

Bridge River Water Use Plan Monitoring Program and Physical Works

Annual Report: 2024

Implementation Period: February 2023 to January 2024

- **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-11A Lower Bridge River Riparian Vegetation Monitoring**
- **BRGMON-11B Lower Bridge River Riverine Wildlife 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 29, 2024

BC Hydro Bridge River Project Water Use Plan Monitoring Programs and Physical Works Annual Report: 2024

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, 2024, as per the Bridge River Order under the *Water Act*, dated March 30, 2011. There are 17 monitoring programs and two 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 Comptroller of Water Rights (CWR).

Table: 2-1: Dates of Bridge River WUP TOR Submissions and Approvals by the CWR

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.9	Jan 30, 2012	Apr 12, 2012	Mar 29,2022	Apr 29,2022
BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring	Schedule A.6	Jan 30, 2012	Jun 26, 2012	Mar 06, 2017	Mar 21, 2017
BRGMON-3 Lower Bridge River Adult Salmon and Steelhead Enumeration	Schedule A.10	Jan 30, 2012	Feb 07, 2012	Mar 29,2022	Jun 07, 2022
BRGMON-4 Carpenter Reservoir and Middle Bridge Fish Habitat and Population Monitoring	Schedule A.7	Jan 30, 2012	Jun 06, 2012	Mar 23, 2015	May 01, 2015
BRGMON-5 Downton Reservoir Riparian Vegetation Monitoring	Schedule A.2	Mar 30, 2012	Jul 11, 2012	Apr 25, 2023	Apr 28, 2023
BRGMON-6 Seton Lake Aquatic Productivity Monitoring	Schedule A.14	Mar 14, 2014	Apr 23, 2014		
BRGMON-7 Downton Reservoir Fish Habitat and Population Monitoring	Schedule A.3	Jan 30, 2012	Jun 06, 2012	Mar 23, 2015	Jun 02, 2015
BRGMON-8 Seton Lake Resident Fish Habitat and Population Monitoring	Schedule A.15	Jan 30, 2012	Jun 07, 2012	Mar 23, 2015	May 01, 2015
BRGMON-9 Seton River Habitat and Fish Monitoring	Schedule A.16	Jan 30, 2012	Jun 07, 2012	Jul 21, 2023	Aug 23, 2023
BRGMON-10 Carpenter Reservoir Productivity Model Validation and Refinement	Schedule A.5	Mar 14, 2014	May 01, 2014	Oct 21, 2014	Nov 04, 2014
BRGMON-11 Lower Bridge River Riparian Vegetation Monitoring	Schedule A.8	Mar 30, 2012	Jun 27, 2012		
BRGMON-11 A Lower Bridge River Riparian Vegetation Monitoring	Schedule A.8	Nov 30, 2018	Jan 25, 2019	Mar 29,2022	Apr 29,2022
BRGMON-11 B Lower Bridge River Riverine Wildlife Monitoring	Schedule A.8	Nov 30, 2018	Jan 25, 2019	Mar 29,2022	Apr 29,2022
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	Feb 07, 2020	Feb 21, 2020
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	Nov 30, 2017	Dec 15, 2017
BRGMON-15 Seton Lake Erosion Mitigation Program	Schedule A.13	Mar 30, 2012	Jul 13, 2012	Nov 09, 2020	Nov 20, 2020
BRGMON-16 Lower Bridge River Spiritual and Cultural Value Monitoring	Schedule A.11	Mar 30, 2012	Jul 26, 2012	Mar 19, 2013	Apr 08, 2013
BRGWORKS-1 Carpenter Reservoir Drawdown Zone Re-Vegetation Program	Schedule A.4	Mar 14, 2014	May 02, 2014	Jul 26, 2022	Sep 21, 2022
BRGWORKS-2 -Seton Erosion Management Projects: Site-Specific Mitigation Projects	Schedule A.12	Nov 29, 2019	Dec 10, 2019	Apr 22, 2020	May 12, 2020

3 Schedule

The following table outlines the current schedule for the monitoring programs and physical works being delivered for the Bridge River WUP.

Table 3-1: Monitoring and Physical Works Schedule as of January 31, 2024

Monitoring Programs	2012 WLR YR1	2013 WLR YR2	2014 WLR YR3	2015 WLR YR4	2016 WLR YR5	2017 WLR YR6	2018 WLR YR7	2019 WLR YR8	2020 WLR YR9	2021 WLR YR10	2022 WLR YR11	2023 WLR YR12	2024 WLR YR13	2025 WLR YR14	2026 WLR YR15	2027 WLR YR16	2028 WLR YR17	2029 WLR YR18	2030 WLR YR19	2031 WLR YR20
BRGMON-1 Lower Bridge River Aquatic Monitoring	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓10	✓	✓	■	■	■	■	■	■	■	■
BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓F									
BRGMON-3 Lower Bridge River Adult Salmon and Steelhead Enumeration	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓10	✓	✓	■	■	■	■	■	■	■	■
BRGMON-4 Carpenter Reservoir and Middle Bridge Fish Habitat and Population Monitoring		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓10	✓	□	□	□					
BRGMON-5 Downton Reservoir Riparian Vegetation Monitoring		✓									x	✓F								
BRGMON-6 Seton Lake Aquatic Productivity Monitoring			✓	✓	✓	✓F														
BRGMON-7 Downton Reservoir Fish Habitat and Population Monitoring		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓F								
BRGMON-8 Seton Lake Resident Fish Habitat and Population Monitoring		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓F								
BRGMON-9 Seton River Habitat and Fish Monitoring		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓10	✓	■	■	■	■	■	■	■	■
BRGMON-10 Carpenter Reservoir Productivity Model Validation and Refinement				✓	✓	✓F														
BRGMON-11A Lower Bridge River Riparian Vegetation Monitoring	✓				✓					✓				■					■	■
BRGMON-11B Lower Bridge River Riverine Wildlife Monitoring	✓	✓	✓		✓		✓			✓	✓	✓	■		■		■		■	■
BRGMON-12 Bridge-Seton Metals and Contaminant Monitoring Program		✓	✓	✓	✓F															
BRGMON-13 Seton Sockeye Salmon Smolts Monitoring Program	✓	✓	✓	✓	x	✓	✓	✓	✓	x	x	x	■							
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	✓	✓	✓	✓	✓	✓	✓F													
BRGMON-15 Seton Lake Erosion Mitigation Program		✓				x	✓	✓	✓	✓	✓	✓	■							
BRGMON-16 Lower Bridge River Spiritual and Cultural Value Monitoring			✓	✓	✓	✓	✓F													
Physical Works																				
BRGWORKS-1 Carpenter Revegetation			✓	✓	✓	✓		✓	✓F											
BRGWORKS-2 Seton Erosion									✓	✓	✓	✓	■	■	■					

Legend: ■ = Program to be undertaken/initiated in identified year
□ = Program to be extended (TOR to be submitted)
✓ = Program completed for the year
x = Program delayed/postponed
✓F = All field work for this project is complete. No further field work is planned.
✓10 = Original 2011 Order scope complete

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 the TORs. These TORs and the reports for work completed to date can be found here:

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

5 Status of Monitoring Programs

5.1 BRGMON-1 Lower Bridge River Aquatic Monitoring

The objective of BRGMON-1 is to quantify the response of key physical and biological indicators in the Lower Bridge River to different instream flow regimes to better understand which variables explain changes observed in aquatic productivity.

This monitoring program was initiated in 2012 and has been implemented annually for ten years. Implementation was extended in 2022 for another ten years until 2032 to accommodate the monitoring of water management impacts until the Lajoie Dam is reconstructed.

From 2016 to 2018 BC Hydro implemented modified operations at Downton Reservoir for dam safety reasons and initiated major capital improvements at Bridge River 1 and Bridge River 2 powerhouses that required extensive planned outages. This resulted in having a variance approved by CWR to allow discharges down the Lower Bridge River during freshet that were higher than the WUP Ordered operations. To plan for and better assess the impact of these operations, additional monitoring complementary to the WUP monitoring was added (not included in WUP expenditures) and the results of both programs are integrated into the same report.

BC Hydro operated Terzaghi Dam under a flow variance approved by the CWR between the spring of 2015 and the spring of 2021 to allow flows peaking above the WUP target (Note: the WUP target maximum peak flow is 15 m³/s) each of those years except for 2020. A flow Order dated April 29, 2022, supersedes previous flow variance from the CWR. The objective of the flow Order is to minimize the risk of a more impactful unplanned fall spill event by allowing higher flows during spring freshet. The conditions of the Order include using a set of Guiding Principles to inform the shape of the hydrograph and actual flow releases from Terzaghi Dam into the Lower Bridge River. The Guiding Principles are used in conjunction with BC Hydro's inflow forecasts annually in the springtime by the St'at'imc/BC Hydro Joint Planning Forum (JPF) to make flow recommendations to BC Hydro. Flow conditional monitoring along the Lower Bridge River is also implemented as a condition of the flow Order, and the data from this additional monitoring is incorporated into the BRGMON-1 monitoring report.

The monitoring report for 2022 (Year 11) will be submitted with the 2025 Annual Report.

5.2 BRGMON-2 Carpenter Reservoir Riparian Vegetation Monitoring

The objectives of the BRGMON-2 monitoring program are:

- To monitor the effects of Carpenter Reservoir operations on vegetation response (including substrates and natural revegetation) within the drawdown zone of Carpenter Reservoir, and
- To monitor the effectiveness of revegetation treatments in the Gun Creek Fan and adjacent area, completed under the physical works program BRGWORKS-1.

This program was initiated in April 2013 and was carried out at intervals over ten years. The final monitoring year fieldwork was completed in 2022.

The final 10-year program report will be submitted with the 2025 Annual Report.

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

The main objective of the BRGMON-3 monitoring program is to provide rigorous estimates of the abundance and distribution of salmon and steelhead spawning in the Lower Bridge River. The BRGMON-3 program will also address data gaps associated spawning timing, spawning distribution, and spawning habitat quality and quantity.

This monitoring program was initiated in 2012 and has been implemented annually for ten years. Implementation was extended in 2022 for another ten years until 2032 to accommodate the monitoring of water management impacts until the Lajoie Dam is reconstructed (see description in Section 5.1).

Flow conditional monitoring is also implemented as a condition of the flow Order, and the data from this additional monitoring is incorporated into the BRGMON-3 monitoring report.

The 2022 Year 11 report will be included in the 2025 Annual Report.

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

The objective of this monitoring program is to collect comprehensive information on the life history, biological characteristics, distribution, abundance, and composition of the fish community in Carpenter Reservoir and Middle Bridge River to determine whether there is a relationship between operating parameters and productivity.

This monitoring program was initiated in October 2012 with fieldwork starting in 2013 and was carried out annually over ten years. The first ten years of the project are complete; however, we anticipate the need to continue some of the monitoring scope until water management challenges stabilize in the Bridge River-Seton system after the Lajoie Dam upgrade project is complete.

A TOR resubmission in spring 2024 will focus on refinements to data collection for answering management questions 4 and 5 of the TOR that focus on the relationship between in stream flow in Middle Bridge River and the productivity of fish populations in Carpenter Reservoir and Middle Bridge River.

The 10-year program report including the 2022 (Year 10) reporting will be included with the 2025 Annual Report.

5.5 BRGMON-5 Downton Reservoir Riparian Vegetation Monitoring

The objective of this monitoring program is to document the response of the riparian community on the Upper Bridge River Fan and in the immediate adjacent drawdown zone of Downton Reservoir to determine if reservoir operations have had a negative impact on riparian vegetation and the overall quality of the habitat for wildlife in the area.

This monitoring program was implemented in 2013 and was planned to implement again in 2022.

In 2016 for dam safety reasons, the normal maximum elevation of Downton Reservoir was lowered by 16 vertical metres from 750 m to 734 m and has been

maintained since. In 2018, vegetation monitoring in the zone between 734m and 750m was implemented. This additional year was not included in the WUP expenditures and was covered in a separate report.

The final data collection was completed in summer 2023.

The 2023 study report is currently being reviewed and will be submitted along with the Annual Report in 2025.

5.6 BRGMON-6 Seton Lake Aquatic Productivity Monitoring

The objective of this monitoring program was to document the impacts of Carpenter Lake Diversion on the biological productivity of Seton Lake Reservoir. Sediment cores taken from the bottom of Seton Lake were analyzed for biological, physical, and chemical parameters to reconstruct past environmental conditions in the aquatic ecosystem, thereby informing whether future operational decisions might be made to potentially mitigate impacts of the diversion.

This monitoring program was initiated in 2014 and was carried out annually over three years. The final field season was completed in 2016.

This project is complete.

5.7 BRGMON-7 Downton Reservoir Fish Habitat and Population Monitoring

The objective of this monitoring program is to collect comprehensive information on the life history, biological characteristics, distribution, abundance, and composition of the fish community in Downton Reservoir. The information collected is required to link the effects of reservoir operation on fish populations and inform future operational decisions.

This monitoring program was initiated in October 2012 with fieldwork starting in 2013 and was carried out annually over ten years. The first ten years of the project are complete; however, we anticipate the need to continue some of the monitoring scope until water management challenges stabilize in the Bridge River-Seton system after the Lajoie Dam upgrade project is complete. The outcome of the WUP Order Review may also impact the future need for this study.

In 2016 for dam safety reasons, the normal maximum elevation of Downton Reservoir was lowered by 16 vertical metres from 750 m to 734 m and has been maintained since. An annual assessment of fish access to creeks and tributaries for spawning was added to this program (not included in WUP expenditures) and the results of both programs are integrated into the same annual monitoring report.

The 2021 (Year 9) monitoring report, dated January 31, 2023, is attached.

The 10-year program report including year 10 (2022) will be submitted in the 2025 Annual Report.

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

The objective of this monitoring program is to collect comprehensive information on the life history, biological characteristics, distribution, abundance, and composition of the fish community in Seton Lake to establish whether there are links to reservoir operations on fish populations.

This monitoring program was initiated in October 2012 with fieldwork starting in 2013 and was carried out annually over ten years. The first ten years of the project are complete; however, we anticipate the need to continue some of the monitoring scope until water management challenges stabilize in the Bridge River-Seton system after the Lajoie Dam upgrade project is complete. The outcome of the WUP Order Review may also impact the future need for this study.

The 2021 (Year 9) monitoring report, dated June 22, 2023, is attached.

The 10-year program report including year 10 (2022) will be submitted in the 2025 Annual Report.

5.9 BRGMON-9 Seton River Habitat and Fish Monitoring

The objective of this monitoring program is to monitor the response of fish habitat and fish populations to Seton Dam operations.

This monitoring program was initiated in November 2012 with fieldwork starting in 2013 and was carried out annually over ten years. The first ten years of the project are complete; however, we have approval to continue monitoring until water management challenges stabilize in the Bridge River-Seton system after the Lajoie Dam upgrade project is intended to be complete. The outcome of the WUP Order Review may also impact the future need for this study.

In 2019, as part of Addendum 1, additional monitoring in the Lower Fraser was added to the project and is reported in a separate monitoring report.

The 2022 10-year program report will be submitted in the 2025 Annual Report.

The 2020 (Year 2 of Addendum 1) draft report for the Lower Fraser River Stranding Assessment is under review and will be submitted with the 2025 Annual Report.

5.10 BRGMON-10 Carpenter Reservoir Productivity Model Validation and Refinement

The objective of this monitoring program was to collect the information required to validate and refine models of the effects of reservoir operation on the biological productivity of Carpenter Reservoir. Reservoir operations drive physical conditions such as light, temperature, nutrient concentrations, and turbidity, which translate to a biological response.

Using data collected under BRGMON-6, BRGMON-10 used two types of models to determine rates of biological production in Carpenter Reservoir. The first model was a habitat model and the second was a physical/chemical model. The models were linked together to predict the biological productivity response to reservoir operations.

This monitoring program was initiated in May 2015 and was implemented over three years to 2017.

This project is complete.

5.11 BRGMON-11A Lower Bridge River Riparian Vegetation Monitoring

The objective of the BRGMON-11A monitoring is to quantify the response of key physical and biological indicators in the Lower Bridge River to different instream flow regimes to determine which variables explain any changes in the riparian community. Note that the first year of BRGMON-11A project was reported in a combined report with BRGMON-11B under BRGMON-11.

This monitoring program was initiated in 2012 and has been implemented annually for ten years. Implementation was extended in 2022 for another ten years until 2032 to accommodate the monitoring of water management impacts until the Lajoie Dam is reconstructed (see description in Section 5.1). Flow conditional monitoring is also implemented as a condition of the flow Order, and the data from this additional monitoring is incorporated into the BRGMON-11A monitoring report.

Field work was completed for the first 10-years of the program in 2022.

The final 10-year program report will be submitted in the 2025 Annual Report.

5.12 BRGMON-11B Lower Bridge River Riverine Wildlife Monitoring

The objective of the BRGMON-11B monitoring program is to document how riverine and riparian wildlife in the Lower Bridge River respond to alternate flow regimes.

This monitoring program was initiated in 2012 and has been implemented annually for ten years. This monitoring program was initiated in 2012 and has been implemented annually for ten years. Implementation was extended in 2022 for another ten years until 2032 to accommodate the monitoring of water management impacts until the Lajoie Dam is reconstructed (see description in Section 5.1). Flow conditional monitoring is also implemented as a condition of the flow Order, and the data from this additional monitoring is incorporated into the BRGMON-11B monitoring report.

The final 10-year program report (2012-2021) dated January 27, 2023, is the final report under the TOR for the original 2011 WUP Order.

The monitoring report for 2022 (Year 11) will be submitted with the 2025 Annual Report.

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

The objective of this monitoring program was to document water quality and potential heavy metal contamination in the Bridge River system. It was also intended to determine if reservoir operations resulted in a change to the concentration and/or distribution of metals and other contaminants. If redistribution occurred, the program was to assess if it resulted in an increased bioaccumulation of metals and contaminants in fish in the system.

This monitoring program was initiated in May 2013 and final reporting was completed in 2016.

This project is complete.

5.14 BRGMON-13 Seton Sockeye Salmon Smolts Monitoring Program

The objective of this monitoring program is to assess the effectiveness of Seton powerhouse shutdowns to reduce the total entrainment mortality of Sockeye Salmon smolts leaving Seton Lake. This study also includes abundance, timing, and biological characteristics of Sockeye smolts leaving the lake, and the relationship between the dam water release and proportion of Sockeye smolts through the Seton Dam into Seton River.

This monitoring program was initiated in April 2012 and was carried out annually to 2015. In 2016, monitoring was suspended due to safety and equipment concerns from the Seton River peak flows. In 2016, trials were implemented to test the durability and suitability of alternate equipment configurations to ensure crews could operate the equipment safely and efficiently under the higher peak flows.

In February 2020 the CWR approved TOR Addendum 1 for this study. The TOR Addendum extended the sampling window and added radio telemetry tagging to the field program. With these additions, two more years of field work were expected for 2020 and 2021. However, there were challenges with the radio tagging program in 2020 including a relatively high proportion of mortalities among the tagged smolts that impacted the quality of data collected. With these results, along with expected shut down of Seton Generating Station during spring freshet for capital and maintenance work in 2021, 2022 and 2023 (and every spring for the foreseeable future), the original field program is no longer being implemented. BC Hydro is planning further methodological changes to focus on using 'sensor fish' through the powerhouse and various water passages at the dam.

All reports to date have been submitted.

We will be resubmitting a TOR addendum in 2024 for approval of these changes utilizing remaining contingency funds on this project. The timing of this new activity is not dependent on the seasonal outmigration of smolts and can be implemented easily under different operating conditions.

5.15 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

The objective of this monitoring program is to determine the effectiveness of current dam operations to ensure successful migration of adult salmon via Seton Dam to spawning grounds. The program aims to evaluate:

- The sensitivity of salmon populations to variations in the level of Cayoosh dilution in Seton River.
- Alternative operating strategies that will mitigate delays in upstream migration without conflicting with other water use goals for environmental protection, flood risk, and power production in the Bridge Seton generating system.

The original monitoring program was initiated in August 2012 and concluded in 2016.

On December 15, 2017, the CWR approved Addendum 1 for BRGMON-14 to test alternative siphon scenarios at Seton Dam by extending enumeration of the

Gates Creek Sockeye for up to an additional four years (2017-2020) with a re-assessment after each field season. After Year 2 of 4 (2018), BC Hydro concluded that the accuracy of post-passage survival estimates was not sufficient to differentiate between routine and alternative Seton Dam Operations and therefore decided against continuing the study beyond 2018.

This project is complete.

5.16 BRGMON-15 Seton Erosion Management Project: Phases 1 and 3

The overall objective of both Seton Erosion Management Projects (BRGMON-15 and BRGWORKS-2) is to identify and manage the priority high and moderate risk shoreline and riverbank erosion sites that are impacted by the operation of the Bridge-Seton Generation facilities. The erosion sites may be adjacent to heritage, cultural and aesthetic resources, and other non-heritage sites on Seton Lake and Seton River.

Phase 1 included identifying sites and determining the appropriate options to manage the erosion risks. Options may include mitigation (Phase 2) and/or may involve monitoring – depending on the risks and characteristics of the site. Subsequent implementation of mitigation plans would be carried out under BRGWORKS-2 Seton Erosion Management Projects: Site Specific Mitigation Physical Works.

Field work was completed in 2013 and 2014 on Seton Lake and on Seton River in 2015 and 2016. Following community meetings in 2018 and 2019, St'at'imc communities identified new sites on Seton Lake and field visits were conducted in August 2019.

On November 20, 2020, a TOR Revision was approved by the CWR that clarified the alignment to the WUP Order clauses, reflected changes to methods and approach and included scope and budget for Phase 3 monitoring.

In 2021, BC Hydro and St'at'imc developed a short-list of sites around Seton Lake for which geotechnical and geomorphological information was collected to determine the relative erosion risk at each site and made recommendations for mitigation at priority sites.

Detailed designs were completed in 2023 for the priority sites and were reviewed and accepted by the Tsal'ah community in a presentation on May 26th, 2023.

The detailed design report for the mitigation for the priority sites will be submitted with the 2025 Annual Report. Construction activities will be completed under BRGWORKS-2.

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

The objective of this monitoring program was to assess the response of St'at'imc spiritual and cultural values to the flow regime on the Lower Bridge River.

This monitoring program was initiated in spring of 2014 and was carried out over five years ending in 2018.

This project is complete.

6 Status of Physical Works

6.1 BRGWORKS-1 Carpenter Re-Vegetation

The objective of this physical work program is to vegetate an approximately 400 ha area of the Carpenter Reservoir drawdown zone between Tyaughton Lake Road Junction and the Gun Creek Fan. Monitoring the effectiveness of this physical works program is undertaken as part of the BRGMON-2: Carpenter Reservoir Riparian Vegetation Monitoring.

This program was initiated in 2014 and was carried out in intervals until 2020.

In 2020, the final year of the planting program was completed which included seeding, live staking, and substrate mounding with 2021 including watering maintenance, comprehensive reporting, and installation of public information signage.

This project is complete.

6.2 BRGWORKS-2 Seton Erosion Management Projects – Site-specific Mitigation Physical Works

The objective of this project is to implement the mitigation plans for erosion protection of the priority sites as developed under the related (Phase one) BRGMON-15 project.

On May 12, 2020, the CWR approved the TOR for BRGWORKS-2 to advance mitigation at the first site on the Seton River. The design basis was updated in 2022 and we are continuing to work with our engineering contractor on design. Detailed design is under review and construction could start as early as fall of 2024. Prior to moving to construction, we will resubmit a request for budget increase to the CWR for approval. A subsequent resubmission will be needed when the Seton Lake priority sites are ready for construction.

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, 2024.

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	\$25,112	\$24,251	\$14,999	\$39,250	(\$14,138)	TOR resubmission sent on January 30, 2024	
BRGM01A Low Bridge R Aquatic	\$6,894,960	\$3,416,687	\$2,721,388	\$6,138,075	\$756,885	Current contingency	
BRGM01A Low Bridge R Aquatic - OR DM	\$318,876	\$159,809	\$139,322	\$299,131	\$19,745		
BRGM01A Low Bridge R Aquatic - OR Imp	\$6,576,084	\$3,256,878	\$2,582,066	\$5,838,944	\$737,140		
BRGM02A Carpenter Rse Riparia	\$837,752	\$829,516	\$4,100	\$833,617	\$4,135	Project Complete	
BRGM02A Carpenter Rse Riparia - OR DM	\$100,937	\$112,487	\$100	\$112,587	(\$11,650)		
BRGM02A Carpenter Rse Riparia - OR Imp	\$736,815	\$717,029	\$4,000	\$721,029	\$15,786		
BRGM03A Low BR Salmon & Steel	\$7,119,710	\$3,630,997	\$2,705,287	\$6,336,284	\$783,426	Current contingency	
BRGM03A Low BR Salmon & Steel - OR DM	\$282,107	\$117,626	\$149,408	\$267,035	\$15,072		
BRGM03A Low BR Salmon & Steel - OR Imp	\$6,837,603	\$3,513,370	\$2,555,879	\$6,069,249	\$768,354		
BRGM04A Carp Rse&Mld BR Fish	\$1,843,675	\$1,851,332	\$682,625	\$2,533,956	(\$690,281)	Planning for project extension	TOR resubmission expected in 2024.
BRGM04A Carp Rse&Mld BR Fish - OR DM	\$98,053	\$60,493	\$22,625	\$83,117	\$14,936		
BRGM04A Carp Rse&Mld BR Fish - OR Imp	\$1,745,622	\$1,790,839	\$660,000	\$2,450,839	(\$705,217)		
BRGM05A Downton Rse Riparian	\$435,589	\$341,073	\$72,450	\$413,523	\$22,066	Project Complete	
BRGM05A Downton Rse Riparian - OR DM	\$48,953	\$40,924	\$9,252	\$50,176	(\$1,223)		
BRGM05A Downton Rse Riparian - OR Imp	\$386,636	\$300,149	\$63,198	\$363,347	\$23,289		
BRGM06A Seton Lake Aquatic Pr	\$1,319,947	\$1,269,557	\$0	\$1,269,557	\$50,390	Project Complete	
BRGM06A Seton Lake Aquatic Pr - OR DM	\$32,524	\$24,224		\$24,224	\$8,300		
BRGM06A Seton Lake Aquatic Pr - OR Imp	\$1,287,423	\$1,245,333		\$1,245,333	\$42,090		
BRGM07A Downton Rse Fish Habi	\$1,063,401	\$1,063,401	\$0	\$1,063,401	\$0	Project Complete.	
BRGM07A Downton Rse Fish Habi - OR DM	\$87,909	\$61,576		\$61,576	\$26,333		
BRGM07A Downton Rse Fish Habi - OR Imp	\$975,492	\$1,001,825		\$1,001,825	(\$26,333)		
BRGM08A Seton Fish Hab & Pop	\$947,702	\$947,702	\$0	\$947,702	\$0	Project Complete.	
BRGM08A Seton Fish Hab & Pop - OR DM	\$85,780	\$46,804		\$46,804	\$38,976		
BRGM08A Seton Fish Hab & Pop - OR Imp	\$861,922	\$900,898		\$900,898	(\$38,976)		
BRGM09A Seton R Habitat & Fis	\$3,584,953	\$1,705,071	\$1,316,248	\$3,021,320	\$563,633	Current contingency	
BRGM09A Seton R Habitat & Fis - OR DM	\$184,611	\$94,732	\$31,391	\$126,123	\$58,488		
BRGM09A Seton R Habitat & Fis - OR Imp	\$3,400,342	\$1,610,339	\$1,284,857	\$2,895,196	\$505,146		
BRGM10A Carp Rse Prod Model	\$995,981	\$995,904	\$0	\$995,904	\$77	Project Complete	
BRGM10A Carp Rse Prod Model - OR DM	\$23,991	\$26,470		\$26,470	(\$2,479)		
BRGM10A Carp Rse Prod Model - OR Imp	\$971,990	\$969,434		\$969,434	\$2,556		
BRGM11A Low BR Riparian Vege	\$1,412,458	\$576,807	\$707,676	\$1,284,484	\$127,974	Current contingency	
BRGM11A Low BR Riparian Vege - OR DM	\$148,689	\$86,741	\$31,358	\$118,099	\$30,590		
BRGM11A Low BR Riparian Vege - OR Imp	\$1,263,769	\$490,067	\$676,318	\$1,166,385	\$97,384		
BRGM11B Low BR Riverine Wild	\$588,448	\$210,494	\$338,794	\$549,287	\$39,161	Current contingency	
BRGM11B Low BR Riverine Wild - OR DM	\$91,351	\$33,393	\$62,720	\$96,113	(\$4,762)		
BRGM11B Low BR Riverine Wild - OR IMP	\$497,097	\$177,101	\$276,074	\$453,175	\$43,922		
BRGM12A Bridge-Seton Metals	\$481,257	\$117,247	\$2,133	\$119,380	\$361,877	Project Complete	
BRGM12A Bridge-Seton Metals - OR DM	\$65,889	\$12,809	\$2,133	\$14,942	\$50,947		
BRGM12A Bridge-Seton Metals - OR Imp	\$415,368	\$104,438		\$104,438	\$310,930		
BRGM13A Seton Powerhouse	\$2,241,459	\$1,983,255	\$229,939	\$2,213,194	\$28,265	Current contingency	TOR resubmission for method adjustment expected in 2024.
BRGM13A Seton Powerhouse - OR DM	\$113,881	\$105,918	\$22,439	\$128,357	(\$14,476)		
BRGM13A Seton Powerhouse - OR Imp	\$2,127,578	\$1,877,337	\$207,500	\$2,084,837	\$42,741		
BRGM14A Cayoosh Flow Dilutio	\$2,564,557	\$2,409,441	\$0	\$2,409,441	\$155,116	Project Complete	
BRGM14A Cayoosh Flow Dilutio - OR DM	\$66,600	\$54,591		\$54,591	\$12,009		
BRGM14A Cayoosh Flow Dilutio - OR Imp	\$2,497,957	\$2,354,850		\$2,354,850	\$143,107		
BRGM15A SON Erosion Mitigate	\$1,027,670	\$647,566	\$285,606	\$933,172	\$94,498	Current contingency	
BRGM15A SON Erosion Mitigate - OR DM	\$224,463	\$200,809	\$21,549	\$222,359	\$2,104		
BRGM15A SON Erosion Mitigate - OR Imp	\$803,207	\$446,756	\$264,057	\$710,813	\$92,394		
BRGM16A Spiritual & Cultural	\$495,211	\$471,773	\$0	\$471,773	\$23,438	Project Complete	
BRGM16A Spiritual & Cultural - OR DM	\$44,246	\$31,244		\$31,244	\$13,002		
BRGM16A Spiritual & Cultural - OR Imp	\$450,965	\$440,530		\$440,530	\$10,435		
BRGW01A Carp Re-Vegetation	\$1,390,852	\$1,355,370	\$7,696	\$1,363,066	\$27,786	Project Complete	
BRGW01A Carp Re-Vegetation - OR DM	\$120,051	\$107,152	\$6,496	\$113,647	\$6,404		
BRGW01A Carp Re-Vegetation - OR Imp	\$1,270,801	\$1,248,218	\$1,200	\$1,249,418	\$21,383		
BRGW02A SON Erosion Control	\$1,196,621	\$822,327	\$7,129,762	\$7,952,088	(\$6,755,467)	Forecast includes cost for lake work and expected cost increases for river work.	Resubmissions expected in 2024.
BRGW02A SON Erosion Control - OR DM	\$180,710	\$177,749	\$129,584	\$307,333	(\$126,623)		
BRGW02A SON Erosion Control - OR Imp	\$1,015,911	\$644,578	\$7,000,178	\$7,644,756	(\$6,628,845)		

OR - Ordered Remissible
ONR - Ordered Non-Remissible

* Red values in parentheses denote overage.