

IJC Lake Ontario-St.Lawrence River Study - Discussion Paper

Improvements in Plans A, B and D Leading to PLANS A⁺, B⁺ AND D⁺

Introduction

The purpose of this paper is to provide a brief summary of differences between the final candidate regulation plans labeled A⁺, B⁺, and D⁺ as presented in the Study Board's Final Report (March 2006) and earlier versions of plans A, B and D as described by the Board at their May - July, 2005 public meetings.

During the first four months of 2005, Plan Formulation & Evaluation Group efforts and Study Board discussion derived Plans A, B & D that were considered the most promising of the array of plans devised. The Board subsequently took those plans public to assess public response and acceptance of the plan principles and performance. These regulation plans were "frozen" so to speak as of May 1, 2005 in order to provide time to prepare briefing materials in French and English and to avoid the confusion of presenting successive refinements of these plans during the public meeting period.

Plan formulators attended the public meetings and refined plans A, B and D based on the comments they heard from the public and the suggestions from the Study Board. The estimated benefits of these plans also changed slightly for other reasons: technical issues were resolved and errors corrected in the final round of quality control; final research results were factored in for coastal impacts; and the Ogdensburg Reach defined in the recreational boating analysis was split in two to better represent that reach. The base plan to which plans were compared was also refined throughout the plan formulation process. The plans were finalized in September 2005 and labeled A⁺, B⁺ and D⁺ to differentiate them from the versions presented during the summer public meetings.

In all cases the basic principles and objectives of the plans remain unchanged. The ⁺ plans are not significantly different from their predecessors, but their overall performance is improved and deficiencies minimized while respecting their original goals and integrity.

Comparisons of the relative performances of the improved plans is best done by comparing the economic and environmental performance tables presented in the handout for the 2005 public meetings with the corresponding historic evaluation results of Tables C2 and C4, Annex 3 of the Board's Final report (all attached).

A brief summary of the objectives and results of the plan modifications follows. All comparisons are based on evaluations over the historic 101-year time period as the stochastic evaluations were not available until the summer of 2005.

Plan A[±]

Changes to the May 2005 version of Plan A were directed at reducing coastal damages. The goal of Plan A was to create the largest economic gain possible without hurting the environment or creating disproportionate loss. Plan A created large navigation and

hydropower benefits by storing more water on Lake Ontario but that caused some additional coastal damages on the lake and along the river. Plan A+ was more conservative. Using the same supplies, Plan A+ lost over \$3 million in hydropower and navigation benefits compared to Plan A, but gained about a half million per year in coastal benefits. It also caused a fairly significant reduction in the environmental score of Plan A. These compromises were accepted because Plan A+ still outperformed Plan 1958DD in hydropower and navigation by about \$7 million per year, because it still slightly outperformed 1958DD on the overall environmental index, and because the lower coastal damages better fit the Board guideline of no disproportionate loss.

Plan B[±]

Modifications of the May 2005 version of this plan were primarily directed at reducing flooding damages on the lower river. The goal of Plan B was to create the largest environmental gain possible while still increasing net economic benefits and without creating disproportionate loss. But Plan B caused the greatest average annual flooding damages along the lower river of all the plans. Plan B+ reduced fall Lake Ontario levels when there was some risk of flooding the following year and implemented specific rules to reduce lake releases during high Ottawa and local river inflows. These changes were made after a great deal of experimentation so that there were essentially no losses in other economic categories and with just a small decline in the overall environmental score. Plan B+ was slightly less likely to produce the high Ontario and Upper River levels boaters like in the fall, but the overall recreational boating economic performance for Plan B+ improved over Plan B.

Plan D[±]

Modifications of the May 2005 version of Plan D were directed at improving performance across the board and particularly in the environmental sector. The goal of Plan D was to improve overall economic and environmental performance while minimizing losses in any sector. The changes that produced Plan D+ were small and numerous, and resulted in slightly better performance in almost every category. Plan D+ improved its overall environmental score by about 7% with gains in 18 of the 32 environmental performance indicators. Plan D+ increased overall economic benefits by \$1.45 million, and increased benefits in most categories. Plan D+ had the smaller losses by sector than Plan D, and had the smallest losses by sector of any of the candidate plans.

Further “tweaking” of all plans is possible, but may cause the plans to migrate towards a more common central position. For example, the occasional low Lake Ontario levels that produce healthier wetlands under Plan B+ also reduce recreational boating benefits in those years. Attempts to “improve” B+ by raising Ontario levels will make it more like Plan D+, with better boating and lower wetlands benefits.

Historical Time Series

Final Economic Results for Candidate Plans (Plus Plan E)

Economic results for candidate plans by interest and region based on the historical supply sequence

Average Annual Net Benefits (\$M)		A+	B+	D+	E ³
Total		\$7.52	\$6.48	\$6.52	-\$12.30
COASTAL		-\$0.62	-\$1.11	\$0.32	-\$25.96
	Ontario	-\$0.36	-\$0.60	\$0.25	-\$23.12
	Shore Protection Maintenance	-\$0.23	-\$0.49	\$0.27	-\$12.98
	Erosion to Unprotected Developed Parcels	-\$0.13	-\$0.10	-\$0.02	-\$0.29
	Flooding	-\$0.01	-\$0.01	-\$0.01	-\$9.85
	Upper St. Lawrence River	\$0.00	\$0.00	\$0.00	-\$1.56
	Flooding	\$0.00	\$0.00	\$0.00	-\$1.56
	St. Lawrence	-\$0.25	-\$0.51	\$0.07	-\$1.27
	Flooding	-\$0.22	-\$0.47	-\$0.02	-\$1.21
	Shore Protection Maintenance	-\$0.03	-\$0.04	\$0.09	-\$0.07
COMMERCIAL NAVIGATION		\$0.41	\$2.20	\$2.31	\$4.13
	Ontario	-\$0.04	-\$0.02	-\$0.01	-\$0.01
	Seaway	\$0.53	\$2.28	\$2.35	\$4.15
	Montreal down	-\$0.08	-\$0.06	-\$0.03	\$0.00
HYDROPOWER		\$3.50	\$5.97	\$1.82	\$14.16
	NYPA-OPG	\$3.51	\$4.16	\$1.04	\$10.23
	Hydro Quebec	-\$0.01	\$1.81	\$0.78	\$3.93
RECREATIONAL BOATING		\$4.23	-\$0.58	\$2.04	-\$4.64
	Above Dam	\$2.21	-\$0.62	\$0.52	-\$5.91
	Ontario	\$1.29	-\$0.64	\$0.13	-\$5.03
	Alex Bay	\$0.89	-\$0.05	\$0.32	-\$0.86
	Ogdensburg	\$0.01	\$0.00	\$0.01	-\$0.09
	Lake St. Lawrence	\$0.02	\$0.06	\$0.06	\$0.07
	Below Dam	\$2.02	\$0.04	\$1.53	\$1.27
	Lac St. Louis	\$1.13	\$0.17	\$0.77	\$0.78
	Montreal	\$0.70	-\$0.02	\$0.58	\$0.41
	Lac St. Pierre	\$0.19	-\$0.10	\$0.17	\$0.08
M&I		\$0.00	\$0.00	\$0.00	\$0.00
	SL One-time infrastructure costs	\$0.00	\$0.00	\$0.00	\$0.00
	LSL Water Quality Investments	\$0.00	\$0.00	\$0.00	\$0.00

Notes to Table:

1. Figures represent the average annual impact relative to Plan 1958-DD, in millions of U.S. dollars. Blue indicates a positive net benefit relative to 1958-DD and red indicates a negative net benefit relative to 1958-DD.
2. These are economic results based on the historical supply series (representing 1900-2000). No discount rate is applied.
3. Plan E is shown for comparison purposes only to represent the natural flow condition. Plan E is not a candidate plan.

Final Environmental Results (Historical) for Candidate Plans (Plus Plan E)

Environmental performance indicator results (ratios) for candidate plans based on the historical supply sequence

Environmental Performance Indicators		A ⁺	B ⁺	D ⁺	E
Ontario	Wetland Meadow Marsh Community	1.02	1.44	1.17	1.56
	Low Veg 18C - spawning habitat supply	0.89	0.95	0.94	0.88
	High Veg 24C - spawning habitat supply	1.05	1.00	1.01	1.08
	Low Veg 24C - spawning habitat supply	1.00	1.02	1.00	1.11
	Northern Pike - YOY recruitment	1.02	1.00	1.05	1.03
	Largemouth Bass - YOY recruitment	0.94	0.98	0.97	0.96
	Least Bittern (IXEX) - reproductive index	0.88	1.04	0.95	1.13
	Virginia Rail (RALI) - reproductive index	0.96	1.11	0.99	1.15
	Black Tern (CHNI) - reproductive index	1.03	1.12	1.01	1.16
	Yellow Rail (CONO) - preferred breeding habitat	0.96	1.01	0.98	1.01
	King Rail (RAEL) - preferred breeding habitat	1.05	1.10	1.03	1.27
Upper R	Low Veg 18C - spawning habitat supply	1.01	1.01	1.01	1.04
	High Veg 24C - spawning habitat supply	1.03	1.01	1.02	1.02
	Low Veg 24C - spawning habitat supply	1.01	1.01	1.01	1.04
	Northern Pike - YOY recruitment	1.05	1.03	1.01	1.06
	Largemouth Bass - YOY recruitment	0.99	1.00	1.00	1.00
	Northern Pike - YOY net productivity	4.02	2.08	1.17	4.08
	Virginia Rail (RALI) - reproductive index	1.16	1.27	1.31	1.33
	Muskrat (ONZI) - house density in drowned river mouth wetlands	1.42	4.39	1.73	37.25
Lower River	Golden Shiner - suitable feeding habitat area	1.00	1.00	1.00	1.03
	Wetlands fish - abundance index	0.87	0.90	0.84	0.97
	Migratory wildfowl - habitat area	1.03	1.03	0.97	1.00
	Least Bittern - reproductive index	1.03	1.06	1.00	1.06
	Virginia Rail (RALI) - reproductive index	0.94	0.97	1.06	1.00
	Migratory wildfowl - productivity	1.06	1.00	1.00	1.03
	Black Tern (CHNI) - reproductive index	0.84	0.77	1.00	0.77
	Northern Pike (ESLU) - reproductive area	0.97	0.94	0.94	0.94
	Frog sp. - reproductive habitat surface area	0.87	0.87	1.03	0.94
	Eastern Sand Darter (AMPE) - reproductive area	1.10	1.03	1.13	1.06
	Spiny Softshell Turtle (APSP) - reproductive habitat surface area	1.03	1.06	1.03	1.03
	Bridle Shiner (NOBI) - reproductive habitat surface area	1.00	0.97	1.00	1.03
	Muskrat (ONZI) - surviving houses	1.04	0.88	0.96	0.80
Percentage "good" scores for each plan		9%	22%	16%	34%
Overall Environmental Index		1.06	1.35	1.10	4.04

Notes to Table:

- Figures represent the impact relative to Plan-1958-DD expressed as ratios, where 1 represents no change from 58-DD, > 1.00 an improvement relative to 58-DD, and < 1.00 a deterioration relative to 58-DD.
- Run using the historical supply sequence (1900-2000).
- Aqua shading identifies species at risk.
- Yellow shading indicates essentially no change from 1958-DD (within 10% difference).

Difference Between Economic Benefits, Historic Water Supplies Final (+) Minus Summer Plans

Average Annual Net Benefits (\$U.S. Million)	A+ minus A	B+ minus B	D+ minus D	E (new) minus E
Total	-\$1.73	\$2.16	\$1.47	\$16.03
COASTAL	\$0.48	\$1.77	\$0.18	\$14.45
Ontario	\$0.23	\$0.10	\$0.07	\$6.38
Shore Protection Maintenance	\$0.08	\$0.17	\$0.07	-\$1.36
Erosion to Unprotected Developed Parcels	-\$0.09	-\$0.06	-\$0.02	-\$0.20
Flooding	\$0.24	\$0.00	\$0.02	\$7.94
Upper St. Lawrence River	\$0.25	\$0.18	\$0.11	\$7.56
Flooding	\$0.25	\$0.18	\$0.11	\$7.56
St. Lawrence	\$0.00	\$1.48	\$0.00	\$0.51
Flooding	-\$0.02	\$1.58	\$0.01	\$0.51
Shore Protection Maintenance	\$0.03	-\$0.10	-\$0.01	\$0.00
COMMERCIAL NAVIGATION	-\$1.78	\$0.24	\$0.36	\$0.47
Ontario	-\$0.01	\$0.00	\$0.00	\$0.00
Seaway	-\$1.73	\$0.23	\$0.42	\$0.44
Montreal down	-\$0.04	\$0.01	-\$0.06	\$0.03
HYDROPOWER	-\$1.48	-\$0.14	\$0.82	\$0.20
NYPA-OPG	-\$0.67	-\$0.63	-\$0.01	-\$0.19
Hydro Quebec	-\$0.80	\$0.49	\$0.82	\$0.39
RECREATIONAL BOATING	\$1.04	\$0.29	\$0.10	\$0.91
Above Dam	\$1.13	\$0.25	\$0.16	\$0.91
Ontario	\$0.69	\$0.14	-\$0.01	\$0.32
Alex Bay	\$0.16	-\$0.05	-\$0.08	-\$0.01
Ogdensburg				
Lake St. Lawrence				
Below Dam	-\$0.09	\$0.04	-\$0.06	\$0.00
Lac St. Louis	\$0.00	\$0.00	-\$0.03	\$0.00
Montreal	-\$0.03	\$0.03	-\$0.02	\$0.00
Lac St. Pierre	-\$0.06	\$0.01	\$0.00	\$0.00
M&I		\$0.00	\$0.00	\$0.00
SL One-time infrastructure costs	\$0.00	\$0.00	\$0.00	\$0.00
LSL Water Quality Investments	\$0.00	\$0.00	\$0.00	\$0.00

Notes to Table:

1. Figures represent the difference in net benefits for final candidate plans vs. those evaluated for the summer 2005 public meetings. The differences are average annual impact relative to Plan 1958-DD, in millions of U.S. dollars. Blue indicates the final plan performs better than the summer 2005 plan and red indicates the final plan performs worse than the summer 2005 plan.
2. These are economic results based on the historical supply series (representing 1900-2000). No discount rate is applied.
3. Plan E is shown for comparison purposes only to represent the natural flow condition. Plan E is not a candidate plan.

Comparison of Environmental Performance, Summer and Final Reports
Values shown are the final (+) plan ratios minus the summer plan scores

	A+ minus A	B+ minus B	D+ minus D	E (new) minus E	
Environmental Performance Indicators					
Ontario	Wetland Meadow Marsh Community	-0.12	0.01	0.00	0.00
	Low Veg 18C - spawning habitat supply	0.00	0.00	0.01	0.00
	High Veg 24C - spawning habitat supply	0.01	0.00	-0.01	0.00
	Low Veg 24C - spawning habitat supply	0.00	0.00	0.00	0.00
	Northern Pike - YOY recruitment	0.01	0.00	0.00	0.00
	Largemouth Bass - YOY recruitment	-0.01	0.00	0.00	0.00
	Least Bittern (IXEX) - reproductive index	-0.03	-0.03	0.01	0.00
	Virginia Rail (RALI) - reproductive index	0.00	0.00	0.04	0.00
	Black Tern (CHNI) - reproductive index	0.04	0.00	0.04	0.00
	Yellow Rail (CONO) - preferred breeding habitat	-0.01	0.00	0.00	0.00
	King Rail (RAEL) - preferred breeding habitat	0.00	0.00	-0.01	0.00
Upper R	Low Veg 18C - spawning habitat supply	0.01	0.00	0.00	0.00
	High Veg 24C - spawning habitat supply	0.01	0.00	-0.01	0.00
	Low Veg 24C - spawning habitat supply	0.00	0.00	0.00	0.00
	Northern Pike - YOY recruitment	0.01	0.00	0.00	0.00
	Largemouth Bass - YOY recruitment	-0.01	0.00	-0.01	0.00
	Northern Pike - YOY net productivity	0.86	-0.08	0.15	0.00
	Virginia Rail (RALI) - reproductive index	-0.07	0.01	0.00	0.00
	Muskrat (ONZI) - house density in drowned river mouth wetlands	-1.11	-0.83	0.71	0.83
Lower River	Golden Shiner - suitable feeding habitat area	-0.03	-0.03	0.00	0.00
	Wetlands fish - abundance index	-0.06	0.03	0.00	0.03
	Migratory wildfowl - habitat area	0.00	0.03	0.03	0.00
	Least Bittern - reproductive index	0.00	0.00	0.00	0.00
	Virginia Rail (RALI) - reproductive index	0.00	0.00	0.03	0.03
	Migratory wildfowl - productivity	0.00	0.00	0.00	0.00
	Black Tern (CHNI) - reproductive index	0.03	0.00	-0.03	0.00
	Northern Pike (ESLU) - reproductive area	0.03	-0.03	0.03	0.00
	Frog sp. - reproductive habitat surface area	0.10	-0.03	-0.03	0.00
	Eastern Sand Darter (AMPE) - reproductive area	-0.03	-0.03	0.06	0.00
	Spiny Softshell Turtle (APSP) - reproductive habitat surface area	-0.03	0.00	0.00	0.00
	Bridle Shiner (NOBI) - reproductive habitat surface area	-0.03	0.00	0.00	0.00
	Muskrat (ONZI) - surviving houses	0.08	0.16	0.08	0.04
	Overall Environmental Index	-0.09	-0.06	0.07	0.07

1. Values are differences in the environmental ratios between the final plans and the summer 2005 plans. Blue values indicate the final plan has improved performance relative to the summer 2005 version and red values indicate the final plan has decreased performance relative to the summer 2005 version.
2. These are environmental results based on the historical supply series (representing 1900-2000).
3. Plan E is shown for comparison purposes only to represent the natural flow condition. Plan E is not a candidate plan.