

Duncan Dam Project Water Use Plan

Monitoring Programs and Physical Works Annual Report: 2021

Implementation Period: April 2020 to March 2021

- DDMMON-1 Lower Duncan River Ramping Rate Monitoring
- DDMMON-2 Lower Duncan River Habitat Use Monitoring
- DDMMON-3 Lower Duncan River Hydraulic Model Development
- DDMMON-4 Lower Duncan River Kokanee Spawning Monitoring
- DDMMON-5 Upper Duncan River Bull Trout Migration Monitoring
- DDMMON-6 Lower Duncan Dam Bull Trout Passage Monitoring
- DDMMON-7 Lower Duncan River Water Quality Monitoring
- DDMMON-8 Duncan Watershed Riparian and Cottonwood Monitoring
- DDMMON-9 Lower Duncan River Mosquito Monitoring and Management Plan Development
- DDMMON-10 Duncan Reservoir Fish Habitat Use Monitoring
- DDMMON-11 Duncan Reservoir Burbot Monitoring
- DDMMON-12 Duncan Reservoir Archaeological Overview Assessment
- DDMMON-13 Duncan Reservoir Archaeological Site Erosion Monitoring
- DDMMON-14 Duncan Wildlife Use Monitoring
- DDMMON-15 Lower Duncan River Stranding Protocol Development and Finalization
- DDMMON-16 Lower Duncan River Fish Stranding Impact Monitoring
- DDMMON-17 Duncan Reservoir Kokanee Stock Assessment
- DDMWORKS-1 Lower Duncan River Argenta Slough Erosion Protection
- DDMWORKS-2 Duncan Reservoir Glacier Creek Boat Ramp Extension
- DDMWORKS-3 Plan to Address Nutrient Retention Caused by Duncan Dam Operations
- DDMWORKS-4 Action Plan to Minimize Stranding of Kokanee Spawning in Lower Duncan River Sidechannels

For Conditional Water Licence for Duncan Dam and Reservoir 27027

April 30, 2021

BC Hydro Duncan Dam Project Water Use Plan Monitoring Programs and Physical Works Annual Report: 2021

1 Introduction

This document represents a summary of the status and the results of the Duncan Dam Water Use Plan (WUP) monitoring programs and physical works to March 31, 2020, as per the Duncan Dam Order under the *Water Act*, dated December 21, 2007, and Clause 1 Amendment dated June 20, 2016. There are seventeen monitoring programs and four physical works.

2 Status

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

Table 2-1: Dates of Duncan Dam 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
DDMMON-1 Lower Duncan River Ramping Rate Monitoring	Clause 5(e)	Apr 03, 2008	Apr 30, 2008		
DDMMON-2 Lower Duncan River Habitat Use Monitoring	Clause 5(e)	Aug 07, 2008	Sep 9, 2008		
DDMMON-3 Lower Duncan River Hydraulic Model Development	Clause 5(e)	Apr 03, 2008	Apr 30, 2008	Nov 12, 2020	Dec 03, 2020
DDMMON-4 Lower Duncan River Kokanee Spawning Monitoring	Clause 6(a)	Apr 03, 2008	Apr 30, 2008	Dec 19, 2008	Mar 17, 2009
DDMMON-5 Upper Duncan River Bull Trout Migration Monitoring	Clause 6(b)	Jan 23, 2008	Mar 05, 2008	Feb 22, 2010	Mar 18, 2010
DDMMON-6 Lower Duncan Dam Bull Trout Passage Monitoring	Clause 6(b)	Jan 23, 2008	Mar 05, 2008		
DDMMON-7 Lower Duncan River Water Quality Monitoring	Clause 6(c)	Dec 16, 2008	Mar 11, 2009		
DDMMON-8 Duncan Riparian Monitoring	Clause 6(d)	Aug 07, 2008	Sep 09, 2008	Nov 01, 2012	Nov 15, 2012
DDMMON-9 Lower Duncan River Mosquito Monitoring and Management Plan Development	Clause 6(e)	Aug 07, 2008	Sep 09, 2008	May 13, 2013	Jun 13, 2013
DDMMON-10 Duncan Reservoir Fish Habitat Use Monitoring	Clause 6(f)	Dec 16, 2008	Mar 11, 2009		
DDMMON-11 Duncan Reservoir Burbot Monitoring	Clause 6(g)	Apr 03, 2008	Apr 30, 2008	May 01, 2013	May 29, 2013
DDMMON-12 Duncan Reservoir Archaeological Overview Assessment	Clause 5(f)	Dec 04, 2009	Feb 05, 2010		
DDMMON-13 Duncan Reservoir Archaeological Site Erosion Monitoring	Clause 5(g)	Dec 04, 2009	Apr 07, 2010		
DDMMON-14 Duncan Wildlife Use Monitoring	Clause 6(h)	Aug 07, 2008	Sep 09, 2008	Jun 09, 2017	Jun 07, 2017
DDMMON-15 Lower Duncan River Stranding Protocol Development and Finalization	Clause 5(e)	Dec 16, 2008	Mar 11, 2009	Jul 30, 2009	Aug 31, 2009
DDMMON-16 Lower Duncan River Fish stranding impact monitoring	Clause 5(e)	Jul 23, 2008	Sep 08, 2008	Jul 04, 2018	Jul 20, 2018
DDMMON-17 Duncan Reservoir Kokanee Stock Assessment	Clause 6(f)	Dec 04, 2009	Apr 08, 2010		
DDMWORKS-1 Argenta Slough Erosion Protection	Clause 5(a)	Jan 23, 2008	Mar 18, 2008	Dec 31, 2018	Jan 25, 2019
DDMWORKS-2 Glacier Creek Boat Ramp	Clause 5(b)	Jan 23, 2008	Mar 18, 2008		
DDMWORKS-3 Plan to Address Nutrient Retention Caused by Duncan Dam Operations	Clause 5(d)	Jan 23, 2008	Mar 18, 2008	Dec 18, 2020	Jan 12, 2021
DDMWORKS-4 Action Plan to Minimize Stranding of Kokanee Spawning in Lower Duncan River Sidechannels	Clause 5(c)	Dec 04, 2009	Apr 08, 2010	Dec 03, 2013	Jan 15, 2014

3 Schedule

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

Table 3-1: Monitoring Programs and Physical Works Schedule as of March 31, 2021

Monitoring Programs	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
	WLR YR1	WLR YR2	WLR YR3	WLR YR4	WLR YR5	WLR YR6	WLR YR7	WLR YR8	WLR YR9	WLR YR10	WLR YR11 Final Review	WLR YR12	WLR YR13	WLR YR14
DDMMON-1 Lower Duncan River Ramping Rate Monitoring	✓	✓F												
DDMMON-2 Lower Duncan River Habitat Use Monitoring	✓	✓	✓	✓	✓F									
DDMMON-3 Lower Duncan River Hydraulic Model Development		✓	✓		✓					✓	x	✓	✓	■
DDMMON-4 Lower Duncan River Kokanee Spawning Monitoring	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓F				
DDMMON-5 Upper Duncan River Bull Trout Migration Monitoring	✓	✓			✓	✓		✓		✓	✓F			
DDMMON-6 Lower Duncan Dam Bull Trout Passage Monitoring	✓	✓	✓	x										
DDMMON-7 Lower Duncan River Water Quality Monitoring			✓	✓	✓F									
DDMMON-8 Duncan Riparian Monitoring		✓	✓		✓	✓	✓	✓	✓	✓	✓F			
DDMMON-9 Lower Duncan River Mosquito Monitoring and Management Plan Development		✓	✓	✓	✓		✓		✓	✓F				
DDMMON-10 Duncan Reservoir Fish Habitat Use Monitoring		✓	✓	✓	✓		✓		✓F					
DDMMON-11 Duncan Reservoir Burbot Monitoring		✓	✓	✓			✓	✓	✓F					
DDMMON-12 Duncan Reservoir Archeological Overview Assessment			✓F											
DDMMON-13 Duncan Reservoir Archeological Site Erosion Monitoring				✓	✓	✓	✓	✓F						
DDMMON-14 Duncan Wildlife Use Monitoring		✓		✓			x			x	✓F			
DDMMON-15 Lower Duncan River Stranding Protocol Development and Finalization		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	■
DDMMON-16 Lower Duncan River Fish stranding impact monitoring	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓F	
DDMMON-17 Duncan Reservoir Kokanee Stock Assessment									✓	✓	✓F			
Physical Works														
DDMWORKS-1 Argenta Slough Erosion Protection	✓	✓	x			x						✓		■
DDMWORKS-2 Glacier Creek Boat Ramp	x	✓												
DDMWORKS-3 Kootenay Lake Nutrient Loading Funding	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	■
DDMWORKS-4 Action Plan to minimize stranding of kokanee stranding in Lower Duncan River Sidechannels						✓	x	x	✓	✓		✓		

Legend:
 ■ = Program to be undertaken/initiated in identified year
 u/w = Program is underway
 ✓ = Program completed for the year
 ■ = Pending
 x = Program started, but encountered operational or hydrological delays
 ✓F = All field work for this project is complete. No further field work is planned.

4 Monitoring Programs and Physical Works Terms of Reference

The monitoring programs and physical works being implemented under the Duncan Dam WUP are described in Terms of Reference. These TOR and the reports for work completed to date can be found here:

http://www.bchydro.com/about/sustainability/conservation/water_use_planning/southern_interior/duncan_dam.html

5 Status of Monitoring Programs

5.1 DDMMON-1 Lower Duncan River Ramping Rate Monitoring

The objective of this study was to assess the impacts associated with the timing, magnitude and rate of operational changes at Duncan Dam on Lower Duncan River fish species life histories of interest.

Several ramping experiments were conducted pre-WUP and in 2009 to support Clause 5(e) of the Order which requires the development of an adaptive protocol to minimize stranding of fish in the Lower Duncan River. In a subsequent stakeholder meeting, stakeholders agreed that ramping experiments were not the most effective way of answering the management questions. It was recommended that further study of fish stranding in LDR be obtained from modified stranding assessments (see DDMMON-16) as year-round stranding assessments cover more habitats, species and seasonal variables than can be simulated through field experimentation.

A review completed in 2017 confirmed that the management questions from DDMMON-1 are being sufficiently addressed through DDMMON-16.

5.2 DDMMON-2 Lower Duncan River Habitat Use Monitoring

This monitoring project was initiated in 2008 and completed in 2012. The objective of this monitoring project was to assess fish habitat use and life histories of Rainbow trout, Mountain whitefish, and Burbot within the Lower Duncan River mainstem and sidechannels.

5.3 DDMMON-3 Lower Duncan River Hydraulic Development

This monitoring program was initiated in 2009. The objective of this monitoring program is to provide a comprehensive model of hydraulic and fish habitat values for the Lower Duncan River floodplain for the normal range of flow conditions affected by Duncan Dam operations.

This program included a two-year development stage at the start of the review period, with model updates scheduled for Years 5 and 10 of the review periods. The 2012 Annual Report provides an accurate summary of the project for the first two years of implementation.

The Year 5 (October 2013) model update captured changing conditions in the river; incorporated advancements in the hydraulic model; and reinforced the potential links between other monitoring programs in the Duncan Dam Project WUP.

In Year 10 (June 2017), the model was updated to adjust for technical differences between the 2010 and 2013 models, eliminating any bias when comparing the two years.

Channel morphology has changed significantly in sections of the river between modelling years. The bathymetry of the river was updated in September 2019 and the final report is attached. The updated model provides a much-improved representation of the river and side channels.

A TOR resubmission was approved in December 2020, to facilitate integration of habitat use data into the model and performance measures re-assessment. Since then, the proposal to complete the work has come in higher than expected. A budget resubmission will be submitted in May 2021. The work will be completed during 2021.

5.4 DDMMON-4 Lower Duncan River Kokanee Spawning Monitoring

This monitoring program was initiated in 2008 and completed in 2017. The objective of this monitoring program is to assess annual Kokanee escapement in the Lower Duncan River, Kokanee spawning as it relates to any operational constraints and defining Kokanee habitat preferences.

Three of the four management questions were addressed in the Year 10 (2017) final report dated May 2018 which was provided with last year's annual report. The fourth management question is answered through DDMWORKS-4.

5.5 DDMMON-5 Upper Duncan River Bull Trout Migration Monitoring

This monitoring program was initiated in 2008 and was carried out periodically over ten years. The objective of the monitoring program is to determine the effectiveness of the adult Bull trout transfer program at Duncan Dam for contributing to Kootenay Reservoir and/or Duncan Reservoir Bull trout recruitment. This project is complete.

Study results demonstrate the need of the bull trout program at Duncan Dam as the transfer program is a significant contributor to Duncan and Kootenay bull trout recruitment.

5.6 DDMMON-6 Lower Duncan Dam Bull Trout Passage Monitoring

This monitoring program was initiated in 2008 for three years.

The operation of the Bull trout transfer program at Duncan Dam May to September each year allows the migration of Bull trout from the Lower Duncan River to spawning locations in the Upper Duncan River system (upstream of Duncan Dam). Fish passage at Duncan Dam is facilitated through the installation of a weir immediately downstream of the flip bucket of the Low-Level Operating Gate. In 2012, it was concluded that the existing weir was an effective system for ensuring Bull trout passage through the dam.

The second objective of this study was to evaluate alternative passage methods. In 2011, redesign and automation of the weir was proposed primarily for operational flexibility and safety reasons. After 2011, the weir was damaged and has not been used since. As implementation of the improvements to update the weir is outside of the scope of the Duncan Dam Project WUP, BC Hydro commenced with design phases of the project under the regular capital planning process. The Duncan weir was approved in February 2021 to proceed to implementation under the capital plan. Construction is expected to commence in 2023.

5.7 DDMMON-7 Lower Duncan River Water Quality Monitoring

This monitoring program was initiated in 2010 and was completed in 2012.

The objective of this monitoring program was to determine if a relationship exists between water quality parameters (TGP levels and water temperature) and Duncan Dam operations and decide how each of the water quality parameters affect fish species downstream of Duncan Dam using the total gas pressure as a performance measure (there is no performance measure for water temperature).

5.8 DDMMON-8 Duncan Watershed Riparian and Cottonwood Monitoring

This project has been divided into two discrete monitoring components based on their locations in the Duncan River watershed.

5.8.1 DDMMON-8-1 Lower Duncan River Riparian Cottonwood Monitoring

This monitoring program was initiated in 2009. This study was carried out every year over a ten-year period with the exception of 2011. The field work was completed in January 2019.

The aim of the study is to provide site-specific data to guide the flow management regime and to improve the understanding of the relationships between flow regime, physical environmental conditions, and riparian vegetation.

The Year 9 (2018) report is attached.

5.8.2 DDMMON-8-2 Duncan Reservoir Riparian Monitoring

This monitoring program was carried out in 2009, implemented in 2012 and 2015, and 2018. The field work for this project is now complete.

This long-term monitoring program is being implemented to assess the effects of Alternative S73 through observation of riparian distribution and abundance and testing of hypotheses underlying the approach taken in the WUP.

The review process for the final report has taken longer than anticipated. Therefore, the Year 4 (2018) report will be submitted with the 2022 Annual Report.

5.9 DDMMON-9 Lower Duncan River Mosquito Monitoring and Management Plan Development

This monitoring program was initiated in 2009 and completed in 2017. All management questions have been addressed.

Initial Lower Duncan flooding during the spring (largely driven by unregulated inflows) represents the largest opportunity for nuisance mosquito production, and re-flooding later in the summer (largely driven by regulated discharges from Duncan Dam) can increase production, depending on the difference between summer and spring peak river flows (regulated + unregulated).

Different vegetation support different levels of nuisance mosquito breeding; regulation of summer flows can influence the flooding of key vegetation types like grasslands. Other factors outside of BC Hydro control, such as precipitation and warmer temperatures, will increase the productivity of nuisance mosquito populations in any given period of the spring and summer.

5.10 DDMMON-10 Duncan Reservoir Fish Habitat Use Monitoring

This monitoring program was initiated in 2009 and completed in 2016. A review of the monitoring program indicates that the management questions have been addressed.

The objective of the monitoring program is to monitor habitat use of reservoir fish species of interest (Rainbow trout, Kokanee, Bull trout and Burbot), reservoir water quality variables, and spawning timing data on a seasonal basis.

5.11 DDMMON-11 Duncan Reservoir Burbot Monitoring

This monitoring program was initiated in 2009 and completed in 2016. In 2013, after three years of attempting to monitor adult Burbot spawning with little success and to capture juvenile Burbot with no success, this program changed its methods from direct biological monitoring to a physical modelling approach.

This program mapped potential Burbot habitat and monitored temperature in the upper Duncan Reservoir drawdown zone. The Burbot habitat mapping and modelling occurred in August 2015 and associated temperature monitoring was completed in 2016.

5.12 DDMMON-12 Duncan Reservoir Archaeological Overview Assessment

The key objective addressed by this monitoring program was to collect information on cultural resource potential or sensitivity within portions of the drawdown zone of the Duncan reservoir and, based on this research, identify cultural site locations suitable for long-term erosion monitoring under DDMMON-13.

This study was initiated in 2010 and was completed in 2011.

5.13 DDMMON-13 Duncan Reservoir Archaeological Site Erosion Monitoring

The purpose of this study was to monitor the rate of erosion at two archaeological sites on Duncan Reservoir. This study was initiated in 2011 and was completed in 2015.

Based on the data collected over five years, it appears that the two archaeological sites are subject to both erosion and deposition, with erosion being the dominant process. Deposition appears to occur during years with relatively quiet or calm weather, while erosion appears to occur under stormy weather. The ground surfaces at both sites have, over the five years of monitoring, lowered in average elevation by approximately 1 cm. Artifacts observed within the monitoring areas have generally

lowered, in keeping with this drop in the ground surface elevation, and shifted away laterally, from their original recorded location by typically less than 10 cm.

The information from this study will be used by BC Hydro's Reservoir Archaeology Program to assess the impacts of normal reservoir operations on these two archaeological sites and to better understand erosion within the Duncan drawdown zone. The study information is also expected to assist future decision makers and the development of an Archaeological Management Plan.

5.14 DDMMON-14 Duncan Wildlife Use Monitoring

This monitoring program was initiated in 2009 and implemented in 2011. The objective of this monitoring program was to identify the impacts of the Duncan operating regime (Alternative S73) on the riparian wildlife community.

The 2014 field season was cancelled because, based on an external review of this study, the TOR required significant revision. Reservoir wildlife monitoring has been refocused on the identification of wildlife habitat values within the wetland at the northern reach of the reservoir.

The TOR was approved July 2017 and fieldwork was conducted in 2018. This project is complete.

5.15 DDMMON-15 Lower Duncan River Stranding Protocol Development and Finalization

This monitoring program was initiated in 2009 and will be carried out every year for ten years.

The regulatory agencies (Fisheries and Oceans Canada and the Ministry of Forests, Lands and Natural Resource Operations) were updated in 2017 on any recommended changes to the Adaptive Stranding Protocol (ASP). No comments were received back from the agencies.

The Year 10 Adaptive Stranding Protocol (ASP) update is in progress however, finalization cannot occur until other monitoring study findings are completed and will be submitted in the 2022 annual report. The project schedule is extended to December 2021 in order to integrate findings from DDMMON-3, and DDMMON-16 into the ASP.

5.16 DDMMON-16 Lower Duncan River Fish Stranding Impact Monitoring

The objective of this monitoring program is to finalize a flow reduction protocol, including stranding response procedures (e.g., fish salvaging), flow reduction procedures at Duncan Dam, internal and external correspondence procedures, stranding assessment methodology, and reporting requirements.

Data collected under this study suggests the Water Use Plan flow reduction measures are effective at reducing fish stranding. When feasible, the Lower Duncan River Stranding Protocol, developed under DDMMON-15 should be consulted and recommendations followed prior to implementing flow reductions at Duncan Dam.

The Year 12 (2019-2020) report dated December 9, 2020 is attached. The Year 13 compendium (summarizing Year 1-13) is in draft and will be submitted in the 2022 Annual Report.

5.17 DDMON-17 Duncan Reservoir Kokanee Stock Assessment

The objective of this program was to improve understanding of the effects of reservoir operation on Kokanee populations to lead to a better understanding of the implications of entrainment on Kokanee populations. This information will be used to assist in future decisions regarding the operation of Duncan Reservoir.

This monitoring program was carried out for three years from 2016 to 2018. The final report will be submitted in the 2022 Annual Report.

6 Status of Physical Works

6.1 DDMWORKS-1 Argenta Slough Erosion Protection

The regulatory agencies (Fisheries and Oceans Canada and Ministry of Forests, Lands and Natural Resources) do not support proceeding with any proposed physical works to armour the eroding bend in Lower Duncan River. Regulators agreed to continue erosion monitoring and the creation of an ecological inventory of the areas of the slough that are threatened by a breach.

The Ecological Inventory was presented to regulators in May 2017. One of the outcomes of the presentation was for BC Hydro to recommend options in lieu of physical works. BC Hydro reviewed the options with the regulators in the fall of 2018 and agreed to provide a contribution to the acquisition of conservation property in lieu of physical works. BCH is continuing to investigate options for this approach.

6.2 DDMWORKS-2 Glacier Creek Boat Ramp Extension

The ramp was completed in May 2009. The Regional District of Central Kootenay (RDCK) is maintaining the ramp. BC Hydro conducted an inspection of the ramp in 2016.

6.3 DDMWORKS-3 Plan to Address Nutrient Retention Caused by Duncan Dam Operations

Payments are made annually to the amount of 17.5% of the previous year's fertilization cost as per the letter of agreement between BC Hydro and the Fish and Wildlife Compensation Program (FWCP). In 2020, the payment was \$180,386.

In 2020, a one-year assessment of the effectiveness of the DDMWORKS-3 contributions was initiated. This involves the review and evaluation of Duncan Dam nutrient retention and DDMWORKS-3 contribution to determine if the level of contribution reflects the level of impacts from Duncan Dam operations. The results will be reviewed once the assessment is complete in 2022. Costs to deliver this assessment are higher than expected, due to unforeseen reservoir access issues.

Additionally, increased resources are required to prepare for the Duncan WUPOR. A budget resubmission will be submitted by October 2021.

6.4 DDMWORKS-4 Action Plan to Minimize Stranding of Kokanee Spawning in Lower Duncan River Sidechannels

The regulatory agencies (Fisheries and Oceans Canada and Ministry of Forests, Lands and Natural Resources) rejected physical works given issues with logistics, annual maintenance and potential secondary effects on other resources in the area.

As an alternate method to mitigate Kokanee stranding, an opportunistic alteration to the flow regime was realized from September 2013 to February 2014. The results from the 2013 DDMMON-4 report were inconclusive about the benefits from the experimental flows because of changes in methodology and difficulties in conducting field studies during the brief peak spawning period.

BC Hydro undertook another opportunistic alteration to the flow regime which occurred from September to October 2016. Observations and data were collected under DDMMON-4 and shared with DDMWORKS-4. The results of this modified operation were shared with regulatory agencies and First Nations.

The flow variance was repeated in 2017 with the endorsement of the regulatory agencies. The study was extended to compare data from the 2017 Kokanee spawning flow variance.

Increasing the target of the kokanee spawning protection flows from 75 to 100 m³/s could be beneficial by increasing the overall amount of wetted spawning/incubation habitat available if flows are maintained at or over the targeted flow through the duration of the emergence period. There is risk of mortality prior to fry emergence if it is not operationally feasible to maintain flows at or above the target flow, so it is important to consider flow timing and duration based on biological needs when making operational decisions.

The final report will be submitted with the 2022 Annual Report.

7 Monitoring Programs and Physical Works Costs

The following table summarizes the Duncan Dam WUP monitoring programs and physical works costs approved by the CWR and the Actual Costs to March 31, 2021

Table 7-1: Duncan Dam WUP Monitoring Programs and Physical Works Costs

Monitoring Programs & Physical Works	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
Duncan Dam WUP Annual Report	\$25,300	\$16,683	\$2,147	\$18,830	\$6,470		
DDMM01A Ramping Rate	\$247,883	\$127,173	\$5,548	\$132,721	\$115,162	Project complete, completion report outstanding	
DDMM01A Ramping Rate - ONR DM	\$34,639	\$18,849	\$5,548	\$24,397	\$10,242		
DDMM01A Ramping Rate - ONR Imp	\$213,244	\$108,324		\$108,324	\$104,920		
DDMM02A Low Duncan HabitatUse	\$566,815	\$502,057	\$3,586	\$505,643	\$61,172	Project complete, completion report outstanding	
DDMM02A Low Duncan HabitatUse - ONR DM	\$84,707	\$40,585	\$3,586	\$44,171	\$40,536		
DDMM02A Low Duncan HabitatUse - ONR Imp	\$482,108	\$461,472		\$461,472	\$20,636		
DDMM03A Low Duncan Hydraulic	\$706,033	\$673,863	\$75,061	\$748,924	(\$42,891)	Additional expense required to finalize project.	Resubmit TOR by May 31, 2021
DDMM03A Low Duncan Hydraulic - ONR DM	\$112,603	\$105,240	\$12,856	\$118,096	(\$5,493)		
DDMM03A Low Duncan Hydraulic - ONR Imp	\$593,430	\$568,623	\$62,205	\$630,828	(\$37,398)		
DDMM04A Low Duncan Kokanee Sp	\$1,462,700	\$1,029,437	\$10,419	\$1,039,856	\$422,844	Project complete, completion report outstanding	
DDMM04A Low Duncan Kokanee Sp - ONR DM	\$148,850	\$78,412	\$10,419	\$88,831	\$60,019		
DDMM04A Low Duncan Kokanee Sp - ONR Imp	\$1,313,850	\$951,025		\$951,025	\$362,825		
DDMM05A Up Duncan Bull Study	\$436,738	\$370,775		\$370,775	\$65,963	Project complete	
DDMM05A Up Duncan Bull Study - ONR DM	\$88,738	\$59,211		\$59,211	\$29,527		
DDMM05A Up Duncan Bull Study - ONR Imp	\$348,000	\$311,564		\$311,564	\$36,436		
DDMM06A Low Duncan Bull Pass	\$280,970	\$99,246		\$99,246	\$181,724	Project complete	
DDMM06A Low Duncan Bull Pass - ONR DM	\$78,970	\$33,316		\$33,316	\$45,654		
DDMM06A Low Duncan Bull Pass - ONR Imp	\$202,000	\$65,930		\$65,930	\$136,070		
DDMM07A Low Duncan Water Qual	\$154,827	\$106,813		\$106,813	\$48,014	Project complete	
DDMM07A Low Duncan Water Qual - ONR DM	\$43,003	\$22,776		\$22,776	\$20,227		
DDMM07A Low Duncan Water Qual - ONR Imp	\$111,824	\$84,037		\$84,037	\$27,787		
DDMM08A Low Duncan Riparian	\$1,457,738	\$1,250,434	\$5,548	\$1,255,983	\$201,755	Efficiencies found during project implementation	
DDMM08A Low Duncan Riparian - ONR DM	\$192,758	\$146,612	\$5,548	\$152,161	\$40,597		
DDMM08A Low Duncan Riparian - ONR Imp	\$1,264,980	\$1,103,822		\$1,103,822	\$161,158		
DDMM09A LDR Mosquito Mon	\$730,574	\$571,985	\$3,586	\$575,571	\$155,003	Project complete, completion report outstanding	
DDMM09A LDR Mosquito Mon - ONR DM	\$122,310	\$115,414	\$3,586	\$119,000	\$3,310		
DDMM09A LDR Mosquito Mon - ONR Imp	\$608,264	\$456,571		\$456,571	\$151,693		
DDMM10A Res Seasonal Habitat	\$791,362	\$680,241	\$3,586	\$683,827	\$107,535	Project complete, completion report outstanding	
DDMM10A Res Seasonal Habitat - ONR DM	\$117,205	\$82,434	\$3,586	\$86,020	\$31,185		
DDMM10A Res Seasonal Habitat - ONR Imp	\$674,157	\$597,807		\$597,807	\$76,350		
DDMM11A Duncan Burbot	\$829,768	\$656,245	\$3,586	\$659,831	\$169,937	Project complete, completion report outstanding	
DDMM11A Duncan Burbot - ONR DM	\$173,632	\$88,105	\$3,586	\$71,691	\$101,941		
DDMM11A Duncan Burbot - ONR Imp	\$656,136	\$568,140		\$568,140	\$67,996		
DDMM12A Duncan Arch Assess	\$68,632	\$71,633		\$71,633	(\$3,001)	Project complete, completion report outstanding	
DDMM12A Duncan Arch Assess - ONR DM	\$21,870	\$27,104		\$27,104	(\$5,234)		
DDMM12A Duncan Arch Assess - ONR Imp	\$46,762	\$44,529		\$44,529	\$2,233		
DDMM13A Duncan Arch Monitor	\$306,185	\$245,646	\$11,658	\$257,303	\$48,882	Project complete, completion report outstanding	
DDMM13A Duncan Arch Monitor - ONR DM	\$79,579	\$66,740	\$11,658	\$78,397	\$1,182		
DDMM13A Duncan Arch Monitor - ONR Imp	\$226,606	\$178,906		\$178,906	\$47,700		
DDMM14A Duncan ResRiparian WLD	\$578,836	\$426,689	\$3,586	\$430,275	\$148,561	Project complete, completion report outstanding	
DDMM14A DuncanResRiparianWLD - ONR DM	\$119,625	\$123,015	\$3,586	\$126,601	(\$6,976)		
DDMM14A DuncanResRiparianWLD - ONR Imp	\$459,211	\$303,673		\$303,673	\$155,538		
DDMM15A LDR Stranding Protocol	\$257,049	\$190,326	\$65,067	\$255,394	\$1,655	Efficiencies found during project implementation	
DDMM15A LDR StrandingProtocol - ONR DM	\$71,421	\$55,450	\$11,338	\$66,788	\$4,633		
DDMM15A LDR StrandingProtocol - ONR Imp	\$185,628	\$134,876	\$53,729	\$188,605	(\$2,977)		
DDMM16A LDR Stranding Assess	\$1,166,464	\$1,166,462		\$1,166,462	\$2	Project complete, completion report outstanding	
DDMM16A LDR Stranding Assess - ONR DM	\$100,166	\$82,684		\$82,684	\$17,482		
DDMM16A LDR Stranding Assess - ONR Imp	\$1,066,298	\$1,083,778		\$1,083,778	(\$17,480)		
DDMM17A Duncan Res KoK Mon	\$248,583	\$138,532	\$10,548	\$149,080	\$99,503	Efficiencies found during project implementation	
DDMM17A Duncan Res KoK Mon - ONR DM	\$49,281	\$16,216	\$5,548	\$21,764	\$27,517		
DDMM17A Duncan Res KoK Mon - ONR Imp	\$199,302	\$122,316	\$5,000	\$127,316	\$71,986		
DDMW01A Argenta Slough Eros	\$735,777	\$232,560	\$503,200	\$735,760	\$17	Project complete, completion report outstanding	
DDMW01A Argenta Slough Eros - ONR DM	\$69,080	\$69,811	\$3,200	\$73,011	(\$3,931)		
DDMW01A Argenta Slough Eros - ONR Imp	\$666,697	\$162,749	\$500,000	\$662,749	\$3,948		
DDMW02A Glacier Creek Boat	\$197,339	\$124,774	\$5,112	\$129,886	\$67,453	Project complete, completion report outstanding	
DDMW02A Glacier Creek Boat - ONR DM	\$71,139	\$38,197	\$5,112	\$43,309	\$27,830		
DDMW02A Glacier Creek Boat - ONR Imp	\$126,200	\$86,576		\$86,576	\$39,624		
DDMW03A Plan Nutrient Reten	\$2,366,810	\$1,966,034	\$417,341	\$2,383,375	(\$16,565)	Additional expense required to finalize project.	Resubmit TOR by October 31, 2021
DDMW03A Plan Nutrient Reten - ONR DM	\$37,030	\$35,900	\$17,551	\$53,450	(\$16,420)		
DDMW03A Plan Nutrient Reten - ONR Imp	\$2,329,780	\$1,930,134	\$399,790	\$2,329,924	(\$144)		
DDMW04A Action Plan Kokanee	\$241,650	\$80,930	\$12,417	\$93,347	\$148,303	Efficiencies found during project implementation	
DDMW04A Action Plan Kokanee - ONR DM	\$90,342	\$34,834	\$7,417	\$42,251	\$48,091		
DDMW04A Action Plan Kokanee - ONR Imp	\$151,308	\$46,096	\$5,000	\$51,096	\$100,212		

OR - Ordered Remissible
ONR - Ordered Non-Remissible

* Red values in parentheses denote overage.