# International Niagara Board of Control
# One Hundred Tenth Semi-Annual Progress Report
# to the
# International Joint Commission

**Covering the Period September 14, 2007 through March 20, 2008**

# EXECUTIVE SUMMARY

The level of Lake Erie began the reporting period 7 centimetres (2.8 inches) below long-term average for the month of September. There was a significant rise in levels from December through February due to above average precipitation and runoff. Preliminary estimates of February's precipitation indicate that it may be a new February record high. The March 2008 six-month water level forecast indicates that the level of Lake Erie is expected to be near its long-term average in the spring and below average through the summer (Section 2).

The level of the Chippawa-Grass Island Pool was regulated under the International Niagara Board of Control's 1993 Directive. The allowable daily range of fluctuation of the Pool level was exceeded on three occasions in February. These occurrences were the result of actions taken to remove ice that had accumulated in the Pool and the East Channel of the Upper Niagara River as the result of a winter storm that forced ice from the eastern end of Lake Erie into the Niagara River. The Power Entities were able to comply with the Board's Directive at all other times during the reporting period (Section 3).

The flow over Niagara Falls was below the required Treaty minimum on October 31 (Section 4) as gates in the International Niagara Control Works were operated in such a way as to prepare for and provide specified Falls flows during a series of discharge measurements at the Cableway Section (Section 7).

Ontario Power Generation continues with construction of the 10.4 kilometres (6.5 miles) long tunnel Niagara Tunnel Project. The Tunnel Boring Machine has passed the tunnel low point (where the dewatering station will be located) and is now proceeding on the incline. Progress has been slowed with the resumption of spiling for pre-support of the tunnel crown (Section 8).

Installation of the Lake Erie-Niagara River Ice Boom began on December 13 and was completed on December 20th. Some boom spans were broken during storm events. The large amount of ice remaining in the eastern portion of Lake Erie and the ice bridges present below Niagara Falls in late March suggest that a delay in ice boom opening beyond April 1 is likely (Section 9).

The Board will hold a meeting with the public in September 2008 in Buffalo, New York (Section 10).

Mr. Charles Goggins resigned from the U.S. Section of the Board's Working Committee with his retirement from the U. S. Federal Energy Regulatory Commission (Section 11).

**COVER:** **Photograph of ice accumulation on the Bird Island Pier, Buffalo, New York taken on February 4, 2008. (U.S. Army Corps of Engineers photo)**

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**INTERNET SITES**

International Joint Commission
www.ijc.org

International Niagara Board of Control
www.ijc.org/conseil_board/niagara/en/niagara_home_accueil.htm
www.ijc.org/conseil_board/niagara/fr/niagara_home_accueil.htm

Lake Erie-Niagara River Ice Boom
www.iceboom.nypa.gov

# INTERNATIONAL NIAGARA BOARD OF CONTROL

Chicago, Illinois
Burlington, Ontario

March 20, 2008

International Joint Commission
Washington, D.C.
Ottawa, Ontario

Commissioners:

## 1. GENERAL

The International Niagara Board of Control (Board) submits its One Hundred Tenth Semi-Annual Progress Report, covering the period September 14, 2007 through March 20, 2008.

## 2. LAKE LEVELS

All elevations in this report are referenced to International Great Lakes Datum 1985 (IGLD 1985). The values are expressed in metric units, with approximate English units (in parentheses) for information purposes only. The monthly lake level data are based on a network of four gauges to better represent the average level of the lake.

The level of Lake Erie began the reporting period 7 centimetres (2.8 inches) below long-term average for the month of September. In November, the lake reached its seasonal low with a monthly mean level of 173.81 metres (570.24 feet), which was 18 centimetres (7.1 inches) below average. Levels remained below average into January and rose above average in February. In February, the level was at 174.10 metres (571.19 feet), or 12 centimetres (4.7 inches) above average. The significant rise in levels from December through February was due to above average precipitation and runoff. Recorded water level data for the period September 2007 through February 2008 and departures from long-term averages are shown in Table 1 and depicted graphically in Figure 1.

The Lake Erie basin received 49.55 centimetres (19.51 inches) of precipitation during the September 2007 - February 2008 period. This is about 23% above average for the time of year. Preliminary estimates of February's precipitation indicate that it may be a new February record high. Recent precipitation data and departures from long-term averages are shown in Table 2 and depicted graphically in Figure 2.

Lakes Michigan and Huron remained well below their long-term average levels during the reporting period. In December 2007 these lakes were only 6 centimetres (2.4 inches) from their record monthly mean minimum level. Flows into Lake Erie from the upper lakes during this six-month time frame were about 9% below the long-term average, 4% lower than they were the same time last year.

Water supplied to Lake Erie from its local drainage basin (shown in Figure 3) was below average for the first two months of the reporting period but significantly above average from December to February. This reflects the above average precipitation those months, coupled with periods of above freezing temperatures which keep winter runoff high. The Niagara River monthly mean flow was below average except in January and February. The higher flows in January were partly due to less than normal ice in the

river, which seasonally retards the flow. The flows in the Niagara River are graphically depicted in Figure 4 and summarized in Section 6.

The March 2008 six-month water level forecast indicates that the level of Lake Erie is expected to be near its long-term average in the spring and below average through the summer.

**TABLE 1 - MONTHLY AVERAGE LAKE ERIE WATER LEVELS**

(Based on a network of 4 water level gauges)

International Great Lakes Datum (1985)

| | Metres | | | Feet | | |
|---|---|---|---|---|---|---|
| Month | Recorded* 2007/08 | Average 1918-2006** | Departure | Recorded* 2007/08 | Average 1918-2006** | Departure |
| September | 174.09 | 174.16 | -0.07 | 571.16 | 571.39 | -0.23 |
| October | 173.95 | 174.06 | -0.11 | 570.70 | 571.06 | -0.36 |
| November | 173.81 | 173.99 | -0.18 | 570.24 | 570.83 | -0.59 |
| December | 173.87 | 173.99 | -0.12 | 570.44 | 570.83 | -0.39 |
| January | 173.94 | 173.99 | -0.05 | 570.67 | 570.83 | -0.16 |
| February | 174.10 | 173.98 | 0.12 | 571.19 | 570.80 | 0.39 |

*Provisional **Period of record is 1918-2006

**TABLE 2 - MONTHLY AVERAGE PRECIPITATION ON THE LAKE ERIE BASIN**

| | Centimetres | | | Inches | | | |
|---|---|---|---|---|---|---|---|
| Month | Recorded* 2007/08 | Average 1900-99+ | Departure | Recorded* 2007/08 | Average 1900-99+ | Departure | Departure (in percent) |
| September | 4.88 | 8.00 | -3.12 | 1.92 | 3.15 | -1.23 | - 39 |
| October | 5.41 | 6.96 | -1.55 | 2.13 | 2.74 | -0.61 | - 22 |
| November | 7.67 | 7.19 | 0.48 | 3.02 | 2.83 | 0.19 | 7 |
| December | 10.54 | 6.60 | 3.94 | 4.15 | 2.60 | 1.55 | 60 |
| January | 8.46 | 6.27 | 2.19 | 3.33 | 2.47 | 0.86 | 35 |
| February | 12.60 | 5.26 | 7.34 | 4.96 | 2.07 | 2.89 | 140 |

*Provisional +Most recent period of record is 1900-99

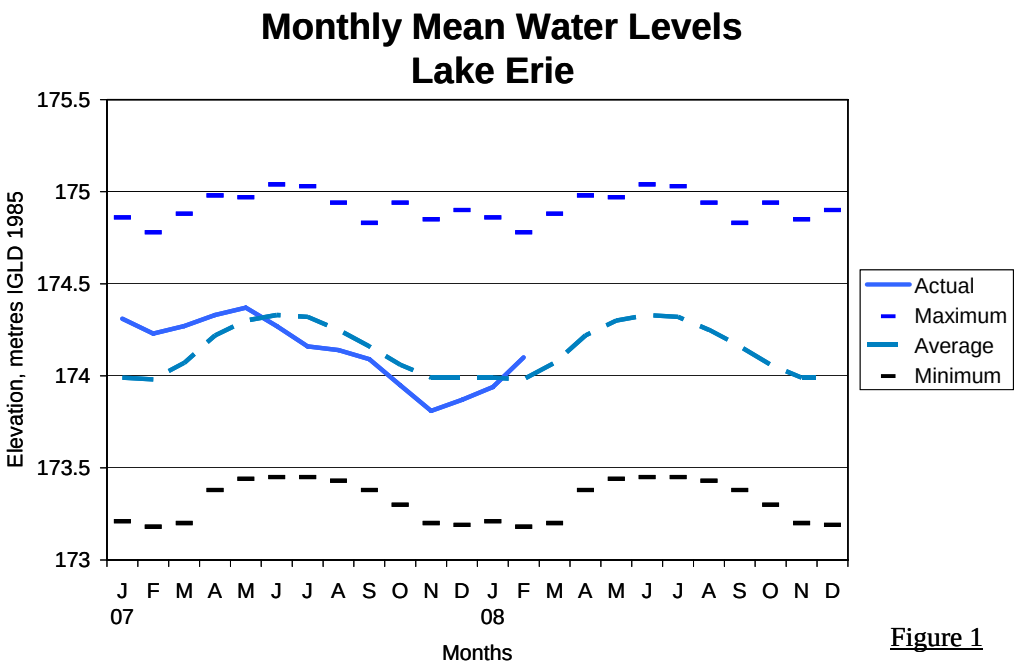



Figure 1

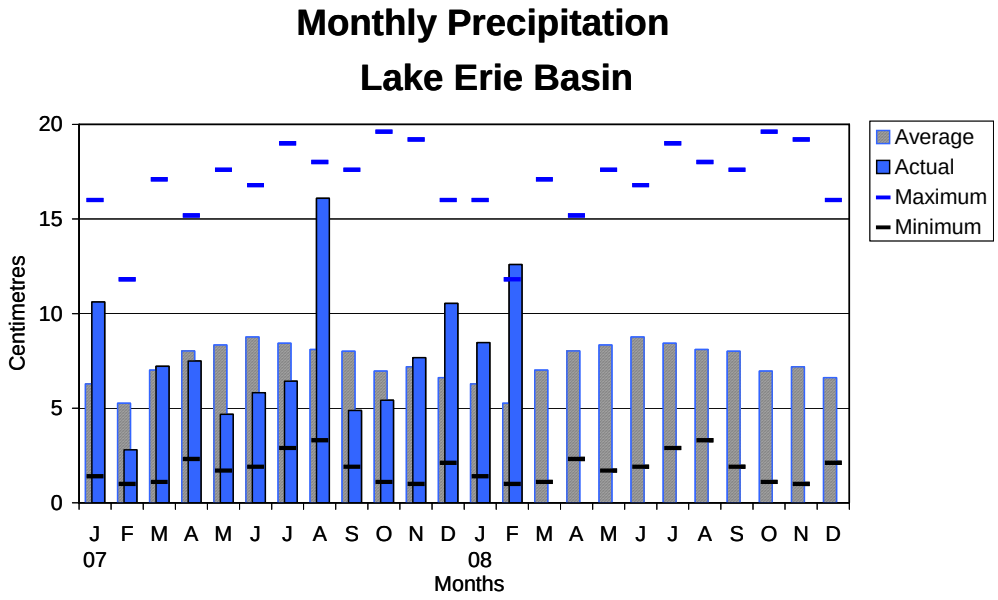



Figure 2

## Monthly Net Basin Supplies
## Lake Erie Basin

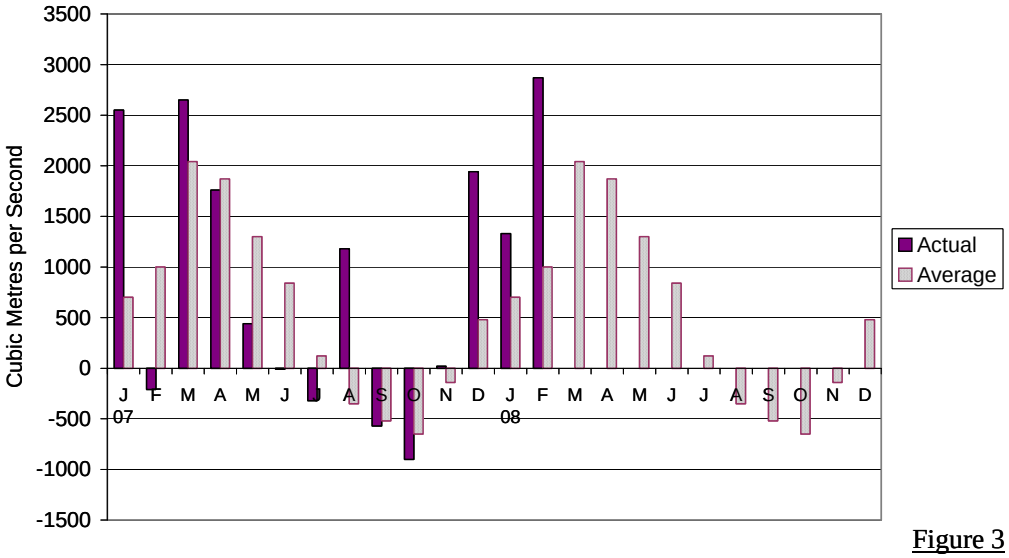



Figure 3

## Niagara River Monthly Mean Flows
at Buffalo, New York

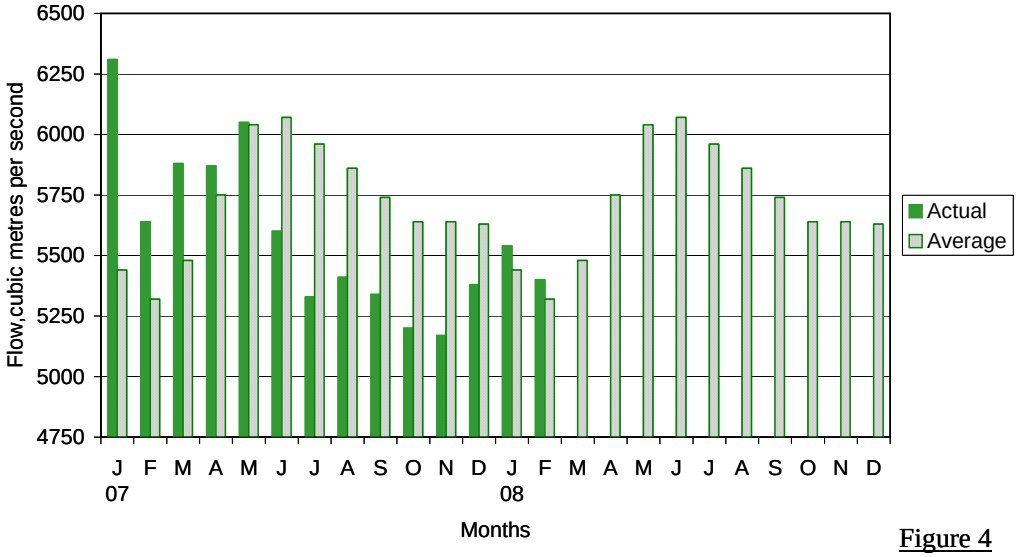



Figure 4

## 3. OPERATION AND MAINTENANCE OF THE CHIPPAWA-GRASS ISLAND POOL CONTROL STRUCTURE

The water level in the Chippawa-Grass Island Pool (the Pool) is regulated in accordance with the Board's 1993 Directive. The Directive requires that the Power Entities, Ontario Power Generation (OPG) and the New York Power Authority (NYPA), operate the Chippawa-Grass Island Pool control structure to ensure the maintenance of an operational long-term average Pool level of 171.16 metres (561.55 feet) to ameliorate adverse high or low water levels in the Pool. The Directive also establishes tolerances for the Pool's level as measured at the Material Dock gauge.

The allowable daily range of fluctuation of the Pool level was exceeded by 0.28 metre (0.92 foot) on January 30, 0.15 metre (0.49 foot) on February 1 and 0.07 metre (0.23 foot) on February 6. These occurrences were the result of actions taken to remove ice that had accumulated in the Pool and the East Channel of the Upper Niagara River as the result of a winter storm that forced ice from the eastern end of Lake Erie into the Niagara River.

The Power Entities were able to comply with the Board's Directive at all other times during the reporting period.

The accumulated deviation of the Pool's level from March 1, 1973 through February 29, 2008 was 0.32 metre-month (1.05 foot-months) above the long-term average elevation. The maximum permissible accumulated deviation is 0.91 metre-month (3.00 foot-months).

Tolerances for regulation of the Pool level were suspended for October 31 and November 1 due to operational requirements for the Board's flow measurement program (Section 7). Tolerances were also suspended for January 30 due to abnormally high

flows (maximum hourly flow at Fort Erie was 11528 $m^3$/s (407,110 cfs) at 0700) and one day in January, 25 days in February and three days in March to assist in ice management.

The locations of the water level gauges on the Niagara River are shown in Enclosure 1. Recorded daily Material Dock water levels covering the period September 2007 through February 2008 are shown in Enclosure 2.

## 4. FLOWS OVER NIAGARA FALLS

During the tourist season daylight hours, the required minimum Niagara Falls flow is 2832 cubic metres per second ($m^3$/s) (100,000 cubic feet per second (cfs)). At night and during the winter months, the required minimum Falls flow is 1416 $m^3$/s (50,000 cfs). The operation of the Chippawa-Grass Island Pool control structure, in conjunction with power diversion operations, ensures sufficient flow over the Falls to meet the requirements of the Niagara Treaty of 1950.

A series of discharge measurements were conducted on October 31 and November 1 to obtain further data points necessary to verify the Ashland Avenue gauge rating. Gates in the International Niagara Control Works were operated in such a way as to prepare for and provide specified Falls flows as defined in the test schedule. As a result, Falls flows were below the required 2832 cubic metres per second ($m^3$/s) for the hours ending 0800 through 1100 on October 31. The Governments of Canada and the United States are in agreement that Falls flows below Treaty requirements are acceptable for the purpose of conducting flow measurements.

Falls flow met or exceeded minimum Treaty requirements at all other times during the reporting period. The recorded daily flow over Niagara Falls, covering the period September 2007 through February 2008, is shown in Enclosure 3.

## 5. DIVERSIONS AND FLOW AT QUEENSTON

Diversion of water from the Niagara River for power purposes is governed by the terms and conditions of the 1950 Niagara Treaty. The Treaty prohibits the diversion of Niagara River water that would reduce the flow over Niagara Falls to below the amounts specified for scenic purposes.

The hydro power plants, OPG's Sir Adam Beck 1 and 2 in Canada and NYPA's Niagara Power Project in the United States, withdraw water from the Chippawa-Grass Island Pool above Niagara Falls and discharge it into the lower Niagara River at Queenston, Ontario and Lewiston, New York, respectively.

During the period September 2007 through February 2008, diversion for the Sir Adam Beck 1 and 2 plants averaged 1630 $m^3/s$ (57,560 cfs) and diversion to the Robert Moses Niagara Power Project averaged 1800 $m^3/s$ (63,570 cfs).

The average flow from Lake Erie to the Welland Canal for the period September 2007 through February 2008 was 217 $m^3/s$ (7,660 cfs) compared to 183 $m^3/s$ (6,460 cfs) for the same period one year ago. Diversion from the canal to OPG's DeCew Generating Stations averaged 175 $m^3/s$ (6,180 cfs) for the period September 2007 through February 2008.

Records of diversions for power generation covering the period September 2007 through February 2008 are shown in Enclosure 4.

The monthly average Niagara River flows at Queenston, Ontario for the period September 2007 through February 2008 and departures from long-term averages are shown in Table 3. Maximum and minimum monthly average flows for the same period are shown in Table 4.

TABLE 3 - MONTHLY NIAGARA RIVER FLOWS AT QUEENSTON

| | Cubic Metres per Second | | | Cubic Feet per Second | | |
|---|---|---|---|---|---|---|
| Month | Recorded 2007-08 | Average 1900-2006 | Departure | Recorded 2007-08 | Average 1900-2006 | Departure |
| September | 5305 | 5732 | -427 | 187340 | 202420 | -15080 |
| October | 5207 | 5649 | -442 | 183880 | 199490 | -15610 |
| November | 5190 | 5662 | -472 | 183280 | 199950 | -16670 |
| December | 5415 | 5692 | -277 | 191230 | 201010 | -9780 |
| January | 5609 | 5529 | 80 | 198080 | 195250 | 2830 |
| February | 5365 | 5426 | -61 | 189460 | 191620 | -2160 |

TABLE 4 - MONTHLY MAXIMUM AND MINIMUM NIAGARA RIVER FLOWS AT QUEENSTON

| | Cubic Metres per Second | | | | Cubic Feet per Second | |
|---|---|---|---|---|---|---|
| Month | Maximum | Year | Minimum | Year | Maximum | Minimum |
| September | 6880 | 1986 | 4340 | 1934 | 242960 | 153260 |
| October | 7220 | 1986 | 4320 | 1934 | 254970 | 152560 |
| November | 7030 | 1986 | 4190 | 1934 | 248260 | 147970 |
| December | 7410 | 1985 | 4270 | 1964 | 261680 | 150790 |
| January | 7240 | 1987 | 3960 | 1964 | 255680 | 139850 |
| February | 6900 | 1987 | 3320 | 1936 | 243670 | 117240 |

During this period, the flow at Queenston averaged 5349 $m^3/s$ (188,900 cfs). One year ago, flows averaged 5856 $m^3/s$ (206,800 cfs) with the monthly averages ranging between 5491 $m^3/s$ (193910 cfs) and 6352 $m^3/s$ (224,320 cfs).

## 6. GAUGING STATIONS

The Niagara River gauges used to monitor the Chippawa-Grass Island Pool levels and the flow over Niagara Falls are the Slater's Point, Material Dock, American Falls and Ashland Avenue gauges (see Enclosure 1). All gauges required for the operation of the Chippawa-Grass Island Pool control structure were in operation during the reporting period.

Both the U. S. National Oceanic and Atmospheric Administration (NOAA) and the Power Entities operate water level gauges at the Ashland Avenue location. Subject to continuing comparison checks of the water level data from both instruments by the International Niagara Committee (INC), the Power Entities' gauge is used for officially recording water levels used in determining the flows over Niagara Falls. Comparison of water level readings from both gauges showed that they were within acceptable INC tolerances throughout the reporting period.

## 7. FLOW MEASUREMENTS IN THE NIAGARA RIVER AND WELLAND SHIP CANAL

Discharge measurements are regularly scheduled in the Niagara River and Welland Canal, for water management purposes, as part of a program to verify the gauge ratings used to determine flows in these channels. All measurements are obtained through joint efforts of the United States Army Corps of Engineers and Environment Canada. Measurement programs require boat, equipment and personnel from both agencies to ensure safety, quality assurance checks between equipment and methods, and bi-national acceptance of the data collected. The Corps and Environment Canada continue efforts to standardize measurement equipment and techniques. Measurements are made at the following locations:

International Railway Bridge: Measurements are made near the International Railway Bridge to provide information for evaluating stage-discharge relationships for the flows entering the Niagara River from Lake Erie. Measurements are scheduled in accordance with a 3-year cycle. Measurements were last made at this section in the spring of 2006. These measurements fit well with the 2001 Buffalo equation and the Buffalo-Material Dock equation. The next series of measurements at this section are scheduled for 2009.

Cableway: Measurements are made at this section, for verification of the Ashland Avenue rating equation, which is used to determine the outflow from the Maid-of-the-Mist Pool, and subsequently the flow over Niagara Falls. Measurements are currently scheduled to be made at this section every 3 years. To analyze the appropriateness of using boat-mounted hydro-acoustic measurement methods at this location, acoustic Doppler current profilers (ADCP) have been used to make measurements near this section each year since 2001. In the spring of 2007, it was decided that this method will replace the use of conventional flow measurement methods, which employed an aerial cablecar. The cablecar will be decommissioned. Both the conventional measurements and the ADCP measurements seem to indicate that the present Ashland Avenue rating curve is under estimating the Falls flow. Because previous ADCP measurements only covered a few narrow ranges of flow, arrangements were made to vary the flow over the Falls to allow measurements in May 2007 at a wider range of flows. These were made mainly in the middle to upper flow ranges. In October-November 2007, flows were measured in the very low and very high ranges to produce a more comprehensive data set to use in the revision of the rating equation. The Board's Working Committee is evaluating a revision of the Ashland Avenue equation. The next series of measurements at this section is scheduled for 2010.

American Falls: The American Falls Section is measured to verify the rating used to determine the amount of flow in the American Falls Channel and to demonstrate that a dependable and adequate flow of water is maintained over the American Falls and in the

vicinity of the Three Sisters Islands. Since American Falls flow is directly related to the operation of the Chippawa-Grass Island Pool, the Board monitors this relationship. At this section, measurements have traditionally been made from pedestrian bridges between Goat Island, Green Island and the U.S. mainland, using conventional measurement methods. The American Falls Section was scheduled for measurement in 2005, per the usual 5-year cycle for this location, but a temporary superstructure placed over the pedestrian bridges by the New York State Office of Parks, Recreation and Historic Preservation made the prospect of taking conventional measurements there, as was done with past efforts, difficult if not impossible. Plans were formulated to utilize new technology in the form of an ADCP mounted on a remote controlled tethered boat, at a location upstream of the bridge, closer to the American Falls gauge. In May 2007, measurements were successfully made using the ADCP, tethered boat and new section location. Ten measurements were made in the middle range of flows, and these compared well with the American Falls rating equation. The ADCP method at the new location gave more consistent flow values than did the conventional method. This is likely due to the new location of the measurement section, which is in an area not as turbulent as farther downstream near the bridges. Additional ADCP measurements are scheduled for this section in 2012, in keeping with the regular 5-year cycle for this location.

Welland Canal: Discharge measurements are made in the Welland Canal to verify the rating curves for the Lock 8 Supply Weir at Port Colborne, Ontario. The measurement section is located upstream of the weir. In recent years, ADCP technology has been used at this section. These measurements are scheduled on a 3-year cycle. The latest set of measurement at this section was made in April 2007. These measurements compared well with the two rating curves currently used to determine flow over the historic range of Lake Erie levels. The next measurement series would be scheduled for the spring of 2010.

## 8. NIAGARA TUNNEL PROJECT

Ontario Power Generation continues with construction of the 10.4 kilometres (6.5 miles) long tunnel Niagara Tunnel Project. When completed, the increased diversion capacity will mean that OPG's Sir Adam Beck plants can more fully utilize Canada's entitlement for power production. By March 17, the Tunnel Boring Machine (TBM) had progressed 1821 metres (5,974 feet). The TBM has passed the tunnel low point (where the dewatering station will be located) and is now proceeding on the incline. The TBM is currently under the buried St. David's gorge and an over-break of more than 3.5 metres (11 feet) in the tunnel crown has triggered the resumption of spiling for pre-support of the tunnel crown. TBM progress is relatively slow, approximately 3 metres/day (10 feet/day), while using spiles. Spiling is expected to continue until the rock conditions improve.

At the Intake, blasting within the dewatered cofferdam is continuing and work on the grout tunnel is expected to start in April 2008. The 8 metre (26 foot) horseshoe shaped grout tunnel will extend 400 metres (1,310 feet) downstream from the intake structure and is intended to reduce the groundwater inflow into the tunnel during construction.

Additional power generation from this increased diversion of water is expected to commence in 2011. This increased diversion will not affect the regulation of the Chippawa-Grass Island Pool governed by the International Niagara Board of Control's 1993 Directive.

## 9. ICE CONDITIONS AND ICE BOOM OPERATION

In accordance with Condition (d) of the Commission's October 5, 1999 supplementary Order of Approval, installation of the Lake Erie-Niagara River Ice Boom's spans commenced on December 13. The Lake Erie water temperature as measured at the Buffalo Water Intake reached 4$^{o}$ Celsius (39$^{o}$ Fahrenheit) on December 9. Installation may begin when the Lake Erie water temperature at Buffalo reaches 4$^{o}$C (39$^{o}$F) or on December 16th, whichever occurs first.

Installation of the ice boom's spans began on December 13 when 10 spans were placed starting from the Canadian side. A further 10 spans went in on December 15 and the remaining 2 spans, continuing on towards the US shore, were installed on December 17.

Ice first began forming behind the boom by the last week of January. A major storm at the end of the month, with significant winds from the southwest, resulted in a lake ice run and three broken ice boom spans. The storm surge on Lake Erie resulted in some properties next to the Buffalo River in the older section of Buffalo being flooded. There were incidents of poles supporting power lines and trees being toppled and structural damage to some building from the high winds. Ice accumulated in the east channel of the upper Niagara River and required the issuance of a flood warning under NYPA's *Flood Warning Notification Plan in the Event of Ice-Affected Flooding on the Upper Niagara River* for potential flooding in low-lying areas around Tonawanda. The warning remained in effect for several hours on the morning of February 2 but was cancelled when the water level receded to below the flood damage level. The opened ice boom spans were repaired and closed by the morning of February 6. No significant flooding was reported. Most of the eastern basin of Lake Erie was open water by early February.

The flood warning plan was again initiated on February 7 as flooding was anticipated in low-lying areas in the vicinity of the North Grand Island bridges. Flooding was reported under the bridges on the Robert Moses Parkway and on some streets on Cayuga Island.

Another ice boom span was forced open on February 10 and a small amount of lake ice entered the river as a result. The span was repaired by February 13. The Power Entities' ice breakers worked almost continuously in the Chippawa-Grass Island Pool and the eastern channel of the upper Niagara River from the end of January through mid-February to remove ice accumulations. Two more spans were opened by a storm on February 17. They were repaired by February 29.

A helicopter flight was conducted on March 12 to measure ice thickness on the eastern part of Lake Erie. Average thickness was 23 centimetres (9 inches) compared to 39 cm (15 inches) one year ago. With an extensive amount of ice still present by the third week of March, a delay in ice boom opening beyond April 1 is likely.

## 10. **MEETING WITH THE PUBLIC**

In accordance with the Commission's requirements, the Board will hold an annual meeting with the public. The meeting will be held in September in Buffalo, New York. Information on items including current and projected Great Lakes levels, the operation of the Lake Erie-Niagara River Ice Boom, the Board's measurement program and OPG's Niagara Tunnel Project will be presented.

## 11. MEMBERSHIP OF THE BOARD

Mr. Charles Goggins of the U.S. Federal Energy Regulatory Commission is retiring in April and has vacated his position on the Board's Working Committee. Membership of the Board and the rest of the Working Committee remain unchanged from the last report.

## 12. ATTENDANCE AT BOARD MEETINGS

The Board met once during this reporting period with Colonel Drolet acting as the U.S. Chair. The meeting was held in Rochester, New York on March 20. BG Berwick and Mr. Mahoney were unable to attend.

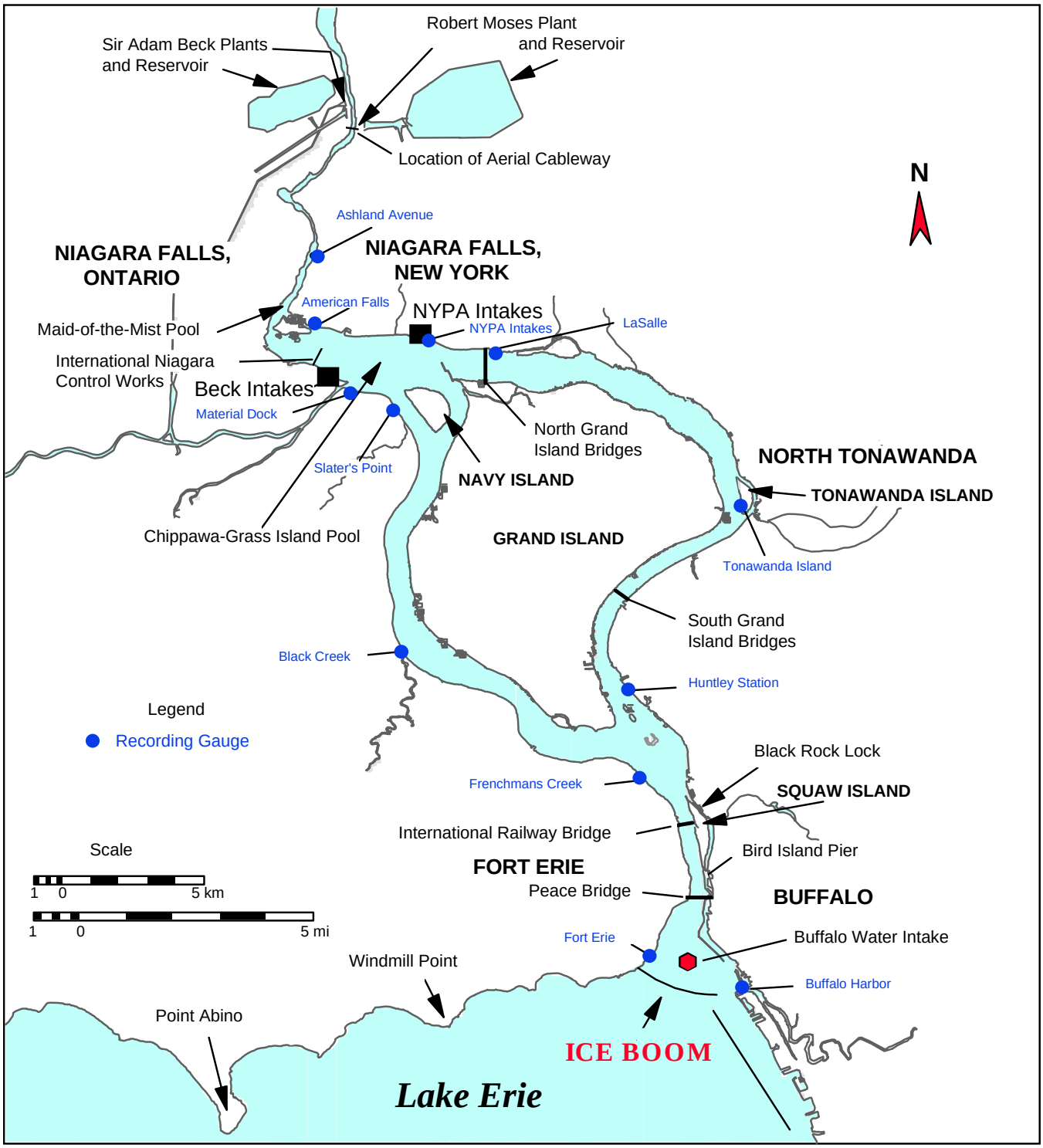
Respectfully Submitted,

BRIGADIER GENERAL BRUCE A. BERWICK
Chair, United States Section

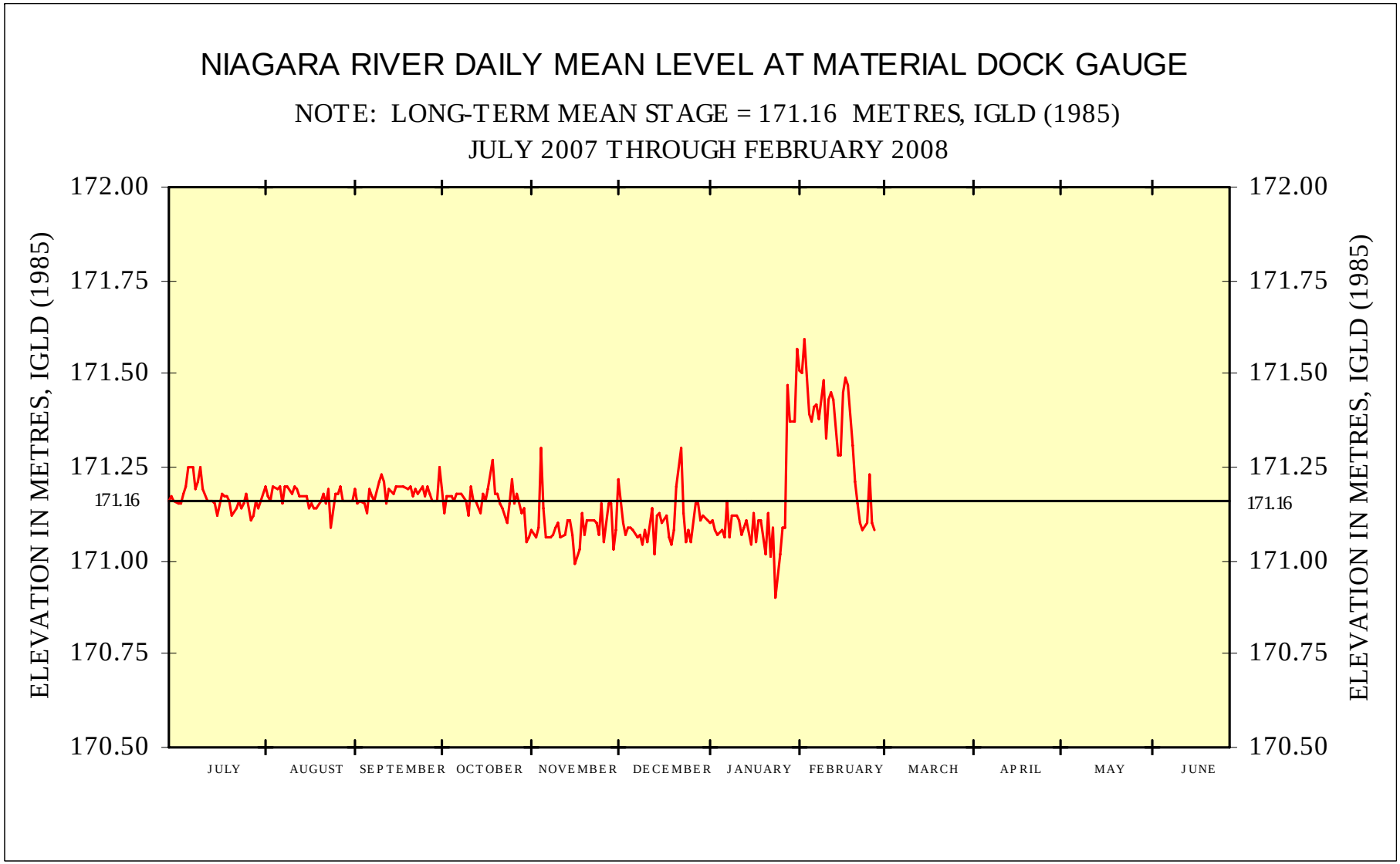
RALPH MOULTON
Chair, Canadian Section

DANIEL J. MAHONEY
Member, United States Section

ROBERT MESSERVEY
Member, Canadian Section


Robert Moses Plant
and Reservoir
Sir Adam Beck Plants
and Reservoir
Location of Aerial Cableway
N
Ashland Avenue
NIAGARA FALLS,
ONTARIO
NIAGARA FALLS,
NEW YORK
American Falls
NYPA Intakes
NYPA Intakes
LaSalle
Maid-of-the-Mist Pool
International Niagara
Control Works
Beck Intakes
Material Dock
North Grand
Island Bridges
NORTH TONAWANDA
TONAWANDA ISLAND
Slater's Point
NAVY ISLAND
Chippawa-Grass Island Pool
GRAND ISLAND
Tonawanda Island
South Grand
Island Bridges
Black Creek
Huntley Station
Legend
Recording Gauge
Black Rock Lock
Frenchmans Creek
SQUAW ISLAND
International Railway Bridge
Bird Island Pier
Scale
FORT ERIE
Peace Bridge
BUFFALO
1 0 5 km
1 0 5 mi
Fort Erie
Buffalo Water Intake
Windmill Point
Buffalo Harbor
Point Abino
ICE BOOM
Lake Erie

ENCLOSURE 1

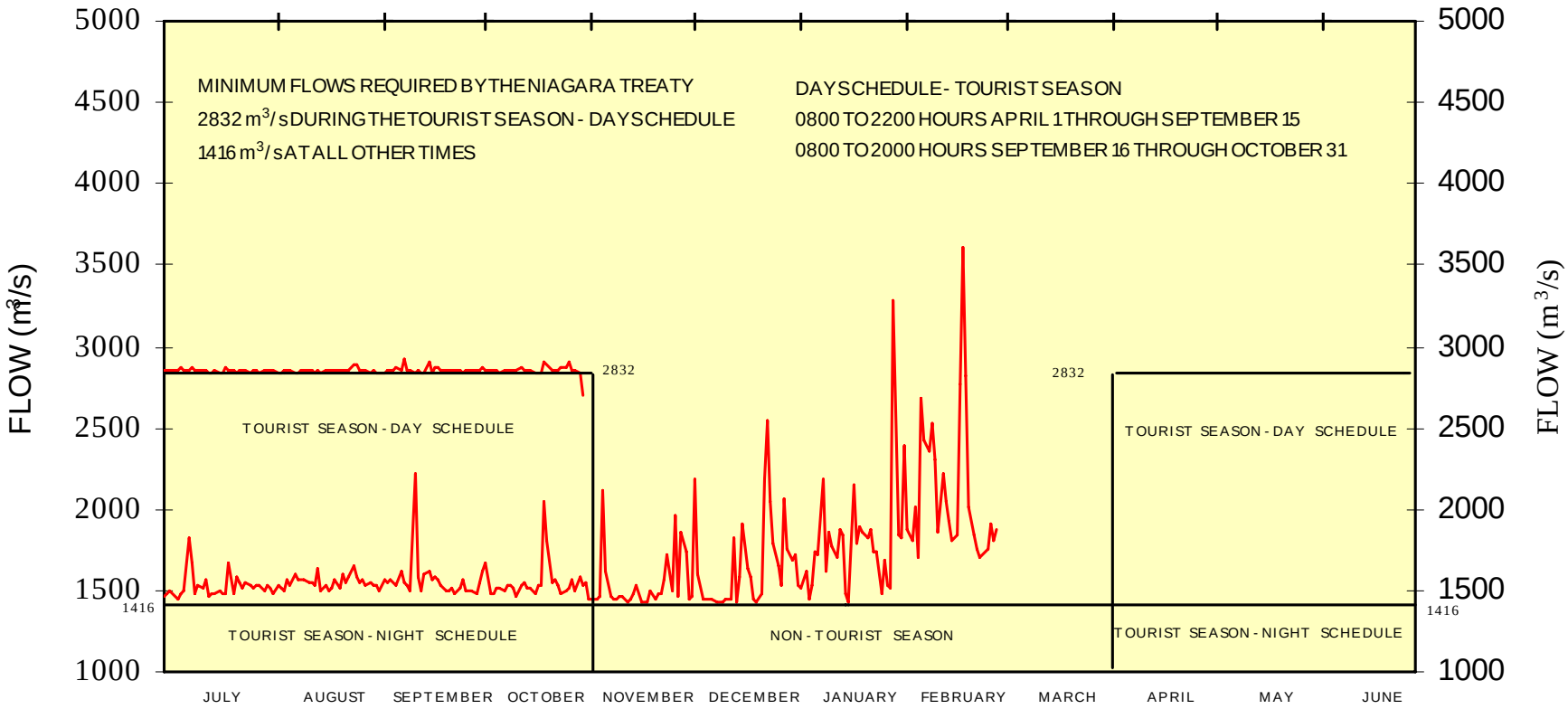

NIAGARA RIVER DAILY MEAN LEVEL AT MATERIAL DOCK GAUGE
NOTE: LONG-TERM MEAN STAGE = 171.16 METRES, IGLD (1985)
JULY 2007 THROUGH FEBRUARY 2008
ELEVATION IN METRES, IGLD (1985)
172.00
171.75
171.50
171.25
171.16
171.00
170.75
170.50
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE

ENCLOSURE 2

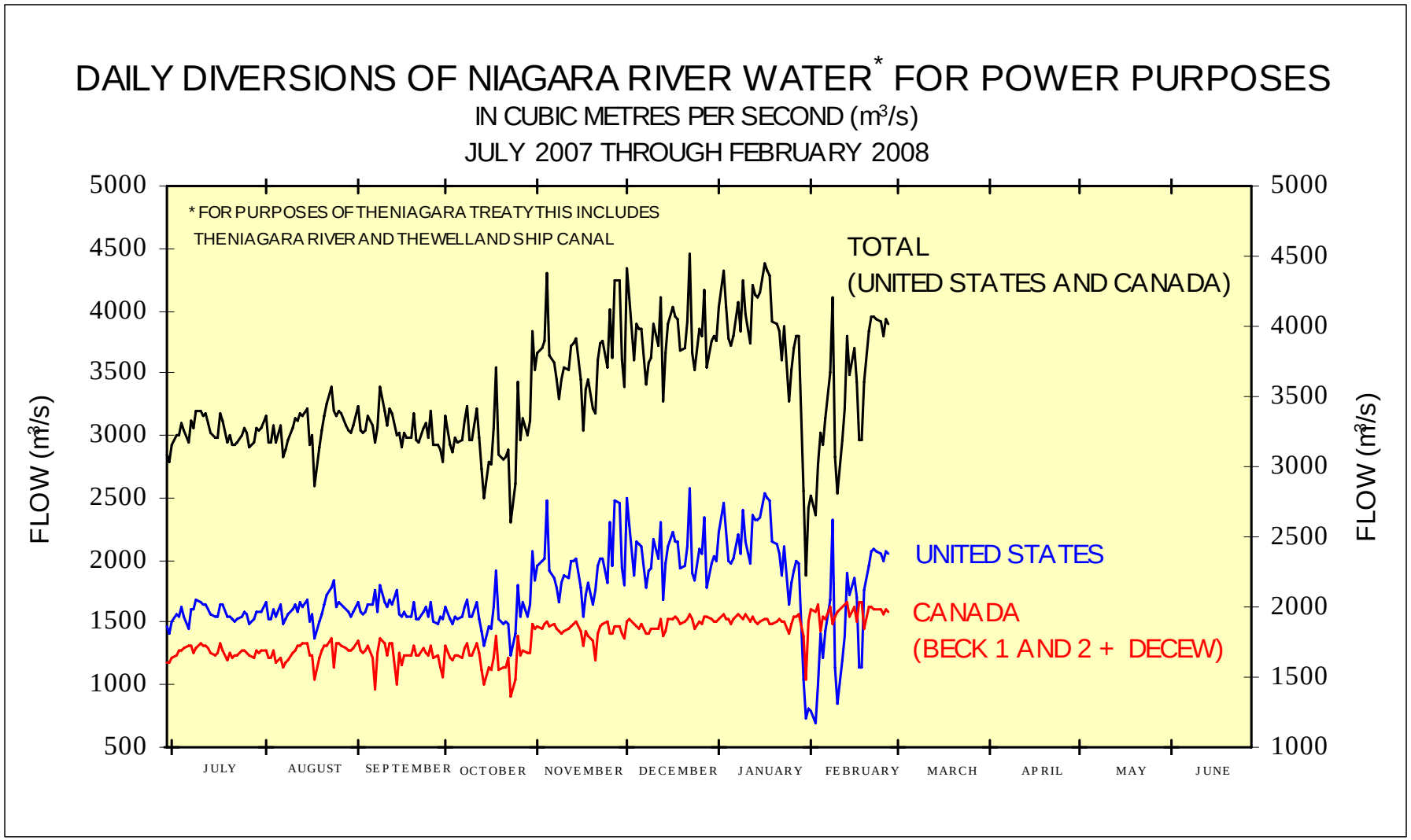
# DAILY FLOW OVER NIAGARA FALLS

## FLOW AT ASHLAND AVENUE GAGE IN CUBIC METRES PER SECOND ($m^3/s$)

## JULY 2007 THROUGH FEBRUARY 2008




ENCLOSURE 3


DAILY DIVERSIONS OF NIAGARA RIVER WATER* FOR POWER PURPOSES
IN CUBIC METRES PER SECOND (m3/s)
JULY 2007 THROUGH FEBRUARY 2008
* FOR PURPOSES OF THE NIAGARA TREATY THIS INCLUDES
THE NIAGARA RIVER AND THE WELLAND SHIP CANAL
TOTAL
(UNITED STATES AND CANADA)
UNITED STATES
CANADA
(BECK 1 AND 2 + DECEW)
FLOW (m3/s)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE

ENCLOSURE 4