



Highway 9 Drainage Study

Environmental Overview Assessment

May 22, 2024

Prepared for:
Ministry of Transportation and Infrastructure
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Project Number:
123222752

Limitations and Sign-off

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Acronyms / Abbreviations

BC	British Columbia
CDC	Conservation Data Centre
CEMP	Construction Environmental Management Plan
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
EM	environmental monitor
EOA	Environmental Overview Assessment
ESC	erosion and sediment control
FVISS	Fraser Valley Invasive Species Society Invasive Plant Priority List
HADD	harmful alteration, disruption, or destruction
km	kilometre
m	metre
mm	millimetre
MBCA	<i>Migratory Birds Convention Act</i>
MOTI	Ministry of Transportation and Infrastructure
MRSS	Miami River Streamkeepers Society
OGMA	Old Growth Management Area
the Project	Highway 9 Harrison Drainage Study
Parsons	Parsons Corporation
QEP	Qualified Environmental Professional
RFR	request for review
SARA	<i>Species at Risk Act</i>
Stantec	Stantec Consulting Ltd.
WSA	<i>Water Sustainability Act</i>



1 Introduction

Stantec Consulting Ltd. (Stantec) was retained by the Ministry of Transportation and Infrastructure (MOTI) to provide environmental support services for the Highway 9 Harrison Drainage Study (the Project) located in Harrison Hot Springs, British Columbia (BC). Specifically, MOTI retained Stantec to complete an Environmental Overview Assessment (EOA) of the Project footprint for a 24 metre (m) outfall drainage along the highway corridor flowing into Miami Creek.

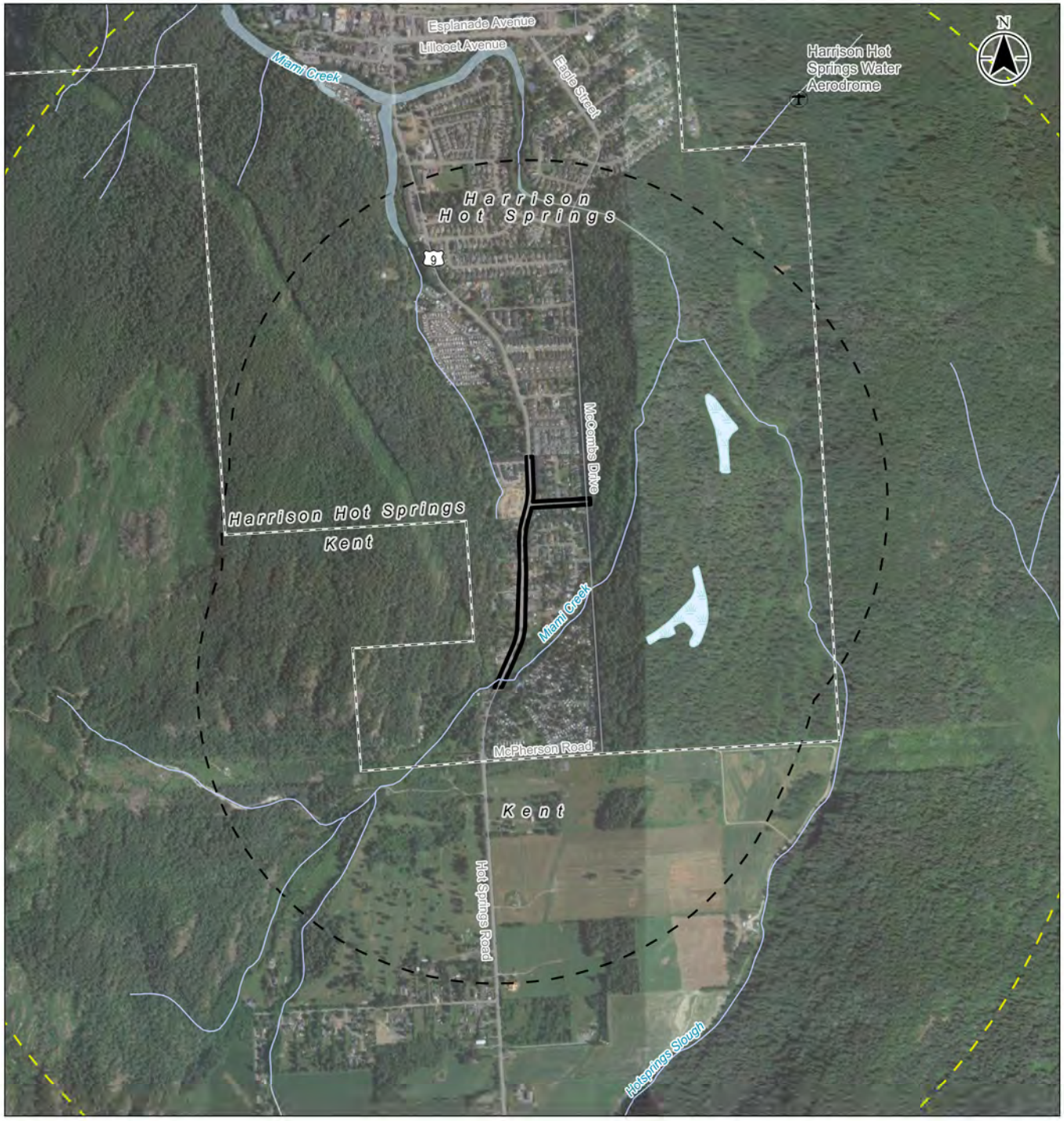
This EOA report summarizes potential vegetation, wildlife, and aquatic resources that may interact with the Project. The purpose of the EOA report is to support the Project planning, design, permitting, and environmental management for Project construction. The key items discussed in this EOA are:

- Desktop review of the Project survey area including surrounding land use and environmental features (e.g., vegetation, wildlife, and fish and fish habitat).
- Field survey observations of existing environmental conditions for fish and fish habitat, wildlife, and vegetation.
- Review of the environmental regulatory requirements for the Project including potential permits, approvals, authorizations, and their requirements.
- Potential environmental effects and anticipated environmental mitigation measures associated with construction.

1.1 Project Location

The Project is located on Highway 9 within Harrison Hot Springs, BC. Highway 9 is a north-south route in the eastern part of the Fraser Valley and is the main access to and from Harrison Hot Springs. The Project footprint begins at the Miami Creek bridge crossing in the south, includes the side street Emerald Avenue, and extends north to Aspen Lane along the western side of the highway (Figure 1).

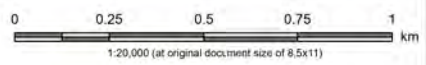




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- Airport
- Road
- Watercourse
- Wetland
- Municipal Boundary
- Project Footprint
- Buffer 1km
- Buffer 2km



Project Location: 123222572
 (21°46'49"W 49°17'11"N)
 Prepared by TCARDINAL on 20231228
 Requested by PBROWNE on 202311227
 Checked by RTHARBY on 20240131

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Figure No.
1
 Title
Overview

Notes
 1. Coordinate System: NAD 1983 BC Environment Albers
 2. Data Sources: DataBC, Government of British Columbia;
 Natural Resources Canada
 Google Earth: Google Earth

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1.2 Project Description

The atmospheric river event in November 2021 led to widespread flooding through the southwest of BC. Harrison Hot Springs experienced extensive flooding during the extreme rainfall event, with flooding and standing water on Highway 9 that impacted traffic and caused flood damage to adjacent properties (Parsons 2023).

Parsons Corporation (Parsons) was retained by MOTI to complete a drainage study for the section of Highway 9 (Hot Springs Road) between McPherson Road to the south and Lillooet Road to the north. The major drainage and watercourse for Harrison Hot Springs is Miami Creek, which drains during low lake water levels via flood gates into Harrison Lake and during high lake water levels via a pump station (Parsons 2023). Parsons recommended a series of infrastructure drainage upgrades along Highway 9, one of which is the construction of a linear drainage infrastructure north of the Miami Creek crossing. The south edge of the Project footprint aligns with the northern western bank of Miami Creek where the ground is disturbed and contains mowed, residential grasses and weedy species. The area adjacent to the bank is a grass-lined ditch (16 m long by 2 m wide) containing many weedy and invasive species and a few ornamental trees. Surrounding the grass-lined ditch and moving north through the Project footprint (i.e., along Highway 9), the area contains residential grass and shrubs, concrete, asphalt, and other residential infrastructure.

The proposed drainage upgrades include the following:

- Installation of new 201 m storm sewer to convey the 100 year design flow without flooding.
- Two new manholes.
- One new outfall with an oil and grit separator.
- 24 m of connected drainage ditch to Miami Creek.
- Three new lawn basins or catch basins to drain the western shoulder of Highway 9.



2 Methods

2.1 Desktop Review

A desktop review for the EOA was completed prior to the field survey. This included a search of publicly available data sources to identify known occurrences of ecological communities, invasive plant species, vegetation, wildlife, and aquatic resources, critical habitat for species at risk (i.e., species designated on Schedule 1 under the Species at Risk Act [SARA] or designated as at risk by the Committee on the Status of Endangered Wildlife in Canada [COSEWIC]), and species of concern (i.e., species provincially designated as “red listed” [species that are endangered or threatened] or “blue-listed” [species that are vulnerable and at risk of becoming endangered]). The desktop review focused on mapped watercourses within 100 m of the Project footprint (Figure 1); vegetation presence and old growth management areas (OGMA), within 1 kilometre (km) of the Project footprint; wildlife records and critical habitat within 2 km of the Project footprint; and records of aquatic species at risk and geospatial areas identified as potential critical habitat within 5 km of the Project footprint (Figure 2; Figure 3).

Existing and/or historical occurrences for each environmental resource were queried using the following desktop tools and public data sources:

- Habitat Wizard (ENV 2024a) – provides data on known or historical occurrences of federally and provincially listed plant, wildlife, and fish species, and provincially listed ecological communities that cross the Project footprint.
- The BC Conservation Data Centre (BC CDC 2024a) – provides a detailed catalogue of the species and ecosystems of BC including life history, occurrence data, and conservation status of plant, wildlife, and fish species.
- *Species at Risk Act* (SARA) Public Registry (Government of Canada 2024) – provides mapped or historical occurrences of vegetation, wildlife and aquatic species at risk.
- InvasivesBC database and map display (BC MOF 2024) – provides invasive plant occurrences.
- BC E-Flora database and map display (E-Flora BC 2021) – provides habitat information and species occurrences for flora in BC, including at-risk species.
- BC E-fauna database and map display (E-Fauna BC 2023) – provides habitat information and species occurrences for fauna in BC, including at-risk species.
- NatureCounts database (Birds Can. 2024) – provides occurrence data for bird species.
- eBird database (eBird 2024) – provides occurrence data for bird species.
- Wildlife tree stewardship atlas (Community Mapping Network 2018) – provides data on known locations of wildlife trees, and observations of osprey and bald eagles.
- iNaturalist (iNaturalist 2024) – provides species occurrences for wildlife and vegetation.



2.2 Field Survey

Two Stantec environmental field staff completed a multidisciplinary field survey on December 21, 2023. The field survey was undertaken to confirm the findings of the desktop review and to document existing conditions as they relate to vegetation, wildlife, and fish and fish habitat within and adjacent to the Project footprint, including potential environmental constraints associated with construction of the drainage infrastructure flowing to Miami Creek. The field survey focused on the environmental resources present in the Project footprint of the grass-lined ditch, as well as resources which may be impacted from construction. Photographs and field notes were taken to document general habitat conditions.

The field survey included documentation of the following:

- Vegetation resources, including:
 - Presence or potential occurrence of vegetation communities at risk and of conservation concern.
 - Presence or potential occurrence of vegetation species at risk and of conservation concern.
 - The presence and distribution of native vegetation species.
 - Density and distribution of invasive species and noxious weeds.
- Wildlife resources, including presence or potential occurrence of:
 - Observations of wildlife or signs of wildlife (e.g., trails, tracks, scat) including species at risk and invasive species (e.g., bullfrog).
 - Presence of important wildlife habitats (e.g., amphibian breeding habitat, songbird nesting habitat, bat roosting habitat).
 - Presence of important wildlife features (e.g., stick nests, tree cavities, dens).
- Fish and fish habitat within the Project footprint including:
 - Watercourse presence, connectivity, and general water conveyance pathways.
 - Instream and riparian fish habitat characteristics (e.g., watercourse bankfull width, bank height, riparian vegetation composition).
 - Locations and extent of culverts.

Conditions during the field survey were overcast and slightly windy with light rain and a high of 10 degrees Celsius (°C). December is not a typical time to complete biophysical assessments with many species dormant, absent, or difficult to detect; however, it is a preferred time of year to detect ephemeral watercourses (those which are wetted or flowing only during certain periods of the year) and some bird species nests are more visible when deciduous trees are leafless. The field survey was completed during the following seasonal constraints:

- A period of dormancy for most plant species.
- A period of dormancy for most invertebrate species.



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Section 2 Methods

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- Outside the most conservative predicted regional nesting period for species known to nest in forest habitats of Nesting Zone A1 (mid-March to mid-August; ECCC 2023), and outside the raptor breeding season (January to August; Province of BC 2013).
- Outside of the amphibian aquatic breeding, development, or dispersal periods (April – July, with post breeding dispersal extending through the fall; BC MFLNRO 2016).
- As noted in Section 3.1.2, Stantec acknowledges the risks and limitations to assessing riparian vegetation during winter months and recommends additional field effort occur between late spring - mid summer of 2024 to confirm results.



3 Results

The results of the desktop review and field survey are provided in the following sections and summarize observations of vegetation, wildlife, and riparian and instream fish habitat.

3.1 Vegetation Resources

3.1.1 Desktop Review

The Project is located within the Dry Maritime Coastal Western Hemlock biogeoclimatic subzone in the Chilliwack Forest District (ENV 2024b). This subzone experiences warm, dry summers and moist, mild winters (Green and Klinka 1994). A query of the BC CDC Species and Ecosystems Explorer (ENV 2024c) identified several provincially or federally listed plant species with the potential to occur within the Project footprint; however, as the Project footprint's plant community has been altered over time due to disturbance (e.g., historical clearing, neighbourhood development, highway), the likelihood of encountering plant species and ecosystems at risk is considered unlikely. No known occurrences of ecological communities at risk are mapped in the Project footprint or within 1 km of the Project footprint (ENV 2024a). Ecological communities at risk can be defined as those that are provincially red- or blue-listed. One legal old growth management area (OGMA) was mapped 71 m west of the Project footprint (OGMA SRY_414_270; ENV 2024a). A legal OGMA is defined as a legally established and spatially defined area of old growth forest (Gov BC 2024a). An old growth forest within the coastal area is defined as a forest containing trees of 250 years old or greater, that often contains more standing dead trees, snags, and decomposing wood than young forests (Gov BC 2024b).

A query of the InvasivesBC and Habitat Wizard databases indicated no noxious or invasive weeds within the Project footprint (MOF 2024; ENV 2024a). Outside the Project footprint there are known occurrences of Japanese knotweed (*Reynoutria japonica*), Bohemian knotweed (*Fallopia x bohemica*), Scotch broom (*Cytisus scoparius*), English ivy (*Hedera helix*), Himalayan blackberry (*Rubus armeniacus*), English holly (*Ilex aquifolium*) and yellow archangel (*Lamiaeum galeobdolon*). Japanese knotweed and Bohemian knotweed are considered provincially noxious weeds and are listed on Schedule A of the Weed Control Regulation.

3.1.2 Field Survey

Stantec notes there are risks and limitations to completing terrestrial ecosystem description and vegetation surveys during the winter months and recommends additional field effort prior to construction between late spring - mid summer of 2024 to supplement the results of the winter survey, including performing an invasive plant species inventory.

Vegetation in the Project footprint is highly disturbed from existing land use and is characterized as a young deciduous tree patch roughly 4 m tall. The tree canopy cover consisted of ornamental, non-native tree species including: sumac (*Rhus* spp.) and willow (*Salix* sp.). The few trees (sumac) located within the Project footprint were smaller than 7.5 m tall and 300 mm in diameter, meaning they are not classified as



a “Tree” under the Harrison Hot Springs Tree Protection Bylaw No. 1015 and therefore, do not require a permit for removal (VHHS 2012). The plant community varied in species composition along the Project alignment and had a high proportion of weedy and invasive plants (Table 1). Within the grass-lined ditch, the shrub layer contained Himalayan blackberry and cutleaf evergreen blackberry (*Rubus laciniatus*). The herb layer was composed of sword fern (*Polystichum munitum*), common horsetail (*Equisetum arvense*), reed canary grass (*Phalaris arundinacea*) and various species of agronomic grass. Outside the Project footprint (i.e., downstream and across the creek from the Project footprint) native species such as bigleaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), paper birch (*Betula papyrifera*) and various shrubs could be found. Several herbaceous species may not have been detected due to seasonal dormancy.

Based on the survey observations, no ecological communities of interest were detected in the Project footprint (i.e., provincially listed ecological communities, wetlands, riparian forest, and old growth forest). The Project footprint was confirmed to have low suitability to support rare plants due to its highly altered state.

A total of four invasive plant species were identified within the Project footprint (Table 1). All four are listed as priority species under the Fraser Valley Invasive Species Society Invasive Plant Priority List (FVISS 2021) with varying management approaches (Table 1). Reed canary grass was the most widespread, covering approximately 25% of the Project footprint. Noxious weeds as listed in the Weed Control Regulation were not detected in the Project footprint during the field survey. Purple loosestrife (*Lythrum salicaria*) was found on the southern banks of the river across from Project footprint (approximately 7 m from the footprint). Purple loosestrife is listed as a noxious weed under Part I of Schedule A of the Weed Control Regulation within the *Weed Control Act*.

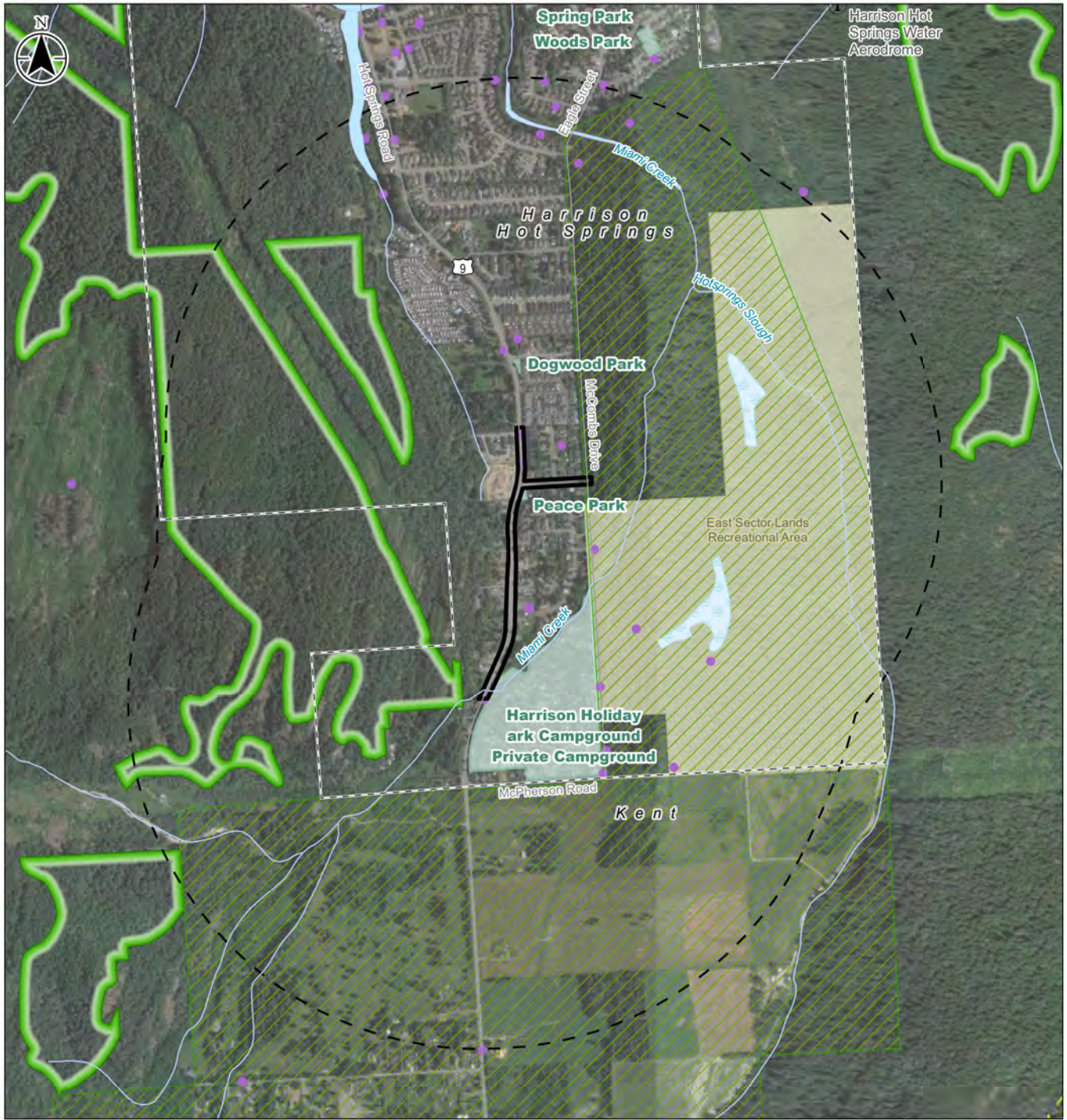


Table 1 Record of Invasive Plants Detected inside the Project Footprint

Scientific Name	Common Name	IAPP Description		Status		Comment
		Density Code ¹	Distribution Code ²	Noxious Weed ³	FVISS ⁴	
<i>Rubus laciniatus</i>	evergreen cutleaf blackberry	L	3 (single patch or clump of occurring species)	-	Established – No Biocontrol	One patch (a 16 m long and 2 m wide strip) with a patchy distribution.
<i>Rubus armeniacus</i>	Himalayan blackberry	H	3 (single patch or clump of occurring species)	-	Established – No Biocontrol	One patch (a 16 m long and 2 m wide strip) with an even distribution.
<i>Phalaris arundinaceae</i>	reed canary grass	D	8 (continuous occurrence of a species with a few gaps in the distribution)	-	Insufficient Information	Plants mixed into the ditch with various other invasive species and weeds. Continuous dense patches next to the creek, especially on the side opposite to the southern end of the Project.
<i>Hypericum perforatum</i>	St. John's wort	M	5 (a few patches or clumps of a species)	-	Established - Biocontrol	Two patches of plants, one on either side of the bridge next to the sidewalk.
Notes: ¹ InvasivesBC Density Codes range from Low to Dense with: L = Low, M = Medium, H = High, and D = Dense. ² InvasivesBC Distribution Codes describe an occurrence's pattern in the surveyed area and range from (1) being a rare individual, or a single occurrence to (9) continuous dense occurrence of a species (BC MOF 2023). ³ Listed on Part I or Part II for the Fraser Valley Regional District on Schedule A of the Weed Control Regulation ⁴ Fraser Valley Invasive Species Society Invasive Plant Priority List (FVISS 2021).						



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Notes
 1. Coordinate System: NAD 1983 BC Environment Albers
 2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; Google Earth; Google Earth

- Airport
- Road
- Watercourse
- Waterbody
- Wetland
- Local Greenspace
- Municipal Boundary
- Project Footprint
- Buffer 1km
- Buffer 2km
- Invasive Plant Site
- Old Growth Management Areas - Legal
- Agricultural Land Reserve
- Recreation Reserve/Site



Project Location: 121°46'47"W 49°17'10"N
 Project Number: 123222572
 Prepared by TCARDINAL on 20231220
 Requested by PBROWNE on 20231219
 Checked by RTHARBY on 20240131

Client/Project/Report
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 Environmental Overview Assessment

Figure No.
2

Title
Land Use and Vegetation Resources

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3.2 Wildlife Resources

3.2.1 Desktop Review

The desktop review identified 21 wildlife species provincially and/or federally listed with distribution ranges known to occur within the Dry Maritime Coastal Western Hemlock biogeoclimatic subzone in the Chilliwack Forest District (Table 2; BC CDC 2024a). A species inclusion on this list was determined by comparing habitat conditions within the Project footprint (e.g., habitat type) to habitat requirements of provincially and/or federally listed species that can be found within the Dry Maritime Coastal Western Hemlock biogeoclimatic subzone of the Chilliwack Forest District. Based on occurrence records, species distribution, and habitat requirements, these species are known or have the potential to occur within, or near the desktop review Study Area. The desktop review identified:

- Sixteen species listed on Schedule 1 of SARA: four endangered, five threatened, and seven special concern.
- Five species provincially red-listed.
- Twelve species provincially blue-listed.

There is one secured occurrence record (#63109) for a species or ecosystem at risk that is within 2 km of the Project footprint. The BC CDC has reviewed the Project location in relation to the actual location of the secured occurrence record and have determined that the details of the record are not required to plan for Project activities due to the distance of the record from the Project location (BC CDC 2024b, pers. comm.).

Table 2 Provincially and/or Federally Listed Wildlife Species with Potential to Occur within 2 km of the Project Footprint

Scientific Name	Common Name	Record of Observation within 2 km of the Project footprint ¹	Provincial Status ²	Federal Status	
				SARA ³	COSEWIC ⁴
Amphibians					
<i>Rana aurora</i>	Northern red legged frog	Yes ⁵	Blue	SC	SC
<i>Rana pretiosa</i>	Oregon spotted frog ⁶	-	Red	E	E
<i>Anaxyrus boreas</i>	Western toad	-	Yellow	SC	SC
Birds					
<i>Contopus cooperi</i>	olive-sided flycatcher	Yes ¹	Yellow	SC	SC
<i>Hirundo rustica</i>	barn swallow	Yes ⁷	Yellow	T	SC
<i>Patagioenas fasciata</i>	band-tailed pigeon	Yes ¹	Blue	SC	SC
<i>Cypseloides niger</i>	black swift	Yes ¹	Blue	E	E
<i>Ardea herodias fannini</i>	great blue heron, <i>fannini</i> subspecies	Yes ¹	Blue	SC	SC



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Scientific Name	Common Name	Record of Observation within 2 km of the Project footprint ¹	Provincial Status ²	Federal Status	
				SARA ³	COSEWIC ⁴
<i>Butorides virescens</i>	green heron	-	Blue	-	-
<i>Accipiter gentilis laingi</i>	northern goshawk, <i>laingi</i> subspecies	-	Red	T	T
<i>Tyto alba</i>	barn owl ⁸	-	Blue	T	T
<i>Megascops kennicottii kennicottii</i>	western screech owl, <i>kennicottii</i> subspecies	Yes ¹	Blue	T	T
<i>Falco peregrinus anatum</i>	peregrine falcon, <i>anatum</i> subspecies	Yes ¹	Red	-	NAR
<i>Coccothraustes vespertinus</i>	evening grosbeak	Yes ¹	Yellow	SC	SC
Mammals					
<i>Corynorhinus townsendii</i>	Townsend's big-eared bat	-	Blue	-	-
<i>Lasiurus cinereus</i>	hoary bat	-	Blue	-	E
<i>Myotis lucifugus</i>	little brown myotis	-	Blue	E	E
<i>Myotis yumanensis</i>	Yuma myotis	-	Blue	-	-
<i>Sorex bendirii</i>	Pacific water shrew	Yes ⁹	Red	E	E
Invertebrates					
<i>Euphyes vestris</i>	dun skipper	-	Blue	T	T
Notes:					
¹ Based on regional occurrence records from BC CDC (ENV 2024b), HabitatWizard (ENV 2024a), E-Fauna BC (2021), eBird (eBird 2024) ² Provincial status indicates species populations are as follows: Red = species that are or may become Extirpated, Endangered or Threatened in BC; Blue = species that are designated as Special Concern in BC; Yellow = species that are apparently secure and not at risk of extinction. ³ Species at risk in Canada listed under Schedule 1 of the federal <i>Species at Risk Act</i> indicates species populations are as follows: Endangered (E) = facing extinction or extirpation; Threatened (T) = likely to become endangered without reversal of limiting factors; Special Concern (SC) = of special concern due to characteristics that make a species sensitive to natural events or human activities. ⁴ Species of conservation concern in Canada assessed by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as endangered (EN), threatened (TH), or special concern (SC); not at-risk species = NAR, data deficient = DD (ENV 2024b); “-“ No Status. ⁵ Twenty-five occurrence records are located within 2 km of the Project footprint. ⁶ The presence of a critical habitat polygon is located 1.7 km from the Project Footprint. ⁷ Nine occurrence records are located within 2 km of the Project footprint. ⁸ The presence of a critical habitat polygon is located 1.8 km from the Project Footprint ⁹ Occurrence record is located 1.3 km of the Project footprint and is a historical occurrence from 1998 (cited as (D. Knopp, pers. comm. 2003) in ENV 2024b.					



3.2.1.1 Amphibians

Provincially and/or federally listed amphibian species, including western toad (*Anaxyrus boreas*), northern red-legged frog (*Rana aurora*), and Oregon spotted frog (*Rana pretiosa*) breed in shallow permanent or non-permanent wetted areas (BC CDC 2024c). Suitable wetland breeding and upland amphibian habitat may occur within the Project footprint. Northern red-legged frog was identified within 600 m of the Project footprint and Oregon spotted frog was identified within 1.7 km of the Project footprint. There are multiple records of northwestern salamander (*Ambystoma gracile*) within 1 km of the Project and the species has been documented as close as 100 m to the Project footprint. One record of green frog (*Lithobates clamitans*), an invasive species, was identified within Miami Creek and within 2 km of the Project footprint.

3.2.1.2 Birds

Eight bird provincially and/or federally listed species have been detected within 2 km of the Project footprint (Table 2; ENV 2024c). The desktop review of BC Conservation Data Centre iMap (ENV 2024b) and BC Species & Ecosystems Explorer (ENV 2024c) data indicated that no observations of bird provincially and/or federally listed species have been reported within the Project footprint.

There are nine barn swallow (*Hirundo rustica*) occurrence records within 2 km of the Project footprint. Barn swallows have the potential to nest within the Project footprint and are known to nest underneath anthropogenic structures such as bridges (BC CDC 2024c).

Potential barn owl (*Tyto alba*) critical habitat is located approximately 1.8 km from the Project footprint, but the critical habitat spatial polygon does not overlap with the Project footprint.

3.2.1.3 Mammals

Based on range and habitat preferences, Townsend's big-eared bat (*Corynorhinus townsendii*), Yuma myotis (*Myotis yumanensis*), little brown myotis (*Myotis lucifugus*) and hoary bat (*Lasiurus cinereus*) may occur within the Project footprint. These species are known to use abandoned buildings for either maternity roosts (Townsend's big-eared bat, little brown myotis) or winter hibernacula (*Yuma myotis*), or deciduous and coniferous forests (hoary bat) when available (BC MOE 2016; E-Fauna 2021; BC CDC 2024c) Yuma myotis are strongly affiliated with lower elevation riparian areas (Braun et. al. 2015). A creek was identified adjacent to the Project footprint that may provide foraging for bats in the area. Due to the apparent young forest structure of the Project footprint, natural habitats are unlikely to provide suitable roosting habitat for bats.

Pacific water shrew (*Sorex bendirii*) use riparian areas along streams to hunt for invertebrates. This endangered species is only found in the Fraser Valley. There is a large area critical habitat within the Miami Creek area (i.e., footprint area; Figure 3; ENV 2024a).



3.2.1.4 Invertebrates

There are no records of provincially and/or federally listed invertebrate within the study area. Species listed in Table 2 have been observed in the Fraser Valley and Lower Mainland. The dun skipper (*Euphyes vestris*) is known to utilize right of ways and wet depressions in fields throughout its distribution (BC CDC 2024c).

3.2.2 Field Survey

3.2.2.1 Amphibians

Suitable aquatic habitat for breeding amphibians (areas of seasonal ponding, wetlands, and watercourses) were observed in the Project footprint during the field survey on December 21, 2023. The Project footprint is characterized by an undulating microtopography with thick grass, shrub cover, wetlands (i.e., potential cover for amphibians), roads and ditches. Based on the conditions observed during the field survey suitable habitat for amphibians occurs within the Project footprint there is evidence to suggest that the Project footprint, especially the southern portions close to Miami Creek, has a high potential to support amphibians. Amphibians were not detected during the field survey.

3.2.2.2 Birds

No birds were observed within the Project footprint during the field survey on December 21, 2023. The multi-layered vegetation structure (i.e., grasses near the creek, young trees, and the patch of invasive shrubs) within the Project footprint has the potential to provide nesting, foraging, and cover habitat for songbirds.

Raptors are known to occur in the Harrison Lake area (eBird 2024) and may occur in suitable habitat outside the Project footprint. The Project footprint does not contain suitable habitat for cavity or crevice nesting birds. Nesting cavities and barn swallow nests were not detected within the Project footprint. However, several properties located outside of the Project footprint could contain nesting cavities and/or barn swallow nests.

3.2.2.3 Mammals

No evidence of bat roosting was observed during the field survey. The trees within the project footprint are unlikely to provide life requisites for roosting. However, the nearby OGMA (71 m west of the Project footprint) has the potential to contain roosting habitat. Given the proximity of the OGMA to the Project and Miami Creek, there is potential for bat forage on mosquitoes and other invertebrates within the Project footprint.

Pacific water shrew were not observed during the field survey. Streams and riparian areas were identified within the Project footprint. Riparian vegetation included young mixed wood forest, dense shrubs, and coarse woody debris which are biophysical features of critical habitat described in *The Recovery Strategy for the Pacific Water Shrew (Sorex bendirii) in Canada* (Environment Canada 2014). A detailed Pacific water shrew habitat survey was not undertaken during the field survey.



A small beaver dam and lodge were located approximately 100 m upstream of the Project footprint (southwest of the project by the OGMA boundary). Beaver foraging on trees within and outside the Project footprint was also observed (Appendix A; Photo 5).

3.2.2.4 Invertebrates

Suitable habitat for dun skipper (i.e., wet grassy depressions and right of ways) were observed in the Project footprint during the field survey in December 2023. December is not a typical time to complete biophysical assessments as many species (especially invertebrates) are dormant, absent, or difficult to detect.

3.3 Aquatic Resources

3.3.1 Desktop Review

Miami Creek (watershed code [WSC]: 110-232100] also referred to as 'Miami River' or 'Miami Slough') is the only watercourse situated within the Project footprint. Miami Creek generally flows south to north through agricultural, residential, and forested lands, prior to discharging into Harrison Lake approximately 2 km downstream from the Project footprint. Harrison Lake is one of the largest lakes in British Columbia, with a length of 60 km and a width of 9 km at its widest point (Balance Ecological 2010). Miami Creek and Harrison Lake are both part of the larger Lower Harrison Watershed which begins at the head of the Lillooet River in the north, conveying water generally south for approximately 177 km into the Harrison River and Fraser River confluence (Balance Ecological 2010).

Miami Creek is a fish-bearing watercourse with records of 19 fish species, which includes six salmonid species, one invasive species, and one species designated on Schedule 1 under SARA (Salish sucker [*Catostomus sp. 4*]). Since 2020, the Miami River Streamkeepers Society (MRSS) have conducted annual chum salmon (*Oncorhynchus keta*) fry releases into Miami Creek as part of DFO's Salmonid Enhancement Program to conserve Pacific salmon stocks (MRSS n.d.). In 2022 and 2023, 50 chum spawning pairs were released into Miami Creek as part of DFO's Chum Spawner Salmon Pilot Project to further support local salmon populations (MRSS n.d.).

MRSS conducts water quality measurements (temperature, pH, dissolved oxygen, turbidity, and depth) throughout the year at multiple sites within Miami Creek. Throughout the year the water quality is generally within BC guidelines considered acceptable for aquatic life, with the exception of hot summer months where observed water temperatures increase, and dissolved oxygen levels are low (ENV 2023; MRSS n.d.).



Table 3 Historic Fish Presence within Miami Creek

Common Name	Scientific Name	BC Provincial Status ¹	COSEWIC Status ²	SARA Status ³	Last Recorded Observation
Brassy Minnow - Pacific group	<i>Hybognathus hankinsoni</i>	Blue	SC	-	2011
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	-	SC/T/E/NAR/DD	-	2011
Chum Salmon	<i>Oncorhynchus keta</i>	-	-	-	2023
Coastal Cutthroat Trout	<i>Oncorhynchus clarkii clarkii</i>	Blue	-	-	2011
Coastrange Sculpin	<i>Cottus aleuticus</i>	Yellow	-	-	2011
Coho Salmon	<i>Oncorhynchus kisutch</i>	-	-	-	2018
Largescale Sucker	<i>Catostomus macrocheilus</i>	Yellow	-	-	2011
Longnose Dace	<i>Rhinichthys cataractae</i>	Yellow	-	-	2018
Northern Pikeminnow	<i>Ptychocheilus oregonensis</i>	Yellow	-	-	2018
Peamouth Chub	<i>Mylocheilus caurinus</i>	Yellow	-	-	2018
Prickly Sculpin	<i>Cottus asper</i>	Yellow	-	-	2018
Pumpkinseed	<i>Lepomis gibbosus</i>	Exotic	-	-	2011
Rainbow Trout – coastal lineage	<i>Oncorhynchus mykiss</i>	No Status	-	-	2018
Redside Shiner	<i>Richardsonius balteatus</i>	Yellow	-	-	2018
Salish Sucker	<i>Catostomus sp. 4</i>	Red	T	1-T	2018
Sculpin (General)	<i>Cottus spp.</i>	-	-	-	2000
Slimy Sculpin	<i>Cottus cognatus</i>	Yellow	-	-	2000
Steelhead	<i>Oncorhynchus mykiss</i>	No Status	-	-	1941
Threespine Stickleback	<i>Gasterosteus aculeatus</i>	Yellow	-	-	2018
Notes:					
¹ BC Provincial Status: Red = Extirpated, Endangered or Threatened; Blue = Special Concern; Yellow = Not at risk ² COSEWIC or SARA status: Threatened (T) = species likely to become endangered if limited factors are not reversed; Special Concern (SC) = species may become threatened or endangered because of a combination of biological characteristics and identified threats; Endangered (E) = species facing imminent extirpation or extinction; Data Deficient (DD) = available species information is insufficient to determine conservation risk; Not at Risk (NAR) = Species is assessed to be not at risk based on current information ³ Species designated on Schedule 1 of SARA					
Sources: Habitat Wizard, BC Conservation Data Centre, MRSS					



There are five species of conservation concern that have been recorded within a 5 km radius of the Project footprint (Table 4). Salish sucker are designated on Schedule 1 under the *Species at Risk Act* and have multiple records of occurrence within 100 m of the Project footprint (Figure 3). Salish sucker's population distribution is confined to a few watersheds in the Fraser Valley and northwestern Washington State (Pearson and Healey 2003). Critical habitat is defined as reaches in streams that currently contain populations of Salish sucker with more than 50 m length of continuous pool habitat and with a water depth exceeding 70 cm at summer low flows (DFO 2020). Pools are important features of critical habitat (DFO 2020) used during most of the Salish sucker's life cycle with the exception of spawning.

Two blue-listed fish species have records of occurrence within Miami Creek including coastal cutthroat trout (*Oncorhynchus clarkii clarkii*) and brassy minnow (*Hybognathus hankinsoni*). Adult coastal cutthroat trout have been observed in a range of habitats, from small headwater streams to sloughs and backwaters associated with larger rivers. Juvenile cutthroat trout are typically associated with small streams (<5 m channel width) with low to intermediate-gradient reaches (0-5%) in pools with large woody debris (McPhail 2007). Brassy minnow typically occur in slow-moving aquatic environments (McPhail 2007) and have been recorded within 100 m of the Project footprint (Figure 3).

Other species of concern that have been observed within 5 km of the Project footprint are white sturgeon (*Acipenser transmontanus*) and pygmy longfin smelt (*Spirinchus sp. 1*). Harrison River and the Fraser River are designated as critical habitat for white sturgeon and Harrison Lake is designated as critical habitat for pygmy longfin smelt. Both of these species are red-listed and typically use larger waterbodies as their primary habitat (e.g., Fraser River, Harrison Lake); therefore, they are unlikely to be present within the Project footprint.

3.3.2 Field Survey

Miami Creek was the only watercourse observed in the Project footprint during the field survey. Stantec assessed Miami Creek from 55 m upstream to 170 m downstream of the bridge crossing. The survey area was confined between multiple private properties. Stantec also assessed the north drainage swale along Highway 9 and proposed location of the grass-lined ditch for aquatic values. Stream dimensions and biophysical measurements were recorded at four transects: two upstream and two downstream of the bridge crossing of Miami Creek.

Miami Creek was slow flowing from south to north through a wetland complex and confined between residential and commercial developments. The stream was low gradient (1-2%) throughout the assessed reach with prevalent glide morphology and few riffles observed. Channel widths ranged from 3.0 m - 6.0 m, and channel depths ranged from 0.9 m to 1.0 m. Overall bank heights were shallow ranging from 0.4 m – 4.0 m and were comprised of organic matter; bed substrate was also comprised of organic matter as typically observed in wetlands.



Table 4 Fish Species of Concern within 5 km of the Project Footprint

Scientific Name	Common Name	BC Provincial Status ¹	COSEWIC Status ²	SARA Status ³	Last Recorded Observation	Location	Likelihood of Occurrence in Project Footprint
<i>Acipenser transmontanus</i> pop. 4	White sturgeon – Lower Fraser River Population	Red	T	–	2015	Fraser River	Unlikely
<i>Catostomus</i> sp. 4	Salish sucker	Red	T	1-T	2018	Miami Creek	Likely
<i>Hybognathus hankinsoni</i>	Brassy Minnow - Pacific Group	Blue	SC	–	2011	Fraser River Miami Creek Hotsprings Slough	Likely
<i>Oncorhynchus clarkii clarkii</i>	Coastal cutthroat trout	Blue	-	–	2018	Miami Creek	Likely
<i>Spirinchus</i> sp. 1	Pygmy Longfin Smelt	Red	DD	–	2001	Harrison Lake	Unlikely
Notes: ¹ BC Provincial Status: Red = Extirpated, Endangered or Threatened; Blue = Special Concern; Yellow = Not at Risk ² COSEWIC or SARA status: Threatened (T) = species likely to become endangered if limited factors are not reversed; Special Concern (SC) = species may become threatened or endangered because of a combination of biological characteristics and identified threats; Endangered (E) = species facing imminent extirpation or extinction; Data Deficient (DD) = available species information is insufficient to determine conservation risk; “-” = No Status. ³ Species designated on Schedule 1 of SARA							
Sources: Habitat Wizard (ENV 2024), BC Species and Ecosystem Explorer (BC CDC 2024)							



Upstream of the bridge crossing displayed more shrubs along the banks edge, whereas downstream existed a more homogenous floodplain cover dominated by forb species, with the left bank possessing deciduous trees such as alder and birch along a gravel access road paralleling the stream (Appendix A; Photo 1). Throughout the survey area, Himalayan blackberry was observed on the margins of the banks bordering the urban developed area (Appendix A; Photo 2). No fish were observed within Miami Creek at the time of the survey.

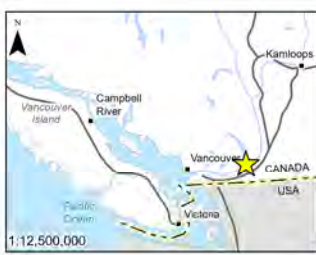
The current design for the grass lined ditch is situated within the riparian area of Miami Creek on the left bank (Appendix B). Along the bridge abutment, where the proposed ditch will be constructed, exists a natural drainage pathway sloping towards the watercourse (Appendix A; Photo 2). This area displayed poor riparian value as most of the area was covered by urban lawn and invasive plants which have deterred the establishment of natural riparian vegetation that contributes shade and nutrients to the stream.

At the time of survey, the drainage ditch along the north side of Highway 9 was not wetted and survey observations were unable to determine if the ditch was connected to downstream fish habitat. Since there was no evidence of scour, it is unlikely to typically contain water and therefore it is unlikely fish can access the ditch from Miami Creek. However, current design drawings indicate the planned drainage will be connected to fish habitat (Miami Creek) once the lawn basin is constructed and connects to the proposed storm main (Appendix B).

Overall, the surveyed portion of Miami Creek was a slow flowing low gradient stream that meanders through a wetland. Features such as the surrounding sloughs, side channels and ponds identified in the desktop survey, indicate it may provide suitable fish habitat for winter rearing. Stressors observed during the survey included the prevalence of Himalayan blackberry invading into the riparian area, urban encroachment, and susceptibility to non-point source pollution and flash flows from impervious urban surfaces. These stressors are particularly prevalent within the proposed Project footprint of the grass lined ditch. Furthermore, Stantec was unable to determine if the drainage swale planned for utility upgrade connects to downstream fish habitat, though it will eventually according to available designs.



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- Airport
- Road
- Watercourse
- Wetland
- Municipal Boundary
- Project Footprint
- Buffer 1km
- Buffer 2km
- Waterbody
- Aquatic Species at Risk**
- Brassy Minnow
- Coastal Cutthroat Trout
- Salish Sucker



Project Location: 121°48'17"W 49°17'10"N
 Project Number: 123222572
 Prepared by TCARDINAL on 20231220
 Requested by PBROWNE on 20231219
 Checked by RTHARBY on 20240131

Client/Project/Report
 Ministry of Transportation and Infrastructure
 Highway 9 Drainage Study
 Environmental Overview Assessment

Figure No.
3

Title
Wildlife and Aquatic Species at Risk

Notes
 1. Coordinate System: NAD 1983 BC Environment Albers
 2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
 © Google Earth, Google Earth

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4 Regulatory Framework

Table 5 summarizes federal and provincial regulatory requirements that may be applicable to the Project prior to and during construction, based on current Project design (50%).



Table 5 Federal and Provincial Regulatory Requirements

Applicable Legislation	Permit or Approval	Applicability to Project	Probability of Requirement	Typical Timeline
Federal				
<i>Fisheries Act</i>	Request for Review (RFR)	An RFR seeks a formal opinion from Fisheries and Oceans Canada (DFO) through a Letter of Advice as to whether a harmful alteration, disruption, or destruction (HADD) of fish habitat is likely to occur as a result of Project activities. If a HADD is unavoidable, then a <i>Fisheries Act</i> Authorization will likely be required (see below).	Likely due to works in riparian habitat.	90 days
	Authorization	If it is determined that a HADD will occur as a result of the Project, an application to DFO for Authorization under Section 35 (2) of the <i>Fisheries Act</i> will be needed.	Unlikely	6 months minimum
	Licence to Fish for Scientific, Experimental, or Educational Purposes	Licence to salvage salmon and federally listed fish from potentially affected waterbodies during the construction phase.	Likely if designs or construction isolation methods encroach on fish habitat	30 days
<i>Species at Risk Act (SARA)</i>	Permit	Occurrences of Salish sucker have been identified within the Project footprint; SARA permits are required for salvaging of all aquatic species at risk. SARA permits are required for the removal of any nests or migratory birds (i.e., barn swallow or bank swallow) listed under Schedule 1 of SARA anywhere they occur. SARA permits for terrestrial species at risk may be required when a project occurs on federal lands. As the Project footprint does not occur on federal lands, permitting for Pacific water shrew is not anticipated under SARA.	Likely if designs or construction isolation methods encroach on fish habitat Likely if a migratory birds nest is found within the Project footprint	90 days
<i>Migratory Bird Convention Act (MBCA)</i>	Permit	The MBCA prohibits the possession, disturbance, and destruction of migratory birds (as identified in Schedule 1 of the MBCA), their occupied nests, or eggs. It also prohibits the deposition of harmful substances in areas frequented by migratory birds (such as streams). No permitting is required; however, the proponent should employ mitigation measures and guidance as required. Project activities (e.g., clearing) that could affect nesting birds should be scheduled to occur outside the regional bird nesting window (see Table 6). Issuance of any permit under Section 70 would be a last resort and only issued where avoidance options (leaving the unoccupied pileated woodpecker nesting cavity alone until the 36-month waiting period has passed) are not feasible due to human health or public safety. Issuance of any permit under Section 70 would be a last resort and only issued where avoidance options (leaving the unoccupied great blue heron nest alone until the 24-month waiting period has passed) are not feasible due to human health or public safety.	Compliance only	At least 90 days
Provincial				
<i>Heritage Conservation Act</i>	Heritage Inspection Permit Site Alteration Permit Application	This act protects all archaeological sites in BC and applies whether sites are located on public or private land, and whether the site is known or unknown. Protected archaeological sites may not be altered or changed in any manner without a permit. There are known archaeological sites within the Project footprint. MOTI will be providing a chance find procedure and best practices to be followed if an archaeological or heritage discovery is made.	MOTI has engaged an archaeologist.	NA
<i>Water Sustainability Act (WSA)</i>	Section 11 Change Approval	Change approvals are written authorization to make complex changes in and about a stream including “any modification to the nature of a stream, including any modification to the land, vegetation and natural environment of a stream or the flow of water in a stream.” Would be required if the conditions for Section 39(1)(a) (see below) are not met.	Unlikely	12 to 18 months
	Water Sustainability Regulations Section 39 Authorized Change	Culvert construction and maintenance may fall under Section 39 and require a notification provided it meets the criteria of Section 39(1)(a) (e.g., dimension of culvert, approach to instream work).	Likely	45 days
	Section 10 Water Use Approval	If dewatering requires pumping groundwater from excavations, a Section 10 Use Approval under the WSA would be required.	Unlikely given the availability of municipal water	3 to 6 months



Applicable Legislation	Permit or Approval	Applicability to Project	Probability of Requirement	Typical Timeline
<i>Wildlife Act</i>	General Wildlife Permit	Miami Creek may provide suitable amphibian breeding habitat and there are records of amphibian species in areas adjacent to the Project footprint. Reptiles may also occur in the Project footprint. An amphibian salvage and relocation program may be required if Project activities will occur in amphibian breeding habitat during the breeding season. A General Wildlife Permit under the <i>BC Wildlife Act</i> will be needed to handle and relocate salvaged amphibians and reptiles.	Possible	2 to 6 months
		Pacific water shrew has the potential to occur in streams and riparian areas within the Project footprint. If Project work will occur in suitable habitat a salvage and relocation program will be required. A General Wildlife Permit under the <i>BC Wildlife Act</i> is required to handle and relocate Pacific water shrew.	Possible	2 to 6 months
		Should beaver dam removal become necessary, MOTI will engage with the local registered trapper(s); submit General Wildlife Permit(s) for beaver dam removal; follow the terms, conditions, and least-risk timing window for the South Coast Region (July 30 to September 1; MOE 2006); and apply standards and best practices as described by DFO (2023) as applicable.	Unlikely	2 to 6 months
	Scientific Fish Collection Permit (Salvage)	A salvage permit will be required should in-water construction activities be required.	Likely	30 days
<i>Integrated Pest Management Act</i>	Pesticide Use Permit	Government agencies are mandated by law to control species that occur on their property or jurisdiction. Use of pesticides are controlled by obtaining a permit. It is recommended that during a site visit, a Qualified Environmental Professional (QEP) conduct an invasive plant survey and if noxious weeds (e.g., purple loosestrife) are identified, MOTI (or their contractor) should apply for a permit to treat the noxious weeds. MOTI should manage the noxious weeds prior to any proposed construction within the Project footprint, as chemical treatments could take multiple years to be effective.	Possible	1 month
<i>Weed Control Act</i>	Permit to treat noxious weeds using herbicides	There are known occurrences of provincially noxious weeds near the Project footprint, with the closest being purple loosestrife, identified approximately 7 meters south of the Project footprint. Government agencies are mandated by law to control species that occur on their property or are within their jurisdiction. Use of pesticides are controlled by obtaining a permit. It is recommended that during a site visit that a Qualified Environmental Professional (QEP) conduct a noxious weed survey and if weeds are identified then MOTI should apply for a permit to treat the noxious weeds. MOTI should manage the noxious weeds prior to any proposed construction at the project sites, as chemical treatments could take multiple years to be effective.	Possible	1 month
Municipal				
<i>Property Maintenance Bylaw No. 1072</i>	Authorization	Every person who owns or occupies real property must remove weeds or invasive species. Not applicable with MOTI right of way	Possible within City lands	Ongoing
<i>Tree Management and Preservation Bylaw No. 1015</i>	Tree Management and Preservation Permit	Permits are required to remove trees that are 7.5 m or more in height and have a diameter of 30 cm or greater within city property limits outside the MOTI right of way	Unlikely	30 days



5 Potential Environmental Effects and Mitigation Measures

This section provides an overview of the potential environmental effects of the Project, as understood based on the current 50% design, and outlines preliminary environmental protection measures to avoid or reduce these potential effects during Project construction. Additional mitigation measures may be advised by regulators as conditions of permit issuance.

5.1 Project Activities and Potential Environmental Effects

The Project has the potential to cause adverse environmental effects on vegetation, wildlife and wildlife habitat, and fish and fish habitat (e.g., environmental values) if avoidance and/or mitigation measures are not implemented. Based on the 50% design and the sensitive environmental features overlapping the Project footprint, there are anticipated to be direct and indirect Project-related impacts associated with construction activities. Project activities potentially affecting habitat during construction include:

- Potential riparian and/or in-stream construction work in Miami Creek.
- Removal of terrestrial and aquatic vegetation.
- Modifications in flow downstream of the crossing of Miami Creek.
- Installation of drainage infrastructure.
- Regrading or modification of Miami Creek stream banks.
- Use of industrial equipment.

Potential effects of the Project include:

- Loss of vegetation due to clearing, ground disturbance, and general construction activities.
- Spread of noxious weeds or invasive species due to the ground disturbance associated with the Project during site preparation, construction, and post construction activities, including during equipment mobilization and soil disturbance.
- Vegetation on site, particularly larger shrubs or trees, provide nesting habitat for birds; clearing during the nesting/breeding season has the potential to disturb and/or kill birds and their eggs.
- Temporary modification to fish habitat in Miami Creek.
- Equipment accidents and malfunctions could potentially affect water and sediment quality or cause direct physical impacts to flora and fauna. Sources of impacts may include spills/leaks (e.g., hydrocarbon, concrete wash water, etc.).
- Enhanced drainage and sediment transport into the creek and reduced long term water quality.



5.2 Environmental Timing Windows

Environmental resources can be more susceptible or sensitive to disturbance at certain times of the year. Table 6 summarizes environmental timing windows that should be considered in Project planning, construction staging, and design. Any work that is conducted outside the least risk timing window for fish or within the highest risk timing windows for wildlife may only be completed with appropriate mitigation strategies as determined in consultation with a QEP.

Table 6 Environmental Timing Windows

Resource	Timing Window	Source
Migratory Birds (Nesting period)	Highest risk timing: March 29 to August 12	(ECCC 2023)
Raptors (nesting period)	Highest risk timing: February 5 – September 5 in the South Coast region (although protected year-round)	(MFLNRO 2013)
Wetland-breeding Amphibians	Species specific but in-stream works are highest risk during the overwintering period (October to February). If works are to occur during the summer breeding period, an amphibian salvage may be required.	(MFLNRO 2016; MOECCS 2020)
Fish and Fish Habitat	High risk timing: September 16 to July 31 Least risk timing: August 1 to September 15, per requirements for South coast trout and salmon species	(MOE 2006)

5.3 Environmental Mitigation Measures

Environmental protection measures (mitigation measures and controls) have been identified based on potential environmental effects of the Project, as described in Section 5.1. Mitigation measures are preliminary and will be refined as the Project advances through planning and tendering. Table 7 presents a summary of site-specific environmental mitigation measures and controls for pre-construction, construction, and post-construction Project phases. These measures should be implemented in addition to the measures in Section 165 (Protection of the Environment) of the Standard Specifications for Highway Design (MOTI, 2020).



Table 7 Environmental Mitigation Measures by Construction Phase and Activity/Concern

Activity/Concern	Project-Specific Mitigation Measures
Pre-Construction	
Construction Environmental Management Plan	<ul style="list-style-type: none"> • Development of a Construction Environmental Management Plan (CEMP) prior to the start of construction activities to outline sensitive environmental features of the Project site and mitigation measures to protect these features during construction. • A copy of the CEMP will be kept on site and reviewed with construction staff.
Tree Disturbance	<ul style="list-style-type: none"> • Develop tree protection zones in consultation with a QEP if construction laydown or the Project footprint areas require tree disturbance in consultation. • Install tree protection fencing to outline the protection zones for trees which are to be retained.
Protection of Fish and Fish Habitat	<ul style="list-style-type: none"> • Works shall be planned to occur during the least risk timing window for fish (August 1 to September 15; Table 6). Prior to in-stream works, a fish salvage and relocation should be completed by a QEP. • Once the area is salvaged, isolation can be established at the work site. Downstream flow should be maintained continuously with appropriately sized pumps to reduce impacts to fish and fish habitat.
Wildlife and Wildlife Management	<ul style="list-style-type: none"> • If amphibians are observed within the Project footprint, exclusion fencing should be used to prevent amphibians from entering the Project footprint. • Should works be undertaken during the amphibian breeding season (Table 6), an amphibian survey and salvage be completed by a QEP. • Additional pre-construction surveys and salvage (where applicable) may be required for Pacific water shrew and must be completed under a General Wildlife Permit. Confirmation surveys for Pacific water shrews can include eDNA sampling of suitable habitat. Salvage targeting Pacific water shrews within high or moderate habitat is recommended to avoid incidental impacts to Pacific water shrews within the construction footprint. Areas of salvage should be focused on watercourses and within riparian areas using pit fall trapping and other live trapping methods as described in the Pacific water shrew Best Management Practices (Craig, 2010). Pacific water shrew salvage must be completed by a QEP with experience in small mammal salvages prior to grading and clearing. Salvage of an area takes a minimum of eight full days of salvage plus setup and removal of trap lines of an isolated area. Pre-construction coordination with other salvage operations is required. • Salvage and relocation should commence approximately seven days in advance of construction to allow time to install exclusion fencing and salvage most individuals. If salvage does not occur on the same day as construction, fencing will be used to exclude other amphibians from entering the site. • Prior to salvage and relocation, exclusion fencing should be installed to prevent wildlife from re-entering workspaces. Exclusion fencing should be geotextile silt fencing and if required in areas of unstable or uneven ground, can be weighted down with sandbags or a hardware mesh fencing if it needs to go through water. • A qualified Environmental Monitor (EM) will monitor the integrity of the exclusion fencing through site preparation and construction activities.
Permits and Approvals	<ul style="list-style-type: none"> • A copy of permits and approvals should be kept on-site in a binder with the CEMP. • The QEP, Environmental Monitor (EM), and Contractor should be familiar with the conditions applicable to the tasks they are completing.



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Activity/Concern	Project-Specific Mitigation Measures
Breeding Birds	<ul style="list-style-type: none"> If construction begins during the breeding bird window (March 29 to August 12; Table 6), a bird nest survey will be undertaken one to seven days before disturbance of vegetation or structures that may support nesting. If a nest is discovered, buffer zones should be established by a QEP depending on the species. A 30 to 100 m setback is typically recommended surrounding active nests depending on the species.
Construction	
CEMP	<ul style="list-style-type: none"> A CEMP is a living document and should be updated as needed with additional mitigation measures to reflect changes in construction or to protect unforeseen sensitive environmental features. The CEMP should be kept on site at all times and must include the requirements of any permits or approvals specific to the Project.
Breeding birds	<ul style="list-style-type: none"> Avoid disturbance or destruction of birds, their nests, and eggs. If a nest is discovered, consult a QEP for mitigation measures (e.g., setbacks based on species). A 30 to 100 m setback is recommended surrounding active nests, depending on the species.
Erosion and Sediment Control (ESC)	<ul style="list-style-type: none"> Install and maintain ESC measures as directed by EM or QEP. Frequency of attendance of the EM on site to record site activities is to be determined. Frequency of inspection may be subject to increase after a significant rainfall event (25 mm rainfall or greater per day or 10 mm per hour).
Soil Management	<ul style="list-style-type: none"> Soils with visual and/or olfactory contamination evidence should be characterized by a QEP prior to disposal. Soils with noxious and/or invasive plant species present should be characterized, stockpiled in an isolated location, and disposed of at a location approved by the EM or QEP.
Protection of Fish and Fish Habitat	<ul style="list-style-type: none"> Measures should be taken to avoid the input of deleterious substances into watercourses on or near the Project footprint. This includes proper storage of materials and equipment as outlined in the Standards and Best Practices for Instream Works (BC Ministry of Water, Land and Air Protection, 2004). Construction equipment should be maintained in good working order without leak or excess grease on any lubrication points. Servicing and fueling of machinery should be conducted in a designated service area located more than 30 m from the top-of-bank of any watercourse or storm sewer catch basin that discharges to a watercourse. The EM will conduct ongoing water quality measurements as required.
Protection of Pacific Water Shrew and Shrew Habitat	<ul style="list-style-type: none"> Contact the Ministry of Environment and submit data summarizing project design and potential impacts to shrew habitat to assess if a further environmental assessment is needed. Use low impact bank stabilization erosion material such as soil bags containing native seeds (i.e., avoid rip rap). Measures should be taken to avoid the input of deleterious substance into watercourses (see "Protection of Fish and Fish Habitat" above). Debris pits and culverts longer than 30 m should be avoided. Long culverts should contain a grate to allow rain and light entry. Avoid the use of armoring of stream crossing structures (especially culverts). If armoring must be used use with varying structure (e.g., "biowalls", imbedded rocks and vegetation) to allow shrews to escape the current.



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Section 5 Potential Environmental Effects and Mitigation Measures
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Activity/Concern	Project-Specific Mitigation Measures
Noxious Weeds and Invasive Species	<ul style="list-style-type: none"> • Construction equipment should be cleaned prior to entering and leaving the construction site to prevent movement of invasive and noxious weeds. • Wheel washing should be used, where required, to prevent tracking of invasive species off-site, and wash water should be contained and disposed of appropriately to avoid spread into watercourses. • Noxious weed removal should be completed under the advice of a QEP or weed management professional. • Topsoil piles should be monitored for invasive and noxious weed growth during construction. Corrective measures such as spraying, mowing, or hand pulling should be implemented to avoid further infestation.
Post-Construction	
Revegetation	<ul style="list-style-type: none"> • Certified weed-free native seed mixes, and native plant (e.g., bull rushes), shrub, and tree stock should be used for revegetation efforts. • Native plant stock should be planted around the culvert to connect the culvert and the remaining natural vegetation. • Seeding will follow replacement of topsoil as closely as possible, pending seasonal and weather requirements. • Vegetation should be inspected regularly to confirm that adequate vegetation cover is established and maintained. If required, take remedial actions, such as additional planting. • Restrict vehicle access over newly planted areas. • Replant native replacement trees for those that cannot be retained.
ESC	<ul style="list-style-type: none"> • Temporary ESC measures should be removed once construction is completed, and the site is confirmed to be stable.



6 Summary

Stantec has completed this EOA for the proposed Project. Baseline data collection consisted of desktop reviews and reconnaissance level field surveys for vegetation, wildlife, and aquatic resources. Additionally, applicable federal, provincial, and municipal permitting requirements were reviewed for the Project. Potential effects of Project construction on vegetation, wildlife, and aquatic resources were assessed. The key findings are summarized below.

The Project footprint was confirmed to have low suitability to support rare plants due to its highly altered state and no ecological communities of interest were detected during the field survey. Four invasive plant species listed under the Fraser Valley Invasive Species Society Invasive Plant Priority List were identified within the Project footprint. One noxious weed was found just outside the Project footprint. Stantec notes there are risks and limitations to completing terrestrial ecosystem description and vegetation surveys during the winter months and recommends additional field effort occur between late spring - mid summer of 2024 to confirm the findings of the December 2023 field survey, including performing an invasive plant species inventory prior to construction.

The Project footprint and surrounding search area (2 km) overlaps with critical habitat and occurrence records for three provincially and federally listed species at risk: northern red-legged frog, Pacific water shrew, and barn owl. Pacific water shrew are protected year-round and cannot be killed, collected, held in captivity, or harassed without a permit under the BC *Wildlife Act*. Contact with the Ministry of Environment is also required to determine if a further environmental assessment for Pacific water shrew is needed. There are documented occurrences of amphibians throughout Miami Creek and suitable amphibian breeding habitat was observed in the Project footprint during the field survey. An amphibian salvage and relocation should be completed if Project activities will occur during the amphibian breeding season within amphibian breeding habitat.

The current design for the grass lined ditch is situated within the riparian area of Miami Creek on the left bank and displayed poor riparian value, as most of the area was covered by urban lawn and invasive plants. Multiple records of Salish sucker were documented within 100 m of the Project footprint. If Project activities require a partial isolation and dewatering of Miami Creek, a SARA permit will be required to conduct a fish salvage.



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Appendices



Appendix A Photolog





Photo 1 View of the left bank from Transect 3 of Miami Creek.



Photo 2 View of the proposed area for the grass-lined ditch.





Photo 3 View upstream of Miami Creek from the highway bridge crossing.



Photo 4 View downstream of Miami Creek from Transect 3.





Photo 5 **View of the beaver dam and lodge from the south bank of Miami Creek.**

