International Lake Superior
Board of Control

Semi-Annual Progress Report to the International Joint Commission

Covering the period September 09, 2010 to March 23, 2011

Table of Contents

Cover photo: Sunrise at the Soo Locks, January 5, 2010. *Photo credit to Ms. Michelle Hill, Park Ranger at the USACE, Soo Area Office.*

Figures

Tables

International Lake Superior Board of Control

Canada
David Fay, Member
Rob Caldwell, Secretary

United States
MG John W. Peabody, Member
John W. Kangas, Secretary

23 March 2011

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

Commissioners:

This semi-annual report covers the Board's activities from 9 September 2010 to 23 March 2011.

1. Highlights

During the past six months, the water levels of Lake Superior remained below average and have been 17 to 23 centimetres (7 to 9 inches) lower than last year's levels, and were 34 cm (13 in.) below average last month. Lake Superior water levels have been consistently below average since April of 1998, which is the longest sustained period of below-average monthly levels in the 1918-2010 record.

The levels of Lakes Michigan-Huron have been below average since January of 1999, and by the end of March this will also be the longest sustained period of below-average monthly levels. Monthly mean Lakes Michigan-Huron levels have been 21 to 36 centimetres (8 to 14 inches) below those of one year ago and last month's monthly mean water level was 51 centimetres (20 inches) below average

The Lake Superior outflows were as specified by Regulation Plan 1977-A. Since September, these monthly outflows have been between 66% and 81% of average. Meanwhile, the monthly outflows from Lakes Michigan-Huron ranged from 86% to 95% of average. Water supplies to Lake Superior were above average in September and January, but were otherwise below average. Water supplies to Lakes Michigan-Huron were above average in September but were below average from October to February, for five straight months.

Ponding by the hydropower entities was permitted on weekends and holidays during the reporting period.

The Board is working with the U.S. Fish and Wildlife Service to facilitate a USEPA-funded study to assess improvements to sea lamprey trapping efficiencies at Sault Ste. Marie and will be submitting a request to the IJC to authorize small over-discharge deviations from Plan flow during a maximum window from 15 May to 31 July for this purpose.

The four-year refurbishment program by Brookfield Renewable Power at the Compensating Works will be extended into the Summer of 2011 in order to complete the above-water work on Gate 1. This was primarily due to inclement weather in 2010. The IJC issued a supplementary Order of Approval on 23 July permitting Brookfield Renewable Power to close Gate 1 temporarily during this work. Gate 1 supplies water to the Fisheries Remedial Works.

The outlook for the next six months is continued below-average water levels on lakes Superior and Michigan-Huron, even if water supplies well above average are experienced.

2. Monitoring of Hydrologic Conditions

The Board continuously monitors the water levels of lakes Superior and Michigan-Huron, and the water levels and flows in the St. Marys River. The Regulation Representatives' monthly reports to the Board provide hydrologic assessments and recommendations on the regulation of outflows from Lake Superior. These reports indicate the amount of water available for hydropower purposes, after the requirements for domestic use, navigation, and the fishery (St. Marys Rapids) were met.

Tables 1 and 2 list the recent monthly water levels, net basin supplies, and outflows for lakes Superior and Michigan-Huron, respectively. Figure 1 compares the monthly water levels for this period to long-term averages and extremes. Figure 2 shows the monthly precipitation over the lakes Superior and Michigan-Huron basins. Figure 3 shows the monthly net basin supplies for the basins.

Precipitation over the Lake Superior basin was 107% of average from September 2010 through February 2011 and would be expected to be exceeded 32% of the time. The net basin water supplies to Lake Superior, which are the net effect of precipitation, evaporation and runoff to the lake, were above average in September 2010 and January 2011 but were below average in October, November and December of 2011 and again in February 2011. On the whole, the September through February net basin supplies to Lake Superior would be expected to be exceeded 86% of the time.

Lake Superior's water levels have been consistently below chart datum (183.2 m or 601.1 ft.) since 28 October and are currently 32 cm (13 in.) below chart datum. Its levels over the past six months ranged from 32 to 35 cm (13 to 14 in.) below average. On 23 March, its level was at an elevation of 182.88 m (600.0 ft.), which was 35 cm (14 in.) below average and 21 cm (8 in.) lower than last year. The levels of Lake Superior have been consistently

below average since April of 1998, which is the longest sustained period of below-average monthly levels in the 1918-2010 period of record.

Modeled snow water equivalent (SWE) values as of the beginning of March show more water available in the snowpack than last year. Snow survey flights to determine the snow water equivalent on the entire Lake Superior basin will be flown between 25 and 29 March, with data made available shortly there after..

Precipitation over the Lakes Michigan-Huron basin was 90% of average over the past six months according to provisional data and would be expected to be exceeded 72% of the time. Net basin water supplies to Lakes Michigan-Huron were above average in September but were otherwise below average from October through February. On the whole, the September through Februarynet basin supplies to Lakes Michigan-Huron would be expected to be exceeded about 86% of the time.

Monthly mean levels on Lakes Michigan-Huron ranged from 35 to 51 cm (14 to 20 in.) below long-term averages. Water levels fell below chart datum (176.00 m or 577.4 ft.) on 4 November, 2010. On 23 March, Lakes Michigan-Huron were at elevation 175.84 m (576.90 ft.), 47 cm (19 in.) below average, 25 cm (10 in.) lower than one year ago, and 16 cm (6 in.) below chart datum. The level of Lakes Michigan-Huron has been below average since January of 1999, and as of the end of March this will also be the longest sustained period of below-average monthly levels on record.

3. Regulation of the Outflow from Lake Superior

The outflows of Lake Superior were as specified by Regulation Plan 1977-A during the reporting period. Lake Superior outflows were 74% of average over the last six months, with monthly flows ranging from 1,530 to 1,570 m^3/s (54,000 to 55,400 cfs). Outflows were limited by Criterion (c) of the Orders in February and March of this reporting period. Outflows were limited to the normal minimum outflow of Plan 1977-A from September to January.

The gate settings at the Compensating Works supplying the main portion of the St. Marys Rapids were at an equivalent one-half gate open from September through February. The equivalent one-half gate open setting was maintained using Gates 11 to 14 open 20 cm (8”) each from 15 July to 30 November in order to facilitate Canadian gate refurbishment activities. The typical gate setting of Gates 7 to 10 open 20 cm (8 in”) was in place after November 30, 2010. Gate 1, which supplies water to the Fishery Remedial Works, was operated on August 21, 22, 23, 24, 25 and 31 and then again on September 7, 8 and 14. In all cases, Gate 1 was moved in 25 mm (1”) increments. Gate 1 was closed 9 times, for periods of less than 24 hours each time, as required in the supplementary Order of Approval of 23 July 2010 permitting Brookfield Renewable Power to close the gate temporarily during the refurbishment work. The Supplemental Order for work at Gate 1 was extended

to 22 September, but Brookfield Renewable Power decided against further gate movements after 15 September. A summary of work performed is provided in Section 5. The negligible storage of water resulting from these temporary closures of this gate was accumulated on Lake Superior.

Several scheduled and a few unexpected flow reductions occurred at the three hydropower plants to facilitate maintenance and make repairs. Details are provided in Section 6. All flow reductions were easily offset by flow increases at other times within each month. When units are taken off-line, water levels at U.S. Slip gauge fall, but quickly rise again as the idled units are brought back on-line. No problems related to water levels were reported as a result of these variations. No ships were reported delayed due to the flow variations.

4. Governing Conditions during the Reporting Period

The monthly mean levels of Lake Superior ranged between 182.87 and 183.25 m (600.0 and 601.2 ft.) during the reporting period, within the limits of 182.76 and 183.86 m (599.6 and 603.2 ft.) specified in the Commission's Orders of Approval.

During the reporting period, the daily mean water levels in the lower St. Marys River at the U.S. Slip gauge downstream of the U.S. Locks, varied between 175.84 and 176.54 m (576.9 and 579.2 ft). Therefore, the requirement for maintaining the level below 177.94 m (583.8 ft.) was satisfied. Daily mean U.S. Slip levels fell below the ponding restriction threshold (see Section 10) of 176.09 m (577.72 ft.) on 22 days during the navigation season within the reporting period (primarily due to wind events) but no impacts to navigation were reported.

5. Inspection and Repairs at the Compensating Works

Ongoing routine maintenance and inspections of the Compensating Works were undertaken in the past six months. The structure is generally in good condition.

On the Canadian side of the structure, Brookfield Renewable Power’s major multi-year repainting and refurbishment program recommenced on 27 May 2010, with inclement weather causing postponement of the program for the year on 29 October 2010. Dewatering structures were installed at Gate 2, with blast cleaning and painting of the gate, steel structures, mechanical devices and counterweight being carried out. Necessary mechanical repairs and skin plate and steel repairs were minimal. While blast cleaning was ongoing, additional items of work including additional painting at Gate 5 and concrete and steel repair at Gate 7 were undertaken. On 27 July 2010, the gear wheel of Gate 6 was removed to repair the hub and spokes. The gear was replaced on 1 October 2010.

On 25 August 2010, blast cleaning and painting of Gate 2 was completed. Outstanding items such as installation of the bottom seal and removal of the dewatering structures were completed and the gate was deemed ready for operation on 19 September 2010.

On 23 July 2010, the Commission issued a supplementary Order, granting Brookfield Renewable Power permission to close Gate 1 temporarily, as required, for periods of less than 24 hours at a time, between 1 August and 15 September, to facilitate the refurbishment work. Letters of concurrence were received from the Batchewana First Nations of Ojibways, Ontario Ministry of Natural Resources, Michigan Department of Natural Resources and Environment, Canadian Department of Fisheries and Oceans, and the US Fish and Wildlife Service. A gate opening and closing protocol approved by the above agencies (i.e., a rate of no more than 16 mm (5/8") every 10 minutes) was followed to minimize potential adverse impacts by accommodating the lack of mobility and slow response of small fish in the downstream channel to receding water and flushing water. A recovery team returned all trapped and stranded aquatic life to flowing water. A monitoring report was prepared and provided to the Board on 22 October 2010. Detailed gate opening and closing information was provided in Section 3.

Inspections, using a pole mounted underwater camera identified debris both in front of and under Gate 1, which had to be removed prior to any gate movements. Debris removal took two days and the first movement occurred 21 August. During the closures, underwater inspections of the gate and apron both upstream and down, along with repairs on the abutment wall, were completed.

Underwater inspections of Gate 1 indicated that it was in a condition comparable with those that had been refurbished and movement of the gate between the noted dates illustrated its ability to operate. As a result, on 15 September, BRP deferred refurbishment of the gate itself to the next cycle of major maintenance. In further support of this decision, it was noted that the five year inspections will continue so that repairs could be initiated should something be identified in the interim.

Monthly inspections and routine maintenance continued to be conducted on the U.S. portion. The five-year periodic inspection of the U.S. portion of the Compensating Works was done on 26 and 27 May 2010. A report of the findings and recommendations was drafted in January 2011, with the review and comment period ongoing. The report is expected to be finalized later this year and will be provided to the Board. Some findings mentioned in the report include some leakage at all gates, especially Gates 12 and 15. Gates 11-16 operated well during the inspection. Monthly inspections are conducted by the USACE Soo Area Office. The 12 January 2011 monthly inspection found the Compensating Works facilities to be in good condition.

6. Repairs and Maintenance at the Hydropower Facilities

a. U.S. Government Hydropower Plant

In September 2010, Unit 10 was offline for 82 hours as the crane & barge performed work. Also in September 2010, Unit 2 was offline for nearly 89 hours for cleaning and inspection.

October 2010 saw outages of varied amounts at all units due to faults at the Magazine Street substation. Unit 3 was the most impacted with an outage time of 397 hours. In early November 2010 a speed probe failure and work at the Magazine Street substation resulted in 20.5 hours of downtime at Unit 1. The remaining units were offline for 18 to 21 hours due to continued work at the Magazine Street substation. Anchor ice build-up on January 23 – 24, 2011 caused 12 hours of down time of Units 2, 3, and 3a. Including aforementioned outages, several more scheduled and unscheduled outages have occurred since September resulting in about 1010 hours of downtime for scheduled and unscheduled maintenance and to correct electrical faults. Flow allocations were met during the reporting period. Cloverland Electric Coop (CEC) used all of the allocation that the government plant was unable to use.

b. Brookfield Renewable Power

A shutdown during daylight hours occurred 25 September to facilitate the annual underwater cable inspection and maintenance for Lake Superior Power Ltd. The head race ice boom was repaired at that time. Most of the previous monitoring issues that had arisen were resolved, but all alarm terminal points were checked and tightened as necessary as well. Unit G3 was shut down from 24 September until 15 October for annual inspection and transformer replacement. Unit G1 was shut down for several hours on 7 October due to a governor failure. Unit G2 was shut down on 22 October and 16 to 17 November for slip ring cleaning and exciter repairs. Unit G1 was also shut down from 14 to 25 January for transformer repairs. Unit G2 was offline on 17 March and G3 was offline from 16 March to the end of the reporting period to fix a problem with a transformer cable.

c. Cloverland Electric Co-operative

Routine maintenance was conducted during the reporting period. Placement of stone on the power canal banks resumed 13 September and was completed on 24 November. During the reporting period all flow allocations were used. Resumption of stone and barrier placement will resume in mid April and will continue through mid June. There will be divers setting barriers this year, so some construction will need zero flow.

7. Flow Verification Measurements

Hydropower flow verification measurements are performed on a five-year cycle, and were completed last summer on 14 – 17 September. A final report will be prepared and the results presented to the Board. The next scheduled verification measurements will be in 2015 per the mandated measurement cycle.

Flow measurements were also made at the USGS ADCP site on 17 September and model sections in the lower St. Marys River on 18 September. These measurements were for model calibration and are not related to the power plant flow verification program.

8. Water Usage in the St. Marys River

Table 3 (Table 4 in cubic feet per second) lists the distribution of outflows from Lake Superior for January 2010 to February 2011. Water uses are divided into four categories: domestic, navigation, fishery and hydropower. According to the 1979 Supplementary Order, after the first three water requirements are satisfied, the remaining outflow is shared equally between the U.S. and Canada for hydropower purposes. Remaining flow, beyond the capacity of the hydropower plants, is discharged through the Compensating Works into the St. Marys Rapids.

As shown in the tables, water used for domestic and industrial purposes ranged from 10 to 11 m^3/s (353 to 388 cfs) or 0.6 to 0.7% of the total monthly outflow.

The monthly flow through the locks depends on traffic volume and varied from 2 to 13 m^3/s (71 to 459 cfs). As a percentage of the total river flow, water allocated for navigation can vary seasonally from 0.1% (when the locks are closed for the winter) to 1.0% in the busiest part of the navigation season.

The U.S. locks closed three days late on 18 January 2011 as requested by the Lake Carriers' Association, due to increased winter demand for iron ore cargos. The U.S. locks are expected to open on 25 March. The Canadian lock remained closed throughout the 2010 season to allow for upgrades to the site infrastructure. The lock was drained for inspections and repairs. The baffle wall was rebuilt, while water infiltration into the powerhouse was also addressed. Boaters were able to use the U.S. locks. The lock is expected to reopen on 15 May.

In accordance with the Commission's Orders to fulfill the fishery needs in the main rapids, a minimum gate setting of one-half gate open is required at all times at the Compensating Works. A setting equivalent to ½ gate open for the main rapids is maintained by having four gates partially open to supply the same quantity of water. This spreads the flow more evenly across the main rapids, and is thought to reduce potential damage from ice floes impacting the gate. In addition, a flow of at least 15 m^3/s (530 cfs) is normally also maintained in the Fishery Remedial Works (through Gate 1; see Section 5 for details on temporary closures of the gate during this reporting period). The flow in the St. Marys Rapids, including that through the Fishery Remedial Works, ranged from 82 to 84 m^3/s (2,900 to 2,970 cfs) over the last six months, or approximately 5% of the total monthly outflow.

The hydropower plants passed an average of 1,450 m^3/s (51,200 cfs) from September to February for power production, or 93.5% of the total river flow. The allocation for this period averaged 1,449 m^3/s (51,200 cfs). Usages at each plant are shown in tables 3 & 4.

9. Long Lac and Ogoki Diversions

Ontario Power Generation (OPG) continued to provide the Board with information on the operations of the Long Lac and Ogoki Diversions. The Ogoki Diversions into Lake Nipigon (which flows into Lake Superior) averaged 105.3 m^3/s (3,720 cfs) and the Long Lac Diversion averaged 39.6 m^3/s (1,400 cfs) from September through February. Combined, these diversions were about 104 percent of average for the period 1944-2010.

Slots cut into Waboose Dam provide a minimum flow northward into the Ogoki River of approximately 2 m^3/s to meet fisheries requirements. "Slot flow" (averaging 2.4 m^3/s (80 cfs)) was passed during September through February.

Continuous flows of at least 2 m^3/s (70 cfs) are maintained from the Saturday of Victoria Day weekend (in May) through Labour Day from the north outlet of Long Lake (Kenogami Dam) for environmental enhancement. An average of 1.0 m^3/s (40 cfs) was spilled from September through February.

10. Peaking and Ponding Operations at Hydropower Plants

Peaking and ponding operations are the within-day and day-to-day flow variations that enable the hydropower plants to better match their electricity production with demand. However, these variations cause the water levels in the St. Marys River downstream of the plants to fluctuate more than they otherwise would. The Commission has approved guidelines within which the Board may restrict peaking and ponding operations by the hydropower entities under certain conditions. Specifically, if the minimum level at the U.S. Slip gauge on the lower river is expected to be below the threshold level of 176.09 m as a result of ponding operations, then the power entities are required to pass peak flows for at least an 8-hour period each weekend and holiday day to provide periods of relatively higher levels on the lower St. Marys River each day. The Board provides summaries of peaking and ponding in its semi-annual reports.

The Commission's guidelines were to be examined on a five-year basis by the Board, beginning in 2010. At the Spring Appearance on 21 April, the Commission agreed that the Board could defer the report until after related findings of the International Upper Great Lakes Study are released.

During the reporting period, the power entities undertook peaking and ponding operations under the supervision of the Board. Ponding was permitted for the entire reporting period. To continue to provide timely information on expected flow variations to the users, the Corps distributes monthly notices during the shipping season (March through January) on expected Lake Superior outflows, and a schedule of flow variations at the hydropower plants. No concerns related to peaking and ponding were reported to the Board during the period.

Figures 4a-4f compare the hourly Lake Superior outflow and the hourly levels at U.S. Slip on the lower St. Marys River. In general, U.S. Slip levels were significantly lower than during the same period last year.

11. Proposed Environmental Studies

Dr. Scudder Mackey, Project Manager, Ecosystem Technical Working Group, International Upper Great Lakes Study (IUGLS) working in collaboration with the Great Lakes Fisheries Commission, have received funding through the U.S. Environmental Protection Agency's Great Lakes Restoration Initiative (GLRI) to test the potential for improving sea lamprey trapping efficiencies at the traps located immediately downstream of the hydropower plants at Sault Ste. Marie by altering the temporal distribution of St. Marys River flows during their spawning period (late May through July). Based on previous analyses, it is hypothesized that trapping of sea lamprey might be greatly improved by the manipulation of both the timing and rate of nighttime flow releases through the hydropower plants and possibly the rapids. These analyses suggest that maintaining high hydropower releases (i.e. on-peak flows) during nighttime may increase trapping efficiencies which are currently at 40%. As more than 85% of the sea lamprey in Lake Huron and northern Lake Michigan are produced in the St. Marys River, improving trapping efficiencies will provide significant environmental benefits to the Upper Great Lakes fishery, especially the lake trout population which is undergoing a strong recovery in Lake Huron.

Field work was initially scheduled to be done in the summer of 2010, but the proposed timeline was modified (at the EPA's request) and now field work is expected to be completed in 2011. The proponents continue to seek cooperation from the Board and power entities to vary the flow releases during the sea lamprey spawning period in 2011 to facilitate these experiments.

Requests include alternating evenings with on peak/off peak flow at both Brookfield Renewable Power and Cloverland Electric during the sea lamprey spawning period. Ideally, the plants would run at peak during the overnight hours one night then run off peak the next. The spawning period is generally 15 May to 31 July, but is dependent on water temperatures and typically lasts about eight weeks. Another request is to move the customary half gate setting from Gates 7, 8, 9 and 10 down to Gates 12, 13, 14 and 15 to help with nest surveys in the rapids.

The Board agreed to cooperate with the experiments, and discussed further details with the experimenters and hydropower companies. The Board reminded them that the prior approval of the Commission was required for any deviations from the monthly mean flow specified by the regulation plan and that low levels may limit any attempt to increase the amount of water passed by the power companies. Board staff will request authority to deviate from the Plan. Any deviations requested will be carried out within the requirements

and criteria of the existing Orders and the Board does not expect there to be a need for a Supplementary Order to facilitate the experiments.

12. Annual Meeting with the Public and Public Information

The Board proposes to hold its 2011 annual meeting with the public in June in Sault Ste Marie, MI. The meeting will include a call-in option for interested parties. The Board continues to recognize the need to coordinate its public communication activities with the IUGLSB to avoid possible confusion of the roles and responsibilities of the two Boards by stakeholders. The exact date and location of its next meeting with the public will soon be set by the Board.

The Board continues to issue, at the beginning of each month, news releases informing the public about Lake Superior regulation and water level conditions. The Board provides monthly media releases and hydrologic update information to the Commission to maintain a Board web site. Content includes information on Board members and responsibilities as well as news releases, semi-annual reports, meeting minutes and hydrologic data summaries. In addition, in support of the Board and the Commission, the Detroit District Corps of Engineers maintains additional technical information on its own Board Web site.

13. Related Items for Interest

Lock Replacement at Sault Ste. Marie, Michigan

A new "Poe-sized" lock is proposed to replace the existing Davis and Sabin Locks at the Soo Locks complex at Sault Ste. Marie, MI. The purpose of this project is to provide for more efficient movement of waterborne commerce. The Water Resources Development Act of 2007 directs that construction of the new lock shall be at Federal expense. This authorization eliminates the need for the eight Great Lakes States to cost share in the project.

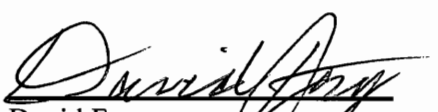
In FY 2010 the two ongoing construction contracts, one for the cofferdam construction and one to deepen the downstream approach channel were completed. In FY 2011 design continues on the plans and specifications for the guide walls/upstream channel excavation and the lock chamber. Additional contracting will take place utilizing funds as provided without committing the Federal Government to future appropriations.

14. Board Membership and Meetings

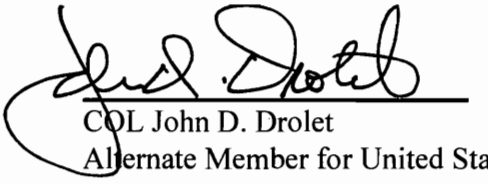
There was no change in the Board membership during the reporting period.

The Board held a meeting on 23 March in Niagara Falls, New York, with the Canadian Member and the U.S. Alternate Member in attendance.

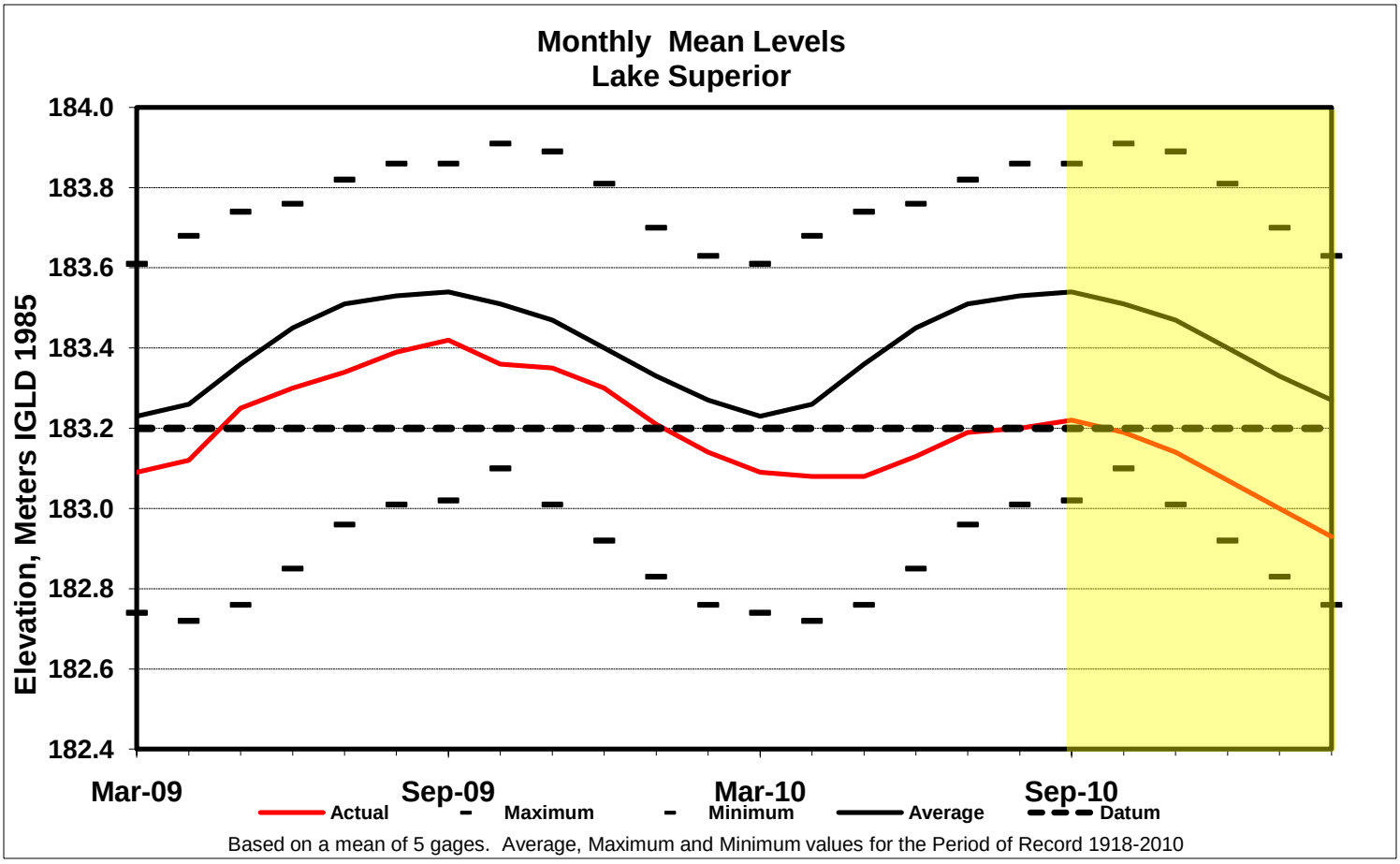
Respectfully submitted,



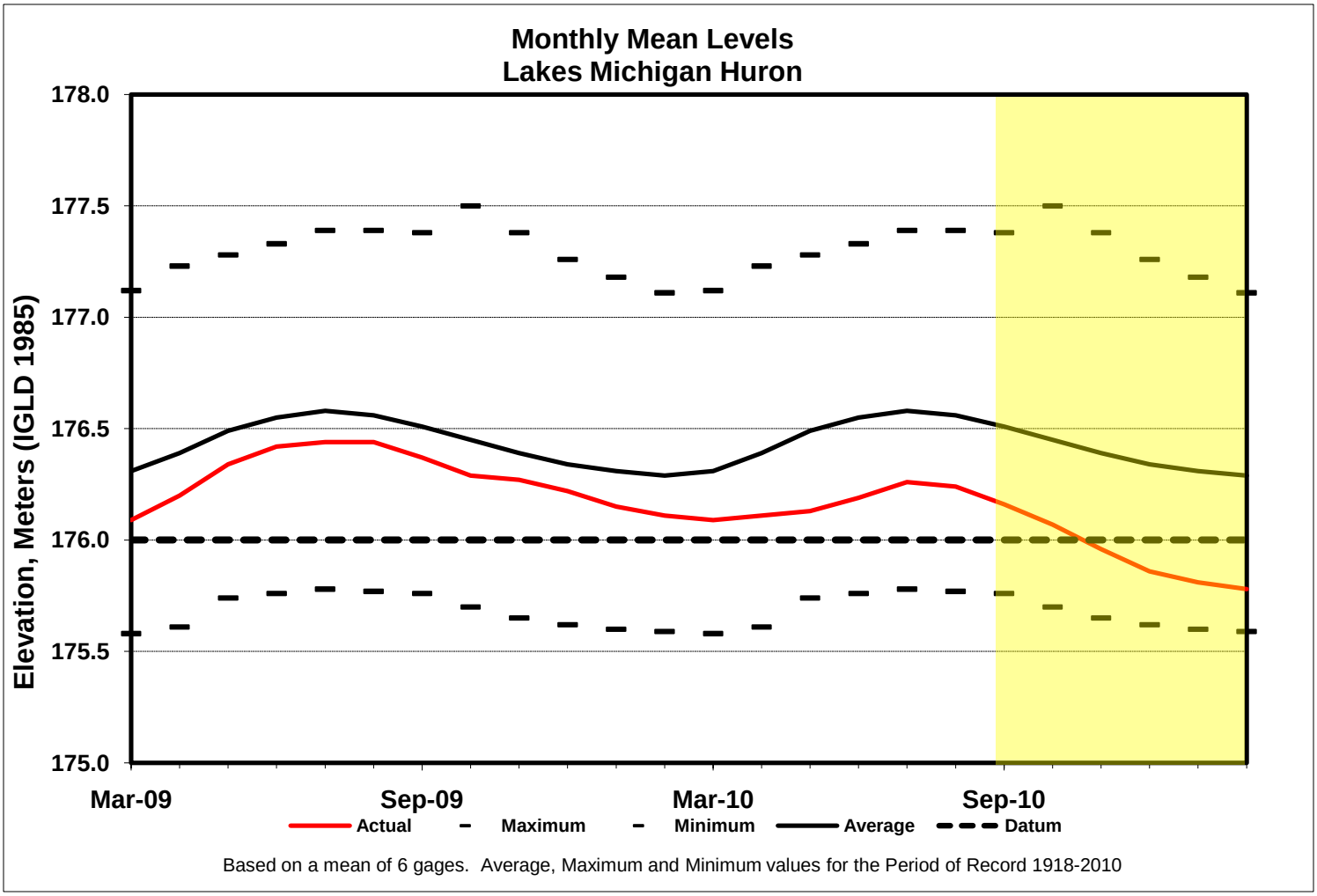
David Fay
Member for Canada



COL John D. Drolet
Alternate Member for United States

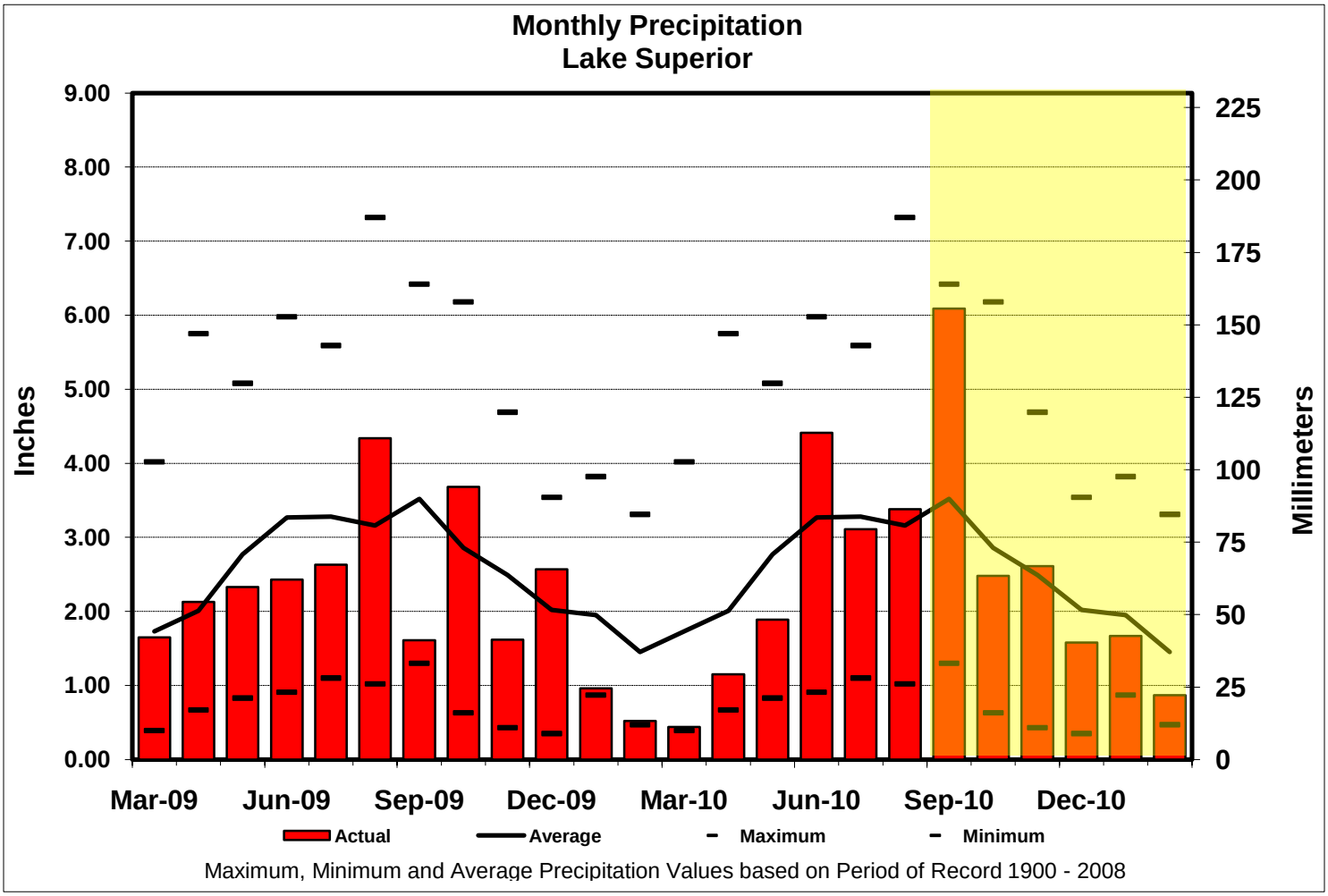


Based on a mean of 5 gages. Average, Maximum and Minimum values for the Period of Record 1918-2010



Based on a mean of 6 gages. Average, Maximum and Minimum values for the Period of Record 1918-2010

Figure 1


Monthly Precipitation
Lake Superior
Inches
Millimeters
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
225
200
175
150
125
100
75
50
25
0
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
Sep-10
Dec-10
Actual
Average
Maximum
Minimum
Maximum, Minimum and Average Precipitation Values based on Period of Record 1900 - 2008

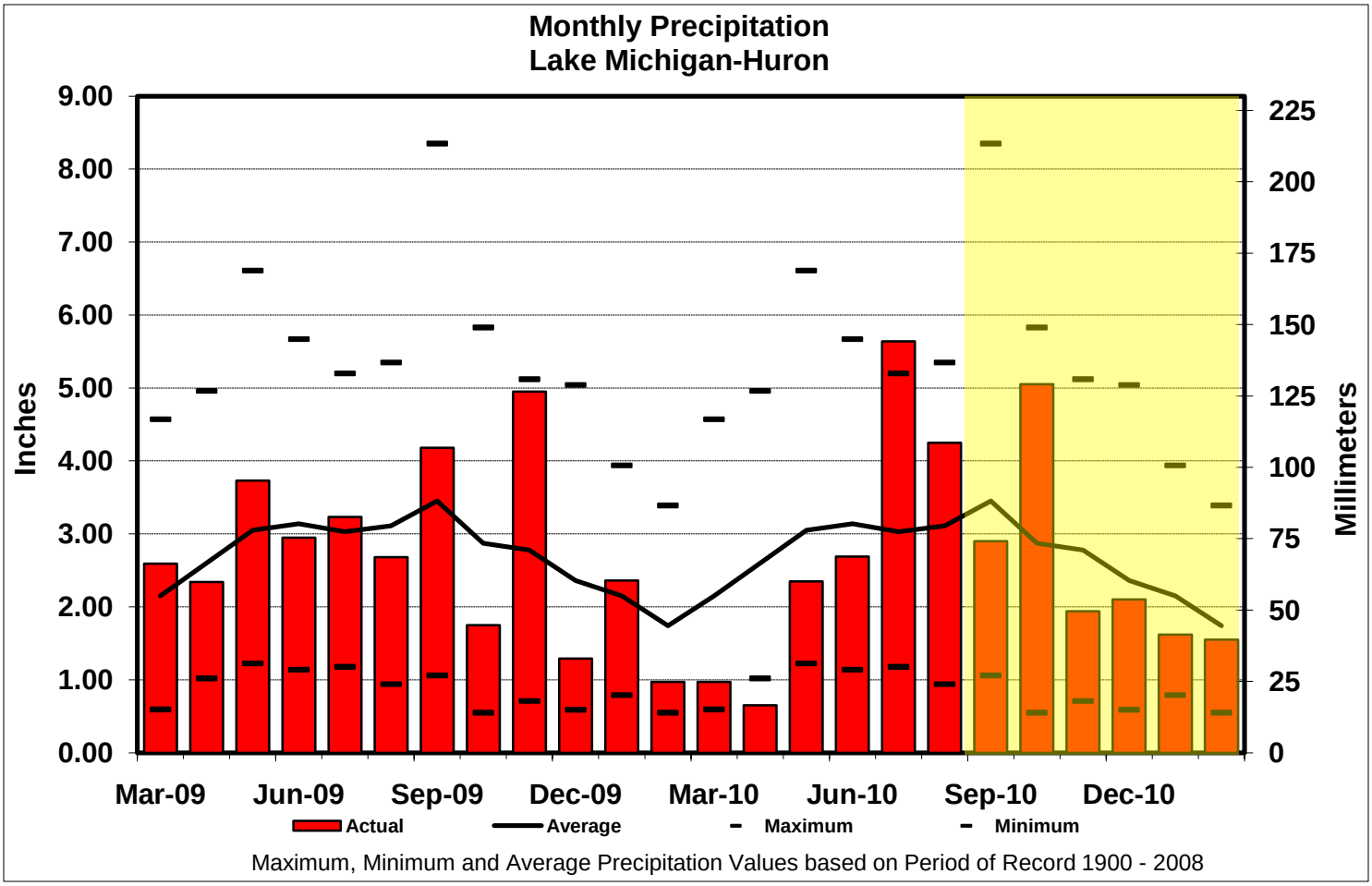
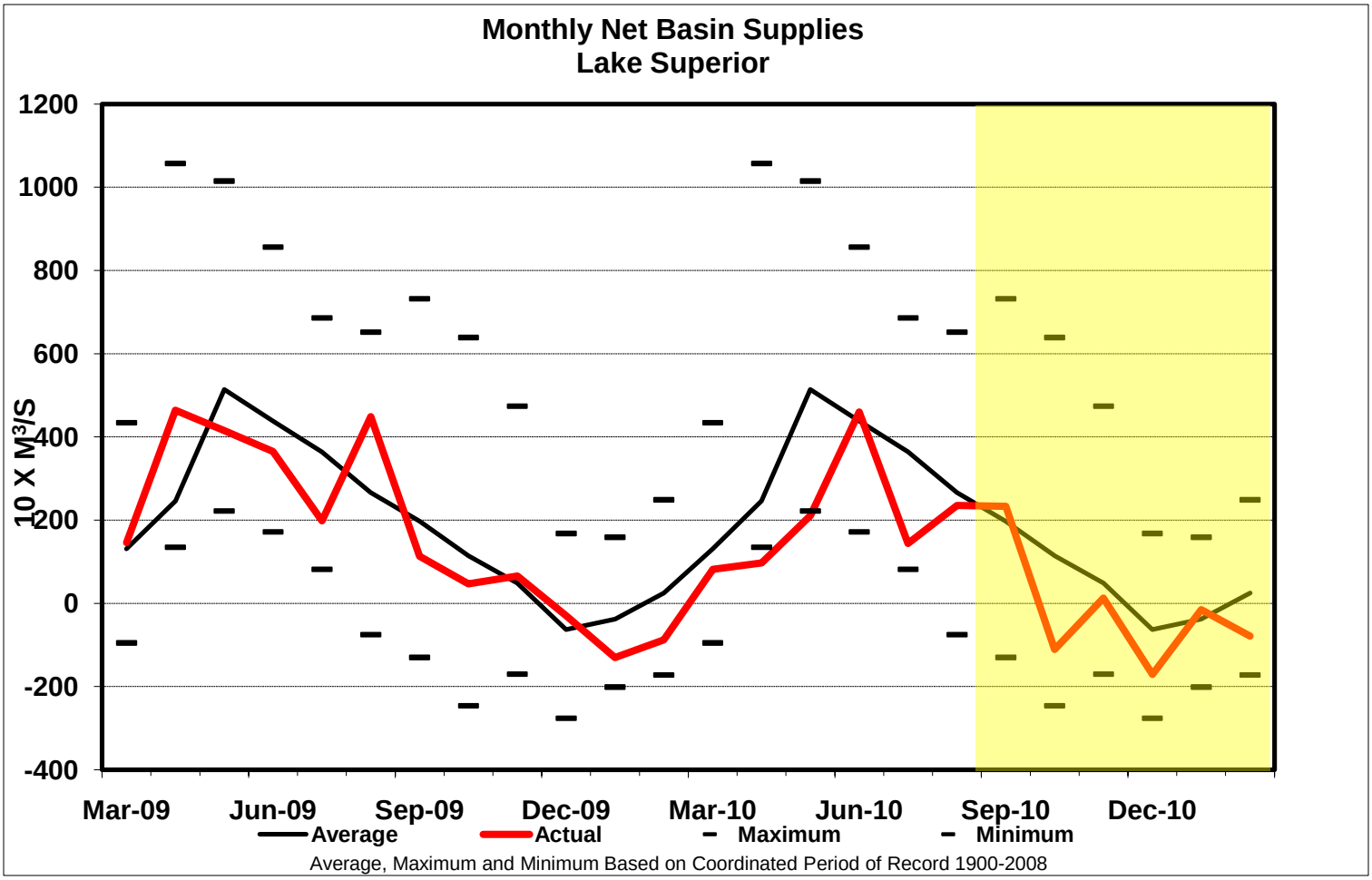

Monthly Precipitation
Lake Michigan-Huron
Inches
Millimeters
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
225
200
175
150
125
100
75
50
25
0
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
Sep-10
Dec-10
Actual
Average
Maximum
Minimum
Maximum, Minimum and Average Precipitation Values based on Period of Record 1900 - 2008

Figure 2


Monthly Net Basin Supplies
Lake Superior
1200
1000
800
600
400
200
0
-200
-400
10 X M³/S
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
Sep-10
Dec-10
Average
Actual
Maximum
Minimum
Average, Maximum and Minimum Based on Coordinated Period of Record 1900-2008

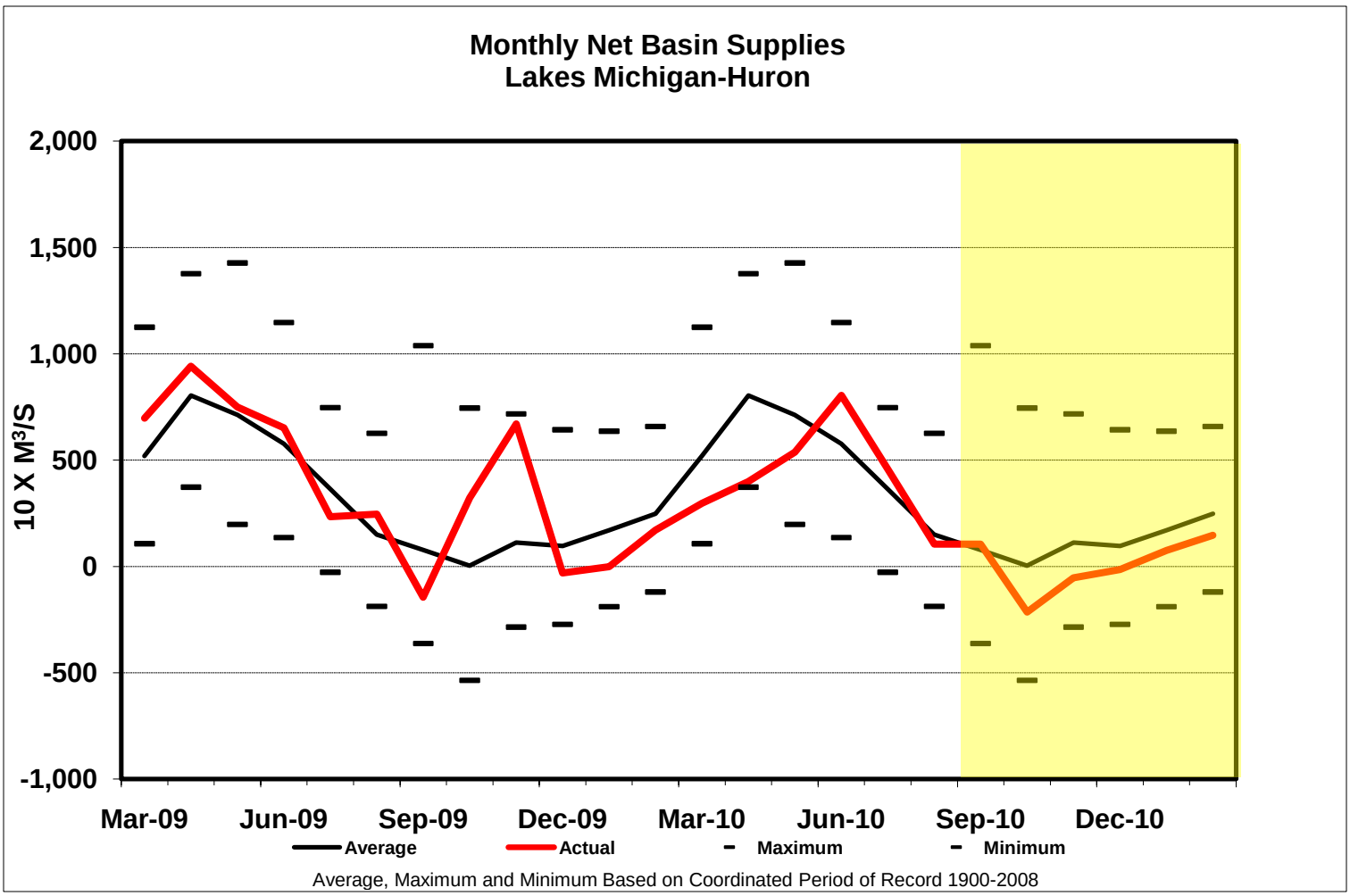
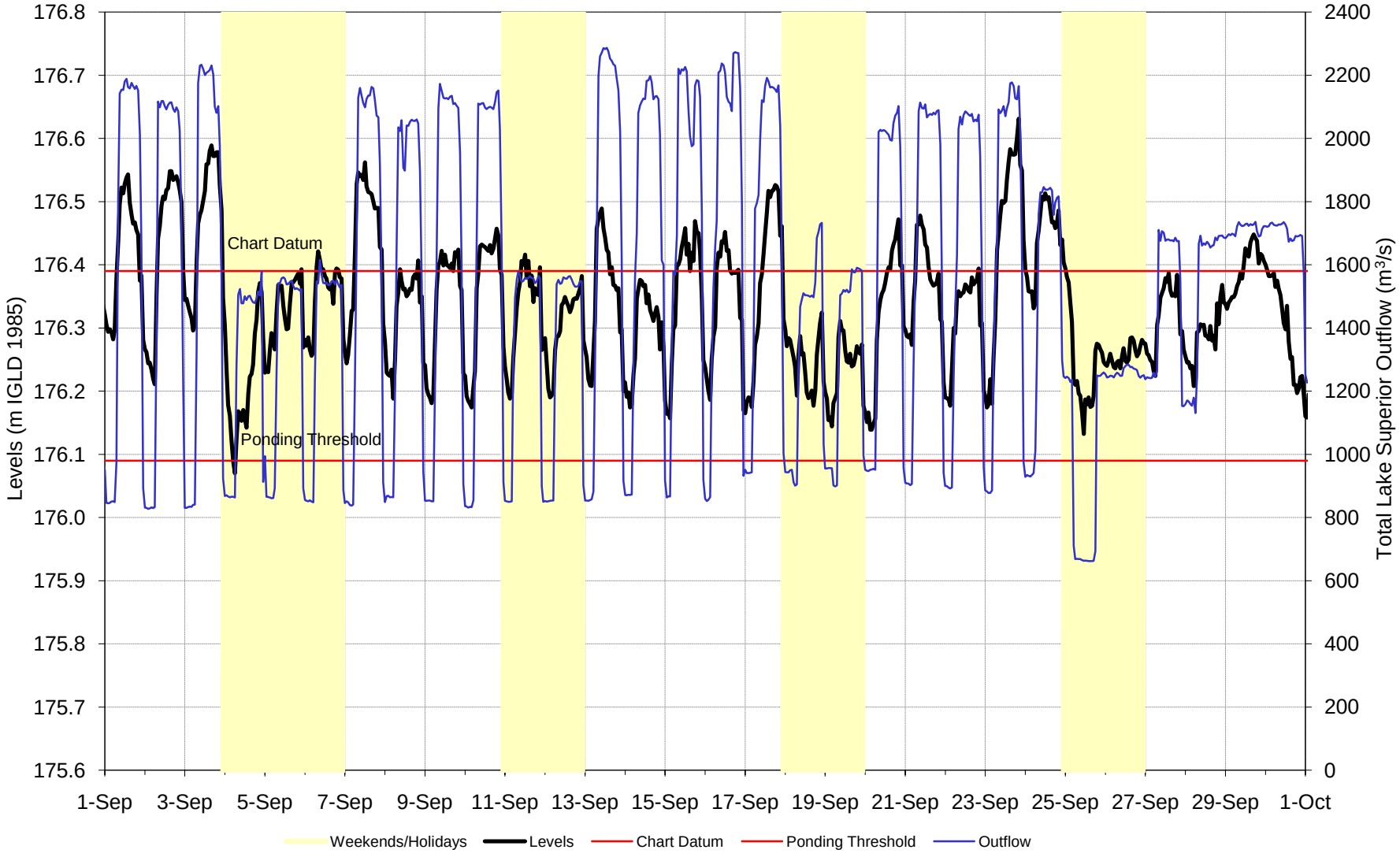
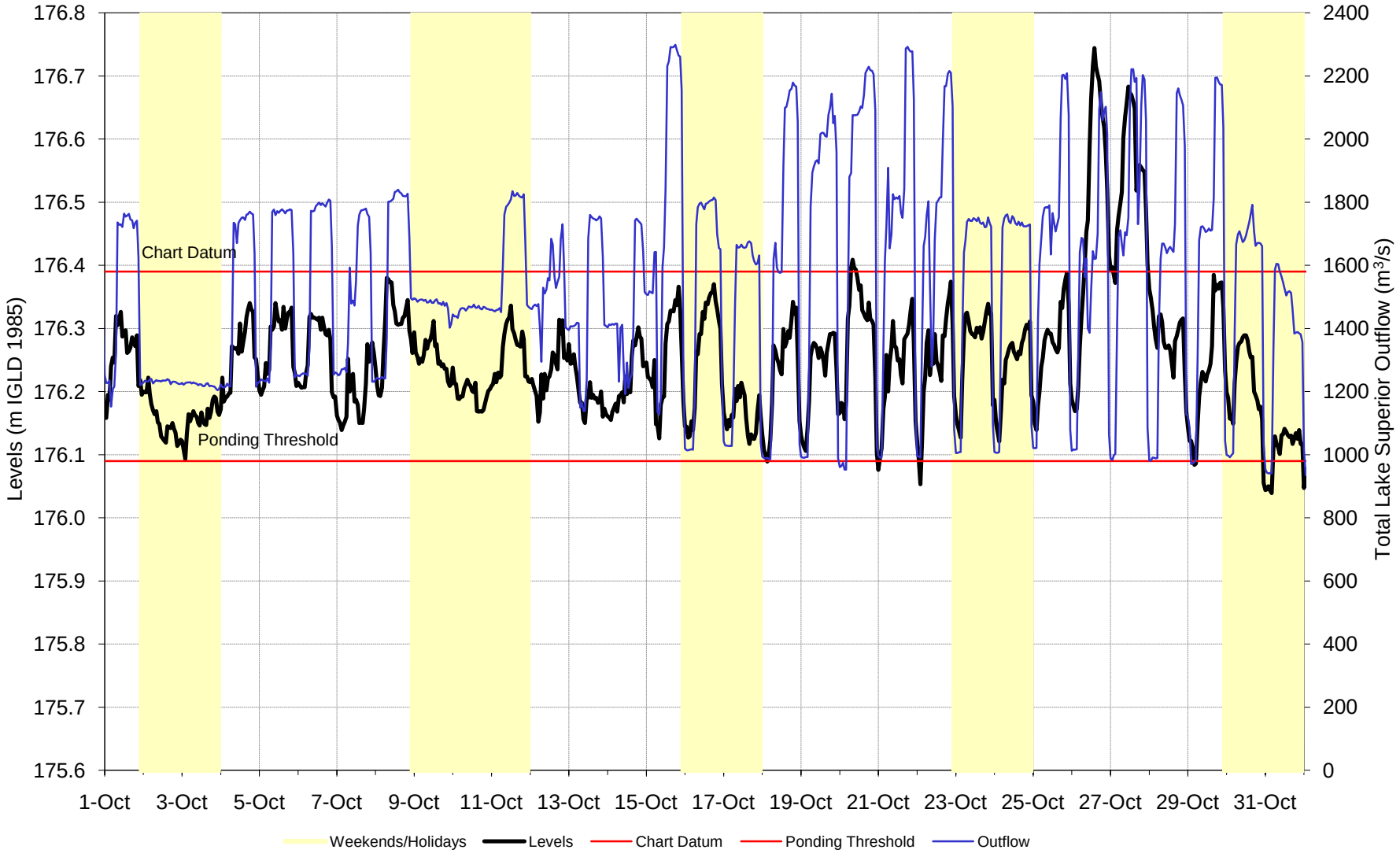

Monthly Net Basin Supplies
Lakes Michigan-Huron
2,000
1,500
1,000
500
0
-500
-1,000
10 X M³/S
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
Sep-10
Dec-10
Average
Actual
Maximum
Minimum
Average, Maximum and Minimum Based on Coordinated Period of Record 1900-2008

Figure 3

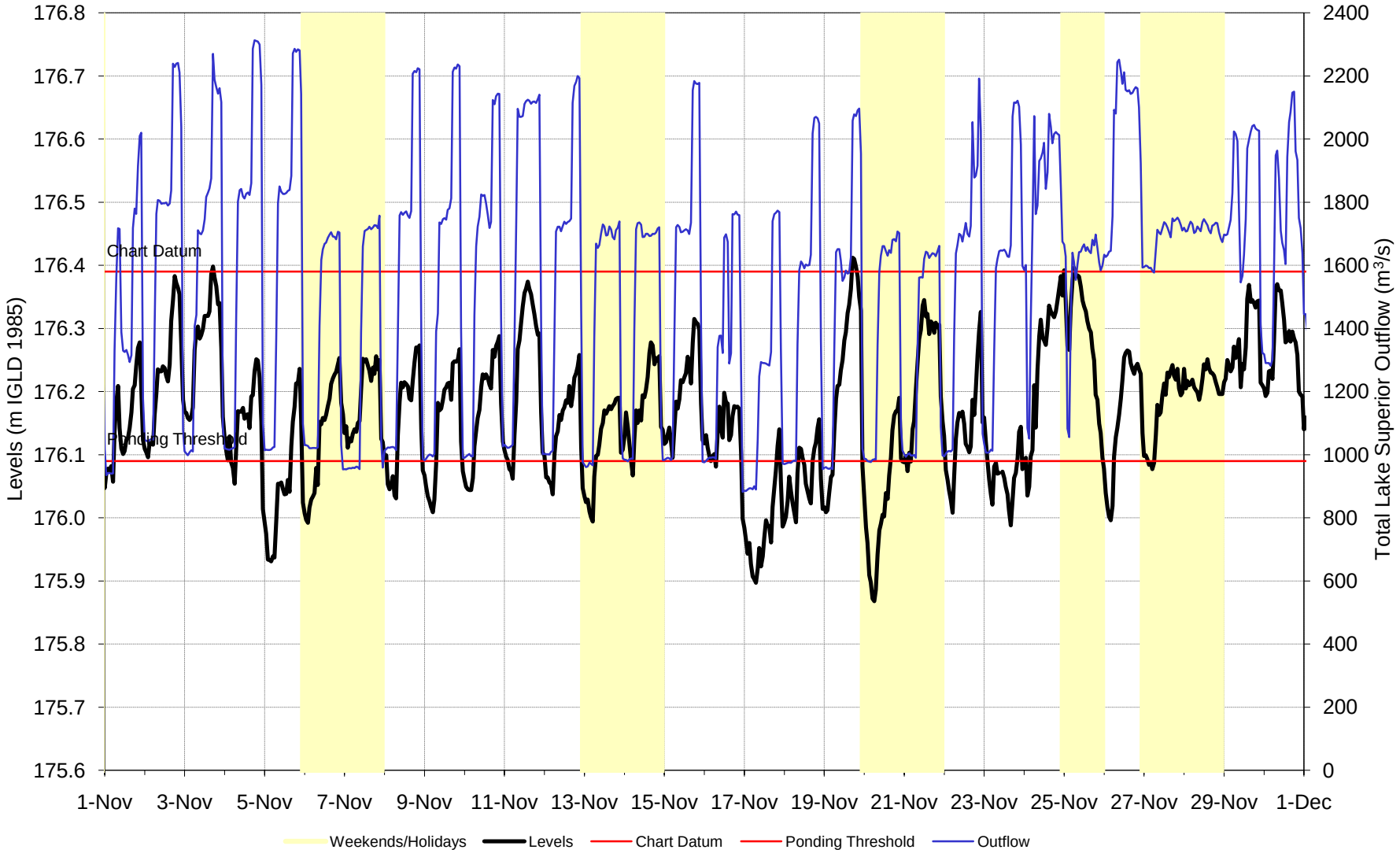
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 4a - September 2010



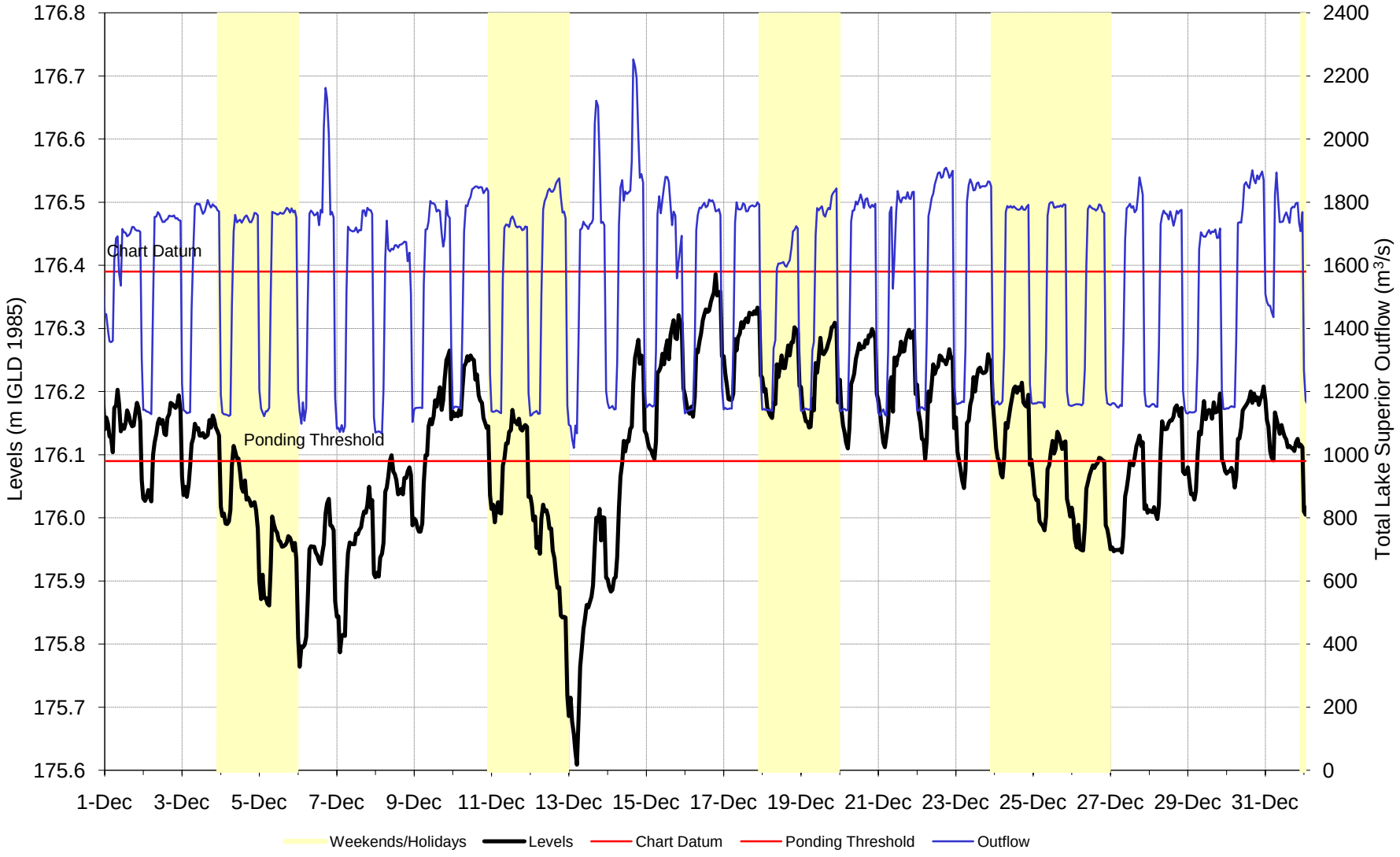
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 4b - October 2010



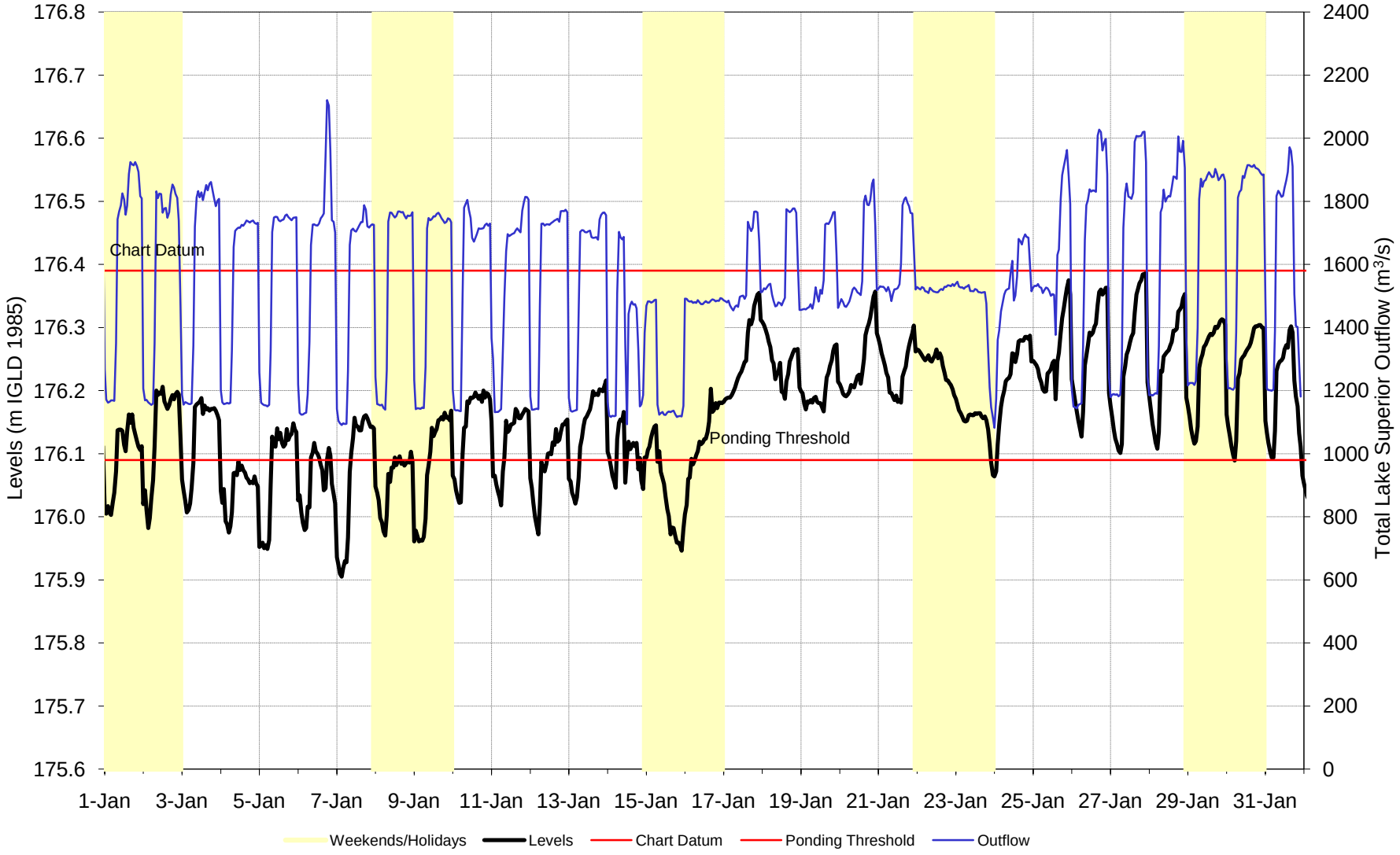
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 4c - November 2010



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 4d - December 2010



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 4e - January 2011



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 4f - February 2011

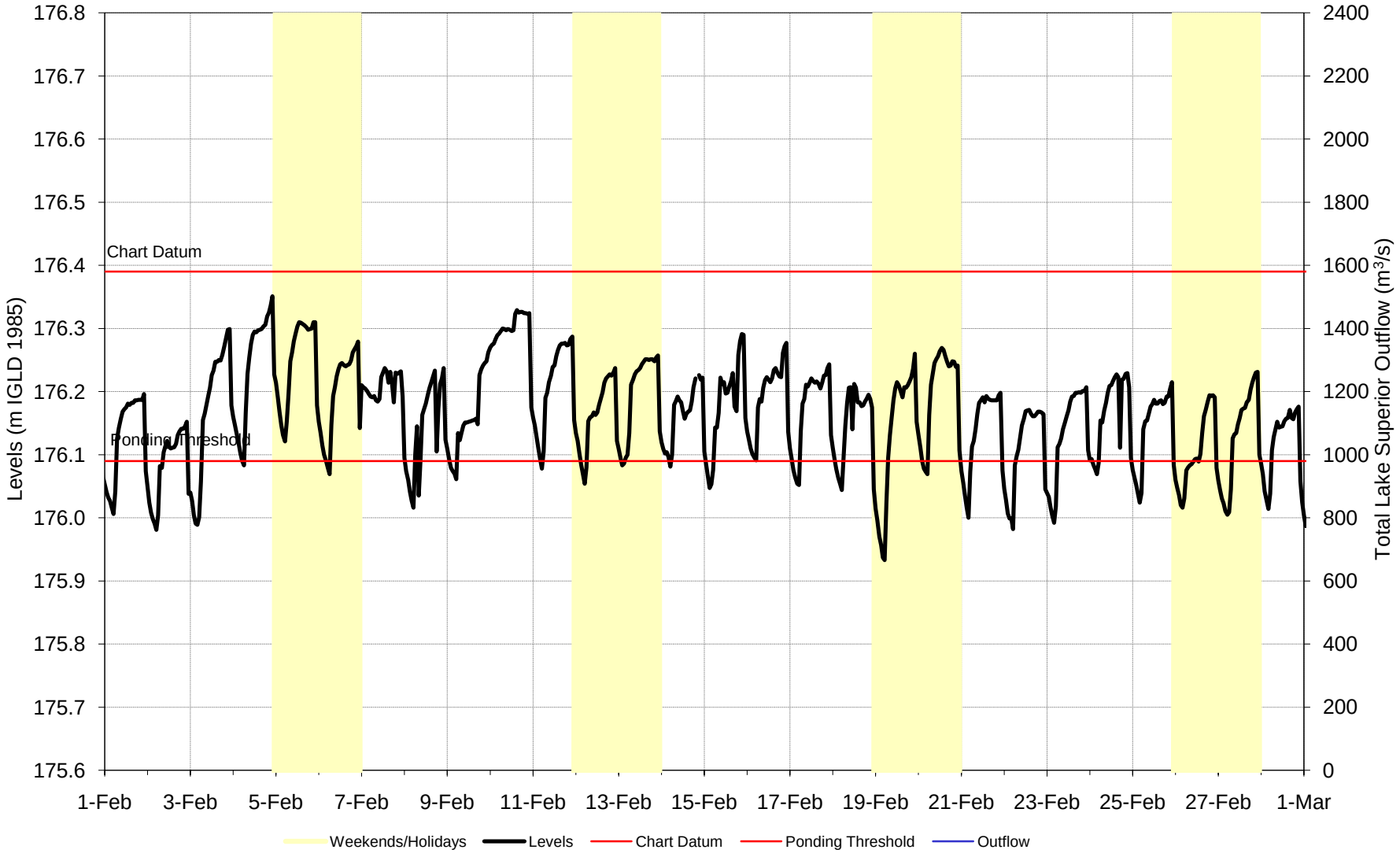


TABLE 1. 2010 - 2011 Lake Superior Hydrologic Factors

Month	Levels				Net Basin Supplies			Outflows		
	Monthly Mean Recorded[1]		Difference From Average[2]		Monthly Mean Recorded		Exceedance Probability[3]	Monthly Mean Recorded		Percent of
	Meters	Feet	Meters	Feet	m3/s	tcfs	(%)	m3/s	tcfs	Average[4]
2010										
JAN	183.21	601.08	-0.12	-0.39	-1,300	-46	91	2,000	71	103
FEB	183.14	600.85	-0.13	-0.43	-880	-31	93	1,750	62	92
MAR	183.09	600.69	-0.14	-0.46	820	29	64	1,550	55	83
APR	183.08	600.66	-0.18	-0.59	970	34	99	1,690	60	88
MAY	183.08	600.66	-0.28	-0.92	2,110	75	98	1,550	55	73
JUN	183.13	600.82	-0.32	-1.05	4,600	162	42	1,550	55	71
JUL	183.19	601.02	-0.32	-1.05	1,440	473	58	1,550	55	68
AUG	183.20	601.05	-0.33	-1.08	2,350	83	58	1,550	55	66
SEP	183.22	601.12	-0.32	-1.05	2,330	82	37	1,540	54	66
OCT	183.19	601.02	-0.32	-1.05	-1,100	-39	95	1,550	55	69
NOV	183.14	600.85	-0.33	-1.08	130	5	59	1,560	55	70
DEC	183.07	600.62	-0.33	-1.08	-1,710	-60	90	1,570	55	77
2011										
JAN	183.00	600.39	-0.33	-1.08	-150	-5	36	1,560	55	80
FEB*	182.93	600.16	-0.34	-1.12	-790	-28	91	1,530	54	81

Notes: m3/s = cubic meters per second tcfs = 1,000 cubic feet per second

[1] Water Levels are a mean of five gauges on Lake Superior, IGLD 1985

[2] Average levels are for the period 1918-2010, based on a mean of five gauges. Differences computed as meters and then converted to feet.

[3] Exceedance probabilities are based on 1900 - 2008.

[4] Average flows are for the period 1900 - 2008.

* Provisional

TABLE 2. 2010 - 2011 Lakes Michigan-Huron Hydrologic Factors

Month	Levels				Net Basin Supplies			Outflows		
	Monthly Mean Recorded[1]		Difference From Average[2]		Monthly Mean Recorded		Exceedance Probability[3]	Monthly Mean Recorded		Percent of
	Meters	Feet	Meters	Feet	m3/s	tcfs	(%)	m3/s	tcfs	Average[4]
2010										
JAN	176.15	577.92	-0.16	-0.52	-10	0	86	4,580	162	101
FEB	176.11	577.79	-0.18	-0.59	1,710	60	70	4,260	150	96
MAR	176.09	577.72	-0.22	-0.72	2,970	105	83	4,880	172	100
APR	176.11	577.79	-0.28	-0.92	3,990	141	97	5,140	182	100
MAY	176.13	577.85	-0.36	-1.18	5,370	190	79	5,040	178	94
JUN	176.19	578.05	-0.36	-1.18	8,040	284	12	5,030	178	92
JUL	176.26	578.28	-0.32	-1.05	4,580	162	26	5,150	182	93
AUG	176.24	578.22	-0.32	-1.05	1,050	37	59	5,190	183	94
SEP	176.16	577.95	-0.35	-1.15	1,050	37	41	5,180	183	95
OCT	176.07	577.66	-0.38	-1.25	-2,150	-76	88	5,120	181	94
NOV	175.96	577.30	-0.43	-1.41	-530	-19	79	4,960	175	92
DEC	175.86	576.97	-0.48	-1.57	-150	-5	70	4,900	173	94
2011										
JAN	175.81	576.80	-0.5	-1.64	750	26	70	4,010	142	88
FEB*	175.78	576.71	-0.51	-1.67	1,470	52	75	3,800	134	86

Notes: m^3/s = cubic meters per second tcfs = 1,000 cubic feet per second

[1] Water Levels are a mean of six gauges on Lakes Michigan-Huron, IGLD 1985

[2] Average levels are for the period 1918-2010, based on a mean of six gauges. Differences computed as meters and then converted to feet.

[3] Exceedance probabilities are based on 1900 - 2008.

[4] Average flows are for the period 1900 - 2008.

* Provisional

TABLE 3

MONTHLY DISTRIBUTION OF LAKE SUPERIOR OUTFLOWS (Cubic Meters / Second)

	POWER CANALS					NAVIGATION CANALS			DOMESTIC USAGE				Fishery	Total Lake
Year and Month	U.S. Gov't Hydro	Cloverland Electric	US Total	Brookfield Power	Total Power Canals	United States	Canada	Total Navigation Canals	Sault Ste. Marie US + CAN	Algoma Steel	St. Marys Paper	Total Domestic Usage	St. Marys Rapids	Superior Outflow (cfs)
2010														
JAN	349	597	946	954	1,900	4.5	0.0	4	0.30	9.9	0.3	10	85	1,999
FEB	352	472	824	827	1,651	3.0	0.0	3	0.30	10.3	0.3	11	85	1,750
MAR	388	334	722	728	1,450	4.6	0.0	5	0.30	8.8	0.3	9	84	1,548
APR	405	389	794	794	1,588	10.9	0.0	11	0.30	8.0	0.3	9	83	1,691
MAY	404	318	722	722	1,444	12.6	0.0	13	0.40	7.6	0.3	8	83	1,548
JUN	397	323	720	720	1,440	13.7	0.0	14	0.30	7.9	0.3	8	84	1,546
JUL	405	318	723	720	1,443	15.6	0.0	16	0.30	9.9	0.3	10	84	1,553
AUG	405	315	720	720	1,440	14.0	0.0	14	0.30	10.3	0.3	11	83	1,548
SEP	390	351	741	697	1,438	13.2	0.0	13	0.30	10.0	0.3	11	83	1,545
OCT	381	342	723	720	1,443	10.0	0.0	10	0.30	9.4	0.3	10	83	1,546
NOV	399	313	712	747	1,459	9.1	0.0	9	0.30	9.3	0.3	10	82	1,560
DEC	401	335	736	729	1,465	9.0	0.0	9	0.30	9.5	0.3	10	84	1,568
2011														
JAN	405	362	767	697	1,464	5.2	0.0	5	0.30	9.8	0.3	10	82	1,561
FEB	405	312	717	717	1,434	2.0	0.0	2	0.30	9.8	0.3	10	82	1,528

NOTE: (1) POWER CANALS COLUMNS INCLUDE FLOWS THROUGH POWER PLANTS AND SPILLWAYS.

TABLE 4

MONTHLY DISTRIBUTION OF LAKE SUPERIOR OUTFLOWS (Cubic Feet / Second)

	POWER CANALS					NAVIGATION CANALS			DOMESTIC USAGE				Fishery	Total Lake
Year and Month	U.S. Gov't Hydro	Edison Sault Electric	US Total	Brookfield Power	Total Power Canals	United States	Canada	Total Navigation Canals	Sault Ste. Marie US + CAN	Algoma Steel	St. Marys Paper	Total Domestic Usage	St. Marys Rapids	Superior Outflow (cfs)
2010														
JAN	12,300	21,100	33,400	33,700	67,100	159	0	159	11	350	11	372	3,000	70,600
FEB	12,400	16,700	29,100	29,200	58,300	106	0	106	11	364	11	386	3,000	61,800
MAR	13,700	11,800	25,500	25,700	51,200	162	0	162	11	311	11	333	2,970	54,700
APR	14,300	13,700	28,000	28,000	56,000	385	0	385	11	283	11	305	2,930	59,600
MAY	14,300	11,200	25,500	25,500	51,000	445	0	445	14	268	11	293	2,930	54,700
JUN	14,000	11,400	25,400	25,400	50,800	484	0	484	11	279	11	301	2,970	54,600
JUL	14,300	11,200	25,500	25,400	50,900	551	0	551	11	350	11	372	2,970	54,800
AUG	14,300	11,100	25,400	25,400	50,800	494	0	494	11	364	11	386	2,930	54,600
SEP	13,800	12,400	26,200	24,600	50,800	466	0	466	11	353	11	375	2,930	54,600
OCT	13,500	12,100	25,600	25,400	51,000	353	0	353	11	332	11	354	2,930	54,600
NOV	14,100	11,100	25,200	26,400	51,600	321	0	321	11	328	11	350	2,900	55,200
DEC	14,200	11,800	26,000	25,700	51,700	318	0	318	11	335	11	357	2,970	55,300
2011														
JAN	14,300	12,800	27,100	24,600	51,700	184	0	184	11	368	11	368	2,900	55,200
FEB	14,300	11,000	25,300	25,300	50,600	71	0	71	11	368	11	368	2,900	53,900

NOTE: (1) POWER CANALS COLUMNS INCLUDE FLOWS THROUGH POWER PLANTS AND SPILLWAYS

(2) Flows for individual users were originally coordinated in m3/s, and are converted here to U.S. customary units (cfs) and rounded to 3 significant figures.

(3) Total flow for each category and total Lake Superior flow in this table are computed from the individual flows in cfs.