Construction Environmental Management Plan

for

Roger Creek Bridge #4

Prepared For:

City of Port Alberni
4850 Argyle Street
Port Alberni B.C. V9Y 1V8

Prepared By:
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June 2023

Introduction:

This report is a Construction Environmental Management Plan to address environmental protection during the installation of the Roger Creek #4 bridge. This is a project by the City of Port Alberni. The proposed works are to install a 26.6m long steel bridge over Roger Creek as well as build trail to connect it to the existing network. David Clough, RPBio and representatives from the City of Port Alberni developed the environmental protection plan. Specific Environmental concerns are:

1. Containment of an oil and/or fuel spill during construction.
2. Introduction of silt and other foreign debris into the stream and the associated impacts on water quality and fish habitat downstream of the construction site.

Project environmental description and location:

This project is located within the City of Port Alberni in Roger Creek Park along the Scott Kenny Trail. This project will add a fourth bridge over Roger Creek, as well as completing a trail connector to the end of 8th street.

There are three similar bridges installed along the trail network with Bridge 3 installed in 2017, Bridge 2 in Bridge 1 in 2014. This past work was done in partnership with local stewardship groups (Alberni Valley Enhancement Association, West Coast Aquatic Society) and included restoration of the stream channel. There have been rock and log groynes, as well as three off channel areas. All the sites have been replanted in native species by City staff as well as Alberni District High school students. The river is stocked annually with Coho by the AVEA as well.

This reach of Roger Creek is 1.5 km upstream from the ocean in a confined valley. It has anadromous salmon (Coho is most common with some Chum and Pink). The Coastal Cutthroat trout is very common with annual sightings of Steelhead in winter. Expect Coho and Cutthroat at a minimum in the river areas near the work site.

The river has perennial flow with bank-full average width of 20m in this reach. In the summer, discharge is reduced and wetted widths in the crossings should be 3-5m. There is a steep headwater and much of Highway 4 over the “Hump” drains into the river. There is a large storm water outfall at 10th avenue as well. As a result of topography and developments, the river may rise quickly in rain events.

In Summary; the work area of the river can be considered to have fish habitat, protected species of fish present and have year round water flow. It is considered high value fish habitat and will require environmental protection measures for any work in or near the stream.

Description of Work

- Install a 26.6m long by 2.6m wide steel bridge across Roger Creek at Bridge 4 site.
- Build approx.120m of connector trail between Bridge 3 and 4 along Roger Creek.
- Build trail from Bridge 4 out of the riparian area to connect to 8th avenue

The bridge design is by Chartwell Consultants (DWG: 21-713A_02_R0_IFT_2023-06-02.). The Trail design is by R.F. Binnie and Associates ltd. (23-0280 - Roger Creek Trail -70% Design Submission)

Schedule of Work

The work is scheduled for summer 2023. The instream work must be done in the August 15-September 15 least risk fish window or as deemed by agencies under the permit conditions.

Trail construction may be undertaken outside the Aug-Sep window provided it follows the weather and sediment control measures in this CEMP.

The contractors must understand the environmental limitations and risks associated with this project. Work must follow all of available best management practices (BMP's), workers must assume rain events will occur and be within their capabilities to protect the wetted environment. They must plan in advance for protection of the environmental areas and have all equipment ready.

Permits:

A BC Government Water Act Section 11 notification has been applied for on behalf of the City of Port Alberni. The proponents must follow all direction in the permit.

This work follows the DFO Codes of Practice for Clear Span Bridges and Fords. A DFO notification must be submitted 10 days before work. The Codes of Practice are attached in the appendices.

A fish collection permit for this watershed may be required for the project environmental monitor if instream work around fish is planned.

All permits must be on hand at the project site.

Figure 1 – Map of site overleaf
Figure 2 – Site Photos overleaf

Figure 1: Overview Project Location

Figure 2 – Site Photos Roger Creek

1.) Bridge 3 & looking downstream at Ford site

2.) Ford site to get to Br4 (was used in 2018)

3.) Bridge 4 Site, flag (LB) and persons (RB) standing at proposed abutment locations

4.) Trail from Br 3 to Bridge 4

Construction Environmental Management Plan (CEMP) - Check List

1. Pre-Work – A job safety and pre-work meeting will be done to ensure that all workers understand the objectives and have clear written plans on their roles and responsibilities. Everyone must be aware of the site environmental areas and protocols as there must be no disturbance or deleterious substance entry into fish habitat. Environmentally sensitive areas (the non work area of the stream) must be identified (e.g. flagging, fencing, coffer dam) and made clear to construction personnel at the site. There must be no disturbance outside the identified work boundaries of fish habitat or addition of any deleterious substance into habitat. This Environmental Protection Plan will be reviewed along with permits and kept on site.

2. Monitoring – The work will be conducted to ensure fish habitat is not damaged. The monitors' role will be to identify sensitive areas to construction crews, advise and record procedures. They are empowered to stop work procedures and direct environmental protection measures. This will be the primary responsibility of D.R. Clough Consulting staff but may involve other qualified personnel (City Staff, Binnie & Chartwell Engineers).
3. Below is the Turbidity guideline to follow;

Table 1: Summary of Water Quality Guidelines Turbidity, Suspended Solids and Benthic Sediments-Water Use

Water Use	Turbidity	Total Suspended Solids (TSS)
Aquatic life (fresh, estuarine)	Change from background of 8NTU at anyone one time during clear flows less than (8NTU)	Change from Background of 25mg/l at any one time during clear flows
	Change from background 10% when background levels are greater than 50NTU	Change from background of 10% when background is greater than 100mg/l during high flow

4. Heavy Equipment (i.e. Excavator/back hoe) must be power washed off site and arrive free of leaks or excess oil and grease. The machinery over water must be using environmentally friendly hydraulic fluid. Fuelling of any heavy equipment onsite must be at least 30m from the waterways. See Equipment and Fuel handling Specifications Below.
5. Gas powered pumps and generators used for the construction must be in spill trays. Fuel cans and chainsaws must be stored in impermeable bins. Chainsaws must use environmentally friendly bar oil. No Fuelling of saws and pumps over water.
6. Spill Kits/ Erosion Control setup – All environmental safety material must be on site and readily available including spill kits and erosion/sediment control materials. There must be spill kits on all heavy equipment in the work area. Erosion protection materials such as plastic or tarp covers, and straw bales (specifications below) must be onsite. All erodible material must be protected through covers, sediment fencing and filtration systems; to be identified in the pre-work and set up before commencement. Use geotextile, rock armour, hay, plastic and grass seed. A spill response plan and spill kit suitable for all substances on-site will be present onsite. All operators are trained on

spill response and environmental monitor will be present during the work in the event that an incident occurs.

7. Riparian Protection – Trees, shrubs and soil in the riparian area is to be protected by minimizing the construction footprint where possible and marking no-go zones. The non-work riparian areas must not be damaged by equipment, material storage. Salvage of trees/shrubs in the work area will be set aside and replanted if possible under the direction of the QEP.
8. Danger trees (arborist identified) in the work area may be cut for safety but the QEP will advise on the best environmental outcome: they may be cut to long lengths and placed in the riparian areas as coarse woody debris above high water mark. All material is expected to be felled away from any waterways.
9. Weather – Wet weather shutdown applies, rainfall will be recorded. In any circumstance (whether raining or not) where a potential exists for release of sediment, the activity must be stopped. The sites access roads are extremely sensitive to rain and shutting down during prior to rainfall minimums (ie 15-25mm) is expected.
10. Temporary Ford – The temporary ford for machine access (Excavator) to the far bank of the Bridge 4 site is to clear the trail and set the abutments and place the bridge. There are two locations identified – the Bridge 3 site was used in 2017 is located next to the Bridge 4 storage location. At this site the excavator will pass the Bridge 4 across the creek and follow. The second potential Ford site is at Bridge 4; at this site there is also an opening between trees on either side. The contractor depending on equipment may determine which ford site is best.
11. Bridge Installation – The installation must follow the DFO Code of practice. The DFO Temporary Ford Code of Practice is attached in Appendix 1.The work does not include:
    - ◦ realignment of the watercourse, dredging, grading or excavating the bed or banks of the watercourse
    - ◦ placement of fill or other temporary or permanent structures (e.g., scaffoldings, abutments, footings, rock) below the ordinary high water mark
    - ◦ installation of a temporary culvert
    - ◦ pile driving

    Depending on the contractor and equipment (Excavator/Crane) the Bridge will be launched from the abutment to the other side. The proposed Bridge 4 structure is lying on the town side of the trailhead at Bridge 3. This bridge will have to be passed over the creek and transferred down the trail to the Bridge 4 site. The other option is to cross at the Bridge 4 site access the isolated Bridge 4 abutment temporary stream crossings are required to complete this project.
12. Ditches and Drainage – Drainage ditches and culverts along the trail must be installed as per the design and completed before Sep 15 in any trails within 30m of the stream.
13. Installation of guard rails, geotextile, rock armour, hay, plastic and grass seed must be applied as required at each crossing site to address construction disturbance and improve environmental protection.
14. Erosion/Storm Water Management– Installation of appropriate sediment management measures must be applied. The contractor must have the following items; (scaled to scope of work and re-supplied as used);
    1. 50 m of 20 cm diameter oil containment boom
    2. 200 x 2 liter absorbent pads

3. Straw bales
4. Tarps or rolls of poly sheeting
5. One industrial spill kit on each piece of heavy equipment

15. Seed/Revegetation – Upon completion; all exposed erodible areas must be graded to address any construction ruts and mounds. Exposed areas must be then seeded (recommend Buckerfields erosion mix less white clover). Seed shall be applied at a rate of 40 kg per hectare on exposed surfaces. Seeding and fertilizing should closely follow the final landscaping. Weather permitting.
16. Tree and shrubs in the riparian area removed as danger trees or damaged from construction will be replaced following the B.C. Tree Replacement Criteria.
17. Reporting – There will be routine environmental inspection records and a construction environmental monitoring report by the site QEP and distributed as requested to agencies

Equipment and Fuel Handling Specifications:

1. Construction will adhere to terms and conditions of the CEMP.
2. Heavy equipment will be inspected daily as a preventative measure to avoid unnecessary spills or leaks due to poor equipment maintenance.
3. Heavy equipment parked in riparian areas due to access limitations must have spill trays when not operating.
4. Fueling of heavy equipment will be conducted from vehicles equipped with Tidy Tanks in designated areas outside the environmentally sensitive area (>30m from channel).
5. Spill response kits will be required for each piece of heavy equipment (i.e. Excavators, Loaders, and Trucks) which will be at least 21 liter drum size each with spill pads, sorbent, small boom, plastic garbage bag and gloves.
6. A commercial sized spill kit (80l) with larger/longer booms and spill pads/sorbent flakes is required for a central location of work.
7. The spill boom material length should be equivalent to double the width of the creek.
8. The designated monitor will inspect all of the equipment before it is moved onto the construction site. Any equipment that is not approved will not be allowed on the worksite until it has been repaired to the satisfaction of the monitor.
9. Fueling and storage will be stored in designated sites away from the environmental areas. TDG tank users must follow the recommended practices outlined in the “Field Guide to Fuel Handling, Transportation and Storage, 2002.”

Spill and Sediment Emergency Response Plan:

Containment materials and equipment must be stored in a readily available area for immediate use and be of sufficient quantity to receive contaminants for later disposal at an acceptable location. Equipment operators and laborers will be instructed as to emergency response procedures and assume full responsibility for containment in the event of an accidental spill. The Environmental Monitor, or equivalent, will provide direction and participate in the clean-up of contaminants, particularly where a spill to the aquatic environment occurs. The following spill response measures will be followed in the event of an accident:

1. Ensure worker and public safety
2. Control the spill source
3. Secure the spill site and eliminate potential ignition sources
4. Contain the spill and prevent contaminant entry into water
5. Report the incident
6. Clean-up, store and dispose of contaminants
7. Monitor downstream impacts to aquatic resources

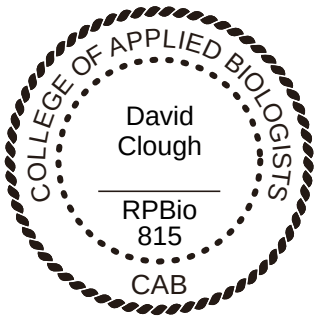
All spills in the working area; are to be remediated. Spill fluids that are deleterious to the environment include oils; greases, fuels and solid fill materials that could contain leachates.

Depending upon the severity of the spill (i.e. > 100 L of flammable liquids or oils), the Environmental Monitor, or equivalent, will report the details of the incident (location, substance, time and duration of spill, estimated volume, containment action) to the Provincial Emergency Program of MOE (1-800-663-3456). All contaminants and contaminated materials will be disposed of in a manner consistent with MOE policy. Spill response measures, as well as all construction measures must also comply with any environmental management system developed on behalf of the construction contractor.

Conclusion

A DFO[1] self-assessment was conducted June 23, 2023 by reviewing the ***Policy for applying measures to offset adverse effects on fish and fish habitat under the Fisheries Act.*** This project was found to have measures to avoid effects to fish and fish habitat by following the CEMP above.

Prepared by



David R. Clough, RPBio
Attachments
Appendix 1 – DFO Code of Practice –Fords
Appendix 2 – DFO Code of Practice – Bridges
Appendix 3 – Bridge Plan View
Appendix 4 – Trail Plan View

[1] *https://www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/policies-politiques-eng.html*

Appendix – DFO Code of Practice – Temporary Fords

Code of Practice

Fisheries and Oceans Canada | Pêches et Océans Canada

Temporary Fords

September 2022

1.0 About this code of practice

This code of practice outlines Fisheries and Oceans Canada (DFO)'s national best practices for fording a watercourse. Temporary fords are employed for short term seasonal access by construction vehicles to the other side of a watercourse when an existing crossing is not available or practical to use.

For the purposes of this code of practice, temporary fords include:

- a one-time crossing (over and back) in flowing waters
- multiple crossings when a streambed is seasonally dry

You can protect fish and fish habitat (including aquatic species at risk, their critical habitat and residences) when proceeding with a ford crossing by following the measures listed below. When implemented correctly, this can mitigate risks to fish and fish habitat associated with temporary fords, which can include:

- disturbance of watercourse beds and banks
- release of sediments or other deleterious substances
- fish injury and mortality

DFO is responsible for the conservation and protection of fish and fish habitat across Canada. Under the *Fisheries Act*, no one may carry out works, undertakings and activities that result in the harmful alteration, disruption or destruction (HADD) of fish habitat, or the death of fish, unless it has been authorized by DFO. DFO's approval under the *Species at Risk Act* is also required if an activity affects an aquatic species at risk, any part of its critical habitat or the residences of its individuals.

The purpose of this code of practice is to describe the conditions under which the code can be applied to your project and the measures you are required to implement in order to prevent harmful impacts to fish and fish habitat and avoid contravention of the *Fisheries Act* and the *Species at Risk Act*. If you cannot meet all of the conditions and implement all of the applicable measures listed below, your project may result in a violation of the *Fisheries Act* and the *Species at Risk Act* and you could be subject to enforcement action.

If you are uncertain about whether this code of practice is applicable to your project, it is recommended that you consult our website or a qualified environmental professional to determine if other codes of practice should also be implemented, or if further review by DFO may be necessary. For any remaining questions, please contact the Fish and Fish Habitat Protection Program office located in your area. It remains your responsibility to comply with the *Fisheries Act* and the *Species at Risk Act*.

It is your duty to notify DFO if you have caused, or are about to cause, the unauthorized death of fish by means other than fishing/harmful alteration, disruption or destruction of fish habitat. Such notifications should be directed to the Fish and Fish Habitat Protection Program office located in your area.

This code of practice does not remove nor replace the obligation to comply with the requirements of any other federal, territorial, provincial or municipal regulatory agency including guidance regarding species and habitats managed by these jurisdictions.

It is good practice to notify nearby Indigenous communities of the works, undertakings and activities.

A project review by DFO is not required when the project activities meet the description in section 1 and the conditions in section 2, and when the measures to protect fish and fish habitat set out in section 3 of this code of practice are applied. Request a project review if your project does not meet all of these requirements.

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2.0 Conditions

The following conditions describe when this code of practice can be applied:

- You determine if there are aquatic species at risk within the affected area by consulting our aquatic species at risk map, and you confirm that:
  - a one-time crossing (over and back) in flowing waters will not take place within the distribution area of any aquatic species at risk
  - dry crossings will not take place within the critical habitat or residences of any aquatic species at risk
- Fords in flowing waters are conducted on shallow watercourses with stable beds (i.e., bedrock or coarse rock), and low sloping banks and approaches.
- The activity does not include:
  - realignment of the watercourse, dredging, grading, excavating or placing fill on the bed or banks of the watercourse
  - installation of a temporary culvert
- You implement the measures in section 3 to protect fish and fish habitat when carrying out the works, undertakings and activities.

As a condition of this code of practice, please submit a notification form (PDF, 50 KB) to your regional DFO office 10 working days before starting work. Notification forms will inform the continuous improvement of the codes of practice over time.

You must download and save this PDF form to your computer before filling it out. How to download and open a PDF form.

3.0 Measures to protect fish and fish habitat

3.1 Protection of fish

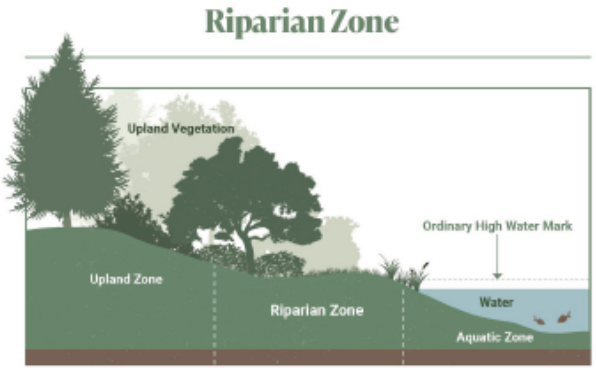
- Plan in-water works, undertakings and activities to respect fish protection timing windows.

3.2 Protection of the riparian zone

- Use existing trails, roads, access points or cut lines.
- Use methods to prevent 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.
- Re-vegetate the disturbed areas with native species suitable for the site.

3.3 Protection of aquatic habitat

- Operate vehicles and machinery in a manner that minimizes disturbance to the watercourse bed and banks.
- Follow code of practice for Temporary Fords if fording is required.



3.4 Protection of fish and fish habitat from sediment

- Conduct one-time fords in flowing waters during periods of low flow.
- Stabilize approaches with non-erodible materials such as brush mats, corduroy or clean stone.
- Do not skid or drag anything across ford.
- Monitor the watercourse regularly for signs of sedimentation and take corrective action if required (see section 3.5.2).

3.5 Protection of fish and fish habitat from other deleterious substances

3.5.1 Develop a prevention plan

- Do not allow the deposit of deleterious substances in any water body.
  - Develop a plan to prevent deleterious substances from entering a water body.
  - Maintain all machinery on site in a clean condition and free of fluid leaks.
  - Wash, refuel and service machinery in such a way as to prevent any deleterious substances from entering a water body.

3.5.2 Implement a response plan

- Implement a response plan immediately in the event of a spill of a deleterious substance (including sediment).
  - Stop all works, undertakings and activities.
  - Report spill immediately when a deleterious substance enters a water body.
  - Contain water with deleterious substances.
  - Clean-up and dispose of water contaminated with deleterious substances.
    - Use an emergency spill kit.

4.0 Glossary

Affected area: The area within which all of the proposed project impacts are likely to occur either directly (i.e., project footprint) or indirectly (i.e., downstream or other surrounding areas).

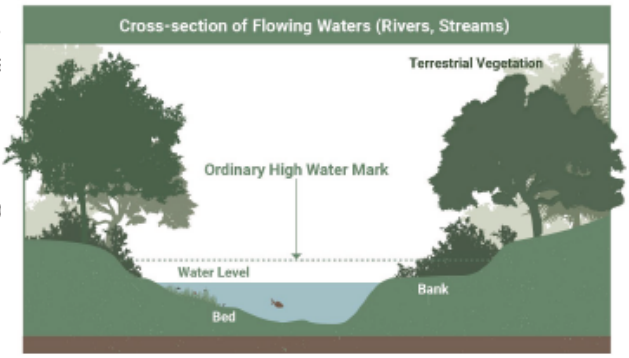
Aquatic species at risk: Any aquatic species listed under schedule 1 of the Species at Risk Act as endangered, threatened, or extirpated.

Deleterious substance: Any substance that, if added to water, would degrade, alter, or form part of a process of degradation/alteration to the quality of that water so that it is possibly rendered deleterious to fish, fish habitat, or to the human use of fish that frequent that water. For example: fuel, lubricants, paint, primers, rust, solvents, degreasers, antifreeze, uncured concrete, creosote, chlorinated water, herbicides, etc.

Harmful alteration, disruption or destruction (HADD): 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.

Ordinary high water mark: The usual or average level to which a body of water rises at its highest point and remains for sufficient time to change the characteristics of the land. In flowing waters (e.g., rivers, streams) this refers to the "active channel/bank-full level" which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body, bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (i.e., full supply level).

Ordinary High Water Mark



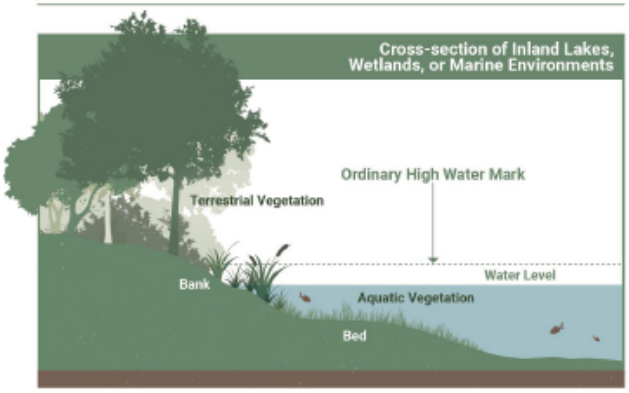
Riparian vegetation: Occurs adjacent to the water body and directly contributes to fish habitat by providing shade, cover and areas for spawning and food production.

Riparian zone: Area located between a water body's ordinary high water mark and upland area.

Qualified Environmental Professional (QEP): A person who is experienced in identifying and assessing potential impacts to fish and fish habitat generated from various works, undertakings or activities conducted in or near water, and implementing management measures to avoid and mitigate them. QEPs possess a post-secondary degree or diploma in biological, geophysical or environmental sciences and are often referred to as:

- aquatic biologist
- fisheries biologist
- fluvial geomorphologist
- applied scientist
- fisheries technician
- environmental consultant or
- natural resource consultant

Ordinary High Water Mark



Appendix 2 – DFO Code of Practice –Clear Span Bridges

Code of Practice

Fisheries and Oceans Canada | Pêches et Océans Canada

Clear Span Bridges

September 2022

1.0 About this code of practice

This code of practice outlines Fisheries and Oceans Canada (DFO)'s national best practices for temporary and permanent clear span bridges in freshwater. Temporary clear span bridges are typically employed for short term seasonal access by construction vehicles to the other side of a watercourse when an existing crossing is not available or practical to use. Permanent clear span bridges are typically small in scale and used for long term vehicle access across a watercourse. Clear span bridges are designed to completely span a watercourse without interfering with the channel bed and banks.

For the purposes of this code of practice, temporary and permanent clear span bridges include:

- the construction, maintenance and decommissioning of temporary clear span bridges
- the construction of permanent clear span bridges

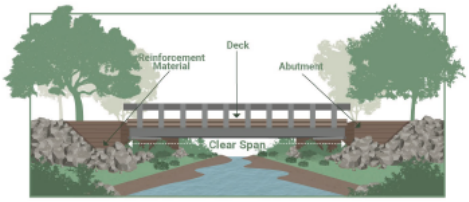
You can protect fish and fish habitat (including aquatic species at risk, their critical habitat and residences) when proceeding with a clear span bridge by following the measures listed below. When implemented correctly, this can mitigate risks to fish and fish habitat associated with clear span bridge, which can include:

- disturbance of watercourse beds and banks
- release of sediments or other deleterious substances
- loss of, or damage to, riparian vegetation

DFO is responsible for the conservation and protection of fish and fish habitat across Canada. Under the *Fisheries Act*, no one may carry out works, undertakings and activities that result in the harmful alteration, disruption or destruction (HADD) of fish habitat, or the death of fish, unless it has been authorized by DFO. DFO's approval under the *Species at Risk Act* is also required if an activity affects an aquatic species at risk, any part of its critical habitat or the residences of its individuals.

The purpose of this code of practice is to describe the conditions under which the code can be applied to your project and the measures you are required to implement in order to prevent harmful impacts to fish and fish habitat and avoid contravention of the *Fisheries Act* and the *Species at Risk Act*. If you cannot meet all of the conditions

Clear Span Bridge



and implement all of the applicable measures listed below, your project may result in a violation of the *Fisheries Act* and the *Species at Risk Act* and you could be subject to enforcement action.

If you are uncertain about whether this code of practice is applicable to your project, it is recommended that you consult our website or a qualified environmental professional to determine if other codes of practice should also be implemented, or if further review by DFO may be necessary. For any remaining questions, please contact the Fish and Fish Habitat Protection Program office located in your area. It remains your responsibility to comply with the *Fisheries Act* and the *Species at Risk Act*.

It is your duty to notify DFO if you have caused, or are about to cause, the unauthorized death of fish by means other than fishing/harmful alteration, disruption or destruction of fish habitat. Such notifications should be directed to the Fish and Fish Habitat Protection Program office located in your area.

This code of practice does not remove nor replace the obligation to comply with the requirements of any other federal, territorial, provincial or municipal regulatory agency including guidance regarding species and habitats managed by these jurisdictions.

It is good practice to notify nearby Indigenous communities of the works, undertakings and activities.

A project review by DFO is not required when the project activities meet the description in section 1 and the conditions in section 2, and when the measures to protect fish and fish habitat set out in section 3 of this code of practice are applied. Request a project review if your project does not meet all of these requirements.

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2.0 Conditions

The following conditions describe when this code of practice can be applied:

- You determine if there are aquatic species at risk within the affected area by consulting our aquatic species at risk map, and you confirm that the work does not take place within a riparian zone identified as part of the critical habitat of an aquatic species at risk. To do so, consult the recovery strategy (found on the Species at risk public registry) for each of the species identified.
- The work does not include:
  - realignment of the watercourse, dredging, grading or excavating the bed or banks of the watercourse
  - placement of fill or other temporary or permanent structures (e.g., scaffoldings, abutments, footings, rock) below the ordinary high water mark
  - installation of a temporary culvert
  - pile driving
- You implement the measures in section 3 to protect fish and fish habitat when carrying out the works, undertakings and activities.

As a condition of this code of practice, please submit a notification form (PDF, 50 KB) to your regional DFO office 10 working days before starting work. Notification forms will inform the continuous improvement of the codes of practice over time.

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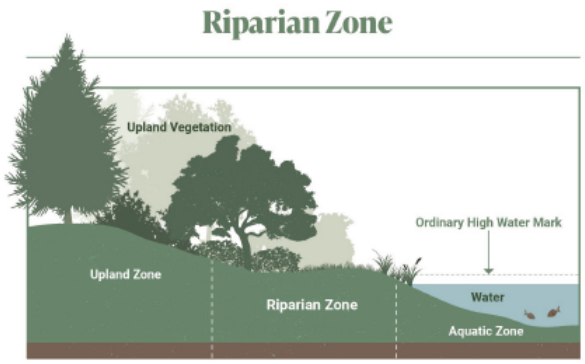
3.0 Measures to protect fish and fish habitat

3.1 Protection of the riparian zone

- Use existing trails, roads, access points or cut lines.
- Use methods to prevent 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.
- Re-vegetate the disturbed areas with native species suitable for the site.

3.2 Protection of aquatic habitat

- Locate temporary crossing site where the watercourse is straight, banks are stable and where approaches have low slopes.
- Operate vehicles and machinery in a manner that minimizes disturbance to the watercourse bed and banks.



3.3 Protection of fish and fish habitat from sediment

- Ensure approach grades are kept to a minimum.
- Install erosion and sediment control measures prior to the beginning of the works, undertakings and activities.
  - Develop and implement an erosion and sediment control plan to prevent the introduction of sediment into any water body during all phases of the works, undertakings and activities.
  - Inspect erosion and sediment control measures and structures regularly during all phases of the works, undertakings and activities.
  - Maintain the erosion and sediment control measures and structures regularly during all phases of the works, undertakings and activities.
  - Monitor the watercourse regularly for signs of sedimentation during all phases of the works, undertakings and activities and take corrective action if required.
  - Use biodegradable erosion and sediment control materials whenever possible.
  - Keep the erosion and sediment control measures in place until all disturbed ground has been stabilized.
  - Remove all erosion and sediment control materials (unless biodegradable) once site has been stabilized.
  - Dispose of, and stabilize, all excavated material on land in a designated area away from the ordinary high water mark of any water body.
- Remove temporary bridge crossing prior to the spring freshet, unless the crossing has been constructed above the annual spring high water level.

3.4 Protection of fish and fish habitat from other deleterious substances

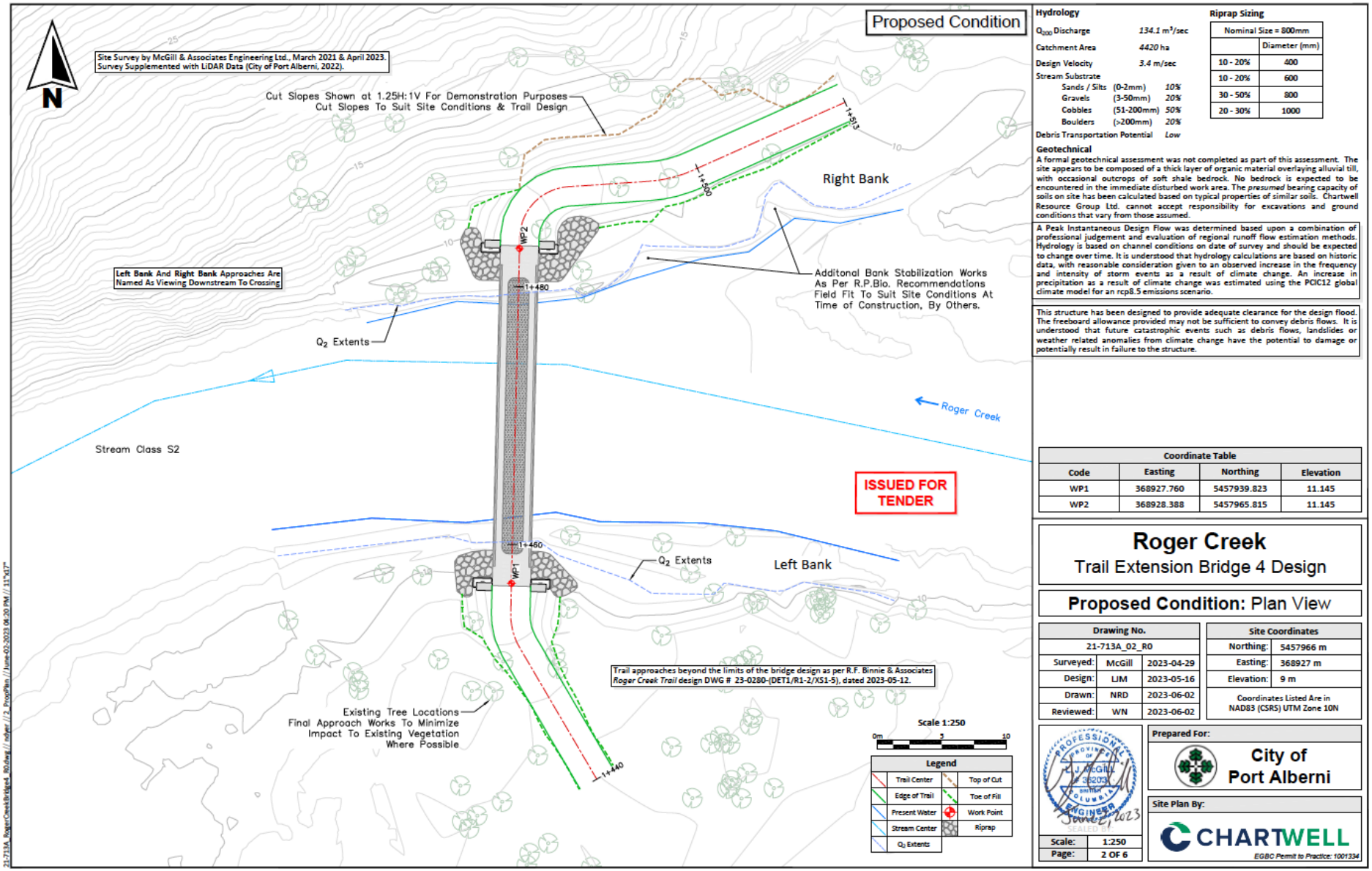
3.4.1 Develop a prevention plan

- Do not allow the deposit of deleterious substances in any water body.
  - Develop a plan to prevent deleterious substances from entering a water body.
  - Maintain all machinery on site in a clean condition and free of fluid leaks.
  - Wash, refuel and service machinery in such a way as to prevent any deleterious substances from entering a water body.
  - Store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering a water body.
  - Dispose of all waste materials on land in a designated area away from the ordinary high water mark of any water body.
- Design the bridge so that storm water runoff from the bridge deck, side slopes and approaches directly run off into a retention pond or vegetated area.

3.4.2 Implement a response plan

- Implement a response plan immediately in the event of a spill of a deleterious substance (including sediment).
  - Stop all works, undertakings and activities.
  - Report spill immediately when a deleterious substance enters a water body.
  - Contain water with deleterious substances.
  - Clean-up and dispose of water contaminated with deleterious substances.
    - Use an emergency spill kit.

Appendix 3 – Bridge plan (From Chartwell Plan 21-713A_02IFT_2023_06_02)



Hydrology

Q_{100} Discharge	134.1 m³/sec	
Catchment Area	4420 ha	
Design Velocity	3.4 m/sec	
Stream Substrate		
Sands / Silts	(0-2mm)	10%
Gravels	(3-50mm)	20%
Cobbles	(51-200mm)	50%
Boulders	(>200mm)	20%
Debris Transportation Potential		Low

Riprap Sizing

Nominal Size = 800mm	
	Diameter (mm)
10 - 20%	400
10 - 20%	600
30 - 50%	800
20 - 30%	1000

Geotechnical

A formal geotechnical assessment was not completed as part of this assessment. The site appears to be composed of a thick layer of organic material overlaying alluvial till, with occasional outcrops of soft shale bedrock. No bedrock is expected to be encountered in the immediate disturbed work area. The *presumed* bearing capacity of soils on site has been calculated based on typical properties of similar soils. Chartwell Resource Group Ltd. cannot accept responsibility for excavations and ground conditions that vary from those assumed.

A Peak Instantaneous Design Flow was determined based upon a combination of professional judgement and evaluation of regional runoff flow estimation methods. Hydrology is based on channel conditions on date of survey and should be expected to change over time. It is understood that hydrology calculations are based on historic data, with reasonable consideration given to an observed increase in the frequency and intensity of storm events as a result of climate change. An increase in precipitation as a result of climate change was estimated using the PCIC12 global climate model for an rcp8.5 emissions scenario.

This structure has been designed to provide adequate clearance for the design flood. The freeboard allowance provided may not be sufficient to convey debris flows. It is understood that future catastrophic events such as debris flows, landslides or weather related anomalies from climate change have the potential to damage or potentially result in failure to the structure.

Coordinate Table

Code	Easting	Northing	Elevation
WP1	368927.760	5457939.823	11.145
WP2	368928.388	5457965.815	11.145

Roger Creek
Trail Extension Bridge 4 Design
Proposed Condition: Plan View

Drawing No.		
21-713A_02_R0		
Surveyed:	McGill	2023-04-29
Design:	LJM	2023-05-16
Drawn:	NRD	2023-06-02
Reviewed:	WN	2023-06-02

Site Coordinates	
Northing:	5457966 m
Easting:	368927 m
Elevation:	9 m
Coordinates Listed Are in NAD83 (CSRS) UTM Zone 10N	

Scale:	1:250
Page:	2 OF 6

Prepared For: City of Port Alberni

Site Plan By: CHARTWELL
EGBC Permit to Practice: 1001334

Appendix 4 – Trail Plans Br3 to Br 4 (from Binnie Diag. 23-280 –Roger 70% Design)