

## **Cheakamus Project Water Use Plan**

### **Monitoring Programs Annual Report: 2015**

**Implementation Period: November 2014 to October 2015**

- **CMSMON-1A Cheakamus River Juvenile Salmonid Outmigrant Enumeration Monitoring**
- **CMSMON-1B Cheakamus River Chum Salmon Escapement Monitoring and Mainstem Spawning Groundwater Survey**
- **CMSMON-2 Trout Abundance Monitor in Cheakamus River (Daisy Lake Dam to Cheakamus Canyon)**
- **CMSMON-3 Cheakamus River Steelhead Adult Abundance, Fry Emergence-timing, and Juvenile Habitat Use and Abundance Monitoring**
- **CMSMON-4 Monitoring Stranding Downstream of Cheakamus Generating Station**
- **CMSMON-5 Monitoring Stranding Downstream of Daisy Lake Dam**
- **CMSMON-6 Monitoring Groundwater in Side Channels of the Cheakamus River**
- **CMSMON-7 Cheakamus River Benthic Community Monitoring**
- **CMSMON-8 Monitoring Channel Morphology in Cheakamus River**
- **CMSMON-9 Cheakamus River Recreational Angling Access Monitoring**

**For Conditional Water Licences 110107 and 114268**

**November 30, 2015**

## **BC Hydro Cheakamus Project Water Use Plan Monitoring Programs Annual Report: 2015**

### **1 Introduction**

This document represents a summary of the status and the results of the Cheakamus Project Water Use Plan (WUP) monitoring programs to October 31, 2015, as per the Cheakamus Order under the *Water Act*, dated February 17, 2006. There are ten monitoring programs and no physical works.

### **2 Status**

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

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

Monitoring Program & Physical Works TOR	Order Clause	Original ToR Submission		Most Recent ToR Resubmission	
		Date Submitted	Date Approved	Date Submitted	Date Approved
CMSMON-1A Cheakamus River Juvenile Salmonid Outmigrant Enumeration Monitoring	Clause 4.i	Nov 20, 2006	Nov 26, 2006	Dec 13, 2012	Dec 18, 2012
CMSMON-1B Cheakamus River Chum Salmon Escapement Monitoring and Mainstem Spawning Groundwater Survey	Clause 4.i	Feb 23, 2007	Mar 22, 2007	Apr 15, 2013	May 06, 2013
CMSMON-2 Trout Abundance Monitor in Cheakamus River	Clause 4.ii	Feb 23, 2007	Mar 22, 2007	Sep 23, 2015	Nov 18, 2015
CMSMON-3 Cheakamus River Steelhead Adult Abundance, Fry Emergence-timing, and Juvenile Habitat Use and Abundance Monitoring	Clause 4.iii	Feb 23, 2007	Mar 22, 2007	Dec 13, 2012	Dec 18, 2012
CMSMON-4 Monitoring Stranding Downstream of Cheakamus Generating Station	Clause 4.v	Feb 23, 2007	Mar 22, 2007	-	-
CMSMON-5 Monitoring Stranding Downstream of Daisy Lake Dam	Clause 4.vi	Feb 23 2007	Mar 22, 2007	-	-
CMSMON-6 Monitoring Groundwater in Side Channels of the Cheakamus River	Clause 4.vii	Feb 23 2007	Mar 22, 2007	-	-
CMSMON-7 Cheakamus River Benthic Community Monitoring	Clause 4.viii	Feb 23 2007	Mar 22, 2007	-	-
CMSMON-8 Monitoring Channel Morphology in Cheakamus River	Clause 4.ix	Feb 23 2007	Mar 22, 2007	Aug 31, 2015	Nov 05, 2015
CMSMON-9 Cheakamus River Recreational Angling Access Monitoring	Clause 4.x	Feb 23 2007	Mar 22, 2007	-	-

### 3 Schedule

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

**Table 3-1: Monitoring Programs Schedule as of October 31, 2015**

2012 Interim Review  
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Monitoring Programs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
	WLR YR1	WLR YR2	WLR YR3	WLR YR4	WLR YR5	WLR YR6	WLR YR7	WLR YR8	WLR YR9	WLR YR10	WLR YR11
CMSMON-1a Cheakamus River Juvenile Salmonid Outmigrant Enumeration Monitoring	✓	✓	✓	✓	✓	✓	✓	✓	✓	■	■
CMSMON-1b Cheakamus River Chum Salmon Escapement Monitoring and Mainstem Spawning Groundwater Survey	✓	✓	✓	✓	✓	✓	✓	✓	✓	■	■
CMSMON-2 Trout Abundance Monitor in Cheakamus River (Daisy Lake Dam to Cheakamus Canyon)	✓	✓	✓	✓	✓	✓		✓			
CMSMON-3 Cheakamus River Steelhead Adult Abundance, Fry Emergence-timing, and Juvenile Habitat Use and Abundance Monitoring	✓	✓	✓	✓	✓	✓	✓	✓	✓	■	■
CMSMON-4 Monitoring Stranding Downstream of Cheakamus Generating Station		✓	✓	✓	✓						
CMSMON-5 Monitoring Stranding Downstream of Daisy Lake Dam	x	✓									
CMSMON-6 Monitoring Groundwater in Side Channels of the Cheakamus River	✓	✓	✓	✓	✓						
CMSMON-7 Cheakamus River Benthic Community Monitoring		✓	✓	✓	✓						
CMSMON-8 Monitoring Channel Morphology in Cheakamus River		✓	✓	*	*	✓	✓	✓	✓	■	■
CMSMON-9 Cheakamus River Recreational Angling Access Monitoring			✓								

Legend:

- = Program to be undertaken/initiated in identified year
- P = Pending decision to proceed
- ✓ = Program completed for the year
- x = Program started, but encountered operational or hydrological delays
- u/w = Under way
- \* = no report was produced for this year due to a change in the contractor for this project.

### 4 Monitoring Programs Terms of Reference

The monitoring programs being implemented under the Cheakamus WUP are described in 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/lower\\_mainland/cheakamus.html](http://www.bchydro.com/about/sustainability/conservation/water_use_planning/lower_mainland/cheakamus.html)

### 5 Status of Monitoring Programs

#### 5.1 CMSMON-1A Cheakamus River Juvenile Salmonid Outmigrant Enumeration Monitoring

Attached is the report for 2014, dated November 4, 2014. The 2015 summary report is currently under review.

**5.2 CMSMON-1B Cheakamus River Chum Salmon Escapement Monitoring and Mainstem Spawning Groundwater Survey**

Attached are the reports for: 2010 dated June 30, 2011; 2011 dated September 15, 2012; 2013 dated November 8, 2015; and 2014 dated November 10, 2015.

**5.3 CMSMON-2 Trout Abundance Monitor in Cheakamus River (Daisy Lake Dam to Cheakamus Canyon)**

The data collected up to early 2015 were reviewed by the technical sub-committee at the Monitoring Advisory Committee Meeting held on July 9, 2015. The committee agreed that sufficient information has been collected to answer the Management Questions and to wait for the outcomes of the Cheakamus Water Use Plan Order Review (WUPOR) before deciding if further monitoring is warranted.

**5.4 CMSMON-3 Cheakamus River Steelhead Adult Abundance, Fry Emergence-timing, and Juvenile Habitat Use and Abundance Monitoring**

Attached is the report for 2013, dated November 4, 2015. The 2014 summary report is currently under review.

**5.5 CMSMON-4 Monitoring Stranding Downstream of Cheakamus Generating Station**

This program was initiated in 2008 and was completed in 2011.

**5.6 CMSMON-5 Monitoring Stranding Downstream of Daisy Lake Dam**

This program was initiated in 2008 and completed within the same year.

**5.7 CMSMON-6 Monitoring Groundwater in Side Channels of the Cheakamus River**

This program was initiated in October 2007 and completed in 2011.

**5.8 CMSMON-7 Cheakamus River Benthic Community Monitoring**

This program was initiated in 2008 and completed in 2011. Following the Interim Review in 2012, BC Hydro considered additional monitoring due to recent improvements in the Whistler wastewater treatment plant. As Whistler Municipality is undertaking monitoring and has agreed to share the data, no further monitoring is being considered by BC Hydro.

**5.9 CMSMON-8 Monitoring Channel Morphology in Cheakamus River**

Resubmission of the TOR for this project was approved November 5, 2015 and included changes to scope to address the management questions. Attached are the final report for 2012 dated May 7, 2014 and the Cheakamus River Hydrometric Monitoring report dated May 2, 2014. Also attached are the final report for 2013 dated December 2014, and the Years 1 to 5 Flow Synthesis report dated December 9, 2014 that clarifies that Management Question 3 is answered. The 2014 summary report is currently under review.

#### **5.10 CMSMON-9 Cheakamus River Recreational Angling Access Monitoring**

This program was initiated in the spring of 2009 and completed within the same year.

### **6 Monitoring Programs Costs**

The following table summarizes the Cheakamus WUP monitoring programs costs approved by the Comptroller and the actual costs to October 31, 2015.

**Table 6-1: Cheakamus WUP Monitoring Programs Costs**

Monitoring Programs	Phase	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>Cheakamus WUP Annual Report</b>		\$13,347	\$8,549	\$6,102	\$14,651	(\$1,304)	Forecasting additional effort for annual report	TOR Resubmission required.
<b>CMSM01A Juvenile Salmonid</b>	<b>Phase 1</b>	\$2,112,685	\$1,786,106		\$1,786,106	\$326,579	Phase 1 Complete (Oct 31, 2012)	
CMSM01A Juvenile Salmonid - ONR DM		\$91,450	\$94,108		\$94,108	(\$2,658)		
CMSM01A Juvenile Salmonid - ONR Imp		\$2,021,235	\$1,691,998		\$1,691,998	\$329,237		
<b>CMSM01A Juvenile Salmonid</b>	<b>Phase 2</b>	\$1,695,092	\$851,554	\$760,375	\$1,611,929	\$83,163	Efficiencies found during project implementation	
CMSM01A Juvenile Salmonid - ONR DM		\$32,735	\$14,386	\$20,975	\$35,361	(\$2,626)		
CMSM01A Juvenile Salmonid - ONR Imp		\$1,662,357	\$837,167	\$739,400	\$1,576,567	\$85,790		
<b>CMSM01B Chum Salmon Monitor</b>		\$1,996,391	\$1,511,434	\$370,635	\$1,882,069	\$114,322	Efficiencies found during project implementation	
CMSM01B Chum Salmon Monitor - ONR DM		\$71,447	\$58,001	\$18,865	\$76,866	(\$5,419)		
CMSM01B Chum Salmon Monitor - ONR Imp		\$1,924,944	\$1,453,433	\$351,770	\$1,805,203	\$119,741		
<b>CMSM02A Trout Abundance Mon</b>		\$250,341	\$250,123	\$218	\$250,341	\$0	Project Completed	
CMSM02A Trout Abundance Mon - ONR DM		\$46,359	\$46,141	\$218	\$46,359	(\$0)		
CMSM02A Trout Abundance Mon - ONR Imp		\$203,982	\$203,982		\$203,982	\$0		
<b>CMSM03A Steelhead Spawner</b>	<b>Phase 1</b>	\$1,080,660	\$1,104,037		\$1,104,037	(\$23,377)	Phase 1 Complete (Oct 31, 2012)	
CMSM03A Steelhead Spawner - ONR DM		\$100,814	\$58,308		\$58,308	\$42,506		
CMSM03A Steelhead Spawner - ONR Imp		\$979,846	\$1,045,729		\$1,045,729	(\$65,883)		
<b>CMSM03A Steelhead Spawner</b>	<b>Phase 2</b>	\$1,142,226	\$576,955	\$509,622	\$1,086,577	\$55,649	Efficiencies found during project implementation	
CMSM03A Steelhead Spawner - ONR DM		\$32,735	\$16,611	\$17,573	\$34,184	(\$1,449)		
CMSM03A Steelhead Spawner - ONR Imp		\$1,109,491	\$560,344	\$492,049	\$1,052,393	\$57,098		
<b>CMSM04A Stranding RiskMonitor</b>		\$238,374	\$218,966		\$218,966	\$19,408	Project Completed	
CMSM04A Stranding RiskMonitor - ONR DM		\$42,414	\$42,391		\$42,391	\$23		
CMSM04A Stranding RiskMonitor - ONR Imp		\$195,960	\$176,574		\$176,574	\$19,386		
<b>CMSM05A Dam downstrm strand</b>		\$29,066	\$31,853		\$31,853	(\$2,787)	Project Completed	
CMSM05A Dam downstrm strand - ONR DM		\$12,992	\$14,523		\$14,523	(\$1,531)		
CMSM05A Dam downstrm strand - ONR Imp		\$16,074	\$17,330		\$17,330	(\$1,256)		
<b>CMSM06A Groundwater Linkage</b>		\$307,297	\$286,425		\$286,425	\$20,872	Project Completed	
CMSM06A Groundwater Linkage - ONR DM		\$62,279	\$32,039		\$32,039	\$30,240		
CMSM06A Groundwater Linkage - ONR Imp		\$245,018	\$254,387		\$254,387	(\$9,369)		
<b>CMSM07A River Benthic monitor</b>		\$304,371	\$297,615		\$297,615	\$6,756	Project Completed	
CMSM07A River Benthic monitor - ONR DM		\$38,153	\$28,322		\$28,322	\$9,831		
CMSM07A River Benthic monitor - ONR Imp		\$266,218	\$269,293		\$269,293	(\$3,075)		
<b>CMSM08A Channel Morphology</b>		\$457,576	\$298,243	\$154,891	\$453,134	\$4,442	Efficiencies found during project implementation.	
CMSM08A Channel Morphology - ONR DM		\$67,733	\$44,297	\$18,686	\$62,983	\$4,750		
CMSM08A Channel Morphology - ONR Imp		\$389,843	\$253,946	\$136,205	\$390,151	(\$308)		
<b>CMSM09A Recreation Angling</b>		\$28,228	\$20,410		\$20,410	\$7,818	Project Completed	
CMSM09A Recreation Angling - ONR DM		\$14,426	\$8,906		\$8,906	\$5,520		
CMSM09A Recreation Angling - ONR Imp		\$13,802	\$11,504		\$11,504	\$2,298		

OR - Ordered Remissible  
ONR - Ordered Non-Remissible

\* Red values in parentheses denote overage.