damage trees.
- Monitor the impacts of construction activities. If roots have been cut make sure they weren't shattered by a backhoe or other equipment. Broken roots should be cut cleanly with a saw.
- Mulch about the base of trees to retain moisture.
- Vertical mulching may be necessary where roots have been severely impacted by machinery or fill.
- Prune any broken limbs with clean cuts.

Construction activities to be avoided for protection of trees in the SPEA:

- Do not trench through the root zone of a tree,
- Do not pave around trees,
- Do not allow concrete washout or other pollutants to contaminate the soil around the SPEA,
- Vertical mulching may be necessary; where significant root damage has been caused, and
- Prune any broken limbs with clean cuts.

VEGETATION CLEARING

- Any vegetation clearing required as part of the one-way road construction as well as the parking lot and service center will need to be preceded by a breeding bird survey if works are conducted between March 12th to August 11th.

[29] BC Ministry of Forest and Lands, Natural Resource Operations and Rural . RAPR Technical Assessment Manual; Riparian Areas Regulation (gov.bc.ca). Accessed February 28th, 2023.

- Follow timing windows to avoid disturbance to vegetation that would impact wildlife (e.g., avoid vegetation removal during bird breeding season); do not clear open land and forest from March 12th to August 11th (timing window is therefore from August 12th to March 11th)[30] to comply with the *Wildlife Act* and *Migratory Birds Convention Act*, unless a breeding bird survey completed by a QEP, concludes there is a high probability that no nests are present in the immediate vicinity of the area to be cleared.
    - Surveys will specifically target songbirds, Red and Blue-listed species, and raptors.
    - A thorough preliminary survey must be conducted within two days of the commencement of works. Vegetation not removed within a reasonable time period (typically 3 days), will require an additional refresher survey prior to works advancement to ensure nest have not been developed in downed shrubs and trees.
    - An additional survey will be required if works are halted for a period of more than 3 days. If identified, an active songbird nest will be given a buffer of 20m and active raptor nests will be given a buffer of 200-500m.

CROSSING STRUCTURE INSTALLATION (ONE-WAY ROAD)

- The potential installation of the ECMP at the wetland crossing associated with the one way road construction will need to be conducted in adherence to the guidelines within the Fish-Stream Crossing Guidebook (DFO, MFLRNO, September 2012) for embedded closed-bottom structures. Guidance includes:
- The pipe should be embedded at least 40% of the culvert diameter, or 0.6m, whichever is greater.
- Any substrate placed within the culvert should be similar in size to the material in the adjacent natural stream channel.
- The gradient through the embedded culvert should not exceed 6%.
- A low-flow channel should be established through the culvert to enable fish passage at low flows.
- An environmental monitor will need to be on site to monitor installation works.
- ESC measures should be implemented as needed during the ECMP installation.

INVASIVE SPECIES

Mitigation measures to limit the spread of invasive species should be taken during vegetation removal and ground excavation. These measures may include, but are not limited to the following:

- Isolated pockets of European holy (*Ilex aquifolium*) was observed throughout the site and stands should be removed as per recommendations below.
- Ensure equipment and machinery used to excavate and modify debris are clean and free of debris prior to and leaving site.

[30] Government of Canada, October 30th 2018, Nesting Periods: Table 1a. Regional nesting period table in Canada, technical information for planning purposes: Nesting Zone A. https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html#_zoneA_calendar

- Uncontaminated gravel should be utilized during road construction in order to prevent invasive species from moving in.
- As soon as practicable, re-vegetate exposed soils, banks, and slopes with a native seed mixture to prevent the establishment and spread of invasive plants.

NOISE MANAGEMENT

Due to the project's location within an urban environment, adjacent to residential properties, measures to minimize noise disturbances from the works have been outlined below:

- Limit the timing of works to daylight hours to avoid disturbances to adjacent property owners (7am to 7pm Monday to Friday, with possible Saturdays).
- Ensure equipment working on-site is in good working order to prevent any excessive noise production due to maintenance issues.
- Turn off engines when machinery is not in use to reduce the overall noise being emitted from the site.
- Notify the surrounding properties of any construction activities that may result in an increased noise disturbance.

AIR QUALITY

Given that the proposed development project is set within an urban environment, special care will be taken to maintain the air quality in and around the site to minimize any impacts to the public. The following mitigation measures will be used to help maintain the air quality in the surrounding environment:

- Emissions from vehicles on site will be reduced by preventing vehicles from unnecessary idling.
- Water will be utilized as a dust suppressant, should the works result in the creation of a large amount of dust (e.g. from excavation and/or backfilling works).
- Vehicle traffic within the work site should be kept to the minimum amount necessary to avoid unnecessary dust creation.
- Debris stockpiles should be stored to avoid the creation of dust.
- Machinery entering and existing the site should be kept as clean as possible to prevent the dispersion of dust particles.
- Machinery that is found to be producing excessive exhaust fumes should be repaired and/or replaced, as necessary.

WASTE MANAGEMENT

Deposition of wastes in or around the project area will be avoided. The mitigation measures for controlling waste deposition include but are not limited to the following:

- All waste will be contained and disposed of in accordance with the ambient waste disposal requirements. Portable latrines should be serviced regularly and kept in a clean and sanitary condition.

- No waste or other materials will be disposed into waterways, storm or sanitary sewers.
- Litter such as coffee cups, lunch wrappers, cigarette butts, and other such items will be placed in covered and secured trash containers. Workers on-site will refrain from leaving waste in the back of vehicles or in immediate work areas where it may serve as a wildlife attractant.
- Best efforts will be made to prevent the deposition of debris into the marine environment. Any debris deposited, whether floating or sinking, shall be contained within the immediate area of the work site and be recovered as soon as practicable.
- The EM should complete routine inspections of vehicles and work areas for food waste and other potential wildlife attractants.

Spill Prevention and Response

Spill prevention and response measures have been outlined and will need to be followed throughout the course of the proposed duplex development. The contractor will provide on-site staff with training in the use of hazardous materials and the location and use of spill kits and other containment devices as applicable. The construction contractor will develop and implement a spill prevention, containment and clean-up contingency plan for hydrocarbon products (e.g., fuel, oil, hydraulic fluid, etc.) and other deleterious substances (such as uncured concrete if applicable) prior to the commencement of onsite works. A site-specific spill response plan will be provided at a later date, prior to construction. Measures outlined in this plan will include, but not be limited to the following:

- The construction contractor will provide suitable type and number of spill containment and clean-up supplies prior to work at the site commencing. Each construction vehicle and piece of heavy machinery will be required to have a fully stocked spill response kit on board and readily accessible. Spill kits should be a size appropriate for the machine and fuel type used.
- These spill containment and clean-up supplies (e.g., storage drums, absorbent pads, barriers or booms capable of blocking the flow of spilled materials into fish habitat) shall be kept available on site whenever the works are underway.
- Machinery will be maintained in proper running order to prevent leaking or spilling of potentially hazardous or toxic products. This includes hydraulic fluid, diesel, gasoline and other petroleum products.
- Fuel storage, handling and labelling procedures will be consistent with A Field Guide to Fuel Handling, Transportation and Storage *(BC MWLAP, 2002)* [31].
- All petroleum, oils, lubricants and other hazardous materials must be stored in a contained, secure location not less than 30m from the high-water mark of any adjacent waterbodies, where possible. Should this not be practicable given the layout of the site, a location as far away from adjacent waterbodies should be identified.

[31] [BC MOE] Ministry of Environment. 2002. A Field Guide to Fuel Transportation, Handling and Storage. <https://www2.gov.bc.ca/.../oilandgas/fuel_handle_guide.pdf> Accessed November 29th, 2022.

- All fueling and vehicle maintenance should take place at a distance not less than 30m from any waterbody, if possible, or as far from the waterbody as practicable.
- Vehicles and equipment must be shut off while refueling.
- Machinery operating on site will be in good working condition, free of any leaks and/or drips and inspected daily prior to the start of work.

In the event a spill does occur, the following steps should be taken to minimize the impacts of the spill and prevent further contamination of the environment:

- If a spill occurs or is at imminent risk of occurring, a responsible person must ensure that the actual or potential spill is immediately reported to the Provincial Emergency Program by calling **1-800-663-3456.**
- If it is safe to do so, the individual who discovers the leak or spill will immediately attempt to stop and contain the leak or spill.
- Any spill or leak must be reported immediately to the Site Supervisor.
- The Spill Response Procedure will follow that outlined in Section 9 of A Field Guide to Fuel Handling, Transportation and Storage (*BC MWLAP, 2002*).
- On-site personnel will be deployed to contain the spilled material using a dyke, pit, or absorbent material.
- Site conditions and environmental impact of various cleanup procedures will be assessed, and an appropriate clean-up procedure will be chosen and implemented.
- On-site personnel will be deployed to mobilize pumps and empty drums (or other appropriate storage) to the spill site.
- All contaminated debris, cleaning materials, and absorbents will be disposed of in an approved disposal site.
- All necessary precautions will be taken to ensure that the incident does not recur.

The EM will be responsible for recording the following information and reporting that information to the appropriate authorities. Division 2.1 Spill Preparedness, Response and Recovery of the Environmental Management Act 2003 (EMA) is effective as of October 2017. *Section 91.2* of EMA identifies the requirements for spill reporting (http://www.bclaws.ca/civix/document/id/crbc/crbc/187_2017).

The Spill Reporting Regulation prescribes the information that is required, as well as the time and manner in which it is required, when reporting spills. A spill response fact sheet and reporting template is provided in Appendix 1. Information gathered following a spill must include the following:

- The reporting person's name and telephone number,
- The name and telephone number of the person who caused the spill,
- The location and time of the spill,
- The type and quantity of the substance spilled,
- The cause and effect of the spill,
- Details of action taken or proposed,

- A description of the spill location and of the area surrounding the spill,
- The details of further action contemplated or required,
- The names of agencies on the scene, and
- The names of other persons or agencies advised concerning the spill.
- An Emergency Fact sheet for spill reporting is available on the Ministry of Environment website at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/spills-and-environmental-emergencies/docs/materials/fact_sheet_spill_reporting.pdf