



Province of British Columbia

Water Act

ORDER

Water Act

Sections 87 and 88

File No. 0212289, 0115688, 0161431, 0210947, 0202694, 0265200, 0199585, 3005073, 3005075 and 3005074.

WHEREAS British Columbia Hydro and Power Authority (BC Hydro) is the operator of the Bridge River hydroelectric system which comprises the Lajoie, Bridge 1, Bridge 2, and Seton generating stations, the La Joie, Terzaghi, and Seton dams, Downton, Carpenter and Seton reservoirs, and the Cayoosh diversion facilities, in respect of which it holds Final Water Licences 126279, 126278, 126280, 126281, 126286, 126287, 126288, 126282, 126283, 126080, 126250 and 126259;

WHEREAS an order issued July 28, 2000 requires flow releases from Terzaghi Dam and related monitoring requirements;

WHEREAS BC Hydro has engaged in public consultation to determine values for system parameters and to develop operating procedures which may provide benefits as described below;

WHEREAS the licensee has submitted the Bridge River Power Development Water Use Plan dated March 17, 2011, which recommends operational changes to the Bridge River hydroelectric system and recommends additional works in areas influenced by the system, with the intent of providing benefits to fisheries and wildlife habitat, shoreline conditions, recreation and flood mitigation;

WHEREAS the Bridge River Power Development Water Use Plan has proposed a monitoring programme to determine whether operating the facility in accordance with the operating parameters and procedures in the Water Use Plan will provide the expected benefits; and

WHEREAS I have accepted the Bridge River Power Development Water Use Plan dated March 17, 2011;

I HEREBY ORDER THAT:

1. The Order dated July 28, 2000 for flow releases at Terzaghi Dam and monitoring of the lower Bridge River, is hereby revoked.

Downton Lake Reservoir and La Joie Generating Station

2. Downton Lake Reservoir shall be operated above a minimum level of 710.00 metres, measured at the dam using the Geodetic Survey of Canada (GSC) datum.
3. Subject to approval from the Comptroller of Water Rights, the minimum elevation of 710.00 metres may decrease to 697.38 metres to continue providing minimum flows for middle Bridge River as specified in clause 4, or for maintenance purposes.
4. The licensee shall operate the La Joie Generating Station and Dam in such a manner as to provide minimum flow down the natural course of the Bridge River, in the following quantities, measured immediately downstream of the dam based on the elevation of Downton Lake Reservoir:

Downton Lake Reservoir Elevation (metres)	Bridge River Minimum Discharge (cubic metres per second)
>718.00	> 18.4
718.00 to 715.00	18.4 to 17.0
715.00 to 710.00	17.0 to 11.3
710.00 to 705.00	11.3 to 5.7
705.00 to 697.38	5.7

5. The licensee shall ramp down at a rate not exceeding 2.5 centimetres per hour and 15 centimetres per day as measured in the Bridge River in the vicinity of the Hurley Bridge. Operations in excess of these ramping rates are permitted if fish salvages along middle Bridge River are implemented as part of the operational change.

Carpenter Lake Reservoir, Bridge River Generating Stations

6. Carpenter Lake Reservoir shall be operated above the minimum level of 606.55 metres as measured at Terzaghi Dam using the Geodetic Survey of Canada (GSC) datum.
7. The licensee shall target a maximum elevation of 648.00 metres for the end of snowmelt season in mid August. If operations are expected to exceed 648.00 metres for 8 weeks or more, BC Hydro will inform the Comptroller of Water Rights.

Terzaghi Dam

8. For the period between May 1, 2011 and April 1, 2015, the licensee shall discharge from Terzaghi Dam to the Bridge River the equivalent to an annual water budget of 6.0 cubic metres per second (cms) and target the following monthly flows:

Date	Target Monthly Flow (cms)*
January	1.5
February	2.0
March	3.0
April	5.0
May	10
June	15
July	15
August	12
September	3.0
October	1.5
November	1.5
December	1.5

* The transition between target monthly flows may occur up to ± 5 days of the beginning of each month. Target monthly flows less than 5.0 cms may vary instantaneously by ± 0.25 cms from the target flow. Target monthly flows greater than 5.0 cms may vary instantaneously by $\pm 5\%$. The total annual flow will be determined on a calendar year basis and may vary $\pm 5\%$.

9. After April 1, 2015, the licensee will work with the Comptroller of Water Rights, provincial and federal fisheries agencies to determine a long term flow release strategy for the Terzaghi Dam based upon information and data from the flow trials collected under Appendix A. May 1, 2015 will be the target decision and implementation date for a long term flow release strategy. The subsequent recommended flow release from Terzaghi Dam will not be less than an annual water budget of 3.0 cms and will not exceed an annual water budget of 6.0 cms.
10. The licensee shall ramp down releases from Terzaghi Dam at a rate not exceeding 2.5 centimetres per hour and 15 centimetres per day as measured in the Bridge River in the vicinity of km 36.8 (Reach 4) of lower Bridge River. Operations in excess of these ramping rates are permitted if fish salvages are implemented as part of the operational change.

Seton Lake and Seton Generating Station

11. Seton Lake shall be operated between the minimum operating level of 235.76 metres and full supply level of 236.36 metres, measured in the vicinity of the Bridge 1 Generating Station using the Geodetic Survey of Canada (GSC) datum.
12. Upon prior approval from the Comptroller of Water Rights, Seton Lake may be operated above 236.36 metres to accommodate high inflow events and below 235.76 metres to accommodate planned maintenance or implementation of the Seton Lake Erosion Mitigation Plan.
13. In an effort to decrease the mortality of sockeye smolts migrating past Seton Dam and Seton Generating Station, the licensee will conduct partial (6+ hours) or blanket (24 hours) daily shut downs of Seton Generating Station during smolt out-migration between April 20th and May 20th.
14. A discharge between a minimum of 5 cms and a maximum of 60 cms shall be released from Seton Dam to Seton River at all times. Discharge in excess of 60 cubic metres per second is permitted if required to minimize spill from Terzaghi Dam into lower Bridge River in excess of the target flow schedules in 0) and 9) above.
15. The following target flows shall be released from Seton Dam to the Seton River. Excursions above or below the target flows are expected under normal operations to accommodate maintenance or to manage other system constraints. If operations deviate from the target flows by more than $\pm 25\%$ for more than a week, BC Hydro will inform the Comptroller of Water Rights.

Date	Target Flow (cms)*	Date	Target Flow (cms)*
Jan 1	11	Jun 15	34
Mar 31	12	Jun 30	30
Apr 7	15	Jul 6	26
Apr 15	25	Aug 15	21
May 7	26	Sep 14	16
May 15	29	Oct 14	14
May 21	32	Nov 14	13
May 31	36	Dec 14	11

Transition from one target flow to the next may occur within ± 5 days of the dates shown above. Target flows measured instantaneously may vary by $\pm 25\%$.

16. The licensee shall ramp down releases from Seton Dam at a rate not exceeding 2.5 centimetres per hour and 15 centimetres per day as measured in the vicinity of the Water Survey Canada gauge (WSC 08ME003) upstream of the confluence with Cayoosh River. Operations in excess of the aforementioned ramping rates are permitted if fish salvages are implemented as part of the operational change.
17. The licensee will target the ratio of Cayoosh Creek water to Seton River discharge as specified below. The ratio is calculated as Cayoosh Creek flow (measured in the vicinity of WSC 08ME002) to total Seton River flow (as measured downstream of the confluence of Cayoosh Creek). Excursions from the target ratio are expected as a result of managing other system constraints, to accommodate facility maintenance under normal operations, or because of factors outside of BC Hydro's control (e.g. Cayoosh Creek inflows).

Date	Target Ratio*
20 July to 31 Aug	< 20%
28 Sep to 15 Nov	< 10%

* The licensee will use the flexibility within the Seton target flow requirements specified in clause 15 above to manage the dilution flows. Efforts to maintain the maximum ratio however will be secondary to meeting the target flow release hydrograph from Seton Dam. The target dilution ratios will be re-assessed upon completion of the Adult Fish Passage Research Program.

Priorities

18. The licensee shall implement the above clauses using the following priorities rank-ordered from highest to lowest:
- a) Dam Safety requirements as defined in the Operation Maintenance and Surveillance Manuals;
 - b) Flood routing requirements;
 - c) Terzaghi target flow schedule;
 - d) Generation and spill at Seton in preference to spilling at Terzaghi Dam in excess of the target flow schedule;
 - e) All specified ramping rates;
 - f) Seton Generating Station shut downs for smolt outmigration;

- g) Carpenter Lake Reservoir elevations;
- h) Seton Lake elevations;
- i) Seton Dam target flow schedule; and
- j) Downton Lake Reservoir elevations.

Works and Monitoring

19. The licensee shall submit, within 9 months of the date of this Order, for approval by the Comptroller of Water Rights, terms of reference for works and monitoring studies listed in Schedule A.
20. Upon approval from the Comptroller of the terms of reference and leave to commence, the licensee shall
 - a) implement the works and effectiveness monitoring programmes in accordance with the approved terms of reference; and
 - b) submit annual reports in February of each year to the Comptroller of Water Rights on the results of the approved works and effectiveness monitoring programmes until the conclusion of the programmes as specified in each terms of reference.

Records

21. With respect to the maintenance and provision of records the licensee must:
 - a) Keep records of
 - i) elevations of the Downton and Carpenter Reservoirs and Seton Lake;
 - ii) flow release from the low-level outlet of Terzaghi Dam;
 - iii) flow releases from the spillways at La Joie Dam, Terzaghi Dam and Seton Dam;
 - iv) generation discharge from La Joie, Bridge 1, Bridge 2, and Seton Generating Stations;
 - v) annual flow diversion from Carpenter Reservoir into Seton Lake; and
 - vi) flow diversion from Cayoosh Creek into Seton Lake.

- b) Provide a written report to the Comptroller of Water Rights on or before February 15 of each year summarizing the records from the previous calendar year; and
- c) Provide on request of the Comptroller of Water Rights records collected under 21 a).

22. The licensee may operate the works in an alternate manner in the event of an emergency, dam safety requirement, or an extreme hydrological event.

23. All emergency operations or other deviations from operations ordered above shall be reported to the Comptroller of Water Rights in a timely manner.

Dated at Victoria, B.C., this 30th day of March, 2011.



Glen Davidson, P. Eng.
Comptroller of Water Rights

Schedule A Works and Monitoring

The licensee shall submit within 9 months of the date of this Order, for approval by the Comptroller, terms of reference for the following:

Bridge-Seton Power Development Projects

1. Bridge-Seton Metals and Contaminant Monitoring Program
 - a. Monitor if operating conditions change the concentration of metals and other contaminants in the water and sediments of reservoirs, lake and rivers in the Bridge River system.
 - b. If redistribution of metals and contaminants occurs, monitor if this results in increased bio-accumulation in fish in the Bridge River system.

Downton Lake Reservoir and La Joie Generating Station Projects

2. Downton Lake Reservoir Riparian Vegetation Monitoring
 - a. Monitor the effect of Downton Lake operating conditions on the upper Bridge River riparian area and in the adjacent Downton Lake Reservoir drawdown zone;
 - b. Monitor the effect of Downton Lake operating conditions on riparian vegetation and wildlife habitat; and
 - c. Determine what activities could be undertaken to preserve these habitat areas.
3. Downton Lake Reservoir Fish Habitat and Population Monitoring
 - a. Monitor biological characteristics of fish populations in Downton Lake Reservoir and its tributaries;
 - b. Monitor the effect of Downton Lake Reservoir operating conditions on abundance and diversity of fish populations;
 - c. Monitor key habitat factors that contribute to the productivity of Downton Lake Reservoir fish populations;
 - d. Monitor the relationship between the minimum reservoir elevation and productivity of fish populations;
 - e. Monitor the effects of periodic deep drawdowns on rainbow trout populations; and
 - f. Determine if refinements can be made to operating conditions, without significantly affecting the instream flow conditions in middle Bridge River, which would improve habitat conditions or enhance fish populations in Downton Lake Reservoir.

Carpenter Lake Reservoir Projects

4. Carpenter Lake Reservoir Revegetation Program
 - a. Implement a short term re-vegetation program to mitigate the effects of dust storms, increase the aesthetic quality, enhance the quality of riparian habitats, and provide localized improvements in the quality and productivity of aquatic habitats in areas affected by the drafting of Carpenter Lake Reservoir.
5. Carpenter Lake Reservoir Productivity Model Validation and Refinement
 - a. Monitor the effects of inflow, nutrients and suspended sediment into Carpenter Lake Reservoir on benthic and pelagic productivity;
 - b. Monitor the relative importance of littoral and pelagic food sources on Carpenter Lake Reservoir aquatic productivity;
 - c. Monitor the differential effects of reservoir operations on productivity of pelagic and littoral habitats; and
 - d. Determine if monitoring program information can refine current models for predicting productivity relationships.
6. Carpenter Lake Reservoir Riparian Vegetation Monitoring
 - a. Monitor the effects of Carpenter Lake Reservoir operating conditions on the riparian area surrounding Carpenter Lake Reservoir; and
 - b. Monitor the effects of the short term reservoir re-vegetation program in 4) with respect to Carpenter Lake Reservoir operating conditions.
7. Middle Bridge River and Carpenter Lake Reservoir Fish Habitat and Population Monitoring
 - a. Monitor the biological characteristics of fish populations in Carpenter Lake Reservoir and middle Bridge River;
 - b. Monitor the effects of operating Carpenter Lake Reservoir and La Joie Generating Station on abundance and diversity of fish populations in Carpenter Lake Reservoir and middle Bridge River;
 - c. Monitor the key operating parameters that contribute to productivity of fish populations in Carpenter Lake Reservoir and middle Bridge River;
 - d. Monitor the relationship between instream flow in middle Bridge River on productivity of fish populations in Carpenter Lake Reservoir and middle Bridge River;
 - e. Determine if refinements to the operation of Carpenter Lake Reservoir and management of flow releases from La Joie Generating Station into middle Bridge River improve fish populations in both of these areas or if existing reservoir operating constraints may be relaxed; and

- f. Monitor if flow restrictions of 24 cms or less from October 15 to December 15 minimize the potential for dewatering mountain whitefish eggs after spawning.

Bridge River Projects

8. Lower Bridge River Riparian Vegetation Monitoring
 - a. Monitor influence of the flow regime on the riparian community of lower Bridge River; and
 - b. Monitor if changes in riparian community and instream flow conditions influence lower Bridge River corridor wildlife populations.
9. Lower Bridge River Aquatic Monitoring
 - a. Monitor influence of the flow regime on the physical conditions in aquatic and riparian habitats of lower Bridge River ecosystem;
 - b. Monitor how changes in aquatic habitat from the flow regime influences community composition and primary and secondary productivity of producers in lower Bridge River; and
 - c. Monitor how flow changes influence the recruitment of fish populations in lower Bridge River.
10. Lower Bridge River Adult Salmon and Steelhead Enumeration
 - a. Monitor how flow regimes affect spawning habitat for adult salmon and adult steelhead.
 - b. Monitor annual abundance of salmon and steelhead spawning in lower Bridge River and its relations with long term flow requirements at Terzaghi Dam.
 - c. Determine if flow releases from Carpenter Lake Reservoir have altered the life history and productivity of the Chinook salmon in lower Bridge River.
11. Lower Bridge River Spiritual and Cultural Value Monitoring
 - a. Monitor if flow releases from Terzaghi Dam effect the cultural and spiritual attributes of lower Bridge River for the St'at'imc.

Seton Lake Projects

12. Seton Lake Erosion Management Program (SLEMP)
 - a. Implement a program to develop and deliver an effective long term program for addressing moderate and high risk shoreline erosion issues for Seton Lake and along Seton River with particular reference to heritage, cultural and aesthetic resources that may be affected;

13. Seton Lake Erosion Mitigation Program
 - a. Monitor what erosion sites, other than heritage or cultural sites, around Seton Lake are affected by Seton Lake fluctuations resulting from operation of the generating facilities.
 - b. Determine what actions are required to protect those sites from further erosion.
 - c. Determine what mitigation plans can be developed to address such erosion sites.
 - d. Monitor if the actions implemented to mitigate erosion at the sites are effective.
14. Seton Lake Aquatic Productivity Monitoring
 - a. Monitor if operations for Seton Lake and Bridge River Generating Stations have an effect on aquatic productivity of Seton Lake.
 - b. Monitor if the inter-annual conditions in Seton Lake associated with diversion affects aquatic productivity.
 - c. Monitor the relationship between quality, quantity, and timing of water from Carpenter Lake Reservoir and the productivity of Seton Lake resident fish.
 - d. Monitor the extent to which aquatic productivity limits the abundance and diversity of fish populations in Seton Lake.
 - e. Monitor what operating refinements may improve habitat conditions or enhance fish populations in Seton Lake.
15. Seton Lake Resident Fish Habitat and Population Monitoring
 - a. Monitor the biological characteristics of resident fish populations in Seton Lake and its tributaries.
 - b. Monitor if operating conditions affect abundance and diversity of fish populations in Seton Lake.
 - c. Monitor if there is a relationship between the quality, quantity, and timing of water diverted from Carpenter Lake Reservoir and the productivity of Seton Lake resident fish populations.
 - d. Monitor what operating refinements may improve habitat conditions or enhance resident fish populations in Seton Lake.
16. Seton River Habitat and Fish Monitoring
 - a. Monitor the biological characteristics of the rearing and spawning fish populations in Seton River in terms of relative abundance, distribution, and life history.
 - b. Monitor if the proposed Seton River hydrograph influences the hydraulic condition of juvenile fish rearing habitats downstream of Seton Dam.

- c. Monitor the potential risk for salmon and steelhead redd dewatering between spawning and incubation periods due to changes in flow imposed by Seton River flows.
 - d. Monitor if the target Seton River flows influence short and long-term availability of gravel suitable for use by anadromous and resident fish for spawning and egg incubation.
 - e. Monitor if discharge from Seton Generating Station significantly affects fish habitat in the Fraser River above and beyond its natural variation.
17. Seton River Sockeye Smolt Monitoring
- a. Monitor variation in diel and seasonal timing of the annual out migration of sockeye salmon smolts from Seton-Anderson watershed.
 - b. Monitor if the operation of Seton Generating Station and Seton Dam affect the relative distribution of fish migrating past the facility in the Seton watershed.
 - c. Monitor if the implementation of planned partial or blanket shutdowns of the Seton generating station meet sockeye salmon smolt population protection targets. The frequency and duration of the shutdowns along with the expected benefits in reducing mortality will be reported to the Comptroller of Water Rights annually.
18. Seton Adult Fish Passage Program
- a. Monitor the factors impeding the success of upstream migration of salmon and steelhead.
 - b. Monitor if upstream passage of salmon are affected due to dilution of Seton River with Cayoosh Creek.
 - c. Determine if the operation of the dam and fish ladder impede fish passage upstream of Seton Dam.
 - d. Monitor what changes to the fishway or operation may mitigate upstream migration issues.