BC Hydro
Power smart

Acid Rock Drainage and Metal Leachate Management Plan – Water Quality Annual Report: January 1 to December 31, 2022

Site C Clean Energy Project

March 31, 2023

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Acronyms

ABA	acid base accounting
AFDE	Aecon, Flatiron, Dragados, and EBC
AG	Acid Generating
ARD/ML	acid rock drainage/metal leaching (or leachate)
BCWQG	British Columbia Water Quality Guidelines for Protection of Aquatic Life
CEMP	construction environmental management plan
CVC	conventional vibrated concrete
DOC	diversion outlet cofferdam
DTIP	diversion tunnel inlet portal
DTOP	diversion tunnel outlet portal
EAC	Environmental Assessment Certificate
EOP	end of pipe (in relation to discharge limits)
EPP	environmental protection plan
IDZ	initial dilution zone
IEM	Independent Environmental Monitor
LB	left bank (of the Peace River, when facing downstream)
LBCD	left bank cofferdam
LBDA	left bank draiange adit
LBDT	left bank drainage tunnel
LBEX	left bank excavation
MCW	main civil works
MWTF	mobile water treatment facility
Non-PAG/NPAG	non-potentially acid generating
PAG	potentially acid generating
PRHP	Peace River Hydro Partners
RB	right bank (of the Peace River, when facing downstream)
RBDT	right bank drainage tunnel
RCC	roller compacted concrete
RSEM	relocated surplus excavated materials (area)
SBIAR	south bank initial access road
TSS	total suspended solids
QP	Qualified Professional

1. ACID ROCK DRAINAGE AND METAL LEACHATE MANAGEMENT PLAN

1.1 Background and Reporting Requirements

The Acid Rock Drainage and Metal Leachate Monitoring Plan has been developed in accordance with the following regulatory conditions:

- Condition 7 of the Site C Project's Federal Decision Statement, issued to BC Hydro on October 14, 2014 and re-issued November 25, 2014, which requires BC Hydro to:
  - "…develop, in consultation with Environment Canada and Natural Resources Canada, a water quality management plan to address environmental effects to the aquatic environment from the Designated Project, including acid rock drainage and metal leaching."
- Condition 3 of the Site C Project's Environmental Assessment Certificate, (EAC #E14-02), issued to BC Hydro on October 14, 2014, which requires BC Hydro to:
  - "…. develop a water quality monitoring program, [which] must be detailed in the Acid Rock Drainage and Metal Leachate Management Plan."

The Site C Project's Construction Environmental Management Plan (CEMP; Revision 10 dated March 9, 2022), Appendix E – Acid Rock Drainage and Metal Leachate Management Plan (Version 6.0, January 17, 2022) fulfills the requirements of the water quality management plan referenced in the above conditions.

This update satisfies the annual reporting requirements specified by these conditions, covering the reporting period from January 1 to December 31, 2022.

We acknowledge this work is being conducted on the traditional territory of Treaty 8 First Nations of Dunne Zaa, Cree and Tse'khene cultural descent.

2. OVERVIEW OF SITE ACTIVITIES IN 2022

2.1 General Description of Site Activities

Site C construction activities continued through 2022, the seventh full year of construction that was initiated in July 2015 and is scheduled to be completed in 2024. The general progression of construction has involved site preparation and construction of access roads, preparation of Relocated Surplus Excavated Materials (RSEM) disposal areas and excavations on both banks of the Peace River, and excavation of twin diversion tunnels on the left bank.

The river was diverted through the diversion tunnels as scheduled in Q3 2020, the isolated section of the river channel was dewatered, and the dam core was placed, compacted and reached an elevation of 445 masl in 2022. Once the dam core is in place to its final elevation, the dam, generating station, and spillways will be completed.

There was no new excavation on the Left Bank in 2022. A cumulative total of just over 1.6M m^3 of material has been placed on the Left Bank, of which more than 1.5M m^3 (more than 90%) has been placed in RSEM L5 and the RSEM L5 Extension.

Bedrock material excavation and disposal was tracked throughout 2022, and details of the construction areas and material disposal are presented in Section 2.5. The primary excavation areas (97% of total excavation) were from the Approach Channel and Spillway, and the remining excavation were in the Earthfill Dam area, mostly from the temporary ramps and dam core blanket. On the Right Bank, most of the material was placed in RSEM Area R5A. Material from the Earthfill Dam area was typically placed in Zone 8.

The location of construction areas and water management structures relevant to ARD/ML material management are described below and are shown on Figure 1 (dam site) and Figure 2 (off dam site). On the dam site, the areas are categorized per their location on the Right (south) Bank or Left (north) bank of the Peace River, and are listed by excavation site, followed by permanent storage facility. Complete details of the site activities related to ARD/ML, including material excavation, placement, mitigation and monitoring programs should be referenced in the attached appendices.

2.2 Environmental Protection Plans (EPPs)

Each construction area is required to have a BC Hydro approved environmental protection plan (EPP) which describes ARD/ML mitigation and management plans relevant to the site work as per Appendix E of the CEMP. A chance find procedure is included in the EPP document where exposure or disturbance of bedrock is not anticipated as part of the construction activities. As of December 31, 2022 (cumulatively since the start of project construction), 1,884 EPPs (including revisions) have been reviewed by BC Hydro covering all contractors and scopes of work. In the calendar year 2022, 278 of these EPPs (including revisions) were submitted to and reviewed by BC Hydro). Implementation of these plans is the responsibility of site contractors, and is overseen by BC Hydro, the Independent Environmental Monitor (IEM) and ARD/ML Qualified Professionals (QPs).

2.3 ARD/ML Mitigation Hierarchy

Mitigation measures implemented to minimize exceedances of discharge limits due to ARD/ML include material management (e.g. excavating or covering bedrock exposure), water management to contain water that may be influenced by ARD/ML, and water treatment to neutralize pH and remove total and dissolved metals.

The primary mitigation strategy for ARD/ML is material management to limit exposure of potentially acid generating (PAG) material and the generation of PAG contact water that may trigger the implementation of additional water management. Weathered material that has been exposed for several months and is becoming acidic is monitored to determine when mitigation is required. PAG bedrock monitoring is discussed in Section 2.4. In addition, material that is placed in RSEM disposal areas is monitored, and weathered material is covered with recently excavated bedrock or overburden. The majority of PAG and AG material will be stored within

the future reservoir footprint. This is to slow reaction rates, and ARD/ML to minimal levels, once the material is permanently submerged in the reservoir.

The secondary mitigation strategy is water management, including diversion of non-contact runoff from above the project to bypass the construction site, such as Garbage Creek, and retaining as much contact water as possible within the site. Water that must be released is directed to RSEM sediment control ponds or monitored and discharged from the associated rock cut location, from where it is discharged to the Peace River. The construction of two pipelines to facilitate the pumping of R5B Phase 2 Sump water to RSEM R5A Pond A, the RSEM R6 ponds or to the water treatment plant (WTP) greatly improved the water management system at site and decreased the risk of discharging non-compliant water to the Peace River.

The tertiary mitigation strategy is water treatment, wherein contact water not anticipated to meet end of pipe (EOP) discharge limits is conveyed to the MWTF which is positioned at RSEM Area R6 and discharges treated effluent through a series of sludge settling cells and ultimately to the RSEM R6W sediment pond. On July 8th, 2022, the mobile water treatment facility (MWTF) operated by Ensero Solutions was replaced by the WTP metal precipitation facility operated by PRHP. The MWTF and WTP effectively treated water to remove dissolved metals and produced RSEM EOP effluent that met the Discharge Limits in 2022.

The implementation of various erosion and sediment control measures at site has reduced the frequency of TSS-related exceedance of EOP discharge limits from RSEM Area sediment ponds since the monitoring program was initiated in autumn 2016.

2.4 PAG Bedrock Monitoring

On the dam site, ARD/ML monitoring is undertaken in areas where bedrock is excavated or where these materials are deposited. Appropriate sampling locations are determined as construction activities proceed rather than routinely sampling at fixed monitoring stations.

Contractors are each responsible for their respective work areas on the MCW site and have their own QP (ARD/ML) for monitoring, management and mitigation of PAG excavation areas. The primary contractor on the MCW site is Peace River Hydro Partners (PRHP) and their QP (ARD/ML) is Lorax Environmental (Lorax). AFDE is responsible for limited areas on the MCW including L2 and the Powerhouse. Any PAG excavated by AFDE is managed within the PRHP RSEMs and AFDE does manage PAG or PAG contact water within their scope on the MCW site.

Geochemical analysis of samples collected during the monitoring program include rinse pH measurements to determine surface pH, as well as acid-base accounting (ABA) and solid phase metals analysis. Rinse pH monitoring is generally focused where samples were previously identified to produce circumneutral to alkaline drainage (rinse pH > 5.5). Where acidic drainage is prevalent, ARD mitigation strategies are identified and recommended.

The geochemical testing program was effective at identifying the onset of ARD/ML, and at identifying areas where mitigation is needed, or is likely to be required.

Details of the PAG bedrock monitoring program is presented in Lorax report (Appendix A). A brief summary of the program is presented below, with sample locations and sample numbers analyzed presented in Table 1.

- In 2022, a total of 181 samples were collected for rinse pH analysis from the Earthfill Dam and the Left and Right Banks.
- Approximately 15% of the samples underwent geochemical testing including ABA and metals analysis.
- Left Bank samples collected from exposed surfaces in acid generating (AG) material were identified in RSEM Area L5 and the Left Bank Excavation (LBEX). RSEM Area L5 is mostly covered with NPAG material, which restricts widespread ARD development from facility. However, the final reconfiguration of the RSEM and placement of cover material is yet to be completed.
- Rinse pH monitoring in Zone 8 of the Earthfill Dam indicated that the proportion of acidic rinse pH samples from this area increased as the year 2022 progressed. Although there was exposed weathered bedrock in Q4 2022, there were no significant precipitation events that produced acidic runoff prior to onset of winter and freezing conditions.
- On the Right Bank, AG material was identified in the bedrock exposures within the RSEM Area R5B catchment, RSEM Area R5A and the temporary stockpile at the west end of the Approach Channel.

In 2022, geochemical sampling was completed by PRHP personnel with guidance provided by Lorax. The majority of sampling occurred during three rounds of sampling in May, August October 2022. In total, 181 samples were analyzed for rinse pH; of these, 27 samples underwent more extensive geochemical testing including ABA and metals analysis (Table 1).

Table 1: Overview of Sample Distribution and Analyses Conducted in 2022

Location	Rinse pH	ABA and Metals
Left Bank		
RSEM Area L5	29	3
Left Bank Excavation	11	2
Earthfill Dam		
Zone 8	31	3
Right Bank		
RSEM Area R5A	75	16
RSEM Area R5B West exposure	14	2
Approach Channel Temporary Stockpile	21	1
Total	**181**	**27**

The 2022 sampling plan recommends that new and confirmatory samples are collected from the major active and inactive excavation sites, RSEM deposition areas, and temporary PAG stockpiles. This sampling will direct water management and material handling and storage strategies such as the placement of a cover or fresh PAG within RSEM areas. Additional recommendations were provided to PRHP in support of Q3 and Q4 sampling.

2.5 Dam Site Activities Related to PAG Material Management

2.5.1 Right Bank PAG Material Management & Excavation

Excavations In 2022, a total of 2,000,655 m^3 of PAG bedrock was excavated. Right Bank excavation (1,936,824 m^3) was primarily from the Approach Channel and Spillway, and Earthfill Dam area (63,831 m^3) mostly from the temporary ramps and dam core blanket. Relatively minor quantities were excavated from the Right Bank Drainage Tunnel (330 m^3), RSEM Area R5B (240 m^3) and Right Bank Foundation Enhancement (RBFE) Area and Tailrace (47,175 m^3). See Appendix A for full breakdown of excavation volumes from different locations.

Material excavated in 2022 was placed primarily in RSEM Area R5A and Zone 8 within the Earthfill Dam footprint.

The cumulative volumes of material placed in RSEM areas at the end of 2022:

- 7,481,243 m^3 of PAG bedrock in RSEM Area R5A and Starter Dyke; and
- 363,847 m^3 remaining in RSEM Area R5B, which is covered by non-PAG material.

In Q1 2022, a large area of weathered PAG bedrock was excavated from the Approach Channel. This excavation resulted in unweathered PAG bedrock exposures in the Approach Channel excavation area and storage locations in RSEM Area R5A, R5B Temporary Stockpiles and Zone 8 in the Earthfill Dam. During the remaining portion of 2022 much of the PAG bedrock exposed in the Approach Channel was covered by the construction and placement of the final Approach Channel surface.

The major excavation from the Approach Channel was progressively covered by concrete and fill cover that will form the final surface during operation of the facility. The temporary PAG stockpile in the Approach Channel area became progressively AG. This temporary stockpile was removed from the Approach Channel by the end of 2022 and relocated to permanent storage areas.

The R5B Temporary Stockpile was removed and relocated to permanent storage in Q4 2022.

Weathered PAG material was excavated or covered to minimize potential ARD/ML on both the Earthfill Dam and Right Bank. In 2022, the risk from PAG exposed in Zone 8 and RSEM R5A was partially mitigated through the ongoing placement of fresh PAG to limit exposure of weathered material. The weathered PAG rock in RSEM Area R5A was partially relocated to the West Expansion and Central Expansion areas in Q4 2022. However, at the end of 2022, significant areas of weathered PAG remained exposed in RSEM Area R5A and Zone 8 within the Earthfill Dam. Additional material relocation is scheduled within RSEM Area R5A in 2023.

Weathered bedrock was also excavated from the Approach Channel in preparation of placing the final channel surface layers. Although PRHP has passed the control of the Approach Channel construction to AFDE, PRHP control ponds and sumps receive PAG contact water from this construction area.

AG material was identified in the bedrock exposures within the RSEM Area R5B catchment, RSEM Area R5A and the Approach Channel West Temporary Stockpile in 2022. AG exposures remain in the western extent of the Approach Channel at the end of 2022. Runoff from these areas is intercepted and directed to the R5B Phase 2 Sump and ultimately the MTP, if required.

2.5.2 Right Bank RSEMs and Catchment Areas

Non-contact water is diverted away from the Right Bank construction areas by two diversion ditches. Non-contact water above RSEM Area R5A is diverted to the Moberly River in the east and the Peace River in the west end of the area by the R5A Diversion Ditch. Non-contact water upstream of the Substation Laydown, Approach Channel and RSEM Area R5B is diverted in the Right Bank Diversion Ditch to the Moberly River confluence with the Peace River adjacent to RSEM Area R5B. Below the diversion ditches, there are five catchment areas within the construction site on the Right Bank.

Below the diversion ditches, there are five catchment areas within the construction site on the Right Bank.

There are three catchment RSEM areas within the construction site on the Right Bank:

- RSEM Area R6 (which includes Area 20/21, the RBDT and associated facilities to the south, and Earthfill Dam, as well as the Approach Channel above it), from which contact water is conveyed to the RSEM Area R6 sediment ponds.
- RSEM Area R5A (which includes the area where the majority of excavated PAG material will be deposited on the west side of the Moberly River), from which contact water is conveyed to the RSEM Area R5A sediment ponds. Water is periodically pumped between the ponds to minimize discharge.
- The RSEM Area R5B sediment pond was decommissioned and backfilled. The majority of water that previously reported to the RSEM R5B sediment pond is now conveyed to the RSEM R6 ponds. Contact water immediately south of RSEM Area R5B and the western extents of the Approach Channel accumulate in the RSEM Area R5B Phase 2 Sump, which is pumped to either the WTP or RSEM Area R6 West Pond. A new pumping / piping system became operational in mid July 2022 to dewater the RSEM Area R5B Phase 2 Sump. A separate pumping system is used to pump water from the R5b Phase 2 Sump to RSEM R5A ponds when required.

Two additional catchment areas are located within the construction site on the Right Bank:

- Area A is a large area to the east of the SBIAR in which aggregates are being extracted for use at the construction site. Contact water from the western portion of the area, including Area 54, was directed to North ditch and transferred to the R6 sediment control ponds or crusher. as needed. Groundwater intercepted in the eastern portion of Area A (which includes Area 24) was dewatered to vegetation or passively channeled to an unnamed water course to the Peace River side channel.
- Area 30 sediment pond - runoff from the stockpiled aggregates in Area 30 accumulate in the Area 30 sediment control pond. The pond discharges to the adjacent wetlands

through a rip-rap lined channel. The Area 30 sediment pond water quality monitoring results in 2022 have triggered additional monitoring in the adjacent wetlands.

Water quality monitoring within the Right Bank RSEM catchment is described by Lorax (Appendix A). Monitoring of water quality associated with the RSEM pond discharges is referenced in Sections 3.1.2 (pond water quality), 3.1.3 (toxicity), and 3.1.5 (Peace River water quality downstream of discharges).

2.5.3 Left Bank PAG Material Management & Excavations

There was no new excavation on the Left Bank in 2022.

Five AG samples were collected from Bench 0 and two AG samples were collected from the western portion of the LBEX in 2022. Although bedrock exposures in the LBEX are small relative to the total LBEX catchment these weathered surfaces generate acidic runoff. Runoff from the lower LBEX benches that report to the LBEX Bench-0 sump and runoff from bedrock exposed in the western portion of the LBEX that reports to the LBEX-PAG-SUMP were occasionally acidic and had elevated metal concentrations.

Two AG samples were collected in 2022 from RSEM Area L5 above the Phase 2 ponds/ RSEM Area L5 is mostly covered with Non-PAG material, which restricts widespread ARD development from facility. Regrading and placement of the final non-PAG cover over the exposed PAG in the L5 Extension is recommended to prevent acidic runoff from reporting to the Phase 2 RSEM Area L5 sediment ponds and possibly discharging during snow melt or high rainfall events. Recontouring and placement of cover material is scheduled for 2023.

2.5.4 Left Bank RSEMs and Catchments

A portion of RSEM Area L5 above the Phase 2 sediment ponds remained AG as documented by two samples collected in 2022. Recontouring and placement of cover material is scheduled for 2023. In the LBEX, AG exposures remain along the northwestern edge and on Bench 0.

There are two large and one smaller catchment areas on the Left Bank. Contact water catchments on the Left Bank are:

- The RSEM Area L5 catchment area contact water is conveyed to the RSEM Area L5 Phase 2 sediment control ponds;
- The Left Bank Excavation (LBEX) catchment area contact water is directed to the RSEM Area L5 East sediment control pond. Contact water from exposed AG bedrock exposed on Bench 0 is directed to the MWTF;
- The small RSEM Area L6, from which contact water is generally conveyed to the RSEM Area L6 sediment pond.

The Diversion Inlet and Diversion Outlet Tunnels are complete, and the Peace River is diverted through the tunnels. Garbage Creek water is diverted through the construction site via lined ditches and pipes. RSEM Area L3 that contains non-PAG material is managed by BC Hydro.

Water quality monitoring within the Left Bank RSEM catchment is described by Lorax (Appendix A). Monitoring of water quality associated with the RSEM pond discharges is referenced in

Sections 3.1.2 (pond water quality), 3.1.3 (toxicity), and 3.1.5 (Peace River water quality downstream of discharges).

2.5.5 Earthfill Dam

Excavations in the Earthfill Dam in 2022 amounted to a total of 63,831 m^3 of PAG bedrock. The majority of the PAG material originated from the excavation of the Temporary Ramps (41,272 m^3) and the Dam Core Temporary Blanket (21,968 m^3). All PAG material that was used to construct the Temporary Ramps and the Dam Core Temporary Blanket in 2021, was excavated and removed by the end of Q2 2022. An additional 591 m^3 was removed from the main excavation in Q3 2022.

Throughout 2022, material excavated from the Earthfill Dam was placed in Zone 8, RSEM Area R5A, or temporarily stockpiled in RSEM Area R5B. Zone 8 is an area within the upstream side of the Earthfill Dam approved for the placement of PAG material. The majority of PAG material placement in this area occurred in Q1 2022. PAG material from the Approach Channel and Spillway and RSEM Area R5B was also placed in Zone 8. At the end of 2022, Zone 8 contained 1,613,992 m^3 of PAG bedrock. In Q4 2022, PAG material was also placed in the Dam Core Temporary Blanket (39,617 m^3) to insulate and prevent freezing of the Dam Core during the winter months.

Rinse pH monitoring in Zone 8 of the Earthfill Dam indicated that the proportion of acidic rinse pH samples from this area increased as the year progressed. Although there was exposed weathered bedrock in Q4 2022, there were no significant precipitation events that produced acidic runoff prior to onset of winter and freezing conditions. Due to the exposures of PAG and AG exposures within the Earthfill Dam at the end of 2022, Lorax (Appendix A) provided recommendations for ongoing monitoring and mitigation including ongoing rinse pH monitoring, expediating the placement of a non-PAG cover, maintaining the water management systems and removing/ relocating the temporary thermal cover to permanent storage by March 2023.

Additional details of the bedrock monitoring rinse pH and acid-base accounting analysis is presented in Appendix A.

2.5.6 Dam Core Dewatering and Discharges

Standpipes were installed in the gravel filters on the upstream and downstream sides of the Earthfill Dam for dewatering of accumulated Peace River seepage water to maintain the water level below the crest of the partially constructed Dam Core. Water levels in the standpipes were monitored and the standpipes were dewatered if the water level reached 409 masl.

Dam core seepage from the western portion of the Earthfill dam excavation was collected in a sump and directed to the RSEM R6 West pond.

2.6 Off Dam Site Activities Related to PAG Material Management

2.6.1 Reservoir Clearing

OLTC16/17 Middle Reservoir Clearing Project – Halfway Frost

PAG was excavated from the MWS36 “scissor cut” and during the deactivation of access road 17.5.

OLTC20a – 4Evergreen Resources

PAG was excavated from WR6a crossing, bridge crossing at Km 13.5 on the Eagle Road, and the Keyed-In-Fill construction. All PAG was consolidated and disposed of at a single location at 13.5 km on the Eagle Road.

2.6.2 Transmission Line Right of Way

No planned nor incidental PAG excavation or exposures were associated with the 1L364, 5L5 or 5L6 Transmission Line RoWs in 2022.

2.6.3 Highway 29 Realignment

Planned and incidental PAG excavation and exposures associated with the Highway 29 Realignment works occurred in 2021. Areas of construction which encountered PAG materials include the following segments and activities:

- *Bear Flats Cache Creek*: PAG was excavated from Pier 1 and during floodplain work and following the tufa seep failure.
- *Halfway River*: PAG related works occurred in 2022.
- *Farrell Creek*: PAG was excavated during the east abutment works.
- *Farrell Creek East*: PAG was exposed and capped in the D5 line. No PAG was excavated or removed from the D5 line.
- *Dry Creek*: PAG excavated from the east bridge abutment and the littoral area.
- *Lynx Creek*: PAG excavated along various section of the new highway alignment and at the east abutment of the bridge.

PAG Disposal Areas are constructed for permanent disposal of PAG excavation associated with Highway 29 Realignment construction within several of the segments

- *Bear Flats Cache Creek*: The MOT rep estimated the volume of PAG disposal in 2022 was 2,000 m^3. The PAG disposal pile was redesigned and expanded in the floodplain.
- *Halfway River*: During the July 2022 site inspections the PAG Disposal Areas B and C were noted to be covered and vegetated which was completed in 2021.
- *Farrell Creek*: During the July 2022 and November 2022 site inspections there was reference to additional PAG excavation being expected during construction of the East Wave Protection area and that there was capacity within the FC PAG disposal area.
- *Dry Creek*: In July 2022, the PAG disposal area was inspected and reported to be completed and covered with Type D, the east end was left partially open to allow for additional disposal as required. Additional PAG was disposed.
- *Lynx Creek*: The MOT rep indicated the quantity of PAG hauled to the disposal B15 in 2022 is 3,604 m^3. PAG disposal area was inspected in July 2022, the western extent of the disposal was capped with high fines, and mixed shale and overburden from the D90 excavation was placed towards the middle of the pile.

Exposed PAG from excavations were mitigated by engineered covers, or by temporary covers in accordance with design and the individual segments PAG Management Plans, and in accordance with the CEMP Appendix E, S.5.2.2.

All PAG disposal areas were constructed and monitored in accordance with the CEMP, Appendix E, S.5.2.2.

2.6.4 Portage Mountain Quarry

BCH is progressing reclamation planning and implementation for Portage Mountain Quarry.

2.6.5 Halfway River Boat Launch

PAG was exposed during the construction of the Halfway River Boat Launch. PAG was excavated and brought to a new disposal site within the floodplain. The final volume of material excavated and placed in the PAG stockpile was 6,265 m^3.

2.6.6 Highway 29 Decommissioning

An incidental PAG excavation was associated with the culvert removal at Dry Creek. PAG was identified in late November, but works did not proceed until 2023.

3. OVERVIEW OF WATER QUALITY MONITORING PROGRAMS RELATED TO ACID ROCK DRAINAGE AND METAL LEACHING

The CEMP Appendix E identifies responsibilities specific to BC Hydro and the contractor. In 2022, BC Hydro, as owner, and Peace River Hydro Partners, as MCW contractor, engaged QPs in ARD/ML to assist with implementation of the various water quality monitoring programs identified in Table 2. Additional qualified professionals were engaged by off dam site contractors as warranted. These roles were filled in accordance with CEMP Appendix E, S.6.1.2.

Lorax Environmental, PRHP's QP for ARD/ML, monitors surface water quality within the construction site, groundwater quality and levels at RSEM Area R5A and R5B (prior to 2020 decommissioning) and observes and tests to assess the geochemical characteristics of bedrock that has been disturbed in the course of construction, such as exposed, excavated and relocated bedrock and RSEM sediment pond dredgate and sludge removal from mobile water treatment facility reactor and settling ponds. In addition to overseeing these water quality monitoring programs, Lorax provided general materials management and professional advice on the topic of ARD/ML

ASKI Environmental Reclamation and Ecofish Research Ltd., BC Hydro's QP, complete Peace River mixing dynamics and water quality monitoring work undertaken in relation to discharge from PAG-contact RSEM sediment ponds.

BC Hydro's QP, Tetra Tech Canada Inc., acted in the capacity of auditor of contractor compliance with CEMP Appendix E, while also providing professional advice on the topic of ARD/ML to BC Hydro.

The results of the 2022 ARD/ML water quality program are summarized below. The network of monitoring stations for the Site C project has been adapted as site conditions change, with some stations that were established early in the construction phase no longer in use, and other new stations added. Water quality monitoring is conducted at end of pipe and upgradient station locations. In addition to the surface water quality stations within the construction area, surface

water quality samples at established upstream, far-field downstream and IDZ locations in the Peace River are sampled.

The water quality monitoring program on the Left Bank included dynamic set of stations across the site and RSEM Area L5 and L6 sediment ponds and discharges. The surface water quality monitoring network that was utilized on the Right Bank in 2022 included several stations in Area 30/Septimus Hill, Area A/Area 24, Approach Channel and Area 23, RSEM Area R5B catchment, Water Treatment Facilities and at the RSEM R6 and R5A sediment ponds. Rock cut water quality monitoring was conducted at the South Bank Initial Access Road (SBIAR) area and L2 Powerhouse rock cut. The water quality monitoring program at the Earthfill Dam included a variety of stations including sumps on both sides of the Earthfill Dam Core Trench, sumps receiving water from the Left and Right Bank Dam Core trench excavations, end of pipe discharges of the Earthfill Dam Core trench waters, as well as Peace River locations upstream and downstream of the Earthfill Dam in the Peace River Isolation Zone.

Table 2 Water Quality Monitoring Programs related to the ARD/ML Management Plan (CEMP Appendix E)

	Program Description	CEMP Appendix E Reference	Frequency	Duration	Geographic Extent	Program Responsibility	Monitoring Program Qualified Professional (QP), 2022
Monitoring associated with PAG-contact RSEM Sediment Ponds	**Collected/Contained Water**						
	PAG-contact RSEM Sediment Pond Water Quality Water quality sampling, and installation and operation of data loggers for measurement of pH, turbidity and electrical conductivity from PAG containing RSEM sediment ponds.	7.3.2	Hourly (*in situ* measurements) Daily (water quality sampling)	Ongoing from December 2016	RSEM sediment ponds conveying PAG-contact water	Contractor (Peace River Hydro Partners)	Lorax Environmental
	RSEM Sediment Pond Toxicity Collection of acute toxicity tests (96hr LC50) from water in PAG-contact RSEM sediment ponds	7.2.1, 7.3.1	1) Bi-monthly In event of failure, additional sample 96 hours after first failed sample, additional samples every 96 hours until sample passes. Targeted acute toxicity if pH drops below 6.5 for more than one hour.	Ongoing from November 2016	RSEM sediment ponds conveying PAG-contact water	BC Hydro	ASKI Environmental Reclamation and Ecofish Research Ltd.
	Groundwater						
	Groundwater Monitoring *Install groundwater monitoring wells upgradient and downgradient of RSEM R5A and R5B, and water quality monitoring of groundwater.*	*7.2.5, 7.3.3*	*Quarterly (No longer required as of September 2020 due to river diversion/headpond creation)*	*September 2016 to July 2020 (wells decommissioned September 2020)*	*RSEM R5A and RSEM R5B*	*Contractor (Peace River Hydro Partners)*	Lorax Environmental
	Peace River Surface Water						
	Peace River Mixing Dynamics and Water Quality Monitoring Field verification of modelled river mixing dynamics for the RSEM discharge sites, assessment of appropriateness of Initial Dilution Zone (IDZ) sample sites through discharge plume characterization, and collection of surface water quality samples at established upstream, far-field downstream and IDZ locations in the Peace River.	6.1.1, 7.2.3, 7.3.4	Monthly during RSEM discharge events	Ongoing from December 2016	Peace River at locations upstream and downstream of PAG containing RSEM areas	BC Hydro	ASKI Environmental Reclamation and Ecofish Research Ltd.
Other Monitoring	**Surface Water**						
	Dam Site Road Cut Water Quality Monitoring Water quality monitoring at construction-related road cuts into PAG material.	5.2.1.7	Monthly (except while dry/frozen) for first year of observation, then quarterly thereafter unless otherwise directed by the QP(ARD)	Ongoing from fall 2016	Throughout the dam site (left and right Peace River banks)	BC Hydro & Contractor (Peace River Hydro Partners), in their respective work areas	Tetra Tech Canada Inc. (on behalf of BC Hydro) Lorax Environmental (on behalf of Peace River Hydro Partners)
	Off Dam Site Project Components Water quality monitoring at excavations into PAG material during construction of these project components.	5.2.2	Once prior to initial discharge, then monthly (except while dry/frozen) for first year of observation, then quarterly thereafter	Ongoing from time of exposure until decommissioning	Throughout exposure area, as appropriate	Contractor (various)	Various

3.1 Summary of Implementation Status: Monitoring Programs Associated with PAG-contact RSEM Sediment Ponds

A summary of RSEMs that are designated to contain PAG material and/or PAG-contact water, and an indication of those that were operational with sediment ponds in 2022, is provided in Table 3.

Table 3 Summary of PAG-contact RSEM Sediment Pond Operational Status in 2022

RSEM	Status in 2022
Right Bank	
RSEM R5A (Phase 1)	Decommissioned in Q3 2020
RSEM R5A (Phase 2)	Operational
RSEM R5B	Decommissioned and backfilled in 2022. Majority of water previously reported at RSEM R5B is now conveyed to the RSEM R6 ponds.
RSEM R6 (PRHP)[1]	Operational, East and West Ponds; includes Area 20/21, RBDT and associated facilities to the south, Earthfill Dam, and Approach Channel above it.
Left Bank	
RSEM L5 (Phase 1)	Decommissioned in Q3 2020
RSEM L5E (Phase 2)	Operational, East and West Ponds; Discharged intermittently from January to May 2022.
RSEM L6	Operational, April to June 2022. Dewatered to Peace River in October prior to freeze-up.

NOTES:
[1] The RSEM R6 ponds operated by the Main Civil Works Contractor, PRHP, are differentiated from the RSEM R6 pond operated by the Generating Station and Spillways contractor, AFDE (which is a non-PAG contact pond). RSEM R6 does not receive PAG material, but the sediment ponds operated by PRHP receive PAG-contact water.

In 2022, surface water quality sampling was undertaken at a total of 56 stations, including 11 stations on the Left Bank (337 in situ and 167 lab samples; Table 3-4 Appendix A), 8 stations on the Earthfill Dam (297 in situ and 58 lab samples; Table 3-10 Appendix A) and river and 37 stations on the Right Bank (1,953 in situ and 921 lab samples; Table 3-14 Appendix A). Laboratory results obtained in 2022 from these stations, summarized below and detailed n Appendix A

For 2022, a total of 138 QC samples were obtained (66 blanks and 72 duplicates) and 1,323 monitoring samples were collected as part of the PRHP ARD water quality monitoring program.

Additionally, continuous *in situ* measurements of pH, conductivity and turbidity were collected by installed instruments and dataloggers in the RSEM Area L5, L6, R6 and R5A sediment ponds during periods when the ponds were managed to discharge. Field measurements of the same parameters were obtained at other locations to monitor conditions across the site.

In 2022 Q1 (January, February, March) as a result of snow melt, very cold weather and corrugated pipes, exceedances were measured in water discharged from PAG-containing

RSEM sediment ponds to the Peace River. No other exceedances were noted in 2022. Discharge monitoring identified five locations where EOP discharge limits (or WQGs, as applicable in the case of the Earthfill Dam) were exceeded:

- RSEM-R6W discharge exceedance of total zinc on January 4, 10, and 11, 2022 during a period of very cold weather and frozen conditions. An upgradient corrugated metal culvert was determined to be the source of elevated total zinc.
- RSEM L5E discharge exceedance of total cadmium on February 11, 2022, attributed to rinsing of water-soluble oxidation products from PAG exposures in the LBEX during a period of warmer temperatures when significant snowmelt occurred.
- RSEM R6E Pond discharge exceedances of total copper, zinc and cadmium on March 17, 2023, attributed to TSS derived from erosion along the flow path.
- RSEM R5A P2-A-EOP discharge exceedances on March 22, 23 and 24, 2022 (total cadmium, zinc), related to significant snowmelt, warmer temperatures, and increased runoff.
- RSEM R5A P2-B-EOP discharge exceedances on March 17 and 21, 2022 (total copper, zinc, cadmium), related to significant snowmelt, warmer temperatures, and increased runoff.

3.1.1 RSEM Sediment Pond Water Management

Water management focuses on segregating possible ARD influenced water (i.e., PAG contact water) from non-PAG contact waters within PAG containing construction areas. Transfers within and between Project area catchments are conducted to improve water management efficiency and to ensure contact waters are routed through an appropriate treatment facility prior to discharge.

The general water management objectives are to:

- Segregate ARD influenced water that must be treated by the WTP;
- Maximize storage capacity for surges of ARD/ML influenced PAG contact water associated with heavy runoff from rainfall or snowmelt; and,
- Minimize the number of treatment facilities (i.e., sediment control ponds) that require daily management.

The water management system is continuously adapted as earthworks are undertaken, and generally utilizes a series of one or more conveyance and holding structures, including ditches, sumps, and settling ponds. Ultimately, the majority of PAG contact water is diverted to one of five RSEM sediment pond facilities for discharge to the Peace River. Higher risk water is directed through the Mobile Water Treatment Facility (MWTF) for treatment prior to discharge to an RSEM sediment pond.

Pipelines were constructed by PRHP in 2022 Q2 and Q3 to facilitate the pumping of R5B Phase 2 Sump water to RSEM R5A pond A, the RSEM R6 ponds or to the MWTF, as needed. The R5B Phase 2 Sump water was generally directed to RSEM R5A sediment control pond A and accounted for the primary source of water discharged from RSEM Area R5A. This maintenance of the water management systems in RSEM Area R5A and the R5B catchment mitigated risk through 2022, as detailed in Appendix A.

A quarterly summary of water transfers in 2022 to PAG containing RSEM sediment control ponds and to the MWTF Pre-Treatment Pond, from Left Bank and Right Bank catchment areas, is provided in Table 4.

Table 4 Quarterly Summary of PAG and Non-PAG Contact Water Transfer to PAG Containing RSEM Sediment Control Ponds and the MWTF Pre-Treatment Pond in 2022 (from Lorax, 2022)

Receiving Facility	Type of Water and Source Area			
	Q1	Q2	Q3	Q4
RSEM L5 East Phase 2 Sediment Control Pond	Non-PAG contact from LBEX	Non-PAG contact from LBEX	Non-PAG contact from LBEX	Non-PAG contact from LBEX
RSEM R6 East Sediment Control Pond	PAG contact from R5B	PAG contact from R5B	Non-PAG contact from Area 20/21/54	Non-PAG contact from Area 20/21/54
RSEM R6 West Sediment Control Pond	MWTF discharge, PAG contact from R5B	MWTF discharge	MWTF discharge, Non-PAG contact from Area 20/21	MWTF discharge, Non-PAG contact from Area 20/21
RSEM R5A Phase 2 Sediment Control Pond A	-	PAG contact water from R5B	PAG contact water from R5B	PAG contact water from R5B
MWTF Pre-Treatment Pond	PAG contact from LBEX, RSEM Area L5, EDUW, AC, RBDT and RCC(AFDE)	PAG contact from LBEX, RSEM Area L5, EDUW, AC, R5B, RBDT and RCC(AFDE)	PAG contact from LBEX, RSEM Area L5, R5B, RBDT and RCC(AFDE)	PAG contact from LBEX, RSEM Area L5, RBDT. RCC(AFDE) wells dewatered into Cell 3 of the Sludge Pond

Notes:
LBEX = Left Bank Excavation; CVC = CVC Batch Plant; AC = Approach Channel; RBCT = Right Bank Core Trench, LBCT = Left Bank Core Trench, EDES=Earthfill Dam East Sump; EDWS=Earthfill Dam West Sump, RBDT=Right Bank Drainage Tunnel, R5B=R5B Sump.
PAG-contact is defined as contact water with a possible ARD influence.
Non-contact is defined as runoff, construction water and groundwater that are not ARD influenced.

The active PAG-contact sediment ponds on the dam site are presented below with approximate volumes of water discharged during the year. Details of water discharge by month is provided in Appendix A.

Right Bank: total volume of 839,661 m^3 water discharged in 2022

- RSEM R6 East – 393,215 m^3 total discharge

- RSEM R6 West – 406,251 m^3 total discharge
- RSEM R5A – 40,195 m^3 total discharge
- RSEM R5B – none; decommissioned and backfilled previously

Overall, the total discharge from Right Bank was sporadic in Q1 2022, with higher discharge coinciding with periods of snowmelt. The discharge was moderate (generally between 10 and 30 L/s) from late April through September and rose to higher levels (greater than 30 L/s) from September through mid-December.

Left Bank: total volume of just over 17,981 m^3 water discharged in 2022

- RSEM L5E – 11,270 m^3, January through May
- RSEM L5W – 3,596 m^3, April to June
- RSEM L6 – 3,114 m^3, April to June

RSEM L5E discharged intermittently from January through May, with peak discharge (greater than 10 L/s) occurring on January 23 and for a few days following heavy rain in mid-April and late May.

3.1.2 RSEM Sediment Pond Water Quality

A brief summary of monitoring undertaken at PAG-contact RSEM sediment ponds is provided below; a detailed description is included in Appendix A Lorax report on water quality.

In general, operational PAG-contact RSEM sediment ponds are subject to the following monitoring regime:

- Continuous (minimum hourly) measurements of pH, turbidity, and electrical conductivity via *in situ* sonde.
- Continuous measurements of discharge volume to the Peace River.
- Daily collection of water quality samples for laboratory analysis of total and dissolved metals, pH, total suspended solids (TSS), turbidity, sulphate, nitrates, conductivity, temperatures, conductivity, and hardness (plus hydrocarbons, if applicable due to a spill event).

These monitoring measures are undertaken except when the pond is dry or frozen.

PAG-contact RSEM sediment pond water quality is subject to EOP discharge limits, as described in the CEMP Appendix E (Table 2), for the following parameters: total metals (cadmium, cobalt, copper, zinc), TSS, and pH. Water quality and flow data are used to calculate metals loading of each PAG-contact RSEM sediment pond to the Peace River on a weekly basis.

Water quality at stations within the construction site upgradient of RSEM sediment ponds are compared to RSEM EOP limits to inform water management. Water that accumulates at these stations is not discharged directly to the Peace River. Consequently, water quality at these stations that exceeds RSEM EOP limits does not indicate non-compliance with CEMP requirements. It indicates only that water management may be required.

Any exceedance of EOP discharge limits in laboratory analysis of water discharged from PAG-containing RSEM sediment ponds to the Peace River is reported within 24 hours of receiving the analytical water quality results. Exceedances are also noted in weekly reports.

PAG contact water is generally contained within the site, or directed to RSEM sediment ponds, from which it is discharged to the Peace River.

In 2022, metal loads discharged from the Right Bank included discharge from RSEM-R6E, RSEM-R6W, RSEM-R5A-A and RSEM-R5A-B. The metal loads discharged from the Right Bank in 2022 included discharge from the RSEM-R6E and RSEM-R6W Sediment Control Ponds. In addition, there was discharge from the RSEM-R5A-A and RSEM-R5A-B ponds.

The metal loads discharged from the Left Bank included discharge from the RSEM-L5E and RSEM-L6 Sediment Control Ponds in Q1 and Q2, as well as from the RSEM-L6 Sediment Control Pond in Q4.

RSEM R5A

PAG material placed in RSEM Area R5A is compacted and covered with NAG soon after placement. This is reflected in the pond water quality which generally meets RSEM EOP limits and BC WQGs.

Site reports indicate that RSEM R5A Phase 2 ponds water levels remained low to moderate, Periodic discharge from RSEM R5A Pond A was reported in March through October. Water levels in RSEM R5A Phase 2 Ponds B, C and D generally remained low and did not discharge, with discharge only from Pond B reported in March. Occasionally, water was pumped sequentially from pond D to C to B to A in order to direct discharge through the Pond A outfall.

In 2022 Q1, on March 17, 21, 22, 23 and 24, there were exceedances of the discharge limit measured for at least two to three of the parameters, total copper, total zinc and total cadmium in discharge from RSEM R5A (Ponds A and B) sediment control ponds. Dissolved species accounted for the majority of the total metal inventory when the EOP concentrations were above the EOP discharge limits. On these dates, temperatures were noted to remain above freezing to encourage snow melt and runoff. The source of the metals was thought to originate from uncovered older PAG material along the sides of the PAG stockpile.

RSEM R5B

Samples were collected from the R5B sumps and drainage ditch which receive runoff from the western portion of the Approach Channel. Responsibility for water management within the Approach Channel was assumed by AFDE on April 1st, 2022. Contact water from this area is collected by AFDE and directed to the R5B Phase 2 Sump, where PRHP redirects it for discharge from the site as deemed appropriate.

As discussed in Section 2.5.2, improvements in the water management system included the construction of two pipelines by PRHP to facilitate the pumping of R5B Phase 2 Sump water to RSEM R5A Pond A, the RSEM R6 ponds or to the WTP as required to manage water levels

and based on water quality. This improvement greatly reduces the risk of non-compliant PAG contact water being discharged.

Field measurements were collected daily to weekly in February to October when adequate quantity of water was present in the R5B Phase 2 Sump. Field monitoring was performed at a lower frequency at the other two stations. Water quality monitoring showed circumneutral to alkaline conditions. Analytical results for R5B Phase 2 Sump water show variable TSS and sulphate values, while total metal concentrations occasionally indicated a partial influence of TSS particularly for Co, Cu, Fe, Mn and Zn.

RSEM R6

The RSEM Area R6 East and West sediment control ponds are divided by a berm which isolates the two ponds from each other. The berm was designed to allow the cells to merge in a lager (greater than 1-in-10 year 24 hour) storm event.

Analytical water quality monitoring of RSEM R6 East and West sediment control ponds was conducted throughout 2022, including daily samples at EOP when discharging or occasional in-pond sampling as water levels allowed. The monitoring records indicate that the RSEM R6 East and West sediment control ponds discharged most days in 2022. The East Pond discharged nearly daily from April to November, while the West pond discharged nearly daily from February to December. Discharged flows from both ponds generally remained < 20 L/s. However, elevated flows (mostly up to 60 L/s) were observed at the East pond in September and October due to high flows through the SBIAR ditch associated with dewatering of Area 54 and sections of Area 20/21.

The RSEM R6 East sediment control pond discharged predominantly April to November 2022, with the highest flows observed September through November due to the dewatering inflows from the upgradient Areas 20, 21 and 54. As freezing conditions established in November, the surface runoff into the RSME R6 East was significantly reduced and the pond did not discharge in December. Discharges from the RSEM R6 West sediment control pond were generally dominated by inflows from the WTP, with additional flows contributed from the dewatering of the Earthfill Dam area and the groundwater wells in the AFDE controlled RCC area.

Analytical water quality monitoring of RSEM R6 East and West sediment control ponds was conducted throughout 2022, including daily samples at EOP when discharging or occasional in-pond sampling as water levels allowed. The continuous in situ sonde was deployed in-pond throughout 2022 at both ponds. excluding brief periods when the pond was not discharging due to low water levels, or the sonde required maintenance.

RSEM R6 East Catchment

The 2022 monitoring data indicate the RSEM R6 East sediment control pond water and EOP discharges were circum-neutral to slightly alkaline, with sulphate concentrations up to 417 mg/L.

The RSEM EOP limits were met for all analytical samples and in situ field pH measurements for RSEM R6 East sediment control pond discharges, with few exceptions.

In 2022 Q1, on March 17, 2022, there were exceedances of the discharge limit measured for total iron, total zinc and total cadmium in RSEM R6E sediment control pond, associated with elevated TSS. The elevated TSS measured in this sample is not considered an exceedance as per the PRHP screening protocol for clear flow conditions in Peace River, which requires a TSS concentration in discharged water to be above the BC short-term WQG for 24 hours (two consecutive days) to be considered an exceedance of the RSEM end-of-pipe limit. For reference, TSS measured at EOP on the following day.

RSEM R6 West Catchment

The 2022 monitoring data indicate that the RSEM R6 West sediment control pond water and EOP discharges were circum-neutral to slightly alkaline, with sulphate concentrations up to 588 mg/L.

All discharge analytical samples and in situ field measurements met RSEM EOP limits except for total Zn in the January 4th (0.084 mg/L), January 10th (0.0801 mg/L) and January 11th (0.0922 mg/L) samples. The source of the total zinc in the R6W sediment pond was suspected to originate from low flows from the MWTF discharging through a corrugated metal culvert upgradient of the RSEM R6W pond. Total Zn levels remained below the EOP limit following redirection of WTP discharge around the culvert starting on January 11th.

RSEM L5

Predominantly frozen conditions in Q1 2022 limited runoff inflows and discharges from the ponds. However, the RSEM Area L5 Phase 2 East sediment control pond discharged on six days from January to March during warmer periods when surface runoff accumulated in the pond. The RSEM Area L5 Phase 2 West sediment control pond discharged at the end of March. Snowmelt driven runoff in RSEM Area L5 and the LBEX led to water accumulation and periodic discharge from the RSEM Area L5 ponds in Q2 2022. The RSEM L5 East sediment control pond was dewatered to the Peace River in April and May. The RSEM L5 West sediment control pond was dewatered to the Peace River at the end of May. Discharge or dewatering in late May was influenced by a precipitation event as well as active pumping of water from LBEX sumps. Low water levels in the RSEM L5 East and West ponds persisted for the rest of the year and the ponds did not discharge.

Water quality in the RSEM L5 Phase 2 East and West sediment control ponds remained circumneutral to alkaline throughout 2022. Carbon dioxide sparging was occasionally applied near the East and West pond discharge pipe intake to reduce pH at EOP. Concentrations of TSS and metals in analytical samples from the RSEM Area Phase 2 L5 East and West sediment control ponds were generally low.

The metal concentrations remained below the discharge limits when there was discharge from these sediment ponds, however, cadmium and zinc concentrations spiked to and above discharge limits when the ponds were not discharging, which may indicate early signs of PAG weathering in RSEM Area L5.

In 2022 Q1, on February 11, there was one exceedance of the discharge limit measured for total cadmium in the RSEM L5E discharge, which was attributed to rinsing of water-soluble oxidation products from PAG exposures in the LBEX during a period of warmer temperatures when significant snowmelt occurred. This runoff reported to the LBEX sump, which was pumped to the RSEM L5 Phase 2 East Pond. Water accumulated rapidly in the RSEM pond at this time due to snowmelt.

RSEM L6

The RSEM L6 sediment control pond remained circumneutral to slightly alkaline with low metal concentrations. PAG material remains covered in this area and no rinse pH samples were collected in 2022.

The RSEM Area L6 sediment pond has a small catchment area and is managed not to discharge to the Peace River. It is excluded from the Risk Rating Matrix as the water in this pond would be transferred to the MWTF, if treatment was required, rather than installing a water treatment facility specifically for this pond.

The RSEM L6 sediment control pond did not discharge in 2022 except on April 23rd-25th, May 17th-19th, and June 4th-5th, when the pond was dewatered to the Peace River. The water quality sample collected from the RSEM L6 sediment control pond EOP station met the RSEM EOP limits when the pond discharged.

3.1.3 RSEM Sediment Pond Toxicity

A summary of toxicity testing undertaken at PAG-contact RSEM sediment ponds in 2022 is provided below; a detailed description is included in Appendix B.

The acute toxicity (Rainbow Trout 96 hour LC50) monitoring program is designed to confirm that water discharged from the PAG contact RSEM ponds is not acutely toxic to aquatic life at the point of discharge into the Peace River. Therefore, prior to discharge into the Peace River, and for the duration of discharge into the Peace River, acute toxicity testing is required for each RSEM pond.

Acute toxicity of RSEM pond water was conducted on a bi-monthly basis throughout 2022, provided sufficient water was available for sampling. Toxicity samples were not collected if the water level was too low or the pond was frozen to the bottom, in this case, sampling was postponed until sufficient water was available. Although it is not a requirement of the CEMP to collect water quality samples from the Peace River in conjunction with acute toxicity sampling, sampling schedules can overlap and, in some cases, acute toxicity testing sampling is done in conjunction with water quality sampling in the Peace River

Acute toxicity was evaluated using a standard laboratory assay (rainbow trout 96-h LC50 test) performed on water samples collected directly from the outflow of each RSEM pond (or the

pond itself when not discharging). In addition, a targeted monitoring program is initiated if a trigger is exceeded that suggests there might be elevated risk to aquatic biota due to poor water quality in the pond, as indicated by in situ pH measurements.

The acute toxicity testing is performed by Nautilus Environmental (Nautilus) in Burnaby or Calgary (under subcontract to ALS Environmental). Sample carboys are delivered to ALS in Fort St. John shortly after sampling (on the same day) and the samples are shipped to Nautilus Environmental following standard chain of custody and within acceptable hold times.

In the event that a toxicity sample is determined to be acutely toxic, the LC_{50} (i.e., the concentration at which there is mortality in 50% (v/v) of the fish) is estimated and reported by Nautilus based on the toxicity results at serial dilutions of the pond water sample. Data are provided in tabular format as % Survival of Rainbow Trout for serial dilutions (% v/v) of the RSEM Pond Water.

Considering all RSEM ponds, a total of 40 toxicity samples were collected in 2022 and all but one test passed (>100% v/v). On March 28, 2022, one acute toxicity test failed at RSEM R5A-P2D. This water never directly discharged to the Peace River. No fish survived in the undiluted pond water while all fish survived in the 50% dilution of the pond water resulting in an estimated LC_{50} value of 70.7% v/v (concentration at which there is mortality for 50% of the fish). Details are provided in Appendix B.

RSEM R5A

In 2022, a total of thirteen acute toxicity samples were collected from the RSEM R5A Phase 2 ponds (P2A, P2B, P2C, and P2D) on March 28, May 24, June 16, July 26 and October 20, 2022. Toxicity samples were attempted to be collected from each pond on a bi-monthly basis outside of frozen or dry conditions from March until October.

From the total thirteen samples collected from the four RSEM R5A-P2 ponds, twelve samples passed the acute toxicity test with results of >100 % (v/v), and one sample failed the acute toxicity test from RSEM R5A-P2D on March 28, 2023 with results of >70.7 % (v/v).

RSEM R5B

The Phase 1 RSEM R5B ponds were decommissioned in 2020. No toxicity testing was completed for the R5B sumps as there is no longer a direct discharge from this RSEM to the receiving environment (Peace River).

RSEM R6

In 2022, six toxicity samples were collected from each of the RSEM-R6W and RSEM-R6E ponds on a monthly basis at alternating west and east locations, totaling twelve samples, with all samples passing the acute toxicity test results of >100 % (v/v).

RSEM L5

In 2022, five toxicity samples were collected from each of the RSEM-L5E-P2 and RSEM-L5W-P2 locations, totaling ten samples, with all samples passing the acute toxicity test results of >100 % (v/v).

RSEM L6

In 2022, five toxicity samples were collected from the RSEM L6 pond on a bi-monthly basis outside of frozen or dry conditions, with all samples passing the acute toxicity test results of >100 % (v/v).

3.1.4 Peace River Mixing Dynamics and Water Quality Monitoring

Mixing in IDZs has been assessed by Ecofish Research Ltd. on behalf of BC Hydro. Water quality monitoring in the Peace River is also undertaken by Ecofish and reported monthly as well as in the annual report (EcoFish, 2022). A brief summary of Peace River mixing dynamics and water quality monitoring work undertaken in relation to discharge from PAG-contact RSEM sediment ponds is provided below; a detailed description is included in Appendix B (EcoFish, 2022).

Monitoring of RSEM pond discharge plumes within the Initial Dilution Zone (IDZ) is conducted to characterize dilution under a variety of pond discharge and Peace River flows to meet the CEMP requirement to confirm discharge plume dynamics, and modeling predictions. Characterization of discharge relies on measurements of in-situ specific conductivity, as conductivity in the RSEM ponds is reliably higher than the Peace River. In-situ specific conductivity measurements are recorded in the Peace River at different depths (typically 15 and 30 cm below the surface), distances from shore, and distances upstream and downstream from pond discharge points.

Prior to the construction of RSEM sediment ponds and any associated discharges, water quality modelling was undertaken by the project to examine the predicted mixing capacity of the Peace River through a 100 m IDZ. Modelling in previous years has demonstrated that the RSEM discharge plume is generally fully mixed with the Peace River 20 m to 40 m downstream of the pond discharge location, but when present at the 100 m IDZ, is detectable at the proposed 10-15 cm depth 1 m from shore. Mixing within the IDZ for each sediment pond discharge occurs with only a portion of the total flow in the Peace River.

The ARD/ML Management Plan (BC Hydro 2020) stipulates water quality criteria (i.e., BC WQG for the protection of aquatic life) at the IDZ location 100 m downstream of each PAG-contact RSEM sediment pond discharge location. To evaluate compliance, a full suite of water quality parameters (including physical parameters, nutrients, anions, total metals and dissolved metals) was measured in-situ and/or sampled for laboratory analysis. Sampling was conducted on monthly and 5 in 30-day sampling schedules (5 sets of samples over a 30 day period during both turbid and clear flow conditions). Sampling was conducted at IDZ sites 100 m downstream

of discharging RSEM ponds, as well as at upstream (upstream of all Site C construction influences), immediate background (just upstream of RSEM discharge points), and far-field downstream locations.

TSS discharge limits at EOP, which are prescribed as the BC water quality guidelines for freshwater aquatic life (CEMP Appendix E, Table 2) and thus, are dependent upon background Peace River water clarity conditions, were determined through measurements collected by automated turbidity gauges located on either bank of the Peace River, upstream of the confluence with the Moberly River.

Site-specific TSS:turbidity relationships were continually re-evaluated through frequent sampling through a range of Peace River and tributary flow conditions. The turbidity-TSS relationship established in 2019 is currently in use by PRHP field staff and is compared to the 2022 monitoring data relationships developed for L5 and R6 RSEM sediment control ponds. For both the RSEM L5 and R6 sediment ponds, the 2022 turbidity-TSS relationships shows a lower regression slope that diverges from the 2019 relationships (higher regression slope) (Figure 4-1, Lorax, 2022). In regard to the RSEM R6 sediment ponds, this is attributed to modifications in water management that introduced different sources to the ponds in more recent years.

For the monitoring conducted in 2022, there were no observations of exceedances in the Peace River of the BC WQG (short-term or long-term) for the protection of aquatic life that were attributed to discharge from the RSEM Ponds. Similar to annual monitoring in 2017 through 2022, and in baseline monitoring in 2012, BC WQG exceedances in 2022 were observed for arsenic, iron, and zinc. The exceedances occurred predominantly during the freshet period (April to the end of June) and were most often associated with elevated concentrations of suspended solids in the Peace River.

3.1.5 Groundwater Monitoring

The groundwater monitoring program at RSEM R5A and R5B was initiated in 2016 and completed in 2020 to fulfill the requirements of CEMP Appendix E, S.7.25 and S.7.3.3. Details of the groundwater monitoring are provided in previous years annual reports.

Separate from the above mentioned program, groundwater seepage water quality and water management is dealt with in various areas of the site including the Approach Channel, RCC areas, and around Area A/Area 24, which is detailed by Lorax in Appendix A.

3.2 Summary of Implementation Status: Other Monitoring Programs

3.2.1 Dam Site Road Cut Water Quality Monitoring

Two large double lane dam site road cuts referred to as River Road (exposed in 2015) on the Left Bank between Howe Pit and the Peace River, and the South bank Initial Access Road (SBIAR), exposed in early 2017, on the Right Bank between Area A and RSEM R6 have been constructed to allow site vehicle access from the upper terrace to the lower flood plain. Continued exposure of bedrock materials from both of these road cuts requires that routine water quality monitoring be conducted by BC Hydro as required by CEMP Appendix E S.5.2.1.7.

Additional monitoring locations were added in October 2020 at the L2 Powerhouse Area and the BC Hydro LBDB to monitor water quality from exposed PAG slopes. The monitoring program includes locations at the discharge points and at midstream locations as well as locations upstream from the discharge to characterize variation to water chemistry within the catchment due to mixing and inflow of water from multiple sources.

A brief summary of the 2022 monitoring results for the dam site road cut water quality program is included below, see Appendix C for details.

River Road

A total of eleven (11) monitoring locations are established in the River Road catchment near Blind Corner to to observe longer term influences from the PAG outcrop at Blind Corner and run-off/seepage from Howe Pit on the water collected in the River Road ditch. ARD-ML management and mitigation along River Road adjacent to the PAG slopes includes a cut-off ditch above the slope, which diverts surface flows into limestone rip-rap lined “Chimney ditches” which then feed into the River Road ditch below the slope. The River Road ditch adjacent to the PAG slope includes a bentonite liner and limestone rip-rap to provide neutralization potential and mitigate against acidic drainage.

In situ field and laboratory results 2022 within the River Road ditch indicated a neutral to alkaline pH throughout the 2022 sampling year. The observation of consistent neutral to alkaline pH drainage conditions at all locations in River Road area in 2022 are indicative of changes in the exposed PAG slope over time. Visual observations show that the slope has weathered and developed a partial clay capping surface which may be limiting ARD/ML reactions, and sections of the exposed PAG slope have been observed to have naturally revegetated in localized areas.

Lab water quality measurements during 2022 resulted in exceedances of total arsenic, total iron, total zinc, dissolved iron, total manganese, and dissolved aluminum noted in sampling events at the start of the year, dominantly between January and May, with one occurrence of total iron in June. The exceedances are primarily attributed to washing, or flushing, of sediment and secondary mineral precipitate during freshet (or precipitation following a dry period), as water contacted accumulated sediment within the ditch in addition to the exposed shale, colluvium, and overburden cut-banks. It is anticipated that sediment in the ditch will continue to accumulate a small amount of secondary mineral formed by up-gradient ARD-ML processes. These minerals commonly contain an elevated concentration of metals related to ML and mineral precipitation from acid neutralizing reactions.

The source of TSS is primarily from River Road run-off, scouring of sediment deposited within the River Road ditch and washing from the cut-slopes. Seasonally, elevated TSS levels have been noted to occur during spring melt and freshet season, typically April, when water flow can wash elevated precipitates from rock. The January and April/ May 2022 sampling events represents both a warming event with melting and early spring freshet conditions that coincide with elevated turbidity and TSS in the Peace River, and water quality exceedances measured in May 2022.

South Bank Initial Access Road

Water quality data was collected from four established sampling locations in 2022 that measure water directly from within the SBIAR ditch locations. The ditch samples provide long-term characterization of SBIAR water management and water quality originating from the SBIAR PAG slope at the upstream and downstream location in the east and west ditches.

Alkalinity and pH indicate that the waters in SBIAR have consistently remained alkaline in 2022, with isolated occurrences of elevated metals above the BC WQG in some sample events.

At the upstream SBIAR ditch locations during 2022, no BC WQG exceedances were measured in the west ditch for all six sampling events at this location. Total arsenic, total iron and total zinc were measured in the east ditch during some sampling events.

At the downstream SBIAR ditch locations during 2022, BC WQG exceedances were measured for total iron, total zinc and dissolved aluminum.

Surface runoff which contacts the bedrock at SBIAR is channeled via a lined ditch to PRHP RSEM R6 pond for management prior to being discharged to the Peace River and does not have a direct downstream receptor. There is an intensive water quality monitoring program in the pond (continuous in situ measurements of pH, conductivity; daily lab analysis for all parameters) conducted prior to discharge by Lorax Ecofish Research Ltd. and others, as well as Peace River receiving environment monitoring conducted by Ecofish and others.

BC Hydro Left Bank Debris Boom

Shale was exposed during construction of the BC Hydro Left Bank Debris Boom (LBDB) anchor area in approximately March 2020. The PAG exposure is limited to an area of approximately 30 m wide by 10 m high slope at approximately 2:1 slope angle. The shale is exposed between elevations of approximately 436 m and 445 m, and will be inundated with reservoir filling.

The ditches above the 420 m elevation are lined with 3-10 inch size fraction limestone as a management measure to provide additional buffering capacity to leachate entering the ditches. The area below 420 m elevation was flooded by the head pond after construction in early Fall 2020, and therefore that area did not require riprap. The area above 420 m elevation will be exposed prior to flooding to the final river/reservoir elevation of around 460 m elevation.

Monthly water quality monitoring stations have been established at the site, at upstream, midstream and downstream stations near the terminus of the drainage channels prior to discharge into the natural environment. The LBDB area water quality monitoring and sampling commenced in October 2020 and has continued on a monthly basis outside of frozen or dry conditions, in accordance with the CEMP Appendix E. Sample collection has primarily occurred at the Left Bank Pond sample location near the upper slope. The Side Channel was sampled once before inundation by the Peace River. The east and west armoured ditches on each side of the road leading downslope through the LBDB area and the downstream drainage from the pond location are generally noted as dry and therefore sampling has been limited to only a

couple of sample events. Field sampling staff are instructed to attempt sampling at these locations outside of the monthly program if a large rainfall event is recorded.

The Left Bank Pond was sampled eight times from March through October 2022. The downstream location in the west armour ditch was sampled twice, in March and May 2022. Three additional locations were able to sampled due to a heavy rain event in May, that include the downstream station in east armour ditch, and the laydown drainage stations downstream from the LBP Pond.

In 2022, at the Left Bank Pond location there BC WQG exceedances measured for total iron, total manganese, total zinc, dissolved iron. This is not a discharge station and water discharging from the LBP Pond area passes through a limestone lined ditch. Water is not commonly observed to discharge from the Left Bank Pond, but if it does it passes through a limestone lined water management ditch system to the downstream monitoring station.

No BCAWQG-FST exceedances were measured during 2022 at the downstream east and west Armor Ditches. Water flow from the Armor Ditch sample locations is considered discharge locations.

L2 Powerhouse Area

Water quality sampling commenced at the BC Hydro L2 Powerhouse area in October 2020 and continued sampling monthly, outside of frozen or dry conditions, through the 2022 monitoring period. Water quality monitoring in this area is for monitoring of water quality associated with shale exposures resulting from construction. During 2022 ongoing construction of the Powerhouse adjacent to the L2 slope included concrete works which may have mixed with drainage at the base of the L2 slope. Due to the complex construction activities and water management that diverts water around the site, the sample stations may be influenced by factors outside of the shale excavations. There are AFDE and PRHP managed waters in this area and ongoing water quality testing is completed by multiple groups outside of the scope of ARD/ML influences.

Water conveyed to AFDE RSEM R6 pond from this area is non PAG contact. Water that is acidic or elevated in metals from the L2 Powerhouse area is pumped to the water treatment facility which discharges treated water to the RSEM R6 pond. Water is monitored by PRHP prior to discharge from the RSEM R6 pond.

The L2 Powerhouse L2 downstream location was sampled seven times from May to August and from October to December. The L2 upstream location was sampled ten times, January, and April to December. The other months noted dry or frozen conditions and sampling could not be completed. In situ measurements were collected in each month where a sample for lab testing was collected.

Sampling at the downstream location, adjacent to the Powerhouse building, shows consistently elevated alkaline pH values and elevated dissolved aluminum contents. Concentrations of ammonia, total arsenic, total iron, total lead, total silver, total zinc were noted in select samples events above the BC WQG. The elevated metal concentrations may indicate that ARD-ML processes are occurring however the processes are being buffered and an alkaline pH is being

maintained. The ammonia and elevated dissolved aluminum contents have been inferred to be connected to construction activities at the L2 Powerhouse connected to structure material and admixtures in concrete cement at the sample location.

3.2.2 Left Bank Excavation

Five AG samples were collected from Bench 0 and two AG samples were collected from the western portion of the LBEX in 2022. Although bedrock exposures in the LBEX are small relative to the total LBEX catchment these weathered surfaces generate acidic runoff.

The LBEX sumps are developed along the LBEX benches to collect surface runoff. The upper benches drain to LBEX-B2 sump through the Left Bank Drainage Channel and the water is piped or trucked to the RSEM Area L5 Phase 2 East sediment control pond. The lower sumps on Bench 0 and Bench 1 collect possible ARD influenced runoff from the PAG bedrock exposed in the lower benches of the LBEX and transferred to the WTP for treatment as needed. A sump west of Garbage Creek collects contact runoff and seepage from the PAG exposure above the LBEX haul road and is directed to the WTP or the RSEM L5 Phase 2 East sediment control pond, as appropriate.

Runoff from the lower LBEX benches that report to the LBEX Bench-0 sump and runoff from bedrock exposed in the western portion of the LBEX that reports to the LBEX SUMP were occasionally acidic and had elevated metal concentrations. Details are provided in Appendix A.

3.2.3 Earthfill Dam

Water management within the Earthfill Dam evolved over the course of 2022. In Q1 and Q2 2022, the collection of runoff and dewatering of Peace River seepage water was performed upstream and downstream of the Earthfill Dam, and within the Isolation Zone. Analytical sampling associated with ARD monitoring was discontinued after May following decommissioning of the upstream and downstream wells and cessation of dewatering in the Earthfill Dam area.

Eight surface water monitoring stations have been established to monitor water quality associated with the Earthfill Dam. Sample locations and details of the water quality monitoring program are presented in Appendix A. Sample locations capture the dam core dewatering and discharges as well as the Non-PAG contact water discharges and Peace River mixing zones.

Samples collected from the two dewatering well upstream of the Dam Core show alkaline conditions with moderate conductivity and generally low TSS. The analytical measurements indicate generally low sulphate levels (<128 mg/L) and elevated total Zn concentrations. Total Zn is primarily present in the dissolved form. The water quality signature suggests that Zn does not originate from ARD influence, rather the Zn concentrations are believed to originate from the galvanized metal walls of the standpipe which are in contact with groundwater.

Dam core seepage from the western portion of the Earthfill dam excavation was collected in a sump and directed to the RSEM R6 West pond. Similarly, a sample station was established for pipeline discharge of dam core water to the RSEM R6 West pond. Dam core water from these stations were characterized by slightly alkaline conditions and moderate conductivity.

Peace River stations upstream and downstream of contact water discharges were used to evaluate any effects on water quality measured in the receiving environment. Water quality monitoring was conducted on a daily to weekly basis at the upstream and downstream Peace River stations. Water quality at both stations was circumneutral to alkaline with low to moderate conductivity. Sulphate concentrations were low, while TSS levels varied throughout 2022. Individual samples exceeded the BC short or long term WQGs for total Cr, total Fe and Zn on a few occasions. Elevated total metal concentrations generally reflected TSS influence.

Overall key findings from the sampling in 2022 indicated that Earthfill Dam water quality for samples were circumneutral to slightly alkaline, with low sulphate and metals concentrations (Appendix A).

3.2.4 Off Dam Site Water Quality Monitoring

Water quality monitoring at off-dam site exposures was completed in accordance with the CEMP, Appendix E S.5.2.2. Water quality monitoring for all construction area PAG contact surface water was be confirmed to meet BC WQG prior to the first discharge into the receiving environment, and then subsequently monitored during construction. Monitoring and associated site inspections by the Contractor's Qualified Environmental Professional (QEP) is increased in frequency if ARD and ML is observed and if there is a risk of downstream effects such as negative impacts to receiving environment chemistry.

- Scissor Cut: BC Hydro conducted water quality sampling on May 2nd and June 14th, 2022.
    - The water quality sampling is conducted in a high flow waterway that passes the Scissor Cut location and ultimately discharges to the Peace River. The May and June sample events noted turbid water at the sample locations. The in situ testing and lab testing shows neutral pH water.
    - The results of analysis at the upstream/background and downstream sample locations showed exceedances in concentrations of dissolved aluminum, total arsenic, total and dissolved iron, and total zinc However, it is noted that the measured concentrations at both the upstream and downstream stations are very similar, and this was observed in both sampling events. This demonstrates that the exceedances noted are interpreted as being natural and that the Scissor Cut is not influencing the water quality.
- Keyed-In-Fill: BC Hydro conducted water quality sampling on May 2nd, 2022.
    - The sample results reported neutral or alkaline pH at the east and west keyed-in fill sample locations, with low sulphate values.
    - No water was observed during the June 14th site visit.

Water quality monitoring took place at the following Highway 29 Realignment Segments as follows:

- Bear Flat Cache Creek
    - DWB Consulting Services (DWB) are retained to oversee the site and to offer guidance relating to environmental management and compliance outlined in the site-specific EPP and the overarching CEMP throughout the remainder of the project.
- Halfway River Boat Launch

- Allnorth Consultants LTD. (Allnorth) has been retained by Duz Cho Contractors (Duz Cho) to provide a Qualified Environmental Professional (QEP) to oversee the site and to offer guidance relating to environmental management and compliance outlined in the site-specific EPP and the overarching CEMP throughout the remainder of the project.
- Allnorth report in the November 13-19, 2022 weekly environmental monitoring report the following information on water management and water quality: A sample for water quality testing was collected from standing water in the bridge end fill area on October 31, 2022. Water sampling results were received on November 7, 2022, and provided in the weekly environmental monitoring report; however, the water had already been relocated to PAG disposal area and treated as contact water at the end of October/beginning of November because the area was needed by Duz Cho to button up construction. The pH of the water sample was 8.05 with a sulphate content of 316 mg/L.

- Farrell Creek
  - DWB Consulting Services (DWB) are retained to oversee the site and to offer guidance relating to environmental management and compliance outlined in the site-specific EPP and the overarching CEMP throughout the remainder of the project.
- Farrell Creek East
  - Allnorth has been retained by Formula Contractors Ltd. (Formula) to provide a QEP to oversee the site and to offer guidance relating to environmental management and compliance outlined in the site-specific EPP and the overarching CEMP throughout the remainder of the project.
  - Allnorth report in the May 29-June 04, 2022 weekly environmental monitoring report the following information on water management and water quality: Site drainage is limited with no contact/influence on the Peace River. Measures previously installed to minimize contact with ground and prevent surface water from leaving site are functioning as expected. Water quality sampling was completed, with values staying within BC water quality guidelines.
- Dry Creek
  - DWB has been retained by Formula to provide a QEP to oversee the site and to offer guidance relating to environmental management and compliance outlined in the site-specific EPP and the overarching CEMP throughout the remainder of the project.
  - DWB report water quality monitoring results in the July 16-22, 2022 weekly environmental monitoring report. The report discusses that on July 19, 2022 the QEP conducted pre-fording orientations with Formula. On July 20, 2022 Formula began removal of the temporary bridge at the floodplain, following approval of the fording prescription submitted to BCH and the pre-ford visual inspection by the QEP of the ford location. The QEP collected water samples for water quality monitoring (WQM) during fording activities and no significant changes were observed during fording.
- Portage Mountain Quarry
  - BC Hydro has implemented water quality monitoring, outside of frozen or dry conditions, to establish water quality conditions as part of the ongoing reclamation work for the quarry.

4. SITE AUDITS

4.1 ARD/ML Site Audits

BC Hydro has engaged Tetra Tech as QP (ARD), in accordance with the CEMP Appendix E S. 6.1.2, to inspect and monitor various construction areas with potential for ARD/ML since June 2016. The site audit includes observations of ARD-ML materials management at various construction areas, Relocated Surplus Excavation material (RSEM) facilities and designated water discharge points.

The site audit locations focused on areas of stored or exposed shale rock, condition and functioning of implemented mitigation and management including limestone riprap and water management structures, and the surface water receptors potentially influenced by PAG materials. While visiting these locations, observations were made based on visual inspection and detailed investigations were not conducted, however, some in-situ measurements or confirmatory rock samples were collected during some audits.

A summary of each of the site audits was reported to BC Hydro during the year. Site audits completed during 2022 for the project were conducted as follows:

- April 25-27, 2022. Scott Kingston, P.Geo., completed a site audit at the MCW dam site and at sites on the Highway 29 Realignment Project. Areas visited during the audit include MCW Left Bank Debris Boom, River Road, RSEM R5A, RSEM R6 ponds, SBIAR, Powerhouse, Moberly River slopes, and other areas. The offsite areas that were visited for the Highway 29 Realignment Project included Farrell Creek East, Dry Creek, Portage Mountain Quarry and Bear Flats Cache Creek. Confirmatory geochemistry samples were collected during the site audit at the Farrell Creek East site from potential bedrock excavation for confirmation of acid generation potential. The analysis informed mitigation and management planning under the direction of the Contractor's QP(ARD)
- July 18-21, 2022. Lara Reggin, P.Geo., completed a site audit at the MCW dam site, sites on the Highway 29 Realignment Project, and the Old Fort Road construction area. Areas visited during the audit include MCW Left Bank Debris Boom, Left Bank Excavation, River Road, Howe Pit, RSEM R5A, RSEM R6 ponds, SBIAR, Powerhouse, Moberly River slopes, and other areas. The offsite areas that were visited for the Highway 29 Realignment Project included Farrell Creek, Lynx Creek, Dry Creek, Halfway River and Bear Flats Cache Creek. A confirmatory rock sampled from the Left Bank Excavation. Analytical results confirmed that the exposed shale is currently acid generating where the sample was collected.
- October 28-30. Scott Kingston, P.Geo. completed a site audit at the MCW dam site, and Highway 29 Realignment. Areas visited during the audit include MCW Left Bank Debris Boom, River Road, RSEM R5A, RSEM R6 ponds, SBIAR, Powerhouse, Moberly River slopes, and other areas. The offsite areas that were visited for the Highway 29 Realignment Project included Farrell Creek, Halfway River Boat Launch, and Portage Mountain Quarry. The Wuthrich Quarry site was also visited to support future use decision making for that quarry.

4.2 Environmental Assessment Office Inspection and Order

From August 15 to 19, 2021 the Environmental Assessment Office conducted an inspection of the Project site. The inspection concluded that the requirements of the Acid Rock Drainage – Metal Leachate Management Plan require both encapsulating exposed PAG surfaces within 30

days, and installing surface water run-off capture and from AG and PAG exposures prior to discharge. The EAO Ordered the project to both encapsulate and capture and treat all exposed PAG locations. This resulted in Order EN2022-006 dated April 21, 2022.

Subsequently, the Environmental Assessment Office provided clarity that the Order does not apply to excavations that continue to be active and will not pursue enforcement against the April 2022 order while the CEMP revisions are underway.

This interpretation is not consistent with the intention of the Acid Rock Drainage – Metal Leachate Management Plan, as it is BC Hydro's intention to implement the most appropriate location specific treatment which could include either encapsulating the exposure or capturing and treating surface water run-off.

In response to the Order, BC Hydro sought revisions to the CEMP. In September 2022 the Environmental Assessment Office requested BC Hydro to provide additional supporting evidence from its Qualified Environmental Professional to support the CEMP revisions. This submission was provided to the Environmental Assessment Office in October 2022 to which a response was not received before the end of 2022.

In parallel with the CEMP revisions, BC Hydro advanced engineered design options for a number of on dam site potentially acid-generating rock exposures that will not be covered by either the reservoir or other works that require final designed treatments.

N

85th Ave Industrial Lands

240 Road

269 Road

Old Fort Road

RSEM R5a North Expansion

Left Bank Debris Boom

RSEM L5 Expansion

Viewpoint Road

R5a

Viewpoint

North Bank Road

L5

L3

RSEM R5a Central Expansion

Left Bank Stabilization Excavation

Diversion Tunnel Inlet

Worker Accommodation

Howe Pit

Moberly River Temporary Bridge

R5b

Earthfill Dam Zone 8

L6

River Road

Blind Corner

Peace River

Diversion Tunnel Outlet

Peace River Construction Bridge

Moberly River

South Bank Erosion Protection Works

Approach Channel

R6

Powerhouse

South Bank Initial Access Road

Area 23

Area 21

Right Bank Drainage Tunnel

Temporary Substation (SCX)

Septimus Repeater Site (SUR)

Septimus Access Road

Septimus Siding and Loading Area

Pine River

Fort St. John

Taylor

Hudson's Hope

Index

Legend

PAG-contact RSEMs

Components

Dam Site Area

1:30,000

0 0.5 1 km

Map Notes:
1. Datum: NAD83
2. Projection: UTM Zone 10N
3. Dam Site Imagery from PhotoSat taken Nov 20, 2021

BC Hydro

Figure 1
Overview - Dam Site

Date	Mar. 15, 2023	DWG NO	1016-N11-01757	R 0

Construction of the Site C Clean Energy Project is subject to required regulatory and permitting approvals.

Path: X:\ArcGISProjects\MonitoringWaterQuality\2022AnnRep_ARD_1016_N11_01757.mxd

N

Charlie Lake

Wuthrich Quarry

Cache Creek

Highway 29 Realignment: Bear Flat/Cache Creek

Highway 29 Realignment: Halfway River

Halfway River

Wilder Creek

Fort St. John

85th Avenue Industrial Lands

Halfway River Boat Launch

km12 Eagle Road

Highway 29 Realignment: Farrell Creek East

Boudreau Lake

Taylor

Highway 29 Realignment: Farrell Creek

Farrell Creek

Peace River

South Reservoir Key-In

Highway 29 Realignment: Dry Creek

Dry Creek

Highway 29 Realignment: Lynx Creek

Lynx Creek

Pine River

Williston Reservoir

Hudson's Hope

Hudson's Hope Shoreline Protection

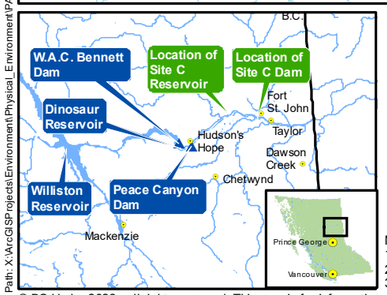
Transmission Corridor

Del Rio Pit

Portage Mountain Quarry

Dinosaur Reservoir

75 km southwest to West Pine Area



Map Notes:
1. Datum: NAD83
2. Projection: UTM Zone 10N
3. Base Data: Province of B.C.

Legend

- PAG Material Disposal Sites
- Potential Access
- Dam Site Area
- Transmission Corridor
- Highway 29 Realignment
- Existing Railway
- Existing Road
- City/District Municipality
- Off-site Construction Material Sources

1:250,000

0 10 km

BC Hydro

Figure 2
Overview – Off Damsite

Date	Mar 22, 2023	1016-N11-01081	R 2

Path: X:\ArcGIS\Projects\Environment\Physical_Environment\PAG_MaterialStorage_1016_N11_01081.mxd

Construction of the Site C Clean Energy Project is subject to required regulatory and permitting approvals