Stave River Water Use Plan

Monitoring Programs

Annual Report: 2015

Implementation Period: July 2014 to June 2015

- SFLMON-1 Pelagic Monitor (Nutrient Load/Total Carbon Levels)
- SFLMON-2 Littoral Productivity Assessment
- SFLMON-3 Fish Biomass Assessment
- SFLMON-4 Limited Block Load as Deterrent to Spawning
- SFLMON-5 Risk of Adult Stranding
- SFLMON-6 Risk of Fry Stranding
- SFLMON-7 Diel Pattern of Fry Out-migration
- SFLMON-8 Seasonal Timing and Assemblage of Resident Fish
- SFLMON-9 Turbidity Levels in Hayward Reservoir
- SFLMON-10 Archaeological Management

For Conditional Water Licences 117530, 117531, 117532, 117533, 117535, 117536, and 117537

July 31, 2015
1 Introduction

This document represents a summary of the status and the results of the Stave River Water Use Plan (WUP) monitoring programs to June 30, 2015, as per the Stave River Order under the Water Act, dated May 6, 2004. There are ten monitoring programs.

2 Status

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

<table>
<thead>
<tr>
<th>Monitoring Program &amp; Physical Works TOR</th>
<th>Order Clause</th>
<th>Original ToR Submission</th>
<th>Most Recent ToR Resubmission</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Date Submitted</td>
<td>Date Approved</td>
</tr>
<tr>
<td>SFLMON-2 Littoral Productivity Assessment</td>
<td>Schedule B.1.1.2</td>
<td>Jun 10, 2005</td>
<td>Jun 30, 2005</td>
</tr>
<tr>
<td>SFLMON-5 Risk of Adult Stranding</td>
<td>Schedule B.1.1.2</td>
<td>Jun 10, 2005</td>
<td>Jun 30, 2005</td>
</tr>
<tr>
<td>SFLMON-6 Risk of Fry Stranding</td>
<td>Schedule B.1.1.2</td>
<td>Jun 10, 2005</td>
<td>Jun 30, 2005</td>
</tr>
<tr>
<td>SFLMON-7 Diel Pattern of Fry Out-migration</td>
<td>Schedule B.1.1.2</td>
<td>Jun 10, 2005</td>
<td>Jun 30, 2005</td>
</tr>
<tr>
<td>SFLMON-8 Seasonal Timing and Assemblage of Resident Fish</td>
<td>Schedule B.1.1.2</td>
<td>Jun 10, 2005</td>
<td>Jun 30, 2005</td>
</tr>
<tr>
<td>SFLMON-9 Turbidity Levels in Hayward Reservoir</td>
<td>Schedule B.1.1.3</td>
<td>Jun 10, 2005</td>
<td>Jun 30, 2005</td>
</tr>
<tr>
<td>SFLMON-10 Archaeological Management</td>
<td>Schedule B.4.0</td>
<td>Jun 10, 2005</td>
<td>Jun 30, 2005</td>
</tr>
</tbody>
</table>

Table: 2-1: Dates of Stave River WUP TOR Submissions and Approvals by the Comptroller of Water Rights
3 Schedule

The following table outlines the current schedule for the monitoring programs being delivered for the Stave River WUP.

### Table 3-1: Table of WUP Schedule

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SFLMON-1 Pelagic Monitor (Nutrient Load/Total Carbon Levels)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFLMON-2 Littoral Productivity Assessment</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFLMON-3 Fish Biomass Assessment</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFLMON-4 Limited Block Load as Deterrent to Spawning</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFLMON-5 Risk of Adult Stranding</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLMON-6 Risk of Fry Stranding</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLMON-7 Diel Pattern of Fry Out-migration</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLMON-8 Seasonal Timing and Assemblage of Resident Fish</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLMON-9 Turbidity Levels in Hayward Reservoir</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLMON-10 Archaeological Management</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend:  ■ = Program to be undertaken/initiated in identified year  ✓ = Program completed for the year  × = Program started, but encountered operational or hydrological delays

4 Monitoring Programs Terms of Reference

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

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

5 Status of Monitoring Programs

5.1 SFLMON-1 Pelagic Monitor (Nutrient Load/Total Carbon Levels)

This monitoring program was initiated in 2005 and was carried out over ten years. All field work was completed in fall 2014. The final comprehensive report will be included in next year’s annual report.

5.2 SFLMON-2 Littoral Productivity Assessment

This monitoring program was initiated in 2005 and was carried out over ten years. All field work was completed in fall 2014. The final report for 2014 will be included in next year’s annual report.
5.3 **SFLMON-3 Fish Biomass Assessment**  
This monitoring program was initiated in 2005 and was carried out over ten years. All field work was completed in fall 2014. The final report for 2013 and 2014 will be included in next year’s annual report.

5.4 **SFLMON-4 Limited Block Load as Deterrent to Spawning**  
This monitoring program was initiated in 2005 and was carried out over ten years. Field data collection was performed in 2005 and 2007. In the intervening and subsequent years, chum spawner data was obtained from DFO. This monitoring program is now complete. The 2014 report will be included in next year’s annual report.

5.5 **SFLMON-5 Risk of Adult Stranding**  
This monitoring program was completed in 2006.

5.6 **SFLMON-6 Risk of Fry Stranding**  
This monitoring program was completed in 2009.

5.7 **SFLMON-7 Diel Pattern of Fry Out-migration**  
This monitoring program was completed in 2009.

5.8 **SFLMON-8 Seasonal Timing and Assemblage of Resident Fish**  
This proposed one-year monitoring program was initiated in March 2010 and extended through March 2011; however, during the 2012 Stave Monitoring Advisory Committee meeting it was discussed that the management questions have not been answered for this monitor. The committee agreed that more monitoring is required and two more years of monitoring was approved in the letter from CWR dated May 27, 2013. During the 2013 Stave Monitoring Advisory Committee Meeting, it was discussed that there was a considerably lower catch success relative to previous years so remaining effort will now be focused to a more qualitative approach to the study. The approach will now focus on collecting physical habitat data at specific flows to assess change in available habitat.

A TOR resubmission regarding the change in scope and budget noted above was approved by the Comptroller’s office in September 2014. Due to safety issues, monitoring did not proceed as planned in 2014. The final year of monitoring is scheduled to be completed in fall 2015.

5.9 **SFLMON-9 Turbidity Levels in Hayward Reservoir**  
This monitoring program was completed in 2009.

5.10 **SFLMON-10 Archaeological Management**  
This monitoring program was complete in 2008.

6 **Monitoring Programs**  
The following table summarizes the Stave River WUP monitoring program costs approved by the Comptroller and the Actual Costs to June 30, 2015.
## Table 6-1: Stave River WUP Monitoring Programs Costs

<table>
<thead>
<tr>
<th>Monitoring Programs</th>
<th>Costs approved by CWR</th>
<th>Life to Date Actuals (LTD)</th>
<th>Estimated to Complete (Forecast)</th>
<th>Total Forecast (LTD and Forecast)</th>
<th>Variance Total to Approved</th>
<th>Explanation</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stave River WUP Annual Report</td>
<td>$11,795</td>
<td>$10,531</td>
<td>$1,264</td>
<td>$11,795</td>
<td>($0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM01A Pelagic Monitor</td>
<td>$536,926</td>
<td>$500,869</td>
<td>$24,210</td>
<td>$525,079</td>
<td>$11,847</td>
<td>Final expenses outstanding</td>
<td></td>
</tr>
<tr>
<td>SFLM01A Pelagic Monitor - ONR DM</td>
<td>$22,110</td>
<td>$18,412</td>
<td>$1,898</td>
<td>$20,379</td>
<td>$1,735</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM01A Pelagic Monitor - ONR Imp</td>
<td>$514,816</td>
<td>$482,456</td>
<td>$32,360</td>
<td>$504,704</td>
<td>$10,112</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM02A Littoral Productivity</td>
<td>$659,139</td>
<td>$540,120</td>
<td>$149,019</td>
<td>$580,781</td>
<td>$78,358</td>
<td>Final report development</td>
<td></td>
</tr>
<tr>
<td>SFLM02A Littoral Productivity - ONR DM</td>
<td>$140,339</td>
<td>$26,434</td>
<td>$114,905</td>
<td>$27,577</td>
<td>$112,762</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM02A Littoral Productivity - ONR Imp</td>
<td>$518,800</td>
<td>$513,686</td>
<td>$5,114</td>
<td>$553,204</td>
<td>($34,404)</td>
<td>Analysis orginally to be completed by BC Hydro now completed by consultant. Final expenses outstanding</td>
<td></td>
</tr>
<tr>
<td>SFLM03A Fish Biomass Assesssme</td>
<td>$532,156</td>
<td>$513,686</td>
<td>$18,470</td>
<td>$513,686</td>
<td>$15,847</td>
<td>Final report development</td>
<td></td>
</tr>
<tr>
<td>SFLM03A Fish Biomass Assesssme - ONR DM</td>
<td>$40,877</td>
<td>$23,735</td>
<td>$1,143</td>
<td>$25,030</td>
<td>$15,847</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM03A Fish Biomass Assesssme - ONR Imp</td>
<td>$491,279</td>
<td>$491,562</td>
<td>$0</td>
<td>$491,562</td>
<td>($283)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM04A Ltd Block Load Monit</td>
<td>$164,206</td>
<td>$101,588</td>
<td>$62,618</td>
<td>$102,765</td>
<td>$61,441</td>
<td>Final report development</td>
<td></td>
</tr>
<tr>
<td>SFLM04A Ltd Block Load Monit - ONR DM</td>
<td>$71,991</td>
<td>$7,601</td>
<td>$64,390</td>
<td>$8,972</td>
<td>$63,019</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM04A Ltd Block Load Monit - ONR Imp</td>
<td>$92,215</td>
<td>$93,987</td>
<td>($174)</td>
<td>$93,792</td>
<td>($1,577)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM05A Adult Stranding Moni</td>
<td>$38,185</td>
<td>$23,735</td>
<td>$1,450</td>
<td>$25,185</td>
<td>$15,847</td>
<td>Project completed</td>
<td></td>
</tr>
<tr>
<td>SFLM05A Adult Stranding Moni - ONR DM</td>
<td>$17,985</td>
<td>$2,404</td>
<td>$15,581</td>
<td>$2,404</td>
<td>$15,581</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM05A Adult Stranding Moni - ONR Imp</td>
<td>$20,200</td>
<td>$20,695</td>
<td>$0</td>
<td>$20,695</td>
<td>($495)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM06A Fry Stranding Monito</td>
<td>$93,529</td>
<td>$70,716</td>
<td>$0</td>
<td>$70,716</td>
<td>$22,813</td>
<td>Project completed</td>
<td></td>
</tr>
<tr>
<td>SFLM06A Fry Stranding Monito - ONR DM</td>
<td>$34,129</td>
<td>$4,635</td>
<td>$0</td>
<td>$4,635</td>
<td>$29,494</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM06A Fry Stranding Monito - ONR Imp</td>
<td>$59,400</td>
<td>$66,081</td>
<td>$0</td>
<td>$66,081</td>
<td>($6,681)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM07A Fry Out-Migrat Diel P</td>
<td>$114,654</td>
<td>$103,707</td>
<td>$0</td>
<td>$103,707</td>
<td>$10,947</td>
<td>Project completed</td>
<td></td>
</tr>
<tr>
<td>SFLM07A Fry Out-Migrat Diel P - ONR DM</td>
<td>$36,254</td>
<td>$11,366</td>
<td>$0</td>
<td>$11,366</td>
<td>$24,888</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM07A Fry Out-Migrat Diel P - ONR Imp</td>
<td>$76,400</td>
<td>$92,341</td>
<td>$0</td>
<td>$92,341</td>
<td>($13,941)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM08A Resident Fish Monito</td>
<td>$170,649</td>
<td>$107,066</td>
<td>$62,583</td>
<td>$169,923</td>
<td>$726</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM08A Resident Fish Monito - ONR DM</td>
<td>$27,152</td>
<td>$20,686</td>
<td>$4,466</td>
<td>$25,166</td>
<td>$2,046</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM08A Resident Fish Monito - ONR Imp</td>
<td>$143,497</td>
<td>$86,380</td>
<td>$57,117</td>
<td>$144,787</td>
<td>($1,290)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM09A Turbidity Levels Hayw</td>
<td>$182,462</td>
<td>$39,050</td>
<td>$0</td>
<td>$39,050</td>
<td>$143,412</td>
<td>Project completed</td>
<td></td>
</tr>
<tr>
<td>SFLM09A Turbidity Levels Hayw - ONR DM</td>
<td>$106,662</td>
<td>$6,757</td>
<td>$0</td>
<td>$6,757</td>
<td>$99,905</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM09A Turbidity Levels Hayw - ONR Imp</td>
<td>$75,800</td>
<td>$32,293</td>
<td>$0</td>
<td>$32,293</td>
<td>$43,507</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM10A Archaeological Mgmt</td>
<td>$143,803</td>
<td>$147,850</td>
<td>$0</td>
<td>$147,850</td>
<td>($4,047)</td>
<td>Project completed</td>
<td></td>
</tr>
<tr>
<td>SFLM10A Archaeological Mgmt - ONR DM</td>
<td>$23,803</td>
<td>$14,191</td>
<td>$0</td>
<td>$14,191</td>
<td>$9,612</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFLM10A Archaeological Mgmt - ONR Imp</td>
<td>$120,000</td>
<td>$133,658</td>
<td>$0</td>
<td>$133,658</td>
<td>($13,658)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OR - Ordered Remissible
ONR - Ordered Non-Remissible

* Red values in parentheses denote overage.