

## **Columbia River Water Use Plan**

### **Arrow Lakes Reservoir Wildlife Management Plan Physical Works**

**Annual Report: 2016**

**Implementation Period: March 2015 to February 2016**

- **CLBWORKS-29A Arrow Lakes Reservoir: Wildlife Physical Works Feasibility Study**
- **CLBWORKS-29B Arrow Lakes Reservoir: Study of High-Value Wildlife Habitat for Potential Enhancement and Protection**
- **CLBWORKS-30A Arrow Lakes Reservoir: Implementation of Wildlife Physical Works – Revelstoke Reach**
- **CLBWORKS-30B Arrow Lakes Reservoir: Implementation of Wildlife Physical Works –Arrow Reservoir**

**Conditional Water Licences for Kinbasket storage (27068 and 39432), Mica diversion (39431), Revelstoke diversion and storage (47215), and Arrow storage (27066)**

**March 31, 2016**

## **BC Hydro Columbia River Project Water Use Plan Arrow Lakes Reservoir Wildlife Management Plan Physical Works Annual Report: 2016**

### **1 Introduction**

This document represents a summary of the status and the results of the Arrow Lakes Reservoir Wildlife Management Plan Water Use Plan (WUP) physical works to February 2016, as per the Columbia River WUP Order under the *Water Act*, dated January 26, 2007 and the Amended Order dated August 23, 2007. There are two studies and two physical works.

### **2 Status**

The following table outlines the dates that Terms of Reference (TOR) for the Arrow Lakes Reservoir Wildlife Management Plan WUP studies and physical works were submitted to and approved by the CWR.

**Table: 2-1: Dates of Arrow Lakes Reservoir Wildlife Management Plan WUP TOR Submissions and Approvals by the Comptroller of Water Rights**

Physical Works TOR	Order Clause	Original TOR Submission		Most Recent TOR Resubmission	
		Date Submitted	Date Approved	Date Submitted	Date Approved
CLBWORKS-29A Arrow Lakes Reservoir Wildlife Physical Works Feasibility Study	Schedule C, Clause 6.a Schedule D, Clause 6.a	Jan 24, 2008	Feb 20, 2008	Apr 30, 2009	Aug 05, 2009
CLBWORKS-29B Arrow Lakes Reservoir Study of High-Value Wildlife Habitat for Potential Enhancement and Protection	Schedule C, Clause 5.h Schedule D, Clause 5.c	Jan 24, 2008	Feb 20, 2008	Apr 15, 2009	May 11, 2009
CLBWORKS-30A Arrow Lakes Reservoir Wildlife Physical Works (Revelstoke Reach)	Condition List, Clause 4.a	Jun 27, 2011	Aug 02, 2011	Oct 06, 2015	Nov 18, 2015
CLBWORKS-30B Arrow Lakes Reservoir Wildlife Physical Works (Arrow Reservoir)	Condition List, Clause 7.a	Conditional			

### 3 Schedule

The following table outlines the current schedule for the WUP studies and physical works being delivered for the Arrow Lakes Reservoir Wildlife Management Plan WUP.

**Table 3-1: Physical Works Schedule as of February 2016**

Physical Works	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	WLR YR1	WLR YR2	WLR YR3	WLR YR4	WLR YR5	WLR YR6 Interim Review	WLR YR7	WLR YR8	WLR YR9	WLR YR10	WLR YR11	WLR YR12	WLR YR13
CLBWORKS - 29A Arrow Lakes Reservoir Wildlife Physical Works Feasibility Study	✓	✓											
CLBWORKS - 29B Arrow Lakes Reservoir Study of High-Value Wildlife Habitat for Potential Enhancement and Protection				✓					u/w				
CLBWORKS - 30A Arrow Lakes Reservoir Wildlife Physical Works-Revelstoke Reach						✓	✓	✓	u/w	■			
CLBWORKS - 30B Arrow Lakes Reservoir Wildlife Physical Works-Arrow Reservoir <sup>1</sup>													
Legend: ■ = Program to be undertaken/initiated in identified year ■ = Program planned pending TOR resubmission u/w = Project is under way ✓ = Program completed for the year Footnote: <sup>1</sup> Terms of reference under development. Implementation date and duration of program not set.													

### 4 Physical Works Terms of Reference

The Physical Works being implemented under the Arrow Lakes Reservoir Wildlife Management Plan WUP are described in Terms of Reference. These Terms of Reference and the reports for work completed to date can be found here:

[http://www.bchydro.com/about/sustainability/conservation/water\\_use\\_planning/southern\\_interior/columbia\\_river/arrow-wildlife.html](http://www.bchydro.com/about/sustainability/conservation/water_use_planning/southern_interior/columbia_river/arrow-wildlife.html)

### 5 Status of Physical Works

#### 5.1 CLBWORKS-29A Arrow Lakes Reservoir: Wildlife Physical Works Feasibility Study

This feasibility study was initiated in 2008 and completed in 2009. The 2012 Annual Report provided a summary of the work that is summarized below for completeness of this Annual Report.

The purpose of this study was to identify and assess wildlife physical works opportunities in Revelstoke Reach and provide guidance towards the implementation of those works by defining treatment options, methods and schedule. Phase I started with sites originally identified by the Consultative Committee during the development of the Columbia Water Use Plan. BC Hydro established a Wildlife Physical Works Committee (WPWC) with representation from BC Hydro, Ministry of Environment, Ducks Unlimited, First Nations, and local stakeholders to assess 45 potential sites.

In Phase II, the WPWC narrowed the projects to 35 potential sites on the basis of technical feasibility and costs, then to eight on the basis of biological and operational criteria. The eight were presented at an open house in Revelstoke in December 2009, and preliminary designs were subsequently developed for five projects.

Following the review of project costs and anticipated benefits, the WPWC endorsed three of the projects:

- Site 6A at Airport Marsh: including construction of a riprap mattress to halt the erosion of the east arm of the outflow channel located near Airport Marsh and Machete Island. The work also included the installation of nest boxes in the Revelstoke Reach area.
- Site 14 at Cartier Bay: including filling in the breach in the old CP railway grade to retain water behind the grade and create seasonal shallow open water habitat.
- Site 15A at Cartier Bay: including removal of an old collapsed wooden box culvert and reconstruction of the dike to be one metre higher than the present elevation.

The implementation of these three wildlife physical works projects is carried out under CLBWORKS-30A.

## **5.2 CLBWORKS-29B Arrow Lakes Reservoir: Study of High-Value Wildlife Habitat for Potential Enhancement and Protection**

This feasibility study was initiated and completed in 2011. The 2012 Annual Report provided a summary of the work that is summarized below for completeness of this Annual Report.

The purpose of this study was to conduct a preliminary feasibility assessment for wildlife physical works opportunities on the middle to lower Arrow Reservoir (outside of Revelstoke Reach). At a stakeholder meeting in 2010, the original five high-value habitat sites identified were reviewed and the following three sites were recommended for further assessment:

- creation of new shallow wetland habitat at Burton Creek;
- creation of new shallow wetland habitat at Edgewood South; and
- enhancement of existing shallow wetland habitat at Lower Inonoaklin Road.

A feasibility assessment was complete in 2011 that assessed the following aspects: hydrological (including substrate, topography, and natural water sources), ecological (wildlife enhancement potential), regulatory (permitting requirements) and financial.

Before physical works projects are carried out under CLBWORKS-30B, the feasibility assessments will be updated in 2016 to current conditions and screened for other important factors in wetland design in the drawdown zone, such as dam safety considerations and known archaeological sites.

## **5.3 CLBWORKS-30A Arrow Lakes Reservoir: Implementation of Wildlife Physical Works – Revelstoke Reach**

The objective of CLBWORKS-30 is to implement the recommendations from the feasibility studies (CLBWORKS-29A and 29B). To ensure the work reflects the terms

of the Order which are specific to Revelstoke Reach and Mid to Low Arrow Reservoir, CLBWORKS-30 was separated into:

- CLBWORKS-30A for Revelstoke Reach; and
- CLBWORKS-30B for Arrow Reservoir.

CLBWORKS-30A includes the detailed design, the construction and ongoing maintenance of the three projects identified in CLBWORKS-29A.

As summarized in depth in the 2015 Annual Report, an Ecological Impact Assessment (EIA) was completed in 2015 which concluded that it is very uncertain whether the proposed projects would create net ecological benefits. The EIA recommended not proceeding with the original design for Site 15A, and identified very limited benefit of the works proposed for Site 14. BC Hydro subsequently revised the scope of the project at Site 15A to reinforce the existing rail bed at the site of the wood box culvert, thereby maintaining and protecting the existing wetland as it is currently functioning. The revised approach was approved by the CWR on November 18, 2015.

Construction planning and permitting for Site 15A was initiated in fall 2015, and BC Hydro became aware that a conservation water licence was required for the rail bed structures. This permitting delay, combined with early warm temperatures, has postponed the project until the next low water window.

To account for costs related to dam safety, an Archeological Impact Assessment for the access route, and for the implementation delay, a budget increase request will be submitted to the CWR by May 15, 2016.

#### **5.4 CLBWORKS-30B Arrow Lakes Reservoir: Implementation of Wildlife Physical Works – Arrow Reservoir**

CLBWORKS-30B includes the detailed design, the construction and ongoing maintenance of the three projects identified in CLBWORKS-29B.

As noted in CLBWORKS-29B above, the 2011 feasibility assessment will be updated in 2016 and will inform the work under CLBWORKS-30B. Once the feasibility assessment update is complete, BC Hydro will be submitting a request for Design Phase work on this project by September 15, 2016.

## **6 Physical Works Costs**

The following table summarizes the Arrow Lakes Reservoir Wildlife Management Plan WUP physical works costs approved by the Comptroller and the Actual Costs to February 29, 2016.

**Table 6-1: Arrow Lakes Reservoir Wildlife Management Plan WUP Physical Works 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
<b>CLB MP7 Arrow Res WL Annual Report</b>	\$4,889	\$2,635	\$3,435	\$6,071	(\$1,182)	Original forecast was conservative for annual report costs.	Request for increase in budget will be submitted prior to exceeding approved budget.
<b>C07W29A Arrow Feas - OR</b>	\$242,054	\$242,054		\$242,054	(\$0)	Project Complete	
C07W29A Arrow Feas - OR DM	\$34,038	\$35,586		\$35,586	(\$1,548)		
C07W29A Arrow Feas - OR Imp	\$208,016	\$206,468		\$206,468	\$1,548		
<b>C07W29A Arrow Feas - ONR</b>		\$1,031		\$1,031	(\$1,031)	CLBWORKS 29A was overspent without approval from the CWR; overage was absorbed through ONR funds.	
C07W29A Arrow Feas - ONR DM Overspend		\$1,031		\$1,031	(\$1,031)		
<b>C07W29B ARR High Value</b>	\$81,045	\$61,345	\$18,129	\$79,474	\$1,571	Project feasibility assessment will be updated for current conditions within existing budget approval.	
C07W29B ARR High Value - OR DM	\$15,387	\$1,345	\$6,129	\$7,474	\$7,913		
C07W29B ARR High Value - OR Imp	\$65,658	\$60,000	\$12,000	\$72,000	(\$6,342)		
<b>C07W30A ARR Wildlife (Rev Reach)</b>	\$1,185,571	\$1,002,995	\$318,915	\$1,321,910	(\$136,339)	Additional costs related to AIA, dam safety permitting and implementation delay.	Budget Increase Request will be submitted by May 15 2016.
C07W30A ARR Wildlife Pw - OR DM	\$142,667	\$178,715	\$39,664	\$218,379	(\$75,712)		
C07W30A ARR Wildlife Pw - OR Imp	\$1,042,904	\$824,280	\$279,251	\$1,103,531	(\$60,627)		
<b>C07W30B ARR Wildlife (Arrow)</b>		\$0			\$0	Project not started	TOR submission for Design Phase will be submitted by September 15 2016.
C07W30B ARR Wildlife Lower - OR DM		\$0					
C07W30B ARR Wildlife Lower - OR Imp		\$0					

OR - Ordered Remissible  
ONR - Ordered Non-Remissible

\* Red values in parentheses denote overage.