

*Acid Rock Drainage and Metal
Leachate Management Plan – Water
Quality Annual Report:
January 1 to December 31, 2023*

*Site C Clean Energy Project
March 28, 2024*

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- Appendix B – PAG Contact RSEM Pond Monitoring: Peace River Surface Water Quality and Pond Toxicity 2023 Annual Report (Ecofish Research Ltd. and ASKI Reclamation LP)
- Appendix C – Site C Clean Energy Project Water Quality Monitoring for River Road, South Bank Initial Access Road, Left Bank Debris Boom and L2 Powerhouse 2023 Annual Report (Tetra Tech)

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 drainage 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
PMQ	Portage Mountain Quarry
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, 2023.

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 2023

2.1 General Description of Site Activities

Site C construction activities continued through 2023, the eighth 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 2023. A cumulative total of just over 1.6M m³ of material has been placed on the Left Bank, of which more than 1.5M m³ (more than 90%) has been placed in RSEM L5 and the RSEM L5 Extension.

Bedrock material excavation and disposal was tracked throughout 2023, and details of the construction areas and material disposal are presented in Section 2.5.

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, 2023 (cumulatively since the start of project construction), 2080 EPPs (including revisions) have been reviewed by BC Hydro covering all contractors and scopes of work. In the calendar year 2023, 187 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. Throughout, 2023, the mobile water treatment facility (MWTF), operated by PRHP continued to operate, and effectively treated water to remove dissolved metals and produced RSEM EOP effluent that met the Discharge Limits in 2023.

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 summary of the program is presented below, with sample locations and sample numbers analyzed presented in Table 1.

- In 2023, a total of 49 samples were collected for rinse pH analysis from the Earthfill Dam and the Left and Right Banks.
- Approximately 10% 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).
- The final NPAG cover material was in place by the end of 2023 Q4 on RSEM Area L5, L5 Garbage Creek and LBEX Bench 0, which restricts ARD development from these facilities.
- Rinse pH monitoring in Zone 8 of the Earthfill Dam indicated that AG material was present in this area. The final NPAG cover material was in place on Zone 8 by the end of 2023 Q4.
- Rinse pH monitoring in Zone 8 of the Earthfill Dam indicated that AG material was present in this area. The final NPAG cover material was in place on Zone 8 by the end of 2023 Q4.d
- On the Right Bank, AG material was identified in the bedrock exposures within the RSEM Area R5B catchment and RSEM Area R5A. The final NPAG cover material was in place by the end of 2023 Q4 on RSEM Area R5A but the final configuration of the R5B catchment is still under investigation.

In 2023, geochemical sampling was completed by PRHP personnel with guidance provided by Lorax. The majority of sampling occurred during three rounds of sampling in April, May and August 2023. In total, 49 samples were analyzed for rinse pH; of these, 5 samples underwent more extensive geochemical testing including ABA and metals analysis (Table 1).

Table 1: Overview of Sample Distribution and Analyses Conducted in 2023

Location	Rinse pH	ABA and Metals
Left Bank		
RSEM Area L5	18	2
Left Bank Excavation	5	1
Earthfill Dam		
Zone 8	14	2
Right Bank		
RSEM Area R5A	4	0
RSEM Area R5B	8	0
Total	49	5

The 2023 sampling plan recommends that new and confirmatory samples are collected from the major active and inactive excavation sites, RSEM deposition areas, and the Earthfill Dam. 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.

2.5 Dam Site Activities Related to PAG Material Management

2.5.1 Right Bank PAG Material Management & Excavation

In 2023, of the total 718,011 m³ of PAG bedrock excavated, the majority of 715,403 m³ was from Right Bank excavation. Right Bank excavation material was placed into the RSEM Area R5A. The Earthfill Dam area excavation totaled 2,205 m³, which was placed into Zone 8. The

Zone 8 also received PAG materials from the Right and Left Bank materials. Relatively minor quantities were excavated from the Right Bank Drainage Tunnel. See Appendix A for full breakdown of excavation volumes from different locations.

Material excavated in 2023 was placed primarily in RSEM Area R5A and the Earthfill Dam (Zone 8), although lesser amounts of PAG material was also placed in RSEM Area L5 and Garbage Creek.

The cumulative volumes of material placed in RSEM and RB stockpiles at the end of 2023:

- 7,906,573 m³ of PAG bedrock in RSEM Area R5A and R5A Starter Dyke; and
- 363,847 m³ in RSEM Area R5B, which did not increase from the previous year and is covered by non-PAG material.
- 59,805 m³ in Area 20-21, Area 23, and AC Temporary Stockpile.

In Q1 and Q2 2023, PAG material was relocated from within the RSEM Area R5A to the West and Central Expansion areas, and additionally, to the Area 20-21 and 23 temporary stockpiles. The Right Bank Cofferdam material was placed into the Approach Channel temporary stockpile from which 2,745 m³ was relocated to Zone 8. In Q3 2023, some material was placed into RSEM Area R5B then relocated to Zone 8 and RSEM Area L5.

Much of the Right Bank material in 2023 was produced from excavations in the Approach Channel and Spillway (520,102 m³). The remaining volume was excavating from the RBEF Area and Tailrace (136,062 m³), the RB Cofferdam (58,854 m³), the Batch Plant (220 m³) and Area 20-21 Stockpile (165 m³).

Approach Channel PAG exposures were mitigated by placing the final channel surface layers and riprap, although small areas of exposed PAG bedrock remain on the slopes above the R5B sump west of the Approach Channel, which are managed under consideration of BC Hydro.

In 2023, two AG samples were identified on the Right Bank. Rinse pH tests were completed in RSEM Area R5A (four samples) and RSEM Area R5B (eight samples), and no ABA or metals testing in the Right Bank in 2023. The 2023 sampling plan recommends that new and confirmatory samples are collected from the major active and inactive excavation sites, RSEM deposition areas, and the Earthfill Dam (Lorax, 2023a). This sampling directs water management and material handling and storage strategies such as the placement of a cover or fresh PAG within RSEM areas.

2.5.2 Right Bank RSEMs and Catchment Areas

Non-contact water is diverted away from the eastern portion of 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:

1. Area 30 stockpile of West Pine Quarry aggregates resulting in runoff accumulates in Area 30 sediment control pond and discharged to adjacent wetlands via a riprap lined channel.
2. Area A east of SBIAR where NPAG aggregates were extracted for use.
3. RSEM Area R6 where contact water is conveyed to RSEM R6 sediment control ponds.
4. RSEM Area R5A drained to the RSEM R5A Phase 2 sediment control ponds until 2023 Q2 when the ponds were decommissioned, backfilled and capped. This area is now managed by BC Hydro.
5. RSEM Phase 2 Sump collected runoff from areas immediately south of RSEM Area R5B and the western extents of the Approach Channel until 2023 Q3 when the sump was decommissioned, backfilled and capped.

. 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 previously decommissioned and backfilled in 2022. The majority of water that previously reported to the RSEM R5B sediment pond is conveyed to the RSEM R6 ponds in 2023. 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. The Phase II R5B sump was decommissioned in October 2023 and all pumping systems removed.

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.
- A temporary PAG Storage pile was constructed in Area 21 within Area A, in October 2023 to accept PAG waste material from the completion of the Approach Channel following the closure of RSEM R5a. The Site is closed facility, built on an low permeability pad, with a lined ditch and collection pond for capture of runoff.
- Area 30 is used to stockpile aggregates from the West Pine Quarry. Runoff from the stockpiles accumulates in the Area 30 sediment pond.. The pond discharges to the adjacent wetlands through a rip-rap lined channel.
- In 2023, Area 30/Septimus Hill water quality monitoring stations included Area-30-SP, Area-30-EOP, and Septimus-Beaver Pond.

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

In 2023, a total of 2,205 m³ was excavated from the Left Bank, which was produced from LBEX Bench 0 and placed into RSEM Area L5 and L5 Garbage Creek Zone 8. The majority of this material was in use on Bench 0 as a safety berm for most of 2023 prior to being relocated to RSEM Area L5.

At the end of 2023, the cumulative volume of PAG material in the Left Bank stockpiles totaled 1,636,342 m³. The PAG material is primarily in the RSEM Area L5 (1,033,011 m³), and RSEM Area L5 Extension (495,792 m³), with lesser volumes in RSEM Area L6, L5 Garbage Creek, LB Dam Core, and RSEM Area L5 Starter Dyke.

Although fresh PAG was placed in L5 Garbage Creek in 2023 Q2 and remained exposed for 6 months, a final cover of NPAG material was placed in Garbage Creek and the responsibility was transferred to BC Hydro by the end of Q4 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. Samples were collected from locations where PAG material was visible at the surface and collected during Q2 and Q3 2023. Samples were generally classified as weathered bedrock or a weathered bedrock – overburden mixture, and one sample was classified fresh bedrock from RSEM Area L5. A large portion of RSEM Area L5 and the RSEM Area L5 Extension has been covered with overburden. RSEM L5 has been completed and capped to design.

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. The majority of material exposed in the LBEX is granular overburden, however shale is exposed near the NW edge of LBEX and at base of LBEX along Bench 0.
- The small RSEM Area L6, from which contact water is generally conveyed to the RSEM Area L6 sediment pond.

The covering of PAG exposures occurred from Q3 to Q4 2023 resulting in no exposed PAG material at surface in the RSEM Area L5 and RSEM Area L5 Extension areas.

In 2023, four AG samples were identified on the Left Bank. Rinse pH tests were completed in RSEM Area L5 (18 rinse pH; 2 ABA and Metals samples) with one AG sample and sample with rinse pH <5.5. and Left Bank Excavation (5 rinse pH; 1 ABA and Metals samples) in the Left Bank in 2023.

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 2023 amounted to a total of 403 m³ of PAG bedrock. The majority of the PAG material originated from the excavation of the Temporary Ramps (41,272 m³) and the Dam Core Temporary Blanket (21,968 m³). 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 m³ was removed from the main excavation in Q3 2022.

In 2023, fourteen rinse pH tests were completed, and two ABA and Metals samples were tested in Zone 8 of the Earthfill Dam in 2023. In Zone 8, 3 of 8 samples had rinse pH >7.0 and one sample had rinse pH <5.5 during Q2 2023. Sampling indicated in Q3 2023 that a higher proportion of material placed in Zone 8 was becoming acidic and two of the six samples had acidic rinse pH and no samples measured a rinse pH above 7.0. The final overburden cover was completed in 2023 Q4. The risk from PAG exposed in both the a) Earthfill Dam upstream of the Dam Core (Zone 8) and b) RSEM Area L5, were mitigated by construction and placement of a final NPAG cover in Q4 2023.

Previously, in 2022, due to the exposures of PAG and AG exposures within the Earthfill Dam, Lorax (Appendix A) provided recommendations for ongoing monitoring and mitigation including ongoing rinse pH monitoring, All AG and PAG material in the earthfill dam has been covered. The Dam is completed to design.

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

Dam elevation at the beginning of 2023 was high enough that seepage from the river was not a factor. The only water management on the dam in 2023 was surface water and that was done with ditching, berms, and sumps.

2.6 Off Dam Site Activities Related to PAG Material Management

2.6.1 Reservoir Clearing

OLTC16/17 Middle Reservoir Clearing Project – Halfway Frost

Monitoring of Scissor Cut continued in 2023. No surface water run-off was observed.

OLTC20a – 4Evergreen Resources

The Eagle Road PAG stockpile was covered and seeded in 2022. Final deactivation of the Eagle Rd PAG cut was completed in August 2023, which included stabilizing the embankment and lining the ditch with limestone to the waterline.

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 2023.

2.6.3 Highway 29 Realignment

Excavation and mitigation of PAG materials and exposures were largely completed prior to 2023. There were a few minor incidental exposures observed. Areas of construction which encountered PAG materials include the following segments and activities:

- *Bear Flats Cache Creek*: Temporary drainage of seepage through shale was put in place to prevent erosion of shale slope under the west abutment of the bridge. The area was covered by permanent construction during 2023.
- *Halfway River*: PAG related works was completed in 2022, there was no excavation or PAG mitigation in 2023.
- *Farrell Creek*: PAG was excavated during the east abutment works during 2022. Completion of the new highway alignment allowed for the final cover to be placed over the previously exposed shale in 2023.
- *Farrell Creek East*: PAG was exposed and capped in the D5 line. No PAG was excavated or removed from the D5 line in 2023.
- *Dry Creek*: There was no PAG excavation at Dry Creek noted in 2023.
- *Lynx Creek*: The L70 line encountered a small PAG exposure on the southwest side of the road which was mitigated by placing fill as cover and limestone riprap was placed at the Drainage outlet. The L2 Vertical extension area excavation exposed shale over an area of approximately 60 m long by 10 m high. Mitigation of the area was completed with woven geotextile and granular material cover.

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 PAG disposal at Bear Flats Cache Creek was completed, covered in high fines soil and hydroseeded during 2023.
- *Halfway River*: Halfway River PAG disposal piles were closed in 2022. The piles have established robust vegetation during 2023.
- *Farrell Creek*: The PAG disposal at Farrell Creek was closed in previous years and not used in 2023.
- *Dry Creek*: The PAG disposal Pile at Dry Creek was closed in 2023, it was covered in high fine soils and hand seeded in late May.
- *Lynx Creek*: The PAG disposal Area at Lynx Creek was re-opened at the south end to receive minor PAG exaction from the L2 Extension area, and the PAG Disposal was extended to the South. The remainder of the pile was covered with soil, erosion control matting and hydroseeded.

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 Halfway River Boat Launch

PAG was exposed during the construction of the Halfway River Boat Launch in 2022, and excavation and completion of the Boat Launch was ongoing in 2023. PAG was excavated and placed in a disposal site within the floodplain, the PAG disposal was closed in 2022, however was reopened on the east side to accept additional PAG materials in 2023. In October 2023 the re-opened portion of the pile was closed, covered with high fines soils and seeded.

2.6.5 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.

2.6.6 Portage Mountain Quarry Remediation

As operations ceased in 2022, no new PAG material was excavated, exposed, or created at Portage Mountain Quarry (PMQ). The Portage Mountain Quarry Reclamation Plan was initiated in 2023 and is anticipated to be completed in 2024.

In preparation for the reclamation, Tetra Tech, as BC Hydro's ARD/ML QP, completed a comprehensive geological and geochemical characterization report for PMQ, where the main sandstone unit has historically been used for riprap along Highway 29 and for the Hudson's Hope Shoreline Protection Berm. The results of the assessment and the subsequent addendum for geochemical characterization of PMQ aggregate stored in Area 4 and 5 are detailed in the following reports:

- Tetra Tech. 2023. Acid Rock Drainage and Metal Leaching Assessment for Portage Mountain Quarry Reclamation Plan.
- Tetra Tech. 2023. Acid Rock Drainage and Metal Leaching Evaluation of Area 4 and 5 Aggregate.

Lorax and AMEC (now Wood) undertook previous ARD/ML characterization as part of the quarry operation, which would have been referenced in previous annual reports. Lorax also provided an ARD/ML assessment report of the Area 5 stockpile and pads in January 2023.

In-situ and geochemical characterization of the bedrock at PMQ identified four (4) main rock types: sandstone (approximate 85% of the exposures), mudstone (10%), conglomerate and coal (combined up to 5%). In-situ conglomerate exposures were limited to the Upper Quarry, with the other three (3) rock types observed throughout the quarry and along the access road. In addition to the bedrock, the geochemical assessment extended to stockpiled material in the Upper Quarry, Haul Road, Fill Benches, Stockpile areas, and the Area 5 stockpiles. ARD/ML evaluation indicated low potential for acid generation and ML for the sandstone, the majority of the mudstone, and most of the stockpiled shotrock and aggregate. Exposed conglomerate, coal, and minor amounts of mudstone influenced by adjacent coal seams were classified as PAG and potentially ML. To evaluate the risk of the exposed coal and conglomerate seams, Tetra Tech (2023) undertook a Detailed Risk Assessment (DRA). The DRA determined there was no risk to environmental receptors, as detailed in the Risk Assessment Evaluation for Mitigation of Exposed Coal Seams at Portage Mountain Quarry (Tetra Tech 2023). As such, mitigation measures are proposed for the coal and conglomerate seams.

Recommendations for mitigation of stockpiles in PMQ and Areas 4 and 5 containing PAG material were provided in the characterization reports. On-going development of mitigation strategy for a stockpile in the Upper Quarry containing up to 70% PAG material (Lorax, 2023) is being completed and planned for construction in 2024.

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 2023, 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 2023 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, including along River Road, at the LBDB and RSEM Area L5 and L6 sediment ponds and discharges. The surface water quality monitoring network that was utilized on the Right Bank in 2023 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), 2023
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 (<i>in situ</i> 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 <i>Install groundwater monitoring wells upgradient and downgradient of RSEM R5A and R5B, and water quality monitoring of groundwater.</i>	7.2.5, 7.3.3	<i>Quarterly (No longer required as of September 2020 due to river diversion/headpond creation)</i>	<i>September 2016 to July 2020 (wells decommissioned September 2020)</i>	<i>RSEM R5A and RSEM R5B</i>	<i>Contractor (Peace River Hydro Partners)</i>	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 2023, is provided in Table 3.

Table 3 Summary of PAG-contact RSEM Sediment Pond Operational Status in 2023

RSEM	Status in 2022
Right Bank	
RSEM R5A (Phase 1)	Decommissioned in Q3 2020.
RSEM R5A (Phase 2)	Decommissioned in 2023.
RSEM R5B (Phase 1)	Decommissioned and backfilled in 2022. Majority of water previously reported at RSEM R5B is now conveyed to the RSEM R6 ponds.
RSEM R5B Sump (Phase 2)	Operational. Receives runoff from Approach Channel south slopes. Drainage accumulating in RSEM R5B Sump periodically directed to RSEM R6 West or RSEM R5A Pond A sediment control ponds.
RSEM R6 (PRHP) ¹	Operational, East and West Ponds; includes Area 20/21w, 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 2023, surface water quality sampling was undertaken at a total of 42 stations, including 12 stations on the Left Bank (289 in situ and 83 lab samples; Table 3-4 Appendix A) and 30 stations on the Right Bank (1,683 in situ and 822 lab samples; Table 3-10 Appendix A). Laboratory results obtained in 2023 from these stations are summarized below and detailed in Appendix A

For 2023, a total of 141 QC samples were obtained (71 blanks and 70 duplicates) and 1,029 monitoring samples were collected as part of the PRHP ARD water quality monitoring program, which represented approximately 14% of the monitoring samples collected and consistent to general industry practice. During 2023, water quality samples were submitted to BV laboratories, a qualified lab under the BC Environmental Data Quality Assurance Regulation (EDQA).

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 2023, AG samples were identified on the Left Bank (n=4), Earthfill Dam (n=3) and Right Bank (n=2).

In 2023 Q1 (March), an exceedance was measured in water discharged from a PAG-containing RSEM sediment pond to the Peace River. No other exceedances were noted in 2023.

Discharge monitoring identified one location where EOP discharge limits (or WQGs, as applicable in the case of the Earthfill Dam) were exceeded:

- RSEM-R6W discharged in Q1, Q2, Q3, Q4 2023. An EOP discharge exceedance of total copper on March 19, 2023 was attributed to sample contamination or lab error.
- RSEM L5E discharged only in 2023 Q2. An exceedance of total cadmium, copper and zinc in March 2023 when the RSEM L5 West Pond was not discharging, may be attributed to indicate signs of PAG weathering in RSEM L5 in 2023 Q1.
- Area 30 sediment control pond measured periodic elevated sulphate and zinc during 2023, associated with weathering of the stockpiled limestone aggregate under neutral conditions. Exceedances are attributed to sediment contamination during sampling.
- RSEM R6E discharged in Q1, Q2, Q3, Q4 2023.
- RSEM R5A-A discharged only in 2023 Q2.
- RSEM R5A-C discharged only in 2023 Q2.
- RSEM R5A P2-A-EOP: The RSEM R5A ponds were operational until 2023 Q2 when they were infilled.
- RSEM R5A P2-B-EOP: The RSEM R5A ponds were operational until 2023 Q2 when they were infilled.
- RSEM L5W discharge only in 2023 Q2.
- RSEM L6 discharged in 2023 Q2 and Q4.

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.

Left Bank

RSEM L5 – final NPAG cover material placement and backfilling of sediment ponds in 2023 Q4.

L5 Garbage Creek – diversion channel liner removed and NPAG cover construction in 2023 Q4.

LBEX – exposed PAG in Bench 0 covered with NAG material in 2023 Q4.

- exposed PAG LBEX West final cover under construction in 2023 Q4.
- LBEX-B2 Sump water accumulations directed to RSEM Area L6 sediment pond via pump and pipeline.

RSEM Area L6 – additional catchment added to the sediment pond via pump and pipeline network from LBEX-B2 Sump to RSEM Area L6, which is in place 2023 Q4.

Right Bank and Earthfill Dam

RSEM Area R5A – expanded to accommodate additional material in both the West and Central Expansion Areas with recontouring and covering entire RSEM Area R5A with NPAG material and backfilling to final configuration in 2023 Q4.

Approach Channel – exposed PAG along base and slopes covered with material and rip rap, with final configuration in 2023 Q4.

RSEM Area R5B sumps – Backfilling and recontouring of R5B sumps completed in 2023 Q4. Small patches of PG remain exposed with low/moderate ARD/ML risk.

Earthfill Dam – PAG fill placement in Zone 8 upstream of Dam Core, with recontouring and covering of entire upstream zone with NPAG material to final configuration in 2023 Q4.

RSEM Area R6 – small stockpiles of PAG material at Area 20/21, Batch Plant, Area 23 (cumulative 60,000 m³) and road cut PAG exposure of SBIAR with low ARD/ML risk in 2023 Q4.

This maintenance of the water management systems in catchments mitigates risk through 2023, as detailed in Appendix A.

A quarterly summary of water transfers in 2023 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 2023 (from Lorax, 2024)

Receiving Facility	Q1	Q2	Q3	Q4
	RSEM L5 East Phase 2 Sediment Control Pond 1	NPAG contact water from LBEX	NPAG contact water from LBEX, water from RSEM L5 West pond	NPAG contact water from LBEX
RSEM L5 West Phase 2 Sediment Control Pond 1	Concrete contact water from L5 Vacuum Truck Dump	- ¹	- ¹	- ¹
RSEM R6 East Sediment Control Pond	NPAG contact water from Areas 20/21/54 and LBEX	NPAG contact water from Areas 20/21/54 and LBEX	NPAG contact water from Areas 20/21/54, PAG contact water from AC, NPAG contact water from RBCD Tailrace	NPAG contact from Area 20/21/54
RSEM R6 West Sediment Control Pond	WTP Sludge Pond (Cell 3) discharge; PAG contact water from AC and Tailrace	WTP Sludge Pond (Cell 3) discharge; PAG contact water from AC, R5B Phase 2 Sump; NPAG contact from Area 20/21 and Area A N Ditch	WTP Sludge Pond (Cell 3) discharge, RSEM R6 East pond; PAG contact water from R5B Phase 2 Sump,	WTP Sludge Pond (Cell 3) discharge,
RSEM R5A Phase 2 Sediment Control Pond A 2	PAG contact water from R5B	PAG contact water from R5B Phase 2 Sump	- ²	- ²
WTP Pre-Treatment Pond	PAG contact water from LBEX, RSEM Area L5, RBDT and concrete contact water from RBCD (Tailrace)	PAG contact water from LBEX, RSEM Area L5, RBDT, AC, Downstream Cofferdam and RSEM Area R5A	PAG contact water from LBEX, RSEM Area L5 West and East Ponds, RBDT and AC	PAG contact water from RBDT
WTP Sludge Pond (Cell 3)	NPAG contact water from RBCD (Powerhouse and Tailrace) dewatering	NPAG contact water from RBCD (Powerhouse and Tailrace) dewatering	NPAG contact water from RBCD (Powerhouse and Tailrace) dewatering	NPAG contact water from RBCD (Powerhouse and Tailrace) dewatering

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.

¹The RSEM L5 ponds were operational until 2023 Q3 when they were infilled. Although the L5 West pond was operation in Q2, water not transferred to the pond in this quarter.

²The RSEM R5A ponds were operational until 2023 Q2 when they were infilled.

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.

During 2023, the water treatment plant was operated intermittently for a total of 41 days in the year and treated a total of 32,245 m³ of PAG contact water. However, discharge from the Sludge Pond at station MWTF-SLP-R5 was observed throughout Q1 to Q4 2023, primarily due to RBCD (Powerhouse; Q1 to Q3) and RBDT (November onwards) dewatering flows, which are excluded from the WTP total treated volume for 2023.

Right Bank: total volume of 860,239 m³ water discharged in 2023.

- RSEM R6 East – 398,412 m³ total discharge, March to December
- RSEM R6 West – 450,187 m³ total discharge, January to December
- RSEM R5A – 11,640 m³ total discharge, April
- RSEM R5B – none; decommissioned and backfilled previously.

Overall, the total discharge from Right Bank was sporadic in Q1 2023, 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 18,092 m³ water discharged in 2023.

- RSEM L5E – 9,615 m³, April to June
- RSEM L5W – 4,595 m³, April
- RSEM L6 – 3,882 m³ (2,456 m³ in April; 1,426 m³ in October)

The RSEM L6 water discharged in October occurred when it was dewatered to the Peace River prior to winter freeze-up.

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 2023, metal loads discharged from the Right Bank included discharge from RSEM-R6E, RSEM-R6W, RSEM-R5A-A and RSEM-R5A-C.

The metal loads discharged from the Left Bank included discharge from RSEM-L5E and RSEM-L5W in Q2, and RSEM-L6 Sediment Control Pond in Q2 and 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. In 2023, discharge from RSEM R5A Phase 2 Pond was reported in April only.

The RSEM R5A area was expanded during 2023 to accommodate additional material in both the West and Central Expansion Areas. Recontouring and covering the entire RSEM Area R5A with NPAG material and backfilling to final configuration occurred in 2023 Q4.

RSEM R5B

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 in April 2023. The R5B Phase 2 sump was decommissioned in September and October 2023, and water transfer to PRHP ceased early October 2023.

In late Q3 2023, some excavated material was placed in RSEM Area R5B which was then relocated to Zone 8 and RSEM Area L5. As a result, the cumulative volume of PAG material at RSEM Area R5B remained 363, 847 m³ in 2023.

Samples were collected from a PAG exposure located to the southwest of RSEM Area R5B in Q2 and Q3, totaling 8 rinse pH and no ABA and metals testing. One of the samples was AG, three samples had rinse pH between 5.5 and 7.0, and four samples were neutral.

PRHP has indicated that design plans for the area between the west end of the Approach Channel and the Moberly River do not specify management measures for the exposed PAG, and development and implementation of a cover concept is recommended.

On August 15, 2023, a dredgeate sample from RSEM R5B Phase 2 Sump measured all metal concentrations below the applicable CSR Soil Standard except selenium (Se), however is within range of Se concentration of NPAG and PAG rock placed in RSEM Area R5A, and considered suitable for long-term placement within a PAG-containing RSEM storage facility.

Water quality monitoring was conducted at R5B sump and drainage ditch which receive runoff from the south slopes of the Approach Channel. Drainage accumulated in the R5B Phase 2 Sump was periodically directed to the RSEM R6W or RSEM R5A Pond A sediment control ponds.

Field measurements were collected daily to weekly in January until October when the sump was decommissioned, backfilled and covered. Field monitoring was performed at a lower frequency at the other two locations, RSEM-R5B-AC-US and RSEM-R5B-P2-Sump. Water quality monitoring showed circumneutral to alkaline conditions. Field conductivity measurements were generally higher, with variable TSS and sulphate values in RSEM-R5B-P2-Sump samples. 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 larger (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 2023, 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 2023. The East Pond discharged nearly daily from April to November, while the West pond discharged nearly daily throughout 2023.

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 RSEM 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 2023, 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 2023 at both ponds, excluding brief periods when the sonde required maintenance.

RSEM R6 East Catchment

The 2023 monitoring data indicate the RSEM R6 East sediment control pond water and EOP discharges were circum-neutral to slightly alkaline, with variable TSS concentrations that reached maximum values on February 22nd, and corresponds to TSS influenced metal concentrations for total Cu, Fe, Mn and Zn. Overall sulphate levels are low and reaching concentrations up to 418 mg/L. All EOP analytical samples and in situ field measurements met RSEM EOP limits in 2023.

RSEM R6 West Catchment

The 2023 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 418 mg/L. All EOP analytical samples and in situ field measurements met RSEM EOP limits in 2023.

RSEM L5

The RSEM Area L5 Phase 2 East and West sediment control ponds are divided by a berm which isolates the two ponds from each other. Water quality in the RSEM L5 Phase 2 East and West sediment control ponds remained circumneutral to alkaline throughout 2023.

The RSEM Area L5 Phase 2 East and West sediment control ponds collected runoff within the RSEM Area L5 Phase 2 catchment as well as water transferred from the LBEX-B2 Sump and the L5 Vac Sump.

The RSEM L5 ponds had low water levels and frozen conditions in early 2023 Q1. Periodic discharge from RSEM Area L5 ponds in 2023 Q2 resulted from snowmelt driven runoff. During 2023 Q1 and Q3, no discharge was recorded from RSEM Area L5 Phase 2 East and West. When discharging, water samples were collected daily from the RSEM Area L5 Phase 2 East and West EOP.

Pond waters in 2023 were typically circum-neutral to alkaline. Carbon dioxide sparging was occasionally applied near the East and West Pond discharge pipe intake to reduce pH at EOP. In both the RSEM Area L5 Phase 2 East and West ponds, sulphate occurred at moderate to high levels, and TSS and metals generally low values. Field and analytical measurements of the RSEM Area L5 Phase 2 East and West ponds met the RSEM EOP limits when the ponds were discharging.

The decommissioning and backfilling of the RSEM L5 West and East ponds was completed as of August 28 and October 12, 2023, respectively.

RSEM L6

The RSEM L6 sediment control pond was predominantly frozen for most of 2023 Q1. The RSEM L6 sediment control pond discharged by pumping on April 10-11 and October 20-22, and

did not discharge for the remainder of the year due to low water levels. The RSEM L6 pond was designed as a hydrovac dump site for AFDE in 2023 Q4 and receiving runoff from adjacent stockpiles originating from the Right Bank Cofferdam and dam overbuild. In October, a pipeline was installed from LBEX Bench 2 sump to the RSEM L6 pond.

In 2023, analytical water samples were collected from the in-pond station seven times between March to September, from the EOP station in April, and during pump discharge to the Peace River in October. In 2023 Q4, bi-weekly analytical water samples and in situ field measurements were collected from the pond. The pH was circumneutral to alkaline with moderate sulphate levels, the overall concentration of metals were low, and RSEM L6 sediment control pond EOP station water quality samples 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 2023 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 2023, 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 LC₅₀ (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 26 toxicity samples were collected in 2023 and all the tests passed (>100% v/v). In 2023, RSEM R6 and RSEM L6 discharged to the Peace River. From April 10-11 and October 20-22, 2023, L6 was dewatered by pumping the water in the pond to the Peace River. In 2023, no observations of exceedances in the Peace River of the BC WQG for the protection of aquatic life were attributed to discharge water from RSEM ponds. On March 29, 2023, a RSEM R5A-P2D sample had five out of ten fish die (50%) in the undiluted pond water after 96 hours, and although the test did not fail since more than 50% of fish did not die, PRHP advised pond management. Details are provided in Appendix B.

RSEM R5A

In 2023, a total of four acute toxicity samples were collected from the RSEM R5A Phase 2 ponds (P2A, P2B, P2C, and P2D) on March 28 and 29, 2023. Toxicity samples were attempted to be collected from each pond on a bi-monthly basis outside of frozen or dry conditions until decommission of the ponds in April 2023.

From the total four samples collected from the four RSEM R5A-P2 ponds, three 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 29, 2023 with results of 100 (95% CL).

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 2023, twelve 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 2023, five toxicity samples were collected from each of the RSEM-L5E-P2 and RSEM-L5W-P2 locations, totaling five samples, with all samples passing the acute toxicity test results of >100 % (v/v).

RSEM L6

In 2023, 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, 2023). 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, 2023).

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 2023

monitoring data relationships developed for L5 and R6 RSEM sediment control ponds. A total of 263 samples collected over 58 dates between December 15, 2017 to October 31, 2023 were used to develop the TSS:turbidity relationship used in 2023. For the RSEM R6 sediment ponds, the 2023 turbidity – TSS relationships diverges from the 2019 relationships with the slopes of the 2023 regression being lower than the slope of the 2019 regression. For the RSEM L5 sediment ponds, the slope of the 2023 regression is higher than the slope of the earlier regression. (Figure 4-1, Lorax, 2023). 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 2023, 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. No exceedance reports were issued in 2023.

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.

Water quality sampling continued at SBIAR, RR, LBDB, and L2 Powerhouse during 2023 outside of dry or frozen conditions, with discontinuation of the L2 Powerhouse sample location following March 2023 due to expansion of construction of the powerhouse extended over top of the sample locations.

A brief summary of the 2023 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 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 2023 within the River Road ditch indicated a neutral to alkaline pH throughout the sampling year. The observation of consistent neutral to alkaline pH drainage conditions at all locations in River Road area in 2023 are indicative of changes in the exposed PAG slope over time. Visual observations show that over time 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 2023 from a total of seven (7) samples collected from RR resulted in fourteen (14) BCWQG-FST exceedances for total iron (6), total arsenic (3), dissolved aluminum (2) and chlorite (2). 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.

South Bank Initial Access Road

Water quality data was collected from four established sampling locations in 2023 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 2023, with isolated occurrences of elevated metals above the BC WQG in some sample events.

At the upstream SBIAR ditch locations during 2023, one (1) BCWQG-FST exceedance was measured in the RBSBIAR-US in September 2023 and one (1) exceedance was measured at RBSBIAR-EUS in June 2023.

In 2023, at the downstream SBIAR locations, total iron (2), dissolved iron (1), dissolved aluminum (2), total arsenic (2), total zinc (1), total cobalt (1), dissolved cadmium (1) were measured at RBSBIAR-DS in six sampling events (March, April, June to September 2023), and total iron (1), total arsenic (1), total zinc (1) were measured at RBSBIAR-EDS in the March 2023 sampling event.

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 most consistently sampled location is LBP Pond, which was sampled five times from March through September 2023. No other LBDB locations were sampled in 2023 due to dry or frozen conditions.

In 2023, BCAWQG-FST exceedances were not measured at the LBP Pond location during the April, June, July, and August sampling events, and four (4) exceedances were measured in the September sampling event for total and dissolved iron, dissolved aluminum, and total manganese. 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.

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 to March 2023, before the L2 Powerhouse sample locations were discontinued due to advanced construction of the area preventing sampling. Water quality monitoring in this area was for monitoring of water quality associated with shale exposures resulting from construction. During 2023 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-US location was sampled three times from January to March 2023, with one BCAWQG-FST exceedance measured for total iron (1). The L2-DS location was not sampled in 2023. In situ measurements were collected in each month where a sample for lab testing was collected.

3.2.2 Left Bank Excavation

Four AG samples were collected from the Left Bank in 2023.

One AG sample was collected in RSEM Area L5 in 2023. When there was discharge from RSEM L5 Phase 2 East and West sediment control ponds, metal concentrations remained below discharge limits, however, cadmium, copper and zinc concentrations were above discharge limits in March when the RSEM L5 West pond was not discharging which may indicate PAG weathering in RSEM Area L5 in 2023 Q1.

Three AG samples were collected from Bench 0 of the LBEX in 2023. 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 periodically had elevated sulphate and moderate metal concentrations.

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. Details are provided in Appendix A.

3.2.3 Earthfill Dam

Three AG samples were collected from the Earthfill Dam area in 2023.

PAG rock placement in Zone 8 continued throughout 2023 monitoring and indicated periodic exposure of AG material in this area. Although there was exposed AG weathered bedrock in Q3 2023, placement of NPAG cover material in this area limited acidic runoff prior to placement of final cover and onset of winter and freezing conditions in 2023 Q4.

Overall key findings from the sampling in 2023 indicated that Earthfill Dam water quality for samples were circumneutral to slightly alkaline, with low sulphate and metals concentrations (Appendix A).

3.2.4 Right Bank Excavation

Two AG samples were collected from the Right Bank in 2023.

In 2023, AG material was identified in bedrock exposures within the RSEM Area R5B catchment and RSEM Area R5A. The AG bedrock exposure in RSEM Area R5B catchment during 2023 are consistent with previous monitoring results. Sulphate and metal concentrations measured in R5B-P2-Sump were moderate to low, indicating limited ARD influenced runoff was required to be discharged.

In 2023, stockpiled PAG material in RSEM Area R5A was moved and placed in both the West and Central Expansion areas. The RSEM Area R5A ponds remained circumneutral (>6.0 pH) with moderate sulphate levels (<350 mg/L). Although some AG material was present, the final NPAG cover placement was completed on the facility in 2023 Q3.

In 2023, RSEM R6 East and West sediment ponds remained circumneutral to alkaline with low to moderate sulphate concentrations and metal concentrations remained below EOP discharge limits.

In 2023, Area 30 sediment pond remained circumneutral to alkaline. Periodically elevated sulphate and zinc concentrations in the sediment pond were associated with weathering of stockpiled limestone aggregate under neutral conditions. The Beaver Pond water quality generally remained within guidelines and, when exceedances, when measured, were attributed to sediment contamination during sampling.

3.2.5 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 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 in-situ water quality sampling on September 27th, 2023.
 - 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 September sample event noted clear water at the sample location. Water was not observed flowing over the exposures. The in-situ testing shows neutral pH water.
- Keyed-In-Fill: BC Hydro conducted visual observations on September 27th, 2023.
 - No water was observed during the September 27th site visit.

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

- Bear Flat Cache Creek: WQ monitoring occurred during removal of the temporary diversion bridge and the temporary detour bridge and the old Hwy 29 Cache Creek bridge. In addition, Allnorth also have completed WQ testing at Cache Creek East culvert removal (old Hwy 29 alignment) in 2023.
- Lynx Creek: WQ monitoring completed during removal of the Lynx Creek bridge.

4. 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 2023 for the project were conducted as follows:

- May 7-9, 2023. Scott Kingston, P.Geo., completed a site audit at the Main Civil Works areas, including Howe Pit on May 7 and 8, and select offsite areas on Highway 29 on May 9. Rinse pH measurements were collected including four from SBIAR and one from Bench 0. Site areas visited during the audit:
 - Left Bank: MCW River Road, L3 Creek discharge area, Left Bank Debris Boom, and RSEM L5 and RSEM L6.
 - Right Bank: RSEM R5A, RSEM R5B, Approach Channel, SBIAR, RBDT portal, Dam Core, Area A, 21, 25, Powerhouse Area, Spillway basin, and Moberly River PAG slope.

- Off-site and Highway 29: two segments of Highway 29 realignment including Dry Creek Culvert Decommissioning site and Halfway River Boat Launch area.
- September 15, 2023. Scott Kingston, P.Geo., completed a site audit at the MCW dam site. The site audit locations focused on areas of stored or exposed shale rock (PAG), 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. No in situ rinse pH values or samples were collected. Site areas visited during the audit:
 - Left Bank: RSEM L5, LBEx, Bench 0, LB Drainage Tunnel, Downstream Dam, LBDB, Gully Road, Garbage Creek, L3 Creek discharge area, and River Road.
 - Right Bank: RSEM R5A, RSEM R5B, Moberly Bridge East Abutment Slope, GSS Powerhouse and Spillway, Approach Channel, Water Treatment Plant and AK Pond, RBDT and Shale Slope, RSEM R6 and Water Treatment Settlement Ponds, Area 20/21, Area 23 Haul Road, Area 24, and SBIAR.