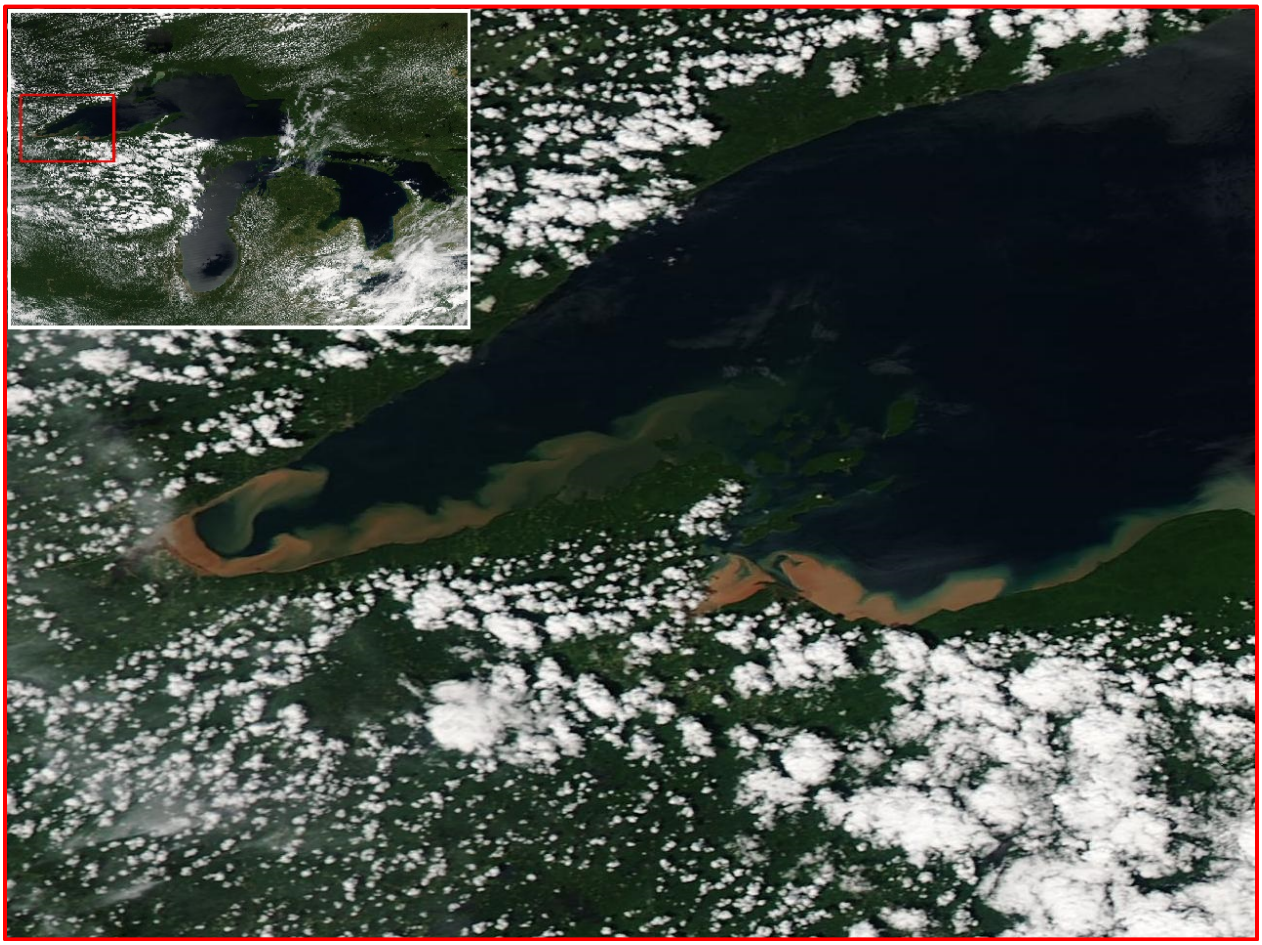
International Lake Superior
Board of Control

Semi-Annual Progress Report to the International Joint Commission

Covering the period March 1, 2016 to August 31, 2016



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Cover: Image taken on July 16, 2016 from NASA Worldview (http://go.nasa.gov/2a2wSWr) to illustrate the impact of substantial rainfall (at least 100 mm over 24 hours) in the western end of Lake Superior contributing to significant runoff into the lake.

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International Lake Superior Board of Control

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

United States
BG Mark Toy, Member
Mr. Arun Heer, Secretary

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

15 September 2016

Commissioners:

This semi-annual report covers the Board's activities from 1 March to 31 August 2016.

1. Highlights

From March through August, the monthly mean water levels of Lake Superior ranged from 14 to 23 cm (5.5 to 9.1 in.) above average, and ranged from 3 cm (1.2 in.) lower to 4 cm (1.6 in.) higher than in 2015.

In the past six months, monthly mean Lake Michigan-Huron levels ranged from 27 to 39 cm (10.6 to 15.4 in.) above average. Lake Michigan-Huron ranged from 10 to 24 cm (3.9 to 9.4 in.) higher than in 2015.

The Lake Superior outflows were as specified by Regulation Plan 2012 in March, April and May. The Board requested and received Commission approval to deviate from the regulation plan by letter dated 26 April 2016 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 greater than those prescribed by Plan 2012 were released in June through August, and these flow increases will be offset by releasing flows less than Plan 2012 in September through November.

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 to approximately one gate open in April, since minimal ice cover remained on Lake Superior and the St. Marys River. In May, the gates were further opened to an equivalent of approximately three gates open and this setting was maintained through June and July. The gate setting was increased to an equivalent of approximately four gates for the month of August. Gate 14 remained closed throughout the reporting period to allow

water level measurements to be collected. Additionally, Gate 16 was opened partially from 11 May through 4 August to provide a small amount of attractant flow to sea lamprey traps located downstream.

Since March, monthly outflows from Lake Superior have been between 112 percent and 129 percent of average. The monthly outflows from Lake Michigan-Huron ranged from 106 percent to 115 percent of average. Water supplies to Lake Superior were above average in March, June, July, and August, and below average in April and May. Water supplies to Lake Michigan-Huron were above average in March, below average in April, May, June, and July, and near average and August.

Monthly inspections of the Compensating Works were conducted during the reporting period. No major issues were identified.

Board representatives met with Cloverland Electric Cooperative, U.S. Government Hydropower Plant, and Brookfield Renewable Energy Partners staff on 22 and 23 June to discuss operational issues at the facilities on the St. Marys River in Sault Ste. Marie, MI and ON. No major issues were reported. Similar meetings may be held in 2017.

The Board continued making progress on hydraulic modeling in the St. Marys Rapids that began after an extensive data-gathering campaign in the spring of 2015. The measured data is being used to calibrate a hydrodynamic model of the St. Marys Rapids, establish limits on the rates of Compensating Works gate changes to protect aquatic organisms, and develop flow relationships for partially open gate settings. The Lake Superior Board and the Great Lakes – St. Lawrence River Adaptive Management (GLAM) Committee are reviewing the impacts of partially open gate settings, and evaluating the impacts of reduced maximum side-channel capacity.

The Board continued its ongoing public communications and outreach efforts including a public webinar on 8 June; participating in Engineer's Day in Sault Ste. Marie, MI, on 24 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. 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 102 percent of average from March through August 2016 and would be expected to be exceeded 38 percent of the time. Precipitation was above average in March, June, and August, below average in April and May, and near average in July. 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, June, July, and August, and below average in April and May. On the whole, the March through August net basin supplies to Lake Superior would be expected to be exceeded 50 percent of the time.

Lake Superior's monthly mean levels over the past six months ranged from 14 to 23 cm (5.5 to 9.1 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 183.70 m (602.69 ft.), which was 16 cm (6.3 in.) above average, 1 cm (0.4 in.) higher than at the same time last year, and 50 cm (19.7 in.) above chart datum.

Precipitation over the Lake Michigan-Huron basin was 107 percent of average over the past six months and would be expected to be exceeded 42 percent of the time. Precipitation was above average in March and August, below average from April through June, and near average in July. Net basin water supplies to Lake Michigan-Huron were above average in March, below average in April, May, June, and July, and near average in August. On the whole, the March through August net basin supplies to Lake Michigan-Huron would be expected to be exceeded 53 percent of the time.

Monthly mean Lake Michigan-Huron levels ranged from 27 to 39 cm (10.6 to 15.4 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 176.81 m (580.09 ft.), 29 cm (11.4 in.) above average, 10 cm (3.9 in.) higher than last year, and 81 cm (31.9 in.) above chart datum.

3. Regulation of Lake Superior

3.1. Outflows

The outflows of Lake Superior were set to the normal winter maximum flow as specified by Regulation Plan 2012 during March and April.

On 7 April, the Board requested approval from the Commission to deviate from the regulation plan from May through November 2016 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 26 April.

In accordance with the approved strategy, deviations were subsequently determined to be unnecessary in May, and instead the Plan-prescribed outflow was released that month. Deviations began the following month, and flows greater than those prescribed by Plan 2012 were released in June through August. These flow increases are expected to be offset by releasing flows less than Plan 2012 in September through November.

Lake Superior outflows were 120 percent of average over the past six months, with monthly flows ranging from 2,170 to 3,010 m^3/s (76,600 to 106,500 cfs).

A few scheduled and unscheduled flow reductions occurred at the hydropower plants, most of which were comprised of maintenance and transmission line work (details are provided in *Section 6* of this report). There were no such outages in March, and in contrast to the previous year, the relatively milder temperatures this winter resulted in much-less-demanding ice conditions in the St. Marys River and minimal impact on side-channel flow capacity, allowing the Plan-prescribed flow to be achieved this month. In April, hydropower maintenance activities reduced the maximum side-channel capacity available, and while this was partially offset by increasing the gate setting at the Compensating Works, somewhat less than the normal winter maximum flow was released and an unintentional deviation from Plan 2012 was incurred. Flow capacity limitations from May through August were addressed by adjusting the gate setting at the Compensating Works in accordance with the Board's approved deviation strategy.

The Board's deviation strategy, hydropower maintenance activities, and uncontrolled hydrologic impacts resulted in total outflows being, on average, roughly equal to the flow that was prescribed by Plan 2012 during the reporting period.

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

During the reporting period, the Board continued to work with the Commission, the hydropower entities, and other stakeholders, to try to address issues raised related to the gate setting of the Compensating Works, and the unusually high water level and flow conditions in the St. Marys Rapids, 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 in March. The half-gate setting is typically employed during winter and maintained until the start of May to reduce the risk of ice-related issues in the St. Marys

River. However, relatively mild temperatures and a resulting lack of ice this year allowed the gates to be opened in April in order to help offset the effects of reduced side channel capacity that month.

Based on feedback received and the successful use of partially opened gates over the past two years, partially open gate settings were again employed this year. On 6-7 April, Gates 2 to 13, 15 and 16 were partially opened to an equivalent of approximately one gate fully open. On 11 May, Gates 2 to 13 and 15 were partially opened further to an equivalent of approximately three gates fully open. This gate setting was maintained through June and July. On 4 August, the gate setting was increased to an equivalent of approximately four gates open by further opening gates 2 to 13, and closing gate 15.

Throughout the reporting period, Gate 1, which supplies water to the Fishery Remedial Works, remained set at approximately 15 m^3/s (530 cfs), and Gate 14 remained closed to allow water level measurements to be collected. Gate 16 was opened 5 cm (2 in.) from 11 May through 4 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 183.46 and 183.70 m (601.9 and 602.7 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 176.81 and 177.28 m (580.1 and 581.6 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 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 continued to be conducted on the Canadian portion by Brookfield Renewable Energy Partners. Inspection observations included 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.

Monthly inspections and routine maintenance continued 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 were cleared from both the upstream and downstream sides of the gates.

USACE also furthered progress on an initiative to automate the US gates at the Compensating Works. The design for this upgrade is complete and a construction contract is expected to be awarded to begin construction in the spring of 2017. Gate settings during mobilization and construction will need to be discussed and coordinated between the USACE project team and the Board. This gate-automation progress would offer much-improved flexibility in the amount of gates opened and the rate at which they are opened and closed to maximize benefits to the St. Mary's Rapids.

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 at any given time of the year, which can affect the plant's abilities to use their full allocations. Allocations were set at "maximum capacity" for each plant throughout the reporting period. There were no reported ice-related issues this winter, and water level conditions were generally favorable and did not inhibit the plants from passing maximum flows.

In addition to hydrologic constraints, maintenance activities at the plants can also lead to reduced capacity. Scheduled and unscheduled outages that occurred at the plants during the reporting period are described below.

6.2. Brookfield Renewable Energy Partners

Planned unit outages at Brookfield's Clergue plant totaled 1,048 hours during the reporting period. Most of these outages were due to annual inspections, regular maintenance and transmission work. Unplanned outages during the reporting period were minimal and totalled 9 hours.

6.3. U.S. Government Hydropower Plant

Unit outages for the reporting period totaled 121 hours. The largest outage was due to a valve malfunction on Unit 3A, totaling 68 hours. A plant-wide 21-day outage is expected in September to replace all protective relays.

6.4. Cloverland Electric Cooperative

Canal restoration work, which began in the spring of 2015, continued this reporting period beginning on 18 April, lasting through June. Canal restoration work is expected to resume in September through October of this year. These repairs require flows to be reduced during working hours, resulting in total plant capacity being limited to about 600 m^3/s during this period. The canal repairs will continue in 2017 on a similar schedule.

7. Flow Measurements

A few St. Marys Rapids flow measurements were collected this reporting period. 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 and Climate Change Canada's Water Survey. The flow measurements were made on 10 and 11 May and 30 August. Additional flow measurements are expected in 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.

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 2015 to August 2016. 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 percent of the total monthly outflow. The monthly flow through the locks depends on traffic volume and varied from 3 to 13 m^3/s (106 to 463 cfs) during the past six months. As a percentage of the total river flow, water allocated for navigation can vary seasonally from 0.1 percent (when the locks are closed for the winter) to 1 percent in the busiest part of the navigation season. The U.S. locks opened on 25 March. The Canadian lock opened on 13 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 88 to 665 m^3/s (3,100 to 23,500 cfs) over the last six months, or approximately 4 to 22 percent 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 2,127 m^3/s (75,110 cfs) from March to August for electric power production, or 83 percent 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 2,280 m^3/s (80,520 cfs). The average monthly difference of 153 m^3/s (5,410 cfs) was due primarily to unit outages as a result of plant maintenance requirements. Usages at each plant are shown in Tables 4 and 5.

8.2. Review of Water Usages

Board representatives met with Cloverland Electric Cooperative, U.S. Government Hydropower Plant, and Brookfield Renewable Energy Partners staff on 22 and 23 June at their respective facilities located on the St. Marys River in Sault Ste. Marie, ON. The informal 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 facilities to meet face-to-face and discuss issues of mutual importance, including water usage and reporting responsibilities, scheduled and unscheduled hydropower outages, 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.

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 127 m^3/s (4,480 cfs) and the Long Lac Diversion averaged 37 m^3/s (1,310 cfs) from March through August. Combined, these diversions were about 98 percent of average for the period 1944-2015.

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 2.2 m^3/s (78 cfs) from March through 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. Outflows through the Kenogami Dam during the reporting period averaged 1.6 m^3/s (57 cfs).

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 above-average 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 comparable to those during the same period in 2015.

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

In its year one work plan, the GLAM Committee outlined a number of tasks related to the ongoing evaluation of regulations plans. This includes two tasks previously identified by the Board as priorities for assessing the performance of Lake Superior Regulation Plan 2012 under actual operational conditions versus what was expected to occur based on modeled results.

11.1. Review of reductions in maximum side-channel capacity

One of the tasks is a review of the impacts of reductions in maximum side-channel capacity due to hydropower outages and other limitations and the development of strategies to address them. Plan 2012 was developed and tested under the assumption that a maximum side-channel flow of 2,320 m^3/s (82,300 cfs) would be possible each month. This was based on a review of physical capacities and limitations of the various flow control structures at the head of the St. Marys River, and this maximum flow is achievable only under "ideal" conditions. However, actual operational conditions vary from month-to-month, and hydropower plant capacity is, at times, limited due to hydrologic variations in water levels and ice conditions, as well as outages due to maintenance activities. Through this task, GLAM and the Board will develop a better understanding of the various factors affecting side-channel capacity, and incorporate this information into plan-evaluation tools. These will be used to review the impacts of reduced side-channel capacity on regulated water levels and flows, to determine the effects on key stakeholders, and to develop and evaluate potential strategies to address these impacts.

11.2. Review of partially open gate settings

The second task is a review of the use of multiple partially open gate settings at the Compensating Works and their impacts on St. Marys River stakeholders. Due to the recent rise in water levels in the upper Great Lakes, Lake Superior outflows through the St. Marys River have also increased, requiring multiple open gates to pass the total flow. The Board began employing multiple partially open gate settings starting in May 2014 based on feedback from stakeholders and their concerns about the impacts of high and fluctuating water level and flow conditions within the St. Marys Rapids. The goal will be to provide potential advantages over the more typical use of fully open gates. As part of this task, GLAM will develop a better understanding of the ecological and economic effects of partially open gate settings, and define areas for further study. Concurrently, the Board will use flow measurements collected over the past few years under partially open gate conditions to support development of improved flow relationships. These findings will be incorporated into plan-evaluation tools and used to develop and evaluate guidelines for Compensating Works gate operations in the future.

11.3. Gate Movement Limits Study and Application to Further Investigations

In the spring of 2015, the Board initiated an ongoing study, led by the USACE Detroit District and partially funded through the IJC's International Watersheds Initiative (IWI), to measure and analyze flow, velocity and water level data in the St. Marys Rapids under varying Compensating Works gate settings. Field-verified limits on the rate of gate changes will be established to prevent harm to fish and other organisms caused by stranding or flushing.

The USACE Detroit District continued to develop a two-dimensional Adaptive Hydraulics (AdH) model of the St. Marys River using the field data collected in 2015. The data was

used to calibrate the model, which provides a better understanding of the unique hydraulics of the St. Marys River, and also extends the analysis to a broader range of flow and water level conditions than has recently been observed. The model permits evaluation of the hydraulic impacts in the St. Marys Rapids from different gate operations and addresses other questions and concerns as to the impacts of natural factors and operational decisions.

The AdH model is also expected to form the basis for developing a two-dimensional integrated ecosystem response model (IERM2D) for the St. Marys River. Development of this model, with application to the St. Marys Rapids area initially, is expected to begin this coming year as a collaboration between the USACE and Environment and Climate Change Canada. This project will also be partially supported by the IWI following a GLAM proposal that was submitted to and subsequently approved by the IJC. The IERM2D, once completed, will allow GLAM and the Board to better evaluate the impacts of flows and water levels on the St. Marys River ecosystem.

12. Public Communications and Outreach

The Board hosted its annual public meeting at noon on 8 June using a combined Webinar and teleconference format. About ten members of the public participated in total, along with IJC staff, Board Members, staff, and associates. The Canadian Chair, Mr. Jaymie Gadal, 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 2017.

Board staff also attended and participated in Soo Locks Engineer's Day on 24 June, hosted by the USACE – Soo Area Office. This was the fourth year that Board staff have participated in this event, which was once again well-attended by the public, with an estimated 7,900 people in attendance. Many of those in attendance stopped at the Board's display table, with two professionally-printed banners, large posters showing Great Lakes water levels and an infographic of Plan 2012, along with numerous brochures and information bulletins to hand out. The three Board representatives in attendance were kept busy throughout the day, speaking directly with over 50 people about water levels, flows, regulation, and other topics of interest. 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. Other popular questions and comments were related to

diversions, including the recent approval of the Waukesha, Wisconsin domestic water diversion. An open house tied with the Soo Locks Engineer's Day in June will again be attended by Board staff in June 2017.

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 the effects of high water levels. A number of reports of coastal erosion have been received, as the effects of winds and waves have been compounded as a result of relatively higher water levels in recent months. Some have also expressed concern about 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 years, 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 regard to recent conditions as well as the Board's deviation strategy, and 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, hydrologic data summaries, and an interactive map describing some of the important features related to the regulation of outflows through the St. Marys River.

13. Board Membership and Meetings

LTC Michael Sellers was replaced as U.S. Regulation Representative by LTC Dennis Sugrue on 28 July. BG Richard Kaiser was replaced as U.S. Chair by BG Mark Toy on 31 August.

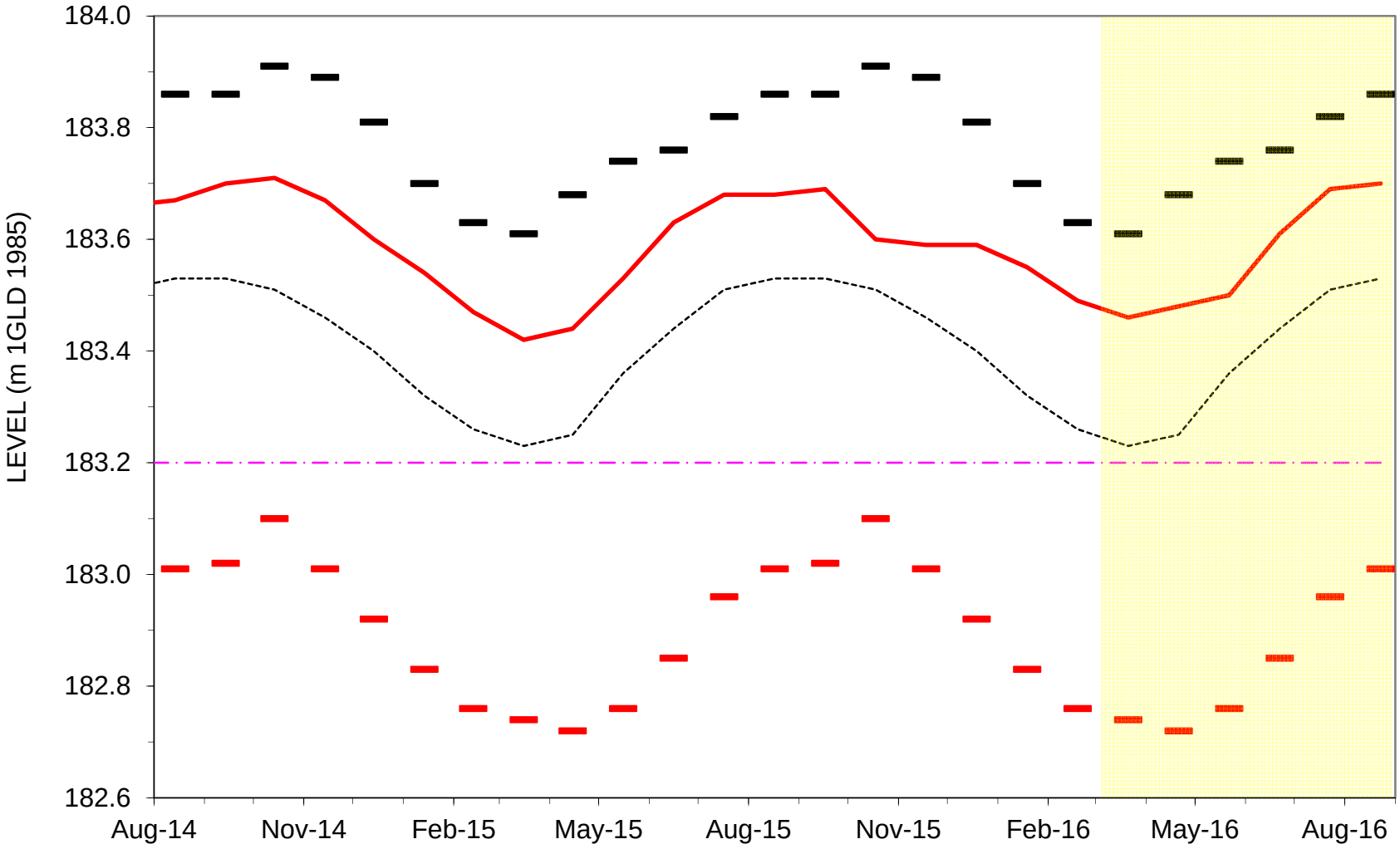
The Board held meetings on 30 March in Detroit, Michigan and 15 September in Quebec City, Quebec.

Respectfully submitted,

Jaymie Gadal
Chair for Canada

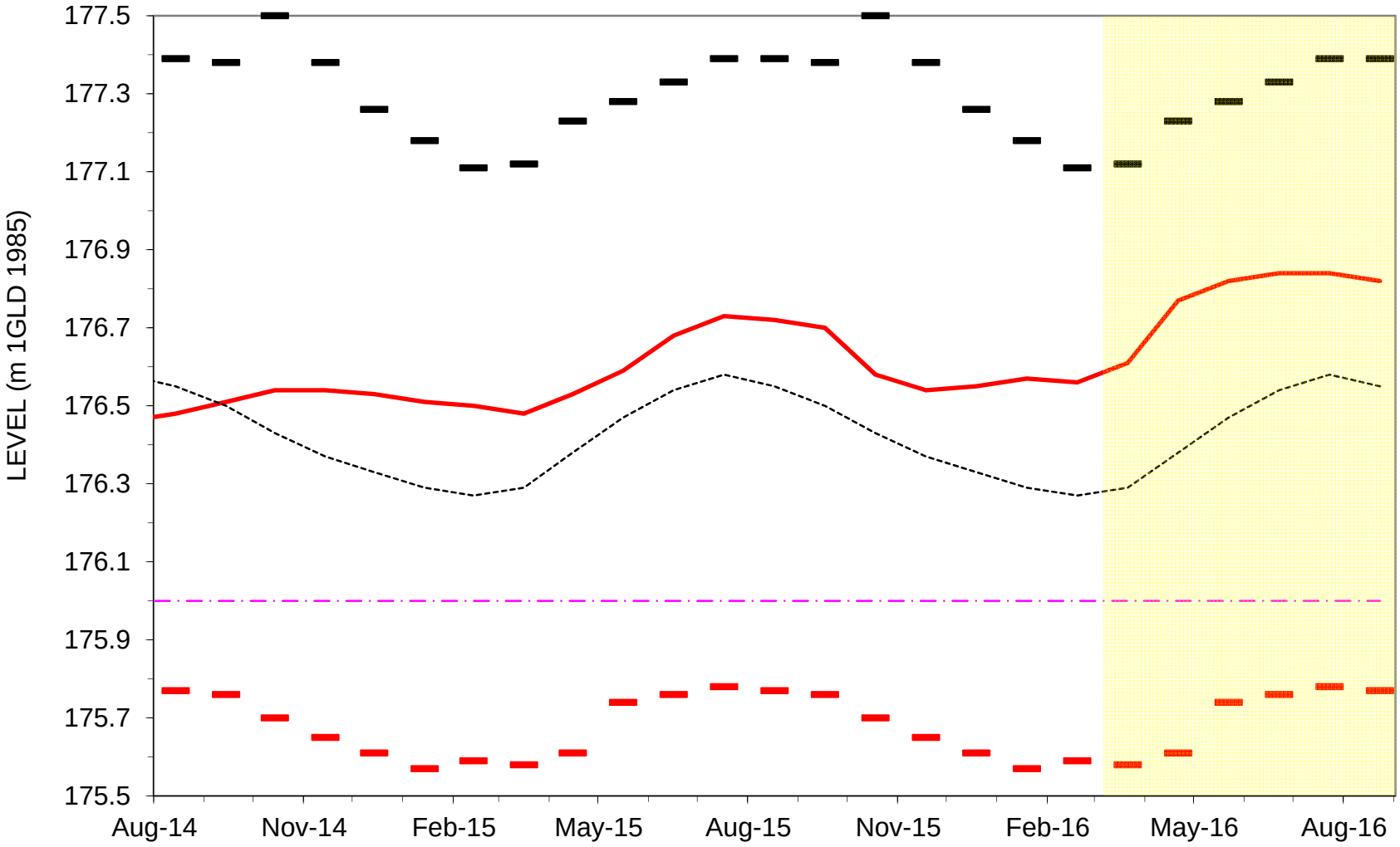
for BG Mark Toy
Chair for United States

Figure 1 - LAKE SUPERIOR MONTHLY WATER LEVELS



Based on a mean of 5 gauges. Average, maximum, and minimum for period 1918-2015.

Figure 2 - LAKE MICHIGAN-HURON MONTHLY WATER LEVELS



Based on a mean of 6 gauges. Average, maximum, and minimum for period 1918-2015.

Figure 3 - LAKE SUPERIOR MONTHLY PRECIPITATION

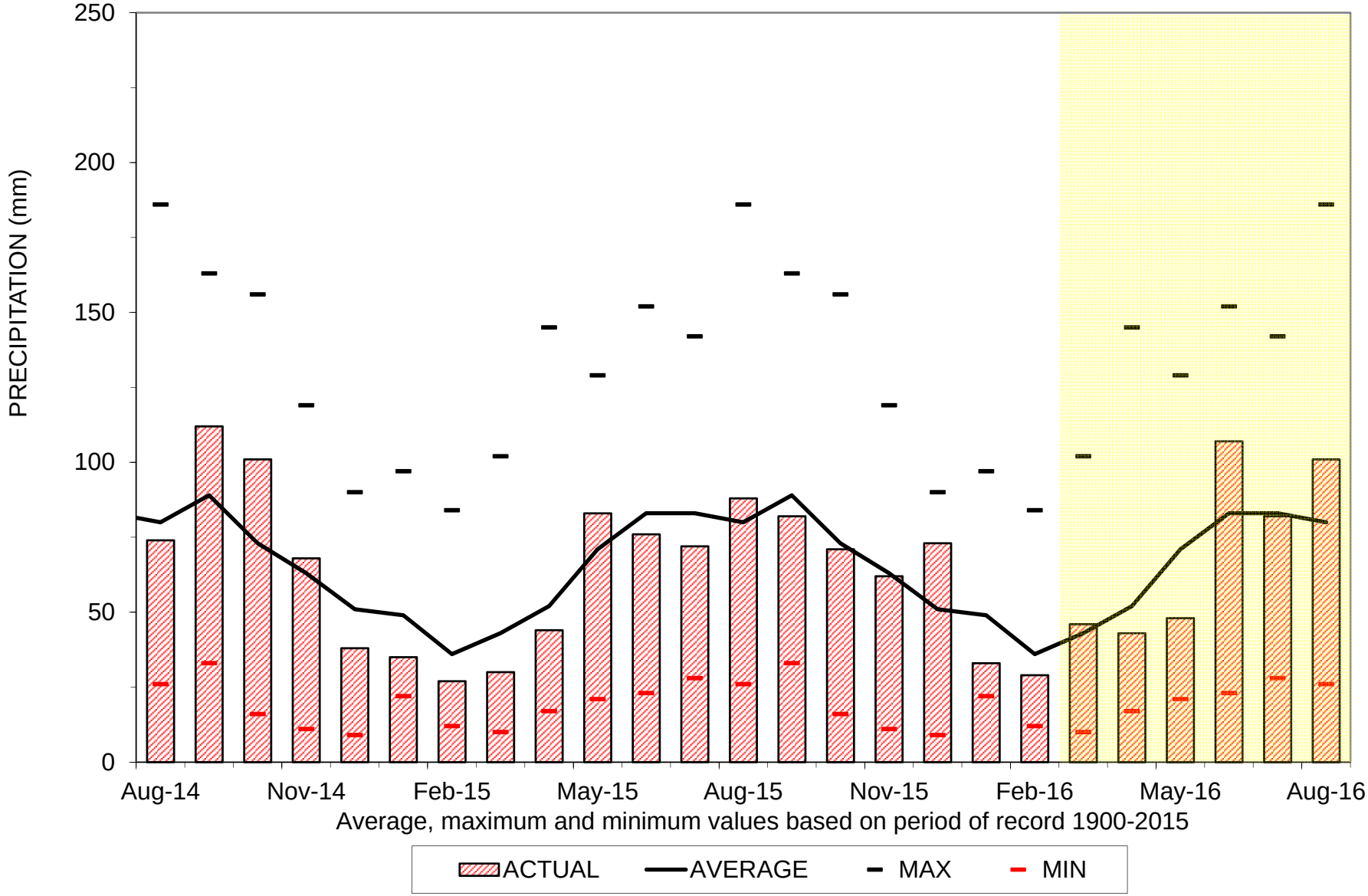


Figure 4 - LAKE MICHIGAN-HURON MONTHLY PRECIPITATION

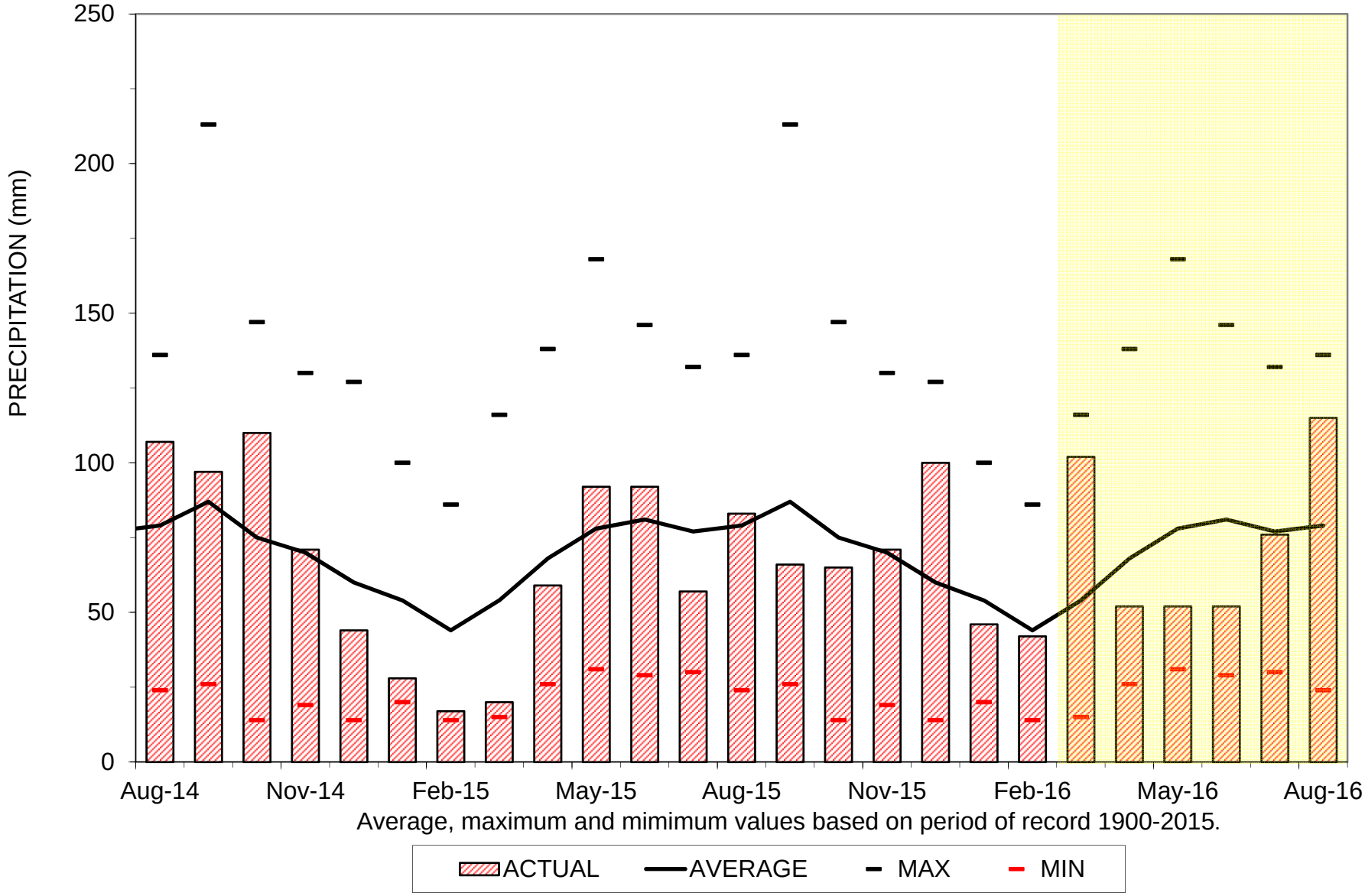
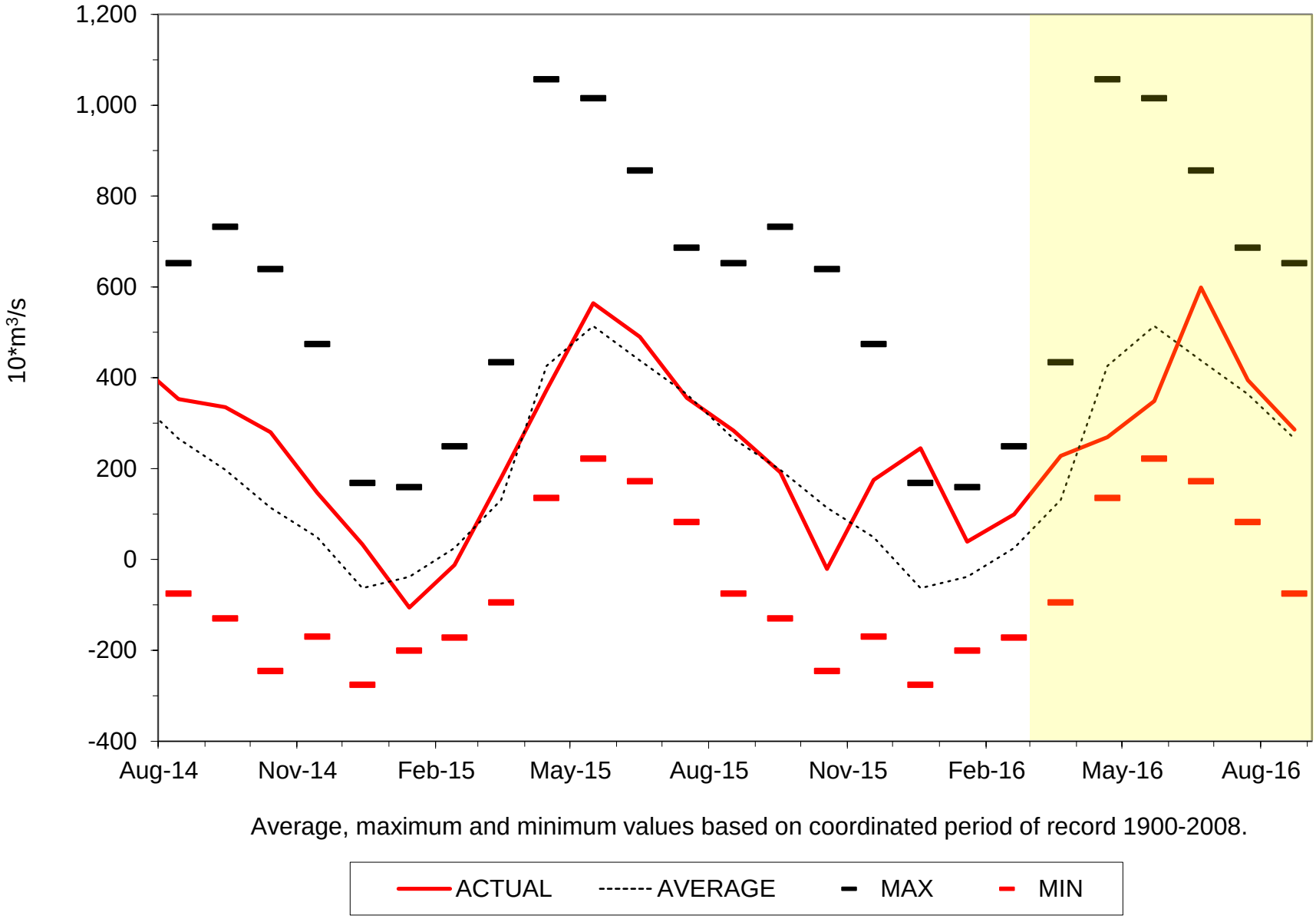
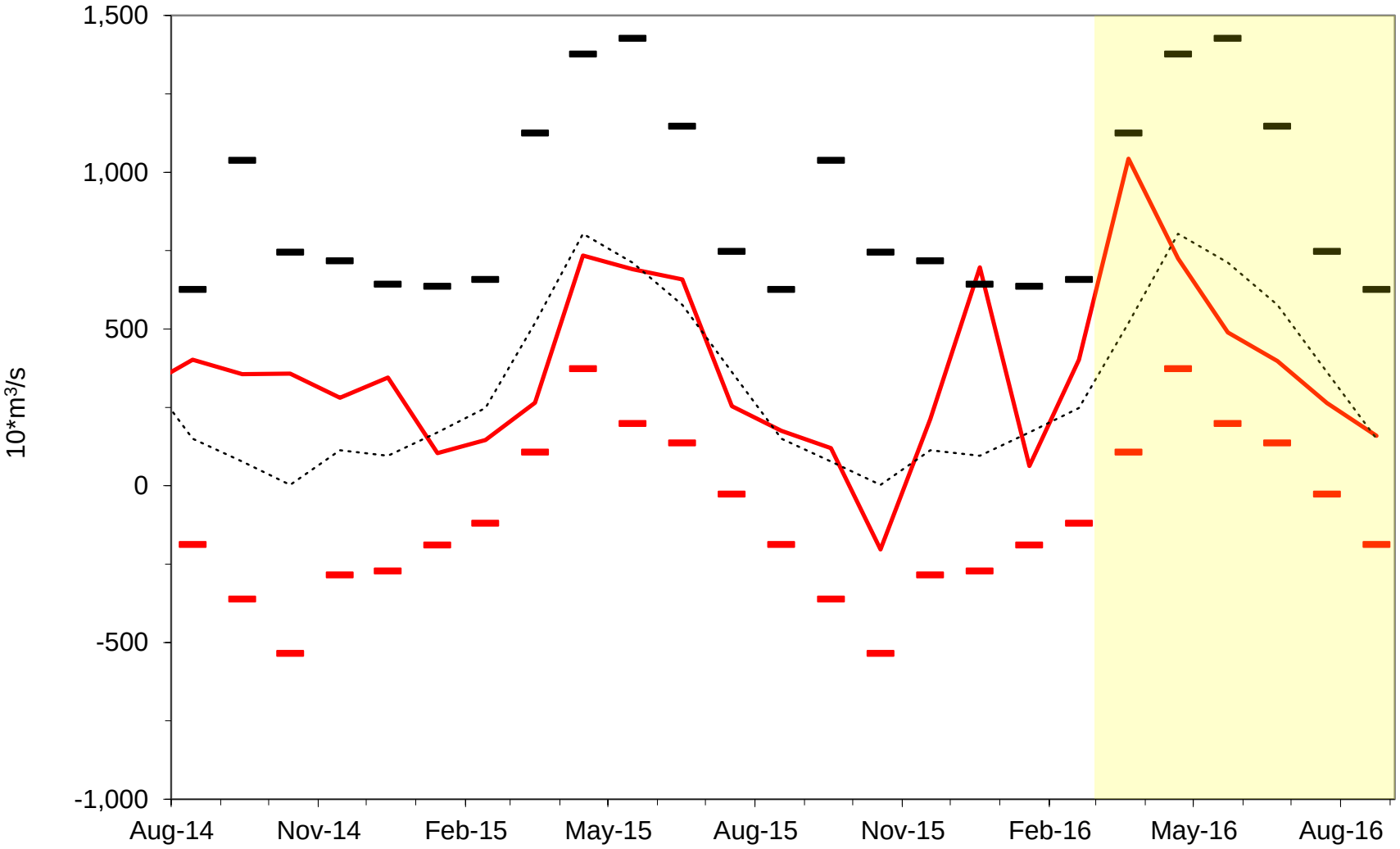


Figure 5 - LAKE SUPERIOR MONTHLY NET BASIN SUPPLIES



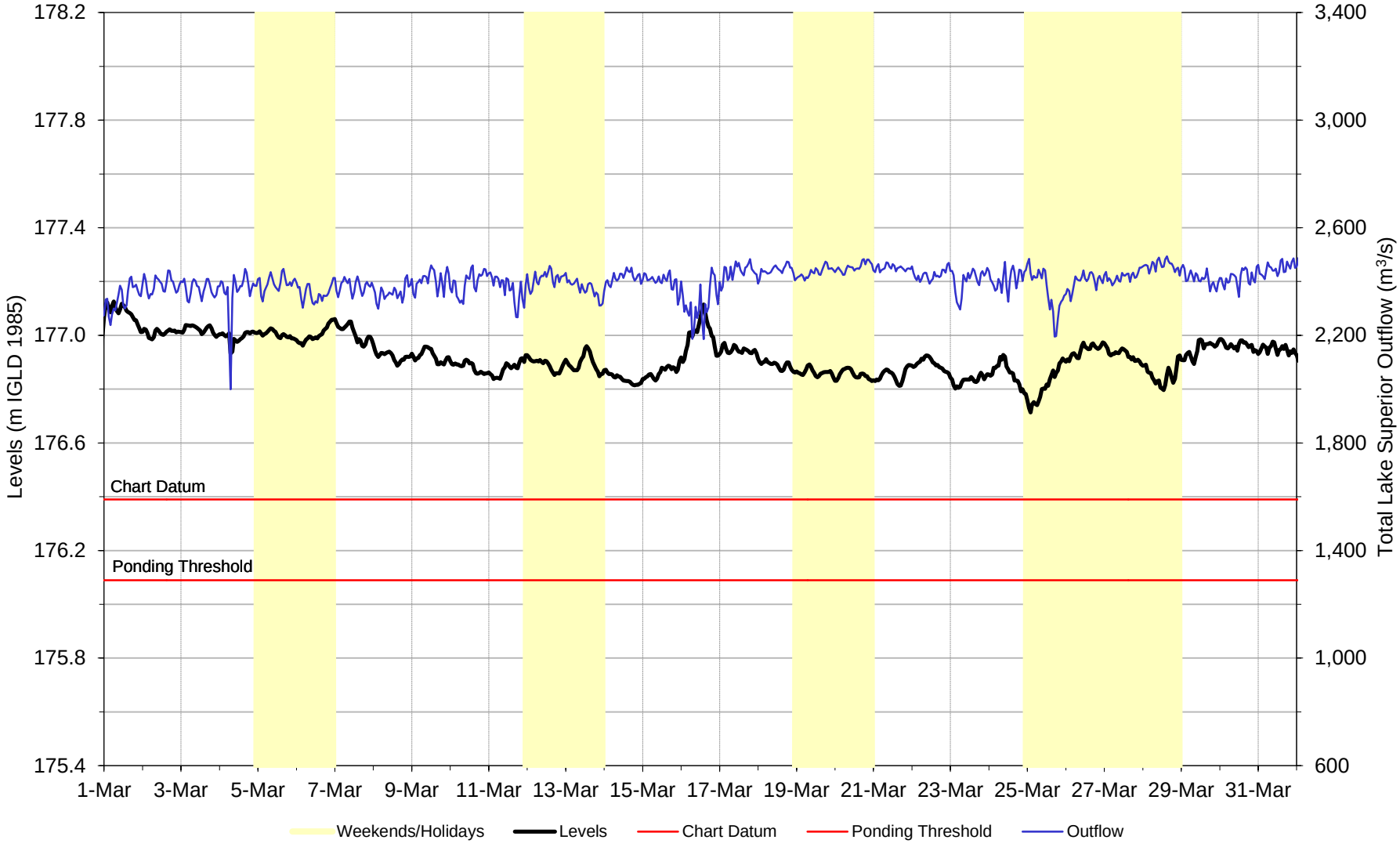
Average, maximum and minimum values based on coordinated period of record 1900-2008.

Figure 6 - LAKE MICHIGAN-HURON MONTHLY NET BASIN SUPPLIES

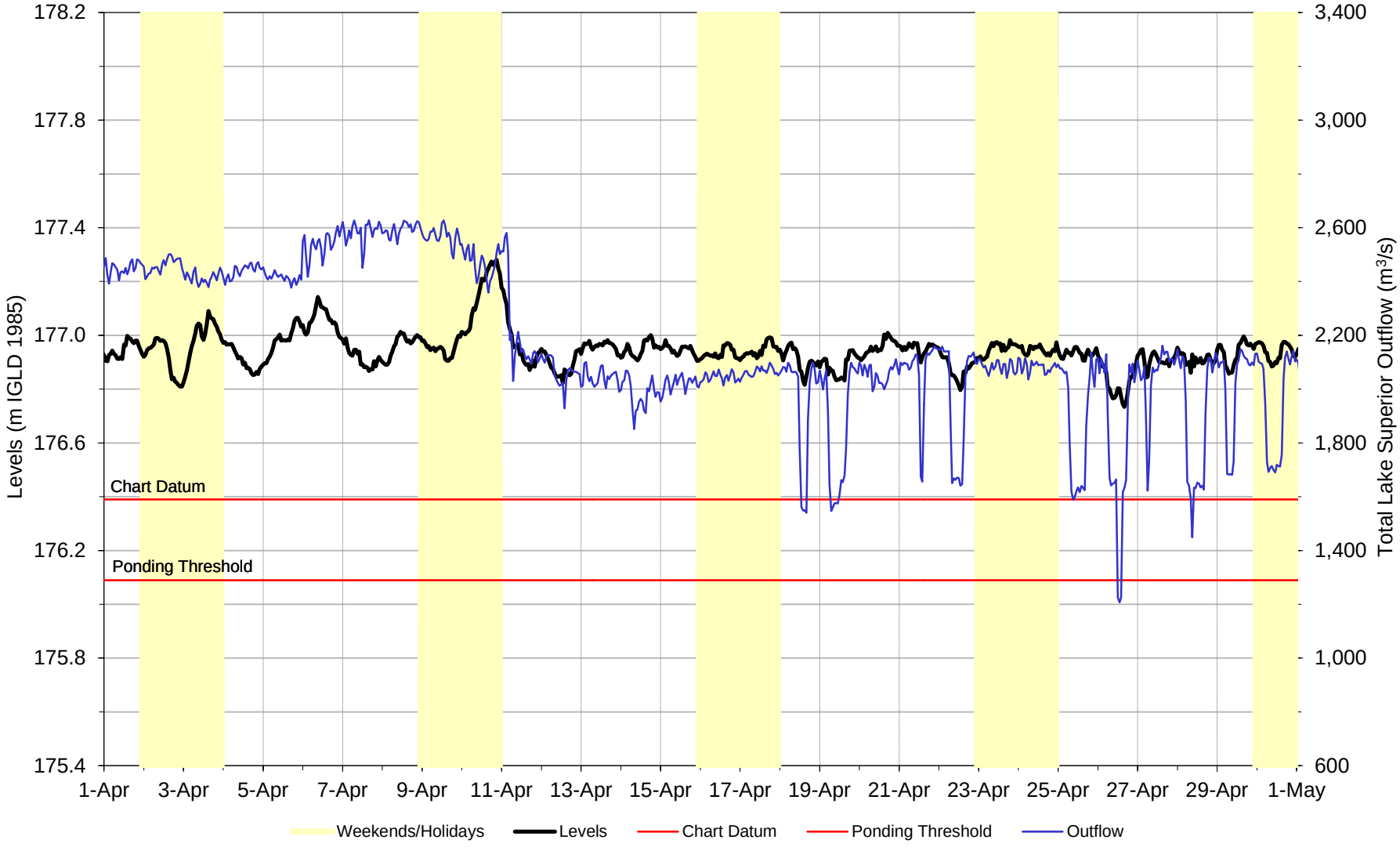


Average, maximum and minimum values based on coordinated period of record 1900-2008.

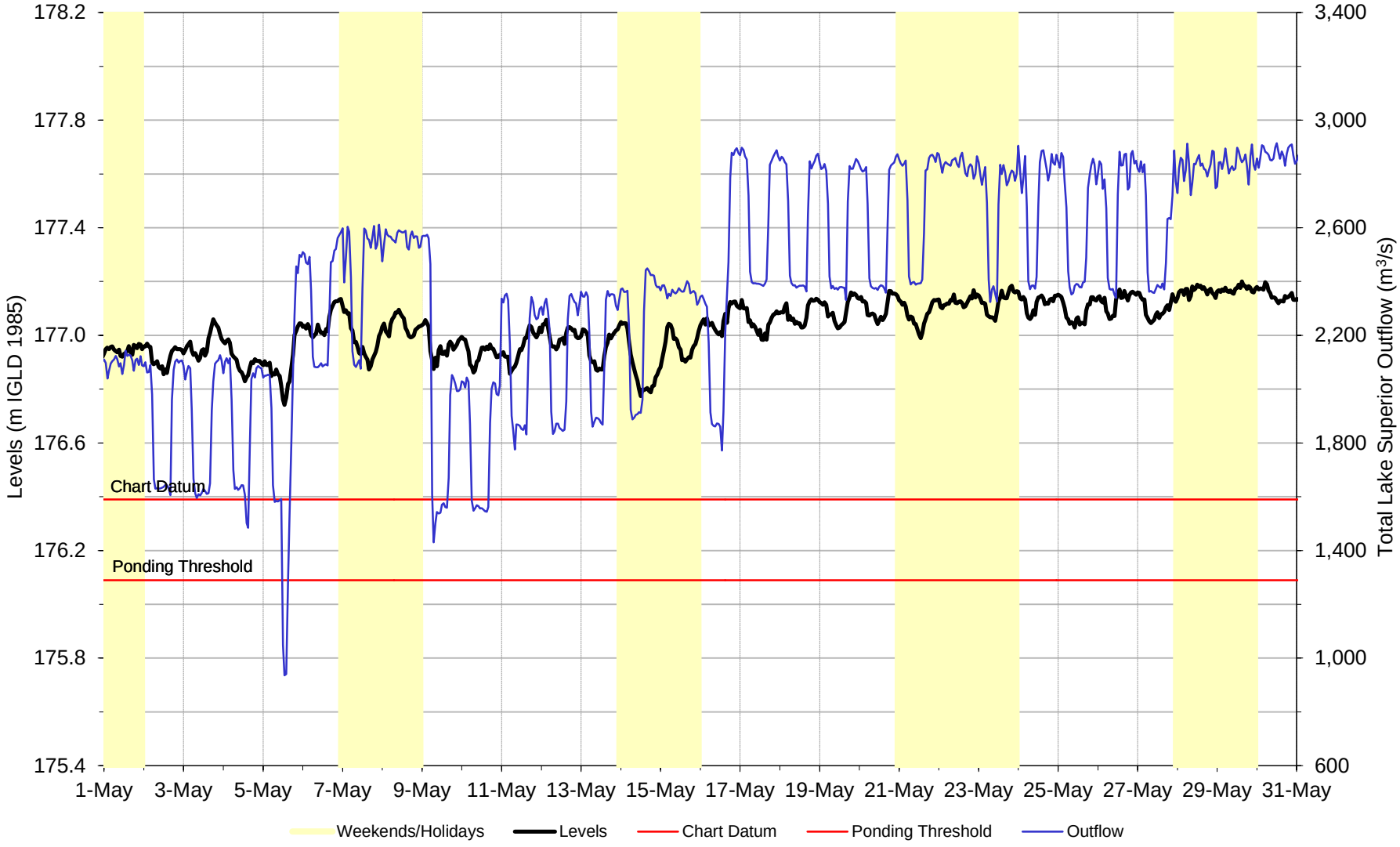
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7a - March 2016



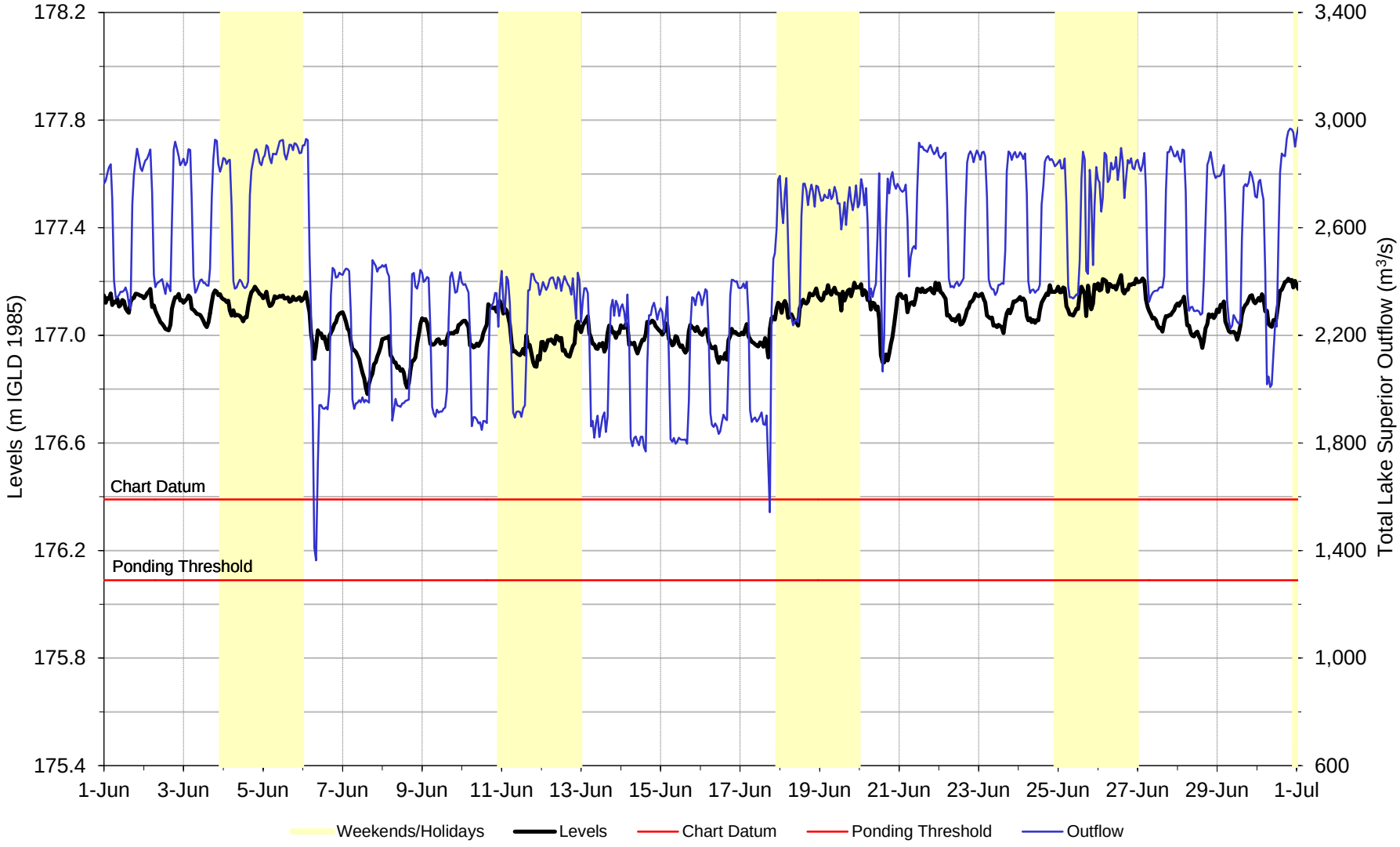
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7b - April 2016



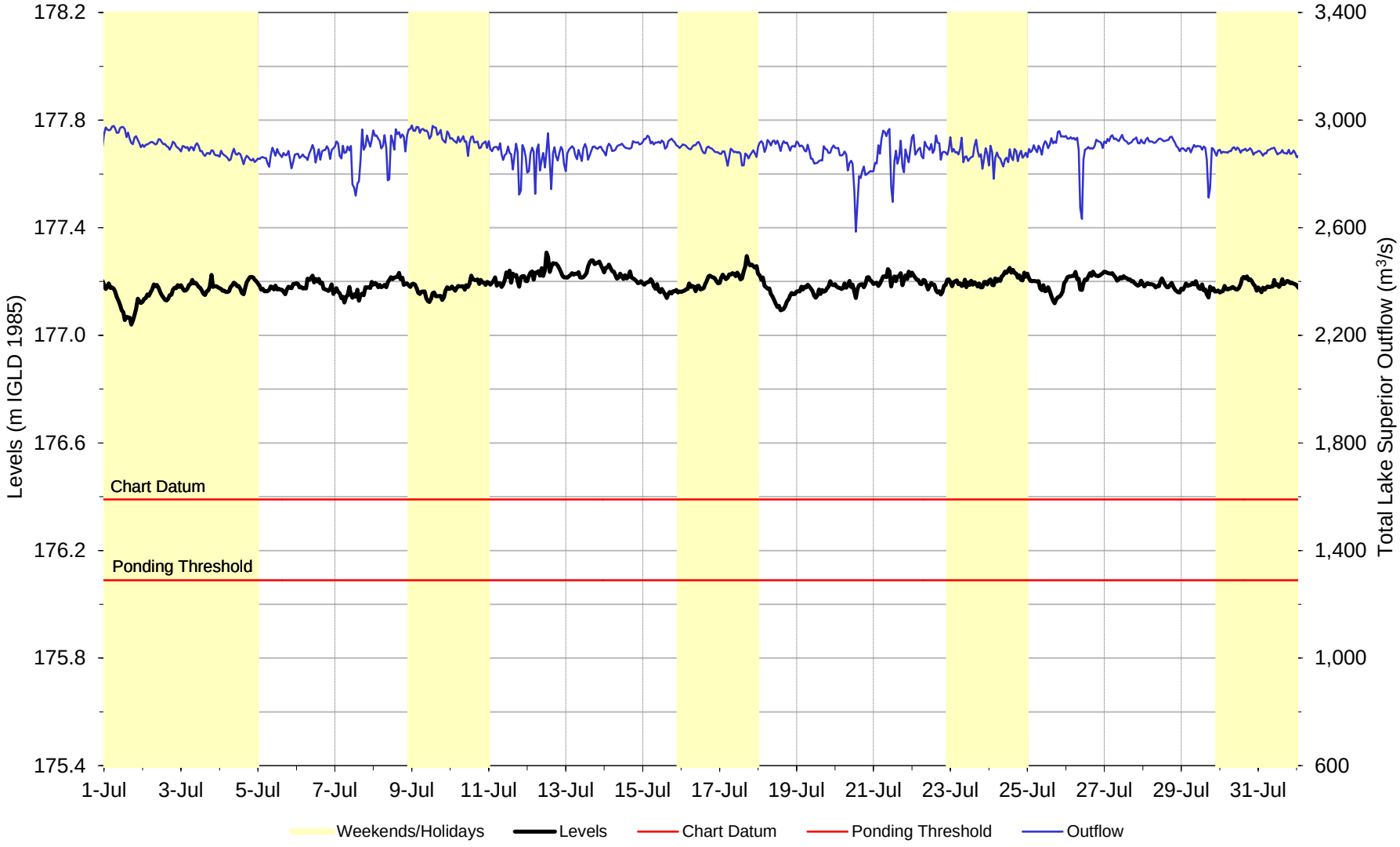
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7c - May 2016



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7d - June 2016



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7e - July 2016



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7f - August 2016

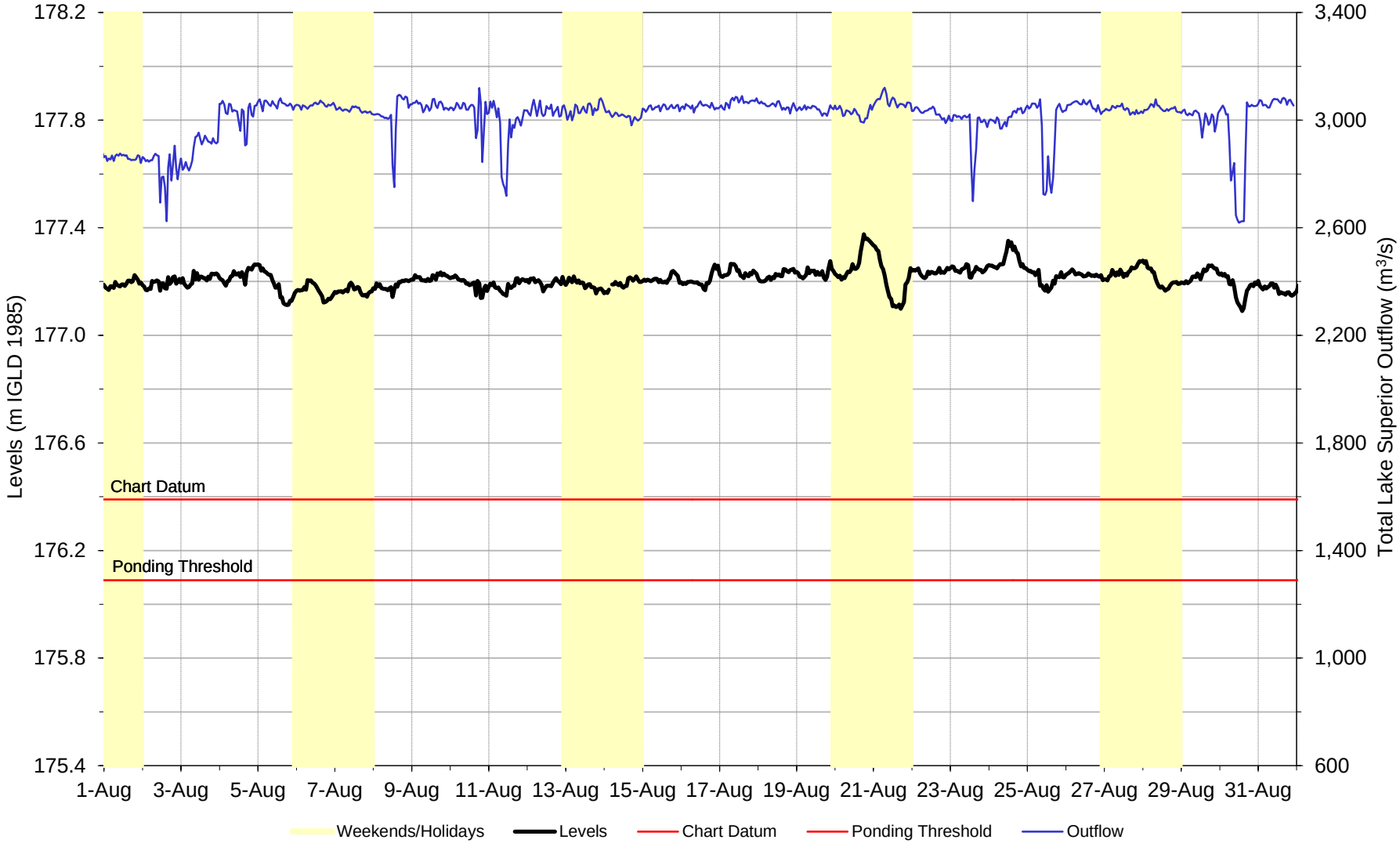


TABLE 1. 2015-2016 Lake Superior Hydrologic Factors

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	m^3/s	tcfs	(%)	m^3/s	tcfs	
Mar-15	183.42	601.77	0.19	0.62	1,800	64	31	2,200	78	118
Apr-15	183.44	601.84	0.19	0.62	3,730	132	63	1,950	69	101
May-15	183.53	602.13	0.17	0.56	5,640	199	37	2,450	87	116
Jun-15	183.63	602.46	0.19	0.62	4,900	173	34	2,720	96	124
Jul-15	183.68	602.62	0.17	0.56	3,560	126	50	3,080	109	135
Aug-15	183.68	602.62	0.15	0.49	2,840	100	42	3,070	108	131
Sep-15	183.69	602.66	0.16	0.52	1,920	68	48	2,770	98	119
Oct-15	183.60	602.36	0.09	0.30	-210	-7	83	2,780	98	123
Nov-15	183.58	602.30	0.12	0.39	1,750	62	15	2,220	78	100
Dec-15	183.59	602.33	0.19	0.62	2,450	87	<1	2,320	82	113
Jan-16	183.55	602.20	0.23	0.75	390	14	14	2,440	86	126
Feb-16	183.49	602.00	0.23	0.75	990	35	17	2,400	85	126
Mar-16	183.46	601.90	0.23	0.75	2,280	81	20	2,400	85	128
Apr-16	183.48	601.97	0.23	0.75	2,690	95	87	2,170	77	112
May-16	183.50	602.03	0.14	0.46	3,490	123	84	2,400	85	114
Jun-16	183.61	602.40	0.17	0.56	5,990	212	15	2,460	87	112
Jul-16	183.69	602.66	0.18	0.59	3,950	139	37	2,890	102	127
Aug-16	183.70	602.69	0.17	0.56	2,860	101	42	3,010	106	128

Notes: m^3/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 1918-2015, 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. 2015-2016 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 Average[4]
	metres	feet	metres	feet	m^3/s	tcfs	(%)	m^3/s	tcfs	
Mar-15	176.48	579.00	0.19	0.62	2,650	94	86	5,210	184	107
Apr-15	176.53	579.17	0.15	0.49	7,340	259	59	5,630	199	109
May-15	176.59	579.36	0.12	0.39	6,910	244	51	5,700	201	106
Jun-15	176.68	579.66	0.14	0.46	6,580	232	32	5,640	199	103
Jul-15	176.73	579.82	0.16	0.52	2,540	90	76	5,530	195	100
Aug-15	176.72	579.79	0.17	0.56	1,750	62	43	5,620	198	102
Sep-15	176.70	579.72	0.20	0.66	1,200	42	38	5,670	200	104
Oct-15	176.58	579.33	0.15	0.49	-2,030	-72	86	5,570	197	103
Nov-15	176.54	579.20	0.17	0.56	2,130	75	29	5,600	198	104
Dec-15	176.55	579.23	0.22	0.72	6,970	246	<1	5,630	199	108
Jan-16	176.57	579.30	0.28	0.92	630	22	73	5,660	200	124
Feb-16	176.56	579.27	0.29	0.95	4,020	142	15	5,440	192	123
Mar-16	176.61	579.43	0.32	1.05	10,430	368	2	5,590	197	115
Apr-16	176.77	579.95	0.39	1.28	7,250	256	60	5,760	203	112
May-16	176.82	580.12	0.35	1.15	4,890	173	85	5,860	207	109
Jun-16	176.84	580.18	0.30	0.98	3,980	141	82	5,900	208	108
Jul-16	176.84	580.18	0.27	0.89	2,640	93	73	5,890	208	107
Aug-16	176.82	580.12	0.27	0.89	1,590	56	47	5,850	207	106

Notes: m^3/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 1918-2015, 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
2016				
6-Apr	Opened 2 - 6	2 - 10 open 20 cm (8 in.)	1	Lack of ice allowed the gates to be opened in order to help offset the effects of reduced capacity of the hydropower plants
7-Apr	Opened 11 - 13, 15 and 16	2 - 13, 15 and 16 open 20 cm (8 in.)	1	
11-May	Further opened 2 - 13, and 15, lowered 16	2 - 13 and 15 open 53 cm (21 in.); 16 open 5 cm (2 in.)	3	To meet Plan 2012 flow due to reduced capacity of the hydropower plants; Field measurements **; Sea Lamprey trapping ***
4-Aug	Further opened 2-13, closed 15 and 16	2 - 13 open 74 cm (29 in.)	4	Deviation strategy to better manage operational limits on hydropower flow capacity; Field measurements **

* Gate 1 remained open 20 cm (8 in.) throughout reporting period (fishery requirement of approximately 15 m^3/s).
Gate 14 remained closed throughout reporting period to allow microwave radar gauge water level measurements.

** St. Marys Rapids flow measurements collected on 10-11 May and on 30 August.

*** Gate 16 set to 5 cm (2 in.) open at request of US Fish and Wildlife Service to allow for sea lamprey trapping (11 May - 4 Aug).

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
2015														
JAN	386	641	1,027	1,084	2,111	4.4	0	4	0.3	2.7	0	3	88	2,206
FEB	393	672	1,065	1,037	2,102	1.4	0	1	0.3	2.6	0	3	87	2,193
MAR	394	666	1,060	1,052	2,112	2	0	2	0.3	2.6	0	3	87	2,204
APR	402	697	1,099	756	1,855	8.3	0	8	0.3	2.7	0	3	87	1,953
MAY	397	625	1,022	907	1,929	11.4	0.3	12	0.3	2.8	0	3	506	2,450
JUN	398	625	1,023	1,030	2,053	11.4	1.1	12	0.3	2.9	0	3	650	2,718
JUL	399	823	1,222	1,043	2,265	11.6	1.9	14	0.3	2.9	0	3	796	3,078
AUG	399	798	1,197	1,080	2,277	10.6	1.7	12	0.3	2.9	0	3	776	3,068
SEP	400	557	957	1,044	2,001	11.1	1.2	12	0.3	2.8	0	3	754	2,770
OCT	392	586	978	1,137	2,115	9.4	0.3	10	0.2	2.4	0	3	653	2,781
NOV	403	637	1,040	1,043	2,083	8.8	0	9	0.2	2.4	0	3	128	2,223
DEC	351	799	1,150	1,070	2,220	8.2	0	8	0.2	2.5	0	3	89	2,320
2016														
JAN	402	797	1,199	1,145	2,344	2.8	0	3	0.2	2.5	0	3	88	2,438
FEB	398	762	1,160	1,145	2,305	1.4	0	1	0.2	2.4	0	3	88	2,397
MAR	400	752	1,152	1,155	2,307	3	0	3	0.2	2.5	0	3	88	2,401
APR	397	710	1,107	834	1,941	7.7	0	8	0.2	2.5	0	3	216	2,168
MAY	399	604	1,003	952	1,955	8.3	0.4	9	0.2	2.7	0	3	435	2,402
JUN	393	598	991	910	1,901	11.3	1.1	12	0.3	2.4	0	3	545	2,461
JUL	397	821	1,218	1,107	2,325	10.8	1.9	13	0.3	2.8	0	3	551	2,892
AUG	399	809	1,208	1,123	2,331	12	1.1	13	0.3	2.8	0	3	665	3,012

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
2015														
JAN	13,600	22,600	36,200	38,300	74,500	155	0	155	11	95	0	106	3,100	77,900
FEB	13,900	23,700	37,600	36,600	74,200	49	0	49	11	92	0	106	3,100	77,500
MAR	13,900	23,500	37,400	37,200	74,600	71	0	71	11	92	0	106	3,100	77,900
APR	14,200	24,600	38,800	26,700	65,500	293	0	293	11	95	0	106	3,100	69,000
MAY	14,000	22,100	36,100	32,000	68,100	403	11	414	11	99	0	106	17,900	86,500
JUN	14,100	22,100	36,200	36,400	72,600	403	39	442	11	102	0	106	23,000	96,100
JUL	14,100	29,100	43,200	36,800	80,000	410	67	477	11	102	0	106	28,100	108,700
AUG	14,100	28,200	42,300	38,100	80,400	374	60	434	11	102	0	106	27,400	108,300
SEP	14,100	19,700	33,800	36,900	70,700	392	42	434	11	99	0	106	26,600	97,800
OCT	13,800	20,700	34,500	40,200	74,700	332	11	343	7	85	0	106	23,100	98,200
NOV	14,200	22,500	36,700	36,800	73,500	311	0	311	7	85	0	106	4,500	78,400
DEC	12,400	28,200	40,600	37,800	78,400	290	0	290	7	88	0	106	3,100	81,900
2016														
JAN	14,200	28,100	42,300	40,400	82,700	99	0	99	7	88	0	106	3,100	86,000
FEB	14,100	26,900	41,000	40,400	81,400	49	0	49	7	85	0	106	3,100	84,700
MAR	14,100	26,600	40,700	40,800	81,500	106	0	106	7	88	0	106	3,100	84,800
APR	14,000	25,100	39,100	29,500	68,600	272	0	272	7	88	0	106	7,600	76,600
MAY	14,100	21,300	35,400	33,600	69,000	293	14	307	7	95	0	106	15,400	84,800
JUN	13,900	21,100	35,000	32,100	67,100	399	39	438	11	85	0	106	19,200	86,800
JUL	14,000	29,000	43,000	39,100	82,100	381	67	448	11	99	0	106	19,500	102,200
AUG	14,100	28,600	42,700	39,700	82,400	424	39	463	11	99	0	106	23,500	106,500

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.