BC Hydro
Power smart

Site C Clean Energy Project

Temporary Upstream Fish Passage Facility Operations Report

Reporting Period: August 1 to 31, 2023

Prepared by BC Hydro

September 11, 2023

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 Q[1]). 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 2023) 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 2023, 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 August 2023.

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 Plan[2].

Summary

Five thousand and ninety three fish – 4728 Redside Shiner, 160 Largescale Sucker, 68 White Sucker, 62 Mountain Whitefish, 36 Longnose Sucker, 18 Northern Pikeminnow, 9 Bull Trout, 4 Arctic Grayling, 4 Rainbow Trout, 2 Spoonhead Sculpin, 1 Kokanee, and 1 Lake Chub – were sorted and sampled at the temporary facility, and transported and released into the Peace River upstream of the Project (Table 1).

Appendix I provides a high-level summary of operation of the temporary facility during the reporting period.

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

[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

Biological operation

In total, 5,093 fish were sorted in the temporary facility during the reporting period (Table 1; Figure 1). Forty mortalities were observed during the reporting period (0.9% of all fish sorted in 2023), which is in-line with the anticipated levels of mortality during operations[3].

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

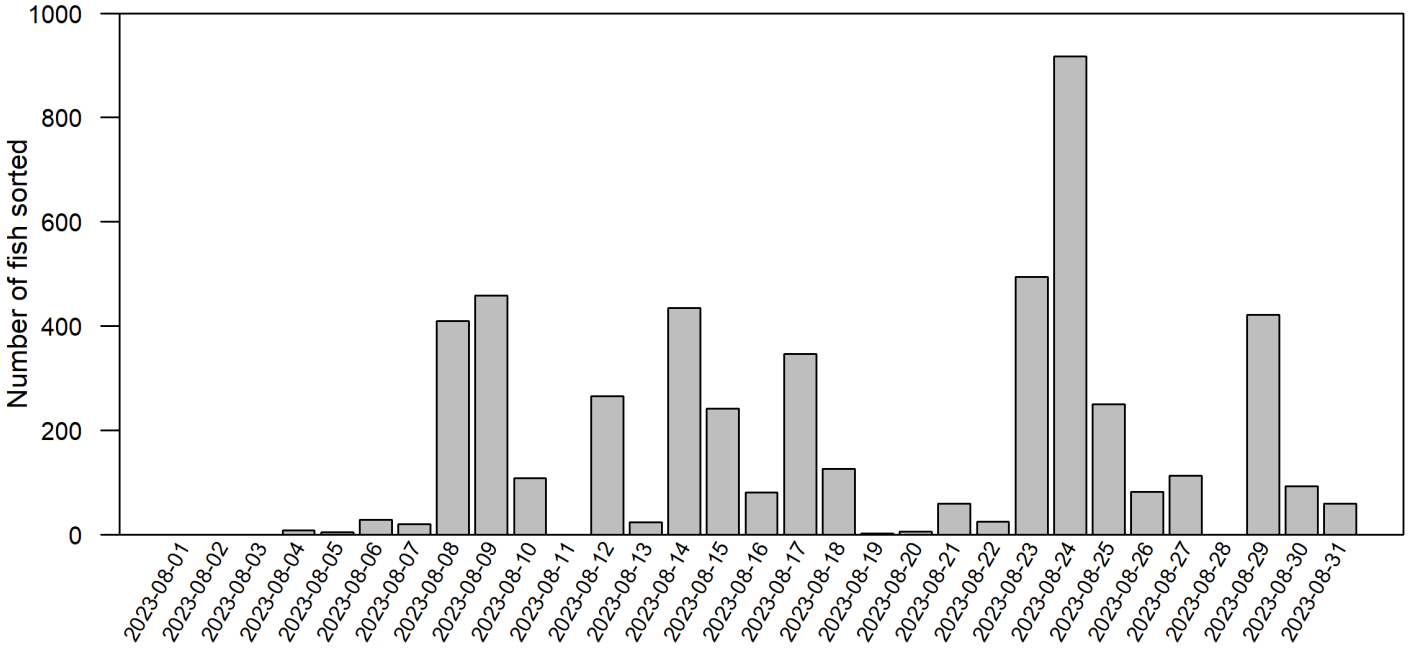
Species	Sorted	Transported and released	PIT tagged	Mortalities	Genetics	Microchemistry or ageing
Arctic Grayling	4	4	3	0	4	4
Brook Stickleback						
Brook Trout						
Bull Trout	9	9	5	0	9	7
Burbot				1	N/A	N/A
Finescale Dace						
Flathead Chub						
Goldeye						
Kokanee	1	1	N/A	0	N/A	1
Lake Chub	1	1	N/A	0	1	N/A
Lake Trout						
Lake Whitefish						
Largescale Sucker	160	160	27	1	N/A	N/A
Longnose Dace						
Longnose Sucker	36	36	15	1	N/A	N/A
Mountain Whitefish	62	62	35	3	N/A	1
Northern Pike						
Northern Pikeminnow	18	18	0	0	N/A	N/A
Northern Redbelly Dace						
Peamouth						
Pearl Dace						
Prickly Sculpin						
Pygmy Whitefish						
Rainbow Trout	4	4	4	0	4	4
Redside Shiner	4728	4728	N/A	29	23	N/A
Slimy Sculpin				4	4	N/A
Spoonhead Sculpin	2	2	N/A	1	2	N/A
Spottail Shiner						
Trout-perch						
Walleye						
White Sucker	68	68	27	0	N/A	N/A
Yellow Perch						
Grand total	5093	5093	116	40	47	17

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 917 fish were sorted daily during the reporting period (Figure 1).

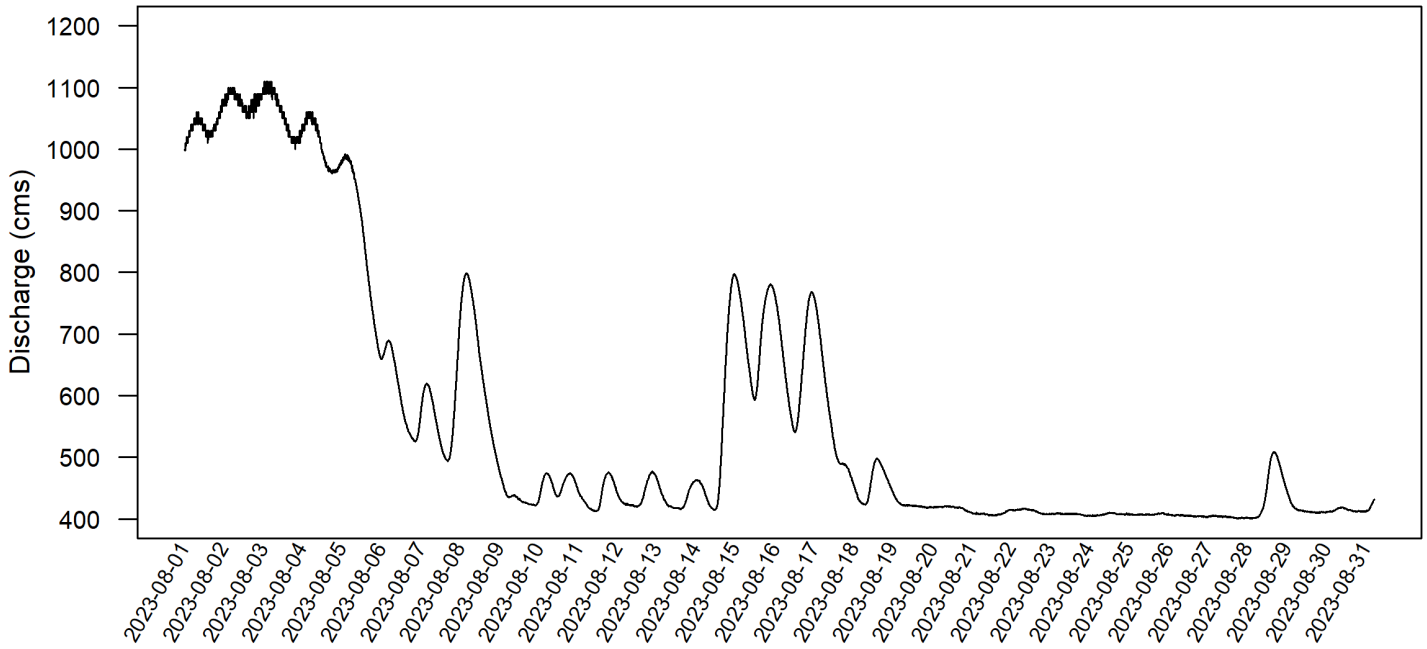
Figure 1. Daily number of fish sorted in the temporary facility during the reporting period.



Environmental conditions

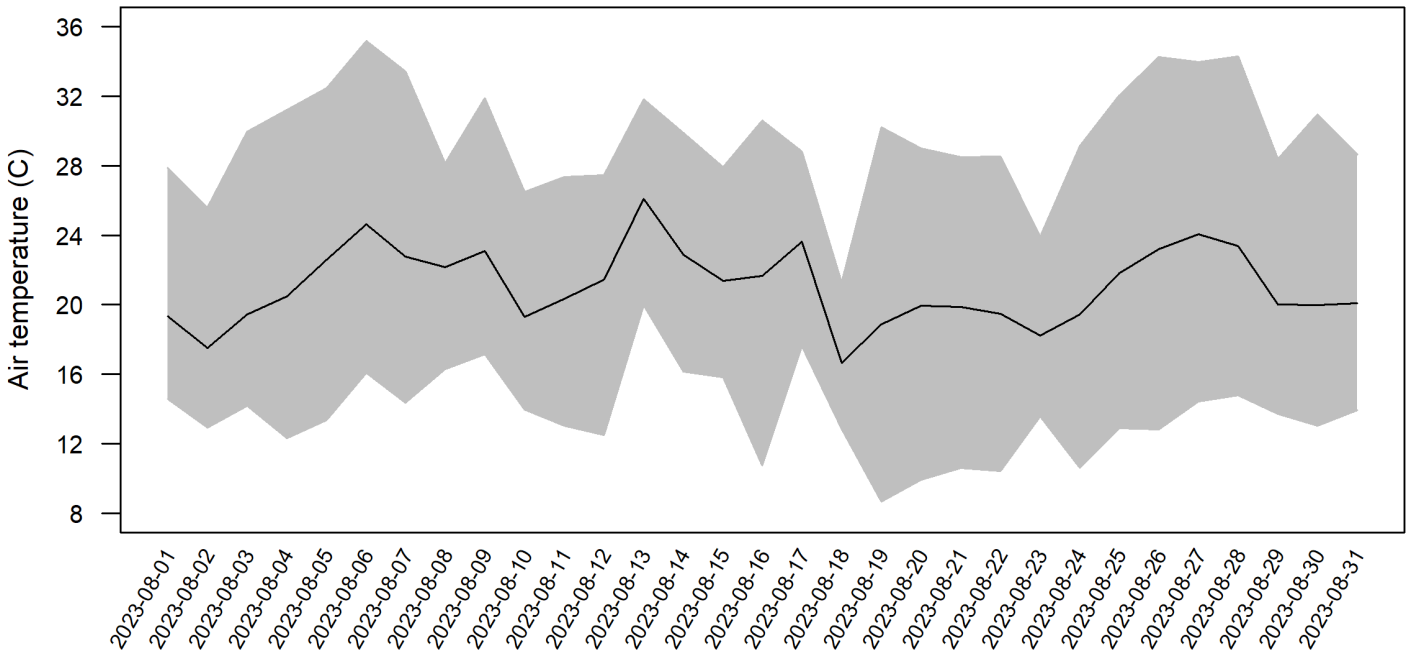
Discharge in the Peace River fluctuated during the reporting period from a low of 401 cms on August 28 to a high of 1110 cms on August 3 (Figure 2).

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 September 8; the downloaded data were provided at 5-minute intervals and were listed as provisional by the WSC.



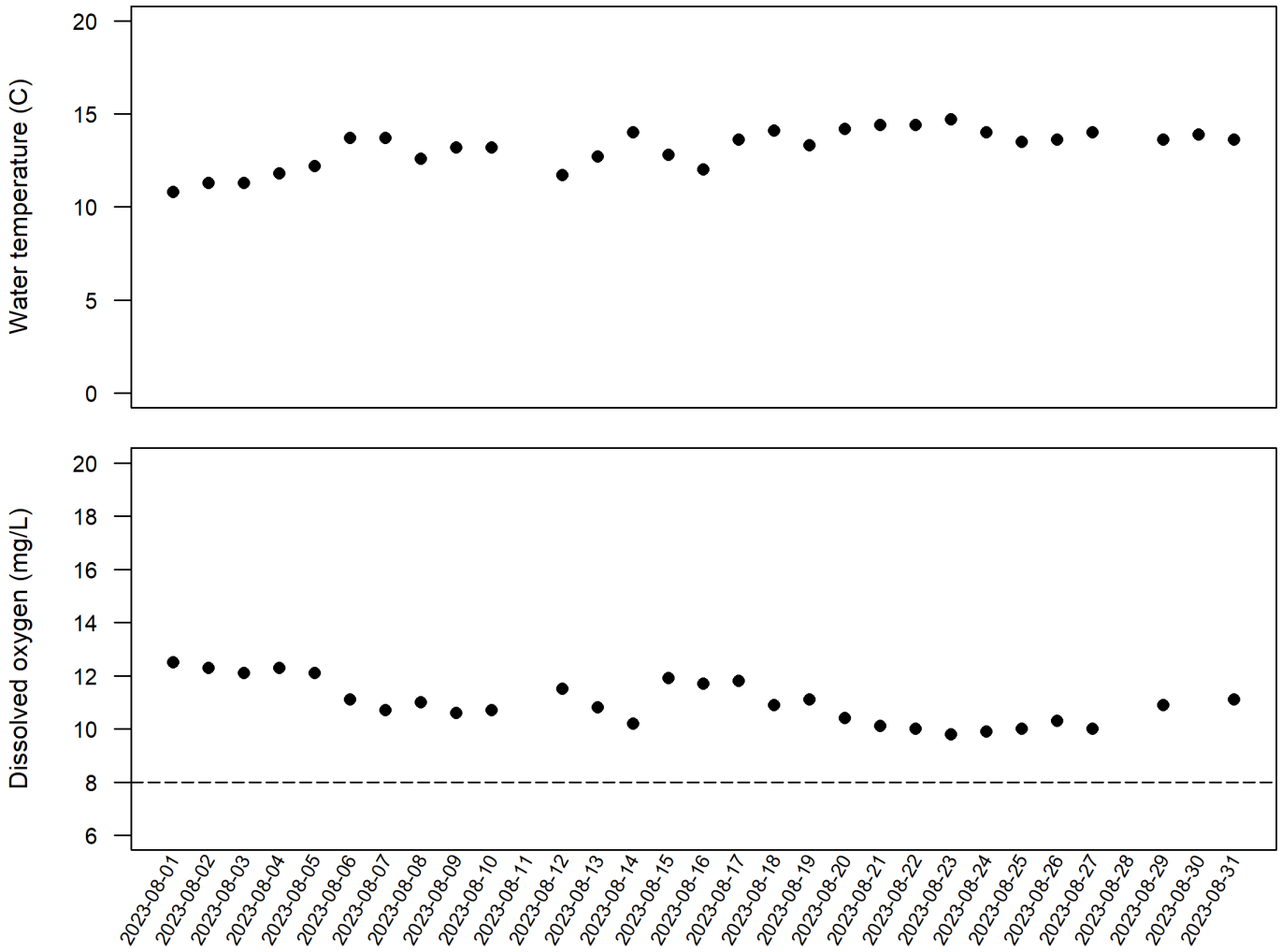
Air temperature fluctuated during the reporting period from a low of 8.7°C on August 19 to a high of 35.2°C on August 6 (Figure 3).

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 the pre-sort holding pool of the temporary facility.

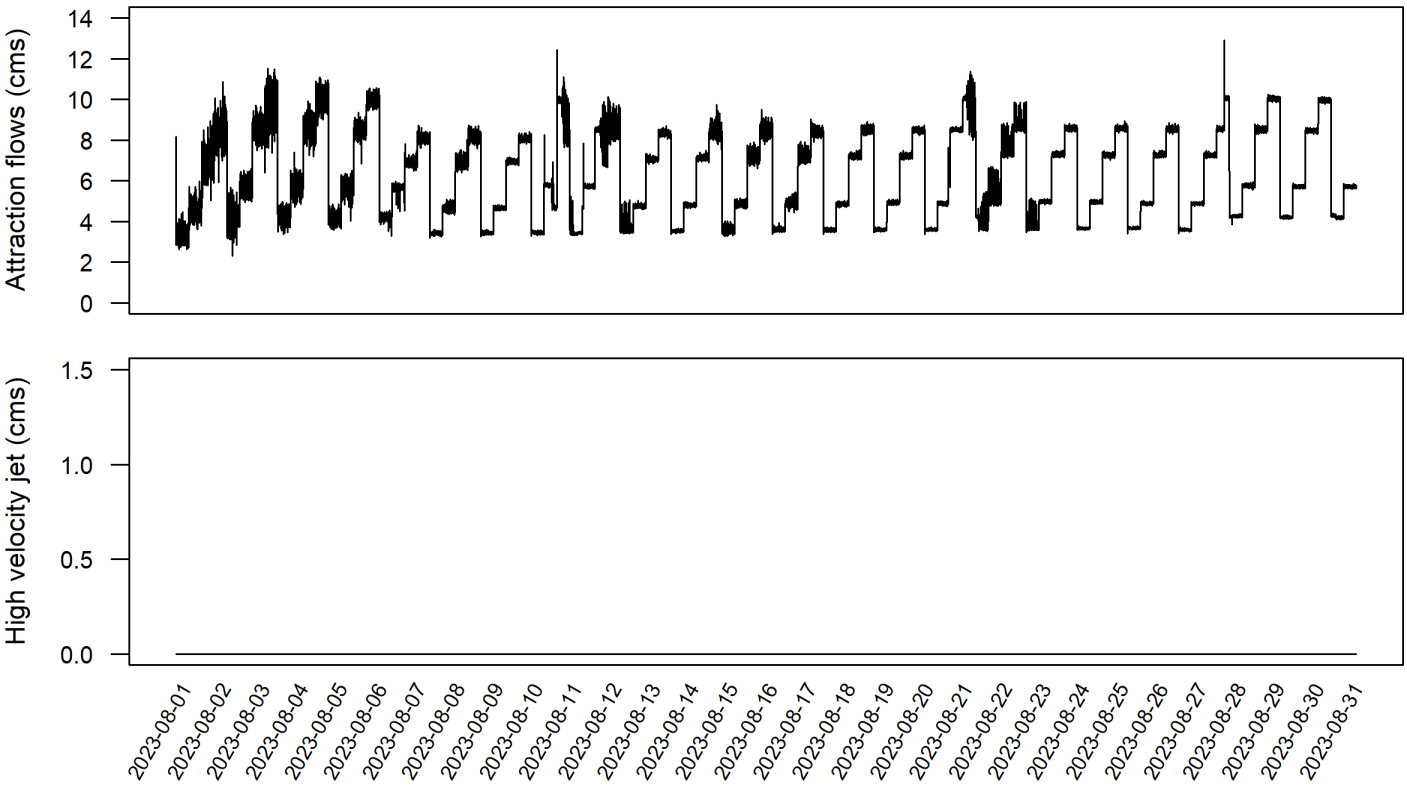


Mechanical operation

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.

BC Hydro operated the attraction flows as described in Section 3.2.1.3 of the OPP, whereby conditions were changed every 8 hours during the reporting period (Figure 5). BC Hydro did not operate the high velocity jet during the reporting period as monitoring data from 2022 suggested that the high velocity jet (1) did not improve the ability of fish to approach and enter the facility and (2) interfered with the ability of monitoring equipment to detect tagged fish and determine the biological effectiveness of the facility.

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 two and five sorting cycles were conducted each day during the reporting period, with the exception of August 11 and 28 due to the facility being shutdown (Table 2).

Table 2. Daily total number of sorting cycles.

Date	Number of sorting cycles	Start time
2023-08-01	4	08:00, 09:30, 11:00, 13:00
2023-08-02	4	08:00, 09:30, 11:00, 13:00
2023-08-03	4	08:00, 09:30, 11:00, 13:00
2023-08-04	4	08:00, 09:30, 11:00, 13:00
2023-08-05	4	08:00, 09:30, 11:00, 13:00
2023-08-06	4	08:00, 09:30, 11:00, 13:00
2023-08-07	3	08:00, 09:30, 11:00
2023-08-08	3	08:00, 11:00, 13:00
2023-08-09	3	08:00, 11:00, 13:00
2023-08-10	2	08:00, 09:00
2023-08-11	-	Facility shutdown
2023-08-12	4	08:00, 09:30, 11:00, 13:00
2023-08-13	4	08:00, 09:30, 11:00, 13:00
2023-08-14	3	08:00, 09:30, 11:00
2023-08-15	4	08:00, 09:30, 11:00, 13:00
2023-08-16	4	08:00, 09:30, 11:00, 13:00
2023-08-17	4	08:00, 09:30, 11:00, 13:00
2023-08-18	4	08:00, 09:30, 11:00, 13:00
2023-08-19	4	08:00, 09:30, 11:00, 13:00
2023-08-20	4	08:00, 09:30, 11:00, 13:00
2023-08-21	3	08:00, 09:30, 11:00
2023-08-22	4	08:00, 09:30, 11:00, 13:00
2023-08-23	4	08:00, 09:30, 11:00, 13:00
2023-08-24	5	08:00, 09:30, 11:00, 13:00, 13:30
2023-08-25	4	08:00, 09:30, 11:00, 13:00
2023-08-26	4	08:00, 09:30, 11:00, 13:00
2023-08-27	4	08:00, 09:30, 11:00, 13:00
2023-08-28	-	Facility shutdown
2023-08-29	3	07:30, 11:00, 13:00
2023-08-30	4	07:30, 09:30, 12:00, 13:00
2023-08-31	3	07:30, 11:00, 12:00

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

Date	Standby or shutdown	Rationale
2023-08-10 10:02 to 2023-08-11 13:02	Shutdown	Flows were held low and passed solely through Diversion Tunnel 1 to support construction activities during the reporting report; this resulted in unique hydraulics in the diversion tunnel outlet as well as debris build-up on the pump screen intakes. On August 10, 20, and 27, these conditions caused the water level differential between the diversion tunnel outlet and the pump wet well to exceed 4 meters, which lead to the operator temporarily shutting the facility down to clean the screen intakes and 'reset' the wet well. Water level differentials greater than 4 meters increases the risk of causing extensive damage to mechanical equipment (e.g., vertical pumps).
2023-08-20 13:43 to 2023-08-21 06:48		
2023-08-27 14:25 to 2023-08-28 12:33		

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
2023-08-02	Breakdown	Pump 7 – that provides water to the fishway – failed unexpectedly at 14:10. Pump 3, which is a backup for Pump 7, continued to provide some flow in the fishway.	Unknown.	Pump 7 was reset at 15:37 and fishway flows were restored.

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 Plan[2]. 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	Low river levels, hydraulics, and debris build-up resulted in a large water level differential at the pump screen intakes on August 10, 20, and 27 (Table 3). Shutting the facility down for a brief period (12 to 24 hours) to clean the screens and 'reset' the differential appeared to help solve the problem and avoid mechanical damange.
Biological operation	River otters continue to routinely predate on fish in and around the facility, and use facility infrastructure (e.g., baffle walls, fish crowder) to assist in the capture and consumption of fish (Photo 1). Otters and otter sign continue to be observed by the facility operator, with a portion of the mortalities observed during the reporting period being attributed to otter predation (Table 1). Deterrence through sound and scent aversion and human presence has been ineffective since 2021. BC Hydro continued efforts to mitigate this issue through the deployment of live traps (Photo 2). If trapped, river otters would be relocated away from the facility.

Photos

Photo 1. River otters continue to perch on facility infrastructure – such as the fish crowder at the top of the fishway (below) – to predate on fish (July 30, 2023).

Photo 2. Baited trap deployed on a floating platform in the entrance pool in an attempt to trap and relocate river otters away from the facility (August 30, 2023).

Prepared by

This report was prepared by the following individuals:

Qualified Individual	Expertise
Brent Mossop, MRM, RPBio	Fisheries
Nich Burnett, MSc, RPBio	Fisheries

Appendix I. High-level summary of operation of the temporary facility during the reporting period.

From:	Brent Mossop and Nich Burnett, Fish and Aquatic – Site C Clean Energy Project
Reporting Period:	August 1 to 31, 2023
Subject:	Monthly Update on Upstream Fish Passage

5093 fish passed

12 species sorted at facility

Operated facility for 29 days

Category	Performance	Commentary
Safety		• Effective interfaces among contractors
Fish Passage[1]		• Passed 5093 fish, however passage at top below expectations
Sorting & Transport		• Sorted 12 species, including 4728 Redside Shiner
Fish Mortality		• Forty mortalities during reporting period • Survival rate > 99% for all fish sorted in 2023
Operation Within Criteria		• Operated within and outside of design criteria
External Communication		• Provided updates to agencies and Indigenous nations
Effectiveness Monitoring		• Monitoring equipment performing well
Learning & Adjustment		• Continue to mitigate otter predation through live trapping and relocation away from the facility (Photos 1 and 2)

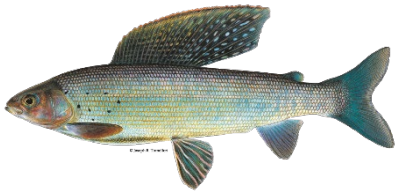
Meets or Exceeds Expectations	Nearing Expectations	Far Below Expectations

[1] Infographic available here: https://www.sitecproject.com/sites/default/files/fish-passage-facility.pdf

Target Species

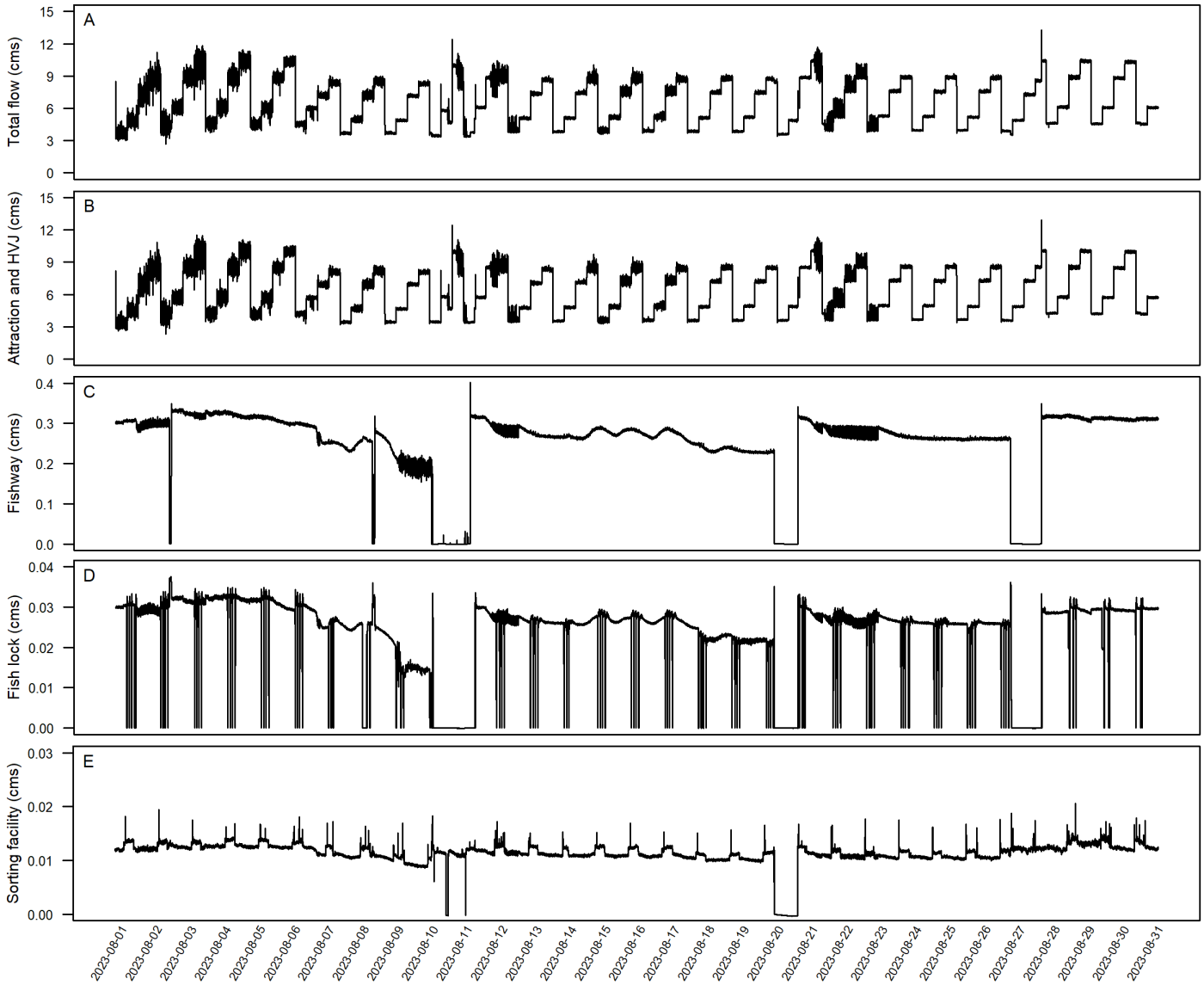
Bull Trout

Rainbow Trout



Arctic Grayling

Appendix II. (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 133987[4], 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://sitecproject.com/sites/default/files/fish-passage-facility-water-licences-133986-133987.pdf