

EXECUTIVE SUMMARY

Water use planning was introduced in 1996 as an approach to ensuring provincial water management decisions reflect changing public values and environmental priorities. A Water Use Plan (WUP) is a technical document that, once reviewed by provincial and federal agencies and First Nations, and accepted by the provincial Comptroller of Water Rights, defines how water control facilities will be operated. The purpose of water use planning is to understand public values and develop recommendations defining a preferred operating strategy for a facility using a multi-stakeholder consultative process.

The Aberfeldie water use planning process was initiated in May 2002 and completed in April 2003. The consultative process followed the steps outlined in the provincial government's *Water Use Plan Guidelines* (British Columbia, 1998). This report summarizes the consultative process and records the areas of agreement and disagreement arrived at by the Aberfeldie Consultative Committee. It is the basis for the *Aberfeldie Draft Water Use Plan* which will be submitted to the Comptroller of Water Rights for review and approval.

Aberfeldie Hydroelectric Project

The Aberfeldie project is located within the Regional District of East Kootenay on the Bull River, in southeastern British Columbia, approximately 35 km east of Cranbrook. The Aberfeldie project is part of BC Hydro's integrated generation system and generates approximately 32.2 GWh per annum, enough energy to service about 3220 homes for one year.

The Aberfeldie project is an in-basin diversion consisting of the Aberfeldie Dam, a wood stave pipeline, surge tank and steel penstock leading to a concrete powerhouse (two generating units for a total capacity of 5 MW) located about 2 km downstream of the dam. Water from the generating station is discharged back into the Bull River, which flows into Lake Koochanusa on the Kootenay River system.

Consultative Committee Process

The Aberfeldie Water Use Plan Consultative Committee (CC) initially consisted of 12 representatives and their designated alternates (where applicable). Subsequent to the first meeting, one participant changed their status from Consultative Committee member to observer. Key interests included fish, wildlife, First Nations' traditional use and power. The representatives included BC Hydro, provincial and federal agencies, regional districts, the Ktunaxa–Kinbasket Tribal Council (KKTC), Canadian Columbia River Inter-tribal Fisheries Commission (CCRIFC), and local area residents. CCRIFC also participated in Fisheries Technical discussions.

The Consultative Committee and its Fisheries Technical Committee (FTC) held a total of 10 meetings, ultimately reaching unanimous endorsement of a preferred operating alternative for the Aberfeldie hydroelectric project and a specified monitoring program.

Objectives and Performance Measures

The Consultative Committee explored issues and interests affected by operations of the Aberfeldie hydroelectric project, and agreed to the following objectives for the Aberfeldie Water Use Plan.

- **Power:** Minimize economic impacts to power generation at the Aberfeldie facility by maximizing revenue from energy sales, minimizing operating and maintenance costs and minimizing negative effects on ancillary services.
- **Recreation:** Maximize recreational opportunities by maximizing access to the river and maximize public safety.
- **Fish and Fish Habitat:** Maximize (native) fish abundance and diversity by minimizing entrainment of fish, maximizing habitat suitability, minimizing fish stranding, minimizing sediment effects and minimizing impacts associated with maintenance and operational procedures.
- **Wildlife and Wildlife Habitat:** Maximize wildlife habitat (quality, quantity and diversity) by maximizing the availability and suitability of Red-listed and Blue-listed species' habitats; maximizing the availability of fish, insects and aquatic invertebrate prey consumed by wildlife; and minimizing the disturbance of Blue-listed Rocky Mountain Big Horn Sheep associated with maintenance operations.
- **Cultural Resources:** Maximize abundance and diversity of fish and wildlife populations to support First Nations harvesting and associated activities (*refer to fish and wildlife objectives*).
- **Flood and Erosion:** Minimize flooding and erosion impacts.
- **Irrigation:** Minimize irrigation impacts.

Given the Aberfeldie project is a run-of-river facility which has limited capacity through operations to influence many of the identified objectives, the Consultative Committee focused on two objective areas: power and fish/fish habitat.

The Consultative Committee developed performance measures for the power-related objectives; however, agreed that it would not be necessary to develop performance measures to assess the impacts of operating alternatives on the fish objectives because of the degree of uncertainty. It was agreed that the most appropriate means of determining whether operating alternatives were effective in achieving fishery benefits would be through professional judgment based on the available data and from the results of two research studies that were carried out during the water use planning process.

No performance measures were developed for wildlife or cultural resources, as it was agreed that the degree to which the fish and wildlife objectives are met would provide an indication of how well operation of the Aberfeldie facility meets these other objectives.

As well, no performance measures were developed for recreation, flood, erosion and irrigation because operations¹ were not thought to significantly affect these interests.

Survival Flows for Overwintering Fish in the Canyon

The Consultative Committee identified low winter flows in the canyon section of the Bull River as the principal issue to be focused on during the Aberfeldie Water Use Plan. During the fall/winter period when inflows to the headpond are equal to or less than plant capacity, inflows are diverted to the powerhouse and little to no water is spilled from the dam. Therefore, river flows between Aberfeldie Dam and the powerhouse are restricted to minimal dam leakage and groundwater input (estimated at about 0.05 m³/s or about 0.2 per cent of the mean annual discharge). The main area of concern is the extent to which low flows affect the suitability and availability of fish habitat and thus the survival of overwintering fish (both resident and those entrained over the dam) within the canyon section.

To address uncertainty regarding fish utilization and the adequacy of the current flow regime for overwintering fish, two assessments of fish and fish habitat within the canyon were undertaken during low flow (non-spill) conditions. Results of these studies (Bisset and Cope 2003, Cope 2003) showed that this reach functions primarily as overwintering/rearing habitat for fish entrained over the dam (mountain whitefish, cutthroat trout) and limited spawning by kokanee between the powerhouse tailrace outlet and the first upstream falls. While the presence of deep pools within the canyon provide some refuge habitat during winter, there is little safety margin given the extremely low flow and restricted habitat connectivity caused by ice formation.

The Fisheries Technical Committee developed two minimum flow options for consideration by the Consultative Committee at their final meeting. Both of these related to an increase in base flows through the canyon to provide more suitable overwintering flows for fish survival. Specifically, the minimum flow would maintain hydraulic connectivity between refuge pools, minimize the likelihood of anchor ice formation, and protect and enhance riffle habitat for rearing juveniles.

Operating Alternatives

A total of four operating alternatives were considered by the Consultative Committee during the Aberfeldie water use planning process. Three of these focused on providing fishery benefits that specifically dealt with concerns over low winter flows through the canyon. These alternatives were based on recommendations provided by fishery consultants and the deliberations of the Fisheries Technical Committee. A summary of the main components for each alternative is provided below.

¹ Aberfeldie is operated as a *run-of-river* facility, which means that there is no significant volume of water stored in the headpond upstream of the dam: what flows in, flows out.

- **Operating Alternative #1: 0.5 m³/s Minimum Flow**

This option involves provision of a minimum flow release from the dam to better ensure the survival of overwintering fish. A gated control structure would need to be built in the dam to regulate the flow.
- **Operating Alternative #2: 0.25 m³/s Minimum Flow and Gravel Recruitment**

This option involves provision of a lower minimum flow from the dam, in conjunction with a one-time habitat enhancement project. The project involves the placement of gravel within the canyon channel to offset the greater risk to fish and the uncertainty surrounding the adequacy of a lower minimum flow. This alternative includes a trigger to increase the minimum flow if results of monitoring indicate that 0.25 m³/s is inadequate in preventing total freeze-up of pool habitat or ensuring habitat connectivity during sustained periods of cold weather. In order to regulate flows, a gated control would need to be built in the dam.
- **Operating Alternative #3: Status Quo**

This option represents how the Aberfeldie facilities are currently operated. There is no provision for a minimum flow, however, the Aberfeldie project is operated as a run-of-river scheme with water flowing over the spillway for approximately 80 per cent of the year.
- **Operating Alternative #4: Monitoring and Enhancement Works**

This option was developed during the final meeting at the request of the Consultative Committee to find a more cost-effective means of achieving similar fishery benefits to the minimum flow alternatives. Due to the lack of available information on habitat availability and utilization in the upper Bull River system, this option includes a habitat assessment component to identify potential enhancement areas and allow detailed enhancement works to be developed. It also includes a one-time gravel augmentation project as an interim measure to help offset the risk of no minimum flow to fish utilizing the canyon channel prior to construction of enhancement works in the upper Bull River, which would provide commensurate fish benefits at a lesser cost than the minimum flow alternatives.

Reaching Consensus on an Operating Alternative

During the final Consultative Committee meeting held on 19 February 2003, the Consultative Committee assessed the alternatives both quantitatively and qualitatively based on the performance measure values, professional opinion, and best available information. The main trade-off was between *minimizing economic impacts* and *minimizing the risk of mortality for overwintering fish*.

While the minimum flow alternatives (#1 and #2) were acceptable to the Consultative Committee, there were concerns about the costs required to achieve the fishery benefits. As a consequence, the Fisheries Technical Committee was asked to develop a new alternative during the meeting (Operating Alternative #4), which was reviewed and discussed by the Consultative Committee. This new alternative focused on providing similar fishery benefits through habitat enhancement works.

The Consultative Committee reached a consensus decision to recommend Operating Alternative #4.

It was also noted that in the event that no enhancement works are identified as required in Alternative #4, the expectation is that one of the minimum flow alternatives (Alternative #1 or #2) will be implemented¹

The Committee also recommended the adoption of a 2-hour ramp down rate² for planned and unplanned outages of the generating units affecting greater than 20 per cent of the river flows below the powerhouse.

This recommendation was developed because of the high concern related to the potential impacts associated with river stage changes on fish stranding and spawning success (below the powerhouse).

Expected Outcomes of the Recommendations

The expected outcomes of the final Consultative Committee recommendations are summarized in Table 1:

Table 1: Expected Outcomes of Recommendations

Power Generation	No impacts to power generation are anticipated.
Fish and Fish Habitat	The anticipated benefits are: <ul style="list-style-type: none"> • Short-term increased invertebrate and benthic productivity, and improved spawning habitat below the dam • Improved spawning, rearing, and overwintering habitat for cutthroat trout in the upper Bull River • Improved fish information for future water use planning decisions • Reduced incidence of fish/egg stranding in the lower Bull River • Improved spawning success in the lower Bull River
Wildlife	The expected improvements to fish resources will also have ancillary benefits for wildlife interests
Cultural Resources	The expected improvements to fish and wildlife will better support First Nations harvesting and associated activities

¹ Subsequent to the final Consultative Committee meeting, Fisheries and Oceans Canada representative suggested that Alternative #2 be initially implemented with appropriate monitoring. In the event that monitoring showed a minimum flow of 0.25 m³/s as inadequate, then this would trigger a jump to 0.5 m³/s as described in Alternative #1.

² Note that no restrictions apply for ramp up rates of the power generators.

Monitoring Program

The recommended monitoring program is directly built into the main component of the Consultative Committee's recommended Operating Alternative #4 (note the initial monitoring program was refined during a subsequent Fisheries Technical Committee meeting held on 16 April 2003). The monitoring program is broken down into two components: a habitat assessment to provide the basis for development of detailed enhancement works, and effectiveness monitoring of the constructed works.

The monitoring program is designed to answer the following water use management question:

“Is a minimum flow release from Aberfeldie Dam required to maintain overwintering habitat within the canyon or can a more cost effective non-operational alternative be implemented to provide equal or greater fish benefits?”

The habitat assessment component of the monitoring program is estimated to cost ~\$35,000 per year and be carried out in Years 1 and 2 after Water Use Plan implementation. The total cost of the assessment is \$70,000.

Biological response monitoring and monitoring of structure effectiveness is estimated to cost ~\$5,000 per year and be carried out in Years 5, 6 and 10.

Implementation and Costs of Recommended Alternative

The expected costs and timeline for the recommended Operating Alternative #4 and the associated monitoring program is as follows:

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| • Year 1 | Gravel recruitment project | \$25,000 |
| • Years 1 and 2 | Monitoring costs – Assessment | \$35,000 per year |
| • Years 3 and 4 | Build enhancement works | \$200,000 ¹ (total) |
| • Years 5,6 and 10 | Monitoring costs – Effectiveness | \$5,000 per year |

Review Period

The Consultative Committee recommended that a formal review of the Aberfeldie Water Use Plan be undertaken 15 years after its implementation.

¹ This value was based on an assessment by the Fisheries Technical Committee to provide commensurate benefits as provided by the minimum flow alternatives for overwintering fish.