PROVINCE OF BC

COLUMBIA VALLEY HIGHWAY STREAM CROSSING FLOOD REPAIRS

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

Ministry of Transportation and Infrastructure | Final Report

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ISL Engineering and Land Services Ltd. Is an award-winning full-service consulting firm dedicated to working with all levels of government and the private sector to deliver planning and design solutions for transportation, water, and land projects.

Proudly certified as a leader in quality management under Engineers and Geoscientists BC's OQM Program from 2014 to 2021.

INDIGENOUS
ACKNOWLEDGEMENT

We acknowledge we are undertaking stream crossing repair work on tributaries to Sxótsaqel (Cultus Lake) within the traditional and unceded territory of the S'ólh Téméxw (Stó:lō), Nuxwsa'7aq (Nooksack), and Coast Salish peoples. We come with respect for this land, and for the people who have and do reside here.

TABLE OF CONTENTS

1.0 Purpose of this Plan 1

2.0 Setting 2

3.0 Regulatory Overview 4

4.0 Fish and Aquatic Habitat Information 5

5.0 Site Reconnaissance Information 7
- 5.1 Site 1 – Hatchery Creek (Sweltzer Creek Tributary) at Lakeshore Drive 7
- 5.2 Site 2 – Sweltzer Tributary at Parmenter Road 8
- 5.3 Site 3 – Hwy Culvert adjacent to Delta Grove Campground 9
- 5.4 Site 4 – Culvert at Teapot Hill Parking Area 10
- 5.5 Site 5 – Culvert at Teapot Hill/Honeymoon Bay Campground 11
- 5.6 Site 6 – Culvert at Maple Bay 12
- 5.7 Site 7 – Leisure Valley Trailer Park Frosst Creek Tributary 13

6.0 In-Stream Works Best Practices 14
- 6.1 Culvert Fish Passage Best Practices 14
- 6.2 Fish Salvage Best Practices 15
- 6.3 Site Isolation Best Practices 15
- 6.4 Bypass Best Practices 15
- 6.5 Trash Pumping Best Practices 15
- 6.6 Water Quality Monitoring Best Practices 16

7.0 Wildlife and Species at Risk 17
- 7.1 Listings and Critical Habitat Polygons 17
- 7.2 General Wildlife Protection Best Practices 19

8.0 Vegetation Management Best Practices 20
- 8.1 Tree and Shrub Protection 20
- 8.2 Invasive Plant Management Plan 22

9.0 Erosion and Sediment Control 23
- 9.1 ESC Plan 23
- 9.2 ESC Measures 23

10.0 Environmental Monitoring 24

11.0 Heritage Site Best Practices 25

12.0 Spill Contingency Measures 26

13.0 Reference Documents 27

14.0 Directory/Contacts 28

1.0 Purpose of this Plan

The enclosed 'Construction Environmental Management Plan' (CEMP) has been prepared by ISL Engineering and Land Services Ltd. (ISL) for the use by the Ministry of Transportation and Infrastructure concurrent with the planning, design and regulatory permitting processes associated with seven stream crossing repairs along the Columbia Valley Highway, Sxótsaqel (Cultus Lake), BC.

Stream crossing repairs and culvert replacements are required due to flooding and channel bed displacement concurrent with the 'atmospheric river' event that occurred November 13 to 15, 2021.

This CEMP represents MOTI's commitments to plan, design, and implement construction of these repairs in a manner that minimizes footprint effects and limits effects upon the productive capacity of watercourses that provide fish habitat and may provide habitat for species at risk.

This EMP establishes the framework for planning and design that will consider site specific requirements and also cites well-known applicable Best Management Practices (BMPs) that will assist in planning, designing and implementing the project we for mitigation of environmental effects.

2.0 Setting

Seven sites along the Columbia Valley Highway were identified as having been affected by the atmospheric river event. A key map showing the general locations is provided in Figure 1. Table 1 provides location information. At six of the seven sites there is evidence of emergency channel dredging to address bedload build-up at the stream crossings and at three of the seven sites temporary corrugated steel pipe culverts have been installed. At two sites (Site 1, and Site 6) existing culverts remain in place and are these culverts are in failing condition.

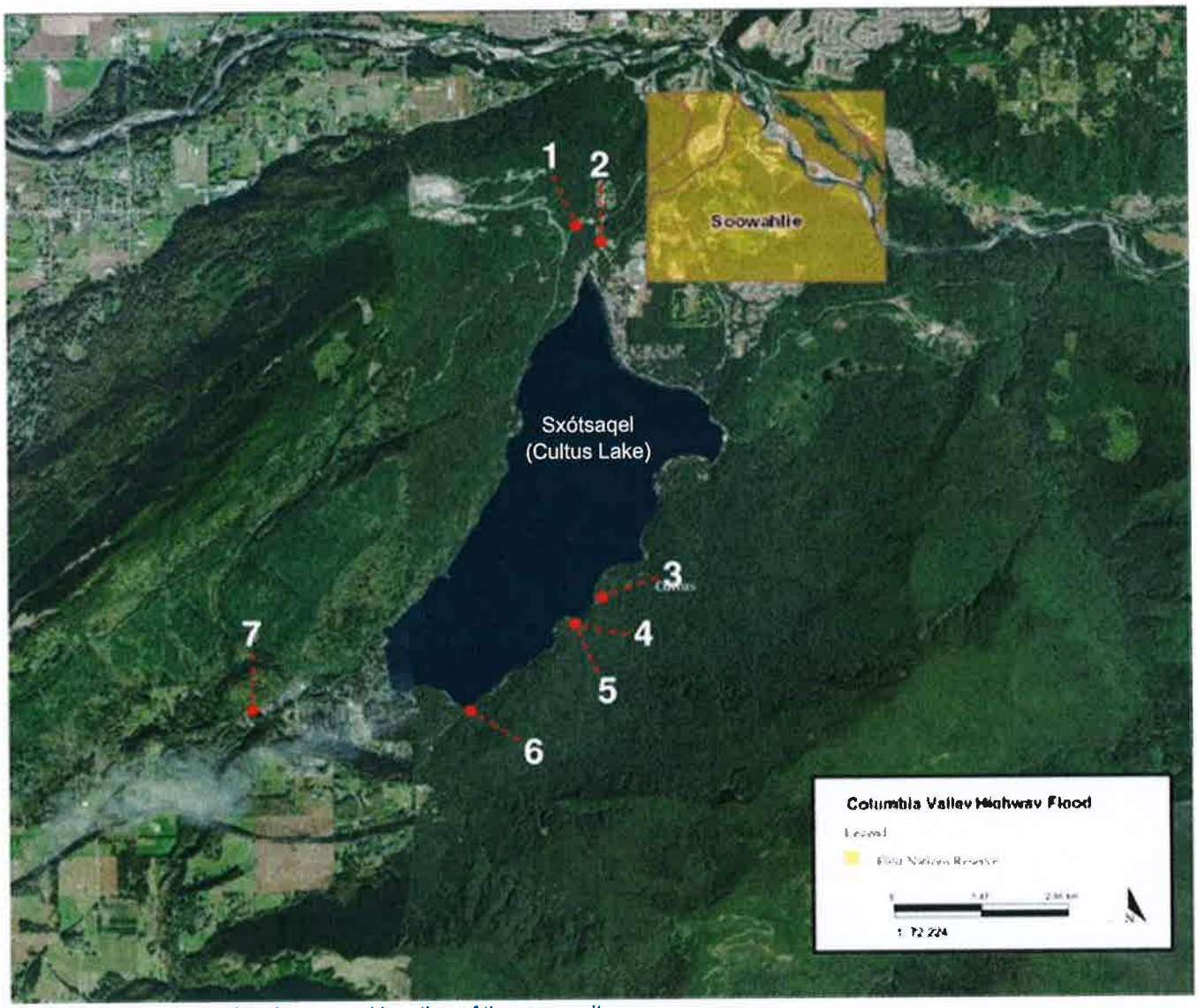


Figure 1. Key map showing the general location of the seven sites.

Table 1. Location of the six stream crossing repair locations.

#	Site	Approx. Coordinates LAT/LONG UTM	Nearest Stream/River/ Body of Water
1	Columbia Valley Rd Culvert at DFO Research Laboratory	49.078697 N / 121.979838 W 10 574499 m E 5436705 m N	Hatchery Creek (Sweltzer Creek Tributary)
2	Parmenter Road over Hatchery Creek (Sweltzer Creek Tributary)	49.080779 N / 121.982887 W 10 574273 m E 5436933 m N	Hatchery Creek (Sweltzer Creek Tributary)
3	Columbia Valley Road Culvert at Delta Grove	49.045108 N / 121.980111 W 10 574568 m E 5433025 m N	Tributary to Sxótsaqel (Cultus Lake)
4	Columbia Valley Road Culvert at Teapot Hill Parking Area West	49.042288 N / 121.984937 W 10 574276 m E 5432653 m N	Tributary to Sxótsaqel (Cultus Lake)
5	Columbia Valley Road Culvert at Teapot Hill Honeymoon Bay Group Camping (East)	49.042816 N / 121.983627 W 10 574181 m E 5432653 m N	Tributary to Sxótsaqel (Cultus Lake)
6	Columbia Valley Road Culvert at Maple Bay	49.034397 N / 121.998997 W 10 573165 m E 5431962 m N	Tributary to Sxótsaqel (Cultus Lake)
7	Columbia Valley Road Culvert at Leisure Valley	49.033951 N / 122.030476 W 10 570865 m E 5431983 m N	Tributary to Frosst Creek

3.0 Regulatory Overview

The CEMP primarily considers applicable provincial and federal legislation pertaining to the management of streams, fish habitat, and wildlife habitats. Including:

- Fisheries Act managed by Fisheries and Oceans Canada (DFO)
- Species at Risk Act (SARA) managed by Fisheries and Oceans Canada (aquatic SAR) or Environment Canada (Terrestrial SAR)
- Migratory Birds Convention Act (MBCA);
- Water Sustainability Act (WSA);
- Water Sustainability Regulation (WSR) and,
- Wildlife Act.

The Ministry will continue to work closely with regulatory partners in order to obtain all necessary authorizations and continues to follow all applicable best management practices to complete the stream crossing repair work.

Fisheries and Oceans Canada (DFO)

Fisheries Act Review, and if required, Authorization for work around fish habitat or aquatic species at risk habitats.

SARA Section 73 Permit for salvage of aquatic Species at Risk, and possible Critical Habitat disruption

BC Ministry of Forests

Water Sustainability Act Section 91 Order or Change Approval or Notice per Authorized Change Section 39(1) per the Water Sustainability Regulation for Changes in and about Streams.

Requirements and Best Management Practices for Making Changes in and About A Stream in British Columbia (Jan 2022).

Adheres to the Standards and Best Practices for Instream Works provided by the Ministry of Water, Land and Air Protection Ecosystem Standards and Planning Biodiversity Branch.

- Fish Collection Permit – for fish salvage
- Wildlife Collection Permit – for handling vertebrates (amphibians)
- Comply with the Heritage Conservation Act

BC Ministry of Transportation and Infrastructure

2020 Standard Specifications for Highway Construction Section 165 Protection of the Environment

Partner Engagement

Frequent meetings amongst provincial and federal regulatory staff to evaluate environmental assessment findings, design and tender and modify work procedures as necessary.

4.0 Fish and Aquatic Habitat Information

Reconnaissance level investigations have been completed (April 25), with detailed site investigation to follow. The following fish species are known to be present within Sxótsaqel (Cultus Lake), Sweltzer Creek and Frosst Creek:

- Bull trout *(Salvelinus confluentus)*
- Dolly Varden (Salvelinus malma)
- Coastal cutthroat trout *(Oncorhynchus clarki clarki)*
- Rainbow trout *(Oncorhynchus mykiss)*
- Steelhead *(Oncorhynchus mykiss)*
- Cultus Lake pygmy sculpin *(Cottus aleuticus)*
- Chinook salmon *(Oncorhynchus tshawytscha);*
- Chum salmon *(Oncorhynchus keta);*
- Coho salmon *(Oncorhynchus kisutch)*
- Pink salmon *(Oncorhynchus gorbuscha)*
- Sockeye salmon *(Oncorhynchus nerka)*
- Kokanee *(Oncorhynchus nerka)*

There is potential for some of these species to utilize tributaries to these systems. That potential is defined by habitat conditions within the tributaries as well as the presence of barriers to fish passage.

ADULT STEELHEAD TROUT

SPAWNED CHUM SALMON

MATURE COHO SALMON

5.0 Site Reconnaissance Information

5.1 Site 1 – Hatchery Creek (Sweltzer Creek Tributary) at Lakeshore Drive

Site 1 is located on Hatchery Creek below Lakeshore Drive with emergent fish present during investigation. The assessed section is a low gradient reach that flows into Sweltzer Creek with no permanent barriers observed downstream. The culvert bottom has collapsed on itself and is currently operating at reduced capacity. Flows were moderate and water was clear, however substrate was packed with fine silts and organic composite indicative of recent disturbance.

Key Observations:

- Sediment release downstream during flood event
- Fish presence and potential habitat for Species at Risk (SAR): Coastal Giant Salamander, Coastal Tailed Frog
- Dredged channel
- Culvert is collapsing, with rusted out bottom

Key Design Elements:

- Q200 flow design
- Culvert fish passage considerations
- Culvert embedment with weirs
- Inlet/Outlet erosion protection
- Restoration of channelized riffle downstream of crossing
- Invasive plant species management
- Riparian restoration planting

Key Construction Mitigation:

- Site isolation
- Bypass
- Working in the dry
- Trash pumping
- Fish salvage
- Environmental monitoring
- Wildlife and Species at Risk Protection
- Wildlife passage

5.2 Site 2 – Sweltzer Tributary at Parmenter Road

Site 2 is located on Hatchery Creek at Parmenter Road. The crossing has been replaced with a temporary CSP, which would appear undersized for Q200 discharge. Both the temporary and existing culvert are well elevated above the channel bed. The site would appear to have been the location of a natural cascade, which would have been a barrier to anadromous fish access. The potential for upstream resident fish presence needs to be investigated. Invasive *Lamium* sp. was observed in the forest immediately adjacent to the temporary crossing.

Key Observations:

- Sediment release downstream during construction to fish habitat and potential SAR (Coastal Giant Salamander, Coastal Tailed Frog, Red-legged Frog, and Trowbridge Shrew) habitat.
- Fish salvage is required (at least at the downstream outlet)
- Resident fish may be present and this needs to be investigated.
- Invasive plant *Lamium sp.*

Design Mitigation:

- Q200 flow design
- Inlet/outlet erosion protection
- Riparian restoration plan

Key Construction Mitigation:

- Site isolation (Working in the dry)
- Bypass
- Trash pumping
- Fish salvage
- Environmental monitoring
- Wildlife and SAR Protection

5.3 Site 3 – Hwy Culvert adjacent to Delta Grove Campground

Site 3 is a moderately sized (3 m wide) seasonal to ephemeral stream that flows into Sxótsaqel (Cultus Lake) through the Deltagrove Campground. The stream was entering its seasonal dry period in April, with reaches downstream of the Columbia Highway exhibiting only intermittent discharge. Upstream from the lake 60 m the stream channel was entirely dry. The potential for this stream to support fish or species at risk is very limited because of the lack of scour at the beach combined with what appears to be extended dry periods (May through to October).

Key Observations:

- Sediment dredging from channel
- Existing or possible partial replacement
- CSP and concrete
- Seasonal to ephemeral discharge
- Access restrictions related to downstream culverts, rip rap and natural dissipation of water volume through the alluvial/colluvial fan

Key Design Mitigation:

- Q200 flow design
- Inlet/Outlet erosion protection
- Riparian planting
- Consider this stream to be insignificant for fish habitation, but some culvert embedment appropriate for small mammal passage

Key Construction Mitigation:

- Work during periods when the stream is naturally dry (May through early October)
- Bypass and trash pumping
- Part-time Environmental Monitoring

5.4 Site 4 – Culvert at Teapot Hill Parking Area

Site 4 is a small <1.5 m wide stream that flows into Sxótsaqel (Cultus Lake). The highway culvert is elevated above the outlet stream and the plunge pool is insufficient in this small stream to facilitate upstream fish passage. Upstream of the highway there is only a short (<20 m long) section of low gradient stream channel. Upstream of this point the stream bifurcates and these two <0.75 m wide channels are on slopes well in excess of 20%.

Key Observations:

- Sediment accumulations dredged from channel.
- No fish passage upstream of existing structure.
- Fish friendly design would not offer significant fish habitat improvements given short length of low gradient channel.
- Sediment release downstream during construction to fish habitat and potential SAR: Oregon Forestsnail, Red-legged Frog, and Trowbridge Shrew) habitat.

Key Design Mitigation:

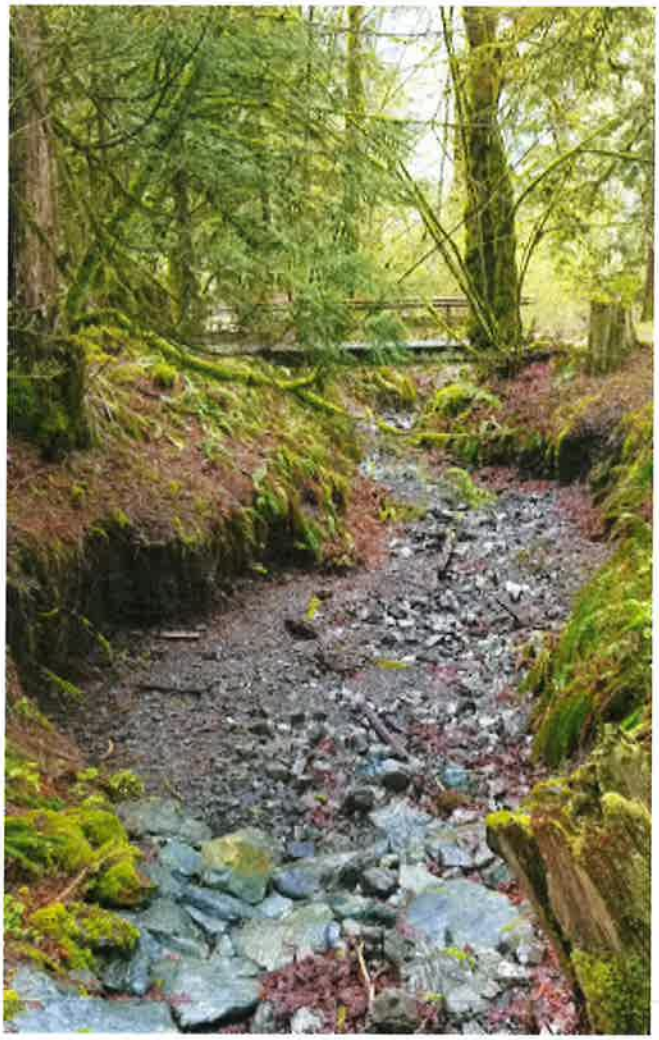
- Q200 flow design
- Inlet/Outlet erosion protection
- Avoid wildlife tree (Class 4) removal.
- Mitigation Class 1 Wildlife Tree root damage.
- Riparian restoration planting

Key Construction Mitigation:

- Site isolation
- Bypass
- Working in the dry
- Trash pumping
- Environmental monitoring

5.5 Site 5 – Culvert at Teapot Hill/Honeymoon Bay Campground

Site 5 is a moderately sized channel that was completely dry during investigation. This ephemerally wetted channel may be an avulsion of another stream channel (wetted at the time of assessment) that is approximately 200 m south of this location. This avulsion channel likely only forms a connection to Sxótsaqel (Cultus Lake) during rare peak flow events, providing no potential use for fish at the elevation of the highway.



Key Observations:

- Appears to have been formed from a partial channel avulsion
- Sediment accumulation and removal during flood event
- Replacement CSP and rock stack headwall
- Dry steep (12%), ephemeral bony channel unsuitable for fish habitation

Key Design Mitigation:

- Q200 flow design for replacement culvert
- No fish passage requirement
- Inlet/Outlet erosion protection
- Riparian restoration planting

Key Construction Mitigation:

- Complete works during periods of no flow (April to October)
- Work in the dry
- Trash pumping as required
- Part-time environmental monitoring

5.6 Site 6 – Culvert at Maple Bay

Site 6 is a very small <1 m wide ditch that collects slope seepage and drains it across the road to a small low gradient stream that has poor connectivity to Sxótsaqel (Cultus Lake). Poor connectivity is due to the observation that the discharge dissipates into the gravel beaches and there is very limited scour that flows into Cultus Lake and provides relief from significant rock seepage upstream. Gradient at the road prism exceeds 35%, so the 'stream' at the level of the road is not one where fish passage is required.

Key Observations:

- Really just shallow ditch relief from east road edge
- Too steep for fish passage

Key Design Mitigation:

- Q200 flow design for replacement culvert
- No fish passage requirement
- Inlet/Outlet erosion protection

Key Construction Mitigation:

- Site isolation if flows are present
- Bypass if flows are present
- Working in the dry
- Trash pumping
- Part time environmental monitoring

5.7 Site 7 – Leisure Valley Trailer Park Frosst Creek Tributary

Site 7 is an unnamed tributary to Frosst Creek that has undergone significant recent channel dredging due to flooding. The existing culvert is elevated well above the channel at the existing culvert outlet. There is no potential for fish passage here given the grade change at the highway. At the time of the assessment there was significant water within the channel and there may be potential for resident fish habitation. This will be investigated, during upcoming environmental assessment.

Key Observations:

- Sediment release downstream during flood event
- Dredged channel
- Fish presence at downstream end of culvert
- Potential for resident fish populations upstream need to be investigated
- Potential SAR habitats
- Invasive English Ivy

Key Design Elements:

- Q200 flow design
- No fish passage considerations natural gradient suggestive of a falls cascade at this location historically
- Culvert embedment with weirs
- Inlet/Outlet erosion protection
- Riparian restoration planting

Key Construction Mitigation:

- Site isolation
- Bypass
- Working in the dry
- Trash pumping
- Fish salvage
- Environmental monitoring
- Potential wildlife and Species at Risk Protection
- Invasive species management considerations

6.0 In-Stream Works Best Practices

A priority for MoTI is to minimize effects to instream fish habitats and aquatic habitats that support Species at Risk. The November 14 -15, 2021 flood events resulted in very significant natural disturbance to stream channels along the Columbia Valley Highway. Most of the damage was the result of bedload mobilization and redistribution causing stream crossings to become plugged and channels to overfill and overflow.

Temporary crossings have been installed in several locations, but ultimate crossing design aims to replace the temporary culverts with permanent structures that will meet the Q200 storm event discharge.

6.1 Culvert Fish Passage Best Practices

Of the seven sites investigated only Site 1 requires a fish friendly design. The balance of the stream crossings have identifiable barriers or severe, natural habitat quality limitations (gradient, ephemeral to seasonal discharge on steeper terrain).

Maintaining fish passage in culverts, or re-establishing fish passage where it has been historically cut-off is a priority for MoTI. Selection of the fish friendly approach to fish passage is dependent on channel size, channel gradient, culvert size (capacity) and culvert type.

Key elements for fish friendly culvert fish passage include:

- Sufficient culvert embedment to minimize outlet scour
- Outlet protection to avoid outlet scour and formation of a culvert outlet drop.
- Downstream weir to facilitate fish passage into the culvert.
- Simulated streambed within the culvert or construction of an artificial weir-pool treatment

6.2 Fish Salvage Best Practices

- A fish salvage crew is to be deployed prior to conducting instream works for Site 1, Site 2 and Site 7.
- The Qualified Environmental Professional (QEP) is responsible for obtaining relevant permits for the salvage operation. The salvage crew must abide by all conditions set out in the permits.
- The QEP will need to install isolation fish fencing upstream and downstream of instream work areas before fish will be removed from the work area. The QEP is also responsible for maintenance and removal of the fencing.
- The fish salvage team must be led by a QEP, and must use gee traps, seine nets, backpack electrofisher or a combination of all three to remove fish from the worksite.
- Fish salvage must be done in a sequential manner and utilize enough passes and techniques to ensure fish have been removed from the worksite.
- Instream works will not start until fish salvage is complete and the EM has issued the Notice to Proceed with site isolation and bypass.
- Isolation fencing is to remain installed for the duration of the project until flows have been established through the worksite.

6.3 Site Isolation Best Practices

- Fully functioning site isolation (coffer dams) are required upstream and downstream of the work site to prevent water flow through the work site during construction. The best form of site isolation is to do the works instream when the streams are naturally dry. Sites 3, 4, 5 and either were dry during reconnaissance inspections in April 2022 or have such low discharge that they are likely to be dry by the late summer early fall construction window.
- Site isolation can be achieved using several methods including sandbags wrapped in polyethylene sheeting or sheet plate installed at the upstream end of the work site.
- The site isolation technique utilized must be "substantially leak free", that is of sufficient depth and quality to stop most discharge from weeping through the upstream site isolation coffer dam.
- Site isolation and bypass must remain in place throughout all instream works. The sites cannot be allowed to flood when crews stand down for evenings or weekends.
- Even in dry stream channels the Tender specifications should include language requiring provisions for site isolation, in the event of unforeseen rain events.

6.4 Bypass Best Practices

- After establishing site isolation, instream works, are to be completed "in the dry"; that is in isolation from flowing water.
- A full stream bypass needs to be deployed concurrent with site isolation and maintained for the duration of the instream works at each project location.
- Even in dry channels, provisions for bypass should be made part of the environmental specification for the Tender.
- Bypass directs clean water from upstream of the site, around the worksite, discharging this same water to the stream channel immediately downstream of the isolated site.
- Water must be returned to the stream channel immediately downstream of the lowest isolation fence, to prevent dewatering of fish-bearing habitat or species at risk habitat
- Bypass water must be discharged back into the watercourse onto non-erodible surfaces (natural bedrock, temporary rip rap placement, plastic sheeting or diffuser.).

6.5 Trash Pumping Best Practices

- Subsurface water or water that leaks through the isolation wall (coffer dam) will accumulate within the work zone. This water is may need to be removed from the worksite before it floods the works. The water accumulating in the work site is usually very turbid and cannot be discharged to streams or ditches that provide fish habitat or habitat for aquatic species at risk.
- A 'trash pump' may need to be deployed to draw this sediment-laden water from the work site and pump it to a location where it will not cause the deposition of a deleterious substance to fish habitat or to species at risk habitat.

- Techniques for the effective control of sediment laden water from a trash-pump system may include:
  - Pumping sediment laden water to dry vegetated areas well away from fish habitat.
  - Pumping water into an onsite baker tank for settlement.
  - Pumping water to a portable treatment system
  - Pumping water to flocculent bags that can weep clean water to vegetated areas
  - Pumping water to constructed soak-away sediment basins
- Trash pump discharge points must be equipped with an energy dissipator to prevent scour of receiving terrain and oversaturation of discharge points leading to overland flow.
- Where trash pumps are discharging to land, frequent movement of the discharge hose is required to avoid excess ground saturation.
- An EM is required to monitor the trash pump discharge point to ensure it is functioning as intended (either dissipating sediment laden water or effectively treating it).

6.6 Water Quality Monitoring Best Practices

As part of the environmental monitoring requirement during construction, water quality data (Turbidity, pH) will be collected during regular inspections upstream and downstream of the worksites. Environmental regulatory permits are put in place outlining term and conditions that need to be followed including water discharge limits.

Monitoring for water quality will be important to address issues relating to sediment release downstream and ensuring that turbid discharge does not occur into downstream fish habitat.

Environmental monitors will be diligent in evaluating the risk to not only mitigating water flowing through the worksite but also to ensure environmental design specifications are followed as to not release sediment laden water downstream (i.e. rip rap is clean of sediment and erosion and sediment control measures are installed).

7.0 Wildlife and Species at Risk

7.1 Listings and Critical Habitat Polygons

Species at Risk (SAR) are Extirpated, Endangered, or Threatened species or a Species of Special Concern. These include species that are 'Red listed' (Extirpated, possibly extirpated, Critically Imperiled, Imperiled) or 'Blue listed' (Special Concern) by the province as well as those species that are Schedule 1 of the Species at Risk Registry of the federal Species at Risk Act. The following SAR and/or SAR habitats have been detected in the Columbia Valley:

- Coastal Giant Salamander *(Dicamptodon tenebrosus)*
- Trowbridge's Shrew *(Sorex trowbridgii)*
- Oregon Forestsnail *(Allogonia townsendia)*
- Marbled Murrelet *(Branchyramphus marmoratus)*
- Coastal Tailed Frog *(Asacphus truei)*
- Red-legged Frog *(Rana aurora)*

Critical Habitat (CH) polygons are established as part of Recovery Plans for SAR. Terrestrial Species at Risk Critical Habitat polygons for Coastal Giant Salamander, Marbled Murrelet, and Trowbridge's Shrew have been identified overlapping Sites 1-7 (Figure 2).

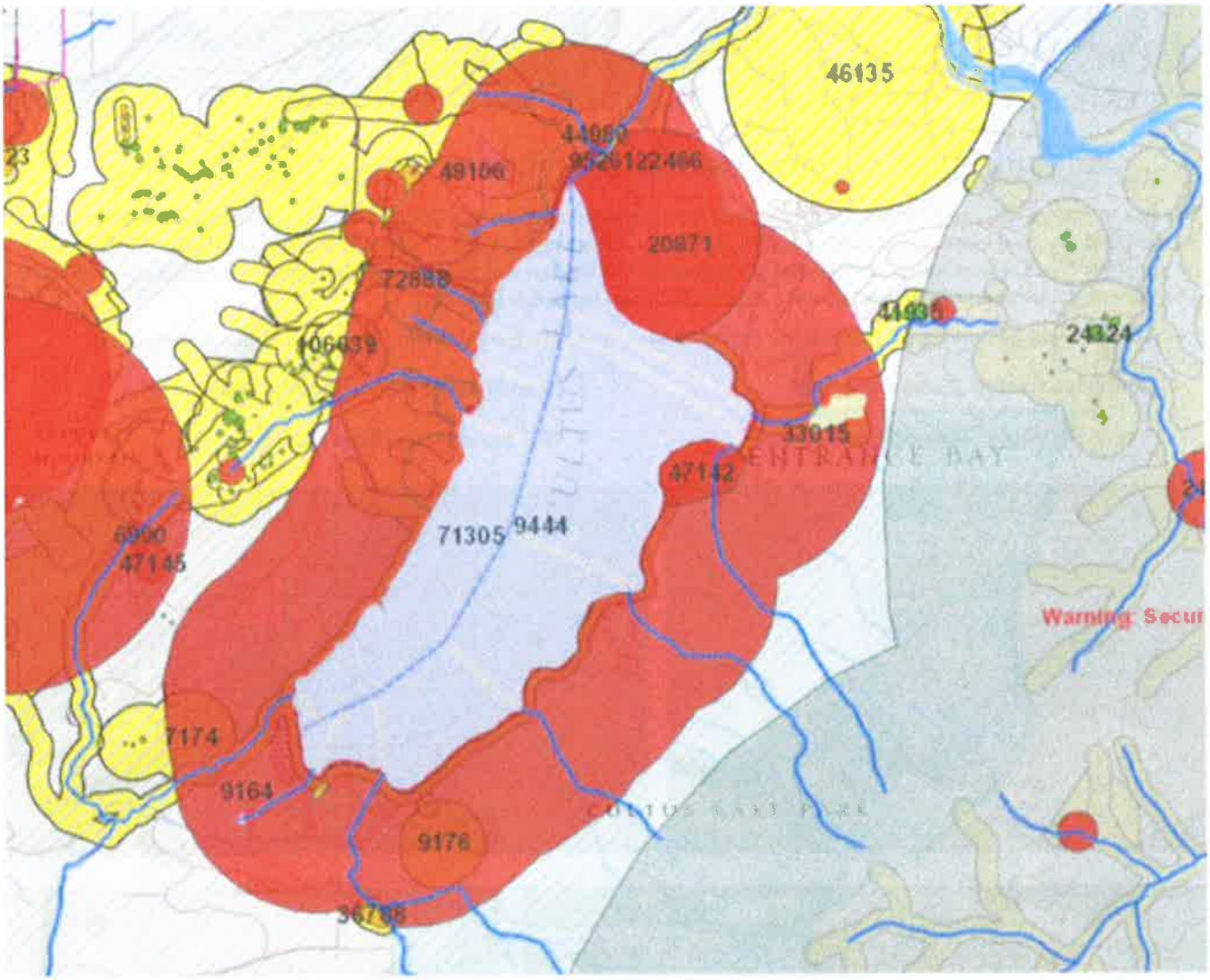


Figure 2. Critical habitat polygons in the southern Columbia Valley.

While CH Polygons are present, these polygons do not always align with the distribution of CH at the site level. For there to be CH at the site level habitat attributes required by the species must be present. A second consideration with respect to CH is that CH is only protected when it is on federal land, lands managed by the federal government, or be protected through a federal Order.

None of the sites are located on federal land. Our preliminary reconnaissance has identified that site specific habitat attributes for SAR are absent at Sites 3, 4, 5 and 6. Largely this is due to site context (edge of highway) and recent site disturbance but also natural conditions (such as seasonal discharge), lack of understory vegetation, steep slopes, lack of pools and ephemeral to short season discharge.

7.2 General Wildlife Protection Best Practices

Our team will take care to protect wildlife in work areas. We are currently surveying where amphibians and vertebrate SAR might be before culvert replacement. No blasting is anticipated to be required for this project. Key wildlife protection measures will be discussed amongst designers, environmental monitors and contractors.

Key wildlife mitigation at design and assessment stages will include:

- A detailed site assessment of aquatic and terrestrial areas at each site will be undertaken by ISL to identify any potential wildlife habitat, nesting, denning sites, or other refugia.
- Site assessments will be used to inform and apply for relevant permitting or authorizations for wildlife salvage which may be required during construction.
- Incorporate considerations for small mammal wildlife passage.
- Consideration for coarse woody debris placement and riparian understory planting.

Key wildlife mitigation at construction will include:

- Works will not commence until the EM has completed the pre-construction survey and any wildlife has been removed.
- Wildlife which is required to be relocated/salvaged to avoid construction impacts will only be handled or salvaged by the EM under appropriate permits/authorizations.
- Unauthorized individuals (i.e. persons not named in permits), will not handle wildlife.
- Locking wildlife-proof waste receptacles will be obtained and deployed by the contractor.
- Littering will be prohibited and monitoring for this activity by the EM will be ongoing throughout the project.

- Wildlife feeding by any persons on-site during the project will be prohibited.
- The EM will be notified of any wildlife that is encountered onsite during construction activities. If wildlife is encountered, works shall be suspended to allow for wildlife to safely pass.

8.0 Vegetation Management Best Practices

8.1 Tree and Shrub Protection

Riparian trees provide shade cover, allochthonous inputs, and insect drop to streams. Tree roots aid in soil stabilization.

Existing site disturbance associated with emergency works undertaken to temporarily address November 2021 flooding and install temporary crossings has resulted in the removal of some trees and understory vegetation.

Site 2 (Parmenter Road), Site 3 (Teapot Hill Parking), Site 4 (Honeymoon Bay Group Camping), Site 6 (Maple Bay) and Site 7 (Frosst Tributary) will require work in proximity to existing trees, and that work has the potential to disrupt tree roots or require additional tree removal.

Broad scale tree and vegetation removal associated with implementation of the ultimate design should not be required given site context (edge of existing road prism) and existing disruption.

Measures to protect trees are particularly important in the context of those located in and about provincial parks, and otherwise, to limit indirect effects to tree roots and boles.

At the pre-design and design stage:

- Survey tree bole and drip line and include tree bole and dripline on survey
- Adjust culvert orientation where feasible to avoid tree removal
- Designate clearing limits and tree protection fencing on drawings
- Create a mark-to-leave prescription and flag all trees and vegetation to be conserved with colour coded "NO DISTURBANCE RIBBON"

At Tender:

- Create supplemental environmental specifications that:
  - Create LOCK-OUT provisions for designated trees and vegetation. LOCK-OUT will be designated with NO-DISTURBANCE RIBBON, and only the Project Environmental Monitor may remove locked out trees and vegetation
  - Require, as part of construction contractor responsibilities, the installation of protective fencing, tree guards and or swamp pads to protect tree boles and tree root zones
  - Require sensitive root areas to be excavated with a hydrovac or by hand under the direction of an arborist or forester

At construction:

- Complete a site level Construction Contractor Environmental Orientation (CEOR) prior to commencement of construction activities
- Arborist monitoring of high-risk activities near key trees
- Excavated topsoil will be salvaged for future reclamation works where feasible
- Revegetation of disturbed areas will be achieved through implantation of restoration planting plans as well as hydraulic seeding. Hydraulic seed mix will be in conformance with SS 757 and consist of either of the following (dependent on site conditions, to be determined through detailed environmental assessment
- Disturbed riparian areas will be replanted, in conformance with SP 754-06

8.2 Invasive Plant Management Plan

Several of the assessed project sites are host to invasive plants including Himalayan blackberry *(Rubus armeniacus)* at Site 1, Purple death-nettle *(Lamium purpureum)* at Site 2, and English ivy *(Hedera helix)* at Site 7.

These sites will be managed in accordance with "Best Practices for Managing Invasive Plants on Roadsides" (2019) as well as the provincial Weed Control Act.

Measures to limit the spread of these plants will include, but not be limited to, the following:

- Work crew will be familiarized with species of concern to this project
- All invasive plants to be reported to the Ministry Representative
- All equipment that is being used for the construction of the project are fully pressure washed before deployment to site.
- EM will inspect machinery for conformance
- Any soil and / or plant material containing invasive plant material will be isolated on polyethylene sheeting and covered with polyethylene sheeting that is weighted with sand bags and disposed of at an landfill that accepts invasive plant material
- All parts of equipment (i.e. excavator and trucks) including tracks, undercarriage, cabin, arm and bucket that has contact with noxious weeds, of soil containing noxious weeds, seeds, and stem fragments will be cleaned prior to demobilization off site or being utilized for another activity

9.0 Erosion and Sediment Control

9.1 ESC Plan

- Prior to construction, an erosion and sediment control (ESC) plan will be prepared in accordance with SS 165.04.01 as well as the methodology described in the "National Guide to Erosion and Sediment Control on Roadway Projects", Transportation Association of Canada 2005.
- The ESC Plan should include provisions for sufficient quantities of materials to stabilize erodible surfaces (for example, silt fence, straw bales, grass seed mix, sandbags, erosion control blanketing, mulch etc.).

9.2 ESC Measures

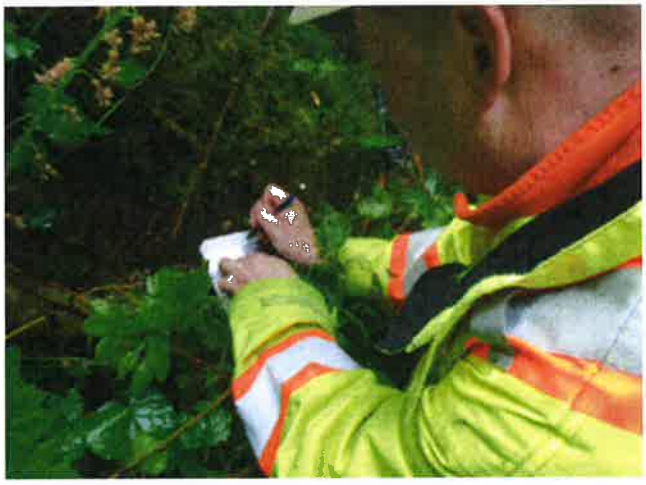
- Work will be completed during seasons of lowest precipitation (late summer to early fall).
- Ensure ESC measures are installed before starting work and capable of continuously preventing the entry of sediment into the watercourse and/or municipal storm system.
- Stabilize all disturbed slopes, watercourse banks and ground surfaces that may contribute sediment-laden water into watercourses.
- Inspect ESC measures regularly to ensure that they are functioning per the ESC Plan.
- If deficiencies are found, repairs to ESC measures will be completed as directed by the EM.
- Slope protection measures may include silt fencing, mulches erosion mats, geotextiles, filter fabric, erosion control blankets, or hydraulic seed application.
- Material stockpiles will be stabilized to prevent them from entering any watercourse. No debris is to remain below the high-water mark.
- Site work will be ceased, modified, or relocated during inclement weather to avoid siltation of watercourses.
- Sediment tracking to roads will be minimized by daily sweeping.
- Once started, work at each site will be completed as soon as possible.

10.0 Environmental Monitoring

Environmental Monitors (EM's) are appropriately qualified professionals with extensive experience in highway/linear development, instream works, fish salvage, SAR and working on complex construction sites. Indigenous Environmental Monitors will be included where agreements are in place.

The Environmental Monitor role is to:

- Be active in site planning and prescription development
- Conduct daily sweeps of work sites for presence of wildlife (fish, snakes, birds, bats, etc...) and develop site-specific mitigation measures as required
- Compile and summarize daily observations into weekly reports which are issued to MoTI
- Work collaboratively with construction crews to ensure the CEMP is adhered to
- Provide technical advice to the teams where appropriate;
- Ensures compliance with regulatory approvals, SS 165, and best practices;
- Document non-conformance where necessary and improving practices and procedures as needed.



11.0 Heritage Site Best Practices

Overview

The *Heritage Conservation Act* aims to protect and conserve heritage property in B.C. A heritage site is land (including land covered by water) that has heritage value to B.C., a community, or aboriginal people, whether designated or not. Your work may impact a heritage site.

Consult your cultural advisor/ monitor

First Nations cultural advisors/monitors will have their own recommendations and preferences depending on the site and significance of the area. These can vary from Nation to Nation. Before engaging in work, seek guidance from the First Nations Advisor on your project team or designated to your project site. First Nations may also be able to provide archaeological, environmental or other services, or a cultural monitor for project works.

Adhere to the following principles

- Ensure worker safety is the top priority
- Ensure people on site are aware of the cultural significance of the site and the need to respect protocols
- Ensure all relevant staff on-site are aware of response plans/schedules for the day to help promote responsible decision making
- Be keenly aware of all potential site hazards, including but not limited to fast-flowing water, unstable grounds etc.
- Before conducting response or recovery work in an area, confirm there are no recorded or known archaeological sites present
- Any workers on site should attend all required toolbox/site safety meetings
- Use the chance-find procedures outlined in SS165.20 and Appendix A if suspected cultural materials are identified
- Any archaeological investigation work that is re- quired must be undertaken by qualified personnel and in accordance with the relevant permit requirements
- Any works taking place near or on reserve lands should be reviewed with affected First Nations communities to identify any areas of potential cultural concern
- Any archaeological staff on-site should work closely with cultural advisors or monitors, following their recommendations and preferences that are specific to the site or area

12.0 Spill Contingency Measures

Overview

All equipment going in-stream should be equipped with bio-oil. The EM needs to check equipment prior to any work commencing and crews have spill kits available at each site. Additionally, qualified professional Environmental Monitors remain on site throughout the duration of the works to ensure that the following best practices are being used:

- The Contractor shall provide onsite, at all times, readily accessible spill response materials such as containment booms, absorbent sweeps, and pads able to handle up to 125% of any potential spill
- Any used spill response and abatement materials must be immediately replaced
- The Contractor shall review the Spill Contingency and Response Plan weekly for its appropriateness, confirm that all required response materials are available and in adequate supply
- In the event of a spill or emergency, the Contractor shall, at their cost, restore the site to the current, applicable standard
- The Contractor will be responsible for removal and appropriate offsite disposal of all waste and clean-up materials, equipment, and goods, including soils and water deemed to be contaminated by the BC Ministry of Environment and Climate Change Strategy (ENV) or Environment and Climate Change Canada
- The Spill Reporting Regulation under the Regulation of the Minister of Environment and Climate Change Strategy, under the Environmental Management Act, defines the information required when reporting a spill

13.0 Reference Documents

Overview

The following documents are used for additional guidance on best practices to be followed:

- **BC MoTI 2020 Standard Specifications for Highway Construction - SS 165 Protection of the Environment**
  https://www2.gov.bc.ca/assets/gov/driving-and-transportation/transportation-infrastructure/engineering-standards-and-guidelines/highway-specifications/volume_1_ss2020.pdf

- **Requirements and Best Management Practices for Making Changes In and About A Stream in British Columbia**
  https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/working-around-water/wsa-ciasrequirements-bmps.pdf

- **A User's Guide for Changes In and About A Stream in British Columbia**
  https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/working-around-water/wsa-ciasusers_guide.pdf

- **Appendix: Scope-specific Best Management Practices for Changes In and About a Stream under the WSA**
  https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/working-around-water/wsa-ciasrequirements-bmps_appendix.pdf

- **BC Ministry of Water, Land and Air Protection - Standards and Best Practices for Instream Works**
  https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/best-management-practices/

- **BC Water Licensing & Rights - Working Around Water**
  https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/working-around-water

- **Land Development Guidelines for the Protection of Aquatic Life**
  http://www.sxd.sala.ubc.ca/9_resources/fed_%20files/fed%20land%20development%20guidelines.pdf

- **Best Practices for Managing Invasive Plants on Roadsides: A Pocket Guide for British Columbia's Maintenance Contractors**
  https://www.bcinvasives.ca/documents/Weeds_Roads_BMP_Guide-2019-web.pdf

14.0 Directory/Contacts

Ministry of Forests, Water Stewardship Branch

- http://www.env.gov.bc.ca/wsd
- 778-698-7344

Ministry of Forests, Archaeology Branch

- 250-953-3334

Environmental Emergency Program, Spill Reporting

- 1-800-663-3456

Fisheries and Oceans Canada, Spill Reporting

- 1-800-889-8852

Fisheries and Oceans Canada, Observe, Record, Report Hotline

- 604-607-4186

Indigenous Services Canada (ISC) BC Office

- 604-775-5100 (Monday to Friday 8:00am to 4:30pm)

Emergency Management BC

- 1-833-376-2452 (daily 7:30am to 5:00pm)
- www.emergencyinfobc.gov.bc.ca

Disaster Financial Assistance

- DFA@gov.bc.ca
- 1-888-257-4777
- https://www2.gov.bc.ca

Canadian Red Cross

- 1-888-863-6582 (daily 8:00am to 8:00pm)
- www.registration.redcross.ca

Columbia Valley Key Contacts

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- **Krista Englund**, MOTI Environmental Coordinator 236-468-195
- **Kelsi Fraser**, MOTI A/ Project Coordinator, Indigenous Relations 236-468-2104
- **David Neufeld**, ISL Engineering Senior Biologist 604-371-0091