International Kootenay Lake Board of Control

2014 Annual Report to the International Joint Commission

Photograph shows a natural channel constriction on the Kootenay River known as Grohman Narows, located upstream of the Corra Linn dam. Grohman Narrows acts as a natural constraint on outflow from Kootenay Lake as was excavated in the 1930's as part of the original Cora Linn Dam construction project. BCHydro is currently studying the feasibility of additional excavation to improve channel capacity.

The Board, Secretaries and attendees from IJC met with representatives from the Kootenai Valley Reclamation Association (KVRA) the morning of October 30th, 2014 to learn about the KVRA, the current agricultural and water management issues, discuss their history relative to the 1938 IJC Order on Kootenay Lake, and to tour a levee/dyking district. The Kootenai Flats area is a broad flat valley that extends from just upstream of Bonners Ferry approximately 48 kilometers (30 miles) downstream to the Canadian border with approximately 170 kilometers (100 miles) of levees in 18 non-federal districts plus the federal Kootenai National Wildlife Refuge. The levees protect 13,960 hectares (34,500 acres) of mostly agricultural land in the United States. Similarly, the valley and levee system extends approximately 45 kilometers (27 miles) to Kootenay Lake in Canada.

The extensive levee system, completed the first half of the 20th century, was designed to protect the City of Bonners Ferry and agricultural land primarily from spring/summer snowmelt Kootenai River floods . The KVRA was organized in the early 1920's when Corra Linn project was first proposed. The first mission of KVRA was to represent farmers and levee/dyking districts in development of the 1938 Order. Several provisions of the Order recognize the need achieve a balance between agricultural needs, flood risk reduction, and power generation. The Order rule curve benefits agriculture by requiring lowering of Kootenay Lake in the spring and limiting lake levels through the spring, summer, and early fall periods of maximum agricultural activity. These provisions mitigate for increased pumping required to evacuate interior runoff and ground water from behind levees. Additionally, FortisBC (owner/operator of Corra Linn Dam and Applicant to the IJC Order) is required to compensate U.S. levee/dyking districts for increased pumping costs. The flow regime of the Kootenay River has changed since Libby Dam became operational in 1972 under the Columbia River Treaty. Libby Dam is a major storage project located upstream of Kootenay Flats, providing flood risk management benefits in addition to power production, but with significant changes to the annual flow regime of the Kootenai River downstream of the dam. The effects of operation of Corra Linn project in accord with the 1938 IJC Order were discussed in some detail with representatives of KVRA. Representatives of KVRA led a tour of Diking District 1, allowing members to view the Kootenai Valley, see some of the fields protected by the IJC Order and, ask questions about crop timing and Kootenai River elevations that impact pumping requirements and the planting and harvesting of crops.

Photograph shows the Kootenai Valley (Kootenai Flats) area with levees and agricultual land on both sides of the Kootenai River. Drainage canal in the foreground leads to a pumping station where groundwater and interior runoff can be pumped in to the the Kootenai River.

2014 Annual Report

This Annual Report covers the operations of Corra Linn Dam by the Applicant to the IJC Order (FortisBC) and the associated effects on the water level of Kootenay Lake. FortisBC operates Corra Linn Dam on the Kootenay River approximately 22 kilometers upstream from its confluence with the Columbia River, and downstream from the West Arm of Kootenay Lake. FortisBC controls discharge through and around Corra Linn Dam in accordance with requirements of the Order of the International Joint Commission dated November 11, 1938. FortisBC co-operates with BC Hydro, which also manages a hydro-electric generating facility (the Kootenay Canal Project) which is hydraulically connected to the Corra Linn forebay on the Kootenay River through a constructed canal.

Kootenay Lake 2014 Summary

Throughout 2014, FortisBC operated Corra Linn Dam in a manner consistent with that prescribed by the 1938 Kootenay Lake Order.

The minimum instantaneous water level was observed at 16:01 PST on March 25, 2014 at elevation 530.30 metres[1] (1739.83 feet). The Lake elevation did not reach the low elevation goal of 1739.32 feet due to high lake inflow beyond the control of the Applicant, so there was no Order violation.

The Board and the Applicant jointly determined the date of the commencement of the spring rise as April 15, 2014. The maximum instantaneous water level for the lake at Queens Bay was subsequently observed at 22:01 PST on May 27, 2014 at elevation 533.508 metres (1750.35 feet). Kootenay Lake discharged 26.5 cubic kilometres (21.5 million acre-feet) of water in 2014, with an average flow of 841 cubic metres per second (29,700 cubic feet per second).

[1] All elevations are referred to G.S.C. 1928 datum.

Board Membership

The Board members during 2013 were as follows:

For the United States,

Col Bruce Estok, District Engineer, Seattle District, through July 17, 2014
Colonel John Buck, District Engineer, Seattle District, July 18, 2014-
United States Army, Corps of Engineers, Seattle, Washington;
Mr. Michael Lewis, Director, Idaho Water Science Center,
United States Geological Survey, Boise, Idaho;

and for Canada,

Mr. Bruno Tassone, Manager (retired), Water Survey
Environment Canada, Vancouver, British Columbia

Mr. Glen Davidson, Director, Water Management Branch,
BC Ministry of Natural Resource Operations, Victoria, British Columbia.

Board Secretariat,

Ms. Amy Reese and Mr. Gwyn Graham provided secretariat support to the US and Canadian sections, respectively.

Photograph: Mr. Joe Figgins (near center in brown jacket) guides the tour of a Kootenai Flats dyking district. Participants, Lt to Rt.: Bruno Tassone, Kootenay Board Chair, Canada; Michael Lewis, Kootenay Board Member, U.S.; Bob Olson, KVRA; Joe Figgins, KVRA; Rich Moy, IJC Commissioner, U.S.; Gordon Walker, IJC Commissioner, Chair, Canada; Mark Gabriel, IJC Engineering Advisor, U.S.; Gwyn Graham, Kootenay Board Secretary, Canada; Col John Buck, Kootenay Board Chair, U.S.; Glen Davidson, Kootenay Board Member, Canada.

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*

Lake Regulation

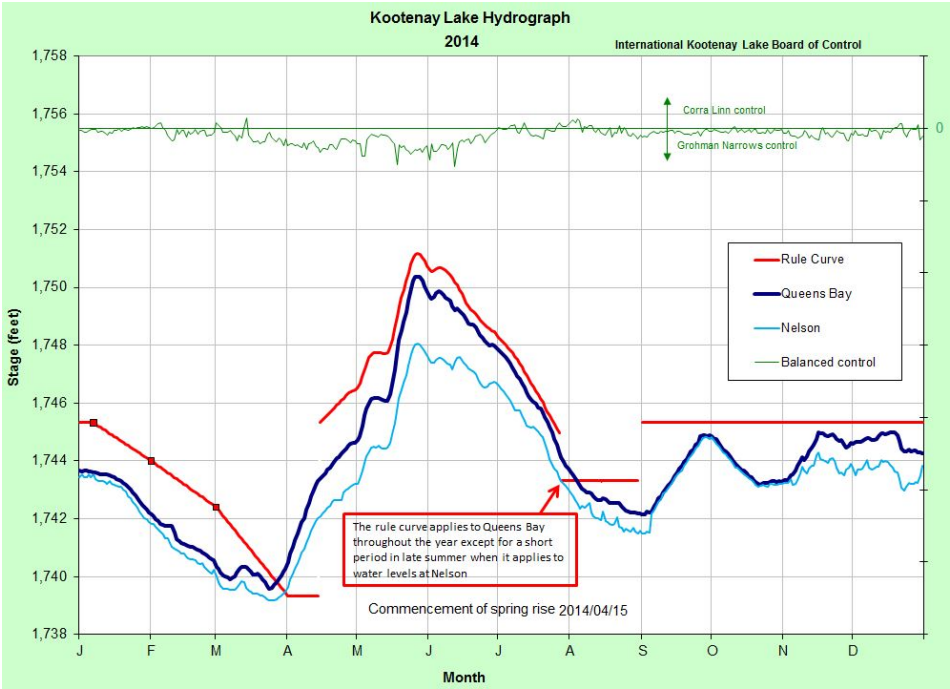
Figure 1 presents observed calendar-year 2014 water levels on Kootenay Lake and the elevations specified in the November 11, 1938 IJC Order. Water levels on Kootenay Lake showed a single distinct freshet peak corresponding to increased inflows from snow-melt in this mountainous watershed. Water levels on Kootenay Lake began to rise at the end of March due to increased inflow from upstream Libby Dam (drafting of Lake Koocanusa) ahead of a clear freshet signal throughout the watershed, hence the apparent delay between the spring rise declaration and the onset of water level rise on Kootenay Lake. Following recession of the freshet peak, Corra Linn dam operations began raising the water level in Kootenay Lake towards the maximum allowable storage elevation through the month

of September. The water levels declined from October to November due to maintenance work at the BCHydro Kootenay Canal dam which normally draws from the Corra Linn dam forebay but required temporary isolation during this time. This resulted in an increase to the Kootenay River discharge through Corra Linn dam and associated decline in Kootenay Lake levels which recovered to the seasonal storage level in November once work on the Kootenay Canal Plant was completed.

The maximum instantaneous water level of 533.508 metres (1750.35 feet) for the lake at Queens Bay was reached on May 27, 2014 at 22:01 PST. The minimum instantaneous water level was observed on March 25, 2014 at 16:01 PST, elevation 530.30 metres (1739.83 feet). Relative to the 84-year period of record (1931 to 2014, with two years missing; 1934 and 1947), this year's maximum water level ranked 46th highest, and the minimum was the 69th lowest annual minimum. Over the period of record, water levels in the lake have ranged from a high of 537.04 metres (1761.95 feet) in 1961 to a low of 529.56 metres (1737.41 feet) in 1944.

Kootenay Lake discharged 26.5 cubic kilometres (21.5 million acre-feet) of water this year through Corra Linn Dam and the Kootenay Canal Plant with an average flow of 841 m^3/s (29,700 cfs). Relative to the 77 years of available discharge data, the annual volume of flow out of the lake was 30th highest over this period of record. Total lake outflow has ranged from a high of 33.8 km^3 (27.4 million acre-feet) in 1954 to a low of 13.8 km^3 (11.2 million acre-feet) in 1944. The maximum daily mean outflow was 2,084 m^3/s (73,600 cfs) on May 28, 2014. The minimum was 323 m^3/s (11,400 cfs) on November 1, 2014.

Figure 1



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. FortisBC attempts to

operate the lake within the optimal range of 1738.5 ft to 1749.5 ft, subject to the stipulations of the IJC Order.

In March 2011, Board members received information on a Columbia River Treaty Operating Committee (CRTOC) decision that Treaty facilities would not be required to reduce releases in the event of Kootenay Lake exceeding the IJC rule curve. This CRTOC decision remains in effect for the two upstream projects, Libby and Duncan Dams. Beginning March 24th and through the date of declaration of spring rise, April 15th, 2014, Libby project drafted water from storage to make reservoir space available for flood risk reduction. This Libby operation forced the lake above the rule curve. The Board determined that the Kootenay Lake outlet control structures were on free-fall during this period. Therefore, the Applicant (FortisBC) was in compliance with the Order and there was no violation of the Order.

In April, the Board received a letter from Mr. Andy Shadrack, a Canadian Director of Regional District Central Kootenay. Mr. Shadrack requested to know if Libby project caused an exceedence of the Order by drafting in late March. Mr. Shadrack was provided a letter response in accord with the information in the paragraph above stating there was no violation of the Order.

The Board and the Applicant jointly determined the commencement of the spring rise to be 16:00 PST on April 15, 2014.

FortisBC undertakes preventative maintenance of its water level recorders twice each year. FortisBC is still working to secure firm land access rights to the Queen's Bay water gauge but in the meantime FortisBC has boat access to this station.

According to the 1938 Order, FortisBC must pay farmers on the Kootenai Flats in Idaho up to $3,000.00 (U.S) for additional pumping costs related to dyke seepage from higher water levels during storage periods. A number of years ago, FortisBC made a separate agreement with the Kootenai Valley Reclamation Association for an additional pumping cost payment based on actual receipts. FortisBC paid the Idaho farmers $32,000 (U.S) in April 2014 to cover 2013 pumping costs.

Board Meetings

The Board held its annual and public meetings in Bonners Ferry, Idaho on October 30, 2014. The minutes were delivered to the Commission prior to the IJC's 2014 fall semi-annual meeting and are available on the IJC's IKLBC website. Board secretaries provided a presentation of hydrologic conditions in 2014, showing FortisBC to be in compliance with the requirements of the IJC Order.

The Board received a presentation from BC Hydro on current feasibility studies regarding channel capacity improvement at Grohman Narrows. BCHydro has initiated studies of the possibility of dredging or other channel improvements at Grohman Narrows. Grohman narrows acts as a hydraulic control of discharge from Kootenay Lake and sometimes precludes reaching the 530.145 meters (1739.32 feet) spring drawdown goal. The hydraulic limitation also controls the maximum lake elevation observed during the freshet in most years. Grohman narrows previously has been excavated in 1890, 1931, and 1939. Preliminary studies by BCHydro indicate that dredging at Grohman Narrows could increase lake drawdown capability and lower the maximum lake elevation, providing flood risk management benefits, in high runoff years. BCHydro's studies are preliminary and more study is required to assess power generation and environmental impacts and to refine economic considerations. BCHydro plans to hold public meetings on the proposal in 2015 and decide if more detailed "Phase 2" studies are warranted.
For the Board's public meeting, an overview of the IJC Order and the related compliance requirements for operation of Corra Linn Dam were provided, as well as a summary of hydrologic conditions in 2014 affecting Kootenay Lake levels, including upstream operations at Duncan and Libby Dams (CRT operations). The Kootenay Lake hydrograph along with explanation of the Libby effect showed that Corra Linn Dam was in compliance with the IJC rule curve in 2014.

The public meeting was attended by approximately 15 local residents. Most of the questions related to lake levels and backwater effects in areas upstream of Kootenay Lake relative to observed runoff, runoff forecasts, and operation of upstream dams (Libby and Duncan). Additional discussion centered on BCHydro's preliminary studies of dredging at Grohman Narrows.

In August FortisBC and BCHydro cooperated to facilitate dewatering of BCHydro's diversion canal and the Canal power plant for repairs and maintenance. During most of the September through October period, water that ordinarily would pass down the diversion canal was passed through Corra Linn dam and also required FortisBC to maintain a lower forebay elevation at Corra Linn during this time.

Following inspection of Corra Linn dam spill gates in 2012, FortisBC submitted a detailed engineering project request to the British Columbia Utilities Commission (BECU) for an access, isolation, and seismic stability upgrade of the entire spillway. FortisBC anticipates BECU approval in 2016 and for rehabilitation of spillways to begin in 2017.

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