Plan 2007 Overview

The International Joint Commission (the Commission) is changing the rule set or "plan" for managing water flows and levels of Lake Ontario and the St. Lawrence River. The Commission approved the current plan, called Plan 1958D, over 40 years ago. It was designed based on the water supplies to Lake Ontario that were recorded from 1860 to 1954. The Commission's International St. Lawrence River Board of Control (Board of Control)—the body responsible for implementing the plan—has often deviated from Plan 1958D, in part because water supplies in the last 40 years have been both wetter and drier than Plan 1958D was designed to handle. The Commission found that the proposed new regulation rule set, called Plan 2007, performs effectively when tested with historic water supply sequences up to the year 2000, with a much greater variety of stochastic supplies, and with climate change scenarios. Stochastic supplies are a statistically simulated set of years, using a sample of historic years as the raw data, to test different regulation plans by simulating conditions such as droughts and floods.

The Commission based the new regulation plan on work done by the Commission's former International Lake Ontario–St. Lawrence River Study Board. The Study Board report, issued in May 2006, presented three options for a new regulation plan, each of which outperforms Plan 1958D in a number of significant aspects and provides benefits beyond those provided by Plan 1958D. These optional plans, called A+, B+, and D+, each struck a different compromise between interests and elements of the system such as performance for the environment, Montreal flooding, shipping concerns, recreational boating, and protection for those who live along the coast of Lake Ontario. Public reaction to the three options was polarized.

In considering the Study Board options along with related public comments, the Commission asked experts who had contributed to the study to continue improving the optional plans to see if a better regulation plan could be developed. The objective was to find a plan that would preserve as many positive benefits of the proposed plan options as possible, while reducing the weak points. Any solution had to be consistent with the requirements of the Boundary Waters Treaty (see Order of Approval).

The experts found that the most significant challenge to developing a better plan was balancing the trade-offs between environmental benefits and coastal protection on Lake Ontario, while providing no less protection on the lower St. Lawrence River downstream from the Moses-Saunders Dam. Plans that move toward the simulation of natural flows (helping the environment) also tend to increase the risk of flooding and erosion to the Lake Ontario shoreline as well as flooding around Montreal and in other parts of the lower Saint Lawrence River.

The experts were able to find a plan with some additional improvements over the study's three plan options. They were not able to gain the same level of environmental benefits as the study's best regulation plan option for the environment, B+, without unacceptable negative effects on other interests that are a consequence of B+ based plans. However, there may be future opportunities to move to a more environmentally beneficial plan, such as a B+ based plan, if mitigation measures are implemented to effectively address the harmful effects to some interests that are specifically associated with B+ based plans. Plan 2007 will outperform the current operating rules in almost every sector, with significant increases in hydropower production, greater wetland plant diversity along the shores of Lake Ontario, fewer delays due to unacceptably strong currents for ships in the St. Lawrence Seaway, and more reliable shipping depths for Montreal Harbour. The plan also reduces damages to properties along the shores of Lake Ontario. Recreational boaters below the dam will benefit from this plan, but boaters using the facilities with the shallowest water depths on Lake Ontario will have draft problems more often than they do now. This is in part an inevitable consequence of keeping Lake Ontario lower occasionally to restore coastal wetlands, and in part it is due to lower spring, winter, and fall levels that help protect Lake Ontario shoreline property when there is a higher risk of damaging storms.

Plan 2007, like the Study Board's three options, is designed to address a far greater range of climatic supplies than does Plan 1958D. These supplies include 495 stochastically generated centuries of climate supply sequences, including drier and wetter conditions than have been recorded historically, as well as four climate change scenarios developed from global climate models.

An important element of the Commission's approach to regulation is the treatment of "deviations," which are occasions when managed flows are allowed to vary from what would be required under the plan. Deviations from the plan's rules will still be allowed for short-term contingencies on the St. Lawrence River. For example, deviations might be allowed in order to address winter ice formation and emergencies, to avoid flooding during the Ottawa River spring flooding (freshet), to allow safe passage for ships legitimately expecting deeper water, and to facilitate haul-out of recreational boats in the fall.

Short-term deviations are those that usually last no longer than a week or two at most. These will continue to be allowed since they have negligible effects on plan benefits. Furthermore, after a deviation, water flows must be adjusted by the Board of Control to recover to the planned flow levels. Deviations to control Lake Ontario levels will rarely if ever be needed since the new plan has been tested with the 50,000-years of stochastic sequences. However, when the Board of Control's successor under Plan 2007 (the International Lake Ontario–Saint Lawrence River Board) finds that the three-month forecast indicates a significant probability of a high level exceeded 1% of the time, or a low level exceeded all but 1% of the time, the successor Board, upon submission of a

system analysis to the Commission, may request permission to deviate for one month at a time.

Differences in water levels produced by Plan 2007 and Plan 1958D, as it has been applied in recent years with deviations will be subtle because both plans address the same concerns (to assess the differences, the study developed a model for Plan 1958D with deviations called "Plan 1958DD"). For example, both plans avoid high Lake Ontario water levels if at all possible since high levels generally result in shore damage (flooding and erosion). However, Plan 2007 is better able than Plan 1958D with deviations to reduce shore damage because it takes into account a Study Board finding that the critical periods for damage from high water levels are during the spring and fall, when storms are most likely to occur, generating waves and surges. Plan 2007 reduces damages by setting lower fall and spring water levels during these critical periods. To achieve this, there is a necessary trade-off of occasionally allowing slightly higher water levels (five inches or less) on the lake during the less critical summer period. As a result, because of the seasonal timing, Lake Ontario shore damages are actually lower under Plan 2007 than under Plan 1958D with deviations. The trade-off of slightly higher summer levels also helps recreational boaters, commercial navigation, and hydropower interests by providing more water when it is needed most.

There will be some differences between Plan 2007 and Plan 1958D with deviations. One of the most significant is that once every 20–30 years, when Lake Ontario is experiencing low water levels, Plan 2007 will keep summer levels lower than they would have been under Plan 1958D with deviations. The lower levels are closer to the water levels that would have occurred naturally (without water level regulation) under low supply conditions. Compared to Plan 1958D as implemented, Plan 2007 moves closer to simulating natural control of cattail populations by drying out their habitats, which occurred prior to water regulation, and provides opportunities for the establishment of more diverse flora and fauna. The Study Board identified wetlands resilience and diversity, which are significantly impacted by Lake Ontario water level management, as one of the most critical and basic indicators of the environmental health of Lake Ontario. In addition, meadow marsh area is the primary indicator of the regulation plan's impact on the environment. Plan 2007 improves meadow marsh area and conditions largely due to these low water periods.

Plan 2007 performs a little better than other plans at maintaining adequate water levels in Montreal Harbour during dry times.

A summary of the effects of Plan 2007, as measured by the environmental and economic performance indicators developed by the Lake Ontario–St. Lawrence River Study Board, is provided in Tables 1 and 2.

Table 1: Environmental Performance Indicators

Plan 2007 produces solid results across almost all indicators, including species at risk.

1.00 =Plan 1958D with deviations as modelled. 0.10 PLUS or MINUS from 1.00 is considered significant (Using Historical Supply Series 1900-2000).

	A+	B+	D+	2007
LAKE ONTARIO				
Wetland Meadow Marsh Community	1.02	1.44	1.17	1.22
Low Vegetation 18C - spawning habitat supply	0.89	0.95	0.94	0.93
High Vegetation 24C - spawning habitat supply	1.05	1.00	1.01	1.01
Low Vegetation 24C - spawning habitat supply	1.00	1.02	1.00	1.01
Northern Pike - YOUNG OF YEAR recruitment	1.02	1.00	1.05	1.02
Largemouth Bass - YOUNG OF YEAR recruitment	0.94	0.98	0.97	0.98
Least Bittern - reproductive index	0.88	1.04	0.96	0.93
Virginia Rail - reproductive index	0.96	1.11	0.99	0.96
Black Tern - reproductive index	1.03	1.12	1.01	0.97
Yellow Rail - preferred breeding habitat	0.96	1.01	0.98	0.99
King Rail - preferred breeding habitat	1.05	1.10	1.03	1.04
ABOVE THE DAM				
Low Vegetation 18C - spawning habitat supply	1.01	1.01	1.01	1.01
High Vegetation 24C - spawning habitat supply	1.03	1.01	1.02	1.02
Low Vegetation 24C - spawning habitat supply	1.01	1.01	1.01	1.01
Northern Pike - YOUNG OF YEAR recruitment	1.05	1.03	1.01	1.00
Largemouth Bass - YOUNG OF YEAR recruitment	0.99	1.00	1.00	1.00
Northern Pike - YOUNG OF YEAR net productivity[1]	N/A	N/A	N/A	N/A
Virginia Rail - reproductive index	1.16	1.27	1.31	1.31
Muskrat - house density in drowned river mouth wetlands	1.42	4.39	1.75	2.04
BELOW THE DAM				
Golden Shiner - suitable feeding habitat area	1.00	1.00	1.00	0.97
Wetlands fish - abundance index	0.87	0.90	0.84	0.81
Migratory wildfowl - habitat area	1.03	1.03	0.97	1.00
Least Bittern - reproductive index	1.03	1.06	1.00	1.00
Virginia Rail - reproductive index	0.94	0.97	1.06	1.06
Migratory wildfowl - productivity	1.06	1.00	1.00	1.00
Black Tern - reproductive index	0.84	0.77	1.00	1.03
Northern Pike - reproductive area	0.97	0.94	0.94	0.90
Frog sp. - reproductive habitat surface area	0.87	0.87	1.03	1.00
Eastern Sand Darter - reproductive area	1.10	1.03	1.13	1.13
Spiny Softshell Turtle - reproductive habitat surface area	1.03	1.06	1.03	1.06
Bridle Shiner - reproductive habitat surface area	1.00	0.97	1.00	1.03
Muskrat - surviving houses	1.04	0.88	0.96	0.96
PERCENTAGE 'GOOD' SCORES FOR EACH PLAN	6%	19%	13%	13%

After the release of the Study Board's Final Report, the Study experts who developed the charts reviewed them and made a number of small adjustments to correct some minor errors and reduce duplication.

1 — The Northern Pike indicator for the upper river was found to be incorrectly functioning following publication of the Study Report. Experts involved in producing the report charts conducted a subsequent review for accuracy and corrected figures are presented.

= Worse than Plan 1958D with Deviations

= Better than Plan 1958D with Deviations

Table 2: Economic Performance Indicators

Plan 2007 produces positive or neutral results economically across nearly all interests and regions as compared to Plan 1958D with deviations.

Average Annual Net Discounted Benefits (Stochastic Series[1]). All values are millions of U.S. dollars per year.

	A+	B+	D+	2007	
COASTAL	-$0.04	-$2.75	-$0.15	$0.15	Plan 2007 produces generally better results across all coastal interests by reducing high levels during the winter and spring storm season.
Lake Ontario	$0.46	-$2.52	-$0.23	$0.06	
Shore Protection Maintenance	$0.57	-$2.16	-$0.17	$0.03	
Erosion to Unprotected Developed Parcels	-$0.23	-$0.17	$0.02	$0.01	
Flooding	$0.12	-$0.20	-$0.08	$0.02	
Upper St. Lawrence River	$0.01	-$0.01	-$0.01	$0.00	
Flooding	$0.01	-$0.01	-$0.01	$0.00	
St. Lawrence	-$0.51	-$0.22	$0.09	$0.09	
Flooding	-$0.51	-$0.22	$0.09	$0.09	
Shore Protection Maintenance[2]	N/A	N/A	N/A	N/A	
COMMERCIAL NAVIGATION	$0.47	$2.13	$1.54	$1.69	While Plan B+ produces strong results for the Seaway and good results elsewhere, Plan 2007 avoids the losses that characterize other plans.
Lake Ontario	-$0.03	-$0.01	-$0.01	$0.00	
Seaway	$0.57	$2.16	$1.56	$1.71	
Montreal down	-$0.07	-$0.02	-$0.02	-$0.01	
HYDROPOWER	$2.74	$6.09	$1.63	$2.37	Although Plan B+ does well for Hydropower, Plan 2007 holds its own while maintaining benefits for other interests.
NYPA - OPG	$2.18	$3.86	$0.48	$0.77	
Hydro Quebec[3]	$0.55	$2.22	$1.16	$1.60	
RECREATIONAL BOATING	$3.81	-$0.74	$1.42	$1.32	Plan 2007 mostly produces good outcomes for boating, but smaller marinas on Lake Ontario find the low levels produced in some years may reduce current benefits of regulation.
Above Dam	$1.20	-$1.42	-$0.36	-$0.15	
Lake Ontario	$0.70	-$1.18	-$0.44	-$0.27	
Alex Bay	$0.47	-$0.29	$0.03	$0.06	
Ogdensburg	$0.01	$0.00	$0.01	$0.01	
Lake St. Lawrence	$0.01	$0.05	$0.05	$0.05	
Below Dam	$2.61	$0.68	$1.78	$1.47	
Lac St. Louis	$1.39	$0.49	$0.89	$0.74	
Montreal	$0.93	$0.19	$0.68	$0.55	
Lac St. Pierre	$0.29	$0.00	$0.21	$0.18	
TOTAL	$6.68	$4.72	$4.43	$5.53	

After the release of the Study Board's Final Report, the Study experts who developed the charts reviewed them and made a number of small adjustments to correct some minor errors and reduce duplication.

1 — A statistically simulated series of years, using a sample of actual historic years as the raw data, to test different regulation plans by simulating conditions such as droughts and floods.

2 — The lower river Shore Protection and Maintenance indicator was not calculated for the full stochastic series by the lower river coastal model.

3 — An error was found in the A+ number for Hydro Quebec subsequent to the Study Board report, and has been corrected by experts involved in producing the report charts.