Site C Downstream Flow and Ice Monitoring and Analysis Plan Annual Report 2024-2025

Site C Clean Energy Project
March 30, 2026

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1.0 Introduction

The Site C Downstream Flow and Ice Monitoring and Analysis Plan ("the Plan") was developed by BC Hydro in consultation with Athabasca Chipewyan First Nation (ACFN) and Mikisew Cree First Nation (MCFN) in accordance with the Site C Settlement Agreement BC Hydro holds with these Nations and Condition 6 of the Federal Decision Statement (FDS), issued to BC Hydro on November 25, 2014. The current version, Revision 2.1 dated July 23, 2024 is available at:

https://www.sitecproject.com/sites/default/files/Site-C-Downstream-Flow-and-Ice-Monitoring-and-Analysis-Plan_0.pdf

The purpose of the Plan is to "analyze the accuracy of predictions made during the environmental assessment on the effects of the Designated Project on downstream water flow, water level and ice (e.g. freeze-up levels, freeze-up and break-up dates and ice thickness)." Specifically, FDS Condition 6 requires BC Hydro to undertake an analysis that includes:

> 6.2.1. assembly of necessary water flow, water levels and ice monitoring data from existing monitoring stations
>
> 6.2.2. comparison of the monitoring data with predictions made during the environmental assessment, including predicted effects from climate change, to assess the accuracy of those predictions

Construction of the Site C Project (the "Project") is now complete and all six generating units are operational. In accordance with FDS Condition 6, this report provides an annual update on the implementation of the Plan.

2.0 Annual Reporting Scope

As described in the Plan, the relative operational effects of the Project on downstream flows described in the Environmental Impact Statement (EIS) assumed that all six generating units at Site C had been installed and commissioned. Until at least five units of the generating station were operational in May 2025, annual reporting was to include downstream flow and ice data for information purposes only; however, this annual reporting compares downstream flow, water level and ice data collected during the 2024-2025 water year, covering October 1, 2024 (the month of commissioning of the first of six generating units) to September 30, 2025.

An analysis of each parameter was performed by comparison against predicted data and in some cases by using the appropriate statistical test to result in three possible outcomes:

1) inside the expected range
2) outside the expected range
3) inconclusive (if statistically insignificant due to not enough years of data).

Additional analysis and reporting on the accuracy of results on the effects of the Project on the ice regime will occur after more years of data have been collected. These additional reports will be provided on 5-, 10-, 15, and 20-year intervals with the first report submitted by March 31, 2030. Findings from the annual reports will support any necessary amendments to the collection or analysis of data if necessary. For the surface water regime, if flow and water level duration curves show substantial differences from information submitted in the EIS, additional analysis and reporting on the accuracy of results on the effects of the Project will be performed for hourly wetted width and average cross-sectional velocities. These additional reports will be provided after 10 and 20 years of operation, if required.

3.0 Site C Project Update

3.1 Reservoir Filling

Reservoir filling for the Project began on August 25, 2024, and was completed on November 7, 2024. The timing was strategically chosen to minimize tributary inflow risks, accommodate environmental and construction constraints, and support downstream ice control requirements.

Reservoir filling was conducted in three controlled stages over approximately 11 weeks, following hydraulic modifications to Diversion Tunnel 2. These modifications included the installation of orifice rings to regulate flow. Throughout the filling process, outflows were maintained above 390 m^3/s, in accordance with the Project's Conditional Water Licences, Environmental Assessment Certificate, Decision Statement, Fisheries Act Authorization and Canadian Navigable Waters Act Approval[1].

The filled reservoir spans approximately 83 km in length and is, on average, two to three times wider than the historical river channel. The normal operating level of the reservoir is between an elevation of 460 m and 461.8 m, which is approximately 50 m higher than historical water levels at this location.

3.2 Operations

The Project transitioned to operations with the commissioning of the first of six generating units on October 28, 2024, following the completion of all required testing and commissioning procedures. The remaining units were brought online one-by-one, with the sixth and final unit successfully commissioned on August 9, 2025.

[1] https://www.sitecproject.com/document-library/permits-and-authorizations

4.0 Surface Water Regime

4.1 Site C Operations

The Site C operational study performed in the EIS took a 60-year simulation (water years 1941 to 2000, i.e., October 1, 1940 to September 30, 2000) using the Generalized Optimization Model (GOM) of the entire BC Hydro energy system. Flow frequency duration curves for Site C were produced for four periods: Winter (November 15 to February 15), Freshet (May 1 to July 15), Summer (July 16 to September 30) and annual. This analysis is described in EIS Section 11.4.4[2] and Volume 2, Appendix D, Part 1[3].

Site C Reservoir release duration curves from the EIS are shown as dashed lines in Figure 4-1 along with 2024 – 2025 flow duration curves based on actual operations as solid lines.

The 10, 50 and 90% exceedance values from the Site C Reservoir release duration curves are shown in Tables 4-1 to 4-4. Site C Reservoir filling took place between late August and early November 2024. Therefore, the 2024 – 2025 annual duration curves would have been influenced by reduced outflows from Site C due to reservoir filling.

[2] EIS Volume 2, Section 11.4.5 available at https://iaac-aeic.gc.ca/050/documents_staticpost/63919/85328/Vol2_Assessment_Methodology.pdf

[3] EIS Volume 2, Appendix D Surface Water Regime Technical Memo, Part 1 available at https://iaac-aeic.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_D.pdf

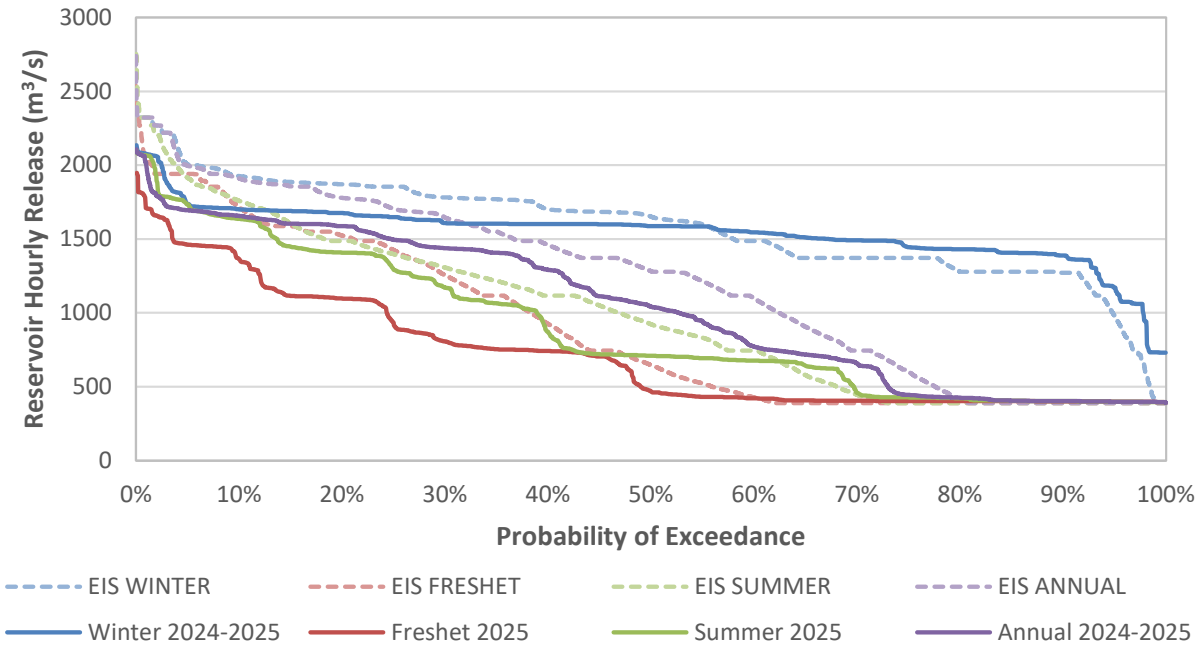


Figure 4-1: Annual and Seasonal Site C Reservoir Release Duration Curves

Table 4-1: Site C Reservoir Release Annual Duration Curves

	10%	50%	90%
EIS	1,910 m^3/s	1,282 m^3/s	390 m^3/s
2024-2025	1,656 m^3/s	1,042 m^3/s	403 m^3/s

Table 4-2: Site C Reservoir Winter (November 15 to February 15) Duration Curves

	10%	50%	90%
EIS	1,926 m^3/s	1,652 m^3/s	1,272 m^3/s
2024-2025	1,701 m^3/s	1,588 m^3/s	1,389 m^3/s

Table 4-3: Site C Reservoir Freshet (May 1 to July 15) Duration Curves

	10%	50%	90%
EIS	1,717 m^3/s	646 m^3/s	390 m^3/s
2025	1,365 m^3/s	468 m^3/s	401 m^3/s

Table 4-4: Site C Reservoir Summer (July 16 to September 30) Duration Curves

	10%	50%	90%
EIS	1,759 m^3/s	923 m^3/s	390 m^3/s
2025	1,636 m^3/s	710 m^3/s	402 m^3/s

In future annual reports, tabulated and graphical comparisons with EIS predictions will be made considering cumulative multi-year operation with Site C in addition to comparisons with the preceding water year as presented in this report.

4.2 Downstream Flows and Water Level

4.2.1 Overview

In the EIS, hydraulic flow routing using the MIKE 11 one-dimensional hydraulic model was conducted to Peace Point. The purpose was to assess the effects of Site C on downstream flows and water levels through relative comparisons of operational scenarios with and without Site C. A subset of 10 representative water years was identified from the GOM output described in Section 4.1 and used as input to the MIKE 11 model. These representative water years were selected based on review of Peace River flows for the 60-year period of the Site C operational study and include a mix of dry, average and wet years. The effects of flow attenuation along the Peace River and tributary discharges were accounted for in the EIS downstream flow modelling. This analysis is described in EIS Section 11.4.5[4] and Volume 2, Appendix D, Part 2 [5].

Model outputs were compared in the EIS as:

- time series hydrographs
- flow and water level duration curves
- hourly changes in water levels
- daily water level range
- hourly wetted width
- hourly average cross-sectional velocity

The predicted flows and water levels from hydraulic modelling performed in the EIS were considered reliable for comparing operational scenarios with and without Site C. Based on the

[4] EIS Volume 2, Section 11.4.5 available at https://iaac-aeic.gc.ca/050/documents_staticpost/63919/85328/Vol2_Assessment_Methodology.pdf

[5] EIS Volume 2, Appendix D, Part 2 available at https://iaac-aeic.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_D.pdf

model calibration performed at Water Survey of Canada (WSC) gauges along the Peace River, maximum water level differences between simulation results and WSC rating curves were generally within 0.2 m to 0.3 m. This approximate model accuracy should be considered when comparing observed hydrometric data with EIS predictions.

In this Annual Report, water level and discharge hourly data for the 2024-2025 water year recorded at WSC long-term stations at Taylor (07FD002), Town of Peace River (07HA001) and Peace Point (07KC001) are compared with predictions made in the EIS. WSC gauge data have been extracted from the Environment and Climate Change Canada Real-time Hydrometric Data web site (https://wateroffice.ec.gc.ca/mainmenu/real_time_data_index_e.html) on October 6, 2025.

Hourly measured water levels at Site C tailrace as well as Site C discharges presented in Section 4.1 are shown in a time series graph in Figure A-1 in Appendix A. Due to generating units coming online sequentially as construction continued through 2024-25, spill magnitudes were greater than will occur in future typical years. Spilling was identified in EIS Volume 1 Appendix B Reservoir Filling Plan as an expected activity during reservoir filling.

Planned construction activities involving channel excavation in the Site C tailrace area during 2025 led to a decrease in measured tailwater levels. For example, for a Site C discharge of approximately 400 m^3/s, the tailwater level on August 17, 2025 was about 0.33 m lower compared to April 14, 2025. This tailrace excavation work which follows the engineering design for the Site C project is planned to continue into 2026.

Time series graphs of hourly water levels and discharges measured at the WSC gauges listed above are presented in Figures A-2 to A-4 in Appendix A.

There are multi-day gaps in the available 2024-2025 WSC data as listed below. Estimates have not been made to fill these data gaps.

- Town of Peace River (07HA001)
    - Water level data gaps: May 5-12, 2025
    - Discharge data gaps: several periods between November 2024 and January 2025; February 2 – April 2, 2025; May 5-12, 2025
- Peace Point (07KC001)
    - Water level data gaps: November 20-21, 2024; May 2-7, 2025
    - Discharge data gaps: April 30 - May 30, 2025

The following WSC data are provisional and subject to further review by Environment and Climate Change Canada:

- Taylor (07FD002) - February 7 to September 30, 2025
- Town of Peace River (07HA001) - January 21 to September 30, 2025
- Peace Point (07KC001) - January 1 to September 30, 2025

Flow travel time, flow and water level duration curves, hourly changes in water levels and daily average water level ranges are discussed in Sections 4.2.2 to 4.2.5. Since the EIS surface water regime analysis did not consider ice effects on water levels, the comparisons presented in these sections focus on open water conditions. For example, flow and water level duration curves are compared for the typical freshet period from May 1 to July 15 and for the typical summer period from July 16 to September 30. Ice cover may exist on portions of the Peace River in early May which can affect water levels and discharges. In addition, gaps in available WSC data at the Town of Peace River and Peace Point in May 2025 noted above could also affect comparisons made with EIS predictions.

Hourly wetted width and average cross-sectional velocity curves with and without Site C were presented in the EIS. The results were based on the hourly water levels noted above and followed the same trends with the largest differences occurring closer to Site C and diminishing effects down to Peace Point. These quantities are not directly measured in the field and were computed using the MIKE 11 hydraulic model for the Site C EIS. In accordance with Plan methods, if there are substantial differences in the comparisons between flow and water level duration curves with Site C prepared in Annual Reports and EIS predictions, additional analysis for hourly wetted width and average cross-sectional velocity will be performed after 10 and 20 years of Site C operation.

In future annual reports, tabulated and graphical comparisons with EIS predictions will be made considering cumulative multi-year operation with Site C in addition to comparisons with the preceding water year as presented in this report.

4.2.2 Flow Travel Time

Hydraulic modelling performed for the EIS indicates that operational flow changes with Site C would be noticed 10 to 12 hours earlier, on average, at downstream locations compared to without Site C.

Flow changes at Site C during the 2024-2025 water year that could be tracked to downstream WSC gauges to estimate travel time during open water conditions were reviewed. It is easier to identify distinct flow changes along the Peace River during periods of relatively constant tributary flow. There were limited distinct Site C flow changes in 2024-2025 that were suitable for this analysis. Site C operations on November 21, 2024 had several hours of relatively constant discharge of approximately 1,718 m^3/s followed by a step down to 1,365 m^3/s. This flow reduction of about 353 m^3/s can be roughly tracked to downstream WSC gauges. The travel time for the

start to end of this step-down flow change from Site C to the Town of Peace River (WSC 07HA001) is approximately 29 to 40 hours.

Jasek and Emmer (2019) provides a summary table of the approximate flow travel time along the Peace River downstream of Peace Canyon Dam based on review of hydrometric data. The travel times apply for discharge changes that are approximately in the 1,300 to 1,700 m^3/s range and vary whether it is a hydro peaking event, step-down change or step-up change. From the start to end of a step-down flow change, the travel time between Peace Canyon Dam and the Town of Peace River is estimated to be between 39 and 63 hours. The exact shape of the upstream hydrograph and downstream tributary flows can influence travel times.

The travel time to the Town of Peace River for the start of the November 21, 2024 step-down flow change at Site C is approximately 10 hours faster than estimated travel times from Peace Canyon Dam to this location. This comparison is consistent with hydraulic modelling performed for the EIS. Limited available operational data makes it difficult to draw firm conclusions about differences in flow travel time with Site C compared to without Site C. Future years of hydrometric data will be reviewed to gain additional insight into flow travel times along the Peace River with Site C.

4.2.3 Flow and Water Level Duration Curves

The 10, 50 and 90% exceedance values from WSC gauge hourly water level duration curves for open water conditions taken as May 1 to July 15, 2025 (freshet period) and from July 16 to September 30, 2025 (summer period) are shown in Tables 4-5 to 4-7. Comparisons are made with EIS predictions for these same seasonal periods. Figures B-1 to B-6 present both water level and discharge data in graphical format in Appendix B.

Table 4-5: Taylor Hourly Duration Curves

	Typical Freshet Period: May 1 to Jul.15			Typical Summer Period: Jul.16 to Sep.30		
	10%	50%	90%	10%	50%	90%
EIS with Site C	404.1 m	403.3 m	402.6 m	403.7 m	403.1 m	402.2 m
2025	403.4 m	402.9 m	402.7 m	403.5 m	402.8 m	402.5 m

Table 4-6: Town of Peace River Hourly Duration Curves

	Typical Freshet Period: May 1 to Jul.15			Typical Summer Period: Jul.16 to Sep.30		
	10%	50%	90%	10%	50%	90%
EIS with Site C	313.6 m	312.7 m	312.0 m	312.6 m	311.9 m	311.2 m
2025	311.9 m	311.6 m	311.4 m	311.8 m	311.4 m	311.1 m

Table 4-7: Peace Point Hourly Duration Curves

	Typical Freshet Period: May 1 to Jul.15			Typical Summer Period: Jul.16 to Sep.30		
	10%	50%	90%	10%	50%	90%
EIS with Site C	213.9 m	212.6 m	211.6 m	212.5 m	211.4 m	210.6 m
2025	212.1 m	211.4 m	211.0 m	211.5 m	210.9 m	210.2 m

At Taylor, the 2025 duration curves are within the range of EIS predictions.

Large portions of northwestern Alberta including the Peace River basin experienced drought conditions with low snowpack, and low stream flows[6] leading to lower 2025 water levels and flows at the Town of Peace River and Peace Point compared to EIS predictions. The four largest tributaries of the Peace River between the Project and Peace Point in terms of drainage area and mean flow contribution are listed in Table 4-8 which shows significantly below average flow conditions in 2025. For the freshet and summer periods, average 2025 flows in the major tributaries were 40% and 50%, respectively, compared to the 10-year period considered in the EIS.

Table 4-8: Average Discharges (m^3/s) in Peace River Major Tributaries Downstream of Site C

	Pine River WSC 07FB001	Beatton River WSC 07FC001	Smoky River WSC 07GJ001	Wabasca River WSC 07JD002	Sum of Major Tributaries
EIS [a]: May 1 - Jul.15	641	173	1,064	237	2,115
2025 May 1 - Jul.15	319	58	420	37	836
2025 Freshet Compared to EIS [a] Freshet: 836 / 2,115 = 40%					
EIS [a]: Jul.16 - Sep.30	147	43	377	102	669
2025 Jul.16 - Sep.30	83	23	215	12	333
2025 Summer Compared to EIS [a] Summer: 333 / 669 = 50%					

[a] – EIS analysis of downstream flows and water levels was based on a 10-year period from October 1, 1964 to September 30, 1974. EIS flow data shown are the average discharges for the freshet and summer periods, as indicated in the table.

[6]Canada Drought Monitor March 2025 and July 2025 reports available at https://publications.gc.ca/collections/collection_2025/aac-aafc/A27-39-2025-3-eng.pdf
https://publications.gc.ca/collections/collection_2025/aac-aafc/A27-39-2025-7-eng.pdf

4.2.4 Hourly Changes in Water Level

The 10 and 30% exceedance values from the WSC gauge hourly water level change duration curves for the open water period taken as May 1 to September 30, 2025 are shown in Tables 4-9 to 4-11. Comparisons are made with EIS predictions for a 10-year period as discussed in Section 4.2.1. Figures B-7 to B-9 present these data in graphical format in Appendix B.

Table 4-9: Taylor Hourly Water Level Change Duration Curves

	10%	30%
EIS with Site C	-0.14 m to +0.13 m	±0.03 m
2025 May 1 - Sep.30	-0.07 m to +0.08 m	±0.01 m

Table 4-10: Town of Peace River Hourly Water Level Change Duration Curves

	10%	30%
EIS with Site C	±0.02 m	±0.01 m
2025 May 1 - Sep.30	±0.03 m	±0.01 m

Table 4-11: Peace Point Hourly Water Level Change Duration Curves

	10%	30%
EIS with Site C	±0.01 m	±0.01 m
2025 May 1 - Sep.30	±0.01 m	±0.01 m

As shown in Tables 4-9 to 4-11, the 10 and 30% exceedance values for hourly water level changes for observed May to September 2025 data are either within the range of EIS predictions or up to 0.01 m outside of the predicted range which is well within the typical accuracy of hydraulic modelling.

Graphical results in Appendix B provide additional information. At Taylor, the May to September 2025 hourly water level change duration curves are fully within the range of EIS predictions. At the Town of Peace River and Peace Point, May to September 2025 hourly water level change duration curves are up to approximately 0.01 m outside the range of EIS predictions.

An important factor that should be considered for these comparisons is that the 2025 hourly water level change duration curves are based on five months of spring and summer data while the EIS predictions are based on 10 years of data that include winter periods (ice effects were not simulated) with relatively more stable Peace River flow. During winter periods, there is generally

less fluctuation in both upstream hydropower flow releases and in downstream tributary discharge compared to the spring and summer.

4.2.5 Daily Average Water Level

The daily average water level range (i.e. average difference between the minimum and maximum water level over each day) for open water conditions taken as May 1 to July 15, 2025 (freshet period) and from July 16 to September 30, 2025 (summer period) at Taylor, Town of Peace River and Peace Point are shown in Tables 4-12 and 4-13. Comparisons are made with EIS predictions for these same seasonal periods.

Table 4-12: Daily Average Water Level Range for Freshet Period (May 1 – Jul.15)

	Taylor	Town of Peace River	Peace Point
EIS with Site C	0.77 m	0.24 m	0.14 m
2025	0.44 m	0.20 m	0.13 m

Table 4-13: Daily Average Water Level Range for Summer Period (Jul.16 – Sep.30)

	Taylor	Town of Peace River	Peace Point
EIS with Site C	0.90 m	0.22 m	0.07 m
2025	0.22 m	0.26 m	0.12 m

At Taylor, the 2025 freshet and summer daily average water level range is approximately 0.3 m and 0.7 m lower, respectively, than EIS predictions. At the Town of Peace River and Peace Point, the 2025 freshet and summer daily average water level range is up to 0.05 m larger than EIS predictions which were based on hydraulic modelling. This difference is well within the typical accuracy of hydraulic modelling.

4.2.6 Summary

Key observations from the comparisons between May to September 2025 observed downstream flows and water levels at WSC gauges (Taylor, Town of Peace River, and Peace Point) and EIS predictions are as follows:

- At Taylor, 2025 water level and flow duration curves are within the range of EIS predictions.
- At the Town of Peace River and Peace Point, drought conditions in the Peace River basin in 2025 led to lower water levels and flows compared to EIS predictions. For the freshet and summer periods, average 2025 flows in the major tributaries of the Peace River

between the Project and Peace Point were 40% and 50%, respectively, compared to the 10-year period considered in the EIS.

- At Taylor, 2025 hourly water level change duration curves are within the range of EIS predictions at Taylor. At the Town of Peace River and Peace Point, the 2025 hourly water level change duration curves are up to approximately 0.01 m outside the range of EIS predictions which is well within the typical accuracy of hydraulic modelling.
- At Taylor, the 2025 daily average water level range is approximately 0.3 m and 0.7 m lower, respectively, than EIS predictions. At the Town of Peace River and Peace Point, the 2025 daily average water level range is up to 0.05 m larger than EIS predictions which were based on hydraulic modelling. This difference is well within the typical accuracy of hydraulic modelling.

5.0 Ice Regime

5.1 Overview

In the EIS, the 1995-1996 to 2010-2011 or 16 years of climate and flow release data were used to model the ice regime in the Peace River with and without Site C, and the difference in the results were used to define the influence of Site C on the ice regime. Simulations were only done for this 16-year period because a very influential input into the model (Peace Canyon tailrace water temperatures) were available for most of these years and this period contained a complete range of climatic years comparable further back to the start of regulation. This report documents Peace River winter ice regime indicators that were analysed in the EIS compared to the 2024 – 2025 water year under the first year of Site C operations. The indicators include freeze-up and breakup dates for locations of interest, freeze-up and break up water levels at the Town of Peace River, and dates of operation for the ferry and ice bridge at the Shaftesbury crossing. These indicators were compared to ranges from the years simulated in the EIS and/or alternatively to measured historical data for longer and more representative pre-Site C data. Where possible, data back to the first winter of BC Hydro's Peace Canyon hydroelectric facility operation (1982–1983) were used. Some ice indicators go only as far back as the 2005 - 2006 ice season due to the current operational rules under the BC - Alberta Joint Task Force on Peace River Ice that changed significantly that year.

A wider range of pre-Site C data was analysed for comparison because significantly warmer winters have occurred since the analysis for the EIS, and this is relevant to the analysis of impacts to ice. Also, taking the approach in making a comparison between pre-Site C observed data and post-Site C observed data (not modelled like in the EIS), the missing Peace Canyon tailrace temperatures are not a barrier to use the older ice regime data back further in time. This allows for a comparison of more years for a more comprehensive statistical analysis in the future. This period includes 42 ice seasons (1982-1983 to 2023-2024) rather than the 16 ice seasons used in the EIS. For ice regime indicators that could be significantly affected by the 2005-2006 change in operational rules, there were 19 ice seasons compared to the 16 in the EIS.

The annual report objective is to document the ice regime indicators that occurred in the past ice season and provide a visual and numerical representation of where they place within the predicted or historical ranges. This was supported by categorising each ice regime indicator into bin ranges placed horizontally in tables and inserting the minimum, average and maximum values for each dataset within these bins and inserting the recorded value for each year under Site C operations in the rows below. This provides a visual check of ice regime indicators under Site C operations as years are added if bins are being populated that stray outside or are bias to more to one side or the other side of each table. However, this must be put into context with the weather that occurs each year since climate change could be the cause of the bias and not Site C operations. Cumulative degree-days of freezing for each winter are also provided in a similar table.

In addition to the vertical visualization of ice regime indicators in the table, a Z-score was calculated for each ice regime indicator value and placed in brackets under that value in the table. Expressed in terms of standard deviations, Z-score is a statistical measure that quantifies the distance between a data point and the mean of a dataset. For example, a Z-score of -2 indicates two standard deviations below the mean value.

A more rigorous statistical analysis of how Site C may have affected the ice regime cannot be done based on the single year of data. A more comprehensive statistical analyses will be done every five years of the 20-year reporting period that includes more rigorous statistical tests, consideration of the climate and plots of the data rather than expression in only tables. This will be for the 2028-2029, 2033-2034, 2038-2039 and 2043-2044 water year reports.

5.2 Ice Season Air Temperatures

This section describes air temperature of 16 years and climate change with Site C as assessed in Sections 3.3.2 and 6.0 of EIS Volume 2, Appendix G[7].

To compare the observed ice regime to that predicted in the EIS, it is helpful to place the coldness of the winter in context of the range of years simulated in the EIS. A convenient parameter to use for this comparison is the cumulative degree-days of freezing (DDF).

To assess climate change, the DDF for Fort St. John Airport, Town of Peace River, Town of Peace River Airport, High Level Airport can be compared to DDF analysis years and those from the 2050s climate change scenario in the EIS. Also included are Fort Vermilion and Fort Chipewyan Airports. The former to document the slightly warmer location than High Level with closer proximity to the Peace River and the latter as an index for further east locations such as Fox Lake Crossing, Garden River, and Peace Point. The 2024-2025 winter was colder than the average 2050s climate change DDFs at the three stations included in the EIS (Tables 5-1, 5-2, 5-4).

Based on the 2024 – 2025 DDFs and how much temperatures at the five locations differed from their usual long-term averages for the five locations in Tables 5-1 to 5-5, the 2024-2025 winter can be characterised as warmer than normal in the south or upstream part of the Peace River, warmer and about normal for the two stations in the middle reach in northwestern Alberta, and colder than normal in the northeast portion of Alberta (the most downstream Peace River reach near Peace Point). It is important to remember that the ice behaviour during freeze-up at any location is determined by meteorological conditions along the entire reach of the Peace River upstream of the ice front. This is also true for breakup and to a lesser extent downstream as solar radiation and warm temperatures can thin and weaken the ice cover causing the ice front to

[7] EIS Volume 2, Appendix G available at https://iaac-aeic.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_G.pdf

recede faster since there is less ice to melt by the air and sun warmed water arriving from upstream.

Table 5-1. Degree-Days of Freezing at the Fort St. John Airport.

DDF (ºC-days)	400-600	600-800	800-1000	1000-1200	1200-1400	1400-1600	1600-1800	1800-2000	2000-2200	2200-2400	2400-2600	2600-2800
Observed Pre and Post Site C for EIS analysed years												
1995-1996 to 2010-2011 (Min, Avg, Max)				1012		1442			2088			
2050s Climate Change Scenario (Min, Avg, Max)			812		1247			1884				
Observed Pre Site C												
42/42 years, 1982-1983 to 2023-2024 (Min, Avg, Max)			919		1389				2088			
Observed Post Site C												
2024-2025					1306 (-0.28)							

Table 5-2. Degree-Days of Freezing at the Town of Peace River Airport.

DDF (ºC-days)	400-600	600-800	800-1000	1000-1200	1200-1400	1400-1600	1600-1800	1800-2000	2000-2200	2200-2400	2400-2600	2600-2800
Observed Pre and Post Site C for EIS analysed years												
1995-1996 to 2010-2011 (Min, Avg, Max)				1169			1692				2434	
2050s Climate Change Scenario (Min, Avg, Max)		785			1279				2004			
Observed Pre Site C												
42/42 years, 1982-1983 to 2023-2024 (Min, Avg, Max)				1088			1647				2434	
Observed Post Site C												
2024-2025						1539 (-0.35)						

Table 5-3. Degree-Days of Freezing at the Fort Vermilion Airport.

DDF (ºC-days)	400-600	600-800	800-1000	1000-1200	1200-1400	1400-1600	1600-1800	1800-2000	2000-2200	2200-2400	2400-2600	2600-2800
Observed Pre and Post Site C for EIS analysed years												
1995-1996 to 2010-2011 (Min, Avg, Max)						1504			2097		2411	
Observed Pre Site C												
27/42 years, 1982-1983 to 2023-2024 (Min, Avg, Max)						1504			2189			2634
Observed Post Site C												
2024-2025									2161 (-0.10)			

Table 5-4. Degree-Days of Freezing at the High Level Airport.

DDF (°C-days)	800-1000	1000-1200	1200-1400	1400-1600	1600-1800	1800-2000	2000-2200	2200-2400	2400-2600	2600-2800	2800-3000	3000-3200
Observed Pre and Post Site C for EIS analysed years												
EIS Analysed (Min, Avg, Max)					1730			2367				3137
EIS 2050s (Min, Avg, Max)			1244			1855				2624		
Observed Pre Site C												
40/42 years, 1982-1983 to 2023-2024 (Min, Avg, Max)					1730			2385				3137
Observed Post Site C												
2024-2025								2231 (-0.49)				

Table 5-5. Degree-Days of Freezing at Fort Chipewyan Airport.

DDF (°C-days)	1000-1200	1200-1400	1400-1600	1600-1800	1800-2000	2000-2200	2200-2400	2400-2600	2600-2800	2800-3000	3000-3200	3200-3400
Observed Pre and Post Site C for EIS analysed years												
EIS Analysed Years (Min, Avg, Max)				1615				2485			3116	
Observed Pre Site C												
42/42 years, 1982-1983 to 2023-2024 (Min, Avg, Max)				1615				2544				3290
Observed Post Site C												
2024-2025									2623 (+0.21)			

5.3 Ice Front Locations

Ice front locations as distance from the W.A.C. Bennett Dam along the Peace River for the 2024-2025 ice season are shown in Figure 5-1. A list of all ice fronts recorded for the 2024-2025 ice season are provided in Appendix C. The grey lines are pre-Site C ice fronts 1982-1983 to 2023-2024 that exclude the period of Pre-Peace Canyon operations. There are very few ice front observations between Fort Vermilion and Peace Point except for the last 10 years due to the advent of satellite remote sensing. Freeze-up dates and breakup dates for Fox Lake and Garden River were obtained from satellite images and aerial observations going back to the 2015-2016 ice season and these are plotted as grey dots in Figure 5-1. A substantial record of freeze-up dates (ice front arrival) and breakup dates (ice front passing downstream) at Peace Point has been compiled from gauge records, with missing values in recent years supplemented and plotted as grey dotes in Figure 5-1 using satellite images. It is typical for multiple ice fronts to form downstream between Vermilion Chutes and Peace Point and occasionally between Carcajou and the Vermilion Chutes.

Figure 5-1 shows that for the 2024-2025 ice season, the upstream ice front advance and timing was near the center of the normal range through to the end of November, followed by below

average ice front advance rates for the months of December and January, followed by higher advance rates in the month of February. The maximum upstream extent of the ice front was km 254.7 that occurred on February 21, 2025. This was about 41 km upstream of Dunvegan. Following the maximum upstream ice front extent, the ice front receded at typical recession rates and near the center of the normal range from late February through to the final breakup in early May at Peace Point.

Generally, the behavior of the ice front in 2024 – 2025 shown in Figure 5-1 responded to the air temperatures along the Peace River as depicted in Figure 5-2.

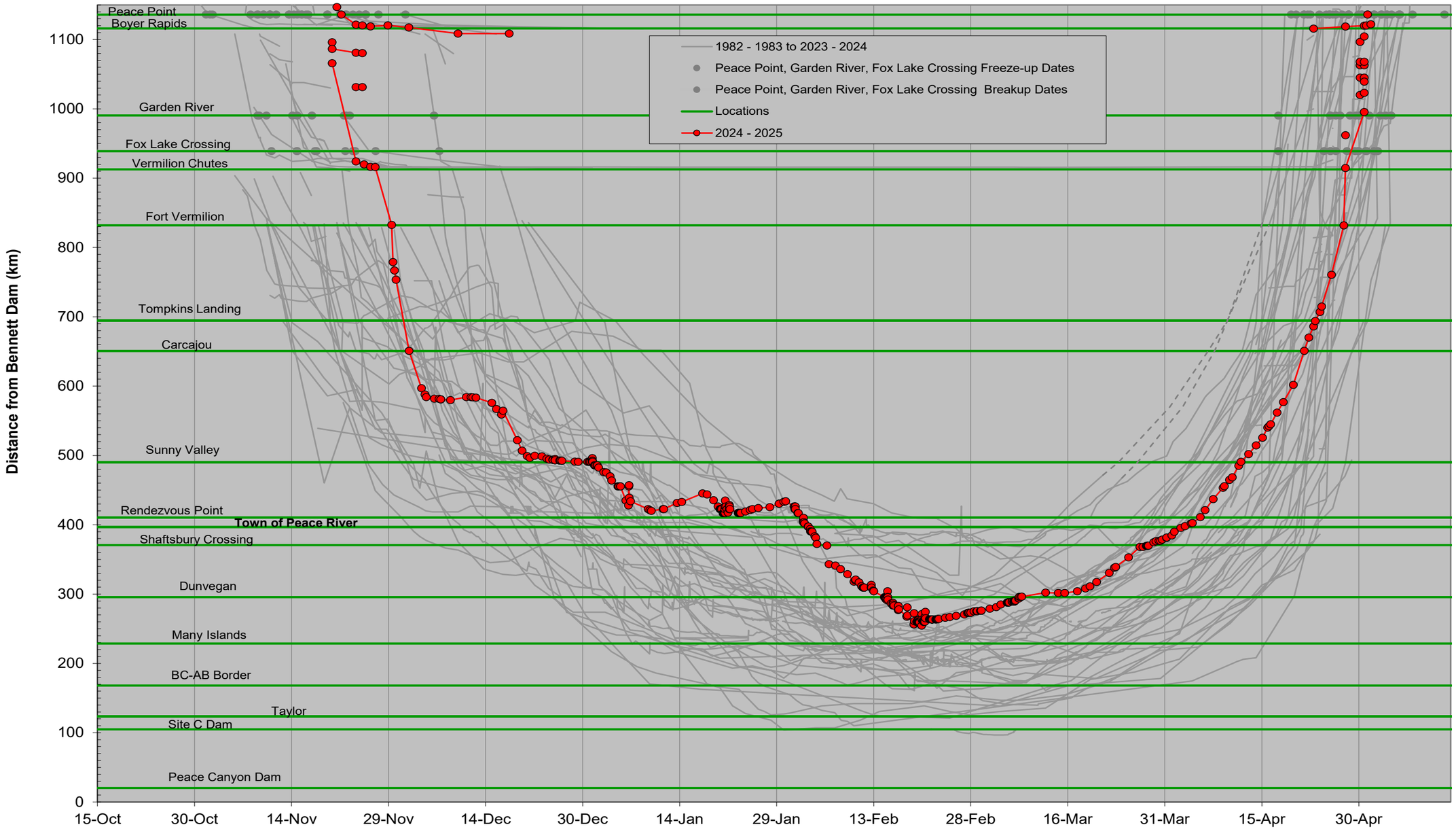


Figure 5-1. Recorded ice front positions for the 2024 – 2025 ice season for the first year of operation with Site C. Background grey lines are pre-Site C ice fronts 1982 – 1983 to 2023 – 2024 that go back in the past to the first year of Peace Canyon operations. *(Mismatch by one day of some grey dotes to lines is due to leap year)*

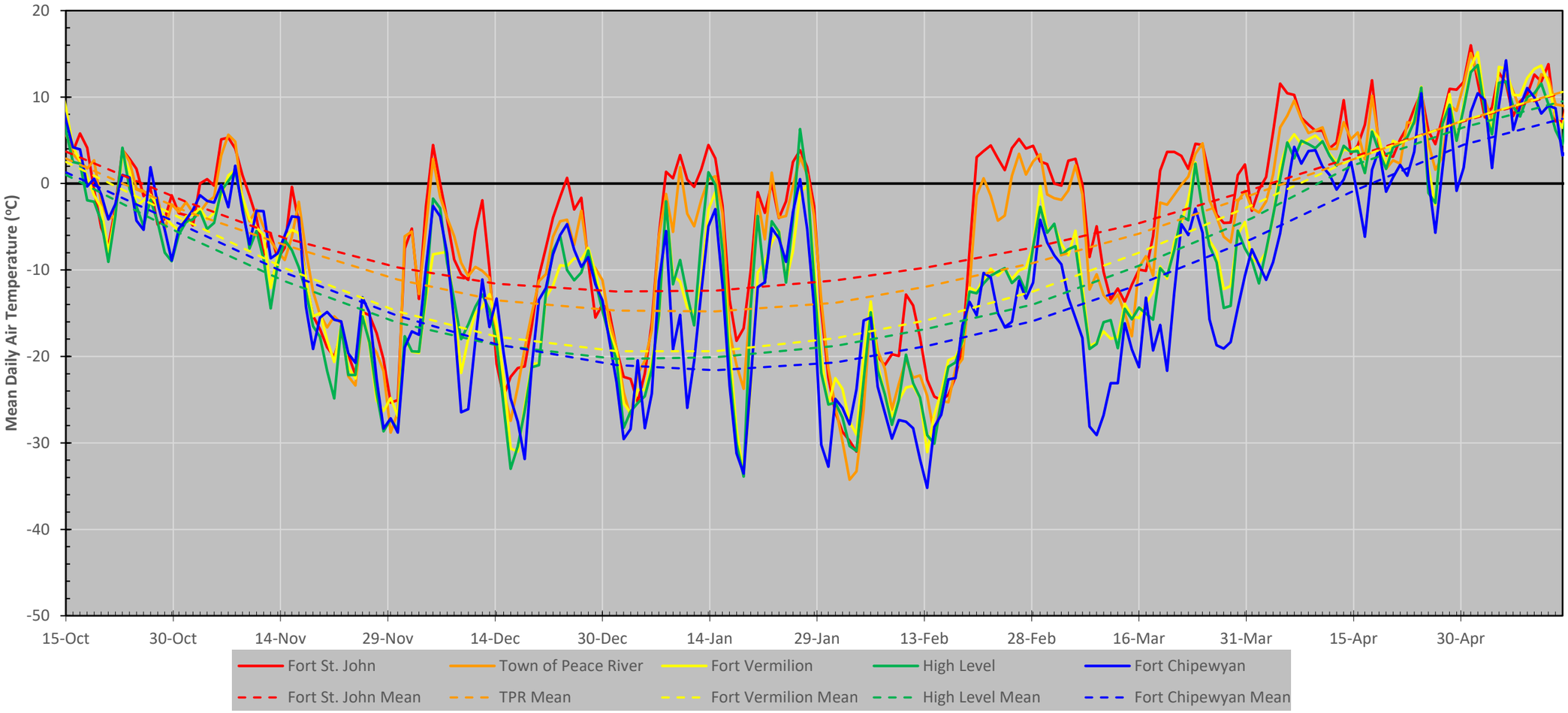


Figure 5-2. Mean daily air temperatures along the Peace River for the 2024 – 2025 ice season. Mean traces are a smoothed average of 1982-1983 to 2023-2024 ice seasons.

5.4 Downstream Ice Regime Extent

This section describes the most downstream extent of the effect of Site C on the ice regime as assessed in Section 4.6 of EIS Volume 2, Appendix G[8].

The EIS studies predicted no changes to the ice regime due to Site C downstream of Carcajou (km 650), 540 km upstream of the Peace-Athabasca Delta. Subsequent monitoring was to be compared to historical freeze-up and breakup dates (rather than modelled) as there are more years of historical than modelled data available. However, the effects due to climate change need to be considered. To determine the most downstream effect of Site C on the ice regime and to compare to the predicted downstream extent at Carcajou as predicted in the EIS, freeze-up and breakup dates both upstream and downstream of Carcajou are documented and compared to historical data. See Sections 5.5 and 5.7 for freeze-up and breakup dates, respectively. A more comprehensive statistical analysis will be conducted every 5 years after the first year of Site C operations to the end of the 20-year reporting period.

There is comprehensive ice front data upstream of Fort Vermilion since the 1982-1983 ice season (42 years) due to close monitoring related to the freeze-up and breakup issues at the Town of Peace River. However, historical freeze-up and breakup dates further downstream are limited but available data were obtained for Fort Vermilion (km 832 – 33 years) and further downstream at Peace Point (km 1136 – 30 years) going back to 1982-1983. Fort Vermilion and Peace Point freeze-up dates were obtained from gauge records at these locations and supplemented by satellite images and breakup observations where gauge data was missing. It was noted, based on examining "B[9]" designations in the Environment and Climate Change Canada (ECCC) records for these two gauges and comparing them to dates derived from stage data and in more recent years from aerial and satellite observations indicated that the "B" designation was not an accurate method of obtaining freeze-up or breakup dates as there were differences of more than a week in some cases. Ice front data for other locations of interest between Fort Vermilion and Peace Point, like Vermilion Chutes, Fox Lake Crossing, Garden River for recent years were obtained using aerial observations and satellite images but the number of observations were limited to 9 years pre-Site C. Ice front timings for locations of interest were interpolated if there was sufficient data for nearby dates.

5.5 Freeze-up Timing

This section describes the effect of the Project on freeze up timing as assessed in Section 4.2 of EIS Volume 2, Appendix G.

[8] EIS Volume 2, Appendix G available at https://iaac-aeic.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_G.pdf

[9] In Environment and Climate Change Canada hydrometric records, the "B" designation stands for "Backwater" affected water level gauge data most often due to ice.

In 2024, freeze-up at Peace Point came about 6 days later than the long-term pre-Site C average with a Z-Score of +0.71 (Table 5-6). Ice formation was likely delayed due to warm temperatures in early November (Figure 3-2). There are a limited number of pre-Site C observations for Garden River and Fox Lake Crossing (9 years) so conclusions about the number of days from average post-Site C will be less certain. Nevertheless, Garden River and Fox Lake Crossing also showed a delay compared to the pre-Site C average but by a smaller amount, 5 and 3 days respectively (Z-scores +0.55 and +0.36, Tables 5-7 and 5-8).

By the time the ice front reached Fort Vermilion (Table 5-10) the delay had shortened to 4 days due to colder weather (Z-score diminished further to +0.30) and by the time the ice front reached Tomkins Landing (Table 5-11) and Carcajou (Table 5-12) the ice front was ahead by 3 and 4 days respectively of the pre-Site C average (Z-scores of -0.21 and -0.31).

During the mostly warm weather in December and January (Figure 5-2), the ice front upstream advance slowed and lagged the pre-Site C dates at Sunny Valley, Town of Peace River, Shaftesbury Crossing, and Dunvegan by 8, 25, 23 and 25 days respectively (Z-scores of +0.47, +1.31, +1.07 and +1.40). See Tables 5-13 through 5-16. The Z-scores generally increase in the upstream direction with the highest Z-Score at Dunvegan.

Table 5-6. Pre and Post Site C freeze-up dates at Peace Point along with Z-scores for Site C years.

	<= Oct 31	Nov 1 - 5	Nov 6 - 15	Nov 16 - 20	Nov 21 - 25	Nov 26 - 30	Dec 1 - 10	Dec 11 - 20	> Dec 21
Observed Pre Site C									
34/42 years, 1983-1984 to 2023-2024 (Earliest, Average, Latest)		Nov 1		Nov 16			Dec 2		
Observed Post Site C									
2024-2025					Nov 22 (+0.71)				

Table 5-7. Pre and Post Site C freeze-up dates at Garden River.

	<= Oct 31	Nov 1 - 5	Nov 6 - 15	Nov 16 - 20	Nov 21 - 25	Nov 26 - 30	Dec 1 - 10	Dec 11 - 20	> Dec 21
Observed Pre Site C									
9/42 years, 2015-2016 to 2023-2024 (Earliest, Average, Latest)			Nov 9	Nov 17			Dec 6		
Observed Post Site C									
2024-2025					Nov 22 (+0.55)				

Table 5-8. Pre and Post Site C freeze-up dates at Fox Lake Crossing along with Z-scores for Site C years.

	<= Oct 31	Nov 1 - 5	Nov 6 - 15	Nov 16 - 20	Nov 21 - 25	Nov 26 - 30	Dec 1 - 10	Dec 11 - 20	> Dec 21
Observed Pre Site C									
9/42 years, 2015-2016 to 2023-2024 (Earliest, Average, Latest)			Nov 11		Nov 21		Dec 7		
Observed Post Site C									
2024-2025					Nov 24 (+0.36)				

Table5-9. Pre and Post Site C freeze-up dates at Fort Vermilion along with Z-scores for Site C years.

	<= Oct 31	Nov 1 - 10	Nov 11 - 20	Nov 20 - 30	Dec 1 - 10	Dec 11 - 20	Dec 21 - 31	Jan 1 - 10	> Jan 10
Observed Pre Site C									
33/42 years, 1982-1983 to 2023-2024 (Earliest, Average, Latest)		Nov 9		Nov 26			Dec 22		
Observed Post Site C									
2024-2025				Nov 30 (+0.30)					

Table 5-10. Pre and Post Site C freeze-up dates at Tompkins Landing along with Z-scores for Site C years.

	<= Oct 31	Nov 1 - 10	Nov 11 - 20	Nov 20 - 30	Dec 1 - 10	Dec 11 - 20	Dec 21 - 31	Jan 1 - 10	> Jan 10
Observed Pre Site C									
39/42 years, 1982-1983 to 2023-2024 (Earliest, Average, Latest)			Nov 14		Dec 3			Jan 3	
Observed Post Site C									
2024-2025				Nov 30 (-0.21)					

Table 5-11. Pre and Post Site C freeze-up dates at Carcajou along with Z-scores for Site C years.

	<= Oct 31	Nov 1 - 10	Nov 11 - 20	Nov 20 - 30	Dec 1 - 10	Dec 11 - 20	Dec 21 - 31	Jan 1 - 10	> Jan 10
Observed Pre Site C									
39/42 years, 1982-1983 to 2023-2024 (Earliest, Average, Latest)			Nov 15		Dec 7			Jan 8	
Observed Post Site C									
2024-2025					Dec 2 (-0.31)				

Table 5-12. Pre and Post Site C freeze-up dates at Sunny Valley along with Z-scores for Site C years.

	<=Nov 15	Nov 16-30	Dec 1 - 15	Dec 16 - 31	an 1 - 15	Jan 16 - 31	Feb 1 - 14	Feb 14 - 29	>=Mar 1
Observed Pre Site C									
42/42 years, 1982-1983 to 2023-2024 (Earliest, Average, Latest)		Nov 26		Dec 23		Jan 29			
Observed Post Site C									
2024-2025				Dec 30 (+0.47)					

Table 5-13. Pre and Post Site C freeze-up dates at the Town of Peace River along with Z-scores for Site C years.

	<=Nov 30	Dec 1 - 15	Dec 16 - 31	Jan 1 - 15	Jan 16 - 31	Feb 1 - 14	Feb 15 - 29	Mar 1 - 10	>= Mar 11
Observed Pre Site C									
42/42 years, 1982-1983 to 2023-2024 (Earliest, Average, Latest)		Dec 3		Jan 9			Feb 27		
Observed Post Site C									
2024-2025						Feb 3 (+1.31)			

Table 5-14. Pre and Post Site C freeze-up dates at Shaftesbury Crossing along with Z-scores for Site C years.

	<= Nov 30	Dec 1 - 15	Dec 16 - 31	Jan 1 - 15	Jan 16 - 31	Feb 1 - 14	Feb 15 - 29	Mar 1 - 10	>= Mar 11
Observed Pre Site C									
, 42/42 years, 1982-1983 to 2023-2024 (Earliest, Average, Latest)		Dec 8			Jan 14			Mar 7	
Observed Post Site C									
2024-2025						Feb 6 (+1.07)			

Table 5-15. Pre and Post Site C freeze-up dates at Dunvegan along with Z-scores for Site C years.

	<= Dec 15	Dec 16 - 31	Jan 1 - 15	Jan 16 - 31	Feb 1 - 14	Feb 15 - 29	Mar 1 - 10	>= Mar 11	No ice cover
Observed Pre Site C									
42/42 years, 1982-1983 to 2023-2024 (Earliest, Average, Latest)		Dec 25		Jan 20			Mar 10		☑
Observed Post Site C									
2024-2025						Feb 15 (+1.40)			

5.6 Maximum Upstream Ice Cover Extent

This section describes the predicted change in the most upstream extent of the ice cover due to Site C, and under climate change scenarios as assessed in Section 4.1 and 6.0 of EIS Volume 2, Appendix G[10].

The first two rows of Table 5-16 show minimum, average, and maximum upstream extent of the simulated ice cover with and without Site C for 16 winters (1995-1996 to 2010-2011) described in the EIS. For the coldest winter Site C moved the maximum upstream extent of the ice cover about 65 km further downstream. Under average winter conditions, the shift was 39 km downstream, and for the warmest winter conditions, the shift was 32 km downstream. This makes sense as colder winters cause the ice front to advance further upstream closer to the warmer discharge location from the Site C where the warm water temperatures have the most affect in slowing down the ice front progression.

For actual maximum upstream ice front extents under Site C operation, it is more comprehensive to compare the Site C operation data with all available data pre-Site C and post-Peace Canyon (42 years, Row 4 in Table 3-16). In the 2024-2025 ice season the maximum upstream extent of the ice cover was to km 254.5. Compared to this pre-Site C historical data, this was 44 km further downstream than the Pre-Site C average (Z-score of +0.67). The observed ice front was also downstream of the average EIS simulated years with Site C by 12 km. However, it was also a warmer than average winter, so this contributed to slowing the upstream advance of the ice front. With only one year of data, it is difficult to separate the effect of a warmer than average winter, and that due to the warmer water discharge point being moved from Peace Canyon to Site C. Subsequent years of observation may make this discernment possible.

[10] EIS Volume 2, Appendix G available at https://iaac-aeic.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_G.pdf

For reference, the third row in Table 5-16 shows the results of the EIS 2050s climate change scenario since at the end of the 20-year reporting period, the year will be only 6 years away from the 2050s.

Table 5-16. Maximum upstream extent of the ice front (minimum distance from Bennett Dam)

km location	> 400	375-400	350-375	325-350	300-325	275-300	250-275	225-250	200-225	175-200	150-175	125-150	100-125
EIS Simulated without Site C													
1995-1996 to 2010-2011 (Min, Avg, Max)						298			204				97
EIS Simulated with Site C													
1995-1996 to 2010-2011 (Min, Avg, Max)				330				243			162		
EIS Simulated with Site C for 2050s Climate Change Scenario													
Adjusted 1995-1996 to 2010-2011 seasons for 2050s	440				304					191			
Observed Pre Site C													
1982-1983 to 2023-2024 (Min, Avg, Max)			371						211				104
Observed Post Site C													
2024-2025							255 (0.67)						

5.7 Breakup timing

This section describes the most downstream extent of the effect of Site C on breakup timing as assessed in Section 4.6 of EIS Volume 2, Appendix G[11] .

The breakup date at Dunvegan was 19 days earlier than the pre-Site C average with a Z-score of -1.38 (Table 5-17). As breakup progressed, this diminished to 7 days earlier than average at the Shaftesbury Crossing, and 5 days earlier than average at the Town of Peace River with Z-scores of -0.52 and -0.42 respectively (Table 5-18 and 5-19). By the time the ice front reached Sunny Valley, the breakup was 2 days early and at Carcajou and Tompkins Landing it was 1 day later than average with Z-scores of -0.22, +0.21 and +0.19 respectively (Tables 5-20 to 5-22). More

[11] EIS Volume 2, Appendix G available at https://iaac-aeic.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_G.pdf

years of data will be needed to discern the separate effects of Site C and the weather in any particular year.

Further downstream, the ice front recession in 2025 was 3 days later than the Pre-Site C average at Fort Vermilion, 2 days earlier than average at Fox Lake, 2 days later than average at Garden River and Peace Point with Z-scores of +0.49. -0.51, +0.34, +0.34 respectively (Tables 523 to 5-26). At these further downstream locations, the range of historical variability has been much narrower, so few day differences exhibit relatively larger Z-scores than the upstream locations. Again, more years of data will be needed to discern the effects of the weather and Site C at these downstream locations.

Table 5-17. Breakup at Dunvegan along with Z-scores for Site C years.

	No Ice cover	<= Jan 15	Jan 16 - 31	Feb 1 - 15	eb 16 - 29	Mar 1 - 15	Mar 16 - 31	Apr 1 - 15	>= Apr 16
Observed Pre Site C									
42/42 years, 1982-1983 to 2023-2024 (Earliest, Average, Latest)	☑				Feb 22		Mar 27		Apr 21
Observed Post Site C									
2024-2025						Mar 8 (-1.38)			

Table 5-18. Breakup at Shaftesbury Crossing along with Z-scores for Site C years.

	No Ice cover	<= Jan 31	Feb 1 - 15	Feb 16 - 29	Mar 1 - 15	Mar 16 - 31	Apr 1 - 15	Apr 16 - 30	>= May 1
Observed Pre Site C									
42/42 years, 1982-1983 to 2023-2024 (Earliest, Average, Latest)				Feb 25			Apr 5	Apr 24	
Observed Post Site C									
2024-2025						Mar 28 (-0.52)			

Table 5-19. Breakup at Town of Peace River along with Z-scores for Site C years.

	No Ice cover	<= Jan 31	Feb 1 - 15	Feb 16 - 29	Mar 1 - 15	Mar 16 - 31	Apr 1 - 15	Apr 16 - 30	>= May 1
Observed Pre Site C									
42/42 years, 1982-1983 to 2023-2024 (Earliest, Average, Latest)					Mar 13		Apr 8	Apr 25	
Observed Post Site C									
2024-2025							Apr 3 (-0.42)		

Table 5-20. Breakup at Sunny Valley along with Z-scores for Site C years.

	<= Feb 29	Mar 1 - 10	Mar 11 - 21	Mar 16 - 31	Apr 1 - 10	Apr 11 - 20	Apr 21-30	May 1 -10	>= May 11
Observed Pre Site C									
38/42 years, 1984-1985 to 2023-2024 (Earliest, Average, Latest)				Mar 25		Apr 14	Apr 30		
Observed Post Site C									
2024-2025					Apr 12 (-0.21)				

Table 5-21. Breakup at Carcajou along with Z-scores for Site C years.

	<= Feb 29	Mar 1 - 10	Mar 11 - 21	Mar 16 - 31	Apr 1 - 10	Apr 11 - 20	Apr 21-30	May 1 -10	>= May 11
Observed Pre Site C									
32/42 years, 1984-1985 to 2023-2024 (Earliest, Average, Latest)					Apr 8	Apr 20	Apr 30		
Observed Post Site C									
2024-2025							Apr 22 (0.21)		

Table 5-22. Breakup at Tompkins Landing along with Z-scores for Site C years.

	<= Feb 29	Mar 1 - 10	Mar 11 - 21	Mar 16 - 31	Apr 1 - 10	Apr 11 - 20	Apr 21-30	May 1 -10	>= May 11
Observed Pre Site C									
31/42 years, 1984-1985 to 2023-2024 (Earliest, Average, Latest)						Apr 11	Apr 22	May 2	
Observed Post Site C									
2024-2025							Apr 23 (0.23)		

Table 5-23. Breakup at Fort Vermilion along with Z-scores for Site C years.

	<= Mar 31	Apr 1 - 10	Apr 11 - 15	Apr 16 - 20	Apr 21 - 25	Apr 26 - 30	May 1 - 5	May 6 -10	>= May 11
Observed Pre Site C									
31/42 years, 1984-1985 to 2023-2024 (Earliest, Average, Latest)				Apr 16	Apr 25		May 5		
Observed Post Site C									
2024-2025						Apr 28 (0.49)			

Table 5-24. Breakup at Fox Lake Crossing along with Z-scores for Site C years.

	<= Mar 31	Apr 1 - 10	Apr 11 - 15	Apr 16 - 20	Apr 21 - 25	Apr 26 - 30	May 1 - 5	May 6 -10	>= May 11
Observed Pre Site C									
13/42 years, 2002-2003 to 2023-2024 (Earliest, Average, Latest)				Apr 18		Apr 28	May 3		
Observed Post Site C									
2024-2025						Apr 26 (-0.51)			

Table 5-25. Breakup at Garden River along with Z-scores for Site C years.

	<= Mar 31	Apr 1 - 10	Apr 11 - 15	Apr 16 - 20	Apr 21 - 25	Apr 26 - 30	May 1 - 5	May 6 -10	>= May 11
Observed Pre Site C									
13/42 years, 2002-2003 to 2023-2024 (Earliest, Average, Latest)				Apr 18		Apr 29	May 5		
Observed Post Site C									
2024-2025							May 1 (+0.34)		

Table5-26. Breakup at Peace Point along with Z-scores for Site C years.

	<= Mar 31	Apr 1 - 10	Apr 11 - 15	Apr 16 - 20	Apr 21 - 25	Apr 26 - 30	May 1 - 5	May 6 -10	>= May 11
Observed Pre Site C									
42/42 years, 1982-1983 to 2023-2024 (Earliest, Average, Latest)				Apr 20		Apr 30			May 14
Observed Post Site C									
2024-2025							May 1 (+0.34)		

5.8 Freeze-up and Break-up Timing at the Town of Peace River

This section describes the predicted change timing of freeze-up and break-up timing at the Town of Peace River as assessed in Section 4.2 of EIS Volume 2, Appendix G[12].

Although freeze-up dates and breakup dates for 2024-2025 at the Town of Peace River were presented in Sections 5.5 and 5.7, additional discussion is warranted given their significance to flood risk management by the Joint Task Force on Peace River Ice.

The modelling presented in the EIS indicates that on average, Site C would delay freeze-up at the Town of Peace River on average by 3 days with a range of 1 to 6 days for the 16 winters

[12] EIS Volume 2, Appendix G available at https://iaac-aeic.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_G.pdf

simulated. This delay in freeze-up does not affect the flood risk at the Town of Peace River or the potential duration of ice control.

Tables 5-13 shows that freeze-up at the Town of Peace River did not occur until Feb 3, 2025, which was about 25 days later than the pre-Site C average (Z-score = +1.31). Once there are more years of data available, it will be easier to separate out the effects of Site C and the weather on freeze-up dates at the Town of Peace River.

The breakup date timing at the Town of Peace River is more important than freeze-up as a late breakup increases the chances of the Smoky River dynamically breaking up into an intact Peace River ice cover at the Town of Peace River, which increases the chance of flooding. The modelling presented in the EIS indicates that on average, the Project would not affect the timing of breakup at the Town of Peace River (0 days) with a range of -2 to +4 days for the 16 winters simulated.

Table 5-19 shows that breakup occurred on April 3, 2025 at the Town of Peace River. This is 5 days earlier than the Pre-Site C average with a Z-score = -0.42. Subsequent analysis after more years of data is collected, should help determine if there are any effects of Site C on the breakup date at the Town of Peace River.

5.9 Freeze-up Water Levels at the Town of Peace River North Gauge (WSC 07AH001)

In Section 4.3.1 of EIS Volume 2, Appendix G, water levels for the entire winter were simulated using the CRISSP model for 16 winters (1995-1996 to 2010-2011). Freeze-up water levels were determined from the maximum stage that occurred within a few days on or after the freeze-up date for each run. The range and average freeze-up elevations at Peace River north (WSC 07AH001) are depicted in Table 5-27 Rows 1 and 2 for without and with Site C, respectively. The goal of this comparison was to determine if the freeboard to the dike to contain subsequent secondary consolidations was maintained for the post-Site C conditions. Comparing Rows 1 and 2 in Table 5-27 indicates that the initial freeze-up elevations were predicted to be largely unaffected, and any differences were well within the modelling uncertainty.

The CRISSP model cannot simulate secondary consolidations that can increase the initial freeze-up water level by several metres. Therefore, the EIS also listed the observed freeze-up levels taken as the maximum water level for the entire winter for the same 16 years that were simulated (Table 5-27, Row 3). The observed range at Peace River north (WSC 07AH001) is much wider, showing both higher and lower elevations, with a slightly lower mean. The higher elevations are explained by two secondary consolidations that occurred in this period, while the lower elevations reflect the model's former inability to simulate juxtaposed ice covers that were driven by extreme cold temperatures (Jasek, 2024).

For assessing the effect of Site C on winter water levels at the Town of Peace River, it is better to compare measured water levels under Site C operations with Pre-Site C historical water levels. To expand that pre-Site C data range, daily average water level data (rather than sub-hourly) going back to the 1982-1983 ice season was used. The period was split into two, 1982-1983 to 2004-2005, and 2005-2006 to 2023-2024, to reflect different dam operating regimes during freeze-up. In the former, ice control flow was set at Peace Canyon and ranged from 1,270 to 1,700 m^3/s with no consideration for local inflows to the Town of Peace River. For the latter, ice control flow was defined at the Town of Peace River as 1,600 m^3/s including local inflows. The data range for these periods is shown in Table 5-27 Rows 4 and 5, respectively. Since operational practices with Site C are more similar to the latter period, the data under Site C years is compared with the 2005-2006 to 2023-2024 period. Table 5-27 shows that for the 2024-2025 ice season, under the first year of Site C operation, the initial freeze-up elevation was 0.12 m lower than pre-Site C 2005-2006 to 2023-2024 average with a Z-score of -0.25.

Table 5-27. Initial freeze-up water levels at the Town of Peace River north (WSC 07HA001). Left to right in each row is Minimum, Average, Maximum for the range of ice seasons specified. For each year of data with Site C, the Z Score is given in brackets relative to Pre-Site C 2005-2006 to 2023-2024 data.

	< 314.0 m	314.0 – 314.5 m	314.5 – 315.0 m	315.0 – 315.5 m	315.5 – 316.0 m	316.0 – 316.5 m	316.5 – 317.0 m	317.0 – 317.5 m	317.5 – 318.0 m	> 318.0 m
Pre Site C Simulated for EIS										
1995-1996 to 2010-2011			314.63	315.33	315.99					
Post Site C Simulated for EIS										
1995-1996 to 2010-2011			314.52	315.22	315.60					
Observed for Site C EIS Analysed Years (1995-1996 to 2010-2011)										
1995-1996 to 2010-2011		314.21		315.03				317.06		
Observed Pre Site C (1982-1983 to 2004-2005)										
1982-1983 to 2004-2005	313.75			314.88			316.83			
Observed Pre Site C (2005-2006 to 2023-2024)										
2005-2006 to 2023-2024		314.24		314.94	315.82					
Observed Post Site C										
2024-2025			314.82 (-0.25)							

Table 5-28 shows the winter maximum daily water level which could be higher than the initial freeze-up water level (Table 5-27). Values in Table 5-28 are higher than in Table 5-27 because they include secondary consolidations in some years that occur after the initial freeze-up. Also, subsequent discharge increases after the initial freeze-up can increase the water level in some years higher than the initial freeze-up level but generally not as high as secondary consolidations.

For the 2024-2025 winter, the highest daily average water level that occurred was 314.90 m, about 0.4 m less than pre-Site C average with a Z-score = -0.53. There were no secondary consolidations at the Town of Peace River in the 2024-2025 winter, and this water level was the

result of higher discharges that followed the initial freeze-up elevation was established (Table 5-27). It is important to note that not all winter discharge increases are the results of upstream dam releases but can be caused by the movement of the upstream ice front that puts water into and out of storage as the ice front changes velocity responding to changes in air temperature.

Table 5-28. Maximum daily water level during the winter at the Town of Peace River north (WSC 07HA001). Left to right in each row is Minimum, Average, Maximum for the ice seasons specified. For each year of data with Site C, the Z-score is given in brackets relative to Pre-Site C 2005-2006 to 2023-2024 data.

	< 314.0 m	314.0 – 314.5 m	314.5 – 315.0 m	315.0 – 315.5 m	315.5 – 316.0 m	316.0 – 316.5 m	316.5 – 317.0 m	317.0 – 317.5 m	317.5 – 318.0 m	> 318.0 m
Observed Pre Site C (1982-1983 to 2004-2005)										
1982-1983 to 2004-2005		314.08		315.32						318.67 (319.92 m instantaneous in 1992)
Observed Pre Site C (2005-2006 to 2023-2024)										
2005-2006 to 2023-2024		314.24		315.31				317.31		
Observed Post Site C										
2024-2025			314.90 (-0.53)							

To ascertain the effect of freeze-up on the Lower West Peace Subdivision groundwater levels, the average of the highest two weeks of daily water levels were calculated for Pre-Site C years. The reason for the two-week period is that groundwater levels take that long to respond to potentially start impacting basements in the subdivision. However, it should be noted that BC Hydro installed a groundwater dewatering system in 2016 to mitigate this issue.

For the 2024-2025 winter, the highest two-week average was about 0.2 m below the 2005-2006 to 2023-2024 pre-Site C average with a Z-score of -0.35 (Table 5-29).

Table 5-29. Maximum two-week average water level during the winter at the Town of Peace River north gauge (WSC 07HA001). Left to right in each row is Minimum, Average, Maximum for the ice seasons specified. For each year of data with Site C, the Z Score is given in brackets relative to Pre-Site C 2005-2006 to 2023-2024 data.

	< 314.0 m	314.0 – 314.5 m	314.5 – 315.0 m	315.0 – 315.5 m	315.5 – 316.0 m	316.0 – 316.5 m	316.5 – 317.0 m	317.0 – 317.5 m	317.5 – 318.0 m	> 318.0 m
Observed Pre Site C (1982-1983 to 2004-2005)										
1982-1983 to 2004-2005	313.97			315.04				317.10		
Observed Pre Site C (2005-2006 to 2023-2024)										
2005-2006 to 2023-2024		314.08	314.99			316.44				
Observed Post Site C										
2024-2025			314.77 (-0.35)							

5.10 Freeze-up Water Levels at the Town of Peace River South Gauge (TPS)

Prior to the 2013-2014 ice season, a second Peace River south gauge (TPS) was installed in the Town of Peace River for recording water levels. It is located about 3 km upstream of the Peace River north gauge (WSC 07AH001). The gauge was installed to provide redundancy but also to provide river level information for the Lower West Peace Subdivision where BC Hydro operates a groundwater dewatering system to mitigate groundwater seepage into basements due to high river levels. During ice conditions, the difference between the Peace River north (WSC 07AH001) and TPS gauges has been observed to be anywhere from about half a metre to over two metres. The higher differences manifest when a consolidation occurs and stops between the two gauges producing relatively much higher water levels at the upstream end of the Town of Peace River than downstream. This is common due to the narrowing of the Peace River between the two gauges that causes consolidations to stop there. This also produces less freeboard to the top of the dyke at the upstream end of town than downstream so it is prudent to collect water levels at both gauges; the downstream one because it has a longer period of record and represents water levels at the downstream end of the Town of Peace River, and the upstream one because it is more representative of water levels at the upstream end of the Town of Peace River and is relatively closer to the top of the dyke in some winters.

Table 5-30 shows that for the 2024-2025 ice season, under the first year of Site C operation, the initial freeze-up elevation was 0.05 m lower than pre-Site C 2013-2014 to 2023-2024 average with a Z-score of -0.13.

Table 5-30. Initial freeze-up water levels at the Town of Peace River south gauge. Left to right in each row is Minimum, Average, Maximum for the range of ice seasons specified. For each year of data with, the Z Score is given in brackets relative to pre-2013-2014 to 2023-2024 data.

	< 315.0 m	315.0 – 315.5 m	315.5 – 316.0 m	316.0 – 316.5 m	316.5 – 317.0 m	317.0 – 317.5 m	317.5 – 318.0 m	318.0 – 318.5 m	318.5 – 319.0 m	> 319.0 m
Daily Average Observed Pre Site C										
2013-2014 to 2023-2024		315.31	315.78		316.53					
Daily Average Observed Post Site C										
2024-2025			315.73 (-0.13)							

Table 5-31 shows the maximum daily water level for the winter which could be higher than the initial freeze-up water level (Table 5-30). Values in Table 5-31 are higher than in Table5-30 because they include secondary consolidations in some years that occur after the initial freeze-up. Also, subsequent discharge increases after the initial freeze-up can increase the water level in some years higher than the initial freeze-up level but generally not as high as secondary consolidations.

For the 2024-2025 winter, the highest daily average water level that occurred was 315.94 m, about 0.4 m less than pre-average with a Z-score = -0.61. There were no secondary

consolidations at the Town of Peace River in the 2024-2025 winter, and this water level was the result of higher discharges that followed the initial freeze-up elevation was established (Table 5-30). It is important to note that not all discharge increases in the winter are the results of upstream dam releases but can be caused by the movement of the upstream ice front that puts water into and out of storage as the ice front changes velocity responding to changes in air temperature.

Table 5-31. Maximum daily water level during the winter at the Town of Peace River south gauge. Left to right in each row is Minimum, Average, Maximum for the ice seasons specified. For each year of data with, the Z-score is given in brackets relative to pre-2013-2014 to 2023-2024 data.

	< 315.0 m	315.0 – 315.5 m	315.5 – 316.0 m	316.0 – 316.5 m	316.5 – 317.0 m	317.0 – 317.5 m	317.5 – 318.0 m	318.0 – 318.5 m	318.5 – 319.0 m	> 319.0 m
Daily Average Observed Pre Site C										
2013-2014 to 2023-2024		315.47		316.37				318.14		
Daily Average Observed Post Site C										
2024-2025			315.94 (-0.61)							

To ascertain the effect of freeze-up on the Lower West Peace Subdivision groundwater levels like which was done for the north gauge in the previous section, the average of the highest 2 weeks of daily water levels were calculated for Pre-Site C years for the south gauge. The south gauge is closer to the Lower West Peace Subdivision (directly across the river) than the north gauge.

For the 2024-2025 winter, the highest two-week average at the south gauge was about 0.2 m below the 2013-2014 to 2023-2024 pre-average with a Z-score of -0.43 (Table 5-32).

Table 5-32. Maximum two-week average water level during the winter at the Town of Peace River south gauge. Left to right in each row is Minimum, Average, Maximum for the ice seasons specified. For each year of data with, the Z Score is given in brackets relative to pre-2013-2014 to 2023-2024 data.

	< 315.0 m	315.0 – 315.5 m	315.5 – 316.0 m	316.0 – 316.5 m	316.5 – 317.0 m	317.0 – 317.5 m	317.5 – 318.0 m	318.0 – 318.5 m	318.5 – 319.0 m	> 319.0 m
Two-Week Average Observed Pre Site C										
Observed Pre-Site C 2013-2014 to 2023-2024		315.04		316.03		317.24				
Two-Week Average Observed Post Site C										
2024-2025			315.80 (-0.43)							

5.11 Town of Peace River Breakup Water Levels

There were no predictions made in the EIS for the breakup water level at the Town of Peace River because peak breakup water levels are a function of the high discharge from downstream unregulated tributaries like the Smoky River. Breakup water levels are generally lower than freeze-up water levels. Breakup water levels for each year are reported in Table 5-33, and if any recorded breakup level exceeds the maximum daily winter water level listed in Table 5-28, the cause will be described in this section. As part of this assessment, the relative contributions of Site C releases to natural inflows to the Town of Peace River during the breakup period will be

evaluated. For the 2025 breakup, the observed water level remained below both the maximum winter water level and the long-term average, corresponding to a Z-score of -0.93.

For a relevant comparison, Table 5-33 includes historical breakup water levels for two time periods (1983 to 2006 and 2007 to 2024). The data was split into these two-time ranges to reflect improved knowledge and surveillance of the Smoky River breakup processes in the latter period that leads to a better forecast for ice control flow releases from Peace Canyon and Site C during breakup. There was a severe breakup flood in 1997, but a successfully implemented ice control occurred in 2007 that avoided a likely flood of a similar magnitude (Jasek et al. 2007).

In 2025, the daily maximum breakup water level was about a metre below average at both the North gauge (Table 5-33) and South gauge (Table 5-34) with Z-Scores of -0.93 and -1.12, respectively. The break-up was thermally driven so water levels were low.

Table 5-33. Daily Breakup water levels at the Town of Peace River north gauge (WSC 07HA001), Minimum, Average, Maximum. For each year of data with Site C, the Z-score is given in brackets relative to Pre-Site C 2005-2006 to 2023-2024 data.

	< 314.0 m	314.0 – 315 m	315 - 316 m	316 – 317 m	317 - 318 m	318 – 319 m	319 – 320 m	320 – 321 m	> 321
Daily Average Observed Pre Site C (1983 to 2005)									
1983 to 2005	313.02	314.21		316.68 daily in 1997			319.92 instantaneous in 1997		
Daily Average Observed Pre Site C (2006 to 2024)									
2006 to 2024	312.38	314.00	315.35 315.48 instantaneous in 2016						
Daily Average Observed Post Site C									
2025	313.35 (-0.93)								

Table 5-34. Daily Breakup water levels at the Town of Peace River South gauge, Minimum, Average, Maximum. For each year of data with, the Z-score is given in brackets relative to Pre2014 to 2024 data.

	< 314.0 m	314.0 – 315 m	315 - 316 m	316 – 317 m	317 - 318 m	318 – 319 m	319 – 320 m	320 – 321 m	> 321
Observed Pre-Site C 2014 to 2024	312.93	314.78		316.22					
2025	313.88 (-1.12)								

5.12 Town of Peace River Ice control Flow

“Ice control flow” pertains to a period where BC Hydro releases flows at a more steady and medium high discharge to promote the stable formation of the ice cover at the Town of Peace River. The end of this ice control occurs when the ice cover is deemed strong enough to resist

higher discharge fluctuations and increases from the upstream BC Hydro facility, previously Peace Canyon and now Site C.

In Section 4.4 of EIS Volume 2, Appendix G[13], sixteen climatic years were simulated to calculate a range of ice controls for Site C operations and compared them to without Site C for 16 winters (First two rows in Table 5-35 and 5-36). These two rows indicate that Site C is not expected to significantly change ice control timing and duration. On average, ice control is expected to start about 5 days earlier on average and last 3 days longer. There have been subsequent simulations performed during operations (ice control ensemble forecasting) that shows a wider range of ice control timing and durations than in the EIS, including climate change studies that indicate that there is a 1 to 2% chance in any given year that no ice control will occur from 2020 to 2040 due ice fronts not making it close enough to the Town of Peace River. The EIS described ice control start and duration ranges as indicated in Table 5-35 and 5-36 below but the additional simulations indicate ice control start dates can occur between November 30 and March 3 including durations ranging from 8 to 91 days without Site C. Since the EIS indicated that freeze-up and breakup dates are not predicted to change substantially at the Town Peace as a result of Site C, and these are linked to ice control, it is possible that more extreme starts and durations than described in the EIS could also occur under Site C operations.

In 2024-2025 ice control started on Feb 2, 2025 (26 days later than the Pre-Site C 2005-2006 to 2023-2024 average, Z-score =+1.26, Table 3-35) and lasted 12 days (11 days shorter than the Pre-Site C 2005-2006 to 2023-2024 average, Z-score =-1.03, Table 5-36). These variations from average are likely due to weather-related factors, including air temperatures and snowfall on the ice cover and are unlikely to be substantially affected by Site C.

[13] EIS Volume 2, Appendix G available at https://iaac-aeic.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_G.pdf

Table 5-35. Timing of the start of ice control for the Town of Peace River.

	<=Nov 30	Dec 1 - 15	Dec 16 - 31	Jan 1 - 15	Jan 16 - 31	Feb 1 - 14	Feb 15 - 29	Mar 1 - 10	>= Mar 11
Simulated Post Site C in EIS									
1995-1996 to 2010-2011 (Earliest, Average, Latest)		Dec 10		Jan 9			Feb 24		
Simulated Pre Site C in EIS									
1995-1996 to 2010-2011 (Earliest, Average, Latest)		Dec 7		Jan 4			Feb 21		
Simulated Pre-Site C**									
1982-1983 to 2020-2021 (Earliest, Average, Latest)	Nov 30			Jan 5			Feb 19		
Observed Pre Site C									
2005-2006* to 2023-2024 (Earliest, Average, Latest)		Dec 7		Jan 7			Feb 24		
Observed Post Site C									
2024-2025						Feb 2 (1.26)			

** Actual ice control durations pre-2005-2006 used a different and more conservative criteria to initiate ice control so years 1982-1983 to 2004-2005 were not used to populate this row. Z-Scores calculated are relative to this row. ** Simulated with observed ice fronts and current ice control flow implementation procedures, Jasek and Evans (2022).*

Table 5-36. Duration of ice control (days) for the Town of Peace River.

	0	< 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	> 70
Simulated Post Site C in EIS									
1995-1996 to 2010-2011 (Shortest, Average, Longest)		9	20		37				
Simulated Pre Site C in EIS									
1995-1996 to 2010-2011 (Shortest, Average, Longest)		9		23		48			
Simulated Pre Site C**									
1982-1983 to 2020-2021 (Earliest, Average, Latest)		8		26					72
Observed Pre Site C									
Actual Pre-Site C 2005-2006* to 2023-2024			11	23			58		
Observed Post Site C									
2024-2025			12 (-1.03)						

** Actual ice control durations pre-2005-2006 used a different and more conservative criteria to come off ice control so years 1982-1983 to 2004-2005 were not used to populate this row. ** Simulated with observed ice fronts and current ice control flow rules by Jasek and Evans (2022).*

5.13 Shaftesbury Crossing Ice Bridge and Ferry

The Shaftesbury crossing is located at Peace River km 370 about 25 km upstream of the Town of Peace River and 265 km downstream of Site C. There are four dates that need to be determined to produce the total number of ferry or ice bridge crossing days to establish the number of crossable days per year. The criteria are listed below and justifications in selecting dates for these criteria are outlined in Section 4.5 of EIS Volume 2, Appendix G[14].

1. Start of ferry operations is 15 days after the ice front passes downstream of Shaftesbury crossing in the spring.
2. Ferry operations stop at the first instance of >=20% surface ice concentration in late fall or early winter. To establish the date of first 20% ice concentration, use the CRISSP model output and collaborate with remote cameras, satellite images or ground-based observations.
3. The start of ice bridge operations starts when the thermal ice thickness reaches 0.25 m. To determine date that the thermal ice reached 0.25 m, examine thermal ice

[14] EIS Volume 2, Appendix G available at https://iaac-aeic.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_G.pdf

measurements to come off ice control at 0.4 m and work backwards on calibrated thermal ice growth model for that year to determine when 0.25 m was reached.

4. Ice bridge operations stop when the ice front recedes downstream of the Shaftesbury crossing (although it would likely be sooner, but this is not easily defined).

All four of the above ice bridge operation crossing criteria are not available back to 1982-1983. For example, for above criteria two, the first instance of >=20% ice concentration is only available back to 1995-1996 where Peace Canyon tailwater temperatures were either available or calibrated for missing years as part of the Site C EIS. This supports post Site C data being compared to 1995-1996 to 2023-2024 period rather than going back to 1982-1983.

It should be noted that after the EIS study was completed, the ice front barley reached the Shaftesbury crossing in two years which did not occur for the 16 years simulated in the EIS. In these two years an ice bridge could not be built; the ice front was within a few kilometers and only for a few days near the Shaftsbury crossing in the 2011-2012 and 2015-2016 ice seasons. This is also possible under Site C operations if a similar mild winter occurs.

For the 2024-2025 winter under the first year of Site C operations, the last ice at Shaftesbury crossing occurred on Mar 28, 2025, about 7 days earlier than the pre-Site C average with a Z-score of -0.52 (Table 5-37). More years of data and further analysis would be needed to ascertain to what degree Site C, and the weather had an effect. This earlier break-up in 2024 reduces the number of ice bridge days but increases the number of ferry days and would not affect the total number of annual crossable days.

Table 5-37. Last ice at Shaftesbury.

	<= Feb 29	Mar 1 - 10	Mar 11 - 20	Mar 21 - 31	Apr 1 - 9	Apr 10 - 20	Apr 21 - 30	>=May 1	No solid ice at Shaftesbury
Simulated Post Site C in EIS									
1995-1996 to 2010-2011(Earliest, Average, Latest)		Mar 9			Apr 5		Apr 22		
Observed Pre Site C									
Observed Pre-Site C 1995-1996 to 2023-2024	Feb 25				Apr 4		Apr 24		2015-2016
Observed Post Site C									
2024-2025				Mar 28 (-0.52)					

For the 2024-2025 winter under the first year of Site C operations, the first instance of 20% ice concentration (the theoretical end of ferry operations) occurred on Dec 1, 2024, about 2 days earlier than average with a Z-score of -0.18 (Table 5-38). This is close to the average value but

and more years of data and further analysis would be needed to ascertain what affect Site C and the weather had on this value.

Table 5-38. First instance of 20% ice concentration.

	<=Nov 1	Nov 1 - 10	Nov 11 - 20	Nov 20 - 30	Dec 1 - 10	Dec 11 - 20	Dec 21 - 31	Jan 1 - 10	> Jan 10
Simulated Post Site C in EIS									
1995-1996 to 2010-2011(Earliest, Average, Latest)			Nov 17		Dec 8		Dec 31		
Simulated Pre Site C in EIS									
1995-1996 to 2010-2011 (Earliest, Average, Latest)			Nov 11		Dec 4		Dec 31		
Simulated Pre Site C									
1995-1996 to 2023-2024 (Earliest, Average, Latest)		Nov 7			Dec 3		Dec 31		
Simulated Post Site C									
2024-2025					Dec 1 (-0.18)				

For the 2024-2025 winter under the first year of Site C operations, the thermal ice thickness reached 0.25 m on Feb 9, 2025, about 3 weeks later than average with a Z-score of +1.00 (Table 5-39). This reduced the number of ice bridge crossable days for the 2024-2025 winter.

Table 5-39. Thermal ice thickness at Shaftesbury reaches 0.25 m.

	<=Dec 15	Dec 15 -31	Jan 1 - 15	Jan 16 - 31	Feb 1 - 15	Feb 16 - 29	Mar 1 - 15	> Mar 15	Does not reach 0.25 m
Calculated Post Site C from EIS									
1995-1996 to 2010-2011(Earliest, Average, Latest)		Dec 26		Jan 25				Mar 16	
Calculated Pre Site C from EIS									
1995-1996 to 2010-2011(Earliest, Average, Latest)		Dec 18		Jan 19			Mar 6		
Calculated and Interpolated from Measured Data Pre Site C*									
1995-1996 to 2023-2024 (Earliest, Average, Latest)		Dec 16		Jan 19			Mar 15		2011-2012, 2015-2016
Interpolated from Measured data Post Site C									
2024-2025					Feb 9 (+1.00)				

**1995-1996 to 2014-2015 from model output for Jasek and Evans (2022) model study and for 2016-2017 to 2023-2024 from daily thermal ice growth model used for operations and calibrated each year with thermal ice measurements at Shaftesbury crossing.*

For the 2024-2025 winter under the first year of Site C operations, the total number of days for possible ice bridge operation was 48 days, 24 days less than average with a Z-score = -0.76 (Table 5-40). Separating the effect of weather and Site C will need more years of data. Ice bridge operation did not occur in the 2024-2025 ice season and has not for more than a decade.

Table 5-40. Potential annual number of ice bridge crossing days at the Shaftesbury Crossing.

	0 - 15	16 - 30	31 - 45	46 - 60	61 - 75	76 - 90	91 - 105	106 - 120	>=121
Calculated Post Site C from EIS									
1995-1996 to 2010-2011 (Earliest, Average, Latest)	15				71			118	
Calculated Pre Site C from EIS									
1995-1996 to 2010-2011(Earliest, Average, Latest)		27			75				123
Calculated Pre Site C									
1995-1996 to 2023-2024	0				72				126
Calculated Post Site C									
2024-2025				48 (-0.76)					

For the 2024-2025 winter under the first year of Site C operations, the total potential crossable days by the Shaftesbury Ferry was 231 days, 4 days more than average with a Z-score of +0.16 (Table5-41).

Table 5-41. Potential annual number of ferry crossing days at the Shaftesbury Crossing.

	<=180	181 - 200	201 - 220	221 - 240	241 - 260	261 - 280	281 - 300	300 - 320	>=321
Calculated Post Site C from EIS									
1995-1996 to 2010-2011(Shortest, Average, Longest)		200		232		277			
Calculated Pre Site C from EIS									
1995-1996 to 2010-2011 (Shortest, Average, Longest)		191		229	254				
Calculated Pre Site C									
1995-1996 to 2023-2024		185		227			283		
Calculated Post Site C									
2024-2025				231 (+0.16)					

Combining data from Table 5-40 and 5-41 the total number of annual crossable days (either by ferry or ice bridge) was calculated. For the 2024-2025 water year under the first year of Site C operations, the total number of crossable days was 279 days out of 365 days, about 21 days less than the pre-Site C average with a Z-score of -0.86 (Table 5-42). This was largely due to a late freeze-up that delayed theoretical ice bridge operations given no ice bridge was constructed at the Shaftesbury crossing during the 2024-2025 period.

Table 5-42. Total potential annual crossable days by ice bridge or ferry at the Shaftesbury Crossing.

	<=200 days	201 - 220	221 - 240	241 - 260	261 - 280	281 - 300	301 - 320	321 - 340	340 – 365/366
Calculated Post Site C from EIS									
1995-1996 to 2010-2011(Earliest, Average, Latest)					275		303	329	
Calculated Pre Site C from EIS									
1995-1996 to 2010-2011(Earliest, Average, Latest)				259			304	329	
Calculated Pre Site C									
1995-1996 to 2023-2024			240			300		331	
Calculated Post Site C									
2024-2025					279 (-0.86)				

5.14 Ice Thickness

As outlined in Section 4.7 of EIS Volume 2, Appendix G[15], thermal ice thickness for supporting small loads would not change due to Site C. Thermal ice growth starts when the ice cover initial forms and is thick enough in a day or two to support a person or a large animal. The same physics apply for the post Site C ice cover. Freeze-up dates and breakup dates can be used as a proxy for this parameter.

5.15 Summary

The following summarises key observations for the 2024-2025 Peace River ice season under the first year of Site C operation.

- The 2024-2025 ice season was warmer than normal in the upstream portions of the Peace River, producing delay in freeze-up. Given only one year of post-Project data, it is difficult to distinguish the influence of weather conditions from the influence of Site C.
- The start of the late fall/winter 2024 was warmer than normal delaying freeze-up in the downstream reaches of the Peace River by several days compared to normal.
- In the 2024-2025 ice season, the Peace River freeze-up was more delayed compared to normal at upstream reaches than downstream reaches.
- The maximum upstream extent of the ice front at km 254.7 occurred on February 21, 2025. This was about 41 km upstream of Dunvegan, 142 km upstream of the Town of Peace River and about 150 km downstream of Site C.
- In the 2024-2025 ice season, the maximum upstream extent of the ice front was 44 km further downstream than the Pre-Site C average. The observed ice front was also downstream of the average EIS simulated years with Site C by 12 km.
- In the 2024-2025 ice season, the breakup was earlier than normal in the upstream reaches, but generally later than normal in the downstream reaches.
- The freeze-up at the Town of Peace River was 25 days later than the pre-Site C average. More detailed analysis with additional years of data will help discern these two affects.
- The break-up date at the Town of Peace River was 5 days earlier than the Pre-Site C average. The EIS predicted no change in the breakup date on average and additional

[15] EIS Volume 2, Appendix G available at https://iaac-aeic.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_G.pdf

years of data will be needed to determine whether this deviation reflects natural variability or a Site C related effect.

- Freeze-up water levels at the Town of Peace River were in the normal range and slightly below normal in 2024-2025.
- Break-up water levels at the Town of Peace River were well below average and the Smoky River was not a factor in the breakup of the Peace River in 2025 due to the below normal snowpack in that basin.
- Ice control for the Town of Peace River started on February 2, 2025, 26 days later than average.
- The duration of ice control was 12 days in February 2025, which is 11 days shorter than the pre-Site C average. This was due to a colder than normal February and lack of snowfall on the ice cover, conditions that allowed the thermal ice to grow quickly.
- For the 2024-2025 winter under the first year of Site C operations, the total number of days for possible Shaftesbury crossing ice bridge operation was 48 days, 24 days less than average.
- For the 2024-2025 winter under the first year of Site C operations, the total potential crossable days by the Shaftesbury Ferry was 231 days, 4 days more than average.
- Combining the Shaftesbury crossing ice bridge and ferry crossable days during the 2024-2025 water year yielded 279 crossable days, about 21 days less than average largely due to the mild winter and short ice bridge season.

6.0 Indigenous Community-based Monitoring

Section 5 of the Plan provides that BC Hydro "will work with ACFN and MCFN to develop a framework to support community-based monitoring (CBM).

During this reporting period, the focus of engagement was the development of a CBM framework to support monitoring of water flow, water levels, and ice conditions downstream of Site C within the geographic scope of the Plan.

BC Hydro held separate meetings in March 2025 with ACFN and MCFN to seek input on an initial community-based data collection approach that proposed collaboratively collecting, analyzing, and reporting ice monitoring data from a supplemental monitoring station at Boyer Rapids. Boyer Rapids, located approximately 14 km upstream of Peace Point within Wood Buffalo National Park, was identified as a valuable Peace River ice monitoring location because the data would help compare predicted and actual downstream ice effects from Site C, improve understanding of ice breakup processes, provide information on potential ice-jam flooding in the Peace-Athabasca Delta (PAD), and support PAD monitoring groups in deploying resources effectively. The proposed Year 2 (fall 2025–spring 2026) CBM included installing remote cameras and a water-level gauge, contractor support for initial setup and remote data acquisition, and MCFN and ACFN field involvement, including Indigenous Knowledge indicator observations.

ACFN and MCFN provided initial feedback on the proposed approach and BC Hydro made revisions in response by proposing two parallel, Nation-specific community-based monitoring approaches:

1) MCFN-led monitoring at Boyer Rapids, using a camera, water-level transducer, and Indigenous Knowledge indicator observations as noted above, and
2) ACFN to conduct Indigenous Knowledge-based ice and water monitoring at an alternate location within the Plan boundaries upstream of Peace Point.

Discussions continued from June to November 2025 as BC Hydro worked to further refine the approach and budget. ACFN expressed reservations about sharing Indigenous knowledge with BC Hydro as part of the CBM framework and stated it would focus on independent review of BC Hydro's annual reporting. MCFN has sought expanded monitoring and funding for two full-time staff. While BC Hydro has worked to refine its approach and budget as discussed above, BC Hydro communicated that the scope of the expansion proposed by MCFN would not be feasible.

BC Hydro will continue consulting both Nations on CBM for future opportunities.

7.0 References

BC Hydro, 2013. Site C Clean Energy - Environmental Impact Statement (EIS). Submitted by BC Hydro to the British Columbia Environmental Assessment Office and the Canadian Environmental Assessment Agency. https://iaac-aeic.gc.ca/050/evaluations/document/88727?culture=en-CA

Jasek, M., Friesenhan, E., Granson, W. 2007. Operational River Ice Forecasting on the Peace River – Managing Flood Risk and Hydropower Production. Proceedings of the 14th Workshop on the Hydraulics of Ice-Covered Rivers, Quebec City, Quebec.

Jasek, M., Emmer, S., 2019. Operating Procedures for Influencing the Freeze-Up and Break-Up of the Peace River at the Town of Peace River. Report Prepared by the Alberta – British Columbia Joint Task Force on Peace River Ice, December 2019.

Jasek, M., Evans., J., 2022. Predicted effects of Climate Change on Hydropower Operations for Freeze-up Ice Jam Flooding Mitigation. 26th IAHR International Symposium on Ice. Montréal, QC, Canada.

Jasek, M., 2024. Enhancement of One-Dimensional River Ice Model to Improve Forecasting of the Start of Peace River Ice Control Flow. Proceedings of the 27th International Symposium on Ice," Gdansk, Poland, 9-13, June 2024.

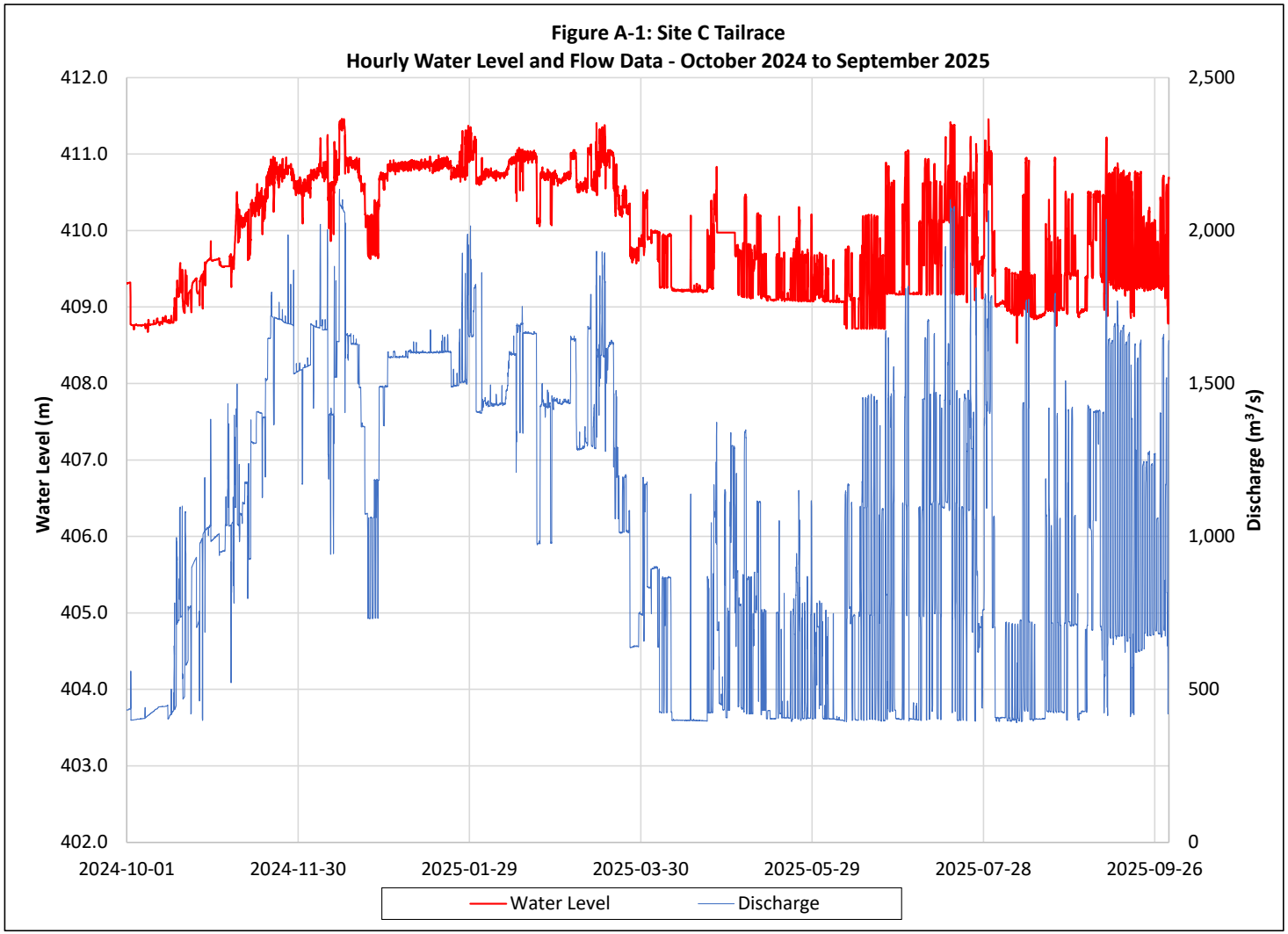
Appendix A
Observed Flow and Water Level Data (2024 – 2025)

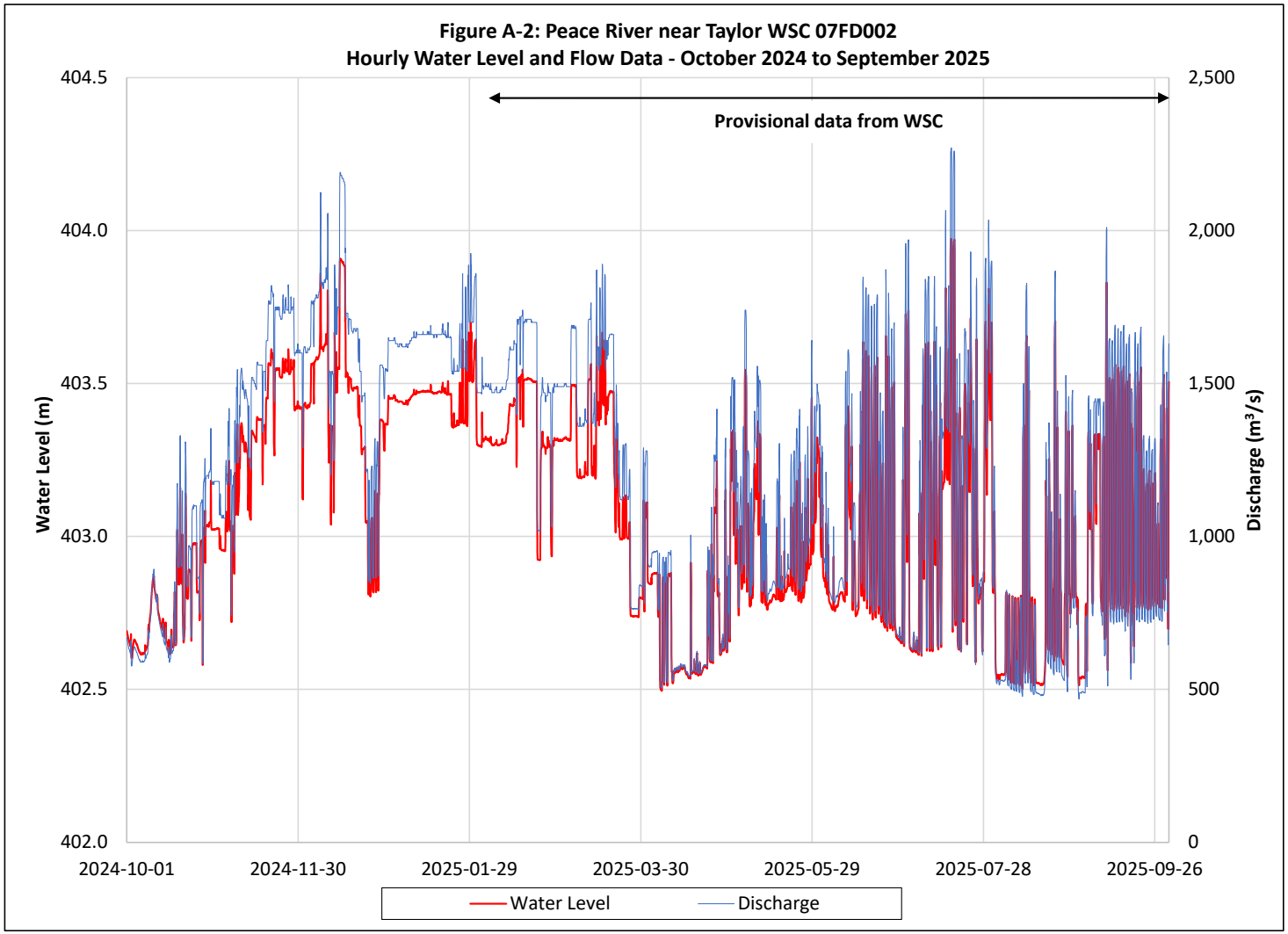
Figure A-1: Site C Tailrace Hourly Water Level and Flow Data - October 2024 to September 2025

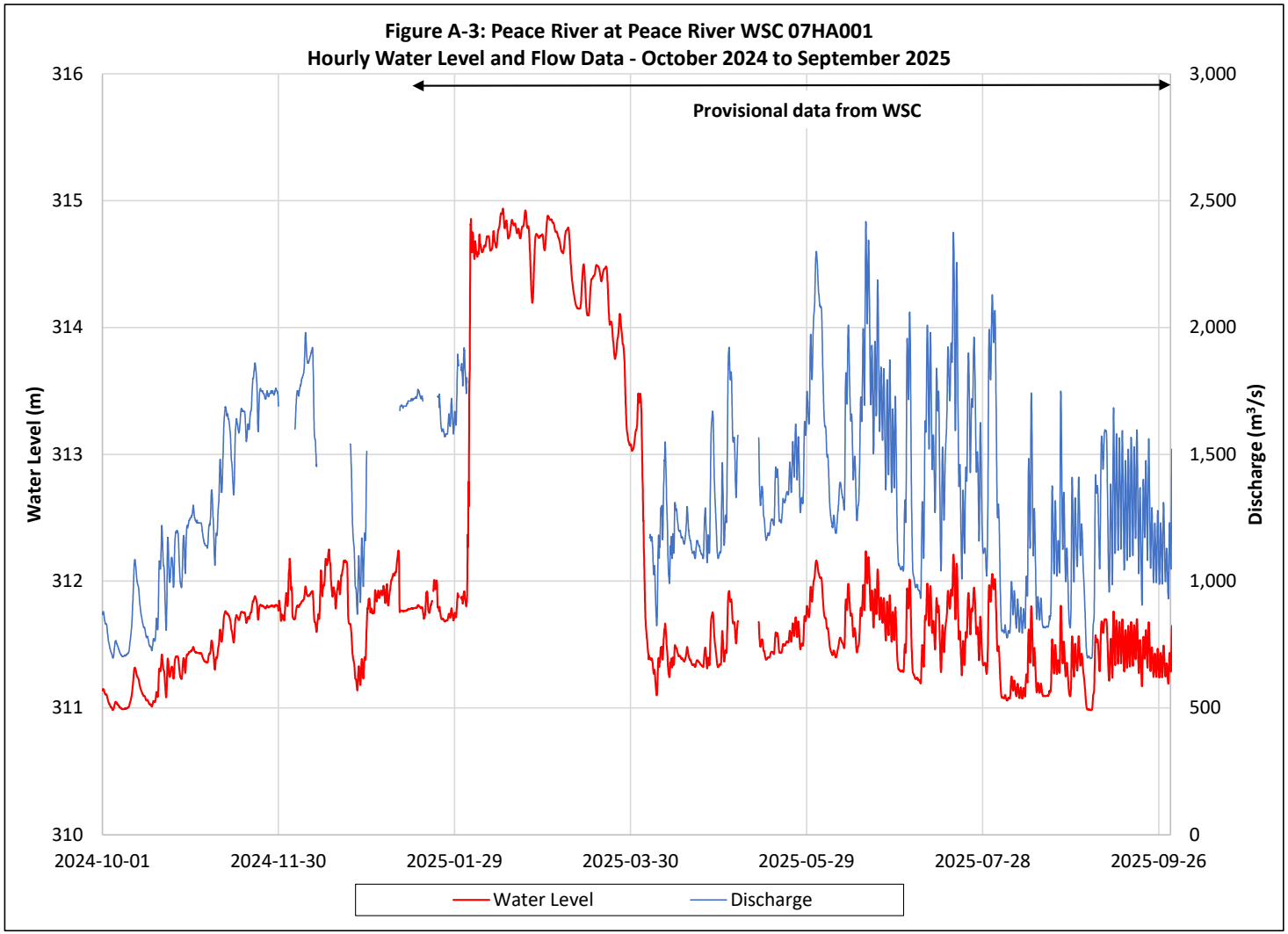
Figure A-2: Peace River near Taylor WSC 07FD002 Hourly Water Level and Flow Data - October 2024 to September 2025

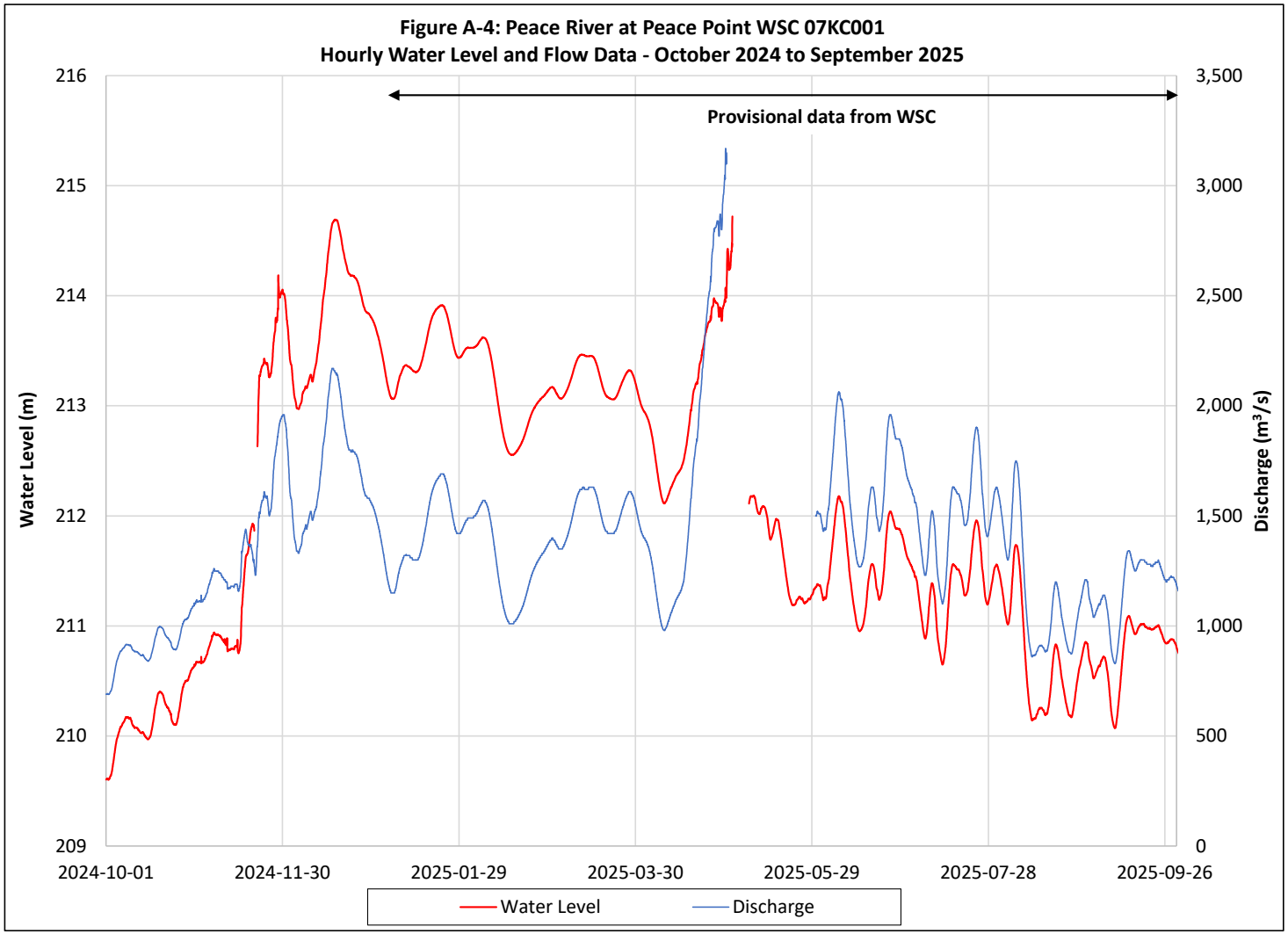
Figure A-3: Peace River at Peace River WSC 07HA001 Hourly Water Level and Flow Data - October 2024 to September 2025

Figure A-4: Peace River at Peace Point WSC 07KC001 Hourly Water Level and Flow Data - October 2024 to September 2025


Figure A-1: Site C Tailrace
Hourly Water Level and Flow Data - October 2024 to September 2025
Water Level (m)
Discharge (m³/s)
412.0
411.0
410.0
409.0
408.0
407.0
406.0
405.0
404.0
403.0
402.0
2,500
2,000
1,500
1,000
500
0
2024-10-01
2024-11-30
2025-01-29
2025-03-30
2025-05-29
2025-07-28
2025-09-26
Water Level
Discharge


Figure A-2: Peace River near Taylor WSC 07FD002
Hourly Water Level and Flow Data - October 2024 to September 2025
Provisional data from WSC
Water Level (m)
Discharge (m³/s)
404.5
404.0
403.5
403.0
402.5
402.0
2,500
2,000
1,500
1,000
500
0
2024-10-01
2024-11-30
2025-01-29
2025-03-30
2025-05-29
2025-07-28
2025-09-26
Water Level
Discharge


Figure A-3: Peace River at Peace River WSC 07HA001
Hourly Water Level and Flow Data - October 2024 to September 2025
Provisional data from WSC
Water Level (m)
Discharge (m³/s)
316
315
314
313
312
311
310
3,000
2,500
2,000
1,500
1,000
500
0
2024-10-01
2024-11-30
2025-01-29
2025-03-30
2025-05-29
2025-07-28
2025-09-26
Water Level
Discharge


Figure A-4: Peace River at Peace Point WSC 07KC001
Hourly Water Level and Flow Data - October 2024 to September 2025
Provisional data from WSC
Water Level (m)
Discharge (m³/s)
216
215
214
213
212
211
210
209
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2024-10-01
2024-11-30
2025-01-29
2025-03-30
2025-05-29
2025-07-28
2025-09-26
Water Level
Discharge

Appendix B
Surface Water Regime Duration Curves (2024 – 2025)

Figure B-1: Taylor Hourly Duration Curves Freshet Period: May 1 to July 15

Figure B-2: Taylor Hourly Duration Curves Summer Period: July 16 to September 30

Figure B-3: Town of Peace River Hourly Duration Curves Freshet Period: May 1 to July 15

Figure B-4: Town of Peace River Hourly Duration Curves Summer Period: July 16 to September 30

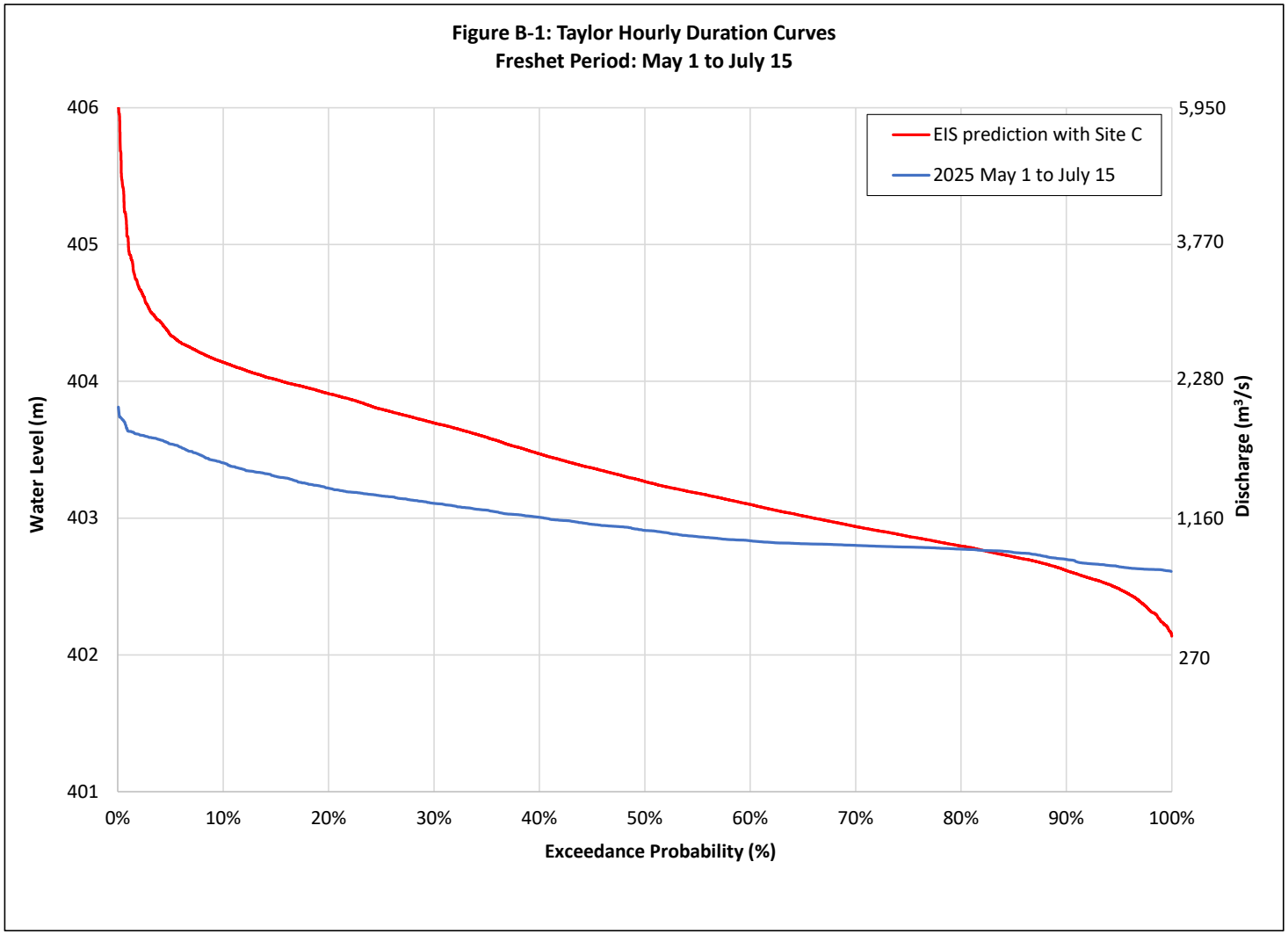
Figure B-5: Peace Point Hourly Duration Curves Freshet Period: May 1 to July 15

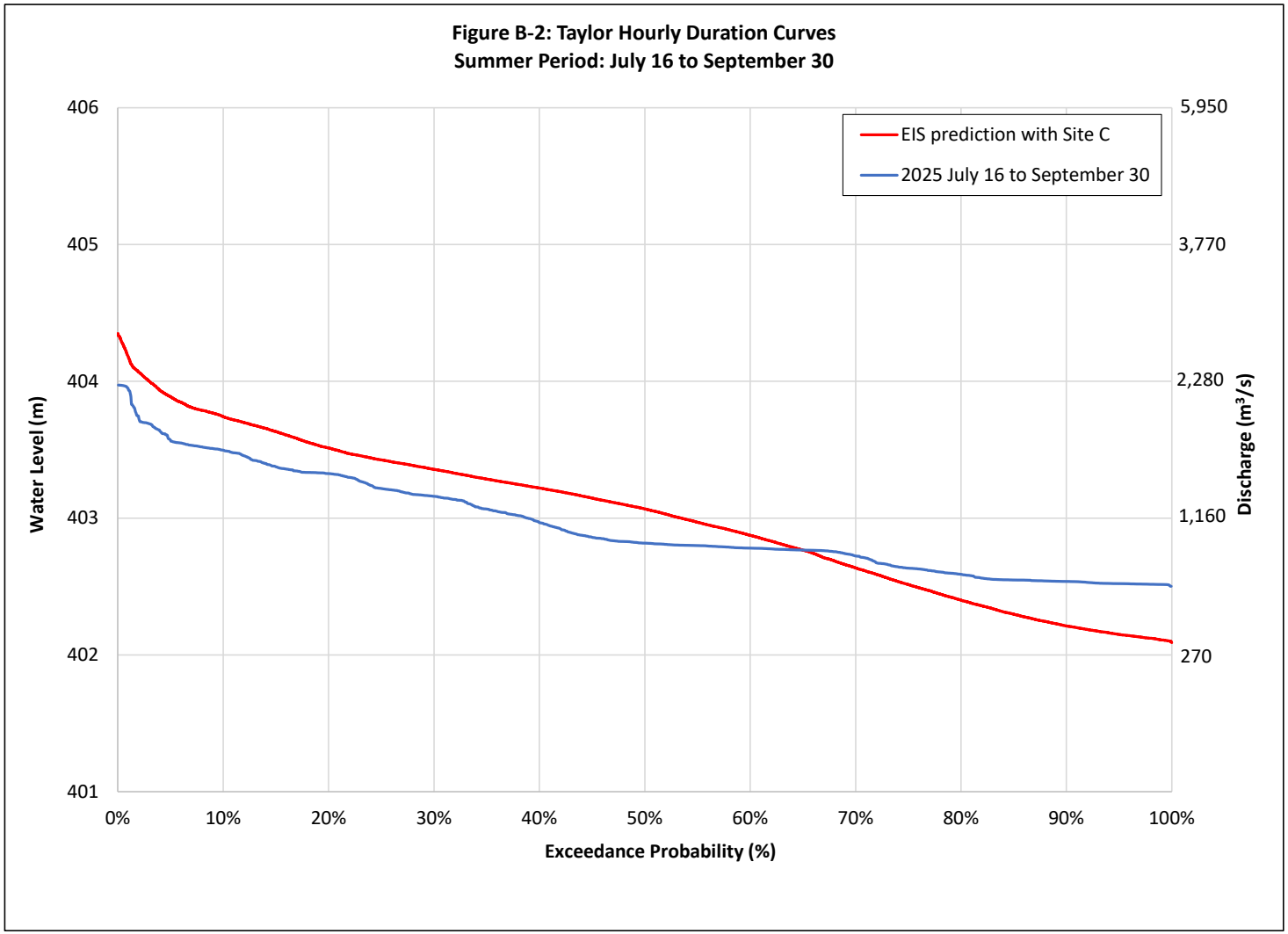
Figure B-6: Peace Point Hourly Duration Curves Summer Period: July 16 to September 30

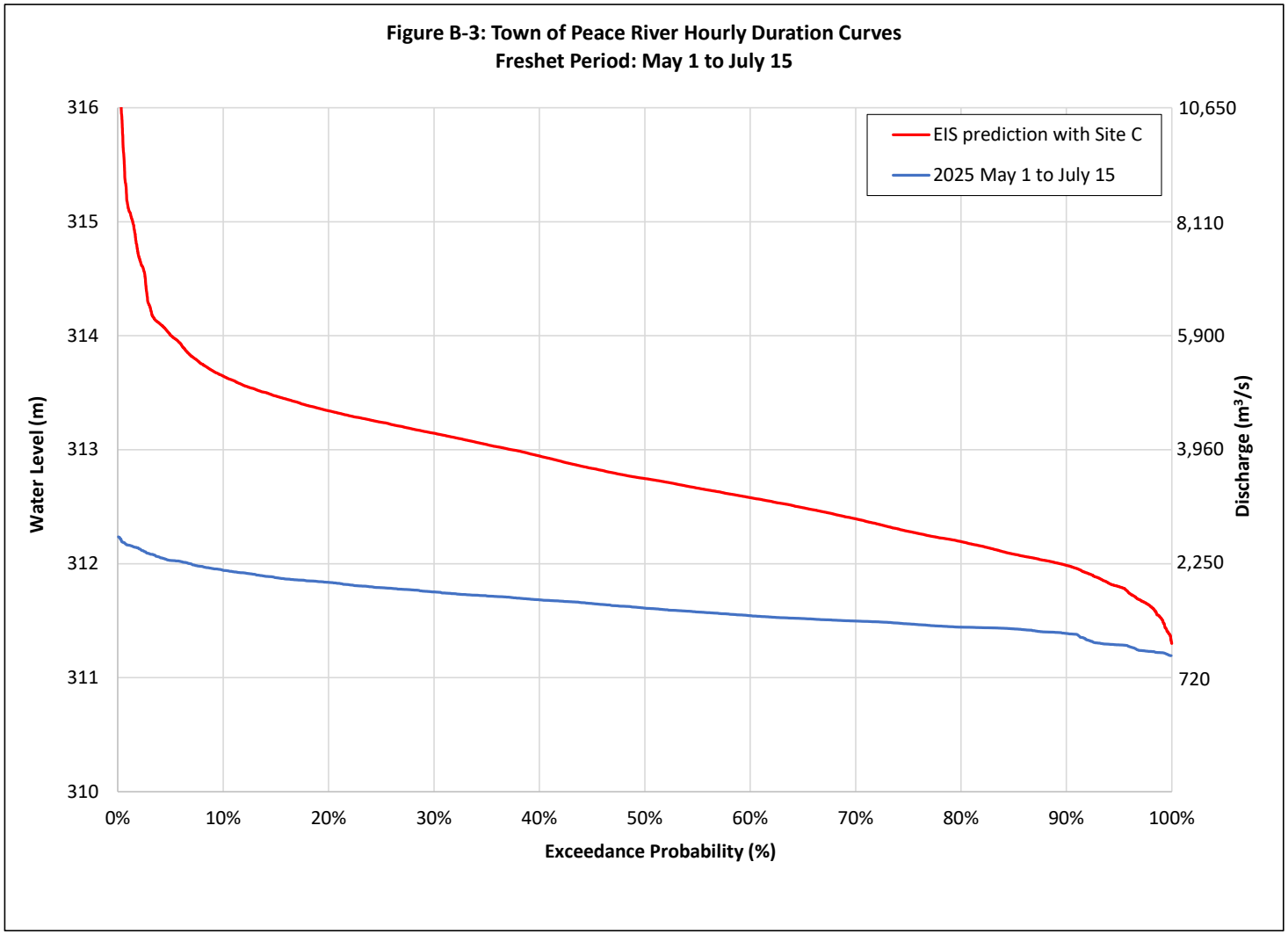
Figure B-7: Taylor Hourly Water Level Change Duration Curves

Figure B-8: Town of Peace River Hourly Water Level Change Duration Curves

Figure B-9: Peace Point Hourly Water Level Change Duration Curves


Figure B-1: Taylor Hourly Duration Curves
Freshet Period: May 1 to July 15
406
405
404
403
402
401
Water Level (m)
5,950
3,770
2,280
1,160
270
Discharge (m³/s)
EIS prediction with Site C
2025 May 1 to July 15
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance Probability (%)


Figure B-2: Taylor Hourly Duration Curves
Summer Period: July 16 to September 30
406
405
404
403
402
401
Water Level (m)
5,950
3,770
2,280
1,160
270
Discharge (m³/s)
EIS prediction with Site C
2025 July 16 to September 30
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance Probability (%)


Figure B-3: Town of Peace River Hourly Duration Curves
Freshet Period: May 1 to July 15
EIS prediction with Site C
2025 May 1 to July 15
Water Level (m)
Discharge (m³/s)
316
315
314
313
312
311
310
10,650
8,110
5,900
3,960
2,250
720
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance Probability (%)

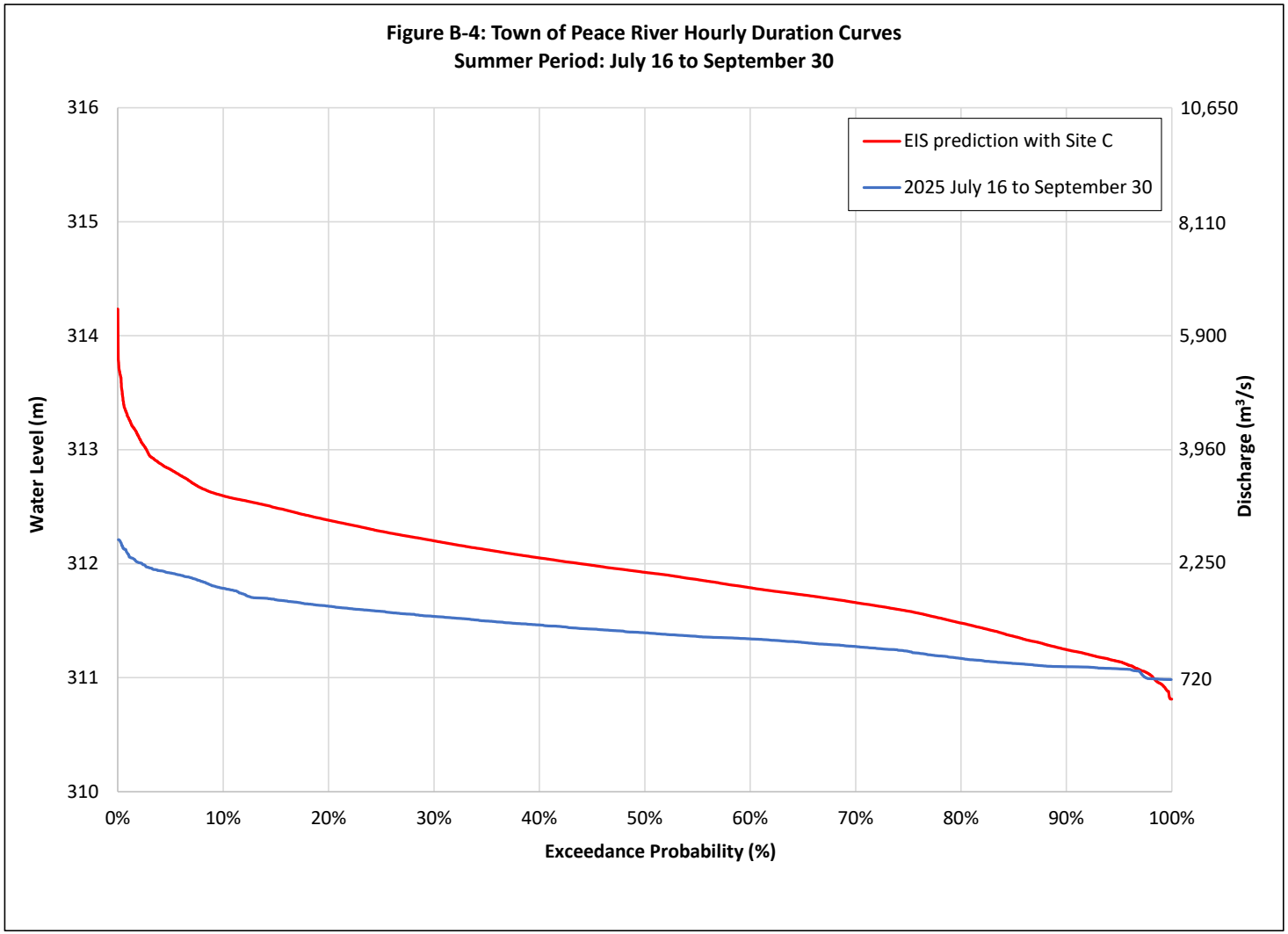

Figure B-4: Town of Peace River Hourly Duration Curves
Summer Period: July 16 to September 30
EIS prediction with Site C
2025 July 16 to September 30
Water Level (m)
Discharge (m³/s)
316
315
314
313
312
311
310
10,650
8,110
5,900
3,960
2,250
720
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance Probability (%)

Figure B-5: Peace Point Hourly Duration Curves
Freshet Period: May 1 to July 15

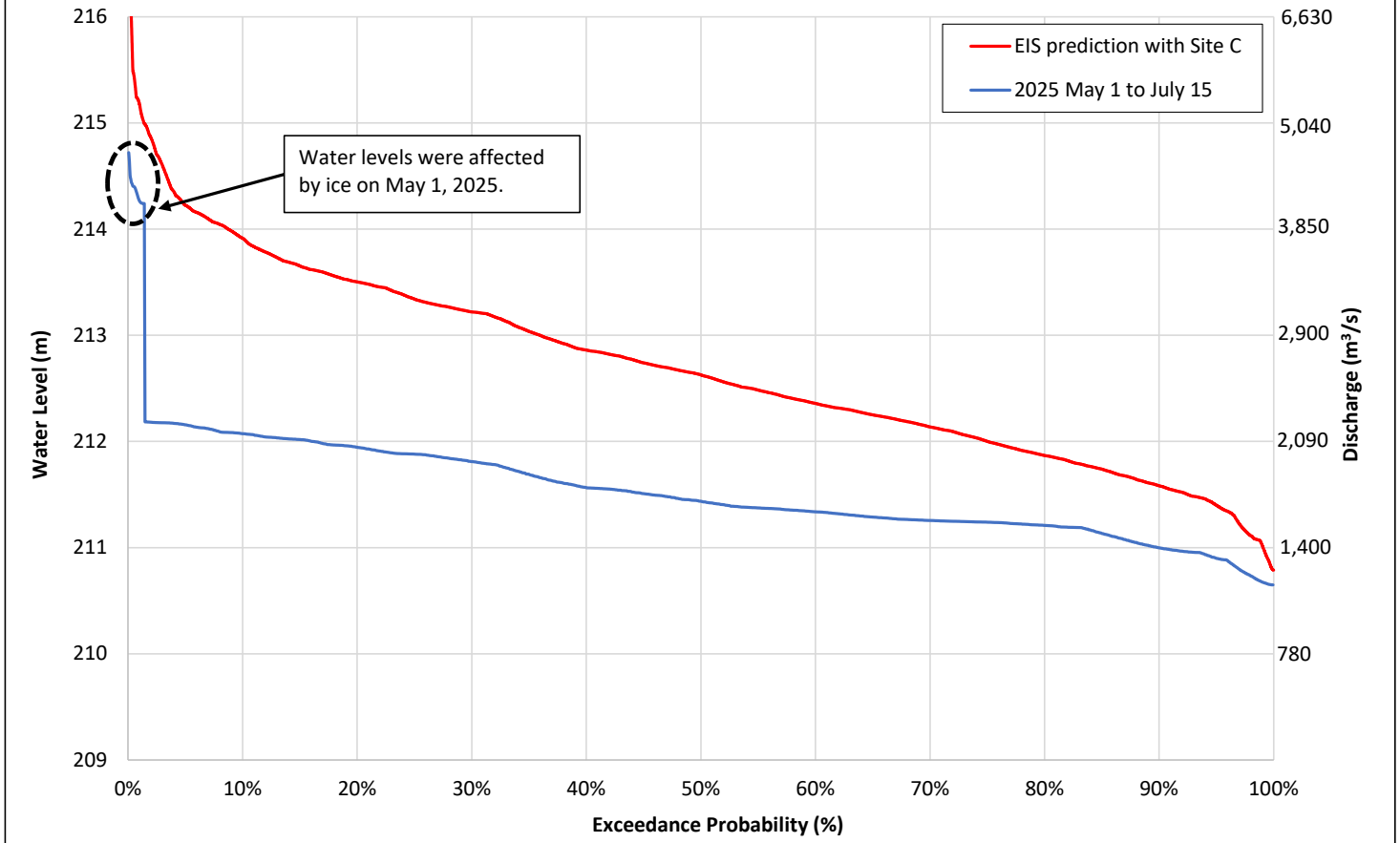


Figure B-6: Peace Point Hourly Duration Curves
Summer Period: July 16 to September 30

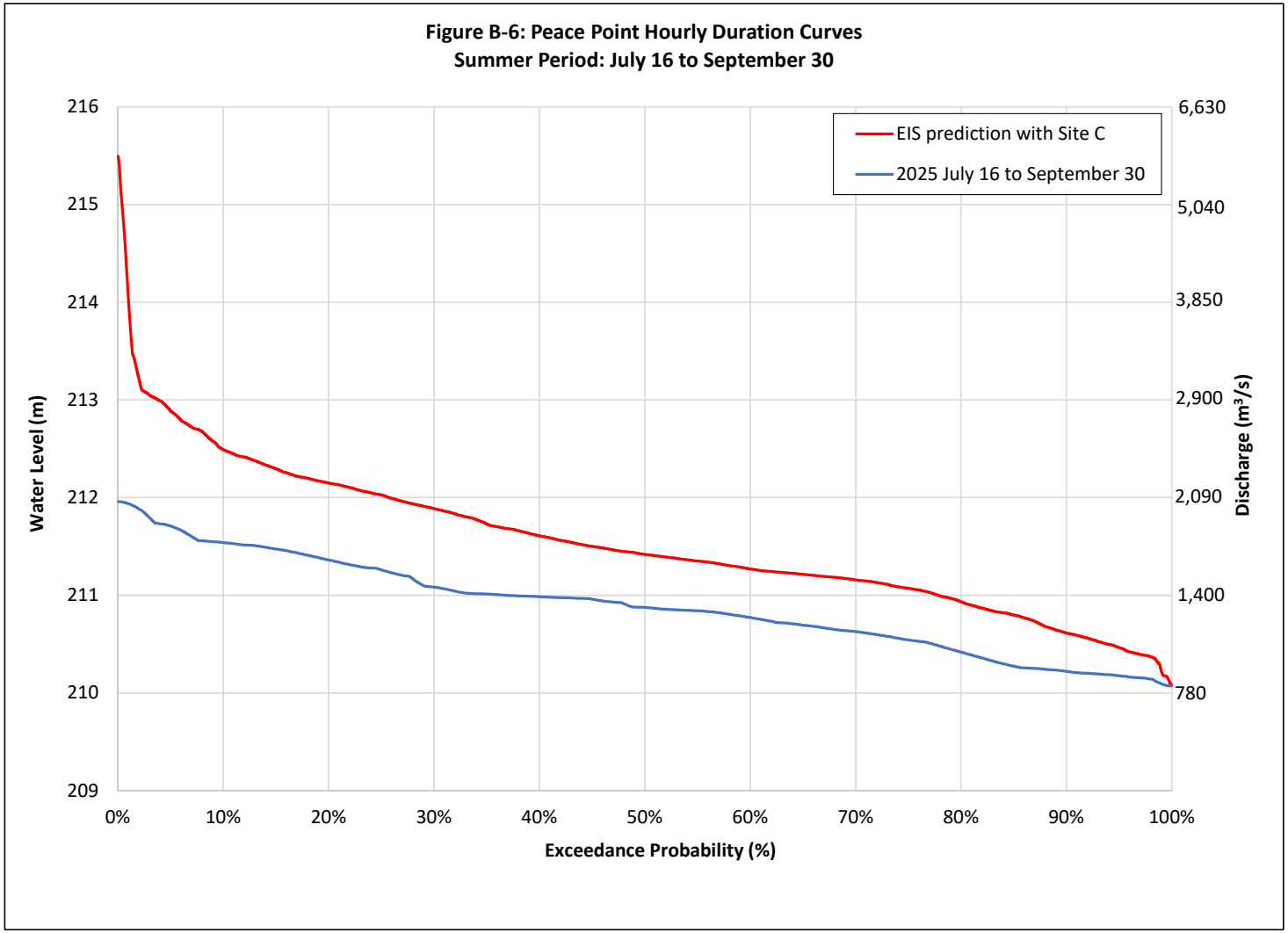


Figure B-7: Taylor Hourly Water Level Change Duration Curves

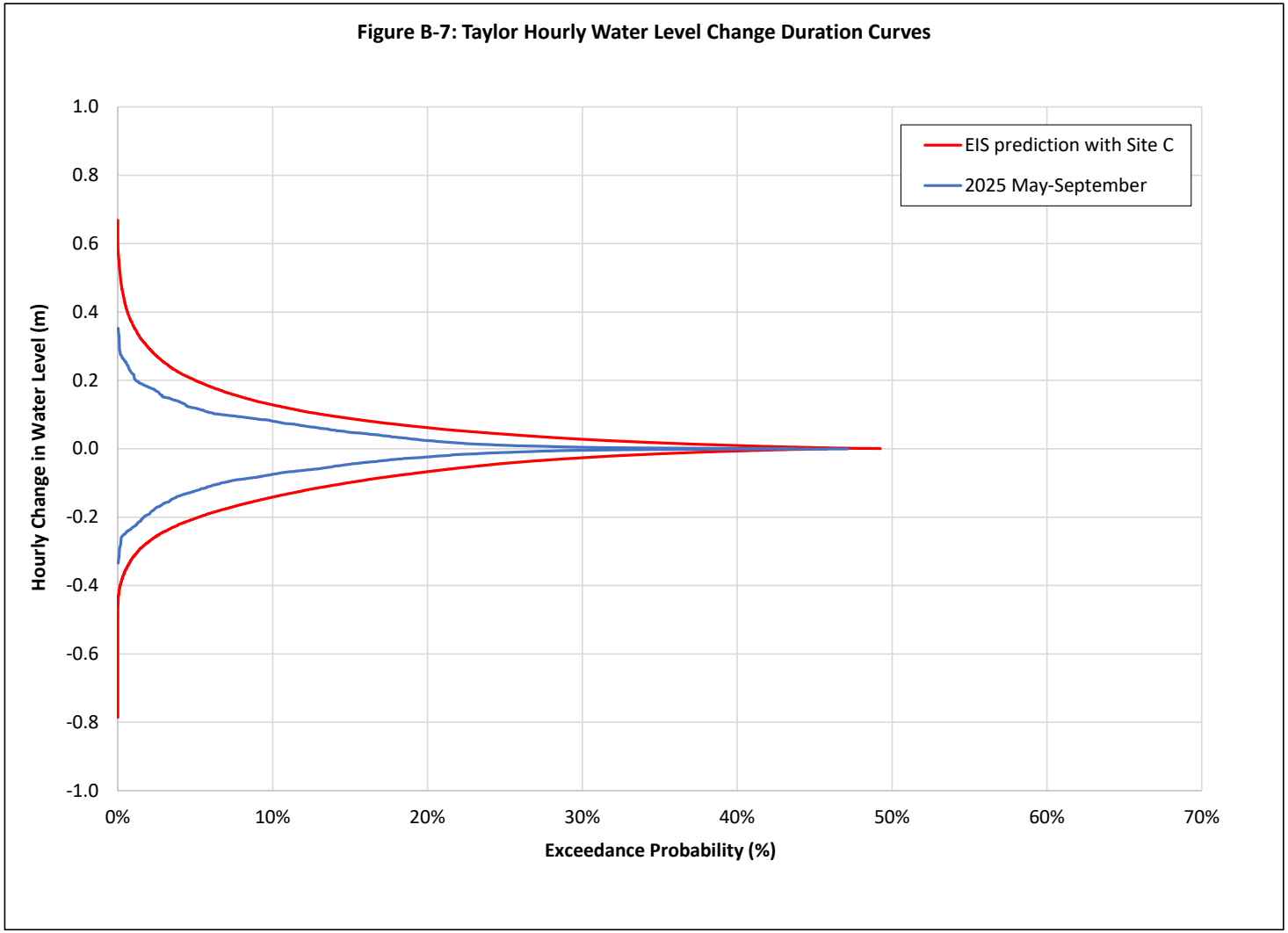


Figure B-8: Town of Peace River Hourly Water Level Change Duration Curves

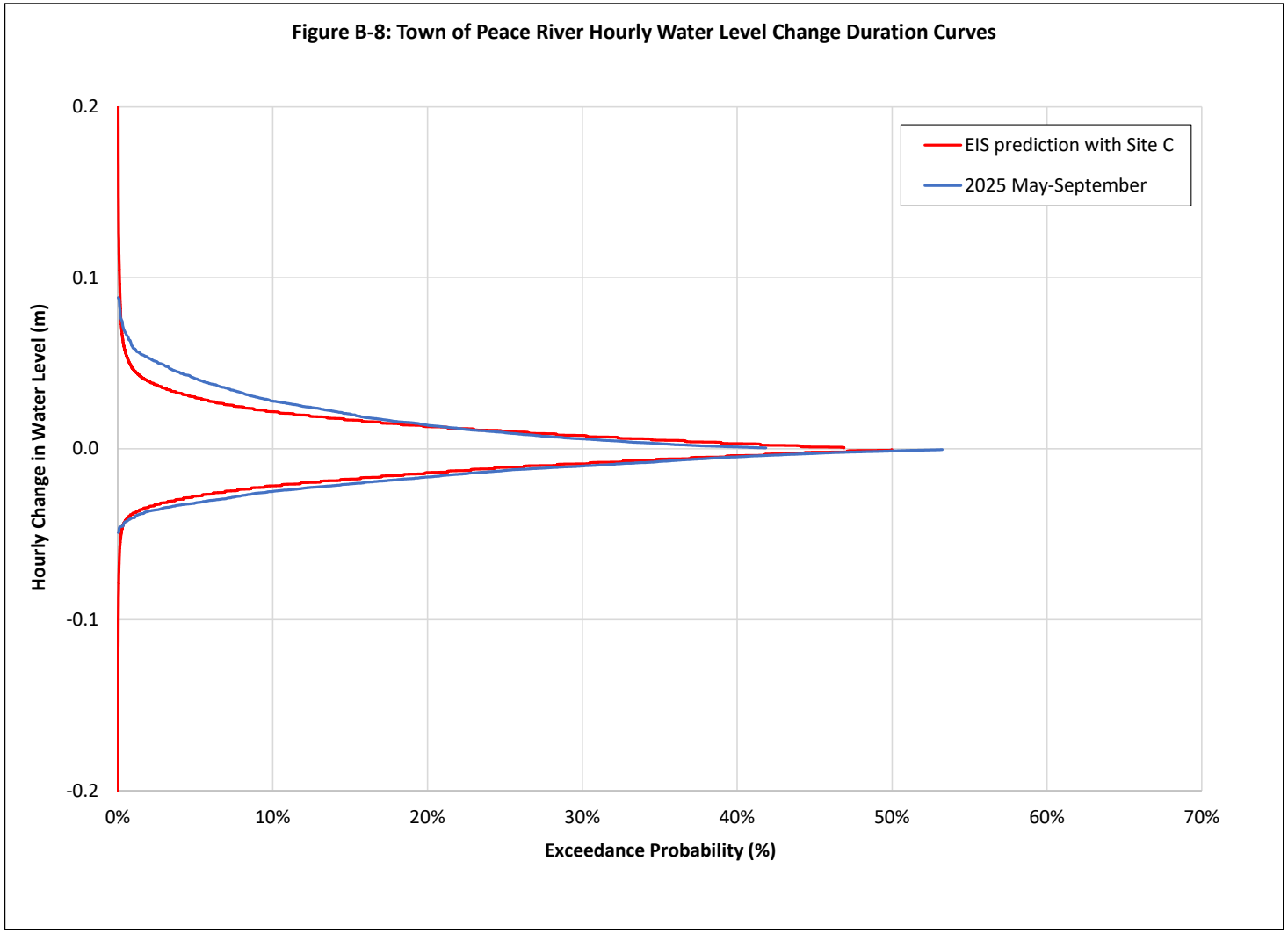
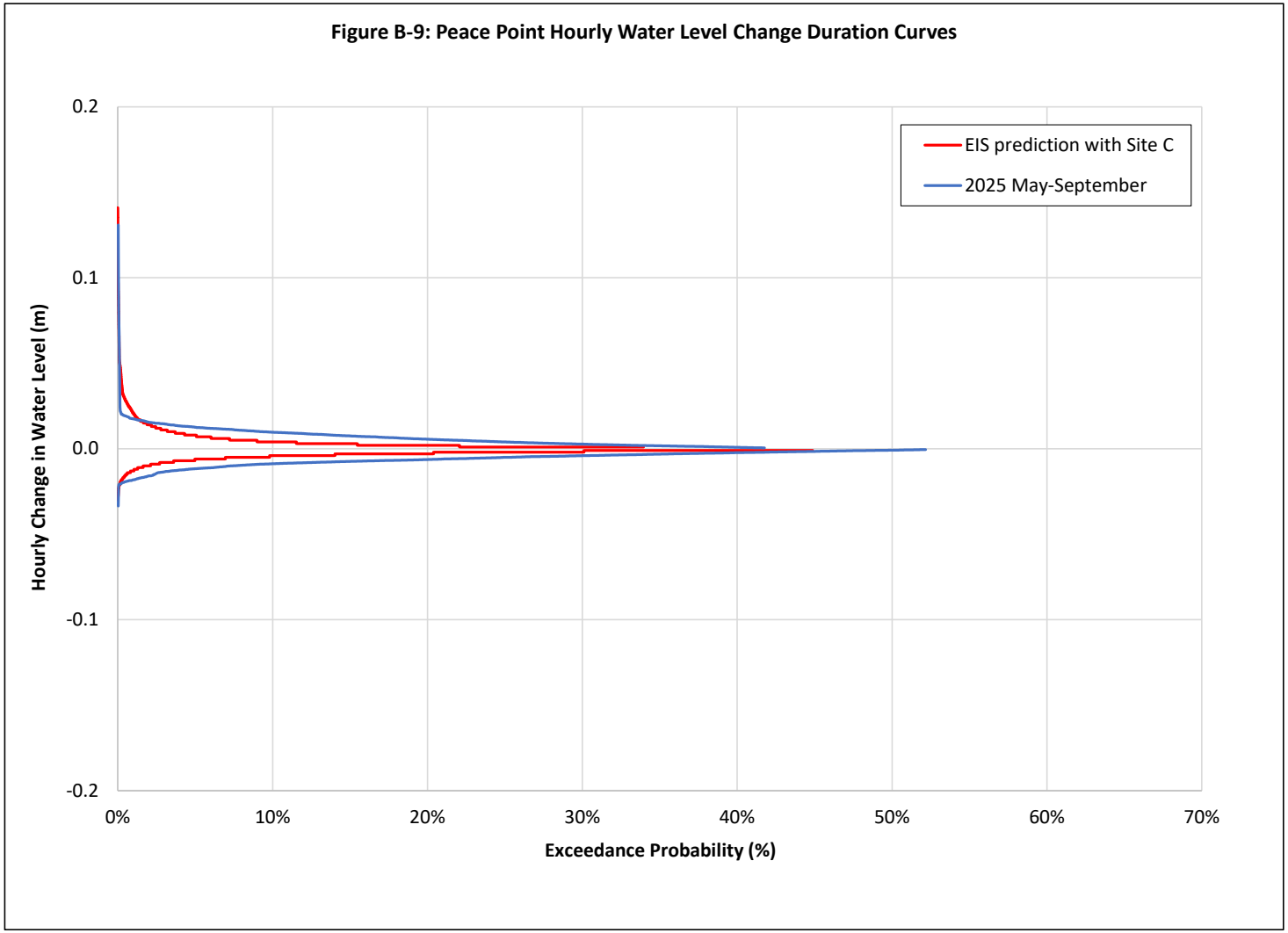


Figure B-9: Peace Point Hourly Water Level Change Duration Curves



Appendix C
Ice Season Ice Front Positions (2024 – 2025)

Date/Time (MST)	Ice Front Location (km)	Comment
12-Nov-2024 18:12		RCM - open km 1087-1320.6
16-Nov-2024 11:40		Sentinel 2/Landsat 9 - mostly cloudy but appears open km 1231-1310, 1182-1183, 1150-1163, 1121-1142, 1040-1043, 1006-1007, 998-1003, 994-996, 970-985
22-Nov-2024 17:59	1342.0	Sentinel 1
24-Nov-2024 11:56	1342.0	Sentinel 2
25-Nov-2024 11:34	1342.0	Landsat 9
22-Nov-2024 17:59	1326.0	Sentinel 1
24-Nov-2024 11:56	1326.2	Sentinel 2
25-Nov-2024 11:34	1326.0	Landsat 9

22-Nov-2024 17:59	1306.1	Sentinel 1
24-Nov-2024 11:56	1304.7	Sentinel 2
25-Nov-2024 11:34	1303.6	Landsat 9
26-Nov-2024 11:47	1303.5	Sentinel 2
22-Nov-2024 17:59	1260.0	Sentinel 1
24-Nov-2024 11:56	1258.0	Sentinel 2
25-Nov-2024 11:34	1254.8	Landsat 9
26-Nov-2024 11:47	1254.0	Sentinel 2
22-Nov-2024 17:59	1239.5	Sentinel 1
24-Nov-2024 11:56	1239.0	Sentinel 2
25-Nov-2024 11:34	1239.0	Landsat 9
22-Nov-2024 17:59	1228.9	Sentinel 1
24-Nov-2024 11:56	1228.9	Sentinel 2
25-Nov-2024 11:34	1228.8	Landsat 9
26-Nov-2024 11:47	1228.7	Sentinel 2

22-Nov-2024 17:59	1217.8	Sentinel 1
24-Nov-2024 11:56	1215.0	Sentinel 2
25-Nov-2024 11:34	1214.6	Landsat 9
26-Nov-2024 11:47	1214.4	Sentinel 2
18-Nov-2024 17:55	1207.0	
19-Nov-2024 11:57	1206.7	Sentinel 2
20-Nov-2024 18:16	**1178.0**	Sentinel 1
20-Nov-2024 21:35	1172.1	Interpolate time using location of subsequent ice front
21-Nov-2024 11:46	1172.1	Sentinel 2
24-Nov-2024 11:56	1171.1	Sentinel 2
25-Nov-2024 11:34	1170.9	Landsat 9
26-Nov-2024 11:47	1170.8	Sentinel 2
20-Nov-2024 23:10	1169.3	Interpolate time using location of subsequent ice front
21-Nov-2024 11:46	**1147.0**	Sentinel 2
22-Nov-2024 04:45	1136.1	Peace Point Gauge - stage up complete

24-Nov-2024 11:56	1121.6	Sentinel 2
25-Nov-2024 11:34	1120.5	Landsat 9
26-Nov-2024 18:28	1119.1	RCM
29-Nov-2024 11:57	1120.6	Sentinel 2
2-Dec-2024 18:16	1117.5	Sentinel 1
10-Dec-2024 11:39	1108.6	Landsat 8
18-Dec-2024 11:39	1108.6	Landsat 9
20-Nov-2024 18:16	1096.0	Sentinel 1
20-Nov-2024 18:16	1086.5	Sentinel 1
24-Nov-2024 11:56	1080.9	Sentinel 2
25-Nov-2024 11:34	1080.6	Landsat 9
24-Nov-2024 11:56	1031.4	Sentinel 2
25-Nov-2024 11:34	1031.3	Landsat 9
20-Nov-2024 18:16	1066.0	Sentinel 1

24-Nov-2024 11:56	924.3	Sentinel 2
25-Nov-2024 18:24	919.9	Sentinel 1
26-Nov-2024 18:28	916.3	RCM
27-Nov-2024 12:06	916.1	Sentinel 2
30-Nov-2024 02:05	832.5	Fort Vermilion Gauge
30-Nov-2024 06:57	779.0	RCM
30-Nov-2024 12:16	767.0	Sentinel 2
30-Nov-2024 18:26	753.5	RCM
2-Dec-2024 19:35	651.0	Carcajou Gauge
4-Dec-2024 18:28	597.0	RCM
5-Dec-2024 07:05	588.0	RCM
5-Dec-2024 12:18	584.3	Sentinel 2
6-Dec-2024 18:12	582.0	RCM
7-Dec-2024 12:07	581.6	Sentinel 2
7-Dec-2024 18:20	581.0	RCM
7-Dec-2024 18:23	581.0	Sentinel 1
9-Dec-2024 07:05	580.0	RCM
11-Dec-2024 18:20	584.3	RCM - Comparing last two RCMs this was a thermal melt and not a consolidation

12-Dec-2024 12:08	584.1	Sentinel 2
12-Dec-2024 18:28	584.0	RCM
13-Dec-2024 07:06	583.4	RCM
15-Dec-2024 18:20	576.0	RCM
16-Dec-2024 11:53	567.0	Landsat 9
17-Dec-2024 07:05	559.0	RCM
17-Dec-2024 12:07	564.5	Sentinel 2
19-Dec-2024 18:24	522.0	Sentinel 1
20-Dec-2024 12:17	507.0	Sentinel 2
21-Dec-2024 07:05	499.0	RCM
21-Dec-2024 17:01	496.5	BCH Remote Camera
22-Dec-2024 12:08	499.6	Sentinel 2
23-Dec-2024 14:40	498.7	BCH Ground Observation
24-Dec-2024 09:01	495.3	BCH Remote Camera
24-Dec-2024 18:28	494.0	RCM
24-Dec-2024 18:32	494.0	Sentinel 1
25-Dec-2024 07:06	493.8	RCM
25-Dec-2024 09:01	493.6	BCH Remote Camera

25-Dec-2024 16:01	493.0	BCH Remote Camera
25-Dec-2024 16:16	494.9	BCH Camera. Toe formed between two pictures.
25-Dec-2024 16:31	493.0	BCH Remote Camera
26-Dec-2024 09:45	492.5	BCH Remote Camera
26-Dec-2024 13:16	492.5	BCH Remote Camera, stopped between two pictures
26-Dec-2024 18:05	492.4	BCH Remote Camera
28-Dec-2024 18:28	491.0	RCM
29-Dec-2024 07:05	490.9	RCM
30-Dec-2024 19:05	490.7	Sunny Valley gauge - moving upstream
31-Dec-2024 00:40	490.7	Sunny Valley gauge - moving downstream
31-Dec-2024 01:00	490.7	Sunny Valley gauge - moving upstream
31-Dec-2024 11:35	490.7	Sunny Valley gauge - moving downstream
31-Dec-2024 05:25	490.7	Sunny Valley gauge - moving upstream
31-Dec-2024 11:00		Somewhere between km 490.7 and km 486 before it consolidated
31-Dec-2024 11:35	490.7	Sunny Valley gauge - moving downstream
31-Dec-2024 11:46	492.4	BCH Remote Camera - moving downstream between two pictures
31-Dec-2024 12:01	495.9	BCH Remote camera - moving toe location
31-Dec-2024 12:16	496.1	BCH Remote Camera - toe formed between two pictures

31-Dec-2024 13:01	492.4	BCH Remote Camera at km 496 looking upstream
31-Dec-2024 13:16	490.7	Sunny Valley gauge - moving upstream
31-Dec-2024 20:16	485.8	BCH Remote Camera, stopped between two pictures - moving upstream
31-Dec-2024 21:16	485.8	BCH Remote Camera, moving upstream between two pictures
1-Jan-2025 00:17	485.8	BCH Remote Camera, stopped between two pictures - moving upstream
1-Jan-2025 05:17	485.8	BCH Remote Camera, moving upstream between two pictures
1-Jan-2025 06:47	485.8	BCH Remote Camera, stopped between two pictures - moving upstream
1-Jan-2025 11:52	482.5	Between km 481 and km 484 Landsat 9
2-Jan-2025 07:05	476.0	RCM
2-Jan-2025 16:15	475.5	BCH Drone
3-Jan-2025 07:14	470.0	RCM
3-Jan-2025 13:11	464.0	
4-Jan-2025 12:17	455.3	BCH Remote Camera between two pictures - ice front moving upstream
4-Jan-2025 13:17	455.3	BCH Remote Camera between two pictures - ice front moving downstream
4-Jan-2025 15:46	455.3	BCH Remote Camera between two pictures - ice front moving upstream
4-Jan-2025 21:47	455.3	BCH Remote Camera between two pictures - ice front moving downstream
4-Jan-2025 22:17	455.3	BCH Remote Camera between two pictures - ice front moving upstream
5-Jan-2025 18:32	435.0	Sentinel 1

6-Jan-2025 04:00	427.8	Extrapolate previous advance to time of drop start at Berreth gauge, extrapolate from a mid-time at km 455.3 camera
6-Jan-2025 05:45	455.3	In the morning showed the consolidation had gone downstream of this camera (IR was not working at night, Use typical consolidation rate
6-Jan-2025 06:00	457.1	Toe in the 12:07 Sentinel 2, ice sheets did shift at km 458-460 (some leads opened but was not consolidated)
6-Jan-2025 07:06	439.0	RCM
6-Jan-2025 12:07	434.0	Sentinel 2
9-Jan-2025 05:46	422.6	BCH Remote Camera between two pictures - ice front moving upstream
9-Jan-2025 12:16	421.0	Sentinel 2
9-Jan-2025 18:28	420.0	RCM
11-Jan-2025 14:31	422.5	BCH Remote Camera - open water come in right of frame
11-Jan-2025 17:16	422.7	BCH Remote Camera - open water leaves left of frame between two pictures
13-Jan-2025 18:27	431.3	RCM
14-Jan-2025 12:17	433.0	Sentinel 2
17-Jan-2025 18:29	445.2	RCM
18-Jan-2025 11:47	443.8	Landsat 8
19-Jan-2025 12:16	435.5	Sentinel 2
20-Jan-2025 05:10	426.5	Berreth Gauge
20-Jan-2025 12:16	422.6	BCH Remote Camera between two pictures - ice front moving upstream

20-Jan-2025 13:46	422.6	BCH Remote Camera between two pictures - ice front moving downstream
20-Jan-2025 14:46	422.6	BCH Remote Camera between two pictures - ice front moving upstream
20-Jan-2025 18:11	422.6	BCH Remote Camera between two pictures - ice front moving downstream and upstream between two pictures
20-Jan-2025 18:21	422.6	BCH Remote Camera between two pictures - ice front moving downstream and upstream between two pictures
20-Jan-2025 23:16	416.8	BCH Remote Camera between two pictures - ice front moving upstream
21-Jan-2025 00:16	416.8	BCH Remote Camera between two pictures - ice front moving downstream
21-Jan-2025 00:46	416.8	BCH Remote Camera between two pictures - ice front moving upstream
21-Jan-2025 02:16	416.8	BCH Remote Camera between two pictures - ice front moving downstream
21-Jan-2025 02:46	416.8	BCH Remote Camera between two pictures - ice front moving upstream
21-Jan-2025 05:16	416.8	BCH Remote Camera between two pictures - ice front moving downstream
21-Jan-2025 05:46	416.8	BCH Remote Camera between two pictures - ice front moving upstream
21-Jan-2025 07:16	416.8	BCH Remote Camera WL drops between two pictures - start of consolidation
		Blank line here since consolidation started at mid-ice cover
21-Jan-2025 06:46	422.6	BCH Remote Camera between two pictures - consolidation moving downstream (movement at km 422.6 starts before WL drop at km 416.8
21-Jan-2025 07:10	426.5	Berreth Gauge - consolidation moving downstream
21-Jan-2025 08:00	435.0	RCM from 21-Jan-2025 18:28 shows a toe here. Estimate time from typical consolidation rates
21-Jan-2025 10:40	426.5	Berreth Gauge - re-advancing upstream

21-Jan-2025 14:31	422.6	BCH Remote Camera ice front in camera view moving upstream
21-Jan-2025 18:28	417.5	RCM
21-Jan-2025 22:46	422.6	BCH Remote Camera ice front in camera view moving downstream
21-Jan-2025 23:10	426.5	Berreth Gauge - consolidation moving downstream
21-Jan-2025 23:22	428.4	Extrapolate based on consolidation and upstream advance rates
22-Jan-2025 00:10	426.5	Berreth Gauge - re-advancing upstream
22-Jan-2025 01:46	422.6	BCH Remote Camera ice front in camera view moving upstream
23-Jan-2025 08:31	417.0	BCH Remote Camera - ice front in photo
23-Jan-2025 09:01	417.1	BCH Remote Camera - ice front in photo
23-Jan-2025 09:31	417.0	BCH Remote Camera - ice front in photo
23-Jan-2025 10:01	417.0	BCH Remote Camera - ice front in photo
23-Jan-2025 10:31	416.9	BCH Remote Camera - ice front in photo
23-Jan-2025 11:01	416.80	BCH Remote Camera - ice front in photo
23-Jan-2025 12:31	416.75	BCH Remote Camera - ice front in photo
23-Jan-2025 14:01	416.8	BCH Remote Camera - ice front in photo
23-Jan-2025 14:31	416.9	BCH Remote Camera - ice front in photo
23-Jan-2025 16:31	416.9	BCH Remote Camera - ice front in photo
23-Jan-2025 17:01	417.1	BCH Remote Camera - ice front in photo

23-Jan-2025 17:31	417.2	BCH Remote Camera - ice front in photo
23-Jan-2025 18:01	417.2	BCH Remote Camera - ice front in photo
24-Jan-2025 12:17	419.0	Sentinel 2
25-Jan-2025 06:07	421.4	RCM
25-Jan-2025 14:31	422.6	BCH Remote Camera - ice front in photo
26-Jan-2025 12:05	424.0	Sentinel 2
28-Jan-2025 07:22	425.4	RCM
29-Jan-2025 18:28	430.4	RCM
29-Jan-2025 18:31	430.4	Sentinel 1
30-Jan-2025 12:30	433.3	Extrapolated based on Berreth gauge stage during last two RCMs ice front locations
30-Jan-2025 19:00	433.8	Extrapolated based on Berreth gauge stage during last two RCMs ice front locations, stage stopped dropping, ice front turning around to moving upstream
1-Feb-2025 02:55	426.5	Berreth Gauge - re-advancing upstream
1-Feb-2025 05:16	422.6	BCH Remote Camera between two pictures - ice front moving upstream
1-Feb-2025 06:00	426.5	Berreth Gauge - consolidating downstream
1-Feb-2025 06:16	422.6	BCH Remote Camera between two pictures - ice front moving downstream
1-Feb-2025 07:35	426.5	Berreth Gauge - re-advancing upstream
1-Feb-2025 07:46	422.6	BCH Remote Camera between two pictures - ice front moving upstream

1-Feb-2025 16:46	416.8	BCH Remote Camera between two pictures - ice front moving upstream
1-Feb-2025 17:46	416.8	BCH Remote Camera between two pictures - ice front moving downstream
1-Feb-2025 18:46	416.8	BCH Remote Camera between two pictures - ice front moving upstream
2-Feb-2025 13:00	405.0	TPR gauge starts dropping indicating start of consolidation, location extrapolate based on previous advance rate
2-Feb-2025 14:01	409.9	BCH Remote Camera - consolidation moving downstream
2-Feb-2025 14:16	410.1	BCH Remote Camera - consolidation toe stopped here between two photos
2-Feb-2025 14:14	403.2	Sentinel 2
2-Feb-2025 15:22	403.7	AEPA Ground Observation
2-Feb-2025 17:45	402.0	AEPA Ground Observation
2-Feb-2025 18:28	402.0	RCM
3-Feb-2025 07:06	397.2	RCM
3-Feb-2025 08:47	397.5	AEPA Ground Observation
3-Feb-2025 12:16		Sentinel 2, Looks like km 392.5 but likely downstream of here as large ice supply makes it difficult to determine moving ice from stationary
3-Feb-2025 15:45	393.8	TPS Gauge
3-Feb-2025 16:45	390.5	AEPA Ground Observation
3-Feb-2025 19:46	389.9	BCH Remote Camera between two pictures - ice front moving upstream
3-Feb-2025 22:16	389.9	BCH Remote Camera between two pictures - ice front moving downstream

3-Feb-2025 22:46	389.9	BCH Remote Camera between two pictures - ice front moving upstream
4-Feb-2025 08:50	383.4	AEPA Ground Observation
4-Feb-2025 12:25	381.4	PSC Gauge
4-Feb-2025 16:52	372.3	AEPA Ground Observation
6-Feb-2025 06:31	370.0	Sharp stage-up between two pictures in km 370.6 camera, toe observed later at ~km 370.
6-Feb-2025 14:00	343.0	AEPA Ground Observation
7-Feb-2025 14:28	341.0	BCH Drone
8-Feb-2025 09:45	336.0	Elk Island Gauge
9-Feb-2025 11:59	328.7	Landsat 9
10-Feb-2025 11:53	318.0	Landsat 9 and Sentinel 2 at 12:05 MST
10-Feb-2025 16:45	320.0	BCH Drone, 100% ice concentration from km 316 to km 320 moving slowly.
10-Feb-2025 18:31	321.0	Sentinel 1
11-Feb-2025 07:06	317.0	RCM
11-Feb-2025 16:25	311.4	BCH Drone
11-Feb-2025 21:01	309.3	BCH Remote Camera between two pictures - ice front moving upstream
11-Feb-2025 23:16	309.3	BCH Remote Camera between two pictures - ice front moving downstream and upstream

12-Feb-2025 02:16	309.3	BCH Remote Camera between two pictures - ice front moving upstream
12-Feb-2025 02:45	309.3	BCH Remote Camera between two pictures - ice front moving downstream
12-Feb-2025 03:16	309.3	BCH Remote Camera between two pictures - ice front moving upstream
13-Feb-2025 04:16	309.3	BCH Remote Camera between two pictures - ice front moving downstream
13-Feb-2025 05:01	313.5	Toe located by BCH Drone, ice sheets shifted down to km 315.
13-Feb-2025 05:46	309.3	BCH Remote Camera between two pictures - ice front moving upstream
13-Feb-2025 12:15	305.0	Sentinel 2
13-Feb-2025 14:13	304.0	BCH Drone
15-Feb-2025 06:16	295.6	BCH Remote Camera between two pictures - ice front moving upstream
15-Feb-2025 08:46	295.6	BCH Remote Camera between two pictures - ice front moving downstream and then upstream
15-Feb-2025 09:31	295.1	BCH Remote Camera (on hill)
15-Feb-2025 10:01	294.6	BCH Remote Camera (on hill)
15-Feb-2025 10:31	294.4	BCH Remote Camera (on hill)
15-Feb-2025 11:01	294.2	BCH Remote Camera (on hill)
15-Feb-2025 11:31	294.2	BCH Remote Camera (on hill)
15-Feb-2025 12:01	293.5	BCH Remote Camera (on hill)
15-Feb-2025 12:04	292.5	Sentinel 2
15-Feb-2025 13:01	293.0	BCH Remote Camera (on hill) was upstream of camera view up to km 492.2 between this time and 12:01

15-Feb-2025 13:31	293.4	BCH Remote Camera (on hill)
15-Feb-2025 17:01	291.0	BCH Remote Camara at km 286.5
15-Feb-2025 17:16	295.6	BCH Remote Camera between two pictures - moving downstream
15-Feb-2025 18:00	304.0	Toe viewed by drone on Feb 20
15-Feb-2025 18:46	295.6	BCH Remote Camera between two pictures - moving upstream
15-Feb-2025 18:50	295.6	Dunvegan gauge moving upstream
15-Feb-2025 20:00	292.0	Estimate stoppage timing from just before Dunvegan gauge starts increasing
16-Feb-2025 07:46	286.5	BCH Remote Camara at km 286.5
16-Feb-2025 14:00	283.5	Estimate time just before consolidation and location based on previous advance rate
16-Feb-2025 14:31	287.0	BCH Remote Camara at km 286.5
16-Feb-2025 14:46	287.3	BCH Remote Camara at km 286.5, between two pictures toe formed
16-Feb-2025 15:00	285.0	Estimate based on previous advance rate to subsequent observation.
16-Feb-2025 18:44	283.5	RCM
17-Feb-2025 10:00	277.0	Upstream extent just downstream of camera and close to previous advance rate
17-Feb-2025 11:00	283.0	Toe in Drone Feb 20 pictures and already there in Landsat 8 image and timing of consolidation consistent with wave at Dunvegan
17-Feb-2025 11:59	278.0	Landsat 8 and downstream of km 276.5 camera, did not go upstream of km 276.5 cameras in Feb 17 daylight
18-Feb-2025 18:26	268.0	RCM
18-Feb-2025 19:00	267.3	Time and position estimated from previous advance rate and typical subsequent consolidation rate.

18-Feb-2025 20:00	281.0	Consolidated downstream past km 276 but stopped upstream of km 286.5 overnight Feb 18-19, toe observed by drone on Feb 20, timing based on wave at Dunvegan
18-Feb-2025 21:00	269.0	The consolidated reach upstream of toe above short and juxtaposed upstream indicating low compression for this consolidation
19-Feb-2025 21:00	256.2	BCH Drone on Feb 20- most upstream extent based on shore ice remnants
19-Feb-2025 22:00	272.4	Consolidation toe observed by drone Feb 20, timing based on wave at Dunvegan
19-Feb-2025 23:00	261.0	Estimate upstream stop after consolidation complete, just downstream of subsequent ice front position by remote camera
20-Feb-2025 07:31	259.8	BCH Remote Camera - moving upstream
20-Feb-2025 10:31	260.0	BCH Remote Camera - moving downstream
20-Feb-2025 11:01	260.3	BCH Remote Camera - moving downstream
20-Feb-2025 11:31	261.2	BCH Remote Camera - moving downstream
20-Feb-2025 11:40	261.8	BCH Drone - shoving downstream slowly
20-Feb-2025 12:01	262.0	BCH Remote Camera - moving downstream
20-Feb-2025 12:04	262.2	Sentinel 2, can see a line of discolouration at downstream end of moving consolidation
20-Feb-2025 12:31	262.4	BCH Remote Camera - moving downstream
20-Feb-2025 13:01	262.4	BCH Remote Camera - toe but ice still packing in at toe
20-Feb-2025 13:31	262.0	BCH Remote Camera - moving upstream
20-Feb-2025 14:01	260.4	BCH Remote Camera - moving upstream
20-Feb-2025 15:11	258.3	BCH Drone

20-Feb-2025 16:15	257.7	BCH Ground Observation - slowly moving upstream
20-Feb-2025 16:26	259.2	BCH Ground Observation - slowly moving downstream
20-Feb-2025 16:31	259.4	BCH Remote Camera - moving downstream
20-Feb-2025 17:01	260.2	BCH Remote Camera - moving downstream
20-Feb-2025 17:31	260.3	BCH Remote Camera - moving downstream
20-Feb-2025 18:01	259.7	BCH Remote Camera - moving upstream
20-Feb-2025 18:31	259.2	BCH Remote Camera - moving upstream
21-Feb-2025 02:00	**254.5**	Observed upstream extent by examining leftover shore ice by drone on Feb 21, time estimated to give typical ice consolidation rate.
21-Feb-2025 03:00	271.2	BCH Drone observed consolidation toe, time determined from start of wave arriving at Dunvegan
21-Feb-2025 03:30	263.0	Estimate location based on subsequent advance rate and time based on typical stoppage rate after a consolidation
21-Feb-2025 07:22	261.5	RCM
21-Feb-2025 07:31	261.2	BCH Remote Camera - moving upstream
21-Feb-2025 08:01	261.1	BCH Remote Camera - moving upstream
21-Feb-2025 08:31	261.1	BCH Remote Camera - moving upstream
21-Feb-2025 09:01	261.0	BCH Remote Camera - moving upstream
21-Feb-2025 09:31	260.5	BCH Remote Camera - moving upstream
21-Feb-2025 10:01	260.1	BCH Remote Camera - moving upstream

21-Feb-2025 10:31	259.9	BCH Remote Camera - moving upstream
21-Feb-2025 11:01	260.0	BCH Remote Camera - moving downstream
21-Feb-2025 11:31	261.3	BCH Remote Camera - moving downstream
21-Feb-2025 12:01	260.1	BCH Remote Camera - stationary
21-Feb-2025 12:31	260.0	BCH Remote Camera - stationary
21-Feb-2025 13:01	260.1	BCH Remote Camera - stationary
21-Feb-2025 14:01	260.1	BCH Remote Camera - stationary
21-Feb-2025 15:03	267.3	BCH Ground observation Feb 21 15:00 ice moving as far as can see to km 262. Interpolate between next and previous observations (Note: Camera at km 259 retrieved and new camera deployed at km 259.7).
21-Feb-2025 16:05	274.4	Consolidation toe observed by drone stopping at this location and time. Subsequent negative wave at Dunvegan indicates that this consolidation was storing flow rather than a wave travelling downstream to Dunvegan
21-Feb-2025 17:00	265.0	Estimated based on previous and subsequent advance rates
22-Feb-2025 07:31	263.6	BCH Remote Camera - border ice pieces feeding the ice front
22-Feb-2025 08:31	263.6	BCH Remote Camera - border ice pieces feeding the ice front
22-Feb-2025 09:01	263.5	BCH Remote Camera - border ice pieces feeding the ice front
22-Feb-2025 11:31	263.5	BCH Remote Camera - border ice pieces feeding the ice front
22-Feb-2025 12:01	263.6	BCH Remote Camera
22-Feb-2025 14:01	263.6	BCH Remote Camera
22-Feb-2025 14:31	263.5	BCH Remote Camera - border ice pieces feeding the ice front

22-Feb-2025 15:31	263.5	BCH Remote Camera - border ice pieces feeding the ice front
22-Feb-2025 16:01	263.4	BCH Remote Camera - border ice pieces feeding the ice front
22-Feb-2025 17:01	263.4	BCH Remote Camera - border ice pieces feeding the ice front
22-Feb-2025 17:31	263.3	BCH Remote Camera - border ice pieces feeding the ice front
22-Feb-2025 18:31	263.3	BCH Remote Camera - border ice pieces feeding the ice front
22-Feb-2025 18:31	263.2	Sentinel 1
23-Feb-2025 07:31	263.4	BCH Remote Camera
23-Feb-2025 08:01	263.4	BCH Remote Camera
23-Feb-2025 08:31	263.5	BCH Remote Camera
23-Feb-2025 11:01	263.6	BCH Remote Camera
23-Feb-2025 12:14	263.6	Sentinel 2
23-Feb-2025 12:31	263.6	BCH Remote Camera
23-Feb-2025 14:01	263.7	BCH Remote Camera
23-Feb-2025 15:01	263.7	BCH Remote Camera
23-Feb-2025 15:31	263.9	BCH Remote Camera
23-Feb-2025 18:36	**264.1**	**RCM, Report #22**
24-Feb-2025 18:44	265.7	RCM
25-Feb-2025 12:02	266.9	Sentinel 2

26-Feb-2025 11:53	268.6	Landsat 8
27-Feb-2025 18:36	270.6	RCM
28-Feb-2025 07:01	272.7	BCH Remote Camera
28-Feb-2025 09:31	273.1	BCH Remote Camera
28-Feb-2025 12:12	273.1	Sentinel 2
28-Feb-2025 18:44	273.1	RCM
28-Feb-2025 19:01	273.1	BCH Remote Camera
1-Mar-2025 07:01	275.2	BCH Remote Camera
1-Mar-2025 17:01	275.2	BCH Remote Camera
1-Mar-2025 17:31	275.3	BCH Remote Camera
1-Mar-2025 19:01	275.3	BCH Remote Camera
2-Mar-2025 07:01	275.8	BCH Remote Camera
2-Mar-2025 10:01	275.8	BCH Remote Camera
2-Mar-2025 10:31	276.1	BCH Remote Camera
2-Mar-2025 11:01	**276.1**	**BCH Remote Camera, Report #23**
3-Mar-2025 18:35	279.0	RCM
4-Mar-2025 18:43	281.1	RCM
5-Mar-2025 12:13	285.0	Sentinel 2, brash front at km 284.6

6-Mar-2025 11:31	287.6	BCH Remote Camera, brash at km 287.2
6-Mar-2025 14:01	287.6	BCH Remote Camera, brash at km 287.2
6-Mar-2025 14:31	287.9	BCH Remote Camera, brash at km 287.4
6-Mar-2025 15:01	287.9	BCH Remote Camera, brash at km 287.6
6-Mar-2025 17:31	287.9	BCH Remote Camera, brash at km 287.6
6-Mar-2025 18:01	288.0	BCH Remote Camera, brash at km 287.7, Note S1 at 18:31 shows brash front at km 287.6 but ice front difficult to discern.
6-Mar-2025 19:31	288.0	BCH Remote Camera, brash at km 287.7
7-Mar-2025 06:31	289.2	BCH Remote Camera, brash at km 288.0
7-Mar-2025 07:01	289.2	BCH Remote Camera, brash at km 288.0
7-Mar-2025 07:06	289.2	RCM, brash front at km 288.0
7-Mar-2025 12:31	289.2	BCH Remote Camera, brash at km 288.0
7-Mar-2025 13:01	289.2	BCH Remote Camera, brash at km 288.1
7-Mar-2025 14:01	289.2	BCH Remote Camera, brash at km 288.3
7-Mar-2025 16:01	289.2	BCH Remote Camera, brash at km 288.3
7-Mar-2025 16:31	290.5	BCH Remote Camera, ice bridge between upstream in-situ ice and downstream lead failed and ice running to new ice front of the DS end of the previous open lead
7-Mar-2025 17:01	290.5	BCH Remote Camera, brash at km 290.1
7-Mar-2025 19:01	290.5	BCH Remote Camera, brash at km 290.1

8-Mar-2025 06:31	293.8	BCH Remote Camera, brash at km 293.4
8-Mar-2025 09:01	293.8	BCH Remote Camera, brash at km 293.4
8-Mar-2025 09:31	296.0	BCH Remote Camera, brash at km 295.6, ice front out of range but assume 400 m of brash to estimate ice front.
8-Mar-2025 14:32	296.0	BCH Remote Camera, brash at km 295.6, ice front out of range but assume 400 m of brash to estimate ice front. (next picture there is not brash front)
8-Mar-2025 18:44	**296.3**	**RCM, brash front at km 295.9**
12-Mar-2025 12:02	302.0	Sentinel 2, based on water temperature data at Alces and below Site C, this should be about the most downstream extent after the change to cooler weather.
14-Mar-2025 11:53	301.6	Landsat 8
15-Mar-2025 12:12	301.6	Sentinel 2
17-Mar-2025 12:00	304.2	Sentinel 2
18-Mar-2025 18:31	308.0	Sentinel 1 - with 300 m of brash ice
19-Mar-2025 11:31	311.0	BCH Remote Camera has brash front at km 310.7, assume 300 m of brash ice upstream of the ice front
20-Mar-2025 12:10	317.5	Sentinel 2
22-Mar-2025 12:01	330.4	Sentinel 2
23-Mar-2025 07:06	338.0	RCM
23-Mar-2025 11:36	339.1	Landsat 8
25-Mar-2025 12:10	353.0	Sentinel 2
27-Mar-2025 07:06	368.1	RCM, brash front at km 367.2

27-Mar-2025 18:35	368.1	RCM, brash front at km 367.7
28-Mar-2025 07:13	369.4	RCM
28-Mar-2025 09:40	369.8	AEPA Ground Observation
28-Mar-2025 11:40	369.8	BC Hydro ground observation
28-Mar-2025 15:10	369.8	AEPA Ground Observation
29-Mar-2025 11:00	374.7	AEPA Ground Observation
29-Mar-2025 19:10	376.3	AEPA Ground Observation
30-Mar-2025 06:58	376.9	RCM, brash front at km 376.4
30-Mar-2025 12:09	376.9	Sentinel 2, brash front at km 376.6
30-Mar-2025 18:31	378.6	Sentinel 1 - brash from at km 377.5 (Comparing to RCM at 18:27 MST indicates the RCM captured brash ice moving into an open lead so S2 ice front is more accurate)
31-Mar-2025 10:45	381.1	AEPA Ground Observation
31-Mar-2025 11:46	381.6	Sentinel 2
1-Apr-2025 07:14	384.6	RCM, based on comparison to RCM 28-Mar-2025 07:13 MST, brash front at km 384.0
1-Apr-2025 15:52	390.0	AEPA Ground Observation
2-Apr-2025 16:06	395.4	AEPA Ground Observation
3-Apr-2025 08:28	398.0	AEPA Ground Observation
4-Apr-2025 07:05	402.1	RCM, brash front at km 401.8

4-Apr-2025 12:09	402.6	Sentinel 2, brash front at km 402.4
5-Apr-2025 18:30	411.0	Sentinel 1, brash front at km 410.2
6-Apr-2025 11:59	421.0	Sentinel 2, brash front at km 420.6
7-Apr-2025 18:27	437.0	RCM, brash front at km 436.1
9-Apr-2025 07:14	453.3	RCM, brash front at km 452.9
9-Apr-2025 12:09	455.6	Sentinel 2, brash front at km 453.2
10-Apr-2025 07:22	464.7	RCM, brash front at km 464.1
10-Apr-2025 18:20	468.3	RCM, brash front at km 467.8
11-Apr-2025 18:31	485.0	Sentinel 1, brash front at km 484.5
12-Apr-2025 02:45	490.7	Sunny Valley Gauge, brash front @ 03:15
13-Apr-2025 07:14	502.0	RCM, brash front at km 501.6
14-Apr-2025 12:09	514.4	Sentinel 2, brash front at km 514.0
15-Apr-2025 11:52	525.6	Landsat 8, brash front at km 524.9
16-Apr-2025 07:05	540.2	RCM, brash front at km 539.8
16-Apr-2025 11:59	542.1	Sentinel 2, brash front at km 541.9
16-Apr-2025 18:36	545.0	RCM, brash front at km 544.2
17-Apr-2025 18:30	561.8	Sentinel 1, brash front at km 561.0
18-Apr-2025 18:23	576.9	Sentinel 1, brash front at km 576.1

20-Apr-2025 07:55	601.7	RCM, brash front at km 601.3
22-Apr-2025 00:40	650.8	Carcajou Gauge, brash front passed at 02:00 MST
22-Apr-2025 18:20	670.0	RCM, brash front at km 667.0
23-Apr-2025 12:08	686.2	Sentinel 2, brash front at km 685.3
23-Apr-2025 18:32	693.8	Sentinel 1, brash front at km 691.6
24-Apr-2025 12:09	707.1	Sentinel 2, brash front at km 706.8
24-Apr-2025 18:36	714.9	RCM, brash front at km 714.1
26-Apr-2025 07:22	760.6	RCM, brash front at km 759.7
28-Apr-2025 05:50	831.9	Fort Vermilion Gauge, Brash front @ 09:40 MST
28-Apr-2025 11:49	914.7	Sentinel 2, brash front at km 913.8
1-May-2025 10:34	995.5	MODIS
1-May-2025 23:00	1136.1	Estimated time based on Peace Point gauge malfunction and back tracking ECCC tracker ball movement
2-May-2025 10:00	1253.0	Parks Canada Flight (accurate time and km may be available from Parks Canada)
3-May-2025 11:49	1216.0	Sentinel 2, brash front at km 1203.3
3-May-2025 17:58	1216.0	RCM, brash front out of frame

4-May-2025 06:49	1216.0	RCM, brash front at 1203.6 (assume ice front downstream and out of frame in the same location.
4-May-2025 11:33	1216.0	Landsat 9, brash front at km 1204.2
5-May-2025 11:39	1216.0	Sentinel 2, brash front at km 1212.2 (secondary channel around Moose Island is open)
3-May-2025 11:49	1252.3	Sentinel 2, brash front at km 1247.5
3-May-2025 11:49	1289.9	Sentinel 2, brash front at km 1286.6.
28-Apr-2025 11:49	962.0	Sentinel 2
30-Apr-2025 18:24	1096.6	Sentinel 1, Brash front at km 1096
1-May-2025 10:34	1104.3	MODIS
23-Apr-2025 11:49	1115.8	Sentinel 2
28-Apr-2025 11:49	1118.8	Sentinel 2, Brash front at km 1118.7
1-May-2025 10:34	1120.0	MODIS
1-May-2025 17:56	1120.3	RCM
2-May-2025 11:27	1122.0	MODIS

27-Apr-2025 11:27	1235.9	Landsat 8
28-Apr-2025 11:49	1236.0	Sentinel 2, Brash front at km 1118.7
1-May-2025 10:34	1242.0	MODIS
30-Apr-2025 18:24	1020.0	Sentinel 1, Brash front at km 1019.8
1-May-2025 10:34	1023.0	MODIS
30-Apr-2025 18:20	1045.0	RCM
1-May-2025 10:34	1045.0	MODIS
30-Apr-2025 18:20	1062.9	RCM
1-May-2025 10:34	1062.9	MODIS
30-Apr-2025 18:20	1067.8	RCM
1-May-2025 10:34	1067.8	MODIS
1-May-2025 10:34	1039.3	MODIS

1-May-2025 10:34	1165.5	MODIS
1-May-2025 10:34	1246.2	MODIS
1-May-2025 10:34	1266.0	MODIS