



Waterpower Projects: Guidelines for Works that may Impact Forest Roads or Timber Tenures

1 – INTRODUCTION

These guidelines will assist waterpower project proponents to define their proposed **works** and identify potential impacts from construction and operation of their projects so as to protect **existing forest roads** and **timber tenure holders' rights** on Crown land. The guidelines are intended to help proponents identify and consider issues of importance to the Ministry of Forests, to other road users, and to forest companies during their preparation of **Development Plans** as part of Ministry of Agriculture and Lands' (MAL) application and permitting process (see steps 1 to 7 in Figure 1).

Section 2, 'Potential Impacts' highlights the possible impacts of works such as the penstock, powerhouse and transmission line, including modifications or realignment to existing forest roads, on road user safety, stability and maintenance of the road, environment, and timber harvesting operations.

Section 3, 'Development Plan Preparation' provides information that will assist the proponent to address potential impacts on forest roads and timber tenure holders' rights in the Development Plan for a waterpower project, prepared under Step 3 of the MAL application and permitting process.

Section 4, 'Review Process and Summary Report Preparation' provides information about possible Ministry of Forests requirements during referral and review in Step 5 of the MAL application and permitting process, and important issues on roads and timber tenures holder's rights that proponents should address during preparation of a Summary Report in Step 6 of that process.

Section 5, 'Glossary of Terms' is intended to help proponents understand some of the more technical language used in these guidelines.

As part of the MAL application and permitting process to acquire a water licence and land tenure, proponents must follow other various Ministry of Forests requirements as detailed in MAL's Appendix F, *Water Applicant's Agency Resource Guide*, available at

Information about the Ministry of Forests **design criteria** for proponents' design of waterpower project works that may impact forest roads or timber tenures is found on the Ministry of Forests website at http://www.for.gov.bc.ca/hth/engineering/publications_guidebooks.htm under *Publications/Reports, IPP Waterpower Projects*. As well, you will find specific requirements for **construction and operation** of waterpower project works located within a Forest Service road right-of-way in the Ministry of Forests' Works Permit and associated schedules available at the above ministry website.

2 – POTENTIAL IMPACTS OF WORKS

Works associated with waterpower projects have the potential to cause different impacts in a number of ways:

- a) Potential impacts on road user safety, stability and maintenance of the road, and environment from installation of penstock, transmission lines, and other works
- b) Potential impacts on road user safety, stability and maintenance of the road, and environment from modification or realignment of existing roads
- c) Potential impacts on timber harvesting operations in the immediate vicinity of the works or in the watershed from installation of penstock, transmission lines, and other works

a) Potential impacts on road user safety, stability and maintenance of the road, and environment from installation of penstock, transmission lines, and other works:	
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Works for penstock installation typically involve the use of heavy equipment, and may include the development of spoil sites, gravel pits and quarries, and extensive cut-and-fill operations.

Where the penstock is buried, works may include excavation of side hill cuts and a deep trench, placement of trench backfill, and compaction of backfill materials in the trench. Where the penstock is elevated, works will likely include installation of structures to support the penstock. Other works to protect the structural integrity of the penstock may include retaining walls or concrete apron slabs over a buried penstock that will be subjected to heavy vehicle loads.

Works associated with waterpower projects may have impacts on the road and on other road users that must be addressed during the engineering design, construction, and operation phases of the project:

- New sources of **sediment** can be created by excavating cuts, constructing embankments, and by transporting and stockpiling excavation waste materials and imported backfill. Uncontrolled soil erosion and deposition of sediment into streams during or after construction of these works has the potential to harm fish or fish habitat, and to adversely affect the quality of water diverted for human consumption.
- The penstock trench may cause changes to **natural drainage patterns** by intercepting creek flow or surface and subsurface drainage water flow above the trench alignment. If a penstock is located along the uphill side of a forest road, captured creek flow or drainage water flow exiting from the penstock corridor may result in altered drainage patterns that are not compatible with the natural surface drainage patterns. Capture and diversion of such flows can increase the size of a drainage area, and may cause landslides or severe erosion within the **road prism** or **clearing width**, or on terrain within, above, or below the road **right-of-way** (see Figure 2).
- The works could damage the existing **road drainage system** and prevent the system from functioning effectively. Failure of the drainage system may initiate a landslide or gully process, and cause loss or damage to **elements at risk**.
- If not designed for the projected life of the waterpower project, the works may result in long-term **road maintenance problems** and higher road maintenance costs.

- Penstock works that are poorly located, designed, constructed or maintained have the potential to affect terrain stability, and to **increase the landslide risk** to forest resources, residents, property and infrastructure and other elements at risk beyond a level acceptable to the Ministry of Forests or other road users. Landslides that cause large scale environmental and visual disruption could have negative implications for forest companies operating in the area.
- Temporary stockpiling of excavation waste materials on road surfaces may result in **changes to road surface conditions** through the mixing of unsuitable soils with existing road surfacing materials. This may cause the road surface to become unusable, and may also increase sediment generation and transport.
- The use and transport of **heavy equipment and materials** along the road for construction of the penstock and other project components can damage the structural integrity of the road, bridges and other structures.
- Some waterpower projects may require the mobilization of worker camps adjacent to forest roads used for logging and other industrial purposes. An **increase in traffic** may mean more frequent road maintenance is required, and therefore raise road maintenance costs.

b) Potential impacts on road user safety, stability and maintenance of the road, and environment from modification or realignment of existing roads:

Some sections of an existing forest road may need realignment to accommodate the penstock, or to avoid excessively long and high cut slopes for installation of the penstock and intake structures.

Affected road users should be consulted about their access needs to ensure that the new alignment is suitable for use by logging trucks and other industrial vehicles, and does not present an increased risk to user safety. The new alignment may also impact fish and fish habitat, water quality, and other **forest resources**.

Where the penstock crosses a forest road, unsuitable construction techniques could impact the structural integrity of the road, the load carrying capacity of the running surface, and the control of surface and ground water. At these locations, the works may increase the level of road maintenance required, and decrease the stability of road fill slopes. This may increase the costs of forestry road inspection and maintenance.

c) Potential impacts on timber harvesting operations in the immediate vicinity of the works or in the watershed from installation of penstock, transmission lines, and other works:

The penstock, transmission line and other components of a waterpower project may have a significant impact on forest management in the area. Operable forestland may be lost and forest management objectives for the area may be negatively impacted. Without sufficient vertical clearance above the road, overhead transmission lines have the potential to restrict industrial operations of authorized road users. As well, helicopter-logging operations may be adversely affected because of restrictions placed on flying over transmission lines.

Installation of a transmission line immediately adjacent to a forest road may make it difficult to carry out routine road maintenance at a safe distance from the lines. As well, transmission line poles may restrict road maintenance and future road modifications.

The installation of a penstock may restrict construction of new forest roads into proposed cutblocks, or may restrict motor vehicle access at existing road junctions. Difficulties associated with crossing these pipes may severely constrain forestry operations (such as ground-based yarding) or raise timber harvesting costs if additional forest roads must be built to re-establish lost or restricted access.

3 – DEVELOPMENT PLAN PREPARATION

Information obtained while carrying out activities described in this section will help the proponent to prepare a **Development Plan** for a waterpower project under Step 3 of the MAL process (see Figure 1). In particular, it will help proponents to:

- a) Identify potential impacts on holders of **permits and timber tenures**
- b) Identify potential impacts on the **forest road** and other elements at risk
- c) **Evaluate** the impacts

a) Identify potential impacts on holders of permits and timber tenures:

To avoid infringing upon the rights of **authorized road users** and those granted the right to **harvest Crown timber**, works within or adjacent to the forest road right-of-way should not:

- cause conditions along the road that are unsafe for other users of the road;
- adversely impact vehicle access, or restrict industrial use of the road;
- compromise a forest company's timber harvesting operations as set out in a Forest Stewardship Plan or Forest Development Plan;

For roads affected by the proposed works, the proponent should identify the **legal status and type of forest road** and the **type of required motor vehicle access**. The waterpower Development Plan should identify:

- holders of **Road Use Permits** who use the road for harvesting of Crown timber or other industrial purposes, if the road is an **industrial use** Forest Service road;
- road user groups, if the road is a **community** or **general use** Forest Service road;
- permit holders who have the right to industrial use of the road and any non-industrial road user groups, if use of the road is authorized under a **Road Permit** or **Special Use Permit**
- identify the stakeholders who are currently responsible for **road maintenance**, and the type of maintenance being carried out.

The proponent should communicate with the **forest district manager** and **permit holders** regarding potential impacts from the construction and operation of the project, and seek their advice regarding their interests.

- To avoid a potentially significant deletion from the **timber harvesting land base**, the proponent should seek input from a professional forester and other appropriate qualified registered professionals to determine if the proposed penstock and transmission line will impact current or planned forestry operations anywhere within the watershed, and particularly within a 1 km wide corridor on each side of the penstock and transmission line alignments.

- The effects of the proposed works on **non-industrial users** should also be considered, particularly in the case where a road provides access to a community, residences, provincial park, or recreation site.
- The forest district manager may advise the proponent that formal **advertising** of the intent to build works within or adjacent to a Forest Service road right-of-way is required in order to notify road users of proposed changes to road access and to solicit input on those changes.

b) Identify potential impacts on the forest road and other elements at risk:

The proponent should retain a Terrain Stability Professional¹ to carry out a **terrain stability assessment** along the portion of the penstock alignment that will be located within or immediately adjacent to a forest road right-of-way. The objectives and general scope of a terrain stability assessment are provided in Section 4 of the *Guidelines for Terrain Stability Assessments in the Forest Sector* available at: <http://www.apeg.bc.ca/library/practiceguidelines.html>.

The terrain stability assessment should identify, as a minimum:

- concerns about the **stability of the terrain** along the existing road corridor, including the stability of the road prism itself, that could be affected by the works;
- **social, environmental, and economic values** at risk of damage from landslides and sedimentation;
- the potential for the proposed works to increase **landslide risks** along the affected segments of the road;
- needed **modifications to existing road sections** affected by the works that will be required to prevent landslides; and
- **natural drainage patterns** including the location of important permanent and ephemeral creek flows and drainage divides, if this information is critical for maintaining slope stability along portions of the penstock located within or adjacent to the forest road right-of-way.

c) Evaluate the impacts:

With the assistance of appropriate qualified registered professionals, the proponent should re-evaluate options for forest road use and general project configuration if:

- **terrain stability problems** along road segments affected by the works cannot be avoided, mitigated or managed to the satisfaction of the Ministry of Forests or other stakeholders;
- the likelihood of being able to resolve **significant conflicts** with other parties is low;
- potential impacts on the size of the **timber harvesting land base** are significant.

4 – REVIEW PROCESS AND SUMMARY REPORT PREPARATION

¹ A Terrain Stability Professional is defined in Section 6 of the *Guidelines for Terrain Stability Assessments in the Forest Sector*.

During Steps 5 and 6 of the MAL application and permitting process (see Figure 1), plans are **reviewed** by government and other parties, and the proponent then prepares a report to **summarize** how issues will be addressed. This section is intended to guide proponents in carrying out the following MAL steps:

- a) Review of the Development Plan (Step 5)
- b) Preparation of a Summary Report (Step 6)

a) Review of the Development Plan:	
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At Step 5 of the MAL application and permitting process, MAL will request government agencies and other affected parties to **review the proponent's Development Plan**.

The review of the Development Plan is an opportunity for these parties to provide information that will enable MAL to determine the impacts of the project on the existing road corridor and timber tenure holders' rights, and appropriate mitigation and compensation measures to address the impacts.

If not previously requested by the forest district manager during Step 3 of the MAL process, the forest district manager at Step 5 may advise the proponent that formal advertising of the intent to build works within or adjacent to a Forest Service road right-of-way is required.

b) Preparation of a Summary Report:	
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At Step 6 of the MAL application and permitting process, the proponent prepares a **Summary Report** based on the Development Plan, the assessment of potential impacts identified through the review process, and comments received during any advertising process.

The proponent should indicate in the Summary Report whether affected parties are in agreement with proposed mitigation and compensation measures with respect to:

- a) **safety** of forest road users;
- b) **stability** of the forest road and associated infrastructure;
- c) possible **impacts on environmental, social and economic** values;
- d) possible loss of **productive forest land**, or negative impacts on current or future **harvesting operations**;
- e) the costs of timber harvesting in the area including forestry road inspection and maintenance expenses;
- f) the legal rights of those authorized to **use the forest road** or to **harvest Crown timber** or conduct other **industrial activities**.

A Summary Report that indicates the proponent and parties that have an interest in the waterpower project are in agreement with the proposed mitigation and compensation measures will simplify MAL's decision on the proponent's water licence and land tenure application at Step 7 of the MAL process.

Proponents that are successful in obtaining a water licence and land tenure from MAL will be required to develop specific design criteria from the data and information gathered during steps 1 to 6 of the MAL process to avoid, mitigate and manage the identified potential

impacts. Proponents will be expected to apply these criteria in the engineering design, construction, and operation of their projects (see steps 8 to 10 in Figure 1).

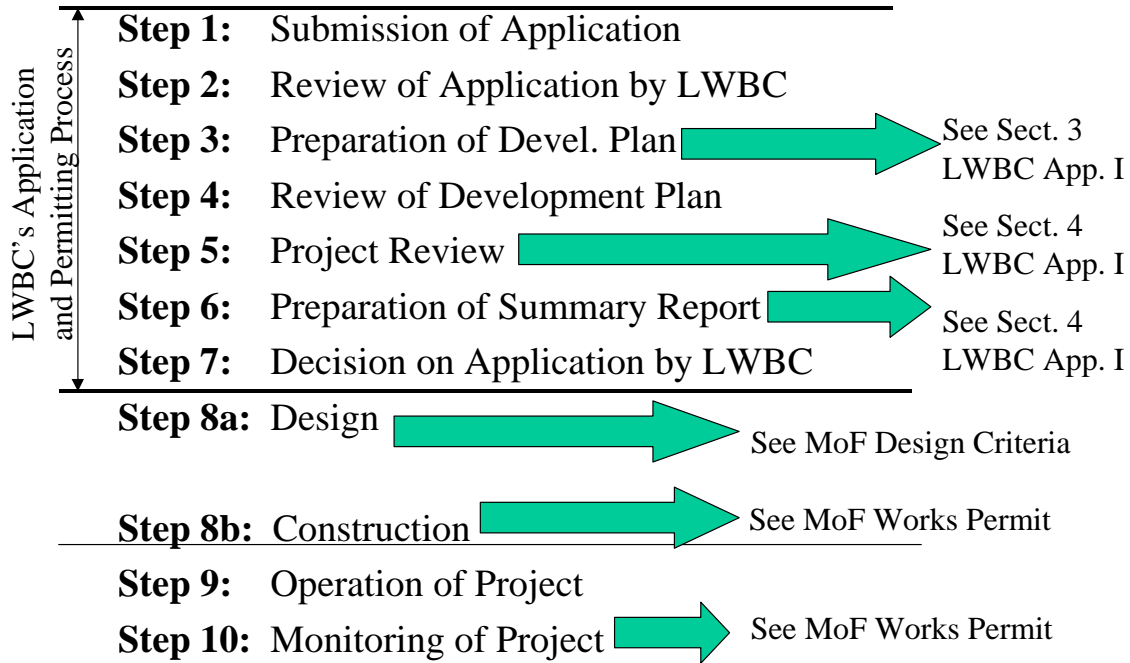
5 – GLOSSARY

Community use FSR	Forest Service road used primarily by non-industrial users that provides access to year-round communities.
Development plan	A plan for a waterpower project prepared by the project proponent at Step 3 in the MAL application process that defines the project and identifies the impacts from construction and operation.
Elements at risk	Humans, property, infrastructure, forest resources, the environment, and other things of value that are put at risk of loss or damage. Qualified professionals are often required for the identification and characterization of elements at risk.
Forest resources	The eleven values specified in section 149(1) of the <i>Forest and Range Practices Act</i> .
General use FSR	Forest Service road used primarily by non-industrial users, but does not provide access to communities. May provide access to private land, year-round residences, isolated residences or cabins, commercial operations, or parks and recreation sites.
Industrial user	Road user classed as 'industrial' as defined in section 22.1 of the <i>Forest and Range Practices Act</i> .
Industrial use FSR	Forest Service road used primarily by industrial users.
Road permit	Permit that authorizes the holder to use a road and, if applicable, to construct a new road or maintain an existing road.
Road or forest road	A road that is (a) a Forest Service road; or (b) authorized under a road permit, a cutting permit, an agreement under the <i>Forest Act</i> , or a special use permit; or (c) certain other roads within a Provincial forest authorized under an Act or its regulations.

More detailed definitions are in Part 1 of the *Forest Planning and Practices Regulation*
<http://www.for.gov.bc.ca/tasb/legsregs/frpa/frparegs/forplanprac/fppr.htm#section76>

Figure 1: Overview of steps in MAL's process for bringing a waterpower project into production, and linkages to Ministry of Forests requirements for works that may impact forest roads or timber tenures

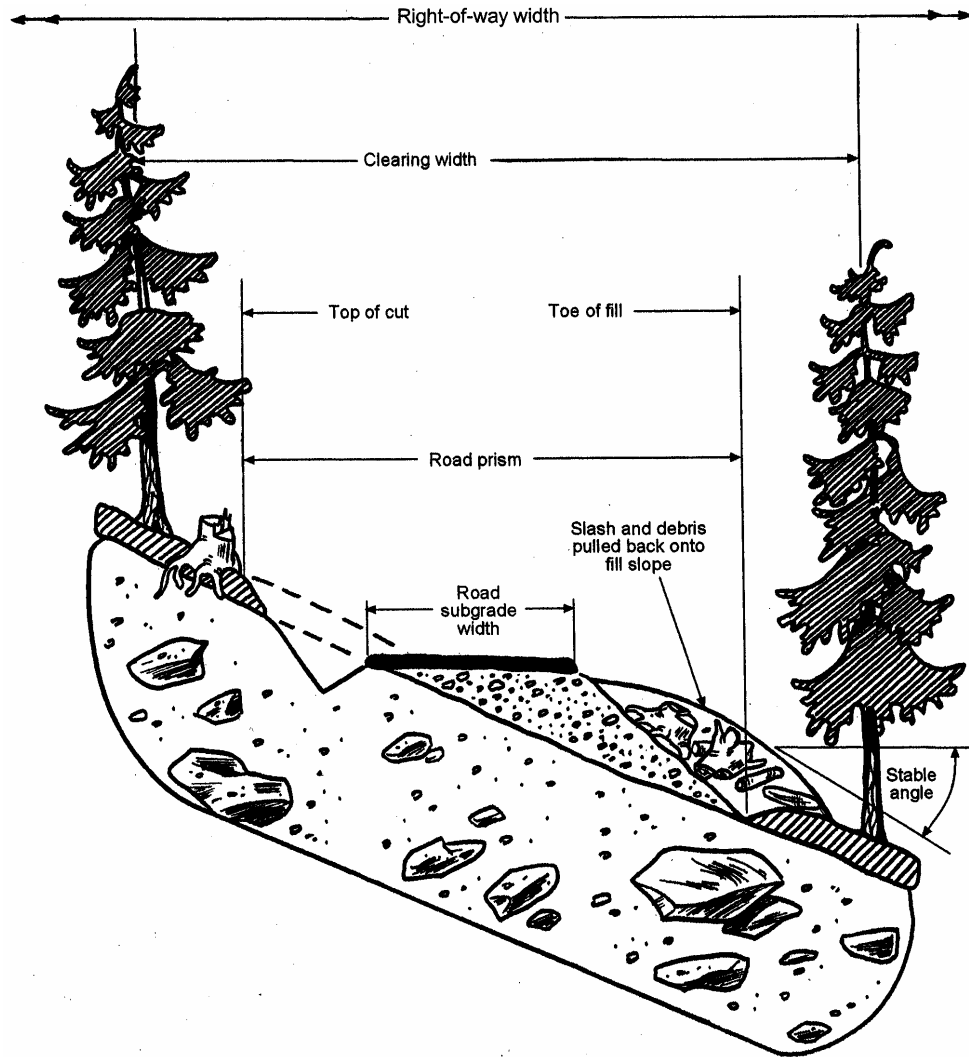
Overview of Process



For more information about the MAL process, see MAL's *Guide for Waterpower Projects* available at

http://www.env.gov.bc.ca/wsd/water_rights/waterpower/cabinet/guide.pdf

Figure 2 Typical forest road cross-section and definition of terms



Road prism width is the width between the top of the road cut slope and toe of the road fill slope.

Clearing width is the width that is cleared of standing trees for the purpose of constructing or maintaining a road, and is typically wider than the road prism width. The clearing width, located within the road right-of-way, is the minimum width required to accommodate the: road prism; user safety; subgrade drainage; subgrade stability; areas for placement of slash, debris and other waste; operation of equipment; snow removal; fencing and other structures that are ancillary to the road; pits or quarries; and landings.

Road right-of-way

- Right-of-way width for a Forest Service road is the width of Crown land legally established or reserved, and for a Road Permit or Special Use Permit road it is the width of Crown land established by the permit, for the purpose of constructing, maintaining or operating the forest road and carrying out other ancillary activities.
- The road right-of-way width is typically much wider than the clearing width. The width of a forest road right-of-way is likely to be at least 30 m, and likely up to 75 m, depending on local conditions. As well, policy on this matter is continually evolving. Proponents are advised to contact the relevant Ministry of Forests district office, who will be able to offer detailed advice on the location and width of a forest road right-of-way in the area of a proposed waterpower project.