

Bridge River Water Use Plan

Monitoring Program and Physical Works

Annual Report: 2014

Implementation Period: February 2013 to January 2014

- **BRGMON-1 Lower Bridge River Aquatic Monitoring**
- **BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring**
- **BRGMON-3 Lower Bridge River Adult Salmon and Steelhead Enumeration**
- **BRGMON-4 Carpenter Reservoir and Middle Bridge Fish Habitat and Population Monitoring**
- **BRGMON-5 Downton Reservoir Riparian Vegetation Monitoring**
- **BRGMON-6 Seton Lake Aquatic Productivity Monitoring**
- **BRGMON-7 Downton Reservoir Fish Habitat and Population Monitoring**
- **BRGMON-8 Seton Lake Resident Fish Habitat and Population Monitoring**
- **BRGMON-9 Seton River Habitat and Fish Monitoring**
- **BRGMON-10 Carpenter Reservoir Productivity Model Validation and Refinement**
- **BRGMON-11 Lower Bridge River Riparian Vegetation Monitoring**
- **BRGMON-12 Bridge-Seton Metals and Contaminant Monitoring Program**
- **BRGMON-13 Seton Sockeye Salmon Smolts Monitoring Program**
- **BRGMON-14 Effectiveness of Cayoosh Flow Dilution, Dam Operation, and Fishway Passage on Delay and Survival of Upstream Migration of Salmon in the Seton-Anderson Watershed**
- **BRGMON-15 Seton Lake Erosion Mitigation Program**
- **BRGMON-16 Lower Bridge River Spiritual and Cultural Value Monitoring**
- **BRGWORKS-1 Carpenter Revegetation**
- **BRGWORKS-2 Seton Lake Erosion**

For Water Licences FWL 126279, 126278, 126280, 126281, 126286, 126287, 126288, 126282, 126283, 12680, 126250 and 126259.

February 28, 2014

BC Hydro Bridge River Project Water Use Plan Monitoring Programs and Physical Works Annual Report: 2014

1 Introduction

This document represents a summary of the status and the results of the Bridge River Water Use Plan (WUP) monitoring programs and physical works to January 31, 2014, as per the Bridge River Order under the *Water Act*, dated March 30, 2011. There are 16 monitoring programs and 2 physical works.

2 Status

The following table outlines the dates that Terms of Reference (TOR) for the Bridge River WUP monitoring programs and physical works were submitted to and approved by the CWR.

Table: 2-1: Dates of Bridge River 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
BRGMON-1 Lower Bridge River Aquatic Monitoring	Schedule A.1	Jan 30, 2012	Apr 12, 2012		
BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring	Schedule A.6	Jan 30, 2012	Jun 26, 2012		
BRGMON-3 Lower Bridge River Adult Salmon and Steelhead Enumeration	Schedule A.10	Jan 30, 2012	Feb 07, 2012		
BRGMON-4 Carpenter Reservoir and Middle Bridge Fish Habitat and Population Monitoring	Schedule A.7	Jan 30, 2012	Jun 06, 2012		
BRGMON-5 Downton Reservoir Riparian Vegetation Monitoring	Schedule A.2	Mar 30, 2012	Jul 11, 2012		
BRGMON-6 Seton Lake Aquatic Productivity Monitoring	Schedule A.14	to be submitted by Mar 14, 2014			
BRGMON-7 Downton Reservoir Fish Habitat and Population Monitoring	Schedule A.3	Jan 30, 2012	Jun 06, 2012		
BRGMON-8 Seton Lake Resident Fish Habitat and Population Monitoring	Schedule A.15	Jan 30, 2012	Jun 07, 2012		
BRGMON-9 Seton River Habitat and Fish Monitoring	Schedule A.16	Jan 30, 2012	Jun 07, 2012		
BRGMON-10 Carpenter Reservoir Productivity Model Validation and Refinement	Schedule A.5	to be submitted by March 14, 2014			
BRGMON-11 Lower Bridge River Riparian Vegetation Monitoring	Schedule A.8	Mar 30, 2012	Jun 27, 2012		
BRGMON-12 Bridge-Seton Metals and Contaminant Monitoring Program	Schedule A.1	Mar 30, 2012	Jul 24, 2012		
BRGMON-13 Seton Sockeye Salmon Smolts Monitoring Program	Schedule A.17	Jan 30, 2012	Apr 05, 2012		
BRGMON-14 Effectiveness of Cayoosh Flow Dilution, Dam Operation, and Fishway Passage on Delay and Survival of Upstream Migration of Salmon in the Seton-Anderson Watershed	Schedule A.18	Jan 30, 2012	Jun 26, 2012		
BRGMON-15 Seton Lake Erosion Mitigation Program	Schedule A.13	Mar 30, 2012	Jul 13, 2012		
BRGMON-16 Lower Bridge River Spiritual and Cultural Value Monitoring	Schedule A.11	Mar 30, 2012	Jul 26, 2012		
BRGWORKS-1 Carpenter Revegetation	Schedule A.4	to be submitted by Mar 14, 2014			
BRGWORKS-2 Seton Lake Erosion	Schedule A.12	to be submitted by Mar 31, 2015			

3 Schedule

The following table (Table 3-1) outlines the current schedule for the monitoring programs and physical works being delivered for the Bridge River WUP.

Table 3-1: Table of WUP Schedule

Monitoring Programs	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	WLR YR1	WLR YR2	WLR YR3	WLR YR4	WLR YR5	WLR YR6	WLR YR7	WLR YR8	WLR YR9	WLR YR10	WLR YR11
BRGMON-1 Lower Bridge River Aquatic Monitoring	✓	✓	■	■	■	■	■	■	■	■	
BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring		✓		■	■	■	■	■		■	
BRGMON-3 Lower Bridge River Adult Salmon and Steelhead Enumeration	✓	✓	■	■	■	■	■	■	■	■	
BRGMON-4 Carpenter Reservoir and Middle Bridge Fish Habitat and Population Monitoring		✓	■	■	■	■	■	■	■	■	■
BRGMON-5 Downton Reservoir Riparian Vegetation Monitoring		✓								■	
BRGMON-6 Seton Lake Aquatic Productivity Monitoring			■	■	■						
BRGMON-7 Downton Reservoir Fish Habitat and Population Monitoring		✓	■	■	■	■	■	■	■	■	■
BRGMON-8 Seton Lake Resident Fish Habitat and Population Monitoring		✓	■	■	■	■	■	■	■	■	■
BRGMON-9 Seton River Habitat and Fish Monitoring		✓	■	■	■	■	■	■	■	■	■
BRGMON-10 Carpenter Reservoir Productivity Model Validation and Refinement			■	■	■						
BRGMON-11 Lower Bridge River Riparian Vegetation Monitoring	✓	✓	■		■		■		■		
BRGMON-12 Bridge-Seton Metals and Contaminant Monitoring Program		✓	■	■	■	■	■	■	■	■	
BRGMON-13 Seton Sockeye Salmon Smolts Monitoring Program	✓	✓	■	■	■	■	■	■	■	■	
BRGMON-14 Effectiveness of Cayoosh Flow Dilution, Dam Operation, and Fishway Passage on Delay and Survival of Upstream Migration of Salmon in the Seton-Anderson Watershed	✓	✓	■	■	■						
BRGMON-15 Seton Lake Erosion Mitigation Program		✓				■		■		■	
BRGMON-16 Lower Bridge River Spiritual and Cultural Value Monitoring		✓	■	■	■	■					
Physical Works											
BRGWORKS-1 Carpenter Revegetation			■	■	■	■	■	■			
BRGWORKS-2 Seton Lake Erosion				■	■						

Legend:

- = Program to be undertaken/initiated in identified year
- ✓ = Program completed for the year
- ✘ = Program started, but encountered delays

4 Monitoring Programs and Physical Works Terms of Reference

The Monitoring Programs and Physical Works being implemented under the Bridge River WUP are described in TOR. These TORs and the reports for work completed to date can be found here:

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

5 Summary of Monitoring Programs

5.1 BRGMON-1 Lower Bridge River Aquatic Monitoring

5.1.1 Status

This monitoring program was initiated in August 2012 and will be carried out over 10 years (see Table 3-1). The final 2012 monitoring report is attached. The 2013 monitoring report will be included in the next annual report.

5.2 BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring

5.2.1 Status

This monitoring program was initiated in April 2013 and will be carried out over 7 years of the 10 year review period (see Table 3-1). Reporting for the 2013 field season is underway and will be included in the next annual report.

5.3 BRGMON-3 Lower Bridge River Adult Salmon and Steelhead Enumeration

5.3.1 Status

This monitoring program was initiated in August 2012 and will be carried out over 10 years (see Table 3-1). The final 2012 monitoring report is attached. The 2013 monitoring report will be included in the next annual report.

5.4 BRGMON-4 Carpenter Reservoir and Middle Bridge Fish Habitat and Population Monitoring

5.4.1 Status

This monitoring program was initiated in October 2012 with field work starting in 2013 and will be carried out over 10 years (see Table 3-1). Reporting for the 2013 field season is underway and will be included in the next annual report.

5.5 BRGMON-5 Downton Reservoir Riparian Vegetation Monitoring

5.5.1 Status

This monitoring program was initiated in November 2012 and will be carried out over 2 years during the 10 year review period (see Table 3-1). Reporting for the 2013 field season is underway and will be included in the next annual report.

5.6 BRGMON-6 Seton Lake Aquatic Productivity Monitoring

5.6.1 Status

This monitoring program will be initiated in May 2014 and will be carried out over 3 years of the 10 year review period (see Table 3-1). The TOR has been circulated for review by agencies and the St'at'imc First Nation. All comments on TOR are expected by February 28, 2014 and we expect to submit the TOR by March 14, 2014. Reporting on this project is expected subsequent to the 2015 field year and will be included in the subsequent annual report.

5.7 BRGMON-7 Downton Reservoir Fish Habitat and Population Monitoring

5.7.1 Status

This monitoring program was initiated in October 2012 with field work starting in 2013 and will be carried out over 10 years (see Table 3-1). Reporting for the 2013 field season is underway and will be included in the next annual report.

5.8 BRGMON-8 Seton Lake Resident Fish Habitat and Population Monitoring

5.8.1 Status

This monitoring program was initiated in October 2012 with field work starting in 2013 and will be carried out over 10 years (see Table 3-1). Reporting for the 2013 field season is underway and will be included in the next annual report.

5.9 BRGMON-9 Seton River Habitat and Fish Monitoring

5.9.1 Status

This monitoring program was initiated in November 2012 with field work starting in 2013 and will be carried out over 10 years (see Table 3-1). Reporting for the 2013 field season is underway and will be included in the next annual report.

5.10 BRGMON-10 Carpenter Reservoir Productivity Model Validation and Refinement

5.10.1 Status

This monitoring program will be initiated in May 2014 and will be carried out over 3 years of the 10 year review period (see Table 3-1). The TOR has been circulated for review by agencies and the St'at'imc First Nation. All comments on TOR are expected by February 28, 2014 and we expect to submit the TOR by March 14, 2014. Reporting on this project is expected subsequent to the 2015 field year and will be included in the subsequent annual report.

5.11 BRGMON-11 Lower Bridge River Riparian Vegetation Monitoring

5.11.1 Status

This monitoring program was initiated in November 2012 with field work starting in 2013 and will be carried out at intervals over 10 years (see Table 3-1). Reporting for the 2013 field season is underway and will be included in the next annual report.

5.12 BRGMON-12 Bridge-Seton Metals and Contaminant Monitoring Program

5.12.1 Status

This monitoring program will be initiated in May of 2013 and will be carried out over 10 years (see Table 3-1). Data collection for this project is tied to the Fish and Fish Habitat Projects (BRGMON-3, -4, -7 and -8). Reporting for the 2013 field season is underway and will be included in the next annual report.

5.13 BRGMON-13 Seton Sockeye Salmon Smolts Monitoring Program

5.13.1 Status

This monitoring program was initiated in April 2012 and will be carried out over 10 years (see Table 3-1). The final 2012 monitoring report is attached. The 2013 monitoring report will be included in the next annual report.

5.14 BRGMON-14 Effectiveness of Cayoosh Flow Dilution, Dam Operation, and Fishway Passage on Delay and Survival of Upstream Migration of Salmon in the Seton-Anderson Watershed

5.14.1 Status

This monitoring program was initiated in August 2012 and will be carried out over 10 years (see Table 3-1). Reporting for the 2012 to 2013 field season has been received in draft. The final report will be included in the next annual report.

5.14.2 BRGMON-15 Seton Lake Erosion Mitigation Program Status

This monitoring program was initiated in July 2013 and will be carried out over 4 to 5 years of the 10 year review period (see Table 3-1). The scope of this project is being reconsidered to focus more closely on assessing the impact to known erosion sites in order to develop a better work plan for BRGWORKS-2 Seton Lake Erosion. We are considering that a resubmission of the TOR for BRGMON-15 may be required during 2014 to accommodate the changes in scope. We do not anticipate any further changes in budget until we move into the next phase of the project.

5.15 BRGMON-16 Lower Bridge River Spiritual and Cultural Value Monitoring

5.15.1 Status

This monitoring program will be initiated in spring of 2013 and will be carried out over 4 to 5 years of the 10 year review period (see Table 3-1). Reporting on this project is due April 2014 and will be included in the subsequent annual report.

A TOR addendum will be prepared to address necessary changes in the management questions and methodology to address the fact that the 3 cms and 0 cms flow regimes noted in the TOR are no longer testable.

6 Summary of Physical Works

6.1 BRGWORKS-1 Carpenter Revegetation

6.1.1 Status

This physical works will be initiated in 2014 and will be carried out over 5 years (see Table 3-1). The TOR has been circulated for review by agencies and the St'at'imc First Nation. All comments on TOR are expected by February 28, 2014 and we expect to submit the TOR by March 14, 2014.

6.2 BRGWORKS-2 Seton Lake Erosion

6.2.1 Status

This physical works will be initiated in 2015 and will be carried out over 3 years (see Table 3-1). Originally we had proposed a 2014 start; however, initiating BRGMON-15 Seton Lake Erosion Mitigation Program has identified the need to reconsider the scope to focus more closely on assessing the impact to known erosion sites in order to better plan and develop a successful work plan for BRGWORKS-2. We expect to submit the TOR for approval by March 31, 2015.

7 Monitoring Programs and Physical Works Costs

The following table summarizes the Bridge River WUP monitoring programs and physical works costs approved by the Comptroller and the Actual Costs to January 31, 2014.

Table 7-1: Bridge River WUP Monitoring Programs and 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
Bridge River WUP Annual Report	\$0	\$1,045	\$15,344	\$16,389	(\$16,389)	Submission for annual reporting costs sent to CWR January 27, 2014	Awaiting Approval by CWR for \$16,389.
BRGMON-1 Lower Bridge River Aquatic Monitoring - OR	\$2,126,171	\$362,260	\$1,906,430	\$2,268,690	(\$142,519)	Costs higher than anticipated in initial years of project. These costs may be offset by lower costs for reduced scope of work in the years following the Bridge River Flow decision.	TOR resubmission may be required pending outcome of Bridge River flow decision; will update in future annual reports
BRGM01A Low Bridge R Aquatic - OR DM	\$92,854	\$25,991	\$64,523	\$90,513	\$2,341		
BRGM01A Low Bridge R Aquatic - OR Imp	\$2,033,317	\$336,269	\$1,841,908	\$2,178,177	(\$144,860)		
BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring	\$412,706	\$132,571	\$306,627	\$439,198	(\$26,492)	Costs in first year of project higher than anticipated related to underestimates in the cost of photogrammetry work. We are determining if costs will be offset by lower spend in future years.	TOR resubmission may be required at a later date; will update in future annual reports
BRGM02A Carpenter Rse Riparia - OR DM	\$65,857	\$6,057	\$41,657	\$47,714	\$18,143		
BRGM02A Carpenter Rse Riparia - OR Imp	\$346,849	\$126,514	\$264,969	\$391,484	(\$44,635)		
BRGMON-3 Lower Bridge River Adult Salmon and Steelhead Enumeration	\$1,975,352	\$597,306	\$1,356,561	\$1,953,867	\$21,485	Efficiencies in direct management found	
BRGM03A Low BR Salmon & Steel - OR DM	\$92,722	\$18,771	\$52,466	\$71,237	\$21,485		
BRGM03A Low BR Salmon & Steel - OR Imp	\$1,882,630	\$578,535	\$1,304,095	\$1,882,630	\$0		
BRGMON-4 Carpenter Reservoir and Middle Bridge Fish Habitat and Population Monitoring	\$1,392,191	\$121,061	\$1,205,936	\$1,326,997	\$65,194	Efficiencies in direct management found	
BRGM04A Carp Rse&Mld BR Fish - OR DM	\$98,053	\$7,178	\$49,361	\$56,539	\$41,514		
BRGM04A Carp Rse&Mld BR Fish - OR Imp	\$1,294,138	\$113,883	\$1,180,255	\$1,294,138	\$0		
BRGMON-5 Downton Reservoir Riparian Vegetation Monitoring	\$355,756	\$146,467	\$217,103	\$363,569	(\$7,813)	Costs in first year of project higher than anticipated related to underestimates in the cost of photogrammetry work. We are determining if costs will be offset by lower spend in future years.	TOR resubmission may be required at a later date; will update in future annual reports
BRGM05A Downton Rse Riparian - OR DM	\$26,922	\$4,742	\$11,689	\$16,431	\$10,491		
BRGM05A Downton Rse Riparian - OR Imp	\$328,834	\$141,724	\$205,414	\$347,138	(\$18,304)		
BRGMON-7 Downton Reservoir Fish Habitat and Population Monitoring	\$922,490	\$75,506	\$812,499	\$888,005	\$34,485	Efficiencies in direct management found	
BRGM07A Downton Rse Fish Habi - OR DM	\$87,909	\$3,625	\$49,799	\$53,424	\$34,485		
BRGM07A Downton Rse Fish Habi - OR Imp	\$834,581	\$71,881	\$762,700	\$834,581	\$0		
BRGMON-8 Seton Lake Resident Fish Habitat and Population Monitoring	\$947,702	\$58,988	\$856,481	\$915,469	\$32,233	Efficiencies in direct management found	
BRGM08A Seton Fish Hab & Pop - OR DM	\$85,780	\$4,119	\$49,428	\$53,547	\$32,233		
BRGM08A Seton Fish Hab & Pop - OR Imp	\$861,922	\$54,869	\$807,053	\$861,922	\$0		
BRGMON-9 Seton River Habitat and Fish Monitoring	\$1,185,918	\$87,570	\$1,065,949	\$1,153,519	\$32,399	Efficiencies in direct management found	
BRGM09A Seton R Habitat & Fis - OR DM	\$85,924	\$3,428	\$50,098	\$53,526	\$32,398		
BRGM09A Seton R Habitat & Fis - OR Imp	\$1,099,994	\$84,142	\$1,015,852	\$1,099,994	\$0		
BRGMON-11 Lower Bridge River Riparian Vegetation Monitoring	\$567,076	\$159,332	\$450,243	\$609,575	(\$42,499)	Costs in first year of project higher than anticipated related to underestimates in the cost of photogrammetry work. We are determining if costs will be offset by lower spend in future years.	TOR resubmission may be required at a later date; will update in future annual reports
BRGM11A Low BR Riparian Vege - OR DM	\$33,052	\$3,601	\$29,479	\$33,080	(\$28)		
BRGM11A Low BR Riparian Vege - OR Imp	\$534,024	\$155,731	\$420,764	\$576,495	(\$42,471)		

Bridge River Project Water Use Plan
Monitoring Programs and Physical Works Annual Report: 2014

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
BRGMON-12 Bridge-Seton Metals and Contaminant Monitoring Program	\$481,257	\$44,336	\$420,777	\$465,112	\$16,145	Efficiencies in direct management found	
BRGM12A Bridge-Seton Metals - OR DM	\$65,889	\$7,675	\$43,913	\$51,587	\$14,302		
BRGM12A Bridge-Seton Metals - OR Imp	\$415,368	\$36,661	\$376,864	\$413,525	\$1,843		
BRGMON-13 Seton Sockeye Salmon Smolts Monitoring Program	\$1,958,221	\$348,842	\$1,594,101	\$1,942,943	\$15,278	Efficiencies in direct management found	
BRGM13A Seton Powerhouse - OR DM	\$89,289	\$14,210	\$55,765	\$69,976	\$19,313		
BRGM13A Seton Powerhouse - OR Imp	\$1,868,932	\$334,632	\$1,538,336	\$1,872,968	(\$4,036)		
BRGMON-14 Effectiveness of Cayoosh Flow Dilution, Dam Operation, and Fishway Passage on Delay and Survival of Upstream Migration of Salmon in the Seton-Anderson Watershed	\$2,234,341	\$388,459	\$1,389,387	\$1,777,846	\$456,495	Efficiencies in direct management found; cost for fish fence in year 2 were lower than anticipated.	
BRGM14A Cayoosh Flow Dilutio - OR DM	\$46,517	\$10,790	\$25,344	\$36,134	\$10,383		
BRGM14A Cayoosh Flow Dilutio - OR Imp	\$2,187,824	\$377,669	\$1,699,155	\$2,076,824	\$111,000		
BRGMON-15 Seton Lake Erosion Mitigation Program	\$184,648	\$10,577	\$173,991	\$184,568	\$80		
BRGM15A SON Erosion Mitigate - OR DM	\$17,403	\$7,665	\$9,657	\$17,323	\$80		
BRGM15A SON Erosion Mitigate - OR Imp	\$167,245	\$2,912	\$164,333	\$167,245	\$0		
BRGMON-16 Lower Bridge River Spiritual and Cultural Value Monitoring	\$495,211	\$48,685	\$431,995	\$480,680	\$14,531	Efficiencies in direct management found	
BRGM16A Spiritual & Cultural - OR DM	\$44,246	\$4,996	\$24,718	\$29,714	\$14,532		
BRGM16A Spiritual & Cultural - OR Imp	\$450,965	\$43,689	\$407,277	\$450,965	\$0		
OR - Ordered Remissible							
ONR - Ordered Non-Remissible							

* Red values in parentheses denote overage.