

# Quinsam Coal Corporations Quarterly Report (July 1 - September 30)

**For Effluent Permit PE: 7008**  
**Environmental Department**

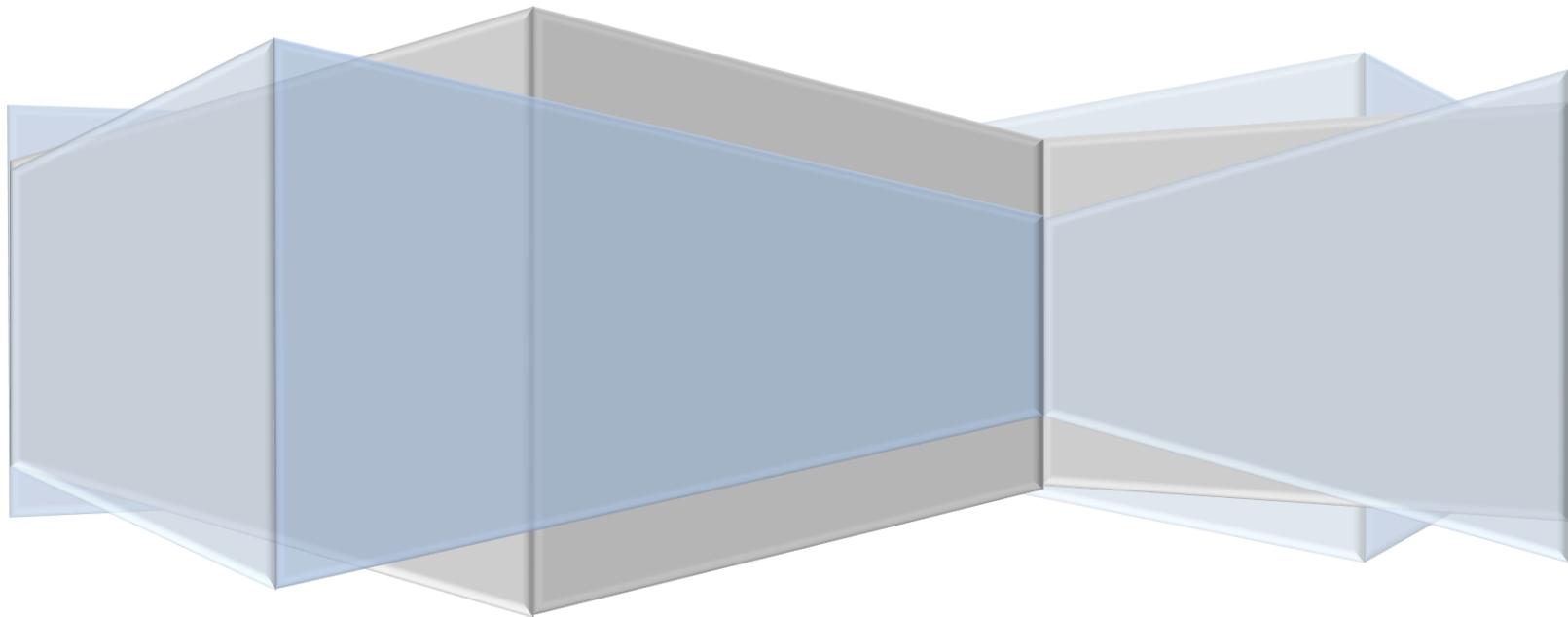


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**SUMMARY OF EVENTS FOR THE SECOND QUARTER:**

This quarter Quinsam Coal Corporation (QCC), continued with retreat mining in 2 North, 4 Mains and pillar splitting and brushing in 400 panel. The 2-North mine is projected to be complete in mid-November to early December. In 7-South development mining continued in 2 Mains with splitting, brushing and storage of potentially acid generating coarse coal refuse (PAG-CCR). In 3 Mains brushing the flooring coal continued. Blasting through the Long Lake Fault Zone to access 7-South Area 5 commenced in mid- July and is projected to be completed mid-November to early December.

During the 2nd Quarter (Summer 2018), the receiving environment monitoring program for both lakes and river/stream stations was completed. Quarterly monitoring was performed for groundwater quality, effluent and in-mine releases. All other environmental sampling and obligations pertaining to permit PE-7008 was completed.

All permitted parameters were below permit limits at all authorized discharge points (Settling Pond #1, Settling Pond #4 and 7SSD).

As displayed in Appendix I, Table 1 parameters observed to be above British Columbia Water Quality Guidelines for Protection of Aquatic Life occurring in the receiving environment include:

- total arsenic,
- total & dissolved iron,
- dissolved sulphate,
- pH,
- hypolimnetic dissolved oxygen

Monitoring of groundwater included 18 wells, 1 underground sump (1M7S) and 2 dewatering wells pumped to surface (5 Mains #2 and 1 Mains 2-North) and 1 surface sump at the 242 reclaimed site. The ex-situ groundwater wells are those wells outside of the mine pool that have the potential to impact aquatic life. These wells are compared to British Columbia Contaminated Sites Regulations – Freshwater Aquatic Life Schedule 6 (CSR-AW). Those parameters that exceeded the Guidelines include dissolved arsenic, sulphate and sulphide as hydrogen sulphide (H<sub>2</sub>S). Exceedances are displayed in Appendix I, Table 2.

In addition to the aforementioned monitoring, the Quinsam Environmental Department conducted routine inspections and completed any required maintenance of the water management structures.

A list of monitoring locations and associated EMS identities is available in Appendix I, Table 1 and Table 2 lists the permit non-compliances for Q2. Table 3 displays a summary of those parameters that exceeded the guidelines throughout the quarter. Appendix I, Tables 4-69 display all water quality results and Charts 1 through 6 display the hydrographs pertaining to Quarter 2, July 1<sup>st</sup>, 2018 through September 30<sup>th</sup>, 2018.

## 1.0 NON-COMPLIANCE EVENTS

There were no reportable spills or parameters outside of the PE 7008 permit limits in Q2.

There were 6 events where a permit non-compliance for daily composite total suspended solid samples occurred at Settling # 4 (July 30<sup>th</sup>, August 14<sup>th</sup>, 15<sup>th</sup>, 30<sup>th</sup> and 31<sup>st</sup>). This was attributed to the water level in the pond being extremely low during the day, used for coal processing. The pond water level fell below the composite sampler suction line intake for most of the day for the required sample volume to be collected. The average on half of the referred to dates was below the 0.054 m<sup>3</sup>/day. Refer to Appendix I, Table 25 for the discharge table. Once this was discovered the suction line was repositioned well below the decant riser to capture a 24-hour daily composite.

It is important to keep in mind that the pond water level was below the decant for most of the day and there was a shortage of water during these occasions. Therefore the 24-hour composite sample required during a maximum discharge event greater than 0.054 m<sup>3</sup>/day is difficult to achieve if the water is not discharging for 12 hours out of day. Quinsam feels this is a clause in the permit that requires some attention and will be addressed in the future.

At Settling Pond #1 there was one event where alkalinity and acidity, required monthly, was not analyzed at the laboratory. A sample was collected but the chain of custody sent to the laboratory did not indicate the required parameters be analyzed. No discharge occurred from this Settling pond until September 29<sup>th</sup>, 2018.

## 2.0 WATER MANAGEMENT SYSTEMS

### 2.1 NORTH WATER MANAGEMENT – SEDIMENTATION POND 4 (WD)

Measured discharge at Settling Pond # 4 occurred for 92 days during this quarter; the average flow rate was estimated above the threshold for composite TSS sampling (daily max flow above 0.054 m<sup>3</sup>/s) for 68 days this quarter. July had the greatest average quantity discharged with August recording the lowest average quantity for Q2.

Dewatering of the underground 2-North mine continued throughout this quarter; water was pumped from 5 Mains and 1 Mains 2-North into Brinco Brook. Brinco Brook mixes with water from the 2-North Portal Sump and flows into Settling Pond 4 where it is released to the environment. This water is used for coal processing activities.

All parameters permitted to discharge at WD remained below permit limits. Sulphate concentrations averaged 570 mg/L; TSS remained low with most samples below detection limits of 4.00 mg/L, averaging 4.26 mg/L and pH remained neutral.

## 2.2 SOUTH WATER MANAGEMENT - SEDIMENTATION POND 1 (SPD)

Discharge occurred for 2 days (September 29<sup>th</sup> and 30<sup>th</sup>) during this quarter from SPD recorded as 310 L/s.

All permitted parameters applied to SPD discharge were sampled from the ponded water and remained below permit limits. As mentioned above alkalinity and acidity were not analyzed at the laboratory during September's monthly sampling event. Monthly sulphate concentrations averaged 256 mg/L, TSS remained below detection limits in most samples with an average of 4.29 mg/L and pH remained neutral.

## 2.3 7-SOUTH (7SSD) WATER MANAGEMENT

Discharge did not occur during Q2 at 7SSD. During spring, fall and winter the sedimentation pond outflow is controlled by pumping water accumulated in the pre-settling pond to the 7-South Portal Sump. This procedure reduces discharge, decreasing the overall parameter loading and the potential for adverse aquatic impact in the receiving environment; as the biological availability for parameters of concern is much lower than under constant discharge conditions. Pumping to the 7-South Portal Sump did not occur during this quarter as there was limited precipitation received.

Monthly samples were obtained from the ponded water (7SSD). This quarter, the corresponding downstream receiving environmental sites 7S and Lower Wetland Outlet were dry.

## 3.0 RECEIVING ENVIRONMENT WATER QUALITY

### Preamble – Water Hardness

For the purposes of this report, the water quality guideline(s) (WQG) for hardness dependent parameters has been derived using the most conservative approach or background values (i.e. monitoring location WA or IR1 hardness ~30mg/L). Quinsam Coal has adopted this approach to provide a conservative comparison of receiving environment water quality.

The average hardness concentration is calculated for the 5 in 30 sampling events (i.e. summer), resulting in dynamic WQG concentrations. For the summer sampling season an average hardness of 30 mg/L was used to derive the hardness dependent guidelines for simplicity purposes for both the Quinsam River and the Iron River.

The table below summarizes the parameters above Provincial water quality guidelines for all sites this quarter. This table is also available in Appendix I, Table 3.

### 3.1 LAKES

Lake sampling commenced July 26<sup>th</sup> following the 5 samples in 30 days approach. This program included No Name Lake (NNL), Long Lake (LLM), Middle Quinsam Lake (MQL) and Lower Quinsam Lake (LQL). Appendix I, Table 36 displays the depth profiling field results with Tables 37 through 52 displaying the water quality results compared to guidelines.

**Table 1: Summary of Water Quality Guideline Observation for Lakes**

SUMMARY OF WATER QUALITY GUIDELINE OBSERVATIONS AT RECEIVING MONITORING LOCATIONS - Q2							
EMS ID & Site Name	Site Code & Depth	Parameter (mg/L or pH Units)	Guideline Limit	Result	Date	Guideline	Sampling Events Exceeding Guideline
E217018 - No Name Lake (NNL)	NNL 6-11.8 metres	pH	6.5	5.84 - 6.48	July 25th through August 23rd	Min	(23/55) Depths profiled during summer
E206619 - Long Lake Middle (LLM)	LLM 9M	SO4-D	128	142	Fall 5 in 30	A	Summer 5 in 30
	LLM 1MB			143			
E292118 - Lower Quinsam Lake (LQL)	LQLB (14- 16.6 metres)	pH	6.5	6.43 - 6.45	August 22nd	Min	(2/77) Depths profiled during summer
		Hypolimnetic DO	3	0.63 - 2.93	August 9th, 16th & 22nd	Min	6 occurrences during summer
	LQL 1MB	Fe-D	0.35	0.442, 0.442, 0.632 and 0.746	July 26th through August 22nd	Max	(4/5) weekly samples during summer
		Fe-T	1	1.17 and 1.35	August 17th and 22nd		(2/5) weekly samples during summer

Min = Minimum Water Quality Guideline (WQG) M= Maximum WQG, A= Average WQG

For all Middle Quinsam Lake Sub-basin and Iron River results background hardness of 30 mg/L was used to calculate those parameters that are hardness dependent.

Noteworthy observations resulting from the lake monitoring program include:

#### Average sulphate concentrations

- Measured below the water quality guideline (128 mg/L) on three lakes at all depths (NNL, MQL and LQL) and in Long Lake at 1 metre and 4 metre depths.
- Resulted in 142 mg/L mg/L and 143 mg/L at 9 metres and 1 metre from bottom (1mb), respectively on Long Lake during summer sampling.
- There was no flow from LLE into Long Lake; however, the Middle Seep (LLSM) flowed up until early August this year. The lake 1 metre and 4 metre depths displayed increasing sulphate concentrations averaging 96 mg/L and 99 mg/L, respectively.
- Lower at surface than at depth on Middle Quinsam Lake ranging from 22 mg/L on surface to 45 mg/L.
- Higher at surface than at depth on Lower Quinsam Lake ranging from 23 mg/L to 15 mg/L.

### **pH in NNL and LQL**

- In NNL pH values fell below the minimum guideline of 6.5 for 23 out of 55 depths sampled, at depths of 6 to 11.6 metres, resulting in a minimum value of 5.84.
- In LQL pH values fell below the minimum guideline for 2 out of 77 depths sampled, at depths of 14 to 15 metres, resulting in a minimum value of 6.43.

### **Hypolimnetic Dissolved Oxygen**

- LL was not observed to have low dissolved oxygen at depth and as a result manganese did not exceed the guidelines.
- In LQL at 14 to 16 metres dissolved oxygen was depleted below 3 mg/L as a results exceedance of both total and dissolved iron were observed at the 1 metre from bottom depth.

### **3.2 STREAMS AND RIVERS**

The 5 samples in 30 days receiving environment program at river and stream sites commenced July 17<sup>th</sup> and concluded August 14<sup>th</sup>, 2018. Appendix I, Tables 53 through 63 display water quality results from this program compared to water quality guidelines for the Middle Quinsam Lake Sub-basin and Iron River.

Monitoring stations captured within the Middle Quinsam Lake sub-basin include:

- Middle Quinsam Lake Inlet (WA),
- Middle Quinsam Lake Outlet (WB),
- No Name Lake Outlet (NNO),
- Long Lake Outlet (LLO),
- Quinsam River Downstream 1 (QRDS1),
- 7-South Quinsam River (7SQR),
- Quinsam River downstream of the confluence with Iron River (IRQR).

Monitoring stations on the Iron River include:

- Iron River Upstream of Mining Operations (IR1),
- Iron River Upstream of future 7-South Area 5 development (IR6), and
- Iron River above the confluence with Quinsam River (IR8).

While monitoring location LLE is considered the initial dilution zone (for water quality evaluation purposes) it is important to note that this location represents the uppermost extent of an initial dilution zone for the South water management system discharge into Long Lake.

**Table 2: Summary of Water Quality Guideline Observations at Receiving Environment Monitoring Locations, Initial Zone of Dilution Site and Long Lake Seeps**

SUMMARY OF WATER QUALITY GUIDELINE OBSERVATIONS AT RECEIVING MONITORING LOCATIONS - Q2							
EMS ID & Site Name	Site Code & Depth	Parameter (mg/L or pH Units)	Guideline Limit	Result	Date	Guideline	Sampling Events Exceeding Guideline
E297231 - Iron River Upstream of 7SA5 (IR6)	IR6	As-T	0.005	0.0052, 0.00565 & 0.00746	August 1st, 7th and 14th	Max	(3/ 5) weekly samples during summer
E297232 - Iron River Downstream of 7SA5 (IR8)	IR8			0.00612, 0.00864 & 0.00961	July 24th, August 1st and 7th		(3/ 5) weekly samples during summer
E292131- Seeps into Long Lake (LLS & LLSM)	LLS	Fe-D	0.35	0.517, 0.526 & 0.373	July 4th, August 8th and September 6th	Max	Monthly samples collected during low flow
	LLSM			0.483	August 8th		Monthly sample collected during low flow
E292130 - Long Lake Entry (LLE)	LLE	SO4-D	128	398	5 in 30 rolling average (June 11th through July 9th)	A	(1/13) weekly rolling averages during Q2
		Fe-D	0.35	0.800	September 17th	Max	Collected during summer low flow once the culvert started flowing again
		Fe-T	1	1.93			
E219412 - Long lake Outlet (LLO)	LLO	Cu-T	0.002	0.00449	Summer 5 in 30	A	Sample collected from a standing pool by hydrometric station
			0.007	0.0204	August 7th	Max	

Min = Minimum Water Quality Guideline (WQG) M= Maximum WQG, A= Average WQG  
 For all Middle Quinsam Lake Sub-basin and Iron River results background hardness of 30 mg/L was used to calculate those parameters that are hardness dependent.  
 \*SO4 at LLE was calculated using a rolling average.

Noteworthy observations resulting from the Summer low flow river/stream monitoring program include:

- The water quality at most river and stream stations remained below guideline levels during the sampling events; exceedances occurred at LLO, IR6 and IR8.
- Rolling average sulphate concentrations at LLE were elevated during one sampling event in July. Total and dissolved iron was elevated during September had started again and was low; there was no flow in from August through to the end of September.
- Average concentrations of total arsenic were elevated in the Iron River (IR6 & IR8) above the average guideline of 0.005 mg/L during summer low flow.
- Elevated total copper concentrations were observed at LLO above both Maximum and Average guidelines. This is thought to be an outlier as all other results were within a normal range. The laboratory re-run was completed and confirms the original result.

- Dissolved iron was elevated at the Long Lake Seeps on one occasion at the larger seep (LLSM) and all events at the smaller seep (LLS). The smaller seep is difficult to sample due to the low flow and location of the monitoring site.

#### 4.0 GROUNDWATER

Groundwater wells are categorized as either ‘in-situ’ or ‘ex-situ’; the definition for each is as follows:

- In-situ: groundwater wells located within the mine workings (disturbance footprint) and therefore represent water accumulated within the mining void. In the absence of groundwater well samples, underground sump samples are used for comparison.
- Ex-situ: groundwater wells located outside the mine workings (disturbance footprint) which reflect water quality flowing from the mine void towards the receiving environment. This also includes baseline and background (up-gradient of workings) groundwater wells.

The groundwater wells outside the mine footprint (ex-situ) are compared to the British Columbia Contaminated Site Regulation (CSR) (BC reg.37/96. O.C. 1480/96), including the amendments (343/2008 January 1, 2009) describing water quality standards for fresh water Aquatic Life (AW). The aquatic life standard assumes that a minimum 1:10 dilution is available for groundwater discharged to a freshwater system; together, they are referred to as CSR-AW.

Table 3 below lists the groundwater wells and sumps monitored during Q2.

**Table 3: List of Groundwater Wells & Underground Sumps Monitored in Quarter 2**

Area	Ex-situ	In-situ
<b>7- South</b>	QU08-13 A	QU14-10, 1Mains 7-South (1M7S)
<b>River Barrier Pillar</b>	QU11-09 S	QU11-09 M
	QU11-05 S & D	
<b>2-North</b>	QU08-21 GS, MW001 S&D MW006 S&D	1 Mains 2-North (1M2N), 5 Mains #2 (5M#2), QU10-13 D
<b>2-3 South</b>		MW00-4, QU11-11 and MW00-2,
<b>5S Mine Pool</b>		5SMW
<b>242 Area</b>	242 portal sump	242MW

**Table 4: Summary of Ex-situ Groundwater Well Observations Compared to CSR-AW Standards in Q2**

British Columbia Contaminated Sites Regulations – Freshwater Aquatic Life Schedule 6 (CSR-AW).			
Ex-Situ Groundwater wells Quarter 2	Parameter	(CSR-AW) (mg/L)	Result
QU0821GS & D, QU1105S, QU1109S & QU0813A	As-D	0.005	0.289, 0.173, 0.0539, 0.115 and 0.411
MW002	SO4-D	1000	1340 & 1280
QU0821GS & D, QU1105S & D, QU1109S & QU0813A	H2SEquiv	0.02	0.0526, 0.0674, 0.126, 7.86, 0.44 & 0.126

Noteworthy observations resulting from the ex-situ groundwater monitoring program include:

- Arsenic was elevated above the CSR-AW (0.05 mg/L) in the groundwater from 7-South, 3-North and River Barrier Pillar (RBP). This is due to the geological features and elevated arsenic found in the host rock geology *i.e.* Dunsmuir Sandstones.
- Hydrogen sulphide was observed to be elevated above CSR-AW (0.02 mg/L) in 7-South, 3-North and RBP. The RBP, QU11-05 D was observed to have the highest concentrations of 7.86 mg/L indicating the groundwater has low redox conditions.

#### 5.0 LONG LAKE SEEP TREATMENT (LLST) SYSTEM AND 2-SOUTH PIT:

In early August the 2 South mine pool pump was replaced and pumping commenced into the main two ponds of the treatment system, Biochemical Reactor and the Sulphide Polishing Cells. The incubation period for the two cells was two weeks. The effluent from the treatment system pond, Sulphide Polishing Cell (SPC-EFF) was directed into the 2-South PAG-CCR facility in order to maintain a 1.5 metre water cover over the PAG-CCR during times of low precipitation. The 2-South Inflow (2SI) monitoring location was included in this quarter’s data for September monthly sampling as this represents the location where (SPC-EFF) enters the pit. All monitoring results from the 2-South mine pool (INF), SPC-EFF and 2SI are displayed in Appendix I, Tables 11, 12 and 13 including water quality monitored within 2-South pit (Table 14). The treatment system discharge is now continuous flow through 2SI to 2S to 3S which is then pumped to Settling Pond #1. This ensures permit limits are met and all mine released water remains within the authorized works. This eliminates the Aeration Lagoon and last Settling Pond in the treatment system as there is no flow to or discharge from, those ponds. The site BDS is also removed as a result.

## 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.

## CONCLUSION

Quinsam Coal is dedicated to reducing the environmental impacts as a result of mining on the environment. Overall, there were few provincial water quality guideline exceedances on site and in the receiving environment this quarter. This exemplifies that the environmental management practices employed by Quinsam Coal are effective in reducing environmental impacts to the surrounding environment. 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,

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