EXECUTIVE SUMMARY

On April 2, 1997, the Sierra Legal Defence Fund and the Sierra Club Legal Defense Fund (the "submitters") made a submission under Article 14 of the *North American Agreement on Environmental Cooperation* (NAAEC) alleging that the Government of Canada is failing to enforce its environmental law effectively. Specifically, the submission asserts that Canada fails to enforce s.35(1) of the *Fisheries Act* and fails to utilize its powers pursuant to s.119.06 of the *National Energy Board Act* to protect fish and fish habitat from damage caused by hydroelectric power generation in British Columbia by BC Hydro (BCH), a provincial Crown corporation.

CANADA'S POSITION

Canada supports the NAAEC process for submissions on enforcement matters, and considers Articles 14 and 15 to be among the most important provisions of the treaty.

Canada submits that it is enforcing its environmental laws, and is in full compliance with its obligations under the NAAEC. Therefore, Canada submits that, in this instance, the development of a factual record is unwarranted as:

- the assertions concerning the enforcement of the *Fisheries Act* are the subject of pending judicial or administrative proceedings within the meaning of Article 14(3)(a);
- Canada is fully enforcing the environmental provisions of the *Fisheries Act*, and the National Energy Board (NEB) has properly exercised its power under the *National Energy Board Act*;
- the provisions of the NAAEC cannot be applied retroactively to assertions of a failure to effectively enforce environmental laws prior to the coming into force of the NAAEC on January 1, 1994. Furthermore, the *Fisheries Act* cannot be applied retroactively; and
- the development of a factual record would not further the objectives of the NAAEC given the detailed information provided in this response.

I. PENDING JUDICIAL AND ADMINISTRATIVE PROCEEDINGS

Article 14(3)(a) of the NAAEC provides that where the matter that is the subject of the complaint is "the subject of a pending judicial or administrative proceeding", then "the Secretariat shall proceed no further". The mandatory language of this provision reflects the intent of the drafters of the treaty that factual records should not be prepared with respect to issues that are the subject of contemporaneous domestic proceedings.

The submission raises issues that are pending before both the Federal Court of Canada and the Supreme Court of British Columbia. These domestic legal proceedings will be examining critical legal issues regarding enforcement of the *Fisheries Act*, including Section 35. Additionally, the federal government is participating in two comprehensive administrative proceedings, B.C.'s Water Use Planning initiative and the Regional Technical Committees. A prime intent of these administrative proceedings is to ensure compliance by BCH with both the federal *Fisheries Act* and applicable provincial laws, and to ensure that environmental objectives are fully integrated into water use decisions.

The outcome of these judicial and administrative proceedings are expected to resolve many of the issues raised in this Article 14 submission. It would therefore be contrary to 14(3)(a) of the NAAEC for the Secretariat to proceed further.

II. EFFECTIVE ENFORCEMENT

Fisheries Act

Canada is effectively enforcing its environmental laws. Article 5 of the NAAEC recognizes that enforcement encompasses actions broader than just prosecution and provides a non-exhaustive list of appropriate enforcement actions. The submission fails to appreciate the comprehensive approach recognized in Article 5 and followed by Canada. Rather, the submission is based on a more limited view of enforcement, which equates enforcement directly with legal and judicial sanctions.

The enforcement methods utilized by Canada in B.C. recognize both the integrated and complex nature of the BCH system and of related fish and fish habitat issues. Canada has determined that a range of compliance activities, from voluntary compliance and compliance agreements to legal and judicial sanctions, are the most productive in terms of providing for the long-term protection of the environment with respect to fish and fish habitat.

As a result of this approach, a clear record of ongoing cooperative, comprehensive, and productive studies and projects to enhance fisheries is evident. In fact, the information provided by the submitters, to a large extent, originates from reports and studies generated by Canada, B.C., and BCH. These reports are important steps in identifying problems and solutions. The reports and studies highlight a number of complex issues which these parties are intent upon resolving. To the extent that they lead to solutions through cooperation, voluntary compliance, negotiation, publicity and persuasion, more compelling enforcement is often unnecessary.

Canada does not hesitate to utilize the full power of its laws to protect fish and fish habitat, where the exercise of these powers is deemed by Canada to be the appropriate response. Canada's use of more compelling enforcement options is evident and contributes to a history of significant enforcement activity under the *Fisheries Act*.

National Energy Board Act

The NEB has effectively enforced the environmental provisions of the *National Energy Board Act*. The *National Energy Board Act* stipulates that the NEB may recommend that applications for the export of energy be designated for a public hearing process. In determining whether to recommend that process, the NEB is to consider the impact of the exportation on the environment and to avoid duplication with provincial regulatory measures.

The Act gives the NEB the discretion to decide whether evidence filed about environmental impacts is sufficient to recommend a designation order for a public hearing. In making its decision on POWEREX's application for a permit to export electricity to Intalco Aluminum Corporation, the NEB correctly applied the provisions of the Act on the basis of the evidence before it. The NEB acted within its discretion in deciding that the evidence filed before it by the British Columbia Wildlife Federation was not strong enough to warrant recommending a designation order. The NEB decided the matter on the basis of the evidence filed before it in relation to the application. Further, the evidence filed before the NEB was not the same as the attachments provided by the submitters. Accordingly, it cannot be said that Canada failed effectively to enforce this provision of the *National Energy Board Act.*

III. PROSPECTIVE APPLICATION OF THE NAAEC

Canada submits that the NAAEC should not be applied retroactively. All the B.C. Hydro facilities referred to by the submitters were built prior to the entry into force of the NAAEC, and so any allegations of failure to enforce environmental laws related to the operation of BCH facilities before January 1, 1994, should not be addressed by the Secretariat.

The NAAEC entered into force on January 1, 1994. Customary international law, as reflected in the *Vienna Convention of the Law of Treaties*, provides that the provisions of a treaty do not bind a party in relation to "any act or fact which took place...before the entry into force of the treaty", unless a different intention appears from the treaty or is otherwise established. No such different intention appears from the NAAEC, or has otherwise been established. Indeed, the clear intent of the drafters of the NAAEC that the treaty should have no retroactive effect is reinforced by the definition of "persistent pattern" in Article 45, dealing with dispute settlement, which is stated to mean "a sustained or recurring course of action or inaction *beginning after the date of entry into force of this Agreement* (emphasis added)".

Furthermore the laws of Canada, and specifically s. 35 of the *Fisheries Act*, do not apply retroactively. Section 35 does apply to current operations of facilities which were in place prior

to the 1978 revisions to the habitat protection provisions if the impacts of those operations result from decisions taken about operating the facility, as opposed to original impacts arising from the basic physical structures themselves.

IV. THE DEVELOPMENT OF A FACTUAL RECORD WILL NOT SIGNIFICANTLY FURTHER THE OBJECTIVES OF THE NAAEC

Given the fact that Canada enforces its environmental laws, and given Canada's full and complete disclosure and case by case response, the development of a factual record would not, in this instance, significantly further the objectives of the NAAEC, and is not warranted. Canada's response clearly illustrates the comprehensive measures taken by Canada to enforce its environmental laws. The fact that Canada bases its enforcement on a comprehensive range of enforcement actions, as recognized in Article 5 of the NAAEC, and the importance Canada places on improving the effectiveness of these methods, is clearly evidenced in the materials submitted to support this response.

I INTRODUCTION

The Sierra Legal Defence Fund and the Sierra Club Legal Defense Fund ("the submitters") have submitted pursuant to Article 14 of the *North American Agreement on Environmental Cooperation* ("NAAEC"), that the Government of Canada ("Canada") has failed to enforce its environmental laws.

Canada supports the Article 14 process. The submissions and factual record provisions of the NAAEC are among its most important and innovative. Canada views this process as a positive and constructive tool through which the public can help the parties to the NAAEC improve their environmental enforcement. Canada submits it is effectively enforcing its environmental laws and is therefore in full compliance with its obligations under the NAAEC. Therefore, the development of a factual record is not warranted.

The submitters generally allege a failure to protect fish and fish habitat in British Columbia's rivers from ongoing and repeated environmental damage caused by hydroelectric dams as a result of Canada's failure to enforce its environmental laws.

There are in essence, two separate allegations of specific default against Canada contained in the submission:

i) a failure to enforce subsection 35(1) of the *Fisheries Act*; and
ii) a failure to utilize powers pursuant to subsection 119.06 (2) of the *National Energy Board Act.*

The submitters contend that the failure of Canada to enforce subsection 35(1) of the *Fisheries Act* against British Columbia Hydro (BCH), a provincial Crown corporation, and to exercise its regulatory power to examine the environmental impacts of the production of power for export, permits and condones the ongoing destruction of fish and fish habitat in British Columbia (B.C.). Canada rejects the allegations that it has failed or is failing to enforce its environmental laws as agreed to under the NAAEC.

In this response, Canada will identify the legal and historical context within which it has framed its enforcement of environmental laws and will outline its integrated approach to seeking compliance with such environmental laws. Further, Canada, will address each of the specific allegations concerning the *National Energy Board Act* and *Fisheries Act* separately, and in so doing will provide a detailed response to all of the major environmental issues raised by the submitting parties.

A factual record is not warranted for the following reasons:

- the assertions concerning the enforcement of the *Fisheries Act* are the subject of pending judicial or administrative proceedings within the meaning of Article 14(3)(a);
- Canada is fully enforcing the environmental provisions of the *Fisheries Act*, and the National Energy Board (NEB) has properly exercised its power under the *National Energy Board Act*;
- the provisions of the NAAEC cannot be applied retroactively to assertions of a failure to effectively enforce environmental laws prior to the coming into force of the NAAEC on January 1, 1994. Furthermore, the Fisheries Act cannot be applied retroactively; and
- the development of a factual record would not further the objectives of the NAAEC given the detailed information provided in this response.

II CONTEXT

Federal/Provincial Jurisdiction

Canada is a federal state. The responsibilities of the federal and provincial governments are set out in the *Constitution Act, 1867*. That division of responsibilities results, in part, for shared legislative jurisdiction with respect to laws in relation to environmental matters. BCH generally falls within provincial jurisdiction, but is subject to federal legislation of general application such as the *Fisheries Act*. In addition, aboriginal first nations and municipal jurisdictions have an interest in the establishment, maintenance and operations of the BCH system.

The federal government is also responsible for interprovincial and international trade, including trade in energy. This is the basis for the *NEB Act*. The provinces have the responsibility for the development, conservation, and management of facilities for the production of electricity.

Canada has responsibility for the seacoast and inland fisheries, and for the habitats which support them to the extent necessary to carry out those responsibilities. Provinces have the authority to enact legislation that affects fish because of provincial responsibility for natural resources and management of public lands, which includes measures to conserve fish stocks and protect fish habitat. Through their responsibility for the management and ownership of natural resources, the provinces have enacted legislation which, in many instances, involves the regulation of activities with impacts on fish habitat.

Compliance activities related to protection of fish habitat can be carried out by either the provincial or federal level of government. In the case of B.C., provincial compliance activity may be carried out under provincial legislation or under powers exercised by the province under the federal *Fisheries Act*. Federal compliance activity is rooted in the constitutional

responsibility for fisheries and is expressed through the *Fisheries Act*. Collectively these compliance activities are identified as "enforcement" under Article 5 of the NAAEC.

In practice, the federal and provincial governments cooperate in setting environmental goals, enacting complementary legislation, and seeking compliance in the most effective manner. Hence, a high level of federal-provincial coordination is desirable to avoid gaps or conflicts in enforcement. Unilateral enforcement by one level of government can be unproductive, except when other levels are uncooperative or when there is an emergency requiring immediate action.

Several provinces have traditionally managed freshwater fisheries, and federal responsibility for habitat, under administrative arrangements with the federal government. In B.C. anadromous and marine species and their habitats are managed by Canada, while B.C. exercises responsibility for managing freshwater species. B.C. also undertakes certain activities with respect to management of freshwater habitats, although Canada retains responsibility for administering the habitat protection provisions of the *Fisheries Act.* The result is a complex administrative environment where cooperation, common goals, and good faith are essential.

Fisheries Act

The *Fisheries Act* addresses both fisheries management and protection of fish habitat. The Department of Fisheries and Oceans (DFO) is principally responsible for the *Fisheries Act*. The relevant environmental enforcement provisions which protect fish habitat are s. 22 on minimum water flows; s. 32 prohibiting killing fish other than by fishing; s. 35 prohibiting unauthorized damage to fish habitat; s. 36 prohibiting unauthorized deposition of deleterious substances into waters frequented by fish; and s. 37 authorizing the Minister of Fisheries and Oceans to require information on works in fisheries waters and to order changes to reduce effects on fish and fish habitat.

National Energy Board Act

The *NEB Act* is a comprehensive statute establishing a framework for regulation of interprovincial and international trade in oil, gas, and electricity. It establishes the National Energy Board as a court of record. The National Energy Board functions as an independent regulator. The Board's responsibilities for regulation of electricity exports are found in Part VI, Division II of the *NEB Act*. Section 119.02 prohibits electricity exports without either a license or a permit to do so. The subsequent provisions of the *NEB Act* set out the statutory scheme. An applicant seeking to export electricity applies to the Board for a permit. By s. 119.06, the Board has a discretion whether to recommend designating the application for the license process, which requires a public hearing. If it does not recommend such a designation to the Governor in Council, or if the Governor in Council does not make the designation order, s. 119.03 makes it mandatory for the Board to issue the permit.

BCH Hydroelectric System

The BCH facilities form an integrated operating system, requiring complex coordination. This huge system is not only an integral part of the economy of B.C., but is interprovincial and international in scope, and is subject to treaties with the United States. The states of Washington, Oregon, Idaho, and Montana are affected parties, as are the province of Alberta and the Northwest Territories. Thus the operations impinge on at least nine jurisdictions (two federal, two provincial, one territorial, and four state), and can require sensitive negotiations to achieve coordinated and responsible results. In general, it is difficult to institute changes to instantly promote or protect any one of many competing interests or values served by the system and jurisdictions. However, despite this overlay of complexity, Canada does not hesitate to utilize the full power of its laws to protect fish and fish habitat where the exercise of these powers is deemed by Canada to be the appropriate response. This ability to act is further illustrated by current actions in the Canadian courts with respect to BCH and the Daisy Lake Dam on the Cheakamus River and the Terzaghi Dam on the Bridge River (see next section).

The BCH facilities were built mostly in the 1960s and predate the 1977 enactment of the Habitat Protection provisions of the *Fisheries Act*, and specifically, section 35 which is relied upon by the submitters. Further, all BCH facilities referred to by the submitters were built before the entry into force of the NAAEC on January 1, 1994.

III DISCUSSION

1. Pending judicial proceedings within the meaning of Article 14(3)(a)

Article 14(3)(a) of the NAAEC provides that where the matter that is the subject of a complaint is "the subject of a pending judicial or administrative proceeding", then "the Secretariat shall proceed no further". The mandatory language of this provision reflects the intent of the drafters of the Treaty that factual records should not be prepared with respect to issues that are the subject of contemporaneous domestic proceedings.

The Secretariat has previously recognized that the outcome of a pending judicial proceeding based on the same facts as alleged in an Article 14 submission could impact directly on the issues raised in the submission and that a pending domestic legal action could resolve many or all of the issues relating to the *Fisheries Act* and, as such, the Secretariat should proceed no further.

The submission raises issues that are pending before both the Federal Court of Canada and the Supreme Court of British Columbia. These domestic legal proceedings will be examining critical

legal issues regarding enforcement of the *Fisheries Act*, including Section 35. It would therefore be contrary to 14(3)(a) of the NAAEC for the Secretariat to proceed further.

In *British Columbia Hydro and Power Authority v. A.G. Canada and Minister of Fisheries and Oceans*, (Federal Court No. T-1171-97) [TAB 1] BCH has brought an application in the Federal Court for judicial review of an order made by the Minister of Fisheries and Oceans pursuant to s. 22(3) of the *Fisheries Act* imposing a minimum flow release schedule for the Cheakamus River below the Daisy Lake Dam. The application alleges that s. 22(3) is legislation which is *ultra vires* the Parliament of Canada. The issue raised in this application for judicial review is an issue of general application, in that this is a broad constitutional challenge to the authority of the Minister of Fisheries and Oceans to make minimum flow orders under s. 22(3) of the *Fisheries Act*.

In *R. v. British Columbia Hydro and Power Authority*, [TAB 2] BCH is charged with five counts under sections 32, 35(1) and 36(3) of the *Fisheries Act*, with respect to the operation of the Terzaghi Dam on the Bridge River. This prosecution is before the Supreme Court of British Columbia (Kamloops Registry No. 44436). The charges relating to s. 32 are that BCH unlawfully destroyed fish by stranding. The s. 35(1) charges allege harmful alteration, disruption or destruction of fish habitat in the Seton River and Bridge River. The s. 36(3) charge is that BCH unlawfully deposited or permitted the deposit of sediment, a deleterious substance, in water frequented by fish (the Bridge River). BCH, in its defense, has questioned the application of these sections of the *Fisheries Act* to its hydroelectric facilities when the Minister of Fisheries and Oceans has used or considered using powers under section 20-22 or when the Minister of Fisheries and Oceans has authorized such facilities, either expressly or implicitly.

The decisions in these cases will be directly applicable to the types of incidents referred to in the submission. Accordingly, Canada advises the Secretariat that the assertions concerning the enforcement of the *Fisheries Act* are the subject of pending judicial proceedings within the meaning of Article 14(3)(a) of the NAAEC. Canada submits that the NAAEC directs that the Secretariat shall proceed no further.

2. Pending administrative proceedings within the meaning of Article 14(3)(a)

In addition to the pending court actions, there are two comprehensive administrative proceedings in which Canada is a participant. The first pending administrative proceeding is British Columbia's Water Use Planning (WUP) initiative. The second administrative proceeding, which is ongoing, is the several Regional Technical Committees described later in this Response which were started in 1988 by Canada, B.C., and BCH to reduce the harmful effects of hydroelectric power generation on fish and habitat.

Water Use Planning Initiative:

The Province of British Columbia announced the WUP process in November 1996. The WUP is an initiative to review all BCH water licenses and to develop water use plans for each of the facilities. The plans will mean re-allocation of water for fish and mitigative measures (e.g., habitat restoration, etc.), where required, to resolve the long-standing fish impact issues. The plans will also result in changes to the water licenses, and changes to the hydro facility System Operating Orders.

The plans will form part of the BCH water licenses and, as such, be binding statutory instruments. Further, the WUP process will review all 88 of BCH's water licenses for 34 hydroelectric facilities. Pending completion of the WUP review process, which may take 5 years or more, the Provincial Comptroller of Water Rights will prepare interim orders, wherever necessary, to clarify the terms of licenses for modified operation of facilities to provide improved flows for fish on streams with high fisheries values, and to ensure that BCH operates in compliance with relevant laws.

A Guideline document is currently being prepared by the Coordinating Committee, in which Canada participates, to give some direction in preparing water use plans. The plans:

- will define the operating parameters for hydroelectric facilities and reservoirs under a full range of water conditions;
- are meant to be comprehensive and will cover other non-power issues such as fisheries, recreation, flood control, and irrigation; and
- will form part of the water licenses and the System Operations Order. It may confirm the existing allocation of water, or in some cases may result in changes to the allocation.

The process will be consultative and will involve public input, and provide opportunity for Canada to ensure that flows required for fish and fish habitat will be given priority. It has been clearly identified that plans will be developed subject to provincial and federal legislation including the provincial *Water Act* and the federal *Fisheries Act*.

The intent of these administrative proceedings is to ensure compliance both with the federal *Fisheries Act* and provincial legislation in the operation of BCH facilities, and to ensure that all environmental, social, and economic values are considered in water-use decisions.

Canada advises the Secretariat that the assertions concerning the enforcement of the *Fisheries Act* are the subject of pending judicial proceedings within the meaning of Article 14(3)(a) of the NAAEC. Canada submits that the NAAEC directs that the Secretariat shall proceed no further.

3. Prospective application of NAAEC

Canada submits that the NAAEC should not be applied retroactively. All BCH facilities referred to by the submitters were built before the NAAEC came into effect on January 1, 1994, and some before World War II. Hence, any assertions of failure to enforce environmental laws related to construction and operation of BCH facilities before that date

cannot be addressed. It is submitted that retroactive application of the NAAEC in this instance would go against the intention of the Parties and would not further the objectives of the NAAEC.

The *Vienna Convention on the Law of Treaties*, to which Canada is a party, applies to treaties between States and provides rules applicable to the interpretation and application of international agreements. Article 28 of the Vienna Convention states:

Unless a different intention appears from the treaty or is otherwise established, its provisions do not bind a party in relation to any act or fact which took place or any situation which ceased to exist before the date of the entry into force of the treaty with respect to that party.

Furthermore, the laws of Canada, and specifically s. 35 of the *Fisheries Act*, do not apply retroactively. Section 35 does apply to current operations of facilities which were in place prior to the 1978 revisions to the habitat protection provisions if the impacts of those operations result from decisions taken about operating the facility, as opposed to original impacts arising from the basic physical structures themselves. New facilities or structures, or changes to existing ones, would be subject to the current environmental laws of Canada. In a similar fashion, new and changing operations are subjected to the more stringent regime of environmental regulation currently applicable.

4. Effective Enforcement

Canada has effectively enforced its environmental laws, in a manner consistent with Article 5 of the NAAEC and within the scope of Article 45(1)(a) of the NAAEC. While the NAAEC commits the Parties to effectively enforce their environmental laws, the Agreement does not try to define what actions are appropriate in a given circumstance, but leaves it to each Party to make this determination. In this regard, Article 5 of the NAAEC provides a non-exhaustive list of government action available to the Parties to effectively enforce their environmental laws.

National Energy Board Act

The National Energy Board (NEB) has effectively enforced the environmental provisions of the *National Energy Board Act*. The *National Energy Board Act* stipulates that the NEB may recommend that applications for the export of energy be designated for a public hearing process. In determining whether to recommend that process, the NEB is to consider the impact of the exportation on the environment and to avoid duplication with provincial regulatory measures.

The *NEB Act* gives the Board the discretion to decide whether evidence filed about environmental impacts is sufficient to recommend designating the application for a public

hearing. In making its decision on POWEREX'S application for a permit to export electricity to Intalco Aluminum Corporation, the NEB correctly applied the provisions of the *NEB Act* on the basis of the evidence which was before the Board. The Board acted within its discretion in deciding that the evidence filed before it by the British Columbia Wildlife Federation was not strong enough to warrant recommending a designation order to the Governor in Council. The NEB decided the matter on the evidence filed before it in relation to the application. Further, the evidence filed before the NEB is not the same as the attachments provided by the submitters. Accordingly, it cannot be said that Canada failed to enforce this provision of the *NEB Act*.

The record of the Board is attached [Tab 3].

All exports of electricity from Canada require the approval of the NEB. That approval can be either by a permit or by a license. Section 119.03 of the *NEB Act* makes it mandatory for the NEB to issue a permit, unless the application is designated by order of the Governor in Council for the license process.

Subsection 119.06(2) authorizes the NEB to determine whether to recommend that designation order to the Governor in Council. In making that decision, the NEB must consider the listed factors as well as any other matter which it considers relevant. One of the listed factors is the impact of the export on the environment (paragraph 119.06(2)(b)). Subsection 119.06(2) also directs the NEB to seek to avoid duplicating measures taken by the government of the province. The NEB properly interpreted this statutory direction. It concluded that the evidence raised by B.C. Wildlife Federation related to operational issues, which are primarily a matter of provincial responsibility. It concluded that it should not duplicate provincial responsibilities, by making findings of fact on matters within provincial jurisdiction, when the record tended to show that B.C. was actively regulating the activity in question.

The record before the NEB demonstrated that B.C. had approved an Energy Removal Certificate on February 15, 1996. The NEB was entitled to conclude that the regulatory concerns of B.C. in relation to POWEREX's export application had been satisfied [Tab 3, document 19].

Further, POWEREX in its application stated that the power to supply the export would come from surplus capacity from BCH's integrated transmission system. The power to supply the proposed export was not associated with the operation of any particular generating facility, but could come from a portfolio of resources, including purchases from other generators, the Canadian entitlement to downstream power benefits under the Columbia River Treaty, and BCH's surplus energy [Tab 3, NEB decision, page 6].

POWEREX's application to the NEB noted that no new construction of generating or transmission facilities was required for the export. The proposed exports were to be generated

and transmitted by existing facilities which have all necessary federal or provincial regulatory approvals and are presently operating within the applicable federal and provincial environmental standards and guidelines [Tab, 3 NEB decision, page 6].

The NEB considered the evidence that the British Columbia Wildlife Federation filed concerning fisheries impacts. The Board was entitled to determine the weight to put on that evidence, and to make the conclusion that the evidence was not strong enough to warrant a finding that the electricity export proposed in the application would result in an adverse environmental impact.

In summary, the NEB acted properly, within its jurisdiction, and within its discretion. The Federal Court of Appeal refused an application for leave to appeal the NEB's decision [Tab 3, NEB Decision]. The *NEB Act* gives the NEB the responsibility and discretion to make the decision it did, and the submitters' allegations are without foundation.

Fisheries Act

a) Enforcement and Compliance - General Approach

Canada is effectively enforcing its environmental laws. Article 5 of the NAAEC recognizes that enforcement encompasses actions broader than just prosecution and provides a non-exhaustive list of appropriate enforcement actions. The submission fails to appreciate the more comprehensive approach recognized in Article 5 and followed by Canada. Rather, the submission is based on a more limited view of enforcement, which equates enforcement directly with legal and judicial sanctions.

The submitters have asserted, pursuant to Article 14 of the NAAEC, that Canada has failed to enforce its environmental laws. In their submission, the submitters have relied on a very limited definition of enforcement that does not fully reflect the provisions of Article 5 of the NAAEC. The submitters' central thesis in respect to enforcement is clearly one that only equates enforcement with legal and judicial sanctions.

The submitters' perspective on the issue of enforcement is evident from their penultimate statements with respect to each of the specific environmental laws in question. With respect to the *Fisheries Act*, the submitters rely solely on references to judicial sanctions to advance their assertions that Canada has failed to effectively enforce s. 35(1).

Canada takes a comprehensive view of enforcement, and further submits that the submitters' limited view only encompasses one component of a much wider system of compliance-seeking activities which collectively constitute the proper enforcement of environmental laws in a modern and complex society. Further, it is just such a wide ranging system of compliance mechanisms and activities that is envisioned under Article 5 of the NAAEC on "Government Enforcement Action".

Article 5 identifies the following as constituting, or forming part of government enforcement activities:

1. With the aim of achieving high levels of environmental protection and compliance with its environmental laws and regulations, each Party shall effectively enforce its environmental laws and regulations through appropriate governmental action, subject to Article 37, such as:
    a) appointing and training inspectors;
    b) monitoring compliance and investigating suspected violations, including through on-site inspections;
    c) seeking assurances of voluntary compliance and compliance agreements;
    d) publicly releasing non-compliance information;
    e) issuing bulletins or other periodic statements on enforcement procedures;
    f) promoting environmental audits;
    g) requiring record keeping and reporting;
    h) providing or encouraging mediation and arbitration services;
    i) using licenses, permits or authorizations;
    j) initiating, in a timely manner, judicial, quasi-judicial or administrative proceedings to seek appropriate sanctions or remedies for violations of its environmental laws and regulations;
    k) providing for search, seizure or detention; or
    l) issuing administrative orders, including orders of a preventative, curative or emergency nature.

2. Each party shall ensure that judicial, quasi-judicial or administrative enforcement proceedings are available under its law to sanction or remedy violations of its environmental laws and regulations.

3. Sanctions and remedies provided for a violation of a Party's environmental laws and regulations shall, as appropriate:
    a) take into consideration the nature and gravity of the violation, any economic benefit derived from the violation by the violator, the economic condition of the violator, and other relevant factors; and
    b) include compliance agreements, fines, imprisonment, injunctions, the closure of facilities, and the cost of containing or cleaning up pollution.

Canada has available all the elements, as required by Article 5, with respect to judicial, quasi-judicial or administrative enforcement proceedings under its law to sanction or remedy violations of its environmental laws. No question or challenge has been raised in the submission with respect to the appropriateness of sanctions and remedies provided for a violation of its environmental laws.

In any regulatory regime, compliance and enforcement are comprised of a series of measures which can range from voluntary compliance to legal and judicial sanctions. Voluntary compliance and compliance agreements and undertakings are deemed by Canada to be the most productive in terms of providing for long-term protection of the environment with respect to fish and fish habitat. The compliance methods being employed by Canada in British Columbia recognize the integrated and complex nature of the BCH system and of the related fish and fish habitat issues. The goal is to make British Columbia waterways hospitable to migrating as well as resident species. Canada states without reservation that Canada and B.C. have a strong commitment to work collectively, and with BCH, to conserve and protect fisheries in British Columbia waters.

Clearly then, there is a difference between Canada's enforcement of its environmental laws which relies on the full range of measures provided for under Article 5 of the NAAEC, and the submitters' limited view of what constitutes enforcement.
The record clearly demonstrates ongoing cooperative, comprehensive, and productive studies and projects to enhance fisheries. In fact, the information provided by the submitting parties, to a large extent, originates from reports and studies generated by Canada, B.C., and BCH. These reports and studies highlight a number of complex issues, and the parties are intent upon resolving them. These reports are important steps in identifying problems and solutions. To the extent that they lead to solutions through enlightenment, publicity, cooperation, voluntary compliance, negotiation, and persuasion, more formal enforcement is often unnecessary. It is for exactly these reasons that Article 5 of the NAAEC identifies "releasing noncompliance information" as one form of enforcement.

More compelling enforcement options are available, such as authorizing terms and conditions, flow opinions, administrative orders, and ultimately prosecutions, and indeed Canada has made use of these more compelling instruments when required, as illustrated in Table 1. While Canada submits that the NAAEC cannot be applied retroactively, the following information illustrates a history of significant enforcement activity which is relevant to Canada's enforcement of the *Fisheries Act*.

Enforcement through prosecutions is a last resort after cooperation and persuasion have failed. Immediate and widespread use of prosecution would be ineffective and counterproductive. Prosecutions can be destructive of cooperative relations and wasteful of limited resources that might better be used to produce solutions. The record shows a substantial history of cooperative, comprehensive, and productive studies and projects to enhance fisheries in waters which also supply BCH generating facilities. Canada intends to continue to pursue such cooperative solutions with B.C. and BCH, and to use prosecutions judiciously.

Table 1: Orders and authorizations Issued to B.C. Hydro since 1990 [TAB 37]

Ss. 35(2) authorizations: harmful alteration, disruption or destruction of fish habitat
S. 32 authorizations: destruction of fish
Ss. 22(3) orders: minimum flow orders

HABITAT MANAGEMENT UNIT, FRASER RIVER DIVISION, NEW WESTMINSTER

Ss. 22(3) Order:

May 2, 1997: Letter from Al Lill, (DFO, A/RDG) to Michael Costello (BCH, President and CEO) regarding *Fisheries Act* flow order on the Cheakamus River (Daisy Lake Dam). DFO issues an order to BCH pursuant to s. 22(3) of the *Fisheries Act* for the release of water from the Daisy Lake Dam into the Cheakamus River equal to a minimum of 45 percent of the previous days inflow, into Daisy Lake, with a minimum daily flow of 5 cms released from Daisy Lake Reservoir.

MID-FRASER HABITAT MANAGEMENT UNIT, FRASER RIVER DIVISION, KAMLOOPS

SS. 35(2) Authorization:

March 18, 1993: Letter from Heather Stalberg (DFO, Kamloops) to Paul Higgins (BCH, Burnaby) regarding dredging Wilsey Dam forebay, Shuswap River.

September 12, 1993: Letter from Byril Kurtz (DFO, Salmon Arm) to Jim Scouras (BCH, Burnaby) regarding replacement of penstock #2 in Wilsey Dam, Shuswap River.

October 29, 1993: Letter from Heather Stalberg (DFO) to Jim Scouras (BCH, Burnaby) regarding dredging Wilsey Dam forebay, Shuswap River.

EASTERN B.C. UNIT, HABITAT MANAGEMENT, VANCOUVER

***Ss. 35(2) and 32 Authorizations*:**

March 28, 1994: Letter from Gordon Ennis (DFO, Chief, Eastern B.C. Unit) to Hugh Smith and Paul Adams (BCH, Burnaby) regarding ss. 35(2) *Fisheries Act* authorization for Norns Creek Fan (pilot recontouring plan discharge reductions from Hugh Keenleyside Dam). DFO authorizes under ss. 35(2) the alteration of habitat in order to provide more abundant spawning habitat for rainbow trout downstream of Hugh Keenleyside Dam.

December 23, 1994: Letter from Gordon Ennis (DFO) to Hugh Smith and Paul Adams (BCH, Burnaby) regarding Columbia River flows/levels. DFO authorizes under ss. 35(2) a flow decrease to 44,000 cfs below Hugh Keenleyside Dam contingent on monitoring and funding of a remedial measures program to offset the impacts caused by dewatering of whitefish eggs.

cember 30, 1994: Letter from Gordon Ennis (DFO) to Hugh Smith and Paul Adams (BCH, Burnaby) regarding Columbia River flows/levels DFO provides notification to BCH that their stated intent to reduce the flow from 44,000 cfs (above) to 32,000 cfs at Hugh Keenleyside Dam on December 31, 1994 will not be authorized except under strict conditions, and alerted BCH to possible prosecutions under the *Fisheries Act*. Flow was reduced and whitefish eggs dewatered and killed. A legal investigation was initiated by the province (MELP); however, no charges were laid.

November 30, 1995: Letter from Gordon Ennis (DFO) to Paul Adams (BCH, Burnaby) regarding Columbia River flow/levels. DFO authorizes under ss. 35(2) a flow reduction to 10,000 cfs for emergency flood control purposes. This was contingent on monitoring and was effective until December 7, 1995.

February 13, 1996: Letter from Gordon Ennis (DFO) to Paul Adams (BCH, Burnaby) regarding Columbia River flow/levels. DFO authorizes a critical dewatering of fish habitat caused by a flow reduction of 15,000 cfs for emergency flood control purposes. This was contingent on mitigation and monitoring, and was effective until February 12, 1996. DFO also requested voluntary action to "alleviate impacts and/or survey brood year juvenile strength [of mountain whitefish]".

December 2, 1996: Letter from Gordon Ennis (DFO) to Walter Udell and Paul Adams (BCH, Burnaby) regarding authorizations pursuant to ss. 35(2) and 32 of the *Fisheries Act* for Seven Mile Unit 4 Project. DFO authorizes works at Seven Mile relating to the installation and operation of a fourth turbine (Unit 4). Authorization conditions included removal of migration barriers, habitat enhancement for rainbow trout and bull trout at adjacent watercourses, monitoring activities and flow releases for the support of fish.

Ss. 22(3) Order:

February 9, 1995: Letter from Louis Tousignant (DFO, RDG) to John Sheehan (BCH, President and CEO) regarding *Fisheries Act* flow order on the Columbia River. On February 9, 1995, DFO receives notification from BCH that they had decided, without authorization, to lower flows in the Columbia River from the Hugh Keenleyside Dam from 24,000 cfs to 18,000 cfs. DFO was of the opinion that this reduction in flow would not protect the eggs of kokanee salmon, mountain whitefish, and rainbow trout that were present in the Columbia River. DFO therefore ordered, pursuant to ss. 22(3) of the *Fisheries Act*, an increase of discharge of water from Hugh Keenleyside Dam to 24,000 cfs.

May 5, 1995: Letter from Paul Adams (BCH, Burnaby) to Gordon Ennis (DFO) regarding BCH remedial works. BCH confirms their commitment to compensation for the February, 1995 flow reduction.

October 25, 1995: Letter from Brian Tobin to Glen Clark which includes background information leading to the flow order; replies to the B.C. position (including the statement . . ."We do not accept that the [Columbia River] Treaty provides BC Hydro immunity from the environmental provisions of the Canadian legislation."); and states Brian Tobin's belief that DFO has the constitutional and legislative responsibility to protect the fisheries resource tempered by the Department's ". . . desire to work cooperatively with BC Hydro and key provincial agencies in ensuring the conservation and protection of our fisheries."

Letter to BC Hydro Requesting Flows:

March 18, 1993: Letter (double registered) from Gordon Ennis (DFO) to Gary Young (BCH, System Control Centre) regarding flows necessary to protect Norns Fan spawners. The letter states that: (1) DFO field staff observed dewatered redds March 18, 1993; (2) DFO does not approve or support any flow regime from Hugh Keenleyside Dam that impacts spawning habitat or threatens the safety of ova; and, (3)
BCH is to submit to DFO a flow proposal to address spawning and incubation requirements and a mitigation plan to protect existing redds and/or ova.

S. 32 CHARGES:
Since 1990 there have been a total of 7 agencies/corporations charged (total of 10 counts) under s. 32 of the *Fisheries Act*. BCH was charged twice with a total of 5 counts.

b) Enforcement and Compliance Strategies

Canada's activity to date and its ongoing activity relative to Article 5 of NAAEC to protect fish and fish habitat in British Columbia rivers from potential environmental damage arising from the operation of hydroelectric dams has and is being given substance through a wide variety of mechanisms as characterized in the following subsections.

New Projects:

Canada's ongoing commitment to the enforcement of its environmental laws is evidenced by the fact that new and changing operations are subject to a stringent regime of environmental regulation. New hydroelectric development projects and retrofit projects are assessed thoroughly pursuant to the habitat protection provisions of the *Fisheries Act* and through the *Canadian Environmental Assessment Act* (CEAA) process, which is harmonized with the similar B.C. *Environmental Assessment Act* process. All impacts anticipated for these projects are scrutinized in accordance with DFO's Policy for the Management of Fish Habitat and Habitat Conservation and Protection Guidelines. Mitigation, compensation, and monitoring plans are required of the proponent for these projects, and when *Fisheries Act* and CEAA responsibilities are satisfactorily addressed, DFO issues section 32 and 35(2) authorizations as appropriate (e.g., Seven Mile Unit 4).

Emergency Operations:

As part of its enforcement strategy, Canada's environmental laws incorporate provisions for dealing with environmental effects arising from emergency situations. Strong action may be required to alleviate a threat to human safety and to avoid significant property damage, such as when flood conditions threaten (e.g. on the lower Columbia in December 1995) or when a sink hole threatens a dam (e.g., at the Bennett Dam in summer 1995). Canada's approach in these situations is to apply section 7(1)(c) of the CEAA (the section dealing with emergencies) and to issue, as appropriate, flow orders under section 22 or authorizations under section 35(2) of the *Fisheries Act* to deal with any harmful alteration disruption or destruction of fish habitat. Mitigation and compensation measures are negotiated to the extent possible, considering the situation. In some circumstances, compensation has been voluntary. Monitoring is usually required to document any impacts and the effectiveness of mitigation. Once an emergency is over, DFO requests the proponent to develop appropriate mitigation procedures and compensation measures to the satisfaction of DFO in anticipation of a similar future emergency.

Regional Technical Committees:

In 1988, DFO , B.C. Ministry of Environment Lands and Parks (MELP), and BCH formed an umbrella committee to look at fish and hydroelectric issues. The purpose of the committee was

to enhance communications by addressing opportunities for improved fish production and by dealing internally with any developing problems. A Steering Committee was formed to deal with policy level issues, while Regional Technical Committees were set up to deal with the technical issues. (i.e., Columbia Operations Fisheries Advisory Committee, Vancouver Island, South Interior and Lower Mainland Fisheries Technical Committees, and the technical and steering and policy committees associated with the compensation programs for the Peace and Columbia River basins). DFO also commissioned a review of the status of anadromous salmon populations in BCH regulated rivers (Hirst, 1991). The objective of the study was to consolidate the information available and to clarify the fisheries issues at specific facilities to enable staff to better address these particular problem issues and to develop system-wide restoration priorities. The report's stated aim was to provide a basis for improved management of the salmon resource in rivers affected by hydroelectric regulation in British Columbia.

The Technical Committees were tasked primarily with identifying existing fisheries concerns and reviewing mitigation and enhancement options at existing hydro facilities in relation to the Electric System Operation Review. DFO is presently working with provincial water licensing authorities in the review of B.C. Provincial water licenses for hydroelectric projects that were issued mostly during the 1960s and the informal agreement on the lower Campbell River to determine if these provincial licenses adequately address the existing requirements for fish protection. Committee meetings have been held approximately every one to three months and include 8 to 10 members from BCH, MELP, and DFO. The committee work has primarily involved identifying and documenting areas of concern for fish and fish habitat at existing hydro facilities and to obtain funding from BCH for biophysical and fish inventory studies by independent consultants to identify improvement possibilities. DFO is reviewing B.C. provincial water licenses for hydroelectric projects that were issued mostly during the 1960's and the informal agreement on the lower Campbell River to detqwermine if these provincial licenses adequately address the existing requirements for fish production.

To ensure continued compliance with Canada's environmental laws, DFO will continue to be involved with BCH in a proposal to review hydroelectric capacity through the Southern Interior Fisheries and Hydro Technical Committee. The proposals are usually operational matters. The Southern Interior Fisheries and Hydro Technical Committee reviews all BCH, MELP, and DFO projects related to BCH operations. Operational issues are also to be resolved through this forum. This committee continues to face a number of significant challenges that will require ongoing negotiation and cooperation to resolve. While a number of assessments have been undertaken (mainly in areas upstream of the Terzaghi and Wilsey Dams) in accordance with the terms of reference of the committee, there do remain some outstanding issues to be resolved such as screening the Seton facility, providing fish access to upstream habitats at Wilsey Dam, and providing a fisheries flow down the Bridge River.

Water Use Planning Initiative:

In 1993, B.C. requested BCH to conduct the Electric System Operation Review (ESOR) to examine BCH integrated electric systems operations and to identify and evaluate potential alternative operations that would increase social benefits including benefits to fish and fish habitat. That study was completed in 1994, however B.C. wished further consideration of fish issues, and partly for that reason, B.C. announced the Water Use Planning (WUP) process in November 1996. The WUP is an initiative to deal with the fish and other non-power issues at all the hydroelectric facilities, where the priority issue is fish. The process will involve a review of the BCH water licenses, and the development of water use plans for each of the facilities. The plans will likely mean, where required, re-allocation of water for fish and mitigative measures (e.g., habitat restoration, etc.), to resolve the long-standing fish impact issues. The plans will also result in changes to the water licenses, and changes to the hydro facility System Operating Orders.
The WUP process came about for three reasons:

1. The Electric System Operation Review undertaken by BCH, and the provincial response to the Review, that the fish issues had not been adequately addressed.
2. The findings of the Ward review indicated that some operations may not be in compliance with the terms of their licenses. This study reviewed historic water use in order to determine if it was within the terms and conditions of the water licenses and operating orders issued by the Comptroller of Water Rights.
3. Public concern over high profile habitat impacts, e.g. the loss of spawning gravel habitat in Campbell River, forced spills; the Downton Lake deep drawdown; and the draft Alouette and Campbell River Water Use Plans.

When the WUP was announced in November 1996, ten hydroelectric developments were identified as first priorities for review over the following three years: Cheakamus, Campbell, Bridge, Stave, Shuswap, Puntledge, Buntzen, Ash, Jordan, and Walter Hardman. At the same time, B.C. announced that all of BCH's 34 facilities would be reviewed over the next five years leading to new water use plans and revisions to the water licenses.

A Guideline document is being prepared by the Coordinating Committee to give some direction in preparing water use plans. The plans:

- will define the operating parameters for hydroelectric facilities and reservoirs under a full range of water conditions;
- are meant to be comprehensive and will cover other non-power issues such as fisheries, recreation, flood control, and irrigation; and
- will form part of the water license and the System Operations Order. It will either set the new allocation of water or in some cases confirm the existing allocation.

The process will be consultative and will involve public input, and provide opportunity for Canada to ensure that flows required for fish and fish habitat will be given priority. It has been

clearly identified that plans will be developed subject to provincial and federal legislation including the *Water Act* and the *Fisheries Act*.

Water Quality Guidelines: DFO, in partnership with Environment Canada (DOE) and MELP, has been working on the development of Water Quality Guidelines. Section 35(2) of the *Fisheries Act* allows DFO to specify safe total gas pressures (TGP) for dissolved gas below dams or obstructions. DFO is working, in partnership with DOE and MELP, on the development and implementation of the B.C. Water Quality Guideline for Dissolved Gas Supersaturating[1][Tab 5]. This guideline[2][Tab 6] is being developed following the federal/provincial process for developing water quality criteria and guidelines, which is a within-government process based on scientific data.

The guideline is ready for imminent publication. Consultation with Crown corporations, small hydroelectric operators, other industry, and the public will be undertaken during the next steps, which include implementation of the guideline and the development of site-specific guidelines, where necessary. Proposed implementation may include the following steps:

- synthesis and review of existing data;
- agency guidance for collection of TGP data, where data gaps exist;
- identification and implementation of remediation strategies;
- assessment of biological effects and development of site-specific objectives (in situations where elevated TGP levels are of concern after remedial measures have been implemented or considered, there may be a need to conduct site-specific assessments to quantify environmental effects in the receiving environment. These assessments may provide local information that can be used to develop site-specific objectives for TGP);
- compensation, after discussion of remedial measures, biological effects, etc.; and
- international monitoring and consultation.

IV RESPONSE TO SPECIFIC ISSUES RAISED IN THE SUBMISSION CONCERNING SECTION 35 OF THE FISHERIES ACT

Harmful Impacts on Fish Habitat

Canada submits that the Secretariat should proceed no further with respect to the assertions concerning the *Fisheries Act*, in light of the pending judicial and administrative proceedings. However, in the interests of making the Commission and the public aware of the relevant facts, Canada wishes to provide the following detailed response to the specific allegations made by the submitters.

Section 35 of the *Fisheries Act* states:

(1) No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat.

(2) No person contravenes subsection (1) by causing the alteration, disruption or destruction of fish habitat by any means or under any conditions authorized by the Minister or under regulations made by the Governor in Council under this Act.

Harmful alteration, disruption, or destruction (HADD) of fish habitat is not defined in the *Fisheries Act*. Operationally DFO defines HADD of fish habitat as: any change in fish habitat that reduces its ability to support one or more life processes of fish.

Fish Habitat is defined in the *Fisheries Act* 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."

Fish habitat is the sum of the biophysical and chemical features (e.g., substrate, structure, aquatic macrophytes, water depth, velocity, temperature, dissolved oxygen, and riparian vegetation) which provide for the life requisites of fish (i.e., food, reproduction, cover, movement, and migration).

The submitters note (pg. 3,4) that the operation of dams in British Columbia causes the HADD of fish habitat in at least seven ways: reduced flows, rapid flow fluctuation, inadequate flushing flows, altered water quality, entrainment, flow diversion, and reservoir drawdown. However, the submission fails to note which impacts occur, and the degree to which they occur cannot be generalized. Impacts are specific to the biophysical features of the drainage and the design of each facility and the context in which they occur, e.g. time of year, degree of change, shape of the channel. Due to the integrated nature of the BCH system, any review of impacts at a given facility must take into consideration what impacts may be engendered at other BCH facilities. As such, each of the seven points outlined in the submission have the possibility of resulting in HADD of fish habitat depending upon the particular situation and circumstance, however that is not to say that any one of the installations is actually producing any or all of the aforementioned impacts.

The purpose of the Water Use Planning Process is to investigate impacts at each facility and develop proposals for operational changes that take into consideration the system wide effects of facility specific changes.

Where impacts are currently understood, or clearly demonstrated, a range of activities have been undertaken to try to mitigate the impacts. These activities are described in detail under the heading "Response to the Thirty-nine Specific Incidents".

Response to the Seven Specific Impacts

The following analysis provides the information on the seven impacts of hydro operations as submitted, as well as Canada's perspective on each of these issues.

1. *Submitted:* *"Reduced Flows: A reduction in the flow released downstream of a facility can result in decreased habitat quantity due to a reduction in stream volume and total wetted area in the stream. Reduced flows may also cause a change in stream temperature, depending on the depth of outflow to the reservoir thermocline and the exchange rate in the river."*

Canada's Response:

Reduced Flows: The submitters' statements are, as far as they go, correct. However, Canada, B.C., and BCH are also considering other possible impacts of reduced flows including:

a) less flushing of fines from downstream gravels;
b) reduced velocities for smolt downstream migration;
c) magnified surface and substrate ice build-up;
d) altered suitability of velocities and depths for spawning; and
e) less waste dilution.

It should be noted however, that in certain circumstances, reduced flows can provide some benefits, e.g. improved over winter survival and early fry rearing under stabilized flows

2. *Submitted:* *Rapid Flow Fluctuation: The rate of change of flow through a dam is known as the ramping rate. A ramping rate that is too high during flow increase may displace fish from favored habitats, while a rapid decrease in flows can leave fish and benthic invertebrates (food sources) out of water or trapped in isolated pools. Rapid changes in flow can also disrupt fish spawning activity.*

Canada's Response:

High ramping rates do not necessarily cause a HADD of fish habitat as channel geometry and fish utilization dictate the amount of habitat affected. For example, the Revelstoke Dam has one of the highest ramping rates in the province, but the trapezoidal channel shape, habitat characteristics, and predominance of adult fish over juveniles and eggs suggest that the ramping does not cause a HADD. A mitigated ramping rate alleviates some stranding concerns, and these are adopted for certain BCH operations. For example, during the 1996 spill at GM Shrum on the Peace River, salvage efforts found only a limited number of fish stranded after ramping rates were held to 10 cm/hr, as measured by the stage downstream. However, flow

fluctuations, regardless of rate of change, may give rise to egg desiccation in dewatered spawning areas.

3. ***Submitted:*** *Inadequate Flushing Flows: Inadequate flushing flows can reduce productivity by permitting sediment buildup. At higher discharges, a river reconditions its natural channel, and flushes out accumulated sediment. The limited and regulated flow regimes at many of Hydro's dams do not incorporate flushing flows.*

Canada's Response:

Inadequate Flushing Flows: As above for "reduced flows", this problem can create a HADD. In rivers such as the Columbia River, that have relatively little sediment input, frequent high flows and lack of flushing flows are not seen to be a problem. Where problems are created, compensation may be possible by loosening the substrate through the use of scarification. BCH is conducting a pilot scarification project which may partially compensate for sediment accumulation and substrate armoring.

4. ***Submitted:*** *Altered Water Quality: When water is impounded, water temperature, dissolved oxygen content, total gas pressure, sediment and nutrient levels, pH and dissolved metal concentrations can all change. Aquatic organisms that depend on physical water parameters, including both fish and the species they feed on, can be adversely affected by these changes in water quality.*

Canada's Response:

Altered Water Quality: The submitters' arguments are generally valid. Not all of the concerns apply to all facilities, but many probably occur in some form at some facilities. DFO is participating in the management of some of these concerns. For example, DFO, together with B.C., BCH, and Cominco, are participating in a TGP reduction exercise by examining TGP production of spillways, ports, and turbines at various dams, and determining which configurations generate the least TGP. A TGP model, similar to one developed for Bonneville Power Administration, is being developed for operations on the Canadian portion of the Columbia River.

5. ***Submitted:*** *Entrainment: Fish that inhabit waters in the proximity of power intakes or spillways run the risk of being drawn into turbines or over spillways. For fish that become entrained in turbines, mortality or severe wounding may result from contact with rudder blades. In addition, death may result from the sudden water pressure drop as water passes through the turbine, which can result in impacts similar to those of gas bubble disease.*

Canada's Response:

Entrainment: Entrainment can be a problem at dams. Mitigation in the form of fish screens or other fish avoidance devices can be prohibitively expensive. However, sometimes operational changes, such as voluntary measures taken at the WAC Bennett Dam, can reduce entrainment problems. Strictly speaking this is not a HADD and therefore not subject to regulation under Subsection 35 (1) of the *Fisheries Act*. The impact in this case is directly on the fish itself and not its habitat.

6. ***Submitted:*** *Flow Diversion: Diversion of water from one stream for use in power generation in another basin can cause the harmful lowering of flows and interfere in the ability of fish to identify and return to home streams when spawning.*

Canada's Response:

Flow Diversion: The flow diversion concerns centre on the small power projects on the lower mainland and Vancouver Island. These will be subjected to the WUP process. There are no transbasin water diversions in Eastern BC from BCH operations, though subbasin water diversions occur at two small hydroelectric operations, Walter Hardman/Cranberry Creek and Whatshan Dam, dewatering portions of the stream bed.

7. ***Submitted:*** *Reservoir Drawdown: Drawdown of a storage reservoir typically reduces productivity in the shallow, littoral areas of the lake by periodically drying out these areas. This results in mortality of aquatic vegetation and bottom-dwelling organisms that comprise the aquatic food chain. In lakes with fish species that spawn along the shorelines, reservoir drawdown may either prevent spawning or result in the stranding of eggs depending on the extent and timing of the drawdown. Many fish species depend on tributary habitat for spawning and/or rearing, and decreased lake levels may inhibit tributary access for these species. Finally, reservoir drawdown may reduce water quality due to wave-induced mobilization of sediment in the drawdown zone.*

Canada's Response:

Reservoir Drawdown: The submitters' arguments are generally valid. DFO, B.C., and BCH are also considering whether continual reservoir level fluctuation can result in stranding of fish, preclusion of littoral vegetation development, reduced invertebrate production, and shoreline sloughing from wave wash and associated sediment release.

Response to the thirty-nine specific incidents

In support of their claims of the failure by Canada to effectively enforce its environmental laws, the submitters raise specific concerns relative to the *Fisheries Act* with respect to six hydro installations and subsequently cite an additional thirty-three incidents and installations in appendix A of their submission.

A complete review of all thirty-nine of these specific allegations follows.

1. *Submitted* : *Keenleyside Dam/ Norns Creek fan:* *in its own Fish Flow Studies Project - Fish Flow Overview Report (Tab 2), Hydro states that the operation of its Keenleyside Dam is known to dewater whitefish habitat and cause mortality. Additionally, the complete shut down of flows at that dam in April, 1990 dewatered and stranded rainbow trout and kokanee fry on the downstream Norns Creek fan (Report, p. 18)."*

Canadian Response: KEENLEYSIDE DAM

The involvement of DFO in eastern BC since 1990 has given rise to an improved operating regime of releases at Keenleyside Dam for the support of fish. The February 9, 1995 flow order, which prevented a decrease in downstream flows that would have resulted in the dewatering of incubating eggs is a case in point. During the critical December to April period, DFO representatives closely monitor and require assessment of flows on downstream fish and their ova. The working group, which includes DFO, MELP, BCH, and BCH consultants, is termed the Fish Information Group.

During November to mid-April, DFO attends weekly group teleconferences which primarily dealt with the status of mountain whitefish spawning and incubation that occurs in the Columbia main stem during this period. Discussion focuses on recent findings from continual field monitoring of spawning sites and spawning intensity, developmental stage of incubating eggs, and predicted flow releases. Detailed flow releases for the following week are presented and discussed, and updates are provided with respect to snow pack and consequent longer term (i.e., two week to spring freshet) ramifications. As evidence that these efforts are paying off; the flow regime during the 1996-1997 spawning season is considered to be the best yet for the maintenance of mountain whitefish spawning habitat.

Flow from Keenleyside Dam typically decreases in late March-early April.
Rainbow trout spawn in this area during spring, with peak spawning and incubation from April to June. The current working agreement between DFO and BCH is to maintain or increase flows during this period to ensure adequate rainbow trout spawning habitat and prevent dewatering of incubating eggs. Any eggs deposited prior to April which are in danger of dewatering are salvaged and incubated elsewhere or irrigated in place.

DFO played a key role in the development of a plan to recontour Norns Creek fan to improve fish habitat. On March 28, 1994, DFO granted an authorization under section 35(2) of the *Fisheries Act* for a pilot study recontouring the Norns Creek Fan. Fish utilized the pilot area and eggs were successfully incubated In addition, rainbow trout which spawn in the Columbia mainstem at Genelle (approximately halfway from Castlegar to Trail) were successfully incubated by preventing access to areas which could be potentially dewatered during the late

March-early April decrease in flow. Access was prevented by the installation of exclusion fencing around areas identified as subject to dewatering. The rainbow trout spawned in adjacent suitable spawning habitat.

In addition to the day-to-day operational work outlined above, strategic planning activities with respect to hydroelectric issues in the Canadian portion of the Columbia basin are conducted under the Columbia Operations Fisheries Advisory Committee (COFAC)[3] [Tab 7]. This body, which was formed at the initiative of DFO, meets on an ad hoc basis, and includes senior representatives of DFO, MELP, and BCH. The purpose of the Committee is to ensure that the Columbia River basin projects in Canada are operated to maximize overall benefits to British Columbia and Canada within the terms of prevailing laws, treaties, and agreements. The committee provides broad direction related to efforts to modify Columbia flows and Keenleyside discharge procedures within the terms of existing rights and obligations to minimize the impact of BCH operations on fisheries. One example of the Committee's efforts is to finalize the draft of the Columbia River Flow Regime Principles to protect fisheries resources downstream of the Keenleyside Dam.

2. ***Submitted****: "****Cranberry Creek****: In the summer of 1996 Hydro dewatered Cranberry Creek south of Revelstoke, B.C., killing and stranding rainbow trout over a ten kilometer section of the creek. A Provincial Ministry of Environment, Lands and Parks memorandum regarding the incident notes that Hydro was in compliance with its water license (which makes no provision for minimum flows for fish) at the time, and that similar situations exist elsewhere (Ministry of Environment, Lands and Parks Information Issue dated Sept. 4, 1996,(Tab 6))."*

Canadian Response: CRANBERRY CREEK (WALTER HARDMAN)

The operation of Water Hardman directly affects flows in Cranberry Creek. In November, 1996 DFO, MELP, and BCH identified ten hydro developments, including Walter Hardman, as the first priorities for review in the WUP initiative[4] [Tab 8] (Water use plans define the operating constraints for a specific facility and incorporate in-stream flow requirements for fish. DFO's position is that the process must place a priority on meeting federal and provincial legislative requirements including the federal *Fisheries Act*)[5] [Tab 9]. Subsequently, DFO has been closely involved in the development of interim operating orders which, when brought into effect, will provide for operational benefits to fish during the development of the water use plan and will require the release of appropriate flows into the lower Cranberry Creek for the support of fish[6][Tab 10].

3. ***Submitted****: **Revelstoke Dam**: This facility, which provides power during peak periods, causes enormous variation in downstream flow rates. Discharge from the power plant ranges from 0 to 1600 m^3/s daily. The fluctuating water flow disrupts spawning, strands fish and prevents fish from utilizing the upper portions of the river reach.*

Canadian Response: REVELSTOKE DAM

Discharge ranges

The discharges from Revelstoke range in the order of zero to 57,000 cfs daily as stated in the SLDF submission. It is a peaking plant, responding to hourly changes in electrical load demands[7][Tab 11] . Since 1995, BCH has informally co-operated with DFO's request to maintain a minimum flow of 5,000 cfs during daylight hours to reduce avian predation and illegal poaching of fish Compliance with this request tends to be under circumstances when adequate water is available and Arrow reservoir is below full pool. Minimum flow requirements will be addressed in upcoming water use plans for this facility[8].

Flow fluctuation effect on spawning

Fluctuations in flow associated with the peaking operations of Revelstoke Powerhouse are unlikely to disrupt spawning. A recent survey (R.L. & L. Environmental Services Ltd., draft 1994)[9] [Tab12] found that fish species utilizing the section of Columbia River downstream of Revelstoke Dam tend not to use the area for spawning, and suggested they spawn in tributaries.

Flow fluctuation effect on stranding

Fluctuations would have minimal effect on fish stranding downstream of the dam. BCH has excavated a trapezoidal channel for the first 1.8 km downstream of the dam with 2:1 bank slopes and flat bottom. The amount of habitat available does not diminish significantly at altered flows in this reach, precluding stranding of fish[10] [Tab12]. Prior to this channelization, the vast gravel bars probably did strand fish. When Arrow Reservoir (immediately downstream) is at full pool, the Revelstoke tailrace is inundated, precluding any stranding. At lower reservoir elevations, some pools were isolated from the channel. BCH voluntarily excavated channels re-connecting these pools to the main stem. A recent survey (R.L.& L. Environmental Services Ltd., draft 1994) found that fish species in the section of Columbia River downstream of Revelstoke Dam tend not to use the area for rearing. Adults and sub-adults tend to be more adept at avoiding stranding than juvenile fish[12] [Tab 14].

Flow fluctuation effect on fish use of upper portions of the river reach

There are no barriers, including velocity barriers, which preclude fish access and use up to the base of Revelstoke Dam. MELP has imposed angling restrictions in this area to prevent over-harvesting of fish that use this reach[13] [Tab15].

4. *Submitted: Cheakamus River:* *Downstream fish populations have declined since project operations began, including the extinction of wild pink salmon. These populations are negatively impacted by the lack of adequate stream flows and rapid fluctuations of flows. Past spills have led to incidents of stranding in the river. During the lowest flow periods, flows are reduced by 50 to 85 percent.*

***Canadian Response**: CHEAKAMUS RIVER*

On May 2, 1997 DFO issued a Flow Order to BCH with respect to the Daisy Lake Dam on the Cheakamus River for the purposes of insuring adequate flows down the river to protect fish and fish habitat. BCH has applied to the Federal Court of Canada for a Judicial review of this Flow Order (Court Number T-1171-97). As the issues raised in the submission regarding the Cheakamus are now before the domestic courts, Canada will make no further response at this time.

5. *Submitted: Shuswap Falls Project: Low winter flows have substantial negative impacts upon downstream incubating eggs, and spawning areas have become dewatered. Rapid flow fluctuations also have a negative impact on fish. The configuration of the dam has led to increased sediment levels. Reservoir fluctuations affect benthic productivity and reduce access to Sugar Lake tributaries.*

Canadian Response: SHUSWAP FALLS PROJECT

***Low Winter Flows have substantial negative impacts upon downstream incubating eggs and spawning areas have become dewatered**:*
In the past, DFO had considered BCH to be managing reservoir waters in some years such that incubating salmon were being jeopardized as a result of low flows in the winter. In 1991, redds (nests in gravel beds) were dewatered as a result of low flows. Because of the concern raised by DFO and MELP over the loss of fish in the dewatered areas, a means to predict and plan the use of available waters which would protect fish was requested of BCH by the fisheries agencies. A rule curve was developed in 1993 by Sigma Engineering with input from DFO, MELP, and BCH. The purpose of this rule curve was to determine what flow scenarios could be discharged given various reservoir levels in Sugar Lake. In 1993 and 1994, BCH contracted Triton Environmental Consultants to assess use of the rule curve. Triton found the majority of chinook and sockeye were protected by the rule curve, and the kokanee results were somewhat inconclusive. The consultants did not monitor coho spawning.

As of 1994, BCH indicated that they did not want to use the rule curves because the model which generated the rule curves:

(1) drafted the reservoir to the lowest level, which BCH would not permit,

(2) used the November 15 date for determining if the winter would be wet or dry; however, by this date chinook, kokanee, and some coho would have completed spawning at possibly higher flows than what could be protected adequately by available incubation flows; and

(3) used historical data from charts and tables that is not considered reliable by BCH.

Therefore, BCH proposed in 1995 to provide a spawning flow of 650 cfs (DFO typically is requesting a spawning flow of 800-1000 cfs), and an incubation flow which would be less than

this. BCH noted this would protect all fish and provide BCH with operational flexibility (i.e., more power generation). DFO has responded verbally that this option is not acceptable and DFO wishes to continue to utilize the rule curves, with the fisheries agencies agreeing upon the chosen flow regime annually.

Rapid flow fluctuations also have a negative impact on fish:
Rapid flow fluctuations do have a negative impact on fish. Flow fluctuations can be as a result of gate changes made at Peers Dam to reduce water released from the reservoir or as a result of power outages at the Wilsey plant. In the summer of 1994, BCH ramped down flows at a rate considered excessive by the DFO. DFO requested an assessment and salvage. The assessment was contracted out by BCH to Aquatic Resources Ltd. but was not initiated until 12 days later, negating the possibility of finding and salvaging stranded fish. Upon receipt of Aquatic Resources Ltd. December 1994 summary report of the occurrence, Heather Stalberg (DFO, Kamloops), wrote to Bryan Hebden (BCH, Kamloops) stressing that the Department was concerned with the potential for stranding of fish on the Shuswap River due to the manipulation of flows by BCH. DFO recommended ramping rates were again provided to Bryan Hebden for incorporation into a proposed ramping study.

Power outages occur when events such as a lightning strike on a power pole occurs in the vicinity of the Wilsey facility. This can cause the discharge through the turbines to shut down. Historically water levels in the forebay were supposed to have been maintained at just below the crest elevation so that in such an event, water would start spilling within minutes. Though spill was supposed to initiate within 20 minutes, it took up to, and sometimes over, an hour to achieve the pre-outage flows downstream of the Wilsey Dam.

To provide the facility again with more operational flexibility and to provide remedial flows downstream in the event of such an outage, a Howell Bunger Valve was installed in Wilsey Dam. This valve is supposed to release between 570-675 cfs, depending upon the level of the forebay (head pressure). Though not sufficient to pass all of the approximately 1100 cfs discharge which the two penstocks can pass, this valve was supposed to provide quicker remedial flows than waiting for the headpond to crest and spill.

To date there have been problems with operating the Howell Bunger Valve. There have been outage events where it has not opened successfully. Before the Howell Bunger Valve was in use, a power outage occurred on October 13, 1994, resulting in a 27 cm drop in the river level for a four-hour period. Triton Environmental Consultants were on the river and took photos. They observed stranded fish. DFO was not advised until November 3, 1994. At that time DFO advised BCH that they were again responsible for monitoring and trying to mitigate the impacts of ramping down flows at their facilities. Recommended DFO ramping rates were provided to BCH and a study design for assessing the appropriateness of the ramping rates on the Shuswap River were again discussed on that date.

In 1994 a contract was awarded to Aquatic Resources Limited for assessing the impacts of ramping down flows on the Shuswap River. The study was a multiple-year study in order to encompass ramping at various river levels in wet and dry years. The rate of ramping in the study was to mirror the DFO recommended rates. In order to do this, gate changes at Peers Dam, located at the outlet of Sugar Lake, were to be calibrated with the Water Survey of Canada gauge located about 200 m downstream.

The ramping study was undertaken in 1995 and 1996, both considered wet years. Therefore, assessments of ramping at lower discharges was not possible. BCH did advise DFO in 1995 verbally that the ramping rates were being met, however we have not monitored this. DFO is awaiting the final report from Aquatic Resources Ltd. to see what their conclusions are and how the Water Survey of Canada gauge has been calibrated. DFO will then make further comment and recommendations. DFO continues to expect BCH to meet the recommended DFO ramping rates. Flow fluctuations also occur downstream of Wilsey Dam during installation and removal of the flashboards. (The flashboards hold the forebay at a desired elevation for head pressure.)

Installation and removal does require reducing forebay levels via an increase in discharge through the turbines. Once the flashboards have been installed, discharge is decreased and the forebay level rises. In December of 1995, DFO was advised by BCH that they needed to repair the flashboards immediately (in two days). Heather Stalberg (DFO Kamloops) specified that Aquatic Resources Ltd. should monitor any changes in flows.

During March 1997, DFO was also given only one day's notice to advise that the flashboards were going to be removed. This did not provide sufficient time for DFO to undertake monitoring of the work and a request for more time was made to BCH for future such events. DFO has specified that flashboard removal and installation should only be done in good weather, so as to avoid low forebay levels when there is a high potential for a power outage during inclement weather.

The configuration of the dam has led to increased sediment levels:
Sediment accumulates upstream of the Wilsey Dam. BCH wishes to remove these sediments for operational reasons. Since 1993, BCH has been suction dredging the sediment accumulations from the forebay and discharging the material to a settling basin upland of the river. DFO conditions have specified that an increase in 25 mg/l above background levels is permitted during the spring and summer and 0 mg/l permitted during the fall and winter. BCH has monitored this work and discharges of sediment were not excessive. DFO has also said to BCH that in extremely dry years when the flow in the river during the winter is equal to or less than that which the Howell Bunger Valve passes (i.e., 570-675 cfs), then BCH may draw down the forebay and use an excavator to remove material and dispose it to a stable upland location.

Reservoir fluctuations affect benthic productivity and reduce access to Sugar Lake tributaries:
Though MELP requested that the impacts of ramping on invertebrates be examined in the Shuswap River ramping study, this was not made a part of the study by BCH. There most likely are impacts upon invertebrates in both the reservoir and river with respect to ramping, however these have not been examined.

".. reduce access to Sugar Lake tributaries."
The effect on resident fish species is uncertain. Wilsey Dam is a barrier to upstream migrating salmonids and if transported above Wilsey, Peers Dam would then block fish migration upstream to Sugar Lake and the tributary habitat beyond.

6. ***Submitted****: "****Downton Lake:*** *In May, 1996 Hydro substantially drained the Downton Lake reservoir. A report prepared by an independent environmental auditor appointed by the Provincial Government concludes that the draw down was deliberate, and caused "substantial fish mortality". The report also notes that similar incidents have occurred in the past at both Downton Lake and other reservoirs (Interim Report of the Special Environmental Auditor With Respect to the Draining of Downton Reservoir in 1996, June 1996, p. 2, (Tab 7)).*"

Canadian Response*: DOWNTON LAKE*

DFO has deferred to the Province on this matter. The matter was investigated by the Provincial Conservation Officers Service. Charges were not pursued as they determined there was no quantitative evidence of fish losses and no pre-impact survey against which to compare. Through a BCH news release provided to DFO by Ian McGregor (MELP, Head of the Fisheries Section, Kamloops), MELP has decided not to charge BCH over the drawdown of Downton Reservoir in May 1996. A warning letter was forwarded to BCH by MELP.

7. ***Submitted (appendix A)****: "****Bennett Dam and G.M. Shrum G.S****.: Reservoir drawdown greatly affects fish productivity. Rapid flow fluctuations have caused strandings below the Peace Canyon Project immediately downstream. Elevated gas levels are a problem and fish with signs of gas embolism have been netted below the dam. The dam also appears to cause sediment problems. There are no ramping rate restrictions in effect at this facility during non-spill events."*

Canadian Response*:* ***BENNETT DAM AND G. M. SHRUM STATION***

These facilities are located in non-salmon drainages in northeast B.C. DFO was not involved at time of construction in the 1960s. BCH has not requested *Fisheries Act* authorization for the

project. DFO's Eastern BC Habitat Unit was formed in 1990, two decades after operations were established at these facilities.

Subsequent to construction, BCH established the Peace/Williston Fish and Wildlife Compensation Program, an $11 million fund generating at present $790,000 per year, co-administered by BCH and MELP[14]. The program oversees various fish and wildlife research and projects for enhancement and compensation. This program has undertaken a variety of successful fisheries enhancement and management activities designed to offset impacts to fish and wildlife from construction of the Bennett and Peace Canyon projects.

Drawdown impacts:

No doubt drawdown affects fish in Williston Reservoir as it does in all other reservoirs. These effects are, at least in part, offset by activities of the compensation program.

Fish strandings:

A steep-walled canyon exists downstream of Bennett Dam, which limits fish stranding between Bennett Dam and Peace Canyon Dam. On one occasion, DFO staff found three juvenile fish isolated in a small pool on an active delta at the mouth of a tributary, Johnson Creek, after water levels were dropped downstream of Bennett Dam. DFO requested this stranding and delta stability be addressed (correspondence Klassen to Chan-McLeod, November 6, 1995[15] [Tab16]), as part of the Peace/Williston Compensation Program. BCH and the Peace Compensation Program subsequently (January 2, 1996 correspondence Chan-McLeod to Klassen[16] [Tab17]) indicated that any compensation works on this delta would be of little value until upper reaches of the stream are restored. Fish stranding may also occur upstream of the dam as Williston Reservoir fluctuates. These impacts are at least in part offset by activities of the Peace/Williston Compensation Program.

The significant impact is in the Peace River, below the Peace Canyon Dam. It is the G.M. Shrum (GMS) that dictates these flows as the Peace Canyon operates as a run of the river.

Gas levels:

During the Peace spill of summer 1996 to drawdown Williston Reservoir levels for dam safety reasons (sink holes were discovered in the dam)[17] [Tab18], dissolved gas levels downstream of Peace Canyon dam resulted in gas bubble trauma (GBT) in fish. TGP generation is an issue associated with operation of the spillway gates at Bennett Dam and Peace Canyon Dam. Spills do not occur every year at these facilities (prior to the summer of 1996 spill, previous spills occurred in 1972 at Bennett Dam, and in 1983 and 1984 at Peace Canyon Dam). DFO assisted BCH in developing terms of reference for a study plan to measure TGP and to investigate the extent of gas bubble trauma resulting from the planned spill of 1996. The report summarizing the findings of the study has not yet been completed[17] [Tab18]. Under non-spill situations, TGP levels are relatively low (likely in compliance with TGP guideline); however, thermal heating in the reservoir can cause some TGP elevation.

Sediment problems:

DFO is unaware of any sediment problems downstream of Bennett Dam caused by operation of the facilities. Rather, two tributaries to Dinosaur Lake (the reservoir below Bennett Dam formed by Peace Canyon) are known to generate high sediment levels during storm events[18] Reservoirs tend to act as settling basins for suspended sediments resulting in downstream turbidity levels much lower than pre-impoundment. Nonetheless, sediment is generated above Bennett Dam from wave action on the shoreline, as is common in reservoirs, possibly impacting fish[18]. These impacts to fisheries are at least in part offset by activities of the Peace/Williston Compensation Program.

Ramping rates:

GMS Generating Station at Bennett Dam is a peaking station, following the daily fluctuations in power demand. These operations may result in fluctuations of several tens of thousand cubic feet per second over the course of a day. Owing to the steep walls of the Dinosaur Lake downstream of Bennett Dam, ramping concerns are negligible from GMS [18].

As potential (downstream) effects of the operation of GMS Generating Station are largely diminished by the presence of Peace Canyon Dam 21 km downstream, further explanations of impacts are provided in the response concerning the Peace Canyon project.

8. ***Submitted*** *(appendix A): "****Peace Canyon Project****: De-watering below Peace Canyon Dam due to inadequate in-stream flows negatively impacts fish and can lead to stranding and lack of access to tributary habitat. Rapid flow fluctuations also harm fish populations downstream of the project. Lack of flushing flows has resulted in abandonment of secondary channels and accumulation of bedload at tributary mouths. Also, because of hypolimnetic withdrawals from Dinosaur Lake, water temperatures are altered. In June, 1993, low flows caused fish stranding. There are no ramping rate restrictions in effect at this facility during non-spill events."*

Canadian Response*: PEACE CANYON PROJECT*

Peace Canyon Project is a BCH peaking plant 21 km downstream from Bennett Dam. The dam was constructed in 1979. DFO Pacific and Yukon Region was not involved at time of construction in the 1970s. BCH has not requested a *Fisheries Act* authorization for the project. DFO's Eastern BC Habitat Unit was formed in 1990, a decade after operations were established at these facilities. It is operated as a run-of-the-river facility, closely following discharges from GM Shrum Generating Station. Flows fluctuate in the order of tens of thousands of cfs per day, except in winter when stable flows are required to prevent ice dam problems downstream[19] [Tab19].

Dewatering:

In response to concerns voiced by the public about fish strandings and investigations by MELP and DFO into reduced flows in the Peace River downstream of Peace Canyon Project, BCH commissioned the study "Peace River Flows Impact Study - Fisheries" (by Sigma Engineering Ltd., June 1994)[20] [Tab20]. This study compares dewatering of secondary channels and other impacts to fisheries at flows of 5,000 cfs (the voluntary minimum for the facility) and 10,000 cfs to average regulated flows of 35,000 cfs. BCH has voluntarily implemented a minimum flow of 10,000 cfs from the Peace Canyon Dam at an annual cost of approximately $2 million to protect the side channel habitat in the Peace River. These minimum flows will continue until such time as agreement can be made on a minimum flow to be established in a water use plan for the facilities[21].

Flow fluctuations - ramping rates:

The 1996 Peace spill provided an opportunity to examine the hydraulic effect of altered rates of flow fluctuations or ramping. Fish salvage operations confirmed that at ramping rates of 0.1 m/hr, engendered by flow increments of 5,000 cfs/hr, negligible fish stranding occurred downstream to the BC/Alberta border. It is anticipated that these results will form the basis for a ramping rate guide for Peace Canyon for application during spills and maintenance activities[22] [Tab21]. As the Peace Canyon Dam operates as a peaking facility, guidelines are not anticipated to be applicable to normal operations where instantaneous changes in flows are effected in response to changes in power demand. DFO is aware of potential concerns with ramping rates during these normal peaking operations and has developed terms of reference for a study to examine the impacts of these operations.

Flushing flows:

The "Peace River Flows Impact Study - Fisheries" (by Sigma Engineering Ltd., June 1994)[23] [Tab22] described the effect of river regulation and lack of flushing flows on gradual infilling of secondary channels. The forced spill of summer 1996 brought flows back to channel-shaping levels which may have improved the situation. The exact benefits of these flushing flows may be derived from continuation of the detailed and long-term geomorphological surveys conducted by Dr. M. Church (Dept. of Geography, U.B.C.)[24] [Tab23].

Water temperatures:

The submitting parties were not technically correct in saying the temperature alterations in the Peace River result from hypolimnetic (deepwater) withdrawals from Dinosaur Lake; in fact the temperature alterations arise from hypolimnetic withdrawals from Williston Lake by the GM Shrum Generating Station. The short residency time of water in Dinosaur Lake acts to transmit these upstream temperature effects downstream. However, the effect downstream is the same - temperatures are moderated such that water is warmer in winter (up to 4 °C) and cooler in summer (down to 14 °C usually). Untangling the complexities of the various beneficial, adverse, significant, and insignificant impacts of these changes on the various physiological and behavioral responses of various life history stages of the various species of fish would be required to justify

any mitigation measures. Mitigation would require modification to the dam's water intake structures.

1993 fish stranding:
Incidents of downstream fish stranding were reported and the low flows prompted MELP to close the river to sport fishing from Peace Canyon Dam to Taylor. The concern also led to commissioning the "Peace River Flows Impact Study - Fisheries" (by Sigma Engineering Ltd., June 1994) discussed above in "Dewatering". BCH has implemented a minimum flow restriction of 10,000 cfs to meet community concerns for recreation and fish. This flow restriction will be maintained until such time that a final minimum flow is set in a water use plan[21]

Ramping rates:
See above on "Flow fluctuations.

9. ***Submitted*** *(appendix A): "****Shuswap Falls Project****: Low winter flows have substantial negative impacts upon downstream incubating eggs, and spawning areas have become dewatered. Rapid flow fluctuations also have a negative impact on fish. The configuration of the dam has led to increased sediment levels. Reservoir fluctuations affect benthic productivity and reduces access to Sugar Lake tributaries. There are no in-stream flow requirements or ramping rate restrictions in effect at this project.*

Canadian Response: SHUSWAP FALLS PROJECT

There are no in-stream flow requirements or ramping rate restriction in effect at the project:
In the past, DFO had considered BCH to be managing reservoir waters in some years such that incubating salmon were being jeopardized as a result of low flows in the winter. In 1991, redds were dewatered as a result of low flows. Because of the concern raised by DFO and MELP over the loss of fish in the dewatered areas, a means to predict and plan the use of available waters which would protect fish was requested of BCH by the fisheries agencies. A rule curve was developed in 1993 by Sigma Engineering with input from DFO, MELP, and BCH. The purpose of this rule curve was to determine what flow scenarios could be discharged given various reservoir levels in Sugar Lake. In 1993 and 1994, BCH contracted Triton Environmental Consultants to assess use of the rule curve. Triton found the majority of chinook and sockeye protected by the rule curve and the kokanee results were somewhat inconclusive. The consultants did not monitor coho spawning.

The Sigma 1993 rule curves are the main tool upon which DFO relies in determining annual flows. In December of 1993, DFO provided comment to BCH on their Local Operating Order and stressed a process through which the fisheries agencies and BCH would agree to a flow scenario for the spawning and incubation period of salmonids. As BCH has expressed reservations about the rule curves, refinement, if possible, may be necessary.

With respect to ramping rates, DFO has repeatedly advised BCH in writing and verbally of the need to ensure ramping rates are not excessive. To this end, DFO has provided BCH with recommended ramping rates used at the Seton Facility. A ramping study undertaken by consultants working for BCH in 1995 and 1996 assessed the effectiveness of ramping on the Shuswap River at the recommended rates. The DFO is awaiting the findings of this study. BCH has advised DFO that they are meeting the ramping rates. (Please also refer to Canada's previous response to issues concerning the Shuswap Falls Project raised by the submission).

10. ***Submitted*** *(appendix A): "**LaJoie Project**: LaJoie Dam impounds the Bridge River to form Downton Lake. Reservoir drawdown severely limits fish production. The lack of a minimum flow requirement downstream and the rapid fluctuation of flows have negatively impacted fish. One notable example of the damage of drawdown occurred in May, 1996. An extreme drawdown was conducted to facilitate a maintenance inspection. An independent Investigator's report (Tab 7) found that there was substantial fish mortality as a result of the draining of the Downton Lake. The report also found that there was a failure to conduct any fish inventories or environmental assessments in advance of the operations and failure to consider or implement mitigation measures. There are no in-stream flow protections or ramping rate restrictions in effect at this facility."*

Canadian Response: LAJOIE PROJECT

For most issues regarding operation of the LaJoie Dam and reservoir, DFO defers to B.C. DFO is involved in ongoing discussions with B.C. and BCH concerning Downton reservoir elevation levels with respect to how they influence any potential for spill down the Bridge River below the Terzaghi Dam or increased discharge through the Seton facility or down the Seton River.

11. ***Submitted****(appendix A): "**Bridge River Project**: Terzaghi Dam impounds Bridge River creating Carpenter Lake. No flow is released from Terzaghi Dam except during spills. This manner of operation has dewatered once productive salmon habitat. The infrequent spills also damage fish habitat by destabilizing stream banks and increasing sediment levels. Spills displace fish and eggs and also lead to fish strandings and deaths by allowing fish access to areas which are quickly dewatered when spills end. The rapid fluctuation of reservoir levels negatively affects fish habitat and limits fish production. B.C. Hydro admits that the extreme draft undoubtedly limits fish production in the reservoir. Additionally, the Bridge River was historically an important source of cooling water for the Fraser River and impoundment of the Bridge River has increased temperatures (elevated temperatures in the Fraser River are currently an identified problem for fish). There are no in-stream flow requirements or ramping rate restrictions present in the water licenses for this project."*

Canadian Response: BRIDGE RIVER PROJECT

DFO laid charges against BCH in 1991 for the harmful alteration, disruption and destruction of fish habitat. As the issues raised in the submission regarding Bridge River are at the time of preparing this response still before the Canadian Courts (Kamploops Supreme Court Registry # 44436), Canada can make no further response at this time.

12. ***Submitted****(appendix A): "****Mica Dam****: An in-river project on the Columbia River creating the 216 km long Kinbasket Lake. Fluctuating reservoir levels and operational draw-downs cause a loss of littoral habitat, dewatering of incubating eggs and increased temperature variations. Temperature alterations can cause fish to spawn out-of-season. The normal drawdown is almost 50m between September and mid-May. There are no in-stream flow requirements or ramping rate restrictions in effect at this facility. Flow change between days average 103 m3/s and B.C. Hydro has downramped as much as 515 cm/s in one day which can strand fish. Kokanee are often entrained through power generation turbines. Dam configuration appears to elevate total gas pressure ("TGP") levels."*

Canadian Response: MICA DAM

Mica Dam is a storage facility on the Columbia mainstem approximately 140 km upstream of Revelstoke. The dam was built during the late 1960-early 1970s.

Fluctuating reservoir levels and operational draw-downs:

These factors affect fish and fish habitat. However, these effects are offset in part by the Columbia Basin Fish and Wildlife Compensation Program.

No in-stream flow requirements or ramping rate restrictions:

This is correct, however in recent years, BCH has maintained a minimum flow of 8,000 cfs (227 cm/second) during kokanee spawning. Since Mica Dam drains into Revelstoke Reservoir the amount of habitat (downstream) potentially affected by flow fluctuation is very limited[25] .

Entrainment:

There is entrainment at this facility. Entrainment studies were proposed for 1993 and 1994, but did not proceed. There is strong evidence that kokanee which survive entrainment through this facility contribute to the Revelstoke Reservoir kokanee populations.

Total gas pressure (TGP):

On September 19, 1994, a fish kill[26] [Tab 24] of about 2500 kokanee was identified immediately downstream of Mica Dam. Possible causes were considered to be: (1) entrainment of fish from Kinbasket Reservoir during unit start-up; (2) extreme turbulent flow and high

velocities below the runner; and (3) high levels of TGP in the draft tube resulting in gas bubble trauma (GBT). Tests conducted in October, 1994, indicate the majority of fish had indications of GBT[26a] [Tab 5, 24]. It has been determined that synchronous condense cycles of operation give rise to elevated TGP levels. A kokanee kill in September 1996 resulted from synchronous-condense operations. DFO was involved in assessing the fall 1996 fish kill and will pursue necessary sampling programs/mitigation measures for this year.

13. ***Submitted****(appendix A): "****Revelstoke****: An in-river project on the Columbia River creating Revelstoke Reservoir. The biggest concerns relate to impacts on the downstream Columbia River. Discharge from the power plant can range from 0 to 1600 m3/s daily. Fish production downstream is affected by these rapid and repetitive flow reductions. There are no minimum in-stream flow requirements or ramping rate restrictions in effect at this facility. The lack of flushing flows may degrade habitat. There also appear to be significant TGP problems downstream of the dam."*

Canadian Response: REVELSTOKE

Revelstoke Dam is a BCH peaking plant 130 km downstream from Mica Dam on the Columbia River. The dam was constructed between 1977 to 1984. It is operated as a run-of-the-river facility, following discharge trends from Mica Generating Station.

Discharge ranges:
The discharges from Revelstoke ranges in the order of zero to 1600 cms daily as stated in the submission. It is a peaking plant, responding to changes in load demands.

Flow fluctuations:
Rapid and repeated fluctuations in flow, associated with the peaking operations, probably have an adverse effect on fish production. Harmful alteration, disruption, and destruction of habitat is currently minimal, in the sense that few fish can utilize the current (post-impoundment) habitat.

Flow fluctuations effect on spawning:
Fluctuations in flow associated with the peaking operations of Revelstoke Powerhouse are unlikely to disrupt spawning in the current flow regime. Spawning may occur if in-stream flows were implemented, as DFO has requested in its review of the Revelstoke Unit 5 Project. A recent survey (R.L. & L. Environmental Services Ltd., draft 1994)[9] [Tab 12] found that fish species found in the section of Columbia River downstream of Revelstoke Dam tend not to use the area for spawning, and suggested they spawn in tributaries.

Flow fluctuations effect on stranding:
Fluctuations in flow associated with the peaking operations of Revelstoke Powerhouse would have minimal effect on fish stranding downstream of the dam. BCH has excavated a trapezoidal channel for the first 1.8 km downstream of the dam with 2:1 bank slopes and flat bottom. The

amount of habitat available does not diminish significantly at altered flows in this reach, precluding stranding of fish. Prior to this channelization, the vast gravel bars probably did strand fish. At full pool the Arrow Reservoir backwaters into this tailrace channel, precluding any stranding[10] [Tab 13]. At lower reservoir elevations, some pools were isolated from the channel. BCH voluntarily excavated channels re-connecting these pools to the mainstem [Tab 9]. A recent survey (R.L. & L. Environmental Services Ltd., draft 1994) found that fish species in the section of the Columbia River downstream of Revelstoke Dam tend not to use the area for rearing. Adults and sub-adults tend to be more adept at avoiding stranding than juvenile fish [Tab 10].

Minimum flows:

BCH has responded to DFO concerns associated with zero discharges from Revelstoke Dam by maintaining minimum flows of 5,000 cfs during daytime hours, when practical, to minimize potential poaching and avian predation of fish in shallow water[8] . Other than this voluntary daylight measure, there are no minimum in-stream flow requirements at the facility at this time. DFO has stated that BCH would be required to maintain minimum flows from the facility in the event Revelstoke Unit 5 Project is undertaken. This project has been placed on hold by BCH[27] [Tab 25].

Ramping rates:

Ramping rate restrictions that would have any consequence to fish are not compatible with operations of this peaking facility. DFO has not raised this issue as a concern for the present facility. However, for the proposed Unit 5 (now on hold) DFO has requested channel works to prevent stranding.

Flushing flows:

Flows discharged from Mica Dam are designed to meet turbine capacities at Revelstoke without spilling. Consequently, historic flushing flows no longer occur in the approx. 7-13 km Columbia River between Revelstoke and the Arrow Lakes Reservoir (the length of the river depends on the level of Arrow Reservoir). The Jordan River, which enters the Columbia River approx. 6 km downstream of Revelstoke Dam, does provide some freshet flows for the lower portion of this reach. System spills occasionally occur over Revelstoke Dam, as in 1991, resulting in some channel and significant bank scour[28] [Tab 26]. B.C. hydro has acted to partially rectify these sediment sources during spills. Regardless of input from this material, the above noted study concludes that scour and deposition processes result in a small net lowering of the streambed. While flushing flows are limited, the reservoir upstream acts as a settling basin such that minimal sediments are entrained past the dam. With the dam acting in this capacity, flushing flows downstream of the dam would have the effect of removing stream bed gravels without replacement from upstream in the first 6 km, resulting in armouring of the channel by boulders. This reach was not found to support spawning at present (R.L. & L. Environmental Services Ltd., 1994)[9] [Tab 12]. DFO has not raised the flushing issue as a concern.

Total Gas Pressures:
Significant elevated TGP problems associated with this facility are related to spills, operation of the units in synchronous-condense mode, and atmospheric air injection for generation stabilization. BCH is monitoring operations suspected to increase TGP levels (R.L. &L. Environmental Services Ltd., draft 1996)[29] [Tab 27]. The study objectives are to determine optimal operating regimes to minimize TGP, including preferential use of Units 1 to 4, with and without synchronous-condense cycles, and other mitigative strategies (exchange of atmospheric air valve on Unit 4). DFO is actively involved in this program through a TGP Committee. (Please also refer to earlier reference concerning the TGP guidelines that DFO, DOE, and MELP are finalizing).

14. ***Submitted*** *(appendix A): "**Keenleyside Project**: An in-river project impounding 50 tributaries and discharging into the Columbia River, creating the 230 km long Arrow Reservoir. Downstream of the dam is a 50 mile stretch of river utilized by transboundary fish populations. Low reservoir water levels prevent access to spawning channels, and reservoir drawdown dewaters eggs. Low water levels also reduce benthic and planktonic production. Downstream, low water levels restrict fish access to tributaries. There are high dissolved gas levels which causes gas bubble disease. High gas pressure also causes fish to seek refuge in deeper water where predation rates are higher. Daily flow fluctuations and rapid ramping rates reduce juvenile and adult productivity through stranding and habitat loss. Dewatered side channels and reaches force fish into the main channel where predation rates are higher. High flow during the fall and winter can result in loss of benthic productivity and reduced spawning success. Low flows have dewatered fish and eggs at Norns Creek fan and near Gennelle, B.C., downstream of Keenleyside Dam. Low flows downstream of Keenleyside during the winter months are known to dewater whitefish eggs and cause mortality at other sites. Entrainment of fish is also a major problem at Keenleyside dam. The in-stream flow requirements are less than 10% of mean annual flow and there are no ramping rate restrictions in effect at this facility."*

Canadian Response: KEENLEYSIDE DAM

Fluctuating reservoir levels and operational draw-downs prevent access to spawning channels, dewater eggs, and reduce benthic and planktonic production.

Entrainment of fish
Entrainment probably occurs at this facility.

High gas levels:
The Keenleyside Dam is recognized as a significant contributor to dissolved gases in the Canadian lower Columbia River. When DFO became aware of this problem, the Department wrote to senior levels of BCH insisting that the unacceptable levels of TGP be reduced and

subsequently (with MELP) have been involved in a program to decrease TGP levels at Keenleyside Dam (and others) . Measurements and modeling of the relative degree of TGP production from the various ports and spillways at Keenleyside Dam enables prescriptions of which combination of release facilities should be used under which discharge scenario. The program is considered successful, though TGP remains an unavoidable problem. Current proposals to develop a powerhouse at these facilities (Keenleyside Power plant Project 150) is anticipated to provide additional relief to TGP production. (Please also refer to earlier reference concerning the TGP guidelines that DFO, DOE, and MELP are finalizing).

Low water levels downstream restrict fish access to tributaries and dewater fish eggs:
The majority of creeks that are suitable for incubating habitat are low gradient and accessible under all Keenleyside dam flow conditions. Murphy and Bear creeks, under some conditions, may have difficult access; this situation is being examined by BCH[30] . Flow levels downstream of Kootenay River are also influenced at times, primarily by flows out of Brilliant Dam, which is not a BCH facility.

In stream flow requirements are less than 10% of mean annual flow:
The minimum flow of 5,000 cfs is more than 10% of the mean annual (pre-impoundment) flow of 43,000 cfs.

Ramping rate restrictions:
BCH restricts changes in flow to a maximum of 15,000 cfs in a 24 hour period except in the event of an emergency[25] .

(Also please refer to earlier response to Keenleyside issues raised in the submission.)

15. ***Submitted*** *(appendix A): "****Walter Hardman****: Storage site, diversion structure, and generation station on Cranberry Creek and South Cranberry Creek. During low flow periods, all water is diverted, causing dewatering in the fall and winter each year resulting in stranding of downstream fish populations. The Ministry of Environment Information Issue (see Tab 6) describes the dewatering of Cranberry Creek which occurred in 1996, which resulted in the deaths and stranding of rainbow trout. There are no in-stream flow requirements or ramping rate restrictions in effect at this facility."*

Canadian Response: WALTER HARDMAN

Dewatering of Cranberry Creek:
Dewatering of the Creek below the diversion dam is being addressed through the WUP process . The current draft of the interim operating order to be issued by the BC Comptroller of Water Rights to BCH for this facility calls for the release of water over the diversion dam for the supply of in-stream flow to downstream reaches of Cranberry Creek. This provision for appropriate

flows will be integrated into the water use plan[6] [Tab 10]. (Please also refer to earlier response to Cranberry Creek issues raised in the submission.)

16. ***Submitted*** *(appendix A): "**Duncan Project**: The Duncan project has significant impacts on fish populations. Reservoir level fluctuations limit productivity and may affect tributary access. Minimum flow levels are inadequate. Rapid flow fluctuations are also a problem. Fish may become entrained during power generation. There is also the potential for elevated TGP levels during spills. There are no in-stream flow requirement or ramping rate restriction in effect at this facility."*

Canadian Response*: *DUNCAN PROJECT

Reservoir level fluctuations affect productivity and tributary access:
These impacts were compensated for, in part, by the construction of a 3.2 km long, 11 m wide kokanee spawning channel adjacent to Meadow Creek, a tributary of the lower Duncan River below the dam, by BCH in 1967[31] [Tab 28].

Total gas pressure:
No power production occurs at Duncan Dam. TGP monitoring in the forebay and tailrace at Duncan Dam during standard operation conditions in August 1995 indicated levels of 110.7% or less. Upstream TGP levels can fluctuate depending on temperature, and may contribute to downstream TGP levels. TGP downstream of Duncan Dam spillways may be elevated for some distance downstream of the spillway plunge pool. Trade-offs between maintaining passage for bull trout and reducing TGP exist[32] [Tab 29].

No in-stream flow requirements or ramping rate restrictions:
BCH operates the plant such that the minimum flow is 100 cfs, and the ramping rate is not greater than 4,000 cfs per day[25] .

17. ***Submitted*** *(appendix A): "**Seven Mile Project**: Downstream, flow fluctuations limit productivity, TGP levels are high and unnatural water temperature changes occur below the dam. High discharge rates during power production entrain fish through turbines. High reservoir levels flood mine sites and may increase metal levels in the water. Concerns over fish entrainment exist. There are also large fluctuations in reservoir levels which decrease reservoir productivity and cause erosion."*

Canadian Response: SEVEN MILE PROJECT

Seven Mile Dam, constructed between 1974 and 1980, is situated on the Pend d'Oreille River, approximately 25 km downstream from Seattle City Light's Boundary Dam (immediately across the US border) and 9 km upstream of Cominco's Waneta Dam. Nine other hydroelectric dams are located on the Pend d'Oreille River and its tributaries further upstream in the US, providing substantial flow regulation to this facility. The facility is operated to moderate block flows released from Boundary Dam such that spill (versus generation) at Seven Mile and Waneta dams are minimized. Flows fluctuate in blocks in the order of tens of thousands of cfs per day.

Flow fluctuations:
The "river" downstream of the Seven Mile Dam is a matter of meters long, depending on elevation of the Waneta Reservoir immediately downstream. While some angling occurs in Waneta Reservoir, the fish are considered largely to be entrained from the Seven Mile Reservoir, with a few rainbow trout also spawned and reared in a tributary stream unaffected by flow fluctuations[33] [Tab 30]. Flow fluctuations passed on through Cominco's Waneta Dam affect fish, and DFO and MELP have developed mitigation requirements regarding the distribution of flows at both Seven Mile and Waneta dams to prevent incremental effects of proposed upgrades at these facilities from further affecting fish productivity downstream of Waneta[34] [Tab 4].

Total Gas Pressure:
TGP generated upstream at the Boundary Dam (US) causes high TGP levels above Seven Mile. TGP production from spillway releases, as measured by BCH during the 1996 freshet spill, confirmed that spill does not contribute to elevated TGP from Seven Mile Dam, probably owing to a terminal "jump" on the spillway which distributes water to the surface rather than plunging to depth. Operations such as synchronous-condense cycles at Seven Mile do contribute to elevated TGP to an unknown degree. As part of their mitigation and compensation plan for the approved Seven Mile Unit 4 project (currently on hold) BCH has agreed to install wicket gate seals, which under synchronous-condense operation will reduce or eliminate leakage of water with high total gas pressure content into the tailrace[35] [Tab 31]. (Please also refer to earlier reference concerning the TGP guidelines that DFO, DOE, and MELP are finalizing.)

Water Temperatures:
Because Seven Mile and Waneta reservoirs are run-of-the-river systems, with only minimal storage capabilities and 1-day retention times, temperatures tend to be isothermic with little stratification, if any, from surface to depth. While temperatures can elevate into critical ranges for cold water fish species (20-24 °C), the source of this temperature lies in the numerous reservoirs upstream in the US. Temperature changes over the Seven Mile Dam, if any, would be minor[36] [Tab 32].

Fish Entrainment:

DFO is of the opinion that entrainment of fish through Seven Mile Dam facilities is widespread, particularly for juveniles during freshet. To offset incremental entrainment of fish through a recently upgraded water license and for the proposed Seven Mile Unit 4 project (on hold), DFO included a requirement for BCH to develop compensation measures in tributaries of the Seven Mile Reservoir[34] [Tab 4]. Fish entrainment through the existing facilities is likely, but undocumented.

Flooding mine sites:
DFO understands that two mines, Red Bird and Remac, both near the confluence of Pend d'Oreille and Salmo Rivers, were abandoned in 1940 and 1975, respectively. During the Environmental Assessment for the Seven Mile Unit 4 application, DFO investigated potential effects of lower reservoir elevations on exposure of these mine tailings. A review of information available indicated that the tailings were not acid generating, though high in metal content[37] [Tab 33]. The majority of tailings were deposited at a lower elevation and not subject to air exposure. Considering these factors and that background dissolved metal levels were already high in the Pend d'Oreille, with metals present in an assessment of fish tissues conducted by BCH (1991), DFO concluded that the additional risk resulting from incremental effects of the Unit 4 project would be insignificant[38] [Tab 34].

Reservoir levels:
Since the addition of two units at the upstream Boundary Dam powerhouse in 1988, the hydraulic capacity of the Seven Mile Powerhouse is approximately 77% that of the Boundary powerhouse. To avoid spilling the water at Seven Mile, BCH attenuates block loading from Boundary powerhouse by daily storage of water in Seven Mile Reservoir, causing reservoir fluctuations. BCH anticipated bringing the Seven Mile powerhouse into hydraulic balance with the construction of Seven Mile Unit 4. However, this project has been put on hold. If Seven Mile Unit 4 and plans for an expansion of the Waneta Powerhouse are completed, all three powerhouses could function in hydraulic balance. While a hydraulic balance between Boundary, Seven Mile, and Waneta powerhouses could result in zero fluctuation in reservoir elevations, one effect would be no attenuation of the Boundary Powerhouse block flow releases, which would be transferred downstream to the Columbia River. From a fisheries perspective, having no attenuation of the Boundary block releases could be extremely detrimental for the critical white sturgeon populations utilizing the Waneta Eddy, which is immediately below Waneta Dam at the confluence with the Columbia River. DFO and MELP have developed mitigative requirements which are conditions of authorizations for the Seven Mile Unit 4 and Waneta Upgrade projects such that this attenuation is not diminished, at the expense of greater reservoir fluctuations. These conditions are echoed in a draft water use plan for the facilities developed by BCH (1997)[39] [Tab 35].

18. ***Submitted*** *(appendix A): "****Whatshan Project****: An out of basin diversion on Whatshan River, a tributary of Arrow Lake, which leaves Whatshan River dry for several*

kilometers. Reservoir fluctuations may reduce littoral productivity. There are no in-stream flow requirement or ramping rate restriction in effect at this facility."

Canadian Response*: *WHATSHAN PROJECT

Whatshan River dry for several kilometres:
The area below the dam is groundwater fed, but the canyon (with falls, about 1 km long) immediately below dam is poor habitat and does not have resident fish. Remaining portion to Barnes Creek (a tributary) is lower gradient and ground water fed and is used by fish from Barnes or lower Whatshan Creek. Prior to construction, flow in portions of the mainstem below Whatshan Lake may have been very low - groundwater may have been the major source of water[30] .

No in-stream flow requirements or ramping rate restrictions:
This is correct.

19. ***Submitted*** *(appendix A): "****Spillimacheen Project****: The configuration of the dam causes high sediment releases which harm fish and fish habitat. There are no in-stream flow requirement or ramping rate restriction in effect at this facility."*

Canadian Response: SPILLIMACHEEN PROJECT

High sediment releases:
The Spillimacheen carries substantial glacial bedload. Since 1993, DFO has been working with BCH to resolve this problem and a range of studies has been undertaken. DFO and MELP have recommended that BCH develop a program to remove accumulated sediment mechanically, followed by upland disposal. The logistics of mechanical removal are under discussion with the agencies. The previous BCH practice of dumping sediment over the dam has been forbidden. Currently, sediment is being routed continuously through the turbines and through the low level port, which is open all year round[25] .

No in-stream flow requirements or ramping rate restrictions:
The Spillimacheen powerhouse is approximately 3 km downstream of the dam. The system typically passes inflow except in rare circumstances when flashboards are installed (additional spill may be required), and flow is transferred from the generator to the spillway. This occurs once or twice a year for a few hours. The length of stream between the dam and the powerhouse has low flows, especially in winter when the only flows are from dam seepage. BCH has sought permission, as part of their Power Smart initiative, to eliminate these seepage flows. DFO has indicated that a minimum flow release would be required in such circumstances[25,30] .

20. ***Submitted****(appendix A): "****Aberfeldie Project****: This project causes low flows during winter, which limits fish productivity. There are no in-stream flow requirements or ramping rate restrictions in effect at this facility."*

Canadian Response: ABERFELDIE PROJECT

Low flows during winter limit fish productivity:
This is a run-of-the-river facility which passes in-flows, hence flows downstream of the powerhouse are similar to the natural (pre-impoundment) flows. There is a portion of stream immediately below the dam that is dewatered[30,31] [Tab 28].

No in-stream flow requirements or ramping rate restrictions:
Aberfeldie typically passes inflow except in rare circumstances when flashboards are installed (additional spill may be required), and/or the system is transferring from generator to spillway. This occurs once or twice a year for a few hours[25] .

21. ***Submitted*** *(appendix A): "****Elko Project****: Low flows may limit fish productivity below the dam. There are no in-stream flow requirements at this facility and there is no consideration of the effects of ramping below the powerhouse."*

Canadian Response: ELKO PROJECT

Low flows during winter limit fish productivity:
This is a run-of-the-river facility which passes in-flows, hence flows downstream of the powerhouse are similar to the natural (pre-impoundment) flows. There is a portion of stream immediately below the dam that has the potential to be dewatered, however there is leakage below the dam hence there is always water in the channel[25,30]

No in-stream flow requirements or ramping rate restrictions:
Elko typically passes inflow except in rare circumstances when flashboards are installed (additional spill may be required), and/or the system is transferring from generator to spillway. This occurs once or twice a year for a few hours.

22. ***Submitted*** *(appendix A): "****Kootenay Canal Project****: Rapid flow fluctuations can lead to stranding, and concerns exist over fish entrainment."*

Canadian Response: KOOTENAY CANAL PROJECT

Rapid flow fluctuations may cause fish stranding:
There are rapid flow fluctuations but the nature of upstream conditions (the canal surface is steep) and downstream (Brilliant Dam reservoir) are such that fish stranding is very unlikely[30] .

Entrainment:
Entrainment may occur.

23. ***Submitted*** *(appendix A): "**Cheakamus Project**: Fish Populations downstream have declined since project operations began. These populations are negatively impacted by the lack of adequate stream flows and rapid fluctuations of flows. Past spills have led to incidents of stranding in the river. During the lowest flow periods, flows are reduced by 50 to 85 percent. The water license for this facility contains a condition which required an order be issued by June 1, 1956, setting forth the quantity and time of water releases to be made for the purpose of maintaining a flow of water in the Cheakamus River for the purposes of fish propagation. This order was never issued"*

Canadian Response: CHEAKAMUS PROJECT

On May 2, 1997 DFO issued a Flow Order to BCH with respect to the Daisy Lake Dam on the Cheakamus river for the purposes of insuring adequate flows down the river to protect fish and fish habitat. BCH has applied to the Federal Court of Canada for a judicial review of this Flow Order (Court Number T-1171-97). As the issues raised in the submission regarding Cheakamus are now before the domestic courts, the Government of Canada can make no further response on these issue at this time.

24. ***Submitted*** *(appendix A): "**Falls River Project**: Upstream fish species are negatively affected by drawdown and rapid water level fluctuations. Downstream fish are negatively affected by fluctuating flows. There are no restrictions on ramping rates in effect at this facility."*

Canadian Response: FALLS RIVER PROJECT

This plant has a small headpond with relatively little impact on resident or migratory fish stocks.

25. ***Submitted*** *(appendix A): **Clayton Falls Project**: Operation of the dam may cause increased sediment levels. There are no in-stream flow requirements or ramping rate restrictions in effect at this facility.*

Canadian Response: CLAYTON FALLS PROJECT

No fish are known to exist upstream of the dam due to a historic barrier. BCH constructed a spawning channel in the tailrace area which receives water either from the turbine or through a bypass from the creek. DFO was involved with the planning process for the project and are pleased with the spawning improvement resulting from the project upgrade.

26. *Submitted* *(appendix A): "**Seton Project**: Spills at this site can damage incubating eggs. Rapid ramping at this facility can negatively impact fish. The water license for this project contains no in-stream flow requirements or ramping rate restrictions."*

Canadian Response: SETON PROJECT

Spills at this site can damage incubating eggs:
This is correct. Because of the manner in which BCH manipulated flows in the Seton River in 1991, salmon eggs were dewatered. Accordingly, the DFO charged BCH for killing fish. In addition, DFO provided a letter to BCH during pink spawning years which states they can discharge no greater than 2000 cfs to protect incubating pink salmon eggs near the outlet of the dam from scour.

Rapid ramping at this facility can negatively impact fish:
This is correct. DFO observed in 1991 and 1992 that BCH's rates of ramping flows were excessive and resulted in the killing of fish. Accordingly, charges were laid for the unauthorized killing of fish on the Seton River in 1991 and 1992.

The water license for this project contains no in-stream flow requirements or ramping rate restrictions:
The 1953 conditional provincial water license contains clauses stipulating that the spill discharge at Seton Dam shall be maintained at 400 cfs during adult sockeye migrations and 200 cfs at other times (or lesser amounts if so determined by the Minister of Fisheries and Oceans). In 1997, for the third consecutive year, BCH has again agreed to do so for this calendar year. BCH have noted that these additional flows will only be provided during years when there is excess water in the system. Excess waters in the system are considered by BCH to be those flows which if passed through the turbine would exceed the DFO-approved operating range of the turbine during the downstream migration period. DFO is involved in ongoing negotiations to have BCH provides for, on a permanent basis, an annually naturalized hydrograph down the Seton River.

While the license does not contain ramping rates, DFO has provided recommendations for ramping rates. These were submitted to BCH, who have been implementing them since that time. In addition to the ramping rates, BCH has been monitoring the ramping and conducting salvages if necessary.

27. *Submitted* *(appendix A): "**Wahleach Project**: Large fluctuations in reservoir restrict tributary access for spawning fish and reduce littoral productivity in the reservoir. This project is used to store spring flows for use in the winter. There are no ramping rate restrictions in effect at this project."*

Canadian Response: WAHLEACH PROJECT

Large reservoir fluctuations restrict tributary access for spawners:
Seasonal fluctuations in the reservoir (Jones Lake) level vary. An average draw down of 18.3 metres is not uncommon. The statement that the reservoir is used to store spring flows for use during the summer and winter is correct. The Wahleach Creek hydroelectric development was completed in 1952. No provision had been made for fish passage in the dam. Accordingly, there is no anadromous salmonid population in the lake or in any of the tributaries upstream from the dam. Resident species include kokanee (stocked in the thirties and are still found in the lake) and cutthroat trout. In order to increase productivity of the lake, BCH at the request of B.C. Environment (Fish and Wildlife Branch) has been involved in a lake fertilization program for the past 4 years. To date BCH has spent $310,000 and is committed to spend another $110,000 in 1997.

BCH has assumed the responsibility for maintaining a pink salmon spawning channel at the lower end of Wahleach Creek. The operation of the spawning channel cost BCH approximately $40,000 every 2 years. The spawning channel is now out of operation. It was rendered inoperable due to a massive landslide that occurred in 1993 in the Wahleach Creek watershed. Representatives of fisheries agencies and BCH are working towards finding a solution.

No ramping rate in effect at this project:
Water from the Jones Lake reservoir is diverted through a tunnel to a power plant by the Fraser River. Turbine discharge enters the side channel of the Fraser River. Fish habitat in the tailrace channel (a short distance of approximately 25 metres) is very limited and the influence of turbine discharge fluctuations in the Fraser River flow regime even during the low Fraser River flow period is negligible. Accordingly, DFO staff does not feel it necessary to impose any ramping rate at this plant.

28. ***Submitted*** *(appendix A): "****Stave Falls Project****: Drawdown of the reservoir affects littoral productivity. There are no in-stream flow requirements or limitations on ramping rates in effect at this project."*

Canadian Response: STAVE FALLS PROJECT

Draw down, littoral productivity, in stream flow, ramping rate:
During normal reservoir operation, draw down extends to about 9 metres. There are no anadromous salmonids in Stave Lake and Hayward Lake. There are resident fresh water fish in the lake that are considered valuable for the recreation fishery. At the request of MELP (Fish and wildlife Branch), BCH has recently completed a grass seeding program in the littoral zones taking advantage of the situation occasioned by the rebuilding of the Stave Falls project (first

built in 1911, dam was again raised in 1922-23, rebuilding is now in progress). Further revegetation is being considered as part of the Stave Falls replacement program. The stretch of the Stave River and its side channel (Blind Channel) between the plant and Hayward Lake (forebay of the Ruskin Power plant downstream) is quite short and therefore DFO staff considers it unnecessary to insist on the maintenance of minimum flows or incorporation of a ramping rate.

There has been a flow agreement in effect since 1989 for the lower Stave River downstream from the Ruskin Dam facilities (built in 1930). In order to adhere to the terms and conditions of the agreement, BCH is required to synchronized the operations of both the Ruskin and the Stave Falls power plants. In that respect, there are some restrictions placed by DFO on the operation of Stave Falls power plant.

29. ***Submitted*** *(appendix A): "****Buntzen Project****: The diversion of water from its original basin causes migration delay and possibly even spawning failure as a result of attracting migrating Coquitlam salmon away from the home stream. There are no in-stream flow requirements or restrictions on ramping rates at this facility."*

Canadian Response: BUNTZEN PROJECT

Out of basin diversion causes migration delay, spawning failure, no in- stream flow requirements and no ramping rates:
Water from the Coquitlam River (Fraser River system) is diverted to the Buntzen generating plant on Indian Arm (Gulf of Georgia, Burrard Inlet complex). In the opinion of the DFO staff, the turbine discharge does not seriously affect the homing behavior of the Coquitlam River salmon.

The turbine discharge mixes with the Indian Arm waters (tidal salt water) and the distance from the point of entry of the adult Coquitlam River salmon at the mouth of the Fraser River to the Indian Arm is large enough that there is no influence on the migration behavior. The turbine discharges may have some effect in delaying the onward migration of the Indian River fish temporarily. Turbine discharge, passing through the draft tubes enters directly into the Indian Arm and there is no point in specifying any ramp rate.

At the request of B.C. Environment (Fish and wildlife), BCH has been running a net pen program in Buntzen lake since 1991 to produce rainbow trout for recreational fishery.

30. ***Submitted*** *(appendix A): "****Alouette Project****: Out-of-basin diversions cause inadequate flows below Alouette dam which has caused significant fish declines and even the extinction of several species from the river. Sediment problems also inhibit fish production."*

Canadian Response: ALOUETTE RIVER PROJECT

Out of basin diversion causes inadequate flows, significant fish decline, even extinction, sediment problems:

All five species of Pacific salmon historically occurred in the Alouette River system. Large runs of sockeye, chinook, coho, chum, steelhead, and cutthroat utilized the Alouette River system prior to 1926. There was no provision for fish passage in the South Alouette River Dam built in 1926. The flow from the river was diverted to the Stave River system by a tunnel at the northern end of Alouette Lake. Lack of adequate flows in the river and lack of access to the lake and the upper tributaries took a toll on the fish run. Sockeye disappeared in 1930, and chinook were not reported after the construction of the dam. The South Alouette River was reduced to the status of a ditch, except for any tributary inflows there were hardly any flows before the early seventies. There were occasional large spills into the river during winter storm periods.

In the early seventies, subsequent to a report of a fish kill due to elevated summer temperature, DFO hired an environmental consultant to study the low flow and water temperature problems. The consultant developed an interim proposal for the release of a minimum of 2 cfs from the reservoir and to maintain a minimum discharge of 25 cfs at the 232nd Street bridge. In the early eighties, DFO hired a consultant to undertake a fisheries study of the South Alouette River. The consultant's report, however, was judged not to have adequately addressed the issues. In late eighties, DFO asked BCH to maintain a minimum discharge of 20 cfs from the reservoir and to undertake a joint DFO/BCH study to assess fish flow requirements. After the 1991 publication of Dr. Stan Hirst's report, DFO initiated a two-level Hydro/Fisheries Committee (steering committee and a number of area technical committees). BCH conducted the fisheries studies of the South Alouette River and the findings were discussed at the technical committee level. Finally, BCH initiated the formation of a stakeholder committee to hammer out a flow agreement. Finally the stakeholder committee came to a consensus and adopted a flow agreement and BCH implemented the proposal on September 1996.

The agreement requires BCH to release a continuous discharge from Alouette Lake year round of the order of 95 to 105 cfs. Additionally, studies will continue for the next several years to determine the optimum flow for fish. Representatives of the fisheries agencies are confident that with the new flow regime there will be significant improvement for the fisheries resource of the river.

Sediment Problem:

There has been a continual problem of sediment input into the river downstream from the dam due to bank erosion of a major tributary. Although the problem has nothing to do with BCH's operations, nevertheless, BCH has been contributing funds for the remedial measures. There was one isolated incident during the rebuilding of the dam in late eighties, when BCH's contractor was negligent in stockpiling construction material close to the river. The material

sloughed into the river and DFO charged BCH and its contractor for deposition of deleterious substances into the river. BCH was found guilty in the provincial Court and was fined $10,000.

Habitat restoration activities:
Four spawning channels have been constructed over a 4-year period under the auspices of the Hydro/Fisheries Technical Committee. These projects were jointly funded by DFO and BCH. BCH has been contributing approximately $20,000 a year for the past four years. At the request of B.C. Environment (Fish & Wildlife), BCH has been running a net pen program at Alouette Lake for the past 4 years to produce rainbow trout for the recreational fishery.

31. ***Submitted****(appendix A): "****Coquitlam Project****: Fish productivity downstream of the dam is suppressed because stream diversions for power production cause low flows. Rapid fluctuations of flows causes fish stranding. The configuration and operation of the dam appears to exacerbate existing sediment problems."*

Canadian Response: COQUITLAM RIVER PROJECT

Fish productivity is suppressed because of low flows, fish stranding caused by rapid flow fluctuations, exacerbated sediment problem:
There is no doubt that the low flows in the upper Coquitlam River adversely impacted natural production of salmon. The dam was built in 1914 by Vancouver Power Company and there had been no requirement in the provincial water license for flow release for downstream benefit. The Coquitlam River was kept alive by Or Creek, a major tributary of the Coquitlam River, entering the river about 5 km downstream from the dam. At the initiative of the MELP (Water Management Branch) a water management study was undertaken during the mid-seventies. DFO participated in the study and contributed the fisheries section of the report. Since the mid-eighties, DFO has been actively involved in meeting with BCH to implement the recommendations of the Coquitlam River Water Management Study report. In November, 1993, a tripartite fish flow agreement involving DFO, MELP, and BCH was completed. The new flow regime, though not optimum for fish production, is certainly hailed as a big step forward. To facilitate the flow releases required for the fisheries, BCH installed flow release valves in two of their low-level outlet gates to at a cost of approximately $32,000.

In conjunction with the new flow agreement, six spawning and rearing channels have been developed. These projects were jointly funded by DFO and BCH. To date BCH has contributed approximately $100,000 towards habitat restoration and development in the Coquitlam River.

Although, occasionally, during a storm event, BCH uses the low-level outlet gates and the overflow, uncontrolled spillway to release flows from Coquitlam Lake, it is unlikely that the associated ramp down would lead to any stranding of fish. In accordance with the agreement now in place, BCH is required to advise DFO staff of any change in the operation of the outlet

facilities. Any such changes are carried out in accordance with DFO specifications. As a minimum, BCH is required to take precautions to avoid any fish stranding and to prepare for a fish salvage operation if need be. (Note: There is no power plant at the outlet of Coquitlam Lake and the Upper Coquitlam River).

The lower Coquitlam River has been affected by gravel-mining operations. Any high flow from the reservoir would tend to flush out sediment rather than exacerbating an existing problem. The problem of landslides is evident in the entire watershed. The high flow release from the lake may at times wash out the base of any slide taking place at the left bank of the Upper Coquitlam River.

32. ***Submitted*** *(appendix A): "****Ruskin Project****: Normal operation of the Ruskin Dam can cause daily fluctuations of 9.91 m. These rapid fluctuations have severe negative impacts on the productivity of the reservoir. The inadequate minimum flows also appear to harm fish habitat."*

Canadian Response: RUSKIN PROJECT

Normal plant operation causes 9.91 m daily fluctuations, severe negative impact on the productivity of the reservoir, inadequate minimum flows harm fish habitat:
During normal operations and operating conditions at Hayward Lake, water level fluctuation (forebay) is limited to 1.8 metres of drawdown. During periods of gate repair, the draw down may be as much as 9 metres. The statement regarding the productivity of the reservoir is correct. As the holding capacity of the Hayward Lake is limited, the flushing rate is fairly rapid which is not conducive to productivity. While there is no fish passage facility incorporated into the Ruskin Dam, there are also anadromous salmonids in the Hayward or Stave Lake.

The Ruskin power plant was operated as a peaking plant since 1930 to the mid eighties, responding to load demand during the day, with the plant shutting off at night when the load demand dropped off. This mode of plant operation definitely took a toll on the fisheries resource of the lower Stave River. Following a winter incident, during the late 1980s, of total flow shut down from the reservoir of several days duration, DFO was alerted. DFO subsequently undertook a flow study in co-operation with BCH and a set of criteria for plant operations was developed. Despite the serious impact to the mode of operation of the power plant, BCH accepted DFO's recommended operating criteria.

Various flow regime scenarios have been developed by DFO covering the critical life stages of salmon (block loading the plant during the spawning period from mid October to end of November, maintaining minimum turbine discharge during the incubation period) and implemented by BCH.

Several initiatives have subsequently been developed, all aimed at bringing back the salmon run. DFO Inch Creek hatchery started collecting brood stock from the lower Stave River, collecting eggs and incubating them in the hatchery and in the spring releasing them into the river. Two spawning channels, and a number of river channel improvement works to provide for more spawning habitats have been undertaken over the past 5 years and have been jointly funded by DFO and BCH. BCH has been contributing at the rate of $50,000 a year for the past 5 years. The success of these efforts have been phenomenal. In recent years the adult escapement of chum salmon into the Stave River has been as high as 350,000 fish from a handful of fish in early fifties.

The flow regime established at present for the lower Stave River is considered to be adequate by the DFO staff.

33. ***Submitted*** *(appendix A): "**Clowhom Project**: Drawdown of the reservoir limits littoral productivity. There is no requirement for an in-stream flow and no ramping rates restrictions in effect at this facility"*

***Canadian Response**: CLOWHOM PROJECT*

This project is located on tidewater and does not impact migratory fish populations. A minimum flow and ramping would therefore be of no benefit to fish. Reservoir operations are typical of most reservoirs in North America and are not known to impact fish spawning or rearing as the populations in the reservoir are stream spawners.

34. ***Submitted*** *(appendix A): "**Strathcona Project**: This project diverts water from the Heber River to the Elk River. Reduced flows in the Heber River negatively affect fish habitat in the Heber River, while the increased flows in the Elk River have destabilized stream banks, increasing erosion and decreasing productivity of the channel."*

***Canadian Response**: STRATHCONA PROJECT*

In 1992, the Vancouver Island Hydro/Fisheries Technical Committee (VIHFTC) was formed, as was a Lower Mainland and Southern Interior Committee, all reporting to the Hydro/Fisheries Co-ordinating Committee for Southwestern B.C.

The VIHFTC commissioned a private consultant to complete an aquatic biophysical assessment of the Heber in 1993. This report "Heber River Aquatic Biophysical Assessment" indicated the principal constraints to fish production in this system were primarily natural phenomena (several barrier falls and natural low flows) none of which are attributed to BCH's diversion. The report also indicated that the pipeline crossing of the mainstem associated with the project may represent an additional obstruction.

More recent discussions have involved assessing the concern about significant erosion in the Elk River from the Crest Creek diversion. MELP (Parks Branch) would prefer that this diversion and erosion cease within Strathcona Park. Although MELP is reviewing its concerns for resident fish stocks utilizing Elk Creek, a final decision regarding remedial action for this facility has not been taken.

35. ***Submitted*** *(appendix A): "LaDore Project: This project diverts water from both the Quinsam and Salmon Rivers. The diversion of water from these rivers during low flow periods has had a negative effect on fish populations. Increased flows in the receiving streams also negatively affect habitat"*

Canadian Response: LADORE PROJECT

There have been major losses of steelhead and coho smolt production from rearing areas upstream of the Salmon River smolt diversion screen. To minimize these concerns the fisheries agencies with input from BCH has installed a fishway, implemented a colonization and stream fertilization program, and enacted a screen monitoring program. Recently screen modification were completed to rectify screen efficiency concerns and evaluations of new screening options are now being considered for better fish protection. Anadromous spawning surveys of the upper watershed have also been proposed for the Salmon River.

A Quinsam River coho stocking assessment has been proposed but has been deferred pending further information on coho out planting details from the Quinsam Hatchery.

36. ***Submitted*** *(appendix A) "**John Hart Project**: Rapid flow fluctuations and inadequate in stream flows have negatively impacted fish habitat at this Vancouver Island project. Also, flows from spillway releases can induce fish to migrate into the canyon. These fish are then stranded in pools when spillway releases stop. Spillway releases also have the potential to elevate TGP."*

Canadian Response: JOHN HART PROJECT

The VIHFTC commissioned an aquatic study of the lower Campbell River in 1994. This study the "Lower Campbell River Aquatic Study"[40] [Tab 36] included field work and analysis and was completed for the Campbell River estuary in 1994. Earlier work included assessing the abundance of salmonids in the estuary, growth of juvenile chinook salmon (hatchery & wild stocks), and a mapping program of available fish habitat in the estuary. In 1995, a study of the carrying capacity of the lower river was completed.

During 1995, the Second Island side channel was installed a short distance below the powerhouse and additional spawning gravels were placed in the Elk Falls Side Channel.

The above activities were undertaken in response to the extreme flow variations (releases from John Hart Dam) that has resulted in the loss of suitable rearing and spawning habitat and to address the concern with lack of gravel replenishment to the river.

37. ***Submitted*** *(appendix A): "****Puntledge Project****: Extensive drawdown of the reservoir reduces fish productivity".*

Canadian Response: PUNTLEDGE PROJECT

Permanent inclined screens were installed in the penstocks (Eicher screens) at the Puntledge diversion dam in the spring of 1993 to provide safe downstream passage for juvenile salmonids. Generally, since these screens were implemented, downstream juvenile migration survival has improved from approximately 42% prior to screening to about 99% since screening[41] [Tab 36]. With the operation of the existing fishways, natural ascent of anadromous species can now be safely realized into Comox Lake and tributary streams and historic levels of fish production are now attained in the upper watershed.

DFO investigated the feasibility of a Comox Lake/Puntledge River cold water[42] [Tab 36] supply in 1993 due to abnormal high lake and river temperatures and the outbreak of PKD in 1992. Implementation of this project was put on hold due to cost estimates of over 2 million dollars.

An aquatic biophysical assessment of the upper Puntledge River (Comox Lake tributaries) was completed in 1994 at the request of the VIHFTC. Stocking strategies have also been discussed for the upper watershed. An aquatic biophysical assessment of the lower Puntledge River watershed[43] [Tab 36] was conducted in 1995 at the request of the VIHFTC.

38. ***Submitted*** *(appendix A) "****Ash Project****: The impoundment of water in reservoirs has raised temperatures to harmful levels during the summer months. Inadequate streamflow negatively affects fish and can cause increased temperatures during summer months."*

Canadian Response: ASH PROJECT

In 1993, the "Ash River Aquatic Biophysical Assessment"[44] [Tab 36] was completed. This report suggested no deleterious impacts were evident from the Elsie Lake facilities and operations on fish habitat. However, densities of juvenile fish were below levels which could be sustained by existing habitat. Facilities at Elsie have not impeded the migration of any anadromous stocks and the cold water releases from Elsie Lake have benefited fish due to reduced stream temperatures. No outstanding needs for migration related to the Elsie Lake Facilities and operations were identified. No substantive changes were recommended to the current operation of the Elsie Lake reservoir.

Further studies regarding BCH's proposed "Ash River Additional Capacity Study"[45] [Tab 36] of 1995 were reviewed by DFO and serious potential concerns with proposed storage levels in Elsie and Great Central Lakes, water temperatures, and the negative implications for sockeye salmon stocks were noted in DFO's response to BCH. The response also outlined a cold water pipeline concept to connect Great Central Lake to the Stamp River which could mitigate the potential problems.

Ash River enhancement, including modification of falls and spawning gravel placement, has been proposed for the 1997/98 fisheries window.

39. ***Submitted*** *(appendix A): "****Jordan River Projects****: Reservoir fluctuation limits fish productivity. Inadequate minimum flows appear to limit fish productivity. There are no in-stream flow requirements or ramping rate restrictions in effect for these projects."*

Canadian Response*:* ***JORDAN RIVER PROJECT***

An informal minimum flow agreement of 35-40 cfs at all times was entered with BCH in 1964. This agreement was primarily for the protection of some 5000 pink salmon (though small numbers of coho, chum, and steelhead also utilized the river) that was expected to spawn in the river below Elloitt Lake. Minimum flow releases were apparently still provided in 1977 though no anadromous species had been documented in the lower river since 1970/71.

A "Biophysical Assessment of Fish Production"[46] [Tab 36] within the Jordan River drainage was completed in 1996. These studies identified seasonal absence of flows in the Jordan River mainstem downstream of Diversion and Elliott reservoirs but compensational releases of flow were not recommended because flow releases would be at the expense of lowering reservoir levels which would have a more significant impact on fish habitat. No anadromous fish stocks were documented in the river during the above field studies undertaken in 1994 to 1996.

Decisions have been made in the past that did not always include adequate information on all fish stocks, carrying capacities, and accurate flow requirements. DFO, with assistance from MELP and BCH are striving to collect and review all relevant criteria to provide the best possible solutions and ensure the protection of the fisheries resource. Emphasis on "due diligence" and "fisheries resource stewardship" are being used to provide compliance under the *Fisheries Act*.

V. CONCLUSION

Canada supports the Article 14 process. The submissions and factual record provisions of the NAAEC are among its most important and innovative. Canada views this process as a positive and constructive tool through which the public can help the parties to the NAFTA improve their environmental enforcement. However, Canada submits that, in this instance, development of a factual record is not warranted for the following reasons:

- the assertions concerning the enforcement of the *Fisheries Act* are subject of pending judicial or administrative proceedings within the meaning of Article 14(3)(a);
- Canada is fully enforcing the environmental provisions of both the *Fisheries Act* and the NEB has properly utilized its power under the *National Energy Board Act*;
- the provisions of the NAAEC cannot be applied retroactively to assertions of a failure to effectively enforce environmental laws prior to the coming into force of the NAAEC on January 1, 1994. Furthermore, the *Fisheries Act* cannot be applied retroactively; and
- the development of a factual record would not further the objectives of the NAAEC given the detailed information provided in this response.

It would be contrary to 14(3)(a) of the NAAEC for the Secretariat to proceed further on this matter, as the submission raises issues that are pending before both the Federal Court of Canada and the Supreme Court of British Columbia.

Canada has effectively enforced s. 119.06(2) of the *NEB Act* as the NEB acted within its discretion in deciding that the evidence filed before it by the British Columbia Wildlife Federation was not strong enough to warrant recommending a designation order for a public hearing.

Canada submits that the NAAEC should not be applied retroactively. All the B.C. Hydro facilities referred to by the submitters were built prior to the entry into force of the NAAEC, and so any allegations of failure to enforce environmental laws related to the construction and operation of B.C. Hydro facilities before January 1, 1994, should not be addressed by the Secretariat.

Canada takes a comprehensive view of enforcement, and submits that the submitters' limited view only encompasses one component of a much wider system of compliance seeking activities which collectively constitute the proper enforcement of environmental laws in a modern and complex society. Further, it is just such a wide ranging system of compliance mechanisms and activities that is envisioned in the NAAEC and illustrated under Article 5 of NAAEC on "Government Enforcement Action".

Article 5 of the NAAEC clearly identifies a number of compliance-seeking mechanisms and activities other than legal or judicial action as forms of enforcement under the NAAEC. As such, compliance activities clearly form part of the continuum that has been identified as "enforcement" under Article 5, and this continuum explicitly extends beyond the more limited view of enforcement that simply equates enforcement with legal and judicial action.

The NEB considered the evidence which British Columbia Wildlife Federation filed concerning fisheries impacts. The Board was entitled to determine the weight to put on that evidence, and to make the conclusion that the evidence was not strong enough to warrant a finding that the electricity export proposed in the application would result in an adverse environmental impact. The NEB acted properly, within its jurisdiction, and within its discretion.

Canada is effectively enforcing its environmental laws. Canada has determined that a range of compliance activities, from voluntary compliance and compliance agreements to legal and judicial sanctions, are the most productive in terms of providing for the long-term protection of the environment with respect to fish and fish habitat. Canada does not hesitate to utilize the full power of its laws to protect fish and fish habitat, where the exercise of these powers is deemed by Canada to be the appropriate response. Given Canada's full and complete disclosure and case by case response, the development of a factual record would not, in this instance, significantly further the objectives of the NAAEC.

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