BC Hydro
Power smart

Site C Clean Energy Project

Temporary Upstream Fish Passage Facility Operations Report

Reporting Period: July 1 to 31, 2022

Prepared by BC Hydro

August 15, 2022

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 July 2022.

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

One thousand three hundred and forty four fish – 804 Mountain Whitefish, 197 Largescale Sucker, 124 Longnose Sucker, 94 White Sucker, 43 Northern Pikeminnow, 35 Arctic Grayling, 33 Redside Shiner, 12 Bull Trout, 1 Rainbow Trout, and 1 Northern Pike – were sorted and sampled at the temporary facility, and transported and released into the Peace River upstream of the Project (Table 1, Photo 1).

Several adjustments to the top of the fishway in August, September and October 2021 were continued in July 2022 to improve the biological and mechanical operation of the temporary facility.

- On June 30, the vee-trap side panels were raised approximately 50 cm to increase flow at the bottom of the water column and prevent sediment from building up in the pre-sort holding pool. Sediment build up was significantly reduced from implementing this change.
- On July 19, the finger weir was raised approximately 11 cm so that the fingers were 12 cm below the water surface; this change was implemented to prevent fish from swimming out of the pre-sort holding pool (i.e., increase trapping efficiency).

[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

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.

Biological operation

In total, 1344 fish were sorted in the temporary facility during the reporting period (Table 1; Figure 1). Five mortalities – 4 Mountain Whitefish and 1 Longnose Sucker – were observed during the reporting period (0.6% of all fish sorted in 2022), 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.

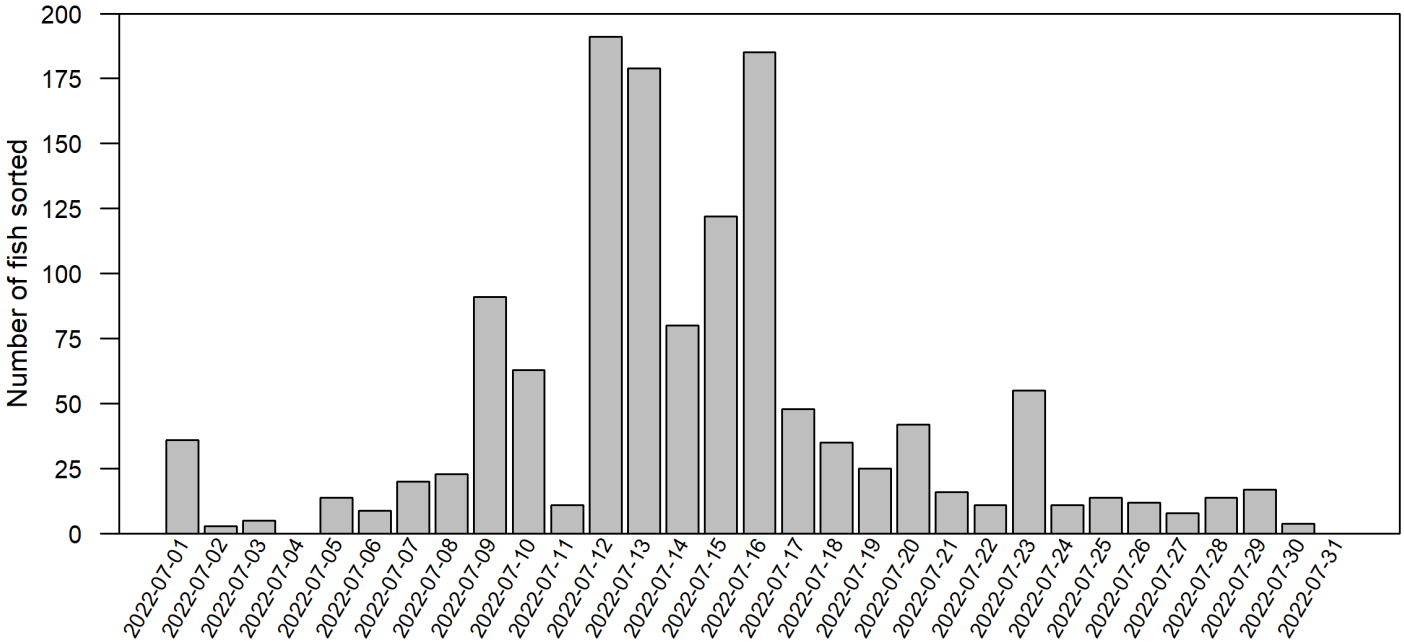
Species	Sorted	Transported and released	PIT tagged	Mortalities	Genetics	Microchemistry or ageing
Arctic Grayling	35	35	34	0	34	29
Brook Stickleback						
Brook Trout						
Bull Trout	12	12	10	0	12	11
Burbot						
Finescale Dace						
Flathead Chub						
Goldeye						
Kokanee						
Lake Chub						
Lake Trout						
Lake Whitefish						
Largescale Sucker	197	197	181	0	N/A	N/A
Longnose Dace						
Longnose Sucker	124	124	107	1	N/A	N/A
Mountain Whitefish	804	804	725	4	N/A	4
Northern Pike	1	1	1	0	N/A	1
Northern Pikeminnow	43	43	N/A	0	N/A	
Northern Redbelly Dace						
Peamouth						
Pearl Dace						
Prickly Sculpin						
Pygmy Whitefish						
Rainbow Trout	1	1	1	0	1	1
Redside Shiner	33	33	N/A	0	33	N/A
Slimy Sculpin						
Spoonhead Sculpin						
Spottail Shiner						
Trout-perch						
Walleye						
White Sucker	94	94	91	0	N/A	N/A
Yellow Perch						
Grand total	1344	1344	1150	5	80	46

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

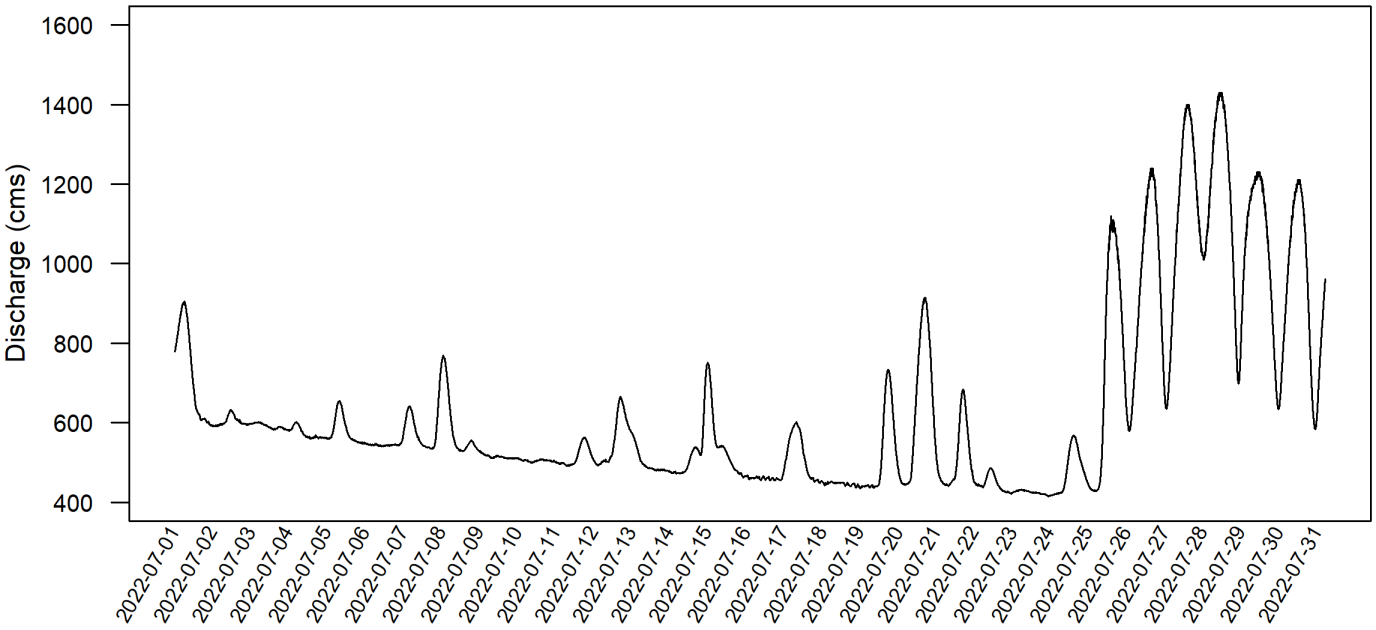
Figure 1. Daily number of fish sorted in the temporary facility during the reporting period.



Environmental conditions

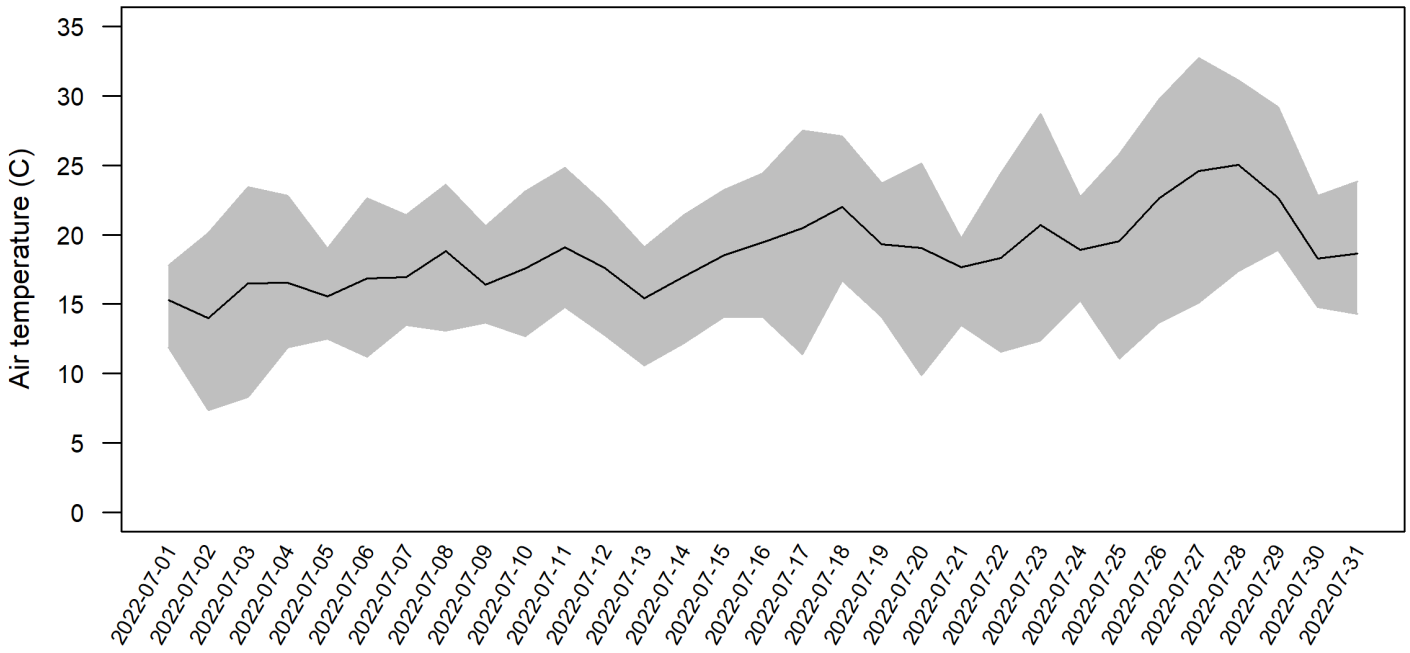
Discharge in the Peace River fluctuated during the reporting period from a low of 415 cms on June 24 to a high of 1430 cms on July 29 (Figure 2).

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 August 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 7.4°C on July 2 to a high of 32.7°C on July 27 (Figure 3).

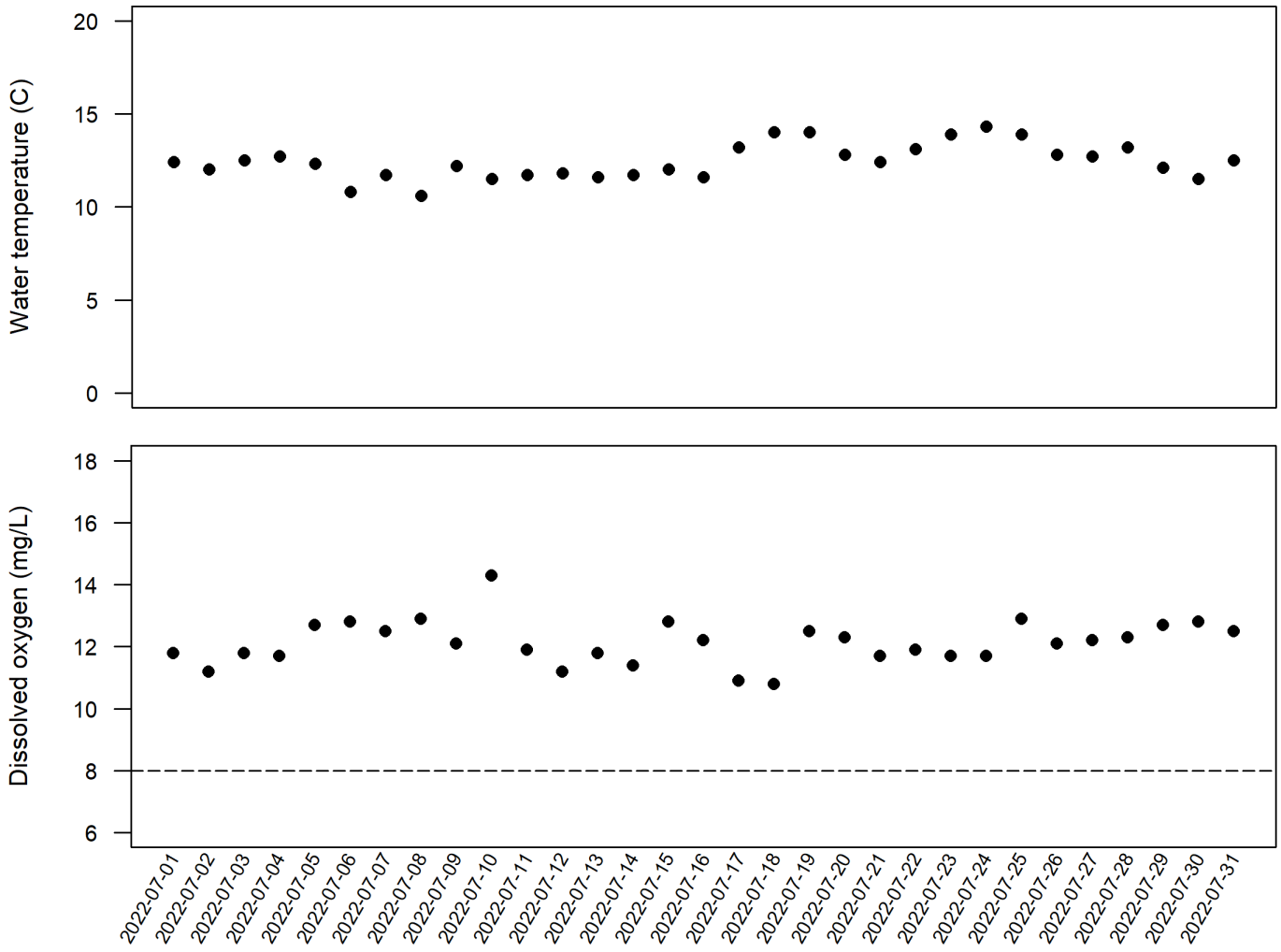
Figure 3. Mean daily air temperature (black line; °C) during the reporting period as measured by the provincial air monitoring station located on the dam site at the Site C Workers Accomodation[4] (E309527). Shaded area represents the minimum and maximum daily air temperatures.



[4] Available at: https://www.env.gov.bc.ca/epd/bcairquality/data/station.html?id=E309527

Water temperature steadily increased during the reporting period from a low of 10.6°C on July 8 to a high of 14.3°C on July 24 (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.

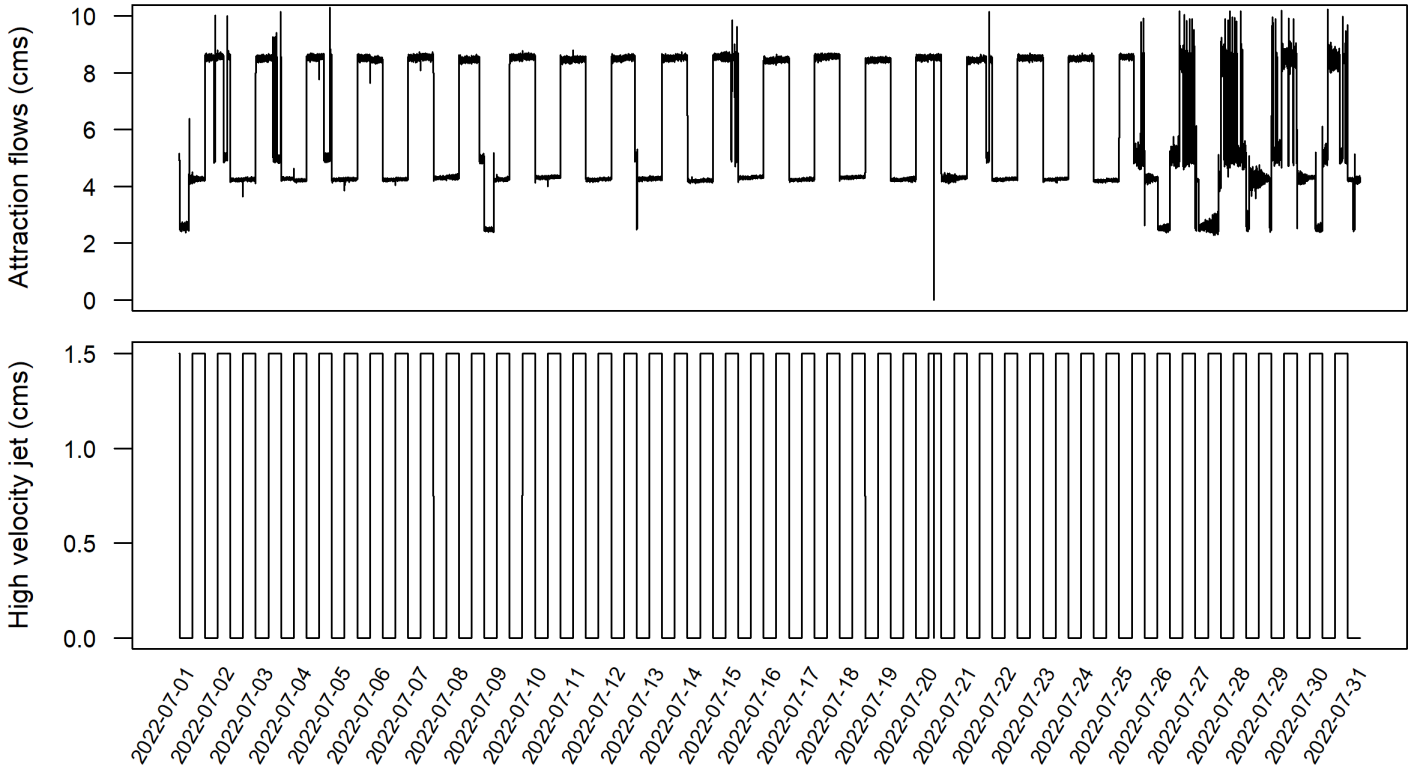


Mechanical operation

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 and high velocity jet as described in Section 3.2.1.3 of the OPP, whereby conditions were changed every 8 hours during the reporting period (Figure 5).

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 three 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
2022-07-01	3	08:30, 11:00, 13:00
2022-07-02	3	08:30, 11:00, 13:00
2022-07-03	3	08:30, 11:00, 13:00
2022-07-04	1	11:30
2022-07-05	3	08:30, 11:00, 13:00
2022-07-06	3	08:30, 11:00, 13:00
2022-07-07	2	08:30, 11:00
2022-07-08	3	08:30, 11:00, 13:00
2022-07-09	3	08:30, 11:00, 13:00
2022-07-10	1	08:30
2022-07-11	2	08:30, 10:30
2022-07-12	1	08:30
2022-07-13	2	08:30, 13:00
2022-07-14	2	08:30, 11:00
2022-07-15	2	08:30, 11:00
2022-07-16	2	08:35, 11:20
2022-07-17	3	08:35, 11:00, 13:00
2022-07-18	1	08:30
2022-07-19	3	08:30, 11:00, 13:00
2022-07-20	3	08:30, 11:00, 13:00
2022-07-21	3	08:30, 11:00, 13:00
2022-07-22	3	08:30, 11:00, 13:00
2022-07-23	3	08:30, 11:00, 13:00
2022-07-24	3	08:30, 11:00, 13:00
2022-07-25	3	08:30, 11:00, 13:00
2022-07-26	3	08:30, 11:00, 13:00
2022-07-27	3	08:30, 11:00, 13:00
2022-07-28	3	08:30, 11:00, 13:00
2022-07-29	3	09:00, 11:00, 13:00
2022-07-30	3	08:30, 11:00, 13:00
2022-07-31	3	09:00, 11:00, 13:00

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

Date	Standby or shutdown	Rationale
N/A	N/A	No standby or shutdown periods occurred during the reporting period.

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
2022-07-03	Breakdown	Brail hoist rod failed.	Normal wear and tear from operations.	Replaced the bearing.
2022-07-29 and 2022-07-31	Malfunction	Pump 9 – used to fill the fish lock – experienced a failure and powered down.	May be due to sediment build-up in the fish lock and pre-sort holding pool.	Over a 30 minute period the sediment was flushed out of the fish lock and pre-sort holding pool by slowly releasing flow through Pump 9.

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. Where appropriate, the adjustments outlined below will be reflected in an updated revision of the OPP for operations in 2023.

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

Component	Adjustment
Mechanical operation	On June 30, the vee-trap side panels were raised approximately 50 cm to increase flow at the bottom of the water column and prevent sediment from building up in the pre-sort holding pool. Sediment build up was significantly reduced from implementing this change.
	On July 19, the finger weir was raised approximately 11 cm so that the fingers were 12 cm below the water surface; this change was implemented to prevent fish from swimming out of the pre-sort holding pool (i.e., increase trapping efficiency).

Photos

Photo 1. Biologists sample a Bull Trout in the sorting facility (July 3, 2022). Twelve Bull Trout passed the temporary facility during the reporting period.

Photo 2. Members from Indigenous nations observe the release of 2 Bull Trout at the Halfway River Boat Launch (July 6, 2022).

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:	July 1 to 31, 2022
Subject:	Monthly Update on Upstream Fish Passage

1344 fish sorted at facility

Operated facility for 31 days

12 Bull Trout transported upstream of the Project

Category	Performance	Commentary
Safety		• Effective interfaces among contractors
Fish Passage[1]		• Improved passage at top since modifying trapping mechanism
Sorting & Transport		• 1344 fish from 10 species
Fish Mortality		• Five mortalities during reporting period • Survival rate 99% for all fish sorted in 2022
Operation Within Criteria		• Operated within and outside of design criteria
External Communication		• Provided updates to Indigenous nations (Photo 2)
Effectiveness Monitoring		• Monitoring equipment performing well
Learning & Adjustment		• Raising vee-trap side panels by 50 cm reduced sediment build-up in the pre-sort holding pool

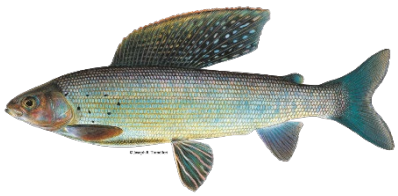
Meets or Exceeds Expectations	Nearing Expectations	Far Below Expectations

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

Target Species

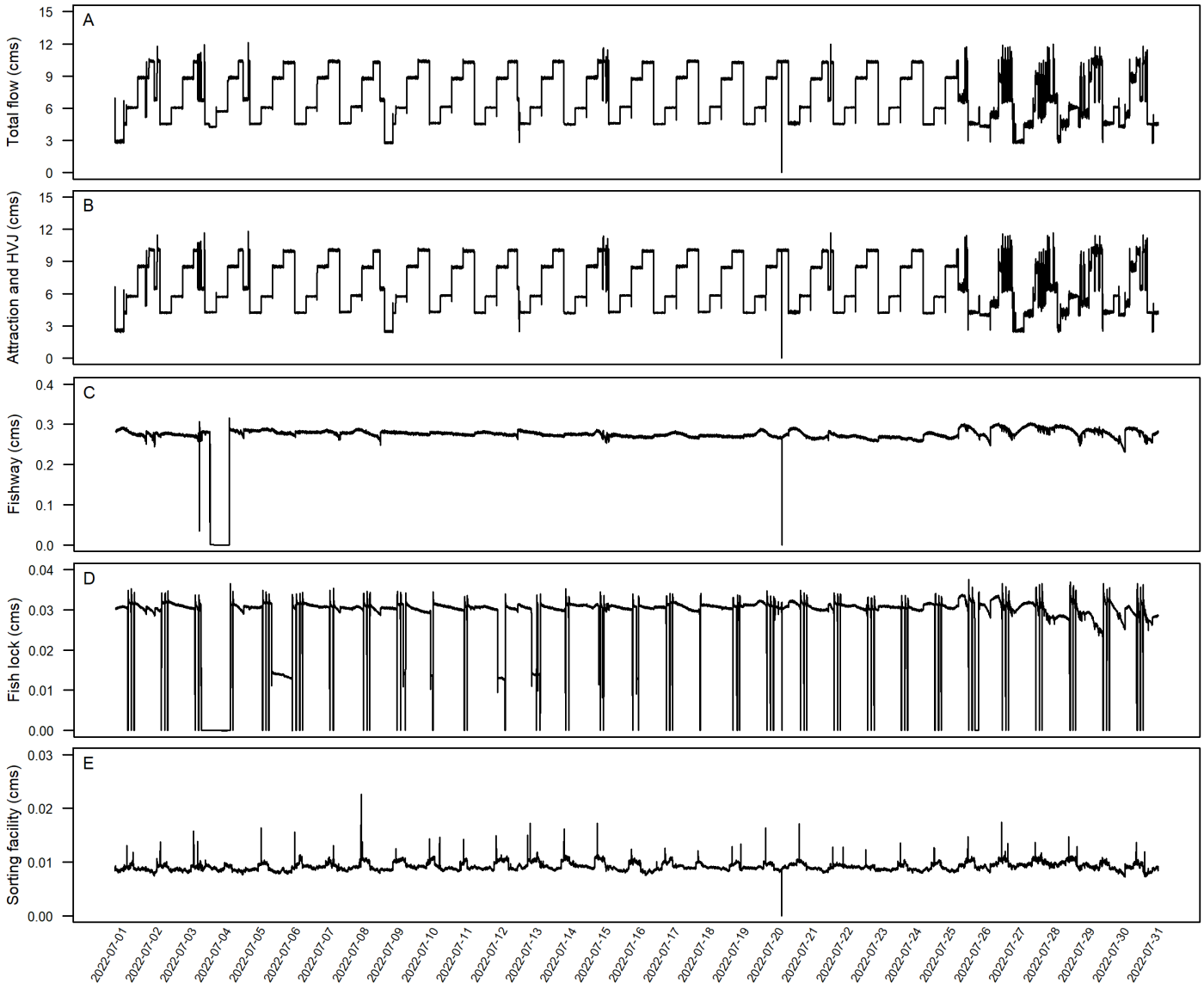
Bull Trout

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[5], 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).



[5] Available at: http://sitecproject.com/sites/default/files/fish-passage-facility-water-licences-133986-133987.pdf