

ADDENDUM - EXECUTIVE SUMMARY

Overview

This **Addendum** is to be read in conjunction with the *Coquitlam-Buntzen Water Use Plan: Report of the Consultative Committee, June 2002*¹ (commonly referred to as the Consultative Committee Report or CCR). It documents new information collected since the Consultative Committee (CC) held their last meeting on March 11th, 2002 and summarizes the proceedings of two additional Fish Technical Committee (FTC) Meetings and one subsequent CC meeting held on March 31st, 2003, which was triggered because the original consensus agreement was found to be “ineffective”.

In June 2002 the Consultative Committee for the Coquitlam Buntzen Water Use Plan completed their report. The report documented the deliberations and recommendations of the CC between November 1999 and March 2002. The final recommendation of the CC was a consensus agreement for an operating plan.² The core of the CC’s Original Agreement was an adaptive management program that would implement and monitor two flow trials (plus current operations) within a fifteen-year period. The primary purpose, and the basis of the consensus agreement, was to reduce significant uncertainties regarding benefits to fish from increased instream flows. The results from the flow trials would inform a future CC undertaking a subsequent water use planning process at the end of the trial period.

At the time of the consensus agreement, the CC was aware of the possibility that the proposed flow trials might not be “effective”, thereby jeopardizing the fundamental purpose of the recommendation: learning. Accordingly, the CC agreed to a process which included a trigger using the results from a *Statistical Power Analysis Study* to evaluate the “effectiveness” of the CC’s agreement. The *Study* was completed at the end of 2002 and the authors concluded that the proposed experimental flow trials and monitoring program would not provide statistically reliable results. Subsequently, the Fish Technical Committee (FTC) met twice to (a) review the results of the *Statistical Power Analysis*, (b) review the newly collected field data and subsequent analyses associated with the Instream Flow Needs (IFN) Study, and (c) recommend potential changes to the CC’s original agreement. The FTC agreed that the CC’s Original Agreement would not be “effective”; they also refined one alternative and proposed three new treatment schedules for consideration by the CC. A final CC meeting was convened on March 31st, 2003 to review the new information collected and to consider the FTC’s proposed options.

At the March 31st, 2003 CC meeting, a new consensus agreement was reached. This Addendum provides a summary of that new agreement including details about the operating plan, the recently completed studies, and the main issues raised at the final meeting.

It must be emphasized that this **Addendum** is a companion piece to the Consultative Committee Report (referred to as the CCR) and cannot be read without it, since the CCR provides necessary context and details for many of the recommendations, issues, performance measures, objectives, alternatives, trade-offs, and monitoring program components.

¹ EcoPlan International, Inc. 2002. *Coquitlam Buntzen Water Use Plan: Report of the Consultative Committee*. Vancouver.

² See p. 68-70 of the CC Report for details of the operating plan.

Statistical Power Analysis Study

The March 31st, 2003 CC meeting was triggered by the low statistical power that resulted from a *Statistical Power Analysis Study* (included in *Appendix AA*) that was conducted to determine the level of “effectiveness” of the recommended adaptive management program. The primary result of the *Study* was a statistical power estimate (the probability) that the proposed monitoring program and adaptive management flow trials would be able to measure the difference in fish benefits between baseline conditions, referred to as 2FVC, and the two flow treatments, referred to as 4FVN and STP5,³ within the 15-year review period. The *Statistical Power Analysis* indicated that the proposed adaptive management program would have a:

- ~40% chance of detecting a change between baseline conditions and the 4FVN flow treatment.
- ~20% chance of detecting a difference between 4FVN and STP5 treatment flow treatment.

These values were considered statistically unreliable. Upon review of the *Statistical Power Analysis* results, the FTC deemed the CC’s proposed adaptive management program as “ineffective” because of the low power results. This conclusion triggered the additional March 2003 CC meeting and led to more work by the FTC to develop potential recommendations for how to proceed.

Fish Technical Committee

In the lead up to the final March 2003 CC meeting, the FTC met twice and reviewed the *Statistical Power Analysis Study* and the results from the *Instream Flow Needs* analysis (associated with the IFN Study, see *Appendix BB* for a copy of the report). The bulk of the FTC’s work centered on developing options that would provide meaningful information (i.e. more statistically reliable) for future decision making at the end of the review period. The work for the *IFN Study* was a key aspect of this as it revised instream flow targets for flow alternative STP5 and amended fish habitat performance measures with actual field data.

The field surveys in the *IFN Study* provided a detailed analysis of the river including habitat, hydrology, and biological assessments at various flow regimes. The results of the study provided the basis for the weighted useable area calculations used for the fish habitat performance measures. Field work carried out in the study included: transect data collection, channel surveys, linear habitat mapping, and snorkel surveys.

As part of the CC Original Consensus Agreement (2002), the FTC was tasked with incorporating the results of the *IFN Study* into the Coquitlam WUP monitoring plan and adjust the STP5 flow regime.⁴ Therefore, the *Revised STP5* flow regime became known as *STP6* and it had **revised** instream flow targets according to the new *IFN Study* field data (whereas STP5 relied heavily on simulated data).

³ See Chapter 5 of the CC Report (CCR) for details of the alternatives.

⁴ See Chapter 7 and Table 24, Page 68 of the CC Report for details.

The FTC's work led to one revised flow alternative (*Revised STP5* became *STP6*) and three new treatment schedules.

Alternatives

As mentioned, the FTC proposed one new revised flow alternative and three new treatment schedules⁵ for the CC to consider at the final March 31st, 2003 meeting.

Flow Alternatives

Four flow alternatives were focused on during the discussions at the final CC meeting: 3 which were unchanged from the last CC meeting—*2FVC* (*current operations*); *4FVN* (*4 Fish Valves Optimized*); and *STP5* (*Share the Pain #5*)⁶—and one revised flow alternative developed by the FTC and referred to as *STP6*.

The FTC developed *STP6* (revised *STP5*) in the spirit of the original agreement. Therefore, like other “sharing the pain” alternatives, it first attempted to satisfy domestic water and fish interests, with hydroelectric power consistently a third priority. To do this, it included upper and lower target flows for both domestic water and instream (fish) needs. The FTC used the revised habitat suitability curves from the *IFN Study* to amend the monthly instream flow targets according to key fish species and life stages in Reaches 2 and 3 of the Coquitlam River (driven by steelhead parr, steelhead spawning, chinook/coho spawning and incubation).

The *STP6* flow targets assigned for GVRD withdrawals were unchanged from *STP5*. During the final CC March 31st, 2003 meeting, there was an accepted change in terms of priorities for when upper flow targets begin to be curtailed: ***GVRD priority went from first to second; river (fish) priority was changed to always being first.***⁷ A summary of the target flows and priorities for both GVRD and the river are provided in *Section A5*.

Treatment Schedules

The FTC proposed 3 additional treatment schedules for consideration by the CC at their final meeting. These Treatment Schedules were developed with the following criteria:

- having a statistical power of at least 0.5;
- having only one additional flow trial in addition to the current baseline flow regime (*2FVC*); and,
- utilizing *STP6* as the additional flow trial⁸ based on available data from the *IFN* field study results.

⁵ Treatment schedules define the start date, the duration, for each flow alternative.

⁶ See CCR Report for details of flow alternatives, Pages 41 to 43.

⁷ Therefore, if there were insufficient inflows to meet both GVRD and river (fish) upper target flows then GVRD nominations would be curtailed first to their lower target range before river upper targets flows would be changed and this was now year round.

⁸ The FTC selected *STP6* as the preferred flow trial because it is anticipated to create the largest effect and therefore improve the statistical power of quantifying fish benefits over other flow trials. A higher statistical power would better differentiate influencing factors and help address key uncertainties.

Therefore, the *only* changing variable between the 3 Treatment Schedules was the duration of the flow trials and when they would begin. The CC quickly focused on Treatment Schedule #2 and #3.

- **Treatment Schedule #2** would monitor the current base flow (2FVC) for 6 years, changing to STP6 for 9 years.
- **Treatment Schedule #3** would monitor the current base flow (2FVC) for 3 years, changing to STP6 for 9 years.

A summary of all the proposed Treatment Schedules can be found in *Section A5*.

Trade-Offs

As with previous CC meetings, the objectives which experienced the greatest change resulting from the proposed flow trials were the focus of the CC member deliberations. These objectives were domestic water, fish and hydroelectric. The trade-offs at the final meeting were reviewed separately for flow alternatives and treatment schedules before a combination was considered. This separation aided in highlighting the different impacts and trade-offs associated with each.

Flow Alternatives

The trade-off discussions by the CC revolved around the impacts of STP6 and how they compared to STP5 and to a lesser extent 4FVN.

The degree to which STP6 performed against the primary objective areas are summarized below:

Fish	STP6 performed better than, or almost the same as (given the uncertainty in the PMs), STP5 on all performance measures. It performed slightly worse than 2FVC for steelhead spawning habitat, but this was a result of STP6 providing slightly more water than the optimal value calculated in the PM.
Domestic Water	STP6 performed slightly worse than 4FVN for annual water allocation, but marginally better during the driest year results (except for meeting the maximum nominations). It also performed better than STP5 across the domestic water PMs (except for 1 day worse for maximum nominations not satisfied in the driest year).
Hydroelectric	STP6 performed worse than 4FVN (except in driest years) and better than STP5 across all the power PMs.

The following points were made during the trade-off discussions:

- BC Hydro maintained that gains to fish from moving to 4FVN are significant, but the tradeoffs with power objectives in particular beyond this are difficult to justify. However, they would consider STP6 in order to gain better data and in the spirit of consensus.
- After reviewing the performance measure information, some CC members highlighted concerns with STP6 and low summer flows in the river. The concern

centered on the impact of low flows under the ‘sharing the pain’ concept. These concerns were relevant during low flow years when dam releases to the river were a second priority to GVRD’s water use requirements (BC Hydro as third priority would have already stopped generating at this point). Furthermore, it was highlighted that STP6 target dam releases through the summer months were less than low dam releases under STP5.

- In response to the concerns regarding low flows under the STP concept, GVRD representatives indicated that demand from the Coquitlam Reservoir in 2015 was expected to be only slightly higher than at present and by 2007 water filtration facilities for the Capilano and Seymour water sources will be complete providing additional flexibility. For these reasons, they did not anticipate impacting the upper target dam releases for fish except, perhaps, in extreme circumstances (and would like to see the STP concept retained). Based on this information, it was suggested that during the testing period, dam releases for the river always be first priority. The low releases would serve as a safeguard not only for GVRD, but also potentially for fish since they provide important information about flow thresholds.

Treatment Schedule

As mentioned, the CC focused on Treatment Schedule #2 and #3. The main differences in moving from Treatment Schedule #2 to #3 were highlighted as follows:

- the loss of .1 in statistical power;
- an increase in annual average cost to BC Hydro of \$312,000;
- three less years of the test period; and
- more water in the river three years sooner.⁹

The following comments were made by CC members:

- **BC Hydro:** Schedule #2 preferred on the basis of cost, but BC Hydro placed a value on consensus and would consider Schedule #3.
- **GVRD:** Schedule #2 was preferred (although one member stated he was prepared to go with Schedule #3) because of the additional statistical power and, hence, better learning. In addition, the GVRD indicated that they are building water filtration facilities for the Capilano and Seymour water sources (with partial funding from Provincial and Federal grants) and these are to be completed in 2007. Therefore, it would be preferable to have the 2FVC fish release at Coquitlam continue through 2007 as the GVRD would have operation experience with the 2FVC fish release.
- **Other CC members:** Schedule #3 was preferred. These members agreed that the statistical power is less valuable for fish than having more water in the river sooner.

⁹ Increased dam releases over and above the present 2FVC may be affected by the ongoing dam upgrade work which is scheduled for completion at the end of 2006.

Recommendations

At the March 31st, 2003 CC meeting a new consensus agreement was reached. The main components of the agreement were: **Flow Alternative STP6** and **Treatment Schedule #3**. Many CC members placed a high emphasis on reaching consensus. In the end, *nobody blocked* the agreement, *7 members endorsed it* and *12 accepted it with reservations* (see *Section A6* for specific comments by CC members). One CC member had strong concerns about the low summer time instream flows for fish in STP6 and the reliance on the *IFN Study* data¹⁰, but ultimately accepted it with reservations.

Flow Alternative STP6

Given the concern expressed by a number of CC members that summertime instream target in STP6 flows are too low for fish, it was agreed that STP6 would be modified to include a change in priority for when target flows would drop to their lower target values. Instream target flows (for fish) would be given first priority year round rather than giving GVRD domestic water nominations priority during the summer months. This recommendation would reduce the probability that dam releases to the river would fall below the desired target flows during the trial period. At the same time keeping the “sharing the pain” concept addressed GVRD’s desire for greater certainty in the alternative by identifying the operating constraints in the very unlikely event of extreme conditions. A summary of the target flows and priorities for both GVRD and the river are provided in the table below.

Table: Target Flows for Flow Alternative STP6

		Jan 1-15	Jan 16-31	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Share the Pain #6 (STP6)	River Flow Target (cms)	5.9	2.92	2.92	4.25	3.50	2.91	1.10	1.20	2.70	2.22	6.07	3.96	5.00
	River Lower Flow Target (cms)	3.60	2.92	2.92	1.77	1.10	1.10	1.10	1.10	1.10	1.10	3.59	1.49	2.51
	River Priority	1	1	1	1	1	1	1	1	1	1	1	1	1
	GVRD Flow Target (cms)	11.9	11.9	11.9	12	12	12	18	23	23	12	12	11.9	
	GVRD Lower Flow Target (cms)	10.7	10.7	10.7	10.8	11	10.9	15.8	20.2	20.9	10.8	10.8	10.7	
	GRVD Priority	2	2	2	2	2	2	2	2	2	2	2	2	2

Treatment Schedule #3

There was acceptance to recommend this treatment schedule to reach consensus. The details of it are outlined in the following diagram.

¹⁰ It is noted that the *IFN Study* report was not finalized nor distributed prior to the March 2003 CC meeting. However, the analyses and field data was used by the FTC during the development of STP6 and the revising of performance measures.

Treatment Schedule 3 - 3 Yrs Base (2FVC); 9 Years STP6																		
Activity	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Treatment #1 - 2FVC baseline smolt monitoring	1	2	3	4	5	6												
Dam Modifications				1	2	3												
Treatment #2 - STP6							1	2	3	4	5	6	7	8	9			

Summary

The following table summarizes the main components associated with the CC’s New Consensus Agreement.

Table: Summary of CBWUP Operating Recommendations

Recommendations	Comments
Change one low level (LLO) outlet at Coquitlam Dam to permit STP6 river flows	<ul style="list-style-type: none"> ◆ Flow regime STP6 will require an infrastructure change, allowing regulated and variable flows through one of the LLOs (expected to be complete by the beginning of 2007)
Treatment Schedule #3 Implement and monitor 2 flow trials: <ul style="list-style-type: none"> ◆ Test flow #1: 2FVC ◆ Test flow #2: STP6 	<ul style="list-style-type: none"> ◆ One of the main purposes of this plan is to test fish benefits from increased flows to Coquitlam River ◆ Test flow #1 will be tested first and will continue until the end of 2006 ◆ Test flow #2 will be implemented beginning in 2007 and will continue until the end of 2015 (9 years) ◆ Develop a monitoring plan with clear design measures
Develop a communication protocol	<ul style="list-style-type: none"> ◆ A process will be established to notify agencies in the event of exceptionally low water levels when GVRD may need to access Coquitlam water
Other Recommendations	<ul style="list-style-type: none"> ◆ Other recommendations agreed to by the Coquitlam-Buntzen WUP CC as laid out in the June 2002 CBWUP Report of the Consultative Committee remain unchanged. In particular, bookends of 4FVN and STP5 would still remain in place and learning from the proposed operating

	plan would be applied within these bookends at a future WUP (refer to Section 6.2, Pg. 68 in the CCR).
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Expected Impacts from the Consensus Agreement

The impacts from the consensus agreement—according to each principal objective area—are summarized in the table below. Note some of these impacts are uncertain and are designed to be addressed as a part of the monitoring program.

Table: Expected Impacts of the Recommended Agreement

Objective	Flow Trial #2- STP6
Domestic Water (values supplied by GVRD)	<ul style="list-style-type: none"> • Increases regional water supply capacity on average by 4.0 cms¹¹ (from 7.88cms to 11.88cms: a 51% increase) • Saves GVRD ratepayers approx. \$3.7 million per year by delaying costs to raise Seymour dam • Increased long-term planning certainty
Fish	<ul style="list-style-type: none"> • Increases instream flows benefiting salmon and steelhead trout (more than a doubling of flows) <ul style="list-style-type: none"> ➢ +17% steelhead spawning habitat ➢ +33% salmon spawning habitat
Hydroelectric	<ul style="list-style-type: none"> • \$1.04 million annualized average costs to BC Hydro¹² • Annual power production is reduced by 71 GWh on average (from 125 to 54 GWh)

¹¹ Cubic metres per second

¹² Costs to BC Hydro are based on projections of Annual Generation Revenue and GVRD payments (costs do not include water rental costs for generation). A discount rate of 8% was used. Costs are based on an amortization schedule for STP6 starting in Year 2007 and extending to the end of 2015.

Monitoring Program

The components of the monitoring plan are unchanged from those described in the CCR (refer to Section 7) with the exception that it was agreed to not include control streams in the monitoring program¹³.

The monitoring schedule has been modified to be consistent with the new operating plan using Treatment Schedule #3. The schedule and estimated costs of the monitoring table are summarized in the table below.

Table: Cost Estimate and Schedule for the Proposed Monitoring Program (\$ in thousands)

Site	Monitoring Aspect:	Current Operations Review				STP6 Review									
		2003*	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Reservoir	Access to Tributaries	10													
	Annual Snorkel Assessment (Ramping Rates)	12	5	5	10	5	5	5	5	5	5	5	5	15	
River	Pink Salmon Access	4		4		4		4		4		4		10	
	Habitat Suitability Criteria	30				15									
	Invert. Productivity Index	20	20	20	20	20	20	20	20	20	20	20	20	30	
	Reservoir Release	10	5	5											
	Temperature Regime														
	Fish Productivity Index	100	100	100	100	100	100	100	100	100	100	100	100	125	
	Flushing Flow Effectiveness	30				30				30				40	
Totals:	216	130	134	130	174	125	129	125	159	125	129	125	220		

Conclusion

In summary, the Coquitlam-Buntzen Water Use Plan Consultative Committee succeeded in achieving consensus on an operating strategy that will enable more informed decisions to be made on a preferred operating flow regime in the future. In particular, the consensus agreement was reached in order to address significant uncertainties related to anticipated fish benefits. The consensus agreement was reached by revisiting the initial CC's Consensus Adaptive Management Agreement (2002) and applying better information provided by the recently completed *Statistical Power Analysis Study* and the results from the analyses done for the *Instream Flow Needs Assessment*.

This document in combination with the original Consultative Committee Report (CCR) are to be forwarded to BC Hydro and the Provincial Comptroller of Water Rights. This consultation process provided a framework to share information and learn, promote understanding between parties and interests, explore alternative ways to operate the facilities, evaluate impacts in a

¹³ Based on discussions of the Statistical Power Analysis results and other factors specific to the Coquitlam River by the FTC at their Feb 3rd and Mar 10th, 2003 meetings, it was agreed to **not** consider the use of control streams within the monitoring program.

structured way and thus allow each participant to make clear choices based on explicit trade-offs between technical and value-based information. Through this interest-based process, a consensus decision was reached whereby fish, domestic water, industry, and recreation interests will all be improved over current operations.