PE:7008 QUARTER 3 REPORT

October - December 2022

Environmental Department

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Appendix I

Summary of Events for the Third Quarter

During the 3rd Quarter (Q3) October 1st through December 31st, Quinsam Mine maintained the environmental obligations for permits PE: 7008 and C-172 under the Environmental Management Act and the Mines Act permit, respectively. The mine continues to be operated in a "*care and maintenance*" mode with The Bowra Group Inc. as the Receiver.

Authorized discharge locations include Settling Pond #1 (SPD), (EMS ID: E218582) on the south side, Settling Pond # 4 (WD), (EMS ID: E207409) on the north side and 7-South Surface Decant (7SSD), (EMS ID: E292069) for the 7-South Mine. Discharge occurred from two authorized discharge locations (WD and SPD) during Q3 with no discharge occurring from 7SSD. Characteristics of the discharge, (water quality and quantity) from the authorized discharge locations is compared to the applicable permit limits.

The receiving environment monitoring program for both lakes and river/stream stations were completed along with other necessary environmental monitoring pertaining to permit PE:7008. The receiving environment monitoring program followed the 5 samples in 30 days schedule, with sampling events spanning October 18th through November 15th. These events were completed during fall anticipating a "fall flush" period. The accumulated precipitation from September 1st through November 15th resulted in 92.7 mm compared to last fall where 468 mm of accumulated precipitation was recorded. Low flow rates were observed in the rivers during this event, which may not have been representative of a fall flush.

Parameters of interest (arsenic, copper, iron, and sulphate) were slightly elevated above British Columbia Water Quality Guideline's – Freshwater Aquatic Life (BC WQG-FWAL) at individual sites in the ambient water quality.

Routine inspections were conducted, and any required maintenance of the water management structures was completed.

In addition to the aforementioned monitoring, the Environmental Department sampled 20 groundwater / underground areas. These included all 11 flooded mine voids and underground sumps (in-situ) and 9 groundwater outside the mine footprint (Ex-situ). This Quarter both in-situ and ex-situ sites were compared to Contaminated Sites Regulations, Schedule 6 - Aquatic Life (CSR-AL). Apart from some slightly elevated parameters of interest (i.e., Dissolved arsenic (As-D), selenium (Se-D), dissolved sulphate (SO_4), and sulfide calculated as hydrogen sulfide (H_2S)), concentrations were not elevated above CSR-AL.

1.0 Non-Compliance Events

1.1 Permit Limit Exceedance

There were no parameters above permit limits this quarter.

1.2 Compliance with Permit

The following represents a summary of permit non-compliance(s) (PNC) specific to missed samples / parameter analysis, continuous flow requirements and unauthorized discharges. This information is also summarized in Appendix I, Table 2.

Composite samples were not collected at Settling Pond's 1 and 4 from October until November 16th, 2023, due to a permit misinterpretation. A Ministry of Environmental inspection received November 16th, 2023, determined the mine was out of compliance with Section 4.3.1. Composite sampling is required weekly at Settling Ponds 1 and 4 based on flows greater than 0.046 (m^3/s) and 0.054 (m^3/s), respectively. Grab samples are collected during freezing conditions rendering collection of composite samples not feasible.

Flow was observed at the H-flume capturing Long Lake Middle Seep (LLSM) flow rates after heavy precipitation on December 11th through 18th and 24th through 28th. This flow was not related to the LLSM seepage location but resulted from an ephemeral stream (ULLS) collecting surface flow after heavy precipitation and snow melt. Seepage locations, LLSM and LLS were dry all quarter. An unauthorized discharge normally occurs year-round from the smaller seep (LLS) and late fall from the larger seep (LLSM). The seeps have not flowed since September 2022, resultant of dewatering efforts from 2-South mine void and low precipitation rates in summer and fall.

Natural flow paths with possible mine related seepage at locations S and S2 (A and B) were discovered in 2021. This quarter flows were not observed at the sites S and S2 B. The location S2 A continued to flow all quarter. Underground 2-North mine water elevations have been measured below the elevation of the river and seepage locations. Mine water does not seem to be influencing S2 A, but rather perched water tables interacting with the Dunsmuir sandstone and underlying coal seams. It has not been determined if this flow path is a groundwater discharge zone related to mine water seepage. Further investigation is underway.

The monitoring location Stream 1, 7S (EMS ID E292109) was not sampling for water quality in November because of deep snow limiting access to the site.

2.0 Water Management Systems

2.1 North Water Management – Settling Pond 4 (WD / SP4)

Discharge at Settling Pond 4 (SP4) occurred for all 92 days during this quarter with an average daily flow rate of 0.0624 m^3/s and a quarterly maximum flow rate of 0.1730 m^3/s. Appendix I, Table 25 display the results for flow at SP4.

Dewatering of the underground 2-North mine continued throughout this quarter with pumping from 1-Mains 2-North (1M2N), 5-Mains 2-North (5M2N) and 3-Mains 2-North (3M2N) with discharge to surface at Brinco Brook. Brinco Brook mixes with water pumped from 2-North Portal Sump and flows into SP4 where it is either released to the receiving environment (Middle Quinsam Lake), used to maintain cover over the 2-North Pond (WP) or used for coal processing activities (when operating).

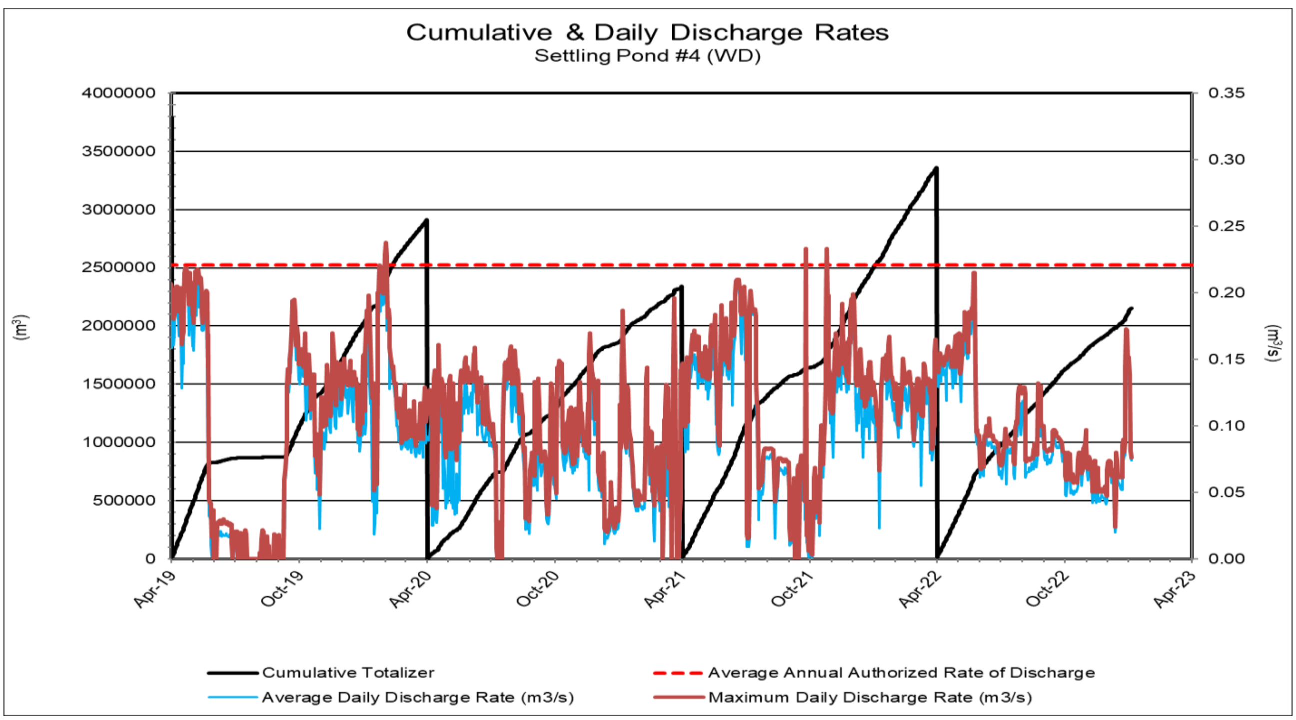

Figure 1: Settling Pond 4 (WD) Cumulative and Daily Discharge Rates

All permitted parameters applied to discharge at SP4 were found in compliance with permit limits. Average quarterly results for dissolved sulphate and total suspended solids (TSS) were 555 mg/L and 1.82 mg/L, respectively. With pH remaining neutral ranging from 7.44 to 8.33 and averaging 7.73 throughout the quarter. Complete results for Setting Pond 4 are displayed in Appendix I, Table 5.

2.2 South Water Management - Settling Pond 1 (SPD / SP1)

Discharge at Settling Pond 1 (SP1) occurred for 92 days during this quarter with an average daily flow rate of 0.0203 m^3/s and quarterly maximum of 0.3494 m^3/s. Appendix I, Table 26 display the results for flow at SP1.

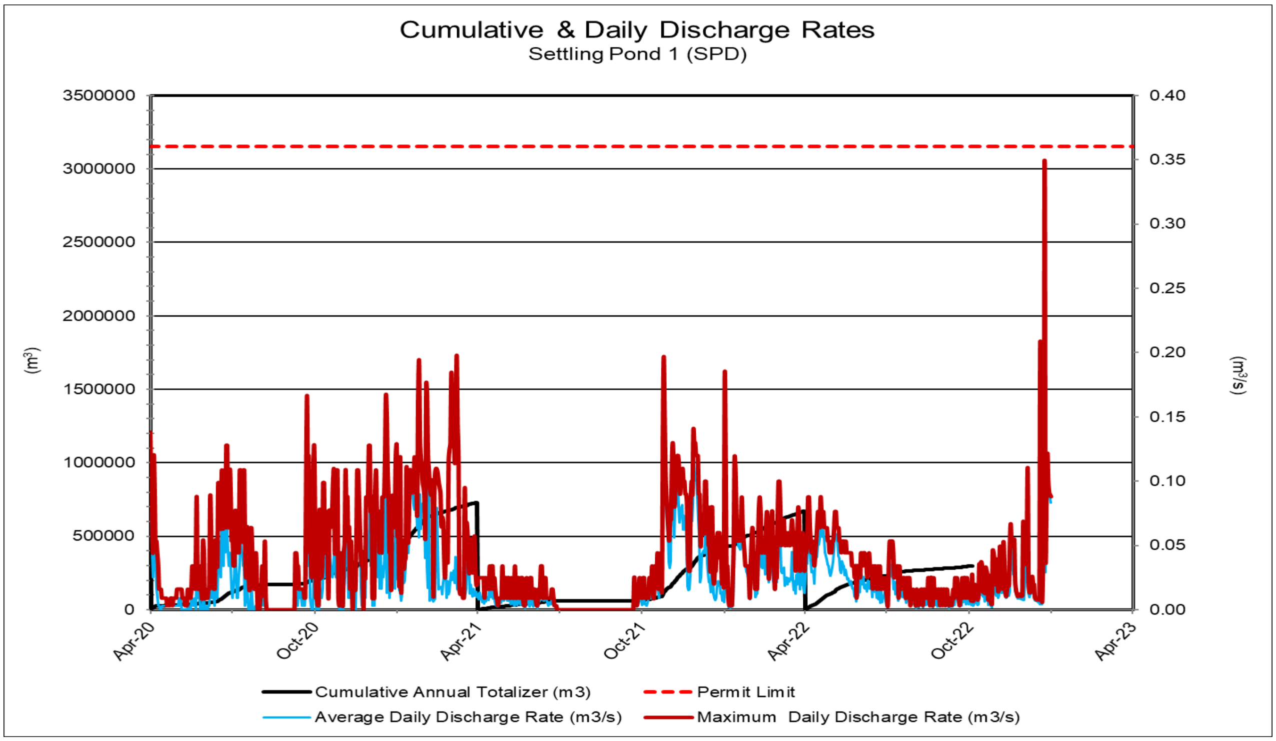

Figure 2: Settling Pond 1 (SP1 / SPD) Cumulative and Daily Discharge Rates

Water from 2-South and 3-South PAG-CCR storage facilities (pits) was routinely pumped into SP1 throughout the quarter. Dewatering of the 2S mine pool at QU11-11 (INF) continued with water directed through the Passive Treatment System (PTS) at cells, Biochemical Reactor (BCREFF) and Sulphide Polishing Cell (SPCEFF) and some raw water bypassing the PTS and entering 2SI. The discharge from the PTS is directed into the 2-South pit where it overflows into the 3-South pit and is pumped to SP1.

All permitted parameters applied to SP1 discharge were found in compliance with permit limits. Averaged quarterly results for dissolved sulphate and TSS were 440 mg/L and 2.64 mg/L, respectively. Weekly pH remained neutral ranging from 6.06 to 7.91 and averaging 7.53 throughout the quarter. Complete results for SP1 are displayed in Appendix I, Table 10.

2.3 96-hour Rainbow Trout Bioassays

Discharge from Settling Pond 1 and 4 were collected for 96-hour rainbow trout bioassays on November 30th, 2022, after a significant rain event. Each test passed with 100 % survival rates.

2.4 7-South (7SSD) Water Management

No discharge occurred from the 7-South Surface Decant Pond (7SSD). All water is directed into the 7-South portal sump (7SPS) where it is pumped into the 5-South Mine Void. The supernatant from 7SSD was sampled on November 2nd this quarter as required by the amended permit. Complete results for 7SSD are displayed in Appendix 1, Tables 22 and 27.

Water quality at 7S, Stream 1 remained within water quality guidelines during December monthly sampling event for all parameters. The stream was dry in October and November monthly sampling event was missed due to deep snow conditions limiting site access. Appendix 1, Tables 24 with flow rates on Table 29.

3.0 Water Quantities & Flow Rates

Flow data is presented tabularly in Appendix I Tables 28 and 29 for the following sites:

- EMS ID E292127 - 2 South Pit Inflow and outflow,
- EMS ID E292130 - Long Lake Seeps (LLS and LLSM),
- EMS ID E292109 - Stream1 7S,
- EMS ID 126402 - Quinsam River at Argonaut Bridge (WA),
- EMS ID 900504 - Middle Quinsam Lake Outlet (WB),
- EMS ID E219412 - Long Lake Outlet (LLO),
- EMS ID E297232 - Iron River Site 8

Flow data for WA has been obtained from the Environment Canada weather monitoring station.
The Quinsam environmental department has established flow curves for all sites required under the effluent permit. Flows were observed to increase during October and through early December in the rivers with peaks observed during the last two weeks of October correlating with heavy rains. The below hydrographs display the flow conditions for the site up to January 2023.

The fall flush was experienced through the months of late November to December with monthly accumulations of 94.50 mm and 160 mm precipitation, respectively. With the greatest accumulation observed in the month of December (160 mm). December experienced the most isolated events of heavy rain (i.e., on December 25th the site experienced 43 mm of precipitation). Total precipitation was 272 mm during Q3. Precipitation data for the site is included in Appendix I, Table 30 and Figure 11 below.

As a result of limited precipitation levels, flow rates in the rivers (Quinsam and Iron) were unseasonably low for fall with flow rates not increasing until late November. Refer to Figures 7 through 10.

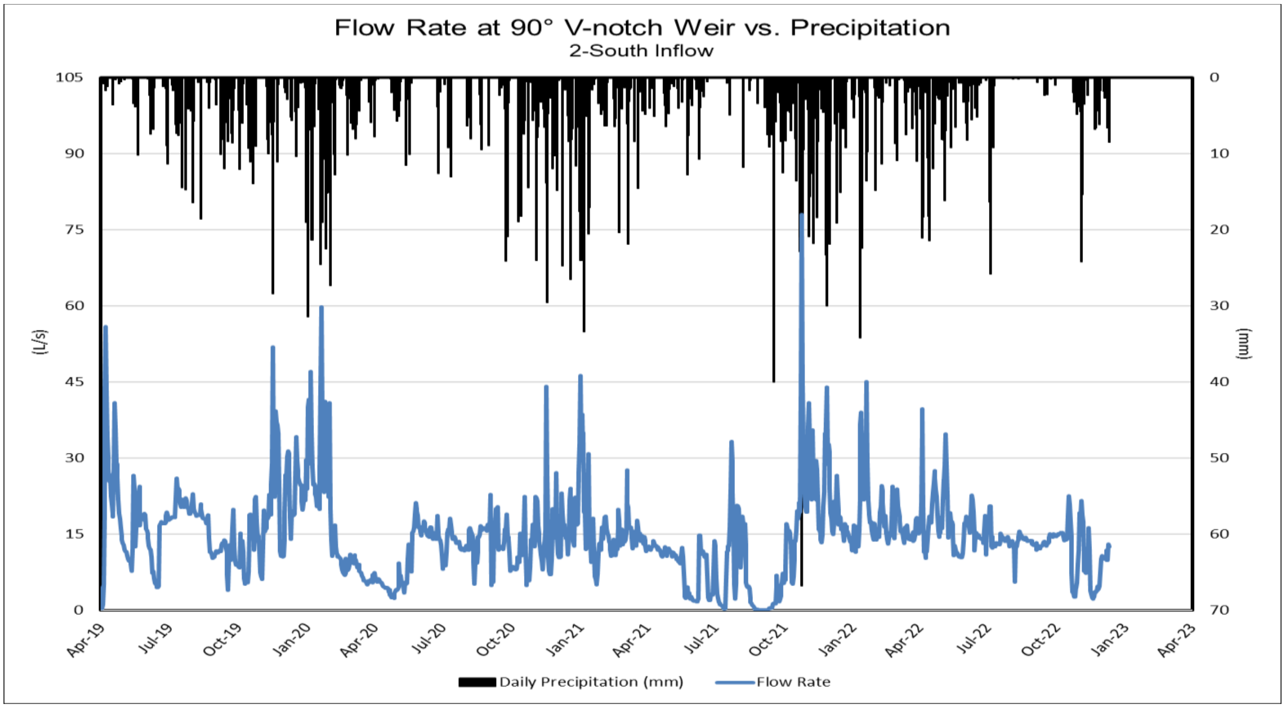

Figure 3: 2-South Pit Continuous Inflow

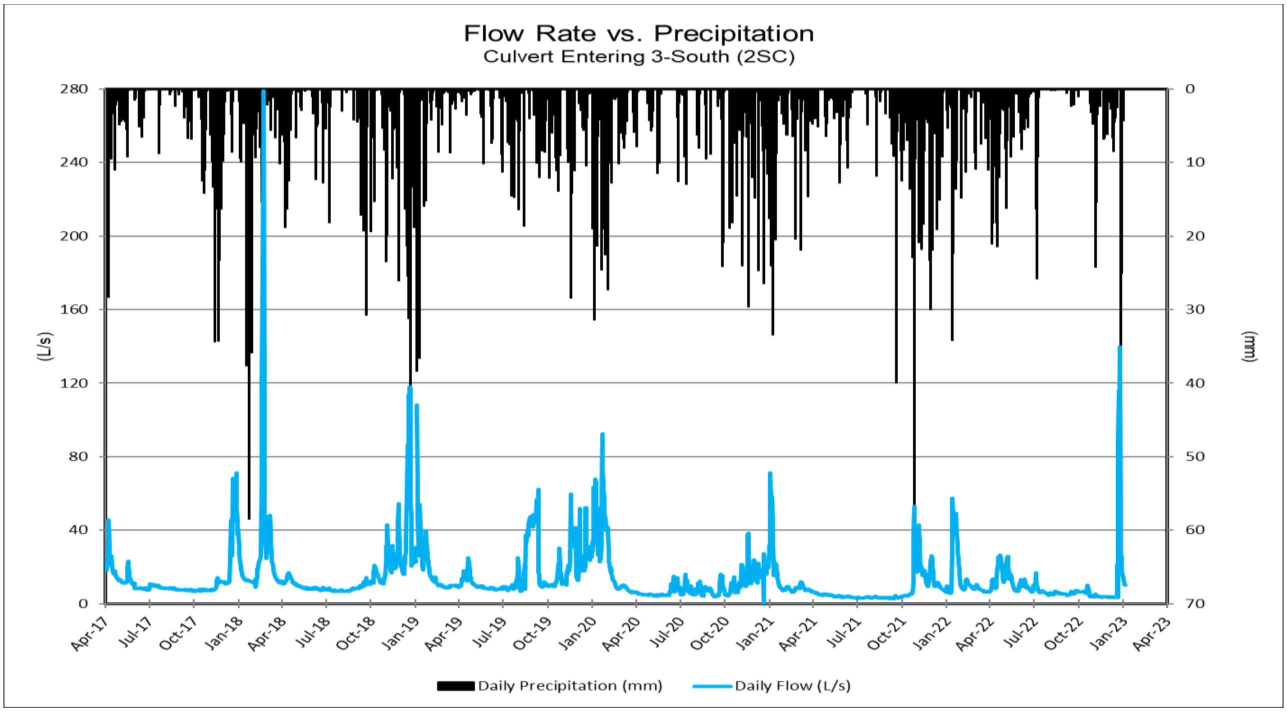

Figure 4: 2-South Pit Continuous Outflow

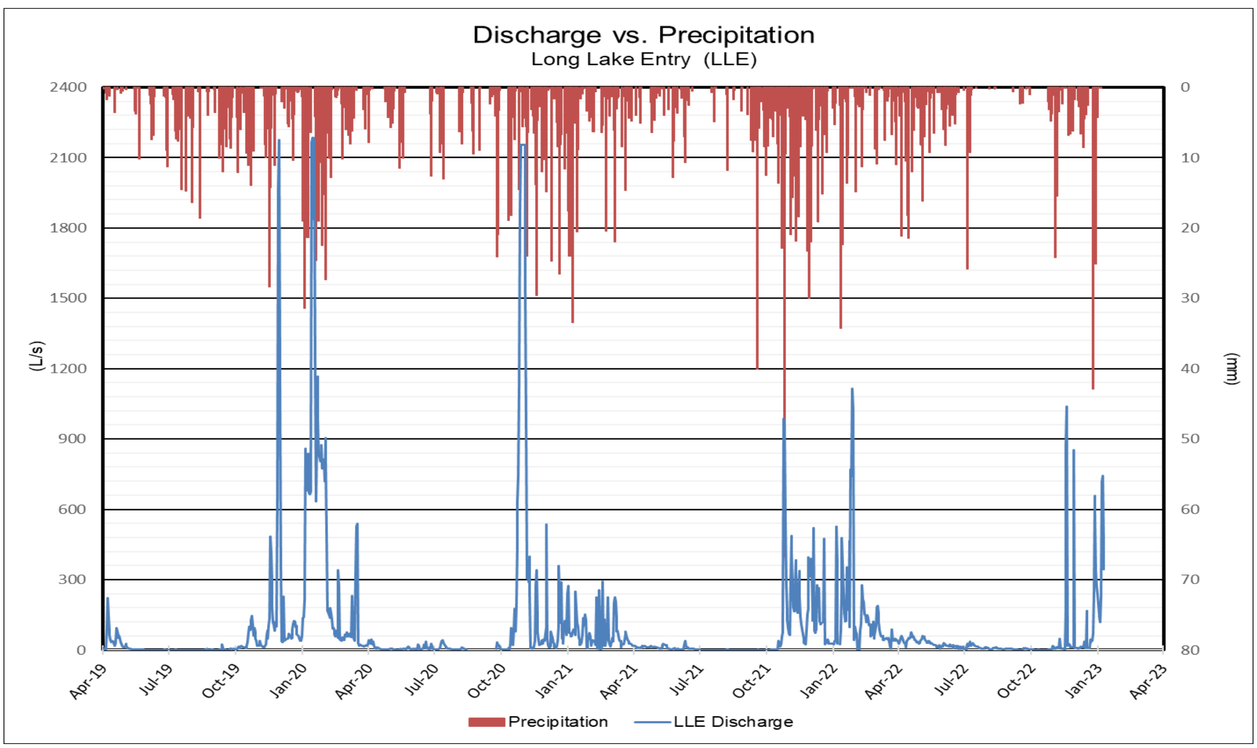

Figure 5: Inflow to Long Lake from the South Mine Area (LLE)

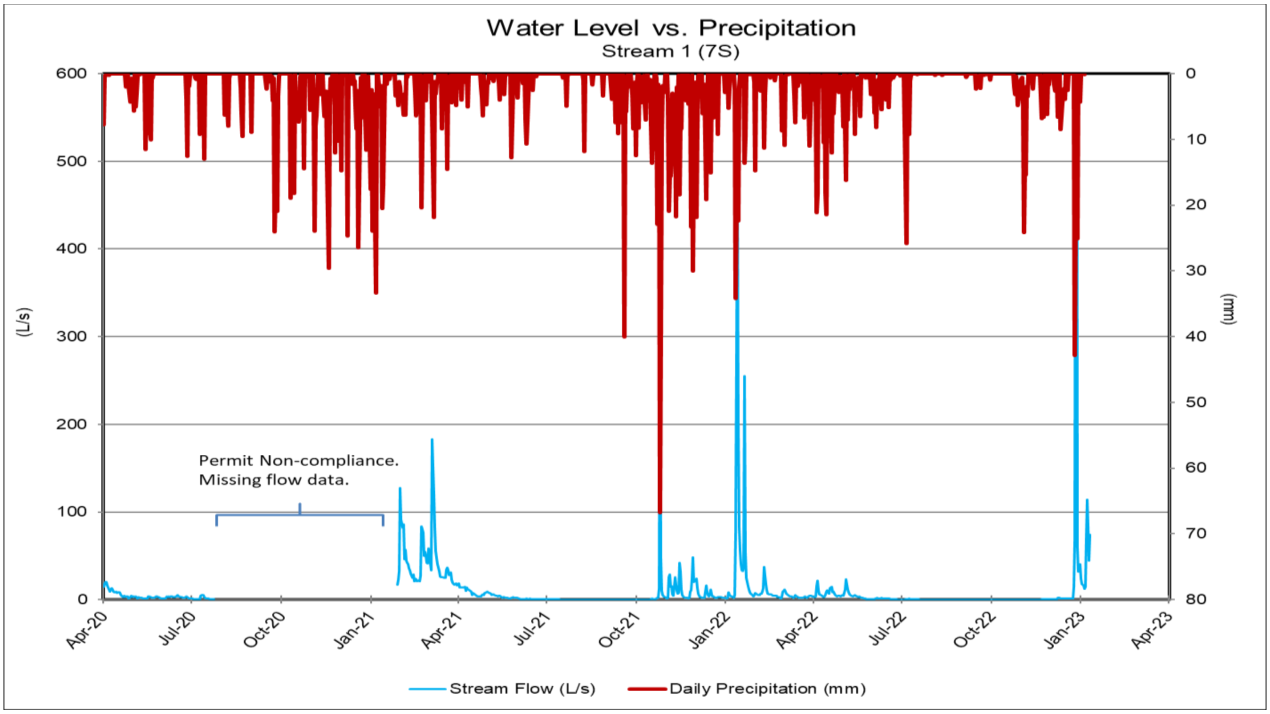

Figure 6: Stream 1 (7S)

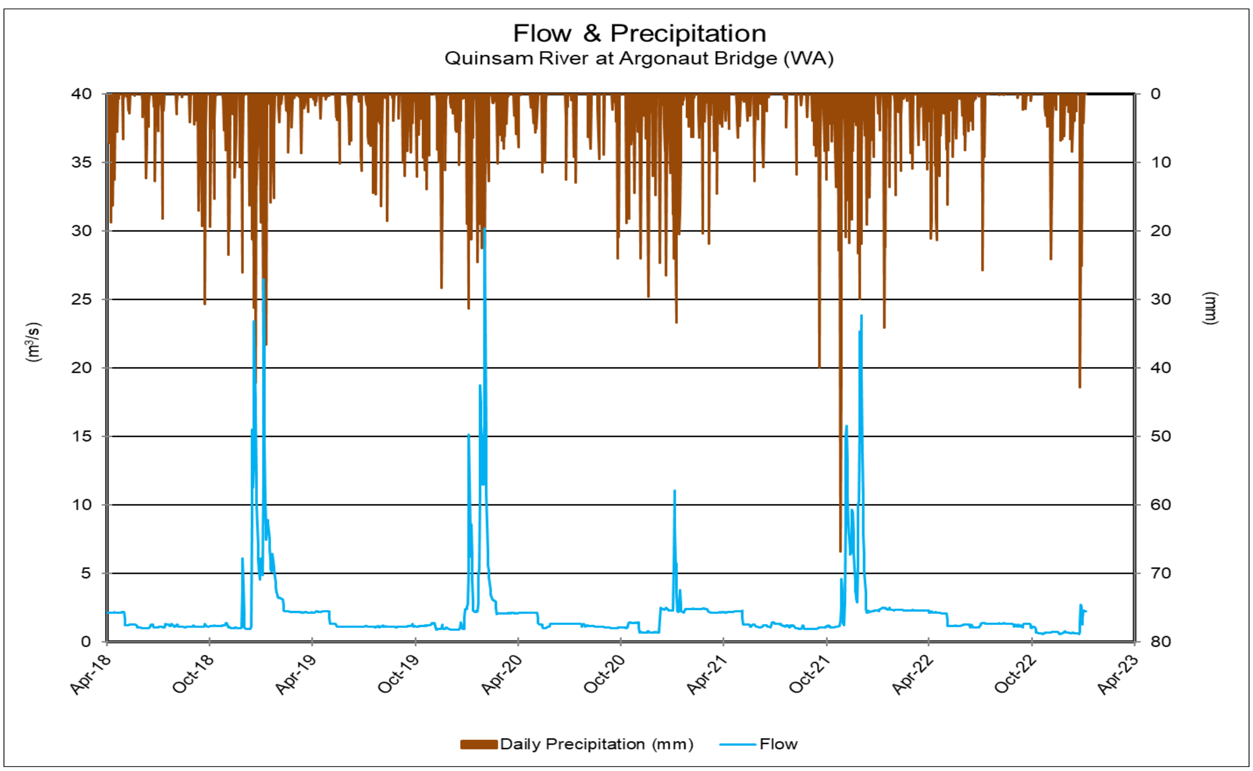

Figure 7: Quinsam River at Argonaut Bridge (WA)

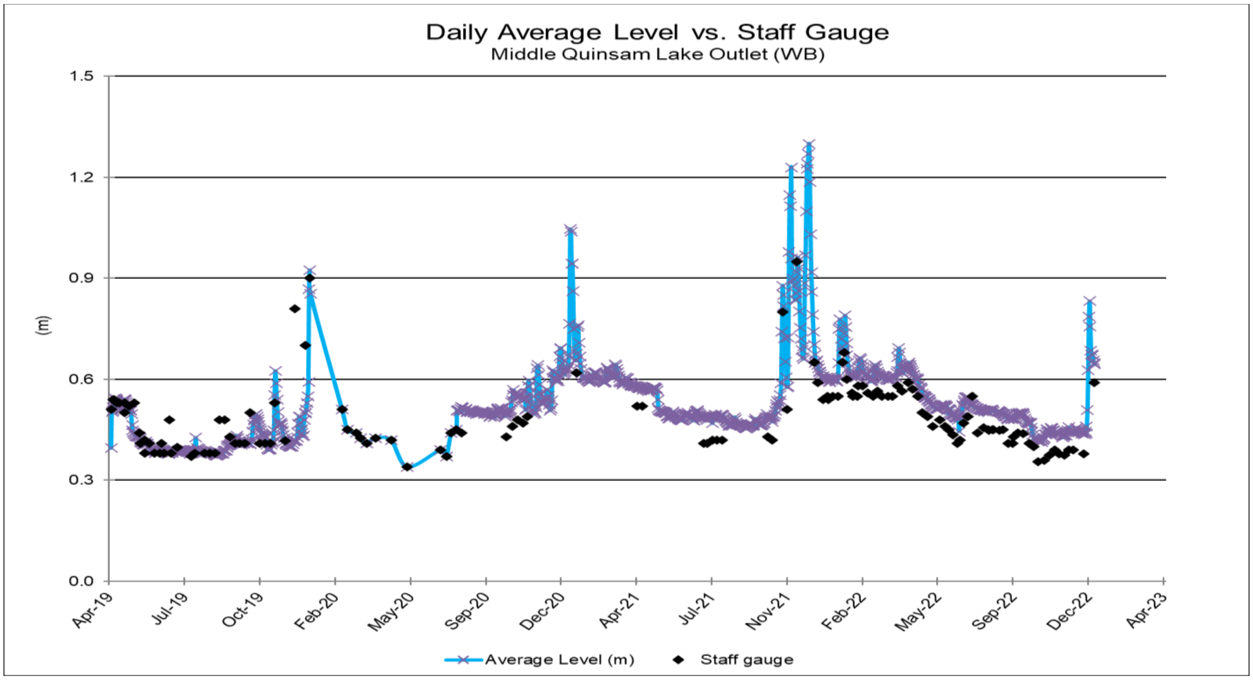

Figure 8: Middle Quinsam Lake Outlet (WB)

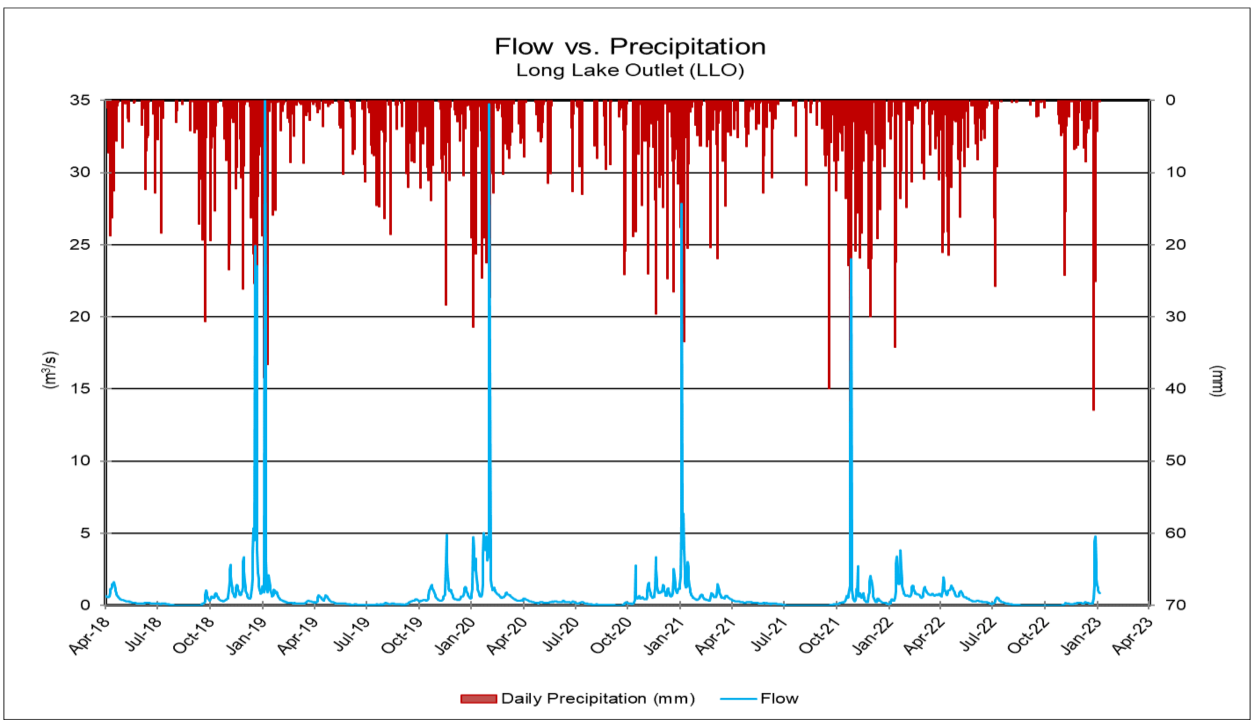

Figure 9: Long Lake Outlet (LLO)

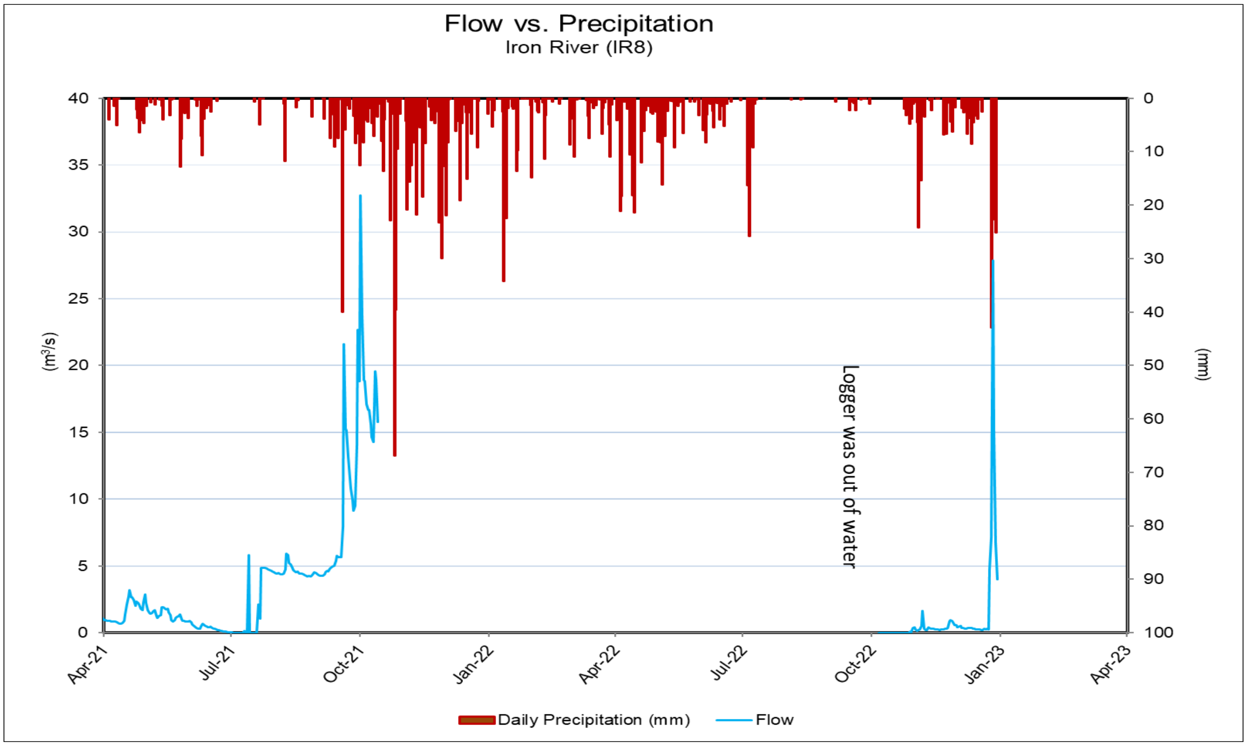

Figure 10: Iron River (IR8)

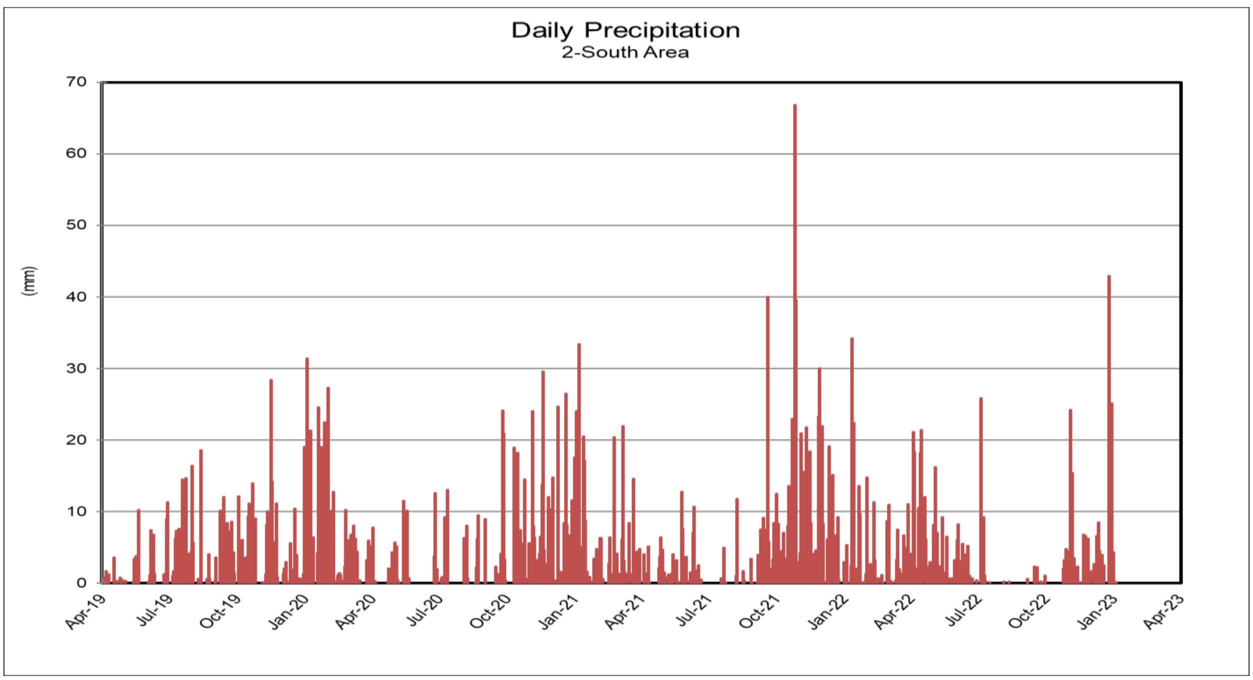

Figure 11: Daily Precipitation (mm)

4.0 Receiving Water (Streams and Lakes) Monitoring Sites

Monitoring stations captured within the Quinsam Mine Site are listed in the table below.

Table 1: Receiving Water (Streams and Lakes) Monitoring Sites

Streams	Lakes	Site Code for Lakes
North Mining Operation		
Quinsam River at Argonaut Road (WA) (EMS # 0126402) – Upstream of mine influence Outflow from Middle Quinsam Lake (WB) (EMS # 0900504)	Middle Quinsam Lake (MQL) Centre at depths of 1 metre (1m), 4 metre (4m), 9 metre (9m) and 1 metre from bottom (1MB) (EMS # E206618)	MQL1, MQL4, MQL9 and MQLB
South Mining Operation		
Long Lake Outlet (LLO) (EMS # E219412) No Name Lake Outlet (NNO) (EMS # E217017)	Long Lake at Centre (LLM) at depths of 1m, 4m, 9m, and 1MB (EMS # E206619) No Name Lake (NNL) at depths of 1m, 4m, 9m, and 1MB (EMS # E217018)	LLM1, LLM4, LLM9 and LLMB NNL1, NNL4, NNL9 and NNLB
7-South Mining Operation (Areas 1 to 4)		
Quinsam River upstream of 7 South Mining Operation (QRDS1) (EMS # E286930) Quinsam River downstream of 7 South Mining Operation (7SQR) (EMS # E292113) Lower Wetland Outlet at the confluence of Quinsam River (LWO) (EMS # E292112)	Lower Quinsam Lake (LQL) (EMS # E292118) at depths of 1m, 4m, 9m, and 1MB	LQL1, LQL4, LQL9 and LQLB
7-South Area 5 Mining Operation		
Iron River upstream of 7SA5 (IR6) (EMS # E297231) Iron River downstream of 7SA5 and 242 inputs (IR8) (EMS # E297232) Quinsam River downstream of confluence with Iron River (IRQR) (EMS # E299256)	Lower Quinsam Lake (LQL) (EMS # E292118)	LQL1, LQL4, LQL9 and LQLB

Preamble – Water Hardness and Dissolved Copper

For the purposes of this report, water quality in the receiving environment is compared to Acute and Chronic BC Water Quality Guidelines for Freshwater Aquatic Life (WQG). For those parameters that are hardness dependent the guideline has been derived using background (i.e., monitoring location WA) hardness (~30mg/L) at all stations. Quinsam Coal has adopted this approach for the Iron River as well. Using a hardness of 30 mg/L provides a conservative comparison of receiving environment water quality when comparing to hardness dependent WQG's. Dissolved copper is the only parameter where the actual site-specific water chemistry is used.

To obtain the dissolved copper guideline ambient water quality from the site-specific receiving environment sites is uploaded into the British Columbia Copper Biotic Ligand Model Database. The database uses specific water chemistry per site such as hardness, pH, temperature and dissolved organic carbon and derives a site specific acute and chronic WQG for copper. The below graphs display the acute and chronic Aquatic Life – WQG's derived for copper compared to individual copper results from receiving environment sites during fall.

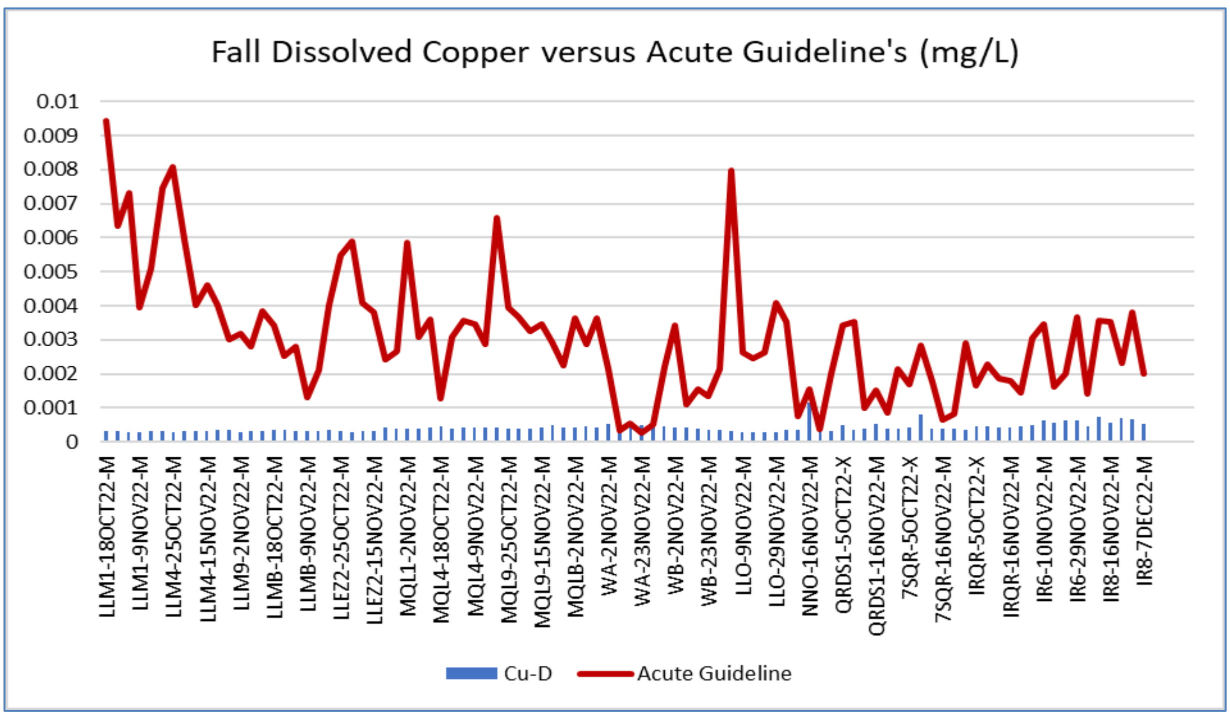

Figure 12: Fall Copper Versus Acute Guidelines Receiving Sites (mg/L)

Receiving water quality during fall mostly remained below the acute copper guidelines derived from site chemistry. The sites that were elevated include upstream of mine influence on the Quinsam River at site WA. Results for the No Name Lake outlet (NNO) were nearing the guideline.

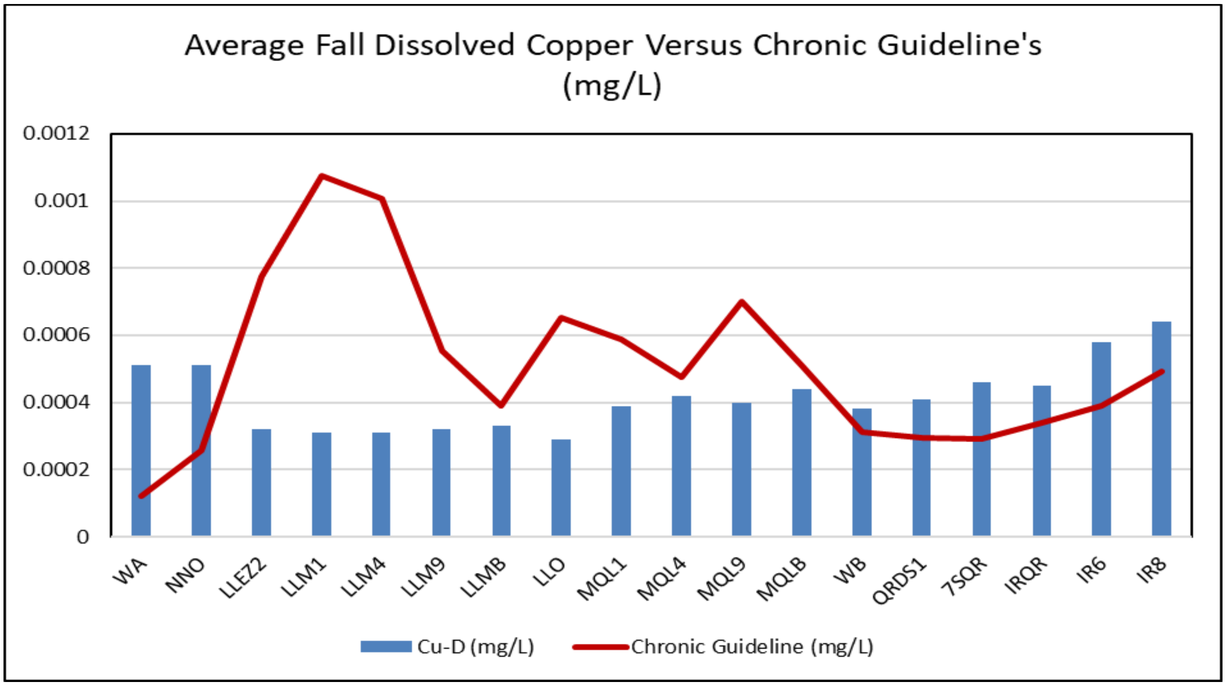

Figure 13: Average Fall Copper Versus Chronic Guidelines Receiving Sites (mg/L)

Receiving water quality during fall remained below the chronic copper guidelines at most sites, derived from averaged water quality. Those sites that were observed slightly above the chronic guideline include the and the Quinsam river upstream of mine influence (WA), downstream of mine influence at Middle Quinsam Lake Outlet (WB) and Quinsam River Downstream Site 1, (QRDS1) and Quinsam River Downstream of 7-South mine, (7SQR), downstream of the confluence with the Iron and Quinsam Rivers (IRQR) and the Iron River at sites IR6 and IR8. No Name Lake Outlet (NNO) also experienced average elevated copper draining from No Name Lake.

4.1 Lakes

Lake sampling commenced on October 18th following the 5 samples in 30 days approach “5 in 30” and completed on November 15th. This program included Long Lake (LLM) and Middle Quinsam Lake (MQL). Depth profiling for physical parameters is performed at every meter from surface to bottom with an Exo Sonde that captures pH, conductivity, temperature, dissolved oxygen (DO) and oxidation reduction potential (ORP). Water chemistry samples are collected for laboratory analysis at 1 metre (1m), 4 metre (4m), 9 metre (9m) and 1 metre from bottom (1MB). Appendix 1, Tables 35 through 37 display the depth profiling chemical water quality results compared WQG-FWAL.

Fall monitoring is meant to capture the fall turn over event when the deeper portions (hypolimnion) have been replenished with dissolved oxygen. This was evident in Middle Quinsam Lake (MQL) as it is a long, shallow lake (13m to 15m) with inputs controlled by the upstream dam on the Quinsam River.

Long lake (LL) is deeper (19m to 22m) and shorter in length with inputs received from No Name Lake and groundwater inputs including Long Lake seeps and mine related discharge at the outlet (LLE). In LL turnover was slow as temperature gradients were differing 11 degrees Celsius from surface (epilimnion), middle (metalimnion), to bottom (hypolimnion) depths during the first week compared to the last week with a 1-degree Celsius difference between surface and bottom depths.

When there is limited inflow at the inlet (from No Name Lake) and ambient temperatures remain warm, lake stratification is extended in LL compared to MQL. In LL, turnover occurs late in the fall, with stratification remaining into November and dissolved oxygen levels depleted (<3 mg/L) in the hypolimnion, referred to as anoxic conditions. Anoxic conditions at depth causes manganese concentrations to increase at the sediment / water interface. Anoxic conditions were observed during the fall sampling events in the hypolimnion zone (16 m to 20 m) but this year manganese was not elevated at the 1 metre from bottom depth (1MB). Concentrations were higher than other depths (1, 4 and 9 meters) but none measuring above WQG's.

In MQL turnover was apparent, distinguished by a less pronounced temperature gradient of less than 1 degree Celsius between surface to bottom depths. Dissolved oxygen levels at 1MB measured below 3 mg/L during the first two weeks in fall and increased to above 3 mg/L during the last three weeks of sampling indicating the lake was turning over.

Refer to figures 14 and 15 showing both lakes (LLM and MQL) 5 in 30 average dissolved sulphate over time.

Noteworthy observations resulting from the lake monitoring program include:

- Average dissolved sulphate in MQL was below the chronic WQG (128 mg/L) at all depths resulting in 27 mg/L at 1-meter, 4-meter and 9-meter depths, and 29 mg/L at 1MB.
- Average dissolved sulphate in LL was below the chronic WQG (128 mg/L) at all depths averaging 62 mg/L at 1 meter and 4 meters, 78 mg/L at 9 meters and 97 mg/L at 1MB depths.

- The fall turnover was apparent in MQL, observed through temperatures remaining consistent per depth.
- Stratification was still apparent during the first three weeks in LLM, again observed through temperature gradients. Turnover was starting to occur during the last two weeks.
- Dissolved oxygen (DO) was below 3 mg/L in Long Lake in the hypolimnion zone resulting in anoxic conditions at depth, but Mn-T was not observed to be elevated above WQG's.
- Low DO is correlated with lake stratification depleting DO where manganese is released at the sediment / water interface.
- LL displays elevated conductivity, increasing with depth ranging from 195 µs/cm to 494 µs/cm, increases are observed between 6-meter and 9-meter depths.
- MQL does not have elevated conductivity like LL ranging from 145 µs/cm to 209 µs/cm, throughout the five weeks of sampling.
- The Long Lake Middle Seep stopped flowing early September and did not flow this quarter, indicating LL had no surface influence from the seeps.

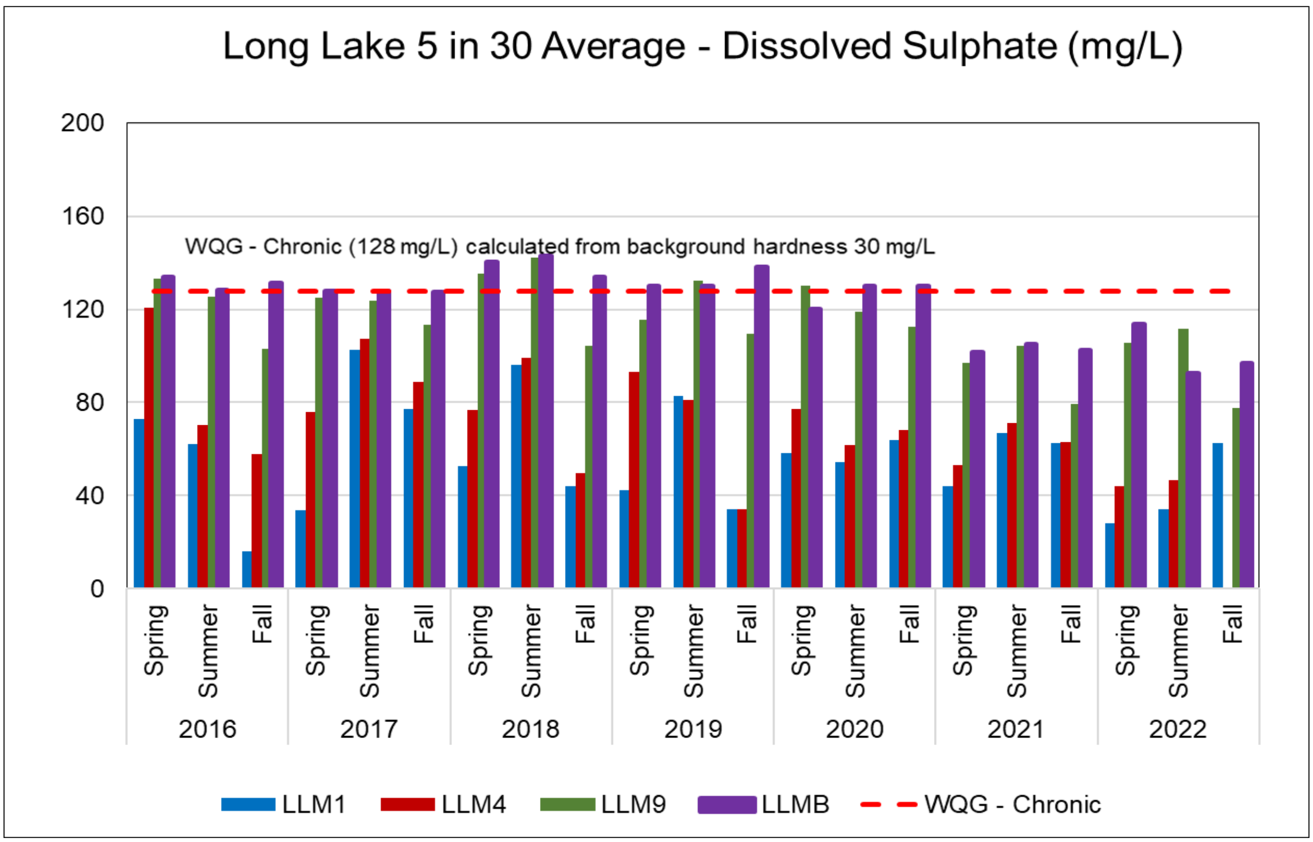

Figure 14: Long Lake Average Dissolved Sulphate

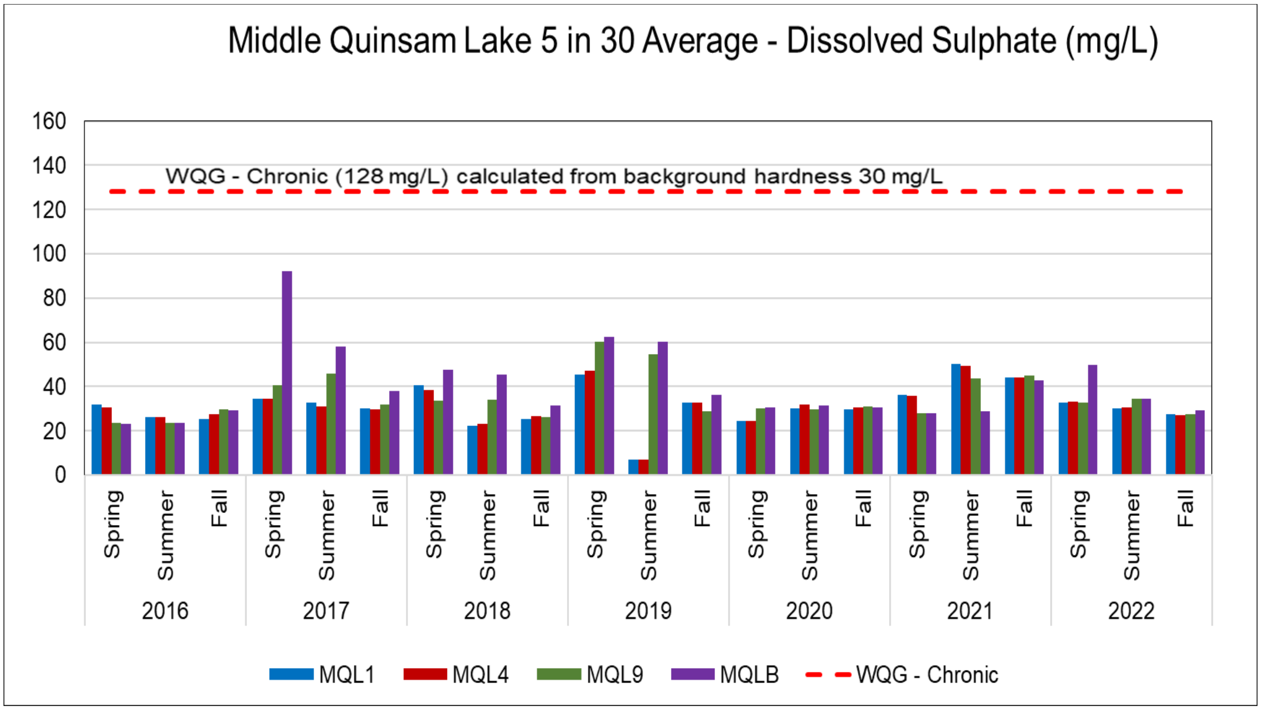

Figure 15: Middle Quinsam Lake Average Dissolved Sulphate

4.2 Streams and Rivers

The '5 in 30' receiving environment program at river and stream sites commenced November 2nd and concluded December 7th.

Appendix I, Tables 3 and 38 display water quality results for this program compared to WQG-FWAL for the receiving environment sites.

Noteworthy observations resulting from the river/stream Q3 monitoring program include:

- Total arsenic was elevated in the Iron River at site IR8 on 2 out 5 sampling events during low flow.
- Average dissolved copper for fall were above the chronic WQG-FWAL in the Quinsam River at sites upstream of mine influence (WA) and downstream of mine influence (WB, QRDS1, 7SQR and IRQR) and at the No Name Lake Outlet (NNO). Iron river was also elevated in dissolved copper at both IR6 and IR8.
- Dissolved copper was elevated above the acute WQG-FWAL at WA for 2 out of 5 weeks.

While monitoring location LLE is considered the initial dilution zone (for water quality evaluation purposes) it is important to note, that this location is a wetland and represents the uppermost extent of an initial dilution zone for the South water management system discharge into Long Lake. The Long Lake Seeps (LLSM and LLS) and newly discovered potential mine related seepage areas (S, S2A and S2B) sites are not considered receiving environment sites with results compared to WQG-FWAL, for assessment purposes only.

LLE and Potential Mine Related Seepage Area (S2A) Observations:

- LLE displayed low flow and elevated results for both total and dissolved iron and dissolved sulphate above WQG-FWAL.
- S2A displayed elevated arsenic and both total and dissolved iron above WQG-FWAL.

A summary of receiving environment guideline observations for river/stream stations is provided in Appendix 1, Table 3.

Figure 16 displays total arsenic concentrations for the Quinsam river. As observed the results remain below the Acute- WQG-FWAL during spring, summer and fall sampling periods with IRQR having the highest results after contributions from the Iron River.

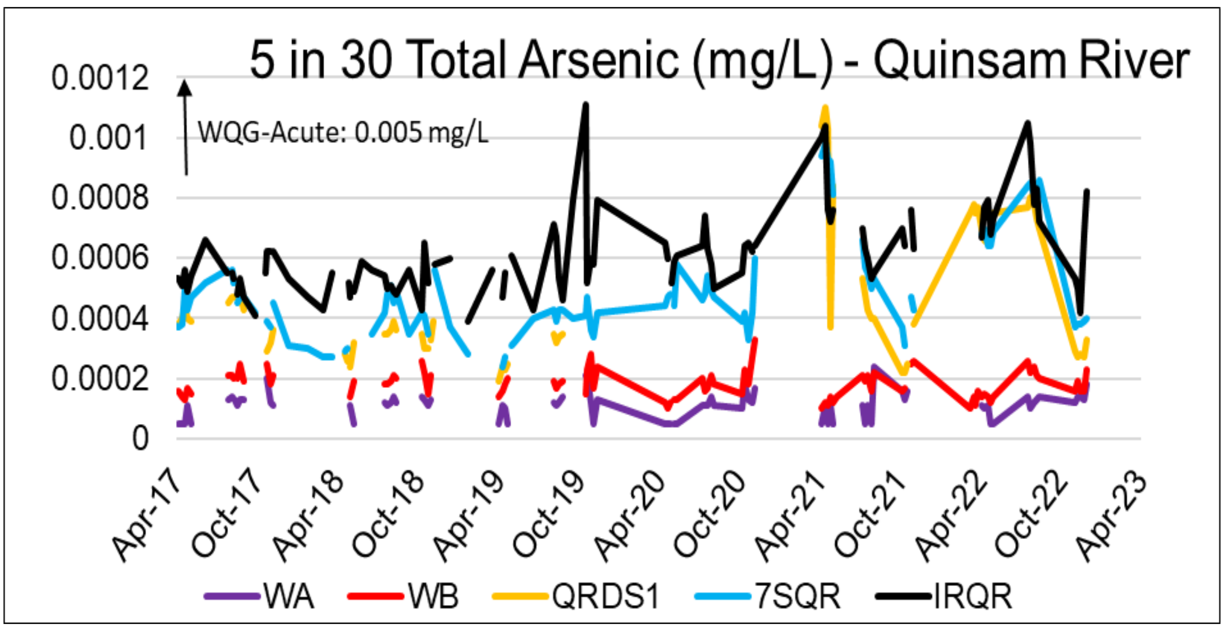

Figure 16: Total Arsenic in Quinsam River

5.0 Biological Monitoring

Chlorophyll "a", phytoplankton and zooplankton samples were collected during one sampling event concurrent to the "5 in 30" fall turnover period. Samples for zooplankton were collected using a zooplankton net that was deployed to 10 metres and vertically towed to surface. These samples were analyzed for zooplankton count and identification of species. Chlorophyll “a” and phytoplankton were collected at one metre below surface and analyzed for count, total abundance, and identification. During Q3, Middle Quinsam and Long Lakes displayed similar chlorophyll “a” and total abundance for zooplankton with MQL having slightly higher counts of zooplankton compared to Long Lake. Long Lake displayed the greatest abundance for Phytoplankton compared to Middle Quinsam Lake. Refer to Figures 17 through 19 below.

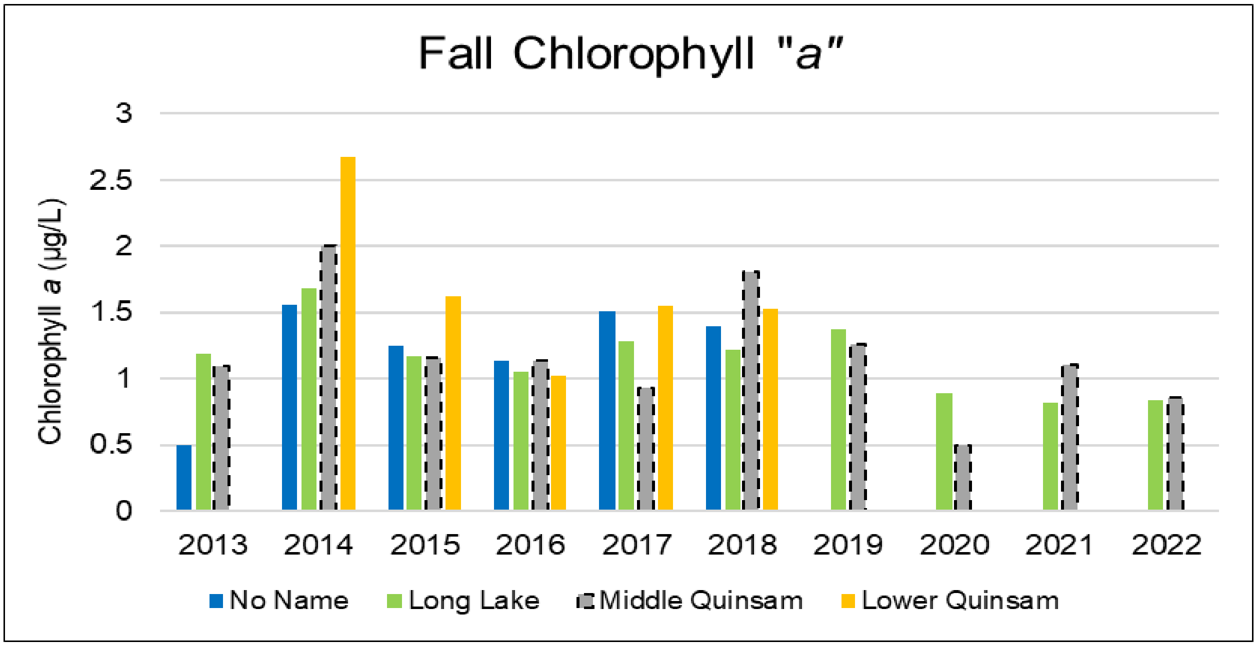

Figure 17: Fall Chlorophyll "a"

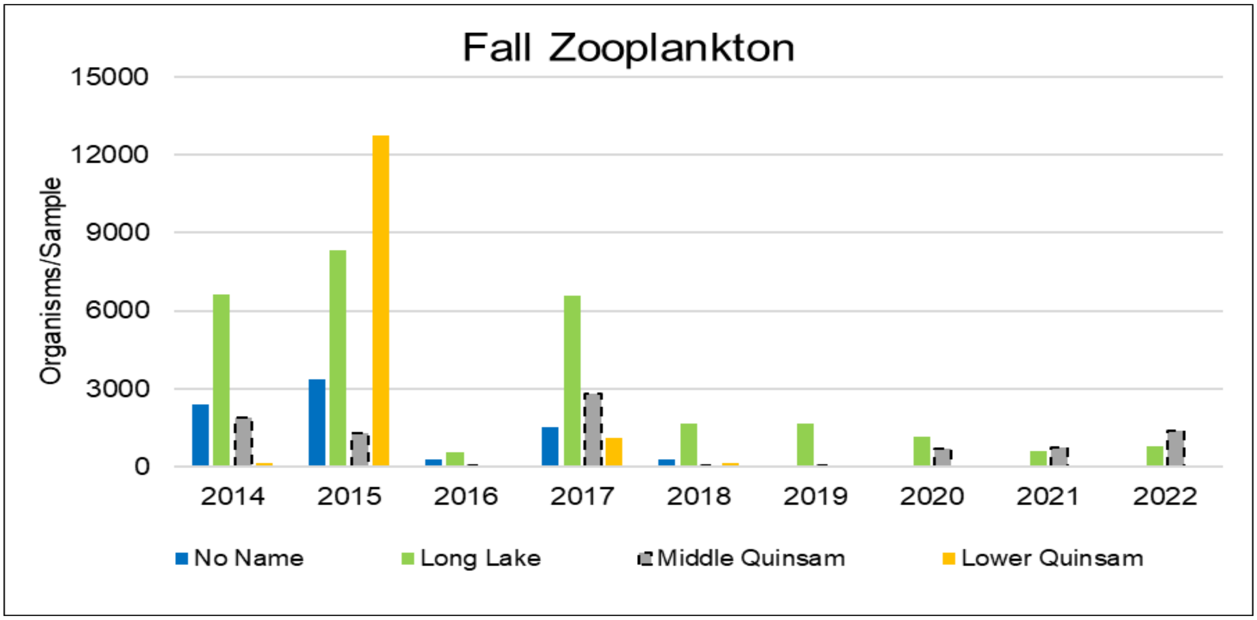

Figure 18: Fall Zooplankton Abundance

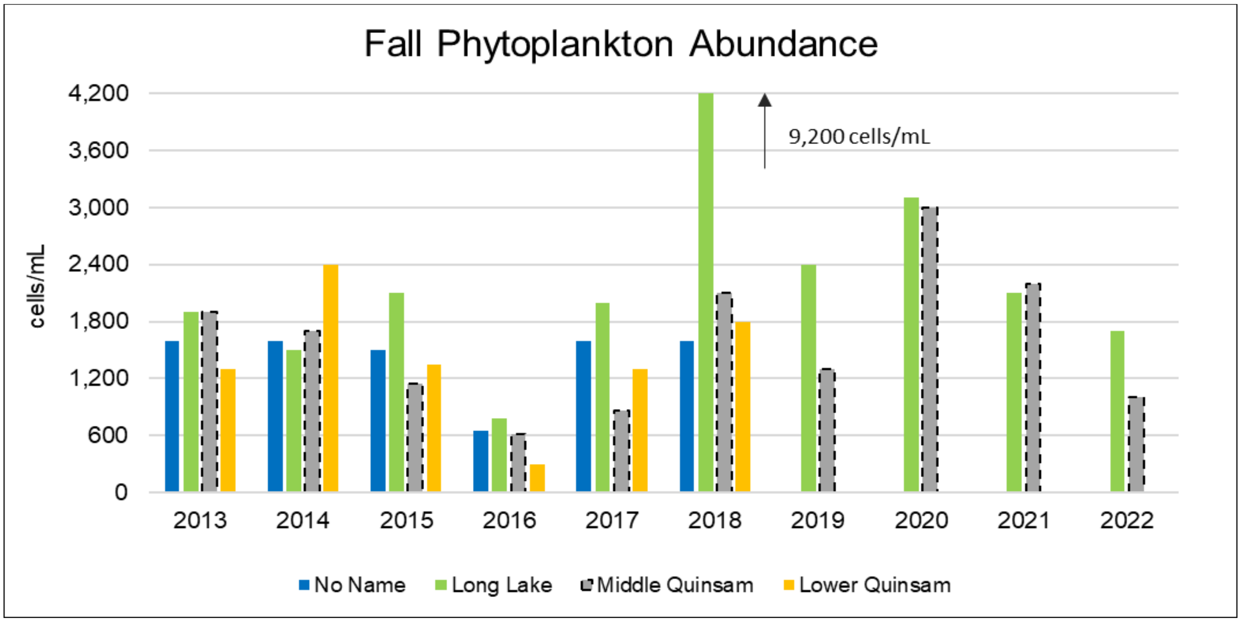

Figure 19: Fall Phytoplankton Abundance

6.0 Groundwater

This quarter, 20 ex-situ groundwater wells, and in-situ mine pools and sumps were monitored. These included 11 flooded mine pools (in-situ) and 9 groundwater wells outside the mine footprint (ex-situ). Ex-situ groundwater is compared to the British Columbia Contaminated Site Regulation (CSR) (BC reg.375/96. O.C. 1480/96), Schedule 6, Aquatic life (CSR-AL). In Q3 both in-situ and ex-situ sites were compared to CSR-AL. Apart from some slightly elevated parameters of interest (i.e., arsenic, selenium, sulphate, and sulfide calculated as hydrogen sulfide), most concentrations were not elevated above CSR-AL.

Refer to Appendix I, Table 4 for those parameters displayed in both ex-situ and in-situ groundwater and flooded mine voids above the CSR-AL. Appendix I, Tables 31 provides details on the well and sump designations and locations. Appendix 1, Tables 32 provide the water quality analyses. Certain parameters found in ex-situ groundwater repeatedly exceed the CSR-AL. Those include the following dissolved parameters: arsenic, chloride, and sulphide as H_2S and occasionally selenium. Selenium is observed periodically in the ex-situ deep and shallow groundwater of QU1105 D and S. This ground water well is situated down gradient of underground tailings disposal in 1Mains 2-North and measures water quality and hydraulic head downgradient of 2-North and River Barrier Pillar. Some of these parameters (Arsenic) are naturally elevated in ex-situ groundwater due to the regional geology of the area. Quinsam monitors trends for arsenic, sulphate and H_2S in in-situ wells and compares them to predictive water quality and source terms developed for certain areas. This is discussed in detail in the Annual Water Quality Monitoring Report due to the frequency of monitoring for groundwater wells and expected travel time of groundwater movement.

7.0 PASSIVE TREATMENT SYSTEM (PTS)

The PTS was operational for Q3. The treatment system was operating between 3.6 L/s to 8.1 L/s, averaging 4.73 L/s. Average amount of treated mine water pumped over the quarter (92 days) was approximately 37597 m^3. The mine pool water level was measured at 5.50 m above the pump on October 4th and increased to 7.6 m by December 28th. Both Seeps were not flowing this quarter. Normally both seeps are flowing mid-November. The increased flow rates during summer depleted the flooded mine and limited surface precipitation during fall have prevented the mine from filing up.

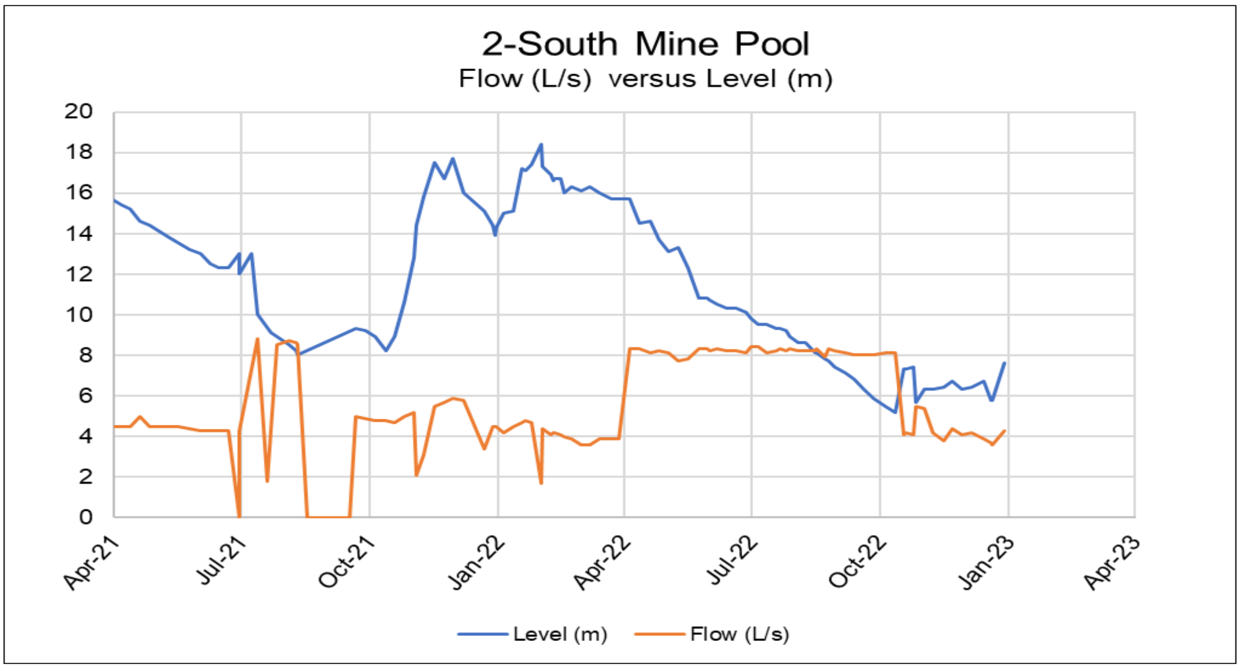

Figure 20: 2-South Mine Pool at INF Flow versus Level

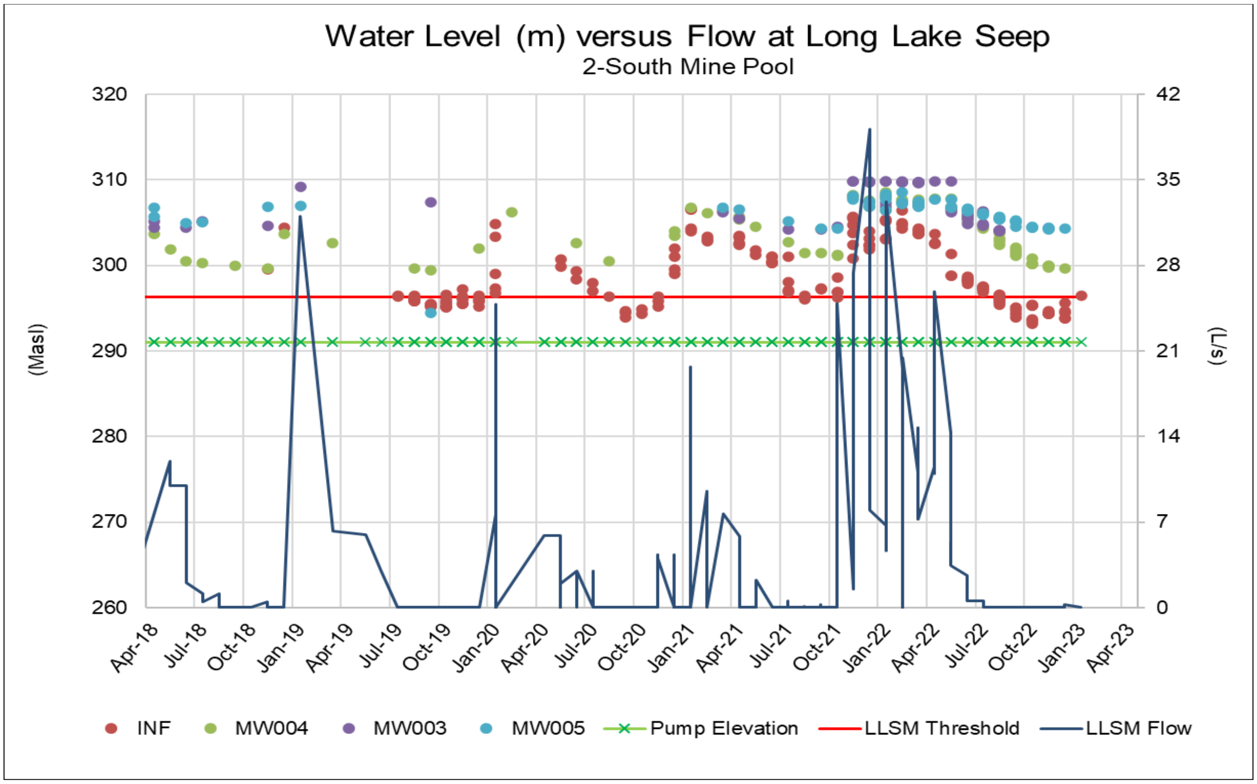

Figure 21: 2-South Mine Pool Versus Long Lake Seep Middle (LLSM) Flow

Figure 20 depicts the 2-South mine pool elevations measured at different locations in the mine area compared to discharge at LLSM. Those include groundwater wells closest to the seeps (MW003, MW004 and MW005) and the 2-South dewatering well (QU11-11). Measurements are compared to the period where discharge is measured at the Seeps and the period of no flow. The mine pool elevation required for the Seep to stop discharging is approximately 296 meters above sea level (MASL).

For Q3 average concentrations of dissolved sulphate entering the PTS from the 2-South mine pool measured at INF were 511 mg/L and leaving the system at the Sulphide Polishing Cell (SPCEFF) resulting in 348 mg/L, (Table 2 and Figure 22). This has led to a reduction in average sulphate concentrations of 163 mg/L, (Figure 23). Sulphate reduction between INF and Biochemical Reactor (BCR) averaged 68 mg/L. The station, 2-South Inflow (2SI), receives discharge from the PTS, had an average sulphate concentration of 452 mg/L and SPD averaged 441 mg/L for Q3.

Table 2: Summary of Site Dissolved Sulphate and Reduction Rates

Q4	INF	BCREFF	SPCEFF	2SI	2S	3S	SPD
Average	511	443	348	452	477	603	441
Count	12	11	13	13	3	3	13
Min	490	380	230	230	460	570	58
Max	530	500	390	520	470	670	500
	INF to BCR	BCR to SPCEFF	INF to SPCEFF	INF to 2SI	INF to 2S	INF to 3S	INF to SPD
Sulphate Reduction	68	95	163	59	34	-93	70

Overall, the greatest average sulphate reduction exists between INF to SPCEFF resulting in 163 mg/L. Warmer ambient temperatures normally increase microbial metabolic activity within the BCR and SPCEFF during summer and early fall. The low average reduction rate (68 mg/L) between INF and BCR could indicate that the substrate requires replacement in the BCR, or the cooler ambient temperatures decreased microbial activities. Overall, a sulphate reduction of 163 mg/L was attained within the PTS between IF and SPCEFF. The original reduction goal for the PTS was to reduce sulphate concentrations to 300 mg/L. This has not been achieved in Q3 but discharge concentrations at SPD remained relatively low, 441 mg/L. Increased pumping from 3 South pit and the 2-South pit may have contributed to higher average concentrations displayed at SPD.

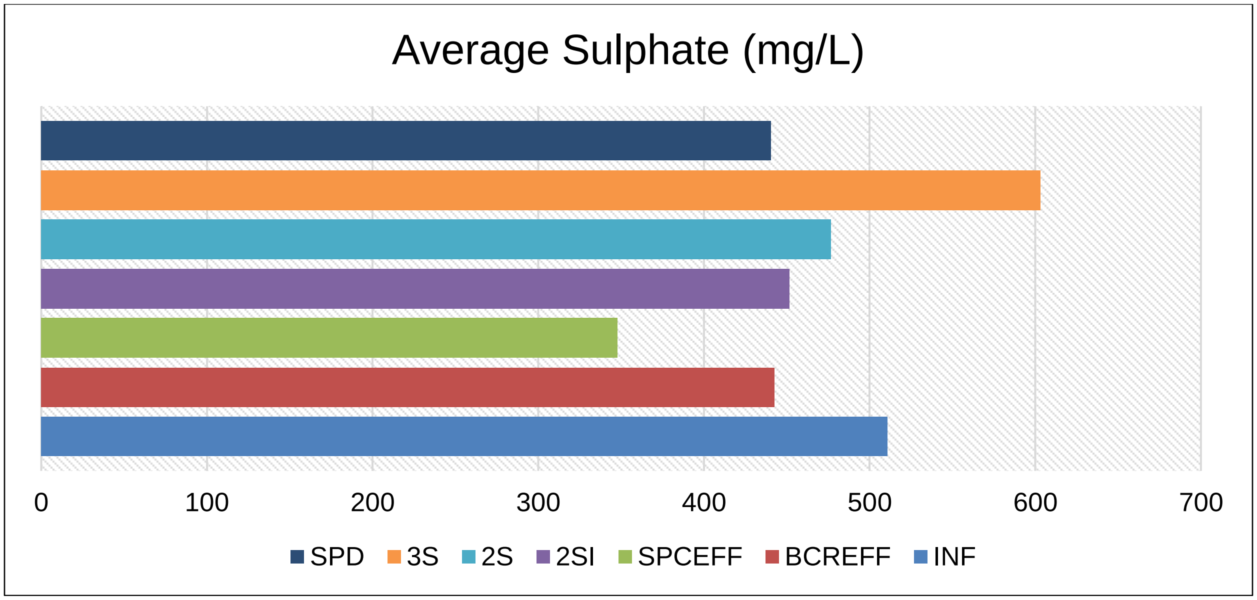

Figure 22: Average Sulphate Concentrations in 2-South Area

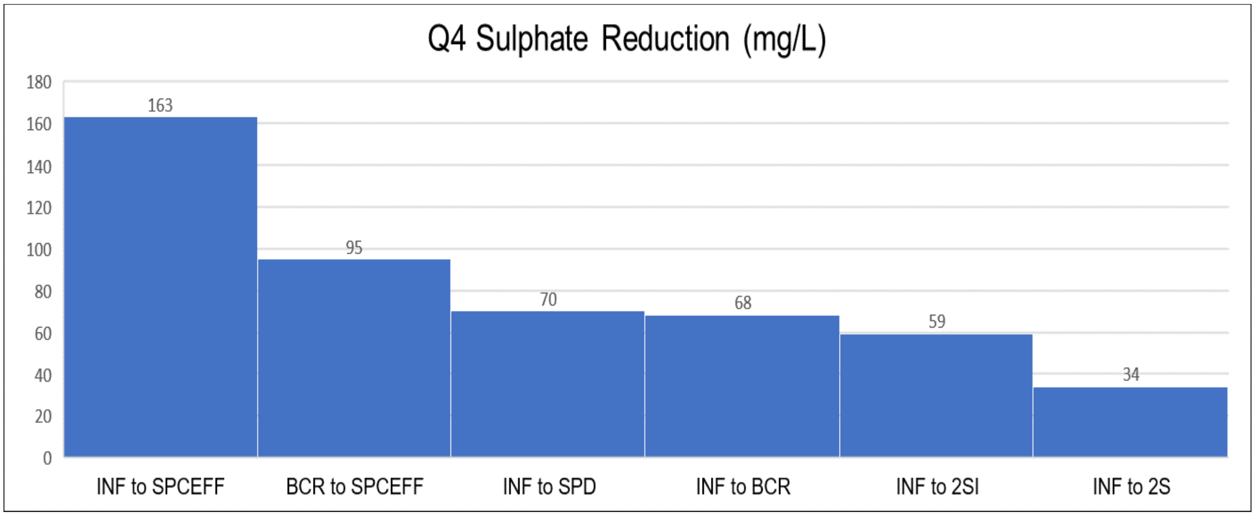

Figure 23: Sulphate Reduction through the Water Management System.

The PTS is effective at maintaining water cover over the PAG-CCR in the 2-South pit and reducing discharge at the Seep into Long Lake during low flow periods. This is accomplished by decreasing the elevation of the mine pool, below the elevation of the seep. The period of "no flow" at the Middle Seep into Long Lake (LLSM) has been observed to be extended by pumping down the mine pool.

Further monitoring of the PTS continues and includes the 2-South Mine pool at (QU11-11 / INF), 2-South and 3-South systems, groundwater wells (MW003, MW004 and MW005) and the Seeps. A relationship between the Seep flows and the elevation of the mine pool at the INF location continues to be developed with observations noted every quarter.

8.0 Quality Assurance Quality Control

All replicate sampling was performed in compliance with the *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 2013 Edition*.

As per these guidelines and in accordance with the Quinsam Coal Quality Assurance/Quality Control (QA/QC) program, one field replicate sample was collected per sampling event. Relative Percent Difference, RPD values were calculated in accordance with the B.C. field sampling manual.

9.0 Conclusion

The surface monitoring program at Quinsam Coal has been established to capture the effects of mine related surface and underground disturbance areas (contact water) with the receiving environment. The comprehensive nature of this program allows Quinsam to generate water quality predictions, strategically manage surplus water generated because of mining activities and create management plans with a focus on mitigating potential receiving environment impacts.

The monitoring period during the fall flush in the receiving environment is meant to capture lake turnover events and increased flow rates on the rivers and streams. This period provides valuable information for water quality during higher flow periods. It is acknowledged that flow rates were low on the rivers during this period, but water quality remained below most applicable guidelines indicating excellent water quality in the receiving environment.

Long Lake remains stratified longer compared to Middle Quinsam Lake and as a result, it turns over slower. Fall sampling in late October early November represented a period when Long Lake was beginning to turnover but was still slightly stratified. Stratification was observed by a broader range of temperature gradients between the epilimnion and hypolimnion, which slowly decreased throughout the program as well with increasing dissolved oxygen levels in the hypolimnion. Middle Quinsam Lake was unstratified and demonstrated a true representation for lake turnover.

As demonstrated by the Q3 monitoring program results, water quality in the Middle Quinsam Lake sub basin remains favorable with few parameters trending above WQG's. Many parameters exhibit stable concentrations with some (e.g., sulphate) decreasing in concentration within the lakes. Quinsam is committed to limit impacts placed on the environment through operational procedures. Quinsam strives to prevent adverse environmental impacts and is dedicated to internally investigate those parameters displaying an increasing trend.

In closing, we trust the information presented in this report satisfies the conditions under Effluent Permit PE-7008. Please contact the Quinsam Coal Environmental Department if you have any questions or comments.

Sincerely,
Quinsam Coal Environmental Department

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