



PE:7008 QUARTER 4 REPORT

January through March 2021

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Summary of Events for the Fourth Quarter

During the 4th Quarter (Q4) January 1st through March 31st, Quinsam Coal Corporation (QCC) maintained the environmental obligations for permits PE:7008 held with the Ministry of Environment and Climate Change Strategy and the Mines Act permit, C-172. The mine continues to be operated in a “care and maintenance” mode with The Bowra Group Inc. as the receiver.

On October 20, 2020, Ministry of Environment and Climate Change Strategy, Environmental Protection Division staff conducted an onsite inspection of the facility, Quinsam Coal Corporation with authorization number UA#7008 under the *Environmental Management Act*. A file review was completed of the Quinsam Coal Mine site to verify compliance with the Environmental Management Act. This inspection was conducted in follow-up to Inspection Report (IR) 71895, which resulted in a warning letter for an unauthorized discharge at the Long lake Seep when the 2-South mine pump failed in late January 2020.

Quinsam was also found out of compliance with a number of permit conditions related to missed samples, continuous discharge and areas in the permit requiring an amendment. A response to the inspection report was sent out to EnvironmentalCompliance@gov.bc.ca on February 17, 2021.

For those areas where a permit amendment is required QCC is prepared to apply for an amendment to PE:7008 with Ministry of Environment and Climate Change Strategy (ENV). QCC recognises an amendment to PE:7008 would address certain issues identified as non-compliant under IR 159669R; however, based on the current operational status of the mine site (care and maintenance with a potential sale) QCC understands ENV does not want to discuss a further permit amendment until the future outcome of the mine is determined. As a result, there are conditions in the permit where QCC will not meet compliance under its current operational status without a further permit amendment. Areas where a permit amendment is required to bring QCC back into compliance include the following include:

- Average authorized discharge rates at Settling Pond #4
- Receiving environment monitoring locations in Block 242 (E225798 and E225808).
- Current operational procedures for 7-South authorized discharge location (7SSD)
- Required water cover over 7SSD

Refer to the Remedial Action Plan for PE: 7008 for further details.

Reports submitted this quarter include:

- Annual Reclamation Report 2021 Mines Act Permit (C-172)
- Environmental Procedures Manual 2020 (PE:7008)
- Annual Report for Middle Point Coal Storage and Barge Loading Facility (PE:17181)

In addition to surface monitoring groundwater monitoring consisted of 8 ex-situ groundwater wells, 12 in-situ groundwater (mine pool) areas and 2 mine sumps were monitored this quarter. Routine inspections were conducted, and any required maintenance of the water management structures was completed.

During Q4 327.2 mm of accumulated precipitation was received at the site with 168 mm received during January (1-15). As a result, 3-South pit water levels rose to concerning levels but were managed with continued pumping. In order to mitigate any future unauthorized discharge from 3-South pit during heavy rain events, a submersible 58 horsepower pump was installed in 2-South pit. The new 2-South pipeline, ties into the existing 3-South pipeline that discharges into a roadside ditch leading to Settling pond # 1. Reducing water levels in 2-South pit below the 1.88 m outlet structure, restricts water level increases in 3-South pit.

In February 2020, the 5-Mains 2-North dewatering pump failed and on November 30, 2020 the 1-Mains 2-North dewatering pump failed as reported in the Q3 report. The 3-Mains pumping network was used as the backup system for dewatering the mine pool until the failed pumps could be replaced. Consequently, the 2-North mine pool water elevation water level rose to 243.7 meters above sea level (MASL) by March 22, 2021. The water was being managed through the 3-Mains pumping system, but the mine had never been flooded to that elevation historically.

During Q4 water was pumped from 7-South mine pool into the 5-South Mine pool continuously with the 5-South mine pool pumped periodically into 3-Mains 2-North mine area.

The combined mine waters are discharged from 3-Mains 2-North into Brinco brook where flows are directed to Settling Pond 4 (WD / SP4). SP4 is the authorized discharge location for the 2-North area where permit limits are applied to water quality and quantity. SP4 discharge water flows through a series of wetlands and biomass areas before entering Middle Quinsam lake, near the inlet.

Poor water quality was observed at SP4 in early March as a result of a full mine pool flushing oxidized mine walls, coupled with pumping from the 5-South Mine. Discharge water quality from SP4 failed to meet permit limits for total suspended solids (TSS) and dissolved iron (Fe-D) on March 4, 9, 10, 11, 15, 19 and 22. Details are described below.

An unauthorized discharge occurred on March 17th from a groundwater well-draining into the Quinsam River. The discharge was mitigated with a cap on the well as of March 19, 2021, reducing the risk for any further potential adverse impacts on the receiving environment. Spill report number DGIR 204584 was generated through the Provincial Emergency Line on March 17, 2021.

1.0 NON-COMPLIANCE EVENTS

1.1 PERMIT LIMIT EXCEEDANCE

Dewatering 5-South mine pool into 3-Mains 2-North and elevated water levels in 2-North mine resulted in high concentrations of iron and TSS in WD. Table 1 below, summarizes the events where TSS and Fe-D were elevated above permit limits at WD.

On March 15th a 96-hour, 100 % concentration, Rainbow trout toxicity test was collected from WD. The test passed with 100 % survival rates. Downstream water quality collected at EMS ID: E207411, site WC resulted in water quality meeting permit limits and acute B.C. Water Quality Guidelines for Protection of Aquatic Life (WQG-Max).

Water entering SP4 was directed to the 2-North PAG-Pond (WP) in order to reduce discharge. This occurred periodically throughout March with discharged completely ceased on March 4, 16, 17 and 24 until results were received from the analytical laboratory. There was limited holding capacity within WP and therefore it was not a permanent solution and water had to be released.

Water quality improved once the 5-Mains 2-North well pump was replaced on March 24, 2021. Results of samples collected at WD from March 25 for Fe-D were 0.012 mg/L and on April 6, 0.0169 mg/L with corresponding downstream at WC from April 6, resulting in 0.0153 mg/L, indicating limited adverse effects for aquatic receptors. A non-compliance report was submitted on April 29, 2021.

Table 1: Exceedance Summary Table for Settling Pond #4

Exceedance Summary Table for EMS ID: E207409 Settling Pond #4												
Results												
EMS ID - Site Name	*DGIR Number	Daily Max. Flow (m3/s)	Daily Average Flow (m3/s)	Date	Sample ID	BV Labs Sample ID	BV Labs Job ID	Parameter	Permit Limit	Result	DL	Units
E207409 - SP4 / WD	204693 (no discharge occurred)	0	0	04-Mar-21	WDCOMP-4MAR21-P	ZL1971	C114768	Dissolved Iron (Fe)	0.3	1.48	0.01	mg/L
	204694	0.131	0.109	09-Mar-21	WD-9MAR21-P	ZL5595	C115472	Dissolved Iron (Fe)	0.3	0.679	0.01	mg/L
	204545	0.084	0.033	15-Mar-21	WD-15MAR21-P	ZM3645	C116949	Dissolved Iron (Fe)	0.3	0.44	0.01	mg/L
	204695	0.081	0.047	10-Mar-21	WDCOMP-10MAR21-P	ZM3621	C116941	Total Suspended Solids (TSS)	25	65	1.0	mg/L
		0.12	0.068	11-Mar-21	WDCOMP-11MAR21-P	ZM3622	C116941	Total Suspended Solids (TSS)	25	39	1.0	mg/L
	204752	0.154	0.102	19-Mar-21	WDCOMP-19MAR21-P	ZN5782-01	C119472	Total Suspended Solids (TSS)	25	35	1.0	mg/L
	204752	0.144	0.093	22-Mar-21	WD-22MAR21-P	ZN3527-03	C118890	Dissolved Iron (Fe)	0.3	9.82	0.01	mg/L
		0.144	0.093	22-Mar-21	WD-22MAR21-P	ZN3527-01	C118890	Total Suspended Solids (TSS)	25	35	1.0	mg/L

*Dangerous Goods Information Reference Number

1.2 COMPLIANCE WITH PERMIT

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

At site Stream 1, 7S (EMS ID E292109) continuous flow was not recorded from November 2nd through January 27th. The pressure transducer in the stilling well could not be retrieved, resulting in missing data. This was replaced on January 27th, 2021.

Missing continuous flow was not recorded at Settling Pond #1 (SP1 / SPD) (EMS ID E218582) where continuous flow is required. This occurred on March 9 due to a sensor issue. Staff gauge readings measuring water height over the decant riser were used to derive the flow rate for the day. The Long lake seep flow meter sensor was used at SP1 until the new sensor arrived and was replaced on March 17th.

An unauthorized discharge occurred at groundwater well QU1109 when the well became artesian, discovered on March 17, 2021. QU11-09 is a nested well that accesses three zones, shallow groundwater, water cover over course coal refuse (CCR) in 1 seam and water quality below the 1 seam. This well is located in 88 panel of the River Barrier Pillar between the 2 North and 5-South Mine.

The water table in 2-North Mine (aquifer recharge zone) increased to a higher elevation (250 MASL) than groundwater well QU1109 (226 MASL) causing the well to become artesian and discharge mine water into the Quinsam river. This occurred from February till March 18 when discharge was directed into a sump area and on March 19 the well was capped, and discharge was reduced. Subsurface seepage continues in the area as the ground elevation is 226.3 MASL and the mine pool is currently at 227 MASL.

Once discovered the Provincial Emergency line was called and the unauthorized discharge was reported with a Dangerous Goods Information Reference (DGIR) number generated, (DGIR 204584) and a report was submitted on March 19.

Monitoring results display elevated iron and sulphate at the well head with reduced concentrations entering the river. Monitoring was performed 80 meters upstream and downstream on the river within the vicinity of the of the well. Results were compared to BC Water Quality Guidelines for protection of aquatic life, maximum values (WQG-Max). All results in the river were below the WQG-Max except copper was elevated upstream resulting in 0.00102 mg/L, exceeded the lowest level (0.0009 mg/L).

The spill pathway was sampled before it entered the river and results indicate fluoride, arsenic and ammonia were above WQG-Max. Refer to Appendix 1, Table 37 for the full set of results.

Table 2: Discharge to River

Discharge Entering River 1 L/s			
Parameter (mg/L)	WQG- Max	22-Mar-21	13-Apr-21
Dissolved Sulphate (SO ₄)		290	300
Dissolved Fluoride (F)	0.4	0.48	0.49
Dissolved Iron (Fe)	0.35	0.117	0.157
Total Arsenic (As)	0.005	0.056	0.0486
Total Iron (Fe)	1	0.942	0.256
Total Ammonia (N)	0.11	0.14	0.15

The flow measurement results for the groundwater well QU1109 and the subsurface seepage to the river is included in the table below. The flow rate measured at the entrance where the seepage is flowing into the Quinsam River was measured at 1.1 L/s on April 21 and 1 L/s on April 26.

Table 3: Measured Flow Rates (L/s)

Site	Date	Flow Rate, l/s	Methodology
QU1109M	March 19, 2021	1	Approximate estimation
QU1109M	March 30, 2021	0.16	Bucket test
QU1109M	April 7, 2021	0.08	Visual estimation (compared to the one measured on March 30, 2021)
QU1109M	April 21, 2021	0.013	1 litre measuring cylinder
Seepage to River	April 21, 2021	1.1	Bucket test
Seepage to River	April 26, 2021	1.0	Bucket test
QU1109M	April 26, 2021	0.19	1 litre measuring cylinder

2.0 WATER MANAGEMENT SYSTEMS

2.1 NORTH WATER MANAGEMENT – SETTLING POND 4 (WD / SP4)

Discharge at Settling Pond 4 (SP4) occurred for all 86 days during this quarter with an average daily flow rate of 0.0641 m³/s and a quarterly maximum flow rate of 0.0.196 m³/s. Appendix I, Table 29 display the results for flow at SP4.

Dewatering of the underground 2-North mine continued throughout this quarter with pumping from 3 Mains 2-North (3M2N) dewatering well to surface at Brinco Brook and the 2N PAG-CCR facility. Brinco Brook mixes with water pumped from 2-North Portal Sump and flows into SP4 where it is either released to the receiving environment, used to maintain cover over the 2N PAG-CCR (WP) or used for coal processing activities (when operating). The 1M2N dewatering pump failed on November 30th leaving only 3M2N operating to dewater the 2-Noth mine.

Sulphate concentrations averaged 808 mg/L, TSS averaging 12 mg/L, and pH remained neutral ranging from 7.23 to 8.34. Complete results for Setting Pond 4 are displayed in Appendix I.

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 0.0453 m³/s and quarterly maximum of 0.2560m³/s. Appendix I, Table 26 display the results for flow at SP1.

Water from 3S PAG-CCR storage facility was routinely pumped into SP1 throughout the quarter. Dewatering of the 2S mine pool at QU11-11 (INF) continued with all water directed through the Passive Treatment System (PTS) at cells Biochemical Reactor (BCREFF) and Sulphide Polishing Cell (SPCEFF). 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. Sulphate concentrations averaged 198 mg/L, TSS averaged 1.27 mg/L and pH remained neutral ranging from 7.31 to 8.02. Complete results for Setting Pond 1 are displayed in Appendix I.

2.3 96-HOUR RAINBOW TROUT BIOASSAYS

Discharge Settling Pond # 4 was collected for 96-hour rainbow trout bioassays on March 15, 2021 water quality failed to meet permit limits. The 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 Pool. The supernatant from 7SSD was sampled on October 5th this quarter as required by the amended permit.

Water quality at 7S Stream 1 remained within water quality guidelines during monthly sampling events.

3.0 WATER QUANTITIES & FLOW RATES

Flow and precipitation data are presented tabularly in Appendix I.

Appendix I, Table 32 display flow requirements for EMS ID E292127 (2S) inflow and outflow. Weekly flow for EMS ID's E292130 (LLE) and E292130 (LLSM / LLS) are available in Appendix I, Table 33.

The Quinsam environmental department has established flow curves for all sites required under the effluent permit. Flows were observed to increase during January through February in the rivers with peaks observed during the first two weeks of January correlating with heavy rains.

Precipitation data for the site during this reporting period is included in Appendix I, Table 36. Total precipitation was 327.2 mm during Q4 with the greatest accumulation observed in January (184 mm). Isolated events of heavy rain contributed significantly to that amount (i.e. on January 6 the site experienced 33.4 mm of precipitation).

7.0 PASSIVE TREATMENT SYSTEM (PTS)

The PTS was operational from May 12th to present. The treatment system was operating at 4.5 L/s, Average amount of treated mine water pumped over the quarter (92 days) was approximately 46000 m³. The mine pool water level was measured at 6m above the pump on October 6 and increased to 18.5 m in early January with increased precipitation and declining to 16 m by the end of the March.

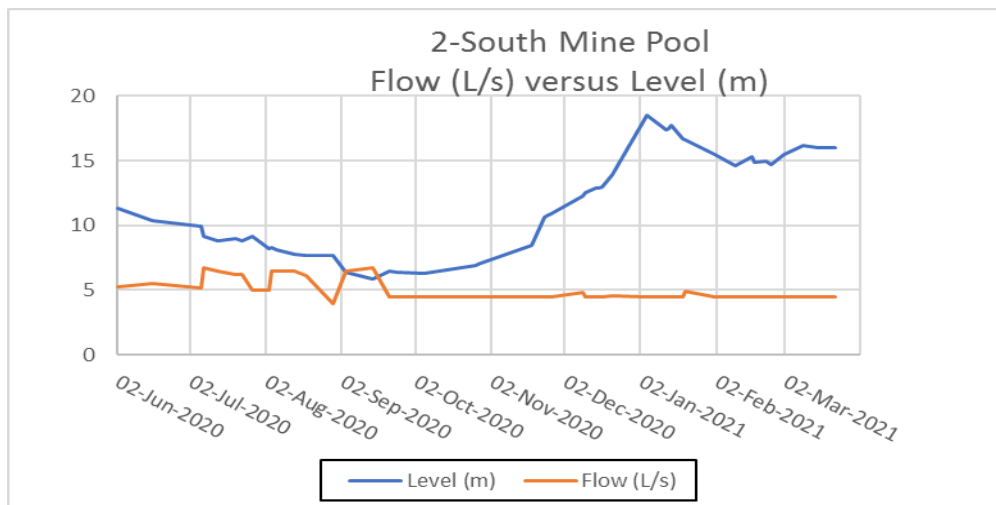


Figure 1: 2-South Mine Pool at INF Flow versus Level.

Table 4: Flow and level table at 2-South QU11-11 (INF)

Date	Level (m)	Flow (L/s)
04-Jan-2021	18.5	4.5
12-Jan-2021	17.4	4.5
13-Jan-2021	17.5	4.5
14-Jan-2021	17.7	4.5
19-Jan-2021	16.7	4.5
20-Jan-2021	16.6	4.9
01-Feb-2021	15.5	4.5
09-Feb-2021	14.6	4.5
16-Feb-2021	15.3	4.5
17-Feb-2021	14.9	4.5
22-Feb-2021	15	4.5
24-Feb-2021	14.7	4.5
01-Mar-2021	15.5	4.5
09-Mar-2021	16.2	4.5
15-Mar-2021	16	4.5
22-Mar-2021	16	4.5
Min	14.60	4.50
Max	18.50	4.90
Avg	16.1	4.5

Average concentrations of dissolved sulphate have been entering the system from the 2-South mine pool measured at INF resulting in 597 mg/L and leaving the system at the Sulphide Polishing

Cell (SPCEFF) resulting in 476 mg/L. Refer to Table 5 and Figures 2 and 3 below. This has led to a reduction in average sulphate concentrations of 121 mg/L. Sulphate reduction between INF and Biochemical Reactor (BCR) averaged 66 mg/L. The station, 2-South Inflow (2SI), receives discharge from the PTS, had an average sulphate concentration of 291 mg/L and SPD averaged 198 mg/L for Q4.

Overall, the greatest average sulphate reduction exists between INF to SPD resulting in 399 mg/L. Warmer ambient temperatures normally increase microbial metabolic activity within the BCR and SPC during summer and early fall. The low average reduction rate 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 399 mg/L was attained between INF and SPD. The original reduction goal has been achieved for the PTS, which was to reduce sulphate concentrations to 300 mg/L.

Table 5 Summary of Sites Sulphate Concentrations and Reduction Rates

	INF	BCREFF	SPCEFF	2SI	SPD	2S	3S
Average	597	542	476	291	198	275	548
Count	12	11	10	12	12	4	5
Min	560	450	250	130	75	230	450
Max	630	590	540	390	320	310	630
Sulphate reduction	INF to BCR	BCR to SPCEFF	INF to SPCEFF	INF to 2SI	INF to SPD		
	55	66	121	306	399		

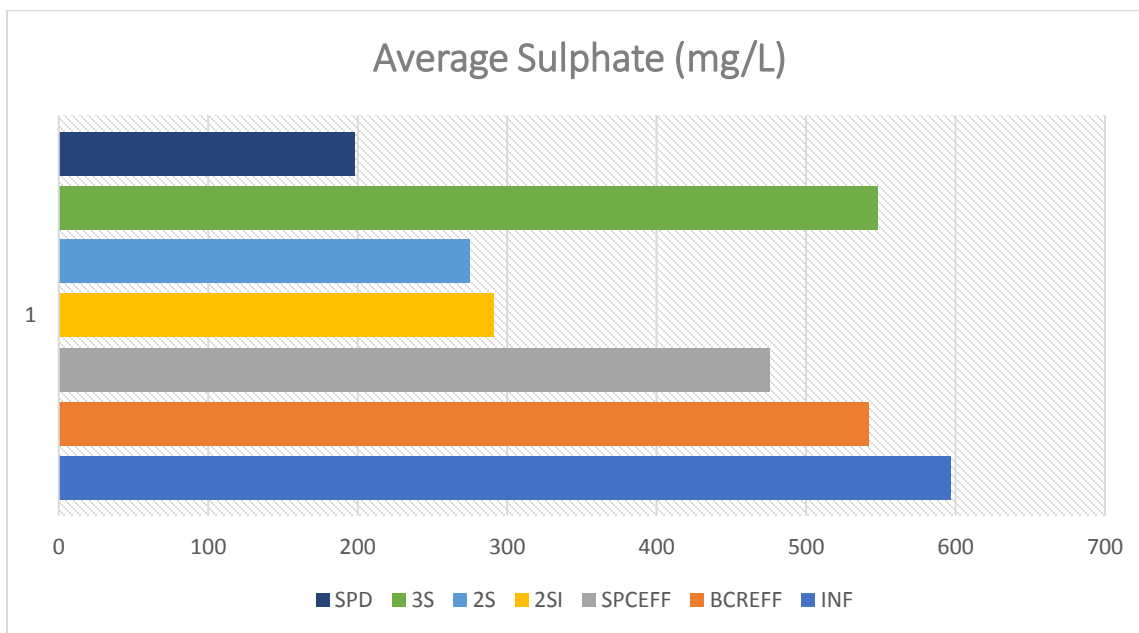


Figure 2: Average Sulphate Concentrations in 2-South Area

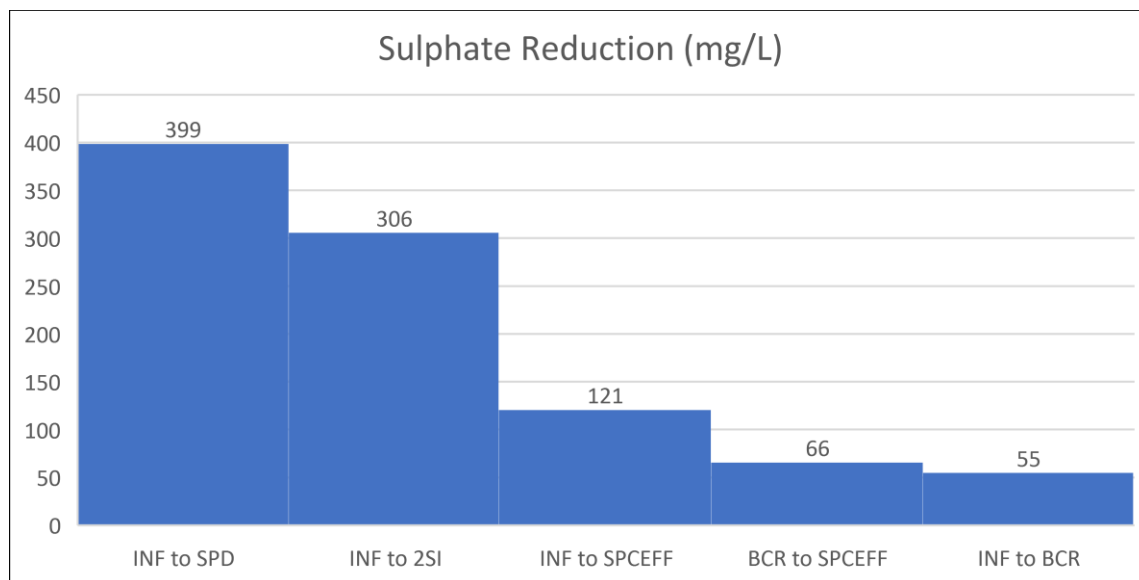


Figure 3: Sulphate Reduction through the Water Management System.

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 and 3-South systems and groundwater well MW004. A relationship between MW004, Seep flow and the elevation of the mine pool at the INF location continues to be developed with observations noted every quarter. Long lake Middle Seep stops flowing when the mine pool water level reaches 8.20 m above the pump with the smaller seep stopping at 7.80 m. The seeps started flowing at about 7.80 m to 8.5 m above the pump in Q3 during late November 2020.

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 as a result of mining activities and create management plans with a focus on mitigating potential receiving environment impacts.

Quinsam is committed to limit impacts placed on the environment through operational procedures, striving to prevent adverse environmental impacts and is dedicated to internally investigate those parameters displaying an increasing trend. The permit limit exceedances and unauthorized discharges experienced this quarter did play a crucial role in understanding the hydrogeological connection to the river if the mine pool is allowed to flood past the 226 MASL. This was unexpected and indicates a revision to the Closure plan is required.

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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