



# Falls River Project Water Use Plan

*Revised for Acceptance  
by the Comptroller of  
Water Rights*

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*C.D. Matheson*

*per*

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**C.D. Matheson**  
Manager, Operations

## **Preface**

The water use planning process for BC Hydro's Falls River facilities was initiated in October 2002 and completed in May 2003.

The operational changes proposed in this Water Use Plan reflect the consensus recommendations of the Falls River Water Use Plan Consultative Committee.

BC Hydro thanks all those who participated in the process that led to the production of this Water Use Plan, for their effort and dedication. The proposed conditions for the operation of BC Hydro's facilities will not come into effect until implemented under the *Water Act*.

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## 1.0 INTRODUCTION

The operating conditions proposed in this Water Use Plan reflect the May 2003 recommendations of the Falls River Water Use Plan Consultative Committee. The basis for the proposed terms and conditions to be authorized under the *Water Act* for the beneficial use of water at the Falls River hydroelectric project are set out in this document. Future reference to the Falls River project includes all works including: Big Falls Reservoir; Falls River Dam; and the Falls River Generating Station and tailrace pond.

The proposed conditions will change current operations and are expected to affect both fish and wildlife interests in the Falls River watershed.

A monitoring program is proposed in order to study key uncertainties to enable improved operating decisions in the future. Refer to the *Falls River Water Use Plan: Consultative Committee Report* dated August 2003 for details on the consultative process, interests, objectives, performance measures, key trade-offs, values associated with operating alternatives, expected benefits and the proposed monitoring program. A review period has also been specified for this Water Use Plan.

## 2.0 DESCRIPTION OF WORKS

### 2.1 Location

The Falls River project is located approximately 50 kilometres (km) southeast of Prince Rupert on the Falls River above its confluence with the Ecstall River. A short section of the Big Falls Creek (also known as Falls River) is located below the spillway and flows into the Ecstall River, itself a tributary of the Skeena River. A map of the Falls River project is provided in Figure 2-1.

Access to the reservoir is by air or water only, and float planes must land in the Ecstall River. There is an access road leading from the powerhouse to the reservoir. There is minimal four-wheel drive access, during some parts of the year, via a network of active and abandoned logging roads.

BC Hydro lands encompass the generating facilities. Land around the reservoir is held by the Crown. In recent years, there has been active logging in the Big Falls Creek area, at the eastern end of the reservoir.

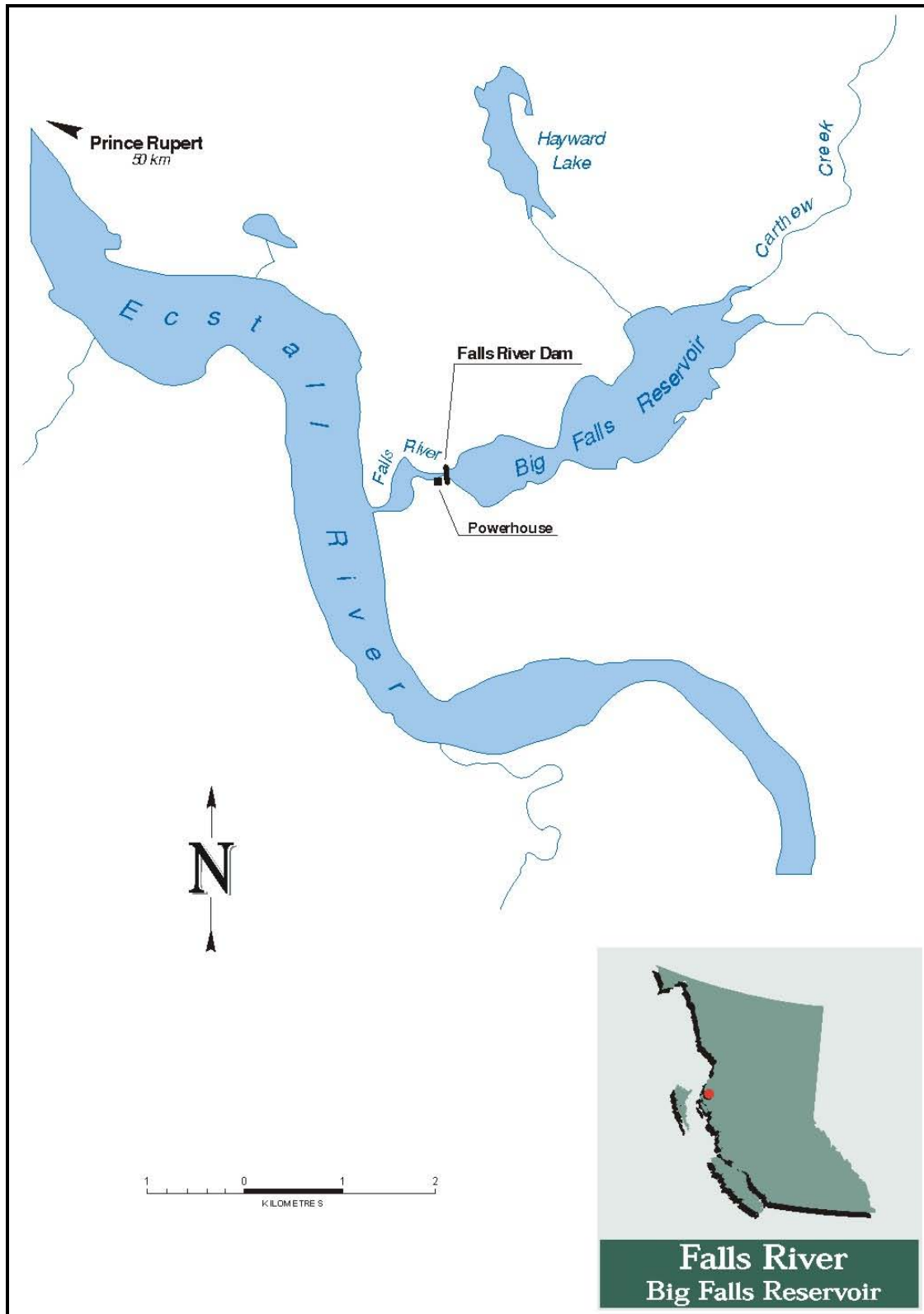


Figure 2-1: Location of Falls River Project

## 2.2 Existing Works

The existing works that comprise the Falls River hydroelectric project include the following components.<sup>1</sup> These are illustrated in Figure 2-2.

**Concrete Gravity Dam:** The dam is approximately 154 m in length and the maximum height of the dam (top of concrete) is 12 m at an elevation is 92.96 m above sea level.

**Free Overflow Spillway:** The crest of the free overflow spillway is approximately 75 m in length, at an elevation of 90.3 m. When timber flashboards are installed, the crest elevation is at 92.4 m. **Sluice Gates:** There is a concrete crest at elevation 83.82 m with permanent sill logs extending up to the sluice gate sills at elevation 87.17 m. There are two functioning sluice gates – each measuring 6.1 x 6.1 m – that are programmed to open for spill control when the reservoir exceeds a set elevation. These gates are operated automatically by a Programmable Logic Controller (PLC) when the reservoir level is above the sill elevation (87.17 m). The minimum gate opening in the remote control mode is 0.3 m, releasing approximately 7 m<sup>3</sup>/s. When the reservoir elevation is at 92.96 m, the combined discharge capacity of the two sluice gates is 317 m<sup>3</sup>/s.

**Undersluice:** There is an undersluice below the sluice gates. Its dimensions are 1.5 x 1.5 m and it has a sill elevation (inlet invert level) of 81.86 m. The undersluice can only be operated by local manual control and is not currently used for normal operation.

**Big Falls Headpond (or Reservoir):** The water surface area created by the dam is 340 hectares when the headpond is at an elevation of 92.4 m. In recent years, the typical operating range for the reservoir has been from 92.4 m (with flashboards installed) down to 88.4 m (which is the threshold for a discretionary reduction in unit load to meet previous discharge levels for fish downstream). The live storage capacity of the headpond, the volume of water between the elevations of 85.5 m and 92.4 m, is 11.5 million m<sup>3</sup> (133 m<sup>3</sup>/s-days).

**Penstock:** Two steel pipes (each 1.83 m in diameter) carry water from the intake at the headpond to the powerhouse. Penstock #1 is 233 m in length and Penstock #2 is 235 m in length. Invert intake elevations for P1 and P2, are 82.30 and 83.84 m, respectively.

**Powerhouse:** The powerhouse holds two 3.5 megawatts (MW) Francis generating turbine units with a normal combined maximum output of 7 MW. Generating Unit #1 (G1) and Generating Unit #2 (G2) have maximum discharge capacities of 15.0 m<sup>3</sup>/s and 8.7 m<sup>3</sup>/s, respectively. Maximum combined maximum discharge on record is of 21.5 m<sup>3</sup>/s.

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<sup>1</sup> All elevations noted herein are referenced to a local datum, where: Local datum (m) - 21.31 m = GSC (m).

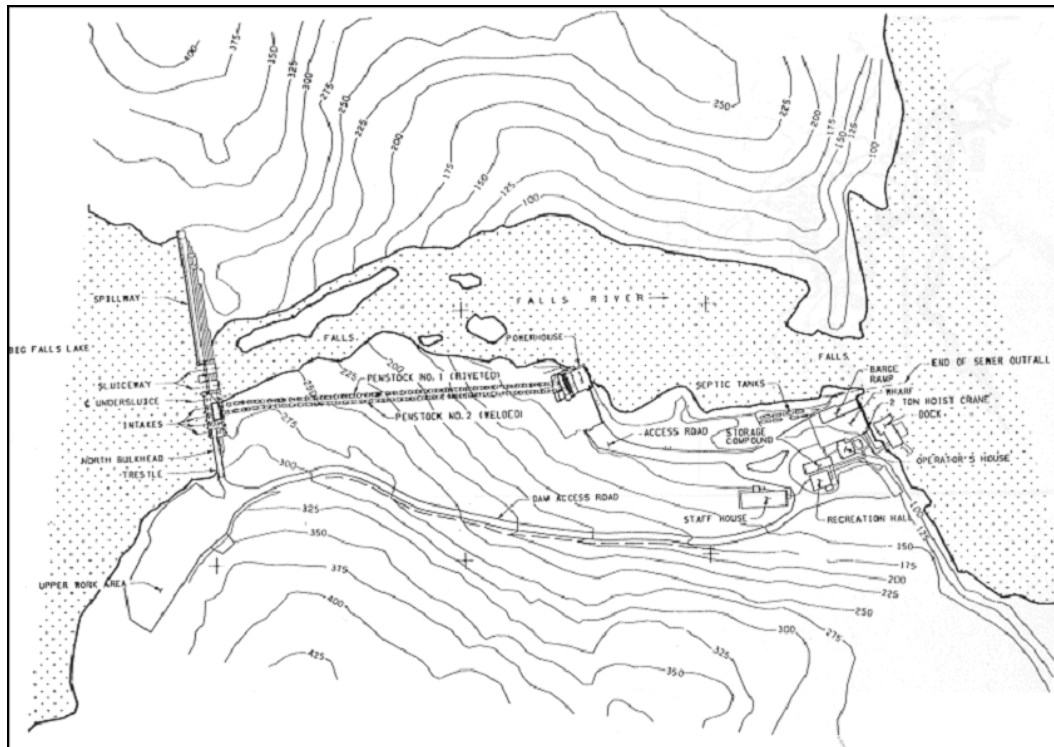


Figure 2-2: Falls River Project Schematic

### 3.0 HYDROLOGY OF THE FALLS RIVER BASIN

The Falls River drainage basin has an area of approximately 246 km<sup>2</sup> draining west into the Ecstall River estuary. The basin is bounded by mountain peaks rising as high as 1,966 m on the eastern side. Several small glaciers are present in the southeast corner of the basin.

The climate of the northern coastal area is influenced predominantly by the flow of warm moist air masses from the Pacific Ocean, although cold dry air masses occasionally extend south and west in the area. The wettest season is winter, as evidenced by the mean monthly precipitation at the Falls River generating station: between 430 and 550 mm monthly for October to January, compared with mean monthly values between 110 and 160 mm for May to August.

The maritime nature of the climate is indicated by air temperature records at Prince Rupert. Mean daily air temperatures range from approximately 2°C in January to 14°C in August with maximum and minimum temperatures of 32°C and -21°C.

## **4.0 OPERATING CONDITIONS FOR FACILITY**

### **4.1 Role of Facility in BC Hydro's System**

The Falls River project is part of BC Hydro's integrated generation system, which is described in 'Making the Connection' published by BC Hydro in April 2000.

The Falls River project currently generates 49.5 GWh/a (gigawatt hours per annum), which is approximately 0.1% of BC Hydro's total system production. It is a remote facility, however, that plays an important role in providing power to the Prince Rupert area when supply from the grid system is disrupted.

### **4.2 Water Use at Falls River Facility**

The Falls River project is classified as a "coastal" system with the majority of its water inflow resulting from seasonal rainstorms and to some degree spring snowmelt. As a result, the average daily turbine discharge from the Falls River generating station varies seasonally and daily with the demand for electricity and the availability of water. Spills occur when inflows exceed generation and storage capacity.

### **4.3 Emergencies and Dam Safety**

Emergencies and dam safety requirements shall take precedence over the operational constraints outlined in this Water Use Plan. Emergencies include actual and potential loss of power to customers. Dam safety requirements for operations are outlined in the following document, which is issued by BC Hydro's Director of Dam Safety:

- Falls River: Operation, Maintenance and Surveillance Requirements (OMS) for Dam Safety.

### **4.4 Conditions for the Operation of Works for Diversion and Storage of Water**

The conditions outlined in this section are proposed for the operations of the Falls River hydroelectric project. BC Hydro may not be able to operate within these constraints during extreme hydrological events.

#### **4.4.1 Big Falls Reservoir**

In addition to power benefits and dam safety requirements, the reservoir will be managed to ensure sufficient storage for fisheries flows and to provide seasonal flooding of the shoreline sedge habitat.

- To facilitate the flooding of sedge habitat in the spring, BC Hydro will set the free spill elevation of Falls River Dam to 92.4 m (Local Datum) between March 15 and May 1.
- To facilitate the exposure of sedge habitat following flooding, BC Hydro will set the free spill elevation of Falls River Dam to 90.3 m (Local Datum) between May 15 and Feb 15.
- Changing the free spill elevation currently requires the complete installation or partial removal of the flashboards, respectively, to raise and lower the free spill set point. Flashboard operation between May 2 and May 14 and Feb 16 and March 14 remains discretionary.

In addition, constraints on total discharge required under 4.4.2 are used to manage the reservoir level for flooding sedge habitat, maintaining reservoir habitat for fish, and ensuring sufficient storage for downstream minimum flows.

#### 4.4.2 Falls River Flow Requirements

Minimum and maximum flows are scheduled, respectively, to ensure fisheries habitat downstream of the dam and to manage reservoir levels. BC Hydro will provide the following flow requirements downstream the confluence of the tailrace and Big Falls Creek:

1. To provide storage for the provision of minimum fisheries flows and to provide a minimum habitat level for fish in the reservoir, BC hydro will manage reservoir levels year round by limiting total discharge to 1.3 m<sup>3</sup>/s when reservoir elevation is less than 88.4 m (Local Datum).
2. To enhance spawning and rearing habitat, BC Hydro will provide the following minimum flows when the reservoir elevation is at or above 88.4 m (Local Datum):
  - i. 6.5 m<sup>3</sup>/s August 1 to October 15
  - ii. 2.6 m<sup>3</sup>/s October 16 to July 31 (Additional requirement: See 3).
3. The requirement under 2 ii. is further restricted to assist the reservoir in filling sufficiently to flood the sedge grass. BC Hydro will manage reservoir levels between March 15 and May 1 by limiting total discharge to 2.6 m<sup>3</sup>/s when the reservoir elevation is greater than 88.4 m (Local Datum) and less than 92.0 m (Local Datum).

When flows are "limited" as per the requirements in 1 or 3 (4.4.2), BC Hydro will meet these target levels +/- a reasonable tolerance based on the capabilities of existing infrastructure.

#### 4.4.3 Plant Outages

BC Hydro will respond to plant outages at the Falls River project as follows:

- Unplanned – return to minimum flow as soon as possible.
- Planned – ensure the provision of a minimum flow through sluice gates before shutting down both generation units.

#### 4.4.4 Ramping Rates

For planned operations and planned outages, when generation discharge is between 1.3 and 6.3 m<sup>3</sup>/s, BC Hydro will implement the following ramping restrictions on the generation units:

- a) From 15 February to 15 March, ramp up such that the turbine discharge changes at a maximum rate of 1.3 m<sup>3</sup>/s over 10 minutes to avoid flushing juvenile fish.
- b) From 1 November to 15 April, ramp down such that the total project outflow changes at a maximum of 1.3 m<sup>3</sup>/s flow over 10 minutes to avoid stranding spawners and rearing fish.
- c) There are no other constraints on ramping up or ramping down.

## 5.0 PROGRAMS FOR ADDITIONAL INFORMATION

Development of the operating recommendations for the Falls River hydroelectric system was complicated by a number of uncertainties and information gaps.

The operating recommendations of the Consultative Committee are contingent on the implementation of a monitoring program to reduce these uncertainties over time. Upon direction from the Comptroller of Water Rights, BC Hydro will undertake a monitoring program that will:

- Assess expected outcomes of the operational change being recommended.
- Provide improved information for future operating decisions.

The main elements of the monitoring program are described below. Estimated annual costs for these studies and associated tasks are summarized in the *Falls River Water Use Plan: Consultative Committee Report*.

### 5.1 Fish - River

**Presence and Timing of Steelhead and Salmon Spawning:** There is uncertainty regarding whether adult steelhead and salmon are in the area and at what time of year. This study will determine the timing of adult presence in the Big Falls Creek tailrace pond between the falls and the confluence with the Ecstall River. The findings of this study may lead to a change in minimum flow requirements and/or the timing of those flows.

**Fish Spawning Habitat in the Tailrace:** There is uncertainty regarding spawning success in the river and tailrace pond. This study will monitor egg-fry survival and evaluate the effect of operations on survival. Study results may lead to a change in operations.

## 5.2 Fish - Reservoir

**Tributary Access and Lakeshore Stranding:** There is uncertainty about the potential for reservoir drawdown operations to restrict fish access to tributaries or strand fish around the reservoir. This study would survey locations of barriers within the drawdown zone in the three key tributaries and identify the location and size of potential areas for stranding along the shore in the drawdown zone. Findings may lead to a change in reservoir drawdown operations.

**Tributary Backwatering:** There is uncertainty as to whether fish spawn in the tributaries to Big Falls Reservoir in the drawdown zone. This study would survey for redds or sample for adult spawners in the drawdown zone of the three key tributaries. The findings may have implications for reservoir operations as well as minimum discharge requirements provided to the Falls River generation station tailrace pond.

## 5.3 Wildlife – Reservoir

**Sedge Habitat Mapping:** There is uncertainty as to whether the existing sedge habitat can be effectively maintained under the proposed changes to operations. This study would assess the extent of sedge habitat as well as its response to the operational change. Study results may lead to changes in reservoir operations, including flashboard installation.

**Wildlife Shoreline Habitat:** There is uncertainty as to whether there is active nesting and denning in the drawdown zone at key elevations and during periods when flooding occurs. If so, operations have the potential to interrupt nesting and denning and/or drown juveniles or adults. This study would survey the drawdown zone for dens and nests established by birds and mammals and map the locations and elevations of any wildlife sites. The findings may lead to a change in reservoir operations.

## 6.0 IMPLEMENTATION OF RECOMMENDATIONS

The proposed conditions and monitoring program in this Water Use Plan will be implemented after BC Hydro receives direction from the Comptroller of Water Rights.

## **7.0 EXPECTED WATER MANAGEMENT IMPLICATIONS**

The implications for the provincial interests considered during the preparation of this Water Use Plan are expected outcomes based on the best available information. After BC Hydro has been directed to implement the operational changes, BC Hydro will be responsible for meeting the operational parameters but not for achieving the expected outcomes.

### **7.1 Other Licensed Uses of Water**

There are no other licensed uses of water on Big Falls Creek.

### **7.2 Riparian Rights**

The proposed conditions are not expected to affect riparian rights associated with the reservoir or along the river below the facilities.

### **7.3 Fisheries**

The proposed conditions are expected to result in improved ecosystem conditions for fish in Big Falls Creek and Big Falls Reservoir and its tributaries.

### **7.4 Wildlife Habitat**

The proposed conditions are expected to impact wildlife in Big Falls Reservoir and may result in a loss of available shoreline habitat for nesting and denning wildlife.

### **7.5 Flood Control**

The proposed conditions are not expected to affect flood control in Big Falls Creek.

### **7.6 Recreation**

The proposed conditions are not expected to affect recreational use of the area.

### **7.7 Water Quality**

The proposed conditions are not expected to affect water quality in Big Falls Creek or Big Falls Reservoir.

### **7.8 Industrial Use of Water**

There are no other industrial uses of water on Big Falls Creek.

## **7.9 First Nations Considerations**

The Falls River project lies within the traditional territory of Lax Kw'Alaams Indian Band. The proposed conditions are not expected to affect traditional use in the area, however, they are expected to benefit fish and wildlife in Big Falls Creek and Big Falls Reservoir.

## **7.10 Archaeological Considerations**

The proposed conditions are not expected to affect archaeological interests.

## **7.11 Power Generation**

The proposed conditions are expected to reduce power generation associated with the Falls River project.

# **8.0 RECORDS AND REPORTS**

## **8.1 Compliance Reporting**

BC Hydro will submit data as required by the Comptroller of Water Rights to demonstrate compliance with the conditions conveyed in the Water Licenses.

## **8.2 Non-compliance Reporting**

Non-compliance with any operation ordered by the Comptroller of Water Rights, will be reported to the Comptroller in a timely manner.

## **8.3 Monitoring Program Reporting**

Reporting procedures will be determined as part of the terms of reference for each study or undertaking.

# **9.0 PLAN REVIEW**

BC Hydro will review the results of the monitoring program five years after implementation of this Water Use Plan. A formal review of the Water Use Plan is recommended in 10 years. A review could be triggered sooner if significant risks are identified through the analysis of monitoring results.

# **10.0 NOTIFICATION PROCEDURES**

Notification procedures for floods and other emergency events are outlined in the *“Falls River Dam Emergency Planning Guide”* and the *“Power Supply*

*Emergency Plan (PSEP): Coastal Generation.*” Both these documents are filed with the Office of the Comptroller of Water Rights.