



Upper Lillooet Hydro Project

Weekly Environmental Monitoring Report #91

Reporting Period: March 27 – April 9, 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 24, 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) dated April 30, 2015
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
Water Sustainability Act Section 10(1) Use Approval dated March 24, 2016

ACRONYMS:

AMBNS	Active Migratory Bird Nesting Survey	IEM	Independent Environmental Monitor
Andritz	Andritz Hydro Canada Inc.	INX	Innergex Renewable Energy Inc.
ANFO	Ammonia nitrate fuel oil (industrial explosive)	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.	OGMA	Old Growth Management Area
CEMP	Construction Environmental Management Plan	OLTC	Occupational License to Cut
CTF	Coastal Tailed Frog	PAG	Potentially Acid Generating
DFO	Fisheries and Oceans Canada	QP	Qualified Professional
DS	Downstream	ROW	Right of Way
EAC	Environmental Assessment Certificate	RVMA	Riparian Vegetation Management Area
EAO	Environmental Assessment Office	SES	Sartori Environmental Services
Ecofish	Ecofish Research Ltd.	SLRD	Squamish-Lillooet Regional District
Ecologic	Ecologic Consulting	TX Line	Transmission Line
EIR	Environmental Incident Report	ULRHEF	Upper Lillooet Hydroelectric Facility
ESC	Erosion and Sediment Control	UWR	Ungulate Winter Range
FAM	Field Advice Memorandum	VC	Valued Component
FSR	Forest Service Road	WEL	Westpark Electric Ltd.
Golder	Golder Associates	WEMR	Weekly Environmental Monitoring Report
GWR	Mountain Goat Winter Range	WHA	Wildlife Habitat Area
Hedberg	Hedberg and Associates Ltd.	WQ	Water Quality
HWM	High water mark		
IE	Independent Engineer (True North Energy)		

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 27 – April 2, 2016	TH, SE, AS, DA	<p>Construction Camp, Laydown Areas, and the Lillooet River FSR</p> <ul style="list-style-type: none"> • Road and ditch maintenance on the Lillooet River FSR • Installation of silt fence from KM40.5 – KM41.2 <p>ULRHEF Intake & Upstream Tunnel</p> <ul style="list-style-type: none"> • Umbrella system excavation and consolidation (class 4CT) • Snow removal at ULRHEF intake <p>ULRHEF Downstream Tunnel Portal</p> <ul style="list-style-type: none"> • Drilling, blasting and tunnel stabilization • Preparation of new pad and installation of the new water treatment system <p>ULRHEF Powerhouse</p> <ul style="list-style-type: none"> • Dewatering of clean ground water seepage to the Lillooet River • Manifold rebar and formwork • Sediment pond construction <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"> • Continued electrical work <p>TX-Line</p> <ul style="list-style-type: none"> • No activity
April 3 – 9, 2016	SE, MC, TH, AS, DE	<p>Construction Camp, Laydown Areas, and the Lillooet River FSR</p> <ul style="list-style-type: none"> • Culvert repair at KM43 and culvert outlet armoring at KM43.3 • Road and ditch maintenance on the Lillooet River FSR <p>ULRHEF Intake & Upstream Tunnel</p> <ul style="list-style-type: none"> • Concrete works at intake structure • Grouting of canopy tubes (April 4 - 9) • Excavation of BEBO (precast arch) wall (April 5 – 9) <p>ULRHEF Downstream Tunnel Portal</p> <ul style="list-style-type: none"> • Drilling, blasting and tunnel stabilization (including shotcrete) <p>ULRHEF Powerhouse</p> <ul style="list-style-type: none"> • Dewatering of clean ground water seepage to the Lillooet River • Installation of second pump in preparation of tailrace excavation (April 8) • Excavation of powerhouse switch yard (April 5 – 6) • Formwork, rebar, and concrete works at ULRHEF switch yard (April 6 – 9) • Excavation of upstream tailrace side slope (April 9) <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 • Switchyard excavation and concrete works <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

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 28	Email	SES, INX	Re. ULHP: INN-766E Maximum jumping height of the Coho Salmon at ULR tailrace. SES was forwarded the INX tailrace design memo prepared as a guiding document for the CE design.	-
March 28 – March 29	<i>Emails</i>	SES, INX, CE	Re: Squamish Mills requested road building material. Discussions included project commitments regarding the use of ANFO blast rock, potential implications to surface water quality, and designation of responsibilities and liabilities.	-
March 29	<i>Email</i>	SES, INX, CE	Re: FAM#11 – ULRHEF downstream tunnel portal water quality concerns. CE provided an update indicating that a decision had been made on the supplier of the new water quality treatment system, and that the system would be operational by the end of the week.	<i>ULR#46 & ULR#49</i>
March 31 – April 1	<i>Email</i>	SES, INX, CE	Re. Temporary culvert KM38.6 and KM40.6 on FSR. Discussions included volumes of melt water flowing across the FSR at KM38.6 and KM40.6 resulting in erosion of the road surface and the installation drainage culverts as per work planning, execution and monitoring standards.	-
April 5	<i>Pre-work meeting</i>	SES, INX, CE	A pre-work meeting for the ULR Powerhouse Tailrace construction was held to review the Work Plan and discuss water management during the first stage of tailrace excavations.	-
	<i>Pre-work meeting</i>	SES, INX, CE	A pre-work meeting for excavation and concrete works for ULRHEF Intake open cut excavation below elevation 666m and the BEBO (precast arch) wall at the upper portal was held to discuss water management, and treatment of turbid and high pH water.	-
April 5 – 9	<i>Emails and Site Meeting</i>	SES, INX, CE, IE	The IEM identified concerns with proposed water treatment ponds constructed at the ULRHEF powerhouse. Concerns included the infiltration capacity and potential flow paths of infiltrating water, adherence to surface water quality commitments, the trapper cabin in close proximity to the ponds, and the protection of identified OGMA's and Class 1/2 summer grizzly bear forage habitat values. INX and the IE further echoed these concerns via email correspondence. On April 7, the IEM highlighted additional concerns regarding the unarmoured outlet of the ponds and adherence to the intents of CE's Erosion Prevention and Sediment Control Plan. CE responded on April 7, confirming that the outlet of the settling ponds would be armored prior to the settling ponds use. On April 9, CE provided photos of the armored outlet of the settling ponds.	-
April 6	<i>Pre-work meeting</i>	SES, INX, CE	A pre-work meeting for the repair of a damaged culvert at KM43 of the Lillooet FSR was held to discuss, staging of construction works, tailed frog salvages, and water management.	-

Date	Communication Type	Participants	Issues Discussed	ITM ID No.
	<i>Pre-work meeting</i>	SES, INX, CE	A pre-work meeting for the armoring of the KM43.5 culvert outlet was held to discuss the need for tailed frog salvages and water management.	-
April 7	<i>Pre-work meeting</i>	SES, INX, CE	A pre-work meeting for the expansion of the BDRHEF BC-5 spoil area was held to discuss the need for AMBNS and watercourse crossings. CE is to provide the IEM with QP verification that AMBNS are not required or that no active nests are present, prior to clearing any vegetation.	-
	<i>Emails</i>	SES, CE, INX	During a site visit, the IEM observed that the overflow from the Boulder Creek powerhouse/downstream tunnel portal water extraction point no longer discharged directly back to Boulder Creek. Instead the overflow discharged to a portion of the channel that is only wetted during high flow events. Due to this discharge, there is the potential for fish access to this portion of the channel. SES notified CE that prior to moving or stopping discharge a precautionary fish salvage will be necessary to ensure fish are not stranded.	-
	<i>Phone and Email</i>	SES, INX, CE	During a portion of tailrace construction activities CE was excavating within 50m of a known archaeological site located to the west of the powerhouse. CE did not require the supervision of an archaeological technician from the Lil'wat Nation because all initial ground disturbances had been previously monitored. The IEM reminded CE that construction works would need to be halted if any archeological artifacts were found during excavation.	-
April 7 – 9	<i>Email</i>	SES, INX, CE	During a site inspection, SES identified that the outside edge of the road had failed and compromised the wood-box culvert at ASTR-04 (Truckwash Bypass 2). The IEM requested that CE's QP prescribe an appropriate fix following assessment of the culvert. Additionally, the IEM requested that CE avoid hauling or travelling across this structure with heavy material or machinery to avoid further damage to the structure. CE responded on April 9, stating that the culvert had been assessed and that CE was in the process of producing a Work Plan to replace the culvert.	<i>ULR#50</i>
April 8	<i>Email</i>	CE, SES, INX, Ecofish	CE provided SES and INX with a memo from Ecofish stating that AMBNS were not required to clear vegetation for the Boulder spoil expansion.	-
April 9	<i>Email</i>	CE, SES, INX	Re. KM41.2 emergency culvert installation – On April 9, high flows triggered by snowmelt exceeded the capacity of the woodbox culvert along the Lillooet River FSR at KM41, which result in water overflowing to the ditch line and eroding a portion of the FSR at KM41.2. CE's night shift installed a temporary culvert to decrease flow within the ditch and prevent further erosion of the FSR. CE is in the process of developing a Work Plan to replace this temporary culvert with a permanent culvert which meets FSR specifications.	<i>ULR#51</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 500m 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 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.

Environmental Summary:

- On April 6, the damaged culvert at KM43 of the Lillooet River FSR was repaired. Ecofish installed isolation netting and conducted a CTF salvage prior to beginning the repair work; no individuals were observed. The IEM monitored construction activities and conducted WQ during culvert replacement (Photo 1 to Photo 4). Short periods of elevated turbidity were observed during diversion pump installation, culvert removal, replacement and dewatering. Exceedances are highlighted in Section 4.5 Water Quality Results. Turbidity exceedance at the downstream monitoring location lasted no longer than 30 minutes and no environmental issues were observed over the course of these works.
- On April 7, the IEM monitored the armouring of the culvert outlet of ASTR-03 at KM43.3 of Lillooet River FSR (Photo 5). All work was conducted outside of the wetted channel, no WQ exceedances were observed and there were no environmental incidents associated with these works. Please see Section 4.5 for water quality sampling results.
- During a site inspection on April 7, 2016, SES identified that the outside edge of the road had failed and compromised the wood-box culvert at ASTR-04 (Penstock Access/Truckwash 2 road). The IEM requested that CE's QP prescribe an appropriate fix following assessment of the culvert (ITM *ULR#50*). Additionally, the IEM requested that CE avoid hauling or travelling across this structure with heavy material or machinery to avoid further damage to the structure. CE responded on April 9, stating that the culvert had been assessed and that CE was in the process of producing a work plan to replace the culvert.
- On April 9, CE completed emergency works to install a temporary culvert across the Lillooet River FSR at KM41.2. High flows triggered by snowmelt exceeded the capacity of the woodbox culvert at KM41.2, which result in water overflowing to the ditch line and eroding a portion of the Lillooet FSR near KM41. CE's night shift installed a temporary culvert to decrease flow within the ditch line and to protect the road from further erosion. The culvert is considered temporary as it does not meet FSR standards, and a permanent solution will be determined in consultation with the IEM, CE and INX (ITM *ULR#51*). The IEM was not onsite to monitor these works as they occurred on night shift, however the site will be inspected in the following reporting period to confirm that no environmental impacts occurred.
- CE removed the earth berm and replaced it with silt fencing between KM40.9 and KM41.2 of the Lillooet River FSR, during the night shift on March 28, 2016. The IEM was onsite to monitor the works as the activity was occurring within 30m of the Lillooet River (Photo 6).

Photos:



Photo 1 – Damaged culvert at KM43 of the Lillooet River FSR (April 7, 2016).



Photo 2 – CTF salvage prior to culvert repair at KM43 of the Lillooet River FSR (April 7, 2016).



Photo 3 – Turbid water associated with the placement of diversion pump at KM43 (April 7, 2016).



Photo 4 – KM43 culvert repair completed (April 7, 2016).

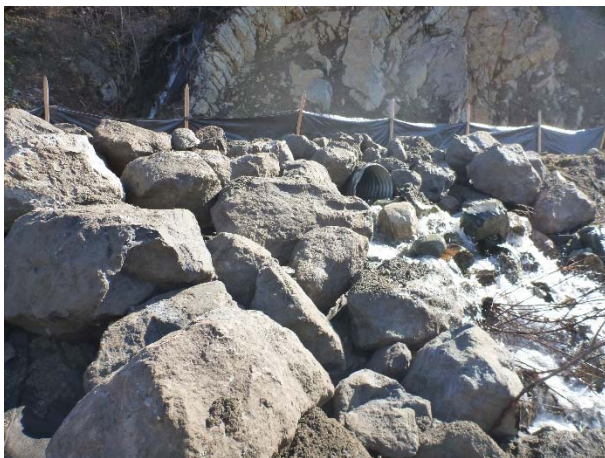


Photo 5 – Armouring of culvert outlet on ASTR-03 (April 7, 2016).

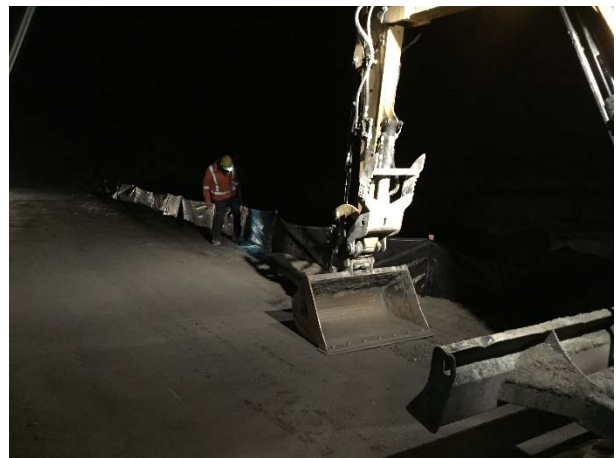


Photo 6 – Silt fence installation between KM40.9 and KM41.2 of the Lillooet River FSR (March 28, 2016).

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.
- Dewatering to ULRHEF intake sediment basins (Photo 7).
- Excavation for the BEBO (precast arch) connection wall between the intake structure and the upper portal began on April 6, 2016.

Environmental Summary:

- During canopy tube installation, drilling, grout injection, and excavation all seepage water was directed to the ULRHEF intake sediment basins for treatment (Photo 7 and Photo 8). CE's environmental management team ensured that the active treatment system was functioning as intended and was maintained on a regular basis.
- The IEM visited the ULRHEF intake daily to conduct water quality monitoring during grout injection and tunnel excavation works. During works, the IEM conducted sampling in the last cell of the treatment system (Pond 7) and/or at the outlet to the Lillooet River (Discharge to Lillooet River) to document the efficiency of the system. Water treatment was successful and water quality within the Lillooet River at the downstream compliance point (Keyhole Bridge) remained within project guidelines (pH 6.5 – 9; and, <8 NTU over background) throughout the monitoring period, with the exception of an exceedance on April 8, 2016 as noted below. Water quality sampling results are available upon request.
- On April 8, water discharging from the BEBO (precast arch) wall excavation was turbid (NTU = 37.6) and was being pumped directly to the Lillooet River without treatment. The IEM notified CE that downstream water quality within the Lillooet River was 9.2 NTU over background (>8 NTU), exceeding BCWQG. CE immediately diverted water back to the treatment ponds. Typically, clean water that is not contaminated by excavation or concrete/grouting activities is conveyed directly back to the river as to not add unnecessary volumes to the treatment system. No WQ measurements were taken downstream at the compliance point to indicate WQ had returned to within BCWQGs; however, the IEM is confident that the problem was rectified as the pond discharge to the Lillooet River was measured within 0.2 NTU of the measured background Lillooet River turbidity levels immediately after the pumps had been switched.

Photos:



Photo 7 – Dewatering of upper portal water into treatment system (April 2, 2016).



Photo 8 – Pond 6 and 7 of upper tunnel water treatment system (April 2, 2016).

4.3 *Downstream Tunnel Portal*

Construction Activities:

- Drilling, blasting, mucking and stabilization works (shotcrete application) within the tunnel.
- On April 2, 2016, CE completed the installation of a new active water treatment system to treat the full volume of water discharging from the ULRHEF downstream tunnel (Photo 9, Photo 10). The system was installed on a pad near the ASTR-03 penstock crossing. The outlet hoses passively discharge directly to the watercourse (ASTR-03) which is non-fish bearing and non-CTF.

Environmental Summary:

Process water continued to bypass the active water treatment and discharge water offsite above BCWQGs until a new treatment system was installed and operational (April 2, 2016; Photo 9). This issue was first identified and tracked as ITM ULR#46. The IEM acknowledges that CE worked quickly to acquire the services of a water treatment company and install a larger system after all other options had been explored and deemed not feasible. Following the installation of the new treatment on April 2, all water from the downstream tunnel was effectively treated and measured to be within BCWQGs. CE has addressed concerns identified and tracked in the ITM table (ULR#46, FAM#11; ULR#49). Daily water quality sampling results are available upon request.

Photos:



Photo 9 – ULRHEF downstream tunnel treatment system, installed on April 2, 2016.



Photo 10 – Outlet hoses from the new water treatment system discharge directly to ASTR-03 (April 2, 2016).

4.4 ***Powerhouse & Access Road***

Construction Activities:

- Construction crews completed the switchyard excavation.
- Formwork, rebar installation, and concrete works for the switchyard structures (Photo 11).
- Excavation of the top of the natural earth berm separating the Lillooet River from the tailrace footprint began above HWM during this reporting period. The excavation was required to permit excavation for the tailrace itself. The excavation began following a pre-work meeting and under IEM supervision on April 8, 2016 (Photo 12).

Environmental Summary:

- The IEM monitored the excavation of the ULRHEF tailrace that occurred within 15 m of the Lillooet River (Photo 12). An excavator equipped with biodegradable hydraulic oil performed the excavation. No rocks or excavated material entered the Lillooet River during this construction activity.

Photos



Photo 11 – Installation of formwork and rebar for the powerhouse switch yard (April 8, 2016).



Photo 12 – Excavation of the top of the natural earth berm separating the ULRHEF tailrace from the Lillooet River (April 8, 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.

Routine Water Quality						
Date	Time	Sample Location Description	pH	Turbidity (NTU)	Cond (µS)	Temp (°C)
March 31, 2016	14:00	ULR Background – ULRHEF Intake	7.3	12.0	112	5.1
	14:15	ULR #0.5 – Downstream of ULRHEF intake at Keyhole Bridge	7.3	11.4	109	4.2
	15:10	ULR # 1 – Upstream of ULRHEF Powerhouse	7.5	14.0	108	5.3
	15:35	ULR #2 – Downstream of ULRHEF Powerhouse between KM 40.5 and KM 41	7.3	13.7	106	5.2
	17:10	ULR #3 – Lillooet River FSR KM 38 Laydown – D/S of Boulder confluence	7.2	13.1	93	5.3
	11:10	ULR #4 – Lillooet River FSR KM 24 – D/S of all works and Meager confluence	7.4	28.6	99	5.1
April 7, 2016	10:46	ULR Background – ULRHEF Intake	7.58	16.3	-	3.4

Routine Water Quality						
Date	Time	Sample Location Description	pH	Turbidity (NTU)	Cond (µS)	Temp (°C)
	11:00	ULR #0.5 – Downstream of ULRHEF intake at Keyhole Bridge	7.97	18.8	-	3.3
	12:39	ULR # 1 – Upstream of ULRHEF Powerhouse	8.0	14.9	-	6.1
	12:50	ULR #2 – Downstream of ULRHEF Powerhouse between KM 40.5 and KM 41	7.9	12.5	-	6.1
	18:02	ULR #3 – Lillooet River FSR KM 38 Laydown – D/S of Boulder confluence	7.9	8.2	-	6.6
	18:34	ULR #4 – Lillooet River FSR KM 24 – D/S of all works and Meager confluence	7.9	20.8	-	8.4
Water Quality for Specific Works						
Culvert repair at KM 43 on Lillooet River FSR						
April 6	8:30	KM 43 Creek (background)	-	6.3	-	-
	8:42	Downstream of construction works	-	32.9	-	-
	8:45		-	8.5	-	-
	9:00		-	3.5	-	-
	11:14		-	5.1	-	-
	11:16		-	815 AU	-	-
	11:18		-	19.8	-	-
	11:22		-	32.0	-	-
	11:31		-	8.5	-	-
	11:43		-	0.4	-	-
	13:50		-	1.8	-	-
	14:40		-	857 AU	-	-
	14:47		-	31.6	-	-
	14:52		-	36.2	-	-
	15:04		-	17.5	-	-
15:12	-		8.7	-	-	
ASTR-04 at KM 43.3						
April 7	8:30	ASTR-04 (background)	-	0.6	-	-
	8:35	Downstream of construction works	-	0.9	-	-
	8:45		-	1.9	-	-
	9:15		-	4.7	-	-
	9:35		-	2.4	-	-
	9:45		-	1.1	-	-
	10:00		-	0.8	-	-

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 regularly monitor the new water treatment system installed to treat water emanating from the ULRHEF downstream tunnel to ensure the system is functioning as intended and that discharge into ASTR-03 continues to meet BCWQGs. The water treatment system capacity should be regularly assessed to ensure the system can handle the necessary volumes of water and to prevent discharging process water above BCWQGs offsite (ITM ULR#46 & ULR#49 are now considered closed). An assessment of the Lillooet River Trail should be performed to determine the extent of erosion caused by water discharging offsite once the snow melts from the area.
- 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).
- Ditch line armouring between KM48.5 and KM49 of the Lillooet River FSR, and along the downstream tunnel portal access road remains to be completed. CE will install armouring 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:

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

Environmental Summary:

- All wastewater related to the BDRHEF tunnelling works continued to be contained and conveyed to the downstream portal settling ponds for treatment. 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 – Current conditions at the BDRHEF tunnel portal, powerhouse, and switch yard (April 04, 2016).



Photo 14 – BDRHEF downstream portal settling ponds (April 04, 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 31, 2016	-	BDR BG – Upstream of BDRHEF intake <i>*not accessible*</i>	-	-	-	-
	-	BDR #1 – Downstream of BDRHEF intake <i>*not accessible*</i>	-	-	-	-
	16:35	BDR #2 – Upstream of BDRHEF Powerhouse	7.2	9.4	73	5.9
	16:50	BDR #3 – Downstream of BDRHEF Powerhouse at Pebble Creek Bridge	7.2	12.3	72	5.5
April 7, 2016	-	BDR BG – Upstream of BDRHEF intake <i>*not accessible*</i>	-	-	-	-
	-	BDR #1 – Downstream of BDRHEF intake <i>*not accessible*</i>	-	-	-	-
	15:20	BDR #2 – Upstream of BDRHEF Powerhouse	7.8	14.9	-	6.1
	15:30	BDR #3 – Downstream of BDRHEF Powerhouse at Pebble Creek Bridge	7.9	12.5	-	6.1
April 8, 2016	-	BDR BG – Upstream of BDRHEF intake <i>*not accessible*</i>	-	-	-	-
	-	BDR #1 – Downstream of BDRHEF intake <i>*not accessible*</i>	-	-	-	-
	14:10	BDR #2 – Upstream of BDRHEF Powerhouse	8.3	24.2	-	8
	14:17	BDR #3 – Downstream of BDRHEF Powerhouse at Pebble Creek Bridge	8.3	28.7	-	7.7

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

- o 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 March 2016.

Upper Lillooet Hydro Project - Wildlife Observation Form					
Date	Time	Observer (Company)	Species or Description	Location	Comments
2/3/2016	8:30	McKenzie Lee	Juvenile Moose	10.5KM Lillooet River FSR	Fleeing
20/03/2016	11:30	Ian McKeachie (CRT)	Coyote	0.25KM Camp Road	Fleeing

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 noise monitoring equipment was removed on December 15 and will be re-installed when works resume in 2016.
- 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:
 - o 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) 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 and 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. April 9: 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	CLOSED	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. Update April 2: A new treatment system was installed and discharge is directed to ASTR-03. 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. Update April 2: Water stopped out-letting from the ponds once the new water treatment system became operational. The assessment and potential repair work necessary for the Lillooet River Trail is pending snowmelt and will be tracked in Section 4.6. 	March 6, 2016	March 14, 2016	April 2, 2016
ULR#49	CLOSED	ULRHEF lower portal and water treatment system	<p><u>FAM#11</u></p> <ol style="list-style-type: none"> 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. 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. 	<ol style="list-style-type: none"> 1. 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 provide an assessment of any damaged 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> 2. 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. 	March 24, 2016	March 31, 2016	April 2, 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 <i>(continued)</i>	CLOSED	ULRHEF lower portal and water treatment system	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.	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. Update March 25: A CO2 diffuser was installed to buffer elevated pH discharge that occurs during shotcrete application in the tunnel. Update April 2 - Installation of a new water treatment system was completed to handle the increased volume of water discharging from the downstream tunnel. Water stopped out-letting from the ponds once the new water treatment system became operational.	March 24, 2016	March 31, 2016	April 2, 2016
ULR#50	OPEN	ASTR04 Woodbox Culvert at penstock access road crossing	A failure of the outside edge of the road has occurred and the whole woodbox structure appears to be compromised. Water is now ponding on the upstream side of the crossing.	Assess the woodbox culvert and develop a plan to replace it with QP designed crossing structure during the instream work window or according to the recommendations of a QP if it has been compromised.	April 7, 2016	April 21, 2016	-
ULR#51	OPEN	Woodbox Culvert at KM41.2 if the Lillooet River FSR	The watercourse over topped the woodbox culvert requiring emergency works to install an additional culvert next to the woodbox to handle the additional flow. The woodbox culvert may have been compromised by the additional flows and the temporary culvert installed as an emergency measure may need to be extended.	Assess the woodbox culvert and develop a plan to replace it with QP designed crossing structure during the instream work window or according to the recommendations of a QP if it has been compromised	April 8, 2016	April 22, 2016	-
No outstanding environmental issues (next ITM – BDR#28 & ULR#52)							

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>								