The Columbia River Treaty:

A Synopsis of Structure, Content, and Operations

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Acronyms

AOP	Assured Operating Plan
BCH	BC Hydro (British Columbia Hydro and Power Authority)
BPA	Bonneville Power Administration
BWT	Boundary Waters Treaty
CBT	Columbia Basin Trust
CE	Canadian Entitlement
CPC	Columbia Power Corporation
CRT	Columbia River Treaty
DOP	Detailed Operating Plan
FCOP	Flood Control Operating Plan
IJC	International Joint Commission
Maf	Million acre feet
PEB	Permanent Board of Engineers
TSR	Treaty Storage Regulation

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Executive Summary

The Columbia River Treaty (CRT, Treaty) came into force on September 16, 1964. It is an international treaty between the governments of the United States (US) and Canada to develop and operate three storage facilities in BC in order to further regulate flows on the Columbia and Kootenay rivers.
The primary objective of the Treaty is to optimise flood control and power generation in both countries, for which Canada is compensated. It further permitted the US to construct the Libby dam and associated Koocanusa reservoir, which extends into BC.

Treaty Overview

- Canada and the US are the official signatories and Parties to the Treaty; however, in two additional agreements, the Federal Government of Canada passed on most of the rights, obligations and benefits to BC. Either Canada or the US may terminate the Treaty; though, Canada must have the concurrence (agreement) of BC before it can do so (Clause 4 (2) (h) of the Canada – BC Agreement).
- The Treaty has no specific termination date. The earliest date of possible termination is 16 September 2024. Either Canada or the US can terminate the Treaty at any time thereafter by giving a minimum of 10 years notice. The *latest* that notification can be given for the *earliest* possible termination is in September 2014. Termination notices well before or after 2014 are also possible.
- Should the Treaty be terminated, Canada would continue to be responsible for 'called upon' flood control. There would be no benefits for Canada associated with increased power in the US and each country could operate its dams as it best suits them, within certain reasonable constraints based on the other governance systems such as the *Boundary Waters Treaty* and customary international law.
- After September 2024, Canada will no longer be responsible for providing 'assured annual flood control', regardless of whether the Treaty is continued or terminated. However, under certain circumstances, it will be responsible for providing 'called upon' flood control (similar to the current 'on call' flood control within the CRT). If the US should request this type of flood protection they would have to compensate BC for operational losses and costs associated with foregoing alternative uses of the storage.
- Treaty Focus and Major Provisions
- After providing for consumptive uses, including irrigation, the focus of the Treaty is on flood control and power generation in the Columbia basin.
- Under the Treaty, Canada provided 15.5 Maf of reservoir storage at Duncan, Arrow/Keenleyside, and Mica. The combined reservoir storage of all the US and Canadian facilities on the Columbia system is approximately 60 Maf.
- The US paid US$64.4 million to Canada for ½ of the expected avoided flood damages for 60 years (till 2024) under 'assured annual flood control' plans.
- The US can request Canada to provide additional 'on call' flood control, subject to proving need and

providing additional compensation to Canada. This has never been requested to date, illustrating the effectiveness of the 'assured annual flood control' plans.

- The flood control and power benefits that are achieved in Canada (BC) through operations under the CRT remain in BC.
- The US and Canada share equally in the computed power benefits in the US associated with the regulation of flow from Canada's CRT projects. Increased power benefits are calculated based on 'projected' optimal operation, not actual operation. Therefore, regardless of how the US chooses to operate its dams in real-life; Canada (BC) will receive 50% of the projected agreed amounts of energy and capacity. This is called the Canadian Entitlement.
- The US paid US$254.4 million for Canada's share of the increased power for 30 years. This money was used to partially finance the construction of the Canadian dams. This sale fully expired on 31 March 2003 such that the Canadian Entitlement has now fully reverted back to Provincial BC government ownership. This is currently about 4000 GWh of power each year, with an estimated annual value of approximately US$300 million.
- The increased power benefits associated with Canadian storage are 'First Added', meaning that the benefit of Canadian storage is recognized in the benefit computations before recognizing storage built in the US after the Treaty was signed (including Libby). The 'First Added' status helps to maintain the financial value of Canadian Treaty storage.
- The CRT permitted the US to build the Libby dam, which it did in 1973, with the Koocanusa reservoir extending 67km into BC. No direct compensation was given to Canada, but Canada benefits from regulated flow from Libby for its power generating facilities on the lower Kootenay River in BC, and for flood control benefits on the Kootenay and Columbia rivers. Although operations of Libby are not detailed under the CRT (as are the other CRT dams), Canada and the US must coordinate (but not necessarily agree on) its operations. Since 2000, Libby has been operated in coordination with BC power and flood interests through the *Libby Coordination Agreement*.
- Canada has the right to divert 1.5 Maf of water annually from the headwaters of Kootenay River directly into the Columbia to provide greater water flows along the Columbia River generating facilities. As yet, Canada has not exercised this right.
- Organisation and management
- The CRT is implemented by the Entities, which are BC Hydro in Canada, and (jointly) the Bonneville Power Administration and the US Army Corps of Engineers in the US. In 1998, the Province of BC became an Entity for the purposes of receiving the Canadian Entitlement (CE) to downstream power benefits when, beginning in 1998, the CE returned to Canada after the initial 30-year sale to the US.
- The Entities develop the Assured Operating Plan (AOP) to focus on flood control and power generation 5 years in advance. The AOP is used to calculate the Canadian Entitlement to power benefits. Actual operations are determined, by mutual agreement, through annual Detailed Operating Plans (DOP), monthly and weekly agreements, as well as supplementary agreements that take into account other interests.
- The CRT created an independent Permanent Board of Engineers (PEB) to review the implementation of the Treaty, provide recommendations to the governments, and assist with resolving any disagreements regarding implementation. Should differences persist, either the US or Canada can refer the issue to the International Joint Commission (IJC), established by the *Boundary Waters Treaty of 1909*, for a decision.
- Overall, operations between the official entities have been constructive and collaborative, and the Treaty Entities have encountered few serious disagreements.
- One area of continued controversy centres round the operations of the Libby dam in the US to protect endangered species in the downstream portions of the US system (such as white sturgeon below Libby, and salmon below Chief Joseph dam). These operations can conflict with power generation, flood control, endangered species, agricultural, and recreational interests in the Canadian section of the river.

- Interests outside the scope of the Treaty
- In developing the Treaty, power and flood control were at the forefront of the Canadian and BC governments' priorities, and there was little consultation with either First Nations or local communities regarding their concerns.
- In Canada, interests outside the Treaty are primarily dealt with through mutually agreed annual operating agreements and/or water use plans developed for each of the Canadian Treaty dam facilities. Water Use Plans, along with clarified water licences, determine operations at each of BC Hydro's dams; however, the plans must be consistent with the CRT.

Preface

This report has been compiled for the Canadian Columbia River Forum, which is a number of federal, provincial, regional and First Nations agencies that have entered into a memorandum of understanding concerning the trans-boundary reaches of the Columbia River. The views expressed herein are those of the authors and do not necessarily state or reflect the views or positions of the Forum or any of its member agencies. This overview of the structure and content of the Columbia River Treaty is designed to provide a clear and concise background and understanding, from a Canadian perspective, of:

i) The current structure and framework, including what was agreed to under the Treaty, the basic benefits, and obligations;
ii) The basic priorities for water use and operations;
iii) The current organisational roles and responsibilities, including how the Treaty has been implemented and operated;
iv) The current flexibility within the Treaty to accommodate other interests; and,
v) The various obligations and responsibilities should the Treaty be terminated or continue past 2024.

This report focuses on issues that are directly related to the Treaty or its operation. It does not attempt to discuss values or interests that have emerged since the signing of the Treaty other than to illustrate how they have endeavoured to be addressed through flexibility within the Treaty.

This report has been compiled based on literature that pertains to the above issues and through interviews with persons knowledgeable as regards to those specific issues.[1] The preparation of this report has been supported through funding from the Columbia Basin Trust and other Canadian Columbia River Forum participants.

Throughout the report, an attempt has been made to use terminology that is understandable to the majority of readers, while preserving the essence of legal and technical terminology, names, and operational terms. The CRT is particularly complex; to help clarify terms a glossary has been included in Section 7. In discussing elements of the Treaty general reference is made to Articles within the CRT, for example: (Article XII (2)). Articles from any other agreements are specifically referenced.

While the Federal Government of Canada signed the Treaty, and text therein refers to Canada, it is the Province of British Columbia (BC) which undertakes the obligations and receives the benefits. Consequently, the use of Canada and BC are often interchangeable throughout this document. Care has been taken to specify which when specification is needed.

1 A list of those interviewed is shown in Section 8.

1 Overview of the CRT

The Columbia River Treaty (CRT, Treaty) is an agreement between the United States (US) and Canada to develop and operate upstream storage in BC in order to provide a regulated flow on the Columbia and Kootenay[2] rivers, and optimise flood control and power generation in both countries. It provides for the US to compensate Canada (specifically, BC) for half of the 'downstream benefits' the US could realize (under the assumed conditions); and it permitted the US to construct the Libby dam and associated Koocanusa reservoir, which extends into BC.

The Treaty was developed in the wake of large hydro-development of the Columbia in the US, and was seen as a way of gaining added benefit to those existing structures. The most prominent of which is the Grand Coulee dam built in 1942, with the Roosevelt reservoir, which remains to this day the fourth largest producer of hydro-electricity in the world, and the largest in the US. The Columbia River is the largest producer of hydroelectricity in North America, with 14 hydro-dams on the main stem alone producing approximately 24,000 MW of power.[3]

With respect to Pacific salmon, the Grand Coulee (1938) and Chief Joseph (1949) dams had effectively stopped salmon migration on the main-stem Columbia into Canada prior to the construction of the Canadian Treaty dams. However, the nine US dams on the main-stem Columbia downstream of Chief Joseph remain passable by salmon, and Columbia salmon continue to migrate into Canada via the Okanagan River, which enters the Columbia River just downstream of the Chief Joseph Dam.

The Columbia River experiences highly variable flows, and the risk of flooding was always a problem. In 1948, a large flood that took lives and destroyed property in the US and Canada helped drive political support for the development of the Treaty.

1.1 The Treaty

On January 17, 1961, Canada and the US signed the *Treaty Between the United States and Canada Relating to Cooperative development of the Water Resources of the Columbia River Basin* (CRT).

The United States ratified the CRT on March 23, 1961. Following development of the *CRT Treaty Protocol* (January, 1964), the development of a *Canada – BC Agreement,* and an assured long-term sale of its share of the additional power produced, Canada ratified the Treaty on September 16, 1964 and it became binding to both Parties.

Either Canada or the US can terminate most of the provisions in the CRT on or after September 16, 2024 with a minimum of 10 years notice (more than 10 years notice can be given). Consequently, 2014 is significant as it is the latest year that notice can be given to terminate the Treaty at its earliest possible date. The obligation to provide 'annual flood control'[4] expires in 2024, independent of Treaty termination.

While the sole Parties to the Treaty are Canada and the United States, the Treaty is implemented by their respective 'Entities':

2 The spelling is Kootenai in the US.
3 This is approximately 2 ½ times BC's peak electrical demand (BCH, 2004).
4 The US paid for this flood control for 60 years.

- British Columbia Hydro and Power Authority for Canada,5 and
- Bonneville Power Administration and the Northwestern Division of the Army Corps of Engineers (Division Engineer) for the United States.

Snapshot of the Power and Flood Benefits

The energy produced in BC by the Canadian CRT dams is entirely at the disposal of BC Hydro.* The Columbia system generates approximately half of the electrical energy produced in British Columbia, under the current operating procedures in compliance with the CRT.

The Canadian Entitlement to Downstream Power Benefits is owned by the Province of BC, and is approximately 4000 GWh per annum (CRT-Entities, 2008). This is estimated at a value of $300 million per year, which may be either in actual power or in sales to other utilities.

The total dam system (not just CRT storage) was able to prevent serious flooding throughout the basin in 1997, where an estimated $7 billion worth of damage might have occurred in Portland alone (BCH, 2008). In 2002, which was an average water year, peak water levels in Trail would have been 2.38 m (7.8 ft) above the flood level (PEB, 2002).

*Note: The power developed at the Arrow Lakes Generating Station is owned by CBT/CPC, and is sold to BC Hydro under a long-term contract.

Under the CRT three large dam facilities were built in BC for storage of water that benefit both the US and Canada in terms of increased power generation, and flood control. Canada (specifically, BC) received, and continues to receive, 50% of the computed increased power benefits achieved in the US. This is called the Canadian Entitlement, and is received in the form of financial payments and/or energy.

The downstream benefits are calculated based on the Assured Operating Plan (AOP) for BC facilities calculated 5 years in advance of each operating year. The benefits are therefore based on *projected* optimisation of power benefits, not the *real-life* operations of US facilities. Under the Treaty the AOP is based on using the facilities in BC and the US to optimise flood control and power generation. The Treaty allows for the development of a Detailed Operating Plan (DOP), by mutual agreement, that may be more advantageous than the AOP based on the operating needs (maintenance of facilities), interests in certain fish species, water levels etc. Actual operation of the Canadian Treaty projects can differ from the DOP, based on mutual agreement, often developed through supplementary agreements, which can incorporate other interests such as fisheries.

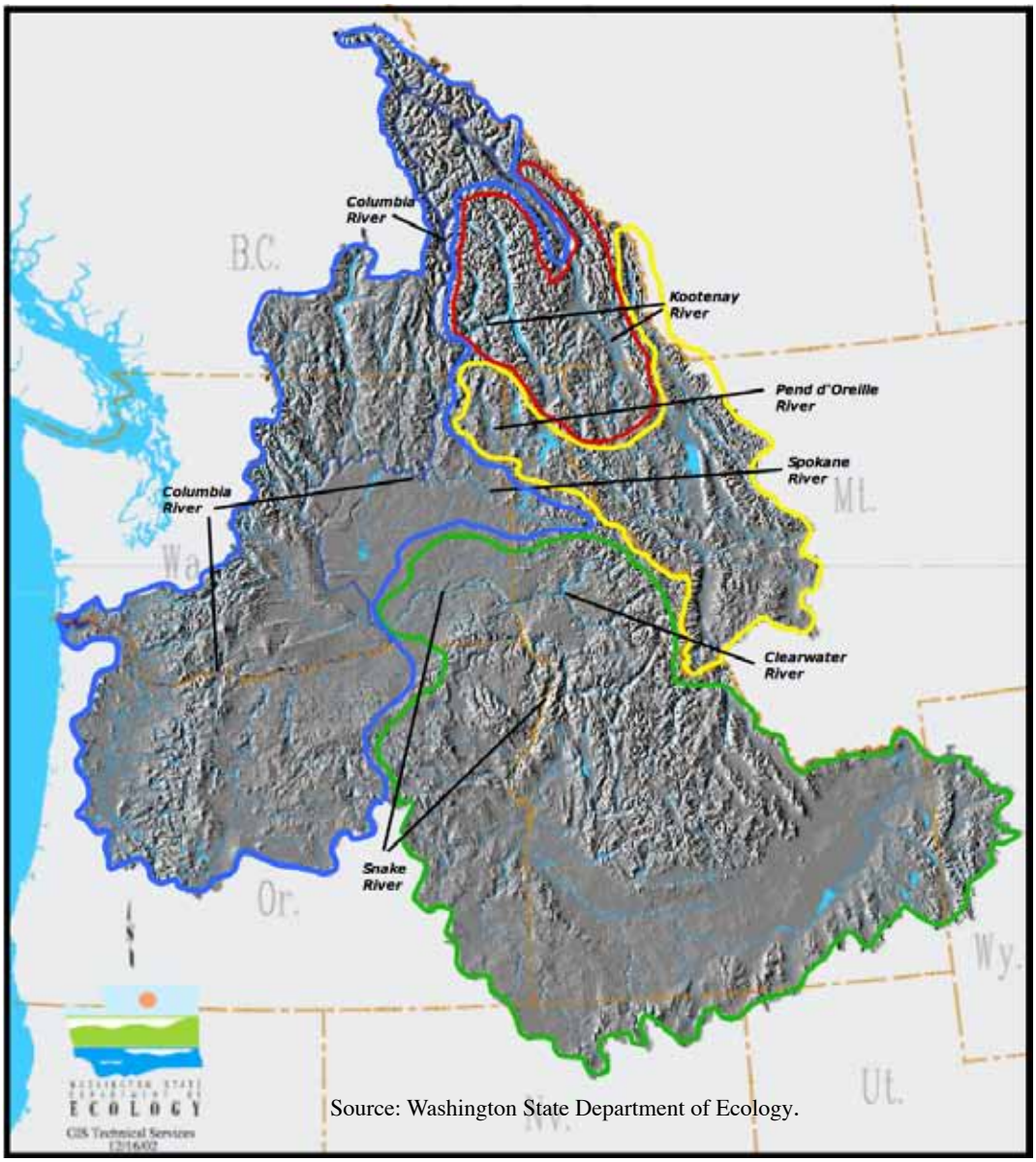
5 The Province of British Columbia became an entity in 1998, for the purposes of dealing with the 'return to Canada' of the Canadian portion of the downstream benefits of increased power.

1.2 Geography of the Basin

The entire Columbia River basin covers approximately 671,000 km^2; this is roughly twice the size of the Federal Republic of Germany. Roughly, 15% of the basin lies in Canada (BC). For the purposes of this report, the basin has been divided into of four main tributary systems (Figure 1):

i) The Columbia River (Blue),
ii) and Kootenay River (Red);
iii) The Pend d'Oreille6 River System (Yellow); and,
iv) The Snake River and Clearwater River System (Green).

Figure 1: The Columbia River Basin



Source: Washington State Department of Ecology.

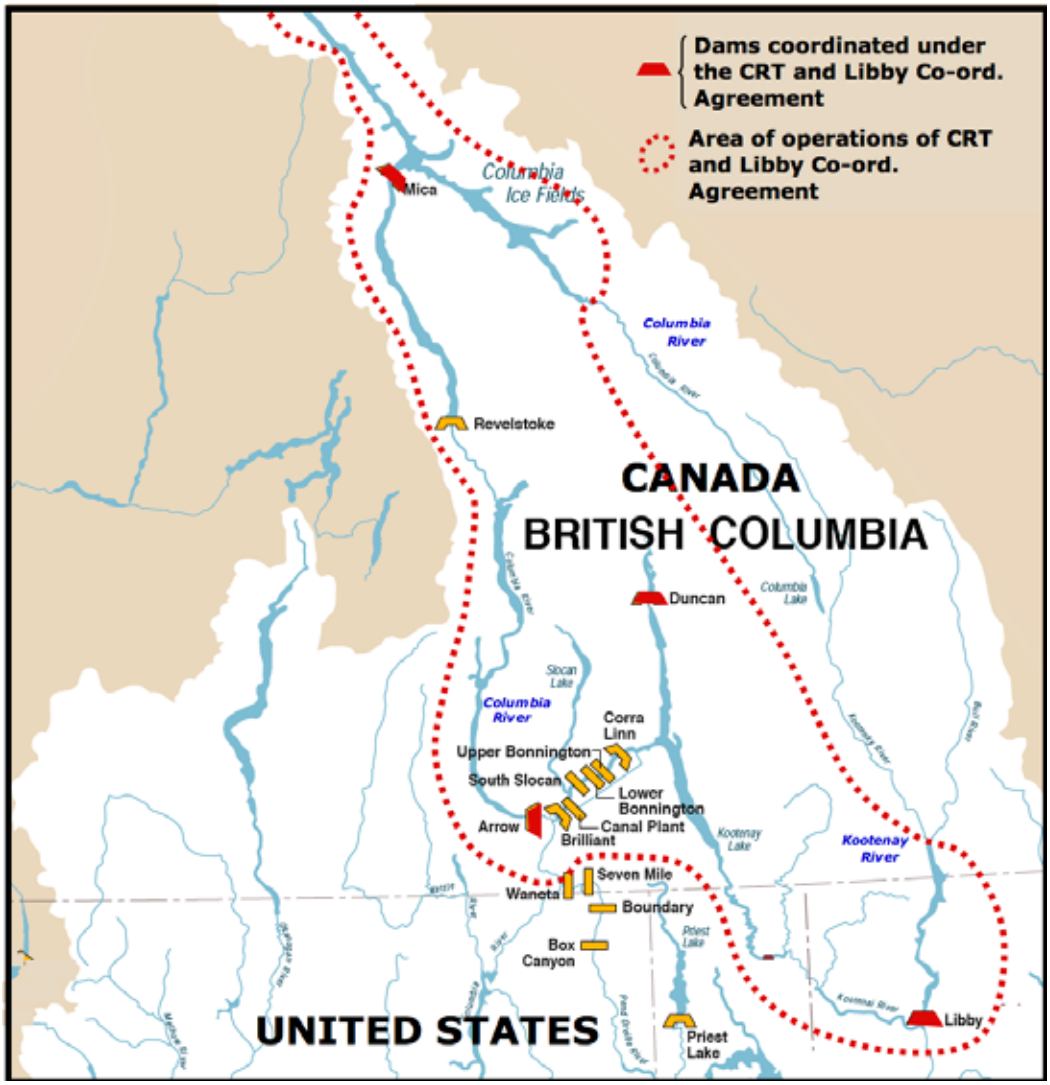
6 US spelling is Pend Oreille.

The CRT deals only with the first two of the above-listed river systems and with the structures specified under the Treaty. The Okanagan River also runs from BC into the US connecting with the Columbia just below the Chief Joseph dam in Washington State. It is not covered under the Columbia River Treaty**.** The other trans-boundary rivers such as the North Fork Flathead River (part of the Pend d'Oreille system) and the Okanagan fall under other governance structures, such as the *Boundary Water Treaty* of 1909 (when applicable), or customary international law. The Snake River system is located entirely within the US.

The Columbia River is approximately 2000 km long, and has an impressive elevation drop of 2690 feet (820m) from its headwaters in Columbia Lake (BC).

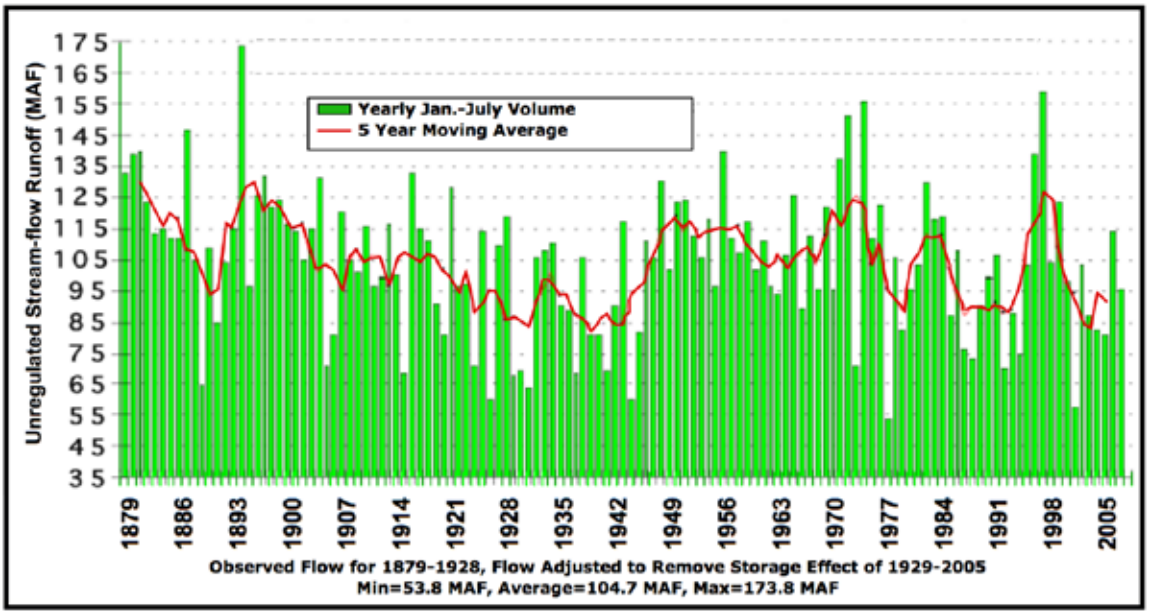
In general, the rivers flow from BC into the US. However, as shown in Figure 2, the Kootenay River flows south from BC into the US and then north returning to BC, where it joins the main stem of the Columbia River. While the area in BC over which CRT is applied is a little less than 15% of the entire Columbia basin it supplies approximately 35% of the water for the entire basin, and as much as 50% at flood levels (BPA, 2008).

Figure 2: Dams affecting flow on the Canadian Columbia River



The Columbia River, particularly in BC, experiences great variability in seasonal flows with the difference between low season flow (in January) and high season flow (in June) being as much as 40 times. Furthermore, the inter-annual flow varies as much as 4 times. Figure 3 shows the yearly variation based on measurements at the mouth of the Columbia River at The Dalles.

Figure 3: Inter-annual Variability in Runoff at The Dalles (mouth of the Columbia River).



Source: BC Hydro Archives, 2005

1.3 History of Treaty Development

Canada[7] and the US signed the *Boundary Water Treaty* of 1909 establishing the International Joint Commission (IJC) to approve of obstructions or diversions that alter the natural level or flow of boundary waters.[8] While the Columbia River is considered as 'trans-boundary river' and not as 'boundary water',[9] in 1944 the governments of Canada and the US asked the IJC to investigate and recommend a plan of development for the Columbia Basin.[10] The IJC created the International Columbia River Engineering Board (ICREB) to analyze use of the waters with respect to: domestic water supply, navigation, efficient power, flood control, reclamation, conservation of fish and wildlife, and other benefits (ICREB, 1959).

The IJC technical studies took 15 years to complete and looked at a variety of alternative sites. It recommended up-river storage in Canada on the Columbia and its tributaries as the most effective for meeting the countries' economic and flood control benefits (IJC, 1959). During that time at least another six technical studies were undertaken by the US, BC and Canada, including a study which looked at diverting the Columbia River into the Fraser River (McNaughton, 1958).

7 It was actually Great Britain that signed the Treaty on behalf of Canada.

8 Article III of the *Treaty Between the United States and Great Britain Relating to Boundary Waters and Questions arising Between the United States and Canada, Washington, 11 January, 1909.*

9 'Trans-boundary river' is considered as water that flows across the border; 'boundary water' is water where a boundary crosses, i.e. Lake Ontario. See Glossary (Section 7)

10 At the time the US produced 40.3 billion kWh per year on the Columbia, compared to Canada's 2.7 billion kWh (ICREB,1959).

While several different options for achieving the desired storage were debated, storage at the Arrow Lakes was common among them. The proximity to the Roosevelt reservoir behind the Grand Coulee dam, and the large portion of Canadian flow generated in the area meant that storage at Arrow was of great importance for firming up power at Grand Coulee and controlling flood flows. The principle debate amongst the decision makers was whether it was to be a high dam or a low dam (McDonald, 1973; McNaughton, 1959). The former was decided on and written into the CRT.

While the studies were still being conducted, a large flood occurred in 1948, causing great damage in both the US and BC. It displaced 30,000 people and killed 50 highlighting the need for collaborative action (BPA, 2008). This served to emphasise the importance of the CRT facilities.

The IJC also determined 16 principles to assist treaty negotiations with respect to selection of the project sites, and the calculation and apportionment of benefits of power development and flood control (IJC, 1959).

The CRT was developed to operate the water resources of the Columbia Basin "in a manner that will make the largest contribution to the economic progress of both countries". After allowing for consumptive uses, including irrigation, it is focused on **flood control and power generation**, as it was felt that cooperation in these areas would generate the "greatest benefit to each country" (Paragraph 4 of preamble). Flexibility within the agreement, and flexibility with respect to extra storage BC developed, which is not included in the initial Treaty, is used to accommodate other interests, such as fisheries and recreation, amongst others.

1.4 Dams built, obligations and rights under CRT

Under the agreement Canada built the Arrow/Keenleyside dam (Arrow Lakes reservoir), Mica dam (Kinbasket reservoir) and Duncan dam (Duncan reservoir) (Article II (2)), and the United States exercised its option to build the Libby dam (Koocanusa reservoir) in US state of Montana.

The total storage in Canada called for under the CRT is 15.5 Maf (Article II (1)). This is referred to as the 'Treaty storage' or 'Canadian storage'. BC effectively added another 5 Maf by building a higher dam at Mica, and the US built Libby with a further 5 Maf. The current storage of all facilities on the Columbia system is approximately 60 Maf. The Canadian Treaty Storage has 'first added' rights ahead of the benefits from other subsequently-built US facilities (Article VII (2b)). This is important as it protects the Treaty benefits from being financially 'de-valued' by the addition of further storage.

Under the Treaty, Canada is obliged to provide assured annual flood control until 2024, 'on call' flood control as requested, and release water as determined to provide optimum power generation in the US and Canada.

In signing the Treaty, the US agreed to compensate Canada (specifically BC) for 50% of the flood control benefits[11] and 50% of the downstream benefits related to increased power generation based on calculations assuming that US facilities were run to optimize power generation.

11 It has done this in the form of lump payments as each Canadian dam was built. The total of $64.4 million was considered to be half the flood benefits for 60 years.

1.5 Extra Storage in Canada

The additional height of the Mica dam resulted in a further 5 Maf storage in the Kinbasket reservoir; 4.5 Maf has been operated under the terms of the *Non-Treaty Storage Agreement* and 0.5 Maf is operated by BC Hydro for its sole use.

For as long as the CRT is in place, any new water resource development that Canada undertakes on the Columbia *must* not adversely affect the control of the water flow to diminish the flood control and power production benefits of the CRT (Article IV (5)).

Example: When Revelstoke Dam was built and the reservoir filled, a separate agreement was developed (see section 3.4). Revelstoke does not come under the CRT, but its operations must not interfere with Treaty operations.

1.6 The Libby Dam

The CRT allowed for the construction of the Libby dam and Koocanusa reservoir which holds 5 Maf storage and floods 67 km into Canada (Article XII). However, the Libby project has somewhat different operational obligations as compared to that for Canadian CRT facilities. While Libby is included in the model studies that drive the development of the AOP and DOP documents, its operating limits and expected operation do not form part of either document.[12] The CRT provides that, should Canada propose an alternative operation at Libby, the US will implement it, providing it does not disadvantage the US (Article XII (5)). Furthermore, Canada and the US agreed to cooperate on a continuing basis to coordinate the operation of Libby with the operation of hydroelectric plants on the Kootenay River and elsewhere in Canada (CRT Protocol Para 5).

Also, the operations of Libby dam are to be consistent with the Kootenay Lake Order made by the IJC, under the *Boundary Waters Treaty*[13] (Article XII (6)).

Since 2000, Libby has been operated under the terms of the *Libby Coordination Agreement* (see section 3.4). This agreement provides a mechanism by which BC is able to compensate itself financially for any lost power generation on the lower Kootenay due to US operations of Libby, primarily for fish interests (see example below). If the US operates Libby for fish benefits such that there are power losses on the lower Kootenay, BC may run other facilities to compensate for this.

Although Canadian land was flooded to fill Koocanusa Reservoir, no direct benefit payments or compensation transpired. However, Libby regulation improves the value of generation at downstream plants, including the projects on the Kootenay River in Canada. Under the terms of the Treaty, downstream power and flood control benefits from operations at Libby belong to the country where they occur. Canada is, therefore, provided with indirect flood control and power benefits from the construction of Libby. When the US chooses to operate Libby for sturgeon and salmon enhancement, some of these flood control and power benefits are lost; however, the fisheries and other ecosystem benefits of this operation may be substantial and it is not clear that net benefits are reduced.[14]

Example: The regulated flow associated with Libby and Duncan allowed for the Kootenay Canal Plant to become economical (and thus be built), and Canada also retains the benefits for the increased power production on the lower Kootenay.

12 The Libby Operating Plan is developed by the US Entity. The modelled operation of Libby is included in the Treaty Storage Regulation (TSR) and is based on the AOP Step I operating criteria.

13 Section 3.4 of this paper deals with associated agreements.

14 Kootenay sturgeon are on the endangered list in the US and are listed as endangered on the Government of Canada's Species at Risk Act Schedule 1.

1.7 Consultation and other interests

Although numerous engineering studies were conducted regarding technical aspects of the proposed water storage system, very little analysis was undertaken by Canada on the potential social, economic and environmental impacts that the CRT dams would have on the local area. Furthermore, little effective consultation was conducted in Canada with those most affected by the projects. Some have argued that the Federal and BC governments appeared to distance themselves from local interests.

While local concerns were raised regarding fisheries, livelihoods as well as flooding, these and other issues were not in the forefront of Provincial and Federal interests at the time (McDonald, 1993; Wilson, 1973).

In 1995, the Columbia Basin Trust (CBT) was created by the Columbia Basin Trust Act to benefit the region most adversely affected by the CRT. The CBT received a $295 million endowment to construct power facilities and for reinvestment into the area.[15] Income from power investments is being spent on social, economic and environmental benefits for the residents of the Basin.

To accommodate interests other than flood control and power generation, BC Hydro has the ability to use flexibility within the Treaty, as well as mutual agreements with the US to manage for additional Canadian interests (See section 4). Consultation with stakeholders occurs through the process of Water Use Planning to update water licenses for operation of the BC facilities, as well as various stakeholder workshops.

To help mitigate some of the footprint effects of the Canadian facilities, BC Hydro, the BC Ministry of Environment, and Fisheries and Oceans Canada have created the Fish and Wildlife Compensation Program (FWCP) to compensate for the impacts of BC Hydro's dams and reservoirs in the Columbia-Kootenay region.[16]

1.8 First Nations

First Nations, specifically the Ktunaxa, Shuswap, and Okanagan Nations were, and continue to be, directly affected by the Treaty projects and their operations in terms of flooding, impact on fisheries, livelihoods and cultural issues. However, there is no indication that any meaningful consultation or dialogue occurred with First Nations during the negotiation period for the Treaty. The First Nations continue to feel the affects of the 'development' of the Columbia River. Currently, consultation with First Nations is generally conducted at the Water Use Planning level, which addresses interests and objectives surrounding reservoir operations, flow releases, and physical works such as shoreline revegetation, access, and environmental and cultural studies.

1.9 Direct effects of the dams and their operations

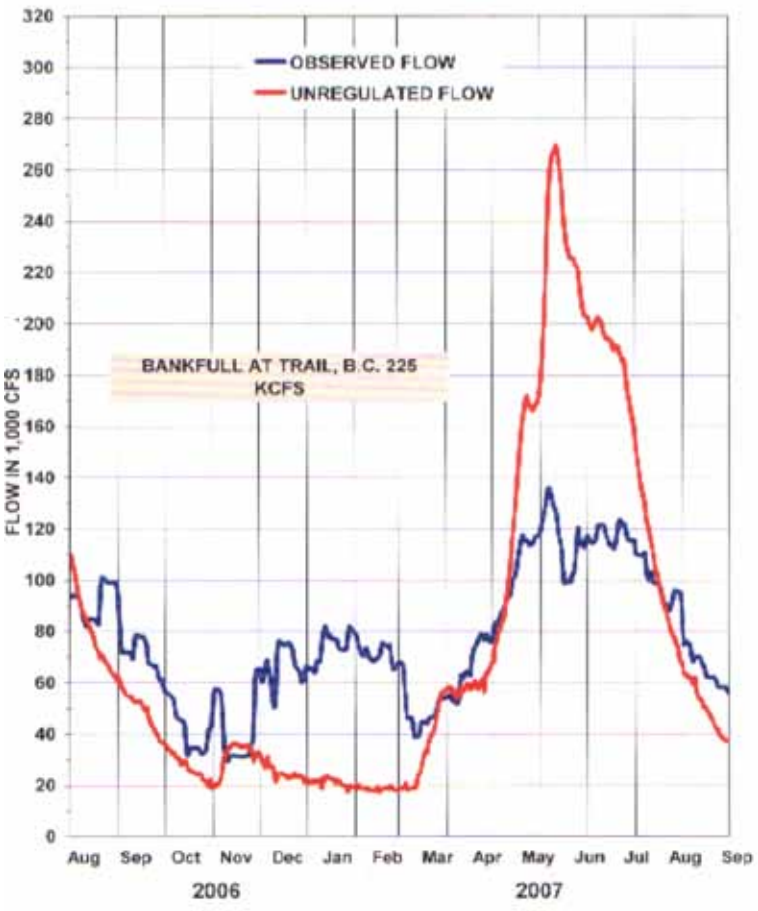
While a detailed discussion of the effects of the dams and their operations is beyond the scope of this report, it is important to have some appreciation of their consequences to better understand the issues surrounding operations, flexibility and the supplementary agreements associated with the CRT.

As mentioned, the Columbia River was a highly variable river and flooding was not uncommon, the largest of which occurred in 1894; however, the second largest in 1948 resulted in the greatest damage, and helped provide the impetus for the CRT. A further flood in 1961 also had a large impact in Canada. There was enormous uncertainty each spring regarding rising water levels in towns such as Trail, BC.

15 Taken from www.cbt.org
16 See www.fwcp.ca

Figure 4 shows the observed flow (Blue) and estimated unregulated flow (Red) experienced in Trail between August 2006 and 2007.

Figure 4 CRT Contribution to Flood Control at Trail, BC

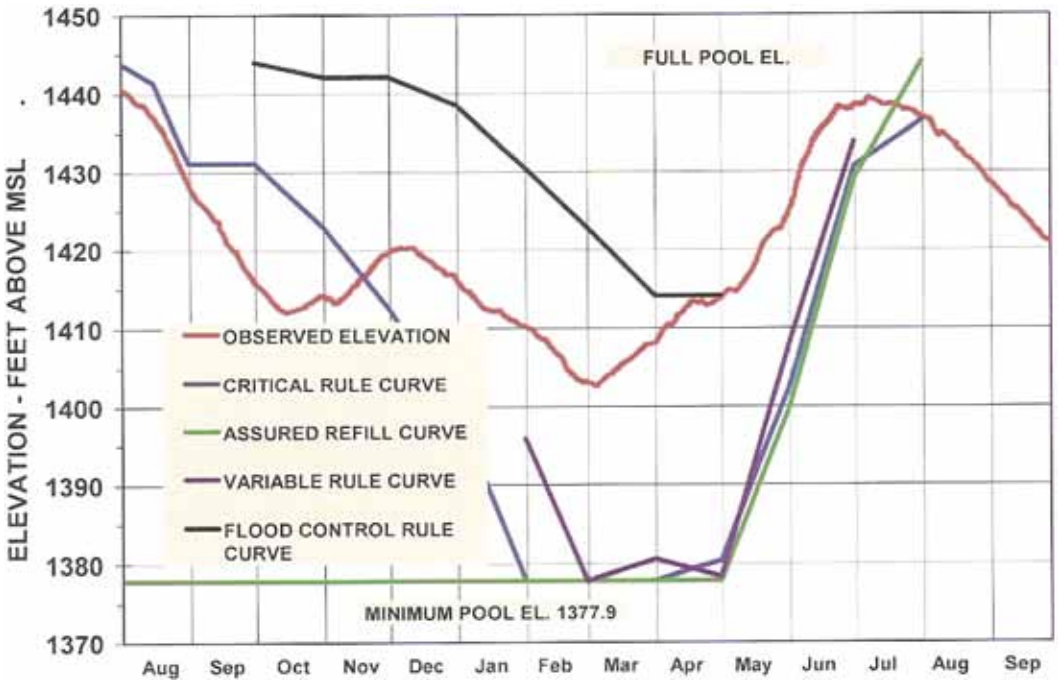


Source Fig. 4: Annual Report (CRT-Entities, 2008)

Approximately 500 km^2 in Canada were flooded to fill the Duncan, Arrow, Kinbasket, and Koocanusa reservoirs. In the case of Koocanusa, behind Libby, Canada received no direct compensation for the relocation of roads, rail, and other structures that were affected (Article XII (4)), the value of which was estimated at $US 8.5 million in 1961 (US Senate, 1961). However, significant flood control and power benefits were, and continue to be, realized within the region and province.

Much of the social impact was centred on the Arrow Lakes, where approximately, 2000 people were relocated locally in Castlegar and Revelstoke or moved entirely from the area (Wilson, 1973). The flooding of the Arrow lakes resulted in the level being 12 metres (40 feet) above the natural level (McDonald, 1993). Moreover, the Arrow lakes lost some 20,000 acres of its 32,000 acre arable land (McDonald, 1993; Wilson, 1973).

Figure 5 Arrow Reservoir Elevations for Aug 06-07

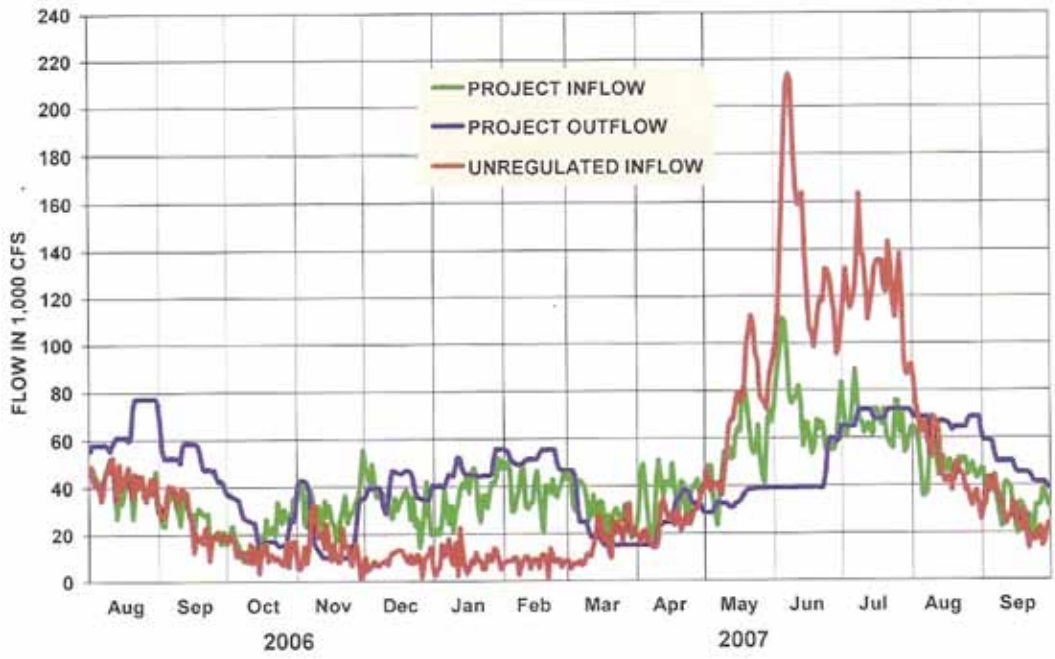


Source: Annual Report (CRT-Entities, 2008)

For the people of the region, there remain a number of outstanding issues regarding impacts from the construction of the CRT dams and creation and operation of the reservoirs. While benefiting flood control, regulation of the river has altered wetlands and riparian ecosystems impacting various fisheries and wildlife values, as well as disrupting the economic, cultural and social way of life of the people who had come to depend on them. Moreover, variations in reservoir levels affect recreation, and have resulted in local dust storms when levels are low and banks are exposed. Figure 5 shows the actual, or observed, fluctuation of level for the Arrow reservoir against several operating curves for the 2006-2007 operating year. It shows clearly that the level altered some 35 feet over the course of operations.

Figure 6 illustrates the flow associated with the Arrow reservoir. The red line indicates the unregulated flow showing a marked spring freshet and high levels in June and July due to snow melt, and very little flow during the winter months. The green line represents the inflow into the reservoir, which is a combination of the releases upstream at Revelstoke and the natural inflow from local streams. Releases from Revelstoke for power generation are indicated by the much higher inflow as compared to the unregulated flow during the winter months. The blue line shows the outflow from the Arrow reservoir.

Figure 6 Arrow Reservoir Flows for Aug 06-07



Source: Annual Report (CRT-Entities, 2008)

In addition to flood control and power generation, there were a number of immediate benefits realised by the region during the construction of the projects such as the employment provided for several thousand people over 5-7 years. Additionally, spin-offs to the community were considered whenever possible, including an extension at the hospital in Castlegar (Wilson, 1973). Currently, BC Hydro pays grants in lieu of taxes to local governments in BC for land occupied by its generation facilities.

2 Substantive Elements of the CRT

2.1 Priority water use within the CRT

1. Consumptive uses are permitted without prior consent of either party (Article XIII (1)). Consumption is defined as water for domestic, municipal, stock-water, **irrigation**, mining and industrial purposes.
2. Flood control is more important than optimising energy operations. Reservoirs must be drawn-down to provide assured evacuated storage volumes for retention of flood water by March 1, April 1 or May 1, depending on the dam (CRT-Annex A – Principles of Operation, (5))
3. Guaranteed or firm energy requires that the reservoirs are drawn-down to produce this energy.
4. Reservoir refill is targeted to occur by July 31 to maximize the firm energy for the following year. However, this goal may not be met in drought conditions due to firm energy needs (see #3).
5. Secondary or additional energy is the final priority of water use. This is extra energy that may or may not be available based on precipitation. As it is not guaranteed it is less valued.

Both Canada and the US have other requirements affecting the regulation of water of the Columbia River. In Canada these include Federal legislation, such as the Fisheries Act, the International River Improvements Act and the International Boundary Waters Treaty Act, as well as Provincial requirements to obtain water licenses, such as the development of Water Use Plans. In developing Water Use Plans a variety of social, cultural and environmental concerns are taken into account, with implementation of the plans intended to achieve a broad array of objectives.

2.2 Flood control

Under the CRT, Canada must provide the following flood control:

- For the first 60 years from ratification, Canada must provide 8.45 Maf of storage17 in accordance with Annex A (Article IV (2) (a)). This is referred to as ‘assured annual flood control’, ‘or primary flood control’ as it is guaranteed each year as part of the Treaty.
- For the first 60 years from ratification, Canada must provide ‘on call’ flood control when needed, requested, and paid for by the US. Under these provisions, Canada is obligated to operate any additional storage Canada might have for as long as the flood period exists (Article IV (2) (b)).18 Beyond the 8.45 Maf of assured flood control, there is an additional 7 Maf of Treaty storage useable for power purposes, and 5 Maf of non-treaty storage that may be available for ‘on call’ flood control, along with space in Revelstoke and Kootenay Lake.
- After the first 60 years from ratification, Canada will continue to provide ‘called upon’ flood control using any storage it might have available for as long as the flood period exists (Article IV (3)).19

17 This has been increased to 8.95 Maf with the swap of 1.5 Maf of Arrow/Keenleyside flood control to Mica.
18 This has never occurred, as the assured annual flood control has provided adequate protection.
19 On call’ and ‘called upon’ are very similar, but the different terms are used by practitioners to distinguish between flood control requested from the US before and after 2024, respectively.

- The US may only request 'on call', and 'called upon' (after 2024), flood protection from Canada after it has operated all its effective facilities for flood control, and a defined need exists. Canada is compensated for its operational costs and economic losses (Article VI (4)).

Uncertainty: As 'on call' flood protection has never been used to date it is uncertain what the exact criteria would be to initiate it, and what the resulting compensation would be for Canada.

2.3 Energy production

After consumption and flood control considerations, the principle objective of the CRT is the optimization of power production in the United States and Canada,[20] based on the improved flow regime provided by Canadian Treaty storage (Article III (1)). Indeed the recommendation from the ICREB report of 1959 stated "the largest and most valuable tangible use of water resources of the basin, either existing or for the foreseeable future, is for hydro-power production" (ICREB, 1959).

2.4 Benefit sharing and downstream benefits

The US benefits from flood control provided by Canada. Canada received a 'one time' payment of US$64.4 million in exchange for the annual operation of 8.45 Maf of storage for flood control until 2024 (Article VI (1)). For each "on call" request, Canada also receives electrical power equal to the hydropower lost for providing the flood storage, as well as $1.875 million for the first 4 'on call' flood requests (Article VI (3)).[21] The power is to be delivered *at the same time* as the power is lost, so it is both equal in amount and equivalent in value (Article VI (3)). (See above *Uncertainty Box*, Section 2.2).

Example: The regulation in flow made additional generation economical at Grand Coulee. Though Canada did not contribute to its development, it receives ½ of the additional expected power generated from these turbines as compared to non-regulated flow from Canada (Newton, 2008).

The US benefits from increased power production at its generating facilities due to storage and regulation of flows by BC facilities. Canada is therefore entitled to one half of the extra power generated at US power plants on the Columbia River. Under the *Canada – BC Agreement,* the Province of B.C. owns this 'Canadian Entitlement to Downstream Benefits'. This currently is approximately 4000 GWh per annum (CRT-Entities, 2008), with an estimated value of $300 million per year. This includes the benefits from new US generation additions that were rendered economic by Treaty regulation, such as new generating turbines installed at Grand Coulee.

20 The Treaty discusses optimisation in either Canada or the US, or both, providing it is mutually agreed to.
21 This has never been used.

The power benefits are calculated based on the Assured Operating Plan simulation studies. They are not calculated on the *actual* storage and operations of the facilities experienced in the payment year (CRT-Entities, 2008). This means that the US may operate their facilities for non-power uses, however, the Canadian downstream power benefits remain unaffected.

> *Example: As a result of recent environmental legislation in the US, some US facilities operate to improve flow for fish at the expense of optimizing power gains. This, however, does not affect the Canadian Entitlement.*

The benefits are calculated by running scenarios using hydrographic data from 1929-1958. This includes the four driest years (1942-1946) to calculate the increase in firm load carrying capability.

The Province of BC sold the first 30 years of these power benefits to a group of US utilities (Columbia Storage and Power Exchange Corporation) for US$254 million. The money helped pay for the construction of the three Treaty dams in Canada. These sales agreements expired in 1998, 1999 and 2003 (the anniversaries of the scheduled in-service dates of the dams). Nine percent of the downstream benefits began returning to B.C. in 1998; 46% more in 1999; and the remaining 45% in 2003.

Under the *Canada-BC Agreement*, the Province of BC owns the Canadian entitlement to downstream power benefits. It has contracted Powerex to sell the energy on the open market, and receives an annual revenue of approximately US$300M. This is generally in the US, but can also be buyers in BC or Alberta. BC Hydro can and does generally reserve some of the capacity in winter months to serve domestic BC needs.

3 Current operational structure and framework

3.1 Organizational Structure

The governments of Canada and United States are the primary parties to the Treaty, but subsequent agreements bring others into the fold.

Under Article 14, the Treaty created Entities to enact the provisions of the agreement. The Treaty Entities are BC Hydro and Power Authority for Canada; and Bonneville Power Administration and the Army Corps of Engineers for the United States. In 1998, when the Canadian Entitlement to downstream power benefits began to be returned to Canada, the Province of BC also became an entity for the purposes of disposing of the Canadian Entitlement within the US (i.e. selling the electricity directly in the US without first bringing it back to Canada).

To assist implementation of the Treaty, the Entities created an Operating Committee (CRTOC) and a Hydro-metrological Committee (CRTHMC) (Article XIV). The CRTOC plans, implements and assesses the actual operations at the facilities, as well as the development of the AOP studies. The CRTHMC is responsible for planning and operating the hydromet data gathering systems and for providing water supply forecasts, and other essential information.

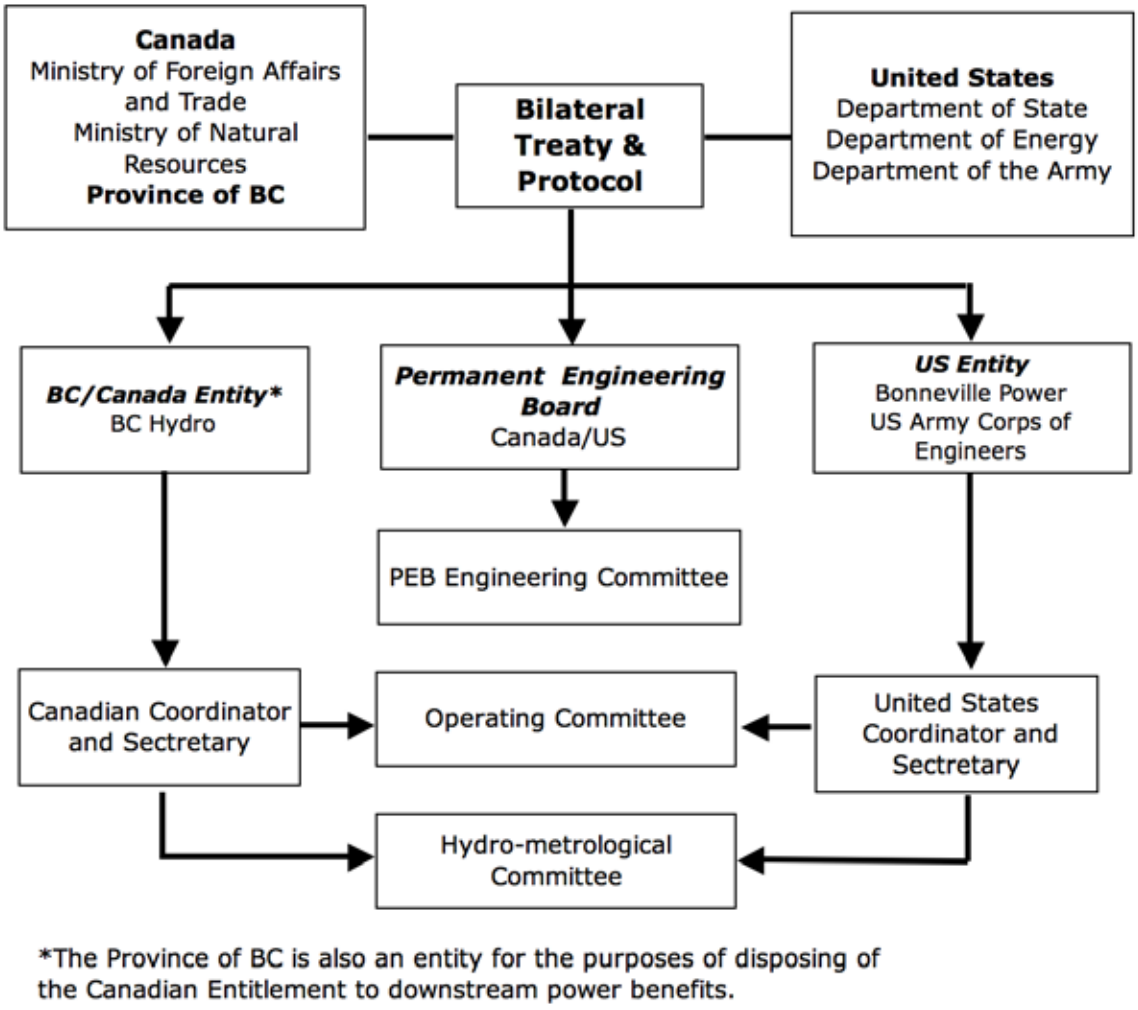
Article 15 established the Permanent Engineering Board (PEB) to provide an independent review of Treaty implementation. It collects statistics, ensures that the objectives of the Treaty are met, and reports to the Canadian and US federal governments. It consists of two persons from Canada (one Federal and one Provincial) and two from the US.

The PEB is not an arbitration board but can ‘find fact’ with operations, meaning that they can determine a view on how operations are being conducted. That ‘fact’ may be accepted in any further tribunal or ruling. Moreover, the PEB can also assist with resolving any contentious issues through dialogue and facilitation.

Annually the PEB reports out to each of the parties (Canada and United States). The Board does not decide or make rules, but its recommendations are powerful and are generally respected by the governments.

The PEB created the PEB Engineering Committee to assess technical elements of the Treaty operations.

Figure 5: Organisational structure for the CRT



Source: Based on CRT Annual Report (CRT-Entities, 2007)

3.2 Planning, Management and Operations

Planning and management is based on an operating year running from August 1 through July 31.

Assured Operating Plan (AOP)

The key planning tool to guide the operations of the dam facilities in the Columbia Basin is the Assured Operating Plan, which is drawn up every year for the 6th successive year (i.e. 5 years ahead of time). It is drawn with the specific goal of achieving optimum power benefits within the specified flood control protection. The flood control protection is specified under the Flood Control Operating Plan. The AOP is used to calculate the Canadian Entitlement to downstream power benefits. Once signed the AOP becomes the default, or assured, plan.

For the purpose of the AOP studies, the US is assumed to operate its facilities in a way that makes the most effective use of the improved stream flow from Canada. However, it does not necessarily have to do so, providing the downstream benefits to Canada are calculated as though it does (Article III).

Optimum Operating Rules are determined annually, and included in the AOP, based on the firm and secondary (non-firm) energy and capacity.

Detailed Operating Plan (DOP)

The DOP is based on the AOP. The Entities may prepare an annual DOP that may achieve more advantageous operation for benefits than would result under the AOP (Article XIV (2-k)). It must be accepted by mutual agreement, or the AOP for that particular year is applied. The DOP may include mutually agreed upon non-power and non-flood control benefits (CRT-Entities, 2006). To date money has not been considered as a means of benefit exchange under the DOP. This means that offering monetary compensation for altering flows to enhance fisheries or other values has not been conducted.

Treaty Storage Regulation (TSR)

The DOP is implemented via TSR studies that determine the monthly storage rights and obligations for Duncan, Mica and Arrow/Keenleyside dams (CRTHMC, 2001). Studies are conducted twice monthly to determine the end of month targets of the reservoir levels in the Canadian Treaty facilities. The TSR uses actual inflows to date plus the forecast stream flows, along with current reservoir conditions. The TSR specified operation can, and is often, modified by mutual agreement from the Entities.

Supplementary Agreements

Additional agreements can be developed to accommodate non-power interests, such as fisheries.

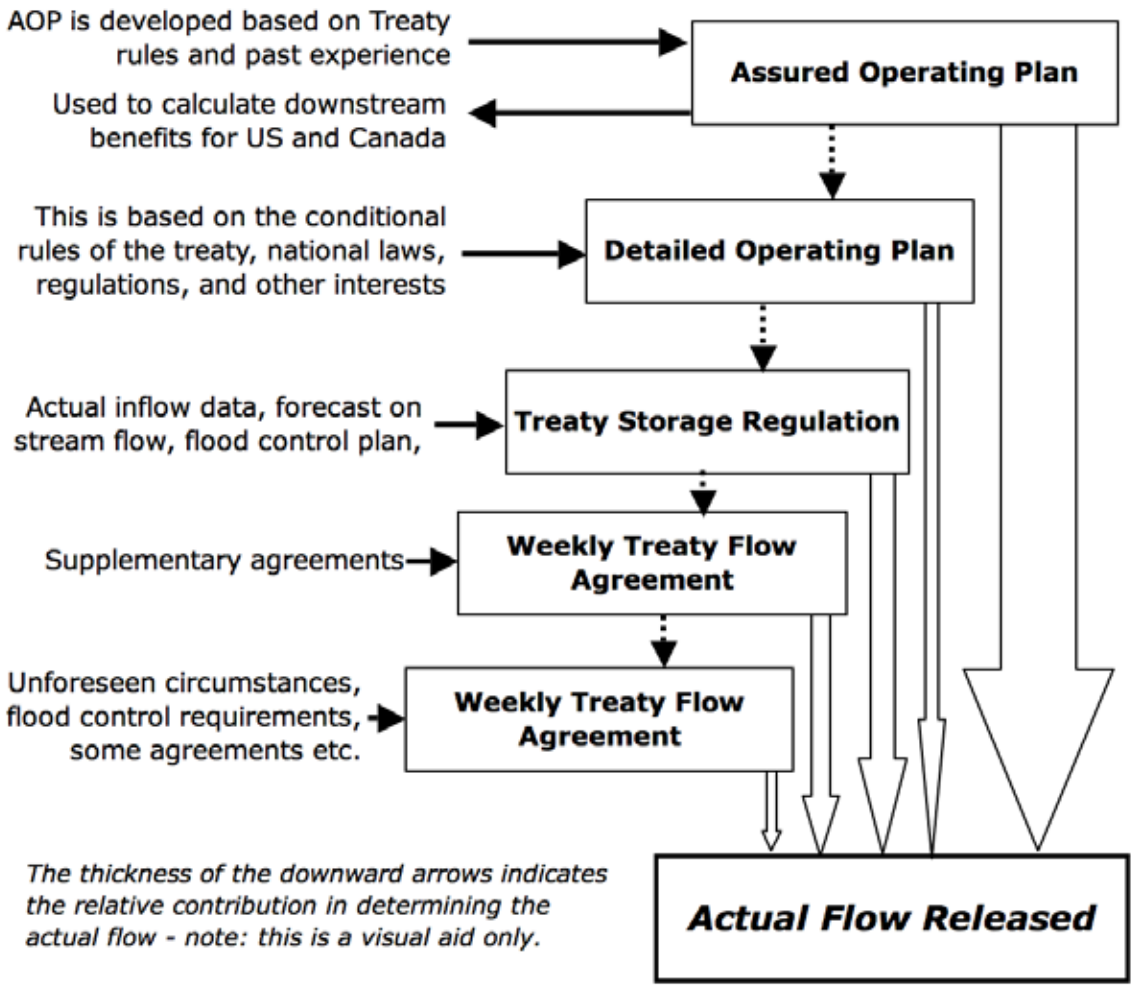
Weekly Treaty Flow Agreement & Conference Call

The actual operation of the Canadian Treaty Storage facilities (Duncan, Mica and Arrow/Keenleyside), is determined weekly based on the TSR and supplemental operating agreements and/or flood control requirements (CRTHMC, 2001).

A weekly conference call usually occurs on Thursday morning, and sets the Treaty Flow Agreement for the following week starting Saturday morning. The Agreement is typically finalized by noon on Fridays. Within-week flow alterations may be accommodated as mutually agreed, but these are generally rare.

The US provides information for Libby at the weekly meetings for coordination operations on the Kootenay.

Figure 6: General influence of various stages of decision making on actual flow.



As figure 6 illustrates, the Assured Operating Plan has the largest influence on the actual flow of the rivers; the Detailed Operating Plan tends to include small alterations from the AOP; the monthly Treaty Storage Regulation may have significant deviations from the DOP based on supplementary agreements; and the weekly alterations are generally minor compared to the overall structure.

It should be noted that under some conditions, flood requests can be made on a daily basis while the power agreement is normally weekly.

Flood Control Operating Plan (FCOP)

The CRT requires the US to develop a FCOP in consultation with Canada (Annex A (5)). This plan prescribes the maximum reservoir levels at various points over the course of the year for Mica, Duncan, Arrow/Keenleyside and Libby. Libby reservoir is included in the FCOP to meet the Treaty requirement to minimize damage to flooding in both Canada and the US (CRT Protocol, Para. (2)).

The FCOP addresses both local flood control issues (immediately downstream of facilities) and system flood control requirements (as indicated at The Dalles) to avoid damaging water levels throughout the system.

3.3 Tools and Calculations

The operation of the Columbia power generating and flood control system is extremely complex. To deal with the complexities of forecasting, a host of modelling tools have been developed over the preceding four decades. For example, HYDSIM is a reservoir simulation tool that was developed for planning the seasonal operation of the hydro-facilities in the basin. Both BC Hydro and the US entities use the tool for developing the AOP, DOP and TSR.

Much of the operations of the facilities are based on detailed rule curves that are applied throughout the course of the year depending on the current situation. These include assured and variable refill curves, upper rule curves for flood control, composite operating curves, end storage curves, and critical rule curves. The curves determine the reservoir levels of the different BC facilities (CRT-Entities, 2008).

The 'Principles and Procedures for the Preparation and Use of Hydroelectric Operating Plans for Canadian Treaty Storage' (POP) details how the AOPs and DOPs are developed and implemented in actual operation (CRT-Entities, 2003).

3.4 Associated and Supplementary Agreements

Associated agreements are those which are related to the CRT but do not directly influence the operations of Treaty Storage. Supplementary agreements are those agreements which may be negotiated directly affecting Treaty Storage.

Long-term agreements

i) Treaty Between the United States and Great Britain Relating to Boundary Waters and Questions arising Between the United States and Canada, Washington, 11 January, 1909. (Boundary Waters Treaty)

The BWT was signed between the US and Great Britain to oversee issues related to waters on the boundaries between the US and Canada. It established the International Joint Commission (IJC) to approve of any issues affecting the natural flow of boundary waters between the US and Canada. The BWT has no termination date, however, either the US or Canada may terminate it with 12 months notice.

Example: *In 1988 the IJC **recommended** that an open pit coal mine in the Flathead River in BC should not be constructed until its potential risks are deemed acceptable to both countries.*

Boundary waters are narrowly defined as lakes, rivers and waterways *along which the international boundary passes* (BWT-Preliminary Article). It therefore generally deals with lakes or reservoirs which may have trans-boundary influence. Consequently, while Canada had wanted it to include trans-boundary rivers, they are not under the overt jurisdiction of the IJC (LeMarquand, 1993). However, Article IV of the treaty also gives the IJC authority over obstructions, such as dams, on trans-boundary rivers where the reservoir extends upstream across the border. Pollution of "waters flowing across the border" (trans-boundary rivers) is also under the rubric of the IJC (BWT- Article IV), and considered as one of its vial roles (Parresh, 2005).

Article XVII of the CRT states that the BWT does not apply to the projects permitted by the CRT (Libby Dam and its Koocanusa Reservoir, which backs water across the border). However, in terms of the cross-boundary movement of water pollution the IJC would still have jurisdiction. Moreover, the BWT and IJC jurisdiction still apply to any Columbia basin structures that back water up-stream across the border, old or new, with the exception of CRT projects (Bankes, 1996). These infrastructure projects would have to be approved by the IJC.

Example: The IJC has written Orders of Approval for

- *Grand Coulee Dam and Lake Roosevelt on the Columbia.*
- *Corra Linn Dam and Kootenay Lake.*
- *Zosel Dam and Osoyoos Lake.*

Of great importance, however, is the provision under the BWT for both governments to refer issues, such as the 1988 Flathead coal mine, to the IJC for report or decision, although a reference for decision has never been used.

Also, the IJC is the first resort for arbitration for any differences of the Parties arising under the CRT (Article XVI). In practice, the PEB reconciles issues which the Entities find difficult to resolve themselves.

Example: *Both Canada and the US asked the IJC to report on cooperative uses of the Columbia River, leading to the CRT.*

ii) Canada – BC Agreement (July 8, 1963) and Canada – BC Agreement (January 13, 1964).

These agreements assured BC the benefits from the CRT but also allocated BC responsibility and liabilities under the CRT.

iii) Canadian Entitlement Purchase Agreement (September, 1964).

This agreement assured the province of BC that it could sell its share of the downstream power benefits to the US. The sale was for 30 years from each of the facilities. The Duncan share of the downstream power benefits returned to Canada in 1998, Arrow/Keenleyside in 1999 and Mica in 2003.

iv) Agreement between Bonneville Power Administration and British Columbia Hydro and Power Authority relating to (1) Use of the Columbia River Non-treaty Storage, (2) Mica and Arrow Reservoir Refill Enhancement, and (3) Initial Filling of Non-Treaty Reservoirs. (July 1990).

These commercial agreements between the entities are referred to as the Non-Treaty Storage Agreements (NTSA). The first agreement was signed in 1984, others have been signed extending the agreement to 2011. These agreements allowed for the initial filling of the Revelstoke reservoir, and outline how the extra storage that BC built in the CRT facilities of Arrow/Keenleyside and Mica (Kinbasket reservoir) as well as Revelstoke would be used.

v) Pacific Northwest Coordination Agreement (1964)

First signed in 1964 and then renewed in 1997, the agreement is between 16 parties in the US northwest to operate most of the power producing facilities in the region as though they were operated as one utility. This allows them to meet the coordination required by the CRT, and to take advantage of the diversity in flows and power loads and permits the optimization of the storage facilities.

vi) Libby Coordination Agreement (February, 2000).

This agreement helps to mitigate some of the controversy around the US operations of Libby dam to the benefit of white sturgeon and salmon and the loss of power generation in BC. Under the agreement, Canada is permitted to draw-down the Arrow reservoir and exchange power with BPA, and may exercise the option to apply the *Libby/Canadian Treaty Storage SWAP.* The LCA may be terminated with 30 days written notice.

vii) Libby/Canadian Treaty Storage SWAP.

Example: BC Hydro may ask to keep Libby high, while they draw-down Arrow.

In years when Arrow water levels may be higher than desired, the lake levels at Libby (Koocanusa Lake reservoir) may be improved in July / August by reducing Libby discharges in return for equivalent water from BC facilities. This results in lower levels and greater outflows from the BC facilities and is only used in some years (for example August, 2008).

viii) Summer Treaty Storage Agreement (July/01 – March/02).
This agreement provided for storage in Treaty Storage space to address Canadian concerns about low reservoir levels during the summer and fall of 2001, and US concerns about the reliability of its electrical system during the fall and winter of 2001-2002. The stored water was released by June 2002. This was a 'one time' agreement under the DOP for that year.

Short-term or one-time agreements

ix) Columbia River Treaty Entity Agreement on Operation of Treaty Storage for Non-power Uses for January 1 through July 31 (Non-Power Uses Agreements).
Beginning in the early 1990s, this is an annual agreement which modifies the outflow from Arrow/Keenleyside between April to June, to enhance Canadian trout spawning, serves to smooth the refill of the Arrow reservoir, enables 1 Maf of storage for US salmon flows, and assists in meeting minimum fish flow requirements at Vernita Bar (US). In recent years it incorporates the *Whitefish Agreement* and other interests, and has been extended to look at changes in flow from Mica and Arrow from 15 December through to 31 July.

x) Whitefish Agreements.
This refers to a series of agreements which are typically renewed each year. Canada benefits from a reduced discharge from the Arrow reservoir during the first 2-3 weeks of January during the spawning of whitefish. The loss of energy for the US is balanced by allowing a draw-down in the Arrow reservoir during September to December. While these are annual agreements, the low reservoir levels in 2001-2002 meant that no agreement was necessary for Canada (that year the Entities signed a *Summer Treaty Storage Agreement- see viii*). These agreements have now been combined into the *Non-power Uses Agreement*.

xi) Agreement on Disposals of the Canadian Entitlement Within the United States for April 1, 1998 through September 15, 2024.
Commonly referred to as the 'Disposal Agreement', this set out the terms and conditions under which the Canadian Entitlement to downstream power benefits can be disposed of (sold) directly in the United States.

xii) Aspects of Delivery Agreement.
This agreement outlines the delivery details for the Canadian Entitlement (to downstream power benefits). It runs from 1998 to 2024 and describes technical issues such as losses due to transmission, and acknowledges that BC should be treated equally to the other US customers for the energy in terms of cut-offs, amongst others.

4 Overview of flexibility in the CRT

4.1 Unilateral Actions

The Treaty allows for flexibility to operate individual dams for maximum Canadian benefits, provided storage operations remain within the constraints of the FCOP and flow across the Canada / US border remains unchanged. This flexibility allows BC Hydro to move water between Mica, Revelstoke,[22] Arrow/Keenleyside and, to some extent, Duncan in response to various power, social and environmental interests.

Examples:

- *Decisions entirely internal to Canada to deviate from Treaty Storage Regulations may be made with respect to flows below Mica or Revelstoke, providing discharges from Arrow are not affected and flood control is protected. For instance, negotiations may occur with DFO for flooding to improve survivability of Kokanee Red fish in certain stretches along the river above Arrow/Keenleyside.*
- *Discharges from Duncan may diverge from Treaty Storage Regulations, provided discharges from Arrow are adjusted to make up the difference at the border with the US and flood control constraints are not violated.*

4.2 Flexibility by mutual agreement

The Detailed Operating Plan (DOP) is developed annually and spells out the operating rules that define how water will be drawn from dams and systems throughout the year. It is based on the Assured Operating Plan (AOP), but may deviate from it by mutual agreement, and for mutual benefit, either at the stage of developing the DOP, the TSR or at the weekly level through the weekly agreement.

It should be noted here that while there are numerous supplementary agreements regarding non-power and flood control benefits, to date, the Parties have not considered money as a means of benefit exchange under the DOP to accommodate the interests of fisheries or other values.

Example:

- *Any of the supplemental agreements, such as the Non-power Uses Agreement, are examples of adjustments to the AOP or DOP by mutual agreement.*
- *It is not uncommon that small alterations to releases will be requested based on unforeseen circumstances throughout the week. Note that flood control requests can be on a daily basis, while requests dealing with power are typically done at the weekly conference call and weekly agreement.*

22 Revelstoke is not a CRT dam.

Moving Flood Control storage within Canada: Canada can shift up to 1.5 Maf of its flood control storage from Arrow/Keenleyside to Mica, to provide the same effectiveness for flood control in the US. (Article IV (2) (iii)). Studies showed that to provide the same level of flood control at Arrow/Keenleyside an additional 0.5 Maf is needed at Mica.

Example: This flexibility has been used twice, both times to shift 2 Maf (for a total of 4 Maf) from Arrow Lakes to Mica/ Kinbasket (Bankes, 1996).

4.3 Constraints to Unilateral Canadian Flexibility

As an international agreement that has been ratified by Canadian parliament, the CRT has a good deal of influence in determining how the CRT facilities can be operated should there be conflict with domestic interests, such as fisheries. How much influence, however, is not entirely clear.[23]

Lack of Clarity: There is lack of clarity regarding which legislation would take precedence with respect to the CRT and Canadian national and provincial legislation. While the opinion of academics is that the CRT would not supersede national laws (i.e. the Fisheries Act), it has not been overtly determined in the courts.

The principal constraints to unilateral Canadian flexibility are those related to the assured annual Flood Control Operating Plan which specifies project-specific maximum storage levels. As such it can be a significant restriction on project operation in the flood season, if the power draft does not direct much deeper project drafts. Power operations are theoretically optimised in AOP, taking into account the flood requirements. The AOP, however, can be altered by mutual consent, and there appears to be nothing restricting financial payment as a mechanism to achieve mutual benefit, there are potentially few constraints. Financial payment for altered water flows has not been considered to date.

Altering the flow regime from that specified in the AOP requires agreement from both Canada and the US. This added level of complexity will place a certain degree of constraint on how Canadian facilities can be operated. Consequently, while Water Use Planning of dam facilities in BC is usually entirely within BC's jurisdiction, altering the flow from the Canadian CRT system requires additional US approval if it alters flow across the border.

Examples:

- *In undertaking Water Use Planning on the Columbia system the Province of BC imposed a limit on the changes that could be agreed to. BC Hydro was not able to agree to changes in operation that were inconsistent with the CRT, and it was understood that restrictions should not be imposed that would tie BC Hydro's hands in negotiating with the US Entities.*
- *When BC Hydro was developing a Water Use Plan for the Arrow reservoir, the WUP committee chose to avoid recommending "hard constraints" (as it had done in other Water Use Plans) and instead recommended "soft constraints" for CRT reservoir operation, because there was no unilateral Canadian mechanism to meet those 'hard constraints'. (Pers. Commun: Green; Ketchum, Robinson, Gosal, 2008).*

23 Because of concerns over whitefish and trout, in 1995 DFO opposed BCH's reduction of flows from Arrow/ Keenleyside; while a year later they accepted similar reduced flows because of flood control requirements under the CRT (See Bankes, 1996).

5 Differences in Treaty Interpretation

The major outstanding difference with respect to Treaty interpretation lies in Article XII (1), which deals with the construction and operation of the Libby Dam. Under the CRT the US had the option to built Libby "to provide storage to meet flood control and other purposes in the US".

Based on the focus of the CRT, and the fact that all benefits which occur in either country due to the operation of Libby remain in that country (Article XII (2)), Canada interprets 'other purposes' to principally mean 'power generation'. The US interprets 'other purposes' to include fisheries issues as well. Consequently, one major concern with the Treaty at this time is the unilateral US operation of Libby.

Example:
Under Variable Flow Operating Procedures (VarQ) are intended to mimic more closely natural flow conditions without the presence of a dam. Under VarQ the US has transferred some of the flood control space from Libby to Grand Coulee, reducing the flood protection between Libby and Grand Coulee, including the area around Kootenay Lake.

In 2006, a flood event affected areas downstream of Libby. Subsequently, the Army Corps of Engineers, who operate the dam, released their Record of Decision on the operation for VarQ Flood Protection (LibbyMT, 2008).

In addition, this operation at Libby has resulted in energy losses at Canadian hydro-generation plants downstream of Libby.

6 Overview of the termination clauses of CRT

6.1 Continuation of the Treaty

There is no official 'expiry date' of the Treaty. Should all parties wish to continue with the Treaty without modifications:

1. Operation of the facilities and communication between the Entities would continue as it has been.
2. Downstream power benefits would continue to be calculated in the same manner that it has been. Little to no change in operating rules for Canadian Treaty storage would be expected.
3. The 'assured' annual flood control, operation of Canadian Treaty Storage, for flood control in the US terminates after 60 years (ie in 2024) regardless of whether the Treaty is terminated or not.
4. Canada would provide 'called upon' flood control using any storage it might have available for as long as the flood period exists (Article IV (3)). The US must first demonstrate that it has made use of all effective flood control storage in the US. The Protocol to the CRT further informs additional limits on Canada and the US with respect to 'called upon' flood control (CRT Protocol Para. 1) Canada is entitled to compensation of operational costs and economic losses incurred by providing on call flood control (Article VI (4 & 5)).
5. Flexibility to address emerging issues under specific agreements to diverge from the AOP would continue in the form of the annual DOP.

6.2 Treaty termination

As the parties to Treaty, only the Federal Government of Canada and/or that of the US can serve notice to terminate the Treaty. However, Canada has an additional obligation. Under the BC and Canada agreements, the Canadian Federal Government cannot give notice without consent from the Province of BC (BC's concurrence – Article 4(2)(h) of *Canada-BC Agreement*).

The Treaty can be terminated by either Canada or the US by giving a minimum 10 years notice to the other. The earliest possible termination is in 2024, and therefore 2014 is the latest year that notice can be given to terminate the Treaty at its earliest date.

What would termination mean?

If either of the parties chose to terminate the agreement the current manner of coordinating water flow between Canada and the US would not exist. The majority of obligations under the CRT would not apply. Canada and the US could:

i) negotiate a new treaty,
ii) let each country operate its own facilities for its own benefit, taking into account that there are obligations for 'called upon' flood control, rules of international law governing transboundary watercourses, and the *Boundary Waters Treaty*.

The countries would be obliged to operate entirely under their national legislation; however, there would be nothing stopping the creation of commercial agreements (as is done now), provided they could obtain water licenses for these operations (as they have to do now). What would change is that these would not be achieved under the 'influence' and unique structure of information exchange and decision-making of the CRT.

If no new agreement were developed Canada would have greater flexibility to optimize its operations with respect to domestic priorities. This would likely result in reduced downstream benefits of flood control and power generation in the US. However, any incidental downstream benefits the US experienced would not require compensation to Canada, unless it was associated with 'called upon' flood control.

What would change?

- The Entities would no longer be operating on behalf of their respective governments, and the existing subsidiary arrangements between them would not apply as they have been conducted between Entities under the CRT.
- The power section of the CRT would be terminated. This means there would be no AOP or DOP to direct storage operations.
- Canada will lose any 'first added' status of additional storage that it now has, moreover the current agreement of 50% of downstream power benefits for the Canadian Entitlement would not exist.
- Currently, flood control has greater priority than power generation. If terminated, there is no guarantee of any particular flood control operation, other than 'called upon' flood control provisions.
- The PEB would not continue in its current form or provide its services of review of operations and conflict resolution. As there are elements of the Treaty which survive termination, it is unclear if the PEB would continue to oversee, review and report on those elements, such as 'called on' flood control and the Libby coordination.

What would remain unchanged?

- Under the CRT the 'assured' annual flood control requirement exists only to 2024, while 'called upon' flood control is required as long as there is available storage in Canada to accommodate the request (Article IV (3)). The US would be obligated to prove need and to continue to compensate Canada for operational costs and economic losses associated with providing this (Article VI (4)).

> *Lack of clarity: it is uncertain exactly how 'called upon' flood control would be determined. Having operated dams for such a long time, it is unclear if Canada has a certain obligation under customary law to avoid destruction of downstream property from flooding. How would this affects what is termed 'called upon' flood control after 2024 and what compensation should Canada be entitled to has not been determined.*

- The obligation to coordinate regarding Libby (CRT XII) would continue for the useful life of the Libby dam (Article XIX (3)).
- For the life of the Libby dam, Canada would continue to provide the (flooded) land for the Koocanusa reservoir (Article XII (10) and XIX (3)).
- Canadian Kootenay River diversion rights. From 2024 to 2064, Canada has the right to divert water from the headwaters of Kootenay River directly into the Columbia to provide greater water flows along the Columbia River generating facilities (Article XII (3)). Note that flow across the border may not fall below 2,500 ft3/s or the natural flow (when it is below 2,500 ft3/s).

What governing rules would apply upon termination?

In the absence of another negotiated treaty:

1. Canada would provide 'called upon' flood control, "for so long as the Columbia River in Canada" constitute a hazard in the US (Article XIV (3)).
2. Providing the Boundary Waters Treaty (BWT) remains in existence:
   i) the relevant provisions would apply to the Columbia River Basin, except for those provisions in the CRT which survive (CRT Article VII (2)) , such as those specifically related to the operations of Libby under Article XII of the CRT (CRT Article XIX (3)), such as flooding of Koocanusa (Article XII (10)).
   ii) For those elements not covered by the BWT, customary international law would apply.

Lack of clarity: customary international law regarding trans-boundary rivers is continually evolving. What was considered as 'normal state practice' when the Treaty was signed, in 1964, is quite different than it is now. We can assume that it will also have evolved by 2024. Consequently, it is difficult to say with any certainty what the rules would be.

3. If the BWT has been terminated:
   i) Article II of the BWT would still be applied to the Columbia Basin (CRT Article XVII (3)). This suggests that exclusive jurisdiction of Canada and US would apply over their sections of the Columbia system. However, any residents who are adversely affected in one jurisdiction, through the actions of the other jurisdiction, are to be treated the same as if they were residents in the jurisdiction causing the harm.

   However, either Canada or the US can terminate this obligation with one year's written notice (CRT Article XVII (4)). Consequently, should the BWT be terminated its effectiveness could be very limited.
   ii) Customary international law would apply in those areas where there are gaps in the BWT and provisions of the CRT which extend beyond termination.

6.3 Automatic alterations in 2024

Operation of the 8.45 Maf for flood control in the US, the Assured Annual Treaty flood control, terminates after 60 years (ie in 2024). 'Called upon' flood control would still require Canada to provide flood control protection under certain conditions (Article IV (3)).

6.4 What is concluded only upon termination of the treaty

1. The Canadian Entitlement of down stream benefits would cease.
2. The obligation of Canada and the US to operate dams in coordination with mutual interests of both countries.
3. The decision-making structure and relationship of the Entities in operating the dams.
4. All subsidiary agreements, including those between BC and Canada regarding ownership of benefits.

7 Glossary of terms

Assured Operating Plan (AOP) – A plan for dam operations, set five years in advance, to achieve maximum power and flood control benefits.

Boundary Water – As defined by the BWT: the waters of lakes and rivers along which the US-Canada boundary passes. Not the waters of rivers flowing across the boundary.

'Called upon' Flood Control – This is the flood protection that Canada is obliged to provided to the US when 'called upon' to do so, providing that the US has used all its available effective storage, and that Canada has additional available storage. It is synonymous to 'on call' flood control, but occurs after 2024.

Detailed Operating Plan (DOP) – A plan developed for the subsequent year of operation, based on the AOP but potentially including mutually advantageous modifications.

Entities – These are the organisations which implement the Treaty on behalf of the governments.

Keenleyside Dam - The original name was High Arrow Dam. The name was changed to honour the Canadian diplomat and co-chairman of BC Hydro (1962-1969).

Maf – Million Acre Feet. An acre foot is a unit of volume equal to one acre of area by one foot in depth (equal to 43,560 cubic feet). This unit is generally used to measure the volume of water stored in reservoirs. 1 Maf = 1.23 km^3.

'On call' Flood Control - This is the flood protection that Canada is obliged to provide to the US when 'called upon' to do so, providing that the US has used all its available effective storage, and that Canada has additional available storage. It is synonymous to 'called upon' flood control, but occurs prior to 2024.

Optimum Rules – These are the rules set in the AOP to optimize power benefits and specified flood protection.

Parties – These are the actual signatories to the Treaty, Canada and US.

Permanent Engineering Board (PEB) – Board that reviews implementation of the Treaty, helps to resolve any disagreements over interpretation, and makes recommendations to Parties (governments of US and Canada)

Trans-boundary River - The waters of rivers flowing across a boundary

Treaty – refers to the Columbia River Treaty

Treaty Storage or Canadian Storage– This is the 15.5 Maf of storage that Canada is obligated to provide and operate under the CRT.

8 References

Primary References

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Treaty Between the United States and Great Britain Relating to Boundary Waters and Questions arising Between the United States and Canada, Washington, 11 January, 1909. US-Great Britain, 36 Stat. 2449

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Persons interviewed

Name	**Affiliation and organization**
Bala Balachandran	Former Member of PEB Engineering Committee
Nigel Bankes	Chair of Natural Resources, University of Calgary, Faculty of Law
Harry Brownlow	BC Hydro – Environmental and Social Issues
David Burpee	Canadian Secretary to PEB to the Columbia River Treaty (1992-2003).
Bill Green	Director, Canadian Columbia Inter-tribal Fisheries Commission
Kelvin Ketchum	Canadian Chair of CRTOC, BC Hydro
Roger McLaughlin	Former Member of PEB Engineering Committee, Senior Policy Advisor for Provincial Government.
Tim Newton	BC member of the PEB to the Columbia River Treaty.
Richard Paisley	Legal Expert, University of British Columbia
Doug Robinson	Canadian Entity Secretary, BC Hydro

8 Annex A: Dams on the Columbia

Note that these are not all the dams on the Columbia River System. They are the dams whose operations are either governed by, or influence the Columbia River in Canada. Those shaded are related to the CRT.

Dam /reservoir	Owned	Date	Treaty Storage	Non-Treaty Storage	Generating Capacity	Draw-down and other information
Main Stem Columbia River						
Arrow (Keenleyside)	BCH	1968	7.1 Maf			15-20 m below full pool
Arrow Lakes Generating Station	CBT/ CPC	2002			185 MW	
Mica / Kinbasket	BCH	1973	7 Maf	4.5 under NTSA and 0.5 for BCH	1,805 MW (to add 868 MW)	25 to 47 m below full pool
Revelstoke/ Revelstoke	BCH	1984			1980 MW	1.5 m (with additional drawdown under emergencies)
Grand Coulee/ Roosevelt	US-BuRec	1942			6,809 MW	
Chief Joseph/ Rufus Wood Lake	US-ACE	1955			2,620 MW	2nd largest hydro-power producer in the US
Kootenay River						
Duncan / Duncan Lake	BCH	1967	1.4 Maf	none	No generation	30 m. Dam operated to allow bull trout to move in and out of reservoir – operates opposite to natural flow, releasing water Jan-March
Corra Linn/ Kootenay Lake	FBC	1932			56 MW	7 ft (2m) draw-down + involuntary storage during freshet
Kootenay Canal	BCH				580 MW	
Upper Bonnington	FBC				59 Mw	
Lower Bonnington	FBC				45 MW	
South Slocan	FBC				55 MW	
Brilliant + Expansion	CPC/ CBT				276 MW	
Libby / Koocanusa	US-ACE	1973	5 Maf		640 MW	Reservoir backs up 64km into Canada. The US often operate the dam for enhancing sturgeon in Kootenay River