International Niagara Board of Control

One Hundred Thirty Ninth Semi-Annual Progress Report

to the

International Joint Commission

Covering the Period March 1 through August 31, 2022

Executive Summary

Lake Erie began the reporting period with a high level for March, 43 cm (16.9 inches) above its 1918–2021 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). In July, the lake level decreased by 7 cm (2.8 inches), instead of its average decline of 1 cm (0.4 inches) for the month. Lake Erie levels ended the reporting period with an August monthly mean water level of 27 cm (10.6 inches) above average (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) were able to comply with the International Niagara Board of Control's (the board) directive at all times during the reporting period (Section 3).

All gauges required for the operation of International Niagara Control Works (INCW) were operating normally most of 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).

During the reporting period the diversion from the Niagara River for the Sir Adam Beck (SAB) I and II plants averaged 1,584 m^3/s (55,940 cfs) and diversion to the Robert Moses Niagara Power Project averaged 2,158 m^3/s (76,210 cfs). The Niagara River flow at Queenston during the period March through August 2022 averaged 6,700 m^3/s (236,610 cfs), which was 718 m^3/s (25,360 cfs) above the 1900-2021 average of 5,982 m^3/s (211,250 cfs) for the period (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. Flow measurements were taken in May 2022 for the Upper Niagara River, having previously been postponed due to COVID-19 travel restrictions. The next measurement series in the Lower Niagara River is planned for November 2022 (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. Removal of the Lake Erie – Niagara River Ice Boom began on March 29 and was completed on April 4. All spans were moved to their summer storage facility by April 13, 2022, ending the 2021–2022 ice boom season (Section 10).

There were several changes in the membership of the board and its Working Committee over the course of the reporting period (Section 12).

Table of Contents

List of Tables

List of Figures

Enclosures

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

COVER: A view of the International Niagara Control Works from the Niagara River Control Centre. (Photo Credit: Hafiz Ahmad, ECCC).

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 September 29, 2022
Burlington, Ontario

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

Commissioners:

1. General

The International Niagara Board of Control (the 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 Ninth Semi-Annual Progress Report, covering the reporting period March 1, 2022 to August 31, 2022.

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

The level of Lake Erie was above average throughout the reporting period. It began the reporting period with a high level for March, 43 cm (16.9 inches) above its 1918–2021 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). In July, the lake level decreased by 7 cm (2.8 inches), instead of its average decline of 1 cm (0.4 inches) for the month. Lake Erie levels ended the reporting period with an August monthly mean water level of 27 cm (10.6 inches) above average. Recorded monthly water levels for the period March 2022 through August 2022 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.

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* 2022	Average 1918-2021	Departure	Recorded* 2022	Average 1918-2021	Departure
March	174.53	174.10	0.43	572.60	571.19	1.41
April	174.59	174.25	0.34	572.80	571.69	1.11
May	174.66	174.33	0.33	573.03	571.95	1.08
June	174.68	174.36	0.32	573.10	572.05	1.05
July	174.61	174.35	0.26	572.87	572.01	0.86
August	174.55	174.28	0.27	572.67	571.78	0.89

* Provisional

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).

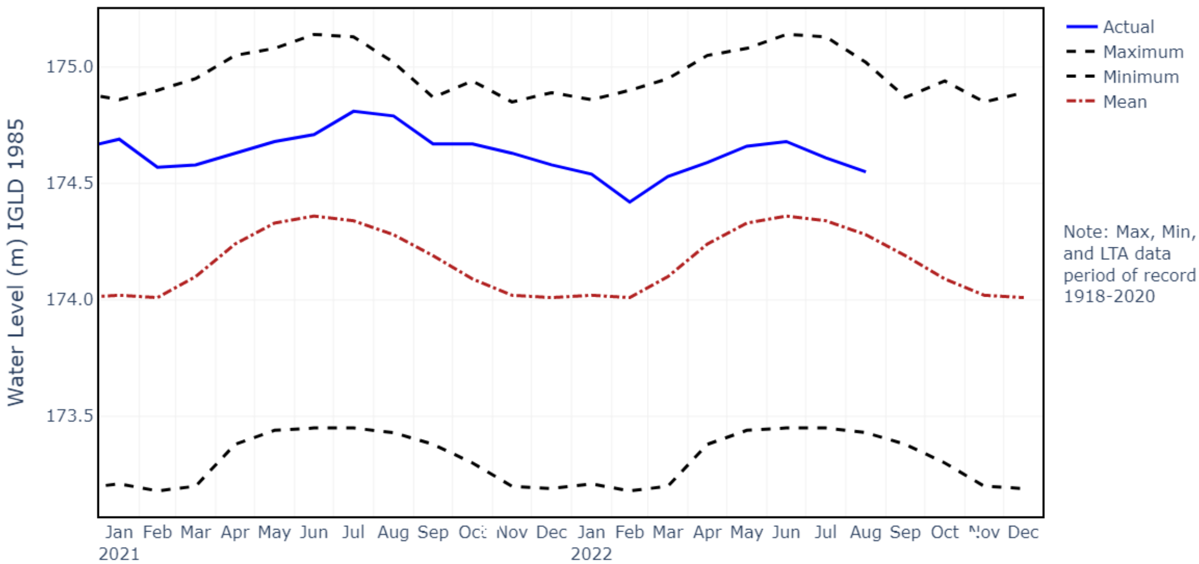


Figure 1: Lake Erie mean monthly actual, maximum, minimum and average water levels.

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 42.79 cm (16.84 inches) of precipitation during the period March through August 2022. This is about 13% below the 1900-2017 average for the period. Precipitation was average for May, below average for March, April, June, and July; and above average for August during the reporting period.

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

	Centimetres			Inches			
Month	Recorded* 2022	Average 1900-2017	Departure	Recorded* 2022	Average 1900-2017	Departure	Departure (in percent)
March	5.75	7.00	-1.25	2.26	2.76	-0.50	-18
April	5.46	8.10	-2.64	2.15	3.19	-1.04	-33
May	8.64	8.60	0.04	3.40	3.39	0.01	0
June	5.34	8.90	-3.56	2.10	3.50	-1.40	-40
July	8.31	8.60	-0.29	3.27	3.39	-0.12	-3
August	9.29	8.20	1.09	3.66	3.23	0.43	13

* Provisional

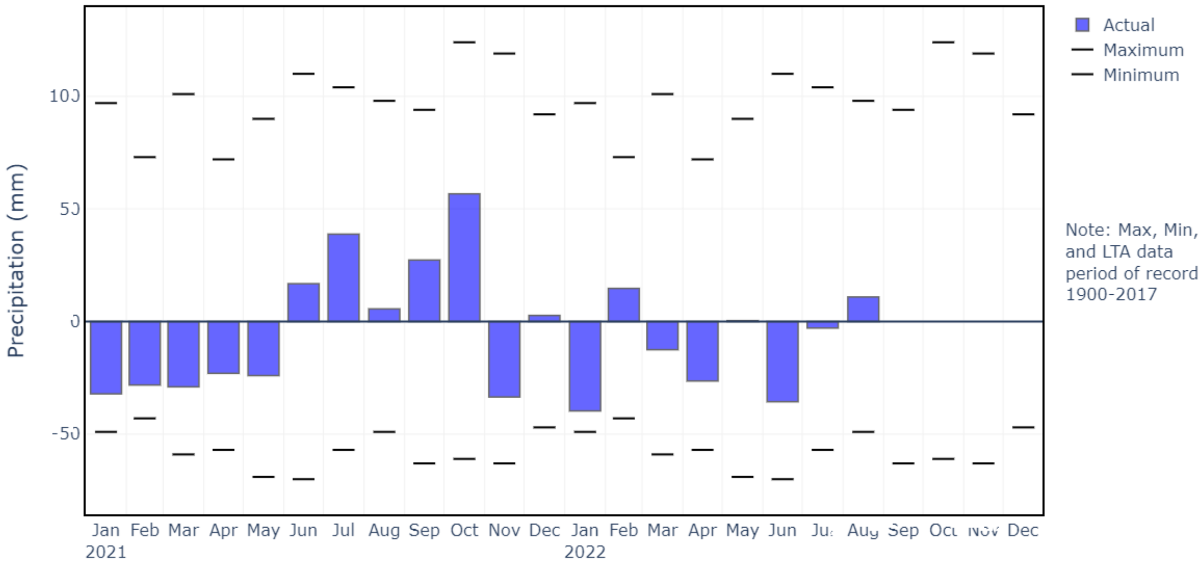


Figure 2: Monthly actual, maximum and minimum precipitation departures from the long-term average on Lake Erie basin.

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 below average for all months except August where it was above 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 the above average levels seen for the past few years, the level of Lake Michigan-Huron was above average for the entire reporting period (Figure 4). The above average lake level caused the flow in the Detroit river to be above average for the entire reporting period (Figure 5). Lake Erie inflow via the Detroit River was approximately 12% above the long-term average from March through August 2022.

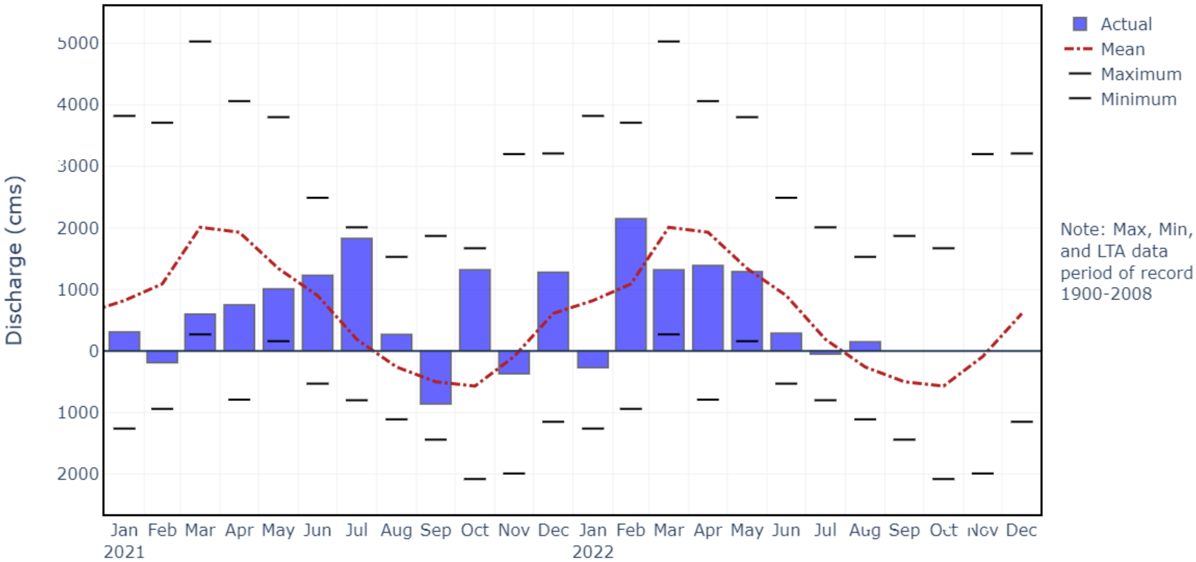


Figure 3: Monthly actual, maximum, minimum and average net basin supplies on Lake Erie basin.

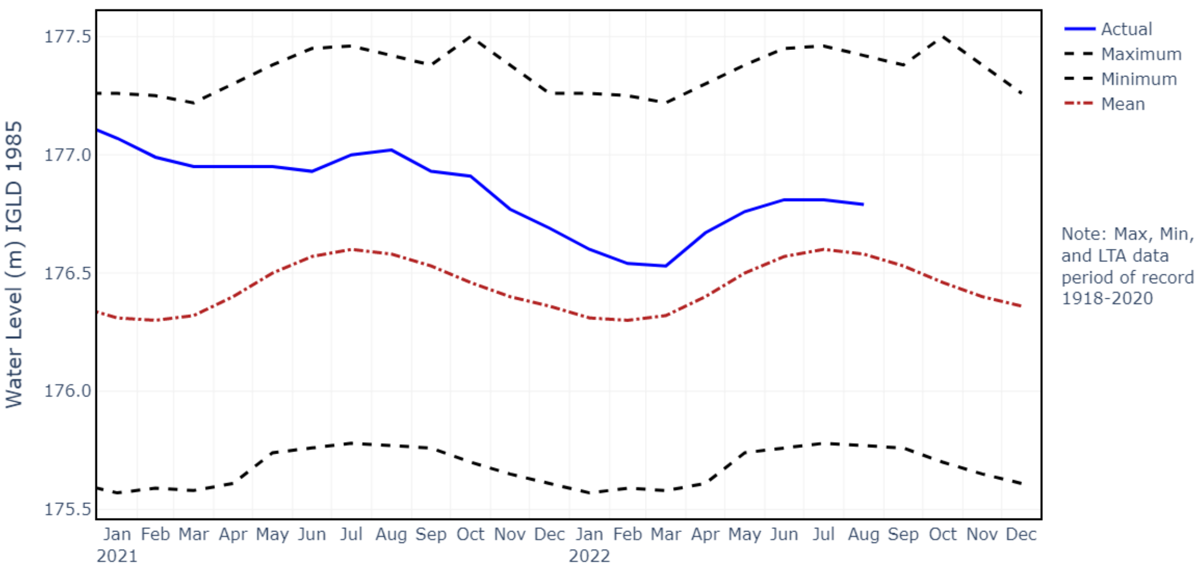


Figure 4: Lake Michigan-Huron mean monthly actual, maximum, minimum and average water levels.

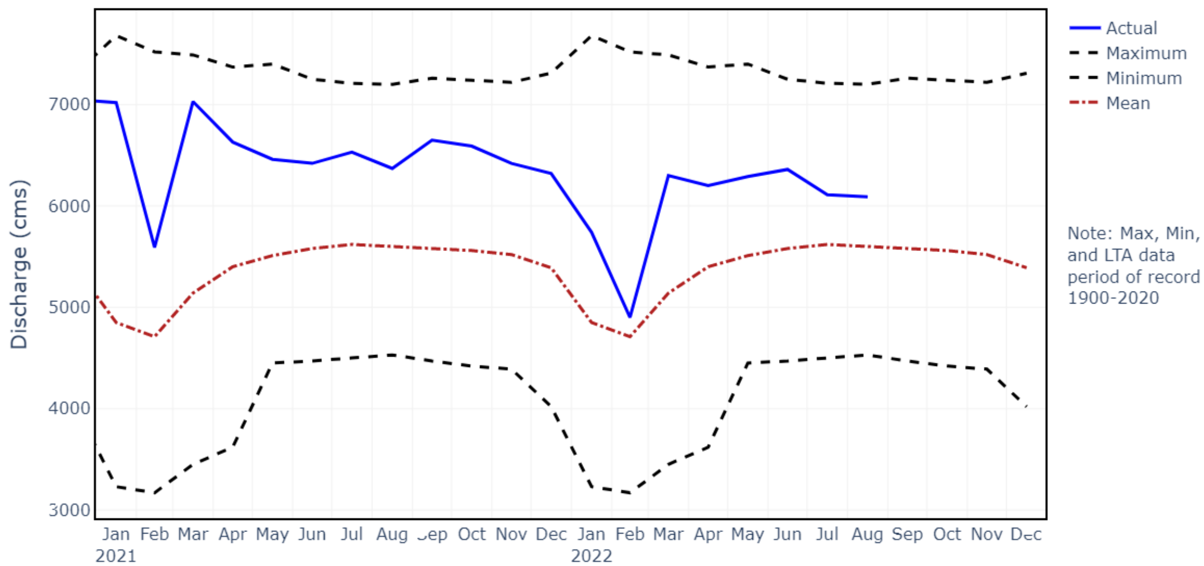


Figure 5: Detroit River mean monthly actual, maximum, minimum and average flows.

The inflow from Lake Michigan–Huron via the Detroit River combined with Lake Erie's NBS resulted in wet conditions with a NTS for Lake Erie of approximately 8% above average for the period March through August 2022. 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.

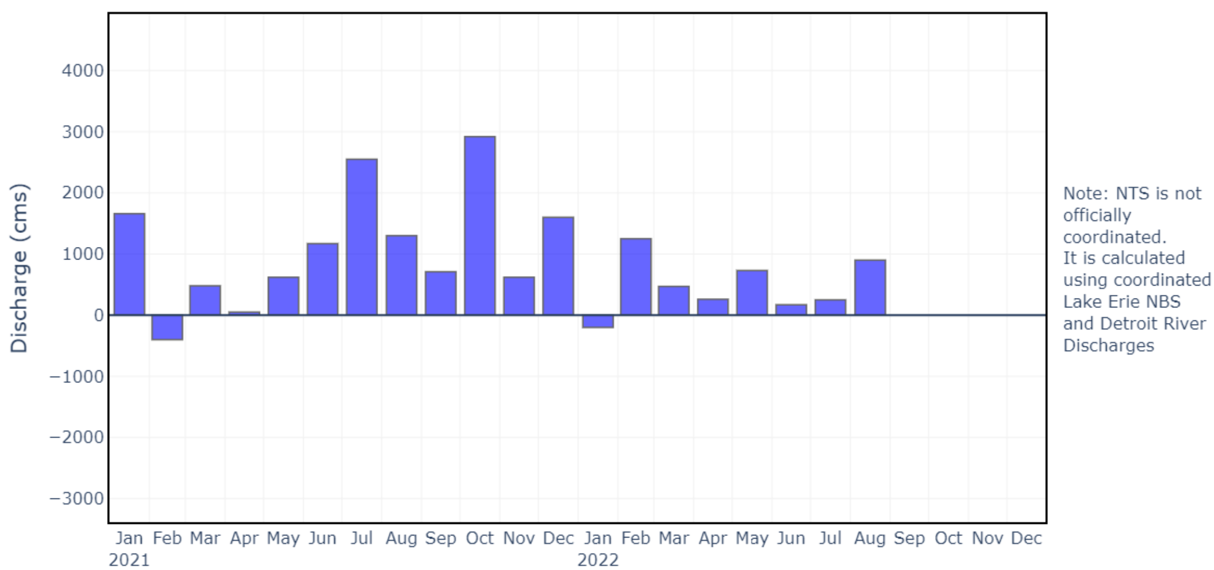


Figure 6: Lake Erie basin monthly net total supplies difference from the long term average.

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, approximately between three and five percent of the total Lake Erie outflow. It 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 the lake outflow. Strong westerly winds raise the lake level at the east end, resulting in increased outflow, while easterly winds have the opposite effect. Throughout the reporting period, the Niagara River monthly average flows at Buffalo were well above-average ranging from 6,450 m^3/s (227,780 cfs) to 6,840 m^3/s (241,550 cfs) due to above-average levels on Lake Erie (Figure 7).

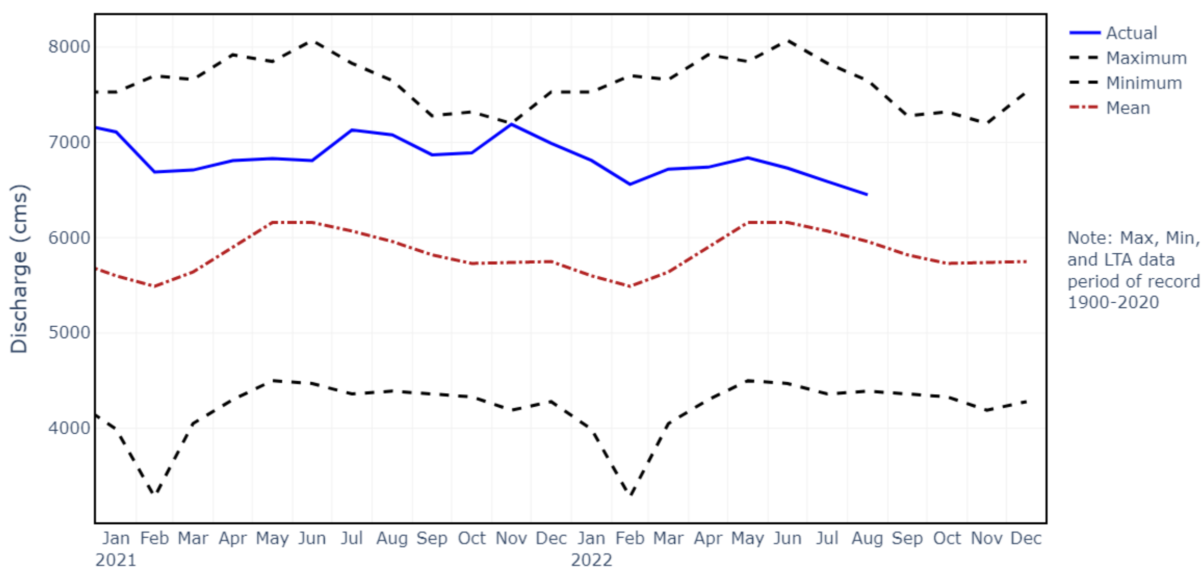


Figure 7: Niagara River mean monthly actual, maximum, minimum and average flows at Buffalo, New York.

While it is impossible to accurately predict future supplies to the lakes, it is possible to estimate future lake levels based on historical supplies, past levels (1918-present), and current levels. 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, 2022 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 on March 4, 20-21, and April 1-4 due to ice conditions; for April 5 due to life saving/emergency operations; and on May 24 due to government testing.

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.

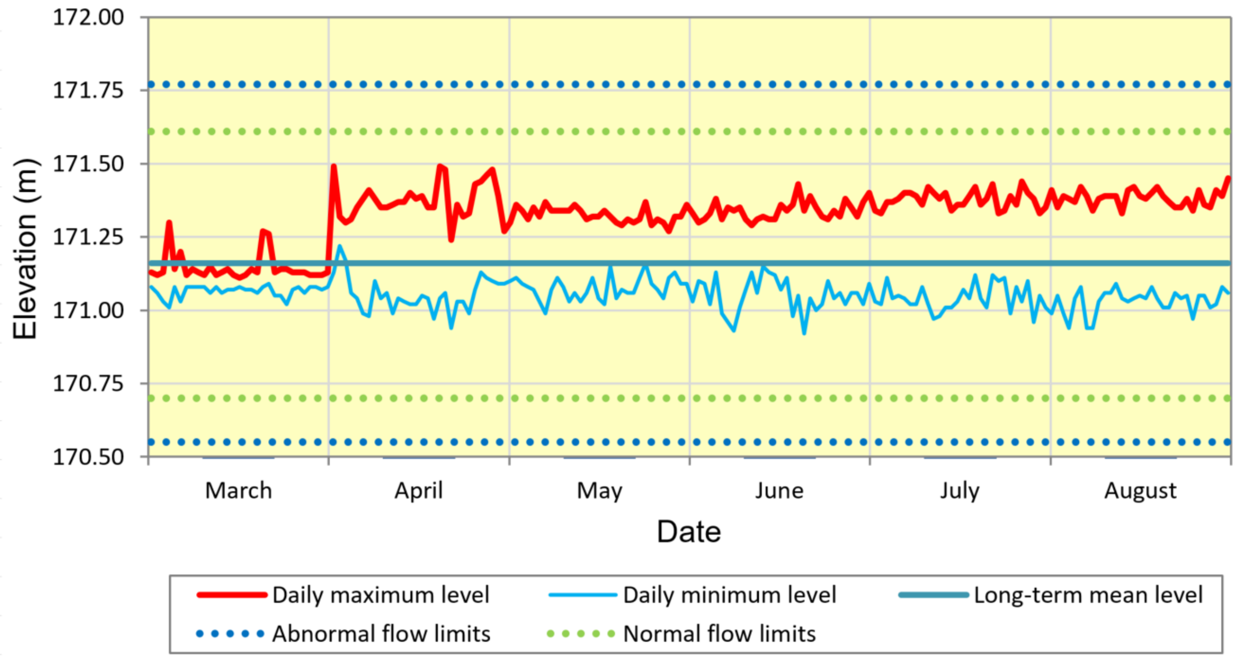


Figure 8: Daily maximum and minimum water levels at Material Dock gauge (March through August 2022).

Regular maintenance at the INCW included a minor overhaul to refurbish Gate 6 hydraulics, which commenced on March 21, 2022 with a completion date of August 5, 2022. Delays were experienced mainly due to a crane operator labor relations strike. Gate 14 was unavailable (in lowered position) due to a failed limit switch which prevented operation from June 13 to June 16, 2022. G12 operation is restricted to last use due to a loose ice shield.

Multiple capital projects have resumed at the INCW after being suspended due to the COVID-19 pandemic. The Niagara River Water Level Gauge (WLG) house replacement project will address the poor condition of the gauge houses and provide upgrades to gauge telemetry/redundancy. This project execution date has been rescheduled due to significant material procurement issues from COVID-19 supply chain delays. It is now scheduled to begin and will be completed in 2023. A new project has been added to replace Niagara River WLG communications in 2025 which will address WLG communication failures due to aging infrastructure. The gate hydraulic system pilot project is scheduled to begin execution phase in 2023 with scheduled completion in 2024. This project will verify the new hydraulic system design, providing a robust and reliable hydraulic system for integration into the upcoming gate rehabilitation project. The gate rehabilitation project will replace all gate components and controls. This project is planned to start in 2024 and will run over 10 years until completion. The septic upgrade project is currently in execution with an estimated completion date of end of September 2022. The ice camera replacement project had a projected completion of 2021, however will be deferred to 2023 to coincide with the NYPA camera replacement project. Working with NYPA will provide for common equipment and software, and create stronger, more reliable ice monitoring. The NRC domain hardware / software replacement project is in the planning stage and is estimated to be complete by 2023. The new system will provide redundancy for improved functionality and reliability. A project has been added to upgrade INCW Microwave communication equipment and address the removal of antiquated, not in use communications equipment.

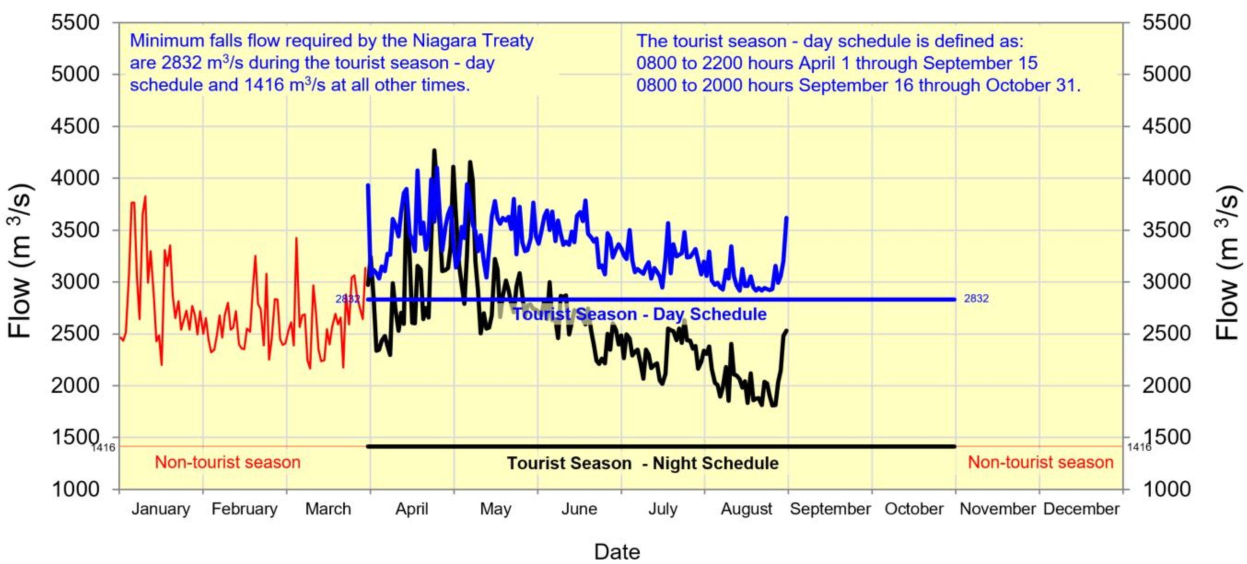
4. Gauging Stations

The gauges used to determine flows in the Niagara River, monitor the CGIP levels and the flow over Niagara Falls are the Fort Erie, Material Dock and Ashland Avenue gauges as shown in Enclosure 1. 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 the following incidents. During a routine maintenance procedure to flush the Fort Erie WLG stilling well, the isolation valve handle broke in the closed position rendering the WLG float to be inaccurate. Divers were arranged to open the valve at the bottom of the well. The valve handle remains broken. The total outage period lasted from June 27, 2022 at 13:41 to June 30, 2022 at 12:32 (EST). On July 4, 2022 at 00:50 EST, communication was lost to the Ashland Avenue WLG. After a ten minute period, communication returned automatically but the gauge was observed to be reporting approximately 1 m higher than the adjacent NOAA Ashland Ave WLG. The NOAA Ashland Ave WLG readings were used for reporting and the Power Entity Ashland

Ave WLG was recalibrated and verified to be reporting accurately on July 5, 2022 at 10:05 EST.

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) daytime 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.



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 2022 (flow at Ashland Avenue in m^3/s).

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 24, 2022) showed no evidence of notable change in the crestline of the Falls during this reporting period.

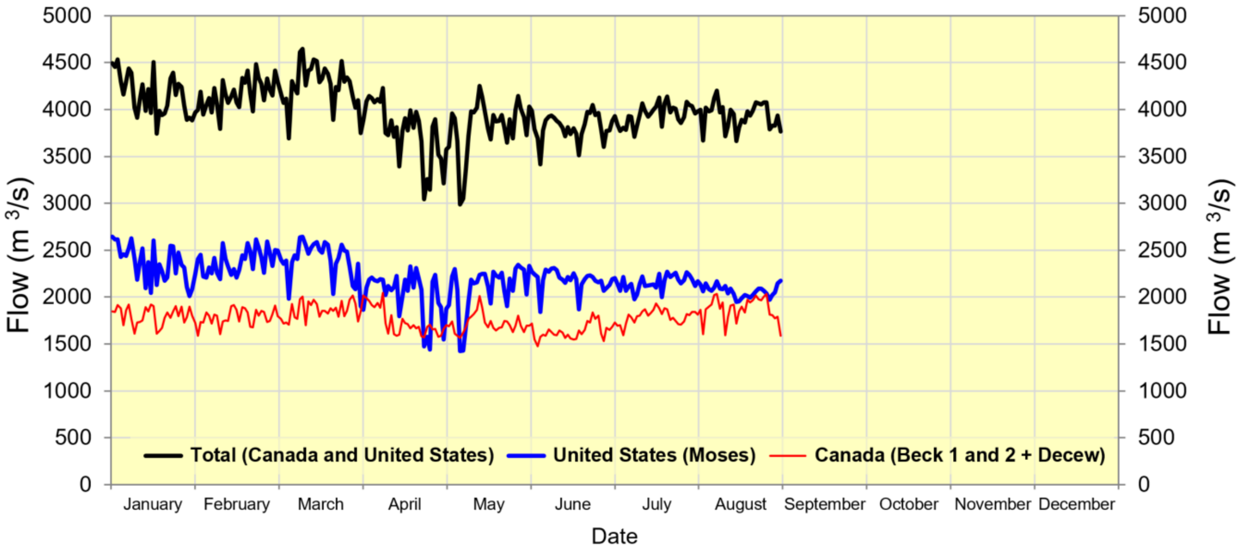
7. Diversions and Flow at Queenston

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 2022, diversion for the SAB I and II plants averaged 1,584 m^3/s (55,940 cfs) and diversion to the Robert Moses Niagara Power Project averaged 2,158 m^3/s (76,210 cfs). Diversion from the Welland Canal to OPG's DeCew Falls Generating Stations averaged 184 m^3/s (6,500 cfs) for the same period. 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 2022, and departures from the 1900–2021 long-term average are shown in Table 3. Maximum and minimum monthly average flows for the 1900–2021 period of record are shown in Table 4. During the period March through August 2022, the flow at

Queenston averaged 6,700 m^3/s (236,610 cfs), which was 718 m^3/s (25,360 cfs) above the 1900-2021 average of 5,982 m^3/s (211,250 cfs) for the period. The monthly values ranged between 6,440 m^3/s (227,430 cfs) and 6,899 m^3/s (243,640 cfs).



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 2022).

Table 3: Monthly Niagara River flows at Queenston.

	Cubic Metres per Second			Cubic Feet per Second		
Month	Recorded 2022	Average 1900-2021	Departure	Recorded 2022	Average 1900-2021	Departure
March	6711	5703	1008	237,000	201,400	35,600
April	6839	5958	881	241,520	210,400	31,120
May	6899	6151	748	243,640	217,220	26,420
June	6728	6127	601	237,600	216,370	21,230
July	6580	6036	544	232,370	213,160	19,210
August	6440	5914	526	227,430	208,850	18,580
Average	6700	5982	718	236,610	211,250	25,360

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	273,930	1934	4130	145,850
April	2020	8014	283,010	1935	4380	154,680
May	2020	7900	278,980	1934	4530	159,980
June	2019	8059	284,600	1934	4470	157,860
July	2019	7851	277,240	1934	4360	153,970
August	2019	7602	268,470	1934	4370	154,330

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. Historically, measurements were made at several locations as 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 regularly scheduled discharge measurements near the International Railway Bridge were taken in May 2022, having previously been postponed due to COVID-19 travel restrictions. The next measurements at this location are scheduled for spring 2025. 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. Measurements taken in September 2019 have been compiled in a final report. The next measurements at this location are scheduled for November 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. This is 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 close to the American Falls Gauge site. Following the 5-year cycle, the next scheduled measurements at this location were expected to be made in spring 2022 but have been delayed until further notice.

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 is used in the determination of flow through the Welland Canal. Measurements were made in the Welland Supply Canal in December 2021. These measurements are currently under review. The next measurement series in the Welland Supply Canal is planned for the fall of 2024.

9. Power Plant Upgrades

OPG is continuing a unit rehabilitation program which began in 2007. Currently, the Sir Adam Beck 1 (SAB 1) G10 Gibson Report was finalized and reviewed by NYPA in summer 2021, and was submitted for approval in September 2021. The SAB 1 G5 unit overhaul is complete and the unit has returned to service. An interim rating table is in place and a Gibson Test was completed in April-May 2022. SAB 1 G4 and G8 are scheduled for an overhaul in 2025-2026. SAB 1 units G1 and G2 are undergoing a frequency conversion from 2021 to 2022 with the installation of new 60 Hz units. G2 was placed into service in June 2022, and G1 is scheduled to be brought online in November 2022. SAB 2 unit overhauls will begin in May 2025, with G19 and G20 in 2025-2027. SAB PGS PG5 overhaul has begun and is expected to be in-service in November 2022.

The DeCew Falls 1 runner replacement for G8 is scheduled for September 2022. Flow testing is being scheduled. DeCew Falls 2 G1 is scheduled for a runner replacement in 2023 to 2024. Ultrasonic flow testing took place on DeCew 1 G5 and G6 in November 2021. Following testing on G8, it will be determined if units are similar and a new rating table needs to be developed.

OPG is in the process of replacing the existing Water Record Accounting (WRA) system for the SAB and DeCew GS. The Kisters WISKI product will be used and is expected to be in operation in late 2022 or early 2023. Through careful planning and understanding of existing processes, the impact to existing regulatory processes is expected to be minimal. The Niagara River Control Centre has a separate WRA system that will not be replaced by this project.

NYPA continues to improve the Lewiston Pump Generating Plant with PG-5 placed back in service March 2022, while deferring re-work on PG-2. PG-7 and PG-2 remain for re-work of the original unit replacement, however work has been postponed due a fire in the stator housing of PG-5 upon its return to service and is under investigation. This is the last of the 12 LPGP unit upgrades. Expected completion is now the last quarter of

2023. At the Robert Moses Plant, RM-10 control upgrades commenced June 2022. RM-6 controls and mechanical upgrades scheduled to start in April 2023 for an 8-month completion. Main control room replacement and upgrades commenced in April 2022, with completion by end of October 2022.

10. Ice Conditions and Ice Boom Operation

The 2021-2022 ice season typically consisted of seasonal and higher than seasonal temperatures. Ice cover over Lake Erie started increasing during the second week of January and peaked at about 96% during the last week of January. It stayed above 70% until the last week of February then steadily declined throughout the remainder of the 2021-2022 ice season (Figure 11).

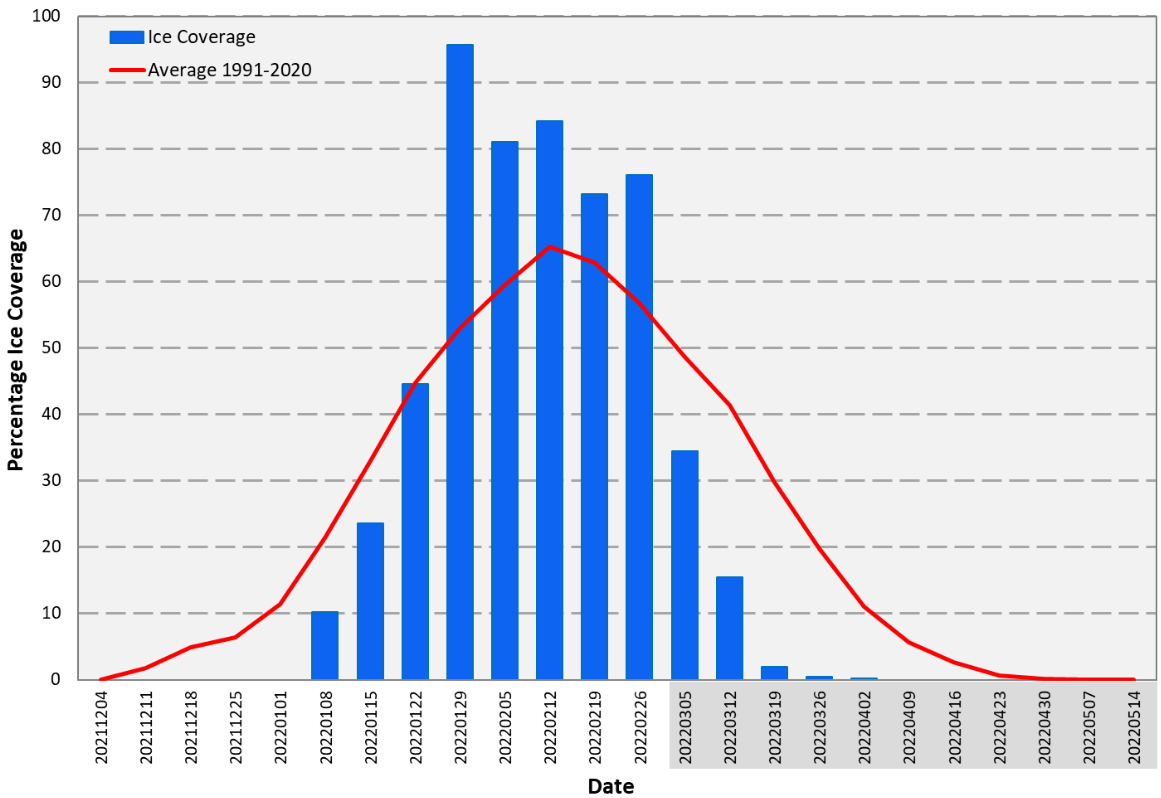


Figure 11: Weekly ice coverage for Lake Erie during the 2021-22 ice season.

The current Order of Approval governing the operation of the ice boom requires that all floating sections of the boom be opened by the first day of April unless more than 650 km^2

(250 mi^2) of ice remains on eastern Lake Erie. The fixed wing survey flight to estimate Lake Erie ice cover was deferred due to COVID-19 restrictions. Satellite imagery was used to estimate the ice cover on the eastern basin of Lake Erie. Satellite imagery analysis on March 17 showed more than 1907 km^2 (736 mi^2) ice cover, which rapidly decreased to 511 km^2 (197 mi^2) on March 21, thus dropping below 650 km^2 (250 mi^2).

A meeting was called on March 22 to discuss ice boom removal options; the power entities informed the INWC in the meeting that the ice boom opening could only begin at earliest March 29 due to the weather forecast and the remaining ice field conditions. The media advisory was delayed based on the weather forecast and field conditions. Subsequently, a media advisory to the public was released on March 28 that opening would start on March 29 should weather and operational safety considerations allow.

The ice boom removal officially began on March 29. The work of removal was delayed due to high winds and large amounts of ice breakup flowing through the open boom. All spans were moved from Lake Erie and tied off to the Buffalo breakwall by April 4. The buoy barrels were then taken off their respective anchor cables by April 6. The 2021-2022 ice boom removal was ultimately completed on April 13, 2022 when all components of the boom were placed into storage.

11. Meeting with the Public

The board participated in two separate Tri-Board Public Webinars, one in English on August 30, 2022 and the other in French on August 31, 2022. The webinars were conducted in collaboration with the IJC commissioners and communications staff, International Lake Superior Board of Control, International Lake Ontario – St. Lawrence River Board and Great Lakes Adaptive Management Committee. The webinars provided members of the public an overview of the current and forecast conditions of the Great Lakes and discussed water levels throughout the system. A total of 70 members of the public participated in the English session and six people attended the French webinar. Following the presentation, many questions were taken from the public during the call, particularly for the Lake Superior Board of Control and the International Lake Ontario – St. Lawrence River Board. The participants were encouraged to visit the board webpage for additional information and to submit any further 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. There are hopes for an in-person event in 2023 as COVID-19 restrictions ease.

12. Membership of the Board and the Working Committee

There were several changes in the membership of the board and its Working Committee over the course of the reporting period. The changes in the order that they occurred are as follows:

- Mr. Hafiz Ahmad, ECCC, was appointed Secretary of the Canadian Section of the INBC by Mr. Aaron Thompson, Canadian Chair, on March 23, 2022, replacing Mr. Derrick Beach.
- BG Kimberly Peeples assumed command of the USACE's Great Lakes and Ohio River Division on June 1, 2022. She succeeds Mr. Stephen Durrett as the new US Chair of the INBC.
- On regular change of command at Buffalo USACE District, LTC Colby Krug took on responsibilities of the US Co-Chair for the INWC on assuming his new duties June 17, 2022 for the departing LTC Eli Adams.
- Mr. John Allis left the USACE on August 12, 2022. Upon doing so, Mr. Allis resigned his appointment as INWC Member. His seat will remain vacant until the appointment of a new INWC Member by the US Section Co-Chair.
- One Canadian Section INWC member seat is also vacant after Mr. Jonathan Staples, Ontario Ministry of Natural Resources and Forestry, retired earlier this year.

13. Attendance at Board Meetings

The board met once during this reporting period. The meeting was held on March 23, 2022 through a virtual platform. Mr. Kyle McCune, U.S. Section Alt. Chair, Mr. Aaron Thompson, Canadian Section Chair, board members Mr. David Capka and Ms. Jennifer Keyes, and board secretaries were in attendance.

Aaron Thompson
Digitally signed by Aaron Thompson
Date: 2022.10.07 12:49:10 -04'00'

Mr. Aaron F. Thompson
Chair, Canadian Section

PEEPLES.KIMBERLY.ANNE.1076314485
Digitally signed by PEEPLES.KIMBERLY.ANNE.1076314485
Date: 2022.10.07 13:43:18 -04'00'

BG Kimberly Peeples
Chair, United States Section

Ms. Jennifer L. Keyes
Member, Canadian Section

Mr. David Capka
Member, United States Section

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