International Lake Superior
Board of Control

Semi-Annual Progress Report to the International Joint Commission

Covering the period March 1, 2017 to August 31, 2017

Table of Contents

Cover: High Lake Huron levels and shore protection near St. Joseph's, ON

Figures

Tables

International Lake Superior Board of Control

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Mr. Rob Caldwell, Secretary

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

21 September 2017

Commissioners:

This semi-annual report covers the Board's activities from 1 March to 31 August 2017.

1. Highlights

From March through August, the monthly mean water levels of Lake Superior ranged from 15 to 25 cm (5.9 to 9.8 in.) above average, and ranged from 7 cm (2.8 in.) lower to 8 cm (3.1 in.) higher than in 2016.

In the past six months, monthly mean Lake Michigan-Huron levels ranged from 23 to 45 cm (9.1 to 17.7 in.) above average. Lake Michigan-Huron ranged from 11 cm (4.3 in.) lower to 18 cm (7.1 in.) higher than in 2016.

The Lake Superior outflows were practically as specified by Regulation Plan 2012 in March and April but minor, unintentional under-discharge deviations were incurred each month due to reduced capacity at the hydropower plants. The Board requested and received Commission approval to deviate from the regulation plan by letter dated 14 April 2017 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 in May and June, and these flow decreases were partially offset by releasing flows more than Plan 2012 in July and August, with additional offsetting flows expected in subsequent months.

The gate settings at the Compensating Works were again opened further 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 to approximately two gates open on 25 April, since minimal ice cover remained on Lake Superior and the St. Marys River. This helped offset the reduced capacity of the hydropower plants and allowed the Board to pass closer to the plan-prescribed flow. On 2

June, Gate #16 was closed partially at the request of the US Fish and Wildlife Service to facilitate sea lamprey trapping efforts. On 6 June, the gates were further opened to an equivalent of approximately four gates open and this setting was maintained until, on 5 July, the gates were further opened to an equivalent of approximately five gates open.

Since March, monthly outflows from Lake Superior have been between 91 percent and 143 percent of average. The monthly outflows from Lake Michigan-Huron ranged from 105 percent to 120 percent of average. Water supplies to Lake Superior were above average in April, May, June and August, and below average in March and July. Water supplies to Lake Michigan-Huron were above average from March through July and below average in August.

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

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 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 19 July, participating in Engineer's Day in Sault Ste. Marie, MI, on 30 June, and informal discussions between Board staff, key stakeholders and the public throughout the reporting period. The Board continued to issue 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 and erosion impacts on lakes Superior and Michigan-Huron. 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 110 percent of average from March through August 2017 and would be expected to be exceeded 21 percent of the time. Precipitation was above average in April, June, and August, below average in March and July, and near average in May. 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 April, May, June and August, and below average in March and July. On the whole, the March through August net basin supplies to Lake Superior would be expected to be exceeded 15 percent of the time.

Lake Superior's monthly mean levels over the past six months ranged from 15 to 25 cm (5.9 to 9.8 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 183.80 m (603.02 ft.), which was 26 cm (10.2 in.) above average, 10 cm (3.9 in.) higher than at the same time last year and at the highest level recorded at this time of year since 1986, and just 6 cm (2.4 in.) below the Criterion "a" level. Lake Superior is also 60 cm (23.6 in.) above chart datum.

Precipitation over the Lake Michigan-Huron basin was 118 percent of average over the past six months and would be expected to be exceeded 6 percent of the time. Precipitation was above average in April, June and August, below average in July, and near average in March and May. Net basin water supplies to Lake Michigan-Huron were above average from March through July, and below average in August. On the whole, the March through August net basin supplies to Lake Michigan-Huron would be expected to be exceeded 8 percent of the time.

Monthly mean Lake Michigan-Huron levels ranged from 23 to 45 cm (9.1 to 17.7 in.) above average. 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 176.97 m (580.61 ft.), 45 cm (17.7 in.) above average, 16 cm (6.3 in.) higher than last year and at the highest level recorded at this time of year since 1997. Lake Michigan-Huron is also 97 cm (38.2 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.

On 11 April, the Board requested approval from the Commission to deviate from the

regulation plan from May through November 2017 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 14 April.

In accordance with the approved strategy, flows less than those prescribed by Plan 2012 were released in May and June. These flow decreases were partially offset by releasing flows higher than Plan 2012 in July and August, with additional offsetting flows expected in subsequent months.

Lake Superior outflows were 120 percent of average over the past six months, with monthly flows ranging from 1,920 to 3,300 m^3/s (68,000 to 116,700 cfs).

A few scheduled and unscheduled flow reductions occurred at the hydropower plants, most of which were comprised of regular and preventative maintenance (details are provided in *Section 6* of this report). Such outages in March and April resulted in minor, unintentional under-discharge deviations from Plan 2012 to be incurred. Flow capacity limitations in May and June 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 (i.e., ½ of one gate open) equivalent setting in March (i.e., using four gates partially open 20 cm or 8 inches). The half-gate equivalent 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 on 25 April to an equivalent of approximately two gates open. This helped offset the reduced capacity of the hydropower plants and allowed the Board to pass closed to the plan-prescribed flow. Based on feedback received and the successful use of partially opened gates over the past three years, partially open gate settings were again employed this year.

On 2 June, Gate #16 was closed partially at the request of the US Fish and Wildlife Service to facilitate sea lamprey trapping efforts. On 6 June, the gates were further opened to an equivalent of approximately four gates open and this setting was maintained until 5 July, when the gates were further opened to an equivalent of approximately five gates open. Throughout the reporting period, Gate #1, which supplies water to the Fishery Remedial Works, remained set at approximately 15 m^3/s (530 cfs). 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 183.39 and 183.78 m (601.7 and 603.0 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 176.69 and 177.48 m (579.7 and 582.3 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. Monthly 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. In addition to the monthly inspections, the annual dam safety inspection was completed by the Regional Dam Safety Engineer and an Independent Consulting Engineer on 10 August. The annual inspection was performed on the Compensating Works structure and the earth dam north of the structure. The inspections found the Compensating Works facilities to be in good condition. No major issues were noted.

Underwater inspection upstream and downstream of Gate #1 and upstream of Gate #2 is being planned for mid-to-late October and is expected to take less than a day. To facilitate the inspection, closure of Gates #1-3 will be required. Closure during this time will not interfere with the gate automation project planned by the Corps (now delayed until Spring 2018) and will take advantage of the high waters overtopping the fishery remedial works

dike to minimize impacts on aquatic life.

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. Construction has now been delayed until Spring 2018 due to delays in the delivery of critical equipment. Gate settings during mobilization and construction will be discussed and coordinated between the USACE project team and the Board. This gate-automation project will offer improved flexibility in setting the height of gate openings and the rate at which they are opened and closed to maximize benefits to the St. Mary's Rapids. Gates #9-10 are already semi-automated, and this project will result in the automation of Gates #11-14.

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 plants' abilities to use their full allocations. Allocations were set at "maximum capacity" for each plant throughout the reporting period. There were minor ice-related issues this winter in January and February. Occasionally, ice has been a problem as late as March, April and even May in years past. 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

Planned unit outages at Brookfield's Clergue plant totaled 1,386 hours during the reporting period (38 percent of the reporting period where at least one unit was shut down). Most of these outages were due to regular maintenance and stator core lamination issues (the steel laminations were found to be vibrating and separating over time, resulting in potential ground faults of the units). Unplanned outages during the reporting period totaled 580 hours (16 percent of the reporting period) and were mostly due to a failed stator winding.

6.3. U.S. Government Hydropower Plant

There were 78 unit outages totalling 1,641 hours (45 percent of the reporting period). The significant increase was due to the Protective Relay Project. Minor outages are scheduled through spring 2018 for preventative maintenance, dive operations to clean the trash racks, and in support of the Compensating Works gate automation project.

6.4. Cloverland Electric Cooperative

Canal restoration work, which began in the spring of 2015, continued this reporting period beginning on 17 April and lasting through June. Canal restoration work is expected to resume in September through early November of this year. These repairs require flows to be reduced during working hours, resulting in total plant capacity being limited to an average of about 700 m^3/s during this period. The canal repairs will continue in 2018 on a similar schedule.

7. Flow Measurements

Flow through the St. Marys Rapids was measured on 6 June. This measurement, done on behalf of the Board, was jointly conducted by the U.S. Army Corps of Engineers Detroit District Staff and the U.S. Geological Survey (USGS). 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

Table 4 (and Table 5 in cubic feet per second) lists the distribution of outflows from Lake Superior for January 2016 to August 2017. 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 2 to 14 m^3/s (74 to 494 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 15 May.

In accordance with the Commission's Orders to fulfill the fishery needs in the main rapids, a minimum gate setting of one-half gate open is required at all times at the Compensating Works. A setting equivalent to 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 86 to 937 m^3/s (3,000 to 33,100 cfs) over the last six months, or approximately 4 to 28 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 2,020 m^3/s (71,330 cfs) from March to August for electric power production, or 80 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) for all three plants. The total average monthly difference of 260 m^3/s (9,190 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.

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 176 m^3/s (6,200 cfs) and the Long Lac Diversion averaged 47 m^3/s (1,660 cfs) from March through August. Combined, these diversions were about 33 percent above average for the period 1944-2016.

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 8.2 m^3/s (290 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 5.6 m^3/s (200 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. Since 2016, the Board provides 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 the same as or higher than those during the same period in 2016.

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

Over the last year or so, the Great Lakes – St. Lawrence River Adaptive Management (GLAM) Committee has focused on establishing the routine analyses that will be foundational to evaluating regulation plan performance over time. Tasks were established in support of regulation plan review and stakeholder impacts that are further detailed below.

11.1. Plan Evaluation

Routine analyses of regulation plan performance over time were identified by the Committee as a means of providing the Board with a baseline understanding of the impacts of regulation on stakeholders. These analyses will leverage existing tools developed during the International Upper Great Lakes Study to review the effects on stakeholders of various water level and flow scenarios. Scenarios will include observed water levels and flows experienced over the past year (including actual operational conditions and any deviations that may have been conducted), simulated conditions assuming Plan 2012 was followed explicitly, simulated conditions under the previous regulation Plan 1977-A, among several others. While it is not expected that the results of these analyses will prove significant on their own, particularly initially, the process itself will provide invaluable training on the tools to staff and provide a base for identifying potential future improvements.

11.2. Stakeholder Impacts

The GLAM Committee has also begun to organize a team that will be tasked with continually reviewing the effects of water levels and flows on stakeholders, maintaining and updating related modelling tools, and incorporating these into the plan evaluation framework. Three stakeholder impact assessment groups were organized, with US and Canadian leads established for each group. The first group is responsible for overseeing three operational interests: hydropower, commercial navigation and municipal and industrial users. The second is responsible for recreational boating and the coastal zone interests, both of which are non-operational in nature but experience economic impacts from varying water levels and flows. The final group will focus on environmental and ecosystem interests. These groups will provide linkages between GLAM and the stakeholder groups to ensure their impacts are being reviewed on an ongoing basis and accurately captured within the GLAM modeling and evaluation framework. Group leads are reviewing material from the previous studies to provide a foundation for the current state of understanding, including what performance indicators were considered and why certain ones were chosen in the existing models. The leads will also be involved in conducting and reviewing GLAM's ongoing plan evaluation work and providing recommendations on potential improvements, and will work with Board staff to coordinate any stakeholder engagement activities, including meetings that may be beneficial to attend.

11.3. Gate Movement Limits Study and Application to Further Investigations

In the spring of 2015, the Board initiated a 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 final report will be available by the end of 2017.

The USACE Detroit District has developed a functional two-dimensional Adaptive Hydraulics (AdH) model of the St. Marys River using the field data collected over the last two field seasons. 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 will also provide the hydraulic conditions necessary to drive a two-dimensional integrated ecosystem response model (IERM2D) for the river. Development of this model, with application to the rapids initially, began last winter as a collaboration between the USACE and ECCC. This project was partially supported by the IWI following a GLAM proposal that was submitted to and subsequently approved by the IJC. The IERM2D allows 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 19 July using a combined Webinar and teleconference format. A small number of members of the public participated, along with IJC staff, Board Members, staff, and associates. The US Alternate Chair, Mr. Stephen Durrett, 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 Board will hold a similar Webinar/teleconference meeting with the public again in 2018, the date of which will be set at the March Board meeting.

Board staff also attended and participated in Soo Locks Engineer's Day on 30 June, hosted by the USACE – Soo Area Office. This was the fifth year that Board staff have participated in this event, which was once again well-attended by the public, with 8,696 people in attendance, the third highest attendance since the event started in 1977. 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 Board representatives in attendance were kept busy throughout the day, speaking directly with dozens of people about water levels, flows, regulation, and other topics of interest. Much of the conversation centered around recent water level conditions, with many curious about how long Lake Superior and Michigan-Huron water levels are expected to remain above average. Several people were concerned that levels are high, and the impacts of higher levels on beaches and waterfront property including shoreline erosion. 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 2018.

During these events and informally throughout the reporting period, stakeholders voiced concerns and asked questions about water level and flow conditions, how the current regulation plan balances levels, and the Board's deviation strategy. 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 year or so as they had been during previous years, perhaps as a result of people being 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 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

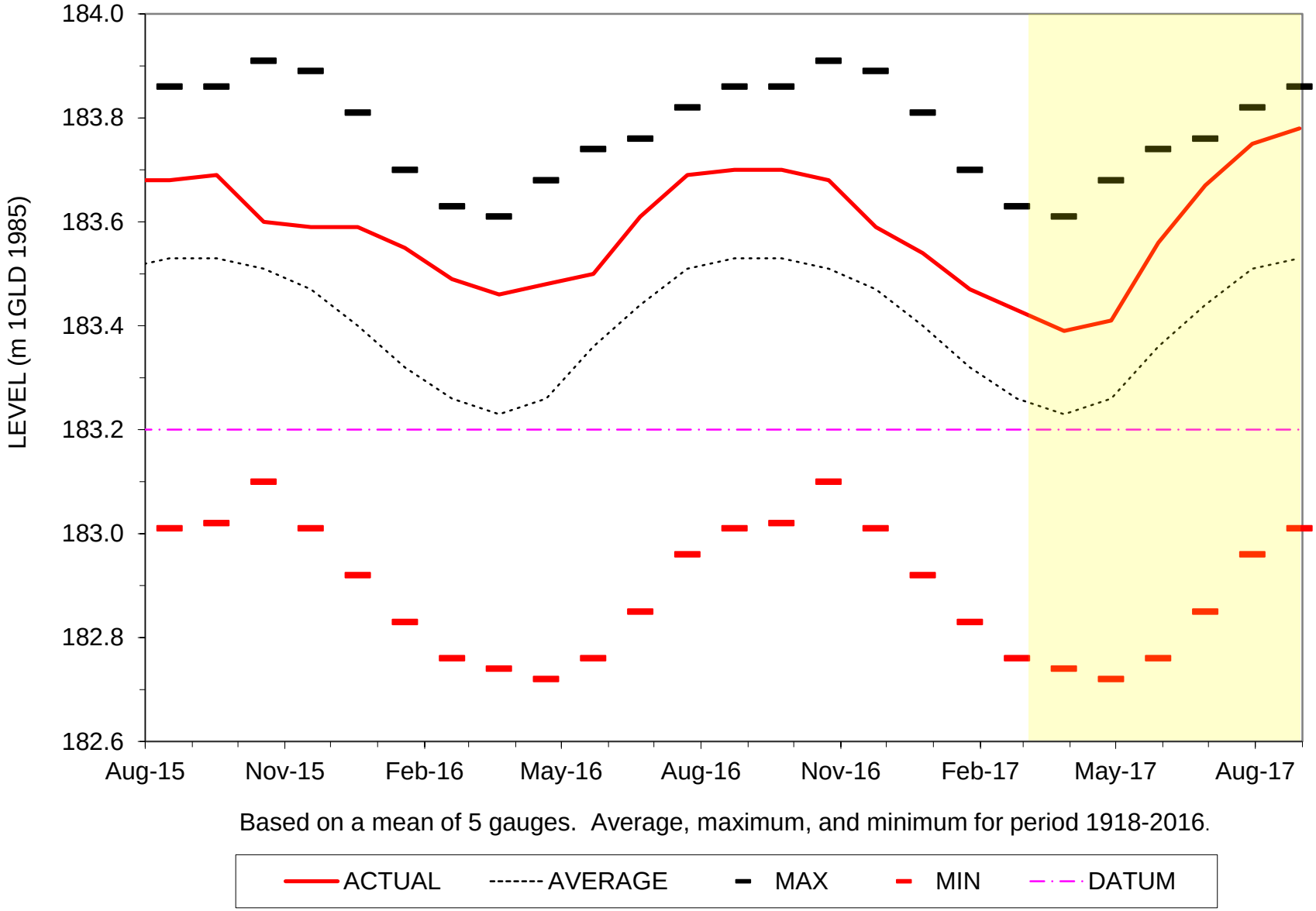
The Board held meetings on 2 March in Cincinnati, Ohio and 21 September in Queenston, Ontario.

Respectfully submitted,

Jean-François Cantin
Chair for Canada

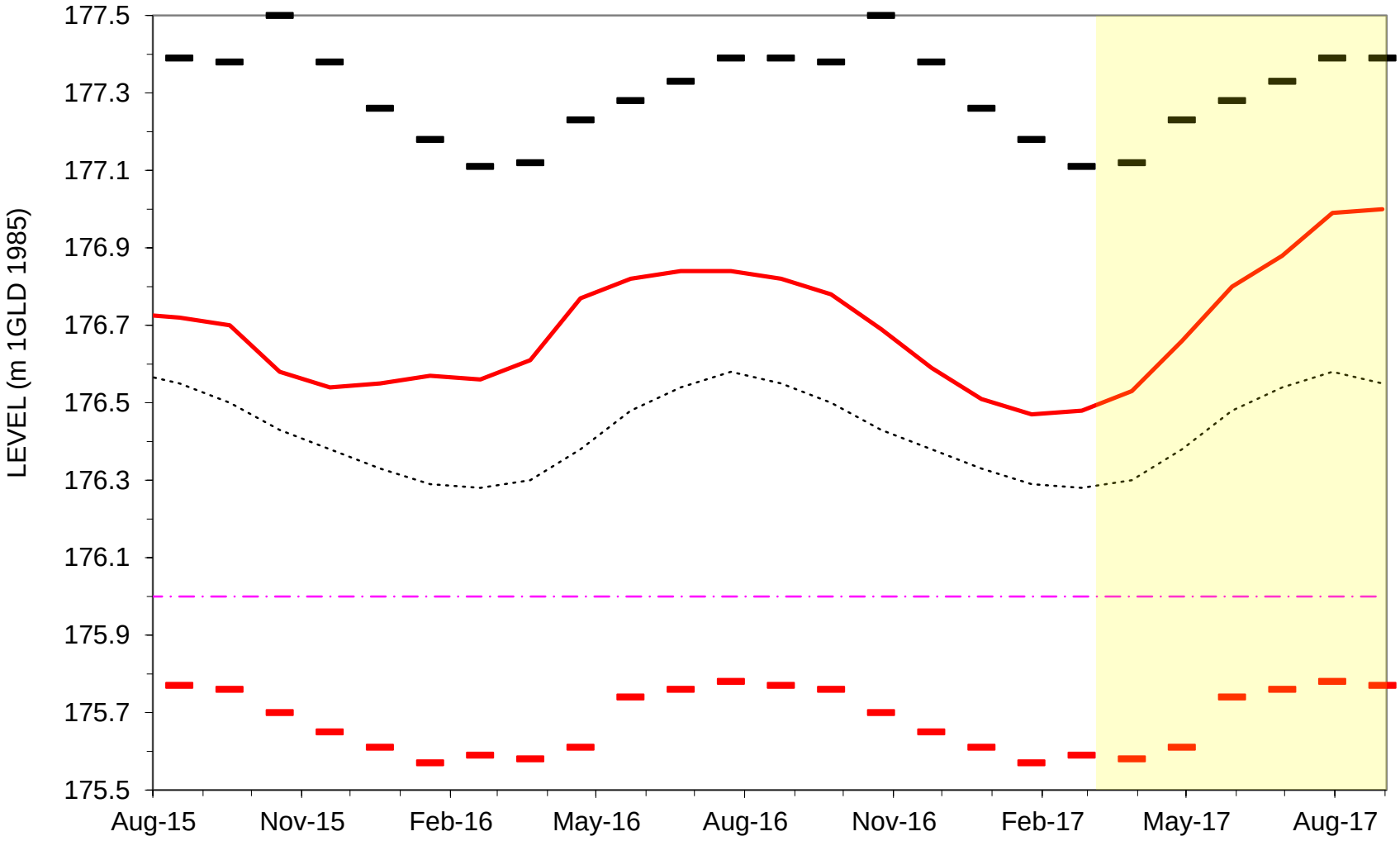
Stephen Durrett
Alternate Chair for United States

Figure 1 - LAKE SUPERIOR MONTHLY WATER LEVELS



Based on a mean of 5 gauges. Average, maximum, and minimum for period 1918-2016.

Figure 2 - LAKE MICHIGAN-HURON MONTHLY WATER LEVELS



Based on a mean of 6 gauges. Average, maximum, and minimum for period 1918-2016.

Figure 3 - LAKE SUPERIOR BASIN MONTHLY PRECIPITATION

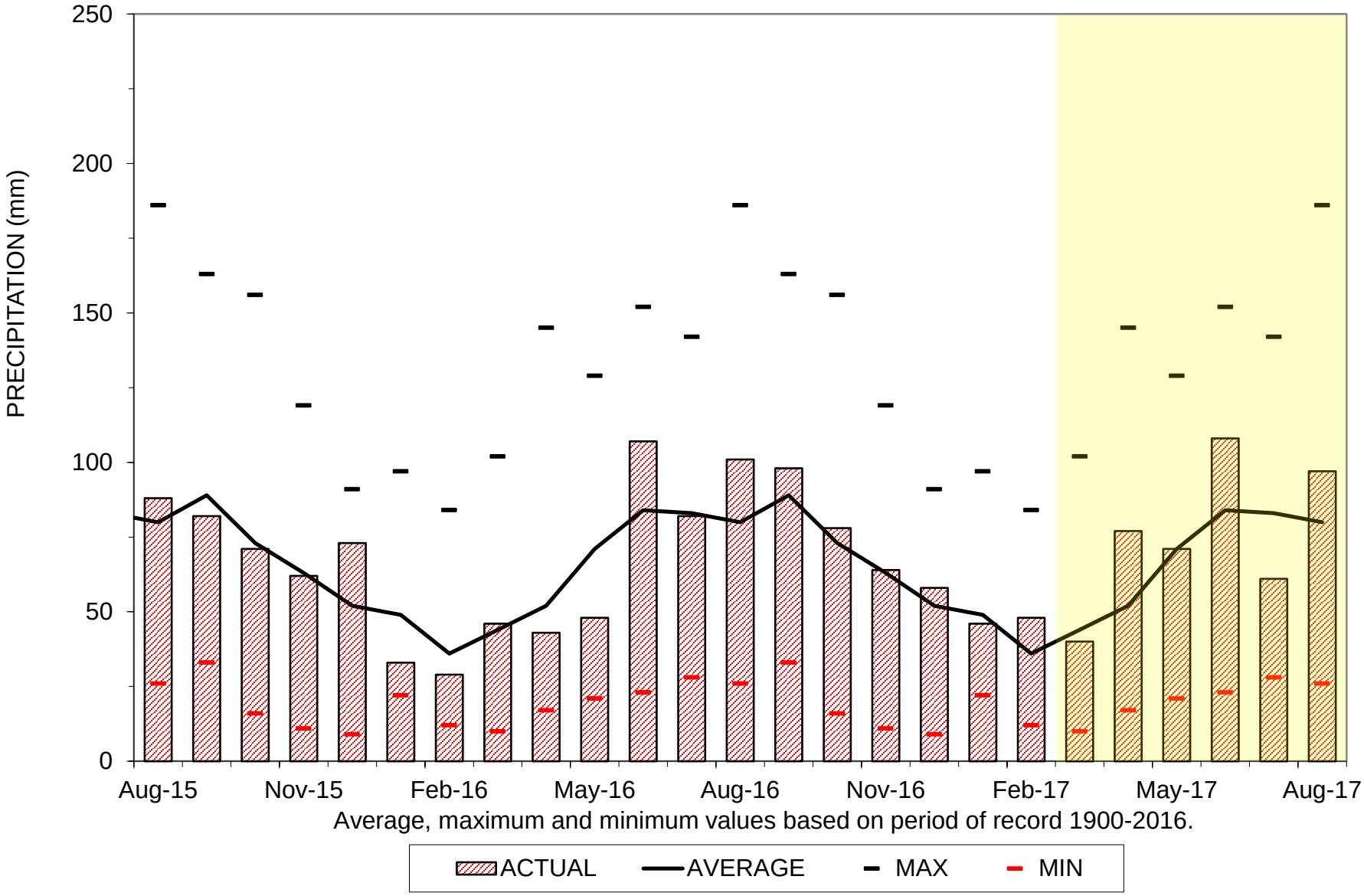


Figure 4 - LAKE MICHIGAN-HURON BASIN MONTHLY PRECIPITATION

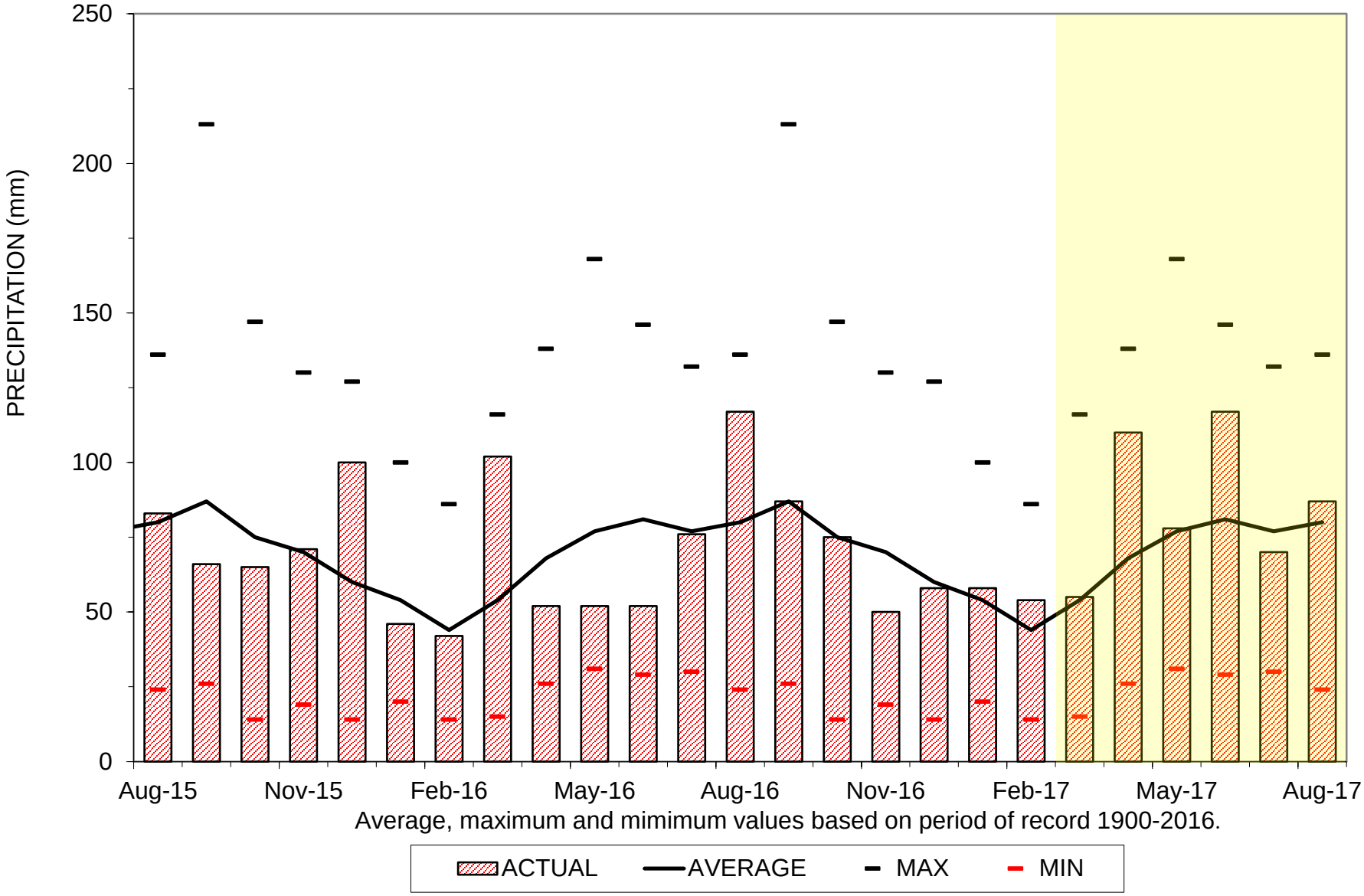
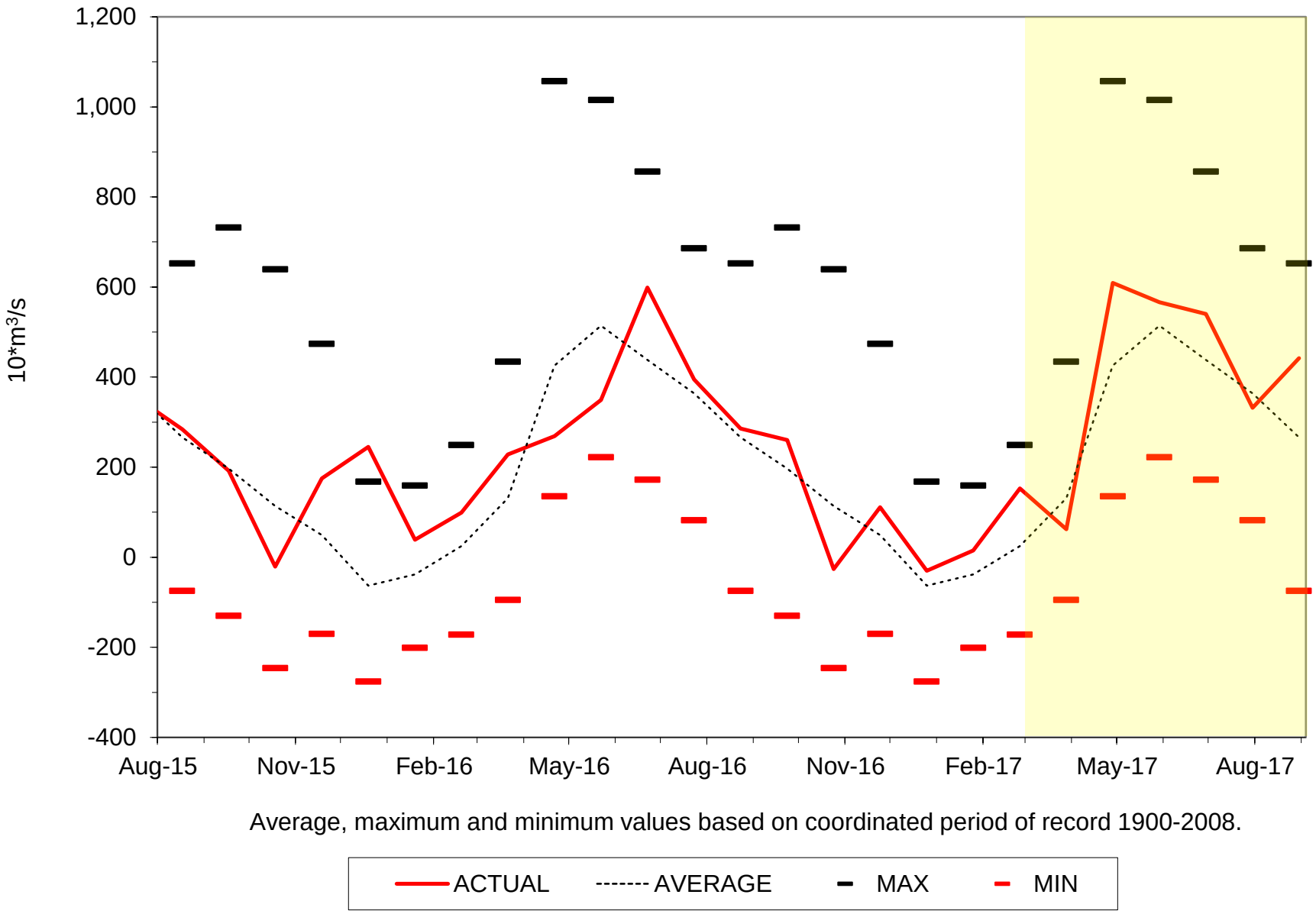
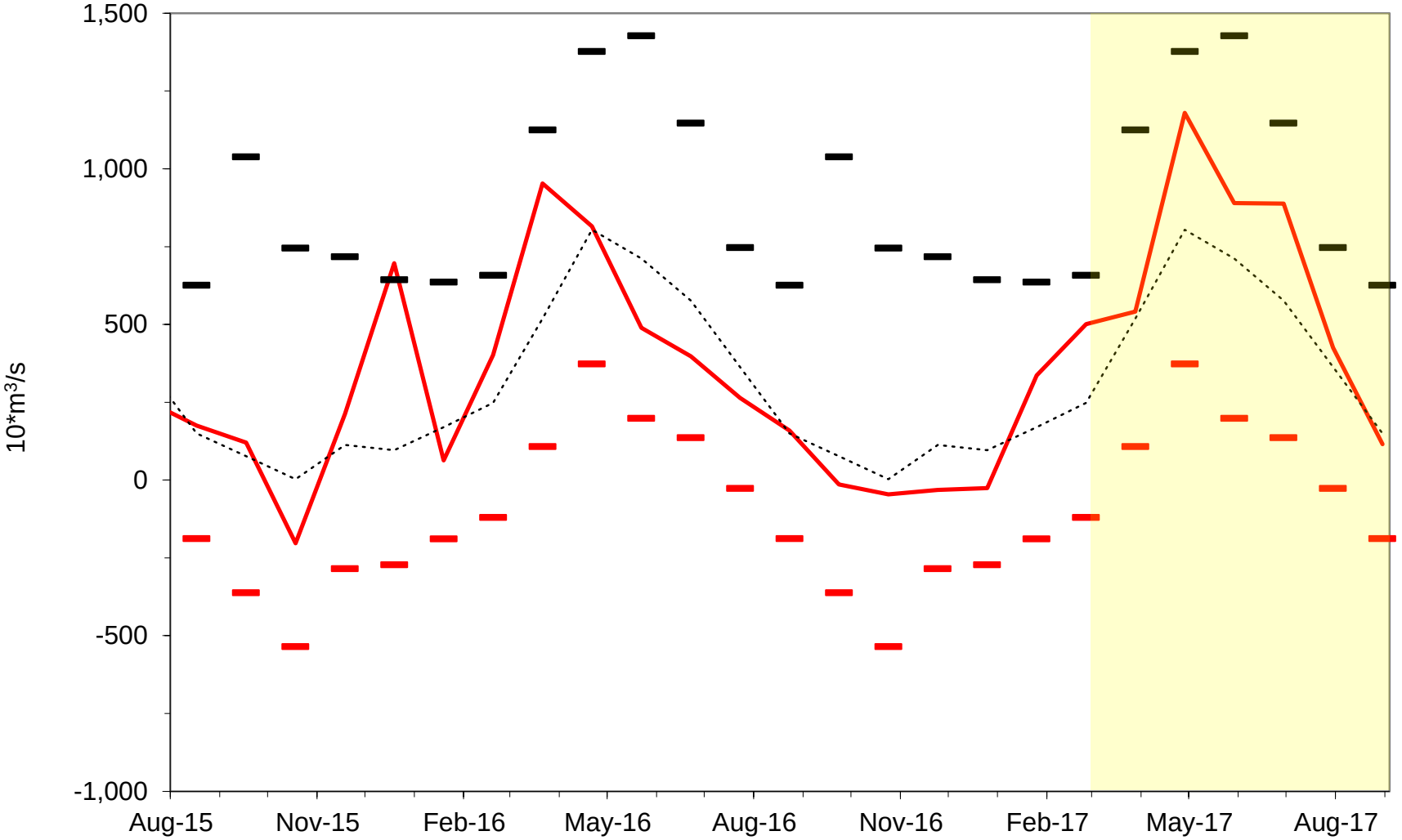


Figure 5 - LAKE SUPERIOR MONTHLY NET BASIN SUPPLIES



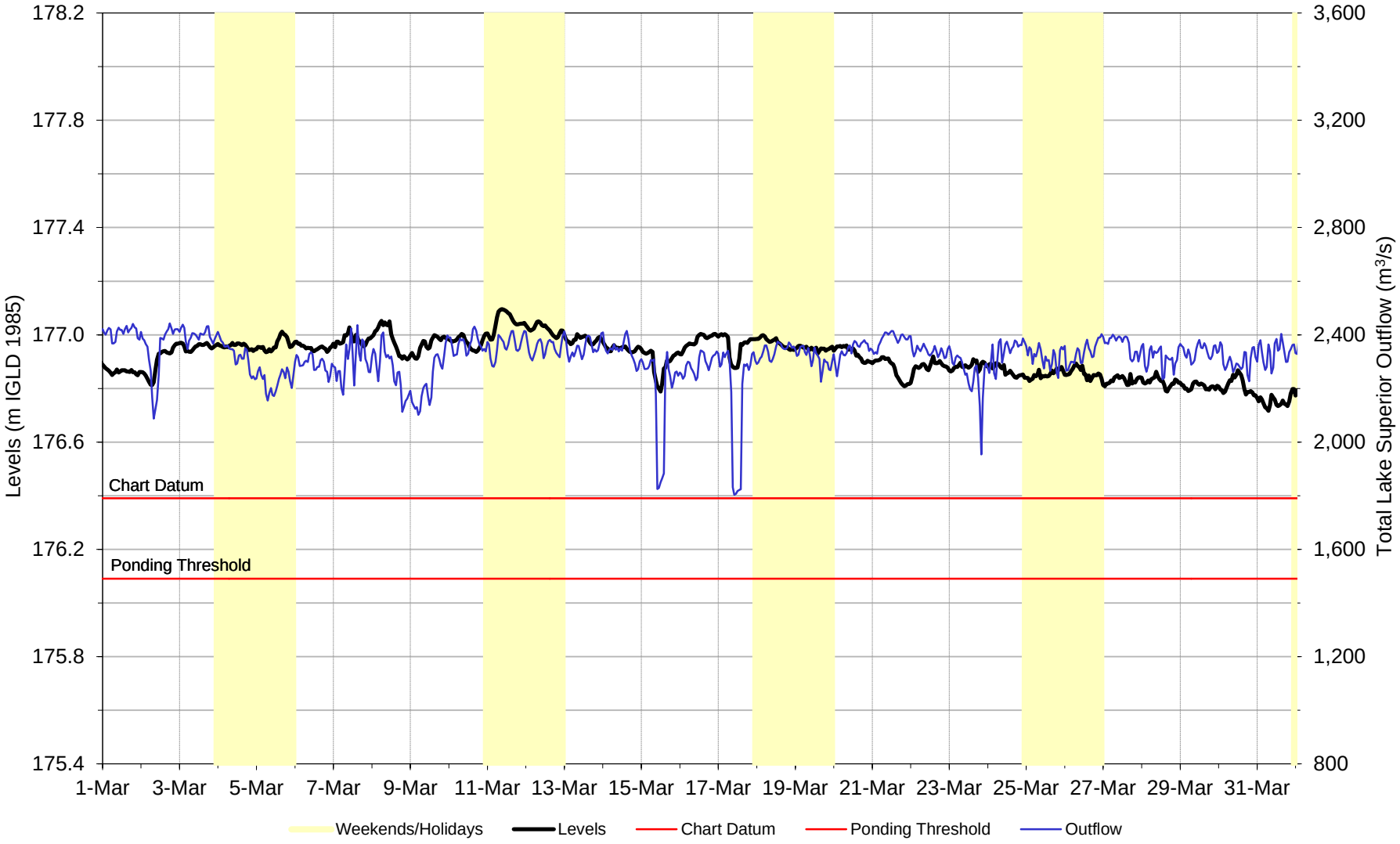
Average, maximum and minimum values based on coordinated period of record 1900-2008.

Figure 6 - LAKE MICHIGAN-HURON MONTHLY NET BASIN SUPPLIES

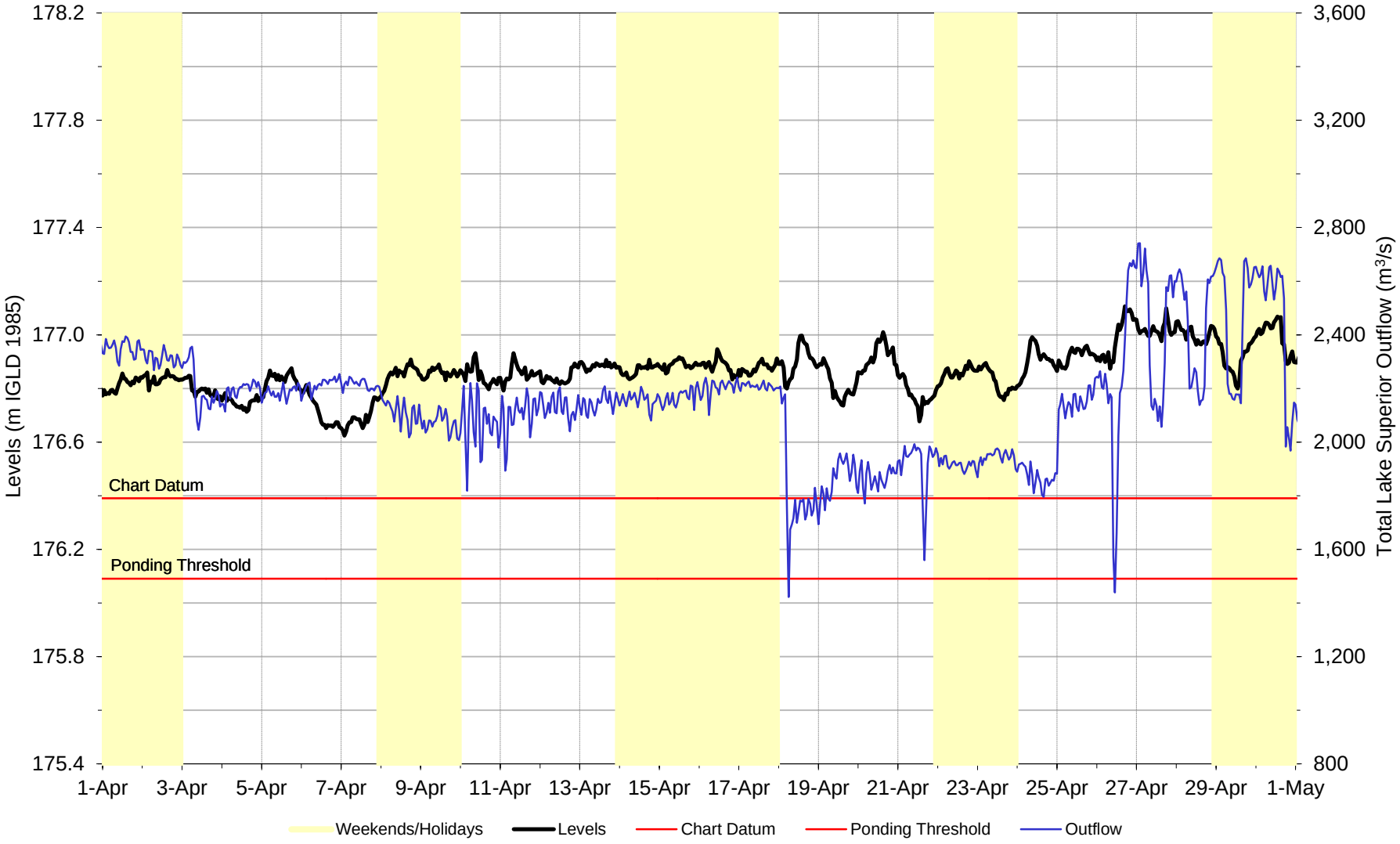


Average, maximum and minimum values based on coordinated period of record 1900-2008.

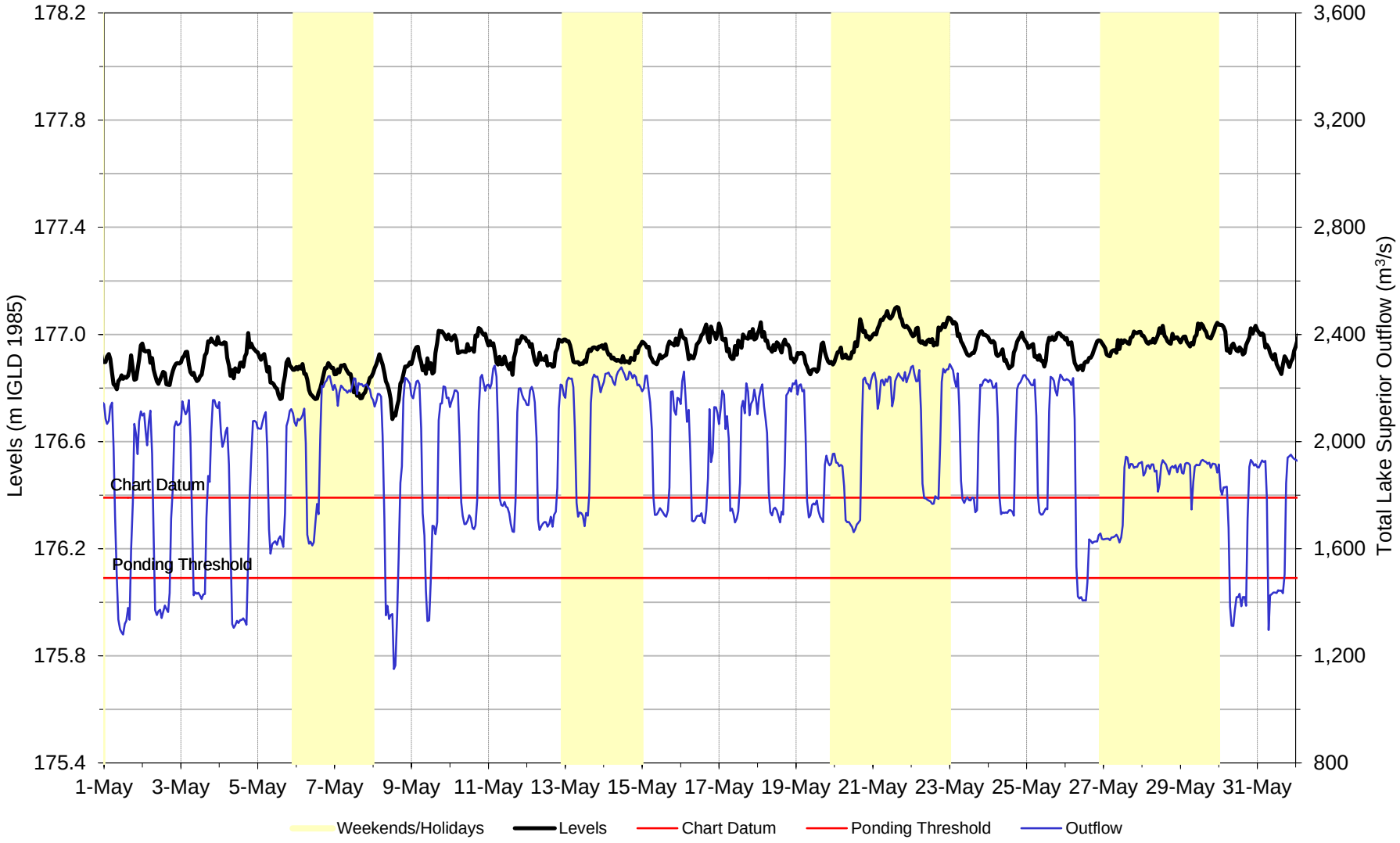
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7a - March 2017



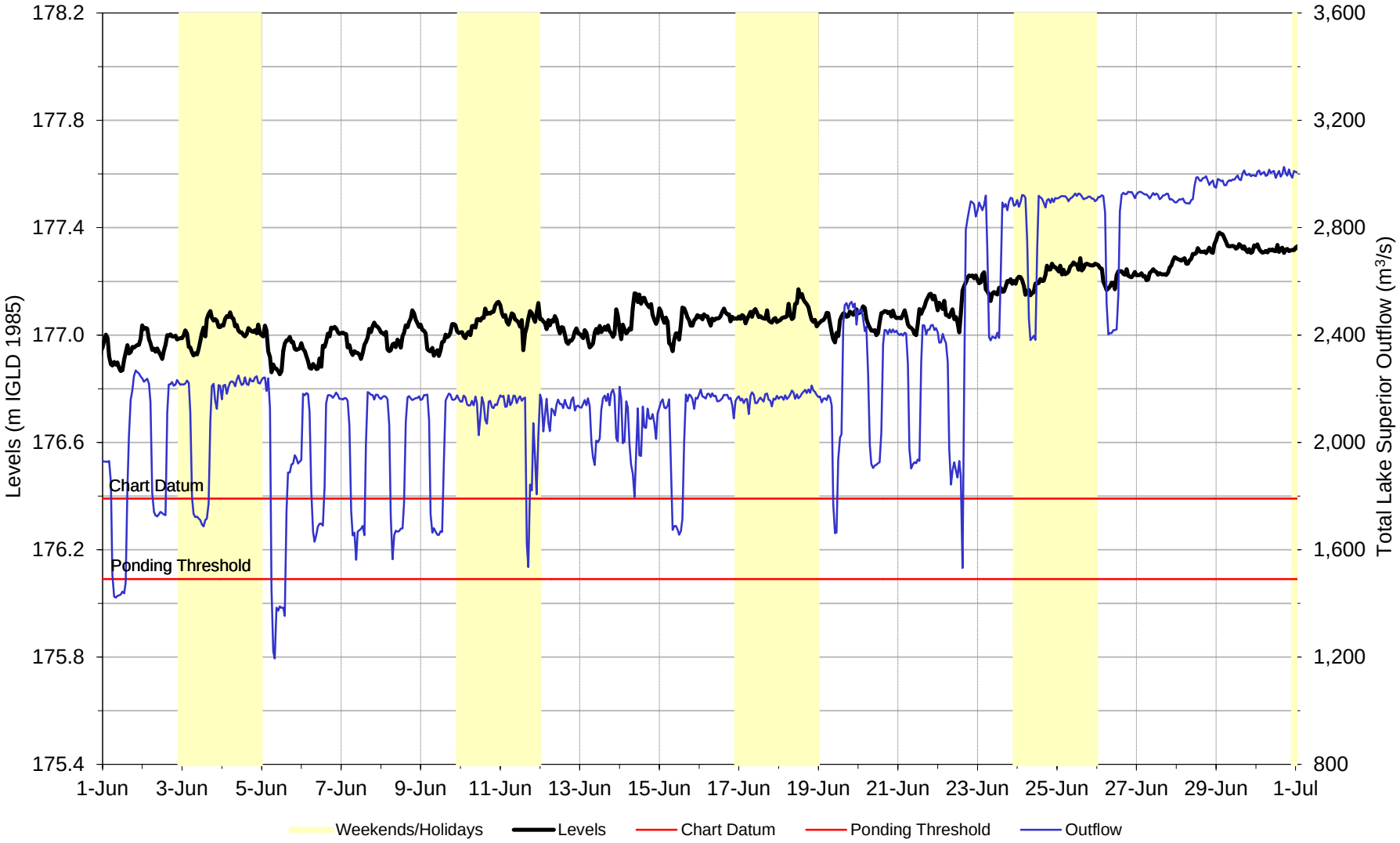
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7b - April 2017



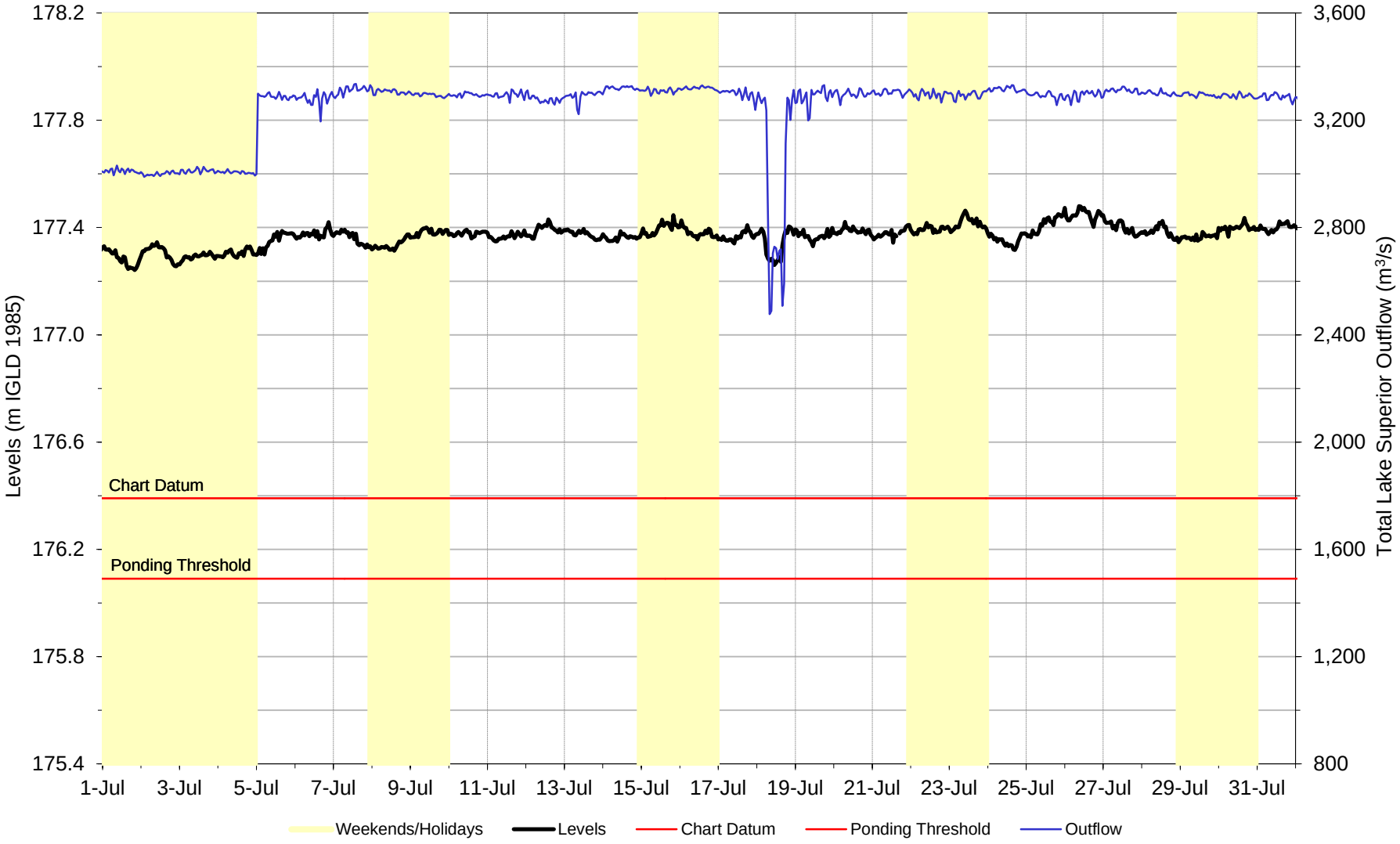
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7c - May 2017



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7d - June 2017



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7e - July 2017



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7f - August 2017

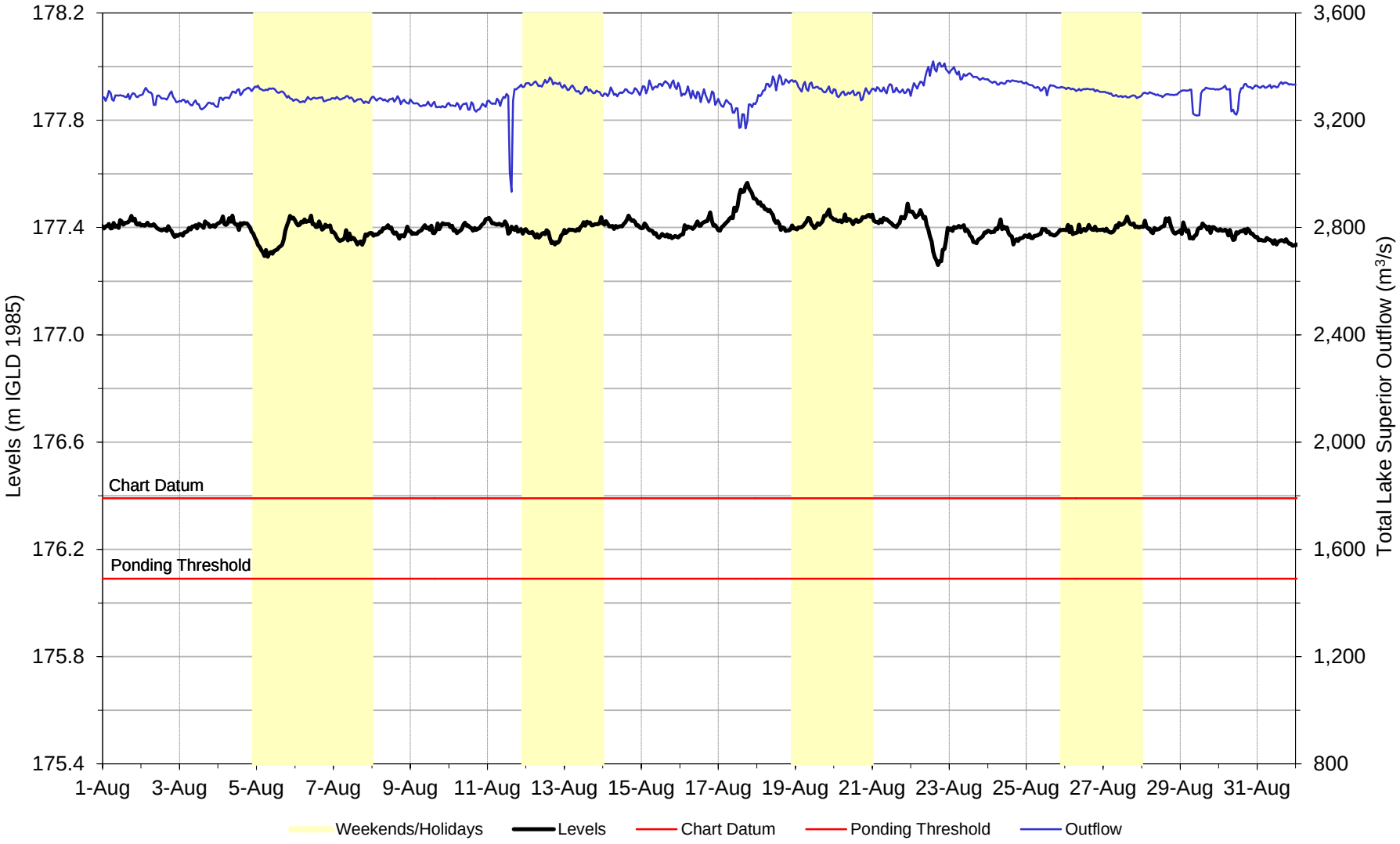


TABLE 1. 2016-2017 Lake Superior Hydrologic Factors

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
	metres	feet	metres	feet	m^3/s	tcfs	(%)	m^3/s	tcfs	Average[4]
Mar-16	183.46	601.90	0.23	0.75	2,280	81	20	2,400	85	128
Apr-16	183.48	601.97	0.22	0.72	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
Sep-16	183.70	602.69	0.17	0.56	2,600	92	30	2,490	88	107
Oct-16	183.68	602.62	0.17	0.56	-260	-9	84	2,740	97	121
Nov-16	183.59	602.33	0.12	0.39	1,110	39	28	2,570	91	116
Dec-16	183.54	602.17	0.14	0.46	-300	-11	34	2,380	84	116
Jan-17	183.47	601.94	0.15	0.49	150	5	22	2,190	77	113
Feb-17	183.43	601.80	0.17	0.56	1,530	54	6	2,300	81	121
Mar-17	183.39	601.67	0.16	0.52	620	22	71	2,310	82	124
Apr-17	183.41	601.74	0.15	0.49	6,090	215	10	2,150	76	111
May-17	183.56	602.23	0.20	0.66	5,660	200	36	1,920	68	91
Jun-17	183.67	602.59	0.23	0.75	5,400	191	24	2,300	81	105
Jul-17	183.75	602.85	0.24	0.79	3,320	117	58	3,250	115	143
Aug-17	183.78	602.95	0.25	0.82	4,420	156	9	3,300	117	140

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 1918-2016, 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. 2016-2017 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	m^3/s	tcfs	(%)	m^3/s	tcfs	Average[4]
Mar-16	176.61	579.43	0.31	1.02	9,530	337	4	5,590	197	115
Apr-16	176.77	579.95	0.39	1.28	8,150	288	45	5,760	203	112
May-16	176.82	580.12	0.34	1.12	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
Sep-16	176.78	579.99	0.28	0.92	-140	-5	67	5,830	206	107
Oct-16	176.69	579.69	0.26	0.85	-460	-16	58	5,760	203	106
Nov-16	176.59	579.36	0.21	0.69	-320	-11	75	5,730	202	107
Dec-16	176.51	579.10	0.18	0.59	-260	-9	73	5,600	198	108
Jan-17	176.47	578.97	0.18	0.59	3,360	119	15	5,460	193	120
Feb-17	176.48	579.00	0.20	0.66	5,010	177	5	5,430	192	122
Mar-17	176.53	579.17	0.23	0.75	5,410	191	44	5,840	206	120
Apr-17	176.66	579.59	0.28	0.92	11,800	417	6	5,820	206	113
May-17	176.80	580.05	0.32	1.05	8,900	314	19	5,820	206	109
Jun-17	176.88	580.31	0.34	1.12	8,880	314	6	5,730	202	105
Jul-17	176.99	580.68	0.42	1.38	4,250	150	33	6,070	214	110
Aug-17	177.00	580.71	0.45	1.48	1,150	41	57	6,150	217	111

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 1918-2016, 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
2017				
25-Apr	Opened 2 - 16	2 - 16 open 33 cm (13 in.)	2	Lack of ice allowed the gates to be opened in order to help offset the effects of reduced capacity of the hydropower plants and to meet Plan 2012 flow
02-Jun	Lowered 16	2 - 15 open 33 cm (13 in.); 16 open 5 cm (2 in.)	2	Sea lamprey trapping**
06-Jun	Further opened 2 - 15	2 - 15 open 56 cm (22 in.); 16 open 5 cm (2 in.)	4	Deviation strategy to better manage operational limits on hydropower flow capacity; Sea lamprey trapping**
05-Jul	Further opened 2 - 15	2 - 15 open 84 cm (33 in.); 16 open 5 cm (2 in.)	5	Deviation strategy to better manage operational limits on hydropower flow capacity; Sea lamprey trapping**

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

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

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
2016														
JAN	402	797	1,199	1,145	2,344	2.8	0.0	3	0.2	2.5	0	3	88	2,438
FEB	398	762	1,160	1,145	2,305	1.4	0.0	1	0.2	2.4	0	3	88	2,397
MAR	400	752	1,152	1,155	2,307	3.0	0.0	3	0.2	2.5	0	3	88	2,401
APR	397	710	1,107	834	1,941	7.7	0.0	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
SEP	130	640	770	1,027	1,797	5.7	1.1	7	0.2	2.6	0	3	680	2,487
OCT	386	647	1,033	921	1,954	10.0	0.3	10	0.2	2.8	0	3	775	2,742
NOV	371	652	1,023	1,131	2,154	9.8	0.0	10	0.2	2.7	0	3	399	2,566
DEC	406	762	1,168	1,108	2,276	9.0	0.0	9	0.2	2.7	0	3	89	2,377
2017														
JAN	396	760	1,156	934	2,090	5.1	0.0	5	0.2	2.6	0	3	88	2,186
FEB	384	733	1,117	1,090	2,207	0.0	0.0	0	0.3	2.5	0	3	87	2,297
MAR	392	702	1,094	1,129	2,223	2.1	0	2	0.2	2.6	0	3	86	2,314
APR	282	698	980	1,008	1,988	9.3	0	9	0.2	2.5	0	3	146	2,146
MAY	362	582	944	574	1,518	11.3	0.4	12	0.2	2.7	0	3	390	1,923
JUN	374	687	1,061	637	1,698	11.8	1.2	13	0.2	2.7	0	3	582	2,296
JUL	395	793	1,188	1,153	2,341	12.3	1.7	14	0.2	2.8	0	3	892	3,250
AUG	395	798	1,193	1,157	2,350	12.2	1.6	14	0.2	2.9	0	3	937	3,304

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
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
SEP	4,590	22,600	27,200	36,300	63,500	201	39	240	7	92	0	106	24,000	87,800
OCT	13,600	22,800	36,400	32,500	68,900	353	11	364	7	99	0	106	27,400	96,800
NOV	13,100	23,000	36,100	39,900	76,000	346	0	346	7	95	0	106	14,100	90,600
DEC	14,300	26,900	41,200	39,100	80,300	318	0	318	7	95	0	106	3,100	83,800
2017														
JAN	14,000	26,800	40,800	33,000	73,800	180	0	180	7	92	0	106	3,100	77,200
FEB	13,600	25,900	39,500	38,500	78,000	0	0	0	11	88	0	106	3,100	81,200
MAR	13,800	24,800	38,600	39,900	78,500	74	0	74	7	92	0	106	3,000	81,700
APR	9,960	24,600	34,560	35,600	70,160	328	0	328	7	88	0	106	5,200	75,800
MAY	12,800	20,600	33,400	20,300	53,700	399	14	413	7	95	0	106	13,800	68,000
JUN	13,200	24,300	37,500	22,500	60,000	417	42	459	7	95	0	106	20,600	81,200
JUL	13,900	28,000	41,900	40,700	82,600	434	60	494	7	99	0	106	31,500	114,700
AUG	13,900	28,200	42,100	40,900	83,000	431	56	487	7	102	0	106	33,100	116,700

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.