Ministry of Transport and Infrastructure Holt Creek Trestle Bridge Replacement – Aquatics Effects Assessment

Prepared for:

Ministry of Transport and Infrastructure
PO Box 9850 Stn Prov Govt
Victoria, BC V8W 9TS

Project No. 107554-01

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1.0 Introduction

The Ministry of Transportation and Infrastructure (MOTI) is planning to undertake the Holt Creek Bridge Replacement Project (the Project). The Project is located at Mile 59.7 on the Trans Canada Trail (TCT), approximately 500 m west of the Glenora Trails Head Park in Duncan, British Columbia (BC) (**Figure 1.1**), the new bridge will ensure continued safe access to the TCT, which connects the Cowichan, Duncan, and Shawnigan Lake communities.

Holt Creek Trestle Bridge was constructed in 1922 on the old CP Rail Cowichan Subdivision Rail Line. Following the decommissioning of the rail line in 1991, the bridge was incorporated into the TCT and supports a pedestrian, equestrian, and cycle path.

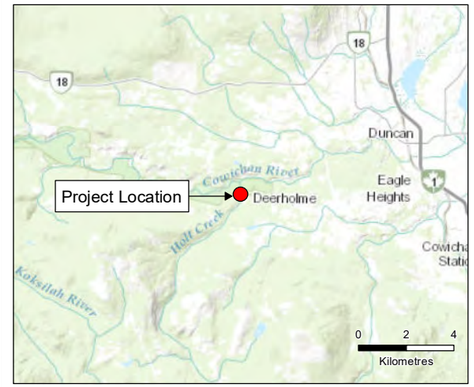
The Project will involve the removal of the current trestle bridge, which is at the end of its functional life, and construction of a new single span, steel frame, timber deck pedestrian bridge structure. The new bridge will also accommodate emergency, maintenance, and construction vehicles and equipment when required.

MOTI has retained Ausenco Sustainability Inc. (Ausenco) to provide environmental services for the Project, including preparation of this Aquatic Effects Assessment (AEA). The purpose of the AEA is to:

- Provide an overview of existing aquatic conditions
- Review potential effects of the Project to the aquatic and riparian habitat
- Determine if the Project has the potential to result in residual effects to aquatic and riparian habitat, including the death of fish or the harmful alteration, disruption, or destruction (HADD) to fish habitat
- Identify mitigation measures to be implemented prior to, during, and after construction to provide adequate protection to instream and riparian habitat.

Aquatic Effects Assessment and Permitting Support
Holt Creek Trestle Replacement Project
Mile 59.7 on the Trans-Canada Trail, Duncan, BC

Location of Holt Creek Trestle Bridge



Legend

- Junction Point
- East Access Road
- West Access Road Option 1
- West Access Road Option 2
- Trans-Canada Trail
- Existing Road
- Major Road
- Local Road
- Resource Road or Trail
- Watercourse
- Holt Creek Trestle
- Laydown Area
- Park
- Property Line
- Wetland
- Waterbody

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Contains information licensed under the Open Government Licence(s) - British Columbia & Cowichan Valley Regional District (CVRD)
- Aerial Image: ESRI World Imagery
- Inset Basemap: ESRI World Topographic Map

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Ausenco

Ministry of Transportation and Infrastructure

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2.0 Project Description

The existing Holt Creek Trestle structure is a 17-bent timber trestle bridge, spanning approximately 73 m in length and extending 34 m above Holt Creek. The existing bridge deck consists of untreated timber and is supported by timber and steel beams on creosote-treated pilings and concrete abutments.

A structural condition inspection was completed in 2017 by Associated Engineering (AE). The structural condition inspection report identified that the bridge was in poor condition, including two areas of significant concern: longitudinal misalignment of the second storey towers and significant undercutting of the rock embankment (Associated Engineering 2017) In 2018, Heritageworks Ltd. was commissioned by AE to complete a condition assessment of the Holt Creek Trestle. The report determined that the bridge required considerable repair or replacement despite improvements made in 2000 and 2002 (Heritageworks 2018). In accordance with the recommendations made by AE and Heritageworks (Associated Engineering 2017, Heritageworks 2018), additional trestle repairs were completed in 2018.

In 2023, SNC-Lavalin completed a structural options review for replacement of the trestle (SNC-Lavalin 2023). The options considered technical constraints, including existing infrastructure, environmental sensitivities, and local community needs. Detailed descriptions of the options considered can be found in Holt Creek Trestle Bridge Replacement Steel Bridge Options Review Report (SNC-Lavalin 2023). The option selected as the preferred alternative is a single span steel girder with wood deck and handrail, which is described in more detail in **Section 2.1**.

The Project schedule is currently being developed and will consider constraints such as the fisheries ("least risk") work window, migratory bird nesting period, and other Project-specific considerations. MOTI is consulting with local Indigenous groups and communities at major milestones with a 30-day response period after each package of information is shared. The Project team is working in consultation with Cowichan Tribe and will continue to do so throughout the duration of the Project.

Given the current structure's age and the need for timely bridge replacement, the Project will aim for the following high-level milestones:

Table 2.1 Project Milestones

Project Milestone	Target Date
Option Selection and Conceptual Design	February 2023
100% Detailed Design	September 2023
Tender	November 2023
Construction	Early 2024 – Winter 2024
Existing Bridge Removal	Summer 2024
Construction Complete/Initiate Site Restoration and Remediation	Winter 2024/Early 2025

2.1 Design of Proposed New Bridge Structure

The proposed replacement structure is a single span bridge that is 74 m long and 4.64 m wide. The proposed bridge will consist of a single steel girder with timber deck and handrails. The bridge will be supported by concrete abutments on the east and west ends of the bridge (**Appendix A –Design Drawings**).

2.2 Proposed Work, Undertaking, or Activity

The replacement bridge will be constructed within the same alignment and location of the current trestle. Access for construction vehicles and equipment will be via:

- An existing path on the east side of Holt Creek with connection to Glenore Trailhead Park.
- An existing, overgrown logging road located on the west side of Holt Creek.

Work pads will be established at the east and west ends of the existing trestle for the staging of heavy equipment (cranes and excavators). Laydown areas will be established to the east and west of Holt Creek (**Figure 1.1**). The east laydown area covers an area of 4,746 m^2 and will be used to erect and assemble the new single span steel girder. The west laydown covers an area of 607 m^2. The east and west laydown areas utilize the existing trail, which reduces the overall area of clearing and grubbing required.

The combined overlap of the two laydown areas with the riparian area of Holt Creek (defined as 30 m from top of bank) is 720 m^2, approximately 245 m^2 of which represents the existing trail footprint and approximately 475 m^2 of additional riparian clearing required for the bridge replacement. The main portion of the east laydown area that will be used for assembly of the new bridge structure is located outside the riparian area of Holt Creek.

The bridge span erection method will consist of launching the completely assembled girder longitudinally across the ravine of Holt Creek. To accomplish the girder launch, the girder will be assembled on a roller system behind the eastern abutment in segments of sufficient length to maintain stability during the launching. Once a segment is assembled, hydraulic jacks or a bulldozer will be used to move the structure across the east abutment until it reaches the abutment located at the west side of the ravine.

The existing railings, deck boards, and trestle bents will be cut and removed to make way for the new clear span steel girder. Once the new structure is in place, a gantry crane will be installed on the new bridge deck to remove the timber trestles and steel components of the old bridge beneath.

No instream work is proposed for Project construction; however, work will occur over the water and there will be some disturbance to the slopes of Holt Creek ravine when the trestle is removed. The existing instream concrete footings, (**Appendix B – Photo 4, 5 and 6**) which have been in place since the original construction of the trestle bridge, will remain in place. These structures stabilize the steeply sloped ravine banks, prevent erosion, and provide stable riparian habitat for trees and shrubs. The footings also provide high-value instream cover in the form of deep pools and runs. Removing the structures is likely to cause instability of the ravine banks and may lead to the degradation and loss of instream and riparian habitat. Potential adverse effects to instream habitat from removal of the footings include loss or change in substrate from local alteration of flows and loss of instream and riparian cover.

A large concrete footing located on the east side of the ravine high above the highwater mark will be removed due to stability concerns (TetraTech 2018). All other components of the existing trestle, including smaller concrete footings on the east and west sides of the ravine and creosote-treated timber support structures (**Appendix B – Photo 7 and 8**) located on the ravine slopes above highwater mark will be removed.

Clearing and grubbing of vegetation will be required for construction access along the east and west access routes, at the location of the proposed eastern laydown area, and at the location of the new east and west abutments and footings. Consideration will be given to Erosion and Sediment Control (ESC) and management of Invasive plant species at these locations. Opportunities for post-construction restoration will also apply.

Table 2.2 Proposed Construction Activity

Phase	At West Approach (Lake Cowichan side)	Over Holt Creek (Center Span)	At East Approach (Duncan side)
0	Site preparation – clearing and grubbing as needed for construction access.	Remove railing and deck on existing trestle. Strengthen trestle bents, if needed. Prepare structure for deconstruction.	Site preparation – clearing and grubbing as needed for construction access and laydown area. Launching frame erection; girder assembly; roll girders on rails from assembly area to launching position.
1	Site preparation to receive launching nose.	Girder launching	Pushing girder from the east side.
2	Dissemble launching nose from main girder.	Launch girder to span over the ravine.	Prepare for stock piling of timber dismantled from existing trestle.
3	No major activities	Assemble movable gantry crane on main girder; remove time trestle to make space for final position of main girder.	Prepare for stock piling of timber dismantled from existing trestle.
4	Install approach span (girders are transported from main girder).	Lower main girders to footing and to their final elevation.	Install approach span.
5	Remove launching frame; install timber deck and railing on approach span.	Install deck and railing.	Remove launching frame; install timber deck and railing on approach span.
6	Site restoration	Bridge deck in place. Demolition of existing trestle structure using a gantry crane from the new bridge deck.	Site restoration

3.0 Regulatory Setting

3.1 *Water Sustainability Act*

The *Water Sustainability Act* (SBC 2014, c. 15) (WSA) is the principal legislation for managing the diversion, use, and protection of water resources in BC.

For changes in and about a stream, an application for a Change Approval or submission of a Notification is required under Section 11 of the WSA. Under the WSA, a stream is defined as "(a) a natural watercourse, including a natural glacier course, or a natural body of water, whether or not the channel of the stream has been modified, or (b) a natural source of water supply, including, without limitation, a lake, pond, river, creek, spring, ravine, gulch, wetland or glacier, whether or not usually containing water, including ice, but does not include an aquifer".

Changes in and about a stream are defined in the WSA as:

- 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; and
- Any activity or construction within a stream channel that has or may have an adverse effect on a stream or a stream channel.

The installation, maintenance, or removal of a clear span bridge is defined as an authorized change under Section 39 of the WSA. Although design of the new bridge structure is clear span, a Change Approval is being sought for the Project because works include the removal of the existing trestle bridge, which is not a clear span structure. These works have the potential to temporarily impact Holt Creek and its riparian habitat.

3.2 *Fisheries Act*

In August 2019, the HADD clause of the federal *Fisheries Act* (DFO 2019) was reinstated (Section 35), broadening previous protection measures which were limited to commercial, recreational, and Aboriginal fisheries and restoring lost protections (i.e., full protection for all fish and fish habitat). Fish habitat, as defined by the *Fisheries Act* under Subsection 2(1) is: water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas (DFO 2019a). Potential disturbances to habitats supporting fish, including not only aquatic habitats but also riparian areas that contribute directly to the biophysical features, functions, and attributes of fish habitat (e.g., contribute to flows, cover, nutrients, and suitable temperatures), such as may occur with the proposed Project, meet the definition of fish habitat afforded protection by the *Fisheries Act*.

Also relevant to the Project, the *Fisheries Act* contains provisions that prohibit the deposition of deleterious substances into water frequented by fish (Section 36.3) and prohibition against causing the death of fish by means other than fishing (Section 34.4), including any eggs or alevins in spawning gravels within the Project area as well as any juveniles that may be using habitats along the river edge as rearing habitat. Section 34.4 and Section 35 qualify prohibitions of the *Fisheries Act* and allows for the authorization of adverse effects to fish and fish habitat by the Minister of Fisheries and Oceans Canada (DFO) or a prescribed person or entity, if the work, undertaking, or activity is carried out in accordance with regulations. When it is not possible to avoid adverse effects to fish and fish habitat, proponents must obtain an Authorization.

Proponents are responsible for understanding, avoiding, and mitigating the potential for a HADD of fish habitat and making determinations regarding the need for Authorization, or alternately a project review by DFO. This requires proponents to "self-assess" whether they require DFO project review, referring to the DFO-defined types of activities and waterbodies, and implementing standards and codes of practice, where DFO review is not required (DFO 2019b). Project review by DFO is recommended if mitigation measures including those described in the Measures to Protect Fish and Fish Habitat (DFO 2019c) cannot be implemented. Furthermore, if it is determined that a project's residual effects will result in a HADD, then an Authorization under the *Fisheries Act* may be required prior to commencing works.

When requesting a DFO review, the proponent is expected to have made a HADD determination, by reviewing and identifying applicable land-based and in-water Pathways of Effects (POE) to determine potential Project-related effects based on Project activities. The Project can be evaluated using typical cause-and-effect relationships between activities, stressors, and fish habitat for each applicable POE to determine where avoidance or implementation of mitigation measures can be applied to break the applicable POE, thus reducing, or eliminating residual effects and the potential for a HADD to occur.

DFO has several codes of practice that provide procedures, practices, and standards for avoiding the death of fish or HADD of fish habitat related to specific works, undertakings, or activities. If all measures specified in the code of practice can be implemented for a project, it can proceed under notification to DFO. There is a code of practice for Clear Span Bridges (DFO 2022). Although design of the new bridge structure is clear span, a Request for Project Review will be submitted to DFO for the Project because works include the removal of the existing trestle bridge, which is not a clear span structure. These works have the potential to temporarily impact Holt Creek and its riparian habitat. The measures to protect fish and fish habitat outlined in the code of practice for Clear Span Bridges have been considered and incorporated into this AEA.

4.0 Study Methods

The AEA consisted of desktop literature review and in-field biophysical assessment of the study area. For the purposes of this assessment, the desktop study area includes the location of Holt Creek Trestle Bridge plus a 2k m buffer in all directions. The in-field assessment includes the footprint of Holt Creek bridge and an area extending 50 m upstream and 50 m downstream. The in-field assessment also includes the riparian area extending for 30 m from top of ravine bank on both sides of the creek. **Figure 4.1**).

A detailed description of the methods employed for the AEA are described in **Sections 4.1** and **4.2**. The objective of the literature review and in-field assessment was to identify and describe existing habitat conditions, with a particular focus on identifying sensitive habitats (i.e., salmonid spawning/rearing habitat), and species-at-risk that may be present in the local setting or the study area. Species-at-risk (SAR) listed on Schedule 1 of the federal *Species at Risk Act* are also discussed.

4.1 Background Review

The following sources of information were reviewed prior to the in-field assessment, as part of the desktop component of the AEA:

- Available ortho-imagery (Google Earth)
- Aquatic Species at Risk Map (DFO, 2023)
- iMapBC (DataBC 2023)
- Fisheries Inventory Data Queries (BC MOE 2023)
- BC Species and Ecosystem Explorer (BC CDC 2023)
- Species at Risk Public Registry (Government of Canada 2023)
- Important Bird and Biodiversity Area (IBA 2023) and,
- Wildlife Tree Stewardship Program Atlas (Wildlife Tree Stewardship Program 2023).

4.2 Aquatic Habitat Assessment

Two Ausenco biologists conducted an in-field aquatic habitat assessment of the study area on March 31, 2023. The purpose of the in-field assessment was to confirm the findings of previous field visits conducted for the Project by Hemmera in 2018 and 2019, and to confirm the current biophysical conditions of fish and fish habitat in Holt Creek following recent atmospheric river events. Channel morphology, habitat characteristics, and water quality information were collected from three transects within the study area (T-1, T-2, and T-3), the location of each is outlined in **Table 4.1** and denoted in **Figure 4.1**.

Table 4.1 Instream Transect Locations

Transect	Description	UTM (10 N) Location
T1	Located at the bridge alignment	441128E, 5400780N
T2	Located approximately 50 m downstream	441127E, 5400840N
T3	Located approximately 50 m upstream	441128E, 5400698N

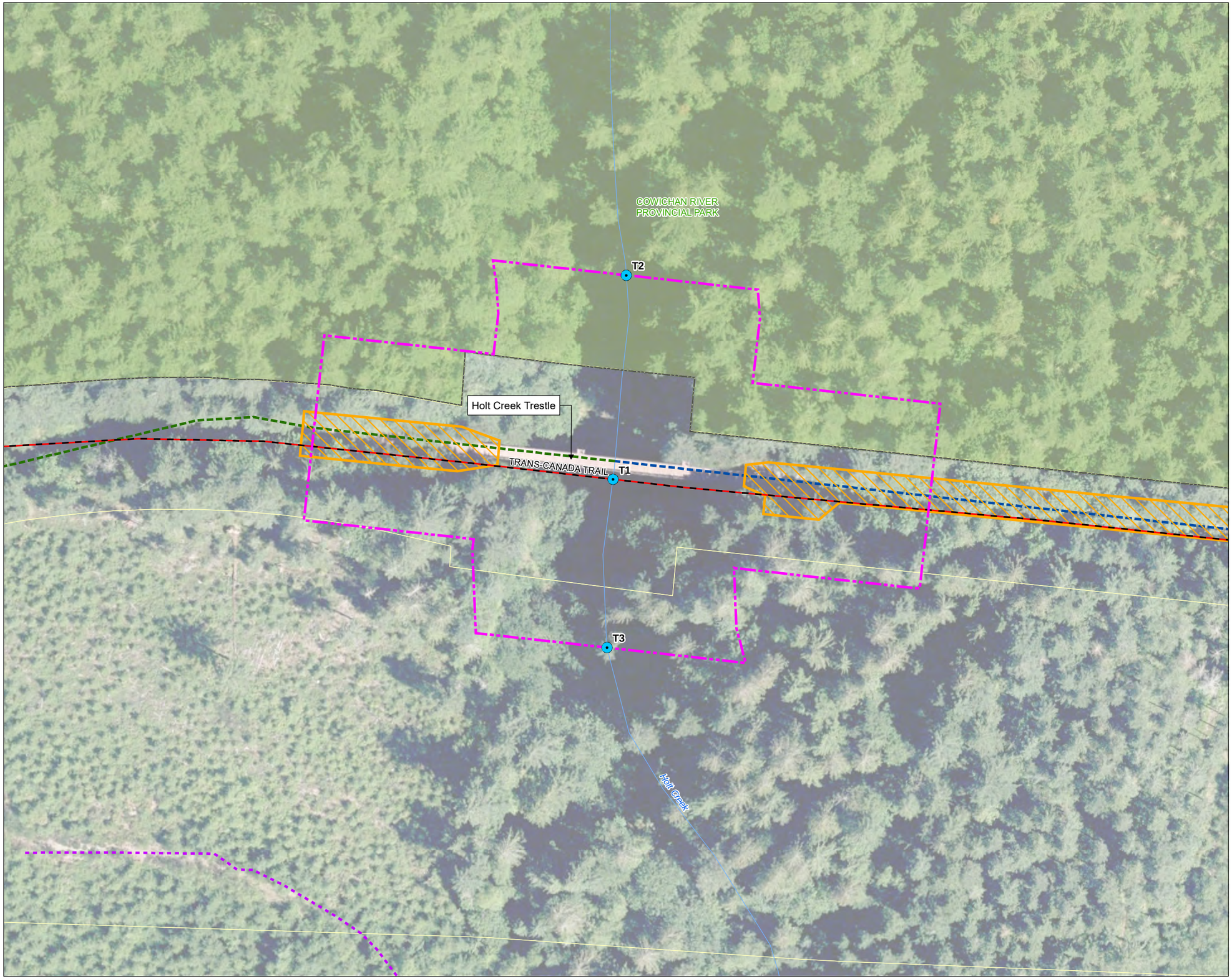
Aquatic resources within Holt Creek were assessed instream and from each bank of the watercourse. No fish sampling was completed as part of the in-field assessment.

4.3 Riparian Habitat Assessment

A riparian habitat assessment was conducted on March 31, 2023, in conjunction with the aquatic assessment outlined above. This assessment involved a review of the study area with a specific focus on vegetated areas overlapping with the Project footprint (**Figure 4.1**). This included characterization of representative vegetated areas within key locations overlapping with the Project footprint (i.e., at the location of the proposed bridge abutments and footings).

Aquatic Effects Assessment and Permitting Support
Holt Creek Trestle Replacement Project
Mile 59.7 on the Trans-Canada Trail, Duncan, BC

Holt Creek Trestle Bridge Study Area



Legend

- Study Area (11,865 m^2)
- Laydown Area
- Instream Transect Location
- Proposed East Access Road
- Proposed West Access Road Option 1
- Existing Old Road
- Trans-Canada Trail
- Park
- Property Line
- Watercourse

Notes

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107554-01	Production Date: May 2, 2023	Figure 4.1

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5.0 Existing Environment

The following is a summary of existing environmental conditions in the study area.

5.1 Aquatic Resources

5.1.1 Instream Habitat

Holt Creek is a tributary to the Cowichan River, which is a major watercourse, and productive salmon and trout-bearing stream in the Cowichan Valley Regional District. Holt Creek flows in a generally northern direction to its confluence with the Cowichan River (watershed code 920-257700-20700), which is located approximately 480 m downstream of the trestle.

Within the study area, Holt Creek flows through a steep ravine, spanning approximately 70 m from top of bank to top of bank. The creek's east and west banks are steeply sloped and extend approximately 34 m high. The east and west banks are generally stable and heavily vegetated; however, recent areas of erosion were noted during the in-field assessment. Further north, downstream of the trestle, is Holt Creek Falls where a fish ladder was installed on the east side of the creek. The sloping banks decrease in steepness as the creek widens and meets with the Cowichan River.

The existing concrete footings (to remain in place) are located in the wetted area of Holt Creek, at a natural narrowing of the channel **(Appendix B – Photos 4. 5 and 6)**. Visual assessments carried out by Hemmera/Ausenco biologists in 2021 and 2023 indicate that the footings do not create a barrier to fish passage nor do they constrict the channel such that increased velocities would hinder fish passage. No large or small woody debris was observed within the trestle footprint, but log jams are known to occur (Hemmera 2021).

Fish habitat was assessed at three instream transects locations: at the bridge crossing and extending to approximately 50 m upstream and 50 m downstream from the existing trestle bridge (**Table 4.1**). Channel morphology, habitat characteristics, and water quality information were collected from the three transects. Average metrics across the three transects at the time of the in-field assessment were:

- Bankfull width = 15.4 m
- Bankfull depth = 1.57 m
- Wetted width = 11.1 m
- Wetted depth = 0.43 m
- Channel gradient = 1%.

Instream substrate within the study area is characterized by exposed bedrock, boulders, and large cobbles that provide abundant interstitial spaces and micro habitat for rearing juvenile salmonids. Small intermittent areas of gravels (<5%) were also noted.

Up and downstream of the concrete footings, the dominant instream cover is provided by boulders and large cobble. Subdominant cover is provided by overhanging riparian vegetation, which provides shading, cover from predators, and nutrient input to Holt Creek. Minimal (< 5%) functional large or small woody debris was observed instream during the in-field assessment.

Water quality parameters for dissolved oxygen (DO), temperature, pH, and turbidity (NTU) were within BC Approved Water Quality Guidelines for the protection of freshwater aquatic life and were within generally optimal ranges to support fish habitat (Government of British Columbia 2021) (**Table 5.1**).

Table 5.1 Holt Creek Water Quality on March 31, 2023

Location	Temperature (°C)	DO (mg/l)	Turbidity (NTU)	pH	Conductivity µs/cm
T1	4.6	12.43	0.30	5.69	52.4
T2	4.8	12.51	0.28	5.90	51.8
T3	4.8	12.52	0.32	5.82	51.4

5.1.2 Fish Species

Provincial records indicate that Holt Creek provides habitat to four species of fish, summarized in **Table 5.2** below (BC MOE 2023).

Table 5.2 Fish Species Present in Holt Creek

Common Name	Scientific Name
Brown trout	*Salmo trutta*
Coastal cutthroat trout	*Oncorhynchus clarkii*
Coho salmon	*O. kisutch*
Rainbow trout (steelhead)	*O. mykiss*

Holt Creek is known to provide spawning and rearing habitat for coho salmon (*Oncorhynchus clarkii*) and steelhead (*O. mykiss*) (BC MOE 2023). A detailed Salmonid Production Plan report was produced in 2002 by Ted Burns for the Cowichan Valley Regional District and includes information on Holt Creek (Burns 2002). Coho, steelhead, and chum (*O. keta*) were found to utilize the lower 270 m of the creek, between the confluence with Cowichan River and Holt Creek Falls. Following stream improvement for fish access at Holt Creek Falls in 1989, steelhead were able to move upstream of the falls and access the upper reaches of Holt Creek, including the study area (Burns 2002).

In summary, Holt Creek (including the study area) provides abundant, high quality, year-round habitat to fish, including rearing and migratory habitat for anadromous salmonids. The study area is currently accessible to steelhead and instream features (concrete footings) and substrate (bedrock, boulders, and large cobble) provide rearing habitat for juvenile salmonids. While spawning habitat value is low in the study area due to the lack of suitable instream substrate, other sections of Holt Creek provide high quality spawning habitat.

5.2 Riparian Resources

The study area is located within the Coastal Douglas Fir moist maritime biogeoclimatic subzone (CDFmm). The CDFmm lies in the rain shadow of the Vancouver Island and Olympic mountains resulting in warm, dry summers and mild, wet winters. Growing seasons are very long and feature pronounced water deficits on zonal and drier sites. The CDFmm represents the mildest climate in Canada (Green and Klinka 1994).

Holt Creek is located within a steep ravine, with top of bank located approximately 34 m above Holt creek's wetted area. For the purposes of this assessment and associated AEA, the riparian area is defined as the area located within the ravine and extending for 30 m beyond top of bank on both sides of the creek. The existing concrete abutments are located within the riparian area and extend the width of the trestle beams, preventing riparian vegetation growth **(Appendix B – Photo 3)**. The east and west banks are steeply sloped, vegetated, and appear to be visually stable at the location of the bridge alignment. Areas of recent erosion were noted upstream from the bridge on the western slope **(Appendix B – Photo 11)** and downstream from the bridge on the eastern slope **(Appendix B – Photo 12).** There are no trails along the toe of the ravine; however, disturbance indicators in this area were observed during the in-field assessment, including the presence of anthropogenic debris (i.e., beer cans and garbage).

Forest vegetation within the study area consists primarily of mixed forest dominated by Douglas-fir (*Pseudotsuga menziesii*), bigleaf maple (*Acer macrophyllum*) and western red cedar (*Thuja plicata*), with scattered black cottonwood (*Populus trichocarpa*), grand fir (*Abies grandis*), western hemlock (*Tsuga heterophylla*), alder (*Alnus sp*.) and yew (*Taxus baccata*). Understory vegetation is comprised of several fern and shrub species, including sword fern (*Polystichum munitum*), bracken fern (*Pteridium sp*.), salal (*Gaultheria shallon*), Oregon grape (*Mahonia aquifolium*), oceanspray (*Holodiscus discolor*), snowberry (*Symphoricarpos*), salmonberry (*Rubus spectabilis*) and huckleberry (*Vaccinium parvofolium*). Non-native species observed included scotch broom (*Cytisus scoparius*) and holly (*Ilex sp*.). The steep, vegetated slopes were dominated by fern species and young bigleaf maple.

In summary, Holt Creek's riparian area is intact and functional, it is a productive transitional zone that connects the aquatic habitat with drier upland habitats, it is defined as fish habitat and provides key ecological functions (e.g., stabilizing banks, reducing stream flow velocities, filtering sediments, providing cool water through cover and shade and introduces woody debris, leaves, and insects to the aquatic environment).

5.3 Species-at-Risk

A desktop-based search of the BC CDC's Species and Ecosystem Explorer was conducted to identify species-at-risk, including any federally listed species, with the potential to occur in the study area (BC CDC 2023). This search returned all at-risk species known to occur in the Cowichan Valley Regional District and was then refined based on the habitat conditions identified during in-field assessment, including any known habitat associations for each species (i.e., nil, low, medium, or high). Species that were determined to have a low, medium, or high potential for presence or interaction are presented in (**Table 5.3**). Of these, only species with a moderate or high potential to occur in the study area and potential to interact with the Project are discussed further.

A focused desktop search for known occurrences of provincially and/or federally listed species and ecosystems was completed within a 2 km radius of the study area (BC CDC 2023). This area is considered sufficiently large enough to capture recorded occurrences of species at risk, especially mobile species (such as birds and fish) and plant species that may have expanded their range since last detection. This search resulted in the identification of occurrences of one at-risk species and two at-risk ecosystems (**Figure 5.1**). The at-risk species consisted of the provincially red-listed and *Species at Risk Act* (SARA) threatened species, Dun Skipper (*Euphyes vestris*), This species is associated with grasslands, meadows, and vernal pools (BC CDC 2001). These habitat types are not present in the Project footprint; therefore, it is not expected to occur. The two at-risk ecosystems included the Grand Fir / Oregon Grape and Western

Redcedar / Salmonberry ecosystems. The red-listed Grand Fir / Oregon Grape ecosystem was identified to exist within the footprint of the trestle, running north-south along the stream valley. The Western Redcedar / Salmonberry ecosystem is located to the west, outside of the study area.

Table 5.3 Species at Risk with Potential to Occur in the Study Area

English Name	Scientific Name	*SARA* Schedule[1]	BC List[2]	Potential to Occur in Study area[3]	Potential to Interact with Project[4]
Plants					
Alaska holly fern	*Polystichum setigerum*		Blue	Low	High, if present
Angled bittercress	*Cardamine angulata*		Blue	Low	
Dwarf bramble	*Rubus lasiococcus*		Blue	Low	
Howell's violet	*Viola howellii*		Red	Low	
Leafy mitrewort	*Mitellastra caulescens*		Blue	Low	
Macoun's meadow-foam	*Limnanthes macounii*	T	Red	Low	
Nevada marsh fern	*Thelypteris nevadensis*	-	Red	Low	
Phantom orchid	*Cephalanthera austiniae*	T	Red	Low	
Pine broomrape	*Aphyllon pinorum*		Red	Low	
Redwood sorrel	*Oxalis oregana*		Blue	Low	
Smith's fairybells	*Prosartes smithii*		Blue	Low	
Tooth-leaved monkey-flower	*Erythranthe dentata*		Blue	Low	
Western wahoo	*Euonymus occidentalis var. occidentalis*		Red	Low	
Amphibians					
Boreal Chorus Frog	*Pseudacris maculata*	-	Yellow	Low	Low
Coastal Giant Salamander	*Dicamptodon tenebrosus*	T	Blue	Low	Low
Coastal Tailed Frog	*Ascaphus truei*	SC	Yellow	Low	Low
Columbia Spotted Frog	*Rana luteiventris*	-	Yellow	Low	Low
Long-toed Salamander	*Ambystoma macrodactylum*	-	Yellow	Low	Low
Northern Leopard Frog	*Lithobates pipiens*	E	Red	Low	Low
Northern Pacific Treefrog	*Pseudacris regilla*	-	Yellow	Low	Low
Northern Red-legged Frog	*Rana aurora*	SC	Blue	High	Medium
Northwestern Salamander	*Ambystoma gracile*	-	Yellow	Low	Low
Oregon Spotted Frog	*Rana pretiosa*	E	Red	Low	Low
Roughskin Newt	*Taricha granulosa*	-	Yellow	Low	Low
Wandering Salamander	*Aneides vagrans*	SC	Blue	Low	Low
Western Red-backed Salamander	*Plethodon vehiculum*	-	Yellow	Low	Low
Western Toad	*Anaxyrus boreas*	SC	Yellow	Low	Low
Wood Frog	*Lithobates sylvaticus*	-	Yellow	Low	Low

English Name	Scientific Name	*SARA* Schedule[1]	BC List[2]	Potential to Occur in Study area[3]	Potential to Interact with Project[4]
Birds					
Ancient Murrelet	*Synthliboramphus antiquus*	SC	Yellow	Low	Low
Bald Eagle[5]	*Haliaeetus leucocephalus*	-	Yellow	High	Medium
Band-tailed pigeon	*Patagioenas fasciata*	SC	Blue	Low	Low
Barn Swallow	*Hirundo rustica*	T	Red	Medium	Medium
Bay-breasted Warbler	*Setophaga castanea*	-	Yellow	Low	Low
Black Swift	*Cypseloides niger*	-	Yellow	Low	Low
Black-throated Gray Warbler	*Setophaga nigrescens*	-	Blue	Low	Low
Black-throated Green Warbler	*Setophaga virens*		Yellow	Low	Low
Canada Warbler	*Cardellina canadensis*	T	Blue	Low	Low
Common Goldeneye	*Bucephala clangula*	-	Yellow	Low	Low
Common Merganser	*Mergus merganser*	-	Blue	Low	Low
Common nighthawk	*Chordeiles minor*	T	Blue	Medium	Medium
Common Poorwill	*Phalaenoptilus nuttallii*	-	Yellow	Low	Low
Connecticut Warbler	*Oporornis agilis*		Yellow	Low	Low
Evening Grosbeak	*Coccothraustes vespertinus*	-	Blue	Medium	Low
Great Blue Heron, *fannini* subspecies	*Ardea herodias fannini*	SC	Yellow	Low	Low
Hutton's Vireo	*Vireo huttoni*	-	Yellow	Low	Low
Marbled Murrelet	*Brachyramphus marmoratus*	T	Yellow	Low	Low
Mourning Warbler	*Geothlypis philadelphia*	-	Yellow	Low	Low
Olive-sided Flycatcher	*Contopus cooperi*	T	Red	Low	Low
Osprey	*Pandion haliaetus*	-	Yellow	Medium	Medium
Philadelphia Vireo	*Vireo philadelphicus*	-	Yellow	Low	Low
Pileated Woodpecker	*Dryocopus pileatus*	-	Yellow	Low	Low
Red Crossbill	*Loxia curvirostra*	-	Blue	Low	Low
Rock Wren	*Salpinctes obsoletus*	-	Red	Low	Low
Spotted Owl	*Strix occidentalis*	E	Yellow	Low	Low
Spruce Grouse	*Falcipennis canadensis*	-	Blue	Low	Low
Yellow-bellied Flycatcher	*Empidonax flaviventris*	-	Blue	Low	Low
Yellow-bellied Sapsucker	*Sphyrapicus varius*	-	Yellow	Low	Low
Invertebrates					
Broadwhorl Tightcoil	*Pristiloma johnsoni*	-	Blue	Low	Low
Crestless Column	*Pupilla hebes*	-	Yellow	Low	Low
Dromedary Jumping-slug	*Hemphillia dromedarius*	T	Red	Low	Low
Oregon Forestsnail	*Allogona townsendiana*	E	Red	Medium	Low
Pacific Sideband	*Monadenia fidelis*	-	Yellow	Low	Low
Pygmy Oregonian	*Cryptomastix germana*	-	Yellow	Low	Low

English Name	Scientific Name	*SARA* Schedule[1]	BC List[2]	Potential to Occur in Study area[3]	Potential to Interact with Project[4]
Scarletback Taildropper	*Prophysaon vanattae*	-	Yellow	Low	Low
Silky Vallonia	*Vallonia cyclophorella*	-	Yellow	Low	Low
Striated Tightcoil	*Pristiloma stearnsi*	-	Yellow	Low	Low
Threaded Vertigo	*Nearctula* sp. 1	SC	Blue	Low	Low
Warty Jumping-slug	*Hemphillia glandulosa*	SC	Red	Low	Low
Western Flat-whorl	*Planogyra clappi*	-	Yellow	Low	Low
Western Thorn	*Carychium occidentale*	-	Blue	Low	Low
Yellow-bordered Taildropper	*Prophysaon foliolatum*	-	Yellow	Low	Low
Mammals					
American Beaver	Castor canadensis		Yellow	Low	Low
American Mink	Neovison vison		Yellow	Low	Low
Little Brown Myotis	*Myotis lucifugus*	E	Yellow	High	Medium
Northern Flying Squirrel	Glaucomys sabrinus		Yellow	Low	Low
Olympic Shrew	Sorex rohweri		Red	Low	Low
Pacific Water Shrew	*Sorex bendirii*		Red	Low	Low
Snowshoe Hare, *washingtonii* subspecies	*Lepus americanus washingtonii*		Red	Medium	Medium
Southern Red-backed Vole, *occidentalis* subspecies	Myodes gapperi occidentalis		Red	Low	Low
Townsend's big-eared bat	*Corynorhinus townsendii*		Blue	Medium	Medium
Trowbridge's Shrew	*Sorex trowbridgii*		Blue	Low	Low
Western Water Shrew, brooksi subspecies	Sorex navigator brooksi	-	Blue	Low	Low
Reptiles					
Northern Rubber Boa	*Charina bottae*	SC	Yellow	Low	Low
Sharp-tailed Snake	*Contia tenuis*	E	Red	Low	Low

Note:

1 SARA listing: E = Endangered, T = Threatened, SC = Special Concern; - = no listing

2 BC List: Red = Species that are extirpated, endangered, or threatened; Blue = Species of special concern; Yellow = species and ecological communities that are secure.

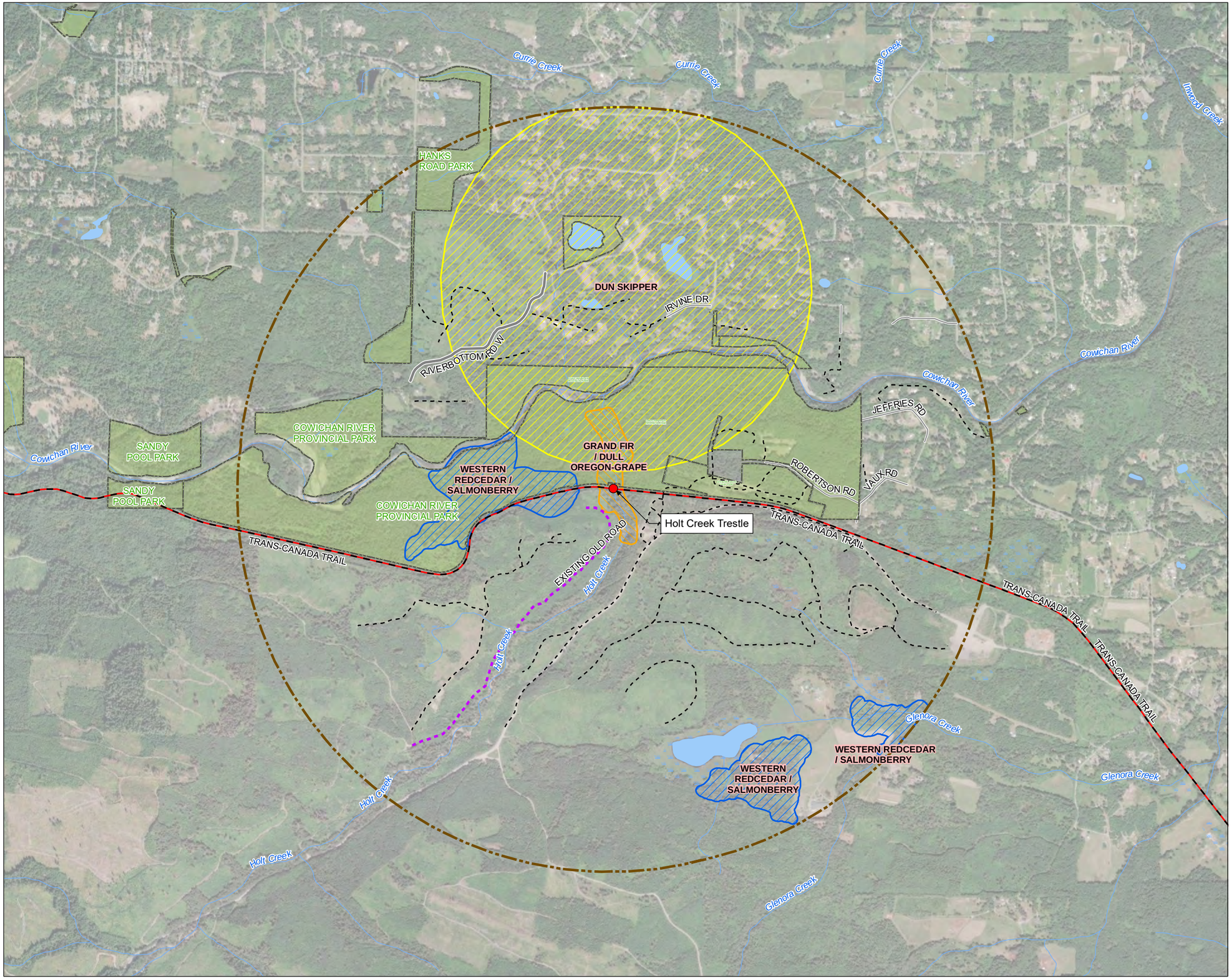
3 **Low**: current understanding of the species' range and/or species habitat associations suggests that the species is unlikely to occur within the site with regularity or in adequate density to provide a functional population; **Medium**: species is expected to occur in the site on a temporary or regular (*i.e.*, predictable) seasonal basis and in densities that facilitate persistence of a functional population within the site; **High**: current understanding of the species' range and/or known species habitat associations suggests that the species is expected to occur in the site regularly and in densities indicative of a preferred habitat.

4 **Nil**: Anticipated activities will not negatively alter habitat required by species to meet life requisites. In this case the effects from habitat alteration may be challenging to quantify but are suspected to be neutral or positive; **Low**: Anticipated activities will alter habitat required by species to meet life requisites. In this case the effects from habitat alteration may be challenging to quantify but suspected to be slightly negative or benign; **Medium**: Anticipated activities will degrade habitat (i.e., negatively alter habitat) required by species to meet life requisites; **High**: Anticipated activities will permanently damage or destroy habitat (i.e., remove habitat) required by species to meet life requisites.

5 Protected year-round under British Columbia *Wildlife Act* section 34B, including birds, nests, and eggs.

Aquatic Effects Assessment and Permitting Support
Holt Creek Trestle Replacement Project
Mile 59.7 on the Trans-Canada Trail, Duncan, BC

Species and Ecosystems at Risk within the Project Area



Legend

- Existing Old Road
- Trans-Canada Trail
- Major Road
- Local Road
- Resource Road or Trail
- Park
- Watercourse
- Wetland
- Waterbody
- Study Area 2 km Buffer

Species and Ecosystems at Risk

- Dun Skipper
- Grand fir / Full Oregon-grape
- Western redcedar / Salmonberry

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a “stand-alone” document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Contains information licensed under the Open Government Licence(s) - British Columbia & Cowichan Valley Regional District (CVRD)
- Aerial Image: ESRI World Imagery

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Ministry of Transportation and Infrastructure

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5.3.1 Birds

Three bird species were observed in the study area during the March 31, 2023, in-field assessment: dark eyed junco (*Junco hyemalis*), chestnut sided chickadee (*Poecile rufescens*), and American crow (*Corvus brachyrhynchos*). The area provides suitable nesting, roosting, and foraging habitat for birds as summarized in **Table 5.2**. The study area is located in Nesting Zone A1 and has a nesting period that typically extends from late-March and to mid-August (ECCC 2018). No active nests were found**.**

Bald eagle (*Haliaeetus leucocephalus)* is considered to have high potential to use habitat in the study area for foraging purposes. This species is known to forage from tall trees near water bodies offering a good view for foraging (BC MOE 2013). Species that are considered to have a medium potential to use habitat in the study area include barn swallow (*Hirundo rustica*), common nighthawk (*Chordeiles minor*), evening grosbeak (*Coccothraustes vespertinus*) and osprey (Pandion haliaetus).

5.3.2 Amphibians

No amphibians were observed in the study area during the in-field assessment. Northern red-legged frog (*Rana aurora*) is considered to have high potential to use habitat associated with the study area. This species is found in forested lowlands of Vancouver Island and requires structurally complex wetlands and forest habitats in suitable spatial configuration (SARA 2016). Holt Creek may provide habitat for this species.

5.3.3 Rare Plant

A rare plant survey was not conducted during the March 31, 2023, in-field assessment. Some habitats within the study area are considered to have a low potential to support rare plant species, as summarized in **Table 5.2**. There are no mapped known locations of rare plants within 2 km vicinity of the Project (BC CDC 2023).

5.3.4 Wildlife

No wildlife was observed during the in-field assessment. The *washingtonii* subspecies of snowshoe hare (*Lepus americanus washingtonii*) is considered to have a medium potential for individuals to forage and breed within the study area. They prefer a non-fragmented dense cover of mixed to coniferous forests with abundant understory vegetation. They also forage in deciduous woodlands and riparian woodlands.

No bat activity was observed under the bridge structure during the in-field assessment; however, a thorough assessment was not conducted. Bats are known to utilize anthropogenic structures for roosting sites, however the lack of full coverage from moisture and temperature is likely to deter roosting behaviour on the bridge structure. As outlined in **Table 5.2,** Little brown myotis (*Myotis lucifugus*) is a species with a high potential to occur in the study area. Townsend's big-eared bat (*Corynorhinus townsendii*) is considered to have a medium potential to occur within the study area.

6.0 Fish and Fish Habitat Effects Assessment

Activities with the potential to cause adverse effects to fish or fish habitat are prohibited by the federal *Fisheries Act*. Fish habitat is defined in subsection 2(1) of the *Fisheries Act* as all waters frequented by fish and any other areas upon which fish depend directly or indirectly to carry out their life processes. Areas that can directly or indirectly support life processes of fish include but are not necessarily limited to spawning grounds and nursery, rearing, food supply and migration areas.

adverse effects to fish or fish habitat are prohibited unless formally approved ("authorized") by DFO, with the understanding that prohibited adverse effects include the death of fish or any HADD. Furthermore, it is understood that a HADD is any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat's capacity to support one or more life processes of fish. Proponents are expected to understand the types of adverse effects they might cause in pursuing a project, take measures to avoid adverse effects, and request a *Fisheries Act* Authorization from DFO when it is not possible to avoid adverse effects to fish and fish habitats.

6.1 Potential Effects

As per federal guidance from DFO's Fish and Fish Habitat Protection Policy Statement (DFO 2019a), a risk-based approach was employed to determine the likelihood and severity of potential effects to fish and fish habitat that could result from the Project. To understand potential effects of the Project on the environment, a list of Project-related activities was compiled with associated land and water-based POEs (DFO 2018). These are presented in **Table 6.1**. It should be noted that the effects described are the potential effects associated with each Project activity on aquatic and riparian resources before the application of mitigation measures.

The Project was then evaluated using typical cause-and-effect relationships between activities, stressors, and fish habitat for each applicable POE to determine where avoidance or implementation of mitigation measures were sufficient to break the applicable POE, thus eliminating residual effects and the potential for death of fish or HADD to occur. A summary of the Project related POEs and associated potential effects is summarized in **Table 6.2**. Recommended best management practices and mitigation measures to avoid or limit potential effects is presented in **Section 7.0**.

An assessment of the potential for death of fish by means other than fishing or for a HADD was then conducted pursuant to guidance from DFO. This assessment considered both the potential effects of the Project and mitigation measures required to eliminate or minimize each effect. The HADD assessment is summarized alongside a discussion of potential residual effects to fish and fish habitat in **Section 8.0**.

Table 6.1 Pathways of Effects for Project-related Activities

Pathway of Effect (DFO 2018)	Project-related Activity
Land-based Activities	
Cleaning or Maintenance of Bridges and other structures	Deconstruction and removal of the existing trestle may include cleaning and surface preparation. New bridge surface finishings may also apply.
Excavation	Excavations for the new bridge abutments and footings are anticipated.
Grading	Grading of work areas and access routes is anticipated.
Riparian Planting	Post construction riparian planting will apply.
Use of Industrial Equipment	Use of mechanical equipment (i.e., crane and excavator) near water is anticipated.
Vegetation Clearing	Clearing of riparian vegetation will be required for access to work areas.
In-Water Activities	
Structure Removal	The manual removal of bridge structure within the riparian area and over Holt Creek will apply.

Table 6.2 Project-Specific Potential Effects Matrix based on DFO Defined Pathways of Effects

Project Specific Potential Effects Based on DFO Pathway of Effects	Pathway of Effect						
	Cleaning or Maintenance of Bridges and other structures	Excavation	Grading	Riparian Planting	Use of Industrial Equipment	Vegetation Clearing	Structure Removal
Change in habitat structure and cover	X		X	X	X	X	X
Change in sediment concentrations	X	X	X	X	X	X	X
Change in food supply				X	X		X
Change in contaminant concentrations				X	X		X
Changes in nutrient concentration				X			
Potential mortality of fish/eggs/ova from equipment					X		

Source: The potential effects matrix is derived from DFO's POE diagrams (DFO 2018)

6.2 Fish Species with the Potential to be Affected by the Project

Fish species, and the corresponding life stages, that have potential to be affected by the Project are summarized in **Table 6.3**.

Table 6.3 Fish Species and Life Stages with Potential to be Affected by the Project

Common Name	Scientific Name	Life Stage
Brown trout	*Salmo trutta*	Egg, Larval, Juvenile, Adult
Coastal cutthroat trout	*Oncorhynchus clarkii*	Egg, Larval, Juvenile, Adult
Coho salmon	*O. kisutch*	Egg, Larval, Juvenile, Adult
Rainbow trout (steelhead)	*O. mykiss*	Egg, Larval, Juvenile, Adult

6.2.1 Fish Injury or Mortality

Activities that occur in, over, or near the water can result in the direct injury or mortality of fish (including eggs and larvae) due to interaction between fish and materials or direct contact with industrial equipment (as identified by DFO's *Pathways of Effects*; (DFO 2018)).

The release of sediment and other deleterious substances can impact water quality, which can result in sub-lethal or lethal effects on certain fish life stages (i.e., injury or mortality), fish habitat effects (i.e., smothering spawning habitat), or changes in fish behaviour.

6.2.2 Disturbance to Fish Behaviour

Fish may exhibit changes in behaviour as result of Project activities. For instance, the potential release of sediments and/or contaminants or other deleterious substances to water could lead to changes in fish behaviour (e.g., disruption of fish swimming, feeding and/or predator avoidance).

6.2.3 Alteration or Disruption of Fish Habitat

No in-water work is proposed for the Project; therefore, no direct impacts to aquatic habitat are anticipated. Some disruption, including temporary alterations to Holt Creek's riparian habitat, is expected. The clearing and grading of riparian areas to the east and west of Holt Creek will be required for the construction of the new bridge abutments and footings, and for the erection of the new clear span bridge launching frame. The total anticipated area of new riparian disturbance is 475 m^2. Site preparation is also anticipated for areas located outside of Holt Creek's riparian area (i.e., site access routes, main east laydown area). The majority of disturbed areas will be restored following Project completion.

The Project will also involve the removal of creosote-covered timbers and concrete footings from the riparian environment of Holt Creek ravine (**Appendix B – Photo 2 and 3**). A potential adverse effect from this activity is the temporary removal of vegetation currently providing habitat structure and cover to the creek. Overall, however, the removal of the timbers and concrete footings followed by replanting of these areas will result in the restoration of habitats that were previously altered during the installation of the original trestle.

In the absence of post-construction restoration, vegetation removal and disturbance of soil may increase the potential for invasive or non-native vegetation growth (e.g., scotch broom), which could result in long-term changes to habitat structure and diversity. In addition, vegetation clearing may result in the removal of wildlife habitat features (e.g., wildlife trees, or snags), which are not readily replaced and typically take time to develop in a maturing forest.

6.2.4 Permanent Loss of Fish Habitat

There will be no permanent loss of instream aquatic habitat.

The Project will result in the permanent loss of a very small area (<50 m^2) of riparian habitat at the location of the new concrete abutments and footings at the east and west ends of the new bridge.

6.3 Water Quality Effects

Project components that may introduce sediments, contaminants, or other deleterious substances to the aquatic habitat of Holt Creek include:

- Releases of fugitive sediment during excavation of bridge footing location
- Erosion/sedimentation events from upland clearing and grubbing
- Releases of sediment or sediment laden water following rain events on cleared areas, areas of disturbed soils, stockpiles, etc. located near water
- Release of concrete wash water / runoff
- Leaks or spills from industrial equipment near water
- Release of construction waste and debris during over water structure removal.

7.0 Measures to Avoid or Mitigate Effects to Fish, Habitat, and Species-at-Risk

Potential Project-related adverse effects to fish, fish habitat, and species-at-risk can be avoided or minimized through the implementation of appropriate measures, including avoidance, protection, management, and mitigation as described within this section.

7.1 Avoidance Measures

Avoidance (i.e., prevention) measures for potential adverse effects are typically considered prior to the development of mitigation strategies. Where avoidance is not possible or practical, best management practices and mitigation measures are then identified for each of the remaining potential effects.

Avoidance measures considered during the planning phase of the Project include site selection, design, and timing.

7.1.1 Site Selection and Design Considerations

The Project will utilize the existing alignment and footprint of the trestle bridge as well as existing access routes and trails, thus minimizing potential incremental adverse effects to the fish and fish habitat in and around Holt Creek. Furthermore, the main portion of the east laydown area will be located outside the riparian area of Holt Creek.

The selected design of the replacement bridge is a clear span structure that will be assembled (at the laydown area) and launched from one side of the Holt Creek ravine. All bridge assembly work will occur from top of bank. No instream work is proposed. The instream concrete footings associated with the existing trestle bridge will remain in place to avoid disturbance of aquatic habitats and minimize the potential for adverse effects to fish and fish habitat.

The removal of components associated with the existing bridge trestle will occur primarily from the surface of the new bridge deck using a gantry crane.

7.1.2 Construction Timing

To the greatest extent practicable, works, undertakings, and activities required for the Project will be scheduled to occur during the fisheries window of reduced risk for the West Coast Region (Vancouver Island and the Gulf Islands). The general fisheries least risk timing window for instream work on Vancouver Island is June 15 to September 15. The reduced risk timing windows for species of fish with potential to be present within the Project area are outlined in **Table 7.1**.

Table 7.1 Fisheries Reduced Risk Timing Window for Vancouver Island

Common Name	Reduced Risk Work Window
Coastal cutthroat trout	August 15 – September 15
Coho salmon	June 15 – September 15
Rainbow trout (steelhead)	August 15 – September 15

Vegetation clearing and removal activities should be conducted outside of the breeding bird nesting period to avoid disturbance or destruction of active bird nests. The general nesting period for migratory birds may start as early as mid-March and extends through late August (Government of Canada 2018). The window of least risk is therefore generally August 18 to March 15. If clearing needs to occur outside this window, a pre-clearing nest survey of the area should be undertaken by a Qualified Environmental Professional (QEP).

7.2 Guiding Documents and Best Management Practices

Guiding documents and best management practices (BMPs) are used to plan and carry out a project in compliance with industry-specific methods or procedures. Guiding documents and BMPs that should be followed during Project activities and incorporated into the Construction Environmental Management Plan (CEMP), where practical, are outlined below.

Potential Project-related adverse effects related to the installation of the new bridge can be avoided or minimized through the implementation of the mitigation measures outlined in DFO's code of practice for Clear Span Bridges (DFO 2022), as outlined below:

- Use existing trails, roads, access points or cut lines.
- Use methods to reduce soil compaction (e.g., swamp mats, pads).
- Limit vegetation removal, pruning and grubbing to the area required for accessing the site of the works, undertakings, and activities.
- Construct roads, access points and approaches perpendicular to the watercourse if a new access point is required to reach the watercourse.
- Restore the banks and riparian vegetation affected by the works, undertakings and activities to their natural state.
- Re-vegetate the disturbed areas with native species suitable for the site.

Other guiding documents and BMPs relevant to the Project are:

- Standard Specifications for Highway Construction Section 165: Protection of the Environment (MOTI 2020)
- Land Development Guidelines for the Protection of Aquatic Habitat (Government of Canada 1992)
- A Field Guide to Fuel Handling, Transportation and Storage (Government of British Columbia 2002)
- A User's Guide to Working in and Around Water (Government of British Columbia 2022)
- BC Water Quality Guidelines (Government of British Columbia 2019b)
- Fish and Fish Habitat Protection Policy Statement (DFO 2019a)
- Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia (Government of British Columbia 2014a).

7.3 Mitigation Measures

Project-specific and site-specific mitigation measures are typically developed once Project design, timing, footprint, and construction methods are finalized. They are developed and subsequently applied to minimize/reduce anticipated adverse effects.

A CEMP should be developed to identify Project-specific mitigation measures. At a minimum, the CEMP should address the following:

- A clear description of how the work will comply with the environmental protection requirements for the Project, including conditions of environmental approvals.
- A summary that clearly demonstrates understanding of the specific environmental issues involved with the Project, including conditions of environmental approvals.
- Contact names, positions, and telephone numbers of individuals responsible for elements of the plan and Environmental Agency contacts.

The CEMP should also include the following sub-component plans:

- Air Quality and Dust Control Plan
- Vegetation Management Plan
- Invasive Species Management Plan
- Wildlife Management Plan
- Erosion and Sediment Control Plan
- Water Management Plan
- Concrete Management Plan
- Hazardous Material Management and Spill Response Plan
- Construction Waste Management Plan
- Site Restoration and Remediation Plan
- Environmental Monitoring Plan.

Environmental construction monitoring should also be utilized to ensure the proper implementation of these mitigation measures and confirm that any potential adverse effects to environmental receptors resulting from Project construction are avoided or minimized.

A summary of key mitigation measures to be applied for the duration of the Project to minimize and/or avoid potential adverse effects is provided in **Table 7.2**. This includes mitigative approaches and strategies derived from the list of BMP's and guiding documents outlined in **Section 7.2**.

Table 7.2 Mitigation Categories and Measures for Project Specific Potential Effects

Instream Activities/Works Construction Description and Construction Stage	Area of Impact (Dimensions and Footprint)	Proposed Duration and Time of Year for Construction	Potential Aquatic and Riparian Benefits and/or Impacts				Proposed Avoidance/ Mitigation Measures
			Aquatic Ecosystem Values (e.g., aquatic species by life stage)	Riparian Ecosystem Values	Water Quantity	Water Quality	
Removal of existing trestle bridge structure	0 m^2 (in-water) 0 m^2 (riparian habitat)	Proposed Time of Year for Bridge Removal: Summer 2024 Anticipated Duration: Approximately 3 months	No anticipated impact	Temporary disturbance of riparian vegetation on ravine slopes	No anticipated impact	Introduction of deleterious substances into surface water (e.g., sediment, construction debris, concrete contact water, etc.)	Conduct regular water quality monitoring, especially during activities with high potential for release of deleterious substances into Holt Creek or surrounding drainages. Inspect equipment to confirm clean and in good working order before use near/over water. Apply appropriate methods for catching debris and minimizing the potential for introduction of deleterious substances into Holt Creek and surrounding drainages (drip trays, net, tarps, etc.). Undertake fueling and maintenance of all equipment at least 30 m from any watercourse (e.g., in the main portion of the east laydown area). Implement appropriate management plans and BMPs (**Section 7.2** and **7.3**)
Clearing / grubbing of riparian vegetation for laydown areas	0 m^2 (in-water) 475 m^2 (riparian habitat)	Proposed Time of Year for Site Preparation: Early 2024 Anticipated Duration: Approximately 3 months	No anticipated impact	Temporary and permanent removal of riparian vegetation Introduction and spread of invasive species	No anticipated impact	Introduction of deleterious substances into surface water (e.g., sediment, construction debris etc.)	Inspect equipment to confirm clean and in good working order before use near/over water. Undertake fueling and maintenance of all equipment at least 30 m from any watercourse (e.g., in the main portion of the east laydown area). Implement appropriate management plans and BMPs, including Vegetation Management Plan, Invasive Species Management Plan, and Wildlife Management Plan (**Section 7.2** and **7.3**)
Construction of new clear span bridge	0 m^2 (in-water) 0 m^2 (riparian habitat)	Proposed Time of Year for Construction: Early 2024 – Winter 2024 Anticipated Duration: Approximately 12 months	No anticipated impact	No anticipated impact	No anticipated impact	Introduction of deleterious substances into surface water (e.g., sediment, construction debris, concrete contact water, etc.)	Conduct regular water quality monitoring, especially during activities with high potential for release of deleterious substances into Holt Creek or surrounding drainages. Inspect equipment to confirm clean and in good working order before use near/over water. Apply appropriate methods for catching debris and minimizing the potential for introduction of deleterious substances into Holt Creek and surrounding drainages (drip trays, net, tarps, etc.). Undertake fueling and maintenance of all equipment at least 30 m from any watercourse (e.g., in the main portion of the east laydown area). Implement appropriate management plans and BMPs, including DFO code of practice for clear span bridges (**Section 7.2** and **7.3).**

Instream Activities/Works Construction Description and Construction Stage	Area of Impact (Dimensions and Footprint)	Proposed Duration and Time of Year for Construction	Potential Aquatic and Riparian Benefits and/or Impacts				Proposed Avoidance/ Mitigation Measures
			Aquatic Ecosystem Values (e.g., aquatic species by life stage)	Riparian Ecosystem Values	Water Quantity	Water Quality	
Site restoration	0 m^2 (in-water) Up to 474 m^2 (riparian habitat)	Proposed Time of Year for Restoration: Winter 2024 / Early 2025 Anticipated Duration: Approximately 3 months	No anticipated impact	Restoration of riparian areas, including replanting with native species Introduction and spread of invasive species	No anticipated impact	Introduction of deleterious substances into surface water (e.g., sediment, construction debris, concrete contact water, etc.)	Conduct regular water quality monitoring, especially during activities with high potential for release of deleterious substances into Holt Creek or surrounding drainages. Inspect equipment to confirm clean and in good working order before use near/over water. Apply appropriate methods for catching debris and minimizing the potential for introduction of deleterious substances into Holt Creek and surrounding drainages (drip trays, net, tarps, etc.). Undertake fueling and maintenance of all equipment at least 30 m from any watercourse (e.g., in the main portion of the east laydown area). Implement appropriate management plans and BMPs, including Vegetation Management Plan, Invasive Species Management Plan, Site Restoration and Remediation Plan, and Wildlife Management Plan **(Section 7.2** and **7.3).**

8.0 Discussion of Residual Effects

The risk-based decision-making process described in DFO's Fisheries Protection Policy Statement (DFO 2019a) was used to determine whether the Project is likely to result in a HADD of fish habitat (section 35 of the *Fisheries Act*) or the death of fish by means other than fishing (section 34.4 of the *Fisheries Act*). Project-related activities that could result in the occurrence of these prohibitions include the deconstruction of the existing trestle structure within Holt Creek ravine and other Project activities carried out over top of and upgradient from Holt Creek.

DFO interprets a HADD as any temporary or permanent change to fish habitat that directly or indirectly impairs the capacity of habitat to support one or more life processes of fish (DFO 2019a). Changes to the biophysical features, functions, and attributes of the instream and riparian habitat that contributes flow, cover, nutrients, and suitable temperatures on which fish depend could result in direct or indirect impairment of the habitat's capacity to support one or more life stages of fish. Death of fish could occur directly through physical harm or release of a deleterious substances.

Table 6.1 and **Table 6.2** provide an overview of the POEs associated with Project-related activities, including potential pre-mitigation effects. Proposed mitigation measures to minimize immediate effects and avoid any residual effects are summarized in **Table 7.2**. A quantitative and detailed description of residual Project effects related to the death of fish or HADD to fish habitat, after the application of proposed mitigation measures, is provided in this section. The anticipated residual effects were then used to determine whether the proposed Project is expected to require an authorization under section 34.4(2)b and 35(2)b of the *Fisheries Act*.

Any identified residual effects for the Project were assessed according to specific criteria (**Table 8.1**). The criteria were developed to evaluate the potential for Project-related fish mortality or a HADD resulting in the direct or indirect impairment of habitat capacity to support one or more life processes of fish. The potential for residual effects is based on professional judgement, and is characterized as follows:

Low: unlikely to result in Project-related fish mortality or a HADD

Medium: moderately likely to result in Project-related fish mortality or a HADD

High: highly likely to result in Project-related fish mortality or a HADD.

A summary of the assessment of the potential for Project-related fish mortality or a HADD for each of the potential POEs is provided below in **Table 8.2**.

The overall risk of Project-related fish mortality or a HADD to fish habitat was assessed as low (**Table 8.2**). This assumes the recommended site-specific mitigation measures described in **Section 7.0** are implemented in full (i.e., mitigation during construction).

Table 8.1 Criteria Used to Quantify Residual Effects on Fisheries Resources

Characteristic and Description		Rank and Description of Associated Effect	
Likelihood	Likelihood and risk of the residual effect occurring	Likely	Residual effect likely to occur
		Unlikely	Residual effect unlikely to occur
Duration	Length of time over which the residual effect is expected to persist. For example, is the duration short enough that it does not diminish the ability of fish to carry out one or more of its life processes?	Short Term	Days to weeks
		Moderate Term	Months to year
		Long Term	Multiple years to permanent
Magnitude	Intensity of the effect relative to natural or baseline conditions	Negligible	No measurable change in fish populations, fish habitat quality or quantity, parameters
		Low	A measurable change within the range of natural variability, but not affecting fish population viability
		Moderate	A measurable change outside the range of natural variability, but not posing a risk to fish population viability
		High	A measurable change outside the range of natural variability and may affect long-term fish population viability
Geographic Scale	Geographic extent / distribution of the residual effect. For example, is the scale small enough that the disturbance will not displace fish that would otherwise be occupying the habitat?	Site	Site/segment, localized effect or temporary displacement
		Reach	Waterbody significantly impacted or permanent displacement (channel reach or lake region)
		Waterbody	Majority of waterbody impacted or permanent displacement (watershed or lake)
Reversibility	Potential for the effect to be reversed or naturally return to baseline level after the disturbance has ceased (or after a period of time after the disturbance has ceased)	Reversible	Baseline conditions will be naturally restored after disturbance has ceased
		Irreversible	Baseline conditions will not be naturally restored after disturbance has ceased
Ecological Context	The availability and condition of the habitat to be altered, relative to nearby fish habitat. For example, is the habitat that is being altered or destroyed the only habitat of its type and quality in the area of the Project?	Prevalent	Altered habitat is prevalent and widely distributed in the Project area or waterbody is still suitable
		Limited	Altered habitat is confined to small areas or has limited distribution in the Project area or waterbody and is significantly reduced in quality
		Rare	Altered habitat is rare or limiting (critical habitat, species at risk) and is no longer suitable

Table 8.2 Residual Effects Assessment for Project-related Effects on Fisheries Resources

Potential Effect (Table 6-1)	Associated POEs (Table 6-2)	Mitigation Measure Categories (Table 7-2)	Quantification of Residual Effects						Potential for Adverse Residual Effects to Fisheries Productivity	Explanation of Potential for Adverse Residual Effects
			Likelihood	Duration	Magnitude	Geographic Scale	Reversibility	Ecological Context		
Change in sediment concentrations	• Cleaning or Maintenance of Bridges and other structures • Structure removal • Excavation • Grading • Riparian Planting • Use of Industrial Equipment • Vegetation Clearing	• Project Planning and Scheduling • Erosion and Sediment Control • Aquatic / Riparian Habitat Considerations	Unlikely	Short Term	Negligible	Site	Reversible	Prevalent	**Low**	With the application of appropriate mitigation (e.g., containments, and ESC measures) there is low likelihood of any notable changes in sediment concentrations occurring. In the unlikely event that changes in sediment concentrations are noted, it is anticipated that only a localized and short-term effect would result. The potential for adverse residual effects to fisheries productivity resulting from a change in sediment concentrations is low.
Change in contaminant concentrations	• Cleaning or Maintenance of Bridges and other structures • Structure removal • Use of Industrial Equipment	• Project Planning and Scheduling • Spill response • Hazardous materials management • Erosion and Sediment Control • Waste management	Unlikely	Short Term	Negligible	Site	Reversible	Prevalent	**Low**	There is the potential for petrochemical spills and leaks from the use of industrial equipment and from the use of hydrocarbon and solvent based products. With the application of mitigation measures including strict containments and BMPs the extent of this effect is anticipated to be minimal. The overall potential for adverse residual effects related to contaminant concentrations is low.
Change in nutrient concentrations	• Riparian Planting	• Riparian Planting Plan • Erosion and Sediment Control	Unlikely	Short Term	Negligible	Site	Reversible	Prevalent	**Low**	Fertilizers used during site restoration and remediation for riparian planting have a low likelihood of any notable changes in nutrient concentrations occurring. With the installation of ESC measures It is unlikely that any residual adverse effects on fish habitat productivity will apply (i.e., low potential).
Change in food supply	• Cleaning or Maintenance of Bridges and other structures • Structure removal • Riparian Planting • Use of Industrial Equipment • Vegetation Clearing	• Project Planning and Scheduling • Aquatic / Riparian Habitat Considerations • Fish Protection • Vegetation management	Unlikely	Short Term	Negligible	Site	Reversible	Prevalent	**Low**	Temporary vegetation effects will be mitigated by decreasing the extent of work and by using the already established foot traffic pathways. There are no negative lasting changes to the riparian habitat. Removing the end-of-life bridge components (including concrete footings and creosote timbers will create space for the surrounding riparian vegetation to fill in this void area over time. Thus, improving overall riparian cover and food supply for fish. The overall potential for adverse residual effects on food supply is low.
Change in habitat structure and cover	• Cleaning or Maintenance of Bridges and other structures • Structure removal • Excavation • Grading • Riparian Planting • Use of Industrial Equipment • Vegetation Clearing	• Project Planning and Scheduling • Aquatic / Riparian Habitat Considerations • Fish Protection • Vegetation management • Invasive plant species management	Unlikely	Short tern	Negligible	Site	Irreversible	Prevalent	**Low**	Removing the existing bridge structure components located within the riparian habitat of Holt Creek will creates space for the surrounding riparian vegetation to fill in this void area. Improving overall riparian cover and food supply for fishes. It is unlikely that any residual adverse effects on fish habitat productivity will apply (i.e., low potential).
Potential mortality of fish/eggs/ova from equipment	• Use of Industrial Equipment	• Project Planning and Scheduling • Erosion and Sediment Control	Unlikely	Short tern	Negligible	Site	Irreversible	Prevalent	**Low**	As no instream activities are proposed, there is a low potential for direct injury or mortality of fish (eggs, larvae, invertebrates, etc.) from physical disruption from equipment. With responsible project planning it is unlikely that any residual adverse effects on fish habitat productivity will apply (i.e., low potential).

9.0 Summary and Conclusion

Project activities have a low potential to adversely affect fish and fish habitat and the effective implementation of mitigation measures identified in this report and those provided in environmental management plans to be prepared by the contractor are expected to limit and/or avoid adverse effects to fish and fish habitat.

Following the removal of the existing trestle components from Holt Creek's riparian habitat (including creosote timbers and concrete footings), and through the implementation of post construction restoration (including planting native riparian plant species), the impact to Holt Creek's aquatic environment is considered to be low. Residual effects on fish and fish habitat are considered unlikely to result from Project activities and a HADD is not anticipated to apply.

10.0 Closure

This Work was performed in accordance with the contract No. 851CS1160 (As & When Professional Environmental Project Coordination Services) between Ausenco and Ministry of Transport and Infrastructure (Client), dated April 21, 2021 ("Contract"). This Memo has been prepared by Ausenco, based on fieldwork and desk top analysis conducted by Ausenco, for sole benefit and use by Ministry of Transport and Infrastructure. In performing this Work, Ausenco has relied in good faith on information provided by others and has assumed that the information provided by those individuals is both complete and accurate. This Work was performed to current industry standard practice for similar environmental work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the Report was produced. The conclusions and recommendations contained in this Report are based upon the applicable guidelines, regulations, and legislation existing at the time the Report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

We sincerely appreciate the opportunity to have assisted you with this project and if there are any questions, please do not hesitate to contact the undersigned.

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Ausenco Sustainability Inc.

ORIGINAL SIGNED

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Report reviewed by:
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11.0 References

Associated Engineering. 2017. Structural Condition Inspection, Cowichan Valley Trail Bridges, Mile 59.7 Holt Creek Trestle. 19 pp

British Columbia Ministry of Environment (BC MOE). 2014. Develop with Care 2014: Environmental guidelines for urban and rural land development in British Columbia. B.C. Ministry of Environment, Victoria, B.C. Available at <http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare/>. Accessed April 2023.

British Columbia Ministry of Environment (BC MOE). 2023. Fisheries Inventory - Fisheries Inventory Data Queries. Provincial Database created by BC MOE. Available at <https://a100.gov.bc.ca/pub/fidq/viewWatershedDictionary.do> Accessed April 2023.

British Columbia Ministry of Transportation and Infrastructure (MOTI), 2020. Standard Specifications for Highway Construction. Volume 1. Adopted November 1, 2020. Available at < https://www2.gov.bc.ca/assets/gov/driving-and-transportation/transportation-infrastructure/engineering-standards-and-guidelines/highway-specifications/volume_1_ss2020.pdf>. Accessed June 2023.

British Columbia Conservation Data Centre (BC CDC). 2023. BC Species and Ecosystems Explorer. BC Conservation Data Centre (CDC); BC Ministry of Environment, Victoria, BC. Available at: http://a100.gov.bc.ca/pub/eswp/. Accessed April 2023.

Burns, Ted. 2002. A Salmonid Production Plan for the Cowichan Valley Regional District. Pp 503-504.

DataBC. 2023. iMap BC. Government of British Columbia - DataBC. Online Database created by the BC Ministry of Forests, Lands and Natural Resource Operations. Available at <https://www2.gov.bc.ca/gov/content/data/geographic-data-services/web-based-mapping/imapbc>. Accessed April 2023.

Chilibeck, B., G. Chislett, and G. Norris. 1992. Land Development Guidelines for the Protection of Aquatic Habitat. Available at <http://www.dfo-mpo.gc.ca/Library/165353.pdf>. Accessed April 2023.

Fisheries and Oceans Canada (DFO). 2018. Pathways of Effects. Available at <http://www.dfo-mpo.gc.ca/pnw-ppe/pathways-sequences/index-eng.html>. Accessed April 2023.

Fisheries and Oceans Canada (DFO). 2019a. Fish and Fish Habitat Protection Policy Statement. Available at <https://www.dfo-mpo.gc.ca/pnw-ppe/policy-politique-eng.html>. Accessed April 2023.

Fisheries and Oceans Canada (DFO). 2019b. Standards and Codes of Practice. Available at <https://www.dfo-mpo.gc.ca/pnw-ppe/practice-practique-eng.html>. Accessed April 2023.

Fisheries and Oceans Canada (DFO). 2019c. Measures to Protect Fish and Fish Habitat. Available at <https://dfo-mpo.gc.ca/pnw-ppe/measures-mesures-eng.html>. Accessed April 2023

Fisheries and Oceans Canada (DFO). 2022. Code of Practice – Clear Span Bridge. Available at < https://www.dfo-mpo.gc.ca/pnw-ppe/codes/clear-span-bridges-ponts-portee-libre-eng.html>. Accessed April 2023

Fisheries and Oceans Canada (DFO). 2023. Aquatic Species at Risk Map. Available at <https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html> Accessed April 2023.

Government of British Columbia. 2002. A Field Guide to Fuel Handling, Transportation and Storage. British Columbia Ministry of Water, Land and Air Protection (MWLAP); British Columbia Ministry of Forests.

Government of British Columbia. 2019. British Columbia approved water quality guidelines: aquatic life, wildlife & agriculture: Summary Report. Ministry of Environment and Climate Change Strategy.

Government of British Columbia. 2022. A User's Guide to Working in and Around Water in British Columbia. Available at <Https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/working-around-water/wsa-cias-users_guide.pdf>. Accessed April 2023

Government of Canada. 2018. Nesting Periods. Available at <https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html#_zoneA_calendar>. Accessed April 2023.

Government of Canada. 2023. Species at Risk Public Registry. Available at <https://www.registrelep-sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1>.Accessed April 2023

Green, R.N. and K. Klinka. 1994. A Field Guide to Site Identification and Interpretation for the Vancouver Forest Region. Ministry of Forests Research Program. Victoria, B.C.

Hemmera Envirochem Inc. (Hemmera). 2021: Environmental Overview Assessment Report – Holt Creek Bridge Replacement Project. 22 pp.

Heritageworks. 2018. Condition Assessment of Holt Creek Trestle for Associated Engineering. 15 pp.

Important Bird and Biodiversity Area (IBA). 2023. IBA Canada Important Bird Areas. Online Database. Available at <https://www.ibacanada.com/explore.jsp?lang=EN>. Accessed April 2023

Species at Risk Act (SARA). 2016. Management Plan for the Northern Red-legged Frong (*Rana aurora*) in Canada. 70 pp.

SNC Lavalin Inc. 2023. Holt Creek Trestle Replacement Project – Steel Bridge Options Review Report –. 12 pp.

TetraTech. 2018.

Wildlife Tree Stewardship Program (WiTS). 2023. Wildlife Tree Stewardship Atlas. Community Mapping Network. Online Database. Available at <http://cmnmaps.ca/WITS/>. Accessed April 2023

Appendix A

Design Drawings

BRITISH COLUMBIA

Ministry of Transportation & Infrastructure

Bridge Project

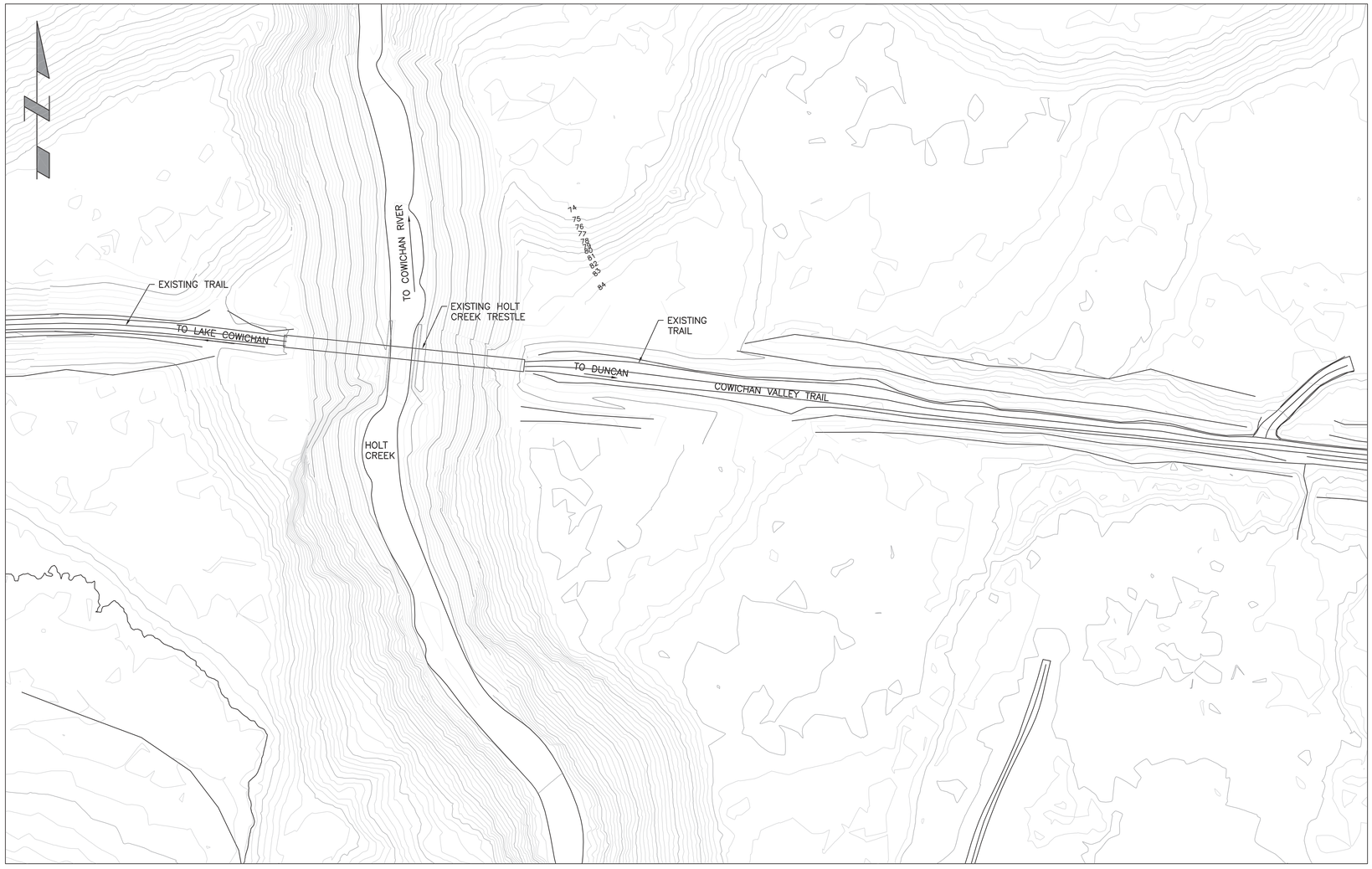
No. 04529 - 0001

Holt Creek Bridge Replacement - Mile 59.7

Cowichan Valley Trail, BC

ISSUED FOR 30% DESIGN SUBMISSION

H-308h-pc(10-03)



SITE PLAN
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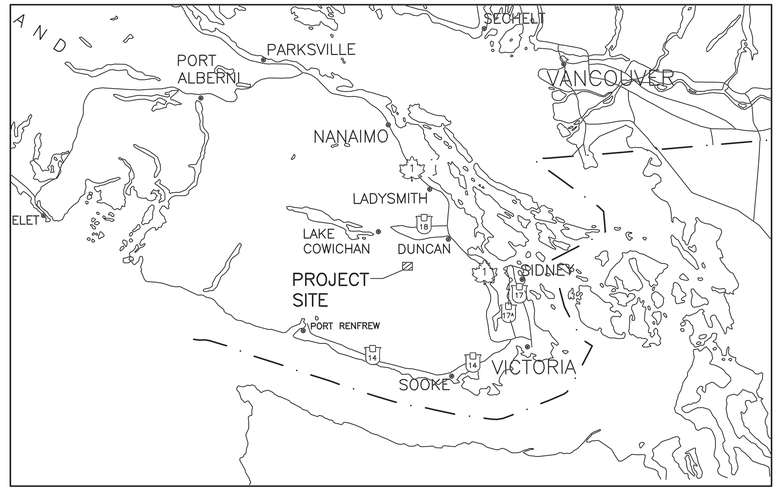

KEY MAP
NTS

NOTES:

1. SURVEY BY: BCMoTI (Jan. 2023)
2. SURVEY DATUM:
   VERTICAL: GEODETIC
   HORIZONTAL: UTM 10 NAD83 (CSRS)
3. SURVEY BENCHMARKS:
   (TO COME)
4. FOR BOREHOLE DATA SEE DRAWING.
   04529–013 & 014

LIST OF DRAWINGS

DWG No.	TITLE
04529–001	OVERALL SITE PLAN AND DRAWING LIST
04529–002	GENERAL ARRANGEMENT
04529–003	ABUTMENT – SHEET 1
04529–004	ABUTMENT – SHEET 2
04529–005	STEEL GIRDER – FRAMING PLAN AND ELEVATION
04529–006	STEEL GIRDER – DETAILS – SHEET 1
04529–007	STEEL GIRDER – DETAILS – SHEET 2
04529–008	STEEL GIRDER – DETAILS – SHEET 3
04529–009	TIMBER DECK – DETAILS – SHEET 1
04529–010	TIMBER DECK – DETAILS – SHEET 2
04529–011	BEARINGS
04529–012	STEEL RAILING DETAILS
04529–013	BOREHOLE LOGS – SHEET 1
04529–014	BOREHOLE LOGS – SHEET 2

REFERENCE DRAWINGS

DWG No.	TITLE

PRELIMINARY
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AUTHORIZED BY

DIRECTOR, ENGINEERING — DATE

REGIONAL DIRECTOR, HIGHWAYS — DATE

#1100–745 Thurlow Street
Vancouver, BC,
Canada. V6E 0C5

SNC•LAVALIN

Rev	Date	Description	Init
A	2023/04/17	ISSUED FOR 30% DESIGN SUBMISSION	LZ

REVISIONS

BRITISH COLUMBIA
Ministry of Transportation & Infrastructure
South Coast Region

VANCOUVER ISLAND DISTRICT
COWICHAN VALLEY TRAIL

HOLT CREEK BRIDGE MILE 59.7
SITE PLAN

PREPARED UNDER THE DIRECTION OF

ENGINEER OF RECORD

DATE

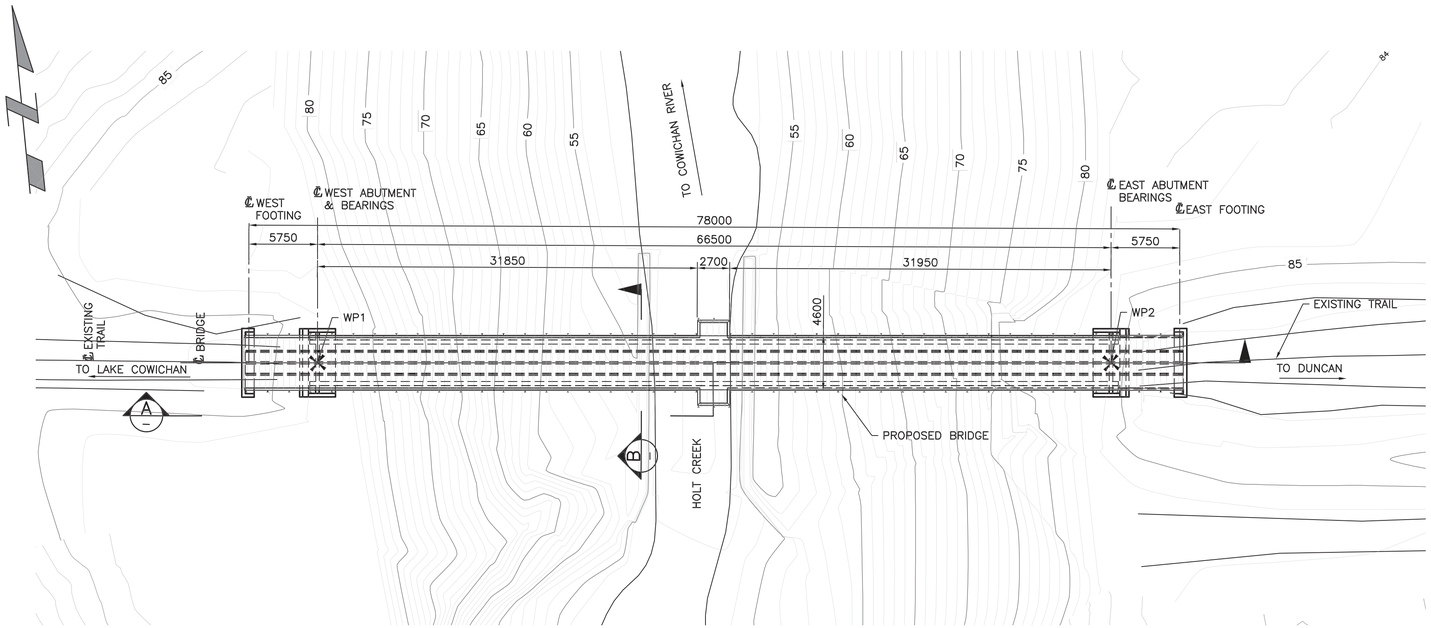
SEAL

DESIGNED KC DATE 2023/04/10
CHECKED LZ DATE 2023/04/14
DRAWN BX DATE 2023/04/10
SCALE AS NOTED
NEGATIVE No.

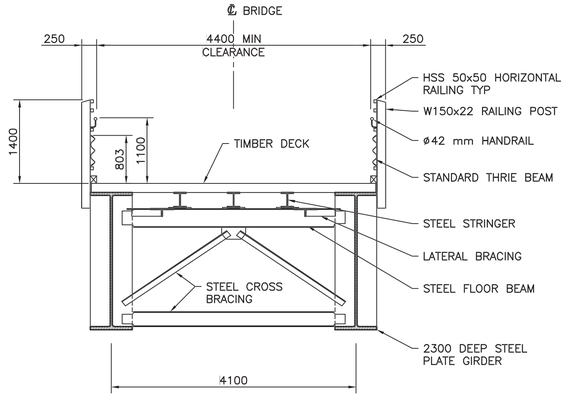
FILE No. | PROJECT No. 04529 – 0001 | REG. | DRAWING No. 04529–001 | A

CANCEL PRINTS BEARING PREVIOUS LETTER

H-308-r1-cs(07-08)

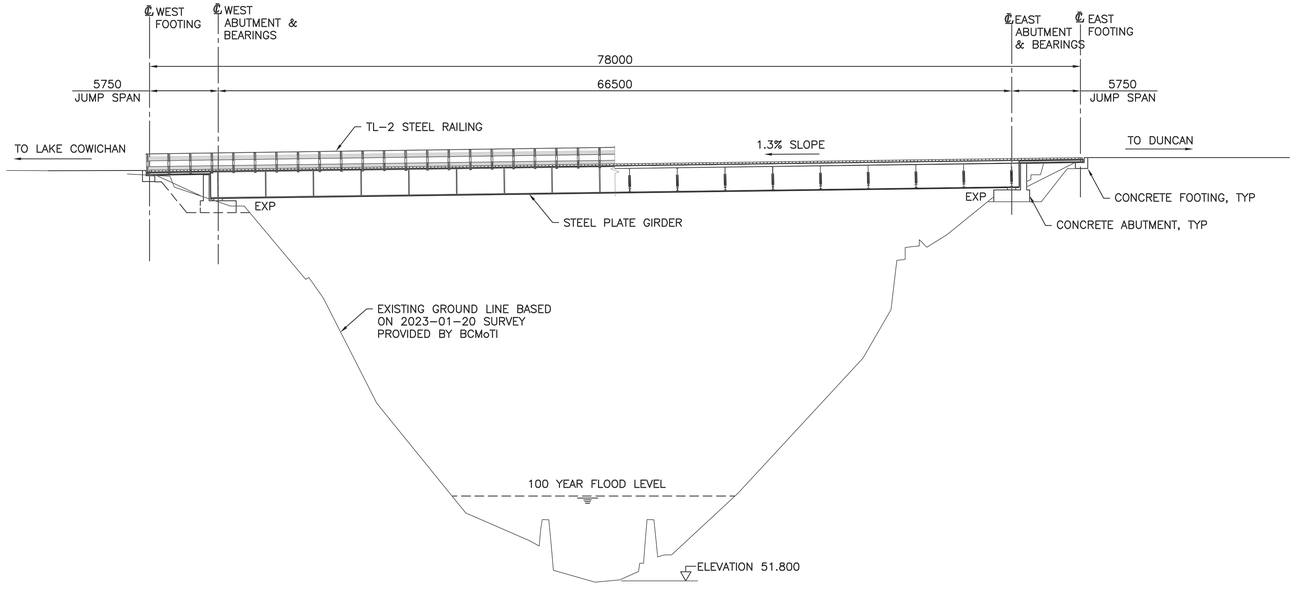


PLAN
SCALE 1:250



SECTION B
SCALE 1:50

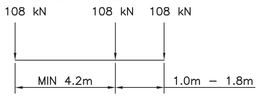
WORK POINT	NORTHING	EASTING	ELEVATION
WP 1	5400755.433	441104.441	86.325
WP 2	5400748.964	441170.626	87.350



SECTION A
SCALE 1:50

NOTES:

1. DESIGN SPECIFICATIONS:
   CAN/CSA-S6-19 AND BCMoTI SUPPLEMENT TO CAN/CSA S6-19
2. DESIGN LOADS:
   - PEDESTRIAN LOAD: p = 5.0 − s/30, WHERE "s" IS TOTAL LOADED LENGTH, BUT NOT LESS THAN 1.6 kPa AND NOT GREATER THAN 4.0 kPa
   - FIRE TRUCK LOAD: MUNICIPAL FIRE TRUCK WITH MAX. PERMITTED AXLE LOADS SHOWN BELOW



   - WIND LOAD: 1 / 50 YEAR REFERENCE = 0.650 kPa
   - DESIGN TEMPERATURE RANGE: MAX. +28°C AND MIN. −8°C
3. DESIGN SPEED: 20 km/h.
4. EARTHQUAKE:
   1/2,475 YEAR REFERENCE (2020 NBCC SEISMIC HAZARD MAP)
   Sa(0.2) = 1.660 g Sa(2.0) = 0.544 g
   Sa(0.5) = 1.480 g PGA = 0.709 g
   Sa(1.0) = 0.872 g
5. EXISTING TIMBER TRESTLE NOT SHOWN FOR CLARITY.

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Certified ISO 9001

Rev	Date	Description	Init
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REVISIONS

BRITISH COLUMBIA
Ministry of Transportation & Infrastructure
South Coast Region

VANCOUVER ISLAND DISTRICT
COWICHAN VALLEY TRAIL

HOLT CREEK BRIDGE MILE 59.7
GENERAL ARRANGEMENT

PREPARED UNDER THE DIRECTION OF

ENGINEER OF RECORD

DATE

SEAL

DESIGNED KC DATE 2023/04/10
CHECKED LZ DATE 2023/04/14
DRAWN BX DATE 2023/04/10
SCALE AS NOTED
NEGATIVE No.

FILE No.

PROJECT No. 04529-0001

REG.

DRAWING No. 04529-002 | A

CANCEL PRINTS BEARING PREVIOUS LETTER

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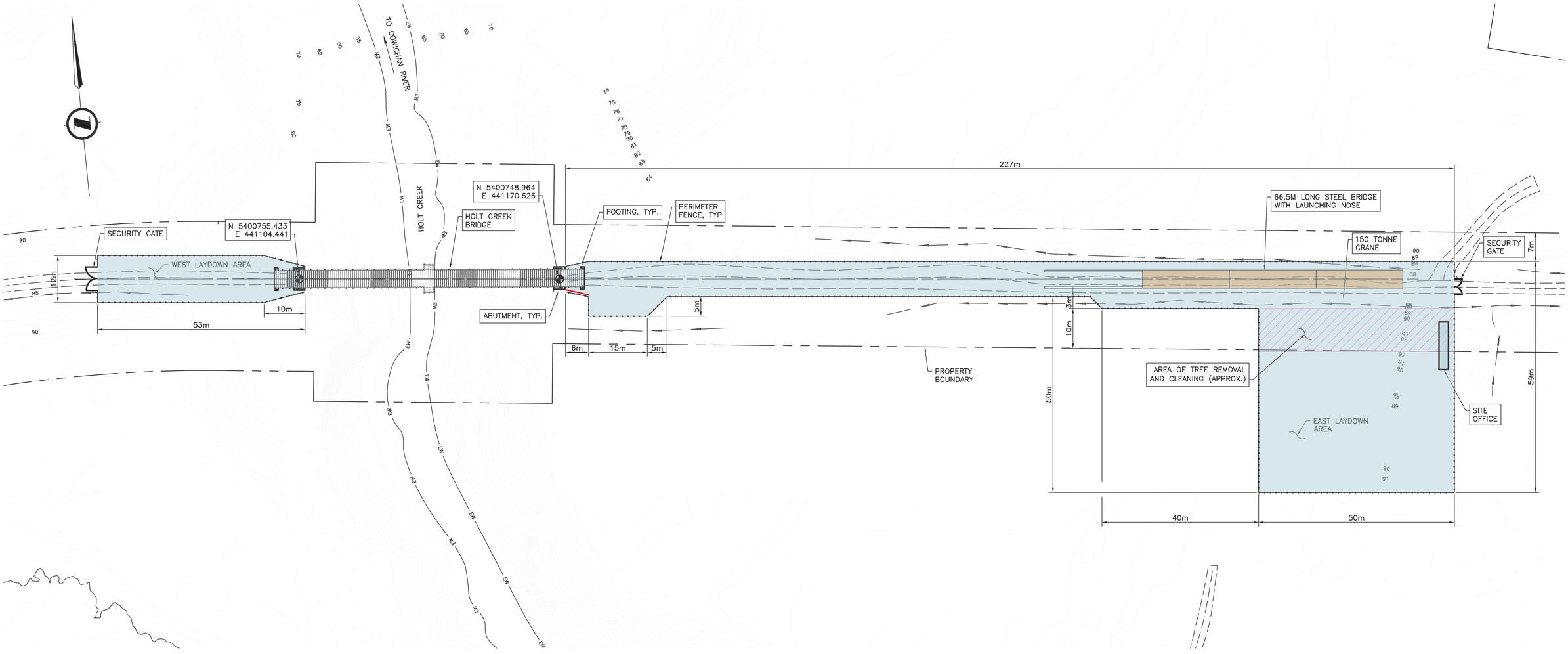

PLAN
SCALE 1:500

NOTE:

1. THE LAYDOWN AREA SHOWN ARE CONCEPTUAL ONLY.
2. THE CONTRACTOR SHALL TAKE ALL NECESSARY MEASURES TO PROTECT ADJACENT PROPERTIES FROM DAMAGE DURING THE CLEARING AND GRUBBING OPERATIONS.
3. NO CLEARING AND GRUBBING SHALL OCCUR WITHIN ANY WETLAND OR OTHER ENVIRONMENTALLY SENSITIVE AREAS WITHOUT PROPER PERMITS AND APPROVALS.
4. THE LIMITS OF THE CLEARING AND GRUBBING AREA SHALL BE CLEARLY MARKED IN THE FIELD TO PREVENT DAMAGE TO SURROUNDING TREES AND VEGETATION.
5. ALL DEBRIS AND EXCESS SOIL SHALL BE REMOVED FROM THE SITE TO PREVENT EROSION AND SEDIMENTATION.
6. ALL CLEARED AND GRUBBED MATERIAL SHALL BE DISPOSED OFFSITE IN ACCORDANCE WITH APPLICABLE LAWS AND REGULATIONS.
7. GROUND SURVEY PERFORMED ON JANUARY 5 AND 6, 2023, BASE FROM DRAWING SURVPLAN–HCT "PLAN – HOLT CREEK TRESTLE COWICHAN VALLEY TRAIL_REV. A" BY McELHANNEY LTD, DATED JANUARY 19, 2023.
8. BOUNDARY SURVEY ARE BASE FROM DRAWING SURVPROPO–HTC TITLE "TRICK SLIDE SURVEY UPPER FRASER VALLEY ROAD_REV A" BY McELHANNEY LTD, DATED APRIL 1, 2022.
9. ORTHOIMAGE AND TOPOGRAPHIC SURVEY OUTSIDE OF THE LIMIT OF GROUND SURVEY PERFORMED ON NOVEMBER 10, 2022 USING LiDAR RADAR, FILE NAME 362506HTC BY TERRA REMOTE SENSING.

PRELIMINARY
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#1100–745 Thurlow Street
Vancouver, BC,
Canada. V6E 0C5
Certified ISO 9001

SCALE 0 200 1:20,000 1000m

CAD FILENAME 04529-702
PLOT DATE 2023-04-17

REV	DATE	REVISIONS	NAME
A	2023-04-17	ISSUED FOR 30% DESIGN SUBMISSION	

BRITISH COLUMBIA
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE
SOUTH COAST REGION
HIGHWAY ENGINEERING AND GEOMATICS

PLAN

HOLT CREEK BRIDGE REPLACEMENT
COWICHAN VALLEY TRAIL - LAYDOWN AREAS

DUNCAN TO LAKE COWICHAN

SENIOR DESIGNER
DATE YYYY-MM-DD

DESIGNED A. LAU DATE 2023-04-10
QUALITY CONTROL L. ZOU DATE 2023-04-15
QUALITY ASSURANCE DATE
DRAWN E. YANG DATE 2023-04-10

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
-	04529-0001	1	702	A

PLOT DATE: 2023/04/17 H:\DATA\670417 – Holt Creek – Detailed Design\41 – Civil Engineering\41DD – Drawings\04529–702.dwg

Appendix B

Site Photographs (Taken on 03.31.2023)

Photo 1 Bridge deck and handrails consists of untreated timber. Facing east.

Photo 2 Existing creosote timbers and concrete footings located within the riparian habitat, Facing southeast.

Photo 3 Existing eastern abutment supporting creosote timbers, Facing northeast.

Photo 4 Existing instream footings (to remain) supporting steel beams and wooden trestle. Facing southwest.

Photo 5 View of existing instream footings (to remain) Upstream facing west.

Photo 6 View of existing instream footings (to remain) Downstream Facing south.

Photo 7 Bridge components (small concrete footings and timber supports) are to be removed. Facing southeast.

Photo 8 Existing wooden trestle to be removed. Facing south.

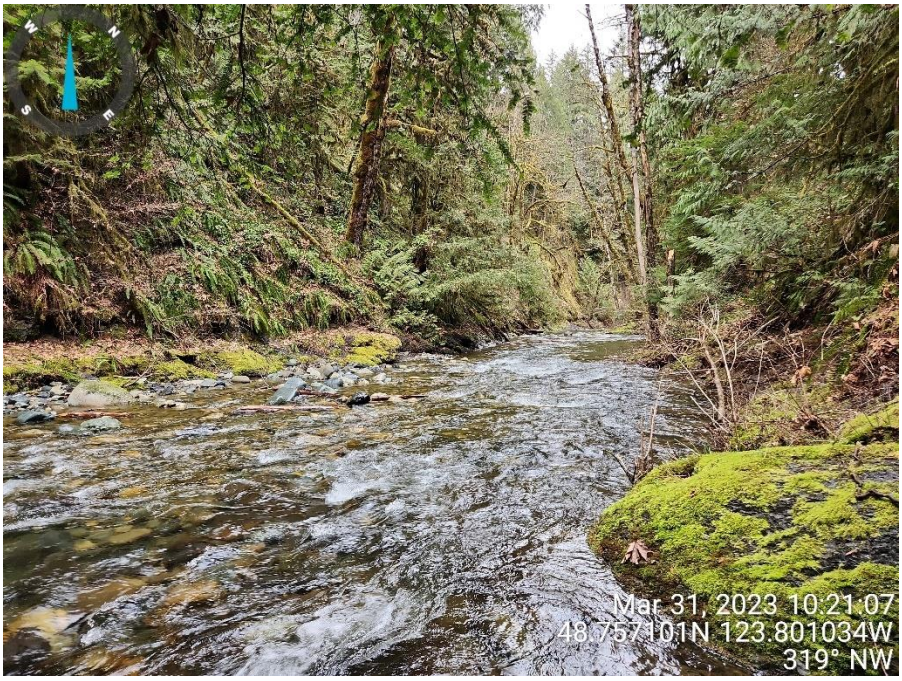

Photo 9 View of Holt Creek facing downstream (northwest).

Photo 10 View of Holt Creek Bridge facing upstream (south).

Photo 11 Erosion of the west bank observed upstream from the bridge. Facing southwest.

Photo 12 Erosion of the east bank located downstream from the bridge. Facing northeast.

Photo 13 View of instream habitat. Facing west.

Photo 14 Invasive plant (scotch broom) observed at the west access. Facing southeast.

Photo 15 View of east access route. Facing east.

Photo 16 View of west access route. Facing southwest.

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