

Approved Work Practices

FOR WATER CROSSING INSTALLATION,
MAINTENANCE AND DEACTIVATION



Canada



BChydro



FOR GENERATIONS

Table of Contents

Foreword	2
1.0 RATIONALE AND APPLICATION OF THE AWPWC	4
1.1. BC Hydro Requirements	4
1.2. Regulatory Agency Requirements	4
1.3. Intent	4
1.4. Application	5
1.5. Scope of the Work	5
1.6. Notification and Reporting Procedures	6
Figure 2: Notification Flowchart	7
2.0 SITE ASSESSMENT AND PROJECT PLANNING	7
2.1 Site Assessment	7
2.2 Location of Stream Crossing	8
2.3 Type of Stream Crossing	8
2.4 Design of Stream Crossings	10
2.4.1 General Design Guidelines	10
2.4.2 Culverts and Bridges	10
2.4.3 Ice Bridges and Snow Fills	10
2.4.4 Fords	11
2.4.5 Temporary Crossings	12
2.5 Permanent Deactivation of Water Crossings	12
3.0 OPERATIONAL MITIGATION MEASURES	12
3.1 Pre -Job Meeting	12
3.2 Standard Operating Procedures	12
3.3 Environmental Management Plans	12
3.4 Inspection and Monitoring	12
APPENDICES	14
Appendix A: Information and Reference Documents	14
References	14
Appendix B: Environmental Management Plan Guidelines	15
Appendix C: Glossary	16
Appendix D: Acronyms	20
Appendix E: Applicable BC Hydro Standard Operating Procedures	21

Foreword

BC Hydro recognizes the importance of protecting aquatic, marine and riparian ecosystems from adverse impacts related to the development and operation of their facilities and infrastructure, and is committed to ensuring the long-term sustainability of these critical habitats. The following document, called the Approved Work Practices for Water Crossing Installation, Maintenance, and Deactivation (AWPWC), was developed to ensure the protection and sustainability of the freshwater habitats associated with water crossings, while simultaneously streamlining the necessary regulatory agency activities related to these developments. The AWPWC represents a component (Appendix B) of the Protocol Agreement for Maintenance Work In and Around Water between BC Hydro, the Province of B.C. and Fisheries and Oceans Canada. Specifically, the AWPWC describes and references the work practices and regulatory processes associated with installation, upgrades, maintenance, and deactivation of water crossings on BC Hydro access roads, tracks, and trails in the province of British Columbia.

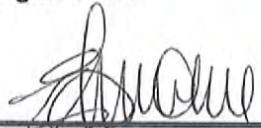
The main agreements of the AWPWC are that:

- This Approved Work Practice document serves as an agreement between BC Hydro, and the Province of B.C., to allow BC Hydro to conduct water crossing works as described herein under the *Fish-stream Crossing Guidebook* (2012 edition);
- BC Hydro agrees to apply the work practices as described and referenced in this document while installing, upgrading, maintaining and deactivating water crossings on their access roads in freshwater environments;
- The Province of B.C. agrees that proposed works, undertakings or activities that are fully consistent with the AWPWC, do not require individual review and Approval under the *Fisheries Act* and *Water Act*, respectively. Notifications pursuant to the *Water Act* will continue to be made for information purposes and future monitoring only;
- Work proposed, which is not fully consistent with the AWPWC, may be subject to review and may require Approvals, submission of Notification, Letters of Advice, or Authorization; and
- This agreement shall be reviewed upon any significant changes to applicable regulatory policy or legislation affecting resource road development.



FOR GENERATIONS


Signatories:



Edie Thorne
Director
Environmental Risk Management
BC Hydro

DEC 22/2014

Date



Tom Ethier
Assistant Deputy Minister
Resource Stewardship Division
Ministry of Forests, Lands and Natural Resource
Operations

DEC 01 2014

Date

1.0 RATIONALE AND APPLICATION OF THE AWPWC

1.1. BC Hydro Requirements

BC Hydro is responsible, through the *BC Utilities Commission Act*, for providing a reliable supply of electricity to customers throughout the province while ensuring public and worker safety. The authority of BC Hydro to conduct its business is derived from the *Hydro and Power Authority Act*, and land tenure is granted through various property rights instruments including those issued under the *Land Act* and the *Land Title Act*. The applicable sections of the *Hydro Act* include sections 20 and 32. BC Hydro builds and maintains access in order to operate the provincial generation, transmission and distribution infrastructure. The access roads, tracks and trails allow BC Hydro to perform operational duties and respond to emergencies on and around their assets and facilities. For the purposes of electrical generation, transmission and distribution, fish and wildlife habitat work, public safety and recreation management, BC Hydro performs the following activities in or about streams (the Work):

- Install or upgrade stream crossings;
- Maintain and replace (as required) existing stream crossings;
- Deactivate stream crossings that are no longer required; and
- Emergency works.

BC Hydro performs the Work at hundreds of water crossings associated with their network of roadways (11,000+ kilometres) each year. These stream crossings occur on roads, tracks and trails that lead to, along and through existing Rights of Way, industrial areas, recreational sites and hydroelectric facilities and other infrastructure operated and maintained by BC Hydro. At times, the Work is also conducted on roads leading to Rights of Way where BC Hydro works cooperatively with forest tenure holders, private forest companies and landowners in cost-share arrangements.

1.2. Regulatory Agency Requirements

DFO is the regulatory body responsible for the protection of fisheries resources across Canada. According to the terms of the federal *Fisheries Act*: No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery (Section 35 (1)), unless authorized by the Minister (Section 35 (2)(b)), and no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish (Section 36(3)), unless so authorized under regulations established by the Minister. In addition, the *Fisheries Act* legislates the protection of fish migration during construction and operation of barriers (dams, culverts etc.) to fish passage (Sections 22 (1) and (2)).

Ownership of water and most lake and stream beds is vested in the Province of B.C. The Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) regulates changes in and about a stream under Section 9 of the *Water Act* to protect values, resources and legal rights associated with waterbodies in British Columbia. Part 7 of the *Water Act* regulation ensures that water quality, fish and wildlife habitat, and the rights of licensed water users are not compromised. Section 44 identifies specific activities that may be carried out under the approval and notification processes.

1.3. Intent

The intent of the AWPWC is to mitigate potential impacts of the Work on fish and fish habitat, and to streamline regulatory activities associated with water crossing works that are deemed routine and low impact. As indicated above, BC Hydro must perform the Work at hundreds of water crossings associated with their network of roadways each year. Currently, Notifications must go through Front Counter BC. To reduce an otherwise impractical and continual volume of notifications, BC Hydro will commit to applying the AWPWC measures and notification procedures contained herein.

1.4. Application

The AWPWC applies to BC Hydro's Work on water crossings in freshwater systems in the Province of British Columbia and serves as an agreement between the signatory partners to allow BC Hydro to conduct the Work (as described in Section 1.1) according to the conditions and measures outlined in the *Fish-stream Crossing Guidebook* (FSCG; 2012 edition), other than the exceptions noted in the sections below. This guidebook is endorsed by both the provincial and federal regulatory agencies.

By adopting the standards and guidelines outlined in the FSCG as well as those described herein, the Work carried out under the AWPWC will constitute accepted practice and comply with the regulations of the provincial *Water Act* and federal *Fisheries Act*. The AWPWC will also allow BC Hydro to proceed with the Work without the requirement for formal review or authorization by DFO or MFLNRO provided the conditions defined within this document are met. This agreement shall be in force from the date of signatory approval and shall be reviewed upon any significant changes to regulatory policy or legislation applicable to resource road legislation.

This AWP does not release BC Hydro from the responsibility to comply with any other legislation (e.g., the provincial *Wildlife Act*, and federal *Species at Risk Act* and *Navigable Waters Protection Act*) that may apply to the Work being carried out. If the conditions of this AWP cannot be followed, BC Hydro will follow the conventional Approval/Notification and project review procedures for all applicable regulating bodies.

Consistent with the *Protocol Agreement for Work In and Around Water*, BC Hydro, DFO and MFLNRO agree to review the results of AWPWC application at the Governance Management Committee meeting, to assess compliance and effectiveness in achieving the regulatory requirements related to the *Fisheries Act* and *Water Act*, and the workability of the approved practices for accomplishing the required works by BC Hydro. This meeting will also provide the context to consider any adjustments to the AWP that may be necessary to ensure compliance and effective implementation. Regional meetings, to be coordinated by BC Hydro, will be conducted every other year as per the *Protocol Agreement*, or as-needed based on interest indicated by the regulatory agencies. The purpose of the regional meetings would be to review monitoring and post-construction reports of previous years' Work, and review planned future Work as available.

1.5. Scope of the Work

The work activities under the AWPWC include the installation, upgrade, maintenance, and deactivation of water crossings on BC Hydro access roads, tracks, and trails in the province of BC. This AWP applies to the following stream crossing structures and ancillary works as described in the FSCG:

1. Open-bottom structures (i.e., Bridges and Open-bottom culverts);
2. Embedded closed-bottom structures (i.e., Corrugated pipe);
3. Ice bridges and snow fills; and,
4. Stream protection measures (e.g., Erosion and Sediment Control)

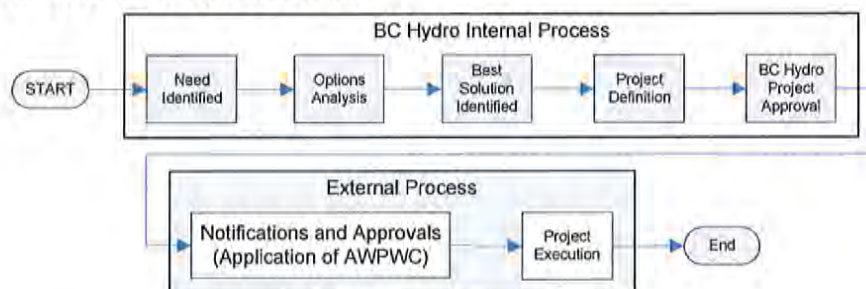
Additional stream crossing types under this AWP which are specific to BC Hydro access requirements, but are not prescribed in the FSCG include:

5. Fords (i.e., Constructed, Modified, or One-time Use for construction/deactivation of crossing structures)
6. Temporary crossings (e.g., for stream channels that are seasonally dry or frozen to the bottom)

Note: Erosion control or other civil works that are not associated with water crossings (such as debris deflectors for electrical structures) are not included in the scope of Work under the AWPWC.

A typical project lifecycle flow is shown in Figure 1. This flow diagram is included for reference on how proposed works are implemented, and at what stage of a project this AWP would apply.

Figure 1: Typical Project Lifecycle Flowchart



1.6. Pre Work Notification and Reporting Procedures

BC Hydro agrees to follow these notification procedures for the Work under this AWP:

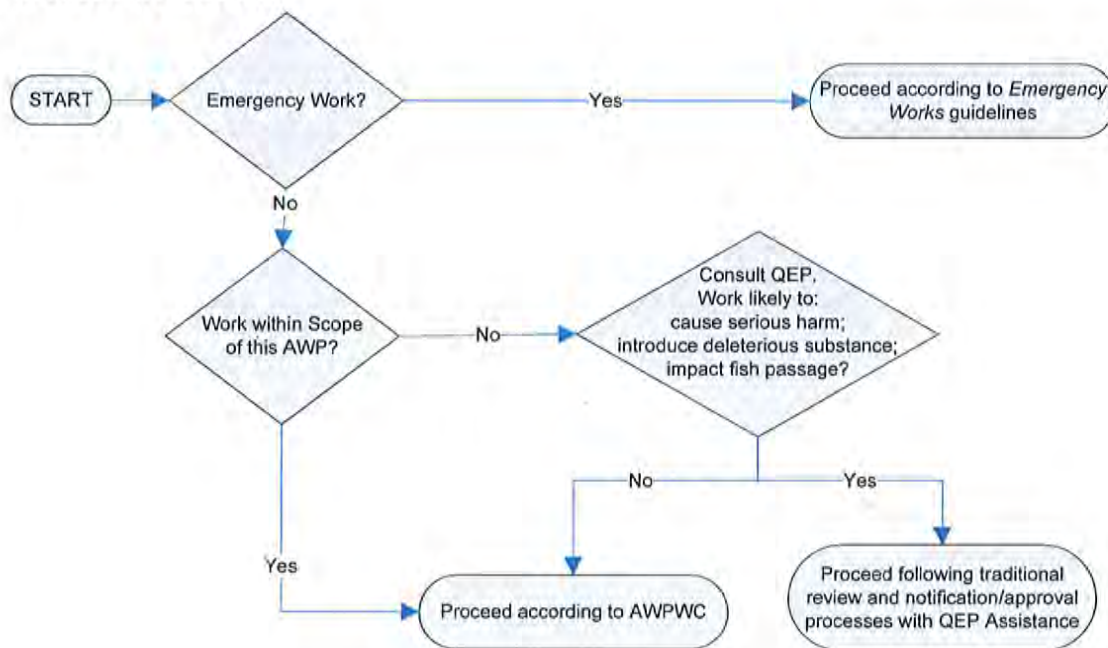
- Notification of individual water crossings will not be required for Works completed consistent with the FSCG or the approved work practices described and referenced herein.
- For instream works on fish-bearing streams or Community Watersheds (as defined in the FSCG and Bill 18-1995 *Forest Practices Code of B.C. Amendment Act* (June 1995), BC Hydro will consult a qualified environmental professional (QEP) to determine if the project is likely to cause serious harm to fish, cause a material adverse effect on fish passage, or introduce any substance that is harmful to fish or human health. If so, the work may require review and approval by the agencies (see Non-Compliance Review Process, below). If not, work may proceed without further notification to DFO and, as per Section 3.3.1 of the FSCG, notification through FrontCounter BC will not be required;
- For annual workplan projects, including crossing type and locations known at the start of the year that involve low risk or routine work activities, a single blanket Notification¹ will be sent to the FLNRO Ecosystems Section Head for each region across the Province.
- For work on streams that are non-fish bearing and not within a Community Watershed, dry, or frozen to the bottom during the construction or maintenance period, additional individual Notifications will not be required.
- For Type 1 and Type 2 Emergencies, Work will be conducted according to the B.C. Ministry of Environment *Specific Standards and Best Practices: Emergency Works* as per the *British Columbia Water Regulation* (Section 44 (o & p)). During an emergency, BC Hydro takes all measures necessary to repair or safeguard its power infrastructure as soon as possible. Wherever feasible, BC Hydro will incorporate into the emergency work methodology practices that are consistent with this AWP. For emergency works, BC Hydro will notify the nearest regional MFLNRO office and
 - a. Determine whether serious harm will occur;
 - b. If not, no notification to DFO required, whether emergency or not.
 - c. If likely, recommend at minimum, a notification via email or verbal discussion. This would be directed at the Triage & Planning Unit; Helpline 1-866-845-6776 or ReferralsPacific@dfo-mpo.gc.ca

¹ The blanket notification will include a list of crossing locations including stream names, crossing coordinates, and type and size of crossing proposed (e.g., 800 mm closed bottom metal culvert, clear span bridge and whether embedded culverts will be used).

Non-Conformity Review Process

During the Project Definition phase (see Figure 1), BC Hydro will evaluate whether the Work will apply within the scope of this AWP based on the process summarized in Figure 2 and sections 1.3 and 3.3 of the FSCG. If the conditions of this AWP or the FSCG cannot be followed, or the project is likely to cause serious harm to fish, cause a material adverse effect on fish passage, or introduce any substance that is harmful to fish or human health, BC Hydro shall conform to the traditional project review and approval process established by DFO and MFLNRO.

Figure 2: Notification Flowchart



2.0 SITE ASSESSMENT AND PROJECT PLANNING

2.1 Site Assessment

As per the FSCG, a Qualified Registered Professional (QRP) will be responsible for planning Work that involves installation or replacement of stream crossing structures. During the project planning phase, the QRP will: i) conduct a Site Assessment to confirm whether the Work can be done in accordance with the AWPWC; ii) determine if the site is fish-bearing² and evaluate the fish habitat at the crossing location (as per Section 3.1 of the FSCG); iii) determine whether or not the site is within a Community Watershed; iv) assess the potential for use of the road and crossing structure by the public; and v) determine if there are any potential adverse impacts to aboriginal rights and title that will trigger the duty to consult with First Nations. This information will be used to decide which form of Notification is required (Figure 2), which

² See definition of Fish Stream in Appendix C: Glossary. Fish-bearing status will be determined by a QRP using standard stream classification criteria that include: fish presence, stream gradient, connectivity to known fish-bearing waters, and the absence or occurrence of barriers to fish passage.

type of crossing structure is best-suited or required at the crossing site, or if a different location must be identified (Figure 3).

In cases where the fish-bearing status of a watercourse cannot be determined according to the criteria in the FSCG, the stream will be considered fish-bearing for the purposes of the crossing site assessment and project planning.

2.2 Location of Stream Crossing

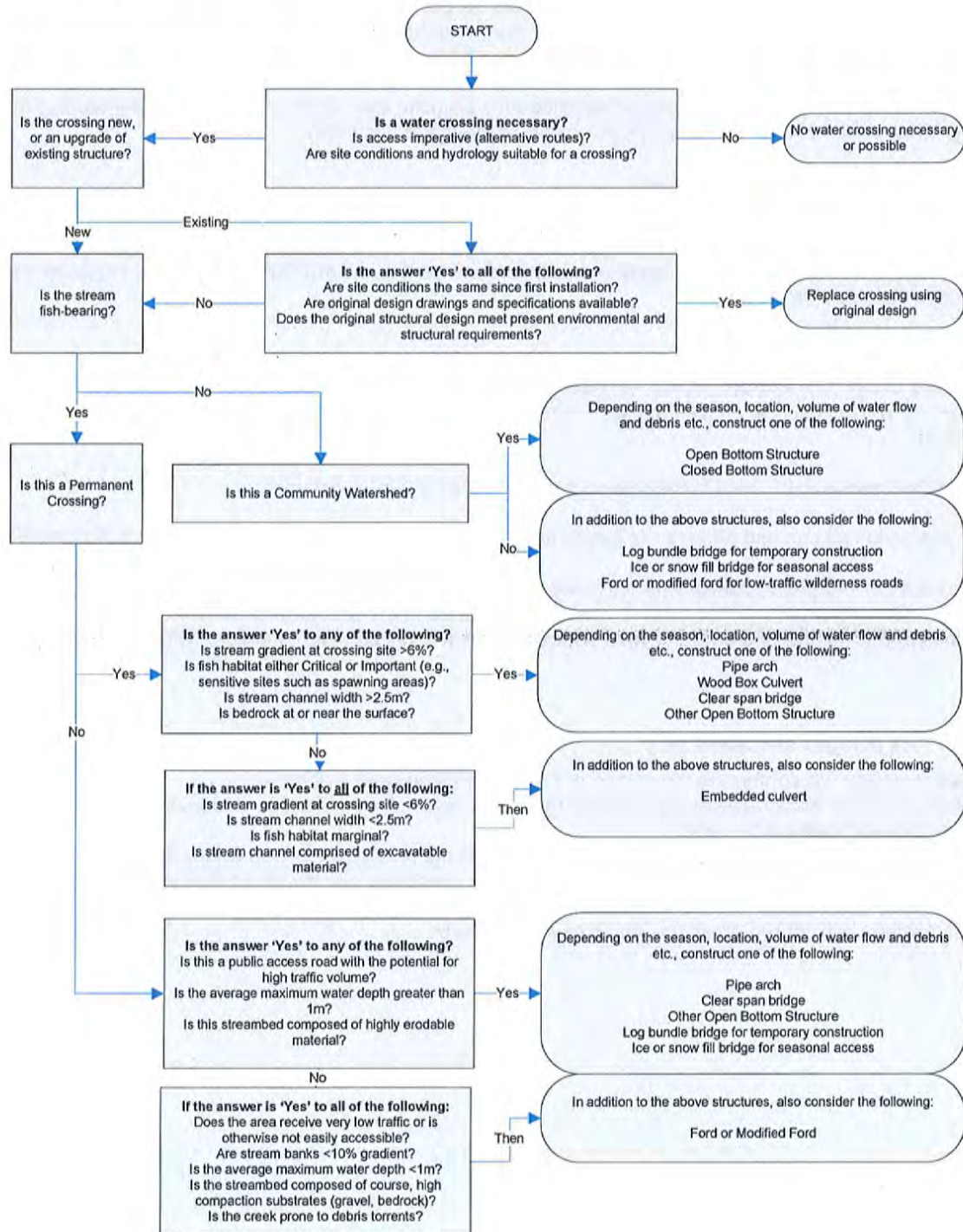
Appropriate siting of a new or replacement water crossing is critical to ensuring compliance with legislation and minimizing impacts to the environment. In order to determine a site that meets the criteria included in the FSCG and provides the access that BC Hydro requires, a site assessment will be completed in advance of the Work at prospective locations.

During the site assessment and, if required, additional site surveys, the QRP will assess whether the proposed crossing location is appropriate according to the criteria in the FSCG, or whether a new location must be identified. Factors that will be considered in this evaluation include fish presence and habitat type (i.e., Marginal, Important, or Critical as defined in the FSCG) at the crossing site, as well as upstream and downstream of the proposed location; occurrence of any species-at-risk or their critical habitats; possible impacts to a Community Watershed; potential adverse impacts to aboriginal rights and title; previous disturbances; existing channel morphology and flow regimes; safe passage of vehicles; the ability to access, repair and maintain the works with minimal impact; and specific design considerations for the type of structure being considered.

2.3 Type of Stream Crossing

Selection of the most appropriate type of crossing structure is also critical to ensuring compliance with legislation and minimizing impacts to the environment. The QRP will use the sequential approach presented in Figure 3 as a process to determine the need for and type of crossing. This approach incorporates the criteria from the decision-making matrix (Section 3.2) in the FSCG. For fish-bearing streams, instream works will take place during the appropriate fisheries timing windows (refer to Appendix A).

Figure 3: Flow Chart to Determine Type of Water Crossing Structure



2.4 Design of Stream Crossings

A QRP familiar with this AWPWC will have the responsibility for overseeing the new design of stream crossings. Designs shall comply with the current and applicable standards and specifications as included in the *Forest Road Engineering Guidebook*, and where applicable the FSCG and the *Guidelines for Professional Services in the Forest Sector – Crossings* (refer to Appendix A). For most permanent access routes the minimum road design standard will accommodate a BCL-625 truck. Larger design vehicles may be used as required. For permanent routes, the preferred structures are those made of long-life materials (for example steel and concrete).

2.4.1 General Design Guidelines

1. Existing crossing locations should be used wherever appropriate (where bank, substrate and road alignment conditions are suitable), in order to minimize impact to riparian vegetation and bank stability;
2. Consider the retention of riparian vegetation in the design, and avoid grubbing vegetation in riparian areas;
3. Use inert and clean materials.

2.4.2 Culverts and Bridges

1. Crossing design will conform to the *Guidelines for Professional Services in the Forest Sector – Crossings*, the *Forest Road Engineering Guidebook*, and where applicable the *Fish Stream Crossing Guidebook* (sections 4.1 and 4.2).
2. Where concrete is to be used in the design, pre-cast structures are preferred;
3. The design of culverts and bridges will satisfy the peak flow requirements outlined in Section 4 of the FSCG.
4. All culverts or bridges installed on a fish bearing stream must ensure fish passage is not impeded. If a closed-bottom culvert is proposed, the culvert must be embedded into the stream substrate to facilitate fish passage as outlined in Section 4.2 of the FSCG or an alternate structure will be used to ensure fish passage.

2.4.3 Ice Bridges and Snow Fills

1. Crossing design will conform to the criteria in the FSCG (sections 4.3 and 4.4);
2. Crossings will be constructed only of clean (ambient) water, ice and snow; materials such as gravel, rock and woody material shall not be used;
3. Snow fills will be constructed in such a way that they will not restrict water flow at any time;
4. The Work shall not include realigning the watercourse, dredging, placing fill, or grading or excavating the bed or bank of the watercourse;
5. The crossing shall not run along the length of a water body.

2.4.4 Fords

The use of constructed fords, have the potential for environmental impacts if this type of crossing is improperly sited, poorly designed, or crossed too frequently. However, in the case of BC Hydro's access routes, there are some specific contexts (low-volume roads at crossing sites with marginal instream habitat or seasonally dry channels) where fords may be the lowest impact alternative and most cost-effective means for crossing a stream. In order for this type of crossing to be considered, the following key siting, design and use criteria must be met to minimize the potential for impacts to the aquatic environment:

1. Installation of fords shall only occur on low-volume roads, tracks and trails that are maintained in a Semi-Permanent Deactivated state (see Appendix C: Glossary for definitions);
2. Where BC Hydro requires higher levels of traffic over a crossing, or anticipates frequent use by the public based on professional judgement or proximity of the site to populated areas, a different crossing structure will be installed according to the criteria in Figure 3;
3. Fords will not be constructed at sites where there is a water licence immediately downstream of the crossing;
4. For fish-bearing streams, fords may only be sited in Marginal habitats as defined in the FSCG and assessed by a QRP, or channels that are seasonally dry; Sensitive sites such as spawning areas must be avoided or crossed using an appropriate open-bottom structure;
5. Construct and use fords during the driest periods of the year to avoid unnecessary disturbance of the channel or suspension of sediments. An exception to this may be for emergency use by BC Hydro (e.g., during the winter storm season) for maintaining its infrastructure;
6. Retain the natural streambed elevation at the crossing site to ensure the maintenance of fish passage over the ford;
7. Fords shall allow the passage of natural channel debris and accommodate 1 in 10 year flows without the loss of the ford or impacts from the crossing on the stream, for the duration of the period the ford is in place;
8. Rock armouring of fords shall be designed and implemented so that the constructed crossing is self-maintaining and stable;
9. Locate crossings at straight sections of the stream with low gradient, stable banks. Avoid crossing on meander bends, braided streams, alluvial fans or any other areas that are unstable and may result in erosion and scouring of the stream bed. Do not site fords through marshes or low compaction substrates;
10. Where necessary for controlling run-off water from the road, as determined by a QRP during the project design phase, each approach to the ford must have a rolling dip or cross ditch to divert any water that may otherwise enter the stream from the road. Dips or cross ditches should drain into dense vegetation or filter strips;
11. Align the approaches and crossing perpendicular to the channel and where the streambed is at or near its shallowest;
12. The crossing must be designed for one-lane traffic width (5m);
13. Select a crossing site with coarse streambed and bank materials (e.g., gravel, solid rock outcroppings) to limit the suspension of sediments, limit substrate compaction and adequately bear the weight of the intended traffic. If bank soils or instream substrates are highly erodible and cannot be adequately stabilized, use an alternate crossing method or location;
14. In cases where a road does not previously exist, select a site with early stage or shrub and grass riparian vegetation where practicable to minimize the amount of riparian clearing necessary. Avoid thick riparian canopies and mature growth;
15. Vehicles and machinery crossing the ford on BC Hydro-related business must be clean, well maintained, and free of fluid, oil, and grease leaks or other contaminants.

Note: It is important to clarify that there is a key difference between fording a stream for construction or other purposes (as per sections 4.5 and 5.5 of the FSCG), and a constructed ford (as defined above). The application of constructed fords in this AWPWC is specific to where established roads cross bodies of water, and is distinct from the one-time fording of streams for crossing construction or deactivation purposes as defined in the FSCG.

2.4.5 Temporary Crossings

In some cases, BC Hydro's access requirements may be short-term and timing may be flexible to accommodate seasonal periods when a stream channel is dry or frozen to the bottom. This may be the case for specific activities such as occasional structure maintenance or civil protective works, etc. In these cases, the frozen or dry conditions would preclude fish presence and water quality considerations during the period of use. As such, snow fills (as per section 4.3 of the FSCG), or temporary fords (as per sections 4.5 and 5.5) would be the most likely crossing types selected in these circumstances. Once access is no longer required, and before seasonal thaw or the return of stream flows, the temporary crossing will be removed and pre-access site conditions will be restored.

2.5 Permanent Deactivation of Water Crossings

The objectives of stream crossing deactivation are i) to return the crossing site to a stable state, and ii) to prevent unauthorized access. As with installation and maintenance activities, removal of an existing crossing must be completed in a manner that prevents serious harm to fish and their habitats, impacts to fish passage, or the introduction of deleterious substances into the watercourse. As such, deactivation activities will conform to industry technical standards including the *Forest Road Engineering Guidebook* and the FSCG. Additionally, the QRP responsible for the Work will follow environmental best practices as appropriate, to ensure that removal works are undertaken in a manner that minimizes impact and returns the area to pre-disturbance conditions. This will include practices such as restoring the stream banks to their natural contours and re-planting or seeding to stabilize disturbed areas. Note that roads which are in a state of Semi-Permanent Deactivation may still have active water crossing structures on them.

3.0 OPERATIONAL MITIGATION MEASURES

3.1 Pre -Job Meeting

Prior to any Work occurring under the AWPWC, the QRP and the contractor hired by BC Hydro shall hold a Pre-Job Meeting. The occurrence of and details discussed at this meeting shall be documented and kept in the project files. At the meeting the QRP will review all the Work prescriptions and designs, as well as the Standard Operating Procedures and, where applicable, the Environmental Management Plan for the Work.

3.2 Standard Operating Procedures

BC Hydro will implement and maintain Standard Operating Procedures (SOPs) that cover the operational mitigation measures associated with the Work (Appendix E). The relevant SOPs provide direction about environmental responsibility; emergency preparedness and response; road construction, maintenance and deactivation; rainfall shutdown; managing petroleum and chemical products; fire preparedness; and, general rights of way. These SOPs shall apply to all Work conducted under this AWPWC, and shall be available to managers, QRPs responsible for site assessment and project planning, as well as employees, contractors and subcontractors performing the Work.

3.3 Environmental Management Plans

In addition to the SOPs, a site-specific Environmental Management Plan (EMP) shall be prepared when the Work requires in-stream operations on fish-bearing streams or within a Community Watershed. Refer to Appendix B for guidelines on the content of Environmental Management Plans. A QEP will be responsible for developing Environmental Management Plans.

3.4 Inspection and Monitoring

Construction monitoring under the AWPWC will be coordinated by the QRP responsible. For Work conducted under only the SOPs (i.e., for non-fish bearing streams outside of a Community Watershed), much of the construction monitoring will be completed during final contract inspections, as the construction contracts will typically include many activities other

than the Work under this AWPWC. Additional specific monitoring and/or assessment of in-stream Work on fish-bearing streams or within a Community Watershed shall be documented in the EMP.

For works under an EMP, a QEP will be present at the work site for the critical stages of the work, including but not limited to:

- The pre-work meeting with the contractor
- Initial monitoring of the works, including any water diversions or fish salvage
- Installation of any in-stream structures
- Any works involving uncured concrete;
- Final inspection of works prior to machinery departing the project site

Following construction, upgrade, or maintenance, the crossing structures will be monitored according to existing inspection practices. Most of the crossings for BC Hydro's access routes are associated with low-use roads. Currently, crossings are inspected at an overview level during routine transmission/distribution line and vegetation maintenance inspections. Further detailed inspections are completed either as a result of deficiencies noted during an overview inspection, as part of an access assessment for specific projects, or for engineered structures on a 5-year cycle.

APPENDICES

Appendix A: Information and Reference Documents

Information

Approved Work Practice for Riparian Vegetation, DFO, MOE, BCTC and BCH, 2002

Environmental Best Management Practices, unpublished internal documents, BCH, 2009.

Protocol Agreement for Maintenance Work In and Around Water, DFO, MOE, BCTC and BCH, 2009.

Transmission Maintenance Standards, Access Roads, unpublished internal documents, BC Hydro, 2012.

Regional Fisheries Timing Windows (Refer to links below for detailed information):

- Cariboo Region: http://www.env.gov.bc.ca/wsd/regions/car/wateract/terms_conditions_car.pdf
- Kootenay Region: http://www.env.gov.bc.ca/wsd/regions/kor/wateract/least_risk_kor.pdf
- Lower Mainland Region: http://www.env.gov.bc.ca/wsd/regions/sry/wateract/work_windows_sry.pdf
- Okanagan Region: <http://www.env.gov.bc.ca/wsd/regions/okr/wateract/workwindows.html>
- Omineca Region: http://www.env.gov.bc.ca/wsd/regions/omr/wateract/omineca_water_act_terms_conditions.pdf
- Peace Region: http://www.env.gov.bc.ca/wsd/regions/nor/wateract/terms_conditions_per.pdf
- Skeena Region: http://www.env.gov.bc.ca/wsd/regions/ske/wateract/work_windows_measures_030205.pdf
- Thompson Region: http://www.env.gov.bc.ca/wsd/regions/thr/wateract/work_windows_jan17_2007.pdf
- Vancouver Island Region: http://www.env.gov.bc.ca/wsd/regions/vir/wateract/terms_conditions_vir.pdf

References

Emergency Works according to the British Columbia Water Act Regulation (Subsections 44 (o & p)), MOE.

Erosion and Sediment Control Practices for Forest Roads and Stream Crossings, FP Innovations, Vancouver, 2007.

B.C. Ministry of Forests, Lands and Natural Resource Operations, B.C. Ministry of Environment, and Fisheries and Oceans Canada, 2012. *Fish-stream crossing guidebook*. Rev. ed. For. Prac. Invest. Br. Victoria, B.C.

Fisheries Act, Canada

Forest Road Engineering Guidebook, BC Ministry of Forests, 2002.

Guidelines for Professional Services in the Forest Sector-Crossings, Association of BC Forest Professionals and Association of Professional Engineers and Geoscientists of BC, 2008.

Hydro and Power Authority Act, British Columbia

Land Act, British Columbia

Utilities Commission Act, British Columbia

Water Act, British Columbia

Appendix B: Environmental Management Plan Guidelines

The following guideline is intended to aid in the preparation of an Environmental Management Plan (EMP) specific to the Work. The EMP is to be prepared by a Qualified Environmental Professional (QEP) who is familiar with the work location. The contents of the EMP will vary depending on scope of work and specific habitat conditions. The EMP will be generally consistent with the following layout:

1.0 Introduction

- 1.1. Project Background and Description of Work
- 1.2. Purpose of the EMP

2.0 Description of Work

- 2.1. Work Procedures
- 2.2. Access

3.0 Environmental Responsibilities

- 3.1. General
- 3.2. Summary of Responsibilities
- 3.3. Permits, Approvals and Contracts
- 3.4. Environmental Monitoring
- 3.5. Forest Fire Prevention

4.0 Valued Ecosystem Components

- 4.1. Fisheries Resources
- 4.2. Vegetation and Wildlife
- 4.3. Socio-economic Resources
- 4.4. Archaeological and Heritage Resources

5.0 Potential Environmental Impacts and Mitigation Measures

- 5.1. Timing of in-stream works, and reduced-risk work windows
- 5.2. Access to Sites near Streams/Wetlands
- 5.3. Material Storage and Waste Disposal
- 5.4. Operation of Heavy Equipment During Construction
- 5.5. Site Restoration Following Completion of Work

Appendices

- Environmental Incident Reporting
- Job Details/Drawings
- Standard Operating Procedures applicable to Job
- Other appendices as appropriate

The QRP and Project Manager (if separate) will ensure all appropriate project personnel review and confirm their understanding of the EMP. Post-construction monitoring requirements will be outlined in the EMP based on site sensitivity and type of crossing.

Appendix C: Glossary

BCL-625 truck is the standard design vehicle for highway roads and bridges in British Columbia, as defined in the *Bridge Standards and Procedures Manual, Supplement to Canadian Highway Bridge Design Guide, S6-06*, Section 3, BC Ministry of Transportation, 2007.

Bridge is a temporary or permanent Open Bottom Structure carrying a road above a stream or other opening.

Clear Span Bridge is a bridge that is designed in such a way that all parts of the structure and abutments are located outside of the High Water Mark of the stream.

Closed Bottom Structure is a stream crossing structure that encloses the bed of the stream (such as a metal or plastic pipe, or concrete box). The opposite of an Open Bottom Structure.

Community Watershed (as defined in Bill 18-1995 *Forest Practices Code of B.C. Amendment Act* (June 1995) which amends section 41(8) of *Bill 40*, is:

the drainage area above the most downstream point of diversion on a stream for a water use that is for human consumption and that is licensed under the Water Act for:

- (i) a waterworks purpose, or
- (ii) a domestic purpose if the licence is held by or is subject to the control of a water users' community incorporated under the Water Act

if the drainage area is not more than 500 km² and the water licence was issued before June 15, 1995.

Composite bridge is one where a deck and girders are intimately connected such that they act as a unit to support the design load. These complex structures require a greater level of technical knowledge with respect to design and installation. Other structures included in this category are those with components that do not act independently of each other, such as concrete slab or box girders with welded or grouted shear connectors, or structures requiring field welding during installation.

Critical Habitat: Habitat that is critical in sustaining a subsistence, commercial, or recreational fishery, or any species at risk (i.e., terrestrial or aquatic red- and blue-listed species, those designated by the Committee on the Status of Endangered Wildlife in Canada, or those SARA-listed species), or because of its relative rareness, productivity, and (or) sensitivity (as defined in the *Fish-stream crossing guidebook* (2012)).

Culvert is a transverse drain pipe or log structure covered with soil and lying below the road surface. Culverts are usually Closed Bottom Structures; however, Pipe Arch Culverts and Wood Box Culverts are Open Bottom Structures.

Deactivation can be used in the context of Water Crossing Deactivation or road deactivation. Water Crossing Deactivation is defined in section 2.5 of the AWPWC, and road deactivation may fall into these categories:

Temporary Deactivation (also Seasonal Deactivation): is the installation of cross-drains on the surface of a permanent road during wet seasons and/or for times when the road is only going to be used for low-volume traffic for a period of up to three years, to protect the running surface of the road from erosion. Culverts, bridges and other point features on the road are left intact.

Semi-Permanent Deactivation: is applied to a permanent road to make it self-maintaining insofar as is possible. It is prescribed for roads where only light traffic is expected, and which may be remote or isolated in some way from the public road network. In addition to the work done for Temporary Deactivation, drainage culverts that are

at risk of overtopping or becoming blocked may either be replaced with water bars, or have swales cut over the top of them to take peak flow. Typically major crossing structures are left in place if their condition allows it, else they are removed and either blocked or replaced with fords. Additionally, roads in this state may become overgrown. Roads in this state may also be designated by the Ministry of Forests as 'Wilderness Roads'.

Permanent Deactivation: is the total removal of the road, including all crossing and drainage structures, and in some cases the re-contouring of the ground to its original state. Permanent Deactivation of a road implies the permanent deactivation of the water crossings.

Distribution is the portion of BC Hydro's business that includes the maintenance of the lower voltage circuits that electrically connect substations to residential and smaller commercial customers. On the BC Hydro system, this includes line voltages of 35kV and below.

Embedded Culvert is placed in a fish stream to continue to provide natural streambed habitat value. It is placed on a low gradient with the bottom just below the gradient of the channel, and partially filled with channel bed material.

Emergency Works are those works that fall under one of the two following categories:

Type 1 emergencies are situations that require immediate attention during a flood event or as designated under the Provincial Emergency Program. These situations have caused, or present in the immediate future (i.e. within 24 hours), a high potential danger to human life, significant damage to property, or significant adverse impacts to fish or wildlife populations or their habitats. *Specific Standards and Best Practices: Emergency Works.*

Type 2 emergencies are situations that require attention in the near future, immediately prior to the next flood event. These situations would present a high potential danger to human life, significant damage to property, or significant adverse impacts to fish or wildlife populations or their habitats if not addressed immediately prior to the next flood event. *Specific Standards and Best Practices: Emergency Works.*

Fish Stream (as defined in the Fish-stream Crossing Guidebook) is a watercourse that:

- a. is frequented by any of the following species of fish:
 - (i) anadromous salmonids;
 - (ii) rainbow trout, cutthroat trout, brown trout, bull trout, Dolly Varden char, lake trout, brook trout, kokanee, largemouth bass, smallmouth bass, mountain whitefish, lake whitefish, arctic grayling, burbot, white sturgeon, black crappie, yellow perch, walleye or northern pike;
 - (iii) a species identified as a species at risk;
 - (iv) a species identified as regionally important wildlife, or
- b. has a slope gradient of less than 20%, unless the watercourse
 - (i) does not contain any of the species of fish referred to in paragraph (a),
 - (ii) is located upstream of a barrier to fish passage and all reaches upstream of the barrier are simultaneously dry at any time during the year, or
 - (iii) is located upstream of a barrier to fish passage and no perennial fish habitat exists upstream of the barrier (Forest Planning and Practices Regulation under the *Forest and Range Practices Act*).

Ford is a dip in a road constructed to facilitate crossing a stream. The objective of a ford is to maintain drainage and provide a safe, erosion-free, and storm-proof crossing that requires little or no maintenance without compromising the integrity and stability of the stream channel.

Generation is the portion of BC Hydro's business that is responsible for converting mechanical or thermal energy into electricity.

Habitat Value Criteria (adopted from *Fish Stream Crossing Guidebook*) is a classification of habitat value on any given stream, and generally results in one of the three following designations:

Marginal Habitat: An area that has low productive capacity and contributes marginally to fish production. The absence of suitable spawning habitat, and habitat with low rearing potential (e.g. locations without deep pools, undercut banks or stable debris, and with little or no suitably sized spawning gravels for the fish species present).

Important Habitat: An area used for feeding, growth, and migration of fish but not defined as critical. Usually contains a large amount of similar habitat that is readily available to the local fish stock.

Critical Habitat: An area that is crucial in sustaining a subsistence, commercial, or recreational fishery, or is in some other way particularly rare, productive or sensitive. This includes streams where there is the presence of high-value spawning or rearing habitat (e.g. locations with abundance of suitably sized gravels, deep pools, undercut banks, or stable debris, which are critical to the fish population downstream of the proposed crossing).

High Water Mark of a stream is normally the top of the stream channel, typically identified as the highest point of typical seasonal scour demarked by the lack of vegetation.

Ice Bridge: a water crossing of a frozen stream, river or other body of water where the depth of water prevents the ice from reaching to the bottom.

Important Habitat: Habitat that is used by fish for feeding, growth, and migration but is not deemed to be critical. This category of habitat usually contains a large amount of similar habitat that is readily available to the stock (as defined in the *Fish-stream crossing guidebook* (2012)).

Log Bundle Bridge: a temporary water crossing made by cabling logs together in a bundle, and then placing the log bundle in a stream channel in order to drive a piece of machinery over the top.

Low-Volume Road: For the purposes of this AWP, this is a remote, isolated road that is primarily used by crews or contractors for accessing BC Hydro infrastructure, and rarely used by the public. Low-volume roads will typically be situated away from populated and other high-use areas.

Marginal Habitat: Habitat that has low productive capacity and contributes marginally to fish production (as defined in the *Fish-stream crossing guidebook* (2012)).

Modified Ford is a Ford that has been constructed overtop of a Culvert. The culvert passes the stream under the road during normal conditions, and during peak flow the stream overtops the road. The objective of a Modified Ford is to accommodate peak flow without the need for a very large structure, and to provide a crossing that is safe for passage and that requires little maintenance or risk of washout.

Open Bottom Structure is a stream crossing structure that does not enclose the bed of the stream (such as an arch, open-bottomed box, or bridge. The opposite of a Closed Bottom Structure.

Permanent Crossing in the context of this agreement one that is located on a road that is expected to be in place for more than 15 years.

Pipe Arch is an arched Open Bottom Structure that resembles the top half of a culvert, with a small abutment on each side to receive the outward force and to prevent the arch from spreading.

Pre-Job Meeting or **Pre-Work Meeting** is defined in section 3.1 of the AWPWC.

Protocol Agreement is the *Protocol Agreement for Maintenance Work In and Around Water*, DFO, MOE, BCTC and BCH, 2009.

Qualified Environmental Professional is an applied scientist or technologist specializing in a relevant applied science or technology and who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise. The QEP may also be a QRP.

Qualified Registered Professional is defined as a person who has appropriate qualifications and experience to carry out the planning of the Work, and is a member of, or licensed by, a regulatory body in British Columbia that has the legislated authority to regulate its members' performance of these activities. In the context of the AWPWC, this may include engineers, biologists and foresters.

Reduced Risk In-stream Work Windows are those times when Work in streams will have the least impact. Refer to Appendix A.

Replacement structures are defined as those that occupy the same riparian management area and crossing location in plan view as the original structure.

Site Assessment is the initial review of a crossing site by a Qualified Registered Professional, for the purposes of identifying what Work is required, and planning that Work. See section 2.1 of the AWPWC.

Snow Fill: a water crossing of a shallow frozen stream, river or other body of water, constructed using snow taken from the areas immediately around the crossing site.

Standard Operating Procedure is a document written to apply in general to a task, meant for the individuals and contractors carrying out the task, outlining the generic safety, quality and environmental conditions that must be followed.

Stream Channel Width is defined as the horizontal distance between the stream banks on opposite sides of the stream, measured at right angles to the general orientation of the banks. The point on each bank from which width is measured is usually indicated by a clearly visible change in vegetation and sediment texture. This border is sometimes shown by edges of rooted terrestrial vegetation. Above this border, the soils and terrestrial plants appear undisturbed by recent stream erosion. Below this border, the banks typically show signs of both scouring and sedimentation deposition.

Temporary Crossing: A bridge, ford, or other structure installed across a stream or watercourse for short-term use during construction or for temporary access to a site.

Transmission is the portion of BC Hydro's business that includes the maintenance of the higher voltage circuits that electrically connect generation facilities to substations and larger commercial customers. On the BC Hydro system, this includes line voltages of 69kV and above.

Wilderness Road is a designation by the MOF denoting a forest road that is in a state of Semi-Permanent Deactivation, and which is not regularly maintained.

Wood Box Culvert is a simple Culvert and Open Bottom Structure made by placing sill logs on either side of the stream, and then stringer logs on top of the sills spanning the width of the stream. The structure is then topped with filter fabric and road ballast.

Work in the context of this agreement is defined in Section 1.1.

Appendix D: Acronyms

AWPWC	Approved Work Practices for Water Crossing Installation, Maintenance and Deactivation
CBS	Closed Bottom Structure
CMP	Culvert, Metal Pipe
DFO	Fisheries and Oceans Canada
EMP	Environmental Management Plan
MFLNRO	British Columbia Ministry of Forests, Lands and Natural Resource Operations
MOE	British Columbia Ministry of Environment
OBS	Open Bottom Structure
PA	Protocol Agreement for Maintenance Work In and Around Water
QEP	Qualified Environmental Professional
QRP	Qualified Registered Professional
SOPs	Standard Operating Procedures
WBC	Wood Box Culvert

Appendix E: Applicable BC Hydro documents:

Standard Operating Procedures (SOP) and Field Guides may be updated by BC Hydro to meet changing requirements beyond the scope of the AWPWC. Applicable SOPs and Field Guides are listed below and copies will be available upon request.

Standard Operating Procedures

- SOP-01 General Rights-of-Way
- SOP-02 Fire Preparedness
- SOP-03 Petroleum and Chemical
- SOP-07 Road Construction, Maintenance and Deactivation
- SOP-08 Rainfall Shutdown
- Field Marking Guide

Access Road Maintenance: Field Guides

- Valley Roads - Overview of Activities
- Hillslope Roads - Overview of Activities
- Access Tracks - Overview of Activities
- Culvert Replacement, Installation and Maintenance
- Cross Ditches, Water Bars and Modified Armoured Swales
- Ditching
- Insloping and Outsloping
- Subdrains and Seepage Management
- Grading
- Road Surfacing
- Road Stability and Soil Placement
- New Road Development
- Erosion and Sediment
- Site Revegetation