



# Upper Lillooet Hydro Project

## Weekly Environmental Monitoring Report #86

Reporting Period: January 17 – 30, 2016

Upper Lillooet River Hydroelectric Facility (Water File No. 2002561, Water licence No. C130613), Boulder Creek Hydroelectric Facility (Water File No. 2003049, Water licence No. C129969) & Transmission Line (TX Line)

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		<b>Date Prepared:</b> March 9, 2016 <b>Date Submitted:</b> March 11, 2016

## Owner Construction Permits and Approvals

- Environmental Assessment Certificate No. E13-01 (Amendment 1, 2, 3, 4, 5, 6, 7)
- Fisheries Act Subsection 35(2)(b) Authorization No. 09-HPAC-PA2-000303 (Amendment 1, 2)
  - Letter of Advice for the Transmission Line No. 09-HPAC0-PA2-000303
    - Leave To Commence Construction (ULRHEF) File No. 2002561
    - Leave To Commence Construction (BDRHEF) File No. 2002453
  - Leave To Commence Construction (TX Line) File No. 2002561/2002453
    - Conditional Water Licence (ULRHEF C130613) File No. 2002561
    - Conditional Water Licence (BDRHEF C129969) File No. 2002453
    - Conditional Water Licence (BDRHEF C131153) File No. 2003601
      - Licence of Occupation (ULRHEF #232384) File No. 2409871
      - Licence of Occupation (BDRHEF #232386) File No. 2409998
      - Licence of Occupation (TX Line #2423386) File No. 2410654
  - Occupant Licence to Cut (ULRHEF) No. L49717 (Amendments 1, 2, 3, 4, 5, 6, 7)
    - Occupant Licence to Cut (BDRHEF – KM 38 laydown) No. L49698
    - Occupant Licence to Cut (BDRHEF) No. L49816 (Amendments 1, 2, 3)
  - Occupant Licence to Cut (TX Line) No. L49697 (Amendments 1, 2, 3, 4, 5, 6, 7, 8, 9)
- General Wildlife Measure Exemption Approval Letter (TX Line & BDRHEF) File No. 78700-35/06 UWR and 39585-20 WHA Heritage Conservation Act – Alteration Permit (ULRHEF) File No. 11200-03/2014-0033
- Road Use Permit No. 6123-13-02 (Lillooet River FSR); 5673-13-01 (Rutherford Creek FSR); 7977-13-01 (Lillooet South FSR); 8015-13-01 (Ryan River); 8188-13-01 (Pemberton Creek FSR); and 9717-13-01 (Miller Bench FSR)
  - Junction Permit (ULRHEF & BDRHEF) File No. 11250-32/6123 (Amendment 1)
  - Aeronautical Obstruction Approval (Tx Line - Lillooet River Crossing) File No. 2013-004
    - Aeronautical Obstruction Approval (Tx Line - Ryan River) File No. 2013-005
    - Aeronautical Obstruction Approval (Tx Line - North Miller) File No. 2013-006
    - Aeronautical Obstruction Approval (Tx Line - South Miller) File No. 2013-007
    - Aeronautical Obstruction Approval (Tx Line - Pemberton Creek) File No. 2013-008
    - Aeronautical Obstruction Approval (Tx Line - Lillooet River near Pemberton) File No. 2013-009
    - Aeronautical Obstruction Approval (Tx Line - Lillooet River near Meager Creek) File No. 2013-010
  - Navigable Water Protection Act (ULRHEF) File No. 8200-2009-500434-001
    - Navigable Water Protection Act (BDRHEF) File No. 8200-2012-501-032-001
      - Navigable Water Protection Act (Tx Line – North Creek) File No. 8200-2013-500103-001
      - Navigable Water Protection Act (Tx Line – Lillooet River) File No. 8200-2013-500101-001
      - Navigable Water Protection Act (Tx Line – Lillooet River) File No. 8200-2013-500102-01
      - Navigable Water Protection Act (Tx Line – Ryan River) File No. 8200-2013-500104-001
    - Navigable Water Protection Act (Tx Line – South Miller River) File No. 8200-2013-500100-001
    - Navigable Water Protection Act (Tx Line – Boulder Creek) File No. 8200-2013-500099-001
      - Navigable Water Protection Act – Extension Approval (ULRHEF, BDRHEF, Tx Line)
        - Navigable Water Protection Act (Bridge – Ryan River) File No. 8200-2013-500381
  - Navigable Water Protection Act (Bridge – Upper Lillooet Side Channel; Extension Approval) File No. 8200-2013-500383
    - Section 57 Authorization (ULRHEF) File No. 16660-20/REC202717
      - SLRD Temporary Use Permit No. 34 – Boulder Creek HEF
      - SLRD Temporary Use Permit No. 35 – Upper Lillooet River HEF
      - SLRD Building Permit (10864) – Upper Lillooet River HEF Powerhouse
      - SLRD Building Permit (10865) – Boulder Creek HEF Powerhouse
    - Works Permit for Construction within FSR Right-of-Way No. 6123-14-01
    - Works Permit for Construction within FSR Right-of-Way No. 7977-15-01
  - Section 52(1)(b) FRPA Authorization for Ryan River Wet Crossing File No. FOR-19400-01/2014
- MOTI Permit to Construct, Use and Maintain Works Upon the Right-Of-Way of a Provincial Public Highway No. 2014-06099
  - Magazine Licence File No. UL76018 (Renewal 1)
- Section 8 Approval – Short Term Use of Water File (Lillooet River and Tributaries) No. A2006123 (Amendment 1)
- Section 8 - Special Use Permit issued for the operation of an avalanche weather station on Crown land (File No. S25988)

### Contractor Construction Permits and Approvals

*Waste Discharge under the Code of Practice for the Concrete and Concrete Products Industry under the Environmental Management Act (Authorization No. 107204) Tracking No. 326969 (Renewal 1)*  
*Wildlife Act Permits – Pacific Tailed Frog Salvage Permit # SU15-164805; Fish Salvage Permit # SU15-174722*  
*Fisheries and Oceans Canada – Anadromous Fish Salvage Permit #XR 178 2015*  
*BC Safety Authority – Temporary Construction Electrical Service Permit EL-140698-2014*  
*Municipal Wastewater Regulation - Authorization # 107032*  
*Water Supply System Construction Permits – VCH-14-613 for Main Camp*  
*Water Supply System Permit to Operate Issued July 30th, 2014 for Main Camp*  
*Section 6(3) and Schedule 3 Wildfire Regulations Fire Exemption for Ryan River Bridge File No. 14350-07*  
*SLRD Building Inspection Report dated August 13, 2014 - Construction Camp Building Permit No. 10830*  
*Lillooet River FSR Temporary Road Closures Approval File No. 11250-32/6123 (Amendment 1, 2)*  
*Lillooet South FSR Temporary Road Closures Approval File No. 11250-32/7977*  
*SLRD Building Permits for Mechanic Shop (10862) and Carpentry Shop (10836) March 18, 2015*  
*SLRD Building Permit Stages 1 - 4 – Boulder Powerhouse Architectural, Electrical and Mechanical (10865) October 8, 2015*  
*SLRD Building Permit Stages 1 - 4 – Upper Lillooet Powerhouse Architectural and Mechanical (10864) October 6, 2015*

#### ACRONYMS:

<b>AMBNS</b>	Active Migratory Bird Nesting Survey	<b>INX</b>	Innergex Renewable Energy Inc.
<b>Andritz</b>	Andritz Hydro Canada Inc.	<b>ISW</b>	Instream Works
<b>ANFO</b>	Ammonia nitrate fuel oil (industrial explosive)	<b>ITM</b>	Environmental Issue Tracking Matrix
<b>ASMP</b>	Archaeological Sites Management Plan	<b>JEM</b>	JEM Energy Ltd. (Delegate Independent Engineer)
<b>ARD M/L</b>	Acid Rock Drainage and Metal Leaching	<b>LTC</b>	Leave to Construct
<b>BCEAO</b>	British Columbia Environmental Assessment Office	<b>MFLNRO</b>	Ministry of Forests, Lands and Natural Resource Operations
<b>BCWQG</b>	British Columbia Water Quality Guidelines	<b>MOE</b>	Ministry of Environment
<b>BDRHEF</b>	Boulder Creek Hydroelectric Facility	<b>MOTI</b>	Ministry of Transportation and Infrastructure
<b>BG</b>	Background	<b>NCD</b>	Non Classified Drainage
<b>BKL</b>	BKL Consultants Ltd.	<b>OLTC</b>	Occupational License to Cut
<b>CE</b>	CRT-ebc Construction Inc.	<b>PAG</b>	Potentially Acid Generating
<b>DFO</b>	Fisheries and Oceans Canada	<b>ROW</b>	Right of Way
<b>DS</b>	Downstream	<b>RVMA</b>	Riparian Vegetation Management Area
<b>EAC</b>	Environmental Assessment Certificate	<b>SES</b>	Sartori Environmental Services
<b>EAO</b>	Environmental Assessment Office	<b>SLRD</b>	Squamish-Lillooet Regional District
<b>Ecofish</b>	Ecofish Research Ltd.	<b>Stringer Line</b>	Temporary Backfeed Transmission Line
<b>Ecologic</b>	Ecologic Consulting	<b>TX Line</b>	Transmission Line
<b>EIR</b>	Environmental Incident Report	<b>ULRHEF</b>	Upper Lillooet Hydroelectric Facility
<b>ESC</b>	Erosion and Sediment Control	<b>UWR</b>	Ungulate Winter Range
<b>FAM</b>	Field Advice Memorandum	<b>VC</b>	Valued Component
<b>FSR</b>	Forest Service Road	<b>WEL</b>	Westpark Electric Ltd.
<b>Golder</b>	Golder Associates	<b>WEMR</b>	Weekly Environmental Monitoring Report
<b>GWR</b>	Mountain Goat Winter Range	<b>WHA</b>	Wildlife Habitat Area
<b>Hedberg</b>	Hedberg and Associates Ltd.	<b>WQ</b>	Water Quality
<b>HWM</b>	High water mark		
<b>IE</b>	Independent Engineer (True North Energy)		
<b>IEM</b>	Independent Environmental Monitor		

## 1.0 Summary of Site Inspections for Reporting Period

The table presented below summarizes the IEM team site presence, weather and monitoring locations by component:

Date	IEM Team Personnel	Key Monitoring Locations & Activities
January 17–23, 2016	SE, DA, TH, AS	<p><b>Construction Camp, Laydown Areas and the Lillooet River FSR</b></p> <ul style="list-style-type: none"> <li>• Snow clearing and road maintenance on the Lillooet River FSR</li> <li>• Avalanche control work at KM41, KM45.5 - KM47.5km of the Lillooet River FSR &amp; ULRHEF upstream and downstream tunnel portals</li> </ul> <p><b>ULRHEF Intake &amp; Upstream Tunnel</b></p> <ul style="list-style-type: none"> <li>• Drilling, water testing, and grouting boreholes</li> <li>• Water treatment system maintenance and monitoring</li> </ul> <p><b>ULRHEF Downstream Tunnel Portal</b></p> <ul style="list-style-type: none"> <li>• Drilling, blasting and tunnel stabilization</li> <li>• Installation of CO2 diffuser in oil/water separator to treat elevated pH (January 17, 2016)</li> </ul> <p><b>ULRHEF Powerhouse</b></p> <ul style="list-style-type: none"> <li>• Snow removal and superstructure construction (work suspended on January 21, 2016 to resume April – May 2016)</li> </ul> <p><b>BDRHEF Downstream Tunnel Portal</b></p> <ul style="list-style-type: none"> <li>• Drilling, blasting and tunnel stabilization</li> </ul> <p><b>BDRHEF Powerhouse</b></p> <ul style="list-style-type: none"> <li>• Mechanical and electrical component installation</li> </ul> <p><b>TX-Line</b></p> <ul style="list-style-type: none"> <li>• No scheduled works</li> </ul>
January 24–30, 2016	SE, DA, AS	<p><b>Construction Camp, Laydown Areas and the Lillooet River FSR</b></p> <ul style="list-style-type: none"> <li>• Snow clearing and road maintenance on the Lillooet River FSR</li> <li>• Avalanche control work at 41km, 45.5-47.5km &amp; ULHEF upstream and downstream portals</li> </ul> <p><b>ULRHEF Intake &amp; Upstream Tunnel</b></p> <ul style="list-style-type: none"> <li>• Drilling, water testing, and grouting boreholes</li> <li>• Water treatment system maintenance and monitoring</li> <li>• Grout injection works shutdown due to increased avalanche activity, Jan 21-24 &amp; 27-28</li> </ul> <p><b>ULRHEF Downstream Tunnel Portal</b></p> <ul style="list-style-type: none"> <li>• Drilling, blasting and tunnel stabilization</li> <li>• CO2 diffuser in oil/water separator in use to treat elevated pH water during shotcrete work</li> </ul> <p><b>BDRHEF Downstream Tunnel Portal</b></p> <ul style="list-style-type: none"> <li>• Drilling, blasting and tunnel stabilization</li> </ul> <p><b>BDRHEF Powerhouse</b></p> <ul style="list-style-type: none"> <li>• Mechanical and electrical component installation</li> </ul> <p><b>TX-Line</b></p> <ul style="list-style-type: none"> <li>• No scheduled works</li> </ul>

**IEM Team Personnel:** TH – Tom Hicks; SS – Stephen Sims; BA – Blake Aleksich; DA – Danita Abraham; SE – Stephanie Ellis; AS – Anne Sutherland

## 2.0 Administrative Summary

Key communications and meetings the IEM team had with the licensees, contractors and/or environmental authorities:

Date	Communication Type	Participants	Issues Discussed	ITM ID No.
January 19	<i>Email</i>	SES, INX, CE, JEM	SES issued FAM#8 regarding the Lower Truckwash water treatment system. The FAM requests that CE provide the IEM with a description of the work plan for the water treatment at the ULRHEF lower tunnel portal now that infiltration capacity has decreased and no longer infiltrates all water to ground.	FAM#8; ULR#41
January 20	<i>Site Visit</i>	INX, SES, CBC	A site tour was performed with CBC personnel to scout potential locations for the filming of mountain goats occupying winter range habitat. Should the filming occur, it would provide material to be used in a CBC produced wildlife documentary.	-
January 20	<i>Email, Phone Call</i>	INX, SES, CE, Snowline Safety	SES informed recipients that noise exceedances recorded on Jan. 17 and 18 were the result of avalanche control blasting. SES followed-up with a phone call to Snowline Safety which confirmed that avalanche control work would be adapted moving forward for this specific area (above KM45.5 of the Lillooet River FSR). Noise levels will be reduced by using 1kg charges weights more frequently in the area to control the volume of snow rather than working to reduce avalanche risk once snow loading/snow pack conditions reach critical levels/conditions. CE and Snowline Safety remain committed to minimizing construction related noise during the critical winter period and noise levels mitigation measure to date are meeting project conditions to the satisfaction of the IEM.	-
January 21	<i>Email</i>	INX, SES, CE, Snowline Safety	Snowline informed CE, SES and INX that Zone C (beyond KM38.5 of the Lillooet River FSR) was closed due to avalanche risk. Site closures continued through January 24 following heavy snowfall and intense winter storm conditions.	-
January 22	<i>Email</i>	SES, INX, JEM	INX provided SES and JEM with an update on the progress of the ULRHEF Upstream Tunnel Portal Grouting and an estimation of when the excavation works would commence.	-
January 23	<i>Email</i>	SES, INX, CE, JEM	CE distributed their response to FAM#8, outlining reasons for the delay in setting up the active water treatment system (avalanche risk and winter storm conditions).	FAM#8; ULR#41
January 21-26	<i>Email/phone calls/Meetings</i>	SES, INX, CE, Snowline Safety	Communications remained open with Snowline safety to discuss minimizing noise levels during avalanche control blasting. Noise level exceeded threshold levels on January 23 despite reduced charge weights and careful shot placement. It is important to note that 134 shots have been detonated during the winter operation period and less than 10 have exceeded the allowable noise level threshold (as of January 26). Snowline has changed their avalanche risk reduction strategy to mitigate noise in identified higher sensitivity areas. They intend to	-

Date	Communication Type	Participants	Issues Discussed	ITM ID No.
			clean snow out of the start zones more frequently; therefore, they should not need to use bigger blast weights. This will result in more missions with smaller more frequent blasts. Snowline expects this will result in more delays but they should be of shorter duration. The IEM is satisfied that all reasonable and safe noise mitigation measures are being employed as part of the active avalanche control works.	
January 27	<i>Email</i>	SES, INX, CE, JEM	CE informed INX, SES and JEM that Stormtec completed the installation of an active water treatment system at the ULRHEF downstream tunnel portal and that it was functioning as intended. With the setup and operation of the active water treatment system, ITM #ULR41 was closed.	FAM#8; ULR#41
	<i>Email</i>	INX, SES, CE, Snowline Safety	Avalanche hazard levels above KM39.7 of the Lillooet River FSR forced the shutdown of all ULRHEF work areas for the majority of the day from January 27-28.	-

### 3.0 Current Work Restrictions and Timing Windows

The table presented below outlines work restrictions applicable during the reporting period for each active Project component location:

Component	Location	Wildlife/Archeology Concern	Construction/Timing Restrictions & Mitigations
Lillooet River FSR & ULRHEF	Access roads above the lower limit of the 200m buffer Truckwash Creek Migration Corridor to the ULRHEF intake	Mountain Goat UWR & Migration Corridor	<p>Noise monitoring equipment was in place to monitor background noise levels and exceedances of the 75dbA noise level maximum resulting from blasting activities. Adaptive drilling/blasting noise mitigation strategies will be developed and implemented should activities show persistent exceedances of the noise level threshold.</p> <p>Mountain Goat monitoring activities will occur daily throughout the winter and spring (November 1 – June 15) when construction activities are occurring at the ULRHEF lower tunnel portal and/or the ULRHEF intake.</p> <p>If a mountain goat is observed within 500m line of sight of construction operations, construction must cease for at least 48 hours. The IEM must record and submit all goat observations to FLNR within 48 hours.</p>

Component	Location	Wildlife/Archeology Concern	Construction/Timing Restrictions & Mitigations
BDRHEF intake	Portion of intake access road and crane pad within UWR	Mountain Goat UWR	<p>During winter months (November 1 – April 30), access to BDRHEF intake must be gated at least 500 m from UWR to restrict motorized use within the UWR, unless otherwise directed by MFLNRO.</p> <p>If a mountain goat is observed within a 500 m line of site of a construction activity within UWR u-2-002 UL 12, construction activities will cease for at least 48 hours. Approval from the IEM must be obtained prior to recommencing construction activities.</p>

## 4.0 Upper Lillooet River HEF – Monitoring Results

### 4.1 *Construction Camp, KM 38 Laydown, Access Roads & Lillooet River FSR*

Activities:

- Routine maintenance of construction equipment within the mechanic shop and fuel management continued at the KM 38 laydown (Photo 1). All hazardous substance materials (waste oil, contaminated soil, used oil/hydraulic fluid containers, etc.) were stored temporarily for off-site disposal in a designated area at the laydown. The materials were all well contained and protected from the weather.
- The electric fences surrounding the construction camp were maintained and operational throughout this reporting period.
- Snow removal on the Lillooet River FSR (Photo 2 and Photo 3), access roads, construction camp (Photo 4), and site buildings continued (Photo 5 and Photo 6).
- Sanding, grating and road maintenance on the Lillooet River FSR continued (Photo 7 and Photo 8).

Environmental Summary:

- No environmental issues were observed or reported at the construction camp, KM38 laydown area, access roads or the Lillooet River FSR.

Photos:



**Photo 1 – Current conditions of the crusher pad at the KM38 laydown (January 27, 2016).**



**Photo 2 – Snow blower removing snow at KM33 of the Lillooet River FSR (January 19, 2016).**



**Photo 3 – Snow removal after avalanche control work at KM47.5 of the Lillooet River FSR (January 17, 2016).**



**Photo 4 – Snow removal on pad 3 at the construction camp (January 26, 2016).**



**Photo 5 – Snow removal off buildings at the downstream tunnel portal laydown (January 26, 2016).**



**Photo 6 – Snow removal off buildings at the ULRHEF intake (January 30, 2016).**





Photo 7 – Cross ditching at KM0.75 of the camp access road (January 27, 2016).



Photo 8 – Sand stockpile at km 36 for road maintenance on the Lillooet River FSR (January 19, 2016).

## **4.2 Intake (North & South Sides), and Upstream Tunnel Portal**

### Construction Activities:

- Grout injection at the ULRHEF upstream tunnel portal (Photo 9).
- Dewatering to ULRHEF intake sediment basins (Photo 10).

### Environmental Summary:

- During all grout injection works in the tunnel, all seepage water was directed to the ULRHEF intake sediment basins for treatment (Photo 10). Prior to works, CE's environmental management team activated the CO<sub>2</sub> injection component of the water treatment system and prepared the flocculant injection system to be used if necessary.
- The IEM was at the ULRHEF intake to conduct daily water quality monitoring during grout injection in the upstream tunnel. During works, the IEM conducted sampling in the last cell of the basins and at the outlet to the Lillooet River (compliance point). The water treatment was successful and water quality remained within project guidelines (pH 6.5 – 9) during grouting works. Please see Section 4.6 Water Quality Results.

Photos:



Photo 9 – Laydown area at KM49 of the Lillooet River FSR for ULRHEF grouting works (January 26, 2016).



Photo 10 – The IEM conducted sampling for pH in the last cell (Pond 7) of the ULRHEF sediment basins during tunnel grouting (January 26, 2016).

### 4.3 Downstream Tunnel Portal

Construction Activities:

- Drilling, blasting, mucking and stabilization works within the tunnel (Photo 11).

Environmental Summary:

- All tunnel seepage water was pumped to the downstream tunnel portal infiltration ponds. During an inspection on January 18, the IEM noted that water discharging from the infiltration ponds had elevated pH due to shotcrete application in the downstream tunnel. The water continued to infiltrate within the OLTC boundary but CE set up a CO<sub>2</sub> diffuser in the oil/water separator to mitigate the increase in alkalinity (Photo 12). During discussions with CE it was agreed that infiltration capacity in the two sets of infiltration ponds would not be sufficient to treat the volume of water required. CE informed the IEM that they were investigating active water treatment options. To formalize these onsite communications and water treatment concerns, the IEM prepared and distributed FAM#8 (ITM ULR#41), requesting that CE distribute an updated water treatment plan and provide notification once it was installed.
- CE provided the IEM and Owner with a response and updated water treatment plan for the lower tunnel portal heading on January 23, 2016.
- On January 27 Stormtec completed the installation of an active water treatment system adjacent to the downstream tunnel portal infiltration ponds to treat turbid and high pH water generated in the downstream ULRHEF tunnel portal (Photo 13). The system consists of flocculant and coagulant injection, CO<sub>2</sub> injection, four settling tanks and a sand filter (Photo 14). Water is pumped from the oil/water separator into the existing infiltration ponds for initial settling prior to being pumping to the active treatment system (Photo 15). The treated water is then released into Truckwash Creek downstream of the treatment system (Photo 16). Completion and operation of the active water treatment system signals the completion of the requested outcomes from FAM#8 and closure of ITM ULR#41.

- On January 29 the water treatment system supplier arrived onsite to perform maintenance, as water discharging from the system was not meeting BCWQGs, forcing CE to direct treated water back to the infiltration ponds. Once the system was repaired and water was within BCWQGs, the discharge was directed to Truckwash Creek (See Section 4.6 for water quality sampling results).
- On January 30, water discharging to from the water treatment system temporarily exceeded BCWQGs for turbidity (NTU = 55.3; See Section 4.6). Upon identification of the exceedance CE directed water back to the infiltration ponds until the system was repaired. The cause was identified as an empty CO<sub>2</sub> tank, which rendered sediment flocculation and coagulation ineffective. The CO<sub>2</sub> tank was replaced and once the system was operational, CE directed treated water (within BCWQGs) back to Truckwash Creek.

Photos:



Photo 11 – Current conditions of ULRHEF Downstream Portal (January 26, 2016).



Photo 12 – CO<sub>2</sub> diffuser installed to treat elevated pH in the oil/water separator (January 18, 2016).



Photo 13 – Excavator clearing a pad for installation of the Stormtec water treatment system (January 18, 2016).



Photo 14 – The sand filter stage of the water treatment system (January 29, 2016).



Photo 15 – Settling tank portion of the water treatment system (January 27, 2016).



Photo 16 – Outlet of the treatment system into Truckwash Creek (January 27, 2016).

#### 4.4 *Penstock*

- No activities occurred along the penstock during this reporting period (Photo 17).

Photos:



Photo 17 – ULRHEF Penstock shutdown for winter (January 29, 2016).

#### 4.5 *Powerhouse & Access Road*

Construction Activities:

- Superstructure construction was suspended on January 21, 2016 (Photo 18 and Photo 19). Work on the ULRHEF powerhouse will resume in April 2016.
- Dewatering to Lillooet River.

Environmental Summary:

- No environmental issues were observed or reported at the ULRHEF powerhouse during this reporting period.

Photos:



Photo 18 – ULRHEF powerhouse superstructure construction (January 19, 2016).



Photo 19 – ULRHEF powerhouse superstructure construction suspended until April 2016 (January 27, 2016).

#### 4.6 Water Quality Results

The following table presents the results of the routine WQ sampling program for the ULRHEF. The IEM is undertaking a weekly monitoring program according to the conditions outlined in the Surface Water Quality Protection Plan. The regular monitoring sites quantify WQ conditions within the Lillooet River upstream and downstream of active construction areas. The IEM acknowledges the natural variability of instream WQ conditions in the Lillooet River due to seasonal melt fluctuations and large tributary inputs. In the event that an exceedance of *in-situ* WQ (turbidity and/or pH) is deemed to be caused by project-related activities, the IEM will highlight the exceedance, discuss the cause, and outline measures undertaken by the Contractor to correct the issue. When an exceedance cannot be attributed to project related activities, the exceedance will be marked by an asterisk (\*).

There is no Weekly WQ for the week of January 17-23; the site was shut down for most of the week due to winter storms and increased avalanche activity.

Date	Time	Sample Location Description	pH	Turbidity (NTU)	Cond (µS)	Temp (°C)
<b>Routine Water Quality</b>						
January 27, 2016	9:29	ULR Background – ULRHEF Intake	7.7	4.4	1222	2.1
	10:05	ULR #0.5 – Downstream of ULRHEF intake at Keyhole Bridge	7.4	3.2	127	0.9
	12:57	ULR # 1 – Upstream of ULRHEF Powerhouse	7.7	5.9	127	2.7
	17:26	ULR #2 – Downstream of ULRHEF Powerhouse between KM40.5 and KM41	7.5	4.2	126	1.1

Date	Time	Sample Location Description	pH	Turbidity (NTU)	Cond (µS)	Temp (°C)
	15:35	ULR #3 – Lillooet River FSR KM38 Laydown – D/S of Boulder confluence	7.8	5.8	107	2.8
	14:53	ULR #4 – Lillooet River FSR KM24 – D/S of all works and Meager confluence	7.8	4.8	121	3.7
<b>ULRHEF Intake sediment basins following grout injection at upstream tunnel</b>						
January 17, 2016	10:30	Discharge to Lillooet River	7.96	-	-	-
	12:05	Pond 7 (lower basins)	9.41	-	-	-
	12:25	Discharge to Lillooet River	8.56	-	-	-
	13:05	Pond 7 (lower basins)	9.43	-	-	-
	13:27	Discharge to Lillooet River	7.81	-	-	-
	14:05	Pond 2 (After primary CO2 treatment)	8.25	-	-	-
	15:05	Pond 7 (lower basins)	9.41	-	-	-
	15:40	Discharge to Lillooet River	7.40	-	-	-
January 18, 2016	14:15	Pond 7 (lower basins)	7.4	-	-	-
	14:35	Pond 5 (directly before secondary treatment)	7.7	-	-	-
	14:50	Pond 2 (After primary CO2 treatment)	9.4	-	-	-
	16:23	Pond 7 (lower basins)	7.4	-	-	-
January 20, 2016	13:15	Pond 7 (lower basins)	7.63	5.55	191	4.3
January 25, 2016	14:25	Pond 7 (lower basins)	8.82	-	-	-
	14:40	Discharge to Lillooet River	7.4	-	-	-
January 26, 2016	9:45	Pond 7 (lower basins)	7.5	-	-	-
	16:20	Pond 7 (lower basins)	7.6	-	-	-
January 27, 2016	9:20	Pond 7 (lower basins)	9.3	-	-	-
	9:30	Discharge to Lillooet River	7.65	-	-	-
	11:31	Pond 7 (lower basins)	8.61	-	-	-
January 29, 2016	10:40	Pond 7 (lower basins)	7.59	-	-	-
	16:30	Pond 7 (lower basins)	7.2	-	-	-
January 30, 2016	9:45	Pond 7 (lower basins)	9.3	-	-	-
	9:55	Discharge to Lillooet River	8.25	-	-	-
	16:35	Pond 7 (lower basins)	9.3	-	-	-
	17:00	Discharge to Lillooet River	8.9	-	-	-

The following table presents the results of water quality for the ULRHEF Downstream Tunnel Stormtec Water Treatment System. The IEM collected daily samples at the outlet of the system to ensure that water quality remained within BCWQGs.

Upper Lillooet Downstream Tunnel Portal - Water Treatment System				
Date	Time (24hr)	Sample Location Description	pH	Turbidity (NTU)
January 27, 2016	16:00	Outlet to Truckwash Creek	7.40	4.5
January 29, 2016	11:30	Test Port	<b>9.5*</b>	<b>31.9*</b>
	16:30	Test Port	7.4	17
	17:30	Outlet to Truckwash Creek	7.4	8.13
January 30, 2016	9:15	Outlet to Truckwash Creek	8.82	<b>55.3</b>
	16:01	Test Port	7.4	25.2

\* Water discharging to the infiltration ponds; therefore, these readings do not represent an exceedance of BCWQGs

### 4.7 Recommendations

IEM recommendations for the ULRHEF are as follows:

- All seepage water in the intake excavation and portal should be conveyed to the sediment basins unless approved for discharge directly to the Lillooet River by the IEM or CE environmental manager.
- CE should be regularly monitoring the downstream tunnel water treatment system to ensure it is functioning as intended and that discharge into Truckwash Creek continues to meet BCWQGs.
- The ULRHEF powerhouse sump water should be monitored regularly. Alkaline or turbid water should be pumped to the settling ponds for treatment.

### 4.8 Upcoming Works

The following new and/or environmentally sensitive construction activities are scheduled to occur in the upcoming reporting period:

- Grout injection will continue at the ULRHEF upstream tunnel portal.
- Drilling, blasting and tunnel stabilization at the ULRHEF downstream tunnel.
- Water will continue to be pumped to the water treatment system at the ULRHEF Intake and discharged to the Lillooet River upon meeting BCWQGs.
- Water will continue to be pumped to the water treatment system at the ULRHEF downstream tunnel portal and discharged to Truckwash Creek upon meeting BCWQGs.

## 5.0 Boulder Creek Hydroelectric Facility – Monitoring Results

### 5.1 Intake & Diversion Tunnel

#### Construction Activities:

- No activity due to winter shutdown period.

### 5.2 Downstream Tunnel Portal and Powerhouse

#### Construction Activities:

- Drilling, blasting and tunnel stabilization in the downstream tunnel portal (Photo 20).
- BDRHEF powerhouse mechanical and electrical component installation (Photo 21).
- Dewatering of the tunnel and powerhouse to the oil water separator and settling ponds continued.

#### Environmental Summary:

- All wastewater related to the BDRHEF tunnelling works continued to be contained and conveyed to the downstream portal settling ponds for treatment.

#### Photos:



Photo 20 – Current conditions at BDRHEF downstream Tunnel Portal (January 26, 2016).



Photo 21 – Mechanical and electrical component installation inside BDRHEF Powerhouse (January 26, 2016).

### 5.3 Water Quality Results

The following table presents the results of the routine WQ sampling program for the BDRHEF. The IEM is undertaking a weekly monitoring program according to the conditions outlined in the Surface Water Quality Protection Plan. The regular monitoring sites have been selected to quantify WQ conditions within the Lillooet River upstream and downstream of active construction areas. The IEM acknowledges the natural variability of instream WQ conditions in Boulder Creek due to seasonal fluctuations in snowmelt. In the event that an exceedance of *in-situ* WQ (turbidity and/or pH) is deemed to be caused by project-related activities, the IEM will highlight the



exceedance, discuss the cause, and outline measures undertaken by the Contractor to correct the issue. When an exceedance cannot be attributed to project related activities, the exceedance will be marked by an asterisk (\*).

There is no Weekly WQ for the week of January 17-23; the site was shut down for most of the week due to winter storms and increased avalanche activity.

Date	Time	Sample Location Description	pH	Turbidity (NTU)	Cond (uS)	Temp (°C)
<b>Routine Water Quality</b>						
January 27, 2016	-	BDR BG – Upstream of BDRHEF intake *not accessible*	-	-	-	-
	-	BDR #1 – Downstream of BDRHEF intake *not accessible*	-	-	-	-
	15:50	BDR #2 – Upstream of BDRHEF Powerhouse	7.5	0.6	85	2.1
	17:10	BDR #3 – Downstream of BDRHEF Powerhouse at Pebble Creek Bridge	7.4	0.8	85	2.2

### 5.4 Recommendations

LEM recommendations for the BDRHEF are as follows:

- All wastewater related to the BDRHEF tunnelling works should continue to be contained and conveyed to the downstream portal settling ponds for treatment. Regular inspections of the treatment ponds should be performed to ensure the necessary maintenance activities outlined in the work plan are performed.

### 5.5 Upcoming Works

The following new and/or environmentally sensitive construction activities are scheduled to occur in the upcoming reporting period:

- BDRHEF downstream portal tunnelling works will continue.
- Component installation will continue at the BDRHEF powerhouse.

## 6.0 Transmission Line – Monitoring Results

### 6.1 Transmission Line Construction Activities

- No activities occurred on the TX Line during this reporting period.

## 7.0 Wildlife Sightings

As per the CEMP, a wildlife sightings record has been implemented and will be updated regularly by Project Personnel. It is mandatory for all personnel to report wildlife sightings including, but not limited to bears, cougars, mountain goats and deer. Wildlife sighting will be reported and recorded by the contractor(s). Wildlife Observation forms will be included in first reporting period following month end. Observation or detection of the following species will trigger notification to identified parties according to the following table.

Species Observed or Detected	Notification Period	Agencies to be Notified
Northern rubber boa	Immediately	IEM, Owner
Grizzly bear	24hrs	IEM, Safety Officer, Conservation Officer, Owner
Wolverine den	24hrs	IEM, MFLNRO, Owner
Spotted owls	24hrs	IEM, MOE, Owner
Mountain goats	48hrs	IEM, MFLNRO, Owner

The Owner, Contractors, and IEM team reported the following wildlife sightings in January 2016.

Upper Lillooet Hydro Project - Wildlife Observation Form					
Date	Time	Observer (Company)	Species or Description	Location	Comments
1/19/2015	9:30	Angel Orejas	Otter	KM26 Wetland next to FSR	Eating
1/20/2015	20:20	Angel Orejas	Raccoon	KM32 Upper Lillooet FSR	
1/20/2015	15:00	Tom Hicks	Moose	KM11 Upper Lillooet FSR	Travelling
1/25/2015	11:00	Tom Hicks	Moose	KM10 Upper Lillooet FSR	Travelling

## 8.0 Mountain Goat Monitoring Program

The following mitigation measures related to mountain goats were implemented during this monitoring period:

- Access to the BDRHEF intake is gated and will now be locked fulltime to restrict motorized use within the UWR until April 30, 2016.
- Noise level monitoring data continued to be collected and used to adaptively manage construction noise and ensure that the 75db noise level threshold is not exceeded as outlined in the Mountain Goat Management Plan.
- The IEM or designate was on site to monitor mountain goat activity within 500m of construction activities at the ULRHEF intake and the ULRHEF downstream tunnel portal. Mountain goats were monitored from four sites:
  - Truckwash Creek viewing river right of the Migration Corridor– MG-OBS01 (10U 467955 5612773);
  - Keyhole Falls viewing the south side u-2-002 UL11 – MG-OBS02 (10U 466593 5613988); and,
  - Garibaldi Pumice mine site viewing u-2-002 UL 19 – MG-OBS03 (10U 467388 561408); and,
  - Salal Creek monitoring site viewing u-2-002 UL 8 – MG-OBS04 (10U 466133 5613991).

Monitoring effort was split between all sites during daylight hours, unless safety concerns or weather conditions interfered. The order of site visits rotated daily. Construction activities must cease if a goat(s) is/are observed moving towards the ULRHEF intake and/or if a goat(s) is/are observed within a 500m line of site of a construction activity. No goats were observed within 500m line of sight of construction activities and no work stoppages were required.

## 9.0 Environmental Issues Tracking Matrix (ITM)

### 9.1 Hydroelectric Facilities (ULRHEF & BDRHEF)

ITM Tracking Legend:		<i>Work Item Open</i>					
		<i>Work Item Complete</i>					
		<i>Issue Closed</i>					
Issue Tracking		Environmental Issue		Mitigation Measures			
ID No.	Status	Location	Issue Description	Action Taken/Recommended	Date of Identification	Targeted Date for Completion	Date Completed
ULR#41	CLOSED	ULRHEF downstream tunnel water treatment ponds at Truckwash Creek	The infiltration capacity of the ponds is no longer sufficient to treat water from the lower tunnel heading. Access water is flowing offsite presenting an ESC concern	<ol style="list-style-type: none"> <li>1. Provide the IEM with a description of the water treatment plan for the lower tunnel portal seepage and process water.</li> <li>2. Implement the plan to prevent discharging water to a vegetated area susceptible to erosion and sediment transport</li> </ol>	January 18, 2016	January 23, 2016	January 27, 2016
<i>No outstanding environmental issues (next ITM – BDR#28 &amp; ULR#42)</i>							

### 9.2 Transmission Line

ITM Tracking Legend:		<i>Work Item Open</i>					
		<i>Work Item Complete</i>					
		<i>Issue Closed</i>					
Issue Tracking		Environmental Issue		Mitigation Measures			
ID No.	Status	Location	Issue Description	Action Taken/Recommended	Date of Identification	Targeted Date for Completion	Date Completed
<i>No outstanding environmental issues (next ITM – Tx#3)</i>							



# FIELD ADVICE MEMO (FAM)

<b>Project:</b>	Upper Lillooet Hydro Project	<b>FAM Number:</b> (yyyy-mm-dd_FAM##)	2016-01-19_FAM#8
<b>FAM Author:</b>	Tom Hicks, Lead Monitor Sartori Environmental Services	<b>Date of FAM Issuance:</b>	January 19, 2016
<b>Distribution List:</b> (Name - Company)	To: Jean Pelletier, Jordan Gagne & Ian McKeachie - CRT-ebc		
<b>Environmental Incident Reports (EIR):</b> (If applicable)	This FAM is not associated with an environmental incident; it has been prepared to outline to potential solutions discussed with CE in relation to the discharge of water from the ULRHEF lower portal treatment system to the surrounding environment. This issue will be tracked in the Issue Tracking Matrix in the Weekly Environmental Monitoring Report.		

## Identified Environmental Issue(s):

Water from the lower ULRHEF tunnel portal is currently being pump to two separate sets of infiltration ponds; however, the infiltration capacity of these ponds is no longer sufficient to permit all water to infiltrate to ground. The discharge does not directly reach a watercourse, but it does flow over the edge of a cliff, which presents erosion and sediment transport concerns for the area at the base of the cliff and downslope areas. Discharging site water at this location is not preferred due to this erosion concern, and potential impacts to the Lillooet River Trail (a public walking trail) that this erosion may cause.

During discussions surrounding what to do in the event that the sediment laden water no longer infiltrates (occasionally this water also has a high pH when shotcrete is being used in the tunnel), CE has always indicated that they will respond to ensure continued adherence to the CEMP and Project EPPs.

During discussions yesterday the IEM was informed that an active water treatment system has been brought to site and will be installed beginning tomorrow. The active water treatment system will be used to adjust the pH and decrease the turbidity of water seeping from the lower ULRHEF tunnel portal to ensure discharging water meet surface quality objectives.

IEM has been informed that CE will use this active water treatment system as a temporary measure until a more permanent system is devised and installed. Looking to future potential concerns CE and the IEM have discussed that the volume of water seeping from the lower ULRHEF tunnel portal will increase dramatically once the upper and lower tunnel sections are connected. We have been informed that CE is currently in the planning phase of preparing for this eventually, and that a treatment solution capable of handling the large volume of water expect will be installed prior that phase of tunneling work.

## Requested Outcome(s)

The IEM requests that CE provide the IEM with a description of the plan for water treatment at the lower ULRHEF tunnel portal in the short term now that infiltration to ground is no longer an option. Please specify the point of discharge of the system and the location which it will be installed in the description. Please note that there are mountain goat replacement areas near Truckwash creek that must not be impacted by the water treatment system installation and discharge. Also please indicate how CE will respond in the event that discharge from the treatment system exceeds surface water quality objectives (for example: redirection of flows to ground or temporary storage areas until the system can be adjusted).

CE has indicated to the IEM that they are preparing a methodology for treating the large volume of water expected at the lower tunnel portal once the upper and lower section of the tunnel are connected, therefore the IEM does not require anything further in this regard at this time. It is expected that the methodology will be provide to the IEM for review and comment once it is finalized in the coming weeks and prior to the tunnel breakthrough.