



## **History of the Lake Ontario–St. Lawrence River Order of Approval and the Regulation Plan and Related Studies**

The International Joint Commission (the Commission) has released a proposed new Order of Approval for the regulation of water levels and flows in Lake Ontario and the St. Lawrence River through the dam located near Cornwall, Ontario, and Massena, New York. This paper provides background information for the public comment process by summarizing the history of the Order and regulation plan. An Order of Approval, or Order, is a document issued by the Commission to permit the construction and operation of a project.

The Boundary Waters Treaty of 1909 (the Treaty) requires that the governments of the United States and Canada approve any new project that would affect the natural water level or flow of boundary waters—such as the International Rapids section of the St. Lawrence River—on the other side of the international boundary. To obtain such approval, the two federal governments can either use the Commission’s application process or negotiate a special agreement with each other. The role of the Commission in ruling on applications is to ensure that the construction and operation of the project are consistent with the terms of the Treaty. Article VIII of the Treaty requires, among other things, that an Order of precedence among water uses be observed. It also states that in cases where the construction of a dam in boundary waters would raise the natural water level on the other side of the boundary, the Commission shall require, as a condition of its approval, that suitable and adequate provision, approved by it, be made for the protection and indemnity of all interests that may be injured as a result.

### **The 1952 Application and Order of Approval**

The Commission and the U.S. and Canadian governments each played integral roles in approving the construction and operation of the hydroelectric power project in the International Rapids section of the St. Lawrence River. In June 1952, the two governments sent the Commission an application for approval to develop the project on behalf of the two electric power entities that would jointly construct and operate it. Operation of this project would determine the outflow from Lake Ontario and affect water levels and flows on Lake Ontario and on the St. Lawrence River from its origin at Cape Vincent, New York, to Trois-Rivières, Québec. The Commission considered the information received from the governments and from the public at public hearings. On October 29, 1952, the Commission ruled that the requirements of Article VIII had been met and issued an Order of Approval that allowed the project to be constructed.

### **The Reference**

At nearly the same time as the application, the governments issued a reference, or request, to the Commission to study whether Lake Ontario outflows could be regulated to



achieve certain objectives. The reference asked the Commission to determine, having regard for all other interests, whether measures could be taken to regulate the level of Lake Ontario for the benefit of property owners on the shores of the lake.<sup>1</sup> As it happened, record-high water levels were occurring on Lake Ontario at that time, and the governments were interested in determining whether the project could be operated in a manner that would provide benefits, such as reducing the natural range of water level fluctuations, in addition to meeting the Treaty requirement that all interests be protected from injury caused by the project. The historical record up to that time showed that the range of fluctuations on Lake Ontario had been more than six feet (measured in terms of the monthly mean water levels).<sup>2</sup> The Commission concluded that regulation could provide benefits as well as protection, and recommended that the two governments approve a four-foot target range of Lake Ontario levels; the Commission also recommended 11 criteria for regulating Lake Ontario outflows and a regulation plan for setting the outflows in a manner that would meet the criteria.<sup>3</sup> As part of the program to construct the project, the Canadian government also removed Gut Dam, which, according to the Commission, had raised the uppermost level of Lake Ontario by 10 centimeters (0.33 foot).<sup>4</sup> In its final report to the governments under the reference, the Commission concluded that all interests in both countries affected by the construction and operation of the project had been safeguarded by its Order of Approval. It also enumerated benefits that the Order would provide to shoreline owners on Lake Ontario, to navigation on Lake Ontario and in the International Rapids section, and to power development in the International Rapids section.<sup>5</sup>

### **The 1956 Supplementary Order of Approval**

Once the governments approved the provisions recommended by the Commission,<sup>6</sup> and after additional public hearings, the Commission amended its Order of Approval on July 2, 1956, to incorporate the four-foot target range for Lake Ontario, the 11 criteria, and the regulation plan (Plan 12-A-9). The criteria address regulated outflows from Lake Ontario and their effect on the minimum level of Montreal Harbour, winter outflows to permit power generation, outflows during the annual spring break-up in Montreal Harbour and during the annual flood discharge from the Ottawa River, minimum regulated outflows to secure the maximum dependable flow for power, and both upper and lower target levels for property owners on the shores of Lake Ontario. Several of these criteria, including the upper target limit of the four-foot range, are contingent on the water supplies to Lake Ontario being within those experienced during the period of record, adjusted to account

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<sup>1</sup> Governments of the United States and Canada. Letters of reference to the International Joint Commission, June 25, 1952.

<sup>2</sup> International Joint Commission. Water Levels of Lake Ontario: Report to the Government of Canada and the Government of the United States. April 5, 1961. p. 32.

<sup>3</sup> International Joint Commission, Letters to governments. May 9, 1955.

<sup>4</sup> International Joint Commission. *op cit*, April 5, 1961. p. 33.

<sup>5</sup> International Joint Commission. *Ibid*, pp. 36-37.

<sup>6</sup> Governments of the United States and Canada. Letters to the International Joint Commission, December 3, 1955.



for the diversions into and out of the Great Lakes basin. The Commission recognized that not all of the criteria could be met when water supplies to Lake Ontario were more extreme than those experienced in the past. The 11<sup>th</sup> criterion, criterion (k), specified how Lake Ontario should be regulated when water supplies were higher or lower than those experienced in the past.<sup>7</sup> The Order established the International St. Lawrence River Board of Control (Board of Control) to carry out the Commission's instructions and ensure that the provisions in the Order are met. The Order also states that the Commission shall retain jurisdiction over matters relating to the regulation of Lake Ontario outflows. In this background paper, "1956 Order of Approval" refers to a consolidation of the 1952 Order of Approval and the 1956 Supplementary Order of Approval.

## **The Project**

The project approved by the Commission has a number of components. One is the Moses-Saunders Power Dam that crosses the St. Lawrence River between Cornwall, Ontario, and Massena, New York. This is the principal structure used to regulate Lake Ontario outflows. Other project features include a second dam, located near Long Sault, Ontario, which acts as a spillway when outflows from Lake Ontario are larger than the capacity of the power dam. A third dam at Iroquois, Ontario, is used principally to assist in the formation of a stable ice cover in the winter as well as to prevent water levels from rising too high in Lake St. Lawrence, which is immediately upstream of the power dam. In addition, channels were enlarged to accommodate flows from the power dam and to facilitate navigation. Ice booms are also placed at several sites in the river during the winter to assist with formation of a stable ice cover.

## **Regulation Plan and Deviations from the Plan**

The regulation plan is a set of rules used to determine the outflow from Lake Ontario on a weekly basis in accordance with the provisions of the Order of Approval. The current plan, Plan 1958-D, determines the outflow based on recent water supplies to the lake, the lake level, time of year, ice conditions, Ottawa River flows, St. Lawrence River levels, and various flow limits in the plan.

The 1956 Order of Approval established Plan 12-A-9 as the regulation plan; however, the plan was never implemented. Plan 1958-A was recommended by the Board of Control in 1958 and became operational in April 1960. Revised versions of the plan were made operational in January 1962 (Plan 1958-C) and October 1963 (Plan 1958-D). Both plans reduced the occurrence of low water levels in Montreal Harbour, but Plan 1958-D better

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<sup>7</sup> Criterion (k) states, "In the event of supplies in excess of the supplies of the past as adjusted, the works in the International Rapids Section shall be operated to provide all possible relief to the riparian owners upstream and downstream. In the event of supplies less than the supplies of the past as adjusted, the works in the International Rapids Section shall be operated to provide all possible relief to navigation and power interests."



met the other objectives of the Order of Approval. Plan 1958-D has remained the regulation plan since 1963.

The Board of Control, in addition to recommending revisions to the plan, made a number of other adjustments to the regulation process as it gained experience. In 1960, the Board requested, and the Commission granted,<sup>8</sup> authority to temporarily deviate from the regulation plan flow under emergency conditions and when ice formed and broke up during winter operations. In 1961, the Board requested, and the Commission granted,<sup>9</sup> “discretionary authority” for the Board to depart temporarily from the plan flow when a deviation of limited magnitude and duration would provide beneficial effects or relief from adverse effects to an interest, without causing appreciable adverse effects to any of the other interests. For example, under certain conditions, increasing the Lake Ontario outflow for several hours can make it possible for a ship to enter Montreal Harbour. Because the environmental impact of deviations was not understood until the Lake Ontario-St. Lawrence River Study, these impacts were not evaluated to determine if they caused an appreciable adverse effect. Such deviations were only to be made by the Board when they, among other things, would not endanger meeting the criteria and other requirements of the Commission’s Order.

In more recent years, the Board of Control has followed the practice of adopting and periodically updating a regulation strategy, which may attempt to keep the Lake Ontario level or outflow higher or lower than that which would occur if outflows were set in strict accordance with Plan 1958-D. The strategy is based on a risk analysis of high or low levels occurring on Lake Ontario or at various locations on the St. Lawrence River, and on the Board’s judgment. The strategy may specify when flow changes are to be made for specific purposes, such as avoiding critically high or low levels or flows at specific locations. Because the Lake Ontario outflow is different from the Plan 1958-D outflow on a fairly frequent basis, the current approach to regulation is called “Plan 1958-D with deviations.”

### **Levels Reference Study**

In August 1986, the governments of Canada and the United States sent the Commission a reference asking it to examine and report on methods of alleviating the adverse consequences of fluctuating water levels in the Great Lakes–St. Lawrence River basin. The study examined a variety of issues across the Great Lakes basin and identified the need for additional work related to the regulation of Lake Ontario outflows. Recommendations to amend the 1956 Order of Approval were made to the Commission by its International Levels Reference Study Board in March 1993. In its final report on the study, the Commission committed to review the recommendations that called for

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<sup>8</sup> International Joint Commission. Telegram to the International St. Lawrence River Board of Control. September 16, 1960.

<sup>9</sup> International Joint Commission. Letter to International St. Lawrence River Board of Control. May 5, 1961.



changes to the regulation plan and the 1956 Order of Approval, as well as the addition of new criteria to the 1956 Order to address the needs of recreational boating and the environment. The Commission also expressed serious concern that the data at the time on shoreline damages and environmental impacts were either out of date or nonexistent.<sup>10</sup>

### **Benefits of Regulation**

Over the years, regulation of Lake Ontario outflows provided significant benefits to shoreline property owners by reducing the occurrence of extreme high water levels on Lake Ontario that would have occurred naturally. For example, the mid-1980s was an unusually wet period in the Great Lakes basin. Lakes Michigan, Huron, and Erie set record-high water levels in 1985 and again in 1986, which, as the water moved downstream, resulted in high water supplies to Lake Ontario. Yet despite supplies being more extreme than the supplies of the past, regulation kept Lake Ontario below the upper limit in the 1956 Order of Approval. Mild weather and favorable ice conditions during the winter of 1986–1987 made it possible to release extremely high flows from Lake Ontario. In January 1987, Lake Ontario was 0.90 meters (2.94 feet) lower than it would have been without regulation.<sup>11</sup> The occurrence of high water levels in the Montreal area has also been reduced by compensating for high flows during seasonal flooding, “the freshet,” on the Ottawa River.

### **Growing Dissatisfaction**

Although regulation provided significant benefits, those who were affected by high or low water levels desired further protection. During the 1980s and 1990s, some interests became increasingly vocal. Property owners on the south shore of Lake Ontario and marina owners on the upper St. Lawrence River, in particular, worked with their elected officials to organize public forums where they presented their views to the Commission. In the mid-1980s, the Commission appointed a member to its International St. Lawrence River Board of Control with expertise in the effects of water levels on recreational boating interests in the upper St. Lawrence River. In 1995, the Commission expanded the membership of its Board from eight to 10 members to ensure that the Board fully considered the potential effects of its decisions on all of the interests. Acting on a recommendation from its International Levels Reference Study Board, the newly expanded Board of Control now included members with extensive knowledge of how water level fluctuations affected communities on Lake Ontario and in the Montreal area, as well as communities on the upper St. Lawrence River.<sup>12</sup>

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<sup>10</sup> International Joint Commission. *Methods of Alleviating the Adverse Consequences of Fluctuating Water Levels in the Great Lakes–St. Lawrence River Basin*. Washington and Ottawa. December 1993.

<sup>11</sup> Environment Canada and U.S. Army Corps of Engineers. *Great Lakes–St. Lawrence River Regulation: What It Means and How It Works*. March 1993.

<sup>12</sup> International Joint Commission. Media release. February 13, 1995.



## Plan 1998

In response to a request from the Commission, the International St. Lawrence River Board of Control developed and tested alternative regulation plans and assessed their performance with historical water supplies and current water supplies over a three-year period. In 1997, the Board of Control recommended that the Commission implement one of the alternatives beginning in 1998 and, therefore, named it Plan 1998. The plan built on more than 30 years of experience with regulation and made modest operational improvements compared to Plan 1958-D with deviations. Plan 1998 faced a general lack of support, along with outright opposition, at six public meetings held by the Board of Control. In January 1999, the Commission announced its decision not to implement Plan 1998. The reasons given were that the Commission did not have sufficient information about the environmental impacts associated with the proposed plan and that the proposed plan would not result in enough of an improvement over Plan 1958-D with deviations.<sup>13</sup>

## Support of the Governments for the Lake Ontario–St. Lawrence River Study

The Commission wrote to the governments in April 1999 that it was becoming increasingly urgent to review the regulation of Lake Ontario levels and flows. It put together a team to develop a detailed Plan of Study and transmitted this document to the governments in October 1999. In announcing its action, the Commission recognized that “the cost and effort are significant and that the study may not lead to a resolution of all the issues by producing significant additional benefits for every interest group beyond those already enjoyed.”<sup>14</sup> However, it had been nearly 50 years since a comprehensive assessment of regulation was performed, and the Commission believed that the Plan of Study provided a reasoned and appropriate approach for such a review. The federal governments of Canada and the United States identified funding the following year, and the Commission appointed the International Lake Ontario–St. Lawrence River Study Board in December 2000.

## Reasons for the Lake Ontario–St. Lawrence River Study

By launching the Lake Ontario–St. Lawrence River Study in December 2000, the Commission formally began the process of reviewing the 1956 Order of Approval. The main reasons the Commission conducted the study and the review of its Order are as follows:

- **Changing needs of the interests.** Uses of the Lake Ontario–St. Lawrence River system by nearly every interest have increased in extent and variety since 1956. This includes further development of the shoreline, a longer season for commercial navigation, and the emergence of recreational boating as a significant

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<sup>13</sup> International Joint Commission. Media release. January 15, 1999.

<sup>14</sup> International Joint Commission. Media release. October 29, 1999.



economic activity. The needs of the recreational boating interests were not taken into account in the 1956 Order.

- **Dissatisfaction on the part of some interests.** The dissatisfaction voiced by various interests, particularly shoreline property owners and recreational boaters, over how Lake Ontario outflows are regulated has increased in the past two decades.
- **Environmental concerns.** Regulation under the 1956 Order did not take into account the impacts of water regulation on the ecosystem. Restricting the range of water levels has reduced the diversity and resiliency of wetlands, which is a core component of shoreline ecosystem health. Wetlands and ecosystem health have become significant concerns in both countries.
- **More extreme water supplies.** Water supplies to Lake Ontario since regulation began under the 1956 Order have been significantly above and below those experienced during the 1860–1954 period of record. Under the 1956 Order, the Commission sets the Lake Ontario outflow when supplies are outside the “supplies of the past as adjusted” (the period of record with adjustments for diversions into and out of the Great Lakes basin).<sup>15</sup> The Commission wishes to have a more rigorous methodology for determining the outflow that would function over a greater range of water supply conditions.
- **Climate change.** It is important to understand how potential climate change scenarios could affect the regulation of Lake Ontario outflows and compliance with the Order.
- **Lack of information about the impacts of regulation.** Prior to the Lake Ontario–St. Lawrence River Study, reliable quantitative information was lacking on the impacts of regulation on shoreline property, recreational boating, and the environment. Better information will improve the ability to make sound decisions regarding the regulation of Lake Ontario outflows.
- **Need for further study.** In 1999, the Commission decided not to implement a new regulation plan that had been recommended by its International St. Lawrence River Board of Control. The proposed plan made modest operational improvements over the Board of Control’s existing approach to regulation. However, the lack of information needed to address public concerns about the environment and other potential impacts convinced the Commission that a comprehensive study and a fundamental review of regulation were needed.

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<sup>15</sup> “Supplies of the past as adjusted” are defined as water supplies to Lake Ontario from 1860 to 1954 adjusted to a condition assuming a continuous diversion out of the Great Lakes basin of 3,100 cubic feet per second at Chicago and a continuous diversion into the Great Lakes basin of 5,000 cubic feet per second from the Albany River basin.



- **Advances in science and technology.** The Lake Ontario–St. Lawrence River Study has also applied many scientific and technological advances related to such factors as environmental assessment, shoreline impacts, and computerized modeling to better understand the likely range of future Lake Ontario water supplies. A better understanding of these and similar issues has led to better options for regulating Lake Ontario outflows.

### Highlights of the Study Process

The Lake Ontario–St. Lawrence River Study made a comprehensive assessment of the impacts of fluctuating water levels on the affected interests. Approximately 200 people and dozens of organizations participated directly in the study. The Study Board provided direction to six technical working groups, to a Plan Formulation and Evaluation Group, and to modeling and information management groups. Extensive public involvement and outreach efforts were carried out with the assistance of the citizen-volunteers on the Public Interest Advisory Group. As planned, the study took five years to complete and cost US \$20 million, shared equally by the two countries.

The technical working groups collected new data and developed models of the impacts of fluctuating water levels on the environment and other interests. Information from the technical working groups was integrated into a Shared Vision Model. With this model, various regulation plans could be simulated and the results measured against performance indicators that reflected the water level preferences of the interests. Plans were formulated, and the Study Board went through several practice decisions, beginning in September 2003, to ensure that the studies were being carried out to generate the information the Study Board would need to make its final recommendations.

To ensure that the regulation plans developed in the study were robust, the plans were tested against 495 hypothetical centuries of stochastic water-supply sequences. The stochastic supply sequences are generated by a probabilistic historically-based model of basin supplies that maintains the geographical and temporal characteristics of supplies to the system (“stochastically generated supply sequences”). These sequences contained more diverse variation than the historical supply sequence. The plans were also tested against the actual historical water supplies and against four climate change scenarios.

Because new data and methodologies were used, the Commission engaged the U.S. National Research Council and the Royal Society of Canada to conduct an independent peer review of certain aspects of the study. This was in addition to an extensive internal review process. As was noted in the review report,<sup>16</sup> with few precedents for a study of

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<sup>16</sup> Review of the Lake Ontario–St. Lawrence River Studies. Committee to Review the Lake Ontario–St. Lawrence River Studies, National Research Council. The National Academies Press. Washington, D.C. 2006.



this scale on regional water level regulation, opportunities for improvement were expected. The review also pointed to the need for ongoing analysis to provide a strong scientific basis for long-term decision making about water level and flow regulation in the Lake Ontario–St. Lawrence River basin. The Commission subsequently met with staff from the National Research Council and some members of the review panel to explore options for developing a long-term monitoring and assessment program. The review report is available online at <http://www.nap.edu/books/0309100682/html/>.

The Study Board selected three candidate regulation plans (Plan A, Plan B, and Plan D) in response to the Commission’s request for options rather than a single recommendation. All these plans provided net economic and environmental improvements when compared to Plan 1958-D with deviations, but to varying degrees and with varying trade-offs among the interests.<sup>17</sup> The Study Board considered each of the candidate plans to be an improvement over Plan 1958-D with deviations. Although not all of the benefits provided by Plan 1958-D with deviations were retained, in the Study Board’s judgment, none of the candidate plans resulted in a “disproportionate loss” to any of the interests. The Study Board held a series of public meetings in summer 2005 to discuss the three candidate plans. Based on public comment, the Study Board developed new plans (Plan A+, Plan B+, and Plan D+). These new plans did not provide as many net economic and environmental improvements as the initial plans, but they retained more of the benefits of Plan 1958-D with deviations. In May 2006, the Study Board released its final report to the public.

### **Commission Deliberations Following the Study**

Following the release of the Study Board’s final report, the Commission invited public comment until September 15, 2006, and began to deliberate on what decisions it would make with regard to Lake Ontario–St. Lawrence River regulation. The Commission undertook a thorough review of the Study Board report, public comments, the report by the National Research Council and Royal Society of Canada, and other considerations. The primary responsibility of the Commission is to ensure that all actions taken with regard to the regulation of Lake Ontario outflows are consistent with the requirements of the Boundary Waters Treaty. This includes reaching a judgment on what measures are suitable and adequate to protect all of the interests, including the interests that were not explicitly recognized in the 1956 Order of Approval (i.e., environmental and recreational boating interests). Because the governments of the United States and Canada were the applicants for the project and played an integral role in the development of the regulation criteria, the Commission has consulted with the governments throughout its deliberations. In September 2007, the Commission postponed release of its proposed decision in Order to extend the period for consultation with the governments.

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<sup>17</sup> In Order to compare candidate regulation plans to Plan 1958-D with deviations, the Study Board developed a model that closely approximates how the Control Board has deviated from Plan 1958-D under various conditions in recent years. The plan derived from the model is called “Plan 1958-DD.”



The Commission asked experts who had been associated with the Lake Ontario–St. Lawrence River Study to explore whether any of the three candidate plans recommended by the Study Board could provide additional environmental benefits while maintaining as much as possible the level of protection and benefits that other interests enjoy under the current Order of Approval. This significant new work by the Commission resulted in two additional plans being developed: a Plan D+ variant, called Plan 2007, and a Plan B+ variant, which provides a greater level of protection for environmental interests than Plan 2007. The Commission determined that it would not be possible at this time to implement a plan based on Plan B+ while still providing benefits and protections comparable to those in the 1956 Order, unless mitigation measures are implemented that reduce the additional risk to all interests of a plan based on Plan B+. However, the Commission is including a provision in the new Order of Approval to assess the progress of mitigation two years after the proposed new Order goes into effect to determine whether risks have been reduced adequately such that a plan based on Plan B+ could be implemented. Such assessments may also be carried out in subsequent years.

### **Next Steps**

In March 2008, the Commission invited comment on a proposed new Order of Approval, regulation plan and related matters. The Commission developed a proposed new Order of Approval, which, among other things, makes provision for the environment and for recreational boating. The Commission also proposes the implementation of Plan 2007. Plan 2007 provides net economic improvements compared to Plan 1958-D with deviations, and retains more of the benefits that the interests currently receive from Plan 1958-D with deviations compared to the three candidate plans developed by the Study Board. Plan 2007 also provides more environmental improvements than Plan A+ or Plan D+ without unduly affecting the benefits the other interests receive from regulation. In light of all the facts, including the interests that currently exist in the basin, the Commission believes that these actions fulfill the requirements of the Boundary Waters Treaty.

The Commission has proposed a long-term monitoring and adaptive management program. In this regard, the governments of Canada and the United States have indicated their strong support for monitoring and adaptive management as an ongoing activity connected with future water level and flow regulation, and will actively participate in the further development of an adaptive management plan for implementation. The draft Order of Approval is designed to allow for future improvements to the regulation plan, as identified through the adaptive management program, including the potential for increased environmental improvement after mitigation measures have been implemented by governments that provide commensurate protection to other interests.

The Commission is committed to carrying over the open and transparent public engagement process from the study to the Commission's decision phase. It has opened a public comment period and plans to hold a series of information sessions and formal



public hearings throughout the Lake Ontario–St. Lawrence River system in the spring. The Commission will carefully consider all comments to make sure that they are taken into consideration and that no concerns have been overlooked. It will also seek the concurrence of the two federal governments before making a decision.