Interim report to the Quinsam Coal Environmental Technical Review Committee:

Update on Three Studies: Long Lake Seep Sampling, Long-term Mussel Monitoring Program and Caged Mussel Experiment

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September, 2010

The Canadian Water Network (CWN) wishes to bring the attention of the Quinsam Coal Environmental Technical Review Committee to three recent studies that build on the material presented in our April, 2010, report. These studies concern the Long Lake Seep, the long-term mussel monitoring program, and the caged mussel experiment.

Long Lake Seep

The Long Lake Seep is a potential source of arsenic to Long Lake. The Quinsam Coal Corporation 2008/09 Annual Water Quality Monitoring and Reclamation Report, September 2009, stated:

Over recent years and subsequent to a landslide event in 2006 the seep has developed from a single flow to smaller numerous small flows; in December of 2008 the number of recognizable seeps from the landslide face totalled five.

The reported concentrations of sulfate and iron in the seep water flowing into Long Lake suggest that pyritic oxidation is taking place in the Long Lake vicinity. Sulfate concentrations ranged from 519-740 mg/L, and averaged 630 mg/L, a decrease from the previous year's average of 643 mg/L. Total iron ranged from 1.57-5.01 mg/L. The permitted iron discharge of 0.5 mg/L was met in only one month, when most of the iron in the water was in suspension.

The reported dissolved arsenic concentrations were low, ranging from 0.005-0.012 mg/L. These numbers suggests that iron may be allowing arsenic to precipitate out of the water.

The CWN collected water and sediment samples on July 28, 2010, to investigate the Long Lake Seep as an arsenic source. Several water flows were active in the seep area, and there was abundant red solid material in the stream beds, suggesting the presence of high concentrations of ferric oxide. One sediment and two water samples were collected from the seep area. The sediment sample contained flocculent material and was centrifuged to separate the water from the solid. The seep water was collected from two different colourless flows. The three water samples sent for analysis were acidified with HNO_3 but not filtered.

Attached are the analytical results for these samples, as determined by the CALA-accredited laboratory ALS. Arsenic, iron and manganese results are presented in Table 1.

Table 1. Arsenic, Iron and Manganese Totals from Long Lake Seep Samples Collected July 28, 2010.

	Sediment		***Water Samples***	
	Solid ppm	***Supernatant ppm***	***1 ppm***	***2 ppm***
Arsenic	*425*	*0.00208*	*0.00338*	*0.00199*
Iron	*452 000*	*1.23*	*1.31*	*1.02*
Manganese	*4330*	*14.3*	*15.1*	*15.2*

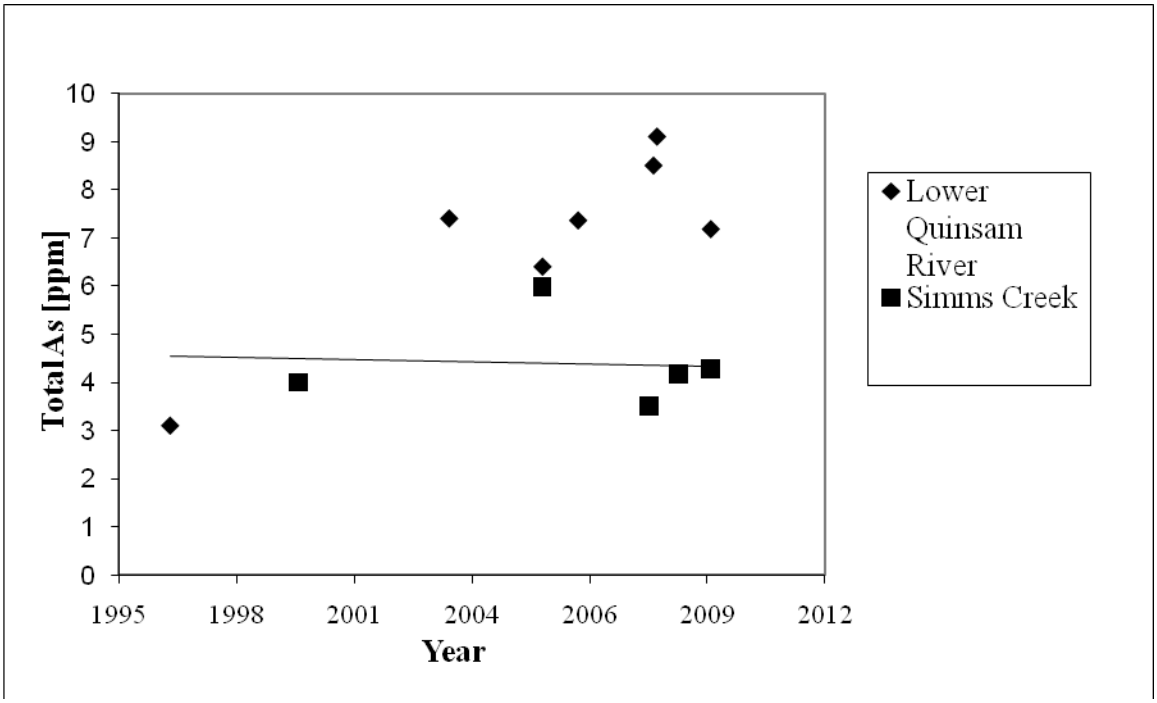
The results obtained by CWN for the water samples are in reasonable agreement with those reported previously by the Quinsam mine: the iron concentration is still well above the permitted iron discharge but the arsenic concentration is not elevated.

The results from the seep sediment sample indicate that the solids are mainly ferric hydroxide which has adsorbed arsenic. The high level of arsenic in the seep sediment is in the same high range as found in some Long Lake sediments (but not found in other sediments in the Quinsam watershed). This result strongly indicates that the seep is a major contributor to the arsenic burden in Long Lake sediments and points to the possibility that there may other sources in the same area, possibly below the lake surface.

Long-term mussel monitoring.

Our April, 2010, CWN report described a long-term mussel monitoring experiment in the Quinsam watershed. We reported that mussels from Quinsam River currently have higher arsenic concentrations than do mussels from Simms Creek. Data from the Quinsam River were collected over time, and a Quinsam River data point from 1997 was included that had lower mussel arsenic concentrations than mussels from subsequent years. We reanalyzed archived mussel samples from 1997 and found that the low arsenic concentration in these mussels was not in error. The results, shown in Figure 1, can be interpreted as indicating that there was an increase in the arsenic stored within the mussels in the river around 2000, and that before this event the arsenic content in mussels from the Quinsam River and Simms Creek were similar.

Figure 1. Total arsenic concentrations in Quinsam River and Simms Creek over time.



Caged Mussel Experiment

We reported earlier on our finding that the arsenic concentration in the flesh of western floater mussels (*Anodonta kennerlyi*), transported from Lower Quinsam Lake to Long Lake, increased over a period of six months. The mussels were caged and the experiment was conducted from June to November 2009. The survival rate of the transported mussels was 100 percent.

We are repeating this experiment using mussels from a different control site in Lower Quinsam Lake (abundant supply and more remote location). Although we have not yet measured arsenic concentrations in tissues, we can report that around 30% of the mussels did not survive over the eight-month period from December, 2009 to July, 2010. The reason for the deaths is not clear and is being investigated.

Table 2. Survival Rate of Caged Mussels.

Long Lake	
Site 1 (East)	Cage Vanished
Site 2 (Middle)	7 mussels 2 dead
Site 3 (West)	7 mussels 1 dead
No Name Lake	
Site 1 (West)	7 mussels 3 dead
Site 2 (East)	10 mussels 3 dead

There is the possibility that the deaths of the mussels, which occurred in both lakes, is connected to the season of the experiment; winter instead of summer. Unfortunately the control mussels were not caged (this cage also vanished) so we have no knowledge of any unusual deaths in this population. Some help here will be given by the results from a cage experiment with the control mussels now underway.

All caged mussel experiments are scheduled to end in November, 2010.