Nechako Fisheries Conservation Program

Terms of Reference (2012-2013)

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Prepared by:
Nechako Fisheries Conservation Program

TABLE OF CONTENTS

BACKGROUND

Annual NFCP activities over the period 2007-2012 have been guided by a 5-year plan which expires on March 31, 2012. The proposed 2012-2013 program will involve baseline activities that are scheduled annually, and will not include any activities that are undertaken on a less frequent basis e.g. residency time estimation, fry emergence (Table 1). Proposed activities are the same as those completed in 2011/2012.

Table 1. Projects undertaken by the NFCP over the past 5 years and proposed for 2012/2013..

	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	**2012/2013**
REMEDIAL MEASURES						
Summer Temperature Management	●	●	●	●		●
Habitat Structure Removal	●	●	●	●		●
Flow Control	●	●	●	●	●	●
Flow Discrepancy Project	●	●	●	●		●
MONITORING						
Enumeration	●	●	●	●	●	●
Residency Time			●			
Carcass Recovery	●	●	●	●	●	●
Juvenile Outmigration				●		
Physical Data Collection			●	●		
Fry Emergence				●		
Substrate Quality and Composition						
Outstanding NFCP Reports	●	●	●	●	●	
Web-site Maintenance	●	●	●	●	●	●

RM12-2 SUMMER TEMPERATURE MANAGEMENT

1.0 OBJECTIVE

The objective of the Summer Temperature Management Project is to moderate elevated water temperatures during sockeye migration by manipulating the timing and volume of reservoir water, through Skins Lake releases, into the Nechako River.

Gate changes at the Skins Lake Spillway are used to manage flows throughout the year, and water temperatures in the Nechako River during the period of sockeye migration. The goal is to keep water temperatures in the Nechako River at Finmore (upstream of the Stuart River confluence) at or below 20 °C.

2.0 RATIONALE

Cooler water temperatures optimize sockeye salmon survival during the migration period (mid July to mid August). The 1987 Settlement Agreement defines specific water temperature targets and protocol using computer modelling and weather forecasts to effectively reduce temperature related risks during the migration period.

Nechako River water temperatures are managed by scheduling large releases from the Skins Lake Spillway with the goal to maintain mean daily water temperatures at or below 20°C in the Nechako River upstream of the Stuart River. Decisions on flow releases from the Skins Lake Spillway are facilitated using a computer-based program and decision protocol as specified in the Settlement Agreement.

3.0 METHODS

3.1 Field Data Collection

Daily field operations involve collection of water temperature, air temperature, river stage, and meteorological data in the Nechako River basin, at a number of sites. Minimum and maximum water temperatures will be collected daily from recorders maintained in the Nechako River at Bert Irvine's (Water Survey of Canada (WSC) data collection platform), the Nechako River at Fort Fraser (upstream of Nautley River), the Nechako River at Finmore (upstream of Stuart River) and in the Nautley River. In addition, spot and corresponding recorder water temperatures will be collected at each location during each site visit. River stages will be collected daily in the Nautley River and the Nechako River below Cheslatta Falls (from the WSC data collection platform) and at Vanderhoof, and used to determine daily river flows at all three locations.

3.2 Weather Forecasts

World Weather Watch, based on data available from the Prince George Atmospheric Environmental Survey weather station, will provide meteorological forecasts. These data, in conjunction with satellite data, will be used each day to develop 5-day meteorological forecasts. These forecasts will be forwarded to Triton each day and entered into a computer database for use in the water temperature forecast model. Each file contains the previous day's observed data and the 5-day meteorological forecasts for the study area.

3.3 Temperature Predictions

The flow and temperature models are run each day with the new data to predict Nechako River water temperatures based on 5-day meteorological forecasts. The data used include observed water temperatures, observed flows and the current 5-day meteorological forecast. The models are then run to predict the expected water temperatures in the Nechako River at the Stuart confluence over the next 5 days. Changes to the releases at Skins Lake Spillway are made based on the results of daily modelling runs.

3.4 Flow Release Decisions

In order to achieve the required responsiveness of the system to moderate water temperatures at Finmore, it is necessary to 'surcharge' the Murray and Cheslatta Lake system in advance to establish a higher 'base' flow through the lake system. Flows at Cheslatta Falls are typically increased from approximately 56.6 $m^3 \cdot s^{-1}$ to 170 $m^3 \cdot s^{-1}$ by July 15 by increasing Skins Lake Spillway releases from early July levels to 227 $m^3 \cdot s^{-1}$ on July 11 and controlling the Spillway so that flows at Cheslatta Falls reach a minimum of 170 $m^3 \cdot s^{-1}$ on July 15. A 5-day lead in release time is required for temperature controls at Finmore because it takes about 5 days for a change in releases at SLS to have an effect at Finmore. Flows are then regulated at Skins Lake Spillway to maintain flows at Cheslatta Falls between 170 $m^3 \cdot s^{-1}$ and 283 $m^3 \cdot s^{-1}$ as typically required during the period July 20 to August 20. Decisions to increase or decrease flows between these limits are made based on the decision protocol discussed below or as influenced by the timing of sockeye runs for any particular year.

The predicted water temperature data produced by the models is used to arrive at decisions on the necessity for flow releases from the Skins Lake Spillway in excess of the summer 'base' flow. These decisions are made by following a decision "Protocol", defined in the Settlement Agreement on Page 4, Sub-Clause 5, and described in Chapter 2 "Methods", of Envirocon Technical Memorandum 1941/C, (summarized below).

The "Protocol" structures the procedure to be followed in arriving at a decision to release additional flows from the Skins Lake Spillway. Essentially, release decisions are reached

by analyzing 3 trends developed using both predicted and observed temperature data. The trends analysis is necessary because of the generally decreasing accuracy of the meteorological forecasts from 1 to 5 days in the future. The 3 trends can best be explained by reference to Table 1 and the following summary:

i. the observed trend; developed from observed mean daily water temperatures measured in the Nechako River above the Stuart River each day (b_0,c_0,). The difference in observed water temperatures for the last two days is extrapolated over the next 5 days to determine the observed water temperature trend.

ii. the predicted trend; developed from the predicted water temperatures for the previous day and the following five days (c_s,c_1,c_2,c_3,c_4,c_5). These data represent the predicted trend.

iii. the forecast trend; developed from the difference between the current five-day and previous five-day predictions for the same calendar days (c_3 and b_4, c_2 and b_3, c_1 and b_2). The differences between forecasted data on coincident dates for the next 3 days only are averaged and added to the 5th day predicted temperature to determine the trend in forecasted temperatures.

Each day, predicted water temperatures for the 5-day forecast period will be checked and the 3 trends calculated. If 2 of the 3 trends indicated that the water temperature in the Nechako River at Finmore may exceed 19.4°C (67.0°F) then Rio Tinto Alcan is directed to increase the release. When this occurs the current day's release will be revised and the flow and temperature simulations re-run using the modified flow regime. Results of each day's final computer run will be subsequently used to initialize water temperatures for the following day's computer simulations.

The following release criteria will be used with the three trends identified above to determine timing and magnitude of the Skins Lake Spillway release:

1. When 2 of the 3 trends show an increase in water temperature in the Nechako River above the Stuart River, and these trends show that potentially the water temperature could exceed 19.4°C (67.0°F), increase the Skins Lake Spillway release according to criteria 2 and 3 below.

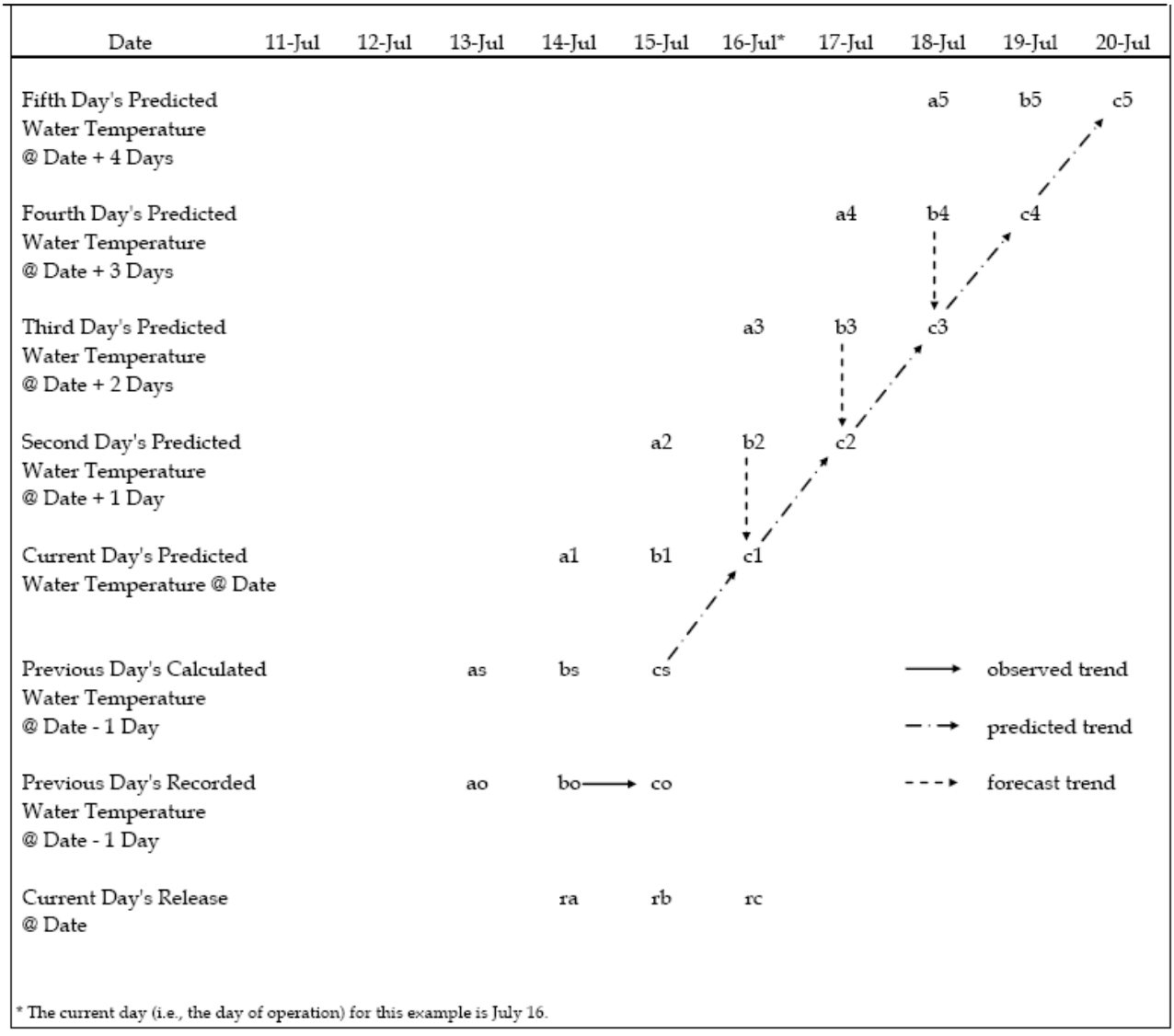
2. Operate Skins Lake Spillway such that flow in the Nechako River below Cheslatta Falls ranges between 170 $m^3 \cdot s^{-1}$ (6,000 cfs) and 283 $m^3 \cdot s^{-1}$ (10,000 cfs) as required and flow in the Nechako River above the Stuart River does not exceed 340 $m^3 \cdot s^{-1}$ (12,000 cfs).

3. At any time of release, increase Skins Lake Spillway from the current level to 453 $m^3 \cdot s^{-1}$ (16,000 cfs) directly to achieve the flow changes in the Nechako River as fast as possible.

4. During cooling periods when 2 of 3 trends in forecasted water temperatures are

decreasing and these trends indicate that potentially the water temperature could drop below 19.4°C (67.0°F) within the forecast period (5 days), reduce the Skins Lake Spillway release from the current level to 14.2 $m^3 \cdot s^{-1}$ (500 cfs).

Table 1. Daily Operations to Manage Water Temperatures in the Nechako River above Stuart River.



Skins Lake Spillway releases are typically decreased to 14.2 $m^3 \cdot s^{-1}$ (500 cfs) within 3 days prior to the end of the water temperature control period (August 20) unless observed water temperatures in the Nechako River above Stuart River are in excess of 20°C (68°F) and are predicted to increase based on meteorological forecasts. The release is to be maintained at 14.2 $m^3 \cdot s^{-1}$ to ramp down the flows in the Nechako River below Cheslatta Falls to at or above 31.1 $m^3 \cdot s^{-1}$ by early September (usually on or before September 6). This approach has been implemented since the full effects of Skins Lake Spillway release changes cannot be achieved at the Stuart River confluence within the 5 day forecast period as a result of the flow routing time through the Cheslatta-Murray Lakes system and the Nechako River. Reducing the Skins Lake Spillway release prior to August 20 optimizes water use for both the NFCP annual water allocation and for Alcan's power production.

4.0 PROJECT ORGANIZATION

It is proposed that Mr. Clyde Mitchell act as the Project Manager. Triton will run the modelling program and request SLS release changes as required. A field technician hired by Triton will collect water temperatures and discharge stages.

5.0 DELIVERABLES

The main product for this project is the daily release decisions for the Skins Lake Spillway made during the sockeye migration period in the Nechako River (July 10 to August 20). Daily records of all data collected in the field, all meteorological forecasts and water temperature predictions and water release decisions will be maintained at Triton's office in a database, and made available on request. These records will be included in data appendices in an annual report on the project. The results of the program will be submitted to the committee in a draft report by December 15, 2011 and a final report submitted by December 31, 2011.

6.0 BUDGET

6.1 2012/2013 Summer Temperature Management

The budget for the 2012/2013 Summer Temperature Management Program includes 109.5 person days and $15,910 in disbursements. A breakdown of staffing requirements and disbursements is presented in the following tables.

RM12-2 SUMMER TEMPERATURE MANAGEMENT

PERSONNEL	LOCATION/TASK	DAYS
Physical Scientists	Office	50
Technicians	Field	52
Office Support	Office	2
Support Staff	Report Production	4.5
	Final Report Review	1
TOTAL		**109.5**

DISBURSEMENTS	QUANTITY	UNIT	UNIT COST ($)	TOTAL
Weather Network - Meteorological Forecasts	1	Project	6,000	$6,000
Equipment Supplies (thermo chart paper)	1	Project	500	$500
Airfares	2	Project	630	$1,260
Technician Vehicle Expenses	52	Day	100	$5,200
Vehicle Rental	2	Day	160	$320
Boat Rental	1	Project	1,500	$1,500
Printing/Photocopying	1	Project	250	$250
Communications	1	Project	320	$320
Freight	1	Project	160	$160
Misc. Equipment	1	Project	100	$100
Report Production	1	Project	300	$300
TOTAL				**$15,910**

RM12-3 HABITAT STRUCTURE REMOVAL

1.0 OBJECTIVE

The objectives of the 2012/2013 project are as follows:

i. to identify any habitat complexes which may pose a navigational hazard;
ii. to remove or modify any habitat complexes which may pose a navigational hazard;
iii. to formally assess and monitor structures for design performance;
iv. to complete the CEAA review process and Navigable Waters permitting for the habitat complexes.

2.0 RATIONALE

2.1 Habitat Complexing

The NFCP Instream Habitat Modification pilot project was initiated in direct response to recommendations of the Nechako River Working Group Report to increase habitat complexity to offset the risks to cover habitat loss after the change to long term flows associated with the Kemano Completion Project. Since 1988, habitat structures have been placed in the Nechako River and monitored for structural integrity as well as for habitat variables (m/sq. cover, cover complexity, water velocities and water depths) in and around the complexes. Accompanying biological assessments have monitored fish use. Some structures have been modified and some removed. However for the most part habitat complexes have performed as designed. As these complexes have been demonstrated to perform successfully and as KCP has been canceled, there is no longer a need for yearly rigorous assessment of these structures.

However, instream conditions can cause habitat complexes to lose seeded debris and some structures can become potential navigational hazards. Ongoing monitoring of habitat complexes and preparation to modify structures that are damaged is prudent given these circumstances. In addition there is a scientific interest to continue to monitor for long-term life of these man made habitat structures. This long term monitoring can provide valuable data on how long these structures will continue to function as well as insight to events (high flow, icing) that may result in loss of complexes.

2.2 Evaluation of Habitat Complexes

Ongoing assessment of the physical integrity of the complexes will include a formal survey in spring, as well as opportunistic surveys completed in the fall in conjunction with other projects. The goal of the formal spring survey will be to assess the structures for design performance, which will include the identification of any structures that have

failed as the result of winter icing conditions. Structures that have failed and have been identified as navigational hazards can then be removed (see section 2.3) or clearly marked before the increase in recreational boating that occurs on the river in the summer.

The best opportunity for opportunistic structure assessment would be in association with the spawner enumeration activities or the carcass recovery activities.

2.3 Modification of Navigational Hazards

Due to deterioration, lack of debris capture and damage from high flows some habitat complexes generally are damaged and/or stripped of debris during normal flow variations. Some of these structures eventually become identified as potential navigational hazards and therefore are recommended for removal or modification. These structures have rails, which may be submerged at some flows and may not be visible to recreational boaters in the Nechako River. In cases where removal of habitat complexes is not cost effective due to travel time of the excavator or other access concerns, it is proposed that structures will be modified with the addition of LWD.

3.0 WORK PLAN

3.1 Evaluation of Habitat Complexes

The formal spring assessment will consist of a visual inspection that will estimate depths and velocities, as well as cover area provided by each of the structures. Assessments of habitat complexes will be conducted by boat and from the shore. Physical condition and stability will be noted with reference to structure durability, position in the river, and affects of cooling flows and ice conditions. Maintenance recommendations will be noted, and the degree to which the habitat complex structures act to entrap and retain debris under prevailing conditions will be assessed.

The existing habitat complexes and their locations are listed in the following Table:

COMPLEX	TYPE OF COMPLEX	LOCATION (km)
LM15.6S	Sweeper	15.6
MC15.7PP	Pocket Pool	15.7
RM16.2S	Rail Anchored Sweeper	16.2
RM16.5RDC	Rail Debris Catcher	16.5
RM16.8RDC	Rail Debris Catcher	16.8
RM17.0PB	Point Bar	17.0
RM17.15PB	Point Bar	17.15
RM17.3PB	Point Bar	17.3
RM17.9DB		17.9
RM17.9SC	Complexed Side Channel	17.9
LM18.3RDC	Rail Debris Catcher	18.3

COMPLEX	TYPE OF COMPLEX	LOCATION (km)
RM20.65RDC	Rail Debris Catcher	20.65
LM21.3RDC	Rail Debris Catcher	21.3
LM22.6RDC	Rail Debris Catcher	22.6
LM22.85RDC	Rail Debris Catcher	22.85
LM24.2RDC	Rail Debris Catcher	24.2
LM24.3RDC	Rail Debris Catcher	24.3
MC25.7RDC	Rail Debris Catcher	25.7
MC35.4PDC		35.4
LM80.9RDC		80.9
LM82.1S		82.1

3.2 Modification of Habitat Complexes

High water in the spring and summer of 2006 and 2007 resulted in the removal of accumulated woody debris from a number of the remaining structures (see the above table where it is noted that structures will or may (depending on access) be removed in the fall or early winter of 2013). Aside from these structures, there are no habitat complexes that have been identified as navigation hazards. If during work on the river in 2012 further structures are identified as a hazards, the Technical Committee will organize efforts to remove the hazard. Experience gained in removing structures during the winter of 2005, 2006 and 2007 has indicated that the structures can be removed with minimal environmental effects as the river banks and access roads are frozen – thus ensuring minimal disturbance by heavy equipment.

4.0 TASK SCHEDULE

4.1 Evaluation of Existing Complexes

Formal assessment of the habitat complexes will occur in spring 2011, once the river has opened up and shore ice has melted enough to allow for the visual inspection of any near-shore features (likely mid-April). Further opportunistic assessments will also be undertaken in 2012 associated with the spawner enumeration activities or the carcass recovery activities. Any observations that are made will be reported to the Technical Committee.

Personnel and time requirements for each task assume that a project biologist or engineer with technical assistance will be utilized.

4.3 CEAA Review and Navigable Waters Permitting

It is proposed the DFO personnel complete the CEAA review process and Navigable Waters permitting for the habitat complexes.

5.0 PROJECT ORGANIZATION

It is proposed that Mr. Clyde Mitchell act as the Project Director. Physical assessments and modifications will be conducted by TECL technical staff.

6.0 DELIVERABLES

Any observations that are made during the formal spring survey will be reported to the Technical Committee in a memorandum to file by May 31, 2011. The reported information would describe physical structure performance and any modifications that are recommended. Similarly, any additional observations made during opportunistic surveys in the fall will be reported to the Technical Committee in a memorandum to file by December 31, 2011.

7.0 BUDGET

7.1 2012/2013 HABITAT STRUCTURE REMOVAL

The budget for the 2012/2013 Habitat Structure Removal Project includes 12 person days and $4,821 in disbursements which will be used for conducting and reporting the results of the formal survey of the habitat structures, and for removal or modification of potential navigational hazards that may be identified. A breakdown of staffing requirements and disbursements is presented in the following tables.

PERSONNEL	**DAYS**
Assessment, modification of navigational hazards	12
TOTAL	**12**

DISBURSEMENTS	**TOTAL**
Modification of Navigational Hazards	$4,821
TOTAL	**$4,821**

RM12-8 FLOW CONTROL

1.0 OBJECTIVE

The primary objectives are to determine the necessary adjustments to the Skins Lake Spillway release to meet the objectives for flow control in the Nechako River by monitoring Skins Lake Spillway releases and river flows and ensuring that the annual water allocation from the Nechako Reservoir is fully utilized.

2.0 RATIONALE

The Technical Committee is responsible for managing the release of the annual water allocation to the Nechako River during each annual water year (April 1 to March 31). The proposed activities will provide the necessary technical support to the Technical Committee to permit them to arrive at decisions regarding flow releases from the Skins Lake Spillway in order to fulfil this mandate.

During the spring and early summer of 1988, considerable effort was expended estimating the effect of different flow releases from the Skins Lake Spillway, in concert with different estimated inflow hydrographs from the Cheslatta-Murray Basin, on flows in the Nechako River below Cheslatta Falls. One of the primary results of this work was that due to the variable nature of the contributions of flow from the Cheslatta-Murray basin, little benefit could be realized in terms of maintaining a stable regime downstream from Cheslatta Falls by attempting month-to-month regulation of flows from the Skins Lake Spillway. However, some work will be necessary to: (a) choose the exact timing of increased flow releases following the start of the 2011/2012 water budget year (April 1); (b) choose the monthly flow regime to be followed throughout the spring and summer; and (c) following the cessation of the cooling flow period in August, calculate the remainder of the water budget and set the flow for the rest of the year.

3.0 WORK PLAN

Prior to April 1, the Nechako River will be assessed for ice conditions and the progression of break-up. The timing of the increase in release above the winter release from Skins Lake Spillway will be dependent on these river ice conditions. Flows will be increased after April 1 (typically mid to late April) to a constant level (approximately 49 $m^3 s^{-1}$) that will be maintained until the cooling flow period in July. The exact timing of the April release will be determined following an overflight of the Cheslatta Murray system to determine ice conditions. Following the cessation of the cooling flow period in August, the remainder of the water budget will be calculated and the flows for the rest of the year will be set.

Activities under this project will be required on a periodic basis during the spring freshet period, from late March to late June. Typically, work will be required over a period of 2 to 3 days immediately prior to the beginning of each calendar month. During this period, flows will be estimated, recommendations made to the Technical Committee, and the Technical Committee's decisions communicated to Rio Tinto Alcan. For the remainder of the year, recorded releases from Skins Lake Spillway and flows in the Nechako River below Cheslatta Falls will be obtained on a monthly and bi-weekly basis (daily during the summer water temperature management project), respectively. A summary of these flows will be forwarded to the Technical Committee on a monthly basis.

Mean daily releases from Skins Lake Spillway and mean daily flows recorded at the WSC gauging station (#08JA017) in the Nechako River below Cheslatta Falls will be tabulated on a monthly basis. These data will be included in a report to be presented to the Technical Committee for review.

Should a discrepancy be observed in the fall (October) between measurements at the Skins Lake Spillway and at the WSC gauging station, it is proposed that the Water Survey of Canada under the direction of the Technical Committee, investigate the source of the discrepancy. This will be done by measuring the discharge at the site established in Reach 1 of the Nechako River between Cheslatta Falls and Bert Irvine's.

4.0 PROJECT ORGANIZATION

It is proposed that Mr. Clyde Mitchell act as the Project Director/Manager and that Triton Environmental Consultants Ltd. conduct the work.

5.0 DELIVERABLES

A summary of Skins Lake Spillway releases and flows in the Nechako River will be delivered to the Technical Committee on a monthly basis. The results of the work on this project will be documented in a formal report. This report will summarize observed mean daily releases from Skins Lake Spillway and flows at the WSC gauging station below Cheslatta Falls. A draft report will be completed by May 15 and the final report by June 30, 2012.

6.0 BUDGET

6.1 2012/2013 Flow Control

The budget for the 2012/2013 Allocation of Flows includes 22.5 person days and $3,410 in disbursements. A breakdown of staffing requirements and disbursements is presented in the following tables.

RM12-8 FLOW CONTROL

PERSONNEL	LOCATION/TASK	DAYS
Engineer	Office	12
Support Staff	Office	3
Senior Fisheries Biologist	Ice Survey	1
Trapper	Ice Survey	1
Support Staff	Report Production	4.5
Project Director	Final Report Review	1
TOTAL		**22.5**

DISBURSEMENTS	QUANTITY	UNIT	UNIT COST ($)	TOTAL
Communications	1	110	110	$110
Ice Survey	1	3,000	3,000	$3,000
Report Production	1	300	300	$300
TOTAL				**$3,410**

RM12-8A NFCP FLOW DISCREPANCY

1.0 OBJECTIVE

The objective is to determine the cause of the discrepancy between gauge readings from the Skins Lake Spillway and the Nechako River below Cheslatta Falls monitoring stations.

2.0 RATIONALE

Should a flow discrepancy become apparent during the 2012/13 water year, a field investigation will be undertaken to investigate the discrepancy between gauge readings from the two monitoring stations.

3.0 WORK PLAN

Should a flow discrepancy become apparent in 2012/13, additional field data on the discrepancies will be collected. It is suggested that these measurements be investigated independently of the parties to the 1987 Settlement Agreement.

4.0 PROJECT ORGANIZATION

It is proposed that Mr. Clyde Mitchell act as the Project Director and Project Manager for this work and that the work be conducted by Mr. Mitchell and the Water Survey of Canada.

5.0 DELIVERABLES

If required, a project memorandum reporting the findings of the field analysis will be provided within 1 month of the completion of the field work.

6.0 BUDGET

6.1 2012/2013 Water Budget Allocation

The budget for the 2012/2013 Flow Discrepancy includes 9 person-days and $10,000 in disbursements for the contingency project. A breakdown of person-power requirements and disbursements is presented in the following tables.

RM12-8A NFCP FLOW DISCREPANCY

PERSONNEL	LOCATION	DAYS
Physical Scientist – Review of documents related to Skins Lake Spillway rating curves.	Office	5
Physical Scientist – Contingency for field evaluation of observed flow discrepancy	Field	4
TOTAL		**9**

DISBURSEMENTS	TOTAL
Field evaluation	$ 10,000
TOTAL	**$ 10,000**

M12-1 ADULT CHINOOK SPAWNER ENUMERATION

1.0 OBJECTIVE

The purpose of this project is to provide an accurate estimate of the size, timing and distribution of the Nechako River Chinook spawning escapement. Helicopter counts of chinook spawners will be conducted using methods consistent with previous years so as to allow year-to-year population comparison. However, the schedule for the flights will be consistent with the 5-year plan, specifically 5 weekly helicopter flights conducted throughout September and the first week of October.

2.0 RATIONALE

Knowledge of the population size is required to assess achievement of the Conservation Goal, as defined in the 1987 Settlement Agreement. The adult spawner enumeration project provides an annual estimate of the spawning escapement of Nechako River chinook salmon.

3.0 WORK PLAN

3.1 Nechako River Aerial Estimate

Five helicopter counts will be conducted on the Nechako River from Cheslatta Falls to Vanderhoof on a weekly basis, beginning the first week of September. Counts will be conducted in a downstream direction since this has been found to maximize visibility. The target day for the weekly flights will be Wednesday, and the tentative schedule of flights for 2012 is September 5, 12, 19, 25, and October 3. However, the flights may be conducted on Tuesday or Thursday if it appears that weather conditions will be better for conducting the observations.

On each flight, two observers will independently record spawner counts for each section. The highest count obtained by the two observers for each section will be used for the escapement estimate. This procedure is based on the assumption that an experienced observer is more likely to miss counting a fish than to count an object that is not a fish. To maintain consistency each section will only be counted once. Chinook will be counted and categorized as on redds, migrating/holding and carcasses. Following the area under the curve (AUC) method, the estimate will be calculated using fish on redds only. Total live fish estimates will provide information on run timing. The location of major spawning areas will be identified.

The AUC method will be utilized, as it is considered the most accurate, reliable and cost-effective method of enumerating spawning salmon from aerial counts. The total number

of spawners is equal to the area under a spawner-date curve divided by the 'survey life' or the average time that a fish resides in the area that was surveyed.

3.2 Residence Time

As described above, the survey life as measured by the female residence time on redds is a key determinate of the population estimate. For several years an estimate of female residence time from 1980 studies was used (Envirocon, 1984). Residence times were estimated yearly from 1989 to 2005 using the visual observation technique described by Neilson and Banford (1984). The estimates obtained have shown small variations between years.

As outlined in the NFCP 5-year plan, there is low sensitivity of spawner estimates to the observed variations in residency time. Residence time was measured in 2009 to optimize the accuracy of the spawner estimate in anticipation of 2010 juvenile surveys. The estimate was 9.8 days, slightly below the long-term average of 10.6 days.

4.0 DELIVERABLES

The data collected will be entered into a database and a technical report detailing the methods used and presenting the size, distribution and timing of the spawning population will be prepared. The draft report will be submitted to the NFCP Technical Committee by March 31, 2013.

5.0 PROJECT ORGANIZATION

It is proposed that DFO be responsible for this program and that Byron Nutton be the Project Director/Manager. Since spawner enumeration is the primary method of assessing the success of the Conservation Goal, representatives of Alcan and the DFO who are experienced in aerial enumeration will conduct the overflights, analyze the data and write the report.

6.0 OUTSTANDING REPORTS

This year efforts will be made to publish some or all of the following outstanding reports:

REPORT NUMBER	TITLE	STAGE OF COMPLETION
M95-1	Nechako and Stuart Rivers Chinook Spawner Enumeration	
M96-1	Nechako and Stuart Rivers Chinook Spawner Enumeration	
M97-1	Nechako and Stuart Rivers Chinook Spawner Enumeration	
M98-1	Nechako and Stuart Rivers Chinook Spawner Enumeration	
M99-1	Nechako and Stuart Rivers Chinook Spawner Enumeration	
M00-1	Nechako and Stuart Rivers Chinook Spawner Enumeration	
M01-1	Nechako and Stuart Rivers Chinook Spawner Enumeration	
M02-1	Nechako and Stuart Rivers Chinook Spawner Enumeration	
M03-1	Nechako and Stuart Rivers Chinook Spawner Enumeration	
M04-1	Nechako and Stuart Rivers Chinook Spawner Enumeration	
M05-1	Nechako River Chinook Spawner Enumeration	
M06-1	Nechako River Chinook Spawner Enumeration	
M07-1	Nechako River Chinook Spawner Enumeration	
M08-1	Nechako River Chinook Spawner Enumeration	
M09-1	Nechako River Chinook Spawner Enumeration	
M10-1	Nechako River Chinook Spawner Enumeration	
M11-1	Nechako River Chinook Spawner Enumeration	

7.0 BUDGET

7.1 2012/2013 Adult Chinook Spawner Enumeration

The budget for the 2012/2013 Adult Chinook Spawner Enumeration Project includes $30,000 for disbursements (mostly helicopter flights) and $8,000 for professional time (16 days).

7.2 Outstanding Report Production

There is no budget allocated for the Outstanding Report Production Project as this was accounted for during previous years.

M12-2 CHINOOK CARCASS RECOVERY

1.0 OBJECTIVE

The purpose of the program is to collect biological data on size, sex, age, life history and egg retention of Nechako River Chinook salmon.

2.0 RATIONALE

Fish length and age data obtained from scales will reflect the relative production of different Chinook year classes. To retain a full database, it is necessary for these programs to continue in their entirety. This information is required for interpretation of enumeration results, as it will indicate which brood years have contributed to the spawning population. Egg retention data may serve as an indirect indicator of population or migration stresses and the quality of the spawning habitat.

3.0 WORK PLAN

Carcass recovery will be performed in two sample runs in order to collect carcasses from the early and late portions of the run-timing. Timing of these sample runs will be determined based on timing of die-off, as observed during the helicopter flights conducted for the Adult Enumeration project.

The Nechako River carcass recovery will be performed from Cheslatta Falls downstream to Vanderhoof. Sampling effort will be divided between the upper, middle and lower sections of the river in proportion to the distribution of spawners, which is to be determined from the helicopter observations conducted for the Adult Enumeration project. A thorough search for dead chinook salmon will be made including the examination of side channels. In deep-water areas, carcasses will be recovered using long handled gaffs. To facilitate carcass recovery and biological sampling a two person crew will be used. One person will operate the boat and the other person will observe and recover carcasses.

A target of 200 scale samples will be set for the Nechako River. These will be evenly split between male and female spawners. Upon recovery, carcasses will be measured for postorbital-hypural length. Egg retention in both spawned and unspawned females will be recorded. Ten scales will be removed from each fish to permit determination of total age. In addition, the anterior dorsal fin ray will be collected to provide a more accurate estimate of ocean residence.

4.0 DELIVERABLES

The results of this work will be added to the existing database. An interpretation of the data will indicate the contribution of parent brood years, compare 2012 data with previous years' results, and interpret ageing results in order to extract life history information. A draft report will be submitted to the NFCP Technical Committee by March 31, 2013.

5.0 PROJECT ORGANIZATION

It is proposed that DFO be responsible for this program and that Byron Nutton (DFO Section Head, Habitat Management) be the Project Director/Manager. Local staff or consultants who are experienced in carcass recovery and sampling techniques will conduct the project.

6.0 OUTSTANDING REPORTS

This year efforts will be made to publish the following report:

REPORT NUMBER	TITLE	STAGE OF COMPLETION
M11-2	Nechako River Chinook Carcass Recovery	inc

7.0 BUDGET

7.1 2012/2013 Chinook Carcass Recovery

The budget for the carcass recovery program in includes a contract valued at $18,000, disbursements valued at $1,000 and 8 person-days valued at $4,000 for a total budget of $23,000.