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Unsafe Dams? A Report by the IJC

International Joint Commission

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International Joint Commission
Commission mixte internationale

A report to the governments of the United States and Canada on the safety of dams and dykes which are subject to International Joint Commission Orders.

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I. Introduction

PURPOSE AND SCOPE

This report examines existing procedures and institutions responsible for dam safety and outlines proposals and recommendations for further action by governments. The International Joint Commission's (Commission) inquiry covered a range of factors that contribute to the safe operation of dams and dykes that are subject to its Orders (Regulated Facilities). These factors include requirements for comprehensive inspection programs, proper maintenance and repairs, adequate emergency action plans with inundation maps, evacuation plans and public awareness programs, and the geography and other features of a watershed that could affect safety.

CONCERNS

There are good reasons for addressing the safety of Regulated Facilities at this time. Many of them were constructed over thirty years ago. A failure of one of these dams could have serious if not catastrophic consequences for persons and property in both countries. Although age alone does not determine the useful life of a structure, engineered structures do not last forever. To remain safe, dams require proper inspection, maintenance and repair programs, and the establishment and regular testing of emergency procedures.

In recent years, the Commission has reviewed the terms of some of its Orders of Approval for the construction of such structures. It has become aware that some of its Regulated Facilities are in need of repair and that some existing programs have not ensured that these repairs were made. These concerns have led the Commission to take stock of measures in place for assessing and ensuring the stability of its Regulated Facilities and responding to any emergencies.

A failure of one of these dams could have serious if not catastrophic consequences for persons and property in both countries.

Existing legislation, regulations, practices and government oversight are insufficient to ensure that Regulated Facilities are safe.

Existing legislation, regulations, practices and government oversight are insufficient to ensure that Regulated Facilities are safe. This does not necessarily mean that any Regulated Facilities are unsafe, but the Commission does not have full confidence in all existing safety programs.

Government oversight alone does not ensure safety. Safety depends on the content of government programs and on the way in which those programs are implemented.

The Commission, nevertheless, is concerned about the absence of any government oversight of Regulated Facilities in New Brunswick and in Ontario. Regulated Facilities in British Columbia are no longer subject to regular government inspections. Oversight in that province is now based primarily on audits and monitoring instead of regular government inspections. There are no other provinces in Canada in which Regulated Facilities are in operation[1].

[1] In 1937, the Commission approved a reclamation project on the Richelieu River in Quebec. This project, which was to be undertaken by the Canadian government, has not been completed.

Federally owned or licensed Regulated Facilities in the United States are subject to regular government inspections. This is not, however, the case for all Regulated Facilities in the United States. In Maine and Minnesota, for example, there are no regular state inspections of Regulated Facilities not covered by federal programs.

The absence of government inspection programs has not only domestic but also cross-boundary implications. It is the Commission's responsibility to draw transboundary water problems of this nature to the attention of governments.

This report provides an overview of existing inspection requirements and procedures followed by governments and owners of Regulated Facilities. The report highlights the information that has led the Commission to its conclusions and recommendations.

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II. Jurisdiction

The Boundary Waters Treaty of 1909 established certain principles, obligations and procedures to be followed by Canada and the United States to prevent disputes and settle issues along their common boundary. The governments agreed in Article III that all future uses, obstructions and diversions of boundary waters on either side of the line that affect the natural level or flow of those waters on the other side would be approved by the Commission unless they are provided for in a special agreement between the United States and Canada. Article IV creates similar requirements for works in waters flowing from boundary waters or in rivers that cross the boundary if they raise water levels upstream in the other country.

When considering applications for the approval of Regulated Facilities, the Commission must follow certain principles set out in Article VIII of the treaty. These include requirements for the protection of interests in the other country if the works will increase natural levels. The Commission's Orders generally contain conditions concerning the maintenance and operation of Regulated Facilities and specify limits or operating bands for water levels and flows. Furthermore, the Commission almost always appoints boards of control to ensure that Regulated Facilities are operated in accordance with its Orders.

The 1938 Rainy Lake Convention between the United States and Canada is somewhat different. It authorizes the Commission to determine when emergency conditions exist in the Rainy Lake watershed and empowers the Commission to adopt measures of control that it might deem proper with respect to structures in the boundary waters of the watershed.

A list of Regulated Facilities subject to the Commission's continuing jurisdiction is in Appendix 1. The locations of these Regulated Facilities are shown in Appendix 6.

III. The Commission's Past Actions

The Commission has been concerned about the integrity and safety of Regulated Facilities in the past. A number of Orders address the issue of maintenance and Commission boards occasionally act on maintenance issues. The Commission's International Lake Superior Board of Control, for example, has adopted safety inspection guidelines that are followed by the owners of Regulated Facilities within that board's area of responsibility. Other boards have also, on occasion, informed the Commission about safety-related matters, allowing it to alert governments to these issues. Commission boards have generally not addressed issues related to the safety of Regulated Facilities as a regular part of their work.

Because of concerns raised by the Commission about the integrity and operating capability of the old Zosel Dam near Oroville, Washington, steps were taken by Washington State in the early 1980's to construct new works to control ouflows from Osoyoos Lake. Boards have also commented on the condition of Regulated Facilities at Kettle Falls at the outlet of Namakan Lake and on the St. Croix River. Recently, the International Kootenay Lake Board of Control has drawn attention to the deterioration of dykes along the Kootenay River near Creston, British Columbia, and the Commission has alerted governments to this situation.

Events such as the 1976 failure of Teton Dam in Idaho and the more recent 1996 Saguenay floods in Quebec underline the importance of dam safety and the need for emergency preparedness.

IV. The Commission's Investigation

INITIAL REQUESTS FOR INFORMATION

In December 1995, the Commission alerted the Canadian and United States governments to potential dam safety issues at Regulated Facilities along the St Croix River so that the governments could notify the appropriate authorities. The Commission received no response to its letter. In an October 1996 letter, the Commission wrote again expressing concern that the situation on the St Croix is likely to repeat itself elsewhere, noting that most Regulated Facilities in boundary waters and transboundary rivers were built over thirty years ago. The letter expressed concern about the safety and emergency operation of all Regulated Facilities, and said that the Commission was considering an inquiry to obtain more information, as well as the possibility of amending its Orders to require the owners to provide government safety certificates periodically. Apart from an interim reply from the Canadian Minister of Foreign Affairs, neither government has responded to the concerns raised by the Commission.

In November 1996, the Commission wrote to the owners of Regulated Facilities asking for information on the nature and frequency of government safety inspections and requesting a copy of the most recent safety inspection certificates issued by a government authority. The Commission also asked its boards of control to provide information about emergency procedures for Regulated Facilities.

PUBLIC HEARING

In Ottawa on February 19, 1997, the Commission held a public hearing to obtain information about the safety of Regulated Facilities. A list of the persons who spoke at the Commission's hearing and a list of the persons who provided the Commission with written submissions are contained in Appendix 2.

SITE VISITS

In the summer and fall of 1997, the Commission visited the Milltown and Grand Falls Dams on the St. Croix River and the Corra Linn Dam at the outlet of Kootenay Lake. During these visits, Commissioners spoke with the owners' staff about maintenance and emergency preparedness practices. In the spring of 1997, the Commission attended Ontario Hydro's annual Emergency Preparedness Plan Co-ordination Meeting and the New York Power Authority's Emergency Action Plan exercise for the St. Lawrence-FDR Power Project.

The information the Commission obtained from hearings, responses to inquiries and on-site visits provided the basis for the following findings.

V. Findings

MAINTENANCE CONCERNS

Some Regulated Facilities were built early in the century. With aging facilities, maintenance programs are an absolute necesssity. Continuing maintenance programs are being implemented in some cases. Monies that owners budget for maintenance work are, however, sometimes not spent. This is, in part, because such expenditures are discretionary and market forces impose other priorities.

GOVERNMENT OVERSIGHT

The United States and Canada have very different approaches to oversight of dam safety.

In the United States, recent federal dam safety legislation brings together expertise and resources of the federal and non-federal communities to reduce the hazard. A synopsis of the U.S. National Dam Safety Program, which was passed in November 1996, is included in Appendix 3. Because this legislation is new, many programs and guidelines are still being developed or revised.

Many of the Regulated Facilities in the United States are either federally owned or are operated and maintained under the supervision of the U.S. Federal Energy Regulatory Commission (FERC), which performs inspections and imposes safety inspection, maintenance and emergency planning requirements. Table 1 shows the ownership and oversight of Regulated Facilities in the United States.

With aging facilities, maintenance programs are an absolute necessity.

TABLE 1:

Ownership and Regular Government Inspection of Regulated Facilities in the United States

Regulated Facilities	Ownership	Regular Inspections by Governments in the U.S.
Forest City Dam (U.S. portion)	Georgia-Pacific Corporation	Federal Energy Regulatory Commission (FERC)[2]
Vanceboro Dam (U.S. portion)	Georgia-Pacific Corporation	FERC
Grand Falls Dam (St. Croix River) (U.S. portion)	Georgia-Pacific Corporation	None
Milltown Dam (U.S. portion)	New Brunswick Power	None
St. Lawrence-FDR Power Project, Long Sault Spillway Dam and Iroquois Dam in the United States	New York Power Authority[3]	FERC
Compensating Works at Sault Ste. Marie (U.S. portion)	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers
Prairie Portage Dam (U.S. portion)	U.S. Department of Agriculture, Forest Service	U.S. Department of Agriculture, Forest Service
International Kettle Falls Dam (U.S. portion)	Boise Cascade Corporation	None
Fort Frances-International Falls Dam (U.S. portion)	Boise Cascade Corporation	FERC
Grand Coulee Dam	U.S. Bureau of Reclamation	U.S. Bureau of Reclamation
Osoyoos Lake Control Structure	State of Washington	State of Washington, Department of Ecology

[2] In a December 23, 1997 Order constituting a final agency action, FERC decided that the Forest City Dam is not required to be licensed, and that FERC's jurisdiction will cease as of the expiration of the original license in 2000.

[3] Iroquois Dam is located in both the United States and Canada. It is owned jointly by the New York Power Authority and Ontario Hydro and is operated by Ontario Hydro.

In the United States, states are responsible for the safety of dams not subject to federal oversight.

FERC has agreements with the U.S. Department of Energy and the U.S. Nuclear Regulatory Commission to perform dam safety inspections on a cost-reimbursable basis. Furthermore, the U.S. Army Corps of Engineers or the U.S. Bureau of Reclamation can be retained by any government entity to provide assistance in dam safety activities, including inspections, on a cost-reimbursable basis.

In the United States, states are responsible for the safety of dams not subject to federal oversight. Although 48 states, including all states along the border with Canada, have set up dam safety programs following the guidance of the Model State Dam Program, programs vary between states. In addition, states may participate in the U.S. National Dam Safety Program, which offers assistance for state dam safety programs.

Three privately owned Regulated Facilities that are partly located in the United States are not subject to federal oversight. Two are located in Maine and the other

in Minnesota. Both states have dam safety legislation [Minnesota Statutes, Chapter 779 (1978), as amended in Chapter 105 (1979); Maine Revised Statutes Annotated, Title 37B, Chapters 21 and 22]. The Commission learned that these privately owned structures have been inspected by the states infrequently or not at all. Evidence was given at the Commission's hearing that inspections conducted by Maine have been cursory. The Commission understands that Maine is developing and staffing its dam safety program and anticipates substantial progress by the summer of 1998.

The Canadian Government has not enacted a dam safety program for Regulated Facilities, and these facilities are not subject to regular provincial inspections. Table 2 shows the ownership and oversight of Regulated Facilities in Canada.

TABLE 2:

Ownership and Regular Government Inspection of Regulated Facilities in Canada

Regulated Facilities	Ownership	Regular Inspection by Governments in Canada
Forest City Dam (Canadian portion)	Georgia-Pacific Corporation	None[4]
Vanceboro Dam (Canadian portion)	Georgia-Pacific Corporation	None[4]
Grand Falls Dam (St. Croix River) (Canadian portion)	Georgia-Pacific Corporation	None
Milltown Dam (Canadian portion)	New Brunswick Power	None
Grand Falls Dam (Saint John River)	New Brunswick Power	None
Saunders Generating Station, Cornwall Dyke and Iroquois Dam in Canada	Ontario Hydro[5]	None[5]
Compensating Works (Canadian portion) at Sault Ste. Marie	Great Lakes Power	None
Prairie Portage Dam (Canadian portion)	U.S. Department of Agriculture, Forest Service	None[6]
Kettle Falls (Squirrel Falls) Dam in Canada	Abitibi Consolidated Inc.	None
International Kettle Falls Dam (Canadian portion)	Abitibi Consolidated Inc.	None
Fort Frances-International Falls Dam (Canadian portion)	Abitibi Consolidated Inc.	None
Kootenay River Dykes in Canada	Individual Landowners	None
Corra Linn Dam	West Kootenay Power	None
Waneta Dam	Cominco Ltd.	None

[4] The dam is located both in the United States and Canada; FERC inspects the entire structure. As stated in footnote 2, in a December 23, 1997 Order constituting a final agency action, FERC decided that the Forest City Dam in the United States is not required to be licensed, and that FERC's jurisdiction will cease as of the expiration of the original license in 2000.

[5] The Iroquois Dam is located both in the United States and Canada; FERC inspects the entire structure. It is owned jointly by the New York Power Authority and Ontario Hydro and is operated by Ontario Hydro.

[6] The dam is located both in the United States and Canada; the U.S. Department of Agriculture inspects the entire structure.

British Columbia, New Brunswick and Ontario have Regulated Facilities in operation. British Columbia has dam and dyke safety programs based primarily on audits and monitoring. The other two provinces do not have dam safety programs. Ontario, like Maine, is developing a dam safety program. Appendix 4 provides a synopsis of provincial dam safety requirements.

Many Regulated Facilities straddle the United States-Canadian border, with each side subject to a different government jurisdiction. Given the lack of comprehensive government safety regulation, sometimes only part of a structure is subject to government oversight. Potential problems on either side can, however, pose risks for both sides of the border. This situation highlights the necessity of cross-boundary coordination, both for safety inspections and emergency preparedness.

The Canadian Government has not enacted a dam safety program for Regulated Facilities, and these facilities are not subject to regular provincial inspections.

The Commission has been informed that the United States Federal Energy Regulatory Commission inspects the whole of the Iroquois, Forest City and Vanceboro Dams, including the portions of those structures that are in Canada. The Iroquois Dam straddles the international border in the St. Lawrence River and is owned jointly by the New York Power Authority and Ontario Hydro. It is operated by Ontario Hydro. The Forest City and Vanceboro Dams straddle the international border in the St. Croix River and are owned by Georgia-Pacific Corporation. The Canadian, New Brunswick and Ontario governments do not inspect or oversee the safety of these dams. The Prairie Portage Dam is owned and inspected by the United States Department of Agriculture, Forest Service, on both sides of the border. It is the Commission's view that the Canadian and United States governments should put in place suitable arrangements for joint oversight of these and other similar structures.

The Commission has found that there may not be regular government safety reports for structures listed in Table 3.

TABLE 3:

Dams for which regular domestic government inspections and inspection reports may not be available.

Dams in the United States	Owner	Location
Grand Falls Dam (U.S. portion)	Georgia-Pacific Corporation	St. Croix River, Maine
Milltown Dam (U.S. portion)	New Brunswick Power	St. Croix River, Maine
International Kettle Falls Dam (U.S. portion)	Boise Cascade Corporation	Namakan Lake, Minn.

Dams in Canada	Owner	Location
Forest City Dam[7] (Canadian portion)	Georgia-Pacific Corporation	St. Croix River, N.B.
Vanceboro Dam[7] (Canadian portion)	Georgia-Pacific Corporation	St. Croix River, N.B.
Grand Falls Dam (Canadian portion)	Georgia-Pacific Corporation	St. Croix River, N.B.
Milltown Dam (Canadian portion)	New Brunswick Power	St. Croix River, N.B.
Grand Falls Dam	New Brunswick Power	Saint John River, N.B.
Saunders Generating Station and Cornwall Dyke	Ontario Hydro	St. Lawrence River, Ont.
Iroquois Dam[7] (Canadian portion)	Jointly owned by Ontario Hydro and New York Power Authority	St. Lawrence River, Ont
Compensating Works at Sault Ste. Marie (Canadian portion)	Great Lakes Power	St. Marys River, Ont.
International Kettle Falls Dam (Canadian portion)	Abitibi Consolidated Inc.	Namakan Lake, Ont.
Kettle Falls (Squirrel Falls) Dam	Abitibi Consolidated Inc.	Namakan Lake, Ont.
Fort Frances-International Falls Dam (Canadian portion)	Abitibi Consolidated Inc.	Rainy Lake, Ont
Kootenay River Dykes	Local Landowners	Kootenay River, B.C.
Corra Linn Dam	West Kootenay Power	Kootenay River, B.C.
Waneta Dam	Cominco Ltd.	Pend d'Oreille River, B.C.

[7] See penultimate paragraph under section on Government Oversight on page 10 of this report.

DAM SAFETY ASSOCIATIONS

Organizations have been formed in both the United States and Canada to promote dam safety. In the United States, the Association of State Dam Safety Officials, in conjunction with the National Dam Safety Program, the Federal Emergency Management Agency, and the Interagency Committee on Dam Safety, provides a forum for exchanging ideas and experiences on dam safety issues, for fostering inter-state and inter-government cooperation in dam safety, and for providing information and assistance to state dam safety programs and officials. The association represents state interests before Congress and federal agencies responsible for dam safety, and works to improve the efficiency and effectiveness of state dam safety programs.

The Canadian Dam Safety Association (CDSA) was founded to advance the implementation of practices that ensure the safe operation of dams in Canada. The Commission understands that the CDSA is joining with the Canadian Committee on Large Dams to form the Canadian Dam Association. This association will continue to provide a forum for the exchange of ideas and experiences with respect to dam safety, foster inter-provincial cooperation, promote the adoption of regulatory policies and safety guidelines for dams and reservoirs throughout Canada, and provide information and assistance to dam owners. Safety guidelines developed by the CDSA are influential in Canada with both dam owners and governments. The guidelines are, however, entirely voluntary and cannot take the place of rigorous government oversight. The Commission heard evidence that the guidelines are not standards or specifications but a useful reference for dam owners.

SITE INSPECTIONS, MAINTENANCE AND REPAIRS

As Appendix 5 shows, there is considerable variation in the way in which Regulated Facilities are inspected.

Regulated Facilities owned and operated by United States federal agencies are inspected by those agencies. The U.S. Army Corps of Engineers conducts inspections every five years and the U.S. Bureau of Reclamation conducts inspections every three years. The U.S. Forest Service conducts visual inspections annually and safety inspections every five to ten years.

Potential problems on either side can... pose risks for both sides of the border

The [Canadian] guidelines are... entirely voluntary and cannot take the place of rigorous government oversight.

FERC inspects structures subject to its oversight. FERC engineers inspect structures with high and significant hazard potential annually, and those classified as having low hazard potential biennially. During each inspection performed by FERC staff, dam safety and operation and maintenance aspects are evaluated, as well as public safety matters and environmental requirements and conditions covered by FERC dam safety regulations and license requirements. In addition, FERC requires structures subject to its oversight to be inspected by an independent consultant every five years if the dam exceeds certain specified height and impoundment criteria or has a high hazard potential. The independent consultant must be a licensed professional engineer with at least ten years of experience and expertise in dam design and construction and in the investigation of the safety of existing dams. The consultant must also be pre-approved by FERC. FERC regulations specify procedures for inspections, preparing inspection reports and implementing corrective measures.

Water Resources Program engineers from the State of Washington's Department of Ecology inspect the state-owned Osoyoos Lake Control Structure (Zosel Dam)

annually. Engineers from the Dam Safety Section, a separate portion of the Department of Ecology, inspect Zosel Dam every five years.

Regulated Facilities in the United States, owned or operated by government agencies or subject to U.S. federal government oversight, appear to have government programs in place to ensure that repairs recommended in site inspection reports are carried out.

In Canada, the only government dam safety program for Regulated Facilities at either the federal or provincial level is administered by the Province of British Columbia. The province monitors dam and dyke owners to ensure that they are discharging their responsibility to maintain safe structures. In the case of dams, provincial officials audit inspection reports prepared by consulting engineers whom owners are required to engage. The province is in the process of preparing special dam safety regulations, policies and procedures which will include guidelines for how consulting engineers are to conduct their inspections and for their selection.

The Commission has been told that the Province of Ontario is also developing a dam safety program which may require dam owners in the province to engage consulting engineers to inspect their structures following a modified set of the CDSA guidelines.

In addition to meeting any government requirements, owners of Regulated Facilities usually have their own self-inspection programs to protect their investments and avoid liability. These inspections are often conducted by consulting engineers and, in Canada, usually follow the CDSA guidelines. The Commission has been told that these reports are treated differently by different companies. The reports are not always available to the public and not automatically referred to boards of directors or senior management. External reporting to governments occurs only where there are legislative requirements, which are largely absent in Canada. Self-inspections raise the possibility of conflicts of interest as there is no government oversight of owner-hired engineers. Without government oversight, there is no assurance that owners will follow up on recommendations coming from their own reviews and implement the recommendations of their inspections.

EMERGENCY ACTION PLANS

Information provided to the Commission indicates that emergency action plans do not exist for all Regulated Facilities. Fortunately, there are plans for most high-hazard dams. Considerable variation exists among the plans. Even though failures could in some instances put cities and major highways at risk, the Commission has observed that emergency preparedness training is not always taken seriously by participants, and governments at all levels are not always fully involved. In some cases, such as in the Rainy Lake Basin and in the St. Croix River, there are dams in series. In these situations, the failure of one dam might affect others downstream. Appendix 5 contains information on government oversight, emergency action plans, and inundation mapping for each of the Regulated Facilities.

The Commission is not satisfied that all existing emergency action plans adequately take into account such matters as the effects of potential upstream dam failures, the possibility of earthquakes, the need for on-site personnel, security requirements and the extent of potential transboundary and domestic loss of life and injury. The Commission believes that emergency preparedness plans which take these factors properly into account should be developed and tested for all Regulated Facilities.

...emergency action plans do not exist for all Regulated Facilities.

...failures could in some instances put cities and major highways at risk...

VI. Conclusions

The Commission agrees with the Canadian Dam Safety Association that "the prime responsibility for public protection" ultimately rests with government.

The existing situation in which some Regulated Facilities are not subject to comprehensive government safety inspections and oversight by governments is unsatisfactory. Throughout the United States it is at least possible for government entities to engage the U.S. Army Corps of Engineers or the U.S. Bureau of Reclamation to perform safety inspections. In Canada, there does not appear to be any way of obtaining regular government safety inspections for Regulated Facilities.

...“the prime responsibility for public protection” ultimately rests with government.

The existing situation in which some Regulated Facilities are not subject to comprehensive government safety inspections and oversight by governments is unsatisfactory.

Without government oversight there is no effective means of ensuring accountability for activities that can put the lives and property of Canadian and United States citizens in jeopardy.

Inspections which are initiated and directed by owners without oversight by a government body may not have the same objectives as government inspections which are aimed at protecting the public. There is no assurance that owner-initiated inspections will be carried out with the frequency and scope needed to protect the public interest. The reports of owner-initiated inspections are usually not available to the public. Owners are under no obligation to implement recommendations contained in their reports. The public and governments have no way of ensuring that the inspector's recommendations are followed. There is no way to ensure that emergency action plans exist or are regularly tested or updated. Without government oversight there is no effective means of ensuring accountability for activities that can put the lives and property of Canadian and United States citizens in jeopardy.

VII. Recommendations

The Commission recommends that governments oversee the safety of Regulated Facilities. This government oversight should include requirements for:

- regular, periodic, complete and independent on-site inspections by qualified experts;
- a reasonable timetable for implementation of all inspection report recommendations;
- establishment and regular testing of emergency action plans which take account of eventualities and include detailed notification procedures, identification of responsibilities, provision for transboundary coordination, and inundation maps; and
- public access to all reports and documentation relating to safety issues.

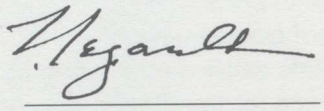
The Commission also recommends that the Canadian and United States governments put in place suitable arrangements for joint oversight of structures that extend across the border.

If the Commission does not receive a substantive response from the Canadian and United States governments by June 1, 1998, about how they are going to deal with the issues raised in this report, the Commission may consider amending its Orders to require the owner of each Regulated Facility to provide the Commission periodically with a certified copy of a safety inspection report prepared by a government official for the structure. These reports would have to be provided on a periodic basis commensurate with the hazard posed by a particular structure. The level of hazard would be established according to rules prescribed by Canadian and United States agencies. Owners would also be required to confirm that all maintenance and repairs recommended in the government's safety report are being undertaken within a reasonable time. Furthermore, owners would be required to develop and provide the Commission with copies of an emergency action plan developed in concert with governments.

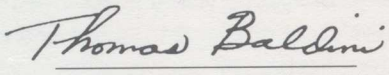
Until the Commission's recommendations are accepted by governments, the Commission recognizes that there may be structures for which regular government safety reports are still not available, as listed in Table 3. The Commission will consider possible means of addressing public safety in the interim.

The Commission attaches great importance to public safety and would welcome any views which the governments or others may have about how best to ensure that Regulated Facilities are maintained and operated safely.

The Commission recommends that governments oversee the safety of Regulated Facilities.



Leonard H. Legault
Canadian Chairman



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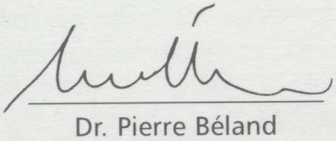
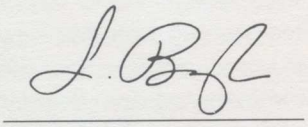
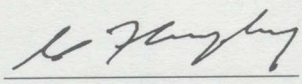


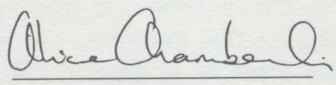
Dr. Pierre Béland
Commissioner



Susan B. Bayh
Commissioner



Francis Murphy
Commissioner



Alice Chamberlin
Commissioner

Structures under Commission Jurisdiction

1. St. Croix and Saint John Rivers

Three dams (Forest City Dam, Vanceboro Dam, and Grand Falls Dam) on the international portion of the St. Croix River are owned and operated by Georgia-Pacific Corporation. Grand Falls Dam at Kellyland, Maine, was constructed pursuant to a 1915 IJC Order of Approval and serves as a storage dam and a source of hydro-power for the Georgia-Pacific Corporation facility at Woodland, Maine. Further upstream, Vanceboro Dam at the outlet of Spednik Lake and Forest City Dam at the outlet of East Grand Lake are operated by Georgia-Pacific Corporation under a 1965 Commission Order of Approval.

Grand Falls Dam on the Saint John River and Milltown Dam near the mouth of the St. Croix River are storage and power dams owned and operated by New Brunswick Power pursuant to Orders issued by the Commission in 1926 and 1934, respectively.

2. St. Lawrence River

The construction of the St. Lawrence River Power Project at Cornwall, Ontario, and Massena, New York, including the Moses-Saunders Dam, the Long Sault Spillway Dam, the Iroquois Dam, and a series of dykes on both sides of the river, was completed by the governments of Canada and the United States pursuant to an Order of Approval issued by the Commission in 1952. Except for Iroquois Dam, the project is owned and operated by Ontario Hydro, in Canada, and the New York Power Authority, in the United States. The Iroquois Dam is jointly owned by the two power entities but operated by Ontario Hydro.

3. St. Marys River (Lake Superior)

In 1914, the Commission approved separate Canadian and United States applications for the construction of Compensating Works in the St. Marys River to divert water on each side for power purposes. The Compensating Works are owned by the U.S. Army Corps of Engineers in the United States and by Great Lakes Power in Canada. Two Supplementary Orders were issued in 1978. One approved a request by Great Lakes Power to redevelop its hydro-electric power facility at Sault Ste. Marie. The other provided for construction of a berm for the protection of the fishery in the St. Marys rapids.

4. Rainy-Namakan Watershed

The Commission issued Orders in 1939 and 1968 for the construction and subsequent reconstruction of a dam at Prairie Portage at the outlet of Sucker Lake. The Prairie Portage Dam is owned by the U.S. Department of Agriculture, Forest Service.

A 1970 Commission Order specifies the manner in which the Kettle Falls Dam, at the outlet of Namakan Lake, and the Fort Frances-International Falls Dam, at the outlet of Rainy Lake, shall be operated to avoid emergency conditions. These structures are owned by Boise Cascade Corporation in the United States and by Abitibi Consolidated Inc. in Canada.

5. Kootenay River

A number of Commission Orders of Approval have been issued since 1928 to various applicants for dykes in the Kootenay Flats area of British Columbia.

In 1938, the Commission issued an Order of Approval which allows West Kootenay Power to operate the Corra Linn Dam in British Columbia so as to store water on Kootenay Lake.

6. Columbia River

A 1941 Commission Order approved construction and operation of the Grand Coulee Dam and Reservoir by the U.S. Bureau of Reclamation.

7. Pend d'Oreille River

In 1952, the Commission issued an Order of Approval for the construction and operation of the Waneta Dam and Reservoir on the Pend d'Oreille River in British Columbia by Cominco Ltd.

8. Okanagan River

In 1946, the Commission issued an Order of Approval for the original Zosel Dam which had been constructed in 1928 in Washington State at the outlet of Osoyoos Lake. In 1982, the Commission issued an Order of Approval permitting the State of Washington to construct and operate a new control structure near the outlet of Osoyoos Lake to replace the original dam.

APPENDIX 2

List of those who spoke at the Commission's hearing at Ottawa on February 19, 1997.

Mr. J. Abbott, Member of Parliament, Kootenay East, British Columbia
Mr. P. Brown, U.S. Army Corps of Engineers, Washington Office
Mr. J. Grundstrom, U.S. Army Corps of Engineers, Detroit District
Mr. A. Tawil, Canadian Dam Safety Association
Dr. E. Elsayed, Ontario Hydro
Mr. D. Pennell, Ontario Hydro
Mr. W. Broderick, New York Power Authority
Mr. A. McPhee, Great Lakes Power Limited
Mr. B. Clarida, Great Lakes Power Limited
Mr. H. Walsh, Great Lakes Power Limited
Mr. T. Howard, Georgia-Pacific Corporation
Mr. J. Lofgren, Boise Cascade Corporation

List of those who provided the Commission with written submissions.

Georgia-Pacific Corporation
Ontario Hydro
Great Lakes Power Limited
Cominco Ltd.
West Kootenay Power
Mr. Grant Christenson, Secretary, Kootenay Valley Associated Dyking Districts
Mr. Bob Rogers
Mr. Ron Hamel
St. Croix International Waterway Commission
U.S. Army Corps of Engineers
Province of British Columbia

APPENDIX 3

U.S. National Dam Safety Program (33 USCS §§467 et seq.)

The National Dam Safety Program, administered by the Director of the Federal Emergency Management Agency (FEMA), applies to both federal and non-federal dams. Although the legislation targets dams at least 25 feet high and impounding at least 25 acre-feet of water, it can encompass any barrier that the Director determines is likely to pose a significant threat to human life or property if the barrier fails. The Director has the authority to establish an advisory National Dam Safety Review Board (Board) to advise and assist the Director on implementation of the program. The legislation also establishes an Interagency Committee on Dam Safety (ICODS) to encourage the establishment and maintenance of effective federal and state programs, policies, and guidelines intended to enhance dam safety for the protection of human life and property. The Director, in consultation with ICODS and state dam safety agencies, and the Board are responsible for establishing and maintaining a coordinated national dam safety program.

The objectives of the program are to ensure that new and existing dams are safe through the development of technologically and economically feasible programs and procedures for national dam safety hazard reduction; encouragement of acceptable engineering policies and procedures to be used for dam site investigation, design, construction, operation and maintenance, and emergency preparedness; encouragement of the establishment and implementation of effective dam safety programs in each state based on state standards; development and encouragement of public awareness projects to increase public acceptance and support of state dam safety programs; development of technical assistance materials for federal and non-federal dam safety programs; and development of mechanisms with which to provide federal technical assistance for dam safety to the non-federal sector. The legislation authorizes funding for various aspects of the program, and makes funds available to states whose dam safety programs are authorized by state legislation, meet certain minimum criteria, are funded by state appropriations, and are approved by the Director.

The U.S. Army Corps of Engineers continues to have the authority to carry out a national program of inspection of dams originally authorized by Public Law 92-337, passed in August 1972, and now incorporated in the National Dam Safety Program. However, this Corps inspection program is currently unfunded and inactive because of the establishment of state programs for inspection of non-federal dams. Under this authority, the Corps can inspect all dams in the United States (as defined by the legislation) except those under the jurisdiction or authority of certain other federal agencies, certain dams inspected by state agencies which the Governor requests be excluded from the inspection, and those dams which the Secretary of the Army determines do not pose any threat to human life or property. The Secretary of the Army would immediately notify the Governor of the state in which a dam is located of any hazardous conditions found during an inspection and may, under these circumstances and at the request of the owner, perform detailed engineering studies to determine the structural integrity of the dam. The U.S. Army Corps of Engineers updates the National Inventory of Dams every two years depending upon the availability of appropriated funds, with the last update occurring in 1996. The inventory contains information on approximately 75,000 dams.

The legislation creating the National Dam Safety Program specifies that nothing in the Act, and no action or failure to act under the Act, relieves an owner or operator of a dam of the legal duties, obligations, or liabilities incidental to the ownership and operation of the dam.

APPENDIX 5

Regulated Facilities, Inspections and Emergency Planning

Structure/ Location	Year of IJC Order	Owner/Year of construction or re-construction	Regular Government Inspections
Forest City Dam/ St. Croix River	1965	*Georgia-Pacific Corporation*/1906	Although this structure is located partly in Canada and partly in the United States, FERC performs an inspection of the whole dam every two years and requires an independent inspection every five years. There are no inspections by Canadian or New Brunswick governments.
Vanceboro Dam/ St. Croix River	1965	*Georgia-Pacific Corporation*/1967	Although this structure is located partly in Canada and partly in the United States, FERC performs an annual inspection of the whole dam and requires an independent inspection every five years. There are no inspections by Canadian or New Brunswick governments.
Grand Falls Dam/ St. Croix River	1915	*Georgia-Pacific Corporation*/1915	The structure is located partly in Canada and partly in the United States. The State of Maine makes occasional inspections. There are no inspections by the Canadian or New Brunswick governments.
Milltown Dam/ St. Croix River	1934	*New Brunswick Power (NB Power)*/1934	The structure is located partly in Canada and partly in the United States. There are no government inspections either in the United States or in Canada.
Grand Falls Dam/ Saint John River	1926	*New Brunswick Power*/ 1930	None
Saunders Generating Station, Cornwall Dyke and Iroquois Dam in Canada/ St. Lawrence River	1952	*Ontario Hydro*/1959	None, except for the Iroquois Dam. The Iroquois Dam is located partly in the United States and partly in Canada. It is owned jointly by Ontario Hydro and the New York Power Authority. Ontario Hydro operates the structure. FERC inspects the whole of Iroquois Dam, including the portion in Canada. There are no inspections by the Canadian or Ontario governments.
St. Lawrence-FDR Power Project, including Robert Moses Power Dam, Long Sault Spillway Dam, Massena In-take Dam, Iroquois Dam, and dykes in the United States/ St. Lawrence River	1952	*New York Power Authority (NYPA)*/1960	FERC performs an annual inspection and requires an independent inspection every five years.
Compensating Works at Sault Ste. Marie (Canadian portion)/ St. Marys River	1914	*Great Lakes Power (GLP)*/1921	None

Non-government Inspections	Emergency Action Plan	Inundation Mapping
Daily staff visits. Remote monitoring of water levels via telemetry. Consultant inspections as needed.	Yes	Yes
Daily staff visits. Remote monitoring of water levels via telemetry. Consultant inspections as needed.	Yes	Yes
Daily staff visits. Remote monitoring of water levels via telemetry. Consultant inspections as needed.	Yes	No
NB Power's dam inspection program consists of annual inspections of all facilities by a NB Power engineering team based on the Canadian Dam Safety Association's (CDSA) guidelines. In addition Milltown inspections include annual staff inspections and inspections by external consultants every 4 years.	No	No
Inspection procedures are similar to those for the Milltown Dam.	No	No
Inspections are performed by an Ontario Hydro Team under Ontario Hydro's Dam Safety Assessment Program, and consist of (i) dam safety assessments, (ii) inspection and monitoring, and (iii) emergency preparedness plans. The program follows CDSA guidelines.	Yes	Yes
NYPA performs its own annual and quarterly inspections of civil structures and other project components.	Yes	Yes
GLP inspects its structures twice a year and on a five year basis in accordance with the International Lake Superior Board of Control's Inspection and Maintenance Manual of October, 1983. Reports are submitted to the Board. GLP also carries out a review to ensure that its structures meet the requirements of "The Dam Safety Guidelines" of the CDSA and the International Lake Superior Board of Control's Inspection and Maintenance Manual. GLP also performs visual inspections on a monthly basis.	Yes	No

Structure/ Location	Year of IJC Order	Owner/Year of construction or re-construction	Regular Government Inspections
Compensating Works at Sault Ste. Marie (U.S. portion)/ St. Marys River	1914	*U.S. Army Corps of Engineers*/1921	U.S. Army Corps of Engineers conducts an inspection every five years.
Prairie Portage Dam/Rainy Lake Basin	1968	*U.S. Department of Agriculture, Forest Service*/1975	The structure is located partly in Canada and partly in the United States. U.S. Forest Service conducts yearly visual inspections and periodic (5-10 years) safety inspections. There are no government inspections in Canada.
International Kettle Falls Dam (Canadian portion)/ Rainy Lake Basin	1970	*Abitibi Consolidated Inc.*/1914	None
International Kettle Falls Dam (U.S. portion)/ Rainy Lake Basin	1970	*Boise Cascade Corporation*/1914	Inspected by Minnesota Department of Natural Resources at unspecified intervals.
Kettle Falls (Squirrel Falls) Dam in Canada/ Rainy Lake Basin	1970	*Abitibi Consolidated Inc.*/1914	None
Fort Frances-International Falls Dam (Canadian portion)/Rainy Lake Basin	1970	*Abitibi Consolidated Inc.*/1909	None
Fort Frances-International Falls Dam (U.S. portion)/ Rainy Lake Basin	1970	*Boise Cascade Corporation*/1909	FERC performs an inspection every two years and requires an independent inspection every five years.
Kootenay River Dykes/Kootenay River	Beginning in 1928	*Local Landowners*/ after 1928	Provincial inspections by the B.C. Ministry of Environment, Lands and Parks from time to time.
Corra Linn Dam/ Kootenay River	1938	*West Kootenay Power (WKP)*/1932	British Columbia audits inspection reports and monitors, based on risk.
Waneta Dam/ Pend d' Oreille River	1952	*Cominco Ltd. (owner) West Kootenay Power (operator)*/1954	British Columbia audits inspection reports and monitors, based on risk.
Grand Coulee Dam/Columbia River	1941	*U.S. Bureau of Reclamation*/1941	The Bureau of Reclamation conducts periodic inspections every three years.
Osoyoos Lake Control Structure/ Okanogan River	1982	*State of Washington (owner), State of Washington Department of Ecology (operator)*/1987	State of Washington performs annual operational inspections, and dam safety inspections every five years.

Non-government Inspections	Emergency Action Plan	Inundation Mapping
The U.S. Army Corps of Engineers inspects the structure in accordance with the Corps' standards and the International Lake Superior Board of Control's Inspection and Maintenance Manual of October, 1983. Reports are submitted to the Board.	Yes	Yes
None	No	No
Periodic inspections are performed by a private consultant engaged by Abitibi Consolidated Inc. to follow CDSA guidelines.	No	No
None	No	No
Periodic inspections are performed by a private consultant engaged by Abitibi Consolidated Inc. to follow CDSA guidelines.	No	No
Periodic inspections (annual if possible) are performed by a private consultant engaged by Abitibi Consolidated Inc. to follow CDSA guidelines.	No	No
None	Yes	Yes
Some inspections are carried out by landowners whose property is protected by the dykes.	Overall regional plan	No
WKP's operation and maintenance manual provides for routine weekly and monthly inspections by WKP staff and annual inspections by WKP supervisors. WKP also engages private consultants to perform inspections following CDSA guidelines.	Under development	Yes
WKP's operation and maintenance manual provides for routine weekly and monthly inspections by WKP staff and annual inspections by WKP supervisors. WKP also engages private consultants to perform inspections following CDSA guidelines.	Yes	Yes
None	Yes	Yes
Not applicable	Yes	No

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