



International Kootenay Lake Board of Control

2023 Report to the International Joint Commission





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Cover Photo:

Aerial view of Balfour, BC and Kootenay Lake.

(credit: https://www.nelsonkootenaylake.com/sites/default/files/images/regions/balfour_Tamarack.jpg)



TABLE OF CONTENTS

Executive Summary..... 4

Unit Conversion Factors..... 5

List of Acronyms..... 6

Kootenay Lake..... 7

Board Membership 8

Order of Approval 9

Hydrologic Conditions..... 11

 Climate and Snowpack..... 11

 Kootenay Lake 13

Order Compliance 15

 Kootenay Lake Rule Curve 15

 Applicant Payments 15

Board Meetings..... 15

 Annual Board Meeting 15

 Annual Public Meeting 16

 Field Tour 16

 IJC Semi-Annual Appearances..... 17

 Semi-Annual Conference Calls 18

 Work Plan..... 18

 Public Communications 19

 Special Projects 19

Appendix A: Key Basin Values and Statistics in 2023..... 22

Appendix B: 2023 Kootenay Lake Rule Curve and Elevations..... 23



EXECUTIVE SUMMARY

Throughout 2023, FortisBC operated Corra Linn Dam in a manner consistent with that prescribed by the 1938 Kootenay Lake Order. Kootenay Lake reached the required minimum of 1739.32 ft (530.14 m) before April 1. There was a period of 4 days in mid-April where the level exceeded the rule curve, however the Applicant remained in compliance as Grohman Narrows was in control of lake outflow during this period. The minimum elevation during the spring period was 1739.06 ft (530.07 m) on April 26-27.

The International Kootenay Lake Board of Control determined the date of the commencement of the spring rise as April 30. An abrupt change from below normal to above normal temperatures at the end of April / beginning of May caused a rapid depletion of the Basin's snowpacks. This resulted in the freshet peak of 1748.52 ft (532.95 m) occurring on May 23, approximately 2 weeks ahead of the historical mean peak.

The daily mean Kootenay Lake inflow peaked at 84,400 cfs (2,390 cms) on May 18. Inflow values decreased to below the historical daily means for the remainder of the receding limb of the freshet peak. Kootenay Lake discharged 14.58 million acre-feet (17.98 km³) of water in 2023. When compared to total outflows from 1999-2022, the 2023 total annual outflows ranked as the 2nd lowest.

In 2023, the IKLBC engaged with First Nations and Tribes within the Kootenay / Kootenai Basin, offering options of membership and other levels of participation. The US-located Tribes (Kootenai Tribe of Idaho and Confederated Salish and Kootenai Tribes) indicated they were interested in participating as observers, while the Ktunaxa Nation in Canada indicated the Lower Kootenay Tribe has identified an individual interested in participating as a Board member. The Board asked the IJC for reference and guidance documents to clarify the distinction between observers, members, advisory groups, and representatives, as well as for an IJC Indigenous Advisor to help with future engagements.

Prior to 2023, the Board submitted an IWI proposal to fund a Climate Change Vulnerability Assessment. In 2023, Secretaries and IJC Engineering Advisors developed a statement of work to contract out the project, which will be split into two phases. Phase 1 includes data identification, model framework identification, additional criteria identification, and study plan creation. Phase 2 consists of data collection, modeling work, analysis, and a report. Initial conversations to begin Phase 1 started in late 2023.

FortisBC made a payment of \$30,000 USD in September 2023 to Idaho farmers to compensate for increased pumping costs during high lake levels in 2022.



UNIT CONVERSION FACTORS

Customary (Imperial) to Système International (Metric)

Multiply	By	To obtain
<i>Length</i>		
inch (in)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
<i>Area</i>		
acre	4,407	square meter (m ²)
acre	0.4047	hectare (ha)
square mile (mi ²)	259.0	hectare (ha)
square mile (mi ²)	2.590	square kilometer (km ²)
<i>Volume</i>		
acre-feet (ac-ft)	1,233	cubic meter (m ³)
thousand acre-feet (Kac-ft)	1.233	thousand cubic decameters (kdam ³)
<i>Flow Rate</i>		
cubic foot per second (cfs)	0.02832	cubic meter per second (cms)

Système International (Metric) to Customary (Imperial)

Multiply	By	To obtain
<i>Length</i>		
millimeter (mm)	0.03937	inch (in)
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
<i>Area</i>		
square meter (m ²)	0.0002471	acre
hectare (ha)	2.471	acre
hectare (ha)	0.003861	square mile (mi ²)
square kilometer (km ²)	0.3861	square mile (mi ²)
<i>Volume</i>		
cubic meter (m ³)	0.0008107	acre-feet (ac-ft)
thousand cubic decameters (kdam ³)	0.8107	thousand acre-feet (Kac-ft)
<i>Flow rate</i>		
cubic meter per second (cms)	35.31	cubic foot per second (cfs)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$^{\circ}\text{F} = (1.8 \times ^{\circ}\text{C}) + 32$$

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:



$$^{\circ}\text{C} = \frac{(^{\circ}\text{F} - 32)}{1.8}$$

LIST OF ACRONYMS

CCVA	Climate Change Vulnerability Assessment
ECCC	Environment and Climate Change Canada
IJC	International Joint Commission
IKLBC	International Kootenay Lake Board of Control
IWB	International Watershed Board
IWI	International Watershed Initiative
NOAA	National Oceanic Atmospheric Administration
SWE	Snow Water Equivalent
USACE	United States Army Corps of Engineers
USGS	United States Geological Services
WKPL	West Kootenay Power and Light Company
WSC	Water Survey of Canada



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KOOTENAY LAKE

Kootenay Lake is a large fjord-like lake that is located on the Kootenay (Kootenai, American spelling) River in British Columbia, Canada, 26 kilometers (16 miles) upstream of the confluence with the Columbia River. Kootenay Lake itself is entirely within Canada, but it has a backwater effect that can extend about 80 kilometers (50 miles) upstream, to the town of Bonners Ferry, Idaho. The area around the Lake is developed, and includes the City of Nelson as well as numerous smaller communities. The backwater area along the Kootenay/Kootenai River upstream of Kootenay Lake is predominantly agriculture land. The Kootenay Lake watershed is shown in Figure 1.

The level of Kootenay Lake is regulated by Corra Linn Dam (Figure 2) and is also influenced by a natural constriction upstream of the dam at Grohman Narrows. FortisBC controls discharge at Corra Linn Dam in accordance with requirements of the Order of the International Joint Commission dated November 11, 1938. FortisBC co-operates Corra Linn with BC Hydro, which also manages a hydroelectric generating facility (the Kootenay Canal Project) that is hydraulically connected to the Corra Linn Dam forebay on the Kootenay River through a constructed canal.

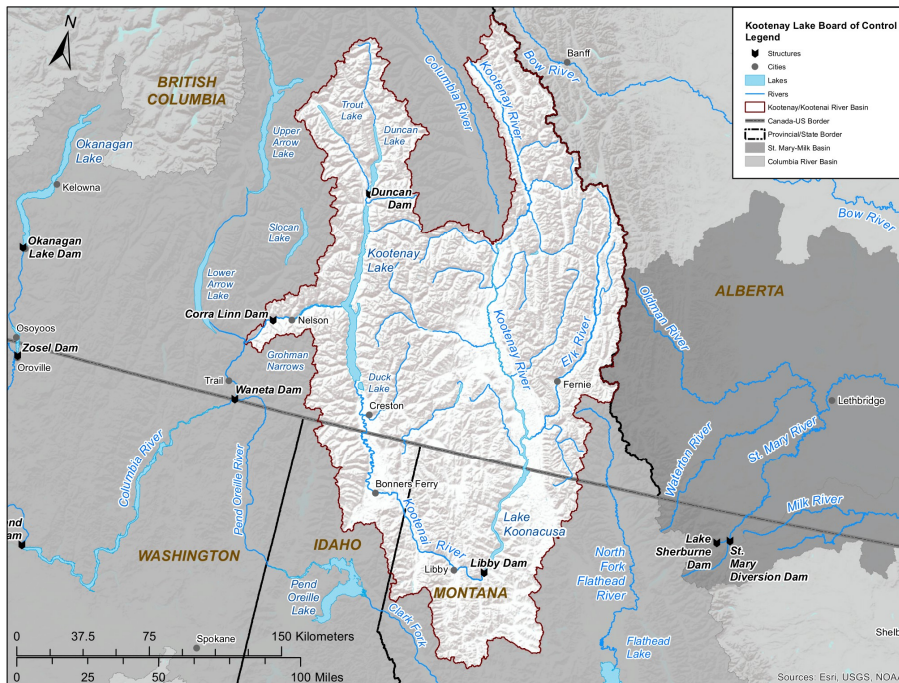








Figure 1. Kootenay Lake Watershed



Figure 2. Corra Linn Dam

BOARD MEMBERSHIP

In 2023, the size of the Board remained the same at four total members with equal representation from Canada and the U.S. In August 2023, Col. Alexander Bullock (US Co-Chair) stepped down and was replaced by Col. Kathryn Sanborn. In December 2023, the Canadian Section co-chair Evan Friesenhan and Canadian Board member Ted White both sent resignation letters to the IJC indicated they would be stepping down from the Board in January 2024.

	Canadian Section		U.S. Section
	<u>Evan Friesenhan</u> (Co-Chair) Manager, Engineering Services West and North National Hydrological Services Environment & Climate Change Canada		<u>Col. Kathryn Sanborn</u> (Co-Chair) District Engineer U.S. Army Corps of Engineers – Seattle District
	<u>Ted White</u> (Member) Director and Comptroller of Water Rights B.C. Ministry of Forests		<u>Roy Bartholomay</u> (Member) Director – Idaho Water Science Center U.S. Geological Survey
	<u>Martin Suchy</u> (Secretary) Senior Scientist National Hydrological Services Environment & Climate Change Canada		<u>Sonja Michelsen</u> (Secretary) Water Resource Engineer U.S. Army Corps of Engineers – Seattle District



ORDER OF APPROVAL

In November 1938, in response to an application submitted by the Government of Canada on behalf of the West Kootenay Power and Light Company (WKPL), which operated Corra Linn Dam, the IJC issued the 1938 Order of Approval. The 1938 Order has several provisions, including:

- Establishing the maximum elevation limits and operational criteria for the lake.
- Appointing the IKLBC to monitor the regulation of the lake to assure the provisions of the order are followed.
- Requiring excavation of the outlet of the lake at Grohman Narrows to expand the hydraulic capacity.
- Providing for reimbursement of increased pumping costs resulting from flooding of agricultural lands caused by Corra Linn Dam operations.

The maximum lake elevation limits are described in the Kootenay Lake rule curve (Figure 3). For the purposes of the Order, self-reported lake elevations from FortisBC are used to determine the applicant’s compliance. The Water Survey of Canada operates a separate gage near the same location and uses the readings to validate those from FortisBC. Important statistics from both gauges/gages are presented in Appendix 1.

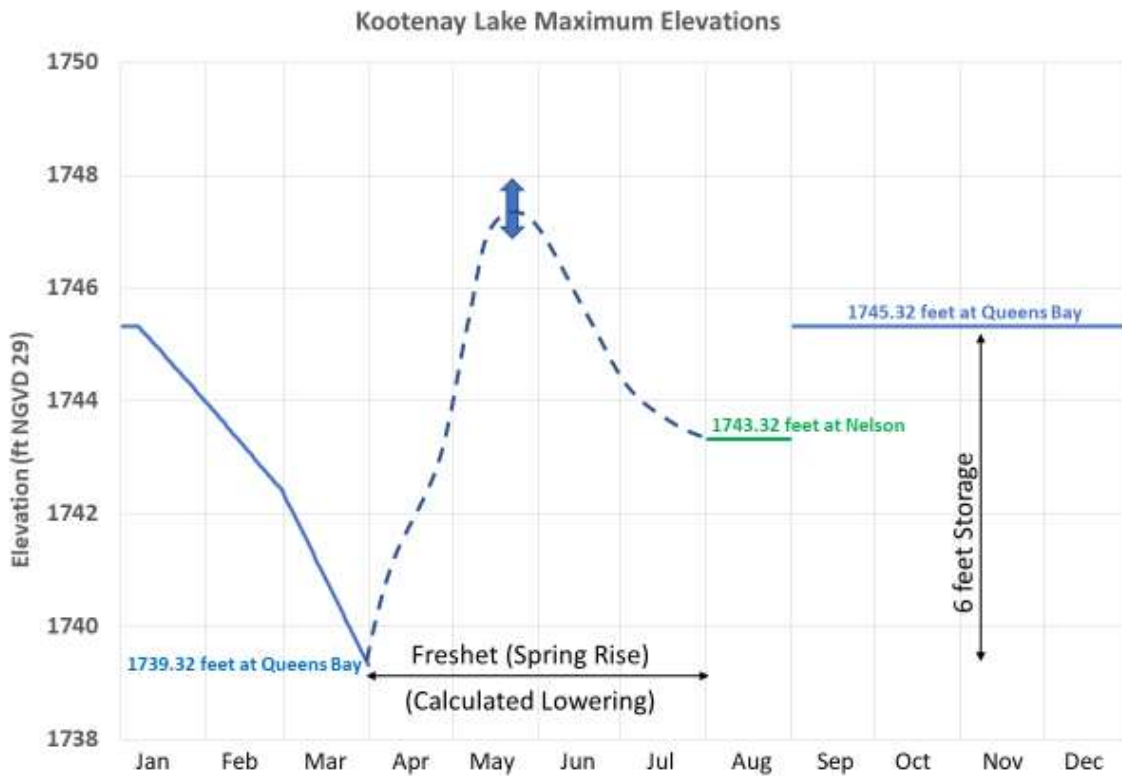


Figure 3. Kootenay Lake Order Rule Curve



1938 Kootenay Lake Order Sections 2(4) 2(5) and 2(6)

2(4) ...the Applicant shall be permitted to store water in the main body of Kootenay Lake to a maximum elevation of 1745.32, Geodetic Survey of Canada datum, 1928 adjustment (i.e., six feet above zero of the Nelson gauge), in accordance with the rule curve detailed in Sub-section (5).

(5) That after the high water of the spring and early summer flood and when the lake level at Nelson on its falling stage recedes to elevation 1743.32, Geodetic Survey of Canada datum, 1928 adjustment, the gates of the dam may be so operated as to retain it at said level until August 31st, and after said date, the level of the main body of the lake may be raised to elevation 1745.32, which shall be the maximum storage level until January 7, and thereafter it shall be lowered so that it shall not exceed elevation 1744 on February 1, elevation 1742.4 on March 1, and elevation 1739.32 (i.e. zero of the Nelson gauge) on or about April 1, except under extraordinary natural high inflow conditions, when sufficient gates shall be opened and remain open throughout such period of excess so as to lower the level of the main body of Kootenay Lake to the storage level at that time obtaining as above defined.

6) ...throughout the period of flood flow in each and every year, (i.e., from the commencement of the spring rise in March or April until the level of the lake at Nelson returns to elevation 1743.32, Geodetic Survey of Canada, 1928 adjustment, on the falling stage), a sufficient number of gates and sluiceways of the dam shall be opened to provide, in conjunction with the flow through the turbines, for the lowering of the main body of Kootenay Lake ... by at least the amounts ... as follows:

Discharge from Kootenay Lake under original conditions (in second feet) [vs.] Amount of lowering to be affected on the main body of Kootenay Lake (in feet)

10,000	1.0
25,000	1.3
50,000	1.7
75,000	2.1
100,000	2.6
125,000	3.0
150,000	3.2
175,000	3.5
200,000	3.8
225,000	4.0



HYDROLOGIC CONDITIONS

Climate and Snowpack

Regional precipitation in 2023 was generally below average. For the first four months of 2023, air temperatures were near or below normal. Temperatures rose rapidly in May and were above normal for the remainder of 2023 (Figure 4).

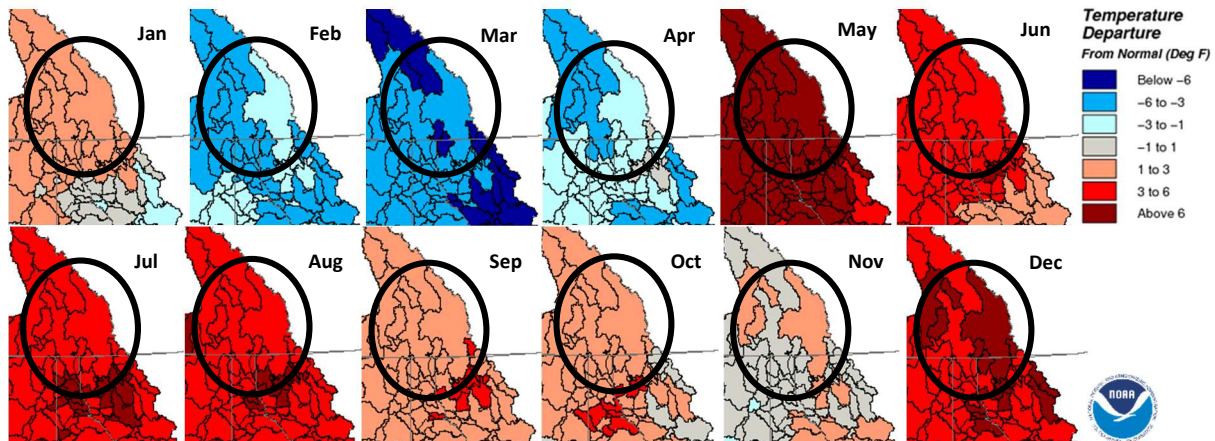


Figure 4. Monthly temperature departure from normal (1991-2020 record) in the Columbia River Basin. The black oval encompasses the East and West Kootenay Basins. (NOAA, 2024).

Snowpack in the West Kootenay Basin, as measured at Redfish Creek (2D14P) (elevation 2,104 m (6,903 ft)), was near normal throughout the 2023 water year (Figure 5B). Snow water equivalent (SWE) at Redfish Creek peaked close to the historic average at 58.8 in (1,493 mm) for the daily peak on April 27. The snowpack in the East Kootenay basin, as measured at Moyie Mountain (2C10P) (elevation 1,940 m (6,365 ft)), was also consistently near normal historic conditions through accumulation during the 2023 water year (Figure 5C). Similar to what was observed in 2022, SWE at this station saw a plateau between mid-March and late April, peaking below the historical average at 15.0 in (382 mm) for the daily peak on April 10. Both snowpacks experienced a significant and rapid snowmelt in early May, with full depletion occurring approximately a month and a half before historical averages.

Snow basin indices for the East and West Kootenay basins (Figure 6), according to the BC River Forecast Center, were between 79-95% of normal from January to April and below 73% in May and June. By June 15, both Canadian basin snowpacks had dropped to 0% of normal. Snowpack in the U.S. was generally slightly above or closer to average but followed a similar trend.

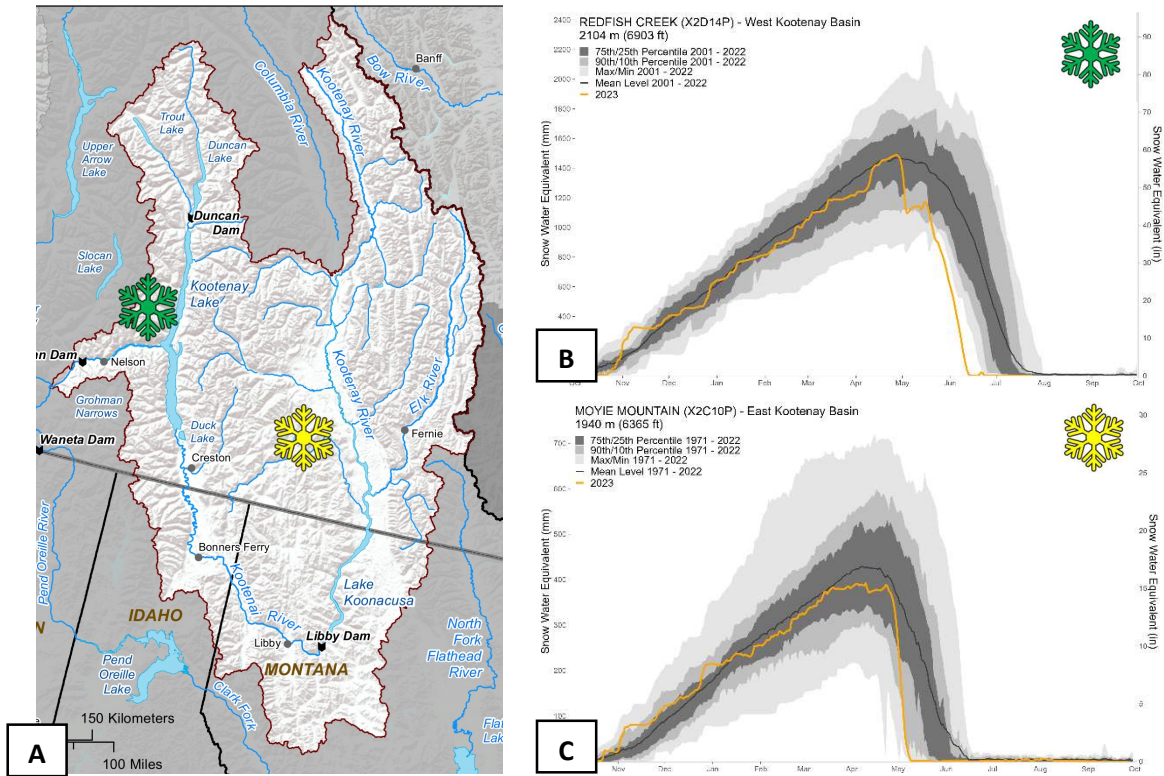


Figure 5. Mountain snowpack conditions for water years 2022-2023. Historical Daily Maximum, 75th/25th Percentile, Daily Mean, Minimum, and 2022/2023 data. A) Locations of the SWE stations. B) Redfish Creek (2001-2023) West Kootenay Basin SWE for the 2023 water-year, C) Moyie Mountain (1971-2023) East Kootenay Basin SWE for the 2023 water-year. (BC River Forecast Center, 2023).

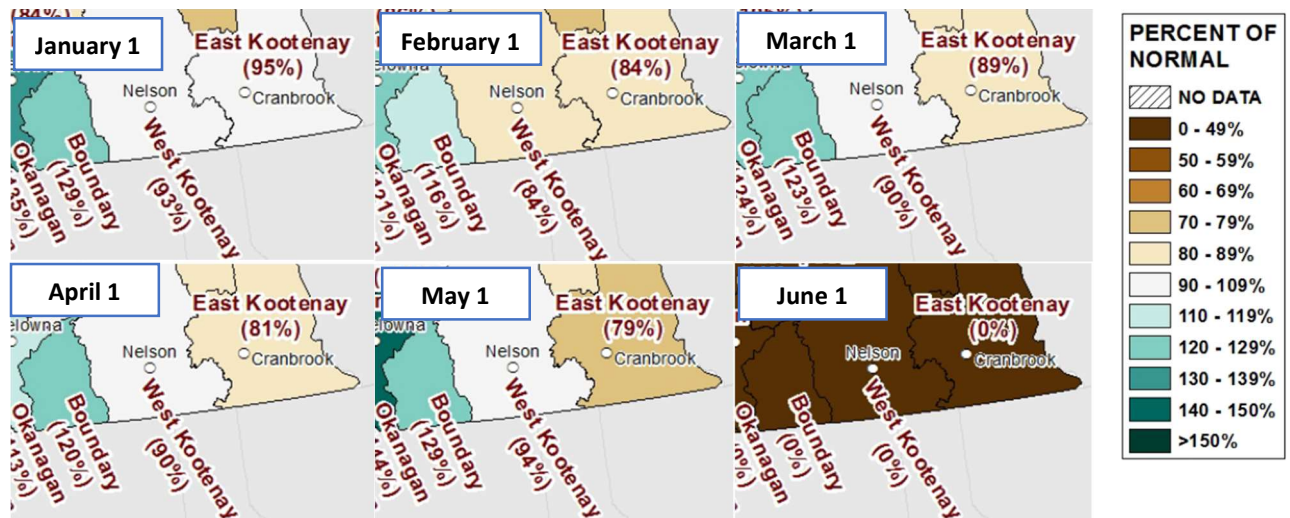


Figure 6. Monthly Basin Snow Water Index, indicating conditions as a percent of normal. For the period January to June 2023 (Province of British Columbia, River Forecast Centre, 2023).



Kootenay Lake

Figure presents observed calendar-year 2023 water levels on Kootenay Lake and the elevations specified in the November 11, 1938, IJC Order. Water levels on Kootenay Lake were drawn down in accordance with the IJC Rule Curve, beginning in early January. The lake reached the required April 1 elevation. However, the lake exceeded the Rule Curve between April 11-14. It reached its annual minimum level as measured at Queens Bay on April 26 and 27 at 1,739.06 ft (530.07 m), approximately three weeks after the historical date. Shortly after, on April 30, the Board declared the commencement of the Spring Rise, the point at which the IJC Rule Curve switches from maximum lake elevation criteria to the lowering formula as stipulated in the IJC Order. Lake levels rose to a maximum of 1,748.52 ft (532.95 m) at Queens Bay on May 23. The lake drafted below elevation 1,743.32 ft (531.364 m) at Nelson on June 25, triggering the end of the high-water period. Grohman Narrows was in control of lake outflows for much of the freshet, with Corra Linn in control only on June 10 and 20. Lake levels stayed near or slightly below historical levels throughout the fall until rising to above normal levels by the end of December. The historic maximum and minimum Queens Bay water levels from FortisBC data are shown on Figure .

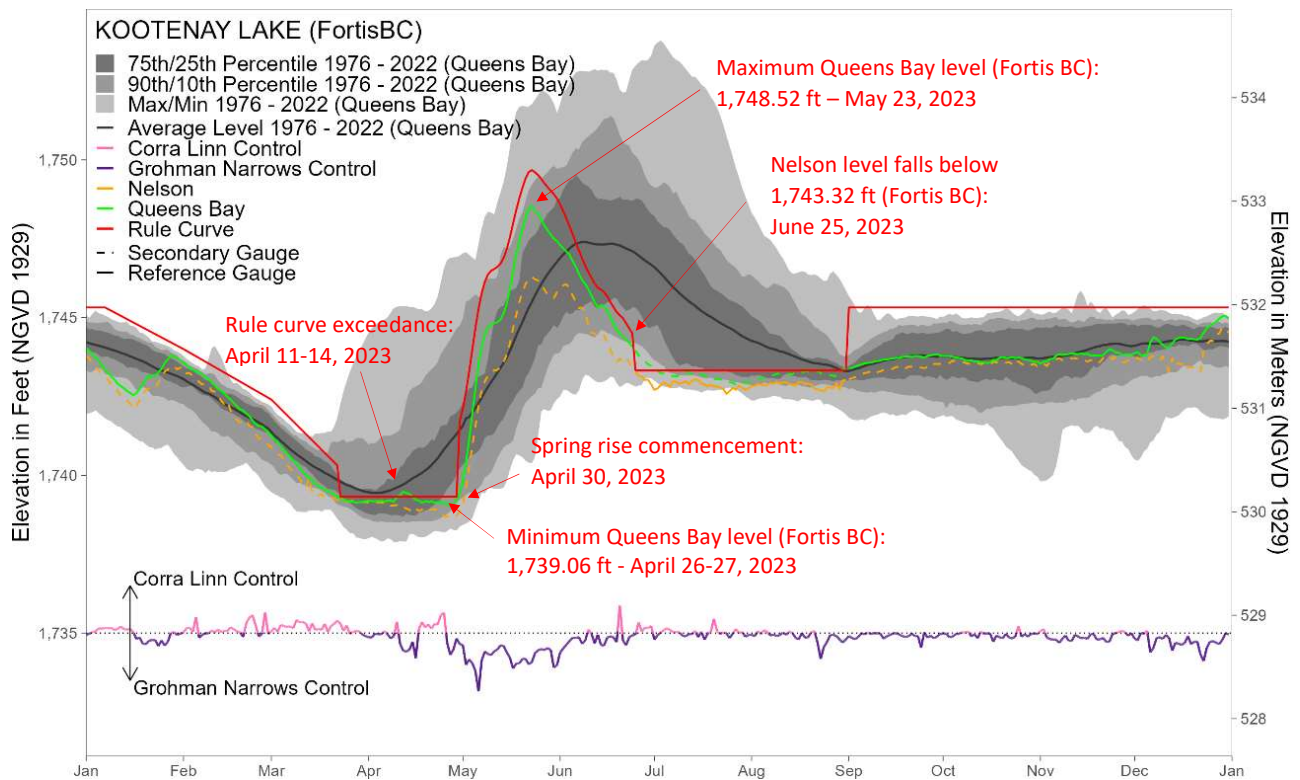


Figure 7. Kootenay Lake at Queens Bay and Nelson 2023 hydrographs (FortisBC), historical maximum/minimum, 90th/10th and 75th/25th percentiles, daily mean, rule curve, key transition dates along with the Corra Linn Dam / Grohman Narrows control balance. When the control line is above the black dotted line (pink), Corra Linn Dam controls the outflow from Kootenay Lake. When the control line is below the black dotted line (purple), this represents lake discharge controlled by Grohman Narrows.



Kootenay Lake daily inflows and outflows for 2023 can be seen in Figure . Daily mean inflows peaked at 84.4 kcfs (2,390 cms) on May 18 while daily mean outflows peaked at 62.7 kcfs (1,775 cms) on May 24. In total, Kootenay Lake took in 14.67 million acre-feet (18.09 km³) and discharged 14.58 million acre-feet (17.98 km³) of water through Corra Linn Dam and the Kootenay Canal Plant. Total annual lake outflow has ranged from a high of 27.4 million acre-feet (33.8 km³) in 1954 to a low of 11.2 million acre-feet km³ (13.8 km³) in 1944.

FortisBC has continued to supply the Board with complete records of the regulation of Kootenay Lake as affected by the operations of Corra Linn Dam and the Kootenay Canal Plant.

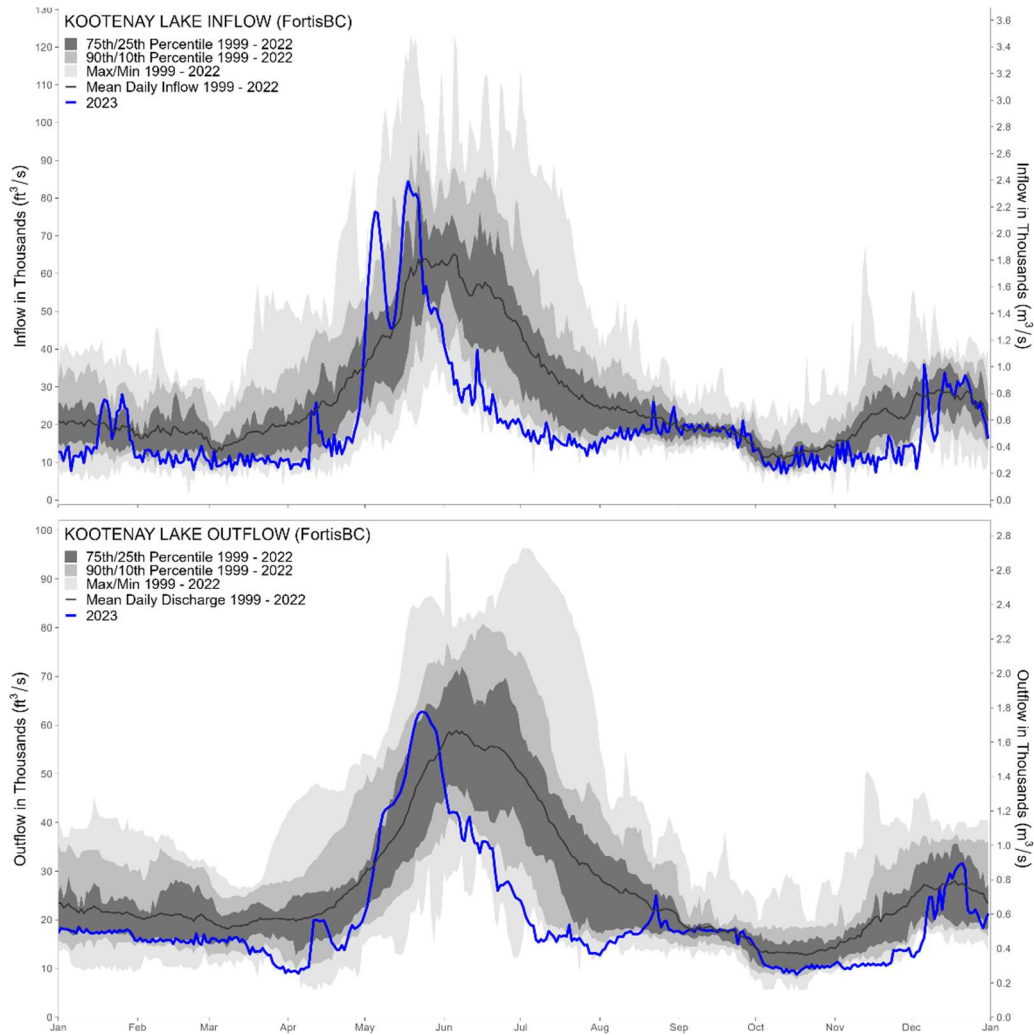


Figure 8. Kootenay Lake 2023 Inflow (top) and Outflow (bottom) hydrographs (FortisBC), historical maximum/minimum, 90th/10th and 75th/25th percentiles, daily mean.



ORDER COMPLIANCE

Kootenay Lake Rule Curve

The Kootenay Lake level at Queens Bay exceeded the rule curve during the drawdown period between April 11-14 by a margin ranging from 0.05 ft (1.5 cm) to 0.16 ft (4.9 cm). Grohman Narrows was in control of lake outflow and Corra Linn Dam was in free fall during this time, indicating that the applicant was in compliance of the Order. At all other times in 2023, the Applicant maintained the lake below the IJC Rule Curve.

Minimum lake level was reached on April 26-27 (1,739.06 ft). Grohman Narrows was controlling outflow from the lake at this time. The Board made the Spring Rise Declaration on April 30, which triggered the rule curve to increase using the lowering formula. Except for June 10 and June 20, Grohman Narrows was in control of lake outflows during the freshet period. Maximum lake level was reached on May 23 (1,748.52 ft).

Applicant Payments

According to the 1938 Order, FortisBC must pay farmers on the Kootenai Flats in Idaho up to \$3,000 (U.S) for additional pumping costs related to dyke/dike seepage from higher water levels during storage periods. FortisBC has a separate agreement with the Kootenai Valley Reclamation Association for an additional pumping cost payment based on actual receipts. A payment of 30,000 USD was issued to Idaho in September 2023 for pumping costs in 2022.

BOARD MEETINGS

Annual Board Meeting

The Annual Board Meeting was held September 19, 2023, from 9:00 am to 3:30 pm (PST). The hybrid meeting was held in-person at the Hume Hotel and Spa's Emporium Boardroom in Nelson, BC and was hosted by the Canadian Section. The virtual component was held over Zoom. Evan Friesenhan (Board Chair, Canadian Section) opened the meeting with welcoming remarks and introductions of the Board Members, IJC Commissioners and guests who attended (physically or virtually). Guests included representatives from Fortis BC, BC Hydro, ECCC, Kootenai Tribe of Idaho, Confederated Salish and Kootenai Tribes, and Global Affairs Canada. Mr. Friesenhan then reviewed the agenda and led a discussion on approval of the Board's summer conference call minutes.

Martin Suchy (Secretary, Canadian Section) reviewed the Applicant's IJC Rule Curve compliance and provided a 2022-2023 hydrology year-in-review. Shannon Price (representing the applicant, Fortis BC) presented on Corra Linn Dam operations, and Gillian Kong (BC Hydro) presented on BC Hydro Kootenay Lake and Duncan Dam operations. Sonja Michelsen (Secretary, U.S. Section) then finished the hydrologic conditions section by presenting on the USACE Libby Dam Operations.

The Board discussed concerns surrounding the alleged Fisheries Act offences related to regulation of Kootenay Lake and the news articles that had been recently published addressing the elevated selenium concentrations in the Elk River Valley from coal mining operations.



International Kootenay Lake Board of Control

Bruce Davison (Guest, ECCC) gave a presentation on his experience with the IJC Souris River Study Board Climate Change Study.

After a round table and lunch break, the Board discussed several business items including public correspondences, First Nation and Tribe engagement, Board expansion, the climate change vulnerability assessment, the IJC's International Watershed Board initiative, the communications plan and updating the workplan.

Annual Public Meeting

The Annual Public Meeting was held in-person at the Nelson Center of Commerce Visitors Information Center on September 19, from 6:30 to 8:00 pm (PST). The meeting was attended by 34 public attendees (12 in-person and 22 virtual attendees). Mr. Friesenhan provided introductions and welcoming remarks, and then proceeded to give an overview of the International Joint Commission framework, responsibilities, and composition. He described the duties of the Kootenay Board, outlined the history of the Kootenay Lake Order of Approval, and referenced the geographic area of the Kootenay Basin. Mr. Friesenhan detailed the main provisions of the Order, including the historical dredging of Grohman Narrows, and explained the significance of Grohman Narrows control on Kootenay Lake levels vs. Corra Linn Dam control, which reduced peak lake levels on Kootenay Lake. Mr. Friesenhan also described the repayment of additional pumping costs to farmers in Idaho.

The Canadian Secretary reviewed the Applicants IJC rule curve compliance and provided a 2022-2023 hydrology year-in-review. The U.S. Secretary detailed the Libby and Duncan Dam operations.

Mr. Friesenhan then led the meeting in a discussion of the Board's activities throughout 2023. The Board took questions from the audience, covering a wide range of public and Kootenay Lake stakeholder concerns and interests. All questions and the Board responses are summarized in the minutes of the public meeting, which have been posted to the Board's website following approval by the board.

Field Tour

The board took a field trip on September 20, 2023 involving three stops along Kootenay Lake. Stop 1 was to the Nelson hydrometric gauge operated by Fortis BC, which is used for Rule Curve compliance monitoring from the time the lake level drops below 1743.32 ft until Sept 1. Stop 2 was a viewpoint Grohman Narrows approximately 6 km west of Nelson on Hwy 3A. Stop 3 was a tour of Corra Linn Dam, which included the forebay and tail race hydrometric gauges, the spillway gates and power house. Figure 9 shows the IKLBC board and guests standing on the right bank near the dam tail race.



Figure 9. IKLBC Annual Board meeting field trip to Corra Linn Dam on September 20, 2023.

IJC Semi-Annual Appearances

The board presented a progress report during the spring IJC semi-annual meeting on April 24, 2023, in Washington DC. U.S. co-chair Col. Alexander Bullock, Canadian Co-Chair Evan Friesenhan, US Section Secretary Sonja Michelsen, and Canadian Section Secretary Martin Suchy attended in person, while others attended the appearance virtually. The presentation focused on hydrologic conditions as well as core and complementary responsibilities related to the Order. Complementary responsibilities were summarized including the Order review, Climate Change Vulnerability Assessment, Board Expansion, the Kootenay Lake Visualization tool, and the Pilot IWB Scoping Study. Additional focus was placed on the Board's public engagement activities, which included public meetings and news releases.

A similar presentation was made on October 16 for the fall IJC semi-annual meeting in Ottawa. The fall presentation was delivered in-person by the Canadian co-chair Evan Friesenhan, with support in-person from Canadian section secretary Martin Suchy, and US Section Secretary Sonja Michelsen and virtually by the other board members.



Semi-Annual Conference Calls

The April 17 conference call included a review of current hydrologic condition, an update on the climate change vulnerability project, and a discussion on the pilot-International Watershed Board (IWB) scoping initiative. Next board expansion and indigenous engagement were discussed, an update was given on the Kootenay Lake Visualization tool, and the board discussed upcoming appearances and the annual board and public meetings.

For the climate change project, the IJC suggesting an alternative matrix approach and that Dr. Casey Brown at the University of Massachusetts perform the work with the help of a Canadian collaborators. The board thought additional information on an alternative approach would be prudent prior to approving the new scope. Next, US Commissioner Lance Yohe gave an overview of the roles and responsibilities of an IJC IWB and explained the rationale behind the IJC's desire for the IKLBC to transition into an watershed board. The board recognized the need for a holistic approach but had questions as to the desire from those within the watershed and where the resources and funding for it would come from among other concerns.

The board was updated on the ongoing communications surrounding the Board's expansion. The Kootenai Tribe of Idaho recommended Shawn Young sit as an observer, not a Board member. In Canada no formal responses had been received at that point. The Board was also given an overview of the functionality of the Kootenay Lake Visualization Tool, and informed how the public will be given access.

The June 8 conference included a hydrologic condition review, finalizing the Board's recommended timeline for the Pilot Watershed Board scoping, review of the Climate Change Vulnerability Assessment scope of work and contracting process, discussion of board outreach and expansion, communication plan development, and review of the annual in-person public meetings.

The Board reiterated support for the IWB scoping effort but recommended waiting until completion of other initiatives. Following the June Board meeting, a letter was sent to the IJC stating this recommendation.

The Climate Change Assessment was still being scoped by the Board and the IJC, pending additional review. The Board supported moving ahead with a two phase approach and contracting with Dr. Casey Brown from University of Massachusetts Amhurst and the Canadian National Research Council. The IJC was coordinating the contracting for this project.

Regarding Board expansion, the Board continued to prioritize Indigenous engagement first. The Tribes on the US side had been in communication with the Board, but the First Nations located in Canada had not responded at this time. The Board decided to continue reaching out to the First Nations and wait to contact non-indigenous groups about Board involvement until a later point.

Work Plan

The Board updated the IKLBC Work Plan at the Annual Board meeting in September 2023, to reflect the priorities leading into 2024. Priorities through 2024 were updated to reflect completed items, prioritize, and edit existing items, add new items, and change language when required.



The visualization tool was removed from the Work Plan since it was completed in 2023 and the news release push notification was marked as complete. Items kept included the Communications Plan development, the Order Review, the Climate Change Vulnerability Assessment, and the Board Expansion initiative, which includes First Nations and Tribal engagement.

Public Communications

Correspondences

The Board received one email correspondence in 2023. The email was sent to the IJC, the Board website was not used. The member of the public asked for a visualization of the rule curve. A reply with a picture taken from the Annual Board meeting presentation was sent in a timely manner.

News Releases

The Board published six news releases throughout 2023 on its IJC website ([News Releases | International Joint Commission \(ijc.org\)](#)) to inform the public and news media about Board activities and hydrologic conditions within the Kootenay Lake basin. The first release, published on May 2, notified the public of the announcement of the Spring Rise for Kootenay Lake and the resulting adoption of the lowering formula for the Kootenay Lake Rule Curve. The second, published on June 7, provided an update on Kootenay Lake levels and snowmelt over the course of the freshet period, as well as the official end of the high-water period. The third, published on July 4, gave notice of historically low flows and that the control point of the Lake's elevation had switched to the Nelson gauge. The fourth, published on July 24, detailed the new Kootenay Lake Visualization tool. The fifth, published on August 16, invited the public to join the Board in-person or virtually at its Annual Public Meeting. The final news release for 2023, published on November 7, gave an update on the fall hydrological conditions and let the public know the control point had returned to Queens Bay on September 1.

Communications Plan

Due to time limitations, the Communication Plan was not discussed during the 2023 annual board meeting. The Board Secretaries had planned to follow up with the edits and updates by email and the Plan is to be put on the Agenda of the next Board meeting.

Special Projects

FortisBC Corra Linn Dam spillway gate replacement

The Board has been tracking the progress of the FortisBC Corra Linn Dam spillway gate replacement project. The scope was to replace all 14 spillway gates, reinforce and paint the hoist superstructure and upgrade various components, with a projected cost of \$66.8 million (CDN). The construction schedule was to be from June 2018 with completion in September 2021; however, the timeline has been extended as a result of delays associated with replacing the concealed components supporting the spillway at certain gates. To date all gates have been completed and have returned to operation. The remaining work onsite includes minor electrical upgrades, installation of a hoist cart enclosure, and defect correction work. Due to procurement issues, some work will extend into 2024.



The project enabled the dam to pass the Probable Maximum Flood, even when gates were under restoration, and has not impacted FortisBC's ability to comply with the Order of Approval.

Recommendations for Order Review and Climate Change Vulnerability Assessment

The 1938 Order has provided an effective means of managing Kootenay Lake for well over eight decades and provides direction for flood-risk reduction, hydropower production and agricultural interests. Some fishery needs have also been met outside of its scope. However, since 1938, significant changes, including the construction of two major upstream dams, flood-risk management actions, ecosystem improvements, etc., have occurred.

On July 29, 2022, the IKLBC sent a letter to the IJC to recommend a review of the 1938 Order, preceded by a climate change assessment. In response, the IJC replied in a letter on November 9, 2022, approving the public release of the Kootenay Information Paper, and approving the commencement of a climate vulnerability study followed by an eventual review of the Order. The IKLBC submitted an IWI proposal in November 2022 to begin scoping the climate change assessment.

In 2023, the Board secretaries and IJC Engineering Advisors developed a statement of work to contract out the project. The Climate Change Vulnerability Assessment has been split into two phases. Phase 1 includes data identification, model framework identification, additional criteria identification, and study plan creation. Phase 2 consists of data collection, modeling work, analysis, and a report. The IJC has begun establishing contracts with both the National Research Council of Canada (NRC) and Dr. Casey Brown of the University of Massachusetts with the intent of kicking off the work in January 2024. The approximate project timeline is 12 months, with Phase 1 being completed by May 2024.

Recommendation to Expand Board Membership

On the June 21, 2022 semi-annual conference call, the Board asked IJC liaisons for ways to best approach potential board expansion and a letter to the Commissioners was suggested. On August 2, 2022, the Board sent a letter to the IJC indicating that the Board wishes to expand the board by one or two members. The Board indicated that should the board expansion recommendation be approved, it would consider factors such as local basin connections, serving the public interest, having unbiased expertise, being well-informed and connected, and having binational viewpoints. The Board would consider Indigenous, municipal/regional governments, non-governmental organizations, and/or members of the public as potential individuals.

On November 9, 2022, the IJC responded with support and encouragement for the addition of local and Indigenous representation on board to better address transboundary water issues, improve communications, enhance diversity and increase engagement with local communities. The IJC approved the board's request with the proviso that the board consider that more than two members may be necessary. The Commission supports the above approach and encourages the Board to work with IJC liaisons as it considers and approaches prospective board members. The IJC recommended that the IKLBC get advice from the Tribes on preferred level of representation (advisory, voting member, non-voting member, etc.), and the board concurred.



In February 2023, the two Board Chairs sent letters to the Tribes and Nations within the Kootenay / Kootenai Basin, offering options of membership and other levels of participation. Some responses were received and there were observers present from the US Tribes at the annual Board meetings in September. The response from the Ktunaxa Nation was received the week prior to the annual Board meeting, and due to limited time, no observers were sent. In the letter sent to the IJC on November 17, 2023, the Board asked for reference and guidance documents to clarify the distinction between observers, members, advisory groups, and representatives, as well as for an IJC Indigenous Advisor to help with future engagements.

The Board secretaries are in the process of creating a list of non-indigenous groups that may show interest in Board membership, but there are no plans to contact until all Tribes and Nations have had an opportunity to express their level of interest and participation.

IWB Scoping

The IJC is looking to initiate scoping for an International Watershed Board in the Kootenay / Kootenai Basin. In 2023 multiple communications regarding the timeline of the IWB Scoping initiative were sent between the IKLBC and the IJC. The Board has expressed that they are interested in starting this process but suggest waiting until the Order Review begins. The IJC is pushing for this initiative to start alongside the board expansion process and Climate Change Vulnerability Assessment. Current plans call for the scoping to be initiated at the Annual Board meeting in Bonners Ferry in May 2024.



APPENDIX A: KEY BASIN VALUES AND STATISTICS IN 2023

A. Kootenay Lake at Queens Bay (FortisBC)

Maximum daily mean elevation	1,748.52 ft (532.95 m)	May 23
Minimum daily mean elevation	1,739.06 ft (530.07 m)	Apr 26-27
Annual mean elevation	1,743.14 ft (531.31 m)	

The annual mean elevation was 99.94 percent of the 94-year (1929-2022) average of 1,744.21ft (531.64 m).

B. Kootenay Lake at Queens Bay (ECCC Station no. 08NH064)

Maximum instantaneous elevation	1748.50 ft (532.94 m)	May 24 03:45
Minimum instantaneous elevation	1,739.00 ft (530.05 m)	Apr 27 14:00
Maximum daily mean elevation	1,748.46 ft (532.93 m)	May 23
Minimum daily mean elevation	1,739.04 ft (530.06m)	Apr 27
Annual mean elevation	1,743.14 ft (531.31 m)	

The annual mean elevation was 99.93 percent of the 91-year (1932-2022) average of 1,744.30 ft (531.66 m).

C. Calculated Kootenay Lake Backwater

Maximum backwater	0.45 ft (0.14 m)	Jun 20
Minimum backwater	-0.93 ft (-0.28 m)	May 6
Annual mean backwater	-0.06 ft (-0.02 m)	

D. Kootenay Lake Inflow (FortisBC)

Maximum inflow	84,400 cfs (2,390 cms)	May 18
Minimum inflow	7,100 cfs (201 cms)	Oct 11 & 13
Annual mean inflow	20,260 cfs (573.7 cms)	
Total annual inflow	14.67 million ac-ft (18.09 km ³)	

The annual mean inflow was 75.5 percent of the 24-year (1999-2022) average of 26,828 cfs (759.7 cms).
The total annual inflow was ranked as the 3rd lowest annual inflow in the previous 25-year (1999-2023) period.

E. Kootenay Lake Outflow (FortisBC)

Maximum outflow	62,700 cfs (1,775 cms)	May 24
Minimum outflow	8,800 cfs (249 cms)	Oct 17
Annual mean outflow	20,132 cfs (570.1 cms)	
Total annual outflow	14.58 million ac-ft (17.98 km ³)	

The annual mean outflow was 75 percent of the 24-year (1999-2022) average of 26,832 cfs (759.8 cms).
The total annual inflow was ranked as the 2nd lowest annual outflow in the previous 25-year (1999-2023) period.



APPENDIX B: 2023 KOOTENAY LAKE RULE CURVE AND ELEVATIONS

	Queens Bay Elevation (ft)	Nelson Elevation (ft)	Rule Curve (ft)	Margin (ft)		Queens Bay Elevation (ft)	Nelson Elevation (ft)	Rule Curve (ft)	Margin (ft)
Jan 1	1744.05	-	1745.32	1.27	Mar 5	1740.81	-	1742.00	1.19
Jan 2	1743.95	-	1745.32	1.37	Mar 6	1740.69	-	1741.90	1.21
Jan 3	1743.81	-	1745.32	1.51	Mar 7	1740.58	-	1741.80	1.22
Jan 4	1743.72	-	1745.32	1.60	Mar 8	1740.47	-	1741.70	1.23
Jan 5	1743.65	-	1745.32	1.67	Mar 9	1740.38	-	1741.61	1.23
Jan 6	1743.47	-	1745.32	1.85	Mar 10	1740.23	-	1741.51	1.28
Jan 7	1743.36	-	1745.32	1.96	Mar 11	1740.11	-	1741.41	1.30
Jan 8	1743.26	-	1745.27	2.01	Mar 12	1739.98	-	1741.31	1.33
Jan 9	1743.13	-	1745.21	2.08	Mar 13	1739.92	-	1741.21	1.29
Jan 10	1743.04	-	1745.16	2.12	Mar 14	1739.84	-	1741.11	1.27
Jan 11	1742.9	-	1745.11	2.21	Mar 15	1739.72	-	1741.01	1.29
Jan 12	1742.83	-	1745.06	2.23	Mar 16	1739.67	-	1740.91	1.24
Jan 13	1742.76	-	1745.00	2.24	Mar 17	1739.59	-	1740.81	1.22
Jan 14	1742.67	-	1744.95	2.28	Mar 18	1739.55	-	1740.71	1.16
Jan 15	1742.61	-	1744.90	2.29	Mar 19	1739.5	-	1740.61	1.11
Jan 16	1742.54	-	1744.84	2.30	Mar 20	1739.44	-	1740.51	1.07
Jan 17	1742.6	-	1744.79	2.19	Mar 21	1739.39	-	1740.41	1.02
Jan 18	1742.73	-	1744.74	2.01	Mar 22	1739.33	-	1740.31	0.98
Jan 19	1742.9	-	1744.69	1.79	Mar 23	1739.26	-	1739.32	0.06
Jan 20	1743.06	-	1744.63	1.57	Mar 24	1739.24	-	1739.32	0.08
Jan 21	1743.16	-	1744.58	1.42	Mar 25	1739.19	-	1739.32	0.13
Jan 22	1743.14	-	1744.53	1.39	Mar 26	1739.17	-	1739.32	0.15
Jan 23	1743.15	-	1744.48	1.33	Mar 27	1739.16	-	1739.32	0.16
Jan 24	1743.26	-	1744.42	1.16	Mar 28	1739.13	-	1739.32	0.19
Jan 25	1743.37	-	1744.37	1.00	Mar 29	1739.15	-	1739.32	0.17
Jan 26	1743.56	-	1744.32	0.76	Mar 30	1739.15	-	1739.32	0.17
Jan 27	1743.68	-	1744.26	0.58	Mar 31	1739.18	-	1739.32	0.14
Jan 28	1743.79	-	1744.21	0.42	Apr 1	1739.2	-	1739.32	0.12
Jan 29	1743.76	-	1744.16	0.40	Apr 2	1739.18	-	1739.32	0.14
Jan 30	1743.73	-	1744.11	0.38	Apr 3	1739.18	-	1739.32	0.14
Jan 31	1743.65	-	1744.05	0.40	Apr 4	1739.18	-	1739.32	0.14
Feb 1	1743.57	-	1744.00	0.43	Apr 5	1739.19	-	1739.32	0.13
Feb 2	1743.49	-	1743.94	0.45	Apr 6	1739.17	-	1739.32	0.15
Feb 3	1743.39	-	1743.89	0.50	Apr 7	1739.19	-	1739.32	0.13
Feb 4	1743.34	-	1743.83	0.49	Apr 8	1739.2	-	1739.32	0.12
Feb 5	1743.3	-	1743.77	0.47	Apr 9	1739.16	-	1739.32	0.16
Feb 6	1743.26	-	1743.71	0.45	Apr 10	1739.32	-	1739.32	0.00
Feb 7	1743.18	-	1743.66	0.48	Apr 11	1739.37	-	1739.32	-0.05
Feb 8	1743.11	-	1743.60	0.49	Apr 12	1739.48	-	1739.32	-0.16
Feb 9	1743.06	-	1743.54	0.48	Apr 13	1739.44	-	1739.32	-0.12
Feb 10	1742.94	-	1743.49	0.55	Apr 14	1739.41	-	1739.32	-0.09
Feb 11	1742.85	-	1743.43	0.58	Apr 15	1739.31	-	1739.32	0.01
Feb 12	1742.74	-	1743.37	0.63	Apr 16	1739.22	-	1739.32	0.10
Feb 13	1742.68	-	1743.31	0.63	Apr 17	1739.2	-	1739.32	0.12
Feb 14	1742.6	-	1743.26	0.66	Apr 18	1739.13	-	1739.32	0.19
Feb 15	1742.48	-	1743.20	0.72	Apr 19	1739.18	-	1739.32	0.14
Feb 16	1742.4	-	1743.14	0.74	Apr 20	1739.15	-	1739.32	0.17
Feb 17	1742.29	-	1743.09	0.80	Apr 21	1739.18	-	1739.32	0.14
Feb 18	1742.19	-	1743.03	0.84	Apr 22	1739.13	-	1739.32	0.19
Feb 19	1742.09	-	1742.97	0.88	Apr 23	1739.13	-	1739.32	0.19
Feb 20	1742.05	-	1742.91	0.86	Apr 24	1739.15	-	1739.32	0.17
Feb 21	1741.96	-	1742.86	0.90	Apr 25	1739.13	-	1739.32	0.19
Feb 22	1741.87	-	1742.80	0.93	Apr 26	1739.06	-	1739.32	0.26
Feb 23	1741.74	-	1742.74	1.00	Apr 27	1739.06	-	1739.32	0.26
Feb 24	1741.62	-	1742.69	1.07	Apr 28	1739.1	-	1739.32	0.22
Feb 25	1741.56	-	1742.63	1.07	Apr 29	1739.2	-	1739.32	0.12
Feb 26	1741.55	-	1742.57	1.02	Apr 30	1739.42	-	1741.72	2.30
Feb 27	1741.45	-	1742.51	1.06	May 1	1739.82	-	1742.11	2.29
Feb 28	1741.36	-	1742.46	1.10	May 2	1740.42	-	1742.65	2.23
Mar 1	1741.27	-	1742.40	1.13	May 3	1741.13	-	1743.28	2.15
Mar 2	1741.12	-	1742.30	1.18	May 4	1741.94	-	1743.97	2.03
Mar 3	1741.06	-	1742.20	1.14	May 5	1742.75	-	1744.67	1.92
Mar 4	1740.93	-	1742.10	1.17	May 6	1743.51	-	1745.28	1.77



International Kootenay Lake Board of Control

	Queens Bay Elevation (ft)	Nelson Elevation (ft)	Rule Curve (ft)	Margin (ft)		Queens Bay Elevation (ft)	Nelson Elevation (ft)	Rule Curve (ft)	Margin (ft)
May 7	1744.07	-	1745.78	1.71	Jul 9	-	1742.9	1743.32	0.42
May 8	1744.47	-	1746.13	1.66	Jul 10	-	1742.93	1743.32	0.39
May 9	1744.69	-	1746.36	1.67	Jul 11	-	1742.98	1743.32	0.34
May 10	1744.78	-	1746.48	1.70	Jul 12	-	1742.89	1743.32	0.43
May 11	1744.82	-	1746.54	1.72	Jul 13	-	1743	1743.32	0.32
May 12	1744.85	-	1746.61	1.76	Jul 14	-	1743.03	1743.32	0.29
May 13	1744.94	-	1746.71	1.77	Jul 15	-	1743.03	1743.32	0.29
May 14	1745.14	-	1746.89	1.75	Jul 16	-	1742.89	1743.32	0.43
May 15	1745.44	-	1747.17	1.73	Jul 17	-	1742.88	1743.32	0.44
May 16	1745.9	-	1747.54	1.64	Jul 18	-	1742.81	1743.32	0.51
May 17	1746.45	-	1747.98	1.53	Jul 19	-	1742.88	1743.32	0.44
May 18	1746.99	-	1748.40	1.41	Jul 20	-	1742.81	1743.32	0.51
May 19	1747.44	-	1748.78	1.34	Jul 21	-	1742.82	1743.32	0.50
May 20	1747.82	-	1749.12	1.30	Jul 22	-	1742.78	1743.32	0.54
May 21	1748.17	-	1749.41	1.24	Jul 23	-	1742.73	1743.32	0.59
May 22	1748.47	-	1749.61	1.14	Jul 24	-	1742.58	1743.32	0.74
May 23	1748.52	-	1749.68	1.16	Jul 25	-	1742.67	1743.32	0.65
May 24	1748.38	-	1749.60	1.22	Jul 26	-	1742.77	1743.32	0.55
May 25	1748.28	-	1749.51	1.23	Jul 27	-	1742.71	1743.32	0.61
May 26	1748.11	-	1749.39	1.28	Jul 28	-	1742.84	1743.32	0.48
May 27	1747.92	-	1749.25	1.33	Jul 29	-	1742.77	1743.32	0.55
May 28	1747.77	-	1749.13	1.36	Jul 30	-	1742.71	1743.32	0.61
May 29	1747.63	-	1749.02	1.39	Jul 31	-	1742.76	1743.32	0.56
May 30	1747.5	-	1748.91	1.41	Aug 1	-	1742.82	1743.32	0.50
May 31	1747.42	-	1748.77	1.35	Aug 2	-	1742.84	1743.32	0.48
Jun 1	1747.3	-	1748.59	1.29	Aug 3	-	1742.89	1743.32	0.43
Jun 2	1747.19	-	1748.37	1.18	Aug 4	-	1742.88	1743.32	0.44
Jun 3	1747.09	-	1748.14	1.05	Aug 5	-	1742.84	1743.32	0.48
Jun 4	1746.99	-	1747.89	0.90	Aug 6	-	1742.87	1743.32	0.45
Jun 5	1746.79	-	1747.64	0.85	Aug 7	-	1742.92	1743.32	0.40
Jun 6	1746.61	-	1747.37	0.76	Aug 8	-	1742.9	1743.32	0.42
Jun 7	1746.38	-	1747.12	0.74	Aug 9	-	1742.97	1743.32	0.35
Jun 8	1746.19	-	1746.87	0.68	Aug 10	-	1742.9	1743.32	0.42
Jun 9	1746.07	-	1746.64	0.57	Aug 11	-	1742.95	1743.32	0.37
Jun 10	1745.89	-	1746.43	0.54	Aug 12	-	1742.94	1743.32	0.38
Jun 11	1745.7	-	1746.25	0.55	Aug 13	-	1742.9	1743.32	0.42
Jun 12	1745.48	-	1746.08	0.60	Aug 14	-	1742.87	1743.32	0.45
Jun 13	1745.32	-	1745.94	0.62	Aug 15	-	1742.83	1743.32	0.49
Jun 14	1745.39	-	1745.89	0.50	Aug 16	-	1742.96	1743.32	0.36
Jun 15	1745.34	-	1745.81	0.47	Aug 17	-	1742.96	1743.32	0.36
Jun 16	1745.23	-	1745.67	0.44	Aug 18	-	1742.89	1743.32	0.43
Jun 17	1745.01	-	1745.49	0.48	Aug 19	-	1742.91	1743.32	0.41
Jun 18	1744.81	-	1745.33	0.52	Aug 20	-	1742.88	1743.32	0.44
Jun 19	1744.6	-	1745.18	0.58	Aug 21	-	1742.75	1743.32	0.57
Jun 20	1744.48	-	1745.07	0.59	Aug 22	-	1742.73	1743.32	0.59
Jun 21	1744.4	-	1744.98	0.58	Aug 23	-	1742.69	1743.32	0.63
Jun 22	1744.3	-	1744.82	0.52	Aug 24	-	1742.65	1743.32	0.67
Jun 23	1744.2	-	1744.66	0.46	Aug 25	-	1742.79	1743.32	0.53
Jun 24	1744.08	-	1744.50	0.42	Aug 26	-	1742.78	1743.32	0.54
Jun 25	-	1743.27	1743.32	0.05	Aug 27	-	1742.76	1743.32	0.56
Jun 26	-	1743.14	1743.32	0.18	Aug 28	-	1742.92	1743.32	0.40
Jun 27	-	1743.14	1743.32	0.18	Aug 29	-	1742.72	1743.32	0.60
Jun 28	-	1743.02	1743.32	0.30	Aug 30	-	1743	1743.32	0.32
Jun 29	-	1743.03	1743.32	0.29	Aug 31	-	1743.03	1743.32	2.29
Jun 30	-	1742.88	1743.32	0.44	Sept 1	1743.4	-	1745.32	1.92
Jul 1	-	1742.71	1743.32	0.61	Sept 2	1743.4	-	1745.32	1.92
Jul 2	-	1742.75	1743.32	0.57	Sept 3	1743.45	-	1745.32	1.87
Jul 3	-	1742.85	1743.32	0.47	Sept 4	1743.49	-	1745.32	1.83
Jul 4	-	1742.93	1743.32	0.39	Sept 5	1743.51	-	1745.32	1.81
Jul 5	-	1742.9	1743.32	0.42	Sept 6	1743.55	-	1745.32	1.77
Jul 6	-	1742.8	1743.32	0.52	Sept 7	1743.56	-	1745.32	1.76
Jul 7	-	1742.98	1743.32	0.34	Sept 8	1743.57	-	1745.32	1.75
Jul 8	-	1742.96	1743.32	0.36	Sept 9	1743.6	-	1745.32	1.72



	Queens Bay Elevation (ft)	Nelson Elevation (ft)	Rule Curve (ft)	Margin (ft)		Queens Bay Elevation (ft)	Nelson Elevation (ft)	Rule Curve (ft)	Margin (ft)
Sept 10	1743.62	-	1745.32	1.70	Nov 7	1743.84	-	1745.32	1.48
Sept 11	1743.63	-	1745.32	1.69	Nov 8	1743.81	-	1745.32	1.51
Sept 12	1743.67	-	1745.32	1.65	Nov 9	1743.83	-	1745.32	1.49
Sept 13	1743.67	-	1745.32	1.65	Nov 10	1743.84	-	1745.32	1.48
Sept 14	1743.69	-	1745.32	1.63	Nov 11	1743.87	-	1745.32	1.45
Sept 15	1743.7	-	1745.32	1.62	Nov 12	1743.85	-	1745.32	1.47
Sept 16	1743.72	-	1745.32	1.60	Nov 13	1743.84	-	1745.32	1.48
Sept 17	1743.72	-	1745.32	1.60	Nov 14	1743.86	-	1745.32	1.46
Sept 18	1743.75	-	1745.32	1.57	Nov 15	1743.84	-	1745.32	1.48
Sept 19	1743.77	-	1745.32	1.55	Nov 16	1743.85	-	1745.32	1.47
Sept 20	1743.77	-	1745.32	1.55	Nov 17	1743.79	-	1745.32	1.53
Sept 21	1743.75	-	1745.32	1.57	Nov 18	1743.8	-	1745.32	1.52
Sept 22	1743.78	-	1745.32	1.54	Nov 19	1743.8	-	1745.32	1.52
Sept 23	1743.78	-	1745.32	1.54	Nov 20	1743.8	-	1745.32	1.52
Sept 24	1743.76	-	1745.32	1.56	Nov 21	1743.81	-	1745.32	1.51
Sept 25	1743.73	-	1745.32	1.59	Nov 22	1743.92	-	1745.32	1.40
Sept 26	1743.79	-	1745.32	1.53	Nov 23	1744	-	1745.32	1.32
Sept 27	1743.8	-	1745.32	1.52	Nov 24	1743.96	-	1745.32	1.36
Sept 28	1743.82	-	1745.32	1.50	Nov 25	1743.89	-	1745.32	1.43
Sept 29	1743.84	-	1745.32	1.48	Nov 26	1743.89	-	1745.32	1.43
Sept 30	1743.8	-	1745.32	1.52	Nov 27	1743.81	-	1745.32	1.51
Oct 1	1743.78	-	1745.32	1.54	Nov 28	1743.82	-	1745.32	1.50
Oct 2	1743.78	-	1745.32	1.54	Nov 29	1743.83	-	1745.32	1.49
Oct 3	1743.78	-	1745.32	1.54	Nov 30	1743.83	-	1745.32	1.49
Oct 4	1743.76	-	1745.32	1.56	Dec 1	1743.87	-	1745.32	1.45
Oct 5	1743.73	-	1745.32	1.59	Dec 2	1743.9	-	1745.32	1.42
Oct 6	1743.72	-	1745.32	1.60	Dec 3	1743.81	-	1745.32	1.51
Oct 7	1743.7	-	1745.32	1.62	Dec 4	1743.79	-	1745.32	1.53
Oct 8	1743.66	-	1745.32	1.66	Dec 5	1743.85	-	1745.32	1.47
Oct 9	1743.63	-	1745.32	1.69	Dec 6	1744.2	-	1745.32	1.12
Oct 10	1743.65	-	1745.32	1.67	Dec 7	1744.37	-	1745.32	0.95
Oct 11	1743.6	-	1745.32	1.72	Dec 8	1744.33	-	1745.32	0.99
Oct 12	1743.62	-	1745.32	1.70	Dec 9	1744.22	-	1745.32	1.10
Oct 13	1743.57	-	1745.32	1.75	Dec 10	1744.14	-	1745.32	1.18
Oct 14	1743.57	-	1745.32	1.75	Dec 11	1744.06	-	1745.32	1.26
Oct 15	1743.56	-	1745.32	1.76	Dec 12	1744.06	-	1745.32	1.26
Oct 16	1743.57	-	1745.32	1.75	Dec 13	1744.18	-	1745.32	1.14
Oct 17	1743.66	-	1745.32	1.66	Dec 14	1744.31	-	1745.32	1.01
Oct 18	1743.65	-	1745.32	1.67	Dec 15	1744.35	-	1745.32	0.97
Oct 19	1743.73	-	1745.32	1.59	Dec 16	1744.37	-	1745.32	0.95
Oct 20	1743.75	-	1745.32	1.57	Dec 17	1744.36	-	1745.32	0.96
Oct 21	1743.72	-	1745.32	1.60	Dec 18	1744.32	-	1745.32	1.00
Oct 22	1743.72	-	1745.32	1.60	Dec 19	1744.33	-	1745.32	0.99
Oct 23	1743.75	-	1745.32	1.57	Dec 20	1744.31	-	1745.32	1.01
Oct 24	1743.71	-	1745.32	1.61	Dec 21	1744.3	-	1745.32	1.02
Oct 25	1743.73	-	1745.32	1.59	Dec 22	1744.35	-	1745.32	0.97
Oct 26	1743.71	-	1745.32	1.61	Dec 23	1744.52	-	1745.32	0.80
Oct 27	1743.67	-	1745.32	1.65	Dec 24	1744.66	-	1745.32	0.66
Oct 28	1743.66	-	1745.32	1.66	Dec 25	1744.73	-	1745.32	0.59
Oct 29	1743.63	-	1745.32	1.69	Dec 26	1744.8	-	1745.32	0.52
Oct 30	1743.59	-	1745.32	1.73	Dec 27	1744.86	-	1745.32	0.46
Oct 31	1743.6	-	1745.32	1.72	Dec 28	1744.97	-	1745.32	0.35
Nov 1	1743.54	-	1745.32	1.78	Dec 29	1745.04	-	1745.32	0.28
Nov 2	1743.6	-	1745.32	1.72	Dec 30	1745.05	-	1745.32	0.27
Nov 3	1743.6	-	1745.32	1.72	Dec 31	1744.96	-	1745.32	0.36
Nov 4	1743.69	-	1745.32	1.63					
Nov 5	1743.69	-	1745.32	1.63					
Nov 6	1743.79	-	1745.32	1.53					