

Site C Clean Energy Project

Temporary Upstream Fish Passage Facility Operations Report

Reporting Period: April 1 to 30, 2024

Prepared by BC Hydro

May 21, 2024

Introduction

BC Hydro diverted the Peace River through two diversion tunnels on the left bank of the dam site during the fall of 2020. River diversion represented the first activity in the construction of the Site C Clean Energy Project (the Project) to affect upstream fish movement in the Peace River (EIS, Volume 2, Appendix Q¹). As such, the temporary upstream fish passage facility (hereafter temporary facility) was operated to pass fish upstream and allow them to fulfill portions of their lifecycles upstream of the Project.

Note that the temporary facility will operate during the river diversion phase of construction (2020 to 2024) on the left bank of the Peace River at the outlet of the diversion tunnels. BC Hydro intends to operate the temporary facility from April 1 to October 31 each year based on the timing of fish movements in the Peace River and to avoid damaging mechanical equipment during cold weather conditions from November to March. Following the closure of the diversion tunnels and reservoir filling in the fall of 2024, the permanent upstream fish passage facility (hereafter permanent facility) will be operated at the outlet of the generating station to provide fish passage during the operation phase of the Project.

Structure of the report

This report summarizes the data and information presented in weekly reports prepared by the facility operator, as described in the Manual of Operational Parameters and Procedures (OPP), and covers the full extent of operations in April 2024.

This report has the following sections:

- Biological operation;
- Environmental conditions;
- Mechanical operation; and
- Adjustments.

Biological operation is defined as the sorting, sampling, tagging, transport and release of fish. Mechanical operation is defined as the operation of the pumps, gates, crowder, lock, sensors, loggers, and other mechanical equipment to ensure the temporary facility achieves the biological objectives described in Section 4.1 of the Fish Passage Management Plan².

Summary

Five hundred and eleven fish – 491 Mountain Whitefish, 18 Arctic Grayling, and 2 Bull Trout – were sorted and sampled at the temporary facility, and transported and released into the Peace River upstream of the Project (Table 1, Photo 1).

Attraction flows steadily declined during the first week of the reporting period and system alarms indicated electrical faults with the horizontal propeller pumps. On April 15, the horizontal propeller pumps were removed from the pump station for detailed inspection (Photo 2). Both pumps had sustained extensive damage from operation in previous years and were prepared to be shipped to the manufacturer for repair. As such, the temporary facility did not provide attraction flows during the reporting period.

More broadly, the temporary facility did not operate as per the design intent, which resulted in key design criteria not being met. For example, one of the most important design criteria at the temporary facility is a 23 cm head differential between the entrance pool and diversion tunnel outlet; this differential ensures there is sufficient velocity coming through the entrance gates to attract fish towards the fishway entrance. This criterion was not met during the reporting period due to several factors: (1) sediment had built up in the stilling wells of the level sensors in the entrance pool, which lead to a 10 cm discrepancy in the readings, (2) the facility programming was only taking into account readings from the faulty level sensor in the entrance pool, which

¹ Available at: https://www.ceaa-acee.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_Q.pdf

² Available at: <http://sitecproject.com/sites/default/files/Fish%20Passage%20Management%20Plan.pdf>

caused the entrance gates to remain too far open, and (3) the horizontal propeller pumps were removed from the pump station. To address these issues, BC Hydro (1) flushed out the sediment in the stilling wells, (2) re-calibrated the level sensors, (3) updated the facility programming to take into account both level sensors in the entrance pool, and (4) prepared the pumps to be shipped to the manufacturer for repair. It is unknown how the operation affected the ability of fish to approach, enter and pass the facility.

Appendix I summarizes the total flow diverted from the Peace River to operate the temporary facility during the reporting period.

Biological operation

In total, 511 fish were sorted in the temporary facility during the reporting period (Table 1; Figure 1). Three mortalities – 2 Mountain Whitefish and 1 Arctic Grayling – were observed during the reporting period (0.6% of all fish sorted in 2024), which is in-line with the anticipated levels of mortality during operations³.

Table 1. Total number of fish sorted, sampled, transported and released during the reporting period.

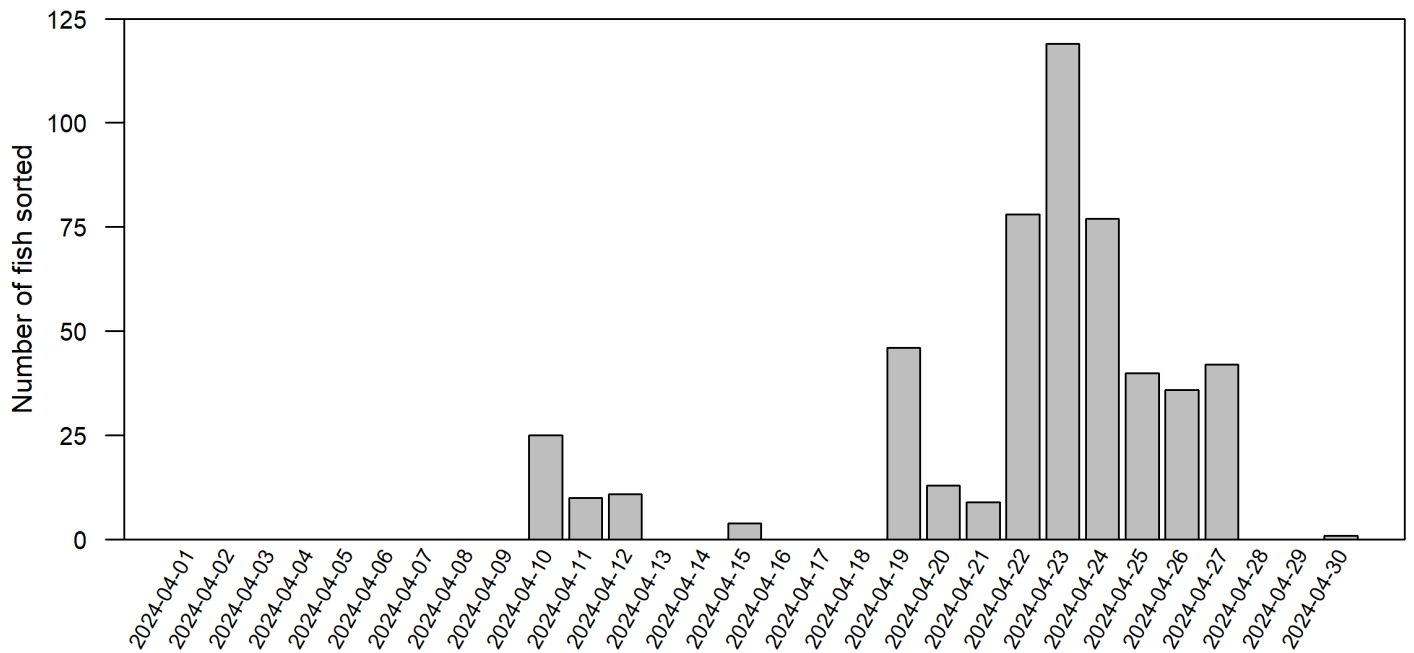
Species	Sorted	Transported and released	PIT tagged	Mortalities	Genetics	Microchemistry or ageing
Arctic Grayling	18	18	18	1	18	18
Brook Stickleback						
Brook Trout						
Bull Trout	2	2	2	0	2	2
Burbot						
Finescale Dace						
Flathead Chub						
Goldeye						
Kokanee						
Lake Chub						
Lake Trout						
Lake Whitefish						
Largescale Sucker						
Longnose Dace						
Longnose Sucker						
Mountain Whitefish	491	491	482	2	N/A	378
Northern Pike						
Northern Pikeminnow						
Northern Redbelly Dace						
Peamouth						
Pearl Dace						
Prickly Sculpin						
Pygmy Whitefish						
Rainbow Trout						
Redside Shiner						
Slimy Sculpin						
Spoonhead Sculpin						
Spottail Shiner						
Trout-perch						
Walleye						
White Sucker						
Yellow Perch						
Grand total	511	511	502	3	20	398

Not all fish species were PIT tagged or sampled for genetics, microchemistry, or ageing, as described in the OPP.

³ The FAA for Main Civil Works and Facility Operations ([15-HPAC-01160](#)) describes an acceptable level of incidental mortality to be no more than 5% of the total number of fish sorted in the temporary facility on an annual basis.

Between zero and 119 fish were sorted daily during the reporting period (Figure 1).

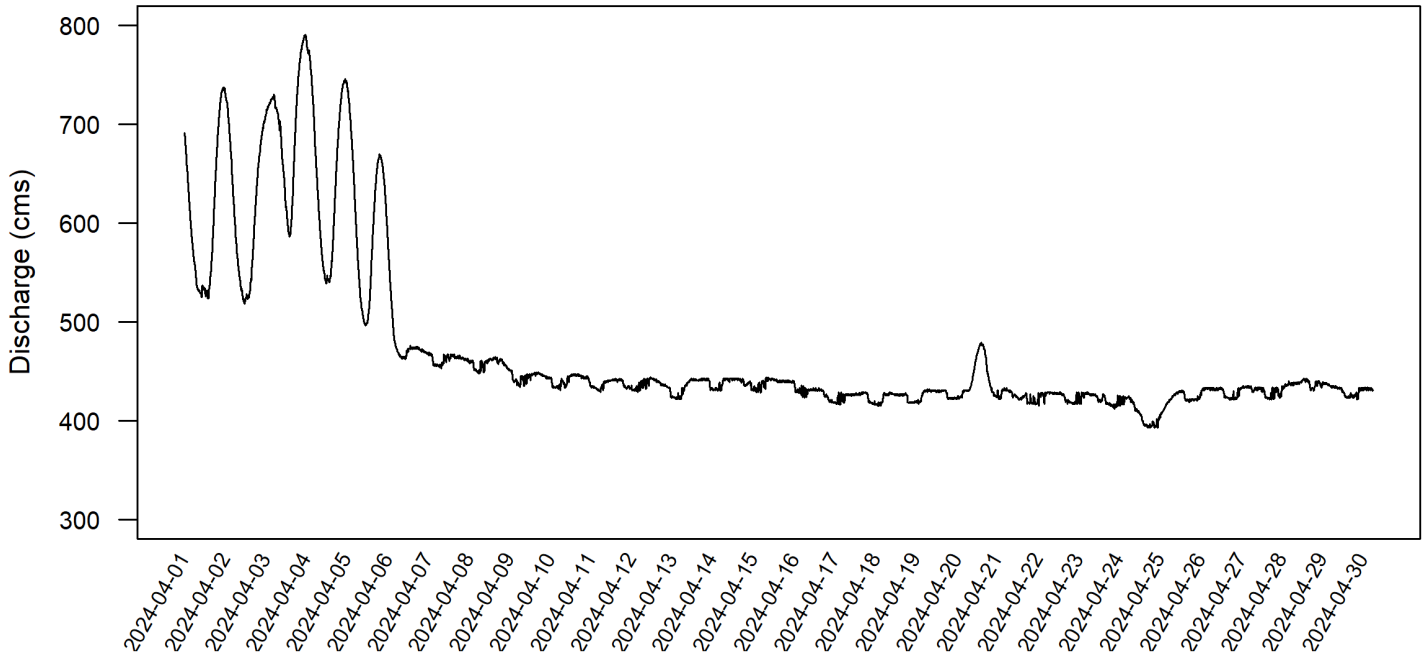
Figure 1. Daily number of fish sorted in the temporary facility during the reporting period.



Environmental conditions

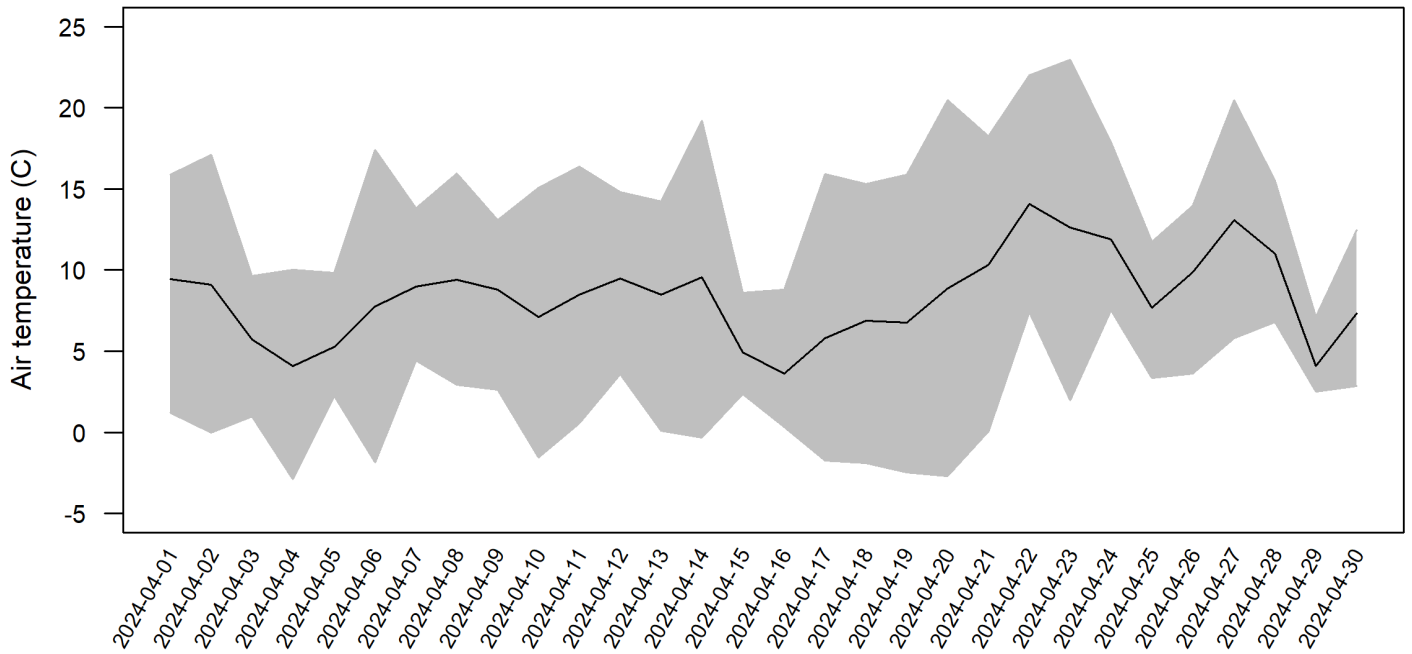
Discharge in the Peace River fluctuated during the reporting period from a low of 393 cms on April 25 to a high of 791 cms on April 4 (Figure 2).

Figure 2. Discharge in the Peace River during the reporting period as measured at the Peace River above Pine River (07FA004) Water Survey of Canada (WSC) hydrometric station. Data were downloaded from the WSC on May 3; the downloaded data were provided at 5-minute intervals and were listed as provisional by the WSC.



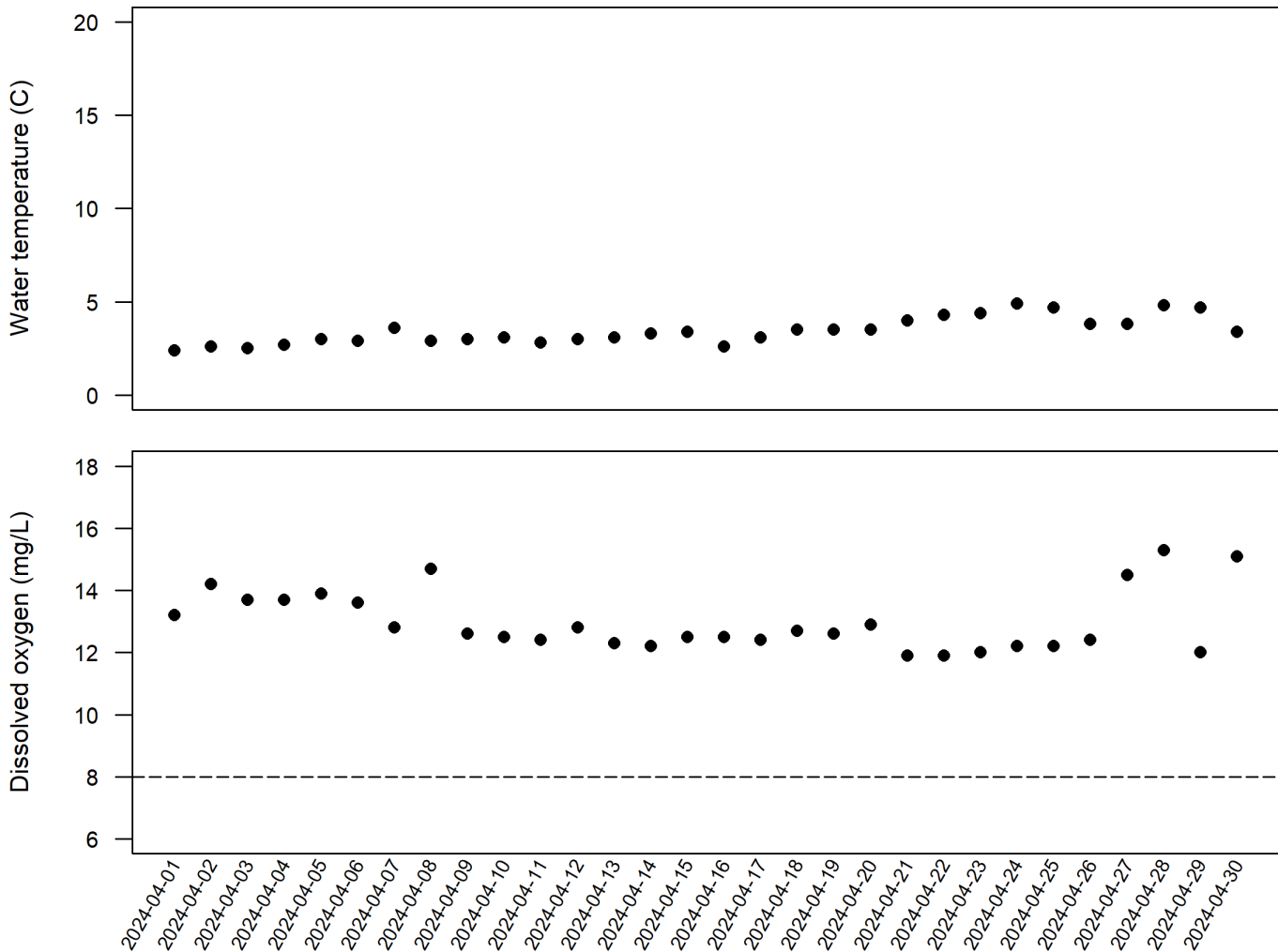
Air temperature fluctuated during the reporting period from a low of -2.9°C on April 4 to a high of 23.0°C on April 23 (Figure 3).

Figure 3. Mean daily air temperature (black line; °C) during the reporting period as measured by a temperature sensor at the temporary facility (TT-602). Shaded area represents the minimum and maximum daily air temperatures.



Water temperature remained stable during the reporting period (Figure 4). Dissolved oxygen remained above the minimum dissolved oxygen level (8.0 mg/L) described in the design report of the temporary facility.

Figure 4. Daily water temperature (°C) and dissolved oxygen (mg/L) during the reporting period as measured in Pool 25 of the temporary facility.

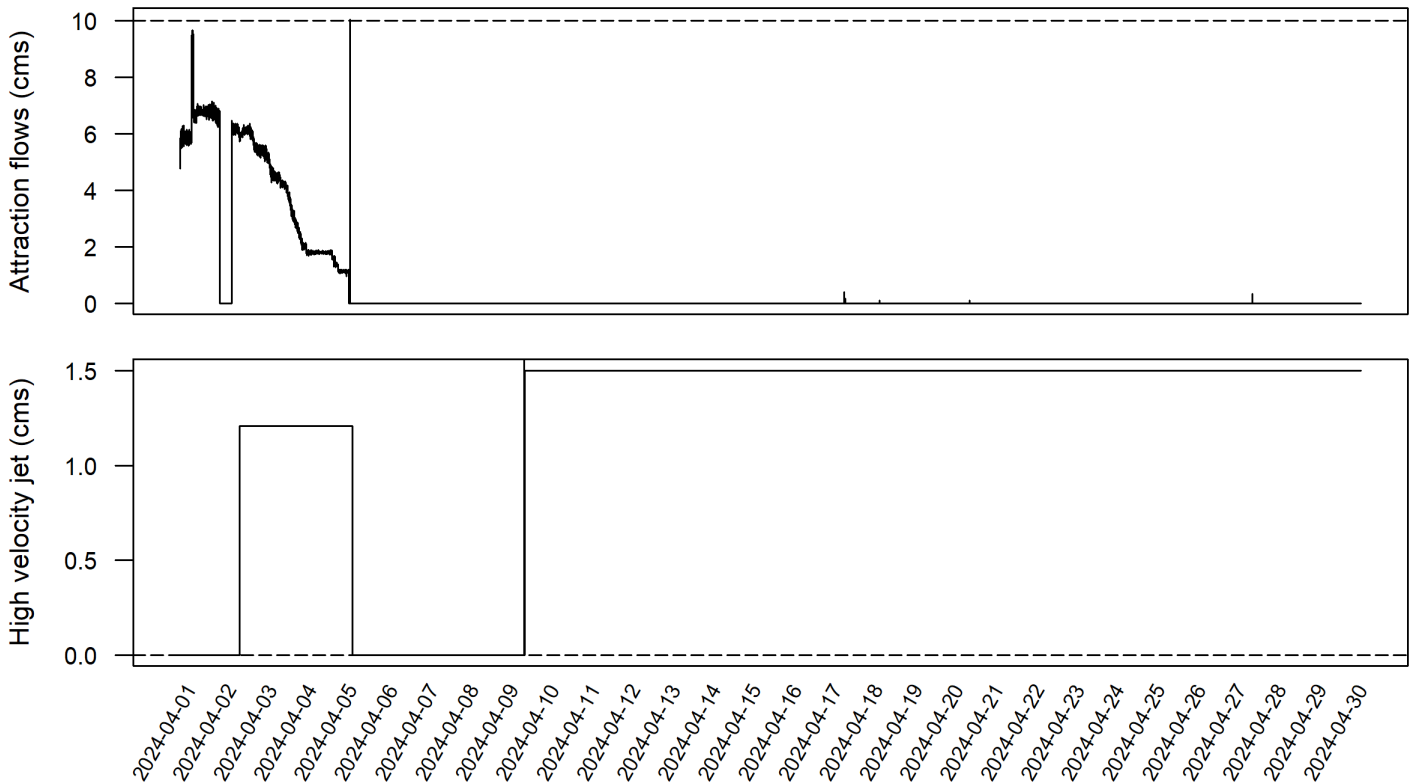


Mechanical operation

Operation of the attraction flows and high velocity jet intends to attract fish towards the fishway entrance. Once fish have entered the temporary facility, flows within the fishway intend to provide a flow signal for fish to detect and swim up each pool to the sorting facility.

In 2024, BC Hydro intended to operate the attraction flows and high velocity jet at 10 cms and 0 cms, respectively (horizontal dashed lines in Figure 5). However, within the first week of operations, the attraction flows steadily declined and system alarms indicated electrical faults with the horizontal propeller pumps. BC Hydro 'turned off' the horizontal propeller pumps on April 5, 2024 (top panel) and removed them from the pump station for a detailed inspection on April 15, 2024 (Photo 2). As such, the high velocity jet was operated at 1.5 cms for the remainder of the reporting period (bottom panel).

Figure 5. Operation of the attraction flows and high velocity jet during the reporting period.



Fish were crowded daily from the pre-sort holding pool into the fish lock. Operators then proceeded to raise crowded fish to the elevation of the sorting facility. Note that this process is referred to as a “sorting cycle”. Between one and five sorting cycles were conducted each day during the reporting period (Table 2).

Table 2. Daily total number of sorting cycles.

Date	Number of sorting cycles	Start time
2024-04-01	3	10:51, 14:08, 15:09
2024-04-02	3	10:41, 11:06, 14:09
2024-04-03	3	09:34, 12:07, 13:54
2024-04-04	3	09:40, 11:59, 14:36
2024-04-05	3	10:30, 13:24, 15:41
2024-04-06	1	12:03
2024-04-07	1	12:30
2024-04-08	5	10:26, 11:30, 12:52, 13:50, 14:31
2024-04-09	5	08:51, 09:59, 10:56, 12:54, 13:27
2024-04-10	3	08:37, 11:18, 13:47
2024-04-11	4	09:44, 11:05, 12:12, 13:14
2024-04-12	5	09:00, 10:13, 12:10, 13:20, 15:00
2024-04-13	5	09:03, 10:27, 12:20, 13:37, 14:43
2024-04-14	5	08:50, 09:57, 11:56, 13:37, 15:27
2024-04-15	2	08:57, 09:47
2024-04-16	5	09:09, 10:19, 11:34, 14:03, 14:33
2024-04-17	5	08:49, 10:03, 11:31, 12:54, 14:05
2024-04-18	5	09:06, 10:43, 12:04, 13:23, 14:37
2024-04-19	5	08:51, 10:30, 12:40, 14:03, 15:19
2024-04-20	5	08:48, 10:06, 11:05, 13:09, 14:29
2024-04-21	5	08:34, 09:47, 11:01, 12:46, 13:32
2024-04-22	5	08:47, 10:20, 11:21, 12:52, 13:53
2024-04-23	2	09:18, 13:25
2024-04-24	2	08:46, 13:58
2024-04-25	5	08:42, 10:04, 11:26, 12:59, 13:35
2024-04-26	5	08:45, 10:02, 11:03, 12:29, 13:15
2024-04-27	5	09:11, 10:39, 12:04, 13:19, 14:27
2024-04-28	5	09:11, 10:12, 11:27, 12:37, 13:41
2024-04-29	5	08:46, 10:07, 11:14, 12:42, 13:57
2024-04-30	5	08:57, 10:16, 11:17, 12:22, 13:34

Table 3. Summary of standby or shutdown periods during the reporting period.

Date	Standby or shutdown	Rationale
2024-04-15 10:11 to 2024-04-15 13:54	Shutdown	Facility shutdown for 3.5 hours to remove the horizontal propeller pumps from the pump station and perform a detailed inspection (Photo 2).

Table 4. Root causes and corrective actions as a result of equipment malfunctions, breakdowns, or damage during the reporting period.

Date	Malfunction, breakdown or damage	Description	Root cause	Corrective action
2024-04-01	Malfunction	Finger weir and orifice plate in the vee-trap throat was jammed.	One of the fingers was bent back, which caused friction with the plate.	Planning a brief shutdown to enable confined space work to bend the finger back and unjam the plate.
2024-04-05	Damage	Attraction flows steadily declined during the first week of operations and system alarms indicated faults.	Both horizontal propeller pumps sustained extensive damage from operation in previous years. Electrical faults appear to be within the pumps' power cables and/or motors.	Removed the horizontal propeller pumps from the pump station for inspection and repair.
2024-04-05	Malfunction	Level sensors in the entrance pool were showing an approximately 10 cm discrepancy in the readings. Based on the facility programming, this lead to no head differential between the entrance pool and the diversion tunnel outlet, which is a key design criteria of the facility.	Two causes: (1) sediment was built up in the stilling well where the level sensors are located, and (2) facility programming was only taking into account the readings from one of the two level sensors in the entrance pool.	Flushed out the sediment in the stilling wells, and updated the programming to take into account both level sensors.
2024-04-05	Malfunction	Level sensors in the fish lock were showing a discrepancy in the readings.	Sediment built up in the stilling wells where the level sensors are located.	Flushed out the sediment in the stilling wells.

Adjustments

Several adjustments were made during the reporting period to improve the biological and mechanical operation of the temporary facility (Table 5). BC Hydro described the potential for adjustments to the day-to-day biological and mechanical operation of the temporary facility in Section 7 of the Fish Passage Management Plan². In general the temporary facility was operated as planned and described in the OPP.

Table 5. Summary of adjustments made to the biological and mechanical operation of the temporary facility during the reporting period.

Component	Adjustment
Mechanical operation	Due to the faulting and removal of the horizontal propeller pumps (Photo 2), the operator turned on the high velocity jet on April 9 to provide some level of attraction to the temporary facility. The HVJ was left on for the remainder of the reporting period.

Photos

Photo 1. Biologists sample Mountain Whitefish (top) and Arctic Grayling (bottom) in the sorting facility during the reporting period (April 10, 2024).



Photo 2. Horizontal propeller pumps – which provide the attraction flows at the temporary facility – were pulled from the pump station for inspection and repair (April 15, 2024).

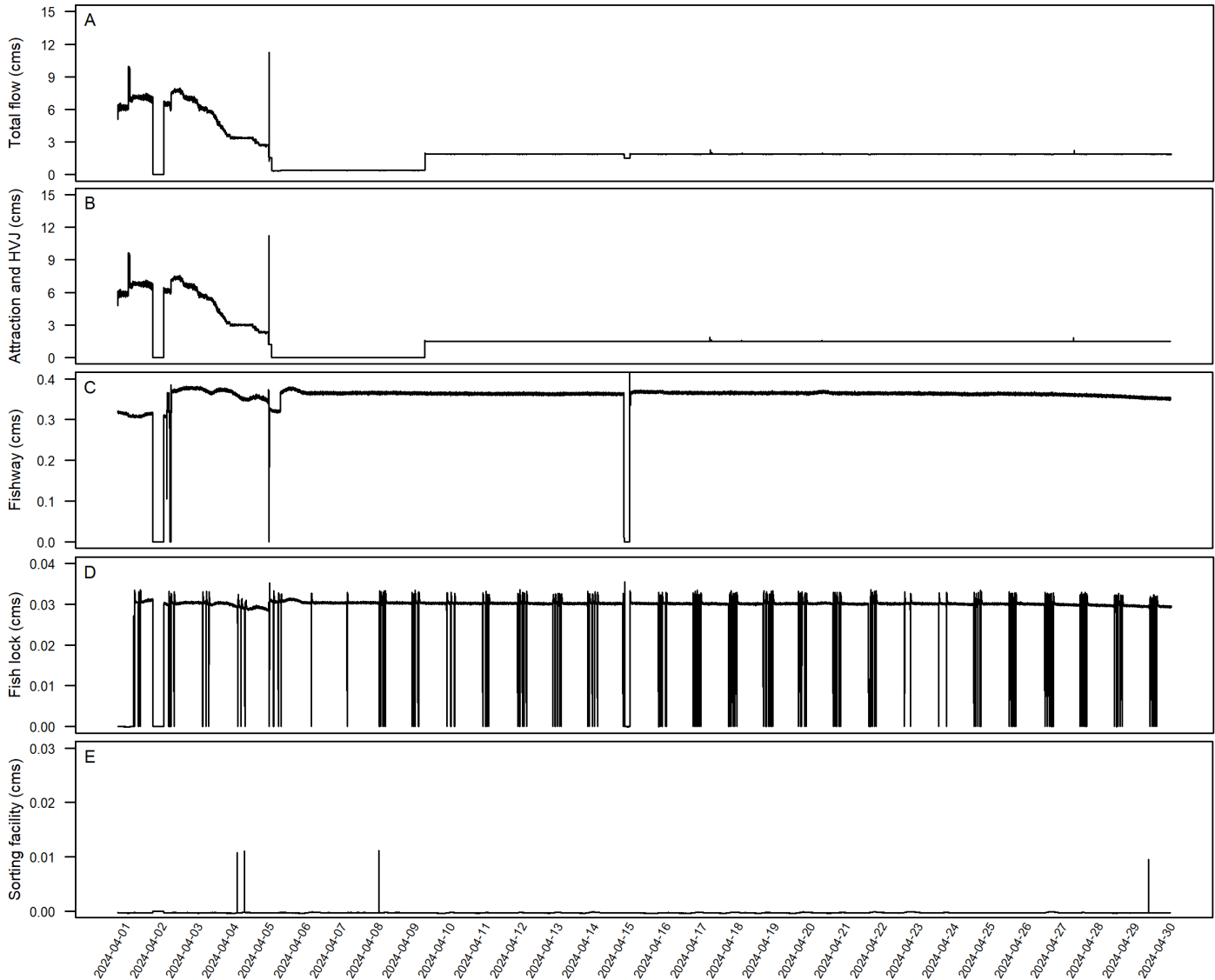


Prepared by

This report was prepared by the following individuals:

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Appendix I. (A) Total flow (cms) diverted from the Peace River to operate the temporary facility during the reporting period. Total flow is a combination of flows used for the attraction flows and high velocity jet (B), fishway (C), fish lock (D), and sorting facility (E), as described in T023 Plan for Measurement of Flow. Under Conditional Water Licence 133987⁴, BC Hydro is authorized to divert up to 15 cms of flow from the Peace River to operate the temporary facility; this authorized quantity was not exceeded during the reporting period (A).



⁴ Available at: <http://siteproject.com/sites/default/files/fish-passage-facility-water-licences-133986-133987.pdf>