





Detailed Bio Inventory Waterfront Landing North Park Revision 4

1500 Highway 99 Squamish, BC

Prepared for: Bosa-Kingswood Properties (Squamish) Inc

Project No.12022 March 2021

Environmental Consulting • Engineering Solutions • Environmental Planning

EXECUTIVE SUMMARY

Bosa Properties and Kingswood Developments, working in partnership as Bosa-Kingswood Properties (Squamish) Inc, has designed a Class "A" public park with trails and amenities at the Waterfront Landing property, located on the former Interfor Sawmill industrial site at 1500 Highway 99, Squamish BC. Keystone Environmental Ltd has prepared this detailed bio inventory of the proposed park development area. The objective of this report is to document existing environmental conditions and describe the potential environmental effects and mitigation for the proposed development of the park.

The project area has historically been used for various industrial activities including the operation of a wood mill. Remedial activities at the property have been ongoing for the past decade, including the treatment of contaminated soils, removal of abandoned boats, piles and barges from the Mamquam Blind Channel, infilling of anthropogenic features and removal of invasive species. The province has issued a certificate of compliance for the northern half of waterfront landing, which includes the park (a certificate of compliance is an instrument issued by the province which certifies that a property has been satisfactorily remediated to meet the applicable standards set by the Environmental Management Act).

The proposed park involves construction of 890 m² of new intertidal marsh and 1,086 m² of upland planted vegetation, which is more than double the lost habitat associated with the construction of a retaining wall at the existing pocket marsh, two outfalls (Outfall 1 and 2), a pedestrian bridge, stepping stones through the pocket marsh and pedestrian trails. Natural areas will be protected with the establishment of at least a 5 m planted setback from the High High Water Mark of the Mamquam Blind Channel. Within the park itself, a variety of park features will be constructed as designed by PWL Partnership Landscape Architects and may include park features including a play area designed for multiple age groups, passive open green space and picnic areas. A small passive open space area will be created at the southeast entrance to the park to act as a hub with a connection trail that will lead down to a marsh and trails to the north into the greenspace of the park. Adjustment to these features outside of ecological areas may change through consultation with the District of Squamish, therefore please refer to the latest edition of the PWL report for details.

The assessment area considered in this bio inventory consists of approximately 400 m of shoreline, backshore and upland vegetation extending along the Mamquam Blind Channel from the northern property boundary adjacent to the Canadian National Railway tracks and south to the midpoint of the property. A desktop review was completed to identify potential species and ecosystems at risk that may occur within five kilometres of the property. Methods employed were in accordance with the District of Squamish's Terms of Reference for a Detailed Site Bio inventory. Methods consisted of i) a desktop review of existing literature, maps, and publicly available data, and (ii) a series of terrestrial and marine field assessments conducted between 2016 and 2018 to characterize existing conditions and to assess potential effects to Environmentally Valuable Resources (EVRs) on or near the development Site.

EVRs identified for the project include upland vegetation, intertidal brackish marsh vegetation, intertidal fish spawning areas, species and ecosystems at risk, and the Mamquam Blind Channel. Details of the physical conditions for the proposed park are provided, including climate,



topography, tides and currents, coastal processes, wind exposure, water quality, soil and sediment, large woody debris, anthropogenic materials. A description of the biological conditions for the proposed park included vegetation, birds, fish, amphibians, reptiles, mammals and species and ecosystems at risk. A total of eight species at risk were found to have a moderate to high potential to occur at the Site, and one blue-listed ecosystem (black cottonwood – red alder/salmonberry) was identified in the backshore portions of the proposed Park.

The proposed development has been designed to avoid the EVRs where possible. Where works are required to raise the grade of the park where there is currently backshore trees and shrubs, those areas will be replanted, except for the perimeter trail, with native vegetation to increase diversity and ecological function. Planting will conform to provincial planting restoration guidelines (i.e. plant selection, plant densities, plant sizes), and will be prepared by a qualified professional for approval by the District of Squamish. Vegetation, the intertidal marsh and foreshore located along the Mamquam Blind Channel will not be disturbed.

This Executive Summary is subject to the same general limitations as contained in the report and must be read in conjunction with the entire report.



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LIST OF ACRONYMS

BC British Columbia

BEC Biogeoclimatic Ecosystem Classification

CD Chart Datum

COSEWIC Committee of the Status of Endangered Wildlife in Canada CWHdm Coastal Western Hemlock Dry Maritime Biogeoclimatic Zone

DFO Department of Fisheries and Oceans Canada

DPA Development Permit Area

EVR Environmentally Valuable Resource

GD Geodetic Datum

GPS Global Positioning System

HHWM High High Water Mark

LLWM Low Low Water Mark

NTU Nephelometric Turbidity Units

PID Parcel Identifier

QEP Qualified Environmental Professional

SARA Species at Risk Act

UTM Universal Transverse Mercator



1. INTRODUCTION

Keystone Environmental Ltd. (Keystone Environmental) was retained by Bosa-Kingswood Properties (Squamish) Inc (the Developer) to conduct a detailed bio inventory for the proposed Waterfront Landing North Park (the Park) located on the northern portion of the parcel at 1500 Highway 99, Squamish BC (the Site). This bio inventory has been revised from the original submission submitted in 2019 and the summer of 2020 to incorporate the design changes from the project team and comments received from the District of Squamish during their reviews. This assessment has been prepared in accordance with the District of Squamish terms of reference for site bio inventories (District of Squamish Development Services 2015) to identify existing biophysical conditions along the shoreline and describe potential effects and mitigation strategies to minimize adverse environmental effects associated with the development of the Park and its amenities (the Project).

This bio inventory consists of: (i) a desktop review of existing literature, maps, and publicly available data, and (ii) a series of field assessments conducted between 2016 and 2021 to characterize existing Site conditions and to assess potential effects to Environmentally Valuable Resources (EVRs) on or near the proposed Park.

This report summarizes the findings of the bio inventory, including a description of the physical and biological conditions within the Park, and provides an approach to avoid and mitigate environmental impacts associated with the Project. The assessment area considered in this bio inventory includes the 400m of shoreline, including the 30m wide park along the northern portion of the Site. This area will be converted to a District of Squamish greenspace including public trails and amenities.

This report defines the habitat areas as follows:

- Upland area: the area above the High Water Mark (HHWM) at 5.1 m chart datum (CD) or 2.1m geodetic datum (GD) to the 5 m setback from the HHWM
- Intertidal area: the area below the HHWM and above the Low Low Water Mark (LLWM) at 0.0 m CD or -2.9 m GD.
- Subtidal area: the area below the LLWM (Note no works are proposed below the LLWM).

1.1 Location

The Site is located at 1500 Highway 99, in the District of Squamish, British Columbia (Figure 1, attached). The Site is bounded by the Mamquam Blind Channel to the west and north, a Canadian National (CN) Railway Line to the east, and a forested area to the south.

The following information summarizes the location and identification of the Site:



| Parcel Identifier (PID): | 026897211 | |
|--------------------------|---------------------------------------|--|
| Legal Description: | Plan BCP26353, DL 486 | |
| Current Zoning: | CD-40: Comprehensive Development Zone | |
| Property Area: | 2276408 sq. ft. | |
| Latitude: | 49° 41' 58" North | |
| Longitude: | 123° 8' 54.5" West | |

1.2 Background

The Site formerly housed a lumber mill, originally built in 1962 by Weldwood of Canada. In 1995, the mill was bought, upgraded and operated by Interfor until it closed permanently in 2004. As a result of 42 years of industrial activities, the Site had varying levels of contamination in soils and groundwater (PGL 2007a, 2007b and 2007c). Previous owners began remediation of the Site before the financial crisis of 2008 interfered, and since then the Site has sat fallow for a period of approximately 8 years. These remediation works were being undertaken under an Approval in Principle (2007) from the BC Ministry of Environment. Since then, the Site was utilized for a period as a wood and construction waste sorting and storage facility by Triack Resources, until the owners at the time requested that waste sorting and storage works cease.

Portions of the Site were heavily disturbed, with stockpiles of wood waste, buried hog-fuel, and piles of construction waste material brought onto the Site by a former tenant of the Site. Remediation activities in 2008 and 2009 were left incomplete, and the Site were left with small trees. Invasive plants have become established and a complete invasive species removal was completed in 2019 in the Phase 1, 2 and Park area. Excavation areas were created from the removal of stored hog fuel for analysis and sorting during previous Site remediation works. Depths of the excavation ranged from 1m below ground level (on the south side) up to 6m below ground level (on the north side). These areas were supposed to have been filled back in, but remedial works were left incomplete by the previous owner and these areas have now filled with water.

Intertidal debris, piles, sunken boats and barges were removed from the foreshore area. In 2016/2017, approvals were obtained from the District of Squamish to remediate and clear the Site up to 30m from the shoreline. These works have been completed for the northern portion of the Site. Keystone Environmental has obtained a Certificate of Compliance (COC) from the province for the northern half of Waterfront Landing which includes the Park.

In 2018, approvals were obtained to remove invasive Himalayan blackberry (*Rubus armeniacus*) from the proposed Park. These works were completed in the summer of 2018 and a native seed mix was applied to stabilize the exposed soils until approvals to construct the Park are obtained.

The park is now owned by the District of Squamish.



1.3 Regulatory Framework

Regulatory considerations for the project are multi-jurisdictional, as the Site is subject to the requirements of federal, provincial, and municipal legislation. The following regulatory Acts, Regulations and guidelines are applicable to the Site development and were considered during the preparation of this bio inventory:

1.3.1 Federal

The following federal legislation has been considered:

- Fisheries Act: Fish habitat is defined in subsection 2(1) to include all waters frequented by fish and any other areas upon which fish depend directly or indirectly to carry out their life processes. The fish and fish habitat protection provisions of the Fisheries Act include a prohibition against causing the death of fish by means other than fishing (Section 34.4) and a prohibition against causing the harmful alteration, disruption or destruction (HADD) of fish habitat (Section 35). The Fisheries Act also protects marine mammals through the Marine Mammal Regulations and against invasive species through the Aquatic Invasive Species Regulations. For works that are not covered under codes of practice, are unable to completely implement the fish habitat protection measures provided by Fisheries and Oceans Canada (DFO) or that have potential to cause the death of fish or a HADD, proponents should submit a request for project review to determine if an authorization is required. Therefore, all riparian and in-water works related to the Park construction will be submitted to DFO for review.
- Species at Risk Act (SARA): Protects the individual and critical habitat, as defined in the
 recovery strategy, of species listed as threatened, endangered, or extirpated under Schedule
 1 of SARA where they occur on federal land. Protection of species at risk on private land falls
 primarily to local government, while protection of species at risk that reside in locations that
 contain fish habitat would be regulated by DFO. Handling of species at risk would require a
 permit from various agencies depending upon species. Handling of species at risk projected
 under SARA is not anticipated at this stage.
- Canadian Navigable Waters Act: The Act can apply to anyone, including industry, all levels of government and the public, who is an owner of works on navigable waters, dealing with interferences to navigation in navigable waters and/or planning works that will affect navigation in navigable waters. If proponents are planning in water works they may need to submit an application for an approval to the Navigation Protection Program of Transport Canada. There are exceptions for minor works that meet the criteria in the Minor Works Order, in which case a No Interference to Navigation submission can be completed through the Transport Canada website.
- Migratory Bird Convention Act. Prohibits harm to bird species listed as migratory under the
 Act, including destruction or disturbance of their nests, eggs, and young. No permits are
 required; however, active nests should be protected during the nesting period
 (spring/summer) by suitable buffers determined by a qualified professional until the birds have
 fledged.



1.3.2 Provincial

The following provincial legislation has been considered:

- Wildlife Act, 1996: Provides protection to most native vertebrate species from harm or harassment unless otherwise indicated under the Designation and Exemption Regulation or authorized under a permit. Section 34 provides additional protection to bird species not listed under the MBCA, including their eggs or nests when occupied. The nests of eagle, peregrine falcon, gyrfalcon, osprey, heron, and burrowing owl are protected year-round. No permits are required; however, active nests should be protected during the nesting period (spring/summer) by suitable buffers determined by a qualified professional until the birds have fledged. Pre-clearing surveys will be required prior to vegetation removal if it occurs during the nesting period to ensure compliance, and an environmental monitor will be onsite during construction. Amphibian salvage and relocation under the supervision of a qualified professional may be required prior to start of in-water works. Documentation such as location of origin and relocation, amphibian species, and numbers relocated will be in a report distributed to the District of Squamish and the Province.
- Environmental Management Act: Regulates the introduction of waste into the environment, including the Contaminated Sites Regulation and the Hazardous Waste Regulation. Any material brought to or from the Park during construction must comply.
- Contaminated Sites Regulation: The Contaminated Sites Regulation establishes the standards for identifying, investigating and cleaning up a contaminated Site.
- Hazardous Waste Regulation: Materials identified or categorized as hazardous must be handled in accordance with the Environmental Management Act and Hazardous Waste Regulation.

1.3.3 Municipal

- District of Squamish Official Community Plan Bylaw 2500: Establishes the direction for future growth and development within Squamish. Associated amendments establish Development Permit Areas and guidelines. The shoreline works are located within the following Development Permit Areas (DPAs):
 - ➤ DPA 1 Environmental Protection
 - DPA 6 Mamquam Blind Channel
 - ➤ DPA 13 Waterfront Landing

An application to the District of Squamish is required to develop the proposed Park.

- District of Squamish Tree Management Bylaw 2640: This bylaw outlines the requirements for Qualified Professionals completing tree assessments, Tree Management Permits for the removal of trees, protection of retained trees and replacement trees, and inspection and enforcement provisions.
- District of Squamish Soil Management Bylaw 2641: This bylaw established requirements for Soils Management Permits regarding the removal or deposit of soil, including for phased developments, and inspection and enforcement provisions.



2. PROJECT DESCRIPTION

The Project involves the development of a multi-use community greenspace, which will be located on the east shore of the Mamquam Blind Channel within the District of Squamish at the north end of the Waterfront Landing Development Permit Area (DPA) and immediately south of the CN railroad crossing. The Park is now owned and will be maintained by the District of Squamish, with the overarching objective of providing a community space for all residents and visitors of Squamish to interact with nature and connect to the Mamquam Blind Channel while supporting ecological processes within the larger landscape context.

2.1 Upland Vegetation Removal

Tree removal is required, inland of the fence (Figure 2, attached) that delineates the boundary between the urban and ecological park, because the park must be regraded and infilled to raise the ground elevation to accommodate sea level rise and follow soil requirements provided by the geotechnical engineers. Historically the inland area consisted of a thick Himalayan blackberry thickets understory that was choking off native vegetation. These invasive species were removed in 2018 throughout the park. Trees still remain, which have been surveyed and are described in detail by an arborist (Diamond Head, 2021).

A total of 106 trees will be retained, located within the 5 m setback from the Mamquam Blind Channel (Figure 9A, attached). Some vegetation removal is required within 5 m of the Mamquam Blind Channel. This includes the outfall locations (Figure 3 and 4), because the outfalls have to discharge to the ocean, one park bench midway along the trail, the bridge located along the public trail, which spans the HHWM at the northern portion of the property, the public trail at the southwest end of the park where the peninsula is not wide enough to accommodate a 5 m setback from the HHWM, and the southeast corner, where the retaining wall must be built to accommodate a 15 m offset from the property line for a potential future dyke. Areas within the 5 m setback from the HHWM that will be permanently removed are summarized below in Table 1 and derived from areas in Figure 7 and 10 attached. The majority of these areas were also covered with invasive species understory prior to invasive species removal in 2018. The historical industrial nature of the site has reduced the ecological value of these areas.

Remaining invasive species located within the 5 m setback from the HHWM and on the crown land parcel will be removed to enhance the habitat along the Mamquam Blind Channel and minimize spread of invasive species into the public park. Trees located within the 5 m setback and within the crown parcel shall be retained as indicated in the arborist report (Diamond Head, 2021). This includes a number of dead trees that, while typically may be considered a danger tree, should be retained to act as wildlife trees and provide additional function to the habitat area.



Table 1 Permanent Upland Habitat Lost

| Description | Area | Rationale |
|-------------------------------------|-------------------|--|
| Outfall 1 | 31 m ² | Required for outfall to reach ocean. |
| Outfall 2 | 20 m² | Required for outfall to reach ocean. Note this was mostly a blackberry thicket (invasive species). |
| Bridge for Trail, North End of Park | 36 m² | Required to reach bridge to keep two halves of park connected. |
| Park Bench midway along trail | 7 m ² | |
| Trail on Peninsula | 123 m² | Required to have trail reach stepping stones at south end of park. Note this is entirely within a blackberry thicket (invasive species). |
| Access to stepping stones | 9 m² | Required to access stepping stones. |
| Retaining Wall South End of Park | 261 m² | Required to maintain 15 m flood control level from property line. This includes area that was a blackberry thicket in 2018 (invasive species). |
| TOTAL | 487 m² | |

The total area of invasive species removal is difficult to map due to the sporadic discontinuous nature of the blackberry that remains along the Mamquam Blind Channel. It will need to be removed by hand where it is mixed in with native species. Procedures for removal will be provided in a separate invasive species management plan for the park.

2.2 Intertidal Lost Habitat

The only location with intertidal vegetation removal is required is within the pocket marsh area at the south end of the park due to the retaining wall and stepping stones, and, from the footprint of outfall #2. Outfall #1 was located to avoid removal of intertidal vegetation. The footprint of the proposed retaining wall will cover the existing habitat located between the marsh and the upland, which includes a mix of habitat types including bare mud, cobble, riprap, and areas that were previously colonized with Himalayan blackberry in 2018. This entire area was heavily industrialized and had previously been filled in the 1970's.

Table 2 Permanent Intertidal Habitat Lost

| Description | Area | Rationale |
|----------------|--------------------|---|
| Outfall 1 | 0 m ² | 62 m ² temporarily affected but no permanent change in function as outfall was located to avoid marsh. |
| Outfall 2 | 19 m² | Cannot avoid marsh as runs continuously along the foreshore. |
| Retaining Wall | 414 m ² | Required to maintain 15m from property line above flood control level. |



| Stepping Stones | 12 m ² | Required to provide public access across pocket marsh to park on opposite side. |
|-----------------|-------------------|---|
| TOTAL | 445 m² | |

2.3 Regrading and Filling

The existing ground will be regraded to slope up to the flood control elevation required along the east side of the park, to the location required to accommodate a potential future dyke. Clean fill will be imported to the park to raise the elevation as required to match the plans and cross-sections provided by the landscape architects (PWL 2021). Excavation may be required for any areas that do not meet geotechnical requirements. Any excavated material must be disposed at a located suitable to receive those soils based on the nature of the soil removed in compliance with the Contaminated Sites Regulation.

2.4 Public Greenspace Design Elements

Public greenspace will be created in park east of the perimeter fence. The park will include the following public greenspace design elements, which are described in greater detail in the Landscape Architect information package (PWL 2021). These features may be refined through additional discussions with the District of Squamish. Examples of features include:

- Public Trails: A series of trails will be installed around the perimeter of the park, including a small bridge.
- Passive Open Spaces: Passive open spaces consisting of grass lawn will be constructed throughout the park.

2.5 Upland Habitat Enhanced

Areas where the invasive Himalayan blackberry will be removed and trails or related park features will not be constructed in there place will be replanted with native vegetation within 5 m of the HHWM. This includes an area towards the north end of the park by the bridge, and, the southern area around the peninsula trail. The native vegetation will match the planting list provided by the landscape architect (PWL 2021). The estimated upland area that will be enhanced is provided in Table 3. The areas can be derived from Figure 7, 8, 10 and 11.

Table 3 Enhanced Upland Habitat

| Description | Area | Rationale |
|---|--------------------|--|
| Blackberry removal within crown land to be replanted. | Negligible | The blackberry on the crown land parcel is sporadic and difficult to map. Replanting will need to be determined during blackberry removal. The area is expected to be small. |
| Blackberry removal outside of trail on peninsula to be replanted. | 132 m² | After blackberry is removed, this area beyond the trail footprint will be replanted with native vegetation. |
| Planting unvegetated areas within 5 m setback. | 79 m² | Will be planted with native species. |
| TOTAL | 211 m ² | |



2.6 Upland Habitat Created

In order to provide habitat compensation for vegetated areas within 5 m of the HHWM that will be permanently lost, the 5 m setback from the HHWM will be increased in width at select locations to create additional area that will be planted and offset low upland habitat required to construct the park. A number of locations where the fence was pushed further away from the Mamquam Blind Channel is shown on Figures 8 and 11. In addition, a 5 m setback will be placed around the new marsh and planted with native species. The areas of these upland habitat created areas is provided in Table 4. The area is more than 2:1 habitat created to habitat lost.

Table 4 Upland Created Habitat

| Description | Area | Rationale |
|---|--------|--|
| 5m Setback Around New Marsh | 305 | Will provide additional function to the adjacent new marsh. Currently these areas are unvegetated. |
| Increases in 5m Setback by Mamquam Blind Channel | 570 | Will increase the width of the riparian area on the Mamquam Blind Channel. Currently these areas are not vegetated and further than 5 m from the HHWM. |
| TOTAL | 875 m² | |

2.7 Intertidal Habitat Created

In order to compensate for the aquatic losses around that will result from the construction of the outfalls, the stepping stones, and the retaining wall, the size of the pocket marsh at the south end of the park will be increased. Areas that are currently above the grade of the existing marsh will be excavated to lower the elevation down to allow marsh rushes and sedges to grow in the intertidal. Intertidal areas that are too high in elevation to supports rush and sedge growth will also be lowered. The bank around the pocket marsh will slope up to the park's riparian area except where the retaining wall is located. A low flow drainage approximately 1m wide will be placed in the centre to ensure water is not trapped during low tide. The entire area will be planted with rushes and sedges to create a high functioning ecological feature. The areas proposed are provided in Table 5 and are based on a 2:1 ratio of habitat created vs habitat lost.

Table 5 Intertidal Created Habitat

| Description | Area | Rationale |
|-------------|--------|--|
| New Marsh | 890 | Will provide additional function to the adjacent new marsh. Currently these areas are unvegetated. |
| TOTAL | 890 m² | |



2.8 Temporary Work Area

The creation of a Temporary Work Area has been approved by DFO under the *Fisheries Act* Letter of Advice as required by the projects engineering team to construct the retaining wall at the south end of the park.

In order to construct this area, we will require that marsh sods be created to preserved the top 300 mm of intertidal marsh that resides within this footprint beyond the toe of the permanent structure so that it can be placed back in this area after temporary works are complete. The sods will be sliced with tools that ensure the plants remain fully retained and a clean horizontal cut can be performed at depth. A depth of at least 300 mm is required. The area of the sods should be at least 300 mm squared. During wall construction, the sods will be transposed and stored at equal elevation at the non-marsh area located southwest of the marsh. A professional biologist experienced in marsh construction must oversee this component to ensure the plants remain viable to transplanting once temporary works are complete. Once works have been completed, the Temporary Work Area will be graded, stabilized and the marsh sods will be transposed back to their native locations with no more than one metre gaps between each individual piece. Works will follow the mitigation measures outlined by DFO permits and stated in Section 6 of this report. The areas of temporary works are provided in Table 6 below, and are derived from Figure 7.

Table 6 Temporary Work in Pocket Marsh

| Description | Area | Rational |
|--|--------|----------------------------------|
| Marsh Temporarily Removed and Replaced | 171 m² | Sods to be removed and replaced. |
| TOTAL | 171 m² | |



3. METHODS

This detailed bio inventory was prepared following a hybrid of the following ecological mapping and assessment procedures:

- District of Squamish terms of reference (District of Squamish Development Services, 2015)
- Develop with Care Guidelines (British Columbia Ministry of Environment 2014)
- Methods for Forest and Grassland Songbirds version 2.0 (British Columbia Ministry of Environment Lands and Parks 1999)
- Methods for raptors version 2.0 (British Columbia Ministry of Sustainable Resource Management 2001)
- Field Manual for Describing Terrestrial Ecosystems, 2nd edition (British Columbia Ministry of Forests and Range, Ministry of Environment 2015)
- Marine Foreshore Environmental Assessment Procedures (DFO 2004)
- Green Shores for Coastal Development Credits and Rating Guide for Waterfront Properties (Stewardship Centre for British Columbia 2016)

The following Site components were considered in this assessment:

- Marine, backshore and terrestrial ecosystems
- Habitat areas that support species of management concern
- Species and ecosystems at risk and sensitive species

A review of online databases, electronic mapping tools, available environmental reports, published papers and grey literature was conducted to identify and assess the Environmental Valuable Resources (EVRs) that occurred at the Site.

Several Site assessments were completed from 2014 to 2020 covering all seasons in order to describe habitat conditions. The methods for these assessments were informed by the desktop resources listed above. The most recent Site assessment was completed in August 2020.

Site visits were conducted to identify the HHWM and extent of upland vegetation along the Mamquam Blind Channel. The HHWM is 5.1 m CD (approximately 2.1 m GD), and the extent of upland vegetation was defined as the edge of terrestrial routed vegetation. Topographic survey data collected by others was used to assist with locating the HHWM. Site aerial imagery was used to check the location of the extent of upland vegetation. The outer salt marsh was flagged by Keystone Environmental and surveyed by others.

Transects were walked at 10 m intervals. A hand-held global positioning systems (GPS) unit was used to identify the location of biota and photographs were collected to document findings. Wildlife habitat was assessed qualitatively through documentation of habitat characteristics with the ability to meet one or more life requisites for wildlife known or with potential to occur within the Site, including breeding/denning, migration, and foraging habitat. Plants and wildlife were visually identified in the field to the lowest practical taxonomic level. Leaves and logs were flipped to



investigate for amphibians. Fish trapping, electrofishing and visual observations were used to document fish usage of the foreshore. Visual and auditory observations of wildlife were documented along with active and non-active nests, typical cover and foraging habitat, observations of wildlife sign (e.g., fecal wash, prey remains), and active use within different habitat types by raptors, herons, waterfowl and songbirds. Wildlife trees were investigated for wildlife use. Soil pits were dug to 40 cm to identify the topsoil layer. Transects with 1 m² quadrats were analyzed on the foreshore to assess relative abundance of biota using the categories listed in Table 7. The results are presented in Section 4.

Table 7 Categorization of Site Relative Organism Abundance

| Category | Flora/Sessile Species (Avg. % Coverage within Quadrats) | Motile Species (Total Count along all Transects) |
|-------------|---|---|
| Trace/ Rare | < 5 | 1 |
| Sparse | 5 – 25 | 2 – 4 |
| Few | 25 – 50 | 5 – 10 |
| Common | 51 – 75 | 11 – 30 |
| Abundant | > 75 | > 30 |

Observed and potential terrestrial and aquatic species at risk within 5 km of the Site were documented through the information available from online databases and Site assessments.



4. RESULTS

4.1 Biogeoclimatic Zone

The project is located within the District of Squamish. Squamish is situated within the Coastal Western Hemlock dry maritime (CWHdm) biogeoclimatic subzone (British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development 2018). This biogeoclimatic zone occurs in low to middle elevations along British Columbia coasts and is characterized by high levels of annual precipitation and temperate weather conditions. Vegetation typically includes a well-formed canopy layer dominated by western hemlock (*Tsuga heterophylla*) interspersed with western redcedar (*Thuja plicata*) and Douglas-fir (*Pseudotsuga menziesii*), as well as a sparse to moderately developed shrub and herb layer typified by *Vaccinium* species. A wide assemblage of wildlife is commonly found in this zone, including a diversity of mammals, amphibians, and birds. Coastal portions of the CWHdm zone provide significant breeding habitat for colony-nesting shorebirds.

4.2 Environmentally Valued Resources

From the review of Site assessment data and information from online databases, Keystone Environmental identified five EVRs at the Site: backshore vegetation, marsh vegetation, fish spawning areas, species at risk, and the Mamquam Blind Channel (Table 8). The EVRs are within the shoreline park area (i.e. environmentally sensitive areas are not present inland in the Waterfront Landing Phase I and II residential areas, which consist of cleared areas with imported fill and no vegetation. A section of the remnant channel that used to be present was infilled under permits from the District of Squamish, DFO, and FLNRORD).

Table 8 Environmentally Valuable Resources on or near the Site

| EVR | Description |
|---|---|
| Terrestrial backshore vegetation | Located between the extent of upland vegetation of the Mamquam Blind Channel and the Waterfront Landing development to the east, the backshore vegetation is a young deciduous forest with a thick understory of shrubs that provides foraging, perching and nesting habitat for wildlife (e.g., migratory song and shorebirds, large mammals, herptiles). There is an abundance of berry producing species present including abundant salmonberry, snowberry, pacific crab apple and patches of invasive Himalayan blackberry. There is a thick organic layer of moist soil over a silty clay soil, which in turn is covered by leaf litter that provides habitat for amphibians, insects and small mammals. |
| Intertidal brackish marsh vegetation | An intertidal brackish marsh is present below the extent of upland vegetation and runs most of the Site. This area is characterized by salt-tolerant aquatic plants like Lyngbye's sedges, which can form highly productive marshes that produce nutrient, detritus, and invertebrates that help maintain the food web in the lower Squamish estuary (e.g. juvenile salmon, crustaceans). They also provide refuge habitat for juvenile fish during high tide, feeding areas for birds (e.g., blue heron), and provide natural erosion protection for the adjacent shoreline. |



| EVR | Description |
|-----------------------------------|--|
| Intertidal fish spawning areas | Pacific herring spawn in the Mamquam Blind Channel in late winter and early spring. Their eggs attached to stable substrates from the middle intertidal to shallow subtidal areas. Higher egg survival has been documented on rockweed, kelp and eelgrass compared to other substrate types. A few small patches of rockweed are present in the middle intertidal at the south end of the Site. |
| Species and ecosystems at risk | A list of potential and observed species and ecosystems at risk is provided in Section 4.5. Examples of species at risk observed on Site include red-legged frogs, which have been observed in the backshore vegetation, and blue herons, which have been observed foraging in the intertidal brackish marshes. Amphibian salvage and relocation under the supervision of a QEP will be required prior to start of in-water works. Documentation such as location of origin and relocation, amphibian species, and numbers relocated will be submitted to the Pricne .Species at risk may be listed as special concern, threatened, endangered under Schedule 1 of the federal <i>Species at Risk Act</i> (SARA), or be classified as blue or red listed by the BC Conservation Data Centre. Species not listed under Schedule 1 of SARA, or that are yellow listed, are not included. These rankings aid in setting conservation priorities and provide a simplified view of the status of BC's species and ecosystems. Ecosystems at risk are summarized in Section 4.5. |
| Mamquam Blind Channel | The Mamquam Blind Channel provides habitat for fish and marine mammals. It runs the entire length of the Site and is connect to Howe Sound to the south. Historically, it was a major migration channel for salmon when it was fed by the Mamquam River, until the 1921 flood that cut a new channel into the Squamish River and construction of a dyke in 1922 (Squamish Chief 2016). In 2005, DFO constructed a crossing under the Mamquam River dyke to divert water from the Mamquam River back into Loggers Lane Creek and eventually to the Mamquam Blind Channel (Hay and Company 2013). Today the channel primarily functions as a rearing area for juvenile salmon prior to their seaward migration and herring spawning channel. |

Keystone Environmental has conducted habitat mapping of the Site to identify existing biophysical conditions. The results are identified on Figure 9A (attached). Areas were mapped based on the categories described in Table 9.

4.2.1 Physical Conditions

The tree and shrub habitat is located on the western portion of the terrestrial area, gently sloping west towards the marine area along the Mamquam Blind Channel and east towards the exposed soil habitat adjacent to the currently developed portion of the Site. The crest of the slope in the tree and shrub zone generally follows the transition between the tree and tree and shrub habitats. The tree and shrub area is located above the extent of upland vegetation of the marine area shown in Figure 3A (attached), although there is evidence of infrequent flood events within the tree and shrub habitat up to the HHWM elevation of 2.1 m GD. The area above the tree/shrub area is a few metres higher and relatively flat. That area drops back down at the edge of the park (roughly 30 m from the extent of upland vegetation) to a flat area with recently imported soil material.



Table 9 Habitat Types at the Park

| Habitat Polygon Name on Figure 3A (attached) | Description |
|--|--|
| Recently Filled | Refers to an area where imported fill has been brought to the Site in 2017 and 2018 to raise the grade to the FCL. Generally imported material is glacial till and has a grey appearance. The material is compact and is within the proposed residential development east of the park. No vegetation is present. |
| Soil No Vegetation | Refers to an area that is roughly 2 m above the surrounding landscape and has no trees or shrubs. Blackberry removal was conducted in August 2018 throughout this area. A sandy soil is present, along with scattered cobble and a few boulders. No organic layer, leaf debris, woody debris, or similar features are present. The soil is expected to be above a layer of wood chips generated from previous activities at the Site. The area has been seeded with a coastal re-vegetation mix. |
| Tree No Shrub | Refers to an area that is similar to the "Soil No Vegetation" habitat type, but with trees that typically range in size from 10 to 40 cm diameter at breast height (DBH). A variety of trees including young maples are present throughout this area. The understory was completely removed in August 2018 in order to remove blackberry. The area has been seeded with a coastal revegetation mix. |
| Tree and Shrub | Refers to areas that have both trees and shrubs. Typically, this is located from the extent of upland vegetation of the Mamquam Blind Channel inland to the extent of blackberry removal in August 2018. The soil in this area is silt and clay with 10 cm of organic topsoil. Leaf litter is abundant and wood debris is present. This area represents higher ecological value than the areas to the east. This area represents the terrestrial backshore vegetation EVR and includes environmentally sensitive areas that will be largely untouched by the park design. Areas affects will be limited to trails and fill that will be replanted. |
| Blackberry | Represents areas where invasive Himalayan blackberry has formed thickets. |
| Lyngbye's Sedge | Refers to areas of intertidal brackish marsh. Includes other marsh species as well. Generally, these areas are considered to have high ecological value. This area outlines the intertidal brackish marsh vegetation EVR. |
| Rockweed | Refers to intertidal areas where rockweed colonization was observed. Rockweed provides spawning habitat for Pacific herring in the Mamquam Blind Channel. This area outlines the intertidal fish spawning areas EVR. |
| Riprap | Large, angular rock is the dominant substrate type. |
| Cobble | Cobble is the dominant substrate type. |
| Pebble/Gravel | Pebble and gravel or the dominant substrate type. |
| Old Stream Bed | Location where the remnant channel used to discharge from. A section of the channel was previously filled under a provincial permit. |



4.2.2 Climate

Climate normals from 1981-2010 for the Squamish STP Central Station located within 1 km of the Site provided by Environment and Climate Change Canada (2018a) show that the average temperature ranged from -0.3 to 23.3°C, with extreme values of -14.5°C (December 9, 2009) and 37.0°C (September 3, 1988). Total annual precipitation averaged 2,230.2 mm, with the bulk of the precipitation (1,939.5 mm or 87%) received between October and May.

4.2.3 Topography

The marine area contained the foreshore slope of the Mamquam Blind Channel and an intertidal brackish marsh was observed in the southern portion of the proposed park. The extent of the marine area is shown in Figure 3A (attached).

4.2.4 Tides and Currents

Squamish experiences a mixed semi-diurnal tide cycle comprised of a higher high tide, lower low tide, mid high tide and mid low tide. The tide ranges from approximately -3 m to 2.1 m GD.

Tidal currents result in an ebb of brackish water into the Mamquam Blind Channel during rising tides and flow of brackish water during descending tides. Tidal currents are low due to the absence of a significant headwater.

4.2.5 Coastal Processes

Studies have documented an accretion rate of 1 to 2 cm/year in marshes in the Squamish estuary (Gibsons, 1994). Due to the distance (over 2 km) from the Squamish River to the Site, deposition is expected to be in the form of silt and clay as opposed to larger particles like sand or gravel.

There are varying levels of erosion that have resulted in scour from a few cm to 0.5 m along the base of the existing marsh that runs the length of the Site. In addition, there are areas of erosion at the extent of upland vegetation.

4.2.6 Wind Exposure

The Squamish wind rose, created from wind data from the Squamish Airport, is shown below in Figure 1 below. It shows the number of hours per year the wind blows in a particular direction. In this case most of the wind is from the south. Winds can reach over 28 km/h, but are typically 12 to 19 km/hr (Metroblue, 2018).



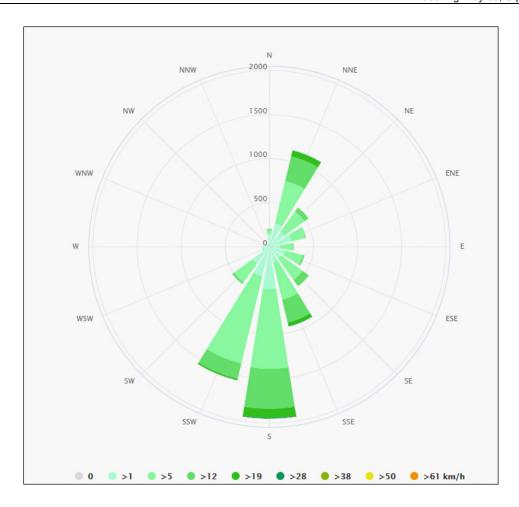


Figure 1 Squamish Wind Rose (Metroblue, 2018)

4.2.7 Water Quality

Volcanic material, unstable tills, glacier runoff, frequent fall floods, steep slopes and high rainfall contribute to high sediment deposits in the Squamish River system resulting in a mean turbidity of 33.9 Nephelometric Turbidity Units (NTU) as reported by Hatfield (1997). Turbidity at the site is significantly reduced but still significant. From a survey on September 10, 2016, Keystone Environmental recorded water temperatures constant at 14.8°C, while salinity ranged from 3.45 to 3.47 ppt (parts per thousand), indicating freshwater influence. Dissolved oxygen ranged from 10.04 to 10.06 milligrams per litre (mg/L) and from between 101.2 and 101.5 percent saturation (%). Conductivity ranged from 5,067 to 5,087 microSiemens per centimetre (µS/cm) while pH ranged from 7.34 to 7.37. Water clarity was very low with the influence of suspended particles of glacial flour (from glacial melt waters in the Squamish watershed) and a blue-green algae bloom. Visibility into the water column ranged from as low as 0.15 m to 1 m over the two field visits. Turbidity was measured between 10.8 and 14.9 NTU. Water quality results are shown in Table 10.



Table 10 Summary of *In Situ* Water Quality in Mamquam Blind Channel

| Parameter | Average Value |
|-------------------------|---------------|
| Temperature (°Celsius) | 14.8 |
| Salinity (ppt) | 3.46 |
| Dissolved oxygen (mg/L) | 10.05 |
| Dissolved oxygen (%) | 101.3 |
| Conductivity (µS/cm) | 5,077 |
| рН | 7.35 |
| Turbidity (NTU) | 12.4 |

4.2.8 Soil and Sediment

The soil and sediment characteristics varied throughout the Site, with eight types described in Table 11.

Table 11 Soil and Sediment Types

| Substrate Type | Elevation Range (m GD) | Location | Description |
|-------------------|------------------------------|---|---|
| 1 | 3.5 – 4.5 | Fill area from Figure 9A (attached), located 30 m from the Mamquam Blind Channel | Imported glacial till and soils from a variety of soils have been placed in 2017 and 2018 to raise the land to the FCL for future development. The recently imported material in the exposed soil habitat was coarse with little to no organic material as shown in Photograph 8 in Figure 9B (attached). |
| 2 | 2.2 – 4.5 | Tree and tree and shrub habitats in Figure 9A (attached), located along eastern half of park. | Soils at the Site are a mix of historically imported fill that has developed a variably thick organic layer over time and recently imported fill that has very little organic content (i.e., in the exposed soil habitat). Photograph 10 in Figure 9B (attached) shows the typical conditions of the soils in the tree zone. Sandy soil is present above wood chips along the eastern half of the park. This area ranges in height but is roughly 2 m above the HHWM. |
| 3 | 1.5 – 2.5 | Backshore tree and shrub area from Figure 9A (attached), located at the HHWM and extent of upland vegetation. | Composed of silty clay alluvial deposits. The soils in the tree and shrub habitat are dominated by silt with a thicker organic layer (approximately 10 cm) relative to the sandier soils in the tree habitat with a thin (<5 cm) organic layer. Photograph 9 in Figure 9B (attached) shows typical conditions of the soils in the tree and shrub zone. |



| Substrate Type | Elevation Range (m GD) | Location | Description |
|-------------------|------------------------------|---|---|
| 4 | 0.0 to 2.0 | The marsh below the extent of upland vegetation as shown on Figure 9A (attached). | Silty clay alluvial deposits. Substrate in the intertidal brackish marsh was predominantly silt with some clay observed to a depth of at least 30 cm. The substrate and vegetation within the intertidal brackish marsh showed staining likely from metal precipitates (e.g. iron and/or manganese oxides). The substrate was saturated through the majority of the intertidal brackish marsh, with standing water consistently observed in the lowest elevation within the centre of the marsh. The intertidal brackish marsh area featured a small low flow channel draining water from the wetland into the Mamquam Blind Channel. |
| 5 | -3 to 2.2 | The un-vegetated foreshore below the marsh. | Typically gravel and small cobble 80 mm or less embedded in silt. The slope was typically less steep than 3:1 (horizontal to vertical). Finer sediments may exist underneath the surface layer. |
| 6 | 0.0 to 3.5 | A short channel (Photograph 4 in Figure 9B, attached) was observed towards the Site on the south side of the intertidal brackish marsh | Rip rap armouring on the banks that ended at an access road where a previous constructed drainage channel had been located. This historic constructed drainage channel was infilled in 2017 following receipt of environmental approvals. This short channel was previously connected to the infilled remnant channel through a floodgate culvert underneath the road. |
| 7 | -3 to 2.2 | Along the steep slopes at the south end of the park. | Patches of concrete slabs are present. |
| 8 | -3 to 2.2m | Along the wave- exposed southern tip of the park. | Patches of cobble substrate are present. |

4.2.9 Large Woody Debris

Large woody debris was not present along most of the park, where recent invasive species removal activities were conducted in August of 2018. Smaller sized woody debris (i.e., 20 cm) was present in the backshore tree and shrub area (Figure 9A, attached). Floating large woody debris was observed in the intertidal brackish marsh area.

4.2.10 Anthropogenic Materials

Anthropogenic debris (i.e., metal and equipment debris from former industrial activities at the Site) was observed in low lying areas of the tree and tree and shrub habitats. Anthropogenic debris including a pile of scrap metal, tires and other industrial equipment debris were observed within



the intertidal brackish marsh and on some portions of the foreshore slope. Wood debris was observed in the marsh (Photographs 2 and 3 in Figure 9B, attached) and included degraded sections of tree boles and limbs.

4.3 Biological Conditions

4.3.1 Vegetation

Vegetation identified on Site by Keystone Environmental included ten trees, ten shrubs, four ground cover species, three invasive plants, five intertidal brackish marsh and one middle intertidal species (Figure 2, below). These included eight different berry-producing species and 14 deciduous species.

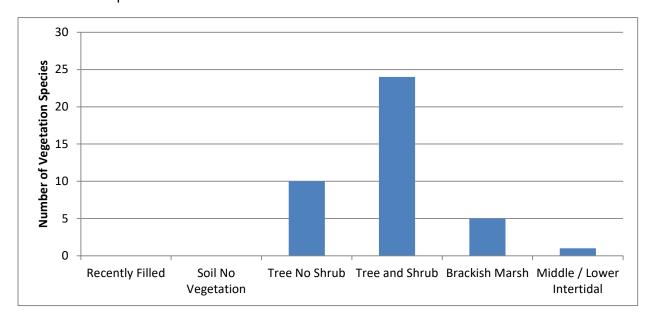


Figure 2 Number of Vegetation Species within each Habitat Areas in the Park

The tree and shrub habitat (Figure 9A, attached) was an early successional upland forest dominated by Pacific crabapple (*Malus fusca*), red alder (*Alnus rubra*) and black cottonwood (*Populus balsamifera* ssp. *trichocarpa*). Other tree species included Western hemlock (*Tsuga heterophylla*) Western redcedar (*Thuja plicata*), bigleaf maple (*Acer macrophyllum*), and Sitka spruce (*Picea sitchensis*). The understorey was characterized by a mix of tall shrubs and herbaceous (non-woody) vegetation, including a mix of native and non-native species. The understory was dense near the HHWM and tended towards water-tolerant species including salmonberry (*Rubus spectabilis*), black twinberry (*Lonicera involucrata*), and willow species (*Salix* spp.). A few wildlife trees were observed within the tree and shrub zone providing habitat for cavity nesters and/or perching sites. Towards the crest of the slope near the break between the tree and tree and shrub habitats, the understory became increasing sparse. Vegetation was overhanging into the adjacent marine foreshore slope providing litter inputs and some shade.



The tree habitat (Figure 9A, attached) was dominated by a mixed coniferous and deciduous forest dominated by red alder and bigleaf maple (*Acer macrophyllum*), with lesser canopy components including black cottonwood, western red cedar, and Sitka spruce (*Picea sitchensis*), paper birch (*Betula papyrifera*). Several wildlife trees were observed in the tree habitat. Invasive plant clearing works conducted in August 2018 removed most of the understory shrubs and forbs in this habitat leaving a mostly bare understory (Photographs 7 and 10 in Figure 9B, attached). Many of the remaining trees in this habitat were damaged as a result of removal works, including broken limbs and cuts/scrapes to portions of the boles.

A total of 283 trees are present in the park and crown land portion fronting the park with a diameter at breast height (DBH) greater than 20 cm. A total of 177 trees will be removed, primarily located outside the 5m setback from the Mamquam Blind Channel where regrading and fill is required to comply with flood protection requirements. A total of 106 trees will be retained within the 5 m setback from the Mamquam Blind Channel (Figure 9A, attached, Diamond Head Consulting 2021). This includes a number of dead trees that, while typically may be considered a danger tree, should be retained to act as wildlife trees and provide additional function to the habitat area.

A classification scheme based on four parameters (dead, poor, moderate, and good) was used to classify the health of individual trees within the Study area. Crown closure was estimated throughout the forested areas and was found to vary between low (30–49%) to medium (50–69%) closure. The trees were found to be in poor health and structure. Only 10% of trees (predominantly bigleaf maple) identified on-Site were assessed as having good condition (Diamond Head Consulting 2021). Two of the trees assessed met the conditions of a Significant Tree as outlined in the Tree Management Bylaw 2640 for District of Squamish (i.e., any tree having a diameter of greater than or equal to 80 cm as measured 1.4 m above the level of the natural ground at the base of the tree). These two trees were red alder and were assessed to be in poor condition (Diamond Head Consulting 2021). Trees situated within the 5 m setback in general will be retained.

Non-native species, including Himalayan blackberry (*Rubus armeniacus*), scotch broom (*Cytisus scoparius*), and lesser amounts of English holly (*Ilex aquifolium*), were observed in the tree and shrub area. Himalayan blackberry was abundant (Photograph 8 on Figure 9B, attached) prior to invasive plant clearing works performed in August 2018 completed through a large portion of the tree habitat. Removal works were successful in removing much of the invasive plants. Recolonization of the tree habitat by Himalayan blackberry was observed in a few areas (Photograph 9 in Figure 9B, attached).

The extent of upland vegetation was defined as the edge of terrestrial vegetation and the HHWM was defined as 2.1 m GD. Vegetation located between the extent of upland vegetation and the HHWM included several shrubs and graminoid species including Pacific crabapple, black twinberry, red alder, red-osier dogwood (*Cornus sericea*) and oceanspray (*Holodiscus discolor*).

Below the extent of upland vegetation, an intertidal brackish marsh was present ranging from approximately 1 to 5 m in width (typically 3 to 4 m). Dominant vegetation included Lyngbye's sedge and creeping spikerush (*Eleocharis palustris*) presented in Photographs 2, 3 and 7 in Figure 9B, attached. Pacific silverweed (*Argentina pacifica*) and curled dock (*Rumex crispus*) were observed in the upper portions of the foreshore slope. There was significant shading of the



upper foreshore slope from the trees and shrubs in the adjacent tree and shrub habitat of the terrestrial area.

In the middle intertidal, rockweed (*Fucus distichus*) was found in small patches on the lower slope (Photograph 1 in Figure 9B, attached). Most of the middle to lower intertidal was not vegetated.

Based on the species observed, the Site corresponded to the black cottonwood – red-osier dogwood site series (CWhdm/09).

A summary of the plant species observed in the Park is provided in Table 12.

Table 12 Vegetation Observed in the Park

| Common Name | Scientific Name | Abundance | Berry Production | Deciduous | |
|--------------------------|--------------------------------------|-----------|---------------------|-----------|--|
| Trees | Trees | | | | |
| Red alder | Alnus rubra | Common | None | Yes | |
| Black cottonwood | Populus balsamifera ssp. trichocarpa | Sparse | None | Yes | |
| Western red cedar | Thuja plicata | Rare | None | No | |
| Western hemlock | Tsuga heterophylla | Rare | None | No | |
| Douglas fir | Pseudotsuga menziesii | Rare | None | No | |
| Paper birch | Betula papyrifera | Rare | None | No | |
| Big leaf maple | Acer macrophyllum | Common | None | No | |
| Bitter cherry | Prunus emarginata | Rare | Yes | Yes | |
| Sitka spruce | Picea sitchensis. | Rare | None | No | |
| Cascara | Rhamnus purshiana | Rare | No | Yes | |
| Oak | Quercus sp. | Rare | No | Yes | |
| Shrub | | • | | | |
| Pacific crabapple | Malus fusca | Abundant | Yes | Yes | |
| Red elderberry | Sambucus racemosa | Rare | Yes | Yes | |
| Sitka mountain ash | Sorbus sitchensis | Rare | Yes | Yes | |
| Salmonberry | Rubus spectabilis | Abundant | Yes | Yes | |
| Red-osier dogwood | Cornus sericea | Sparse | No | Yes | |
| Oceanspray | Holodiscus discolor | Rare | No | Yes | |
| Snowberry | Symphoricarpos albus | Common | Yes | Yes | |
| Indian plum | Oemleria cerasiformis | Rare | Yes | Yes | |
| Nootka rose | Rosa nutkana | Rare | No | Yes | |
| Black twinberry | Lonicera involucrata | Sparse | No | Yes | |
| Ground Cover | | | | | |
| Robert's geranium | Geranium robertianum | Rare | No | - | |
| Pacific bleeding heart | Dicentra formosa | Rare | No | - | |
| False lily-of-the-valley | Maiantemum dilatatum | Rare | No | - | |



| Common Name | Scientific Name | Abundance | Berry Production | Deciduous |
|--------------------------|------------------------------------|-----------|---------------------|-----------|
| Sword fern | Polystichum munitum | Sparse | No | - |
| Invasive Species | | | | |
| English holly | llex aquifolium | Rare | No | - |
| Scotch broom | Cytisus scoparius | Sparse | No | - |
| Himalayan blackberry | Rubus armeniacus | Common | Yes | |
| Intertidal Brackish Mars | Intertidal Brackish Marsh Plants | | | |
| Lyngbye's sedge | Carex lyngbyei | Abundant | No | - |
| Creeping spikerush | Eleocharis palustris | Common | No | - |
| Pacific silverweed | Argentina pacifica | Common | No | - |
| Curled dock | Rumex crispus | Rare | No | |
| Middle and Lower Intert | Middle and Lower Intertidal Plants | | | |
| Rockweed | Fucus distichus | Few | No | - |

4.3.2 Birds

Several bird species were observed within the terrestrial area, including several American robin (*Turdus migratorius*), cedar waxwing (*Bombycilla cedrorum*), Northwestern crow (*Corvus caurinus*), spotted towhee (*Pipilo maculatus*), bushtit (*Paltriparus minimus*), Northern flicker (*Colaptes auratus*) and red-winged blackbird (*Agelaius phoeniceus*). Songbird nests were documented in surveys conducted in 2017 and 2018. Raptor nests have not been observed on Site.

Wildlife documented within the marine area included Canada geese, red-winged blackbird, great blue heron, and river otter. Burrows were not observed along the foreshore slope or within the intertidal brackish marsh. A summary of the biota observed in the marine area is provided in Table 13.



Table 13 Birds Observed in the Park

| Common Name | Scientific Name | Abundance | | |
|---------------------------|--------------------------|-----------|--|--|
| Songbird | | | | |
| American robin | Turdus migratorius | Common | | |
| Cedar waxwing | Bombycilla cedrorum | Rare | | |
| Red-winged blackbird | Agelaius phoeniceus | Few | | |
| Bushtit | Paltriparus minimus | Rare | | |
| Northern flicker | Colaptes auratus | Rare | | |
| Spotted towhee | Pipilo maculatus | Rare | | |
| Red-winged blackbird | Agelaius phoeniceus | Rare | | |
| Raptor | | | | |
| Bald eagle | Haliaeetus leucocephalus | Rare | | |
| Heron | | | | |
| Great blue heron | Ardea herodias fannini | Rare | | |
| Goose | | | | |
| Canada goose | Branta canadensis | Sparse | | |
| Exempt under Wildlife Act | | | | |
| Northwestern crow | Corvus caurinus | Few | | |

4.3.3 Fish

Fish observed on-Site during the assessments conducted by Keystone Environmental included coho salmon (*Oncorhynchus kisutch*), rainbow trout (*Oncorhynchus mykiss*), and three-spine stickleback (*Gasterosteus aculeatus*). Pacific herring (*Clupea pallasii*) have been documented to spawn in the Mamquam Blind Channel and have been observed.

Based on the review of the Fisheries Inventory Data Queries (British Columbia Ministry of Environment 2018a), Habitat Wizard (British Columbia Ministry of Environment 2018b) and DFO (2016) databases, along with McPhail (2007), the fish species that may be present in the area of the Site are summarized in Table 14.

Table 14 Fish Species and Observations in and around the Mamquam Blind Channel

| Common Name | Scientific Name | Observations |
|-------------------------|--------------------------|---|
| Coho salmon | Oncorhynchus kisutch | Observed at the Site |
| Chinook salmon | Oncorhynchus tshawytscha | Mamquam Blind Channel at Stawamus River |
| Pink salmon | Oncorhynchus gorbuscha | Mamquam Blind Channel at Stawamus River |
| Chum salmon | Oncorhynchus keta | Mamquam Blind Channel at Stawamus River |
| Rainbow trout/steelhead | Oncorhynchus mykiss | Observed at the Site |
| Cutthroat trout | Oncorhynchus clarkia | Mamquam Blind Channel at Stawamus River |
| Bull trout | Salvelinus confluentus | Squamish River |
| Dolly varden | Salvelinus malma | Mamquam Blind Channel at Stawamus River |
| Threespine stickleback | Gasterosteus aculeatus | On-Site, upper Mamquam Blind Channel |



| Common Name | Scientific Name | Observations |
|-----------------------|------------------------|---|
| Prickly sculpin | Cottus asper | Mamquam Blind Channel at Stawamus River |
| Coastrange sculpin | Cottus aleuticus | Mamquam Blind Channel and Squamish River |
| Western brook lamprey | Lampetra richardsoni | Mamquam Blind Channel at Logger's Lane Ck |
| Pacific herring | Clupea pallasii | Mamquam Blind Channel |
| Sand lance | Fam. Ammodytidae | Howe Sound, Squamish River |
| Eulachon | Thaleichthys pacificus | Howe Sound, Squamish River |
| Rockfish | Genus Sebastes | Howe Sound |
| Staghorn sculpin | Leptocottus armatus | Howe Sound |
| Starry flounder | Platichthys stellatus | Howe Sound |
| Capelin | | |
| Surf smelt | Hypomesus pretiosus | Howe Sound, Squamish River |
| Spiny dogfish | Squalus acanthias | Howe Sound |
| Shiner Perch | Cymatogaster aggregata | Howe Sound |

Forage fish including Pacific herring are known to occur in the area of the Site. Pacific herring Spawning has been recorded both in the Squamish estuary near Squamish Terminals and Nexen Beach (Buchanan 2015) and within the Mamquam Blind Channel directly across from the Site at the Squamish Yacht Club (Warren Appleton, pers. comm., September 12, 2016). These sites are classified as "medium" to "minor" value for herring spawn records as shown in Figure 3 below (DFO 2016). Spawning in Howe Sound is typically in mid-March, with extreme values between February 1 and April 18 (DFO 2016).

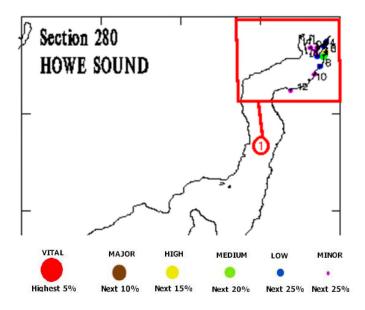


Figure 3 Section 280 Howe Sound Pool 1 Herring Spawning Records



Pacific herring spawn by broadcasting eggs and sperm into the water column, and the fertilized eggs then drop and attach to substrates. In the Squamish area, typical spawning substrates include pilings, eelgrass, and rockweed (Buchanan, 2015). In 2006 during an inspection of salmon net pens used by Squamish Terminal for enhancement purposes, the Squamish Streamkeepers noted dead herring eggs on creosote pilings under the terminal (Squamish Terminals, 2016). Further studies have proven creosote, a coal tar-based preservative used on wood pilings to prevent marine wood-boring worm infestation, is toxic to herring eggs. As a result, the Squamish Streamkeepers, along with local funders and stakeholders, have undertaken a program to wrap creosote piles to provide a barrier for herring eggs, and as a result they have seen an increase in returning herring spawners (Squamish Terminals, 2016).

Other forage fish known to occur in Howe Sound include eulachon (*Thaleichthys pacificus*), Pacific sand lance (*Ammodytes hexapterus*), surf smelt (*Hypomesus pretiosus*); additionally capelin (*Mallotus villosus*), Pacific sardines (*Sardinops sagax*), and Northern anchovy (*Engraulis mordax* were historically observed but are not known to spawn in Howe Sound (BCSSA 2013; Hay 1998; Lamb and Edgell; 2010; McFarlane and Beamish 2000; Zwolinski et al. 2011).

4.3.4 Amphibians

Amphibians observed on Site have included chorus frogs (*Pseudacris* spp.), northern red-legged frogs (*Rana aurora*), and northwest salamanders (*Ambystoma gracile*) (Table 15). Observations included one to a few individuals visually or audibly for each species. Amphibian salvage and relocation under the supervision of a QEP will be required prior to start of in-water works. Documentation such as location of origin and relocation, amphibian species, and numbers relocated will be in a report distributed to the District of Squamish and the Province.

Table 15 Amphibians Likely to Occur at or Near the Site

| Common Name | Scientific Name | Abundance* |
|---------------------------|--------------------|------------|
| Wildlife | | |
| Northern Pacific treefrog | Pseudacris regilla | Rare |
| Northern red-legged frog | Rana aurora | Moderate |
| Northwest salamander | Ambystoma gracile | Rare |

^{*}Rare due to the lack of freshwater features currently present.

4.3.5 Reptiles

Additional wildlife observed within the terrestrial area included a garter snake (*Thamnophis sirtalis*). Additional species likely to occur at or near the Site are summarized in Table 16.



Table 16 Reptiles Likely to Occur at or Near the Site

| Common Name | Scientific Name | Abundance | | |
|----------------------|---------------------|-----------|--|--|
| Wildlife | | | | |
| Garter snake | Thamnophis sirtalis | Rare | | |
| North American racer | Coluber constrictor | Rare | | |
| Rubber Boa | Charina bottae | Rare | | |

4.3.6 Mammals

Terrestrial mammals observed on Site included beavers (*Castor canadensis*), black bears (*Ursus* americanus) and river otters (*Lontra canadaensis*). Marine mammals that have been documented within 5 km of the Site, but are unlikely to be found at the north end of the Mamquam Blind Channel due to the shallow depths, include:

- Dall's Porpoise (Phocoenoides dalli)
- False killer whale (Pseudorca crassidens)
- Pacific white-Sided dolphin (Lagenorhynchus obliquidens)
- Harbour porpoise (*Phocoena phocoena*)
- Humpback Whale (Megaptera novaeangliae)
- Grey Whale (Eschrichtius robustus)

Table 17 summarizes the terrestrial and marine mammals that have been observed at or in the area of the Site.

Table 17 Terrestrial and Marine Mammals Likely to Occur at or Near the Site

| Common Name | Scientific Name |
|-----------------------------|---------------------------------|
| American beaver | Castor canadensis |
| American black bear | Ursus americanus |
| Columbian black-tailed deer | Odocoileus hemionus columbianus |
| Eastern grey squirrel | Sciurus carolinensis |
| Common muskrat | Ondatra zibethicus |
| Raccoon | Procyon lotor |
| Bobcat | Lynx rufus |
| Cougar | Puma concolor |
| Little brown myotis | Myotis lucifugus |
| Californian myotis | Myotis californicus |
| Yuma myotis | Myotis yumanensis |



| Common Name | Scientific Name |
|---------------------|------------------------|
| California sea lion | Zalophus californianus |
| Harbour seals | Phoca vitulina |
| Killer Whale | Orcinus orca |
| River otter | Lontra canadensis |
| Stellar Sea Lion | Eumetopias jubatus |

4.4 Species and Ecosystems at Risk

A desktop review of plant and wildlife species at risk was performed using the mapped known occurrences database (British Columbia Conservation Data Centre 2018a) for results within 5 km of the Site, and the Species and Ecosystem Explorer database (British Columbia Conservation Data Centre 2018b) for habitat types present at the Site within the District of Squamish.

Based on the information on the British Columbia Conservation Data Centre (2018a, 2018b) results, the habitat requisites for these species and assessments of the habitats at the Park, the species identified from these databases were assessed for their potential to occur at the Park. Results are provided in Table 18.

Table 18 Assessment of Potential Occurrence of Species at Risk at the Site

| Common | Scientific | Listing | | | Probability of | |
|------------------------------------|--------------------------|---------|--------------------|---|---|--|
| Name | Name | ВС | SARA | Preferred Habitat | occurring on Site | |
| Vegetation | Vegetation | | | | | |
| Roell's brotherella | Brotherella roellii | Red | Endangered | Associated with cool to moist mixed deciduous and coniferous forests at low elevations | Low- not observed during multiple surveys of the disturbed habitats at the Site. | |
| Vancouver Island beggarticks | Bidens amplissima | Blue | Special Concern | Found in freshwater and tidal shorelines with fluctuating water levels, and is often associated with waterfowl preening areas | Low- not observed during multiple surveys of the marine foreshore or the intertidal brackish marsh. | |
| Henderson's checker-mallow | Sidalcea hendersonii | Red | - | Typically found within marshes at the mouth of estuaries | Low- not observed during multiple surveys of the marine foreshore. | |
| Fish | | | | | | |
| Green sturgeon | Acipenser medirostris | Red | Special Concern | Marine and brackish waters along the Pacific coast in Canada during migration and overwintering | Low – marine environment could provide habitat for migration or overwintering, unlikely to use Mamquam Blind Channel. | |



| Common Scientific | | Listing | | | Probability of |
|---|-----------------------------|---------|--------------------|--|---|
| Name | Name | ВС | SARA | Preferred Habitat | occurring on Site |
| Herptiles | | | | | |
| Coastal tailed frog | Ascaphus truei | Yellow | Special Concern | Swift flowing, moderate to steeply sloped watercourses with substrate dominated by cobbles and boulders. | Nil – on-site aquatic habitat does not meet requirements. |
| Western toad | Anaxyrus boreas | Yellow | Special Concern | Woodlands near freshwater pools or ponds; slow-moving watercourses or ditches | Moderate - freshwater wetland breeding habitat may be available in adjacent lands. |
| Northern red- legged frog ¹ | Rana aurora | Blue | Special Concern | Woodlands near freshwater pools or ponds. | Moderate – Previously observed on Site, freshwater wetland breeding habitat may be available in adjacent lands. |
| Birds | | | | | |
| Band-tailed pigeon | Patagioenas fasciata | Blue | Special concern | Found in forests near marine environments, with coniferous trees and fruiting shrubs. | Low - habitat available on Site, no recent occurrence records on or near Site. Could forage at or near the Site. |
| Common nighthawk | Chordeiles minor | Yellow | Threatened | Utilize open areas for nesting, which may include gravel roads, recently cleared areas, and coastal sand dunes. | Moderate – breeding and forage habitat available on Site. Could forage at or near the Site. |
| Marbled murrelet | Brachyramphus marmoratus | Blue | Threatened | Breeding – mossy limbs of +30 m trees in old forest; Marine – waters to 30 m depth with abundant prey, sand and gravel substrates | Low - foraging and stopover habitat available along marine foreshore and tidal wetland |
| Great blue heron | Ardea herodias fannini | Blue | Special Concern | Nests in tall coniferous and deciduous trees. Foraging habitat includes diversity of marine and freshwater aquatic areas. | High – previously observed on-Site, foraging habitat present along marine foreshore and tidal wetland. Breeding habitat unlikely due to young age of trees retained. |

¹ Amphibian salvage and relocation under the supervision of a QEP will be required prior to start of inwater works. Documentation such as location of origin and relocation, amphibian species, and numbers relocated will be in a report distributed to the District of Squamish and the Province.



| Common | Scientific | Listing | | | Probability of |
|------------------------|-------------------------------|---------|--------------------|---|--|
| Name | Name | ВС | SARA | Preferred Habitat | occurring on Site |
| Northern goshawk | Accipiter gentilis laingi | Red | Threatened | Mature and old forests with abundant suitable wildlife trees (+50 years) with suitable forage; require 100 – 200 ha | Nil – Site does not provide the preferred breeding or foraging requirements. |
| Western screech-owl | Megascops kennicottii | Blue | Threatened | Open woodland with wildlife trees | Low - habitat available on Site, but sensitive to human disturbance, no recent occurrence records on or near Site. Could forage at or near the Site. |
| Spotted owl | Strix occidentalis | Red | Endangered | Strongly associated with old and late- successional coniferous and mixed forest; complex, closed canopy | Nil – habitat not on-Site; associated with old growth; estimated less than 33 breeding pairs. |
| Peregrine falcon | Falco peregrinus anatum | Red | Special Concern | Nesting habitat strongly associated with various cliff types in BC. | Low – breeding habitat not on-Site; limited foraging potential. |
| Olive-sided flycatcher | Contopus cooperi | Blue | Threatened | Breed in variety of forest and woodland habitats, including mixed coniferous-deciduous forest. Strongly associated with forested edges. | Moderate - habitat available on Site, no recent occurrence records on or near Site. Could forage at or near the Site. |
| Barn swallow | Hirundo rustica | Blue | Threatened | Agricultural, estuary grassland, lakes, wetland, stream, and sparsely vegetated habitats. | Low – habitat available on Site, no recent occurrence records on or near Site. Could forage at or near the Site. |
| Mammals | | | | | |
| Little brown bat | Myotis lucifugus | Yellow | Endangered | Use a variety of habitats in natural and man-made structures. Forage in woodlands near water. | Moderate - habitat available on Site, no recent occurrence records on or near Site. Could forage at or near the Site. |
| Keen's myotis | Myotis keenii | Blue | - | Typically use coastal forest habitat. Roost in tree cavities, bark crevices, and buildings. | Moderate - habitat available on Site, no recent occurrence records on or near Site. Could forage at or near the Site. |



| Common | Scientific | L | isting | | Probability of | |
|--------------------------|----------------------------|------|--------------------|---|--|--|
| Name | Name | ВС | SARA | Preferred Habitat | occurring on Site | |
| Townsend's big-eared bat | Corynorhinus townsendii | Blue | 1 | Nest in large tree cavities, caves, and man-made structures. Forage in variety of forested habitats near aquatic resources. | Low - habitat available on Site, no recent occurrence records on or near Site. Could forage at or near the Site. | |
| Grizzly bear | Ursa arctos | Blue | Special Concern | Require a large area with diverse resources to provide forage and shelter throughout the year. | Moderate – forage habitat available on-Site along foreshore and tidal wetland, observations recorded across the Mamquam Blind Channel in 2018. | |

Details for the species with moderate to high potential to occur at the Site are discussed below with respect to their life cycle, habitat requirements and habitat available at the Site.

Two amphibian species at risk were identified as a concern for habitat within or adjacent to the Site: western toad and northern red-legged frog. Both species use a variety of freshwater aquatic habitat types for breeding, including permanent or ephemeral wetlands, slow-flow watercourses, ditches, and artificially created water features (Environment and Climate Change Canada 2016a, 2018). Additionally, the northern red-legged frog requires sufficient emergent vegetation for egg sac attachment (Environment and Climate Change Canada 2018). Outside of the breeding season, the western toad and northern red-legged frog may occupy shrub- or tree-dominated upland habitat available within the Site along the edge of the Mamquam Blind Channel. However, amphibian breeding habitat is not present in the park. The marine areas on Site will not support amphibian breeding due to saline conditions inhospitable to both northern red-legged frog and western toad. The park has been designed to minimize impacts to the narrow band of shrub/tree vegetation in the blue-listed ecosystem where they could be found (Figure 9A, attached). A planting plan will be prepared incorporating native vegetation into the design. Potential impacts to western toad and northern red-legged frog are expected to be low.

The great blue heron was identified as having a high potential of occurring at the Site. Great blue heron utilizes a variety of fresh and saltwater environments for foraging, including marshes, rivers, grasslands, kelp forests, and anthropogenic waterbodies such as ornamental ponds (Butler and Vennesland 2015). Nesting habitat typically includes large woodlands proximal to eelgrass beds, along rivers, and in estuarine and freshwater marshes (Butler and Vennesland 2015). The great blue heron will nest in small to large colonies; some colonies will show a high degree of site fidelity, whereas other colonies will relocate every few years (Butler and Vennesland 2015). The great blue heron has been observed within the marine areas on Site and is therefore considered to have a high potential for occurring within the terrestrial and marine environments. Nesting has not previously been observed on Site and is not anticipated to occur due to a lack of suitable nesting trees (i.e., large trees). Due to the absence of nesting at the Site, no blue-heron setbacks are proposed. Foreshore areas where blue-herons forage will be left undisturbed along the western side of the park. While there is a partial infill area proposed within marsh area for flood protection, it will be replaced with a native marsh extension that will provide foraging opportunities for blue herons, therefore there will be no-net-loss of blue heron habitat.



Two other avian species at risk were identified as having moderate potential to occur within or adjacent to the Site: common nighthawk and olive-sided flycatcher, both of which are protected under Schedule 1 of the SARA. Common nighthawk prefers dry, open habitat such as beaches, burns, and grasslands, as well as anthropogenically modified habitats, including gravel roads, clearcuts, railway beds, or rooftops; with open foraging habitat typically near water or artificial lighting where flying insects are found in abundance (Environment and Climate Change Canada 2016b). A review of the recovery strategy was conducted to identify critical habitat, which has not been defined for this species (Environment and Climate Change Canada 2016b). Olive-sided flycatcher prefer mature to old, open, coniferous or mixed forest adjacent to edges, e.g., near open water, meadows, or wetlands for nesting (Environment and Climate Change Canada 2016c). Anthropogenically created forest edges also attract this species. A review of the recovery strategy was conducted to identify critical habitat, which has not been defined for this species (Environment and Climate Change Canada 2016c).

Two bat species at risk were identified as having moderate potential to occur within or adjacent to the Site: little brown myotis, a federally Endangered species protected under Schedule 1 of the SARA; and Keen's myotis, a provincially blue-listed species. Both species use a variety of habitats over the course of the year including hibernacula for overwintering, summer roosting and foraging habitat, and swarming habitat in late summer and early fall for socializing and mating. Preferred overwintering habitats include underground openings, caves, wells and abandoned mines that can be used year after year (Environment Canada 2015; Chatwin 2004). These habitat features were not present at the Site. Preferred roosting habitats include foliage tree cavities and raised bark in woodlands, little brown myotis is also known to occupy man-made structures near water, urban and suburban areas. Foraging habitat is poorly understood for Keen's myotis, however, inferences can be made from little brown myotis and other bat species, which prefer open habitats along roads and watercourses and open canopy forests where they feed nocturnally on insects, beetles and spiders (Environment Canada 2015). The habitat conditions at the Site could be used for foraging and/or roosting. Preferred swarming and mating habitats include areas outside entrances to overwintering hibernacula, and areas near watercourses (Environment Canada 2015). Keen's myotis has only one known maternity colony which was located at a geothermal spring in Gwaii Haanas National Park (Chatwin 2004). These habitats were not identified at the Site. In general, habitat for bats and birds will be improved through planting additional backshore native vegetation along the Mamquam Blind Channel.

Grizzly bear in the Squamish area are part of the Squamish-Lillooet Grizzly Bear Population Unit (GBPU), which is considered Threatened, with an estimated population size of 59 bears (BC MOE 2012). Grizzly bear requires a large home range (>50 km²) with a variety of forage opportunities (Hamilton and Austin 2004). In coastal BC, spring forage will consist of early green vegetation such as sedges and skunk cabbage along estuary shorelines, transitioning primarily to berries during the summer, and salmon in the fall. Overwintering typically occurs in dens on steep-sloped, north-facing, high elevation habitat (Hamilton and Austin 2004). The marine foreshore adjacent to the Site provides forage for a portion of the grizzly bear's requirements and there have been recent sightings of grizzly bear in downtown Squamish, near the Site (Wildlife Safe BC 2018). The Site does not provide suitable overwintering habitat.



From a review of the Species and Ecosystems Explorer results, the Site is located within the Southern Pacific Ranges Ecosection of the Pacific Ranges Ecoregion, contained within the Coast and Mountains Ecoprovince (British Columbia Conservation Data Centre 2018b). A search for ecosystems at risk within the CWHdm biogeoclimatic zone in the Southern Pacific Ranges Ecosection yielded three results summarized in Table 19. The overall park design is expected to create more functional, clean and improved habitat for species.

Table 19 Ecosystems at Risk that Could Occur at the Site

| Scientific Name | English Name | BC List | BGC/ Site Series | Comments |
|--|--|------------|---------------------|--|
| Populus balsamifera ssp. trichocarpa – Alnus rubra / Rubus spectabilis | Black cottonwood – red alder / salmonberry | Blue | CWHdm/09 | Present within the proposed Park in patches along the shoreline. |
| Leymus mollis ssp. mollis - Lathyrus japonicus | dune wildrye - beach pea | | CWHdm | Not observed within the proposed Park. |
| Brasenia schreberi - Utricularia spp. | water shield - bladderworts | | CWHdm | Not observed within the proposed Park. |

The black cottonwood – red alder / salmonberry blue listed ecosystem at risk is identified on Figure 9A attached, which is shown as an area that runs along the northwest boundary of the park along the HHWM. The area ranges from 5 m to 16 m in width and is 375 m long. The park has been designed to avoid permanent impacts to this area by locating park structures to the east. A small trail runs through a portion of this area in select locations, and some minor changes in elevation are required to meet District flooding requirements; however the majority of these areas will be replanted with native vegetation according to a planting plan prepared by a qualified professional and subject to review by the District of Squamish.



5. POTENTIAL EFFECTS

5.1 Grading

Placement of fill material is required to raise much of the park area in order to meet sea level rise and flood protection requirements. Most of the park needs to be raised by one metre. These works will require the removal of existing vegetation where re-grading is required, whether or not these vegetations are considered healthy. Potential effects from raising the park include the following:

- Loss of native vegetation / ecological areas.
- Disruption of active songbird nests in spring and summer construction.
- Compaction of roots of adjacent vegetation, which can result in poor tree health.
- Placement of fill below the HHWM, resulting in a loss of fish habitat.
- Potential release of contaminants from construction equipment, which could affect soil/water quality.
- Exposing soil to wind, which can result in migration of soil particles in the air to adjacent properties.
- Exposing soil, which can result in increased opportunities for colonization by invasive plants like Himalayan blackberry.
- Erosion and/or generation of sediment laden waters from exposed soils. This can increase the turbidity of adjacent watercourses, which adversely affects fish. It can also lead to smothering or erosion of vegetation that is stabilizing the foreshore.

The purpose of regrading the park is to raise the elevation to accommodate flood protection requirements from the District. As discussed in Section 6, a significant amount of native planting will be incorporated into the final park design in a planting plan to be prepared by a qualified professional. Therefore, potential environmental effects from grading will be restricted to the construction period with no long-term adverse effects once the planting becomes functional.

5.2 Marsh Extension and Infill

The construction of the proposed enhancement habitat areas has the potential to cause short- and long-term impacts to fish and fish habitat with the goal of producing productive fish habitat.

5.3 Short-term Effects on Fish and Fish Habitat

Potential temporary effects to fish and fish habitat resulting from habitat enhancement construction activities include changes in sediment concentrations, changes in contaminant concentrations, and risk of behaviour and physical disturbance to local fish species.



5.3.1 Change in Sediment Concentrations

The excavation of upper intertidal sediments during low tides and dry weather conditions has a low potential to temporarily elevate total suspended solids in the water column at the Site and adjacent areas. Increased sediment concentrations can cause adverse effects (e.g., respiratory, foraging) to fish and other aquatic organisms.

5.3.2 Change in Contaminant Concentrations

The use of machinery to construct the reefs provides a low risk of hydrocarbons leaks. Examples include, but are not limited to, refuelling of equipment and failure of hydraulic lines. Hydrocarbons could contaminate the sediment and have adverse effects on wildlife including direct mortality of benthic and motile organisms; alterations in growth, decreases in reproductive success and competitive abilities; and a loss or reduction of food supply. The likelihood of a spill occurring is expected to be low.

5.4 Long-Term Potential Effects

Following the completion of habitat enhancement works, the following long term potential effects are anticipated.

5.4.1 Change in Habitat Structure and Cover

The habitat enhancements will provide new intertidal brackish marsh habitat for fish and other aquatic animals used to address the impact areas identified for the Project below HHWM. The marsh will be vegetated with a species assemblage similar to the existing marsh.

5.4.2 Change in Food Supply

An increase in marsh vegetation (e.g., Lyngbye's sedge) will increase primary productivity and food availability for the intertidal and subtidal aquatic biological community at and adjacent to the Site.

5.4.3 Changes in Water Flow and Currents

The location of the proposed habitat enhancements is sheltered from tidal currents and has limited water flow. The former stream channel has been filled through the Site and the remainder will be filled in by the Project works. Changes in water flow and currents are expected to be minor and localized in nature.

Proposed mitigation strategies to minimize or eliminate the potential effects are described in Section 6.



6. MITIGATION MEASURES

6.1 Timing of Works

The following best management practices will be incorporated into the work in order to minimize the potential for adverse effects on fish and wildlife.

- All in-water works will be constructed during the least-risk fisheries work window for the Howe Sound portion of DFO Area 28: August 16 to January 31 in order to minimize adverse effects on juvenile salmon and Pacific herring spawn.
- Songbirds construct nests and raise young between March 1 to August 30. Vegetation clearing should be planned to avoid this nesting period where possible. If vegetation removal must occur during this period, a qualified environmental professional (QEP) must conduct a pre-disturbance bird survey to identify the location of active nests and establish a buffer (e.g., 30 m) from the nest to ensure no harm befalls a bird, its eggs, or its nest. Clearing may proceed for a period up to 5 days of each nest survey.
- Works below the HHWM will be completed at low tide as much as possible so as to minimize in-water work.
- Work will be avoided during inclement weather such as heavy rainfall (i.e., 25 mm or more in a 24-hour period).
- Once works starts, it will be completed as quickly as possible to reduce potential for impacts to occur.

6.2 Erosion and Sediment Control

All works must be completed in compliance with an Erosion and Sediment Control (ESC) plan approved by the District of Squamish. Incorporation of these measures will reduce the likelihood of generating sediment laden waters. Measures that should be incorporated into the plan include:

- Material stockpiles will be covered with plastic tarps or sheeting when not in use.
- Material must be stockpiled outside of any riparian zone to prevent it from entering the watercourse.
- Outlet scour protection will be used at all outlets of all stormwater systems, pipes, culverts, or anywhere runoff is conveyed into natural or manmade drainage features.
- Disturbance of existing vegetation along the Mamquam Blind Channel will be minimized where possible.
- Waste hog fuel must be stabilized and protected to reduce the likelihood of it entering any watercourse (i.e., cover stockpiles with plastic tarps, poly, or build physical berms of non-contaminated materials between the stockpile and any fish-bearing watercourse).
- Seeding or planting will occur on exposed surfaces as soon as possible to prevent erosion.
 Seed or plant mixture to be specified on a planting plan prior to exposure of soil. Plant and seed mixtures to use native varieties that do not contain invasive species.



- Silt fencing shall be installed at the downhill toe of all exposed or cleared areas. They shall be
 installed as specified in an ESC plan (i.e. toe of fabric buried in the ground) to prevent
 migration of silty water underneath.
- Effective erosion and sediment control measures must be maintained until the re-vegetation of the disturbed area has been completed.
- Environmental monitoring will be performed to inspect erosion and sediment control measures. Monitoring inspections will typically occur following significant rainfall events, with more frequent visits in the winter than the summer. On average monitoring may be weekly in the winter and bi-weekly during the summer.
- Rock materials shall be clean and free of excess fines.
- Ensure that material placed below top of bank of the watercourse is inert and free of silt, overburden, debris, or other substances deleterious to aquatic life.
- Do not deposit any substances deleterious to fish and fish habitat directly or indirectly into the
 watercourse or downstream reaches of the watercourses. Minimize the introduction of
 sediments (e.g., silts, clays and sand) into the watercourse or downstream reaches of the
 watercourse.

6.3 Water Quality

- Complete the works as quickly as possible once they are started.
- Operate machinery from the top of bank, or, if necessary, from atop fill material in a manner that reduces disturbance to the bottom substrate.
- Conduct excavation activities on dry days to minimize the suspension of fine sediment particles in the water column.
- Trucks hauling fill materials to Site will not be overloaded to prevent loss of material over the sides of the box, and all loads will be covered to prevent mobilization of material by wind.
- The Environmental Monitor will measure turbidity in discharge waters and advise the contractor on additional measures where necessary.
- A water treatment system will be available on Site should there be any rainfall or residual water requiring treatment during works.
- Spill Response Plan posted at the Site understood by all contractors.
- The Environmental Monitor will confirm spill kits are appropriately stocked and available if needed.
- Equipment must be in good condition and free of leaks, inspected regularly; no excess oil or grease that could enter the water.
- Prevent discharge of storm water into the marsh.
- Avoid use of fertilizers and soils high in nitrates and fecal coliforms to avoid nutrient loading of the marsh.
- Use care when pouring concrete, to prevent a change in pH in adjacent water bodies.



The BC Water Quality Guidelines include the following freshwater turbidity criteria for sustained aquatic life to be used to evaluate Project works:

- Change of 8 Nephelometric Turbidity Units (NTU) from any one background measure for a period of 24 h in all waters during clear flows or in clear waters.
- Change of 2 NTU from any one background measure for a duration of 30 days in all waters during clear flows or in clear waters.
- Change of 5 NTU at any time when background ranges from 8 NTU to 50 NTU during high flows or in turbid waters.
- Change of 10% when background is >50 NTU at any time during high flows or in turbid waters.
- pH to remain between 6.5 and 9.0.
- Ammonia and fecal coliform levels to conform to CSR long-term standards.

6.4 Soil Quality

- Stop works if suspect soils are found (e.g., staining or smells that may indicate petroleum hydrocarbons, etc.). Have the Environmental Monitor/QEP assess the sediment to advise on the appropriate course of action.
- Imported soil shall conform to the Contaminated Sites Regulation (CSR) park standards for soil chemistry.
- Imported soil shall prevent nitrogen loading on the lagoon such that the water quality is below the long-term CSR ammonium and fecal coliform standards.
- Imported soil to meet geotechnical standards for the proposed application in order to ensure they are physical stable.
- Imported rock to be free of acid generating properties.
- Imported soil to be free of invasive species.

6.5 Water Management

- Ensure the discharge point for any water retention and/or treatment system is protected from scour to prevent sediment generation.
- The environmental monitor shall check the discharge water quality to ensure it is compliant with provincial water quality criteria.

6.6 Deleterious Substance Control/Spill Management:

Deleterious substance control and spill management will be performed to prevent the releases
and improve clean-up response of hydrocarbons, sediment, and silt from entering the
Mamquam Blind Channel. Equipment used for the proposed works will be in good working
condition, and spill kits will be on-Site, readily accessible and appropriately stocked for the
type of clean-up that may be required.



- Spills of a substance of reportable quantities that are toxic, polluting or deleterious to aquatic life will immediately be reported to the Provincial Emergency Program, Environmental Emergency Management Plan Incident Reporting Hotline.
- All hydraulic machinery will use environmentally sensitive hydraulic fluids that are non-toxic to aquatic life.
- Refuelling will not occur within 30 m of the Mamquam Blind Channel without a special refuelling management plan.
- A minimum of two of the Contractors' onsite staff will be trained in spill response and the specifics of the Contractors' Spill Response Plan. In the unlikely event of a spill, the Contractor must clean up the spill immediately.
- Used spill response materials and/or contaminated soils will be disposed of at a registered, licensed waste disposal facility.

6.7 Vegetation Management

- Machinery will operate within the marked boundaries of the worksite to prevent damage to adjacent vegetation.
- Restore area by planting native grass seeds on fill area after works.
- Native vegetation should be retained wherever possible. If not practicable, restoration should
 be incorporated into the development, such as the replanting of previously cleared native or
 indigenous vegetation species. This will be addressed in the planting plan for the park.
- Maintain a minimum of 5 m wide ecological area from the extent of upland vegetation for majority of the outer park length. The current Park design maintains an average backshore vegetation width of 8 m. Temporary disturbance to riparian vegetation will be minimized where possible. Native or indigenous vegetation should be retained wherever possible.
- Trees outside of the project footprint must be protected with snow or silt fencing prior to the start of works.
- Replanting of backshore vegetation will occur between the perimeter trail and the extent of upland vegetation in areas where the grade must be raised.
- Replanting will conform to provincial replanting criteria (e.g., maximum of 1 m spacing between plants). A planting plan must be prepared by a qualified professional.
- Native plants will be selected to restore habitat function in ecological areas of the park. Urban plants may be used in urban areas of the park.
- An invasive species management plan will be in place. Measures will be undertaken to prevent
 the introduction of invasive species through existing machinery. Existing invasive species will
 be removed, stockpiled separately from native materials and disposed at an appropriate
 location capable of accepting the type of invasive species.



6.8 Fish and Wildlife

- In-water works will be conducted during the least-risk timing window for Howe Sound (August 16 January 31).
- Marine-based equipment will be checked daily for Pacific herring spawn between February 1 and April 15. If spawn is found on marine-based equipment, it will be kept immobilized until eggs have hatched to prevent adverse effects.
- Conduct excavation activities on dry days to minimize the suspension of fine sediment particles in the water column.
- Vegetation clearing activities within the bird nesting window should take place within five days of the completion of bird nest surveys for areas where no active nests are present. If clearing cannot commence within that five-day period, additional pre-clearing survey would need to be conducted immediately prior to clearing. In the event a nest is identified as active, a qualified professional will determine a suitable buffer to reduce the potential for adverse effects. Typically, active songbird nests require a species-specific buffer zone applied. Raptor nests were not present.
- Conduct pre-construction surveys in advance of intrusive works and during nesting/breeding
 periods to determine if breeding wildlife species are present and determine appropriate
 setbacks/buffers in time and space to reduce the potential for adverse effects. Environmental
 monitoring during works to confirm wildlife species are not being impacted.
- In general, excavation and grading of new wetland habitat will be completed with industrial
 equipment operated from above the HHWM where practicable. Where equipment is required
 to access areas below the HHWM, swamp pads or equivalent measures will be used to reduce
 soil disturbance and contractors will have a plan in place to be able to remove industrial
 equipment if it malfunctions before tide water inundate the work site.
- Areas that require excavation works shall be left at the end of the day in a manner that
 prevents fish entrapment. There must be either a low-flow channel out or it must be backfilled
 the same day.
- If there is a risk to a marine mammal from direct contact, temporarily suspend works until the individual has left the area or has not been sighted for 30 minutes.
- In-water works will not be completed without isolation and salvage of aquatic organisms within isolated areas prior to works commencing. Amphibian salvage will be conducted prior to start of in-water works under the provincial wildlife permit. Details, such as locations of origin and relocation, amphibian species, and numbers relocated will be included in a report distributed to the District of Squamish and the Province. Fish salvage will also be conducted prior to start of in-water works under the federal DFO permit. Details will be included in a report distributed to DFO, the District of Squamish, and the Province.



6.9 Species and Ecosystems at Risk

- Pre-construction surveys will be conducted by a QEP in advance of intrusive works (i.e., excavation, vegetation clearing) to confirm that species at risk are not present prior to the commencement of these works or to determine an appropriate adaptive strategy to avoid impacting a species at risk.
- A QEP should be consulted if species at risk are observed during construction activities when an environmental monitor is not present.
- Amphibian salvage, including for the northern red-legged frog, under the supervision of a QEP will be conducted prior to start of in-water works under the provincial wildlife permit. Details, such as locations of origin and relocation, amphibian species, and numbers relocated will be included in a report distributed to the District of Squamish and the Province.

6.10 Environmental Monitoring Plan

The Developer will engage the services of a QEP to conduct environmental monitoring during works. The environmental monitor will have documented experience performing environmental monitoring of construction works around terrestrial and marine environments. These works must be conducted by, or under the supervision of, a Registered Professional Biologist with at least five years of directly related experience.

A pre-construction meeting should be conducted that includes the environmental monitor and the contractor, to ensure all parties understand the applicable best practices, safety, responsibilities and response plan for the project. Prior to the commencement of works, the perimeter of the work area will be flagged so that works will only occur within the confines of the plan shown in the Park (Figure 2 attached).

The environmental monitor will conduct field turbidity sampling and ensure the contractor is performing the works in compliance with project-related environmental requirements. Works in and around aquatic features (i.e., the Mamquam Blind Channel) will be monitored regularly by the environmental monitor. To confirm erosion and sediment control measures are functioning effectively, works that are not around aquatic features will be monitored through weekly visits during the winter (October through March) with frequency reduced to biweekly during the summer (April to September) if conditions are stable.

The environmental monitor will be familiar with identifying bird nests for any vegetation removal during the breeding season. The monitor shall follow methods in British Columbia Ministry of Environment Lands and Parks (1999) and British Columbia Ministry of Sustainable Resource Management (2001).

A weekly monitoring report will document the observations and will be submitted to the Owner and the District of Squamish. The environmental monitor will inform the Owner of any recommended changes where necessary. These recommendations will be relayed to contractor as required for timely responses to deficiencies.



6.11 Summary of Mitigation Measures and Potential for Residual Effects

Table 20 provides a summary of the potential effects, associated mitigation measures and best practices to reduce the potential for impact to EVRs, and an assessment of potential for residual effects following the successful implementation of the mitigation measures and practices.



Table 20 Summary of Mitigation Measures and Residual Effects Anticipated

| Resource Category | Potential Environmental Effects | Mitigation Measures | Residual Effect |
|----------------------|---|---|---|
| Water Quality | suspended solids. Inputs of petroleum hydrocarbons from small spills and/or leaks from equipment. | Complete the works as quickly as possible once they are started. Operate machinery from the top of bank, or, if necessary, from atop fill material in a manner that reduces disturbance to the bottom substrate. Conduct excavation activities on dry days to minimize the suspension of fine sediment particles in the water column. Trucks hauling fill materials to Site will not be overloaded to prevent loss of material over the sides of the box, and all loads will be covered to prevent mobilization of material by wind. The Environmental monitor will measure turbidity in discharge waters and advise the contractor on additional measures where necessary. Have a water treatment system available on Site should there be any rainfall or residual water requiring treatment during works. Have a Spill Response Plan posted at the Site understood by all contractors. The Environmental monitor will confirm spill kits are appropriately stocked and available if needed. Equipment must be in good condition and free of leaks, inspected regularly; no excess oil or grease that could enter the water. Prevent discharge of storm water into the marsh. Avoid use of fertilizers and soils high in nitrates and fecal coliforms to avoid nutrient loading of marsh. Use care when pouring concrete, if required, to prevent a change in pH in adjacent water bodies. | Potential temporary increase in total suspended solids in adjacent areas of the access channel during works, and after first rainfall |



| Resource Category | Potential Environmental Effects | Mitigation Measures | Residual Effect |
|----------------------|--|--|-----------------|
| Sediment Quality | Inputs of petroleum hydrocarbons from small spills and/or leaks from | Stop works if suspect sediment is found (e.g., staining or smells that may indicate petroleum hydrocarbons, etc.) have the environmental monitor assess the sediment to advise on the appropriate course of action. | None expected |
| | equipment. | Deleterious substance control and spill management will be performed to prevent the releases and improve clean-up response of hydrocarbons, sediment, and silt from entering the Mamquam Blind Channel. Equipment used for the proposed works will be in good working condition, and spill kits will be on-Site, readily accessible and appropriately stocked for the type of clean-up that may be required. | |
| | | Spills of a substance of reportable quantities that are toxic, polluting or deleterious to aquatic life will immediately be reported to the Provincial Emergency Program, Environmental Emergency Management Plan Incident Reporting Hotline. | |
| | | All hydraulic machinery will use environmentally sensitive hydraulic fluids that are non-toxic to aquatic life. | |
| | | Refuelling will not occur within 30 m of the Mamquam Blind Channel without a special refuelling management plan. | |
| | | A minimum of two of the Contractors' onsite staff will be trained in spill response and the specifics of the Contractors' Spill Response Plan. In the unlikely event of a spill, the Contractor must clean up the spill immediately. | |
| | | Used spill response materials and/or contaminated soils will be disposed of at a registered, licensed waste disposal facility. | |



| Resource Category | Potential Environmental Effects | Mitigation Measures | Residual Effect |
|----------------------|--|---|-----------------------------------|
| Vegetation | Loss of additional native riparian vegetation. | Machinery will operate within the marked boundaries of the worksite to prevent damage to adjacent vegetation | Unavoidable permanent net loss of |
| | Introduction/spreading of | Restore area by planting native grass seeds on fill area after works. | vegetation to create the park. |
| | invasive species | Native or indigenous vegetation should be retained wherever possible. If not practicable, restoration should be incorporated into the development, such as the replanting of previously cleared native or indigenous vegetation species. | None expected |
| | | Maintain a minimum of 5m wide ecological area from the extent of upland vegetation for majority of the outer park length. The current Park design maintains an average backshore vegetation width of 8 m. | |
| | | Trees outside of the project footprint must be protected with snow or silt fencing prior to the start of works. | |
| | | Replanting of backshore vegetation will occur between the perimeter trail and the extent of upland vegetation in areas where the grade must be raised. | |
| | | Replanting will conform to provincial replanting criteria (e.g., maximum of 1 m spacing between plants). A planting plan must be prepared by a qualified professional. | |
| | | Native plants will be selected to restore habitat function in ecological areas of the park. Urban plants may be used in urban areas of the park. | |
| | | An invasive species management plan will be in place. Measures will be undertaken to prevent the introduction of invasive species through existing machinery. Existing invasive species will be removed, stockpiled separately from native materials and disposed at an appropriate location capable of accepting the type of invasive species. | |



| Resource Category | Potential Environmental Effects | Mitigation Measures | Residual Effect |
|--------------------------|---|--|---|
| Fish and Fish Habitat | Effects on juvenile salmon and herring. | In-water works will be conducted during the least-risk timing window for Howe Sound (August 16 – January 31). | Infill of habitat types below the HHWM will |
| | | Conduct excavation activities on dry days to minimize the suspension of fine sediment particles in the water column. | result in a temporary change in function for fish and fish habitat. |
| | | Marine-based equipment will be checked daily for Pacific herring spawn between February 1 and April 15. If spawn is found on marine-based equipment, it will be kept immobilized until eggs have hatched. | Fish habitat will be enhanced through the extension of the |
| | | In general, excavation and grading of new wetland habitat will be completed with industrial equipment operated from above the HHWM where practicable. Where equipment is required to access areas below the HHWM, swamp pads or equivalent measures will be used to reduce soil disturbance and contractors will have a plan in place to be able to remove industrial equipment if it malfunctions before tide water inundate the work site. | marsh by 235 m ² |
| | | Areas that require excavation works shall be left at the end of the day in a manner that prevents fish entrapment. There must be either a low-flow channel out or it must be backfilled the same day. | |
| | | If there is a risk to a marine mammal from direct contact, temporarily suspend works until the individual has left the area or has not been sighted for 30 minutes. | |
| | | In-water works will not be completed without isolation and salvage of aquatic organisms within isolated areas prior to works commencing | |
| Wildlife | Loss of nesting and foraging habitat for birds, mammals and amphibians, reduced survival or fecundity of birds if disturbed during nesting, negative impacts from spills of | Vegetation clearing activities within the bird nesting window should take place within five days of the completion of bird nest surveys for areas where no active nests are present. If clearing cannot commence within that five-day period, additional pre-clearing survey would need to be conducted immediately prior to clearing. In the event a nest is identified as active, a qualified professional will determine a suitable buffer to reduce the potential for adverse effects. Typically, active songbird nests require a species-specific buffer zone applied. Raptor nests were not present. | None expected |
| | deleterious substances. | Conduct pre-construction surveys in advance of intrusive works and during nesting/breeding periods to determine if breeding wildlife species are present and determine appropriate setbacks/buffers in time and space to reduce the potential for adverse effects. Environmental monitoring during works to confirm wildlife species are not being impacted. | |



| Resource Category | Potential Environmental Effects | Mitigation Measures | Residual Effect |
|---------------------------|--|---|-----------------|
| Species and Ecosystems at | Loss of foraging or wading habitat for great | Pre-construction survey in advance of intrusive works to confirm species at risk are not present, or to develop appropriate adaptive strategies if they are found. | None expected |
| Risk | blue heron. Effects on northern red- | A QEP should be consulted if species at risk are observed during construction activities when an environmental monitor is not present. | |
| legged frogs | | In-water works will not be completed without isolation and salvage of amphibians, including northern red-legged frog within isolated areas prior to works commencing | |
| General | Environmental incident due to lack of awareness. | Contractor must conduct a kick-off meeting to ensure general industry best management practices have been identified and are understood by all crew and subcontractors prior to commencement of work. | None expected |
| | Works occur outside of the approved worksite | An environmental monitor will perform regular visits during the works as per the Environmental Monitoring Plan. | |
| | boundary. | Prior to the commencement of works, the perimeter of the work area will be flagged so that works will only occur within the confines of the plan shown in the Park (Figure 2 attached). | |
| | | Operate machinery from the top of bank, or, if necessary, from atop fill material in a manner that reduces disturbance to the bottom substrate. | |



7. RESIDUAL EFFECTS AND OFFSETTING

Permanent changes in habitat areas and their associated residual effects are provided in Table 21 for intertidal areas. Using a 2:1 habitat compensation ratio, the total amount of marsh that needs to be constructed is 890 m².

Table 21 Intertidal Residual Impacts

| Description | Habitat Loss | Habitat Created | Habitat Enhanced | Net Change |
|---------------------------------------|-----------------|--------------------|---------------------|---------------|
| Outfall 1 | 0 | 0 | 0 | 0 |
| Outfall 2 | 19 | 0 | 0 | -19 |
| Retaining Wall | 414 | 0 | 0 | -414 |
| Stepping Stones | 12 | 0 | 0 | -12 |
| New Marsh (Compensation at 2:1 Ratio) | 0 | 890 | 0 | +890 |
| Total | 445 | 890 | 0 | +445 |

Permanent changes in habitat areas and their associated residual effects are provided in Table 22 for upland areas. The proposed habitat creation and enhancement is more than double the habitat loss.

Table 22 Upland Habitat Balance

| Permanent Impacts | Habitat Loss | Habitat Created | Habitat Enhanced | Net Change |
|--|-----------------|--------------------|---------------------|---------------|
| Outfall 1 | 31 | 0 | 0 | -31 |
| Outfall 2 | 20 | 0 | 0 | -20 |
| Bridge for Trail, North End of Park | 36 | 0 | 0 | -36 |
| Park Bench midway along trail | 7 | | | -7 |
| Trail on Peninsula | 123 | 0 | 0 | -123 |
| Access to stepping stones | 9 | | | -9 |
| Retaining Wall South End of Park | 261 | 0 | 0 | -261 |
| Blackberry Removal and Replanting on Peninsula | 0 | 0 | 132 | +132 |
| Planting beyond 5m setback | | | 79 | +79 |
| 5m Setback Around New Marsh | 0 | 305 | 0 | +305 |
| Increased 5m Setback and Planted Along Mamquam Blind Channel | 0 | 570 | 0 | +570 |
| Total | 487 | 875 | 211 | +599 |



8. MARSH DESIGN CRITERIA

New marsh is required in order to compensate for the installation of the retaining wall and outfall 2. The area of marsh proposed is double the total intertidal area that will be permanently impacted. Temporary impacts are not included as they will be returned to similar ecological function post construction.

Areas selected to construct the marsh are all within the former saw mill operations footprint and have historically been highly disturbed by industrial activities. A map identifying the types of substrate and biota present within the proposed marsh footprint is provided on Figure 7. No intertidal brackish marsh is present within the proposed marsh footprint. Areas within the footprint are provided below in Table 23 and include disturbed industrialized portions around the existing pocket marsh. Construction of marsh in these areas will improve ecological function and increase the overall size of the pocket marsh to help it function more effectively as a whole.

Table 23 Disturbed Areas within Proposed Marsh Footprint

| Description | Area | Rational |
|---|--------|---|
| Intertidal Newly Seeded Vegetation (former blackberry in 2018). | 208 m² | This area was a blackberry thicket in 2018 and completely bare after removal. Blackberry was removed to access the park for surveying and planning. It was reseeded in 2018 for erosion and sediment control purposes. This area will be cut down to create marsh as it is too high for those plants to grow. See Photograph 6, Figure 9B attached. |
| Upland Newly Seeded Vegetation (former blackberry in 2018). | 306 m² | This area was a blackberry thicket in 2018 and completely bare after removal. Blackberry was removed to access the park for surveying and planning. It was reseeded in 2018 for erosion and sediment control purposes. This area will be cut down to create marsh as it is too high for those plants to grow. See Photograph 6, Figure 9B attached. |
| Intertidal bare (unvegetated) pebble cobble. | 102 m² | This area is unvegetated because it is too low for marsh plants to grow and located where a former channel (from the old "central ditch") used to discharge into the pocket marsh area. This area will be raised in elevation and planted to allow marsh plants to grow. See Photograph 2, Figure 9B attached. |
| Intertidal bare pebble silt. | 102 m² | This area is too steep or too low for marsh plants to grow, and is effectively an eroding bank on the side of the former channel described above. This area will be regraded level and placed at an elevation suitable for |



| | | marsh plants to survive. See Photograph 2, Figure 9B attached. |
|--|--------------------|--|
| Intertidal backshore vegetation (i.e. upland plants growing below the HWM) | 50 m² | This is a thin band of vegetation on the industrialized slope where upland plans are growing below the HHWM. See Photograph 2, Figure 9B attached. |
| Upland backshore vegetation. | 85 m² | This is a thin band of vegetation on the industrialized slope where upland plans are growing above the HHWM. See Photograph 2, Figure 9B attached. |
| Intertidal invasive blackberry (i.e. blackberry growing below the HHWM). | 29 m² | A blackberry thicket that still remains (was not cleared in 2018) that is located below the HHWM. |
| Upland invasive blackberry | 8 m² | A blackberry thicket that still remains (was not cleared in 2018) that is located above the HHWM (note 43 m2 is on Figure 7, of which only 8 m² is within the proposed marsh). |
| TOTAL | 890 m ² | |

The marsh design incorporated the following requirements in order to ensure that it meets the functional intent of this bio inventory:

- In general, excavation and grading of new wetland habitat will be completed with industrial equipment operated from above the HHWM where practicable. Where equipment is required to access areas below the HHWM, swamp pads or equivalent measures will be used to reduce soil disturbance and contractors will have a plan in place to be able to remove industrial equipment if it malfunctions before tide waters inundate the work site. In-water works will not be completed without isolation and salvage of aquatic organisms within isolated areas prior to works commencing.
- Disturbance to the existing marsh shall be minimized. Any disturbed areas must be repaired
 or replanted immediately. This includes the area at the base of the new wall, where a
 temporary foundation will be constructed. This area must be converted back to marsh as soon
 as possible. This also includes installation of stepping stones. Any works required to install
 the stepping stones shall minimize disturbance to existing marsh and ensure marsh is planted
 right up to the rocks.
- The top 0.3 m of substrate gain size shall consist of at least 50% silt. The clay fraction shall not exceed 20%.
- The finish grade of the marsh shall be 1m GD +/- 0.5 m.
- The slope of the marsh shall be graded to ensure no water is trapped. A small low flow channel should be utilized to allow water to escape.
- The slope of the marsh shall not be steeper than 1H:15V.
- The marsh shall be planted at a density of at least two plugs per m².
- All plants must be within their respective growing elevations that can be measured on-site.



- The marsh shall be planted with Lyngbye's sedge as the dominant species in segments with high moisture and silt content.
- Adjacent riparian areas to be planted with native vegetation.
- Cattails may be planted towards the northern end closest the existing marsh where the moisture content will be highest.
- Areas along the bank that are created should be planted with a native seed mix and a variety
 of sedges and rushes.
- The seaward face of the marsh should be protected from erosion through an engineered slope. A small wave trip should be added for maximum benefit to the marsh, but must still allow flow to drain out of the marsh without becoming trapped. The seaward face must not have any holes or erodible surfaces that will allow the sediment behind to escape over time, therefore any holes in the wave trip must be at marsh grade, not below or above.
- The areas of the marsh created must meet or exceed the areas identified in this bio inventory.
- Acid-generating rock or contaminated sediments shall not be used.



9. COST ESTIMATE

The estimated hard costs to complete the habitat enhancements and created habitat is provided below in Table 24.

Table 24 Estimated Costs

| Item | Cost |
|--|----------|
| Silt Fence | \$1,000 |
| Silt Curtain at Pocket Marsh Entrance | \$1,000 |
| Purchase Upland Plants Assume 1,100 @ \$10 / plant | \$11,000 |
| Purchase and Install Perimeter Fence Assume 360 m @ \$45/m | \$16,200 |
| Purchase Soil for Marsh Assume 280 m³ @ \$40/m³ | \$11,200 |
| Trucking for Marsh Work Assume 28 Trucks, \$500 / truck load | \$14,000 |
| Excavator Assume Two Weeks @ \$1,200/day | \$12,000 |
| 10% for Bonding | \$6,640 |
| Total | \$73,040 |



10. CONCLUSION

Keystone Environmental is confident that the proposed park design will maintain the ecological integrity of features present both upland and in the intertidal. Keystone Environmental recommends that the project proceed subject to the following recommendations:

- An Environmental Management Plan (EMP) is prepared to ensure works are constructed in accordance with these mitigation strategies:
- A Canadian Navigational Waters Protection Act No Interference to Navigation submitted, if required by Transport Canada.
- Salvage permits are acquired from the Province and DFO prior to works to allow salvages to occur if required, and works are executed in accordance with those permits.
- Works are conducted in accordance with the Fisheries Act Letter of Advice (Appendix A).
- Permits are obtained from the District of Squamish.
- All imported soil and rock to be inspected by a qualified professional to ensure they are clean and suitable for use.
- A planting plan of the backshore vegetation is overseen by a qualified professional.
- A qualified environmental monitor is retained for the project and is present for all works that could potentially affect ecological areas.
- The marsh construction is overseen by a professional biologist with experience in marsh construction.



11. LIMITATIONS

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

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

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

This report was prepared by Arman Ospan, Dave Langill, Corrie Allan, Meagan Leicht, Tia Gabruch and Warren Appleton. Warren Appleton is the professional of record for this report.

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Prepared by:

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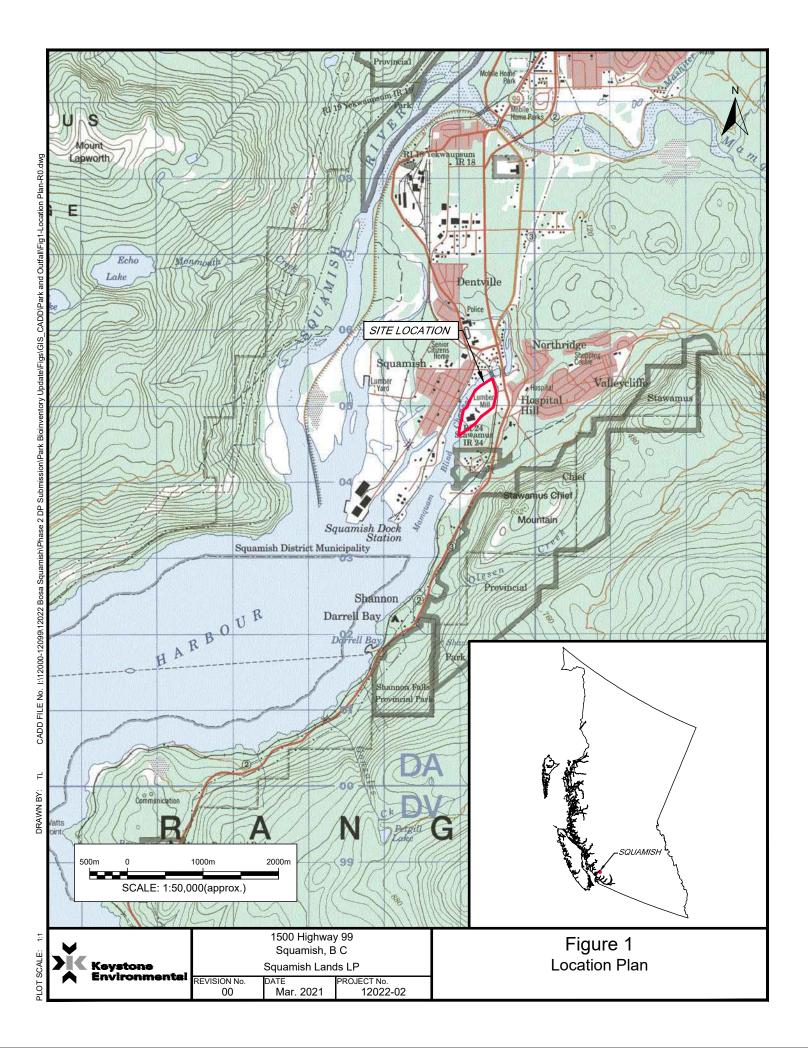


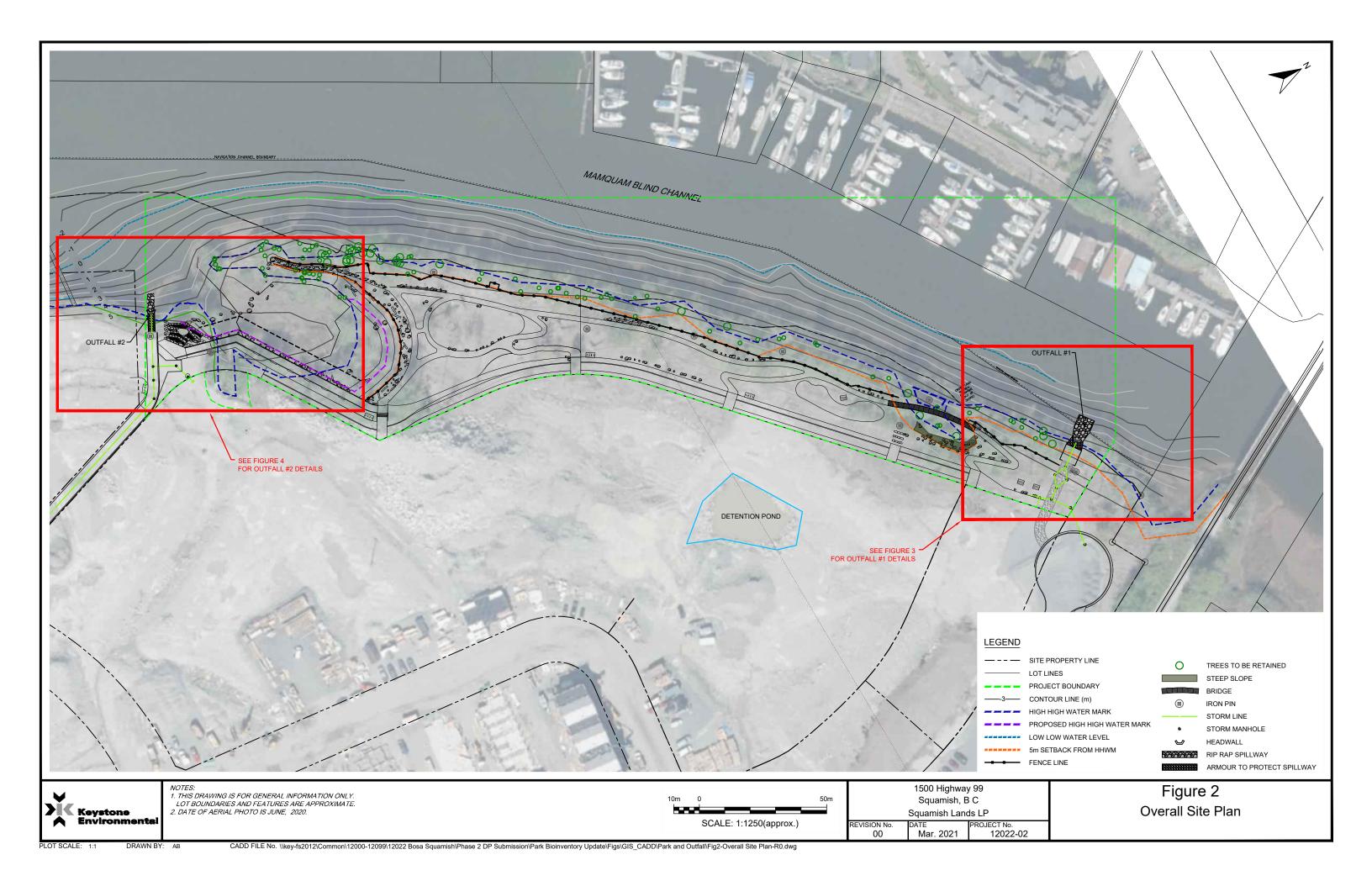
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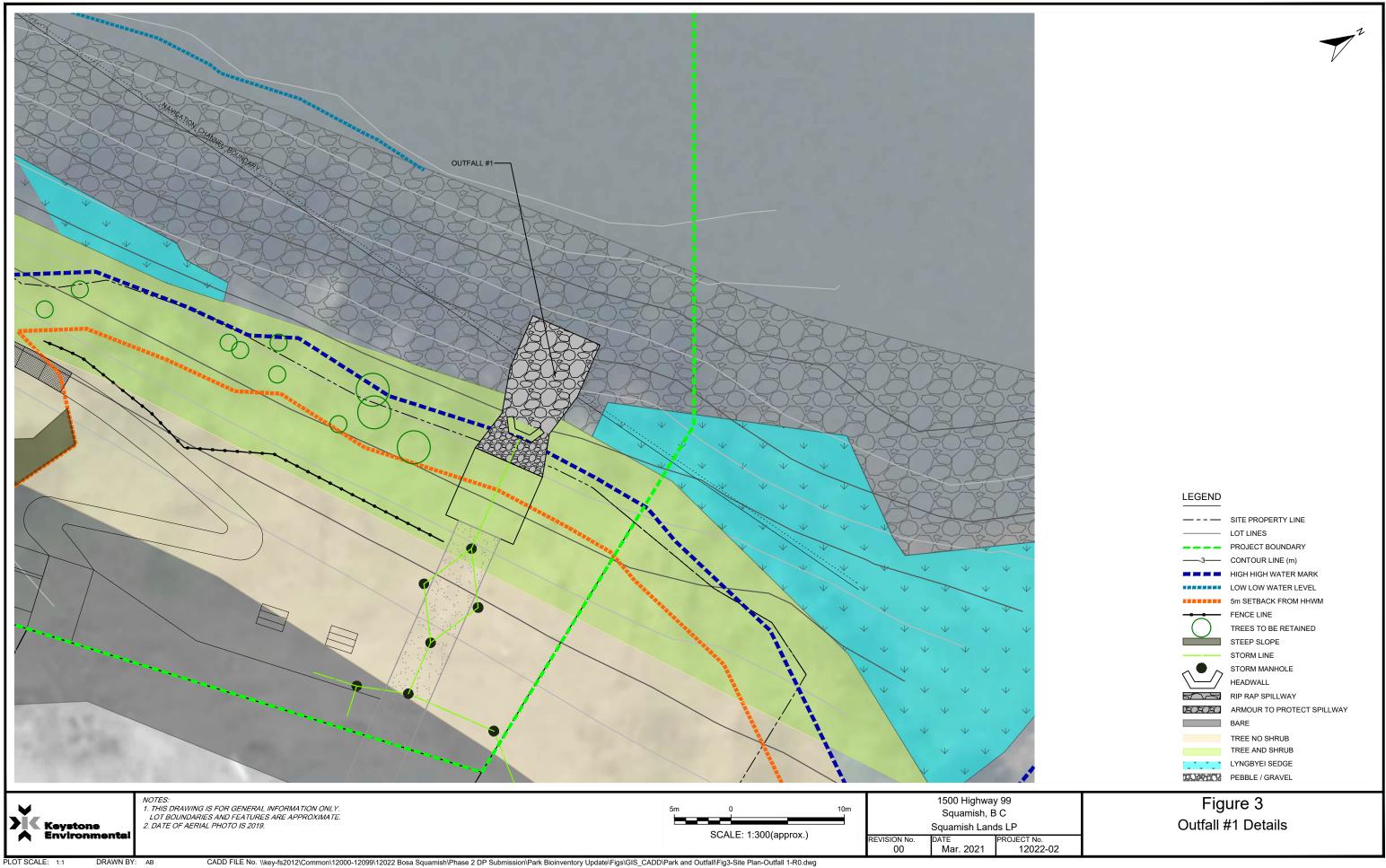


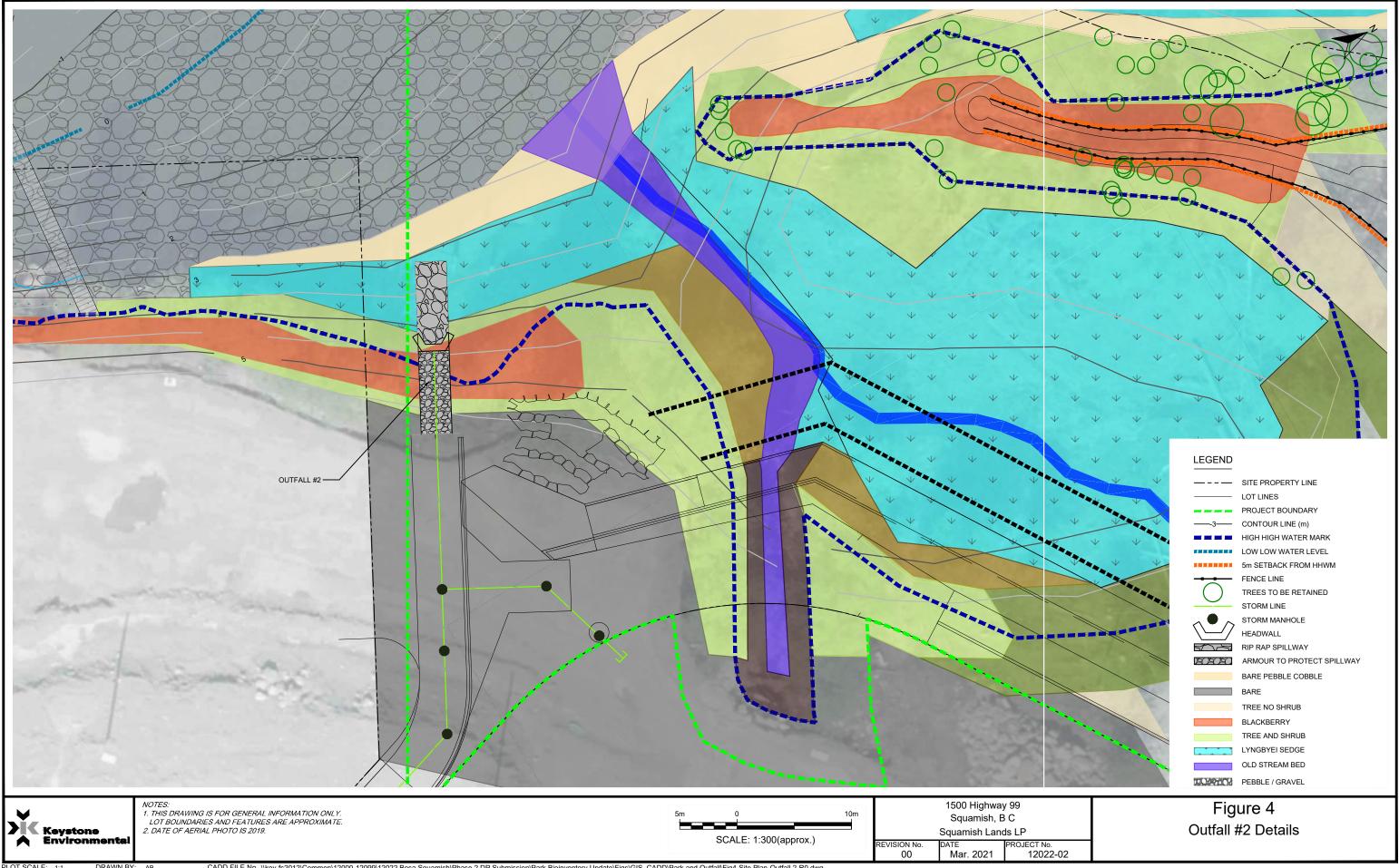
FIGURES

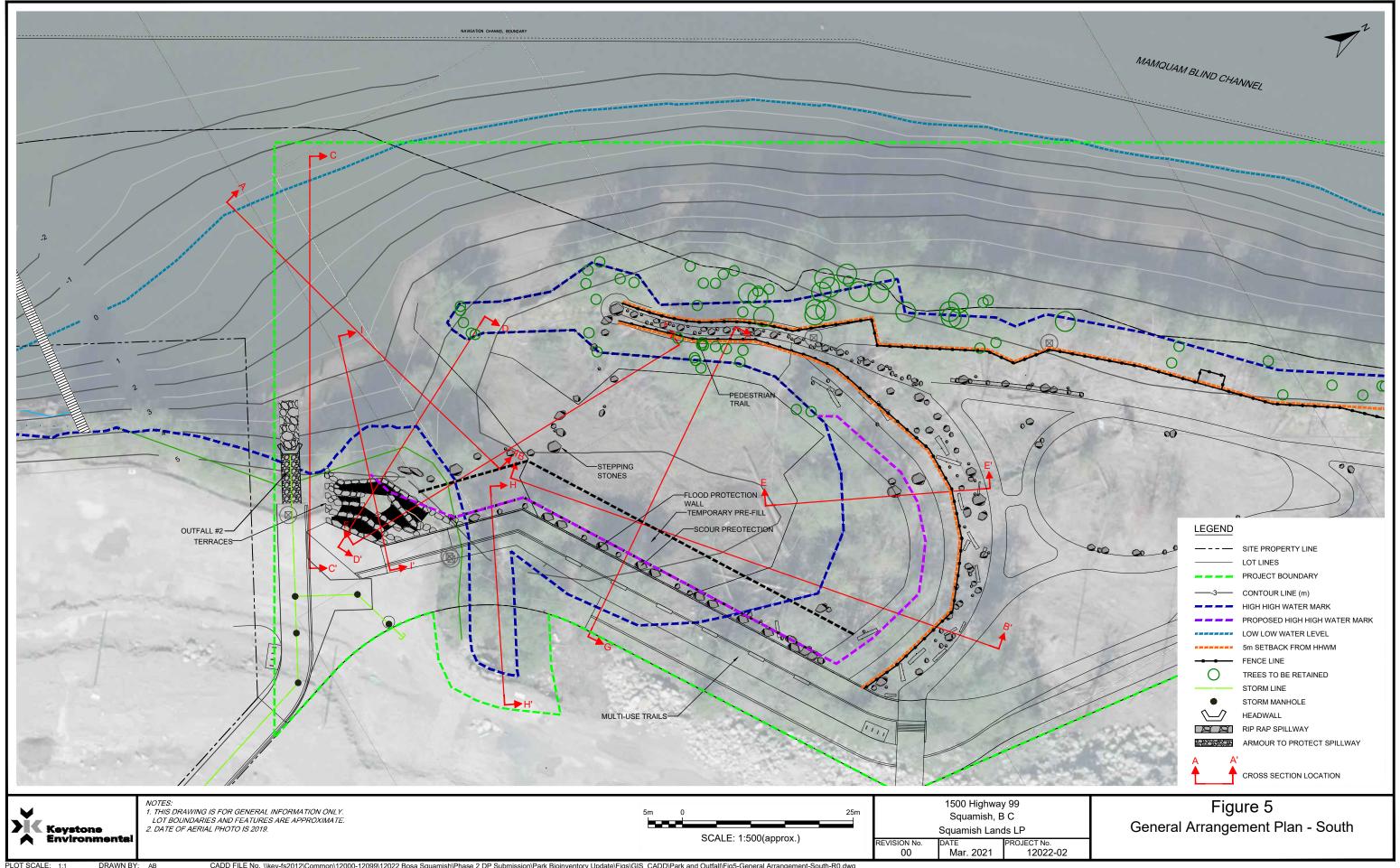


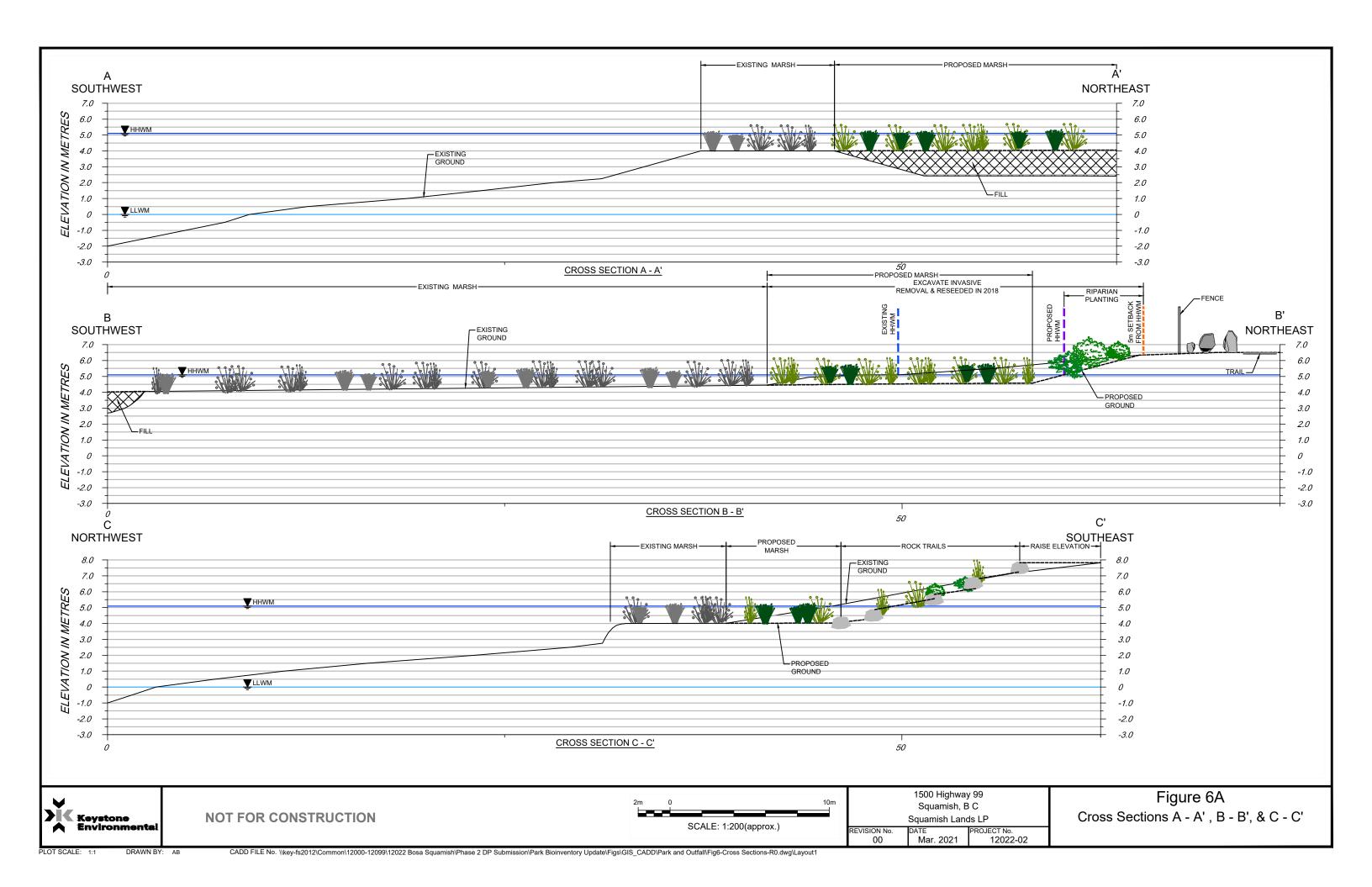


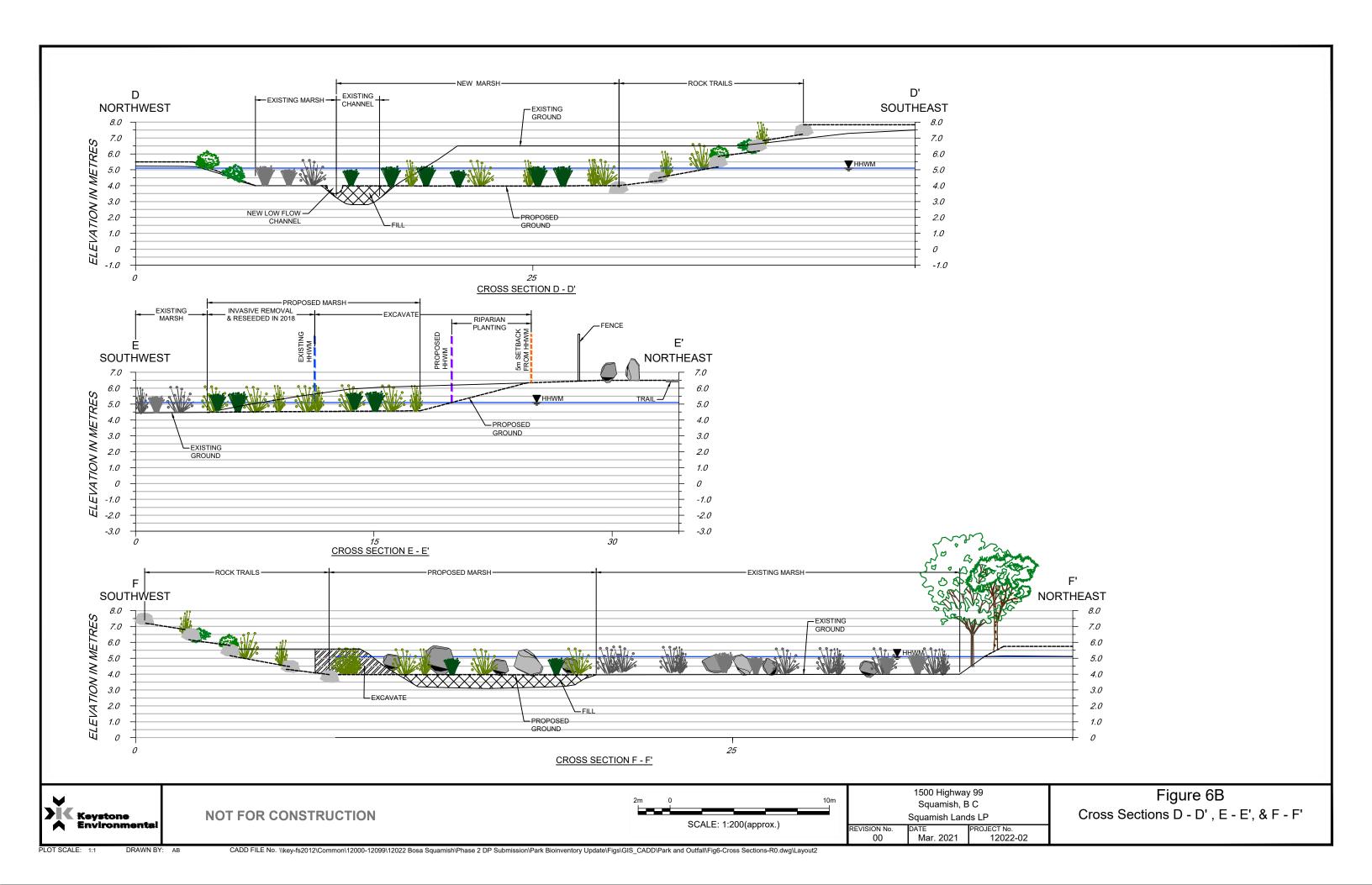


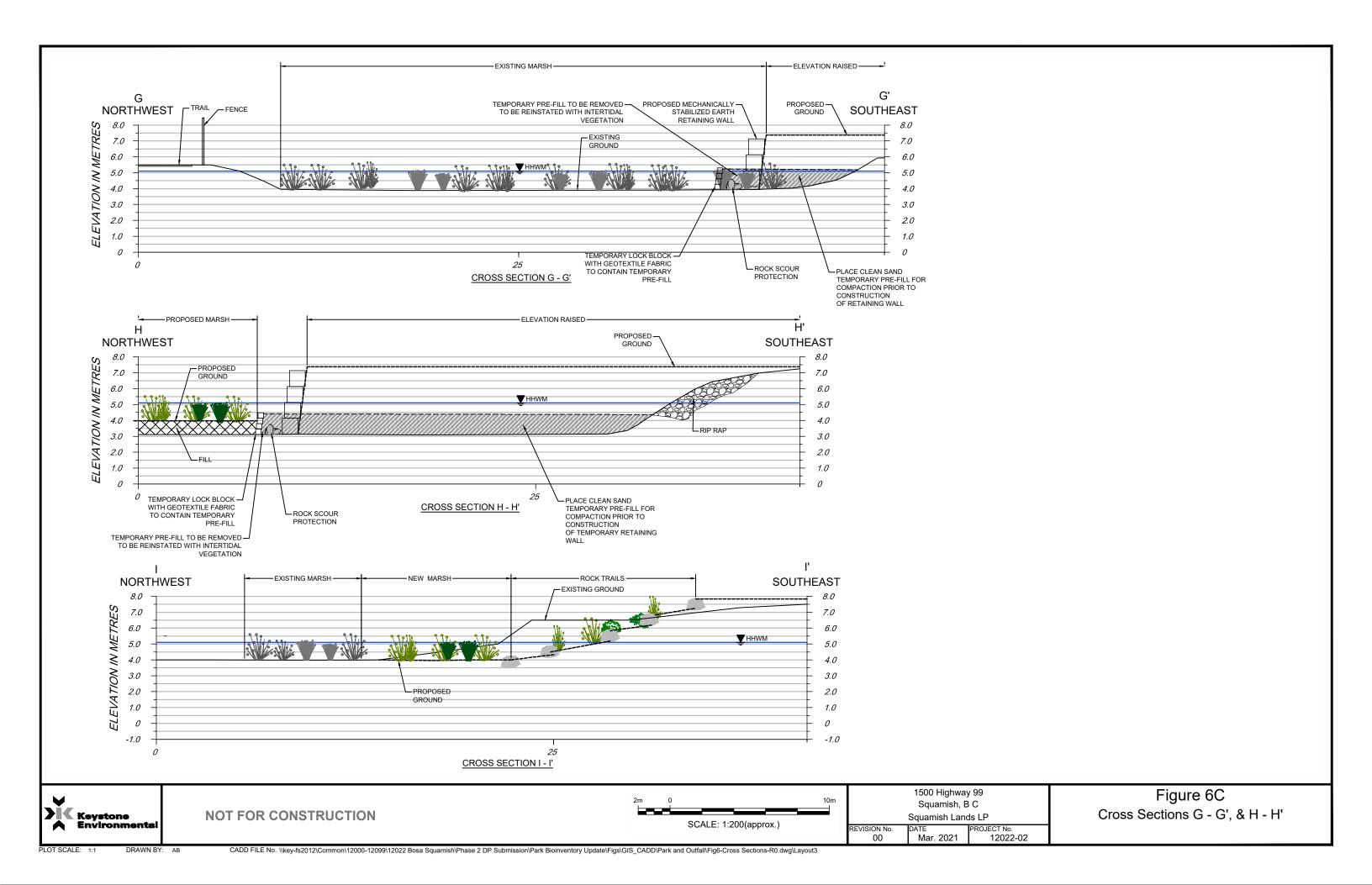


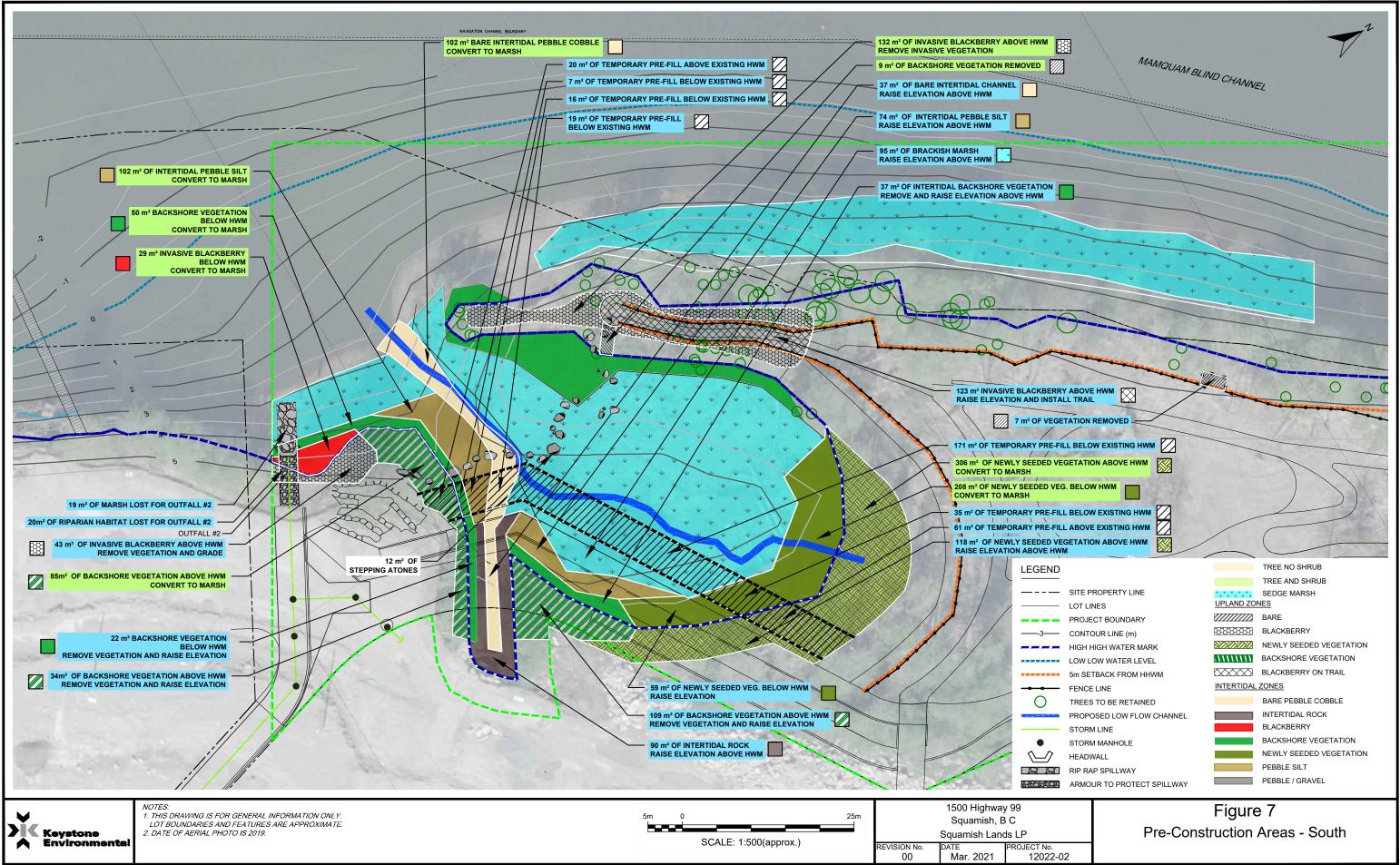


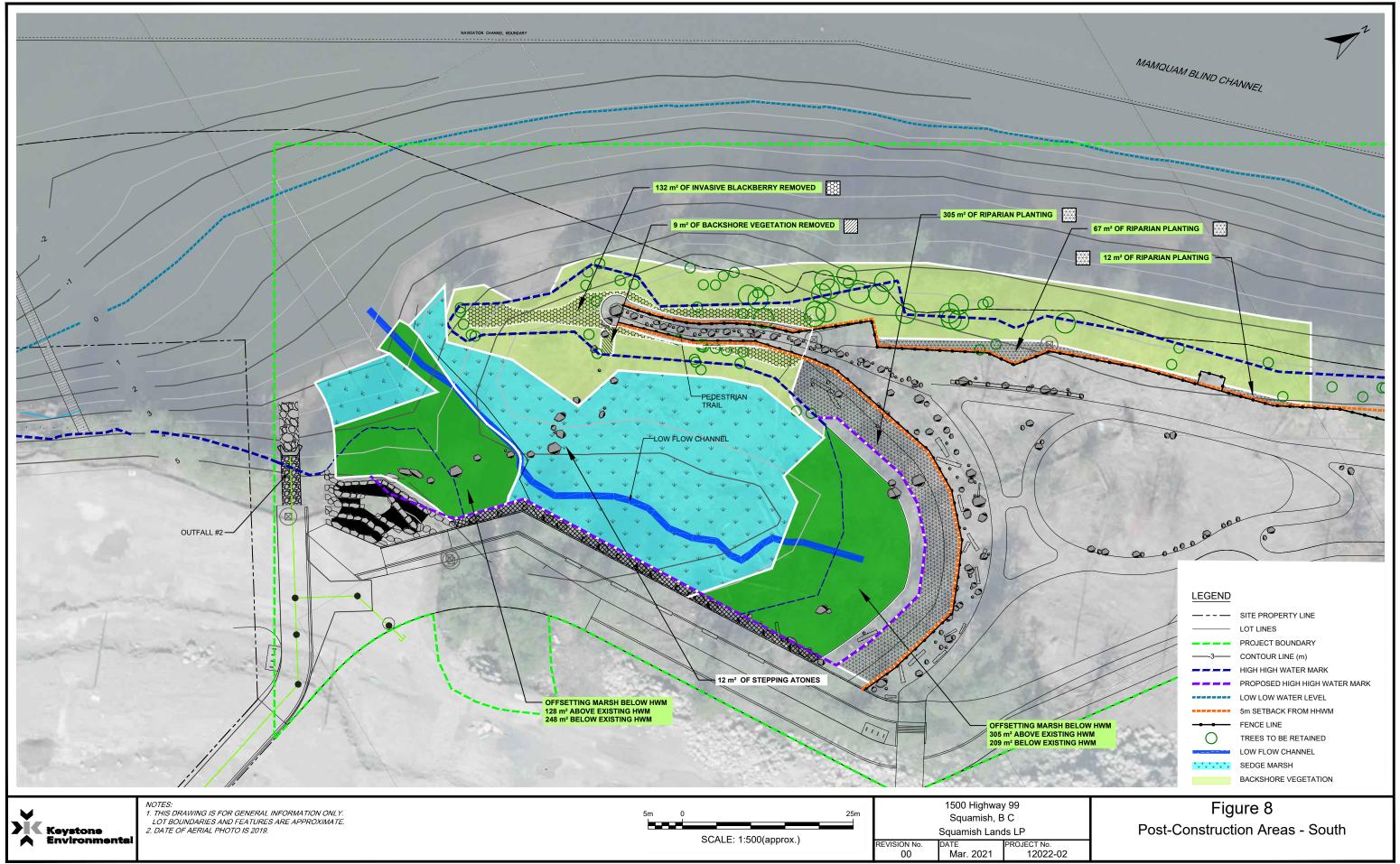












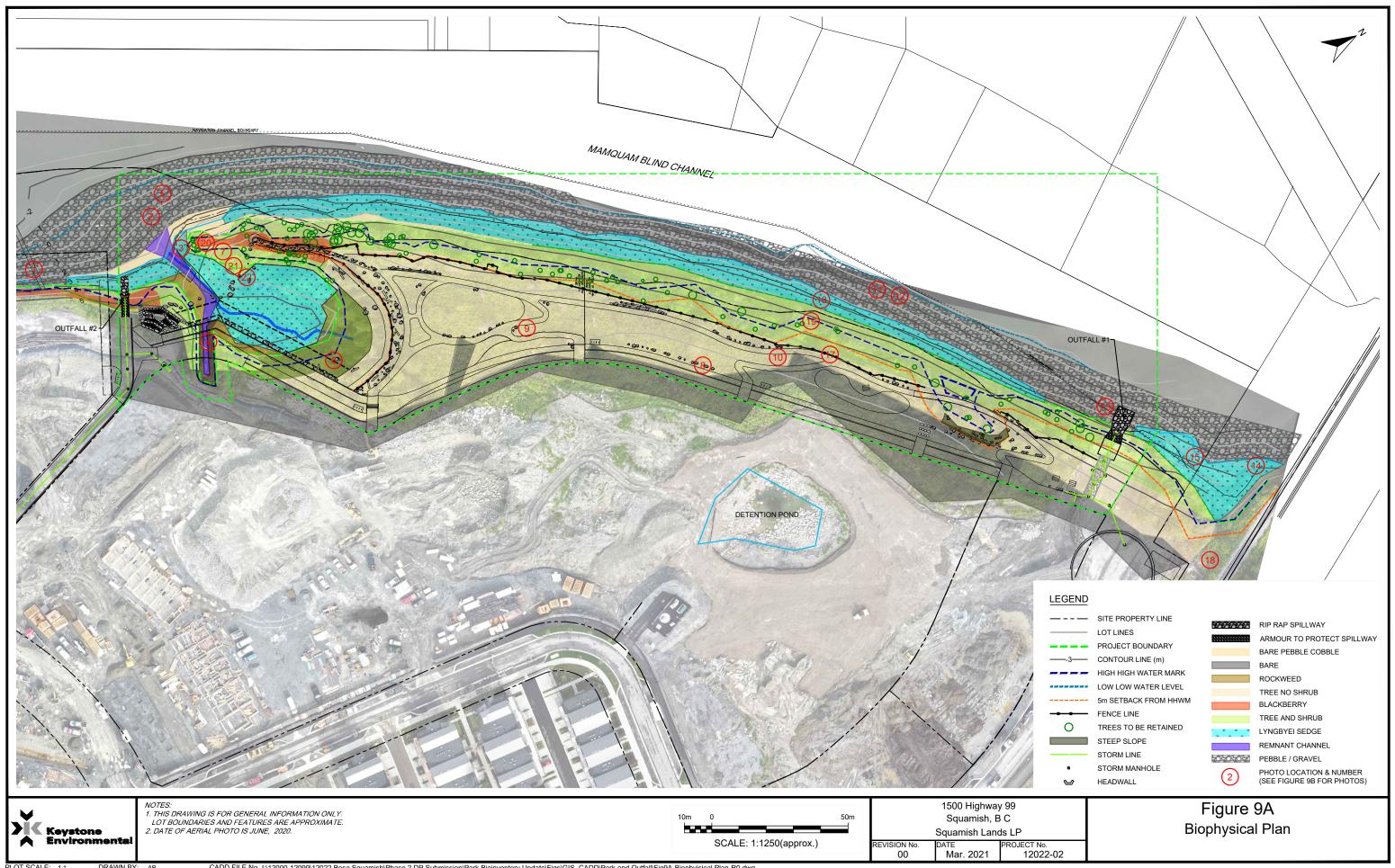




PHOTO 1. ROCKWEED GROWING IN INTERTIDAL



PHOTO 2. WOOD DEBRIS AND COBBLE AT ENTRANCE TO POCKET MARSH



PHOTO 3. WOOD DEBRIS AND SILT IN POCKET MARSH



PHOTO 4. REMNANT CHANNEL



PHOTO 5. COBBLE SUBSTRATE IN INTERTIDAL WITH NO ROCKWEED



PHOTO 6. BLACKBERRY REMOVED FROM AROUND POCKET MARSH IN 2018



PHOTO 7. MARSH POCKET AT HIGH TIDE



PHOTO 8. FILL AREA EAST OF PARK



PHOTO 9. BLACKBERRY CANE IN CLEARED AREA



PHOTO 10. SOIL PIT IN MAPLE TREE AREA



PHOTO 11. CAREX LYNGBYEI MARSH AND BACKSHORE VEGETATION



PHOTO 12.CAREX LYNGBYEI MAR



PHOTO 13. EROSION AT BASE OF HIGH WATER MARK



PHOTO 14. PEBBLE AND COBBLE AT BASE OF MARSH



PHOTO 15. MARSH AT NORTH END OF SITE



PHOTO 16. THICK CRAB APPLE VEGETATION ALONG CHANNEL EDGE



PHOTO 17. MAPLE TREES ALONG BANK WHERE BLACKBERRY REMOVED



PHOTO 18. BLACKBERRY THICKET ALONG CN TRACKS



SILTY CLAY SUBSTRATE



PHOTO 20. MARSH



PHOTO 21. BLACKBERRY THICKET REMOVED AROUND PERIMETER OF POCKET MARSH THAT WILL BE LOWERED TO CREATE NEW MARSH

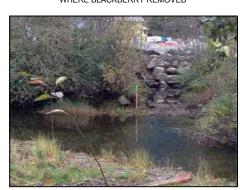


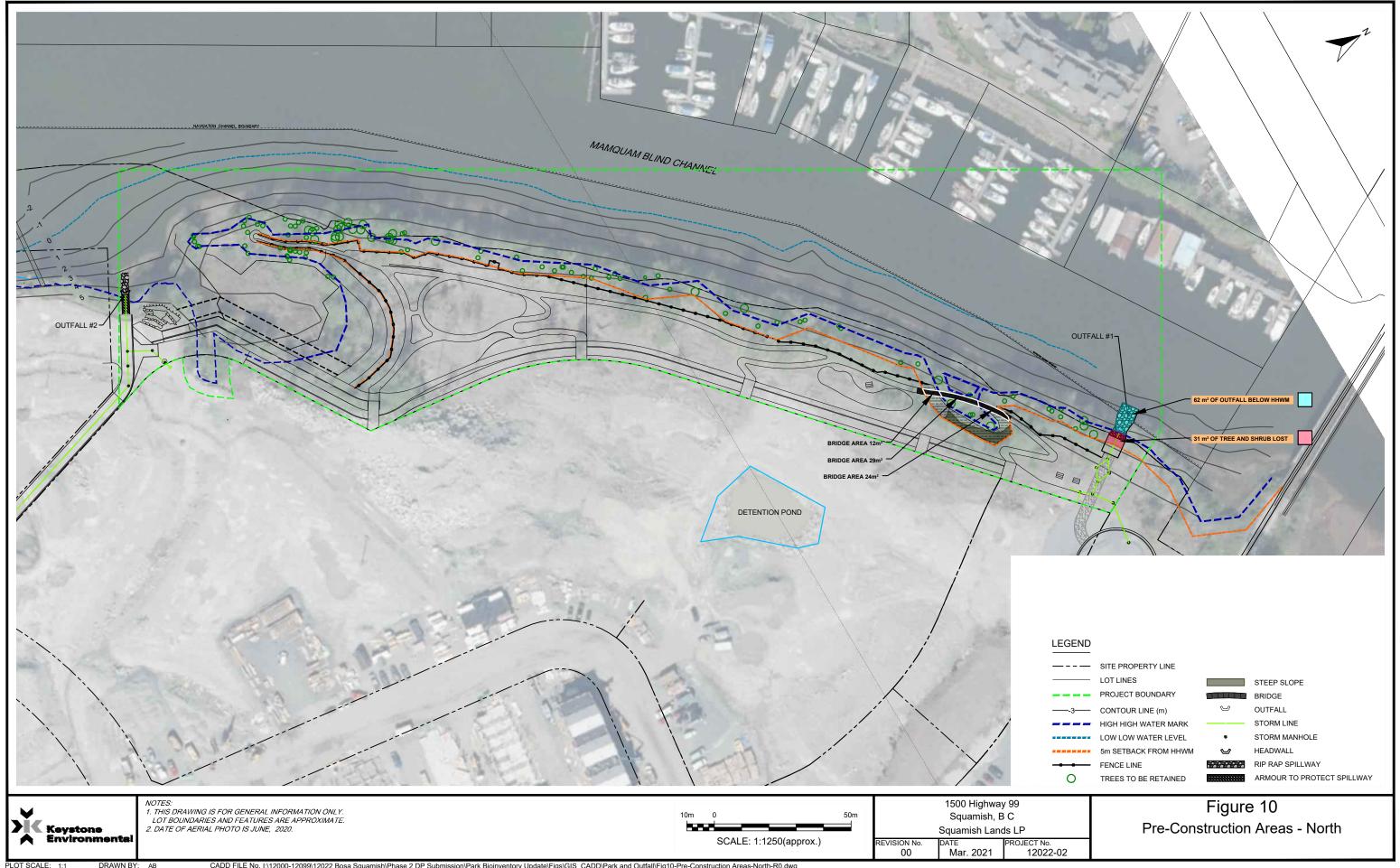
PHOTO 22. FORMER DITCH TO REMNANT CHANNEL

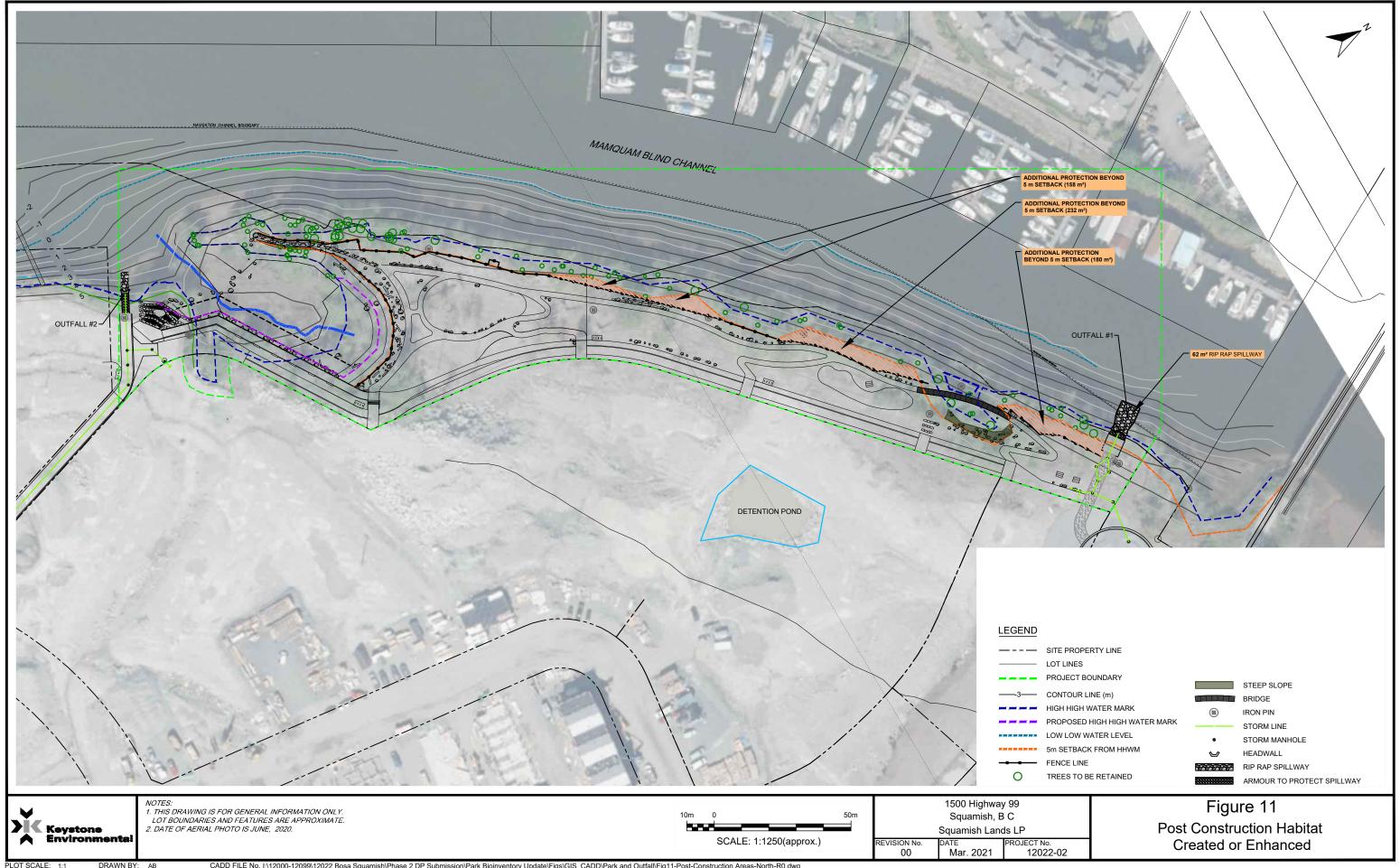


NOTES: 1. SEE FIGURE 3A FOR PHOTO LOCATIONS.

| | 1500 Highway 99 Squamish, B C Squamish Lands LP | | |
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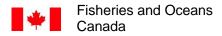
Figure 9B Biophysical Photos





APPENDIX A DFO LETTERS OF ADVICE





Pacific Region Suite 200 - 401 Burrard Street Vancouver, British Columbia V6C 3S4

Pêches et Océans Canada

Région du Pacifique Pièce 200 - 401 rue Burrard Vancouver (C.-B.) V6C 3S4

February 21, 2020

Our file Notre référence

19-HPAC-00856

Peter Stefanski 838 West Hastings Street Vancouver, B.C., V6C 2X1

Via email: pstefanski@bosa.com

Subject: Stormwater outfall construction, Mamquam Blind Channel, Squamish – Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat

Dear Peter Stefanski:

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your proposal on December 31, 2019. We understand that you propose to conduct project works at the Squamish Waterfront Landing site at 1500 Highway 99, Squamish. The proposed works include:

- The installation of a stormwater outfall and riprap spillway, within a footprint of 62 m²; and
- The permanent removal of 65 m² of riparian vegetation, and temporary removal of 240 m² of riparian vegetation which will be re-planted.

Our review considered the following information:

- Request for Review form submitted by Mike Carter, R.P.Bio., Keystone Environmental, dated December 31, 2019;
- Site visit discussion and photos conducted by DFO on February 13, 2020; and
- The additional information submitted by Jeff Levine, JLA Management Consulting, on February 19, 2020.

Your proposal has been reviewed to determine whether it is likely to result in:

- the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat which are prohibited under subsections 34.4(1) and 35(1) of the *Fisheries Act*; and
- effects to listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act*.



The aforementioned outcomes are prohibited unless authorized under their respective legislation and regulations.

In addition to the avoidance and mitigation measures described in the submitted information, we recommend implementing the measures listed below to avoid and mitigate the potential for prohibited effects to fish and fish habitat:

- All works below the high water mark (HWM) will be completed in the dry, during low tide.
- Areas that require excavation works shall be left at the end of the day in a manner that prevents fish entrapment. There must be either a low-flow channel out or it must be backfilled the same day.
- Works should be conducted during favorable weather conditions (i.e., avoided in heavy rainfall).
- All imported material to be placed below the HWM will have a low silt or clay content by fraction (less than 5%). All rock brought to the site must be non-acid generating.
- If there is a risk to a marine mammal from direct contact, temporarily suspend works until the individual has left the area or has not been sighted for 30 minutes.
- Erosion and Sediment Control measures should be installed and inspected regularly during construction. This includes:
 - Covering exposed soils during works. All disturbed areas shall be stabilized and maintained with effective temporary erosion and sediment control measures until completion.
 - Machinery will be operated in a manner that minimizes disturbance to the shoreline and seabed.
- Do not deposit any deleterious substances in the watercourse.
- Develop and implement a response plan to avoid a spill of deleterious substances. This includes:
 - Machinery to be used will arrive on site in a clean condition, free of fluid leaks.
 - An emergency spill kit will be on site in case of fluid leaks or spills from machinery.

Provided that you incorporate these measures into your plans, the Program is of the view that your proposal is not likely to result in the contravention of the above mentioned prohibitions and requirements.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to remain in compliance with the *Fisheries Act*, the *Species at Risk Act* and the *Aquatic Invasive Species Regulations*.

It is also your *Duty to Notify* DFO if you have caused, or are about to cause, the death of fish by means other than fishing and/or the harmful alteration, disruption or destruction of fish habitat. Such notifications should be directed to (http://www.dfo-mpo.gc.ca/pnw-ppe/contact-eng.html).

We recommend that you notify this office at least 10 days before starting your project and that a copy of this letter be kept on site while the work is in progress. It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.

If you have any questions with the content of this letter, please contact Rangyn Lim at our Vancouver office at 604-666-2418, or by email at Rangyn.Lim@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

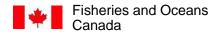
Yours sincerely,

Vance Mercer Senior Biologist Fish and Fish Hebitat Pro

Fish and Fish Habitat Protection Program

cc:

Jeff Levine, JLA Management Consulting, jeff.levine19@gmail.com
Mike Carter, R.P.Bio., Keystone Environmental, mcarter@keystoneenvironmental.ca



Pacific Region Suite 200 - 401 Burrard Street Vancouver, BC V6C 3S4

Pêches et Océans Canada

Région du Pacifique Pièce 200 - 401 rue Burrard Vancouver (C.-B.) V6C 3S4

Your file Votre référence

June 5, 2020

Our file Notre référence 20-HPAC-00375

Bosa – Kingswood Properties (Squamish Inc.) 838 West Hastings St, Vancouver, B.C. V6C 2X1

Attention: Peter Stefanski

Subject: Stormwater Outfall #2 – Mamquam Blind Channel, Squamish, B.C. - Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat

Dear Mr. Stefanski:

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your proposal on March 22, 2020. We understand that you propose to conduct the following works:

- Install a pre-cast concrete stormwater outfall and riprap apron in the intertidal zone (approx. footprint 42 m²).
- Remove riparian vegetation for site access and replant following the works (approx. footprint of 91 m²).

Our review considered the following information:

- The Request for Review Form completed and signed by Michael Carter dated March 20, 2020 and supporting documents.
- The *Outfall #2 Impact Assessment and Mitigation Plan* produced by Keystone Environmental dated March 20, 2020.

Your proposal has been reviewed to determine whether it is likely to result in:

- the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat which are prohibited under subsections 34.4(1) and 35(1) of the *Fisheries Act*.
- effects to listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act*.

The aforementioned impacts are prohibited unless authorized under their respective legislation and regulations.



To avoid and mitigate the potential for the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat, it is important that all proposed measures are implemented as set out in the information that was submitted to the Program in relation to your project. In addition, we recommend implementing the measures listed below to avoid and mitigate the potential for the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat. If there is a conflict between the proposed measures as set out in the information that was submitted to the Program and the following measures, the following measures shall prevail.

- We understand that the in-water works, undertakings and activities will predominantly take place outside of the timing windows to protect fish, including their eggs, juveniles, spawning adults, and/or the organisms on which they feed and migrate. Please note that it is DFOs recommendation that you take steps to complete the project in a timely manner that would minimize the amount of work outside the recommended timing windows to minimize the risk of the works contravening the Fisheries Act prohibitions.
- Retain a Qualified Environmental Professional (QEP) on site to monitor for compliance with regulations and to ensure appropriate implementation of environmental best practices during works.
- All works below the high water mark (HWM) will be completed in the dry, during low tide.
- Areas that require excavation works shall be left at the end of the day in a manner that prevents fish entrapment. There must be either a low-flow channel out or it must be backfilled the same day.
- Ensure that material such as rock, riprap, or other materials placed on the banks or within the active channel of the watercourse is inert and free of silt, overburden, debris, or other substances deleterious to aquatic life.
- If there is a risk to a marine mammal from direct contact, temporarily suspend works until the individual has left the area or has not been sighted for 30 minutes.
- Minimize the introduction of sediments (e.g., silts, clays and sand) into the watercourse.
- Develop and implement an Erosion and Sediment Control Plan to avoid and minimize the introduction of sediment into or induced sedimentation in the watercourse. Erosion and Sediment Control measures should be installed and inspected regularly during construction.
- Do not deposit any deleterious substances in the watercourse.
- Develop and implement a response plan to avoid a spill of deleterious substances into the watercourse.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to remain in compliance with the *Fisheries Act*, avoid prohibited effects on listed aquatic species at

risk, any part of their critical habitat or the residences of their individuals, and prevent the introduction of non-indigenous species.

It is also your *Duty to Notify* DFO if you have caused, or are about to cause, the death of fish by means other than fishing and/or the harmful alteration, disruption or destruction of fish habitat. Such notifications should be directed to (http://www.dfo-mpo.gc.ca/pnw-ppe/CONTACT-eng.html) or to the DFO-Pacific Observe, Record and Report phone line at 604-607-4186 in Greater Vancouver or toll free at 1-800-465-4336.

Please notify this office via email at <u>Duncan.Lanoville@dfo-mpo.gc.ca</u> before starting your project. A copy of this letter should be kept on site while the work is in progress. It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.

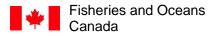
If you have any questions with the content of this letter, please contact me at 1-236-330-5702 or by email at Duncan.Lanoville@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Sincerely,

Vance Mercer Senior Biologist Fish and Fish Habitat Protection Program

cc:

Jeff Levine, JLA Management Consulting (<u>Jeff@jlamc.ca</u>) Warren Appleton, R.P.Bio., Keystone Environmental Ltd. (<u>WAppleton@keystoneenvironmental.ca</u>) Mike Carter, R.P.Bio., Keystone Environmental Ltd., (<u>MCarter@keystoneenvironmental.ca</u>)



Pacific Region Ecosystem Management Branch 200 – 401 Burrard Street Vancouver, BC V6C 3S4 Pêches et Océans Canada

Région du Pacifique Direction de la gestion des écosystèmes Pièce 200 – 401 rue Burrard Vancouver (C.-B.) V6C 3S4

Your file Votre référence

Our file Notre référence 20-HPAC-01003

November 13, 2020

Bosa-Kingswood Properties (Squamish) Inc. ATTENTION: Brendan Yee 838 West Hastings St Vancouver, B.C. V6C 2X1

Via email: byee@bosa.com

Dear Mr. Yee:

Subject: Wetland Infilling, Mamquam Blind Channel, Squamish – Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your proposal on August 25, 2020. We understand that you propose to:

- Wetland Infilling Temporary placement of preload and permanent infilling of intertidal and supratidal habitat in the Mamquam Blind Channel to provide a suitable grade for a flood-protection wall (approximately 426 m² aquatic footprint below the high water mark (HWM), and 1081 m² riparian footprint).
- Enhancement Works Creation of intertidal marsh habitat, extension of a low-flow channel, invasive species removal in the riparian area, and removal of wood waste in the Mamquam Blind Channel (approximately 514 m² aquatic footprint below the HWM, and 132 m² riparian footprint).

Our review considered the following information:

- The Request for Review form completed and signed by Brendan Yee dated August 21, 2020.
- The WFL Phase 2 and Public Greenspace Development Habitat Enhancement Plan report produced by Keystone Environmental dated October 21, 2020.

Your proposal has been reviewed to determine whether it is likely to result in:

• the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat which are prohibited under subsections 34.4(1) and 35(1) of the *Fisheries Act*; and



• effects to listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act*.

The aforementioned outcomes are prohibited unless authorized under their respective legislation and regulations.

To avoid and mitigate the potential for prohibited effects to fish and fish habitat (as listed above), we recommend implementing the measures listed below:

- Instream works to take place during the Least Risk Window for Howe Sound (August 16 January 31).
- All mitigation measures outlined in the WFL Phase 2 and Public Greenspace Development – Habitat Enhancement Plan report dated October 21, 2020 are to be implemented during the works.
- The removal of disturbance to riparian vegetation should be kept to a minimum during the works.
- Grade, stabilize and reseed disturbed areas upon completion of the works.
- All works below the HWM are to be conducted in the dry or at low tide.
- Complete the works as quickly as possible once they are started.
- Undertake works during dry weather and low water conditions.
- Equipment is to be situated and operated from beyond the top of bank.
- Ensure that material placed below top of bank of the watercourse is inert and free of silt, overburden, debris, or other substances deleterious to aquatic life.
- Minimize the introduction of sediments (e.g., silts, clays and sand) into the watercourse or downstream reaches of the watercourse.
- Develop and implement an erosion and sediment control plan to avoid and minimize the introduction of sediment, or induced sedimentation, in the watercourse.
- Do not deposit any substances deleterious to fish and fish habitat directly or indirectly into the watercourse or downstream reaches of the watercourses.
- Develop and implement a response plan to avoid a spill of deleterious substances into the watercourse.
- Works should be monitored during start-up and any instream works or sensitive
 activity. The environmental monitor must be an appropriately qualified
 professional and ensure mitigation measures are implemented for the protection of
 fish and fish habitat.

Provided that you incorporate these measures into your plans, the Program is of the view that your proposal is not likely to result in the contravention of the above mentioned prohibitions and requirements.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to remain in compliance with the *Fisheries Act*, the *Species at Risk Act* and the *Aquatic Invasive Species Regulations*.

It is also your Duty to Notify DFO if you have caused, or are about to cause, the death of fish by means other than fishing and/or the harmful alteration, disruption or destruction of fish habitat. Such notifications should be directed to the DFO-Pacific Observe, Record and Report phone line at 1-800-465-4336 or by email at DFO.ORR-ONS.MPO@dfo-mpo.gc.ca.

We recommend that you notify this office at least 10 days before starting your project and that a copy of this letter be kept on site while the work is in progress. It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.

Please note that this Letter of Advice does not provide relief from the obligations set out in the government of British Columbia's Riparian Areas Protection Regulations (RAPR), and cannot be construed to provide authorization pursuant to section 3(2) of the RAPR, for any work, undertaking or activity within the Riparian Assessment Area. For more information on the RAPR, including contacts, please visit: https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/fish/aquatic-habitat-management/riparian-areas-regulation.

Please note that the advice provided in this letter will remain valid for a period of 1 year from the date of issuance. If you plan to execute your proposal after the expiry of this letter, we recommend that you contact the Program to ensure that the advice remains up-to-date and accurate. Furthermore, the validity of the advice is also subject to there being no change in the relevant aquatic environment, including any legal protection orders or designations, during the 1 year period.

If you have any questions with the content of this letter, please contact Duncan Lanoville at our Vancouver office at 1-236-330-5702 or by email at duncan.lanoville@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

The

Duncan Lanoville

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