International Lake Superior Board of Control

Semi-Annual Progress Report to the International Joint Commission

Covering the period March 1, 2015 to August 31, 2015

Table of Contents

Cover: New banners and posters on display at the International Lake Superior Board of Control's booth at Engineer's Day, 26 June 2015 (photo credit: Mr. Jacob Bruxer)

Figures

Tables

International Lake Superior Board of Control

Canada
Mr. Jaymie Gadal, Member
Mr. Rob Caldwell, Secretary

United States
BG Richard Kaiser, Member
Mr. Arun Heer, Secretary

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

24 September 2015

Commissioners:

This semi-annual report covers the Board's activities from 1 March to 31 August 2015.

1. Highlights

From March through August, the monthly mean water levels of Lake Superior ranged from 15 to 20 cm (5.9 to 7.9 in.) above average, and ranged from 1 to 19 cm (0.4 to 7.5 in.) higher than in 2014.

In the past six months, monthly mean Lake Michigan-Huron levels ranged from 12 to 19 cm (4.7 to 7.5 in.) above average. Daily mean levels have remained above average since 7 September 2014. Lake Michigan-Huron ranged from 24 to 53 cm (9.4 to 20.9 in.) higher than in 2014.

The Lake Superior outflows were as specified by Regulation Plan 2012 in March and April. The Board requested and received Commission approval to deviate from the regulation plan by letter dated 16 April 2015 in order to better manage operational limitations on hydropower flow capacity and reduce the potential for adverse consequences of high and fluctuating flows in the St. Marys Rapids. To achieve this objective while minimizing the impacts on both Lake Superior and Lake Michigan-Huron water levels, flows less than those prescribed by Plan 2012 were released during the spring (May – June) and are also expected to be released in the fall (September – November) when side-channel capacity is limited. These flow decreases were offset by releasing flows greater than Plan 2012 during the summer months (July – August) when there were no side-channel flow limitations.

Based on potential benefits identified and positive feedback received during the previous year, the gate setting at the Compensating Works was again increased during the spring and summer months by employing multiple partially-open gates in lieu of fully-open gates. The gate setting was increased from the normal winter setting equivalent of one-half gate open in March and April, to approximately two gates open at the start of May to avoid issues related to ice, and three gates fully open by the end of this month. In June, the gates were

further opened to an equivalent of approximately four gates open. A gate setting equivalent to approximately five gates open was employed in July and August. Additionally, Gate 16 was opened partially to provide a small amount of attractant flow to sea lamprey traps located downstream.

Since March, monthly outflows from Lake Superior have been between 101% and 135% of average. The monthly outflows from Lake Michigan-Huron ranged from 100% to 109% of average. Water supplies to Lake Superior were above average in March, May, June, and August, below average in April and near average in July. Water supplies to Lake Michigan-Huron were below average in March, April, and July, near average in May, and above average in June and August.

Detailed monthly inspections of the Compensating Works were conducted during the reporting period, and the five-year inspections of the Canadian side of the Compensating Works were completed on 11-12 August. No major issues were identified.

Board representatives met with Brookfield and Parks Canada staff on 24-25 June to discuss operational issues and review water usage and measurement techniques at these Canadian facilities on the St. Marys River in Sault Ste. Marie, ON. No major issues were reported. A similar meeting and review at the various U.S. facilities is expected in 2016.

The Board initiated an extensive field measurement study in the St. Marys Rapids that began in the spring of 2015. The study involves measurement and analysis of flow, velocity, and water level data in the St. Marys Rapids under varying Compensating Works gate settings in order to establish field-verified limits on the rate of gate changes in an effort to prevent harm to fish and other organisms caused by stranding or flushing. The data collection component of this work was adjusted by the Board to reduce the risk of adverse impacts on St. Marys River stakeholders and is expected to be completed by the fall of 2015, with subsequent modelling and analysis following thereafter.

The Board continued its ongoing public communications and outreach efforts, which during the past six months included: a public webinar on 9 June; participating in Engineer's Day in Sault Ste. Marie, MI, on 26 June; informal discussions between Board staff, key stakeholders and the public throughout the reporting period; and the issuing of News Releases and other content through the Board's website and Facebook pages, which continue to grow in popularity. Over the reporting period, some stakeholders voiced concerns about high levels on lakes Superior and Michigan-Huron. Others remain concerned about the recent period of low levels and a potential return of such conditions. Some remain concerned about potential impacts due to climate change and variability.

2. Monitoring of Hydrologic Conditions

The Board continuously monitors the water levels of lakes Superior and Michigan-Huron, and also the water levels and flows in the St. Marys River. The Regulation

Representatives' monthly reports to the Board provide hydrologic assessments and recommendations for 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) are met.

Tables 1 and 2 list the recent monthly water levels, net basin supplies, and outflows for lakes Superior and Michigan-Huron, respectively. Figures 1 and 2 compare the monthly water levels for this period to long-term averages and extremes for each lake. Figures 3 and 4 show the monthly precipitation over the lakes Superior and Michigan-Huron basins. Figures 5 and 6 show the monthly net basin supplies for each basin.

Precipitation over the Lake Superior basin was 95% of average from March through August 2015 and would be expected to be exceeded 58% of the time. Precipitation was below average in March, April, June, and July, and was above average in May and August. The net basin water supplies to Lake Superior, which are the net amount of precipitation, evaporation, and runoff to the lake, were above average in March, May, June, and August, average in July, and below average in April. On the whole, the March through August net basin supplies to Lake Superior would be expected to be exceeded 38% of the time.

Lake Superior's monthly mean levels over the past six months ranged from 15 to 20 cm (5.9 to 7.9 in.) above average. Lake Superior's water levels remained above chart datum (183.2 m or 601.1 ft.) throughout the reporting period, and on 31 August, the lake was at elevation 183.69 m (602.66 ft.), which was 16 cm (6.3 in.) above average, 1 cm (0.4 in.) higher than at the same time last year, and 49 cm (19.3 in.) above chart datum.

Precipitation over the Lake Michigan-Huron basin was 92% of average over the past six months according to provisional data and would be expected to be exceeded 74% of the time. Net basin water supplies to Lake Michigan-Huron were below average in March, April and July, near average in May, and above average in June and August. On the whole, the March through August net basin supplies to Lake Michigan-Huron would be expected to be exceeded 70% of the time.

Monthly mean Lake Michigan-Huron levels ranged from 12 to 19 cm (4.7 to 7.5 in.) above average throughout the reporting period. Water levels remained above chart datum (176.00 m or 577.4 ft.) throughout the reporting period, and on 31 August, Lake Michigan-Huron was at elevation 176.71 m (579.76 ft.), 19 cm (7.5 in.) above average, 21 cm (8.3 in.) higher than last year, and 71 cm (28.0 in.) above chart datum.

3. Regulation of Lake Superior

3.1. Outflows

The outflows of Lake Superior were as specified by Regulation Plan 2012 during March and April. On 19 March, the Board requested approval from the Commission to deviate

from the regulation plan from May through December 2015 in order to better manage operational maintenance requirements at the hydropower plants and limitations on maximum combined side-channel flow capacity, and to reduce the potential for adverse consequences of high and fluctuating flows in the St. Marys Rapids. The Commission granted approval on 16 April.

To achieve the objectives of the deviation strategy while minimizing the impacts on both Lake Superior and Lake Michigan-Huron water levels, flows less than those prescribed by Plan 2012 were released during the spring (May – June) and are also expected to be released in the fall (September – November) when side-channel capacity is limited. These flow decreases were offset by releasing flows greater than Plan 2012 during the summer months (July – August) when there were no side-channel flow limits.

Lake Superior outflows were 122% of average over the past six months, with monthly flows ranging from 1,950 to 3,080 m^3/s (67,800 to 108,800 cfs).

Several scheduled and a few unexpected flow reductions occurred at the three hydropower plants during the reporting period, most of which were to facilitate maintenance and make repairs. Additionally, natural factors, including seasonal water level fluctuations and impacts of storms and ice conditions, also resulted in reduced hydropower flows at times (details are provided in Section 6 of this report). When the three hydropower plants are running below capacity, such flow reductions can be offset by increasing flow during the remainder of the month or through water sharing agreements between the plants themselves. However, when the plants are running at capacity, as they were throughout the reporting period, such arrangements are not possible. In such cases, flow reductions can only be offset by increasing flow through the Compensating Works at the head of the St. Marys Rapids.

However, continuing from the previous reporting period, reduced flow capacities in March and April, which were due to a combination of uncontrolled natural factors and hydropower maintenance requirements, could not be offset since the Compensating Works gates are normally maintained at the winter setting of one-half gate open equivalent due in part to the difficulty of moving gates frozen in ice. As a result, outflows were somewhat less than the normal winter maximum flow that was prescribed by Plan 2012 during these two months. From May through August, flow reductions at the hydropower plants were offset by increasing flow through the Compensating Works, in consideration of the deviation strategy approved by the Commission.

3.2. Compensating Works Gate Settings and St. Marys Rapids Conditions

During the reporting period and similar to the previous year, a number of concerns were again raised related to the gate setting of the Compensating Works, and the unusually high water level and flow conditions in the St. Marys Rapids. Concerns raised included: the risk of ice damage to the Compensating Works and structures in the lower St. Marys River; the

impacts of higher flows and levels on the St. Marys Rapids fishery and recreational anglers; the impacts of higher flows on sea lamprey monitoring and control measures; potential flooding of Whitefish Island; the impacts of "spilled" water on hydropower production; and impacts to commercial navigation due to reduced levels in the lower St. Marys River if gate settings were reduced. The Board worked with the Commission, the hydropower entities, and other stakeholders, to try to address these concerns, while adhering to the principles of the Boundary Waters Treaty and the Orders of Approval for Lake Superior regulation.

The gate setting of the Compensating Works was maintained at the minimum half-gate equivalent setting until 1 May. The half-gate setting is employed during winter to reduce the risk of ice-related issues in the St. Marys River. Based on feedback received and the successful use of partially opened gates in 2014, partially open gate settings were again employed starting in May 2015. On 1 May, Gates 3 to 14 were partially opened to an equivalent of approximately two gates fully open. This setting was selected in part to avoid ice issues similar to those experienced in May 2014. On 8 May, as ice conditions had further stabilized, Gates 3 to 14 were further opened to a setting equivalent to approximately three gates open. In June, Gates 3 to 13 and 15 were partially opened to an equivalent of four gates fully open. This was completed in two stages on 3 and 10 June to accommodate crew availability and facilitate flow measurements at the Rapids. On 6 and 14 July, the gates were again further opened in two stages to an equivalent of approximately five gates open. A gate setting equivalent to approximately five gates open was maintained throughout August.

Gate 1, which supplies water to the Fishery Remedial Works, remained set at approximately 15 m^3/s (530 cfs). Gate 2 was left in a closed position during May and June based on feedback from local anglers and in an attempt to provide lower velocities and potential angling opportunities along the northern portion of the main Rapids. Gate 14 was closed in June through August to facilitate field measurements. Gate 16 was opened 5 cm (2 in.) from 3 June through August to provide a small amount of flow to attract sea lamprey to the U.S. Fish and Wildlife Service traps located downstream of the gate.

A complete summary of gate setting changes is provided in Table 3.

4. Governing Conditions during the Reporting Period

The monthly mean levels of Lake Superior ranged between 183.42 and 183.68 m (601.8 and 602.6 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 176.62 and 177.24 m (579.5 and 581.5 ft.). Therefore, Criterion B of the Commission's 2014 Orders, which restricts outflow to no more than preproject values when the level at U.S. Slip is above 177.94 m (583.79 ft.), was not a concern. Furthermore, daily mean U.S. Slip levels generally stayed

well above the ponding restriction threshold (see Section 10) of 176.09 m (577.72 ft) for the reporting period. However, while ponding was permitted during the entire reporting period, there was no opportunity for plants to perform ponding operations as they were running at full capacity.

5. Inspection and Repairs at the Compensating Works

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

Routine monthly maintenance inspections continue to be conducted on the Canadian portion by Brookfield Renewable Energy Partners. Inspection observations include public safety features such as fencing and signs, the concrete and masonry structure, gates, and mechanisms, on-site safety equipment such as life jackets and air horns, as well as anything unusual. The monthly inspections found the Compensating Works facilities to be in good condition. No major issues were noted.

The five-year inspection of the Canadian portion of the Compensating Works structure was completed on 11-12 August by an independent consultant firm (Hatch). Brookfield and the consultants were in communication with Board representatives well in advance of the inspections, allowing ample time to develop and coordinate an appropriate strategy and gate change schedule. Underwater inspections were performed on Gates 2 through 8. Due to higher flows and multiple partially open gates being employed this year, to allow safe work conditions for divers, the inspections of each of these gates required the gates' closure and the closure of the immediately adjacent gates (one exception was that Gate 1 was not closed during inspections of Gate 2). To reduce the impacts on flows and water levels in the main Rapids, the effects of each gate closure were offset by further opening one or more of the other gates, as directed by the Board. Note that an underwater inspection on Gate 1 was not performed in 2015 since reduced flows downstream of this gate are not permitted under the existing Orders of Approval and would therefore require the approval of the IJC and the issuance of a Supplementary Order of Approval, or an alternative means of performing the inspections. Brookfield continues to investigate various options and consult with local stakeholders/agencies, and anticipates performing the underwater inspection of Gate 1 in the summer of 2016, at which time the findings will be appended to the final 2015 five-year inspection report.

The final report is expected to be received and a copy provided to the Board during the next semi-annual reporting period. A preliminary report identified no new significant findings. The mechanical equipment is in excellent condition with some minor maintenance required. The concrete structure top side civil inspection noted general areas of cracking and spalling in the pier tops, which can be addressed during normal maintenance. A wide crack with spalled and undercut edges was observed at the middle of the apron downstream of the still beam of Bay 8 and another diagonal crack was observed continuing towards Pier 8 at the downstream side of the gate. This item has been reported as far back as 1981 and it is

thought that the crack is a cold joint that occurred at the time of construction when one side of the joint was allowed to harden without proper joint preparation. As a result, a feather edge occurred on the horizontal slab and has continued to erode over time. Owing to the higher flow velocities through the gate recently, the crack may have scoured clean, making it more visible. There is no immediate threat to structural integrity of the bay, but the preliminary report recommends monitoring and repairing of these cracks. The repairs to the concrete apron will be addressed in Brookfield's 20-Year Capital Expenditure and Major Maintenance Plan. A survey of the Canadian side of the Compensating Works does not indicate any significant movement of Piers 1-8.

Monthly inspections and routine maintenance continue to be conducted on the U.S. portion by the U.S. Army Corps of Engineers (USACE) Soo Area Office. The monthly inspections found the Compensating Works facilities to be in good condition overall. Gate gears have been greased and the padlock access to the structure has been lubed. Logs and other debris have been cleared from both the upstream and downstream sides of the gates.

6. General Conditions, Repairs and Maintenance at the Hydropower Facilities

6.1. General Conditions at the Hydropower Facilities

All three hydropower plants experience variations in flow capacity as a result of changing hydrologic conditions. Continuing from the previous reporting period, reduced winter flow capacity at all three plants continued in March and April due to a combination of seasonally declining headwater levels, high tailwater levels caused primarily by ice conditions in the lower St. Marys River, and in the case of the Cloverland plant, additional ice-related impacts from ice buildup on the units themselves. These natural factors inhibited the plants' abilities to pass their full allocations, which were set at maximum capacity during these two months and throughout the remainder of the reporting period.

As ice conditions improved and water levels began their seasonal rise in May, hydropower plant capacity generally increased, notwithstanding the effects of outages at the three hydropower plants, described below.

6.2. Brookfield Renewable Energy Partners

Planned unit outages at Brookfield's Clergue plant totaled 880 hours during the reporting period. Most of these outages were due to annual inspections and regular maintenance. The annual inspection and maintenance outage on Unit 3 was extended to allow for additional repairs on the thrust bearing and throat ring. Unplanned outages during the reporting period were minimal. There were issues loading Unit 1 to maximum output starting in the spring of 2015. The issue was originally thought to be caused by trash in the trash racks. However, after cleaning the trash racks in July, it was determined that this was a mechanical issue. The issue was corrected during the annual maintenance on Unit 1 that began on 31 August.

6.3. U.S. Government Hydropower Plant

Unit outages for the reporting period totaled 111 hours. The majority of the outages were attributed to replacement of a slip ring on Unit 1. Unit 1 outages totaled 53 hours; Unit 2 totaled 11 hours; Unit 3 totaled 16 hours; Unit 3A totaled 10 hours; and Unit 10 totaled 20 hours. Aside from regular maintenance activities, an outage of 17 hours on all units was attributed to a low flow request to conduct dive inspections on the International Bridge piers in June. An unexpected intruder found in the headrace in July prompted a 14-hour shutdown. Work on a sump pump upgrade for Units 1-3A is expected to take place next year. Also, a plant-wide 20 day outage is expected next year as well, to replace all protective relays.

6.4. Cloverland Electric Cooperative

Canal repairs took place beginning in April and lasted until 27 June, and resumed 26 August and will continue until about 11 November. These repairs required flows to be reduced during working hours, resulting in plant capacity being limited to about 600 m^3/s during this period. The canal repairs will continue in 2016 on a similar schedule, beginning again in late April and continuing through the end of June, at which time repairs will be suspended from July to early August, before continuing in late August through November.

7. Flow Verification Measurements

Flow verification measurements were conducted throughout the reporting period.

A series of St. Marys Rapids flow measurements were collected this year. These were led on behalf of the Board by the U.S. Army Corps of Engineers Detroit District in cooperation with the U.S. Geological Survey (USGS) and Environment Canada's Water Survey. Flow measurements were made on 9 and 10 June, 13 and 14 July, and 4 August. Additional flow measurements are expected in October and November. Board staff are using the results of these flow measurements to verify and adjust the sluice gate equations and parameters used to compute St. Marys Rapids flows under partially-open gate settings. The flow measurements will also be used in the development and calibration of hydrodynamic models and in support of a study to review the effects of gate movement rates and establish limits on water level and flow fluctuations to protect fish and other aquatic organisms in the St. Marys Rapids.

Discharge measurements to verify the flows through the hydropower plants (last made in September 2010) were also collected from 14 to 16 July. The results of these measurements will be reviewed at a later date.

The USGS and Water Survey continued to gather flow and water level data for rating the acoustic Doppler velocity meter (ADVM) at the International Gauging Station on the St.

Marys River. This data provides a secondary means of estimating the total flow in the river, and Board staff have begun incorporating this information into their operational and research efforts

8. Water Usage in the St. Marys River

8.1. Water Usage During Reporting Period

Table 4 (Table 5 in cubic feet per second) lists the distribution of outflows from Lake Superior for January 2014 to August 2015. 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. Any remainder, beyond the flow 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 was 3 m^3/s (106 cfs) over the past six months, or 0.1 to 0.2% of the total monthly outflow.

The monthly flow through the locks depends on traffic volume and varied from 2 to 14 m^3/s (71 to 490 cfs) during the past six months. 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 opened on 25 March. The Canadian lock opened on 14 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 one-half 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 reduces potential damage from ice floes impacting the gates. 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. The flow in the St. Marys Rapids, including that through the Fishery Remedial Works, ranged from 87 to 796 m^3/s (3,100 to 28,100 cfs) over the last six months, or approximately 4 to 26% of the total monthly outflow. Table 3 provides a summary of the gate changes that occurred during the reporting period.

The hydropower plants passed an average of 2,082 m^3/s (73,520 cfs) from March to August for electric power production, or 80.7% of the total river flow. All plants were directed to run at their maximum capacities throughout the reporting period, which varies depending on hydrologic conditions, but on average is assumed to be approximately 2280 m3/s (80,520 cfs). The average monthly difference of 198 m^3/s (7,000 cfs) was due primarily to unit outages as a result of plant maintenance requirements, plus additional limitations

during winter due to water level and ice conditions. Usages at each plant are shown in Tables 3 and 4.

8.2. Review of Water Usages

Board representatives met with Brookfield and Parks Canada staff on 24-25 June at their respective Canadian facilities located on the St. Marys River in Sault Ste. Marie, ON. The meetings, which were held in advance of the Engineer's Day event scheduled at the U.S. locks later that week, presented a good opportunity for newer staff of both the Board and the Canadian hydropower and lock facilities to meet face-to-face and discuss issues of mutual importance, including water usage and reporting responsibilities, measurement techniques, emergency measures, and communications and engagement with key stakeholders and the public. Board staff have produced a summary report of these meetings, but in general, no new major issues were reported in terms of flow measurement and accounting procedures, and all parties agreed that the meetings were informative and generated positive discussions.

A report on the 2014 review of the U.S. facilities is completed, and Board staff have continued to follow up on the issues identified. A similar series of meetings and reviews at the various U.S. facilities is expected to be completed in 2016.

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 Diversion into Lake Nipigon (which flows into Lake Superior) averaged 144.1 m^3/s (5,100 cfs) and the Long Lac Diversion averaged 49.9 m^3/s (1,800 cfs) from March through August. Combined, these diversions were about 116 percent of average for the period 1944-2014.

Slots cut into Waboose Dam provide a minimum flow northward to the Ogoki River of approximately 2 m^3/s (to meet fisheries requirements). This slot flow averaged 1.9 m^3/s (74 cfs) during March and April 2015. Due to wet conditions, starting near the end of May and continuing through June and most of July, additional water was spilled northward, such that the average rate of flow was 84.4 m^3/s (3,000 cfs) over this three-month period. The northward flow was again reduced at the end of July, and averaged 3.8 m^3/s (134 cfs) in August.

Continuous minimum 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 northern outlet of Long Lake (Kenogami Dam) for environmental enhancement. However, this year, wet conditions required additional water to be spilled northward through the Kenogami Dam starting on 21 May and continuing through 4 June. As a result, the May and June flows through the Kenogami Dam averaged 14.4 m^3/s (510 cfs) and 6.5 m^3/s (229 cfs), respectively. Flows averaged 2.4 m^3/s (85 cfs) in July and August.

10. Peaking and Ponding Operations at Hydropower Plants

Peaking and ponding operations are the within-day and day-to-day flow variations, respectively, 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 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 (577.7 ft.) as a result of ponding operations, then the power entities are required to pass on-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. Beginning in 2016, the Board will provide written reviews every five years that are to include any recommendation for adjusting the IJC Directive, if necessary.

Continued above-average outflows from Lake Superior combined with increasing Lake Michigan-Huron levels resulted in levels at U.S. Slip remaining well above the established threshold, such that ponding was permitted throughout the report period. However, the power entities were unable to conduct peaking and ponding because the hydropower plants were operating at maximum capacity from March through August.

To continue to provide timely information on expected flow variations to the users, the USACE distributes monthly notices during the shipping season (March through January) on expected Lake Superior outflows, and a schedule of flow variations. No related concerns were reported to the Board during the period.

Figure 7 compares the hourly Lake Superior outflow and the hourly levels at U.S. Slip on the lower St. Marys River for the past six months. In general, U.S. Slip levels were somewhat higher than during the same period in 2014.

11. Plan 2012 Implementation

Following the Board's implementation of Plan 2012 in January 2015 and the issuance of a Directive on Deviations from Plan 2012 by the Commission to the Board on 17 February 15, the Commission issued a Directive on Peaking and Ponding Operations to the Board on 27 April 2015. The directive provides specific guidance regarding supervision by the Board of peaking and ponding operations conducted by the entities that own and operate hydropower facilities subject to the Commission's 17 July 2014 Supplementary Order of Approval on the St. Marys River at Sault Ste. Marie. The Regulation Representatives' offices have incorporated the provisions of this directive into the Operational Guides for Plan 2012 and are currently developing a final draft of this document.

12. Great Lakes – St. Lawrence River Adaptive Management Committee

The Great Lakes – St. Lawrence River Adaptive Management (GLAM) Committee held its inaugural face-to-face meeting on 3-4 March in Buffalo, NY, and the full committee and its sub-committees have corresponded through e-mail and held several teleconferences since then during the reporting period.

The Committee has been developing its draft annual work plan, and has outlined a number of projects and tasks relevant to the Superior Board. The short-term focus is expected to be on operational issues related to the implementation of Plan 2012 and impacts in the St. Marys River, and a more comprehensive list of longer-term priorities has been initiated by Board staff.

Development of a communications strategy and information management plan has also begun, and the GLAM Committee submitted three International Watersheds Initiative (IWI) proposals to the Commission in June.

The next GLAM meeting is scheduled for September 22-23 in Montreal, QC.

13. Gate Movement Limits Study and International Watersheds Initiatives

Starting in the spring of 2015, the Board began a study, led by the USACE Detroit District, to measure and analyse flow, velocity, and water level data in the St. Marys Rapids under varying Compensating Works gate settings to establish field-verified limits on the rate of gate changes in an effort to prevent harm to fish and other organisms caused by stranding or flushing. This study, first proposed by the Board in 2013 and partially funded by the Commission through the IWI, had been postponed since October 2013 due to scheduling issues and recent high flow conditions in the St. Marys Rapids. A tentative proposal to complete the field work during the fall of 2014 was also abandoned based on advice received from fisheries experts, who noted that this was a critical spawning period for salmonid species.

As a result of continued high flows and water levels and related concerns on the impacts of large fluctuations in hydraulic conditions in the St. Marys Rapids on fish and aquatic organisms, the Board made adjustments to the gate movement limits study plan. Rather than scheduling a series of gate changes and collecting field measurements all in a single week, as was originally planned, the Board installed water level sensors in the spring as soon as conditions permitted, and expects to leave them installed for the entire season, before removing them in November, prior to winter. This will allow the Board to continuously measure the effects on water levels of both gate changes and natural factors (such as wind effects) and make comparisons. Furthermore, flow measurements were scheduled to be collected throughout the field season at the beginning of those months that the gate setting of the Compensating Works was expected to be changed as a result of normal regulatory operations. This would avoid any additional negative impacts that would

result from additional gate changes, while providing flow measurement information at a wider range of gate settings and flow conditions. The data collected this year will be used to develop and calibrate hydrodynamic models of the St. Marys Rapids to further extend the analysis to a broader range of flow and water level conditions.

Additionally, Board staff will also use the data to develop and validate flow ratings for partial gate settings, and are investigating whether use of partially-opened gates in lieu of the traditional use of fully open gates may help facilitate limiting the rates of gate changes, while also providing additional fishery or water management benefits.

To help facilitate this extensive field measurement effort, a second IWI proposal was submitted by the Board and approved by the Commission in June to help fund Water Survey of Canada's participation in these additional field measurements.

The data collection component of this work is expected to continue this fall, with subsequent modelling and analysis following thereafter.

14. Public Communications and Outreach

The Board hosted its annual public meeting on 9 June using a combined Webinar and teleconference format. The Board again offered two sessions - the first in the afternoon at 1200 hours, followed by a second session in the evening at 1800 hrs - to permit people the choice to participate during or outside of regular business hours. About nine members of the public participated in total, along with IJC staff, Board Members, staff, and associates. The U.S. Alternate Chair, Mr. Stephen Durret, presented information describing Plan 2012, expected flows and deviations, current and expected water levels, the gate movement limit study and other Board initiatives. The meeting was then opened for public comment, questions, and concerns. The slide presentation shown during the Webinar was also made available online to callers beforehand, and callers were able to interact with the Chair and other participants during the event. The date of the next meeting with the public will be set at the spring business meeting. The Board will hold a similar Webinar/teleconference again in 2016.

Board staff also attended and participated in Soo Locks Engineer's Day on 26 June, hosted by the USACE – Soo Area Office. This was the third year that Board staff have participated in this event, which was once again well-attended by the public, with an estimated 9,655 people in attendance. Many of those in attendance stopped at the Board's display table, which Board staff had significantly improved from the previous year, with two professionally-printed banners, large posters showing Great Lakes water levels and an infographic of Plan 2012, and numerous brochures and information bulletins to hand out. The three Board representatives in attendance were kept busy throughout the day, speaking directly with over 100 people about water levels, flows, regulation, and other topics of interest. Most people were from nearby in Michigan in the Upper Peninsula, while some were from further down state and there were several Canadians, with lakes Superior,

Michigan and Huron, as well as the St. Marys River, all represented. Much of the conversation centered around recent water level conditions, with many surprised by how quickly levels have risen over the past two years and curious about the causes. Most people were generally content with the current water level conditions, though some were becoming concerned that levels were high. No major shore protection or flooding concerns were raised, but some were concerned about the impacts of higher levels on beaches and waterfront property. Many people were unfamiliar with the Board and its responsibilities, but were interested in discussing these aspects as well. An open house tied with the Soo Locks Engineer's Day in June will again be attended by Board staff in June 2016. Given the success of this event, Board staff have also begun investigating whether attendance at other similar events might prove as effective in terms of outreach and engagement.

During these events and informally throughout the reporting period, stakeholders voiced concerns about water level and flow conditions, and how the current regulation plan balances levels. Despite recently increased water levels, some citizens on Lake Superior remain concerned about the previous period of low water levels and its causes, and in particular how recent gate openings may be affecting levels of Lake Superior. Some on Lake Superior and Lake Michigan-Huron are also concerned about high water levels, and the potential for flooding and impacts on beaches and shore protection. Stakeholders in the St. Marys River, including anglers, hydropower entities, commercial navigation and Batchewana First Nations have also expressed concerns over recent gate settings and the resulting high St. Marys River flows. However, these concerns were not voiced as strongly during the past several months as they had been during the previous year, perhaps as a result of people again becoming more accustomed to the higher level and flow conditions. There has also been some positive feedback received with regards to recent conditions as well as the Board's deviation strategy, and with regards to the use of multiple partially-open gates in lieu of multiple gates open fully. Some remain concerned about potential impacts due to climate change and variability.

The Board continues to issue, at the beginning of each month (and before any significant change in outflows), news releases informing the public about Lake Superior regulation and water level conditions. These news releases are sent by both the Canadian and U.S. Regulation Representative offices to e-mail distribution lists that include various agencies, stakeholders and media outlets. The Board also makes these news releases available to the public online through the Board's Website (http://ijc.org/en_/ilsbc) and the Board's Facebook page (https://www.facebook.com/InternationalLakeSuperiorBoardOfControl), both of which continue to grow in popularity. Additional content available online includes information on Board Members and responsibilities, semi-annual reports, meeting minutes, regulation updates, and hydrologic data summaries.

15. Board Membership and Meetings

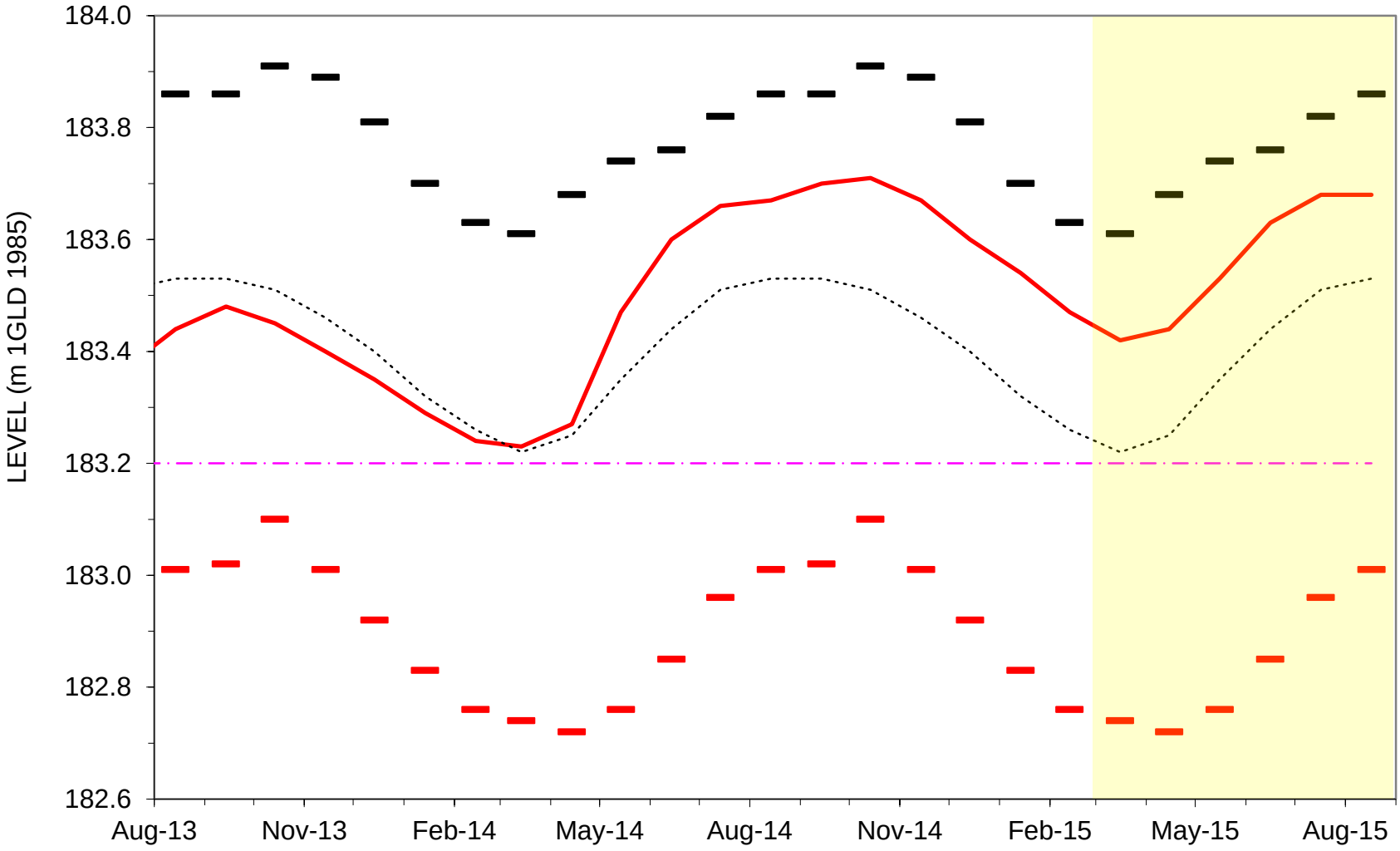
Mr. Stephen Durrett was appointed U.S. Alternate Chair on 25 March. Mr. Kyle McCune was replaced as U.S. Secretary by Mr. Arun Heer on 20 April.

The Board held a meeting on 5 March in Buffalo, New York. The next meeting is scheduled for September 24 in Montreal, Quebec.

Respectfully submitted,

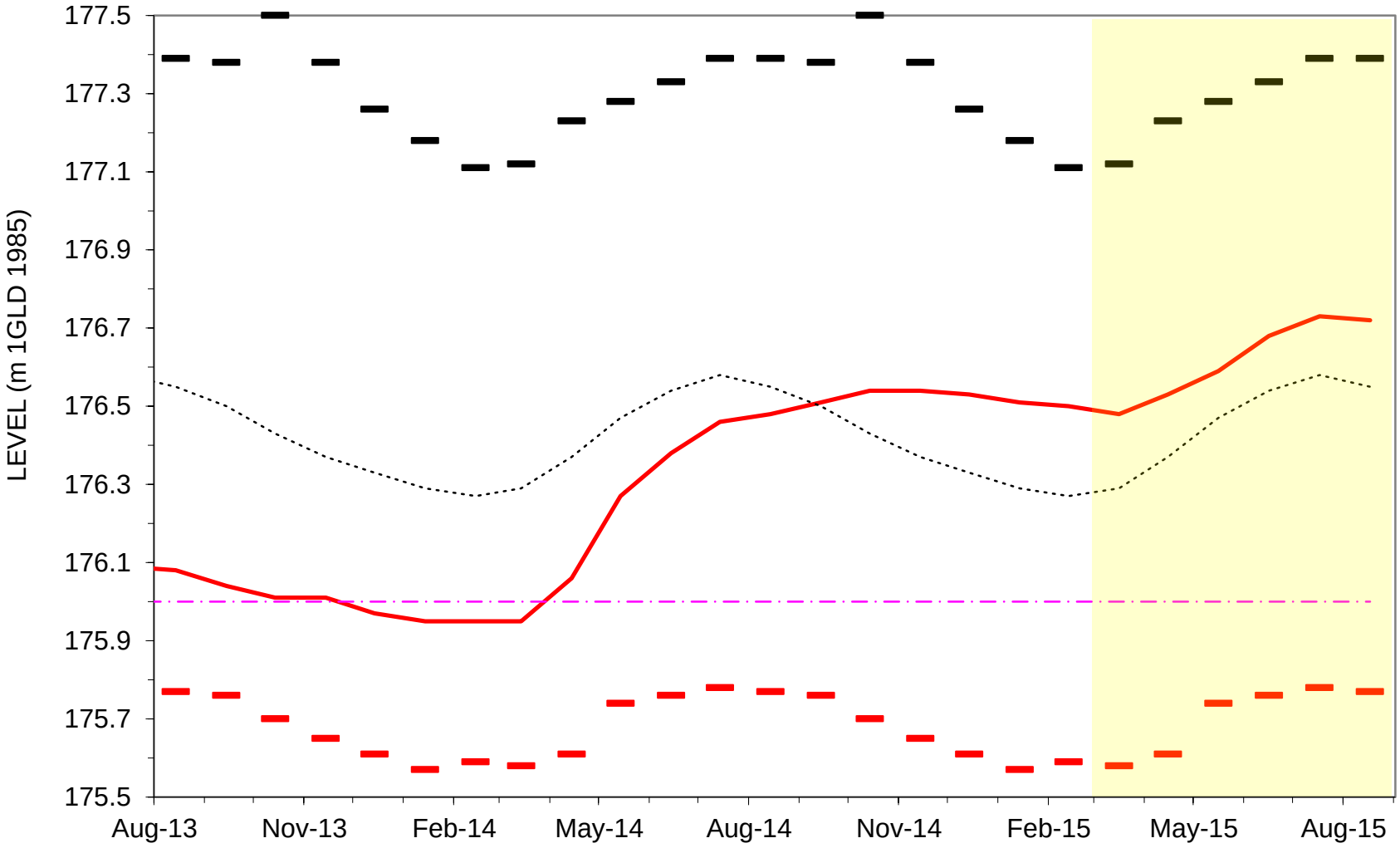
_____	_____
Jaymie Gadal	Stephen Durrett
Chair for Canada	Alternate Chair for United States

Figure 1 - LAKE SUPERIOR MONTHLY WATER LEVELS



Based on a mean of 5 gauges. Average, maximum, and minimum for period 1918-2014.

Figure 2 - LAKE MICHIGAN-HURON MONTHLY WATER LEVELS



Based on a mean of 6 gauges. Average, maximum, and minimum for period 1918-2014.

Figure 3 - LAKE SUPERIOR MONTHLY PRECIPITATION

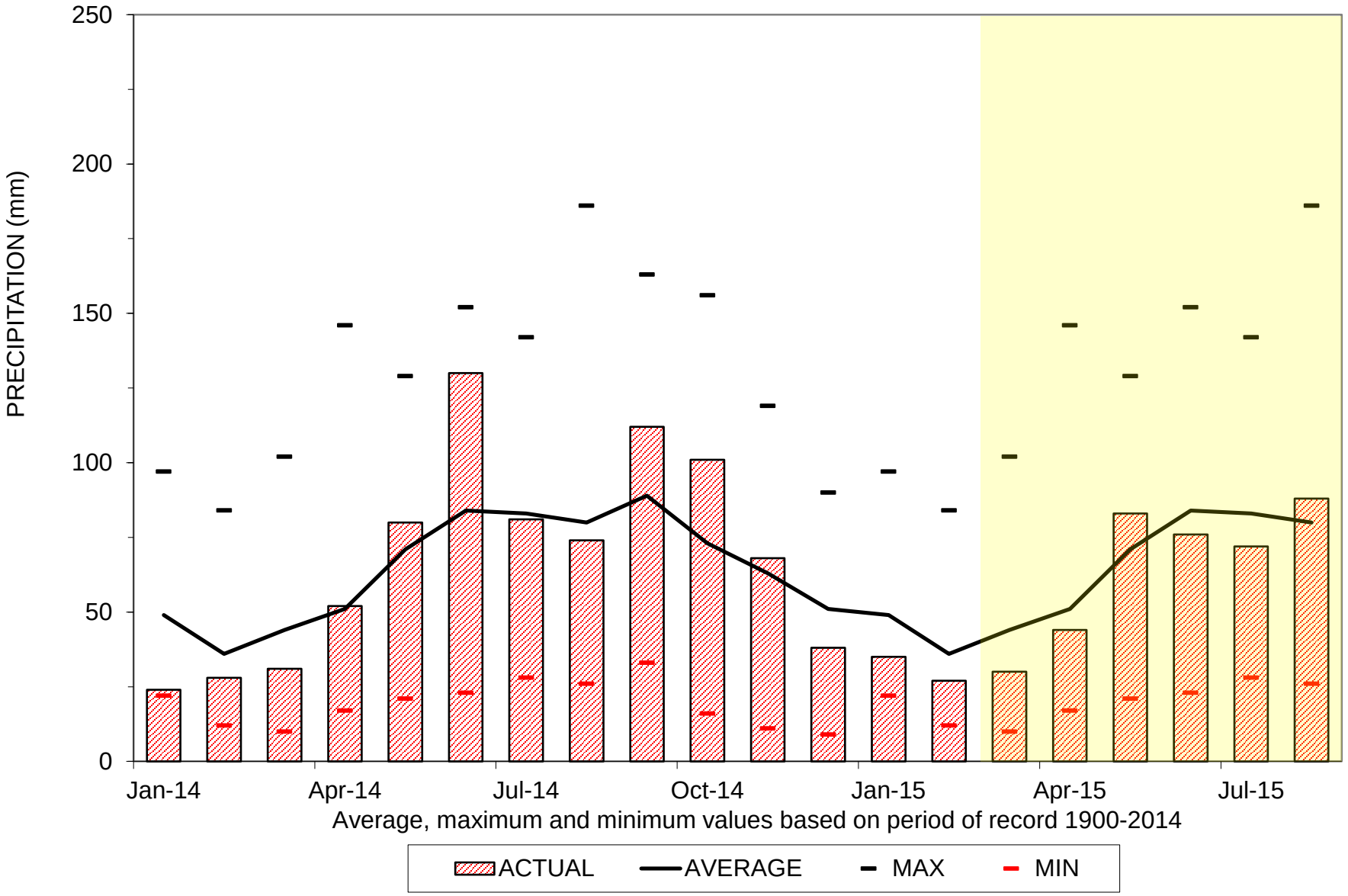


Figure 4 - LAKE MICHIGAN-HURON MONTHLY PRECIPITATION

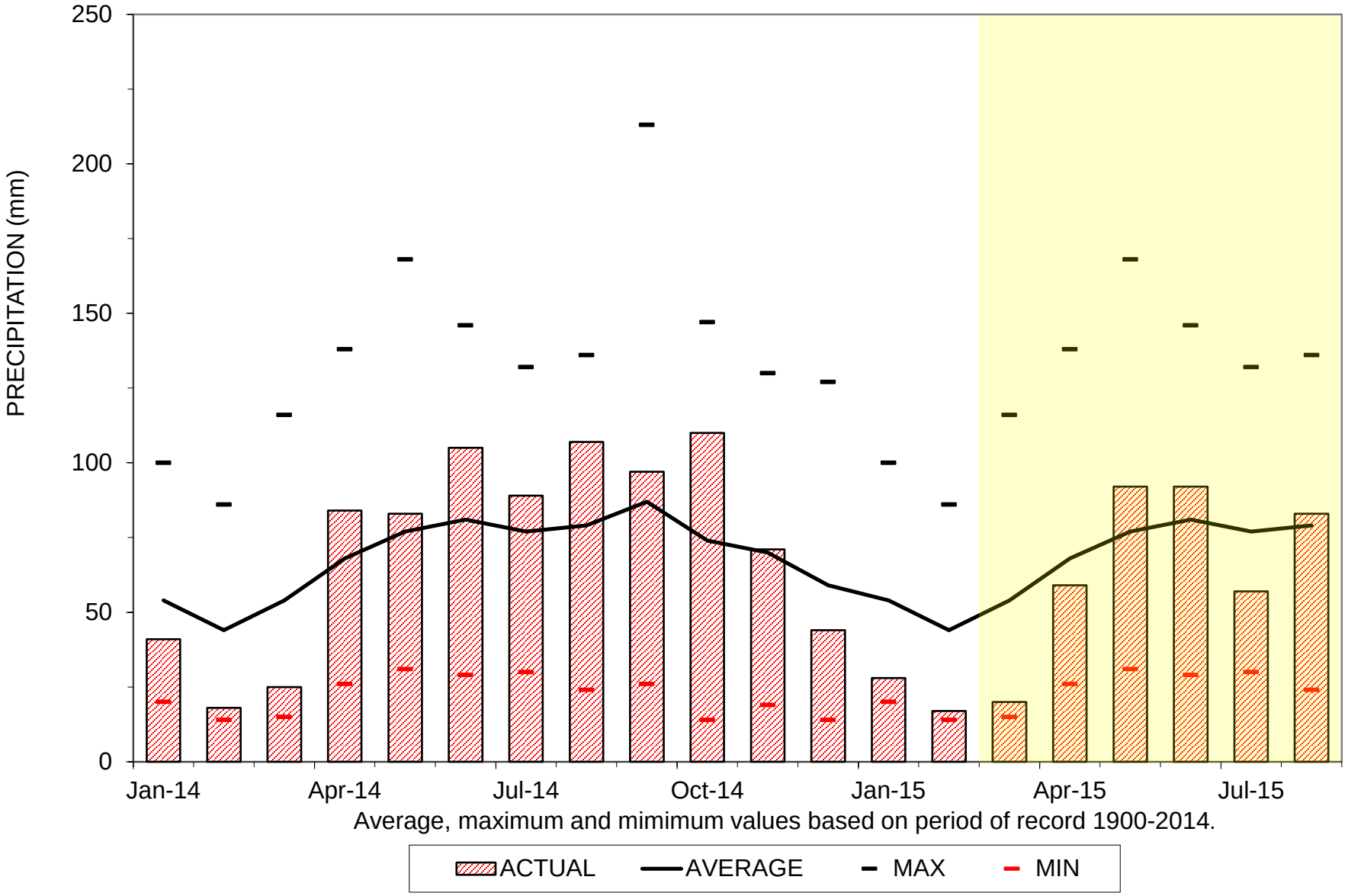
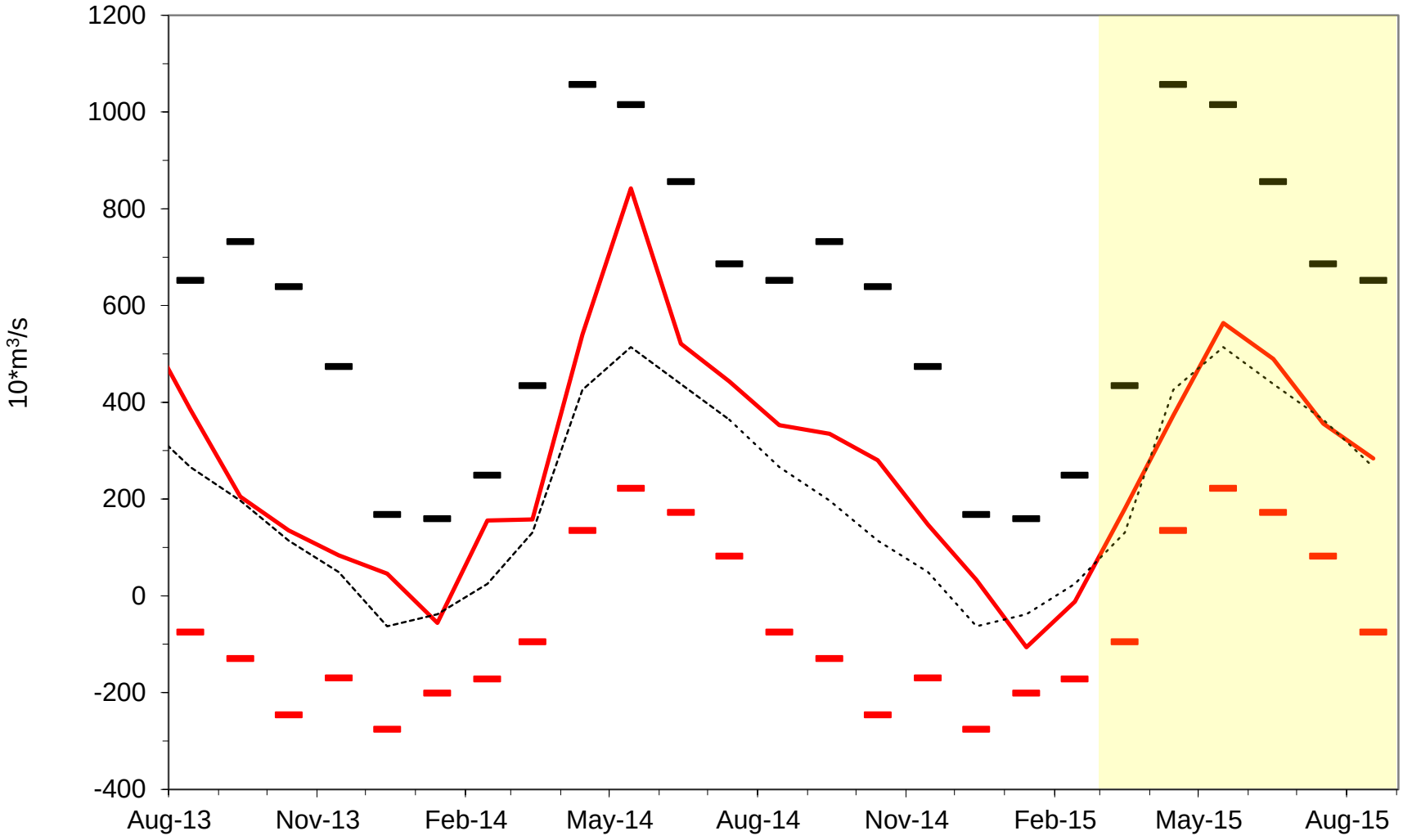
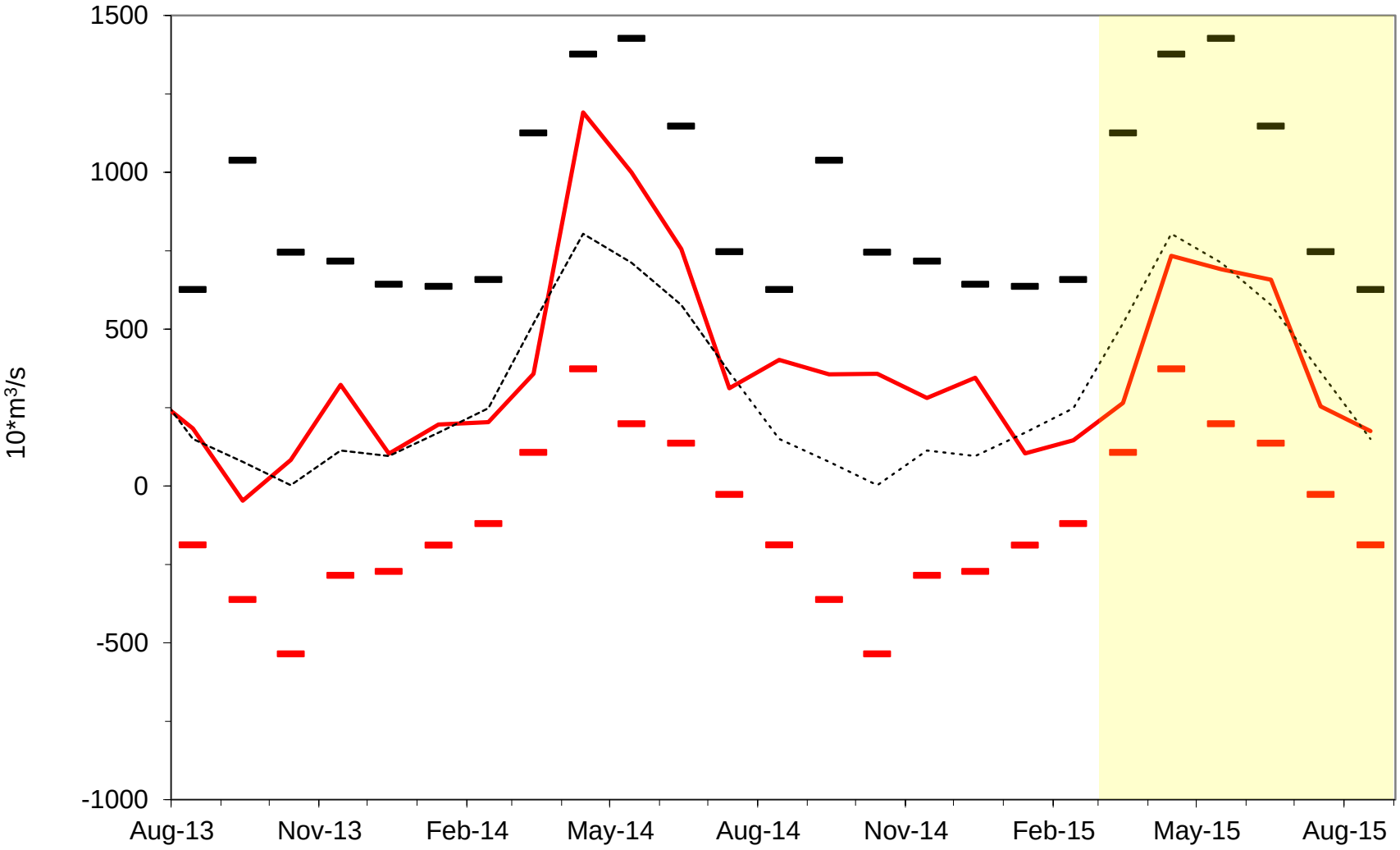


Figure 5 - LAKE SUPERIOR MONTHLY NET BASIN SUPPLIES



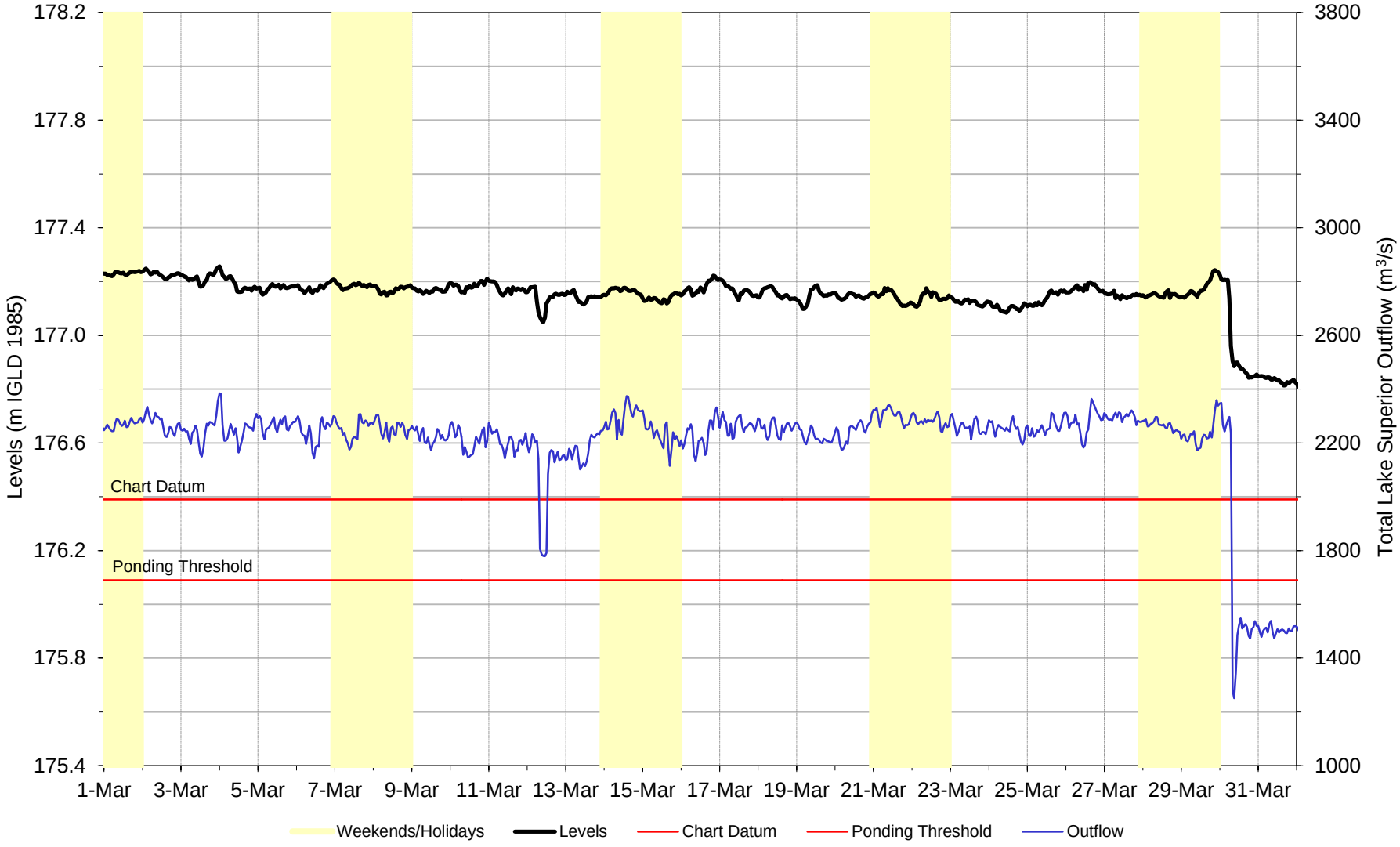
Average, maximum and minimum values based on coordinated period of record 1900-2008.

Figure 6 - LAKE MICHIGAN-HURON MONTHLY NET BASIN SUPPLIES

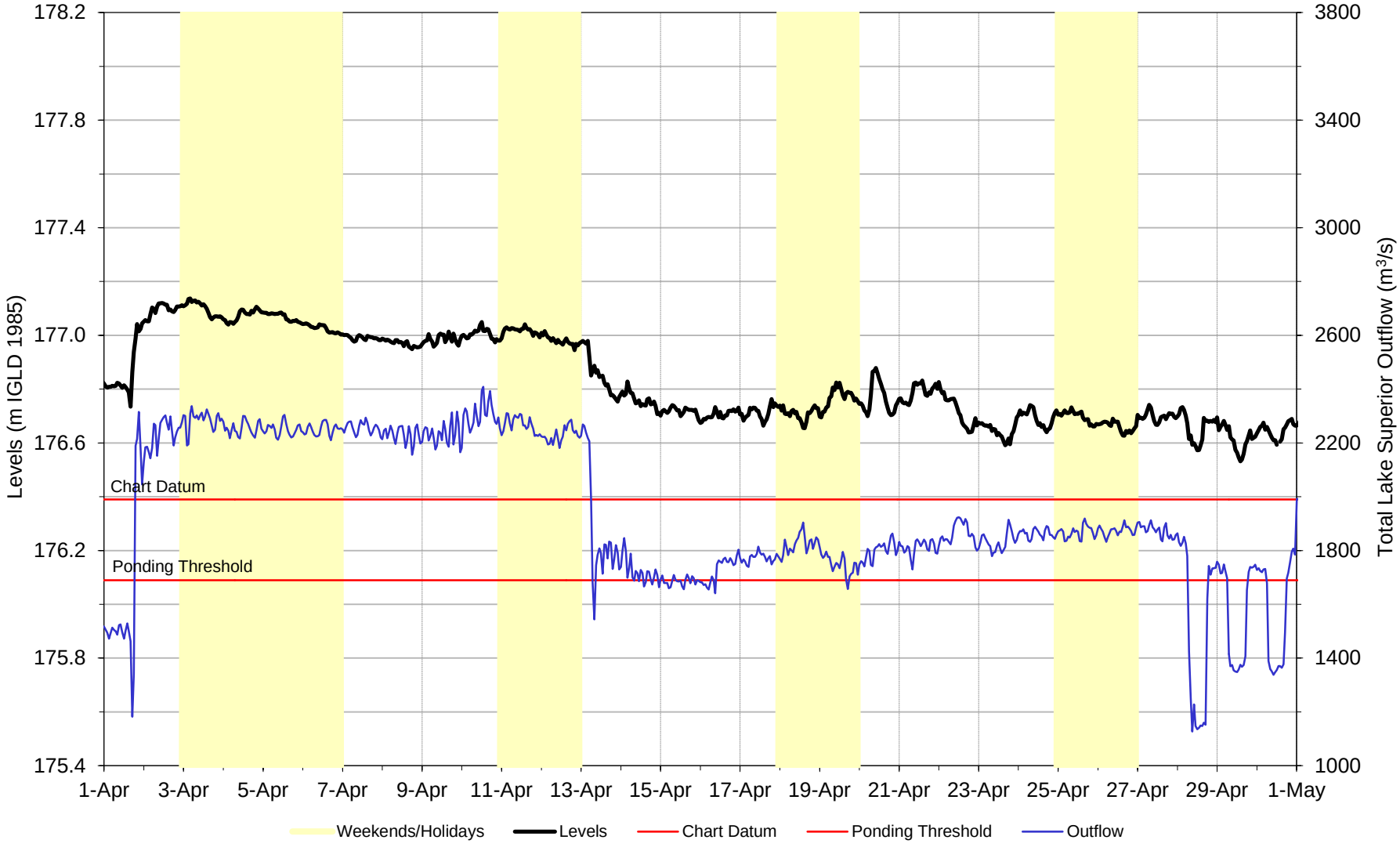


Average, maximum and minimum values based on coordinated period of record 1900-2008.

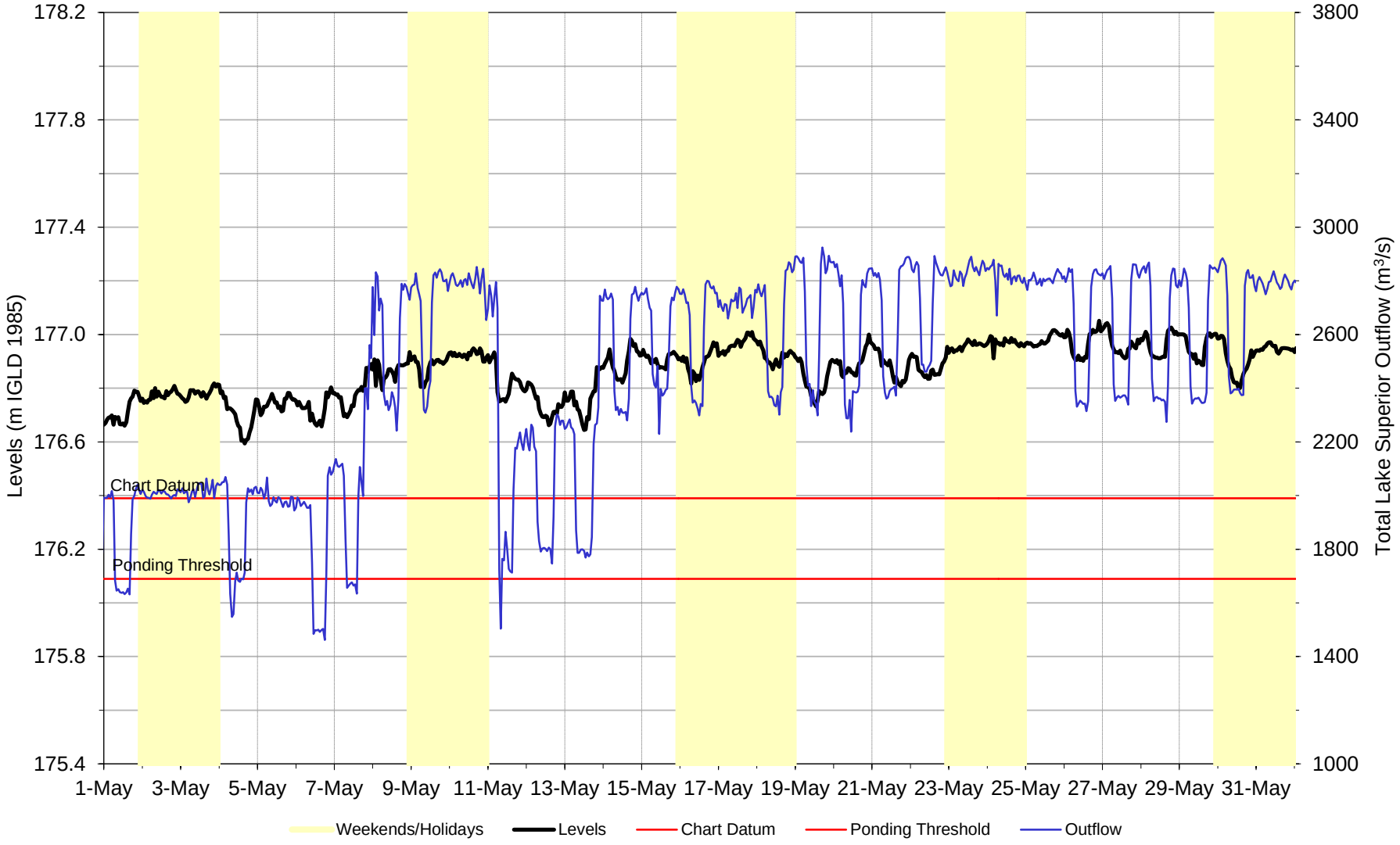
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7a - March 2015



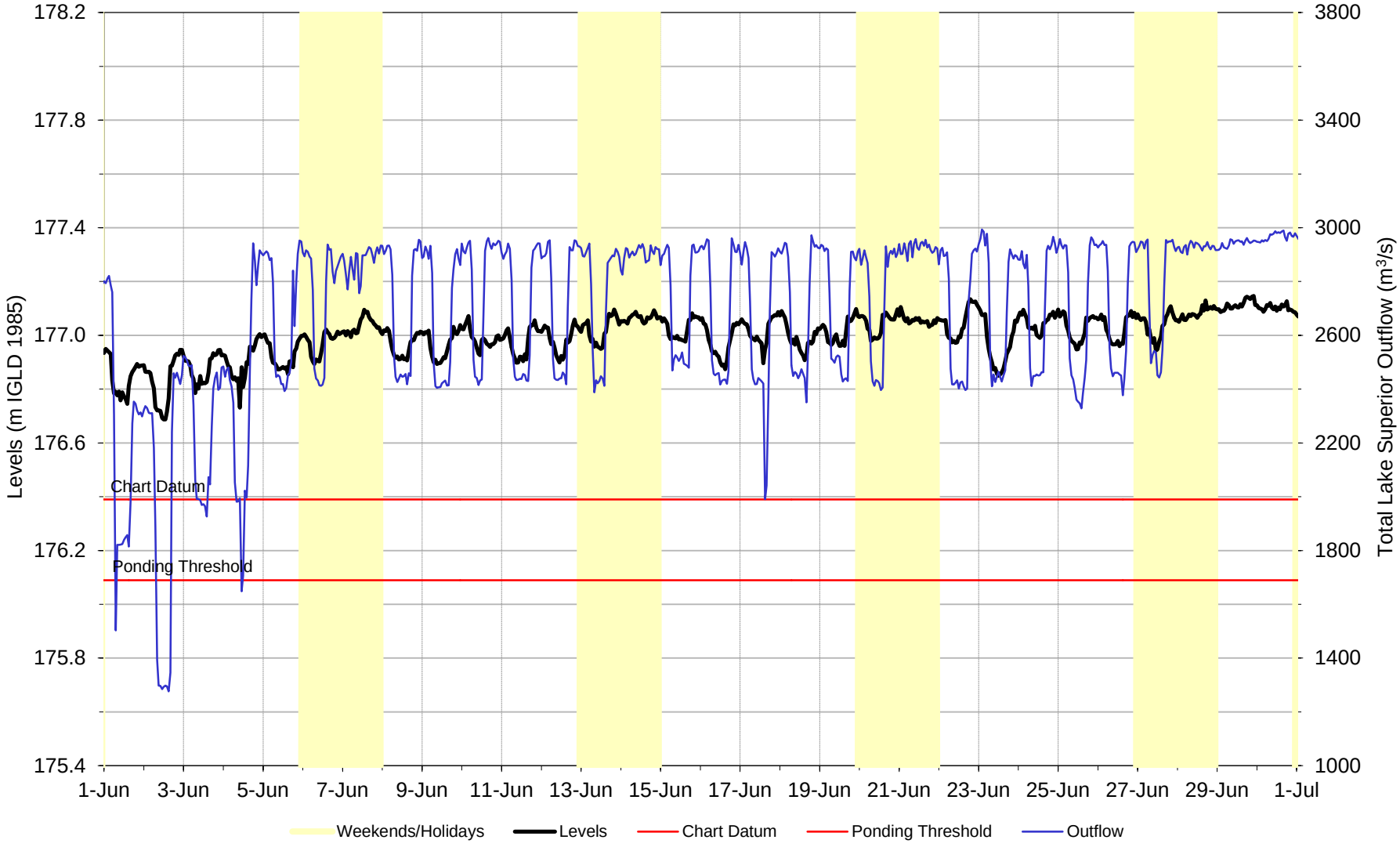
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7b - April 2015



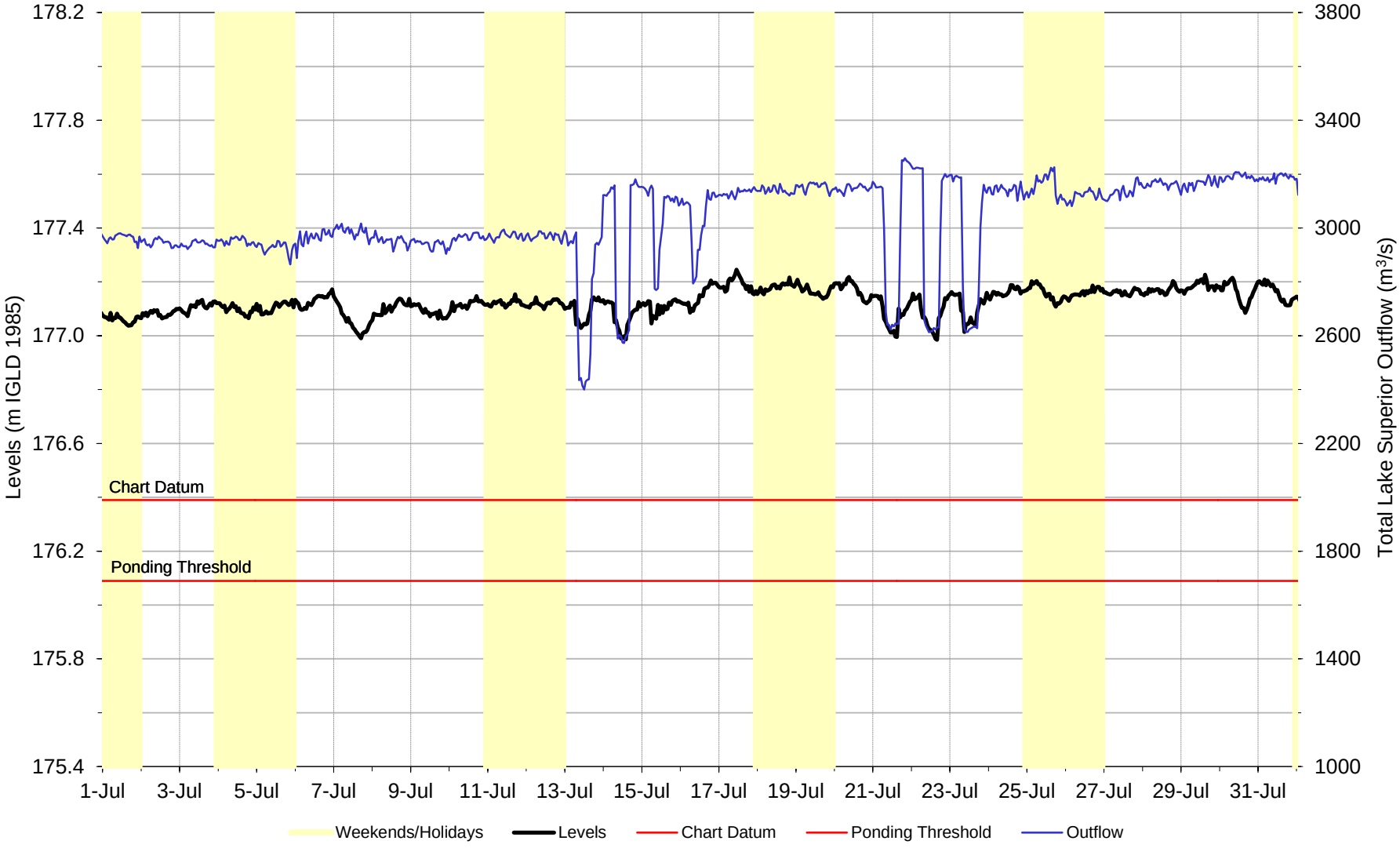
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7c - May 2015



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7d - June 2015



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7e - July 2015



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7f - August 2015

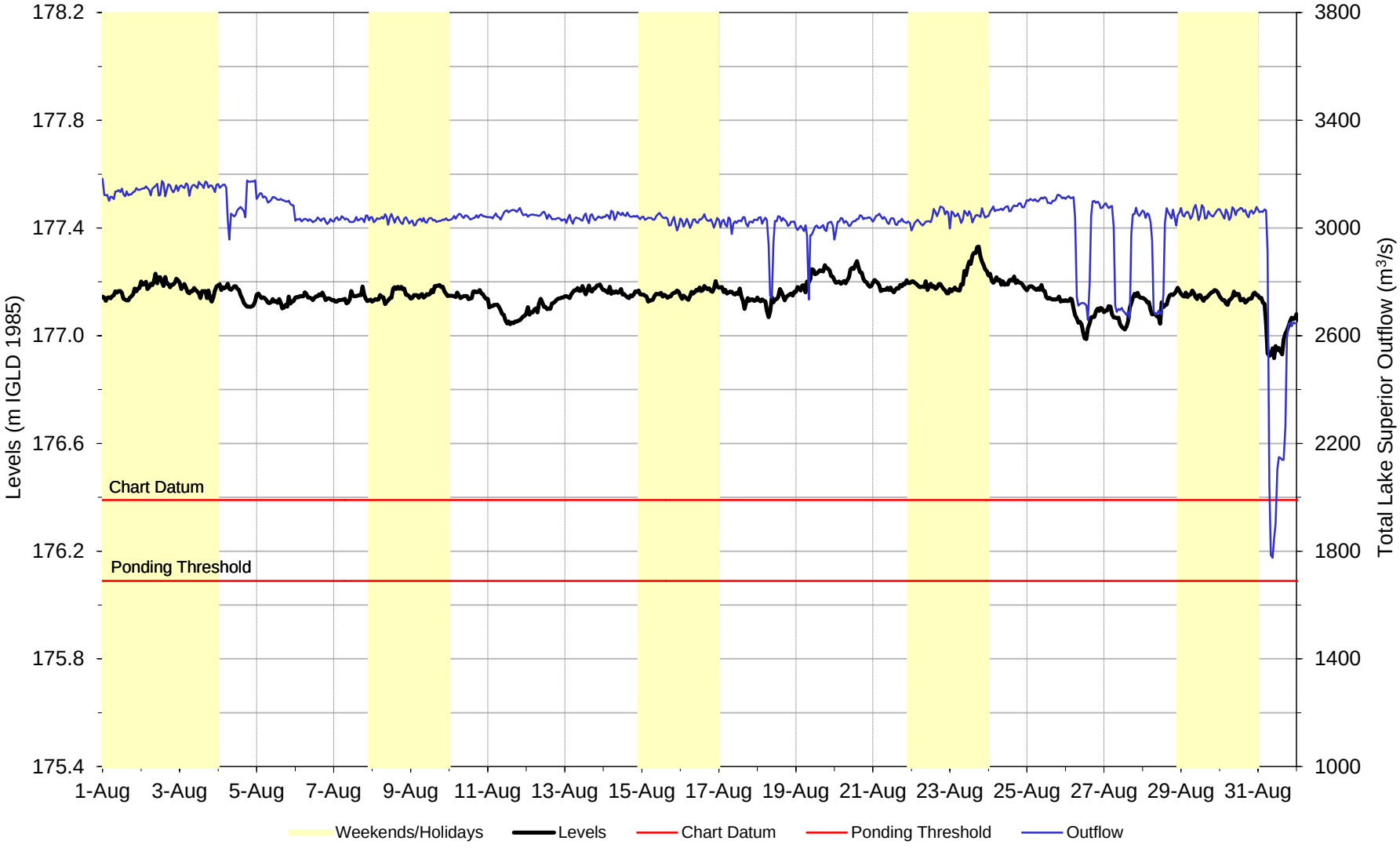


TABLE 1. 2014-2015 Lake Superior Hydrologic Factors

Month	Levels				Net Basin Supplies			Outflows		
	Monthly Mean Recorded[1]		Difference From Average[2]		Monthly Mean Recorded		Exceedence Probability[3]	Monthly Mean Recorded		Percent of Average[4]
	metres	feet	metres	feet	m3/s	tcfs	(%)	m3/s	tcfs	
Mar-14	183.23	601.15	0.01	0.03	1580	56	38	1970	70	105
Apr-14	183.27	601.28	0.02	0.07	5400	191	19	2020	71	105
May-14	183.47	601.94	0.12	0.39	8420	297	3	2360	83	112
Jun-14	183.60	602.36	0.16	0.52	5210	184	28	2700	95	123
Jul-14	183.66	602.56	0.16	0.52	4430	156	24	3260	115	143
Aug-14	183.67	602.59	0.14	0.46	3530	125	24	3280	116	140
Sep-14	183.70	602.69	0.17	0.56	3350	118	16	2910	103	125
Oct-14	183.71	602.72	0.20	0.66	2800	99	12	3040	107	135
Nov-14	183.67	602.59	0.21	0.69	1470	52	20	2950	104	133
Dec-14	183.60	602.36	0.20	0.66	330	12	12	2380	84	116
Jan-15	183.54	602.17	0.22	0.72	-1060	-37	84	2210	78	114
Feb-15	183.47	601.94	0.21	0.69	-120	-4	66	2190	77	115
Mar-15	183.42	601.77	0.20	0.66	1800	64	31	2200	78	118
Apr-15	183.44	601.84	0.19	0.62	3730	132	63	1950	69	101
May-15	183.53	602.13	0.18	0.59	5640	199	37	2450	87	116
Jun-15	183.63	602.46	0.19	0.62	4900	173	34	2720	96	124
Jul-15	183.68	602.62	0.18	0.59	3560	126	50	3080	109	135
Aug-15	183.68	602.62	0.15	0.49	2840	100	42	3070	108	131

Notes: m3/s = cubic metres per second tcfs = 1000 cubic feet per second

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

[2] Average levels are for period 1918-2014, based on a mean of five gauges. Differences computed as metres and then converted to feet.

[3] Exceedence probabilities are based on the period 1900-2008.

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

TABLE 2. 2014-2015 Lake Michigan-Huron Hydrologic Factors

Month	Levels				Net Basin Supplies			Outflows		
	Monthly Mean Recorded[1]		Difference From Average[2]		Monthly Mean Recorded		Exceedence Probability[3]	Monthly Mean Recorded		Percent of
	metres	feet	metres	feet	m3/s	tcfs	(%)	m3/s	tcfs	Average[4]
Mar-14	175.95	577.26	-0.34	-1.12	3580	126	74	4570	161	94
Apr-14	176.06	577.62	-0.31	-1.02	11910	421	6	4910	173	95
May-14	176.27	578.31	-0.20	-0.66	10000	353	10	5120	181	96
Jun-14	176.38	578.67	-0.16	-0.52	7560	267	17	5260	186	97
Jul-14	176.46	578.94	-0.11	-0.36	3120	110	62	5400	191	98
Aug-14	176.48	579.00	-0.07	-0.23	4020	142	7	5420	191	98
Sep-14	176.51	579.10	0.01	0.03	3560	126	9	5490	194	100
Oct-14	176.54	579.20	0.11	0.36	3580	126	6	5640	199	104
Nov-14	176.54	579.20	0.17	0.56	2810	99	19	5670	200	106
Dec-14	176.53	579.17	0.20	0.66	3450	122	10	5740	203	111
Jan-15	176.51	579.10	0.22	0.72	1040	37	64	4500	159	99
Feb-15	176.50	579.07	0.23	0.75	1460	52	76	4450	157	100
Mar-15	176.48	579.00	0.19	0.62	2650	94	86	5210	184	107
Apr-15	176.53	579.17	0.16	0.52	7340	259	59	5630	199	109
May-15	176.59	579.36	0.12	0.39	6910	244	51	5700	201	106
Jun-15	176.68	579.66	0.14	0.46	6580	232	32	5640	199	103
Jul-15	176.73	579.82	0.16	0.52	2540	90	76	5530	195	100
Aug-15	176.72	579.79	0.17	0.56	1750	62	43	5620	198	102

Notes: m3/s = cubic metres per second tcfs = 1000 cubic feet per second

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

[2] Average levels are for period 1918-2014, based on a mean of six gauges. Differences computed as metres and then converted to feet.

[3] Exceedence probabilities are based on the period 1900-2008.

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

TABLE 3
COMPENSATING WORKS GATE CHANGES

Date	Gate Change	Final Gate Settings *	Gate Equivalent (approx.)	Notes
2014				
3-Dec	Lowered 9 and 10	7 - 10 open 20 cm (8 in.)	1/2	Plan-prescribed
2015				
1-May	Opened 3 - 14	3 - 14 open 31 cm (12 in.)	2	To avoid ice issues
8-May	Further opened 3 - 14	3 - 14 open 62 cm (24 in.)	3	Deviation strategy to better manage operational limits on hydropower flow capacity
3-Jun	Further opened 9 - 13, closed 14, opened 15 and 16	3 - 8 open 62 cm (24 in.); 9 - 13 and 15 open 71 cm (28 in.); 16 open 5 cm (2 in.)	4	Continuing deviation strategy; Field measurements; Sea Lamprey trapping
10-Jun	Further opened 3 - 8	3 - 13 and 15 open 71 cm (28 in.); 16 open 5 cm (2 in.)	4	
6-Jul	Opened 2	2 - 13 and 15 open 71 cm (28 in.); 16 open 5 cm (2 in.)	4	
14-Jul	Further opened 2 - 13 and 15	2 - 13 and 15 open 89 cm (35 in.); 16 open 5 cm	6	
5-Aug	Lowered 9-13 and 15	2-8 open 89 cm (35 in.); 9-13 and 15 open 76 cm (30 in.); 16 open 5 cm (2 in.)	5	
6-Aug	Lowered 2-8	2 - 13 and 15 open 76 cm (30 in.); 16 open 5 cm (2 in.)	5	

* Gate 1 remained open 20 cm (8 in.) throughout reporting period (fishery requirement of approximately 15 m^3/s)

TABLE 4
MONTHLY DISTRIBUTION OF LAKE SUPERIOR OUTFLOWS
(UNITS: m^3/s)

YEAR AND MONTH	POWER CANALS					NAVIGATION CANALS			DOMESTIC USAGE				FISHERY	TOTAL
	US GOVT HYDRO	CEC	US TOTAL	BREG	TOTAL POWER CANALS	UNITED STATES	CANADA	TOTAL NAV CANALS	SAULT STE MARIE US + CAN	ESSAR ALGOMA STEEL	ST MARYS PAPER	TOTAL DOM USAGE	ST MARYS RAPIDS	LAKE SUPERIOR OUTFLOW
2014														
JAN	393	585	978	998	1976	2.4	0	2	0.3	2.6	0	3	85	2066
FEB	393	541	934	950	1884	0	0	0	0.3	2.7	0	3	85	1972
MAR	395	518	913	966	1879	0.3	0	0	0.4	2.6	0	3	85	1967
APR	389	595	984	949	1933	3.7	0	4	0.3	2.6	0	3	85	2025
MAY	401	737	1138	663	1801	10.6	0.3	11	0.3	2.7	0	3	545	2360
JUN	366	771	1137	763	1900	12.5	1.2	14	0.3	2.7	0	3	783	2700
JUL	350	774	1124	1132	2256	13.6	1.5	15	0.3	2.8	0	3	991	3265
AUG	358	774	1132	1144	2276	13	1.4	14	0.3	2.8	0	3	991	3284
SEP	378	708	1086	959	2045	12.7	0.7	13	0.3	2.7	0	3	851	2912
OCT	398	747	1145	1092	2237	11	0.2	11	0.3	2.7	0	3	790	3041
NOV	399	718	1117	1138	2255	10.8	0	11	0.3	2.6	0	3	681	2950
DEC	398	764	1162	1106	2268	10.3	0	10	0.3	2.7	0	3	102	2383
2015														
JAN	386	641	1027	1084	2111	4.8	0	5	0.3	2.7	0	3	88	2207
FEB	393	672	1065	1037	2102	0	0	0	0.3	2.6	0	3	87	2192
MAR	394	666	1060	1052	2112	2	0	2	0.3	2.6	0	3	87	2204
APR	402	697	1099	756	1855	8.3	0	8	0.3	2.7	0	3	87	1953
MAY	397	625	1022	907	1929	11.4	0.3	12	0.3	2.8	0	3	506	2450
JUN	398	625	1023	1030	2053	11.4	1.1	12	0.3	2.9	0	3	650	2718
JUL	399	823	1222	1043	2265	11.6	1.9	14	0.3	2.9	0	3	796	3078
AUG	399	798	1197	1080	2277	10.6	1.7	12	0.3	2.9	0	3	776	3068

NOTE: Power canals columns include flows through power plants and spillways

TABLE 5
MONTHLY DISTRIBUTION OF LAKE SUPERIOR OUTFLOWS
(UNITS: cfs)

YEAR AND MONTH	POWER CANALS					NAVIGATION CANALS			DOMESTIC USAGE				FISHERY	TOTAL
	US GOVT HYDRO	CEC	US TOTAL	BREG	TOTAL POWER CANALS	UNITED STATES	CANADA	TOTAL NAV CANALS	SAULT STE MARIE US + CAN	ESSAR ALGOMA STEEL	ST MARYS PAPER	TOTAL DOM USAGE	ST MARYS RAPIDS	LAKE SUPERIOR OUTFLOW
2014														
JAN	13900	20700	34600	35200	69800	85	0	85	11	92	0	103	3000	73000
FEB	13900	19100	33000	33500	66500	0	0	0	11	95	0	106	3000	69600
MAR	13900	18300	32200	34100	66300	11	0	11	14	92	0	106	3000	69400
APR	13700	21000	34700	33500	68200	131	0	131	11	92	0	103	3000	71400
MAY	14200	26000	40200	23400	63600	374	11	385	11	95	0	106	19200	83300
JUN	12900	27200	40100	26900	67000	441	42	483	11	95	0	106	27700	95300
JUL	12400	27300	39700	40000	79700	480	53	533	11	99	0	110	35000	115300
AUG	12600	27300	39900	40400	80300	459	49	508	11	99	0	110	35000	115900
SEP	13300	25000	38300	33900	72200	448	25	473	11	95	0	106	30100	102900
OCT	14100	26400	40500	38600	79100	388	7	395	11	95	0	106	27900	107500
NOV	14100	25400	39500	40200	79700	381	0	381	11	92	0	103	24000	104200
DEC	14100	27000	41100	39100	80200	364	0	364	11	95	0	106	3600	84300
2015														
JAN	13600	22600	36200	38300	74500	170	0	170	11	95	0	106	3110	77900
FEB	13900	23700	37600	36600	74200	0	0	0	11	92	0	103	3070	77400
MAR	13900	23500	37400	37200	74600	71	0	71	11	92	0	103	3070	77800
APR	14200	24600	38800	26700	65500	293	0	293	11	95	0	106	3070	69000
MAY	14000	22100	36100	32000	68100	403	11	414	11	99	0	110	17900	86500
JUN	14100	22100	36200	36400	72600	403	39	442	11	102	0	113	23000	96200
JUL	14100	29100	43200	36800	80000	410	67	477	11	102	0	113	28100	108700
AUG	14100	28200	42300	38100	80400	374	60	434	11	102	0	113	27400	108300

NOTE: Power canals columns include flows through power plants and spillways

NOTE: Flows for individual users were originally coordinated in m^3/s, and are converted here to U.S. customary units (cfs) and rounded to 3 significant figures. Total flow for each category and total Lake Superior flow in this table are computed from the individual flows in cfs.