International Niagara Board of Control

One Hundred Thirty Fifth Semi-Annual Progress Report

to the

International Joint Commission

Covering the Period March 1 through August 31, 2020

Executive Summary

The Niagara River and Lake Erie basin had record breaking conditions during this reporting period. Lake Erie began the reporting period at a seasonal record high with a March mean level 86 cm (33.9 inches) above its period-of-record (1918-2019) average level for the month. The level of Lake Erie was well above average throughout this reporting period, setting record high monthly mean values for March, April and May and was only slightly below record high values for July and August. The very high levels on Lake Erie resulted in high flows in the Niagara River with an average over the reporting period of 7761 m^3/s (274,080 cfs) which was 1802 m^3/s (63,640 cfs) above the average value (Section 2).

The level of the Chippawa–Grass Island Pool (CGIP) is regulated under the International Niagara Board of Control's 1993 Directive. The Power Entities (Ontario Power Generation and the New York Power Authority) complied with the board's directive at all times during the reporting period. Due to high flows in the Niagara River during this reporting period tolerances of the directive were suspended due to abnormally high flows for 7 days in March, 18 days in April, 17 days in May, 20 days in June, 16 days in July and 8 days in August. Tolerances were suspended for life-saving/emergency operations for 3 days in March and 2 days in June. Even with the record high flows in the Niagara River the tolerances in place appear to be functioning well. The board will continue to monitor and assess performance as high flows continue (Section 3).

Gauges were operating at all times during this reporting period to provide flow measurements over Niagara Falls (Section 4).

Flow over Niagara Falls exceeded minimum Treaty requirements at all times during the reporting period (Section 5).

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

minimum amounts for scenic purposes. During the reporting period the diversion from the Niagara River for the SAB I and II plants averaged 1,577 m^3/s (55,690 cfs) and diversion to the Robert Moses Niagara Power Project averaged 2,516 m^3/s (88,850 cfs). Diversion from the Welland Canal to OPG's DeCew Falls Generating Stations averaged 201 m^3/s (7,100 cfs). During the reporting period, the Niagara River flow at Queenston averaged 7,761 m^3/s (274,080 cfs), which was 1,802 m^3/s (63,640 cfs) above the 1900-2019 average of 5,959 m^3/s (210,440 cfs). The March, April and May monthly mean flows set new period-of-record highs, respectively, for the Niagara River at Queenston (Section 7).

Flow measurements are taken on a regular schedule to confirm the accuracy of the gauges used to determine the allocation of water from the Niagara River. No flow measurements were scheduled during this reporting period. The next scheduled flow measurements are for the Upper Niagara River and the Welland Canal in 2021. Measurements are scheduled at the Ashland Avenue Gauge Rating Section and for the American Falls location for 2022. However due to the world-wide COVID-19 pandemic, international flow measurement field procedures may need to be altered or the scheduled measurements postponed in order to keep field measurement crews safe. (Section 8).

Ontario Power Generation (OPG) and New York Power Authority (NYPA) continued ongoing upgrades to their generating units for efficient use of water for power generation (Section 9).

The Lake Erie – Niagara River Ice Boom was operated by the Power Entities in accordance with conditions of International Joint Commission Order of Approval. Solid ice formation did not occur during the winter of 2019-2020. A media advisory was issued by the board on March 2, 2020 informing the public that removal operations would begin as soon as conditions were safe and ice boom removal began by NYPA on the same day. Removal operations were slowed by requirements to modify field operations in light of COVID-19 pandemic. All spans were moved to their summer storage facility by June 4, 2020, ending the 2019–2020 ice boom season (Section 10).

On regular change of command at Buffalo USACE District, LTC Eli S. Adams took on responsibilities of the US Co-Chair for the International Niagara Working Committee on assuming his new duties June 26, 2020 for the departing District Commander LTC Jason A. Toth. (Section 13).

Table of Contents

List of Tables

List of Figures

Enclosures

COVER: Photo of the Niagara River at Sir Adam Beck and Lewiston Power Plants taken during September 17, 2019 flow measurements from Water Survey of Canada vessel Paul E (Photo Credit Hafiz Ahmad, Environment and Climate Change Canada).

INTERNET SITES

International Joint Commission
English: https://ijc.org/en
French: https://ijc.org/fr

International Niagara Board of Control
English: https://www.ijc.org/en/nbc
French: https://www.ijc.org/fr/ccrn

Lake Erie-Niagara River Ice Boom
https://iceboom.nypa.gov/

INTERNATIONAL NIAGARA BOARD OF CONTROL

Cincinnati, Ohio
Burlington, Ontario

September 30, 2020

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

Commissioners:

1. General

The International Niagara Board of Control (board) was established by the International Joint Commission (IJC) in 1953. The board provides advice to the IJC on matters related to the IJC's responsibilities for water levels and flows in the Niagara River. The board's main duties are 1) to ensure the operation of the Chippawa-Grass Island Pool (CGIP) upstream of Niagara Falls within the limits of the board's 1993 Directive (revised in 2017), and 2) to oversee the operation of the Lake Erie-Niagara River Ice Boom at the outlet of Lake Erie. The board also collaborates with the International Niagara Committee (INC), a body created by the 1950 Niagara Diversion Treaty to determine the amount of water available for Niagara Falls and hydroelectric power generation.

The board is required to submit written reports to the IJC at its semi-annual meetings in the spring and fall of each year. In accordance with this requirement, the board herewith submits its One Hundred Thirty Fifth Semi-Annual Progress Report, covering the reporting period March 1, 2020 to August 31, 2020.

All elevations in this report are referenced to the International Great Lakes Datum 1985 (IGLD 1985). Values provided are expressed in metric units, with approximate customary units (in parentheses) for information purposes only. Monthly mean Lake Erie water levels are calculated from four gauges established by the Coordinating Committee on Great Lakes

Basic Hydraulic and Hydrologic Data (http://www.greatlakescc.org) to provide a lake-wide average water level.

2. Basin Conditions

Lake Erie set new seasonal record high water levels for the first three months of this reporting period and were only slightly below record high levels for the last two months. The Lake Erie monthly mean levels for March through May were 7 cm, 7 cm and 3 cm higher respectively, than the previous records set in 1986, 1985, and 2019, respectively. As a result, the Niagara River experienced record setting high flows during the reporting period.

The level of Lake Erie was above average throughout the reporting period. It began the reporting period with a record-high level for March, 86 cm (33.9 inches) above its 1918–2019 average for the month. During its seasonal rise, Lake Erie's water level rose 15 cm (5.9 inches) from March to June, compared to its average rise of 26 cm (10.2 inches). Its decline in July of 5 cm was greater than the average decline of 1 cm. Lake Erie levels ended the reporting period with an August monthly mean water level of 66 cm (26.0 inches) above average. Recorded monthly water levels for the period March 2020 through August 2020 are shown in Table 1 and depicted graphically in Figure 1. The following paragraphs provide more detail on the main factors that led to the water level changes observed on Lake Erie during the reporting period.

Lake Erie receives water from its local drainage basin and from the upstream lakes. The water supplied to a lake from its local drainage basin is referred to as its net basin supply (NBS). A lake's NBS is the sum of the amount of water the lake receives from precipitation falling directly on its surface and runoff (including snow melt) from its surrounding basin watershed, minus the amount of water that evaporates from its surface. The sum of Lake Erie's NBS and the inflow from Lake Michigan–Huron via the St. Clair-Detroit Rivers system is its net total supply (NTS).

Precipitation is a major contributor to NBS, both directly on the lake and through runoff from the lake basin due to rain and snowmelt. Recent precipitation data and departures from the long-term average are shown in Table 2 and depicted graphically in Figure 2. The Lake Erie basin received 46.12 cm (18.16 inches) of precipitation during the period March through August 2020. This is about 7% below the 1900-2017 average for the period. Precipitation was above average for March, May, and August while it was below for April, June, and July during the reporting period.

The monthly Lake Erie NBS for this reporting period are shown in Figure 3. A negative NBS value indicates that more water left the lake during the month through basin evaporation than entered it through precipitation and runoff. On average, this is the case for Lake Erie from August to November. For the remainder of the year, average precipitation and runoff are typically greater than the water lost to evaporation. During the reporting period, the lake's NBS was well-below average for all months except March and May which were near average.

Inflow via the Detroit River is the major portion of Lake Erie's NTS, and is greatly influenced by the level of Lake Michigan–Huron. Continuing the trend of well above average levels seen for the past couple of years, the level of Lake Michigan-Huron reached seasonal record high levels for the entire reporting period (Figure 4). As a result of these record high levels on Lake Michigan-Huron, every month during the reporting period (March-August) set a new seasonal Detroit River flow record high for the period of record 1900-2020 (Figure 5). Lake Erie inflow via the Detroit River was approximately 36 percent above the long-term average from March through August 2020.

The inflow from Lake Michigan–Huron via the Detroit River combined with Lake Erie's NBS resulted in very wet conditions with a NTS for Lake Erie of approximately 23 percent above average for the period March through August 2020. The NTS were above-average for all months this reporting period. The NTS to Lake Erie for this reporting period is depicted relative to the long-term average in Figure 6.

Lake Erie discharges water to Lake Ontario through the Niagara River and the Welland Canal. The portion of the Lake Erie outflow that is diverted through the Welland Canal is relatively small (between approximately three and five percent of the total Lake Erie outflow) and is used for navigation purposes through the canal and for the generation of electricity at Ontario Power Generation's (OPG's) DeCew Falls hydroelectric plants. Most of the outflow from Lake Erie occurs through the Niagara River and depends on the level of the lake at its outlet. Generally speaking, above-average lake levels result in above-average outflow, and below-average lake levels lead to below-average outflow. Flow in the river is also influenced by winter ice and summer aquatic plant growth in the river, both of which can decrease the flow. Prevailing winds can also cause variations in lake outflow with strong westerly winds raising the level of the lake at the east end resulting in increased outflow and easterly winds having the opposite effect. Throughout the reporting period, Niagara River monthly average flows at Buffalo were well above average ranging from 7,420 m^3/s (262,030 cfs) to 7,920 m^3/s (279,690 cfs) due to above average levels on Lake Erie (Figure 7). High flow in March and April set new monthly mean high flow records for these months for the river.

While it is impossible to accurately predict future supplies to the lakes, using historical supplies and the current levels of the lakes, it is possible to estimate future lake levels based on past lake levels (1918-present). The six-month water level forecast prepared at the beginning of September by the U.S. Army Corps of Engineers (USACE) and Environment and Climate Change Canada (ECCC) indicates that if average water supply conditions are experienced, the level of Lake Erie would remain above average throughout the fall and early winter.

3. Operation and Maintenance of the International Niagara Control Works

The water level in the Chippawa-Grass Island Pool (CGIP) is regulated in accordance with the Board's 1993 Directive. The Directive requires that the Power Entities – Ontario Power Generation (OPG) and the New York Power Authority (NYPA) – operate the International Niagara Control Works (INCW) to ensure the maintenance of an operational long-term average CGIP level of 171.16 m (561.55 feet) to reduce the adverse effects of high or low water levels in the CGIP. The Directive also establishes tolerances for the CGIP's level as measured at the Material Dock gauge. The Power Entities complied with the Board's Directive at all times during the reporting period.

The accumulated deviation of the CGIP's level from March 1, 1973 through August 31, 2020 was +0.20 meter-months above the long-term operational average elevation. The accumulated deviation was within the maximum permissible accumulated deviation of ±0.91 meter-months for this reporting period.

During the reporting period, tolerances for regulation of the CGIP were suspended due to abnormally high flow conditions and life saving operations. During this reporting period tolerances of the directive were suspended due to abnormally high flows for 7 days in March, 18 days in April, 17 days in May, 20 days in June, 16 days in July and 8 days in August due to high flows in the Niagara River. Tolerances were suspended due to abnormal flow conditions on March 13, 14, 20, 21, 29, 30, 31; April 1, 2, 8-23; May 1-4, 9, 10, 12, 13, 22-27, 29-31; June 1-13, 23-29; July 2-4, 11-17, 19-21, 27-29; and August 2-5, 11, 27, 29, 30. Due to life-saving/emergency operations, tolerances were suspended 3 days in March (on March 15, 24, 25) and 2 days in June (on June 14, 15).

The locations of the water level gauges on the Niagara River are shown in Enclosure 1. Recorded daily maximum and minimum Material Dock water levels covering the reporting period are shown in Figure 8.

Regular Maintenance at INCW involved a minor hydraulics overhaul on Gate 4, which commenced on Dec 16, 2019 with a completion date of June 22, 2020. The minor overhaul of Gate 3 was initiated on July 19, 2020. After assessment and determination that gate seals were sufficient, the gate was returned to service Aug 31, 2020. Gate 12 restriction of last use due to loose ice shield remains in place.

Several on-going maintenance projects continue at the INCW. The public safety monitoring project continues to be operationalized and enhanced. The bullnose Rehabilitation project has been completed. The control room upgrade is in execution phase with targeted completion in the 4th quarter of the Fiscal Year 2020. The water level gauge house replacement will address the poor condition of the gauge houses and provide minor upgrades to gauge telemetry/redundancy. It is scheduled to commence in the 2nd quarter of 2021 but subject to weather constraints and Niagara Parks Commission concerns. The gate hydraulic system pilot project is expected to begin execution phase in 2021. This will permit the ongoing maintenance of the gates as sourcing parts is becoming difficult. The project will also address environmental concerns by containing gate hydraulics to the respective piers, thus eliminating the under deck crossover hydraulic piping.

4. Gauging Stations

The Fort Erie, Material Dock and Ashland Avenue gauges (as shown in Enclosure 1) are used to determine flows in the Niagara River, monitor the CGIP levels and monitor the flow over Niagara Falls. The Buffalo, Slater's Point, and U. S. National Oceanic and Atmospheric Administration (NOAA) Ashland Avenue gauges are used as alternatives in the event of primary gauge failure. The Slater's Point and Material Dock gauges are owned and operated by the Power Entities. Both NOAA and the Power Entities own and operate water level gauges at the Ashland Avenue location. All gauges required for the operation of the INCW were in service during this reporting period, except for a period of 4 hours during a communications failure (modem failure) on Aug 31, 2020 at the Frenchman's Creek gauge and two communication outages at Slater's Point gauge on Aug 13 and Aug 31, 2020 both due to communication failures lasting 1 hour

5. Flow over Niagara Falls

The Niagara Diversion Treaty of 1950 sets minimum limits on the flow of water over Niagara Falls. During the tourist season (April-October) day time hours, the required minimum Niagara Falls flow is 2,832 cubic metres per second (m^3/s) (100,000 cubic feet per second (cfs)). At night and at all times during the non-tourist season months (November-March), the required minimum Falls flow is 1,416 m^3/s (50,000 cfs). The appropriate operation of the INCW, in conjunction with power diversion operations, maintains sufficient flow over the Falls to meet the requirements of the 1950 Niagara Diversion Treaty. Falls flow met or exceeded minimum Treaty requirements at all times during the reporting period. The recorded daily average flow over Niagara Falls, covering the reporting period, is shown in Figure 9. Due to the high flows in the Niagara River during this reporting period, only August had night time flows below 2,832 m^3/s (100,000 cfs) while all other months (March-July) had both day time and night time values well above the day time minimum limit. The maximum Falls flow of 4,856 m^3/s (171,490 cfs) for the reporting period occurred on April 10, 2020 in the night time hours and the maximum day time flow of 4,719 m^3/s (166,650 cfs) occurred on May 3, 2020.

6. Falls Recession

The board monitors the Horseshoe Falls for changes in its crestline. Crestline changes may result in a broken curtain of water which could change the scenic value of the Falls. Changes in the crestline could also form a notch which could signal a period of rapid Falls recession that has not been seen in more than a century. A review of the Falls crest imagery (most recent image found during this reporting period was taken on August 26, 2020) showed no evidence of notable change in the crestline of the Falls during this reporting period.

7. Diversions and Flow at Queenston

Diversion of water from the Niagara River for power purposes is governed by the terms and conditions of the 1950 Niagara Diversion Treaty. The Treaty prohibits the diversion of Niagara River water that would reduce the flow over Niagara Falls for scenic purposes to below the amounts specified previously in Section 5 of this report.

The hydroelectric power plants, OPG's Sir Adam Beck (SAB) I and II in Canada and NYPA's Robert Moses Niagara Power Project in the United States, withdraw water from the CGIP upstream of Niagara Falls and discharge it into the Lower Niagara River at Queenston, ON and Lewiston, NY, respectively. During the period of March through August 2020, diversion for the SAB I and II plants averaged 1,577 m^3/s (55,690 cfs) and diversion to the Robert Moses Niagara Power Project averaged 2,516 m^3/s (88,850 cfs).

The average flow from Lake Erie to the Welland Canal for the period March through August 2020 was 253.6 m^3/s (8,960 cfs). Diversion from the canal to OPG's DeCew Falls Generating Stations averaged 201 m^3/s (7,100 cfs) for the same period of time. Records of diversions for power generation covering the reporting period are shown in Figure 10.

The monthly average Niagara River flow at Queenston, Ontario, for the period of March through August 2020, and departures from the 1900–2019 long-term average are shown in Table 3. Maximum and minimum monthly average flows for the 1900–2019 period of record are shown in Table 4. During the period March through August 2020, the flow at Queenston averaged 7,761 m^3/s (274,080 cfs), which was 1,802 m^3/s (63,640 cfs) above the 1900-2019 average of 5,959 m^3/s (210,440 cfs) for the period. The monthly values ranged between 7,400 m^3/s (261,330 cfs) and 8,014 m^3/s (283,010 cfs). The monthly mean Niagara River flow at Queenston for March (7,757 m^3/s, 173,940 cfs), April (8,014 m^3/s, 283,010 cfs), and May (7,900 m^3/s, 278,990 cfs) set new high flow records for these months. Additionally, March 2020, April 2020 and May 2020 were the highest monthly mean flows on record (1900-2020) respectively, at Queenston.

8. Flow Measurements in the Niagara River and Welland Canal

Discharge measurements are regularly scheduled in the Niagara River and Welland Canal as part of a program to verify the gauge ratings used to determine flow in these channels for water management purposes. Measurements are obtained through joint efforts of the USACE and ECCC. Measurement programs require boats, equipment and personnel from both agencies to ensure safety, quality assurance checks between equipment and methods, and bi-national acceptance of the data collected. The USACE and ECCC continue efforts to standardize measurement equipment and techniques. There were no scheduled measurements for the reporting period. Measurements for the Upper Niagara River and Welland Canal are scheduled for 2021, and American Falls and Ashland Avenue Gauge Rating Section are scheduled for 2022. It is noted that due to the world-wide COVID-19 pandemic, international flow measurement field procedures may need to be altered or the scheduled measurements postponed in order to keep field measurement crews safe. Historical measurements made at several locations are described below.

Upper Niagara River: Regularly scheduled measurements are taken near the International Railway Bridge, located in the Upper Niagara River, on a 3-year cycle to provide information to evaluate stage-discharge relationships for flow entering the Niagara River from Lake Erie. The last regularly scheduled discharge measurements near the International Railway Bridge were taken in May 2018. The next measurements at the International Railway Bridge are scheduled for 2021. These measurements support the stage-discharge relationship known as the Buffalo rating equation, due to the use of water level data from the Buffalo NOAA gauge. The Buffalo rating equation is used in the Great Lakes water supply routing models to estimate the flow in the Niagara River.

Lower Niagara River: Discharge measurements are made on a 3-year cycle at the Ashland Avenue Gauge Rating Section, located just upstream of the OPG and NYPA hydroelectric generating stations at Queenston–Lewiston, to verify the 2009 Ashland Avenue gauge rating of the outflow from the Maid-of-the-Mist Pool below the Falls. The Ashland Avenue gauge rating is used to determine the flow over Niagara Falls for purposes of the 1950 Niagara Treaty. A report documenting the measurements made in September 2019 is currently under review by the INWC. The next measurements at this location are scheduled for September 2022. This set of measurements has been coordinated between ECCC, USACE and the Power Entities.

American Falls Channel: Discharge measurements are made in the American Falls Channel on a 5-year cycle to verify the rating equation used to determine the amount of flow in the American Falls channel and to demonstrate that a dependable and adequate flow of water is maintained over the American Falls and in the vicinity of Three Sisters Islands as required by the IJC directive to the board. Since the American Falls flow is directly related to the operation of the CGIP, the board monitors this relationship. The measurements are made using a section near the upper reach of the American Falls channel near the American Falls Gauge site. Following the 5-year cycle, the next scheduled measurements at this location are expected to be made in the spring of 2022.

Welland Canal: Discharge measurements are made on a 3-year cycle in the Welland Supply Canal above Weir 8 to verify the index-velocity rating for the permanently installed Acoustic Doppler Velocity Meter (ADVM), which are used in the determination of flow through the Welland Canal. Measurements were made in the Welland Supply Canal in May 2018. These measurements are currently under review. The next measurement series in the Welland Supply Canal will take place in 2021.

9. Power Plant Upgrades

Following a unit rehabilitation, a Gibson Test on unit G10 was witnessed by members of the International Niagara Working Committee members on February 28, 2019 and a draft report has been written. Following review from NYPA it will be submitted to the Board. The Sir Adam Beck G5 unit overhaul was initiated in January 2020 and is expected to be completed in Jun 2021. An interim rating table will be available after the project and Gibson Test will be scheduled. The Sir Adam Beck 1 power canal closure structure and Montrose Gate are planned to be refurbished in 2022-2023. A project has commenced to re-establish SAB 1 as a 10 unit station by replacing G1 and G2 with new 60 Hz units. The old units are currently being removed with forecast in-service dates of January 2022 for G2 and May 2022 for G1. SAB 2 overhauls have been deferred and will now start in 2023. A runner replacement is planned for DeCew 1 G8 from September 2020 to July 2021. The same runner design will be utilized.

NYPA continued to improve the Lewiston Pump Generating Plant with further work on PG 3 and PG1. At the Robert Moses Plant planned upgrades began on the control room. The Robert Moses Unit 1 refurbishment was also ongoing for this reporting period.

10. Ice Conditions and Ice Boom Operation

The winter of 2019-2020 was one of the warmest on record, with above average temperatures for all months, in general. Solid ice formation did not occur during 2019-2020 ice season. Maximum ice cover over Lake Erie was about 9% for a short period during the first week of March (Figure 11). On February 27, 2020, given the limited ice cover, the above average forecasted temperatures, and the limited potential for significant new ice buildup in the eastern part of Lake Erie and in the Niagara River, the Power Entities informed the INWC that removal of the ice boom would begin as early as March 2, 2020. On confirmation, a media advisory was issued by the board on March 2, 2020 and ice boom removal began by NYPA the same day. All spans of the ice boom were removed from Lake Erie and tied off to the Buffalo breakwall by March 5, 2020.

On March 17 the boom spans remained secured to the Buffalo Harbor breakwall and 17 anchor buoys remained on Lake Erie. NYPA informed the board on March 17, that in order to meet safety protocols due to the COVID-19 pandemic, their operations for placing the boom components into storage would be delayed. On April 20 NYPA was able to safely resume reduced boom operations and removed the remaining 17 buoys from Lake Erie on the same day. NYPA informed the board that during the period from March 5 to June 1, inspections were performed to ensure that the boom spans remained securely tied to the breakwall. NYPA, under continued reduced operations for safety, towed the spans from the breakwall to dry storage from June 1 to June 4, closing boom operations for the 2019-20 ice season on June 4, 2020.

In response to prior public concern on the timing of ice boom removal and INWC efforts to monitor Lake Erie ice cover, regular updates were provided on the board's website at ijc.org/en_/inbc/ice_boom.

11. Other Issues

American Falls Bridges Project: There are two pedestrian bridges spanning the American Falls Channel. These bridges have fallen into a state of disrepair and require significant work to make them functional again. New York State Parks (NYSP) has worked with consultants to evaluate the existing condition of the structures and possible rehabilitation and replacement alternatives. The two pedestrian bridges in question are the ones crossing the American Falls Channel from Prospect Park to Green Island and from Green Island to Goat Island.

The New York State Office of Parks, Recreation and Historic Preservation (Parks), in conjunction with the New York State Department of Transportation (NYSDOT) and their contractor Greenman-Pedersen, Inc. (GPI), have been developing a feasible path towards the reconstruction of the Goat Island Road bridges. The two bridges cross the American channel of the Niagara River and traverse very turbulent water flows. These challenging conditions require a higher level of preliminary planning including a greater emphasis on constructability. The most formidable challenge will be diverting water flows to construct the bridge foundations. Beyond the difficulties associated with constructing water diversion structures such as cofferdams, the implications of diverting water flow may greatly affect international waters. The ramifications of various cofferdam options need to be considered with a heightened focus on the rise and reduction of water flow levels within the Niagara River, specifically within the Canadian channel and further upstream.

During this reporting period, the INWC was advised that NYSDOT's consultants have been completing further analysis on options for construction. As well NYSDOT's consultants requested more information on the permitting requirements by the IJC. The INWC will continue to monitor this project as information is provided by NYSDOT and report as needed to board and IJC staff.

12. Meeting with the Public

The board participated in a Tri-Board Public Webinar on July 17, 2020. The webinar was conducted in collaboration with the IJC commissioners and communications staff, Lake Superior Board of Control, International Lake Ontario – St. Lawrence River Board and Great Lakes Adaptive Management Committee. The webinar provided members of the public with information on the causes of high Great Lakes water levels and the relief from high water levels that the boards could provide. In general it was communicated that the ability for boards to provide relief to high water in wet conditions is limited, and that communities around the Great Lakes will need to develop resiliency to minimize the impact of high water conditions in the future. A total of 729 members of the public participated on the webinar. Following the presentation, many questions were taken from the public during the call. Due to the interest in the webinar and the high number of questions received, not all questions could be answered during the webinar time allotment. Those questions that could not be answered during the webinar were answered after the call in a response posted on the IJC website: https://ijc.org/en/loslrb/video-july-2020-tri-board-webinar-great-lakes-water-levels-and-answers-additional-questions.

The Niagara Board would support future combined IJC Great Lakes Board events such as the Tri-Board Public Webinar. The event drew interest from many stakeholders and was an efficient means of communicating widely on the board's mandate and role with respect to water management in the Great Lakes Basin.

13. Membership of the Board and the Working Committee

On regular change of command at Buffalo USACE District, LTC Eli S. Adams took on responsibilities of the US Co-Chair for the International Niagara Working Committee on assuming his new duties June 26, 2020 for the departing District Commander LTC Jason A. Toth.

14. Attendance at Board Meetings

The board met once during this reporting period. The meeting was held on March 12, 2020 at the Great Lake Environmental Research Laboratory, Ann Arbor, Michigan, United States. Mr. Stephen Durrett, U.S. Section Chair, attended in person. Mr. Aaron Thompson, Canadian Section Chair and board members Mr. David Capka and Ms. Jennifer Keyes attended via WebEx due to COVID-19 travel restrictions.

Original Signed By

Mr. Aaron F. Thompson
Chair, Canadian Section

Original Signed By

Mr. Stephen G. Durrett
Chair, United States Section

Original Signed By

Ms. Jennifer L. Keyes
Member, Canadian Section

Original Signed By

Mr. David Capka
Member, United States Section

Table 1: Monthly average Lake Erie water levels based on a network of four water level gauges and the International Great Lakes Datum (1985).

	Metres			Feet		
Month	Recorded* 2020	Average 1918-2019	Departure	Recorded* 2020	Average 1918-2019	Departure
March	174.95	174.09	0.86	573.98	571.16	2.82
April	175.05	174.24	0.81	574.31	571.65	2.66
May	175.08	174.32	0.76	574.41	571.92	2.49
June	175.10	174.35	0.75	574.48	572.01	2.47
July	175.05	174.34	0.71	574.31	571.98	2.33
August	174.93	174.27	0.66	573.92	571.75	2.17

* Provisional

Table 2: Monthly average precipitation on the Lake Erie basin.

	Centimetres			Inches			
Month	Recorded* 2020	Average 1900-2017	Departure	Recorded* 2020	Average 1900-2017	Departure	Departure (in percent)
March	8.51	7.00	1.51	3.35	2.76	0.59	21
April	5.33	8.10	-2.77	2.10	3.19	-1.09	-34
May	9.78	8.60	1.18	3.85	3.39	0.46	14
June	5.99	8.90	-2.91	2.36	3.50	-1.14	-33
July	7.14	8.60	-1.46	2.81	3.39	-0.58	-17
August	9.37	8.20	1.17	3.69	3.23	0.46	14

* Provisional

Table 3: Monthly Niagara River flows at Queenston.

	Cubic Metres per Second			Cubic Feet per Second		
Month	Recorded 2020	Average 1900-2019	Departure	Recorded 2020	Average 1900-2019	Departure
March	7757	5676	2081	273,940	200,450	73,490
April	8014	5933	2081	283,010	209,520	73,490
May	7900	6131	1769	278,990	216,510	62,480
June	7793	6108	1685	275,210	215,700	59,510
July	7702	6013	1689	271,990	212,350	59,640
August	7400	5892	1508	261,330	208,070	53,260
Average	7761	5959	1802	274,080	210,440	63,640

Table 4: Monthly maximum and minimum Niagara River flows at Queenston.

	Maximum Flows			Minimum Flows		
Month	Year	m^3/s	ft^3/s	Year	m^3/s	ft^3/s
March	2020	7757	273,940	1934	4130	145,850
April	2020	8014	283,010	1935	4380	154,680
May	2020	7900	278,990	1934	4530	159,980
June	2019	8059	284,600	1934	4470	157,860
July	2019	7851	277,260	1934	4360	153,970
August	2019	7602	268,460	1934	4370	154,330

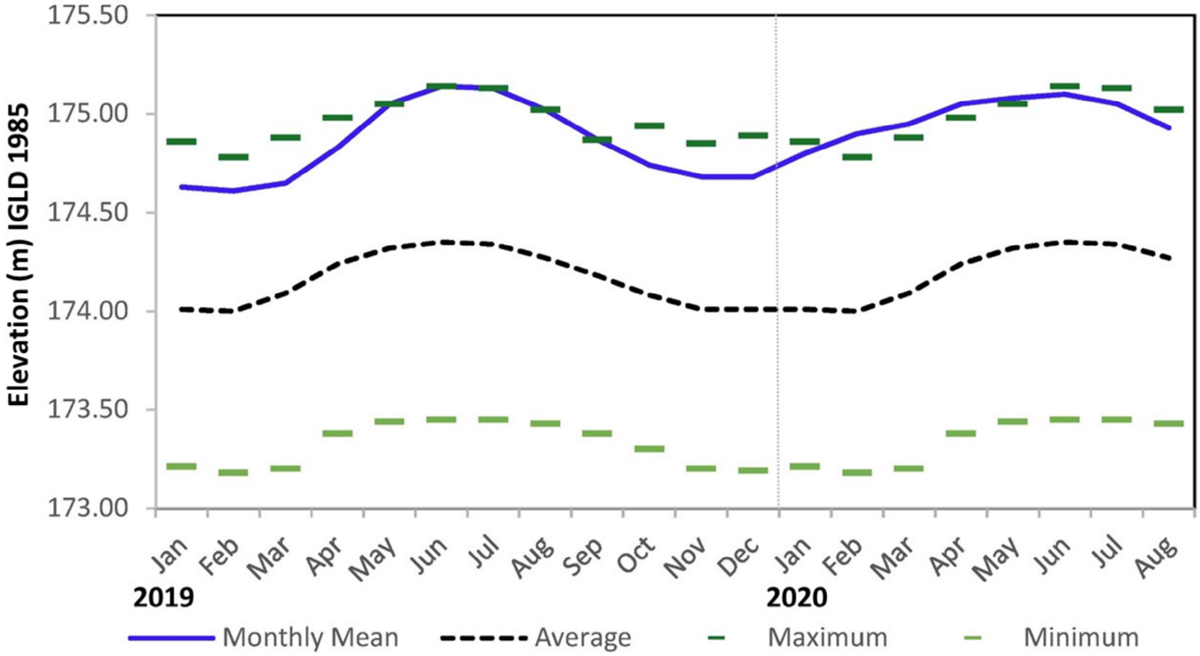


Figure 1: Lake Erie mean monthly and long-term maximum, minimum and average water levels for period-of-record 1918-2019.

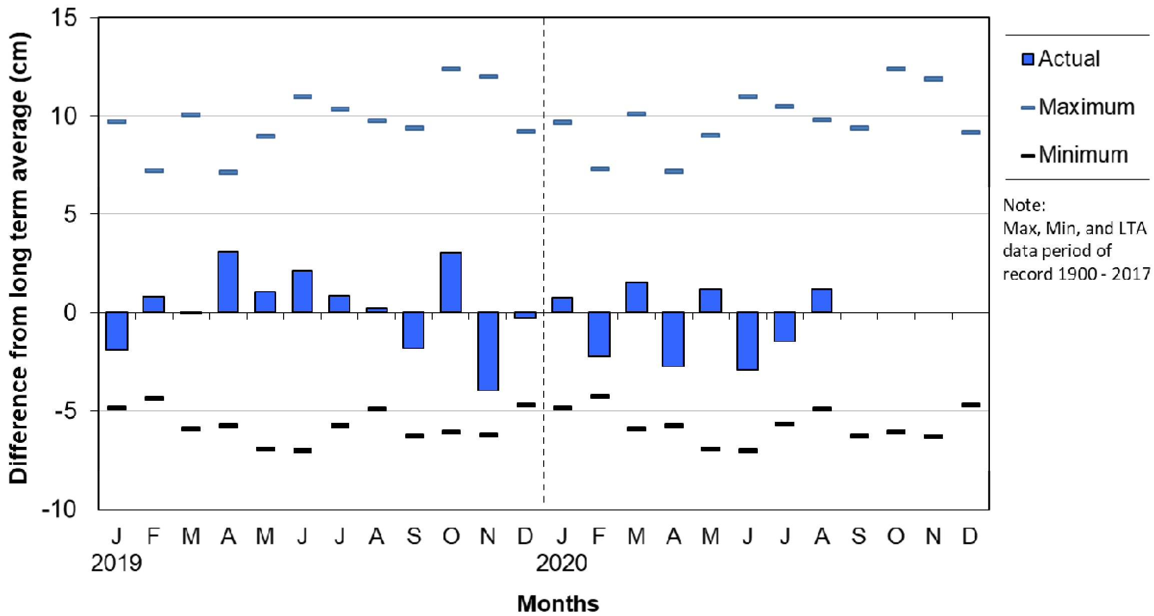


Figure 2: Monthly actual, maximum and minimum precipitation departures from the long-term average on Lake Erie basin.

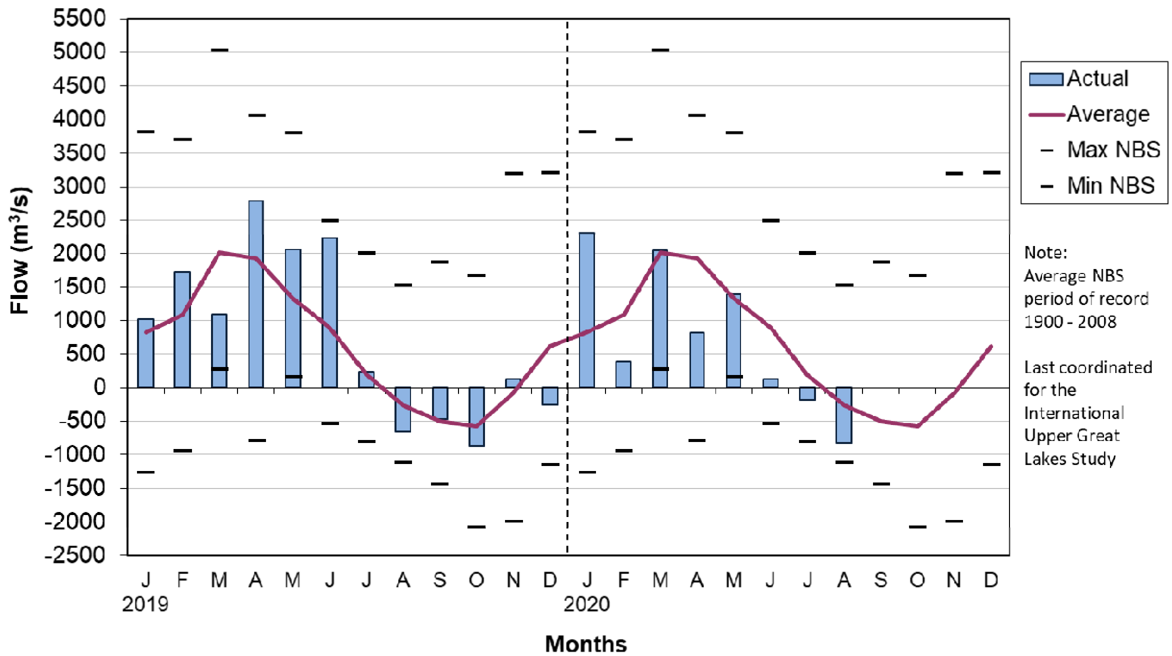


Figure 3: Monthly actual, maximum, minimum and average net basin supplies on Lake Erie basin.

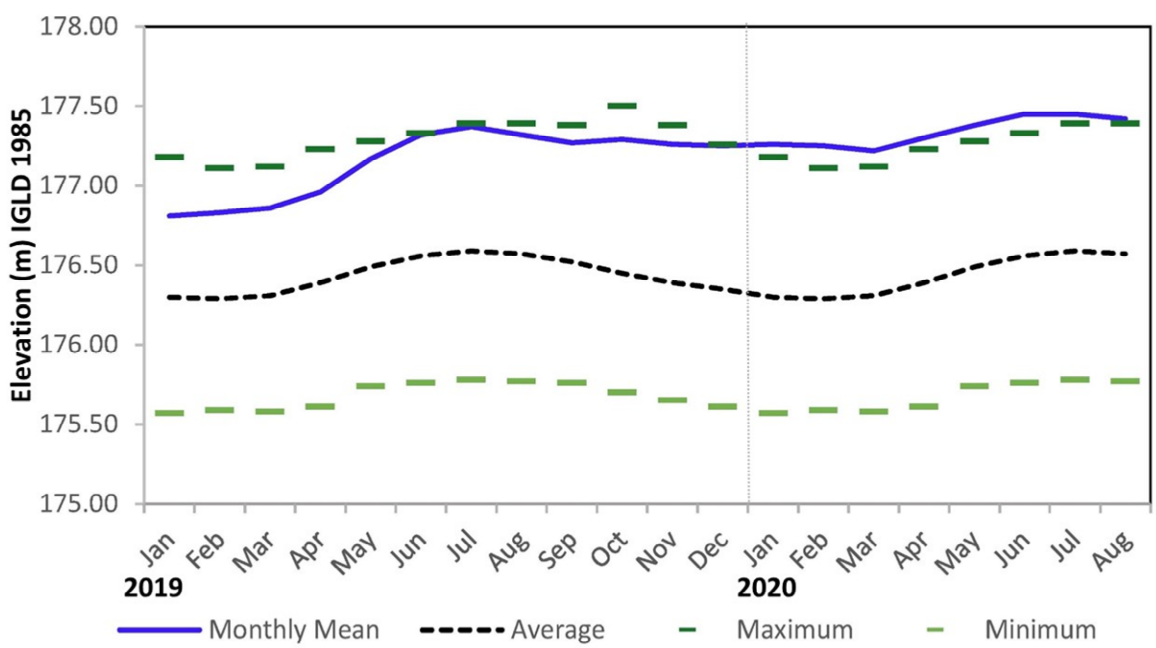


Figure 4: Lake Michigan-Huron mean monthly, maximum, minimum and average water levels for period-of-record 1918-2019.

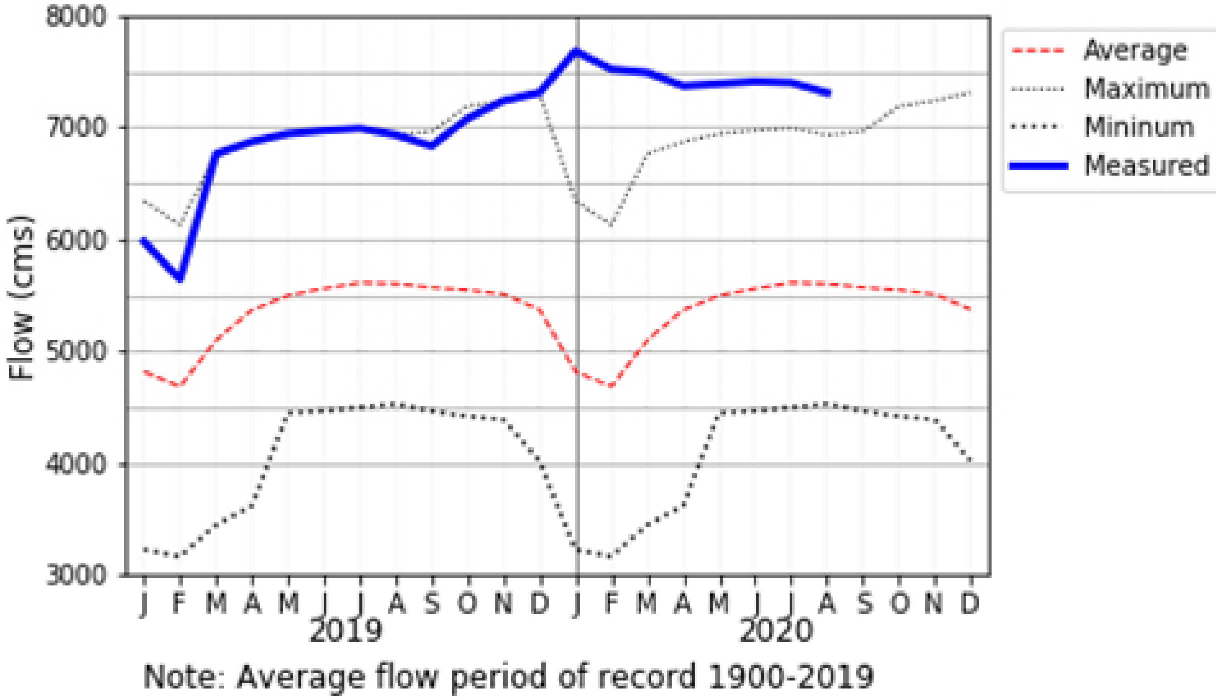


Figure 5: Detroit River mean monthly actual, maximum, minimum and average flows.

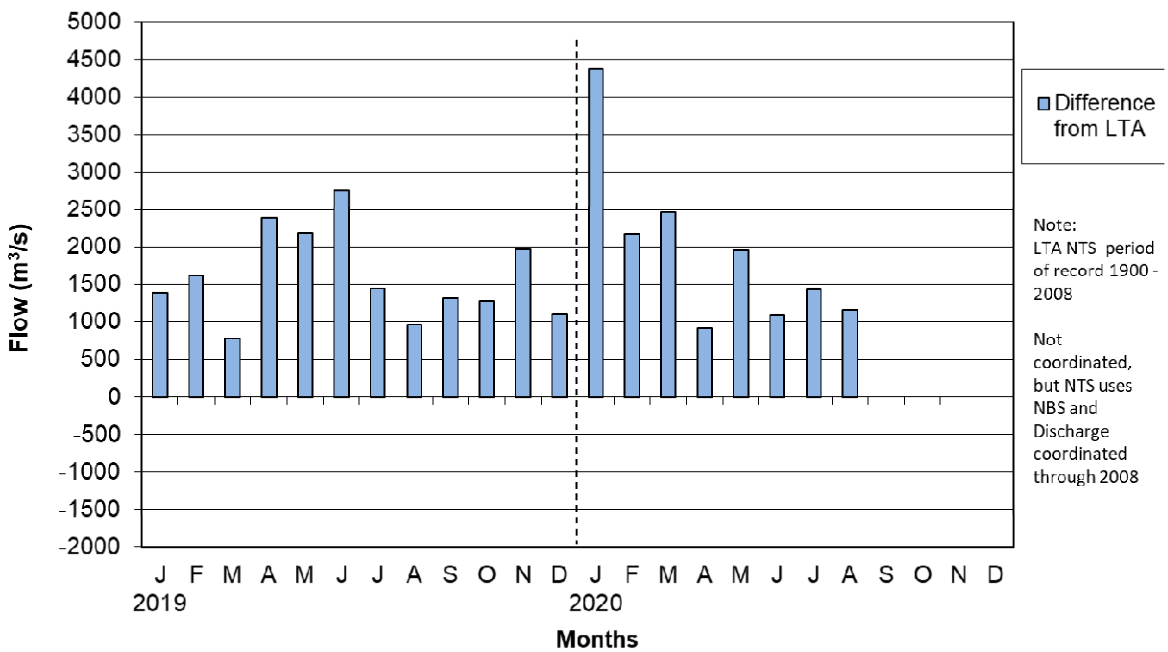


Figure 6: Lake Erie basin monthly net total supplies difference from the long term average.

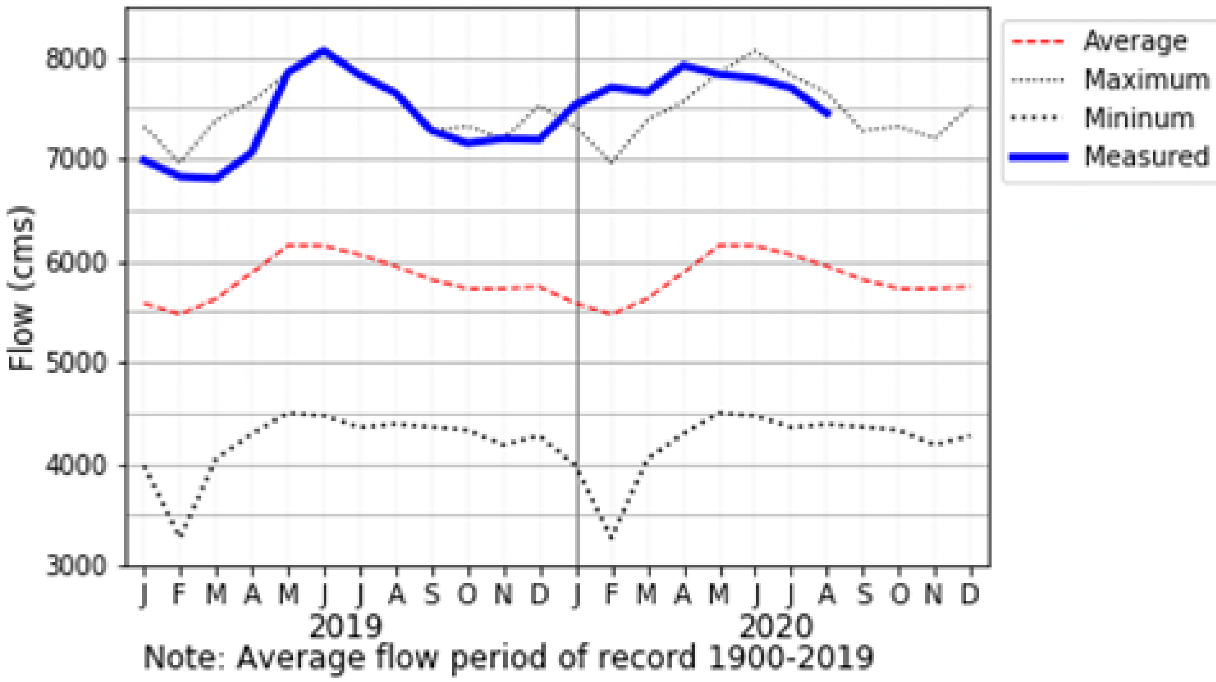


Figure 7: Niagara River mean monthly actual and average flows at Buffalo, New York.

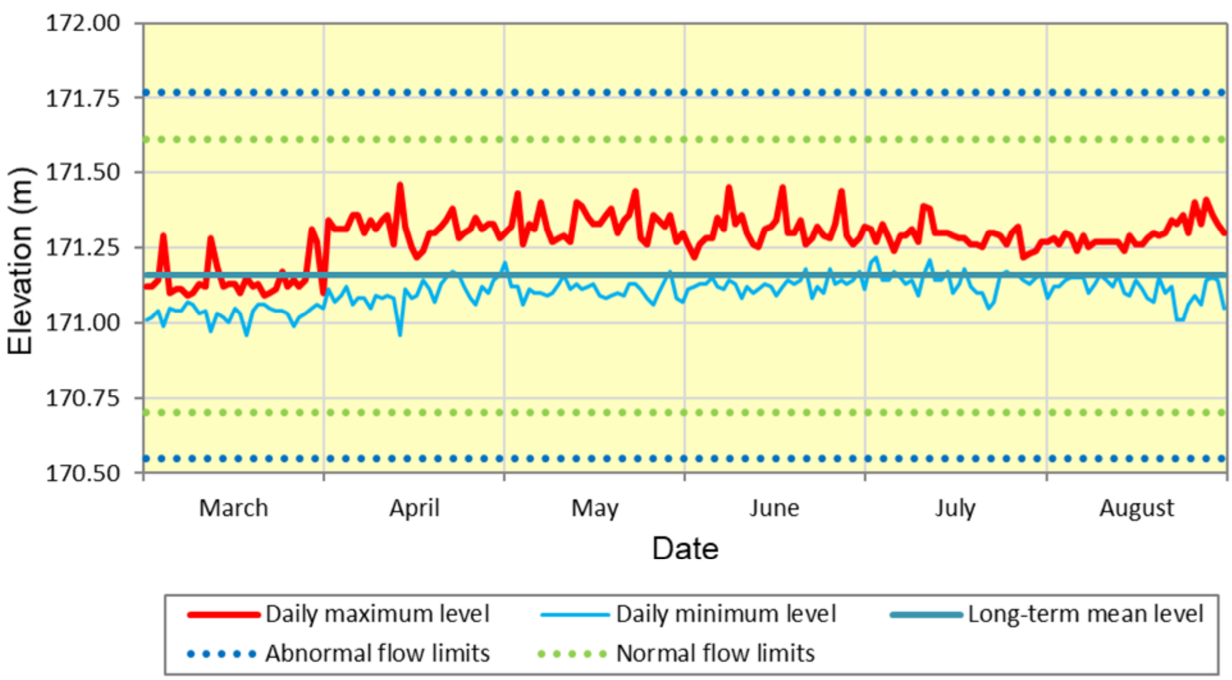
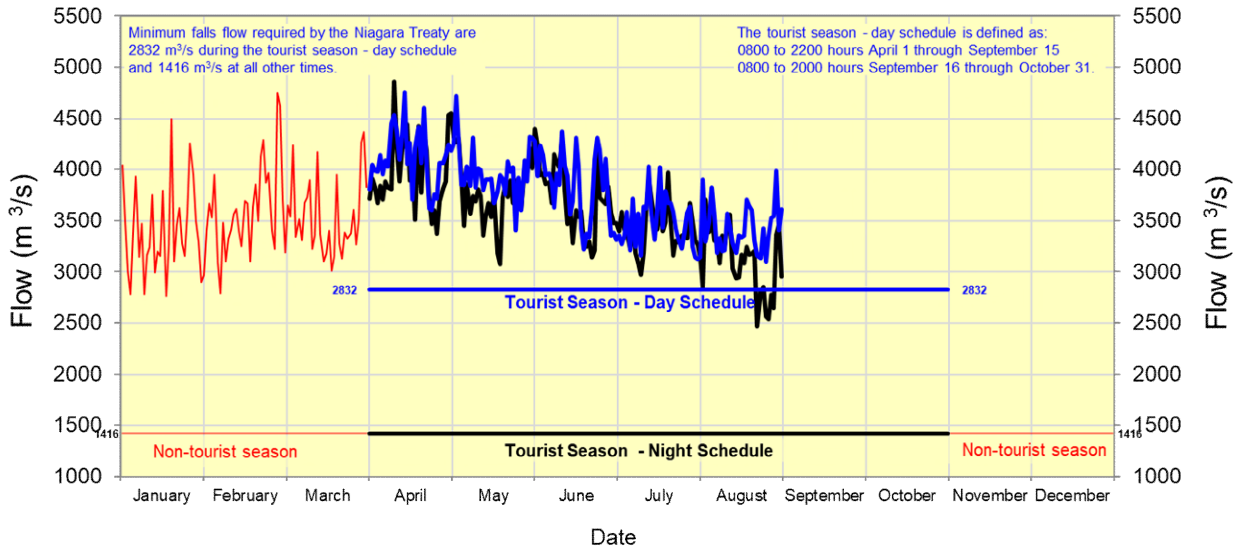
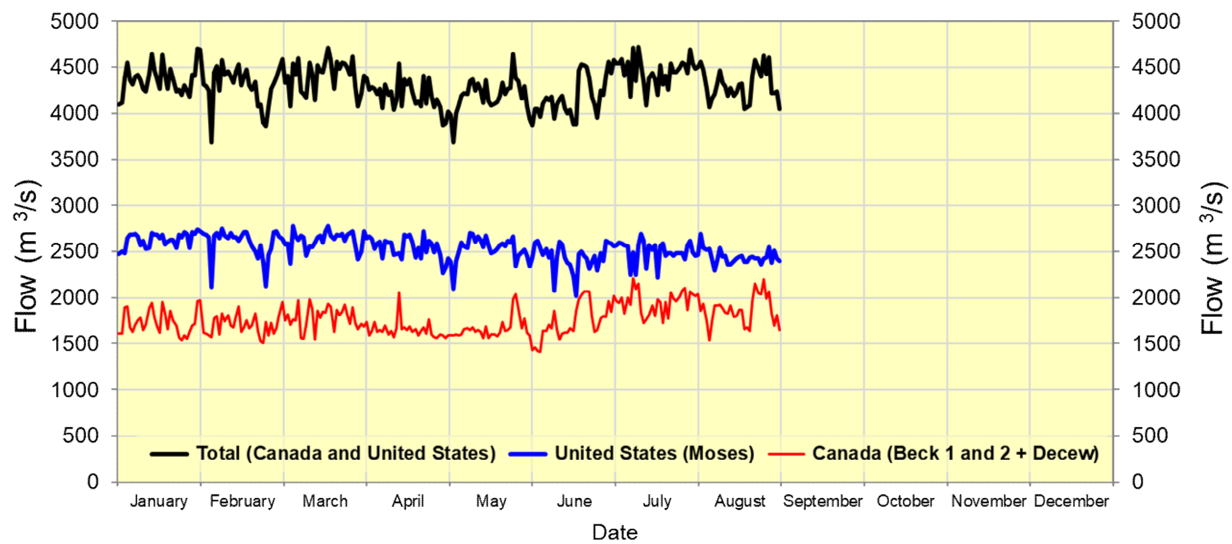


Figure 8: Daily maximum and minimum water levels at Material Dock gauge (March through August 2020).



Note: Flow over Niagara Falls is defined as the flow at Ashland Avenue gauge

Figure 9: Daily flow over Niagara Falls from January through August 2020 (flow at Ashland Avenue in m^3/s).



Note: For purposes of the Niagara Treaty, the Canadian diversion includes water diverted from the Niagara River and water diverted through the Welland ship canal for power purposes

Figure 10: Daily diversion of Niagara River water for power purposes (January through August 2020).

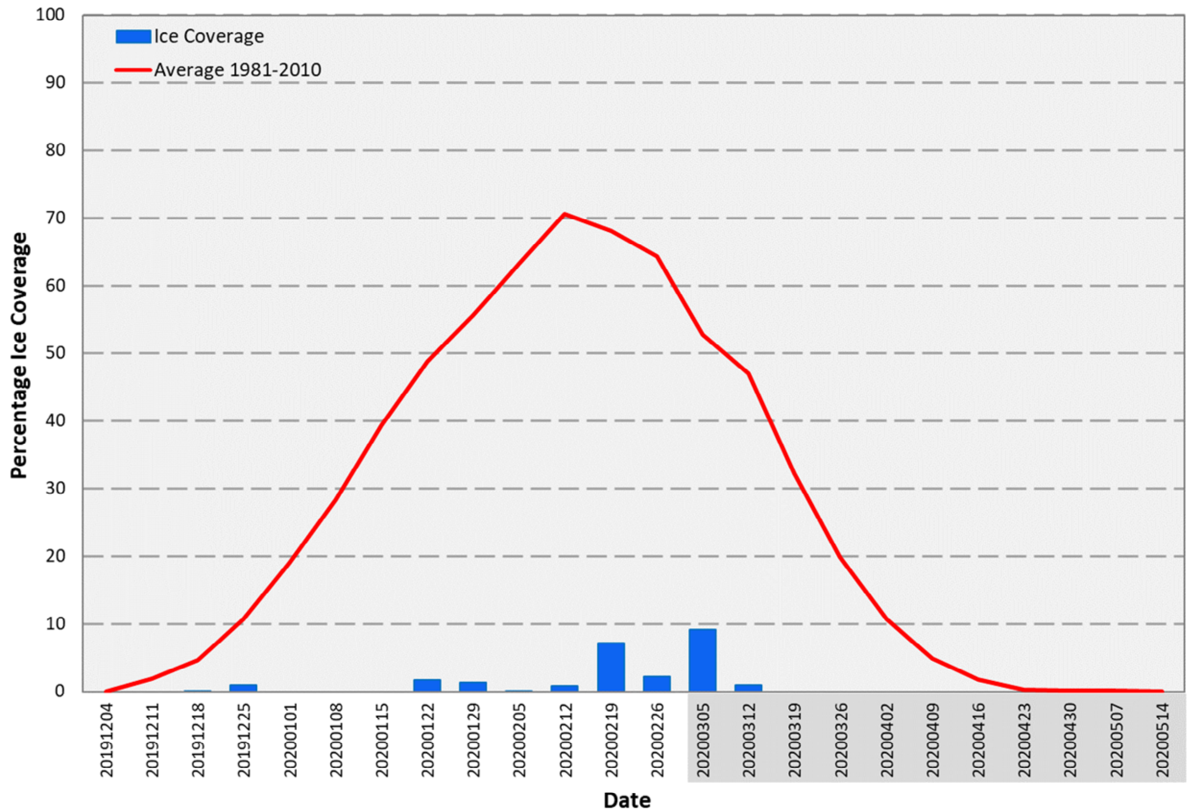
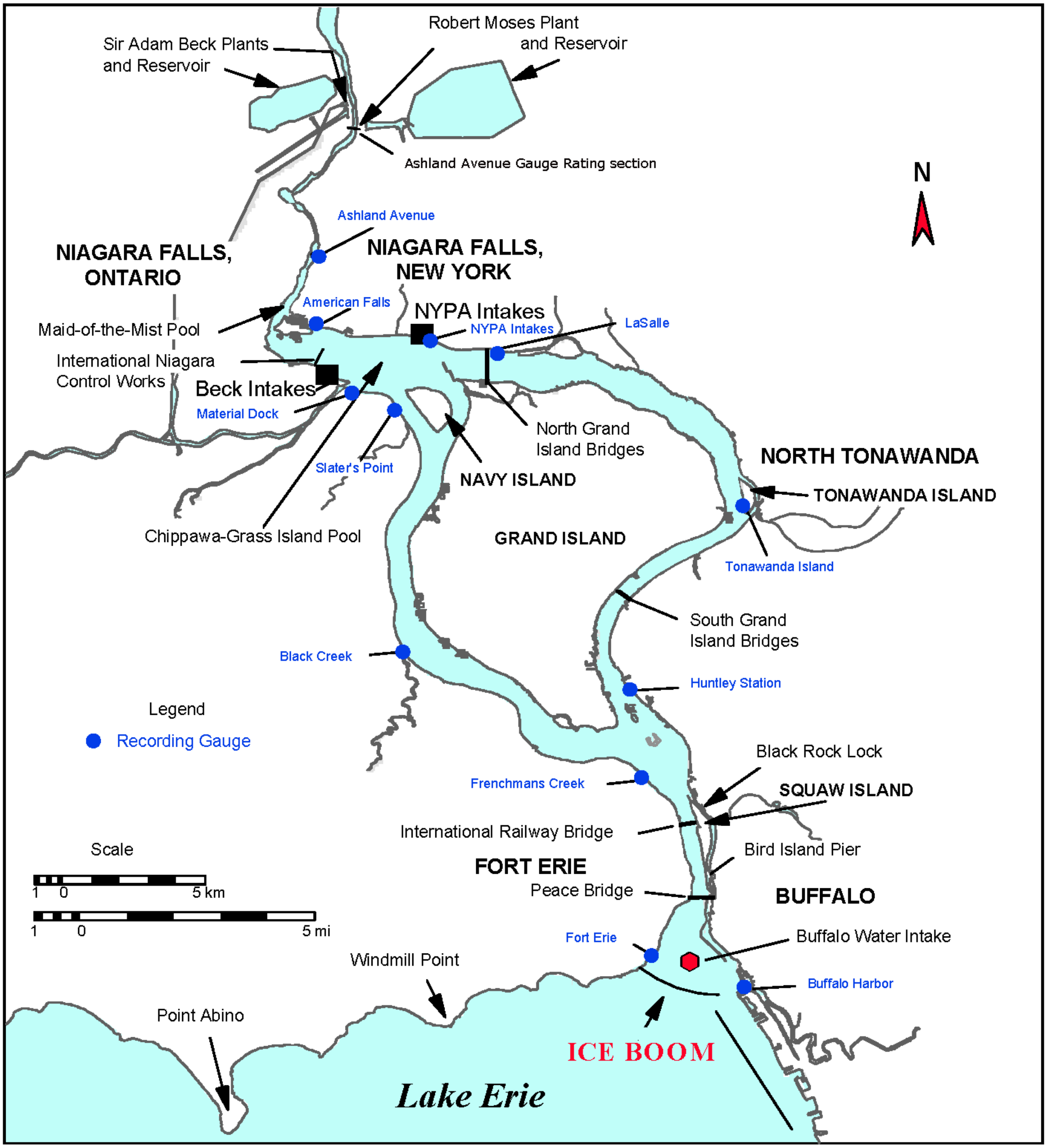


Figure 11: Weeky ice coverage for Lake Erie during the 2019-20 ice season.



Enclosure 1: Map of the upper Niagara River showing water level gauge locations.