Clowhom Project Water Use Plan

Monitoring Programs

Annual Report: 2020

Implementation Period: May 2019 to April 2020

- **COMMON-1 Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations**
- **COMMON-2 Role of Littoral Zone in Governing Clowhom Reservoir Productivity Capacity**
- **COMMON-3 Validation of the Effective Littoral Zone Performance Measure**
- **COMMON-4 Archaeological Sites Monitoring**

For Water Licences 120562, 120565, and Conditional Water Licence 119822

May 29, 2020

BC Hydro Clowhom Project Water Use Plan Monitoring Programs Annual Report: 2020

1 Introduction

This document represents a summary of the status and the results of the Clowhom Project Water Use Plan (WUP) monitoring programs to April 30, 2020, as per the Clowhom Order under the *Water Act*, dated April 20, 2005. There are four monitoring programs.

2 Status

The following table outlines the dates that Terms of Reference (TOR) for the Clowhom Project WUP monitoring programs were submitted to and approved by the Comptroller of Water Rights (CWR).

Table: 2-1: Dates of Clowhom Project WUP TOR Submissions and Approvals by the Comptroller of Water Rights

Monitoring Program TORs	Order Clause	Original ToR Submission		Most Recent ToR Resubmission	
		Date Submitted	Date Approved	Date Submitted	Date Approved
COMMON-1 Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations	Schedule A.1.a	September 23, 2005	October 28, 2005	February 28, 2019	March 27, 2019
COMMON-2 Role of Littoral Zone in Governing Clowhom Reservoir Productivity Capacity	Schedule A.1.b	September 23, 2005	October 28, 2005	April 2, 2015	April 23, 2015
COMMON-3 Validation of the Effective Littoral Zone Performance Measure	Schedule A.1.c	September 23, 2005	October 28, 2005	December 24, 2019	May 12, 2020
COMMON-4 Archaeological Sites Monitoring	Schedule A.2	September 23, 2005	October 28, 2005		

3 Schedule

The following table outlines the current schedule for the monitoring programs being delivered for the Clowhom Project WUP.

Table 3-1: Monitoring Programs Schedule as of April 30, 2020

Monitoring Program	Study	2006 WLR YR1	2007 WLR YR2	2008 WLR YR3	2009 WLR YR4	2010 WLR YR5	2011 WLR YR6	2012 WLR YR7	2013 WLR YR8	2014 WLR YR9	2015 WLR YR10	2016 WLR YR11	2017 WLR YR12	2018 WLR YR13	2019 WLR YR14	2020 WLR YR15	2021 WLR YR16	2022 WLR YR17	2023 WLR YR18	2024 WLR YR19	2025 WLR YR20
COMMON-1 Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations	Wildlife Census	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	■	■	■	■	■
	Air Photography	✓				✓	✓				X[1]	✓			✓						■
COMMON-2 Role of Littoral Zone in Governing Clowhom Reservoir Productive Capacity	Fish Survey	✓		✓	✓	✓	✓				X[1]	✓				✓					■
	Juvenile Habitat Use Survey		X	✓	X	✓	✓					✓**F**									
COMMON-3 Validation of the Effective Littoral Zone Performance Measure		✓	✓	✓	✓	✓	✓				X[1]	✓	✓			✓**F**					
COMMON-4 Archaeological Sites Monitoring			X	✓	✓**F**																

Legend:
- ■ = Project to be undertaken in identified year
- ✓ = Project is completed for the year
- X = Encountered operational or hydrological delays
- X[1] = Work delayed due to program review
- ✓**F** = All field work for this project is complete. No further field work is planned.

4 Monitoring Programs Terms of Reference

The monitoring programs being implemented under the Clowhom Project WUP are described in Terms of Reference (TOR). These TOR and the reports for work completed to date can be found here:

http://www.bchydro.com/toolbar/about/sustainability/conservation/water_use_planning/lower_mainland/clowhom.html

5 Status of Monitoring Programs

5.1 COMMON-1 Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations

The objective of this project is to determine to what extent the ecology (e.g., species diversity) in the wetland at upper end of Clowhom Falls Reservoir is linked to the operation of the reservoir. The wildlife census component of this monitoring program was initiated in 2006 and will be carried out annually over 20 years. The wildlife census field work scheduled for 2019 was completed with a refined approach focusing on amphibians and ground-nesting birds in the upper drawdown zone of the reservoir.

The Year 13 (2018) report is currently being drafted and will be submitted with the 2021 annual report. The Year 14 (2019) report will be submitted with the 2021 annual report.

5.2 COMMON-2 Role of Littoral Zone in Governing Clowhom Reservoir Productivity Capacity

The objective of this 20-year monitoring program is to track changes in fish productivity through sampling of rearing populations. This program was developed and implemented in 2006 to measure if fish productivity has decreased.

Fish surveys occurred in alternate years from 2006 to 2010 and are scheduled to occur at five-year intervals thereafter. The last survey was completed in September 2016. The Year 10 report, dated June 1, 2019, is attached.

5.3 COMMON-3 Validation of the Effective Littoral Zone Performance Measure

The objective of this program is to detect changes in the reservoir littoral zone (e.g., the part of the reservoir close to shore) and compare these changes to model predictions validating performance measures for the different reservoir operational alternatives.

This monitoring program was initiated in 2006 with data collection occurring every year until 2010. The sampling period was successful and provided enough data to facilitate the evaluation the Effective Littoral Zone (ELZ) Model. However, by 2015 BC Hydro began to re-evaluate the validity of the Effective Littoral Zone Model (ELZ) for Clowhom due to results on other BC Hydro reservoirs. Review and analysis of results on Clowhom Reservoir in comparison to other reservoirs was completed in 2018 and concluded that littoral production had little effect on fish condition, in this case rainbow and cutthroat trout. Modelling was completed in 2018 and compiled in a 10-year summary report.

As per the May 12, 2020 letter, the CWR approved relief from the remaining years of study implementation for COMMON-3 Validation of the Effective Littoral Zone Performance Measure. This project is complete.

5.4 COMMON-4 Archaeological Sites Monitoring

This monitoring program was initiated in 2008, was carried out over two years. The objective of this program was to collect additional information about condition and location of sites in the drawdown zone and to monitor site specific impacts due to reservoir operations.

Leave to commence was not received for the COMMON-4 Archaeological Sites Monitoring TOR. As per the October 28, 2005 letter, this work proceeded under the *Heritage Conservation Act*.

This project is complete.

6 Monitoring Programs Costs

The following table summarizes the Clowhom Project WUP monitoring programs costs approved by the CWR and the Actual Costs to April 30, 2020.

Table 6-1: Clowhom Project WUP Monitoring Program Costs

Monitoring Programs	Costs approved by CWR	Life to Date Actuals (LTD)	Estimated to Complete (Forecast)	Total Forecast (LTD and Forecast)	Variance Total to Approved	Explanation	Corrective Action
Clowhom WUP Annual Report	$43,186	$15,598	$11,085	$26,683	$16,503		
COMM01A Mon Aquatic Wildlife	$364,673	$213,037	$119,955	$332,992	$31,681	Efficiencies found during project implemention.	
COMM01A Mon Aquatic Wildlife - ONR DM	$174,773	$65,342	$31,390	$96,732	$78,041		
COMM01A Mon Aquatic Wildlife - ONR Imp	$189,900	$147,695	$88,565	$236,260	($46,360)		
COMM02A Role Littoral Zone	$188,424	$107,618	$66,200	$173,818	$14,606	Efficiencies found during project implemention.	
COMM02A Role Littoral Zone - ONR DM	$85,324	$34,653	$31,200	$65,853	$19,471		
COMM02A Role Littoral Zone - ONR Imp	$103,100	$72,965	$35,000	$107,965	($4,865)		
COMM03A Valid Littoral Zone	$155,909	$125,651	$1,730	$127,381	$28,528	Project Completed	
COMM03A Valid Littoral Zone - ONR DM	$57,909	$19,432	$1,730	$21,162	$36,747		
COMM03A Valid Littoral Zone - ONR Imp	$98,000	$106,219	$0	$106,219	($8,219)		
COMM04A Archaeological Sites	$0	$7,350	$0	$7,350	($7,350)	Project Completed	
COMM04A Archaeological Sites - ONR DM	$0	$6,681	$0	$6,681	($6,681)		
COMM04A Archaeological Sites - ONR Imp	$0	$669	$0	$669	($669)		

OR - Ordered Remissible
ONR - Ordered Non-Remissible

* Red values in parentheses denote overage.