# Policy and Practice Report

# Regulation of Water Uses in the Fraser River Watershed

## 18 August 2011

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## INTRODUCTION

1. This Policy and Practice Report (Report) is intended to provide an overview of water use regulation in British Columbia as it may relate to Fraser River sockeye.[1] [2]

2. There are two major categories of water use that have the potential to impact water flow and temperature in the Fraser watershed:
    - Withdrawal and diversion of surface water and extraction of groundwater for agricultural, domestic and industrial uses; and,
    - Storage and diversion of water for hydroelectric power production.

*Surface water use and groundwater extraction*

3. For all species of salmon, the amount of water flowing in a stream is crucial to their survival at several life stages.[3] The obvious impact of removing water from a stream, for any purpose, is to reduce the magnitude of flow.[4] Low stream flows have the potential to impact salmon in various ways, for example, by limiting access to spawning and rearing habitat, interrupting the passage of adults to spawning grounds, and contributing to the problem of high water temperatures during the summer migration period.[5] In some parts of the BC Interior, extensive water withdrawals occur in the summer for irrigation, at a time when streams have naturally lower flows and maximum temperatures.[6]

[1] The information contained in this Report is derived from documents disclosed to the commission or otherwise obtained through the commission's investigations. The accuracy of this report is therefore subject to the accuracy of the documents so provided or obtained. Descriptions of policy and program objectives, purposes, intentions, outcomes, reviews or any other qualitative assessments contained in this Report are as provided in the documents cited and are not necessarily the views of the commission.
[2] The commission's Terms of Reference direct the Commissioner to use the automated documents management program specified by the Attorney General of Canada, the Ringtail Legal database. Source references in this Report refer to the unique document identifier attached to a given document by the Ringtail Legal database. To identify a document that has been referred to by its Ringtail identifier (e.g. CAN023188), see Appendix 1. Documents that have been disclosed to the commission but that have not yet been entered into the Ringtail database are identified as "Non-Ringtail documents" and will be provided to participants to the inquiry directly.
[3] CAN023188 at p. i.
[4] The "magnitude" of discharge or flow in a stream refers to the volume of water moving past a fixed point per unit of time, and is usually expressed in cubic metres per second ($m^3/s$). See: CAN024205 at p. 100.
[5] CAN023188 at pp. 14-15. Also see: Cohen Commission Exhibit 562 at p. 46.
[6] CAN002582 at p. 3.

4. Groundwater has a number of functions that may contribute to the survival of salmon, and that may be impacted by extraction. As groundwater sources are often connected to streams, groundwater upwelling augments stream flow in dry summer months and provides localized cooling or "thermal refugia" for migrating adults and rearing juveniles. Also, in winter months, groundwater upwelling provides a warming influence on temperatures in rearing streams and inhibits the production of ice cover.[7]

*Hydroelectric power production*

5. Hydroelectric power projects have the potential to fundamentally change freshwater environments that support salmon populations. These changes may be grouped into two general categories:[8]

    - *Barriers and connectivity*, which refers to the infrastructure that prevents or impacts upstream and downstream movement of fish, and structures designed to permit fish passage (e.g., fish ladders);
    - *Alteration of the flow regime*, which encompasses changes to stream characteristics related to the amount of water present in a stream and its movement.

6. There are two large-scale hydroelectric projects in the Fraser watershed with the potential to impact sockeye: BC Hydro's Bridge-Seton Power Project, near Lillooet, and Rio Tinto Alcan's Kemano Power Project, which diverts water from the Nechako River.[9] As well, there are several small hydro projects (known as Independent Power Projects) in the Fraser watershed, built mostly in the past decade, but their direct impact on sockeye appears to have been limited to date.[10]

[7] Richard Bailey, DFO's Program Head, Chinook and Coho Stock Assessment, BC Interior, has studied the role of groundwater in moderating thermally-challenging environments for salmon in the Southern Interior of BC. His research is focused on Chinook and coho salmon. See: CAN411723 at pp. 8-10. Note that sockeye salmon may not be influenced by groundwater in the same way, as their habitat preferences are different.
[8] CAN002895 at p. 2.
[9] Cohen Commission exhibit 562 at p. 34.
[10] Cohen Commission exhibit 562 at p. 41. Also refer to paragraphs 170-172 of this Report.

*Regulatory overview*

7. Both the provincial and federal governments are involved in the regulation of water use in BC. Pursuant to provincial legislation, the provincial government (the Province) has property in and the right to use surface water in streams[11] and groundwater[12] anywhere in BC, except insofar as private rights are granted to other persons. The Province is thus responsible for the licensing of surface water use and groundwater extraction, including water stored and diverted for the purpose of power generation.[13] The federal government is responsible for ensuring that water use, storage, and diversion is carried out in a manner that does not harm fish or fish habitat.[14]

*Organization of this Report*

8. This Report reviews the respective roles of the Province and the federal government in regulating the impacts of water use on Fraser sockeye, with a particular focus on hydroelectric power development, and the specific regulatory and policy responses unique to its circumstances.

9. The Report is divided into two sections. Part One describes the regulatory framework for water use in BC, and is sub-divided into three sections:

- the federal government's role in regulating water use insofar as it affects fish and fish habitat;
- the Province's regulatory framework for water allocation as it relates to both groundwater and surface water, and recent efforts to modernize this framework; and,
- provincial and federal regulatory responses to droughts and low flow conditions.

[11] *Water Act,* s. 2(1).
[12] *Water Protection Act,* R.S.B.C. 1996, c. 484, s. 3(2).
[13] Provincial authority over the regulation surface water and groundwater arises from its powers under the *Constitution Act, 1867*, (U.K.), 30 & 31 Victoria, c.3. Pursuant to ss. 92 and 92A, the provinces have exclusive authority to make laws in relation to: management of public lands; local works and undertakings; property and civil rights; matters of a merely local or private nature; as well as the development, conservation and management of sites and facilities for the generation and production of electrical energy.
[14] Pursuant to section 91(12) of the *Constitution Act, 1867,* the federal government has legislative authority over the sea coast and inland fisheries.

10. Part Two addresses the regulation of hydroelectric power production, as it relates to impacts on Fraser sockeye. Also sub-divided into three sections, Part Two focuses on:
    - BC Hydro's facilities in the Fraser watershed, in particular the Seton Dam;
    - The Kemano Power Project; and
    - Independent Power Projects in the Fraser watershed.

*Related topics not addressed in this Report*

11. This Report does not purport to be comprehensive nor authoritative, but instead aims to provide a contextual background to inform the commission's hearings on these issues. In particular, this Report does not address the issue of climate change and its effect on water flow and temperature in the Fraser watershed. For information on this topic, refer to the commission's Technical Report 9 titled "A Review of Potential Climate Change Effects on Survival of Fraser River Sockeye Salmon and an Analysis of Interannual Trends in En Route Loss and Pre-Spawn Mortality".[15]

## PART ONE: THE REGULATORY FRAMEWORK FOR WATER USE IN BC

*Federal Regulation of Water Use*

12. Fisheries and Oceans Canada (DFO) is the federal agency with primary responsibility for the management of fisheries and regulation of impacts to fish and fish habitat.[16] DFO exercises this authority mainly through the *Fisheries Act*.

*Relevant legislation*

13. The following table summarizes provisions of the *Fisheries Act* that are potentially relevant to the regulation of water use:

[15] Cohen Commission exhibit 553. For further discussion of Technical Report 9, refer to the commission's transcripts from March 8 and 9, 2011, available online at: http://www.cohencommission.ca/en/Schedule/.
[16] Note that Environment Canada also has responsibility for regulation of impacts to fish and fish habitat.

| Section | Authority |
|---|---|
| 20 | The Minister may require the owner or occupier of an obstruction[17] to construct a fish-way or canal to permit the free passage of fish |
| 22 | The Minister may require the owner or occupier of an obstruction to (a) provide sufficient flow of water into the river below the obstruction in order to allow for the safety of fish and flooding of spawning grounds, and (b) provide for free passage of ascending or descending migratory fish during the period of construction. |
| 27 | Prohibits (a) damage or obstruction of fish-ways, (b) impeding fish from entering or passing fish-ways and (c) fishing in the vicinity of a fish-way. |
| 30 | Requires the construction of a fish guard or screen at any water intake or diversion that conducts water from a stream or water body. |
| 32 | Prohibits the destruction of fish by means other than fishing unless authorized by the Minister. |
| 35 | Prohibits carrying out any work or undertaking that results in harmful alteration, disruption or destruction of fish habitat, unless authorized by the Minister or under regulations. |

14. Section 35 is the primary habitat protection provision under the *Fisheries Act*. Subsection 35(1) prohibits carrying out any work or undertaking that results in harmful alteration, disruption or destruction (HADD) of fish habitat. "Fish habitat" is defined broadly as "spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes."[18] Because "migration areas" are included in this definition, DFO has indicated that the obstruction of fish passage may be considered a HADD of fish habitat.[19] DFO has also indicated that withdrawal or diversion of water from a stream may result in a HADD where instream flows are insufficient for the protection of fish populations (commonly referred to as a flow-related HADD).[20]

[17] "Obstruction" is defined in s. 2 of the *Fisheries Act* as "any slide, dam or other obstruction impeding the free passage of fish."
[18] *Fisheries Act,* s. 34.
[19] CAN186004 at p. 5.
[20] Non-Ringtail document: DFO, Introduction to Small Hydro Instream Flow Risk Management Framework, March 2011.

15. Relief from the prohibition against HADDs is found in s. 35(2), which allows a HADD to occur with the Minister's authorization or pursuant to regulations.

16. Section 32, which prohibits the destruction of fish by means other than fishing unless authorized by the Minister, is also relevant to the regulation of water use. For example, DFO has expressed concern that fish mortality may result from entrainment in the structures of hydroelectric facilities or impingement against water intake structures.[21]

*DFO's role in regulating water use*

17. DFO manages impacts to fish and fish habitat through its Habitat Management Program (HMP). In the Pacific Region, the HMP is administered by the Ecosystems Management Branch.[22]

*Project Review*

18. The primary focus of the HMP's regulatory work is reviewing proposed projects that have the potential to cause harm to fish or fish habitat. When a project proposal is submitted to DFO for regulatory review, the process is termed a "referral."[23] DFO may receive referrals directly from project proponents, or from other government agencies.[24]

19. The referral process enables DFO's habitat staff to assess whether a contravention of s. 35(1) or s. 32 is likely to result from a proposed project. Habitat staff provide advice to proponents on how to proceed in a manner that complies with the *Fisheries Act.* Under certain conditions, where harm to fish or fish habitat is unavoidable, habitat staff may issue an authorization under s. 32 or s. 35(2).[25]

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[21] CAN186004 at p. 5.
[22] Formerly called the Oceans, Habitat and Enhancement Branch.
[23] CAN186041 at p. 1. Proponents voluntarily participate in the referral process. The *Fisheries Act* does not create a mandatory obligation for licences to seek advice or authorization from DFO. However, failure to do so may expose a licensee to charges and prosecutions under the *Fisheries Act*. See: CAN445419 at pp. 12-13.
[24] CAN002978 at p. 8.
[25] CAN445419 at pp. 12-13.

Such authorizations must be preceded by an environmental assessment under the *Canadian Environmental Assessment Act.*[26]

20. For further information regarding DFO's project review process, refer to the commission's policy and practice report titled "Habitat Management Policies and Practices" at pp. 31-51.[27]

*Monitoring*

21. Monitoring allows DFO's habitat staff to determine whether proponents are complying with the *Fisheries Act* and any conditions of authorizations or orders, and whether developments (e.g., hydroelectric projects) conform to any advice aimed at avoiding negative effects to fish and fish habitat.[28] This can be determined by collecting data through site visits or by obtaining reports from the proponent or a third party, which may be a condition of a *Fisheries Act* authorization.[29] For a detailed discussion of DFO's monitoring programs, refer to the commission's policy and practice report titled "Habitat Management Policies and Practices" at pp. 73-79.

*Enforcement and Compliance*

22. Responsibilities for habitat enforcement and compliance are shared between DFO's habitat staff and DFO's Conservation and Protection (C&P) Program. Habitat investigations and prosecutions involve teams of people including DFO staff from C&P and HMP, and legal support from the Department of Justice or Crown agents. Other departments such as DFO's Science Branch, or outside consultants may also be involved.[30] For further information regarding DFO's policies and practices on habitat enforcement, refer to the commission's policy and

[26] S.C. 1992, c. 37.
[27] Cohen Commission exhibit PPR8.
[28] CAN186007 at p. 8.
[29] Ibid.
[30] CAN002978 at pp. 8-14.

practice report titled “Enforcement of the Habitat Protection and Pollution Prevention Provisions of the *Fisheries Act*”.[31]

*Provincial Water Allocation*

23. Water allocation refers to the system of rules and procedures that grant access to water rights through licences and approvals.[32] The *Water Act* establishes the system for allocation of water rights in BC. The use of surface water for any purpose other than emergency withdrawals and certain domestic uses requires a water licence or approval.[33] As of 2010, there were approximately 44,000 active water licences in BC, and approximately 300 to 500 new licences are issued each year.[34] In addition to licences, the Province also issues short-term water use “approvals” for periods of up to 12 months.[35] Approvals are issued for variety of purposes (e.g., road construction, mining exploration) and can result in significant withdrawals.[36]

24. The *Water Act*’s licensing system currently does not apply to groundwater extraction.[37] Regulation of groundwater extraction is discussed further at paragraphs 42-45.

25. The Ministry of Forests, Lands and Natural Resources Operations (MFLNRO) is the provincial agency in charge of licensing, approvals and monitoring of surface water and groundwater resources. The Ministry of Environment (MOE) is responsible for science and knowledge management, as well as the development of policy and legislation in respect of surface water use and groundwater extraction.[38]

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[31] Cohen Commission exhibit PPR9.
[32] BCP008204 at p. 37.
[33] *Water Act,* s. 42.
[34] BCP008204 at p. 37.
[35] *Water Act,* s. 8.
[36] BCP008204 at p. 39.
[37] *Water Act,* s. 1.1(1).
[38] BCP008137 at p. 4. Prior to September 2010, MOE’s Water Stewardship Division was responsible for all aspects of the regulation of water resources including policy, legislation and science, as well as water

*Licensing of surface water use*

26. Authority to issue licences under the *Water Act* is vested with statutory decision makers, specifically the Comptroller of Water Rights (comptroller) or a regional water manager. The comptroller or a regional water manager has authority to grant, amend or refuse all or part of an application for a water licence.[39]

27. A 2010 MOE technical document indicates that water licenses are issued through the following process:[40]
    - An application for a water licence is submitted to the Province;
    - The application is checked for completeness and to identify potential impacts on: existing licence holders or earlier applicants, minimum instream flow requirements, landowners or crown land tenure holders, other agencies, and the interests of First Nations;
    - Potentially affected licensees and other interested parties are notified and provided an opportunity to comment on or object to the application;
    - Provincial staff perform a technical assessment of the application to determine if there is sufficient water available in the source to issue a new licence;
    - The comptroller or a regional water manager reviews the technical assessment, considering potential impacts and the availability of water, and will either grant, amend or refuse the application.

*Terms and conditions of a water licence*

28. According to MOE, the following terms and conditions are typically attached to a water licence:[41]
    - the name and location of the stream from which water may be taken or stored;
    - the priority date of the licence;

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allocation and licensing. The Water Stewardship Division no longer exists; its operational functions (e.g., water allocation and licensing) were transferred to MFLNRO, while its policy, legislation and science functions remained with MOE.

[39] *Water Act*, s.12.

[40] BCP008204.

[41] Ibid. at p. 41.

- the purpose(s) for which the water may be used;
- the maximum quantity of water which may be used or stored;
- the time of year during which the water may be used;
- the property where the water is to be used and to which the licence is attached;
- authorization to construct works to divert or convey the water from the stream; and
- other clauses that define the special conditions of a particular use.

29. Most water licences are issued "in perpetuity" and have no expiry date, with the exception of recent licences for hydropower purposes, which have terms of 40 years.[42] The comptroller or a regional water manager may attach an expiration date to a non-power licence, but this rarely occurs.[43]

30. Under the *Water Act,* the priority of a water licence is determined by the principles of prior allocation, also called "first in time, first in right." The priority date of a licence is assigned according to the date on which the application is received.[44] In times of water scarcity, the licence with the earliest priority date is entitled to extract its full allocation, prior to a licence with a later priority date.[45]

*Consideration of fisheries impacts in water licensing decisions*

31. There is no requirement under the *Water Act* to consider stream health or fisheries impacts in making water allocation decisions.[46] MOE indicates that the comptroller and regional water managers have responded to this absence of legislated direction by using discretion to include consideration of "environmental flows" in their decision-making processes.[47] According to MOE, the term "environmental flow" refers to the "time dependent flows or water level in a stream required to

[42] *Water Act,* s. 12.2(2).
[43] BCP008204 at p. 40.
[44] Ibid.
[45] *Water Act,* s. 15(1). Where two licences have the same priority date, priority is determined based on the purpose of water use: *Water Act,* s. 15(2).
[46] BCP008204 at p. 2.
[47] Ibid. at pp. 2-3.

protect stream health," which varies for each stream depending on the needs of fish, other wildlife or riparian vegetation.[48] Environmental flows are determined using many different methodologies and communicated in a format known as "instream flow requirements." The methodology chosen depends on the values or interests to be protected and the time and resources available.[49] The term "fish flow" is also used where instream flow requirements are intended to protect fisheries resources.

32. In specific circumstances, the comptroller and regional water managers are directed to consider, or required to consider, environmental flows and/or fisheries concerns in their water allocation decisions. These circumstances are explained below.

*Sensitive streams*

33. The provincial *Fish Protection Act*[50] states that the Lieutenant Governor in Council may, by regulation, designate sensitive streams where such designation will contribute to protecting a population of fish whose sustainability is at risk due to inadequate water flow within a stream or due to habitat degradation.[51] In 1997, the Lieutenant Governor in Council designated 15 sensitive streams, of which the following flow into the Fraser River: Nathan Creek, Salmon River, Silverdale Creek, West Creek and Whonnock Creeks.[52] As of July 2011, no further streams have been designated.[53]

34. When assessing a water licence application on a sensitive stream, the comptroller or a regional water manager is required to consider impacts to "protected fish

[48] Ibid. at p. 1.
[49] Ibid. at p. 2. See BCP008204 at pp. 11-14 for further information regarding methodologies for calculating instream flow requirements.
[50] S.B.C. 1997, c. 21.
[51] *Fish Protection Act*, s. 6(2).
[52] *Sensitive Streams Designation and Licensing Regulation*, B.C. Reg. 89/2000.
[53] Ibid. In a 2004/05 report, the BC Auditor General stated that "many other streams" in BC would likely qualify as sensitive streams. See: BCP002115 at p. 36.

populations,"[54] and may only issue or amend a licence where impacts to those populations are "likely to be insignificant."[55] Where impacts are anticipated, a licence may only be issued or amended if the water licence application includes mitigation or compensation measures.[56]

*Water allocation restrictions*

35. MOE maintains a record of "water allocation restrictions" to alert decision makers to potential water allocation concerns.[57] Provincial staff may initiate a water allocation restriction on a stream where there are possible water shortages, or where a stream is "fully recorded."[58] According to MOE, water allocation restrictions are to be considered by the comptroller or a regional water manager, along with other factors, in deciding whether to grant or refuse a water licence application.[59]

36. The type of water allocation restriction initiated varies with the situation. For example, licensing for agricultural purposes may be restricted on a particular stream unless the licensee agrees to construct supporting water storage facilities. In a few cases, water allocation restrictions have been initiated to ensure that minimum fish flow clauses are included in future water licences. Such clauses prohibit licensees from withdrawing water during times of the year when flow drops below a specified level required to support fish populations. [60]

*Water allocations plans*

37. MOE has not developed water allocation plans in the Fraser watershed. However, according to MOE, water allocation planning has been a success in the Vancouver

[54] The term "protected fish population" refers to a population of fish in relation to which a sensitive stream designation has been made: *Fish Protection Act,* s. 6(1).
[55] *Fish Protection Act,* s. 6(6).
[56] *Fish Protection Act*, ss. 6(7), 6(8) and 6(9).
[57] The full list of water allocation restrictions in BC, as of June 5, 2009, is available at CCI001228.
[58] "Fully recorded" is a subjective term used to categorize a stream where a technician has determined that no further licences should be issued. See: CCI001229.
[59] BCP008204 at p. 39.
[60] CCI001263.

Island Region and "there is growing interest in using water allocation plans in other parts of the province."[61]

38. In the Vancouver Island Region, MOE has developed water allocation plans at the watershed level to provide guidance to decision makers regarding future water licensing decisions. According to MOE, water allocation plans are intended to "determine the amount of water that is available for allocation while ensuring environmental objectives are met."[62] To inform these plans, assessments are undertaken to evaluate: (a) the amount of surface water resources available for allocation; (b) the existing and potential demand for water resources; and (c) minimum flow requirements for sustaining fisheries resources.[63] Regional policy directs that water licensing decisions be made in accordance with approved plans.[64]

*Water licence amendment, suspension and cancellation*

39. Once a water licence is issued, the comptroller or a regional water manager has a limited ability to amend, suspend or cancel a licence. Thus, according to MOE, licensees have a great deal of security in maintaining their rights to water.[65]

40. The terms of a licence may only be amended in limited circumstances, for example, if an error was made in the original licence, or if the quantity of water authorized to be diverted was erroneously estimated.[66] Likewise, a licence may only be suspended or cancelled for a limited number of reasons, including:
    - failure to comply with the *Water Act,* regulations, the terms of a licence, or an order of the comptroller, a regional water manager, or an engineer;[67]
    - failure to pay annual rentals or water bailiff's fees;[68]

[61] BCP008204 at p. 7.
[62] BCP008204 at p. 7.
[63] MOE has completed 23 water allocation plans on Vancouver Island. Available here: http://www.env.gov.bc.ca/wsd/water_rights/wap/index.html.
[64] CCI001240 at p. 10.
[65] Ibid. at p. 41.
[66] *Water Act,* s.18(1).
[67] *Water Act,* ss. 23 (e), 23(f) and 23(g).

- failure to construct works authorized under the licence in the time specified;[69] or,
- making a material misrepresentation or misstatement in a licence application or in information provided to the comptroller or a regional water manager.[70]

41. In addition, a licence may be suspended or cancelled for failure to make beneficial use[71] of the water for three consecutive years.[72] This provision codifies the "use it or lose it" principle, whereby water rights may be forfeited for non-use. According to a 2007 report by the Sierra Legal Defence Fund,[73] this provision allows for phasing out of water rights and reallocation of water to other uses, but may also encourage licensees to use water when not needed, so as to maintain their rights.[74] MOE has indicated that water licences are rarely cancelled for non-use.[75]

*Regulation of groundwater extraction*

42. With limited exceptions, the Province does not regulate groundwater extraction in BC. As noted above, the parts of the *Water Act* that regulate licensing, diversion and use of water currently do not apply to groundwater. Under s. 1.1(2) of the *Water Act*, the Lieutenant Governor in Council may, by regulation, fix a date on which the licensing provisions of the *Water Act* apply to "ground water,"[76] but this has not been brought into effect. BC is now the only jurisdiction in Canada where a licence is not required for groundwater extraction.[77]

43. MOE has acknowledged that, where surface water is limited or fully allocated, land owners are able to bypass the surface water licensing process by drilling wells,

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[68] *Water Act,* ss. 23(c), 23(d).
[69] *Water Act,* s. 23(b).
[70] *Water Act,* s. 23(h).
[71] "Beneficial use" means using water for the licensed purpose (e.g., irrigation, industrial, domestic) and in accordance with the terms and conditions of the licence: BCP008205 at p. 12.
[72] *Water Act,* s. 23(a).
[73] The Sierra Legal Defence Fund is now known as Ecojustice.
[74] CCI001110 at p. 11.
[75] BCP008204 at p. 41.
[76] "Ground water" is Defined in s. 1 of the *Water Act* as "water below the surface of the ground."
[77] CCI001110 at p. 5.

often adjacent to streams, to obtain groundwater. Since groundwater is a source of base-flow in many streams, this can result in depletion of surface water.[78]

44. Although there is no licensing requirement in BC, proposed groundwater extraction may be subject to review under the BC *Environmental Assessment Act*,[79] if it is: (a) part of a groundwater extraction project with an extraction capacity of greater than 75 litres per second (e.g., municipal water supply), or (b) a component of a larger project that is subject to review under the *Environmental Assessment Act* for other reasons (e.g., pulp mill, mine, fish hatchery).[80]

45. The Ground Water Protection Regulation,[81] enacted under the *Water Act*, establishes standards for drilling, altering and closing wells,[82] and requires well drillers and pump installers to register with the Province.[83] This regulation does not address the depletion of groundwater.[84]

*Information about groundwater resources in BC*

46. Groundwater is found in aquifers, which are bodies of material below the ground that have the ability to hold and transmit water. In BC, groundwater is primarily found in unconsolidated aquifers (e.g., sand and gravel) and fractured bedrock aquifers. BC's unconsolidated aquifers are some of the most productive in Canada and can yield thousands of cubic metres of water per day.[85]

47. The Province has obtained information about aquifers through its classification system, which is based on usage and vulnerability. As of December 2010, the Province had classified 916 aquifers, although much of BC has yet to be mapped. MOE indicates that the aquifer classification does not provide the level of detail

[78] BCP008204 at p. 64.
[79] S.C. 1992, c. 37.
[80] Reviewable Projects Regulation, BC Reg. 270/2002, s. 11, table 9. Also see, MOE Website: http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/library/envass.html.
[81] BC Reg. 299/2004,
[82] BC Reg. 299/2004, ss. 7-14.
[83] BC Reg. 299/2004, ss. 2-6.
[84] BCP008137 at p. 16.
[85] BCP008204 at p. 61.

required to manage groundwater.[86] While aquifer characterization does provide more detailed information about aquifers, the characterization work undertaken by the Province is limited and has been done on a piecemeal basis.[87]

48. Wells are excavations or structures created to access groundwater held in aquifers. MOE maintains a database of voluntarily submitted groundwater well records (i.e. for wells that access aquifers) called the WELLS database. Well records contain important information about wells; however they lack information on current actual use or actual volumes pumped. Of the 200,000 estimated wells in BC, approximately 100,000 are identified in the WELLS system. Submission of well records remains voluntary under the Ground Water Protection Regulation.[88]

49. By installing remote sensors in some wells and through periodic water sampling, the Provincial Observation Wells Network monitors the levels, and to some extent, the quality of the groundwater. As of July 2009, the network had 145 active observation wells covering major developed groundwater areas of the Province. [89] According to an MOE report, for the period of 2000-2005, approximately 35% of its observation wells showed declining water levels due to human activities.[90]

*2010 audit of the management of groundwater resources*

50. Between December 2009 and July 2010, the Auditor General of British Columbia carried out an audit of the Province's effectiveness in promoting the sustainability of groundwater resources in BC. It examined activities undertaken by the Province during the period from 2002 to 2010.[91] At the time the audit was prepared, MOE was the main agency responsible for the management of groundwater in BC.[92]

[86] BCP008137 at p. 10.
[87] Ibid. at p. 10.
[88] Ibid. at p. 12. Also see BCP008204 at p. 62.
[89] Ibid. at p. 12.
[90] Ibid. at p. 15.
[91] Ibid. at p. 9.
[92] Ibid. at p. 4. As noted at paragraph 25, responsibilities have now been divided between MOE and MFLNRO.

51. The Auditor General concluded that:

    1. MOE's information about groundwater is insufficient to enable it to ensure the sustainability of this resource;
    2. groundwater is not being protected from depletion and contamination or for the purpose of ensuring the viability of the ecosystems it supports; and
    3. control over access to groundwater is insufficient to sustain the resource and key organizations lack adequate authority to take appropriate local responsibility.[93]

52. The Auditor General made seven specific recommendations, which focused on: [94]

    - Augmenting existing resources that provide information about groundwater, such as the WELLS database and the Provincial Observation Wells Network, consolidating other possible sources of information, and developing a groundwater information management strategy; and
    - Developing systems and plans to protect groundwater from depletion and contamination, within a framework of clearly established roles and responsibilities, which includes integrated watershed management plans in priority areas.

53. MOE provided a response to each of the audit's recommendations.[95] Part of its overall response has been to lead the process of modernizing the *Water Act*.[96]

*Water Act Modernization*

54. In December 2009, the BC Government initiated a process to amend the *Water Act,* called *Water Act* Modernization (WAM).[97] MOE provided the following rationale for initiating the WAM process:

[93] Ibid. at p. 9.
[94] Ibid. at p. 3.
[95] See BCP008137 at pp. 4-6 for MOE's specific responses to each of the audit's seven recommendations.
[96] BCP008137 at p. 6.
[97] BCP008205.

> Water law in British Columbia has evolved over more than 100 years although most of the principles were established in or before the first *Water Act* of 1909. BC's *Water Act* is one of the province's oldest provincial statutes. It reflects the issues and practices of a time when BC's population was less than 500,000, water was considered plentiful, and industrial and agricultural developments were only emerging. Societal expectations and values have, and will continue to change. British Columbians care about keeping our water resources healthy and sustainable and have a strong desire to maintain salmon and other fish stocks and their habitat. Our understanding of the effects of human activities on watershed health has also increased significantly.[98]

55. In February 2010, MOE released a Discussion Paper[99] that presents a number of proposals for changing the *Water Act*. The four goals and supporting objectives for WAM, as described in the Discussion Paper, are as follows:

    1. Protect stream health and aquatic environments
        - Environmental flow needs are considered in all water allocation decisions;
        - Watershed or aquifer-based water allocation plans include environmental flows and water available for consumptive use; and
        - Habitat and riparian area protection provisions are enhanced.

    2. Improve water governance arrangements
        - Governance roles and accountabilities are clarified in relation to the allocation of water and the protection of stream health;
        - Governance arrangements are flexible and responsive to future needs and values; and,

[98] BCP008202 at p. 3.
[99] BCP008202. DFO was provided with a draft of the Discussion Paper and given an opportunity to comment on it, see CAN394697.

- Management is coordinated with neighbouring jurisdictions, across all levels of government and those with a major interest in the watershed.

3. Introduce more flexibility and efficiency in the water allocation system
    - The water allocation system emphasizes and encourages efficiencies in both water use and the administration of water as a natural resource;
    - Water users and decision makers have flexibility to quickly adapt to changing environmental, social and economic conditions;
    - The water allocation system integrates the management of groundwater and surface water resources where required in problem areas; and
    - Water users conserve water during drought or when stream health is threatened.

4. Regulate groundwater use in priority areas and for large withdrawals
    - Groundwater extraction and use is regulated in priority (critical) areas and for all large withdrawals.

56. The Discussion Paper provides policy options for achieving each of the objectives, but did not take a position on the desirability of any given option. With respect to the objective of regulating groundwater, the Discussion Paper presents possible options for defining the threshold for a "large withdrawal" and the criteria to be used in determining a "priority area."[100] These options are set out in Table 1 below.

[100] BCP008202 at p. 47. For a full list of policy options provided in the Discussion Paper, see pp. 44-47.

**Table 1: Proposed options for regulating groundwater withdrawals**[101]

| **Option A:** | **Option B:** |
|---|---|
| **Large groundwater withdrawals are:**<br><br>500 $m^3$/day for wells drilled in unconsolidated, sand and gravel aquifers,<br><br>*and*<br><br>100 $m^3$/day for wells drilled into consolidated bedrock aquifers, or if otherwise determined by a Water Management Plan. | **Large groundwater withdrawals are:**<br><br>250 $m^3$/day for wells drilled in unconsolidated, sand and gravel aquifers,<br><br>*and*<br><br>100 $m^3$/day for wells drilled into consolidated bedrock aquifers or if otherwise determined by a Water Management Plan. |
| AND:<br>**Options for determining priority areas:**<br>A. Heavy groundwater extraction and use;<br>B. Area of known quantity concern;<br>C. Groundwater in direct hydraulic connection with surface water in areas of known concern;<br>D. Significant population who is reliant on groundwater for drinking water;<br>E. Trans-boundary aquifers;<br>F. Basins where surface water is at or near the allocation limit; *or*<br>G. Any combination of the above. | |

57. Following the release of the Discussion Paper, MOE sought feedback from the public, stakeholders and other affected parties through a formal engagement process. MOE received approximately 900 written submissions, summarized in its "Report on Engagement", and held 12 public workshops across the province in March and April 2010. [102]

58. MOE also sought input from other government agencies, including DFO, through formal cross-government dialogue. DFO formed a working group, led by its Policy

[101] Ibid. The proposed thresholds are the highest in Canada, which according to MOE, is "due to the relative abundance of groundwater in some parts of BC." The threshold of 500 $m^3$/day per day would capture mid to large sized water supply systems for small towns, larger farms, resorts and golf courses; the 250$m^3$/day threshold would also capture some smaller enterprises, but would increase regulatory costs. The lower threshold of 100 $m^3$/day is used for bedrock aquifers because they are more impacted by extraction due to their confined nature and limited recharge potential. See: BCP008202 at p. 31.
[102] BCP008203 at p. 3.

Branch, to engage with MOE on WAM.[103] According to DFO, WAM offers an opportunity to "harmonize province and federal legislation," and to "ensure that water flow for fish and fish habitat needs are met, stream health is protected, and critical habitat for SARA listed species is protected."[104] According to Kim Hyatt, Head, Salmon in Regional Ecosystems Program, DFO Science:

> Given the Water Act's roughly 100-year vintage, potential overlap between WAM aims and objectives with Fisheries Act, SARA and Wild Salmon Policy aims and objectives, this may constitute a once in a lifetime opportunity to achieve greater integration of aims and objectives that DFO, EC[105] and BC share with respect to management of water to meet both human system and natural system needs now and into the future.[106]

59. DFO provided input and technical advice to MOE regarding WAM at cross-government workshops in June 2010.[107] In preparation for these workshops, DFO prepared a detailed written response to MOE's Discussion Paper, which states that, "Overall, the Public Discussion Paper represents a positive step forward and reflects many of the discussions that DFO has had with the Province regarding water management."[108]

60. While DFO supported the overall goals and objectives of the Discussion Paper, it also offered a number of specific recommendations focused on improving protections for fish and fish habitat, and harmonizing the *Water Act* with the goals and objectives of the *Fisheries Act* and the *Species at Risk Act*.[109]

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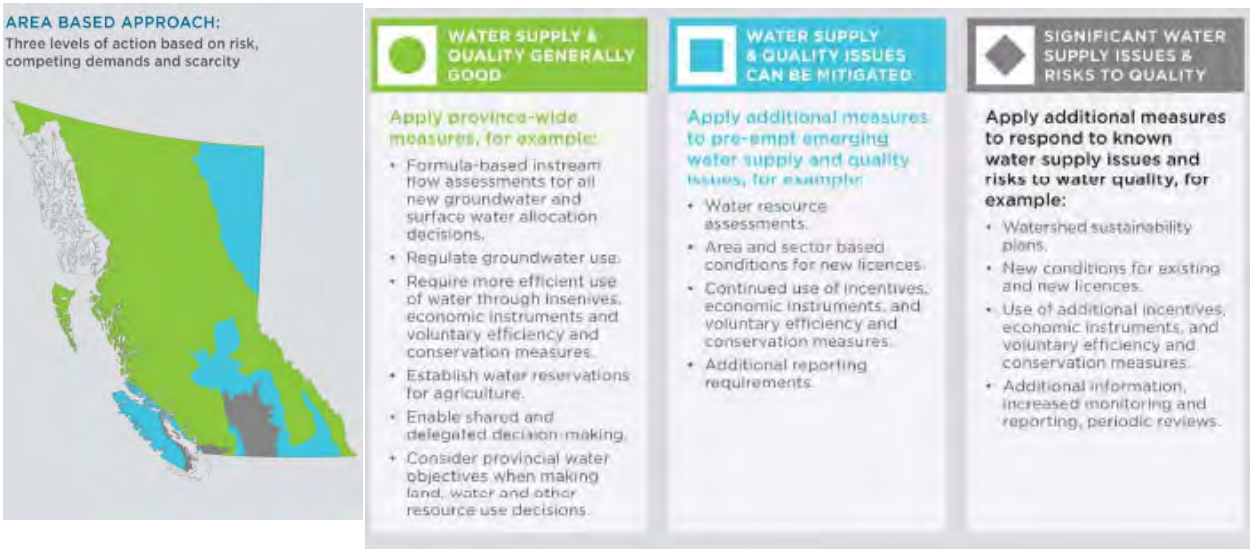
[103] CAN394694 at p. 1.
[104] Ibid.
[105] "EC" refers to Environment Canada.
[106] CAN450406 at p. 1.
[107] CAN394694 at p. 1.
[108] Ibid. at p. 1.
[109] See CAN394694 at pp. 4-32 for a chart outlining DFO's response to the Discussion Paper.

*Policy Proposal on British Columbia's new Water Sustainability Act*

61. In December 2010, MOE released a document titled "Policy Proposal on British Columbia's new *Water Sustainability Act*" (Proposal),[110] which summarized the key aspects of proposed legislation that would replace the current *Water Act*.

62. The Proposal indicates that, under the *Water Sustainability Act*, an "area-based" framework would be established for water management. This framework would provide for three levels of regulatory action in different areas of the province, based on risk, competing demand and scarcity. As shown below in Figure 1, some regulatory requirements would apply province-wide (green), while more stringent requirements may apply in: (a) known problem areas where water supply issues are emerging and can be mitigated (blue), or (b) chronic problem areas where there are significant risks to water quantity and quality (grey). Recovery action may also be required in chronic problem areas.[111]

**Figure 1**: Area-based approach under the proposed *Water Sustainability Act*[112]




63. The Proposal lists seven "policy directions" for the *Water Sustainability Act*, summarized below.[113]

[110] BCP008205.
[111] Ibid. at p. 7.
[112] Ibid. at p. 16.

1. **Protect stream health and aquatic environments:** Decision makers will be required to "consider" instream flow guidelines for all new water allocation decisions, for both surface water and groundwater. This approach will not be applied to existing licences. If a new water licence incorporates instream flow requirements, the licensee will be required to adhere to them in the same way as other terms or conditions of a licence. [114]

2. **Consider water objectives in land-use decisions:** Provincial Water Objectives will be developed and used to guide decisions regarding land, water and resource use under the proposed *Water Sustainability Act* as well as other provincial legislation (e.g. *Forest and Range Practices Act, Oil and Gas Activities Act*). As a number of activities (both on land and in water) have the potential to affect water quantity and quality, the use of common, province-wide water objectives is expected to improve consistency in decision making in relation to the protection of water resources.[115]

3. **Regulate groundwater use:** Groundwater extraction will be licensed for all large withdrawals throughout BC. The threshold for a large withdrawal could be in the range of 250 to 500 $m^3$/day for unconsolidated aquifers, and 100 $m^3$/day for bedrock aquifers. In known and chronic problem areas, licensing requirements will likely apply to smaller users, and in some circumstances may apply to private domestic wells.[116]

4. **Regulate during scarcity:** A staged approach to water management will be adopted "in times of scarcity," defined as periods when insufficient water is available to meet the needs of users or the environment (e.g. drought, over-licensing). The first stage is to encourage voluntary conservation, followed by proportional reductions for all users. If those measures are insufficient, restrictions may be imposed based on the priority date of the licence ("first in time, first in right"). In exceptional circumstances (e.g., where high importance water uses are at risk, such as municipal water supplies), restrictions may be imposed based on priority of use, rather than priority date.[117]

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[113] Note that four of the policy directions reflect the goals listed in the Discussion Paper, while three have been added.
[114] BCP008205 at p. 8.
[115] Ibid. at p. 9.
[116] Ibid. at pp. 9-10.
[117] Ibid. at pp. 10-11.

5. **Improve security, water use efficiency and conservation:** A range of economic instruments will be enabled as incentives for improving water use efficiency (e.g., fee-based measures, rebates, liability and assurance regimes, tradeable permits). Water user efficiency will be incorporated into the definition of beneficial use,[118] thus licensees may be required to demonstrate efficiency of use in order to maintain their licences.[119]

6. **Measure and report:** Licensees will be required to report actual water use, starting with large surface water and groundwater users province-wide. In known or chronic problem areas, smaller users such as domestic licensees may also be required to report on water use.[120]

7. **Enable a range of governance approaches:** Approaches will be enabled to support increased collaboration and participation in decisions, such as the ability to delegate responsibility to local or regional agencies. Ultimate accountability will remain with the Province.[121]

64. MOE asked for feedback on the Proposal and received approximately 1,200 comments and submissions. The engagement process ended in March 2011. The Province will now determine final policy options and begin drafting the new legislation. According to MOE, the *Water Sustainability Act* is expected to be introduced in the legislature in 2012.[122]

*Water Use Regulation In Times of Drought or Water Scarcity*

65. Drought is a common occurrence in the Southern Interior of BC, in particular the Thompson, Nicola and Shuswap basins. In the summers of 2003, 2006 and 2009, parts of the Southern Interior experienced drought conditions and low stream flows, which impacted the survival of adult salmon returning to spawning grounds, as well as juvenile stream-rearing salmon.[123] Water withdrawals from irrigation and other uses contribute to low stream flows in the Southern Interior.

[118] Under the current regime, beneficial use means using water for the licensed purpose (e.g., irrigation, industrial, domestic) and in accordance with the terms and conditions of the licence. See: BCP008205 at p. 12.
[119] BCP008205 at p. 11.
[120] Ibid. at pp. 12-13.
[121] Ibid. at p. 13.
[122] Ibid. at p. 2.
[123] See: CAN213857, CAN023346, CAN119205.

66. The Province and DFO are both involved in coordinating responses to drought conditions.

*Provincial legislation*

67. The *Water Act* does not authorize the comptroller or regional water managers to restrict water use by licensees in times of drought or water scarcity. As noted above, a water licence generally cannot be amended, suspended or cancelled, provided that the licensee complies with the terms of the licence and applicable legislation. However, under s. 35 of the *Water Act,* the comptroller may appoint a water bailiff to manage water use conflicts in a stream before or during a drought.[124] A water bailiff has authority to enter on any land in order to regulate and control water diversion, and is given the powers of a police constable under the *Police Act.*[125]

68. Under s. 9 of the *Fish Protection Act,* the Minister may issue a temporary order to restrict the use and diversion of water by a licensee if, during a drought, the flow of water in stream is likely to become so low that the survival of a population of fish may be threatened.[126] Prior to issuing an order under s. 9, the Minister must give due consideration to the needs of agricultural users.[127] The Minister may issue an order to any licensee, irrespective of priority under the *Water Act.*[128]

69. Although the *Fish Protection Act* was passed in 1997, s. 9 was not brought into force until 2009, as part of a response to severe drought conditions in the Southern Interior that year.[129] Licensees voluntarily complied with requests to limit water use in most cases. However, the Minister issued a s. 9 order in one case where a

[124] *Water Act,* s. 35. Also see: BCP007951 at p. 9.
[125] *Water Act,* s. 35(2).
[126] *Fish Protection Act,* ss. 9(1) and 9(2).
[127] *Fish Protection Act,* s. 9(3).
[128] *Fish Protection Act,* s. 9(2).
[129] BCP008204 at p. 41.

licensee refused to stop irrigation in order to provide minimum flows for kokanee spawning.[130]

*Federal legislation*

70. The *Fisheries Act* may be used as an enforcement tool if a water withdrawal results in harmful alteration, disruption or destruction of fish habitat,[131] or results in destruction of fish by means other than fishing.[132] However, according to Linda Nowlan, environmental lawyer and consultant for the Watershed Watch Salmon Society, the utility of the *Fisheries Act* is limited in this context because it is difficult to prove that one particular licensee or water user is responsible for impacts to fish habitat.[133]

*Local government by-laws*

71. Water conservation by-laws have been enacted by a number of municipalities and regional districts in BC.[134] These by-laws typically authorize a municipality to restrict specific types of water use (e.g., lawn watering, outdoor cleaning) at times of the year when water is scarce.[135]

*Non-regulatory responses*

72. Provincial agencies and DFO also rely on a number of non-regulatory tools to address the issue of water withdrawals. This includes various strategies to encourage voluntary conservation of water resources, such as issuing news releases and low stream flow advisories, and communicating directly with licence holders to request reductions in use.[136]

[130] The licensee operated a ranch in the Nicola basin. See: CAN438976 at p. 4.
[131] *Fisheries Act,* s. 35(1).
[132] *Fisheries Act,* s. 32.
[133] CAN305183 at p. 145.
[134] MOE has compiled a list of municipal initiatives to conserve water, available at: http://www.env.gov.bc.ca/wsd/plan_protect_sustain/water_conservation/wtr_use_eff_cat_bc/legal.html.
[135] For example, see the District of Lillooet's Water Conservation Bylaw at CCI001247.
[136] BCP007951 at p. 19. For an example of a DFO news release, see CAN023346.

*British Columbia Drought Response Plan*

73. In 2010, MOE released the British Columbia Drought Response Plan (Plan).[137] The Plan is intended to guide the coordination and communication of actions taken before, during and immediately after a drought, and is primarily directed at staff in provincial government agencies, but also provides recommended actions for federal and local government agencies including DFO, as well as licensees.[138] When the Plan was released, MOE was the provincial agency with primary responsibility for drought response in BC. Since then, a number of MOE's functions have been transferred to the Ministry of Forests, Lands and Natural Resource Operations.[139]

74. The Inter-Agency Drought Working Group, chaired by a manager from MOE, is responsible for implementing the Plan. Membership is drawn from a number of provincial and federal government agencies, including DFO. The Inter-Agency Drought Working Group meets once a year and as needed in times of water scarcity or drought. The Inter-Agency Drought Working Group receives advice from the Technical Drought Working Group, comprised of staff from MOE, DFO and the Ministry of Agricultural and Lands. The Technical Drought Working Group meets monthly prior to the onset of drought, and bi-weekly if drought conditions or low stream flows require immediate attention.[140]

75. The Plan establishes four successive levels of drought conditions (green, yellow, orange, red) that provide a framework to guide drought responses. The Technical Drought Working Group determines when to move to an elevated level of drought response based on an assessment of a number of environmental indicators (e.g., snow levels, seasonal runoff forecasts, average stream flow over seven days, average precipitation over 30 days).[141]

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[137] BCP007951.
[138] Ibid. at p. 2.
[139] See paragraph 25 of this Report.
[140] BCP007951 at p. 6.
[141] Ibid. at p. 12-14.

76. The four levels are each linked to a range of responses, including voluntary conservation, restrictions and regulatory enforcement. Table 2 below summarizes the four levels, as well as associated responses and suggested water use targets.

**Table 2: Summary of drought response levels under the British Columbia Drought Response Plan**[142]

| Level | Conditions | Significance | Response | Suggested Target* |
|---|---|---|---|---|
| 1 (Green) | Normal Conditions | There is sufficient water to meet human and ecosystem needs | Preparedness | Ongoing reductions in community water use |
| 2 (Yellow) | Dry Conditions | First indications of a potential water supply problem | Voluntary conservation | Minimum 10% reduction |
| 3 (Orange) | Very Dry Conditions | Potentially serious ecosystem or socioeconomic impacts are possible | Voluntary conservation and watering restrictions | Minimum additional 20% reduction |
| 4 (Red) | Extremely Dry Conditions | Water supply insufficient to meet socio-economic and ecosystem needs | Voluntary conservation, watering restrictions and regulatory response | Maximum reduction |

* Actual water use targets will depend on regional conditions.

77. At level 1 (green), emphasis is placed on drought preparedness. At level 2 (yellow), emphasis is placed on stewardship and voluntary conservation through education, communication and planning. At level 3 (orange), emphasis continues to be placed on voluntary conservation but with increasing use of municipal watering restrictions. At level 4 (red), voluntary measures and use of watering restrictions will continue but may be augmented by regulatory responses.[143] As well, at level 4, the Inter-Agency Drought Working Group may determine, based on the information provided by the Technical Drought Working Group, that regulatory action should be taken under s. 9 of the *Fish Protection Act*. [144]

[142] Ibid. at p. 11.
[143] Ibid. at p. 10-11.
[144] Ibid. at p. 14.

78. Appendix 1 of the Plan provides a detailed list of recommended actions for each level of drought.[145] Table 3 below, is based on this list and sets out selected possible actions for levels 2, 3 and 4.

**Table 3: Possible actions under the BC Drought Response Plan**

| **Possible Actions at Level 2 (Yellow)** | **Lead responsibility** |
|---|---|
| Issue province-wide news release and targeted news releases in impacted geographic regions | MOE<br>PAB[146] |
| Issue information bulletins to local governments, water suppliers, First Nations, industry and stewardship groups, major licensees and other key stakeholders in impacted water basins and specific watersheds/streams | MOE |
| Issue low stream flow advisories as required in impacted regions | MOE<br>DFO |
| Temporarily discontinue issuing major new water licences or short term use approvals as appropriate | MOE (regions) |
| Implement appropriate watering restrictions to achieve a targeted reduction in use | Local government |
| **Possible Actions At Level 3 (Orange)** | **Lead responsibility** |
| Intensify communication efforts as appropriate based on current streamflow conditions; hold media news conference to announce activation of additional drought measures and to provide updated information | MOE<br>PAB |
| Advise high volume water licensees (or all licensees on high risk streams) directly of conditions via mail and request that they implement voluntary conservation measures | MOE |
| Limit the number of, or impose restrictions on, new licences, regulate storage or invoke conditions on existing licences | MOE (regions) |
| Impose restrictions as appropriate based on priority water licence rights, in addition to voluntary water conservation requests | MOE (regions) |
| Ensure that water bailiffs are appointed and active on appropriate streams in drought areas | MOE (regions) |
| Implement next stage watering restrictions to achieve targeted reduction in water use; enforce compliance through bylaws | Local government |
| **Possible Actions at Level 4 (Red)** | **Lead responsibility** |
| Increase frequency of communication by all levels of government | MOE |

[145] Ibid. at p. 19.
[146] PAB refers to the BC Public Affairs Bureau, which no longer exists. The functions of PAB are now performed by Government Communications and Public Engagement.

| | |
|---|---|
| and water suppliers with all water users through media, advertizing, internet, email updates and other forums | PAB |
| Restrict use by lower priority licensees or those with conditional clauses in their water licences | MOE (regions) |
| Ensure water bailiffs are actively regulating and controlling the diversion and use of water from the streams they are appointed to and are accurately communicating drought conditions and watering restrictions and targets | MOE (regions) |
| Implement regulatory controls under the *Water Act, Fish Protection Act* or other statutes (including the *Fisheries Act*) as appropriate if voluntary measures are not enough to protect water users and fish | MOE<br>DFO |
| Implement progressively stricter watering restrictions to achieve targeted reduction, including outdoor watering bans where necessary | Local government |

## PART TWO: HYDROELECTRIC POWER PRODUCTION IN THE FRASER WATERSHED

*Background*

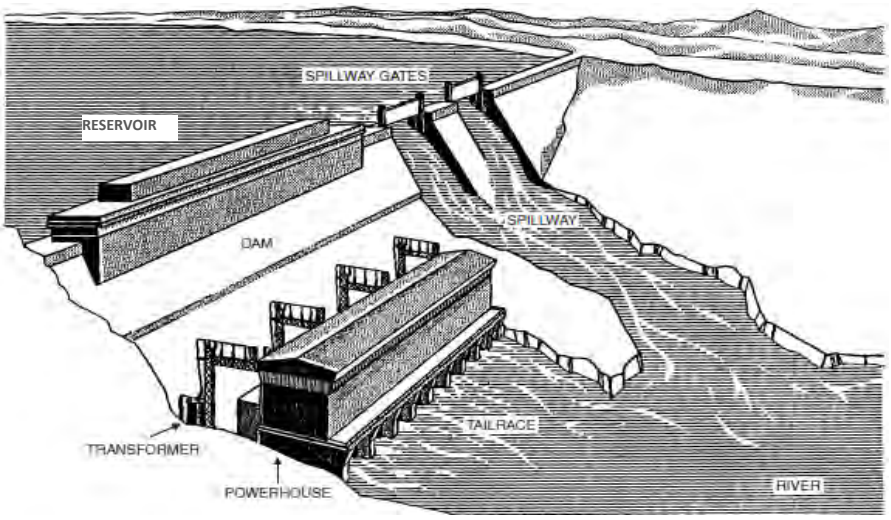
79. Hydroelectric power is produced by the energy of flowing water as it moves from a higher to lower elevation. This energy is carried through pipelines to turbines, causing them to rotate, which in turn drives a generator. The generator converts mechanical energy into electric energy, which is then fed into the electrical grid through transmission lines. Hydroelectric facilities are usually classified as either "storage" or "run-of-river" facilities.[147]

*Components of a storage facility*

80. A storage facility, also called an impoundment facility, uses a dam to retain large volumes of water in a reservoir. The Kemano Power Project and the Bridge River Power Project are examples of storage facilities. Figure 2 shows the components of a typical storage facility.

[147] CAN024166 at pp. 11-12.

**Figure 2: Components of a storage facility[148]**



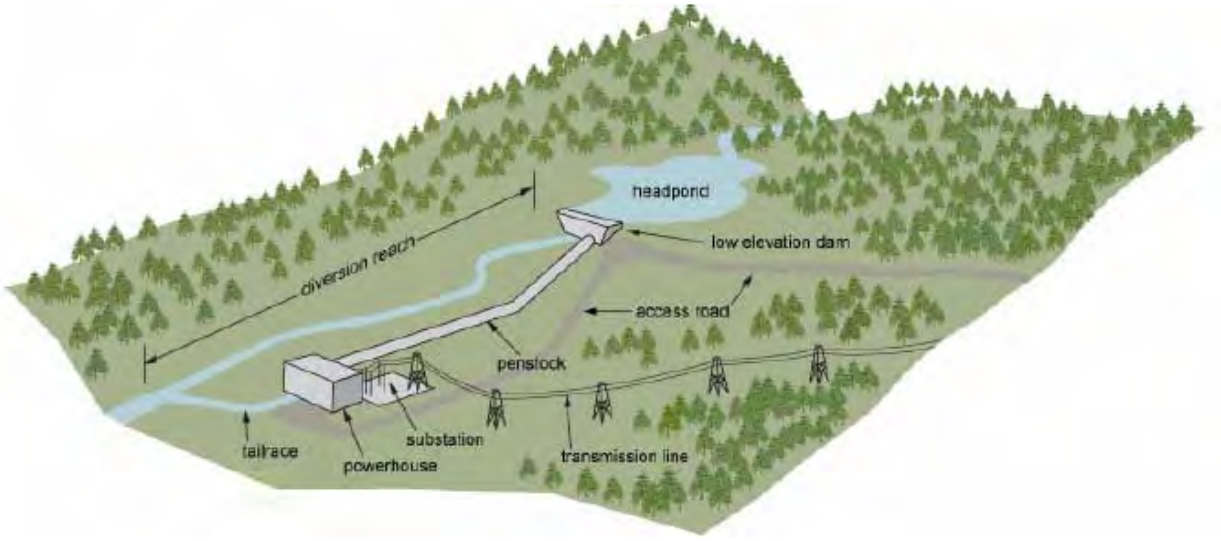

81. Water from the reservoir is routed through the penstock to the turbines, or through a release facility called a "spillway." The spillway is a channel or passageway around or over a dam through which excess water is released without passing through the turbines, like a safety valve for the dam. "Entrainment" is the process by which fish are swept into and through penstocks, turbines and spillways, which may result in injury and fish mortality. The "powerhouse" contains the turbines, generators and related facilities for power generation. Water discharged from the powerhouse enters the river through a channel called the "tailrace."[149]

*Components of a run-of-river facility*

82. By contrast, a run-of-river facility does not typically store large volumes of water in a reservoir. Rather, as the name suggests, water is allowed to run past the dam and is returned to the river at approximately the same volume and time as it enters upstream.[150] Figure 3 shows the components of a typical run-of-river facility.

[148] Ibid.
[149] Ibid. at pp. 61-64.
[150] Ibid. at p. 12.

**Figure 3: Components of a run-of-river facility**[151]




83. In a typical facility, a small dam creates a "headpond," which is not used as storage for power generation, but to ensure that the penstock intake is fully submerged. From the headpond, water is diverted through a penstock to the powerhouse, and returned to the river through the tailrace. The length of the diversion from the dam to the tailrace, called the "diversion reach," is often several kilometres long.[152]

84. There is no absolute distinction between "storage" and "run-of-river" facilities. In some cases, small hydro projects are structured like a typical run-of-river facility, but also have storage reservoirs for power generation.

*BC Hydro Power Projects*

*Legal status and governance*

85. BC Hydro is a Crown corporation, owned by the Province, and continued under the *Hydro and Power Authority Act*.[153] Its powers and governance structure are set out in sections 4, 5, 9 and 12 of the Act. The Lieutenant Governor in Council appoints a Board of Directors to be responsible for the overall direction of the company, and to oversee its

[151] CCI001266 at p. 7.
[152] Ibid.
[153] R.S.B.C. 1996, c. 212.

management.[154] BC Hydro is mandated, among other things, to generate and supply power, including hydroelectric power, as well as to develop power sites, projects and plants.[155] Pursuant to this mandate, BC Hydro owns, maintains and operates a number of hydroelectric facilities throughout the province.

*BC Hydro facilities in the Fraser watershed*

86. BC Hydro operates a system of dams across the province, including several in the Fraser watershed. All dams now operated by BC Hydro in the Fraser watershed were constructed before 1960, which pre-dated the formation of BC Hydro.[156] Dams that generate power in the Fraser watershed are listed below in Table 4.

**Table 4:** BC Hydro power-generating dams in the Fraser watershed[157]

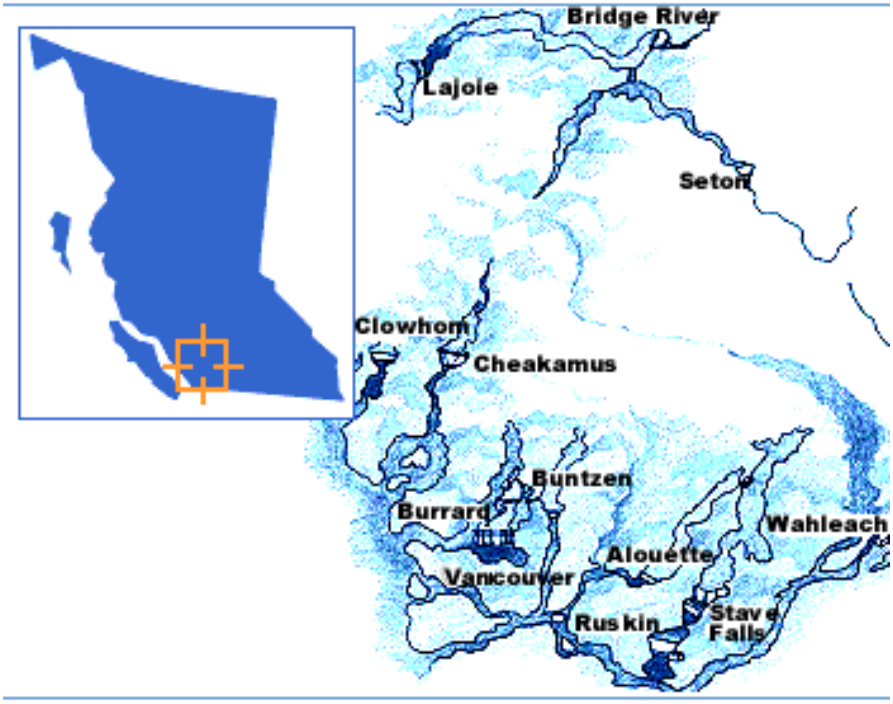
| **Dam (location)** | **Generating capacity (kW)**[158] |
|---|---|
| Alouette (near Mission) | 9000 |
| Bridge River (near Lillooet) | 478,000 |
| La Joie (near Lillooet) | 25,000 |
| Lake Buntzen (near Mission) | 72,800 |
| Ruskin (near Mission) | 105,000 |
| Seton (near Lillooet) | 48,000 |
| Stave Falls (near Mission) | 91,000 |
| Wahleach (near Chilliwack) | 65,000 |
| Wilsey (at Shuswap Falls) | 6000 |

87. Dams in the Fraser watershed account for approximately 8.8% of BC Hydro's hydroelectric capacity, and 7.9% of its total capacity.[159] The majority of BC Hydro's

[154] BC Hydro website: http://www.bchydro.com/annual_report_2009/corporate_governance.html.
[155] *Hydro and Power Authority Act*, s. 12.
[156] BC Hydro was formed in 1962 when the Province passed a law that purported to expropriate all the shares of BC Electric Corporation and to amalgamate it with the British Columbia Power Commission. The legislation was struck down as *ultra vires,* but by 1964 a settlement had been reached that allowed the amalgamation to proceed: *British Columbia Hydro and Power Authority v. British Columbia (Environmental Appeal Board)*, 2003 BCCA 436, at paras. 10-13.
[157] CCI001243 at p. 2.
[158] "Generating capacity" is the maximum sustainable amount of energy that can be produced or carried at any instant: CCI001243 at p. 1.

capacity is generated by dams on the Peace and Columbia Rivers. Figure 4, below, shows the general location of BC Hydro's dams in Southwestern BC, including most of the Fraser watershed dams.

**Figure 4:** Location of BC Hydro power-generating dams in Southwestern BC[160]




88. BC Hydro also operates a number of non-generating dams for diversion purposes in the Fraser watershed, which are not shown in Figure 4 above. This includes the Coquitlam Dam that diverts water from Coquitlam Lake via a tunnel to the Buntzen Dam, where power is generated.[161]

89. Hydro projects in the Fraser watershed are limited to its tributaries. In spite of past interest in damming the mainstem of the Fraser River, and several proposals to do

[159] CCI001243 at p. 2. Note that BC Hydro also generates energy from thermal and diesel sources.
[160] The Clowhorn, Cheakamus and Burrard facilities are not located in the Fraser watershed. BC Hydro website: http://www.bchydro.com/energy_in_bc/our_system/generation/our_facilities/lower_mainland.html.
[161] CCI001267 at p. 1.

so,[162] the mainstem remains undammed.[163] In 1997, the Province enacted the *Fish Protection Act*, which prohibits bank-to-bank dams on a number of protected rivers, including the Fraser River.[164]

90. Three dams in the Fraser watershed were built below spawning areas for Fraser sockeye: the Coquitlam, the Alouette and the Seton. The Coquitlam Dam, built in 1903, blocked access to Coquitlam Lake, the main spawning area for an early (May) run of sockeye.[165] The Alouette Dam, built in 1924-26, also blocked access to an early run of sockeye, as well as a smaller stock of fall run sockeye.[166] Federal officials did not require fish passage structures to be built at Alouette or Coquitlam. The Seton Dam, completed in 1956, is located on the migration route of two significant runs of sockeye salmon; however, a fish ladder provides access to spawning grounds upstream of the dam.[167] The Seton Dam is discussed in more detail at paragraphs 109-130 below.

91. The situation in the Fraser watershed can be contrasted to that in the Columbia River watershed where, unlike the Fraser, both the mainstem and the tributary network have been heavily developed for hydropower production. The Columbia River watershed has 13 mainstem dams that fish must pass to complete their life cycle and more than 130

[162] The most ambitious proposal was put forth by Moran Power Ltd. in the 1950s. The proposed structure involved a 261 metre high dam at Moran Canyon, located about 20 kilometres upriver from Lillooet. Had it been built, it would have obstructed the migration route of all but one of the major sockeye runs in the Fraser system. One study identified several factors that may help explain why this dam was not built, even though it had many influential supporters, including the Province. These factors included: (1) Fraser salmon are administered under an international agreement between the US and Canada, making it difficult for the Province to unilaterally initiate a project that would impact US interests; (2) research by the International Pacific Salmon Fisheries Commission demonstrated the potential impact of a mainstem dam on salmon runs, causing dam proponents to realize that mitigation efforts would not be adequate; (3) the federal government, with its responsibility over fisheries and fiduciary duty owed to Aboriginal people, opposed the dam because of its likely impact on both salmon and First Nations; and (4) there were other major power developments in BC that could be pursued that were less contentious. See: CCI001258 at pp. 145-146.
[163] CAN005102 at p. 193.
[164] *Fish Protection Act*, s. 4.
[165] CCI001267 at p. 8.
[166] CCI001250 at pp. 2, 7.
[167] CCI001220 at pp. 33-34.

large dams in total.[168] Today, an estimated 30% of the historic Columbia River salmon populations have been extirpated.[169]

*Regulation of BC Hydro facilities*

92. As described above, the regulation of hydro facilities involves both federal and provincial responsibilities. The Province issues water licences and enforces compliance with the terms and conditions of licences. Pursuant to the *Fisheries Act*, DFO is responsible for ensuring the BC Hydro facilities do not cause harm to fish or fish habitat.

93. In order to facilitate regulatory co-operation, the federal and provincial governments and BC Hydro, have formed two committees primarily for the purpose of managing the impacts of BC Hydro facilities on fish. The Fish Wildlife & Hydro Policy Committee (Policy Committee)[170] comprised of senior level management from these three parties meets a minimum of twice a year to provide strategic direction.[171] The Fish/Hydro Management Committee (Management Committee),[172] on the other hand, comprised of staff-level members of the three parties, meets quarterly or as needed to discuss operational issues, resolve disputes when required and make recommendations to the Policy Committee.[173]

*Water use planning: Re-examining BC Hydro's water licenses*

94. Most BC hydro facilities were first issued water licences prior to 1962.[174] In November 1996, the Province announced a water use planning initiative that would eventually require a review of each BC Hydro water licence, and the development of a "water use plan" (WUP) for each facility.[175] The impetus behind this initiative formed for a number of reasons, including the finding from the Ward review[176] that many BC Hydro facilities

[168] CCI001258 at p.143.
[169] Ibid. at p. 147.
[170] For terms of reference, see BCP000167.
[171] CAN437263 at p. 2.
[172] For terms of reference, see CAN473003.
[173] CAN437263 at p. 2.
[174] CCI001232 at p. 59.
[175] CCI001230 at p. 10.
[176] In June 1996, a report commissioned by the Department of Fisheries and the BC Ministry of Environment, Land and Parks was released by Ward and Associates concerning BC Hydro's water

were not complying with the terms of their licences, as well as public concern over high profile impacts on fish and fish habitat.[177] From the point of view of BC Hydro, the WUP process was a way to obtain regulatory clarity: "within the bounds set, the company will have the flexibility to maximize operating efficiency, while meeting fisheries needs."[178]

95. A WUP is a technical document that defines the operating parameters of a hydro project.[179] According to BC Hydro, the purpose of water use planning is to define operating parameters that recognize multiple water use objectives, using a consultative planning process.[180] Examples of water use objectives include power generation, protection of fish and fish habitat, flood control, recreation, drinking water supply, irrigation and navigation.[181] Water use planning is not intended to address the historic ("footprint")[182] impacts of hydroelectric development; its focus is on current regulation of stream flows and reservoir operations.[183]

96. There is no specific authority under the *Water Act* for WUPs. In its "Water Use Plan Guidelines", the Province points to a provision of the *Water Act*[184] which authorizes the comptroller, deputy comptroller, or an engineer to initiate an "inquiry" into any matter within his or her jurisdiction, for example, in order to resolve a water use conflict or review compliance with a water licence. However, instead of initiating a formal "inquiry," where possible, the comptroller begins a less formal process by issuing a request that a

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diversion practices. The Ward Report found that for the majority of time since 1960, BC Hydro's water diversions significantly exceeded their licensed flow. In approximately 33 out of the 38 years on record, BC Hydro had diverted water averaging 19-27% in excess of its licensed amount, with the greatest excess recorded in 1995, when water diversion was 51% in excess of the licensed amount. See: *British Columbia Hydro and Power Authority v. Canada (Attorney General)*,1998 CanLII 7998, 11 Admin L.R. (3d) 296 (F.C.).

[177] CCI001230 at p. 20.

[178] CCI001232 at p. 63.

[179] CAN405510 at p. 8.

[180] BC Hydro website: http://www.bchydro.com/planning_regulatory/water_use_planning.html.

[181] Ibid.

[182] "Footprint" impacts are the historical effects on fish and wildlife of the physical developments that occurred primarily as a result of reservoir creation, watercourse diversions and construction of dam structures. See: CCI001253 at p. ii.

[183] CCI001115 at p. 4.

[184] The WUP guidelines point to s. 31 of the *Water Act* (repealed in 2001). However, s. 89 of the *Water Act* currently states: "If it appears to the comptroller, a regional water manager or an engineer that the proper determination of a matter within his or her jurisdiction requires a public or other inquiry, he or she may hold that inquiry."

licensee, such as BC Hydro, prepare a WUP in accordance with provincial guidelines.[185] In 1998, the Province requested that BC Hydro undertake water use planning for its hydro projects.[186]

*WUP development*

97. According to the Province's WUP Guidelines, there are 13 steps in the process of developing a WUP.[187] These steps are summarized in Table 5 below.

**Table 5: Summary of steps in the process of developing a Water Use Plan**

| Step | Responsible party |
|---|---|
| 1: Initiate a WUP process for the particular facility. | Comptroller |
| 2: Scope the water use issues and interests. | Licensee |
| 3: Determine the consultation process to be followed and initiate it. | Licensee |
| 4: Confirm the issues and interests in terms of specific water use objectives. | Licensee, Consultative Committee |
| 5: Gather additional information on the impacts of water flows on each objective. | Licensee, Consultative Committee |
| 6: Create operating alternatives for regulating water use to meet different interests. | Licensee, Consultative Committee |
| 7: Assess the tradeoffs between operating alternatives in terms of the objectives. | Licensee, Consultative Committee |
| 8: Determine and document the areas of consensus and disagreement (and produce a report with recommendations as to operating parameters). | Licensee, Consultative Committee |
| 9: Prepare a draft WUP and submit it to the Comptroller for regulatory review. | Licensee |
| 10: Review the draft plan and issue a provincial decision. | Comptroller |
| 11: Review the authorized WUP and issue a federal decision. | DFO |
| 12: Monitor compliance with the authorized WUP. | Comptroller, DFO, regulatory agencies |
| 13: Review the plan on a periodic ongoing basis. | Licensee, Comptroller |

98. For each WUP, a Consultative Committee is established with membership representing a variety of interests, including the general public.[188] For example, the Consultative Committee for the Bridge River Water Use Plan included members representing local

[185] CAN405510 at p. 42.
[186] CCI001115 at p. 4.
[187] Ibid. at pp. 1-5.
[188] Ibid.

residents, environmental groups, business groups, BC Hydro, the St'at'imc First Nation, as well as federal and provincial agencies.[189] Consultative Committees are divided into technical sub-committees to address specific issues, e.g., fisheries.[190] DFO has been an active participant in this process, placing representatives on Consultative Committees and Fish Technical Committees.[191]

99. Consultative Committees develop water use objectives, assess trade-offs between different flow regimes, and ultimately produce a report with consensus recommendations as to operating parameters.[192] The Consultative Committee reports are used by BC Hydro to prepare draft WUPs for submission to the comptroller. [193]

100. Prior to approving the WUP, the comptroller provides a copy of the WUP to DFO and other interested parties for comment.[194] Once approved, the comptroller authorizes the WUP which "may accompany the issue of a new license or an amendment to an existing license, or may occur as a regulatory order of an engineer under the *Water Act*, as appropriate."[195]

*Current status of the WUP process*

101. To date WUPs have been completed for 23 BC Hydro facilities, including all of its facilities in the Fraser watershed, which are listed in Table 6 below.

[189] CCI001268 at p. 1. Note that participation by the St'at'imc First Nation in the Consultative Committee was not continuous throughout the process.
[190] CCI001115 at p. 4.
[191] CAN250750 at p. 2.
[192] See, for example, CCI001269.
[193] CAN250752 at p. 1; CAN405510 at p. 32.
[194] Ibid.
[195] CAN405510 at p. 33.

**Table 6: List of Water Use Plans for BC Hydro projects in the Fraser watershed**[196]

| Water Use Plan | Date accepted by comptroller |
|---|---|
| Alouette | April 2009 |
| Bridge River | March 2011 |
| Coquitlam-Buntzen | April 2005 |
| Shuswap Falls / Sugar Lake | October 2005 |
| Stave River | May 2004 |
| Wahleach | January 2005 |

102. Specific circumstances delayed the comptroller's approval of the Bridge River WUP until March 2011. The Consultative Committee report was completed in 2003 and supported by all participants, except for one abstention (the St'at'imc Nation).[197] BC Hydro submitted a draft WUP to the comptroller in December 2003,[198] but it did not receive approval, in part due to outstanding St'at'imc concerns. After a number of years of negotiations between BC Hydro and St'at'imc representatives, a revised WUP was submitted to the comptroller, and accepted in March 2011.[199]

*Results and evaluation of the WUP process*

103. In 2004, the Watershed Watch Salmon Society released a report of its review of seven WUPs from a fisheries conservation perspective.[200] It found that "outcomes to date for fish conservation have…been generally positive, although not without some level of compromise on fish objectives and a lack of full consensus at several facilities." [201] According to the report, although the WUPs reviewed did not always present the best flow alternatives for fish, they were better than the status quo, and the planning helped identify knowledge gaps, and establish parameters for ongoing monitoring and adaptive

[196] Water Use Plans are available on BC Hydro's website, see: http://www.bchydro.com/planning_regulatory/water_use_planning.html.
[197] CAN331836 at p. 1.
[198] BC Hydro website: http://www.bchydro.com/planning_regulatory/water_use_planning/lower_mainland/bridge_river.html.
[199] BC Hydro website: http://www.bchydro.com/planning_regulatory/water_use_planning/lower_mainland/bridge_river.html.
[200] CCI001115 at p. 6.
[201] Ibid. at p. 2.

management of key fish flow issues. As well, the report found that the WUPs shed light on the relationship between hydroelectric operations and fish conservation, and how to improve methods for balancing competing objectives, to the point that "in many cases…led to important efficiencies and net gains in both power and fish production potential."[202]

104. In 2009, a Regional Director of DFO's Habitat Management Program noted that: "To date, the WUPs for BC Hydro's facilities seem to be effectively achieving their objectives, with only a few fisheries regulatory issues having emerged that required immediate resolution."[203]

*Fisheries Act authorizations*

105. In June 2009, DFO indicated its intention to issue authorizations under s. 35(2) and s. 32 of the *Fisheries Act* for BC Hydro facilities where the comptroller had approved a WUP.[204] These authorizations permit "impacts from upstream and downstream habitat alteration as well as destruction of fish by stranding or entrainment, provided that such impacts occur in association with WUP operations or specified maintenance activities, and in accordance with specific mitigation, compensation and monitoring requirements."[205]

106. DFO has issued *Fisheries Act* authorizations for the following BC Hydro projects in the Fraser watershed: Alouette,[206] Coquitlam-Buntzen,[207] Shuswap,[208] Stave River[209] and Wahleach.[210]

[202] Ibid. at p. 2.
[203] CAN250750 at p. 2.
[204] CAN250752 at p. 1.
[205] CAN250750 at p. 2.
[206] CAN178161.
[207] CAN178163.
[208] CAN439975.
[209] CAN178162.
[210] CAN178151.

*Compliance Protocol*

107. To address the compliance of BC Hydro facilities with regulatory authorizations and agreements designed to manage impacts upon fish and fish habitat, DFO, MOE and BC Hydro developed a Compliance Protocol, dated March 6, 2006. The Compliance Protocol is designed to, *inter alia*, facilitate communications between the parties and encourage expedient resolution of issues to prevent violations of the *Fisheries Act*.[211] The implementation of the Compliance Protocol is overseen by the Policy Committee and the Management Committee.[212] Unless renewed by mutual consent, the Protocol will terminate in 2016.[213]

108. With respect to WUP compliance in particular, Annex 1 of the Compliance Protocol sets out an Incident Response Procedure to address "perceived and actual compliance issues during the implementation and operation of the Water Use Plans for BC Hydro facilities."[214] The Incident Response Procedure provides a "Roadmap" of actions to be followed by the three parties, which is triggered when a fish or fish habitat impact is observed or reported at a BC Hydro facility.[215]

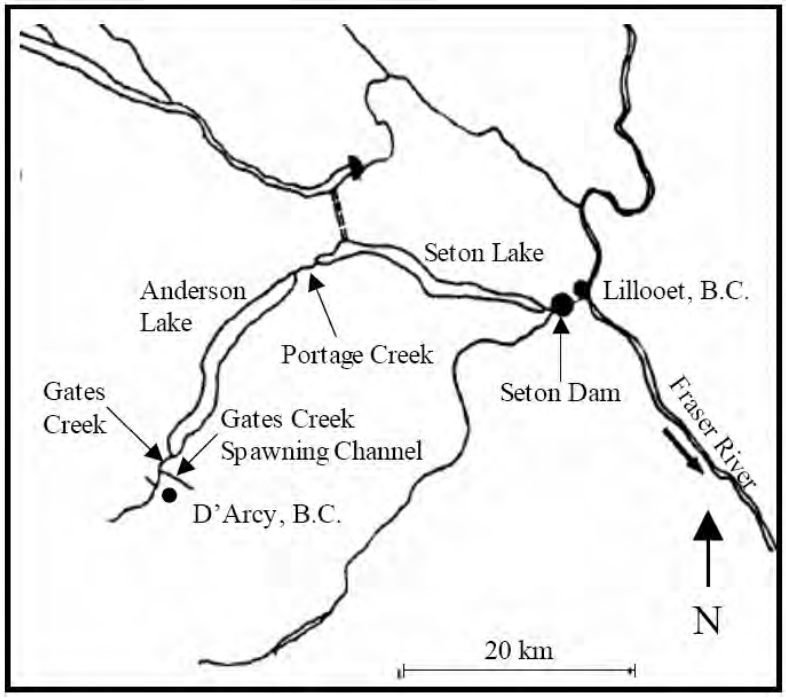
*The Seton Dam*

109. BC Hydro's Seton Dam is located on the migration route of two sockeye runs that return to spawning grounds above the dam. The Gates Creek run returns first during the third week in July and continues to late August, while the Portage Creek run arrives in mid-September and continues to early November.[216]

110. Figure 5 below shows the location of the Seton Dam, as well as the spawning grounds at Gates Creek and Portage Creek.

[211] CAN437263 at p. 1.
[212] Ibid. at p. 2.
[213] Ibid. at p. 4.
[214] Ibid. at p. 5.
[215] Ibid. at pp. 6-8.
[216] CCI001220 at pp. 32-33.

**Figure 5**: **The Seton-Anderson watershed**[217]




*Bridge River Power Project*

111. The Seton Dam is part of the Bridge River Power Project located in the traditional territory of the St'at'imc Nation. This development harnesses the power of the Bridge River – a tributary of the Fraser flowing from Monmouth Mountain in the coastal range to join the Fraser River near Lillooet – by diverting it through a mountain range to the Seton-Anderson watershed, at a lower elevation. [218]

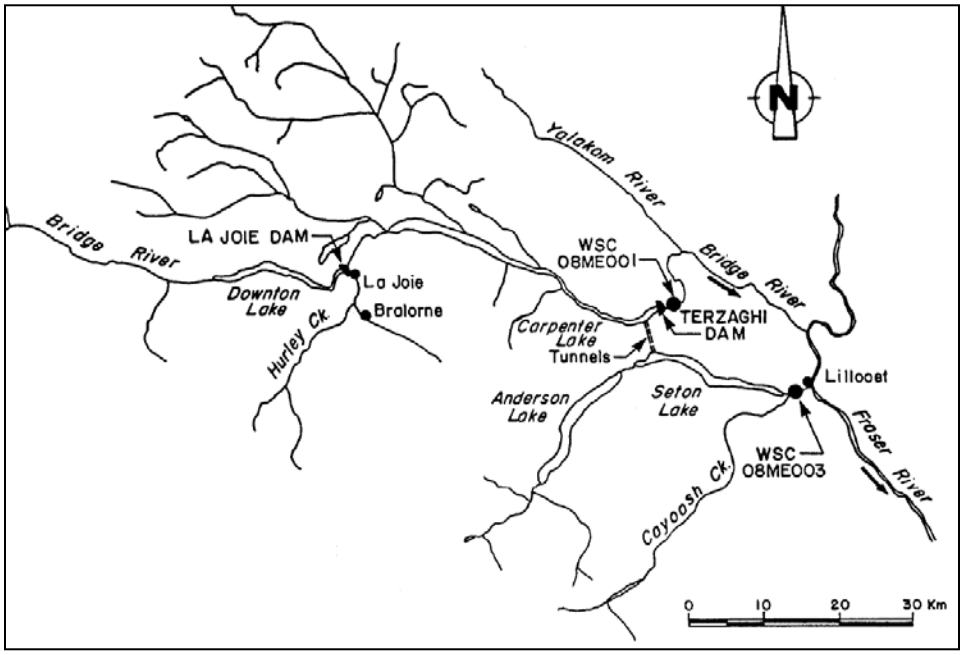
112. The Bridge River Project has three components. First, the upstream portion of Bridge River is impounded by the Lajoie Dam and forms Downton Reservoir. All water flowing into this reservoir flows to the second component, the Carpenter Lake Reservoir, where it is then impounded by the Terzaghi Dam. As there are no power generating facilities at the Terzaghi Dam, water flows down through tunnels to two generators located on the shores of Seton Lake. The Seton Dam is part of the third component of the system,

[217] CCI001265 at p. 64.
[218] CCI001222 at p. 1.

which also includes the Seton-Anderson lake system and a powerhouse located by the Fraser River.[219]

113. The components of the Bridge River Project are shown in Figure 6, below.

**Figure 6: The Bridge River Power Project**[220]




*Structure of the Seton Dam*

114. The Seton Dam is a concrete structure, approximately 13.7 metres high and 76.5 metres in length[221] and is located approximately 850 metres downstream of the natural outlet of Seton Lake.[222] Water from Seton Lake is diverted at the Seton Dam along a 3.7 kilometre canal to the Seton powerhouse located adjacent to the Fraser River, where the water eventually discharges via a tailrace. [223] Water may also be released, bypassing power generation, into the Seton River (also called Seton Creek) via release

[219] *R. v. B.C. Hydro and Power Authority*, 1997 CanLII 4373 (BCSC) at paras. 16-17, 19.
[220] CCI001236 at p. 2. Note that the approximate location of the Seton Dam is indicated by the arrow pointing from "WSC 08ME003".
[221] The length of a dam, also called the crest length or top length, is the distance measured across the top of the main body of the dam between each abutment on land. See the definition of "crest length" at U.S. Department of Interior website: http://www.usbr.gov/library/glossary/#C.
[222] CCI001265 at p. 14.
[223] CCI001222 at pp. 1, 8.

facilities that are operated in different combinations in order to manage spills and provide fish flows. [224]

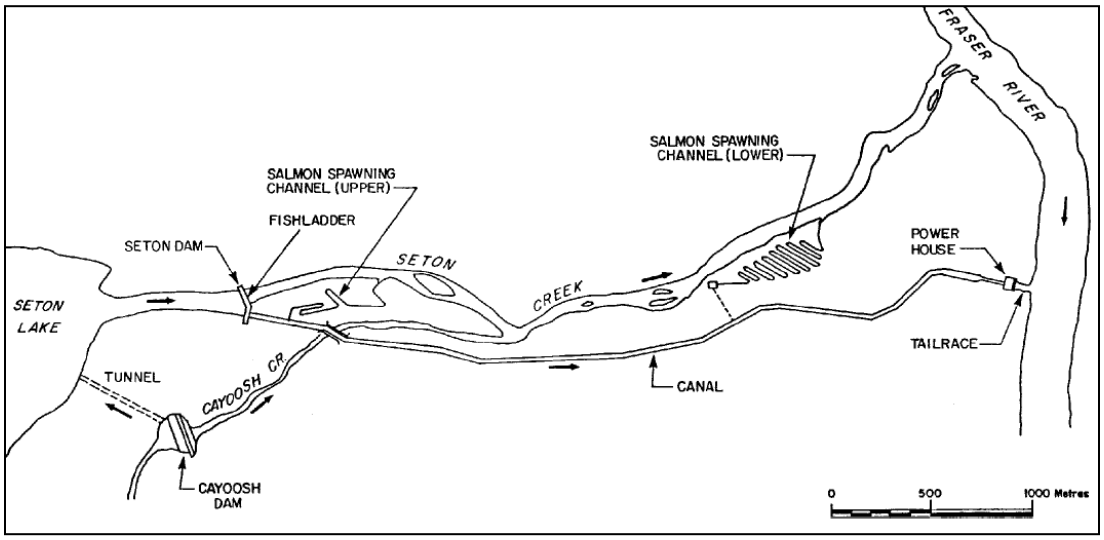
115. Cayoosh Creek is the only major tributary of the Seton River. Water from Cayoosh Creek is diverted through a tunnel from a dam on Cayoosh Creek to Seton Lake, which provides additional operational flow for the Seton Dam and is used to mitigate for sockeye tailrace delay (as explained in paragraphs 120-123 below). When the diversion tunnel is not in use, water from Cayoosh Creek flows directly into the Seton River below the dam.[225]

116. A vertical slot fish ladder provides access for salmon migrating to spawning grounds upstream of Seton Dam.[226] To ascend the ladder, fish swim through a series of 32 vertical slots, resting in pools between them. The total elevation from the bottom to the top of the fish ladder is 8.22 metres.[227]

117. Figure 7 below shows an aerial perspective of the facilities associated with the Seton Dam.

[224] Ibid. at p. 8.
[225] CCI001265 at p. 14.
[226] Ibid. at p. 10.
[227] CCI001254 at Appendix E, p. 12.

**Figure 7: Facilities associated with the Seton Dam**[228]




*Potential impacts of the Seton Dam on sockeye migration*

118. As smolts migrate seaward from spawning grounds at Gates and Portage Creek, the smell of Seton River water is imprinted in their olfactory senses to guide their later return.[229] On their return migration, Gates and Portage sockeye swim up the Fraser River, and turn into the Seton River, through to Seton Lake.

119. BC Hydro's Seton facilities pose a number of potential challenges to successfully completing this migratory route.

*Upstream passage concerns at the Seton Dam*

120. When returning to Seton Lake, sockeye must successfully pass the tailrace of the Seton powerhouse and enter the Seton River. However, due to the strong smell of Seton River water pouring into the Fraser from the turbine, the sockeye sense this water and tend to school in the tailrace, thus delaying their migration upstream.[230] Studies conducted 25-30 years ago indicated that these two runs often stopped their migration upstream and were injured at the tailrace.[231] In 1976, the International Pacific Salmon Fisheries

[228] CCI001236 at p. 1.
[229] CCI001220 at p. 35.
[230] Ibid.
[231] CCI001265 at p. 10.

Commission issued a report observing that "adult sockeye populations destined for spawning areas in Gates and Portage Creek are being seriously depleted because the fish are unable to migrate past the tailrace of the Seton…without delay, injury and mortality."[232]

121. The problem of tailrace delay was found to be caused by the dilution of the Seton River with Cayoosh Creek water, such that the salmon were not finding their way back to the Seton River. Field telemetry and water preference studies indicated that adult sockeye are able to discriminate between pure Seton water and that diluted by water from Cayoosh Creek.[233]

122. BC Hydro addressed the problem by diverting Cayoosh Creek into Seton Lake by tunnel to reduce the amount of Cayoosh water in the Seton River to levels acceptable to the Portage and Gates runs.[234] Studies showed that if the concentration of Cayoosh water in the Seton River was less than 20%, Gates Creek sockeye would move out of the tailrace and into the river. For Portage sockeye, the concentration had to be less than 10%.[235] Dilution guidelines reflecting these figures have been in place since 1979, [236] and are included as a term of the Bridge River WUP. [237]

123. However, a 2008 study raised concerns that the tailrace may still attract and delay sockeye, even under guideline dilution conditions. As this finding was based on a small sample size, the authors recommended further research to follow up on the results.[238]

124. If sockeye successfully pass the tailrace and enter the Seton River, they must then travel five kilometres to the Seton Dam and ascend the fishway before migrating through to Seton Lake. The 2008 study found that 20% of adult fish re-released downstream of the dam (i.e., fish that had prior experience entering the fishway) failed to traverse the

[232] CCI001220 at p. 38.
[233] Cohen Commission Exhibit 562 at p. 35.
[234] CCI001220 at p. 38.
[235] CAN005102 at 193.
[236] Cohen Commission Exhibit 562 at p. 36.
[237] CCI001222 at pp. 21-22.
[238] CCI001265 at pp. 33, 43.

fishway a second time. The authors concluded that the failure was due to difficulty locating the entrance and not difficulty ascending the fishway itself.[239] The authors recommended minimizing high discharge in the Seton River, but identified the need for further research into the relationship between discharge level and passage success.[240]

125. With respect to these first two obstacles – surpassing the tailrace and ascending the fishway – the Bridge River WUP directs BC Hydro to undertake a monitoring program to improve information for future operating conditions, which will include the "Adult Fish Passage Research Program". Specifically, this program will address the following questions: [241]

- What are the factors impeding the success of upstream migration of salmon and steelhead?
- Is upstream passage of salmon affected due to dilution of Seton River with Cayoosh Creek?
- Does the operation of the dam and fish ladder impede fish passage upstream Seton Dam?
- What changes to the fishway or operation may mitigate upstream migration issues?

*Downstream migration concerns at the Seton Dam*

126. A further challenge which may be posed by the Seton Dam occurs once the juvenile sockeye begin their journey seaward as smolts. In order to reach the Fraser River, smolts use one of five possible exit routes to pass the Seton Dam: power canal, fish ladder, fish water release gate, siphon spillway, or radial gate spillway.[242]

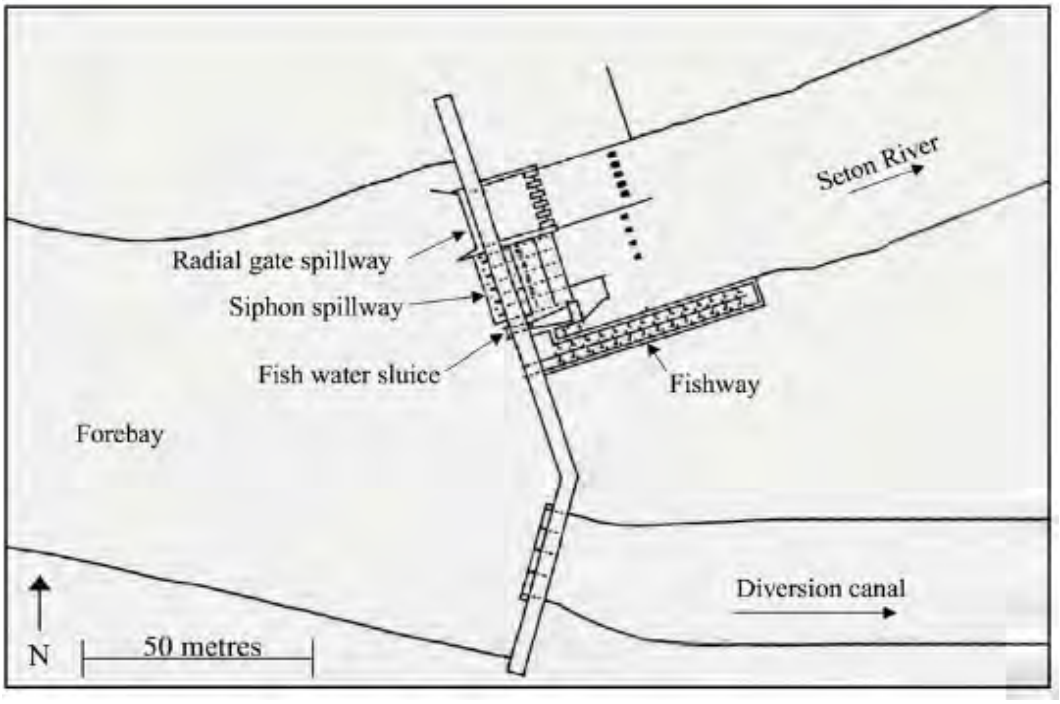
127. One concern is that smolts tend to concentrate in the high discharges of the power canal. Previous studies indicated that over 80% of the smolts used the power canal as

[239] Ibid. at 3.
[240] Ibid. at 44.
[241] CCI001222 at pp. 23, 27.
[242] CCI001235 at p. 3.

their exit route. [243] Smolts are subject to an estimated 17% mortality rate following entrainment in the power canal and passage through the turbine.[244] This mortality rate estimate is based on previous International Pacific Salmon Fisheries Commission studies and includes direct mortalities as well as latent mortality from injuries, cumulative stresses, disease and predation.[245]

128. On the other hand, the spillways, the fish water release gate, and the fish ladder act as reasonably safe "by-pass" structures.[246] Figure 8 shows an aerial perspective of the Seton Dam power canal and by-pass structures.

**Figure 8: Seton Dam power canal and by-pass structures[247]**




129. To address the issue of smolt entrainment, BC Hydro, with assistance from Northern St'at'imc Fisheries, has implemented a mitigation strategy that involves shutting down the powerhouse at night during periods of smolt out-migration (April/May). Nightly

[243] Ibid. at p. 3.
[244] Ibid. at p. 4.
[245] Ibid.
[246] Ibid.
[247] CCI001265 at p. 66.

shutdowns are used because a high percentage of smolts migrate at night, with peak migration occurring from approximately 9:00 pm to 3:00 am.[248] When the powerhouse is not operating, smolts are able to use the "safe" exit routes to pass the dam, as water is not diverted through the power canal.

130. According to a recent study, while implementing nightly shutdowns from 2006 to 2009, smolt mortality rates were limited to 1.7% (2006), 3.1 % (2007) and 1.8% (2009). In 2008, the mortality rate was higher (10.1%) because it was necessary to operate the power canal for fish sampling purposes.[249] In line with these results, the Bridge River WUP directs BC Hydro to conduct powerhouse shutdowns during smolt out-migration (April 20 - May 20) as needed in order to meet a target of 5% mortality or less.[250]

*Bridge-Coastal Fish and Wildlife Restoration Program*

131. The Bridge-Coastal Fish and Wildlife Restoration Program (BCRP), established in 1999, is a joint initiative by BC Hydro, the Province and the federal government to address the historical effects of hydroelectric development on fish and wildlife resources in the Bridge-Coastal Generation Area, which includes BC Hydro's facilities in the Fraser watershed. The BCRP's goal is to restore, to the extent practicable, fish and wildlife resources that have been adversely affected by the original "footprint" development of hydroelectric facilities.[251] The BCRP Strategic Plan refers to restoring anadromous fish passage as a potential restoration objective.[252]

132. The BCRP Board of Directors is comprised of nine persons with one representative each from BC Hydro, DFO and the Province, three representatives from First Nations and three representatives from the general public.[253] The BCRP has funded over 280 projects addressing footprint impacts to fish and wildlife.[254] Funding is awarded through

[248] CCI001235 at p. 14.
[249] Ibid. at p. 28.
[250] CCI001222 at p. 20.
[251] CCI001253 at p. ii.
[252] Ibid. at pp. 10-11.
[253] BC Hydro website: http://www.bchydro.com/bcrp/about/governance_detailed.html.
[254] BC Hydro website: http://www.bchydro.com/bcrp/projects/index.html.

a competitive grant-awarding process, with approximately $1.7 million available annually.[255]

*Fish Passage Decision Framework*

133. BC Hydro has acknowledged that the BCRP is not sufficiently funded to finance the construction of fish passage structures (e.g., fish ladders) to re-establish historic stocks above BC Hydro dams. As a result, BC Hydro has established a "Decision Framework" that sets out a seven step process for consideration of fish passage projects. Final decisions related to funding of fish passage structures are made by the BC Hydro Board of Directors, rather than the BCRP Board of Directors.[256]

134. The first five steps in the Decision Framework are facilitated by the BCRP, with input from the government agencies and BC Hydro at certain points: [257]

Step 1: Preliminary Screening
Step 2: Stakeholder and First Nation Engagement
Step 3: Environmental Feasibility Studies
Step 4: Preliminary Technical Feasibility Consideration
Step 5: BCRP Endorsement

135. Further steps are carried out by BC Hydro with input and approval from government agencies at key points:[258]

Step 6: Business Case Development (Environmental, Technical/Financial and Social Benefits Assessments)
Step 7: BC Hydro Board of Directors Approval

*Opportunities for restoring Fraser sockeye runs at BC Hydro dams*

136. The BCRP has funded studies to assess the feasibility of reintroducing sockeye above the Coquitlam Dam and the Alouette Dam.[259] In the case of Alouette, feasibility studies have been followed by on-the-ground efforts to re-establish the stock.

[255] BC Hydro website: http://www.bchydro.com/bcrp/about/index.html.
[256] CAN403714.
[257] CCI001251 at p. 2.
[258] Ibid.
[259] CCI001153. For information on the Coquitlam initiative, see: CCI001257.

137. In 2006, the Consultative Committee for the Alouette WUP identified the restoration of an anadromous sockeye run as a priority in the Alouette River system. As a means to re-establish the stock, the WUP provides for the release of 3 $m^3$/s of flow from April to June to facilitate the out-migration of kokanee/sockeye smolts from the Alouette Reservoir. Beginning in 2005, smolts have successfully migrated during the spring flow releases to the ocean via the Alouette River.[260]

138. Since 2007, a monitoring program has been in place to enumerate sockeye returning to the Alouette River. Upon their return, sockeye are caught using a fish fence that directs them into a trap, and then transported by truck in tanks to the Alouette Reservoir, where they are released.[261] Each year, sockeye have successfully migrated back from the ocean to the Alouette River, but in limited numbers. Table 7 indicates the estimated number of smolts leaving the reservoir from 2005-2010, and the number of returning adults from 2007-2010.

**Table 7: Results of program to re-anadromize sockeye at the Alouette Dam[262]**

| Year | Estimated number of smolts leaving the Alouette Reservoir | Number of returned adults | Number released alive into the Alouette Reservoir |
|---|---|---|---|
| 2005 | 7,900 | n/a | n/a |
| 2006 | 5,064 | n/a | n/a |
| 2007 | 62,915 | 28 | 5 |
| 2008 | 8,257 | 54 | 53 |
| 2009 | 4,287 | 45 | 43 |
| 2010 | 15,915 | 115 | 103 |

[260] CCI001249.
[261] Ibid. at pp. 4-6.
[262] Ibid. at pp. 3, 7.

## *The Kemano Power Project*

### *History and construction of the Kemano Power Project*

139. The Kemano Power Project originated in the 1940s when the Aluminum Company of Canada Ltd. (later Alcan Inc. and now Rio Tinto Alcan Inc., hereinafter referred to as "Alcan") and the Province began discussing the establishment of an aluminum smelter in Northwestern BC and the hydroelectric project required to power it.[263] In the early 1950s, the Province gave permission to Alcan to construct a smelter in Kitimat BC.[264]

140. In 1950, under the authority of the *Industrial Development Act*,[265] the Province entered an agreement with Alcan (the "1950 Agreement")[266] and issued it a Conditional Water Licence.[267] The 1950 Agreement granted rights to the unrecorded water in the Nechako watershed and the Nanika watershed above the site of the dam.[268] The original Conditional Water Licence issued in 1950 permitted the storage of 35 million acre feet of water and the diversion of 9,500 cubic feet per second.[269] The licence did not stipulate flows from the reservoir for the purpose of protection of fish,[270] nor was there an official policy regarding Alcan's responsibility for protecting the fisheries resource.[271]

141. In 1951, Alcan began construction on the Kenney Dam – a rock-filled and clay-core dam located at the entrance of the Grand Canyon of the Nechako River. It has a maximum height of 93 metres and a length[272] of 474 metres.[273] The area upstream of the Kenney Dam contained a chain of rivers and lakes that were flooded to form what is now known

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[263] CAN005907 at p. 6.
[264] The Kemano Project initially powered the Kitimat aluminum smelter, as well as neighbouring communities of Kitimat, Terrace and Prince Rupert until 1978 when the BC Hydro inter-tie reached Terrace and linked Kemano to the provincial power grid. This allowed Alcan to sell power to BC Hydro. See: CAN005907, at p. 6.
[265] S.B.C. 1949, c. 31.
[266] RTA000002.
[267] RTA000003.
[268] RTA000002 and RTA000009 at p. 23.
[269] RTA000003 at p.2
[270] RTA000009 at p. 23.
[271] CAN005102 at p. 187.
[272] The length of a dam, also called the crest length or top length, is the distance measured across the top of the main body of the dam between each abutment on land. See the definition of "crest length" at U.S. Department of Interior website: http://www.usbr.gov/library/glossary/#C.
[273] CCI001270 at pp. 10-11.

as the Nechako Reservoir.[274] The Nechako Reservoir upstream of the Kenney Dam has an area of approximately 1,200 square kilometres, including Eutsuk Lake which is not affected by reservoir operation. It has live storage capacity of 7.1 billion cubic metres.[275] The reservoir took about four years to fill, and once full, the majority of the flow into the reservoir was diverted to a powerhouse at Kemano, on the other side of the Coast Mountains via a 16-kilometre tunnel.

**Figure 9: The Kenney Dam[276]**

142. A spillway (the "Skins Lake Spillway") located approximately 80 kilometres west of the Kenney Dam on Ootsa Lake and above Skins Lake provides controlled flows from the reservoir.[277] It contains two steel gates, which can be raised to release water from the

[274] CAN002877 at p. 2. The Kenney Dam, together with nine saddle dams, were constructed to impound the water that formed the Nechako Reservoir: CCI001270 at p. 1.
[275] RTA000009 at p. 17.
[276] CCI001270 at p. 10.
[277] CAN002877 at p. 2.

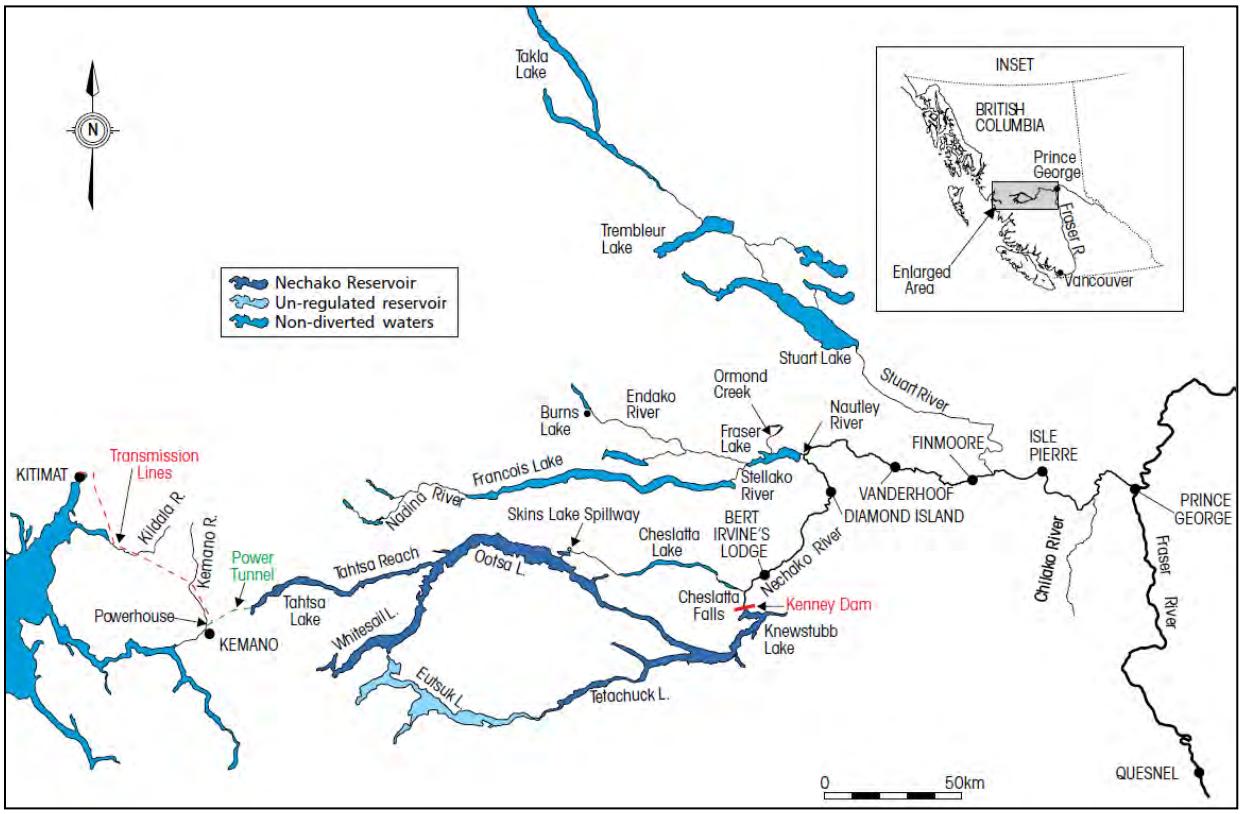
reservoir into Cheslatta River system, which then joins the Nechako River at Cheslatta Falls.[278]

**Figure 10: The Skins Lake Spillway[279]**

143. Figure 11 below provides an aerial perspective of the Nechako watershed and facilities associated with the Kemano Power Project, including the Kenney Dam and the Skins Lake Spillway.

[278] RTA000009 at p. 17.
[279] CCI001270 at p. 11.

**Figure 11: Aerial perspective of the Nechako River watershed and facilities associated with the Kemano Power Project**




*Impact of the Kemano Power Project on sockeye migration*

144. The Kemano Project reduced water flows in the Nechako River by diverting water to the powerhouse in Kemano. Between the late 1950s and 1978, the reservoir's operation reduced annual discharges in the river by 40-50%.[280] Although the diversion did not block migration to any known sockeye spawning grounds, it affected conditions for upstream migration of sockeye to lake systems accessed by tributaries of the Nechako River.[281]

145. Several runs of sockeye salmon use the Nechako River as a corridor: to the Stuart (early and late runs); to the Nadina (early and late runs); and to the Stellako (late run)

[280] CAN309569 at p. 1204.
[281] CAN005102 at p. 186.

rivers.[282] According to DFO, migrating adult sockeye take two to three days to migrate from the mouth of the Nechako to its confluence with the Stuart River and four to six days to reach its confluence with the Nautley River – the access point to the Stellako and Nadina Rivers.[283]

146. Table 8 shows the timing of migrations for sockeye runs returning to the Stuart, Nadina and Stellako rivers, at three locations along their migration route: (1) Prince George, near the Fraser/Nechako confluence, (2) the Stuart/Nechako confluence, and (3) the Nautley/Nechako confluence.[284]

**Table 8: Timing of adult sockeye migrations in the Nechako watershed[285]**

| | Nadina run | | | | Stellako run | | Stuart run | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | early | | late | | | | early | | late | |
| Nechako River location | earliest date | latest date | earliest date | latest date | earliest date | latest date | earliest date | latest date | earliest date | latest date |
| Prince George | Jul 18 | Aug 14 | Jul 25 | Aug 21 | Aug 12 | Sep 29 | Jul 10 | Aug 09 | Aug 01 | Sep 06 |
| Stuart | Jul 20 | Aug 16 | Jul 27 | Aug 23 | Aug 15 | Oct 02 | Jul 12 | Aug 11 | Aug 03 | Sep 08 |
| Nautley | Jul 22 | Aug 18 | Jul 29 | Aug 25 | Aug 18 | Oct 05 | | | | |

147. According to the authors of the commission's Technical Report 3 titled "Evaluating the Status of Fraser River Sockeye Salmon and the Role of Freshwater Ecology in their Decline,"[286] the concern for sockeye is that low water flows in the Nechako may cause higher summer water temperatures, which in turn, can increase stress on migrating adults making them more susceptible to disease and pre-spawning mortality.[287]

*Addressing concerns over inadequate water flow releases*

148. Concerns over inadequate water flow releases began soon after the Kemano Power Project was proposed. However, until 1980, higher reservoir inflows and lower power

[282] CAN005909 at p. 20.
[283] CAN170900 at p. 6.
[284] Note that the Stuart runs turn off to the Stuart River before reaching the Nechako/Nautley confluence.
[285] CAN005909 at p. 20.
[286] For further discussion of Technical Report 3, refer to the commission's transcripts from March 10 and 14, 2011, available online at: http://www.cohencommission.ca/en/Schedule/.
[287] Cohen Commission exhibit 562 at p. 37.

generation needs allowed Alcan to release sufficient flows to address DFO's concerns related to impacts on fish and fish habitat. In 1979/80, however, low reservoir inflows and increased demand for power caused Alcan to reduce discharges from the Skins Lake Spillway into the Nechako. In June 1980, the International Pacific Salmon Fisheries Commission raised concerns about the safety of the Stuart and Nadina sockeye runs, on the basis of its temperature prediction models.[288]

149. In 1980, the Attorney General of Canada obtained a temporary injunction from the BC Supreme Court on behalf of DFO, ordering Alcan to release additional water flows for fisheries purposes.[289] In response to the court injunction, Alcan began releasing flows designed to protect fisheries in the Nechako River. With respect to impacting the conditions of sockeye migration in particular, operating protocols were developed between 1980 and 1983 for release of "cooling flows"[290] in summer months.[291] This program of summer flow releases, now referred to as the Summer Temperature Management Program, is described below at paragraphs 155-159.

150. In 1985, Alcan petitioned the BC Supreme Court for a permanent resolution to discharge rates in the Nechako River, and a trial date was set.[292] Prior to trial, however, in April 1987, the Minister of Fisheries and Oceans and Alcan agreed to participate in tripartite settlement negotiations,[293] and in September 1987, a settlement agreement was entered into between Alcan and the federal and provincial governments (the "1987 Settlement Agreement").[294]

*The 1987 Settlement Agreement*

151. The purpose of the 1987 Settlement Agreement was to ensure that the water resources of the Nechako River were managed to an acceptable level of certainty for the

[288] RTA000009 at p. 23.
[289] CAN309569 at p. 1204.
[290] Although the term "cooling flows" is commonly used, water released from the Skins Lake Spillway is not necessarily colder than water in the Nechako River. Rather, flow releases affect temperature by increasing the volume of flow in the Nechako River, thus making the river less susceptible to heating.
[291] CAN002877 at p. 3.
[292] CAN309569 at p. 1204.
[293] RTA000009 at p. 27.
[294] RTA000006.

conservation and protection of salmon, while allowing Alcan to continue to generate hydroelectric power for industrial purposes.[295] Alcan agreed to release specific flows into the Nechako River for fish protection and abandoned its rights to water in the Nanika River.[296] The Province issued an amended Conditional Water Licence to Alcan which reflected these terms.[297]

152. Section 3 of the 1987 Settlement Agreement[298] established a two-tier committee structure, which is commonly referred to as the Nechako Fisheries Conservation Program (NFCP). The NFCP is comprised of a steering committee and a technical committee. Membership on both committees includes one person from each of the signatory parties (BC, Canada, Alcan). The technical committee selects an independent technical expert to sit as their fourth member.[299]

153. The steering committee's responsibilities include: overseeing the implementation of the 1987 Settlement Agreement; determining matters referred to it by the technical committee; and approving and publishing annual reports on program activities and their effectiveness. In relation to sockeye salmon, the technical committee is tasked with managing the program of flow releases provided for in the Settlement Agreement.[300]

154. The 1987 Settlement Agreement included a schedule of short-term water releases, but did not specify the volume of water to be released to protect migrating sockeye salmon. Instead, the agreement required the release of an annual water allocation "plus additional flows as are determined to be required for cooling purposes" in July and August.[301] The need for release of additional flows for cooling purposes is determined by computer models and protocols developed from 1980-1983.[302]

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[295] See part G of the preamble to the 1987 Settlement Agreement, RTA000006.
[296] RTA000006 at pp. 5-10.
[297] RTA000004 at "Schedule C".
[298] RTA000006 at s. 3.
[299] RTA000009 at pp. 31-32.
[300] RTA000009 at p. 33.
[301] CCI001271, "Schedule 3". This document (CCI001271) contains the schedules referred to in the 1987 Settlement Agreement.
[302] CAN005909 at p. 21.

*The Summer Temperature Management Program*

155. The practice of spilling water from the Skins Lake Spillway in order to affect water flows, and therefore water temperatures[303] in the Nechako River, began in its present form in 1983, and is today referred to as the Summer Temperature Management Program (STMP).[304] The STMP is operated each summer by Triton Environmental Consultant Ltd. on behalf of the NFCP.[305] The goal of the STMP is to maintain mean daily water temperatures at, or below 20°C[306] during the period of adult sockeye migration from July 20th to August 20th as measured at Finmoore, near the Nechako's confluence with the Stuart River.[307]

156. To accomplish this, the STMP relies on a computer model that incorporates real-time data and forecasts of water temperature, water flow, and meteorological conditions, to make daily decisions on the necessary volume of water that needs to be spilled through the Skins Lake Spillway in order to meet the temperature target. If the predicted temperature exceeds 19.4°C, then an increase in the water spilled will be required.[308]

157. It is not possible to maintain a temperature of under 20°C at all times due to flooding concerns and the lag time resulting from the distance between the Skins Lake Spillway and Finmoore. Because it takes five to seven days for flow changes to translate through the 240 kilometres of river and 40 kilometres of lakes between the Spillway and Finmoore, water temperatures at Finmoore will occasionally exceed 20°C.[309] Also, research has suggested that to maintain 20°C between the confluence with the Stuart River and the Nechako's mouth, flows of 226.6 $m^3/s$ are continuously needed during the migration period, with occasional higher flows during extremely hot weather. These

[303] Water temperature depends, in part, on the ratio of its surface area to its volume, since the greater the ratio, the more responsive water is to the warming effects of the atmosphere. See: CAN002877 at pp. 22-23.
[304] CAN005909 at p. 21. Flow releases for the purpose of temperature management also occurred between 1980 and 1982, but using methods that differed from those in use since 1983.
[305] CAN005908 at p. 314.
[306] Note that a "safe" or "threshold" temperature could not be precisely established. See: CAN170900 at p. 6.
[307] CAN005909 at p. 21.
[308] Ibid. at pp. 21-22; CAN005908 at p. 314.
[309] CAN005909 at p. 21.

higher flows, however, are restricted as there is a risk of flooding in Fort Fraser and Vanderhoof if flow in the Nechako River below Cheslatta Falls exceeds 283 $m^3/s$.[310]

158. Both the NFCP and DFO have conducted evaluations of the STMP. The NFCP has evaluated the efficacy of the STMP by comparing pre-STMP (1953-1979) and post-STMP (1983-2000) water temperatures, as well as comparing the water temperatures in the Nechako River, to those of the unregulated Stuart River, which shares the same hydrological basin and biogeoclimatic influences.[311] In making the first comparison, it found that water temperatures have generally remained between 15°C and 21°C, while only infrequently exceeding 20°C, which falls within the range of maximum and minimum mean daily values.[312] In comparing the Nechako to the Stuart, the NFCP concluded that since 1983, mean daily water temperatures exceeded 20°C more frequently in the unregulated Stuart than in the managed Nechako. The average number of days where the temperature was greater than 20°C has increased in the Stuart River since 1983, while remaining relatively stable in the Nechako River.[313]

159. DFO scientists conducted a study to, *inter alia,* assess the success of the STMP in moderating high summer water temperatures in the Nechako at the target location.[314] Analyzing empirical data from 1981-2002, the authors found that controlled flow releases from the Skins Lake Spillway accounted for 24% of the temperature variability at the target location (Finmoore), and were likely a factor in achieving the STMP's temperature objective.[315] According to the authors, the STMP has been "an effective strategy" from the perspective of achieving reduced water temperatures at Finmoore.[316] The authors noted that there is a limitation in the scope of the STMP's objectives. In particular, water released to meet the STMP's temperature target of 20°C at Finmoore has a cooling influence on temperatures in the Nechako downstream of Finmoore. This part of the Nechako is important for sockeye migration success, as it is used by sockeye

[310] CAN170900 at p. 6.
[311] CAN005909 at p. 24.
[312] Ibid. at p. 24.
[313] Ibid. at p. 25.
[314] CAN197989.
[315] Ibid. at p. 2.
[316] Ibid. at p. 19.

runs migrating to the Stuart River, as well as to the Nadina and Stellako systems. However, moderating temperatures downstream of Finmoore is not recognized as an objective of the STMP.[317]

*The Kemano Completion Project*

160. Once the initial Kemano Power Project was completed in 1954, Alcan continued to investigate ways it could use all of its water rights granted by the 1950 Agreement.[318] Diverting additional water from the Nechako and Nanika Rivers in conjunction with an expanded powerhouse at Kemano was initially investigated. However, following the 1987 Settlement Agreement, Alcan proposed to divert additional water only from the Nechako watershed by means of a project known as the Kemano Completion Project (KCP).[319] Alcan began construction of the KCP in 1988, but suspended work in 1991 as a result of legal proceedings related to whether the project would be subject to a federal environmental assessment.[320] In January 1993, the Province initiated a public review of the KCP by the British Columbia Utilities Commission (BCUC). The BCUC Report,[321] submitted in December 1994, neither approved nor disapproved of the KCP, but the Province ultimately declined to permit the construction of the KCP in January 1995.[322]

*1997 Settlement Agreement*

161. Alcan initiated legal proceedings against the Province in connection with its cancellation of the KCP,[323] but the two parties ultimately reached a negotiated settlement in August 1997 (the "BC/Alcan 1997 Settlement Agreement").[324] Among other things, the Province agreed to issue a Final Water Licence[325] to Alcan, superseding the amended

[317] Ibid. at pp. 19-20.
[318] RTA000002 at pp. 2-4.
[319] CAN005907 at p. 6.
[320] CAN171028 at pp. 4-5.
[321] RTA000009.
[322] CAN171028 at p. 5.
[323] Ibid. at p. 5.
[324] RTA000007.
[325] RTA000005.

Conditional Water Licence issued in 1987.[326] This required a further amendment to the 1950 Agreement, as amended in 1987.[327]

162. The BC/Alcan 1997 Settlement Agreement also established the Nechako Environmental Enhancement Fund (NEEF) with a Management Committee mandated to "…review, assess and report on options available for the downstream enhancement of the Nechako watershed area."[328] Alcan agreed to contribute a maximum of $50 million to the NEEF on a matching contribution basis, i.e., if "another person" contributes funds to the NEEF.[329] The agreement also specified that the Nechako Watershed Council be formed to "provide advice to the Management Committee on uses and priorities of [NEEF]."[330] The Nechako Watershed Council is a multi-stakeholder group with representatives from First Nations, business groups, community groups and various levels of government.[331]

*Plans to construct a Cold Water Release Facility at the Kenney Dam*

163. In 2001, after several years of consultations, the Management Committee of the NEEF recommended that the best use of the NEEF would be to construct a Cold Water Release Facility at the Kenney Dam.[332] The idea of constructing a cold water release facility arose out of an effort to reduce the amount of water required for fisheries management purposes, especially from the STMP, so that it could be used for other purposes. The expectation was that if colder water was released from Kenney Dam into the Nechako River in summer months, water previously used to operate the STMP would no longer be needed, and the "freed-up" flows could be used to meet other objectives (e.g. restoration of a more natural flow regime, rehabilitation of the Cheslatta Lake system, increased power generation, etc.).[333]

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[326] Ibid. at (i).
[327] RTA000007 at "1997 Amendment", s. 2.1.
[328] Ibid. at "Schedule 4", s. 10.
[329] Ibid. at "Schedule 4", s. 15.
[330] RTA000007 at "Schedule 4", s. 14.
[331] CAN096197 at pp. 1-2.
[332] CAN171028 at pp. 23-24.
[333] CAN096197 at p. 1.

164. In 2008, after seven years of work to address technical issues and calculate benefits and costs, the Nechako Watershed Council determined that a Cold Water Release Facility was no longer the preferred option because of engineering risks, escalating costs and a lack of "freed-up" flows.[334] A 2007 DFO study predicted that in the context of a warming climate, the water "saved" by discharging smaller amounts of cold water, instead of discharging more surface water as done with the STMP, would be "modest."[335] The authors explained that "a cold water release facility may open up new management options to manage flow and temperature for sockeye, sturgeon and other biota,"[336] but noted potential concerns from a fisheries conservation perspective.[337] One concern was that temperature models being used to calculate water use trade-offs did not account for the importance of large volumes of water in resisting heating in the lower Nechako downstream of the target location (Finmoore). While releasing cold water at the Kenney Dam would be effective in meeting the STMP's temperature objective of 20°C at Finmoore, the smaller volumes of water would heat up more quickly and potentially be less effective in cooling the river downstream of Finmoore. As well, the release of cold water to moderate high temperatures for migrating sockeye could potentially lower temperatures in the upper Nechako to suboptimum or even lethal levels for other species of fish (e.g., rainbow trout, bull trout, mountain whitefish, northern pikeminnows).[338]

165. Instead, the Nechako Watershed Council recommended that a simplified Surface Water Release Facility be considered, indicating it would result in fewer engineering risks and lower costs, while still allowing for the rehabilitation of the Cheslatta Lake system. However, there would be minimal "freed-up" flows with this facility. The Nechako Watershed Council commissioned a cost estimate which determined that $259.4 million would be needed to build the Surface Water Release Facility.[339] As of June 2011, no

[334] CAN096197 at p. 3.
[335] CAN002877 at p. 25.
[336] Ibid. at p. 24.
[337] Ibid. at pp. 24-25.
[338] Ibid. at pp. 24-25.
[339] CAN096015.

person had contributed funds to the NEEF for the purpose of constructing a Surface Water Release Facility.

*Independent Power Projects*

*Development of Independent Power Projects in BC*

166. Over the past decade, the Province's energy policy has encouraged the development of Independent Power Projects (IPPs). An IPP refers to a small power project (usually less than 50 megawatt (MW) capacity) that is developed independently of BC Hydro.[340] IPPs are typically developed by the private sector[341] but operated through Electricity Purchase Agreements (EPAs) with BC Hydro and connected to the provincial power grid.[342]

167. BC Hydro has implemented a series of calls for power in order to attract future electricity capacity from IPPs. Under a call for power, IPPs are invited to submit a proposal outlining a potential energy project as well as the amount of electricity and source of power to be produced. BC Hydro assesses each proposal and offers an EPA to successful bidders.[343]

168. BC Hydro began issuing calls for power in the late 1980s. Fifteen IPPs were built following calls for power in 1988 and 1989, including 13 small hydro projects.[344] There was minimal activity in the 1990s,[345] but after a shift in provincial energy policy, [346] the pace of IPP development increased rapidly and BC Hydro issued several calls for power from 2001 to present.[347] As of April 1, 2011, BC Hydro had

[340] CAN286307 at p. 6.
[341] Independent power producers are typically investor or operator-owned business corporations, but may also be other entities such as First Nations or local governments. See: BCP008130 at p. 12.
[342] IPPs may be built to provide off-the-grid electricity in some locations, but most are constructed for the purpose of selling power to BC Hydro.
[343] Non-Ringtail document: Pricewaterhouse Coopers, "Economic Impact Analysis of Independent Power Projects in British Columbia," December 2009, at p. 10.
[344] CCI001260.
[345] Ibid.
[346] The Province's 2002 Energy Plan stated that future power generation will be developed by IPPs with BC Hydro's role limited to efficiency improvements at existing facilities. See: CCI001248.
[347] CCI001260.

entered EPAs with 68 IPPs that were connected to the provincial power grid and delivering power to BC Hydro.[348] These account for 3,183 MW of capacity,[349] as compared to BC Hydro's self-generated capacity of 11,345 MW.[350]

169. IPPs generate power from a number of renewable sources (e.g., hydro, wind, biomass, geothermal, etc.).[351] However, this Report is limited to those that generate hydroelectricity, referred to hereinafter as "small hydro projects." Approximately 65% of operating or proposed IPPs in BC are small hydro projects.[352] Most of these are run-of-river facilities, but several have reservoirs with capacity for water storage.[353]

*Potential impacts of small hydro projects on Fraser sockeye*

170. As of September 2010, five small hydro projects were operating in the Fraser watershed, while a further 13 are planned but not yet operational.[354]

171. Table 9 below is a list of the planned or operational small hydro projects in the Fraser watershed. The fourth column indicates the status of the project; "Post-COD" projects have been built and are operating, while "Pre-COD" projects have not started operating. "COD" refers to the commercial operating date. Note that not all pre-COD projects will necessarily be built.[355]

[348] Ibid.
[349] Ibid.
[350] CCI001243.
[351] CAN286307 at p. 6.
[352] CCI001260
[353] Ibid.
[354] CCI001273
[355] CCI001272

**Table 9: List of small hydro projects in the Fraser watershed as of September 2010**[356]

| Call Year | Project Name | Proponent / Seller | Capacity (MW) | Status | City/town in vicinity |
|---|---|---|---|---|---|
| 1989 | Walden North | Walden Power Partnership | 18 | Post-COD | Lillooet |
| 1989 | Morehead Creek | Morehead Valley Hydro Inc. | 0.11 | Post-COD | Williams Lake |
| 2006 | Kwalsa Energy | Harrison Hydro Limited Partnership | 90 | Post-COD | Mission |
| 2006 | Upper Stave Energy | Harrison Hydro Limited Partnership | 54.7 | Post-COD | Mission |
| 1989 | Boston Bar Hydro (Scuzzy Creek) | Boston Bar Limited Partnership | 6 | Post-COD | Boston Bar |
| 2010 | Jamie Creek | Sequoia Energy Inc. | 19.4 | Pre-COD | Gold Bridge |
| 2010 | Big Silver - Shovel Creek | Cloudworks Energy Inc. | 36.9 | Pre-COD | Harrison Hot Springs |
| 2010 | Boulder Creek | Creek Power Inc. | 23 | Pre-COD | Pemberton |
| 2010 | Bremner - Trio | Greengen Holdings Ltd. | 45 | Pre-COD | Harrison Hotspings |
| 2006 | Kookipi Creek Hydroelectric | Highwater Power Limited Partnership | 9.99 | Pre-COD | Boston Bar |
| 2006 | Kwoiek Creek Hydroelectric | Kwoiek Creek Resources Limited Partnership | 49.9 | Pre-COD | Lytton |
| 2006 | Log Creek Hydroelectric | Highwater Power Limited Partnership | 9.99 | Pre-COD | Boston Bar |
| 2010 | North Creek Hydroelectric | Creek Power Inc. | 16 | Pre-COD | Pemberton |
| 2006 | Sakwi Creek Run of River | Spuzzum Creek Power Corp. | 5 | Pre-COD | Agassiz |
| 2006 | Tamihi Creek | KMC Energy Corp. | 9.9 | Pre-COD | Chilliwack |
| 2010 | Tretheway Creek | Cloudworks Energy Inc. | 21.18 | Pre-COD | Mission |
| 2010 | Upper Lillooet River | Creek Power Inc. | 74 | Pre-COD | Pemberton |
| 2003 | Mkw'alts Creek | Mkw'alts Energy Limited Partnership | 45 | Pre-COD | Mount Currie |
| 2010 | Northwest Stave River | Cloudworks Energy Inc. | 17.5 | Pre-COD | Mission |

[356] CCI001273;CCI001272.

172. The commission's Technical Report 3, titled "Evaluating the Status of Fraser River Sockeye Salmon and the Role of Freshwater Ecology in their Decline,"[357] investigated the potential interaction between small hydro projects and Fraser sockeye. To do so, the authors gathered geographic coordinates for the facilities listed above in Table 9, and used Geographic Information Systems to intersect these locations with sockeye spawning areas and migration corridors. This investigation revealed that one small hydro project (the Douglas Creek facility) is currently operating in an area that supports sockeye spawning. The Douglas Creek facility is part of the Kwalsa Energy project, and is located upstream of spawning habitat for late-run Harrison sockeye. The authors also identified two projects that are in their final planning stages, also located upstream of spawning habitat for late-run Harrison sockeye (the Silver Creek and Sakwi-Weaver Creek projects).[358] According to the authors, no small hydro projects have been built on migration routes for Fraser sockeye.[359]

*Regulation of small hydro projects*

173. The Province and DFO are both involved in the regulatory approvals process for small hydro projects. This section reviews how impacts to fish and fish habitat are considered by the Province and DFO. This is a limited review. In 2009, the Province indicated that a typical small hydro project requires more than 50 permits, licences and approvals and reviews from 14 regulatory bodies.[360] For further information, refer to "Independent Power Production in BC: An Inter-agency Guidebook for Proponents" (IPP Guidebook)[361] published by the Province. The IPP Guidebook provides a detailed review of the statutory, regulatory and procedural requirements applicable to all types of IPPs, including small hydro projects.

[357] Commission exhibit 562 at p. 40. For further discussion of Technical Report 3, refer to the commission's transcripts from March 10 and 14, 2011, available online at: http://www.cohencommission.ca/en/Schedule/.
[358] Ibid. at pp. 40-41.
[359] Ibid. at p. 115.
[360] Non-Ringtail document: Letter from B. Tyzuk re "Independent Power Production – Overview/Other Topic Areas," July 30, 2010, with attachment: BC Government, Fact Sheet, "An Overview of the Regulatory Environment for Water Power Projects in British Columbia," March 24, 2009.
[361] BCP008130.

*Provincial regulation*

174. Small hydro power projects entail diverting water from a stream, river or lake and returning the water at a lower elevation. As such, proponents must obtain a water licence under the *Water Act*. Under s. 12.2(2) of the *Water Act*, the term of a licence for the purpose of power generation is limited to 40 years. The licensing process under the *Water Act* is described above at paragraphs 23-41.

175. The BC *Environmental Assessment Act*[362] requires that certain projects obtain an Environmental Assessment Certificate from the Environmental Assessment Office.[363] The Reviewable Projects Regulation[364] establishes thresholds for review of proposed projects. For power projects, an environmental assessment is required for any proposed facility with a capacity to generate 50 MW or more of electricity.[365] In most cases, small hydro projects do not exceed this threshold. For example, only two of the 21 small hydro projects in the Fraser watershed, listed above in Table 9, have a capacity that exceeds 50 MW.

*Instream Flow Guidelines*

176. Water licences for small hydro projects may include requirements for minimum instream flows for the protection of fish and fish habitat.[366] The Province has developed guidelines for assessing Instream Flow Requirements (IFRs) for small hydro projects.[367] IFRs are assessed using a two-tiered process. In the first tier, projects are assessed against instream flow "thresholds", which indicate flow levels that may result in a risk to fish and fish habitat.[368] The thresholds act as a "coarse filter" for identifying fisheries concerns and are intended to be applicable to all

[362] S.B.C. 2002, c. 43.
[363] BCP008130 at p. 121.
[364] B.C. Reg. 370/2002.
[365] B.C. Reg. 370/2002, s. 10, table 7.
[366] Non-Ringtail document: BC Government, Fact Sheet, "An Overview of the Regulatory Environment for Water Power Projects in British Columbia," March 24, 2009, at p. 5.
[367] BCP008130 at p. 73.
[368] Instream flow thresholds are set out in the following guidance document: Hatfield et. al., "Instream Flow Thresholds for Fish and Fish Habitat as Guidelines for Reviewing Proposed Water Uses," (2003), available at CCI001225.

streams in BC.[369] If the coarse filter indicates a potential fish-flow concern, then the proponent generally has three options:[370]

- abandon the project;
- redesign it to meet the flow thresholds (e.g., alter diversion rates or timing); or
- undertake a detailed assessment to demonstrate that fish-flow concerns are adequately addressed within the proposed flow regime.

The latter option of undertaking a detailed assessment is the second tier of the process for assessing IFRs.[371]

*Federal regulation*

177. DFO has identified the following as concerns in relation to small hydro projects:[372]

- construction and installation of powerhouses, intakes, turbines, tailraces and other hydro infrastructure may cause a HADD of fish habitat;
- the operating requirements of a facility may alter natural flow regimes and cause a flow-related HADD of fish habitat (i.e., where instream flows are insufficient for the protection of fish and fish habitat); and
- entrainment may lead to mortality of fish.

178. Where a small hydro project is expected to result in a HADD of fish habitat (s. 35) or mortality of fish by means other than fishing (s. 32), DFO requires the proponent to obtain an authorization under the *Fisheries Act*. Prior to issuing a *Fisheries Act* authorization, DFO is required to conduct an environmental assessment under the *Canadian Environmental Assessment Act*.[373]

[369] CCI001225 at pp. 3-4.
[370] Ibid.
[371] Methods for undertaking a detailed assessment are set out in the following guidance document: Lewis et. al., "Assessment Methods for Aquatic Habitat and Instream Characteristics in Support of Applications to Dam, Divert, or Extract Water from Streams in British Columbia," (2004*),* available at CAN024182.
[372] Non-Ringtail document: DFO, Introduction to Small Hydro Instream Flow Risk Management Framework, March 2011.
[373] BCP008130 at p. 31.

179. In order to expedite reviews of IPP projects, DFO has developed an Instream Flow Risk Management Framework (Framework)[374] for reviewing small hydro projects according to their potential risk to fish and fish habitat. The Framework consists of a table, shown below, that identifies four risk categories for small hydro projects.

[374] Non-Ringtail document: DFO, Instream Flow Risk Management Framework, March 2011.

## Table 10: Instream Flow Risk Management Framework[375]

| | Low Risk | Low to Moderate Risk | Moderate to High Risk | High to Unacceptable Risk |
|---|---|---|---|---|
| **Fish presence** | Project impact boundaries are above fish bearing waters. | Fish are present, but no SARA or provincially managed species of concern present within project impact boundaries. | Fish are present, but no SARA or provincially managed species of concern present within project impact boundaries. | Anadromous fish populations and habitats within project impact boundaries and with potential for management concern;<br>**or**<br>SARA species are present;<br>**or**<br>Provincially managed species of concern present. |
| **Fish habitat criteria** | Instream Flow Requirements (IFR) met.<br><br>If IFR is not met, then see next column(s) for additional supporting information that may be required. | IFR met, **or**<br><br>Modified through detailed assessment, **and** proposed flow regime not likely to cause HADD.<br><br>Fish passage and entrainment mitigated. | IFR not met, **unless**<br><br>Modified through detailed assessment, **and** proposed flow regime likely to cause HADD.<br><br>Fish passage and entrainment mitigated. | IFR not met, and proposed flow regime likely to cause HADD for any of above.<br><br>Fish passage and entrainment may or may not be mitigated. |
| **Supporting Information Requirements** | IFR developed using either coarse filter or detailed assessment.<br><br>Detailed assessment of fish-bearing status. | IFR developed using either coarse filter or detailed assessment.<br><br>Detailed assessment of fish-bearing status.<br><br>Detailed fish and fish habitat assessment in all affected reaches. | IFR developed with detailed assessment.<br><br>Detailed assessment of fish-bearing status.<br><br>Detailed fish and fish habitat assessment in all affected reaches.<br><br>Habitat compensation, financial security required.<br><br>Detailed impact assessment required. | DFO will request that the proponent redesign/relocate their project to mitigate an unacceptable HADD.<br><br>If the proponent decides to continue with their project as proposed then the same supporting information as the previous column will be required. |
| **Risk of a flow related impact** | No Flow HADD | Likely no Flow HADD | Potentially acceptable flow HADD | Unacceptable Flow HADD |

[375] Ibid.

180. DFO has summarized the four categories of risk as follows: [376]

1. **Low Risk** projects are generally smaller projects located in non fish bearing waters, have reduced information and assessment requirements, and undergo a more streamlined and expeditious review and approval process.

2. **Low to Moderate Risk** projects have greater risks associated with fish and fish habitats, but do not affect federally or provincially managed species of concern. All HADDs of fish habitat, including fish passage and entrainment issues, can be mitigated. These projects will need additional hydrometric assessments and mitigation measures, more detailed and extensive baseline information, and a more extensive review and approval process.

3. **Moderate to High Risk** projects are often more complex, difficult to mitigate and represent greater uncertainty with respect to fish and fish habitat. These projects are in fish bearing waters and are considered high risk as footprints and/or flow related HADDs cannot be fully mitigated. These projects will not affect federally or provincially managed species of concern. An environmental assessment under CEAA will be required for projects where residual HADDs occur. Most projects in this category will need to be authorized with appropriate compensation. Time lines from project proposal to potential authorization will be dependent upon the adequacy of the information provided, including appropriate mitigation, habitat compensation, and monitoring plans. In the past project proposal time lines have exceeded multiple years.

4. **Very High to Unacceptable Risk** projects propose impacts to fish and fish habitat that are unlikely to be successfully mitigated or compensated,

[376] Non-Ringtail document: DFO, Introduction to the Small Hydro Instream Flow Risk Management Framework, March 2011.

and therefore are unlikely to be authorized as proposed. Proponents will be asked to re-design or relocate a project where federally or provincially managed species of concern are present (e.g., anadromous salmon, species at risk, provincially listed species). These projects will require all of the upfront information as moderate to high risk projects as indicated above. Significant stream flow alterations and inter-basin transfers of water are examples of impacts that may also pose an unacceptable risk.

*Small Hydro/Instream Flow Working Group*

181. DFO established the Small Hydro/Instream Flow Working Group (Working Group) in February 2003. The purpose of the Working Group is to address water quantity/quality, fish habitat, fish passage and mortality issues associated with small hydro power projects or other water diversion projects throughout the Pacific Region. [377]

182. The Working Group has the following functions:[378]

- Providing a forum for discussion and exchange of information on the issues;
- Promoting consistency in habitat management decisions for the review of small hydro developments and associated instream flow changes;
- Developing support tools (e.g. decision framework, IPP monitoring guidelines, etc.), to facilitate the review process and to address the issues in the region; and,
- Identifying and resolving further issues that need to be addressed from a policy perspective.

183. Membership consists of at least one representative from each of the HMP's regional offices in BC, representatives from other HMP divisions (Environmental Assessments and Major Projects, Habitat Compliance Modernization), a

[377] Non-Ringtail document: DFO Pacific Region, Small Hydro/Instream Flow Working Group, Terms of Reference, November 2010.
[378] Ibid.

representative from DFO's Science Branch, and a representative from the Department of Justice. Conference calls are held on a quarterly basis at a minimum and up to two face-to-face meetings are held each year.[379]

[379] Ibid.

## Appendix 1: List of Documents Referenced in this Report

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## Appendix 2: List of Figures and Tables

### Figures



### Tables

## Appendix 3: List of Acronyms

| | |
|---|---|
| BCRP | Bridge-Coastal Fish and Wildlife Restoration Program |
| BCUC | British Columbia Utilities Commission |
| C&P | Conservation and Protection |
| COD | Commercial Operating Date |
| DFO | Fisheries and Oceans Canada |
| EPA | Electricity Purchase Agreement |
| HADD | Harmful alteration, disruption or destruction (of fish habitat) |
| HMP | Habitat Management Program |
| IFR | Instream Flow Requirements |
| IPP | Independent Power Project |
| KCP | Kemano Completion Project |
| MFLNRO | Ministry of Forests, Lands and Natural Resources Operations |
| MOE | Ministry of Environment |
| NEEF | Nechako Environmental Enhancement Fund |
| NFCP | Nechako Fisheries Conservation Program |
| STMP | Summer Temperature Management Program |
| WAM | *Water Act* Modernization |
| WUP | Water Use Plan |

## Appendix 4: Recommendations from Previous Reports

The following table contains recommendations from previous examinations, investigations or reports into Pacific fisheries that relate to water use and hydroelectric power production. This is not a comprehensive list of all recommendations that may have been made in relation to this topic.

### Hon. Bryan Williams, Q.C.: The 2004 Southern Salmon Fishery Post-Season Review[380]

| Number | Recommendation |
|---|---|
| 17. | "The feasibility should be investigated of modifying existing flow control/hydro facilities and water use agreements that might decrease Fraser mainstem and tributary temperatures during high temperature years." |

[380] CAN002496.