



Upper Lillooet Hydro Project

Weekly Environmental Monitoring Report #90

Reporting Period: March 13 – March 26, 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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		Date Prepared: May 23, 2016 Date Submitted: June 1, 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:

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

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
March 13 – 19, 2016	SE, DA, ML, AS,	<p>Construction Camp, Laydown Areas and the Lillooet River FSR</p> <ul style="list-style-type: none"> • Snow removal and some ditch line re-shaping along the Lillooet River FSR from KM 48.5 – KM 49 (ULR#43) • Ditch improvements and installation of a protection berm along the road edge between KM40.9 and KM41.2 of the Lillooet River FSR (ULR#47) <p>ULRHEF Intake & Upstream Tunnel</p> <ul style="list-style-type: none"> • Umbrella support system installation, consolidation, and excavation in class 4CT material • Preparations to resume using the concrete lined sump and pumps • Continued installation of bulk CO₂ system <p>ULRHEF Downstream Tunnel Portal</p> <ul style="list-style-type: none"> • Drilling, blasting and tunnel stabilization (including shotcrete) • Installation of an infiltration pit intended to be used to direct excess water not captured by the water treatment system to the penstock sub-drain. <p>ULRHEF Powerhouse</p> <ul style="list-style-type: none"> • Dewatering of clean ground water seepage to the Lillooet River • Snow removal and manifold works; rebar and form works <p>BDRHEF Downstream Tunnel Portal</p> <ul style="list-style-type: none"> • Drilling, blasting and tunnel stabilization <p>BDRHEF Powerhouse</p> <ul style="list-style-type: none"> • Electrical component installation <p>TX-Line</p> <ul style="list-style-type: none"> • No activity
March 20 – 26, 2016	SE, DA, AS, TH, Sartori	<p>Construction Camp, Laydown Areas and the Lillooet River FSR</p> <ul style="list-style-type: none"> • Road maintenance on the Lillooet River FSR <p>ULRHEF Intake & Upstream Tunnel</p> <ul style="list-style-type: none"> • Umbrella support system installation, consolidation, and excavation in class 4CT material <p>ULRHEF Downstream Tunnel Portal</p> <ul style="list-style-type: none"> • Drilling, blasting and tunnel stabilization (including shotcrete) • Active water treatment system still not capable of handling all process and seepage water from the tunneling operation <p>ULRHEF Powerhouse</p> <ul style="list-style-type: none"> • Dewatering of clean ground water seepage to the Lillooet River • Removal of formwork from around the manifold (Mar 8-12, 2016) <p>BDRHEF Downstream Tunnel Portal</p> <ul style="list-style-type: none"> • Drilling, blasting and tunnel stabilization <p>BDRHEF Powerhouse</p> <ul style="list-style-type: none"> • Electrical component installation <p>TX-Line</p> <ul style="list-style-type: none"> • No activity

IEM Team Personnel: TH – Tom Hicks; SS – Stephen Sims; DA – Danita Abraham; SE – Stephanie Ellis; AS – Anne Sutherland; ML – McKenzie Lee; Sartori – Alex Sartori

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.
March 13	<i>Email</i>	CE, SES, INX	Re: Collapse of Truckwash Sediment ponds # 2 - follow-up. CE issued an email to the IEM indicating that water released from the sediment ponds was likely a result of material sloughing into the ponds that resulted in the displacement of water. No damage of an environmentally sensitive nature was observed by the contractor, however further assessment and inspections will be carried out once the snow has melted.	-
March 14	<i>Email</i>	SES, CE, Snowline Safety & Construction, INX	Re: Mountain Goat UWR noise level exceedances documented in the previous week. The IEM issued an email identifying noise threshold exceedances associated with avalanche control measures (<i>i.e.</i> helicopter travel, blasting). The IEM is satisfied with the mitigation measures to reduce noise being undertaken by the avalanche control specialist and do not require that additional measure be undertaken given the infrequency, intensity, and duration of the noise level exceedances recorded to date.	-
March 14 & 17	<i>Emails</i>	SES, CE, INX	Re: ITM update for the week of March 6-12. An email was provided by the IEM addressing the status of issues remaining on the ITM from the previous week. Outstanding issues were pertaining to site drainage and the treatment of high sediment/alkaline discharge from the WQ ponds and treatment systems. On March 17, CE provided a response to the issues identified in the weekly ITM update.	<i>ULR#47 & FAM#10-ULR#48</i>
March 16 & 18	<i>Emails</i>	SES, CE, INX	FAM #10 – On March 16 the IEM issued a FAM to the contractor highlighting drainage issues that have been tracked in the weekly ITM since February 19, 2016. It was acknowledged that CE was working to resolve the issues; however, issue closure had yet to be achieved to the satisfaction of the IEM. The IEM also highlighted issues from FAM#8 pertaining to the ULRHEF downstream portal treatment system that have reappeared and requested an update on how the contractor plans to address WQ issues. On March 18, CE provided a response regarding the environmental issues in FAM#10.	<i>FAM#10-ULR#48#</i>
March 21	<i>Emails</i>	CE, SES, INX	Re: Management of excess wastewater – ULRHEF downstream portal. CE provided an email indicating that discharging water to the penstock sub-drain could not be successfully implemented; therefore, CE proposed to temporarily direct excess water from the sediment pond through a trench containing a perforated pipe surrounded by drain rock, which would be installed along the top of the penstock fill slope. This would be in place until CE could install new, appropriately sized, treatment ponds at	<i>FAM#10-ULR#48-</i>

Date	Communication Type	Participants	Issues Discussed	ITM ID No.
			<p>KM42.5 of the Lillooet River FSR. The IEM reviewed the updated ULRHEF Tunnel Waste Water Work Plan and provided conditional approval of the proposal. In response to the IEM's conditions, INX requested written confirmation that the Design Engineer had considered the potential issues posed by CE's proposal. The proposal was deemed to present too large a risk and not feasible. CE is working on sourcing an active water treatment system capable of handling the volume of water discharging from the ULRHEF downstream tunnel.</p>	
March 22	<i>Email</i>	INX, CE, SES, JEM	<p>Re: BDRHEF Spring Mountain Goat Timing Amendment update. INX provided the contractor with a summary of discussion points with MFLNRO regarding the issuance of a potential timing exemption.</p>	-
	<i>Email</i>	CE, SES, INX	<p>Re: Excess turbid water – ULRHEF downstream portal. CE issued an email indicating that they were actively in discussions with waste water treatment system suppliers to increase the treatment capacity of the system and the downstream portal, and that a solution and schedule for installation will be provided ASAP.</p>	<i>FAM#10-ULR#48</i>
March 24 & 25	<i>Email</i>	SES, CE, INX	<p>The IEM prepared and distributed FAM#11 to highlight ULRHEF downstream tunnel area material and water management concerns. CE responded to the three issues raised in FAM #11. See Section 4.3 for further details.</p>	<i>FAM#11-ULR#49</i>

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 is 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>
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 500m 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, KM38 Laydown, Access Roads & Lillooet River FSR

Activities:

- Routine maintenance of construction equipment within the mechanic shop and fuel management continued at the KM38 laydown. All hazardous 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 (Photo 1). 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.

- Ditch maintenance and the installation of a berm along the riverside edge of the Lillooet River FSR between KM40.9 and KM41.2 was completed during this reporting period to address concerns outlined in ITM ULR#47.

Environmental Summary:

- On March 14, CE completed repairs to rectify identified drainage concerns at KM41 of the Lillooet River FSR. The IEM requested that CE repair the ditch line and re-install the silt fence between KM40.9 and KM41.2 of the Lillooet River FSR. CE has temporarily installed a berm in lieu of silt fencing as the frozen ground made the silt fence key/anchor difficult to install. The current repairs have eliminated the contribution of sediment-laden water to the Lillooet River; therefore, the IEM has closed ITM ULR#47. Silt fence will be installed once ground conditions permit; this will be tracked in Section 4.6.
- Ditch armoring remains outstanding at KM49 of the Lillooet River FSR. On March 16, the IEM issued FAM#10 after road drainage discharging to the Lillooet River was over-range on the turbidity meter. This issue has been tracked as ITM ULR#43 since February 19, 2016. Repairs are required to prevent turbid runoff from discharging to the Lillooet and causing temporary exceedance of BCWQGs. CE responded to FAM#10 on March 18, indicating that the following repairs will be installed:
 - Re-dig and improve the ditch along the Lillooet River FSR (completed March 19, Photo 2) and install angular rock armoring once the material crushing/screening plant can produce it.
 - The ditch will end in a sump near where a new culvert was installed a week ago. The ditch will have check dams (when clean angular rock becomes available).
 - A second sump will be dug prior to the outlet to the Lillooet River. It was discussed that if water in the sump is discharging above BCWQGs a pump will be installed to direct sediment laden water to a vegetated area for infiltration.

Outstanding concerns outlined in FAM#10 will continue to be tracked as ITM ULR#43.

Photos:



Photo 1 – Hazardous materials stored at the KM38 laydown stored temporarily prior to off-site disposal (March 17, 2016).



Photo 2 – Snow removal and ditch maintenance near KM49 of the Lillooet River FSR (March 19, 2016).

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

Construction Activities:

- Consolidation and excavation of class 4CT material continued. Works included canopy tube drilling and grout injection operations, followed by the rounds of drilling and blasting in class 4CT material.
- CE completed the setup of the bulk CO₂ system and connections to the ULRHEF intake treatment system and setting ponds (Photo 3).
- Dewatering to ULRHEF intake sediment basins (Photo 3 - Photo 4).
- Snow removal (*i.e.* snow melting by spraying hot water) at the intake structure began as of March 23, 2016 (Photo 5).

Environmental Summary:

- During canopy tube installation, drilling, grout injection, and blasting all seepage water was directed to the ULRHEF intake sediment basins for treatment (Photo 3 & Photo 6). CE's environmental management team ensured that the active treatment system was functioning as intended and stocked with required water treatment chemical.
- The IEM visited the ULRHEF intake daily to conduct water quality monitoring during grout injection. During works, the IEM conducted sampling in the cells downstream of the treatment system and at the outlet to the Lillooet River. The water treatment was successful and water quality remained within project guidelines (pH 6.5 – 9; and, <8NTU over background) throughout the monitoring period. Water quality sampling data is available upon request.

Photos:



Photo 3 – Installation of the bulk CO₂ system to support the water treatment system at the ULRHEF intake was completed and active as of March 19, 2016.



Photo 4 – Discharge from ULRHEF sediment basins to Lillooet River during canopy tube installation (drilling) in the tunnel (March 22, 2016).



Photo 5 – Spraying hot water to melt snow at the ULRHEF intake structure (March 23, 2016).



Photo 6 – Canopy tube installation; a component of the umbrella support system being installed within the ULRHEF upstream tunnel (March 23, 2016).

4.3 Downstream Tunnel Portal

Construction Activities:

- Drilling, blasting, mucking and stabilization works (shotcrete application) continue within the tunnel.

Environmental Summary:

- The IEM conducted regular inspections of the active water treatment system and found that water discharging to Truckwash Creek was within BCWQGs during all inspections (Photo 7). Water quality data is available upon request.
- On March 14, 16-17, 20-23 and 25, the IEM observed that process water was bypassing the active water treatment system and was discharging from the ponds above BCWQGs (Photo 8). This issue was first identified and tracked as ITM *ULR#46*. With the increased volume of water, the situation appears to have worsened. The IEM acknowledges that CE has been attempting to find a solution to treating the excess water (CE proposed to discharge excess water to the penstock sub-drain or disperse it along the top of the penstock fill slope with a diffusion pipe; however, both options were deemed to present too high a risk and were denied by the Design Engineer). As the situation had not improved during the reporting period the IEM issued FAM#11 on March 24, 2016 to address the outstanding concern (ITM *ULR#49*). CE has indicated that they are sourcing a larger capacity treatment system capable of handling the increased amount of process water from the downstream tunnel portal.
- On March 24, the IEM discovered that CE might have pushed debris and snow beyond the work area limits and into the mountain goat UWR replacement area adjacent to the ULRHEF lower tunnel laydown. FAM#11 was prepared to highlight the IEM's concern and to request that CE assess whether any material was placed within the mountain goat UWR replacement area (*ULR#49*). CE attempted to remove as much material as possible and placed lock blocks to prevent further encroachment (March 25; Photo 9). CE will provide an assessment of any damaged caused to the area that may influence its use as suitable UWR replacement

area. The assessment will be completed once the snow fully melts. This issue will be tracked in the recommendation section until it is completed.

- On March 25, CE installed a concrete pad in front of culvert that is intended to intercept road and work site runoff and direct it to the active water treatment system. The fix was implemented to prevent the culvert from undermining (Photo 10; ULR#43).

Photos:



Photo 7 – Active water treatment system at the downstream tunnel infiltration ponds (March 22, 2016).



Photo 8 – Water continues to discharge from the ULRHEF downstream tunnel infiltration ponds despite the treatment system being active. The IEM is under the understanding that an upgraded water treatment system is on order (March 26, 2016).



Photo 9 – Some of the snow and material was removed that was pushed into the UWR mountain goat replacement area. CE will assess the area and develop a reclamation plan if necessary once the snow has melted (ULR #49; March 25, 2016).



Photo 10 – CE installed a concrete pad in front of culvert that is intended to intercept road and work site runoff and direct it to the active water treatment system (ULR#43; March 25, 2016).

4.4 **Powerhouse & Access Road**

Construction Activities:

- Some damage to the outside of the powerhouse was observed, which was caused by snow falling from the roof (Photo 11).
- Construction activities resumed with snow removal, formwork installation and manifold structure concrete pours at the ULRHEF powerhouse (Photo 12); dewatering to Lillooet River continues.

Environmental Summary:

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



Photo 11 – Minor snow damage resulting from snow sliding off the roof of the ULRHEF powerhouse (March 23, 2016).



Photo 12 – Concrete pour for the powerhouse manifold (March 25, 2016).

4.5 **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 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 the Lillooet River 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 (*). The table also presents the results of WQ sampling collected at both the ULRHEF intake and downstream tunnel portal water treatment systems.

Date	Time	Sample Location Description	pH	Turbidity (NTU)	Cond (µS)	Temp (°C)
Routine Water Quality						
March 17, 2016	12:31	ULR Background – ULRHEF Intake	7.8	4.0	-	3.8
	-	ULR #0.5 – Downstream of ULRHEF intake at Keyhole Bridge	No sample			
	11:08	ULR # 1 – Upstream of ULRHEF Powerhouse	7.2	2.6	-	3.1
	11:19	ULR #2 – Downstream of ULRHEF Powerhouse between KM 40.5 and KM 41	7.3	3.3	-	3.0
	10:39	ULR #3 – Lillooet River FSR KM 38 Laydown – D/S of Boulder confluence	7.6	0.4	-	1.6
	7:15	ULR #4 – Lillooet River FSR KM 24 – D/S of all works and Meager confluence	7.2	10.4	-	2.4
March 20, 2016	15:10	ULR Background – ULRHEF Intake	7.6	3.9	139	4.6
	14:46	ULR #0.5 – Downstream of ULRHEF intake at Keyhole Bridge	7.42	3.61	142	4.5
	15:46	ULR # 1 – Upstream of ULRHEF Powerhouse	7.8	4.8	140	5.6
	16:07	ULR #2 – Downstream of ULRHEF Powerhouse between KM 40.5 and KM 41	7.7	4.7	135	5.7
	16:30	ULR #3 – Lillooet River FSR KM 38 Laydown – D/S of Boulder confluence	7.6	-	119	5.0
	10:25	ULR #4 – Lillooet River FSR KM 24 – D/S of all works and Meager confluence	7.6	8.6	121	4.4

4.6 Recommendations

ITEM recommendations for the ULRHEF are as follows:

- All water from the ULRHEF upstream tunnel heading should be conveyed to the sediment basins for treatment. CE should perform regular monitoring to ensure that the water treatment system is functioning as intended and that discharge to the Lillooet River continues to meet BCWQGs.
- 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 water treatment system capacity should be assessed to prevent discharging process water above BCWQGs offsite (ITM *ULR#46* & *ULR#49*).
- Once the snow in the area melts, CE should assess whether deposited material within the mountain goat UWR replacement area has compromised the suitability of the potentially impacted area and undertake any remedial actions recommended by the QP (ITM *ULR#49*; FAM#11).
- CE should remove the earth berm and replace it with silt fencing between KM40.9 and KM41.2 of the Lillooet River FSR, once conditions permit.
- Ditch line armoring between KM48.5 and KM49 of the Lillooet River FSR, and along the lower tunnel portal access road remains to be completed. CE will install armoring once the screening/rock crushing plant can generate suitable material. (ITM *ULR#43* & *ULR#49*).

4.7 Upcoming Works

The following new and/or environmentally sensitive construction activities are scheduled to occur at the ULRHEF:

- Canopy tube installation, umbrella lattice structure installation, grout injection, drilling, and blasting in class 4CT material will continue at the ULRHEF upstream tunnel portal.
- Drilling, blasting and tunnel stabilization at the ULRHEF downstream tunnel.
- Dewatering to the ULRHEF intake sediment basins will continue.
- CE will consult with a QP prior to performing repairs needed at the outlet of the culvert at KM43.5 of the Lillooet River FSR to ensure protection of CTF during the works.

5.0 Boulder Creek Hydroelectric Facility – Monitoring Results

5.1 Intake & Diversion Tunnel

Construction Activities:

- No activity due to winter shutdown period.

Environmental Summary:

- No environmental issues were observed or reported at the BDRHEF intake during this reporting period.

5.2 Downstream Tunnel Portal and Powerhouse

Construction Activities:

- BDRHEF powerhouse electrical component installation (Photo 13).
- Drilling, blasting and tunnel stabilization in the downstream tunnel portal (Photo 14).
- Dewatering of the tunnel and powerhouse to the oil water separator and settling ponds continued (Photo 15).

Environmental Summary:

- All wastewater related to the BDRHEF tunnelling works continues to be conveyed to the downstream portal settling ponds for treatment (Photo 15). Water discharging from the sediment ponds empties to the perimeter ditch surrounding the spoil pile and continues to infiltrate to ground prior to reaching surface waters.

Photos:



Photo 13 – Conditions inside the powerhouse (March 24, 2016).



Photo 14 – BDRHEF downstream tunnel portal (March 24, 2016).



Photo 15 – BDRHEF sediment ponds (March 23, 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 Boulder Creek 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 (*).

Date	Time	Sample Location Description	pH	Turbidity (NTU)	Cond (uS)	Temp (°C)
Routine Water Quality						
March 17, 2016	-	BDR BG – Upstream of BDRHEF intake *not accessible*	-	-	-	-
	-	BDR #1 – Downstream of BDRHEF intake *not accessible*	-	-	-	-
	10:03	BDR #2 – Upstream of BDRHEF Powerhouse	6.8	10.5	77	1.6
	10:24	BDR #3 – Downstream of BDRHEF Powerhouse at Pebble Creek Bridge	7.7	2.9	-	1.4
March 20, 2016	-	BDR BG – Upstream of BDRHEF intake *not accessible*	-	-	-	-
	-	BDR #1 – Downstream of BDRHEF intake *not accessible*	-	-	-	-
	13:32	BDR #2 – Upstream of BDRHEF Powerhouse	7.6	0.7	87	3.7
	13:20	BDR #3 – Downstream of BDRHEF Powerhouse at Pebble Creek Bridge	7.6	2.5	89	4.2

5.4 Recommendations

IEM 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 at the BDRHEF:

- BDRHEF downstream portal tunnelling works will continue.
- Electrical 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

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 is 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 related 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) 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:		Work Item Open Work Item Complete Issue Closed					
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#43	OPEN	Road Drainage along the Lillooet River FSR between KM44.5 – KM49	Road run-off caused by rain and snowmelt is not being directed to roadside ditches and is eroding the running surface/contributing sediment to watercourses.	<ol style="list-style-type: none"> Address road drainage concerns between KM47.5 and KM48 to prevent further turbid water inputs to the fish-bearing stream at KM48. Update: CE installed a temporary cross-ditch to divert water away from the watercourse on February 19. Address road drainage concerns between KM44.5 - KM46 and along the ULRHEF downstream tunnel portal access road to prevent further turbid water inputs to Truckwash Creek. March 6: A ditch and cross ditching has been installed along the downstream tunnel portal access road and drainage is being directed to the ditch, oil/water separator and water treatment system. Address road drainage concerns between KM48 and KM49 to prevent further turbid water inputs to the Lillooet River at Keyhole Bridge. Update: March 6 CE has installed a sump adjacent to the Keyhole Bridge; however turbid water discharge at this location continues to result in exceedance of the BCWQGs. Update March 16 – The IEM issued <u>FAM#10</u> to address this outstanding concern. Ditch armoring remains outstanding and turbid water continues to discharge to the Lillooet River during period of heavy rain or increased snowmelt. March 26: Ditch armoring remains outstanding. 	February 19, 2016	February 26, 2016	-

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#46	OPEN	ULRHEF lower tunnel water treatment system	The active water treatment system at Truckwash creek is not sufficiently sized to treat all water emanating from the ULRHEF lower tunnel	<ol style="list-style-type: none"> 1. Address turbid & high pH water discharging to vegetation that is not being captured in the water treatment system. Update March 24 – FAM#11 was issued by the IEM to address this outstanding issue. 2. Water out letting from the ponds and down the bank may cause erosion and impact the Lillooet River Trail downstream. Assess and confirm that necessary repair work will be completed to stabilize areas that have been eroded due to runoff from this excess discharge. March 24 – FAM#11 was issued by the IEM to address this outstanding issue. 	March 6, 2016	March 14, 2016	-
ULR#47	CLOSED	KM41 of the Lillooet River FSR	Drainage and ditching requires maintenance to prevent turbid road run-off from discharging to the Lillooet River	<ol style="list-style-type: none"> 1. Repair ditches between KM40.5 – KM41.2 and ensure road runoff is directed to repaired ditch lines. Ditch lines have been opened and the culvert inlets have been cleaned. 2. Install silt fencing along the riverside edge of the FSR between KM41.2 - KM40.75. A berm has been installed temporarily to prevent road drainage from eroding the road edge. Silt fencing will replace the berm once the ground has thawed sufficiently. 	March 6, 2016	March 14, 2016	March 14, 2016
ULR#48	CLOSED	ULRHEF lower portal access road ditch & KM49 of the Lillooet River FSR (tracked in ULR#43)	<p><u>FAM#10</u> ULRHEF lower portal access road ditch discharging turbid water through mountain goat UWR replacement area and creating erosion of a steep bank prior to entering into Truckwash Creek.</p>	<p>CE armour ditches with clean angular rock and install velocity checks at spacing and configurations appropriate to the grade of the ditch line to settle suspended sediment and meet BCWQG criteria for turbidity prior to discharging water to Truckwash creek at a location that does not present erosion risk. Update March 25: CE installed two large infiltration sumps at the base of the ditch line. Should their capacity be insufficient a pump will be installed to direct flows to the water treatment system. <u>The ditch line armouring remains to be completed and will be tracked in the recommendation section of the report until it is completed.</u></p> <p>OR</p> <p>Redirect turbid flows to the ULRHEF lower tunnel water treatment system once the capacity issue is resolved.</p>	March 16, 2016	March 23, 2016	March 25, 2016

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#49	OPEN	ULRHEF lower portal and water treatment system	<p><u>FAM#11</u></p> <ol style="list-style-type: none"> It appears that CE may have pushed debris and snow beyond the work area limits and into the mountain goat UWR replacement area adjacent to the ULRHEF lower tunnel laydown. Turbid water continues to transport sediment into the mountain goat UWR replacement area which ultimately ends up in Truckwash Creek. The temporary ditch work that CE has completed is not functioning to ensure water quality meets the objective of the surface water quality protection plan. The active water treatment system at the ULRHEF downstream portal is not capable of handling the volume of water emanating from the tunnel and the excess water is discharging off-site in an untreated state. Water quality of this discharge is regularly above surface water quality guidelines for turbidity and pH. This water is also eroding a portion of the Lillooet River Trail. 	<ol style="list-style-type: none"> Please assess whether any material has been deposited within the mountain goat UWR replacement area. If there has been an encroachment, please ensure this material is removed and provided an assessment of any damage caused to the area that may impact its use as suitable UWR replacement area. Update March 25: CE removed some snow and debris and have placed lock blocks to prevent further encroachment into this area. An assessment will be completed once the snow fully melts. CE will remove any debris and proceed with reclamation of the area based on the results of the assessment. <u>This issue will be tracked in the recommendation section of the weekly environmental monitoring report until it is completed.</u> Please prevent sediment laden water from discharging to Truckwash Creek through the mountain goat UWR replacement area. Direct this water to the active water treatment system until work to armour the ditch line is performed and WQ flowing through it meets surface water quality objectives. All turbid water from the work area requires treatment prior to discharging to Truckwash Creek. Update March 25: CE installed two large infiltration sumps at the base of the ditch line. Should their capacity be insufficient a pump will be installed to direct flows to the water treatment system. The installation of a new system should be treated as a top priority. Until this new water treatment system is installed and functioning the IEM acknowledges that, some turbid water will be continuously discharging from the treatment ponds. As this water reaches the Lillooet River via surface connection, please ensure that a CO2 diffuser is installed to treat the pH of water prior to discharging off-site. Additionally, please perform all measures possible to treat turbidity in the discharge water. The IEM suggests installing Curlex wattles (not matting) as check dams along the drainage path at the base of the penstock fill slope. The check dam spacing should be determined according to the grade of the drainage path. Update March 25: A CO2 diffuser was installed to buffer elevated pH discharge that occurs during shotcrete application in the tunnel. 	March 24, 2016	March 31, 2016	-

No outstanding environmental issues (next ITM – BDR#28 & ULR#50)

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)

Project:	Upper Lillooet Hydro Project	FAM Number: (yyyy-mm-dd_FAM##)	2016-03-16_FAM#10
FAM Author:	Tom Hicks, Lead Monitor Sartori Environmental Services	Date of FAM Issuance:	March 16, 2016
Distribution List: (Name - Company)	To: Jean Pelletier, Jordan Gagne, Ian McKeachie, Lianne Leblond - CRT-ebc		
Environmental Incident Reports (EIR): (If applicable)	This FAM is not associated with an environmental incident; however, it outlines ESC and surface water quality issues that remain outstanding and have been tracked in the Issue Tracking Matrix for the past month (formally since February 19, 2016).		

Identified Environmental Issue(s):

Sediment laden water is being conveyed offsite from project access roads and ditch lines at KM49 and at the ULRHEF lower tunnel access road. These two areas have been identified as areas of concern for the past month and require immediate attention to prevent continued exceedance of surface water quality parameters in site discharge during wet weather and during the spring melt period.

See photos on the next page.

Requested Outcome(s)

In response to this FAM, the IEM requests that CE provide the IEM with the following:

1. Provide a plan to address the turbid discharge to the Lillooet River at KM49. The IEM recommends that CE armour ditches with clean angular rock and install velocity checks at spacing and configurations appropriate to the grade of the ditch line to settle suspended sediment and meet BCWQG criteria for turbidity.
2. Provide a plan to address the turbid discharge being conveyed offsite (through mountain goat replacement habitat and directly to Truckwash Creek) from the ditch lines along the ULRHEF lower tunnel portal access road. The IEM recommends that CE armour ditches with clean angular rock and install velocity checks at spacing and configurations appropriate to the grade of the ditch line to settle suspended sediment and meet BCWQG criteria for turbidity.

The implementation of the requested plans should be installed immediately to prevent continued exceedance of surface water quality parameters for the turbidity of site discharge.

Photos:



Photo 1 – Site discharge at KM49 being directed to the Lillooet River was over-range on the 2020we turbidity meter yesterday. (March 15, 2016)



Photo 2 – Turbid water flowing through mountain goat replacement area flows over the edge of a cliff and directly into Truckwash Creek. Turbidity of Truckwash Creek downstream of this input measured 1202AU on March 14, 2016 when background was below 8 NTU.



Photo 3 – Turbid site runoff flowing over the edge of a cliff directly to Truckwash Creek.



Photo 4 – Confluence of Truckwash Creek and the Lillooet River downstream of the Truckwash Creek pedestrian bridge.



FIELD ADVICE MEMO (FAM)

Project:	Upper Lillooet Hydro Project	FAM Number: (yyyy-mm-dd_FAM##)	2016-03-24_FAM#11
FAM Author:	Tom Hicks, Lead Monitor Sartori Environmental Services	Date of FAM Issuance:	March 24, 2016
Distribution List: (Name - Company)	To: Jean Pelletier, Jordan Gagne, Ian McKeachie, Lianne Leblond - CRT-ebc		
Environmental Incident Reports (EIR): (If applicable)	This FAM is not associated with an environmental incident; however, this may become an environmental incident if it is found that CE has encroached within the mountain goat UWR replacement area adjacent to the ULRHEF lower tunnel portal. This issue will be tracked in the Issue Tracking Matrix in the Weekly Environmental Monitoring Report.		

Identified Environmental Issue(s):

During an inspection of the ULRHEF lower tunnel portal work area the IEM observed multiple causes of concerns:

1. It appears that CE may have pushed debris and snow beyond the work area limits and into the mountain goat UWR replacement area adjacent to the ULRHEF lower tunnel laydown.
2. Turbid water continues to transport sediment into the mountain goat UWR replacement area which ultimately ends up in Truckwash Creek. In response to the IEMs concerns in this area CE has indicated that they will perform the necessary repairs once they are able to generate and process clean crushed rock to armour ditch lines upslope of the discharge location. The temporary ditch work that CE has completed (see photos) is not functioning to ensure water quality meets the objective of the surface water quality protection plan.
3. The active water treatment system at the ULRHEF downstream portal is not capable of handling the volume of water emanating from the tunnel and the excess water is discharging off-site in an untreated state. Water quality of this discharge is regularly above surface water quality guidelines for turbidity and pH. This water is also eroding a portion of the Lillooet River Trail. CE has explored additional options for treatment; however, these options have not been acceptable due to the risk they present to currently installed project infrastructure. The IEM understands the difficulty of the water treatment situation at the ULRHEF downstream tunnel portal that currently exists. CE has indicated that they are working with a water treatment system supplier to procure a system that is capable of treating the volume of water required. An assessment of damage to the Lillooet River Trail should be completed once the new water treatment system is installed and any restoration works that are required should be done in consultation with RSTBC.

Requested Outcome(s)

In response to the three concerns outlined in FAM#11, the IEM requests that CE provide the following:

1. Please assess whether any material has been deposited within the mountain goat UWR replacement area. If there has been an encroachment, please ensure this material is removed and provided an assessment of any damaged caused to the area that may impact its use as suitable UWR replacement area.
2. Please prevent sediment laden water from discharging to Truckwash Creek through the the mountain goat UWR replacement area. Direct this water to the active water treatment system until work to armour the ditch line is performed and WQ flowing through it meets surface water quality objectives. All turbid water from the work area requires treatment prior to discharging to Truckwash Creek.
3. The installation of a new system should be treated as a top priority. Until this new water treatment system is installed and functioning the IEM acknowledges that some turbid water will be continuously discharging from the treatment ponds. As this water reaches the Lillooet River via surface connection, please ensure that a CO2 diffuser is installed to treat the pH of water prior to discharging off-site. Additionally, please perform all measures possible to treat turbidity in the discharge water. The IEM suggests installing Curlex wattles (not matting) as check dams along the drainage path at the base of the penstock fill slope. The check dam spacing should be determined according to the grade of the drainage path.

Photos:



Photo 1 – Material deposited appears to be outside of the project area and within mountain goat UWR replacement area. (March 23, 2016)



Photo 2 – Measures installed by CE to treat turbid water in the ditch line are not functioning as intended. Please ensure all water from this ditch line is directed to the water treatment system until material required to fix the ditch line is available. (March 23, 2016)



Photo 3 – Turbid discharge that is not able to be fully captured by the active water treatment system at Truckwash Creek is being directed offsite, over the edge of a cliff, and ultimately connects to the Lillooet River. The discharge presents an ESC risk to downstream areas and exceeds BCWQGs for pH and turbidity. Please install appropriate ESC and pH mitigation measures until a large capacity water treatment system is installed. (March 23, 2016)