

Real Time Water Quality Report Duck Pond Operations (Teck Cominco Limited)

Deployment Period 2008-04-21 to 2008-05-21

General

- The Water Resources Management Division (WRMD) staff monitors the real-time web page on a daily basis. Any unusual observations are investigated, with site visits being carried out as warranted.
- Management at Duck Pond Operations are informed of any significant water quality events or instrumentation problems by WRMD.
- Tributary to Gills Pond Brook Station is located 1700 m downstream of the final discharge point for the mine's Polishing Pond. This station is located such that any impacts from the mine discharge on receiving waters can be measured.
- East Pond Brook Station is located several kilometres downstream of the Tailings Management Area. This station is located such that any surface water impacts from the Tailing Management Area via seepage through Dam A may be measured.
- Monitoring Well After Tailings Dam Station is located near Tailings Dam A. This station is located such that any ground water impacts from the Tailing Management Area via seepage through Dam A may be measured.
- The two DataSondes (Tributary to Gills Pond Brook Station and East Pond Brook Station) are set up to measure Ammonium and Nitrate however, technical problems with the instrumentation render readings of these parameters unreliable. Therefore, these parameters will not be discussed or interpreted until the technical problems have been overcome and the data are reliable.
- The Quanta G monitoring probe has been removed from Monitoring Well After Tailings Dam Station due to the fact that this well freezes at surface during the winter months. This unit will be reinstalled once the well thaws in the late spring / early summer.
- There was effluent from Polishing Pond into the receiving waters (Tributary to Gills Pond Brook) from April 28, 2008 until May 9, 2008.
- Raw (uncorrected) data has been used in the preparation of the graphs and subsequent discussion below.

Maintenance and Calibration of Instrumentation

- A freshly calibrated spare DataSonde was installed in Tributary to Gills Pond Brook on April 21, 2008, such that there would be no period without data from the receiving waters below the Polishing Pond. On April 21, 2008 the regular DataSonde at East Pond Brook was removed for regular cleaning and calibration and was deployed on April 24, 2008. Both instruments remained deployed until May 21, 2008 (31 day period for Tributary to Gills Pond Brook and 27 day period for East Pond Brook).
- *In-situ* measurements of ambient water quality were undertaken with a freshly calibrated MiniSonde each time a DataSonde was installed or removed.
- The comparative results between the MiniSonde and DataSonde values at the beginning and end of the deployment period are shown in **Table 1** for Tributary to Gill's Pond Brook and **Table 2** for East Pond Brook.

Table 1: QA/QC Data Comparison Ranking During Deployment Period

Station	Date	Action	Minisonde vs. Datasonde Comparison Ranking			
			Temperature	pH	Conductivity	Dissolved Oxygen
Tributary to Gill's Pond Brook	2008-04-21	Installation	Excellent	Good	Good	Good
	2008-05-21	Removal	Excellent	Good	Good	Excellent

Table 2: QA/QC Data Comparison Ranking During Deployment Period

Station	Date	Action	Minisonde vs. Datasonde Comparison Ranking			
			Temperature	pH	Conductivity	Dissolved Oxygen
East Pond Brook	2008-04-24	Installation	Poor	Fair	Good	Fair
	2008-05-21	Removal	Excellent	Fair	Good	Good

Data Interpretation

TRIBUTARY TO GILLS POND BROOK

- The water temperature (**Figure 1**) increased gradually during deployment period, with an obvious diurnal pattern. Apart from the first few days, there was little or no ice in this stream. Temperature values ranged from a minimum of -0.02 °C to 16.15 °C over the deployment period.

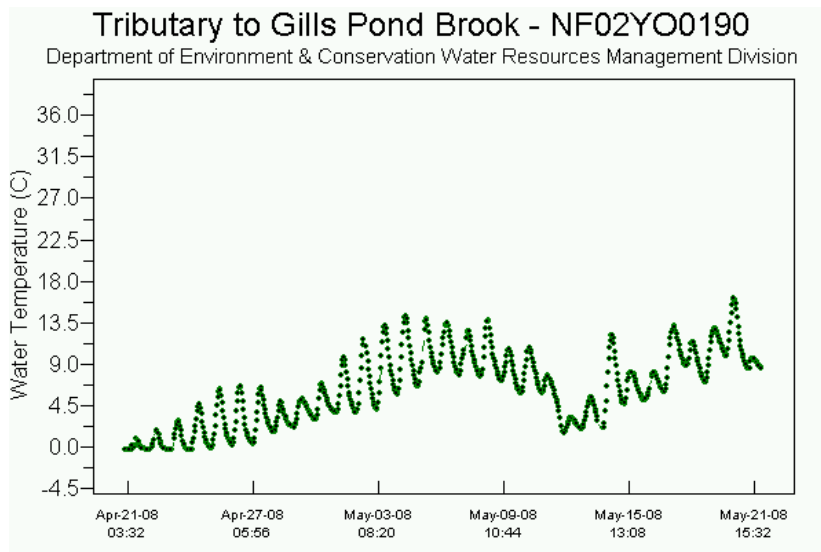


Figure 1

- pH values (**Figure 2**) generally increased throughout the deployment period. The most notable increase in pH corresponds to the release from the Polishing Pond over the period of April 28, 2008 to May 9, 2008. pH levels remained fairly consistent after this event. The pH values ranged from a minimum of 5.93 to a maximum of 6.93 with some of the values falling below the recommended range (6.5 – 9.0) for the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life*. The background pH of this stream is normally lower than the recommended range.

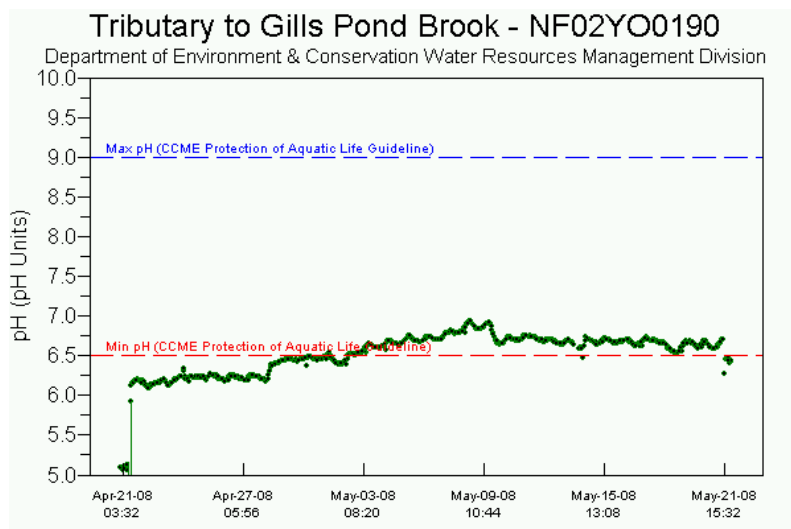


Figure 2

- The specific conductance (**Figure 3**) ranged from a minimum of 15.4 $\mu\text{S}/\text{cm}$ to a maximum of 64.5 $\mu\text{S}/\text{cm}$ over the deployment period. The most dramatic change in conductivity corresponds to the period when there was discharge from the Polishing Pond. The conductivity in the stream was slightly higher following the discharge event.

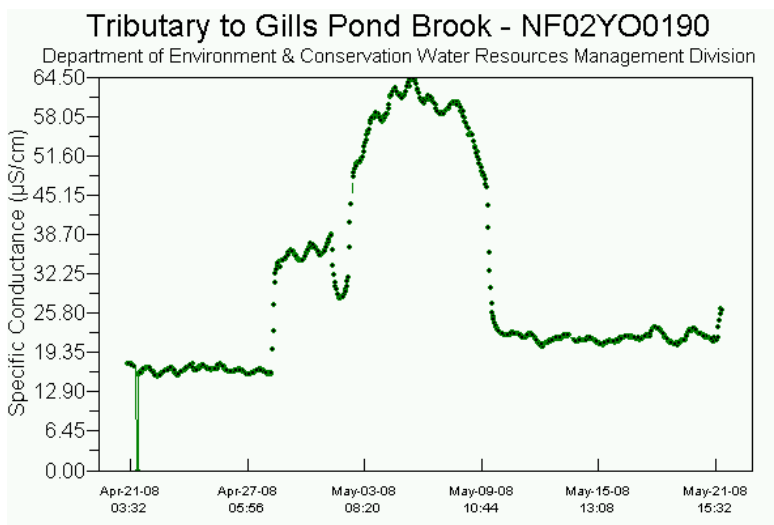


Figure 3

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 9.48 mg/L to a maximum of 13.98 mg/L over the deployment period. Dissolved oxygen variation is inversely proportional to water temperature. Dissolved oxygen values generally fall within the recommended CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* for dissolved oxygen (cold water/other life stages – above 6.5 mg/L; cold water/early life stages – above 9.5 mg/L).

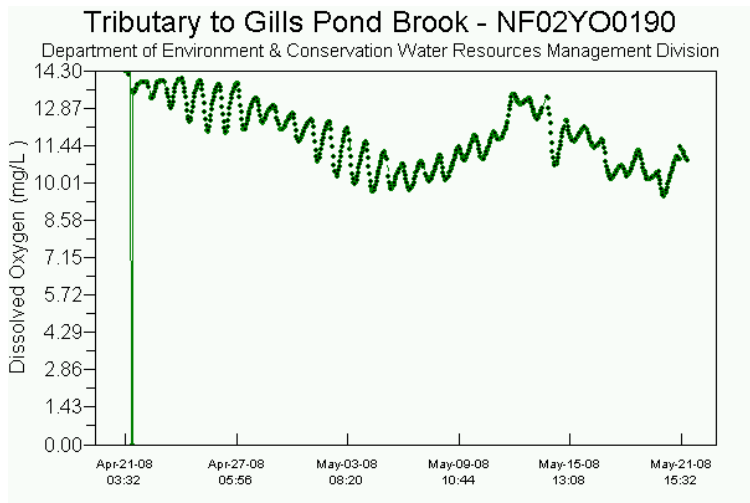


Figure 4

- The turbidity values (**Figure 5**) ranged from a minimum of 0.0 NTU to a maximum of 238.8 NTU. During this deployment period a different DataSonde was used to determine whether or not the variable turbidity levels are related to instrumentation problems. Since variability in this parameter is similar to previous deployment periods, it has been determined that the problem is not related to the specific instruments. Turbidity values were most variable during the period of discharge from the Polishing Pond. Turbidity values from grab samples collected by staff of Department of Environment and Conservation and Duck Pond Operations both returned results less than 2.0 NTU. Turbidity at this location will continue to be investigated. Due to a data processing error, this data graphed as a scatter plot as opposed to the regular line graph.

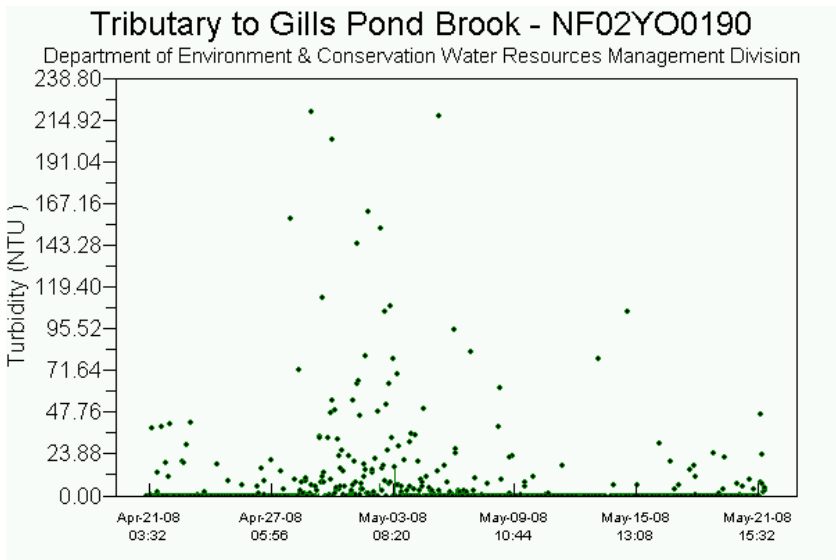


Figure 5

- The stage (**Figure 6**) or water level ranged from a minimum of 1.29 m to a maximum of 1.52 m. The beginning of the discharge period from Polishing Pond is obvious around April 28, 2008. There are no other significant features related to stage.

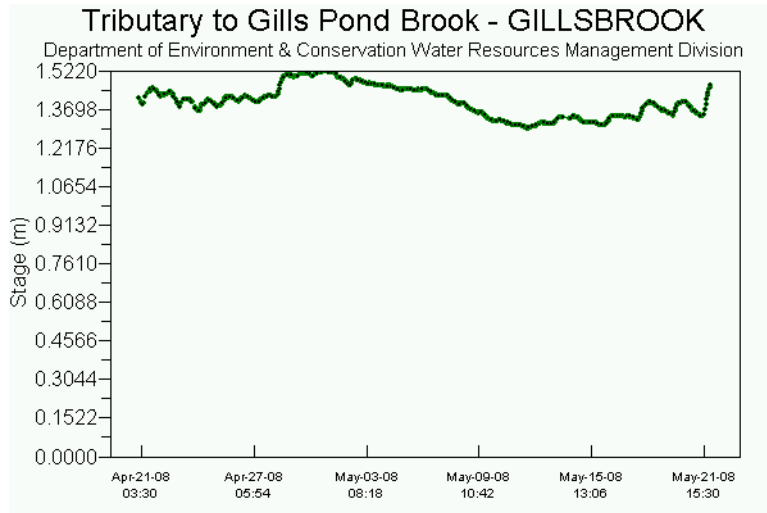


Figure 6

EAST POND BROOK

- The water temperature (**Figure 7**) increased gradually during deployment period, with an obvious diurnal pattern. Apart from the first few days, there was little or no ice in this stream. Temperature values ranged from a minimum of -0.07 °C to 15.58 °C over the deployment period.

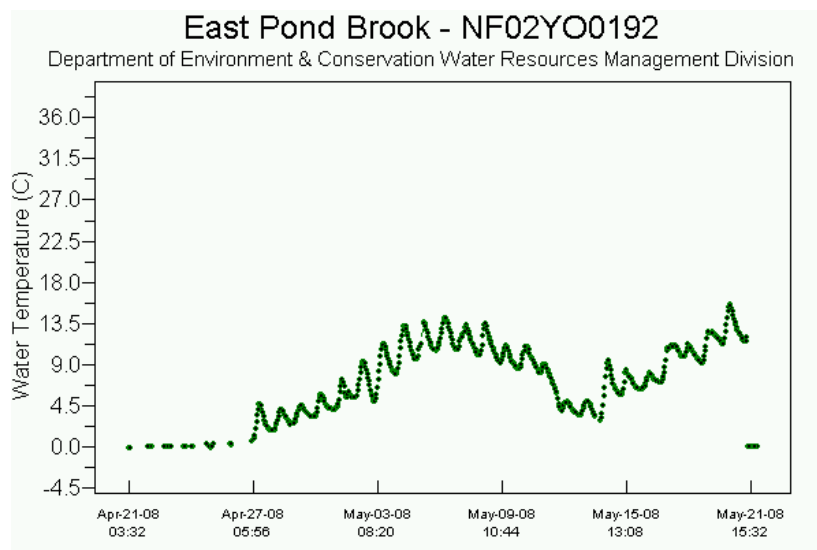


Figure 7

- pH values (**Figure 8**) remained fairly constant between 6.05 and 6.54 throughout the deployment period. Most of the pH values fall below the recommended range (6.5 – 9.0) for the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life*. The background pH of this stream is normally quite low.

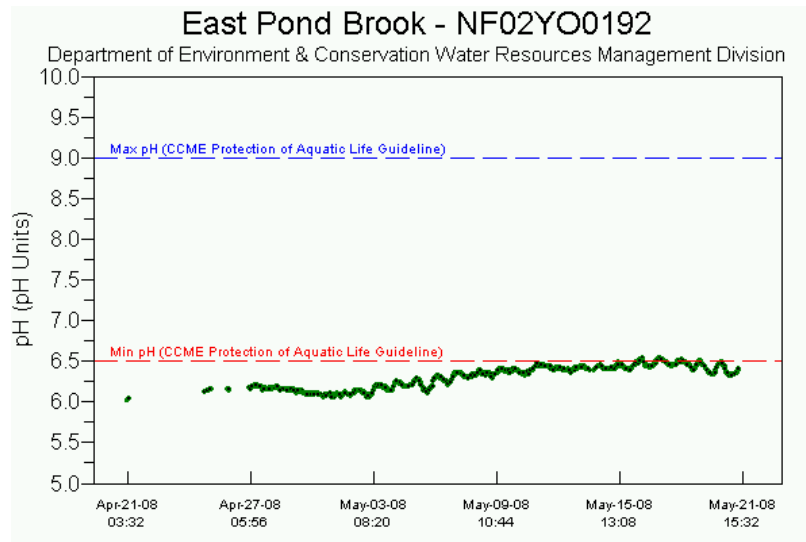


Figure 8

- The specific conductance (**Figure 9**) ranged from a minimum of 10.6 $\mu\text{S}/\text{cm}$ to a maximum of 17.14 $\mu\text{S}/\text{cm}$ over the deployment period. This normal variation is inversely proportional to the stage or water level. See Figure 12.

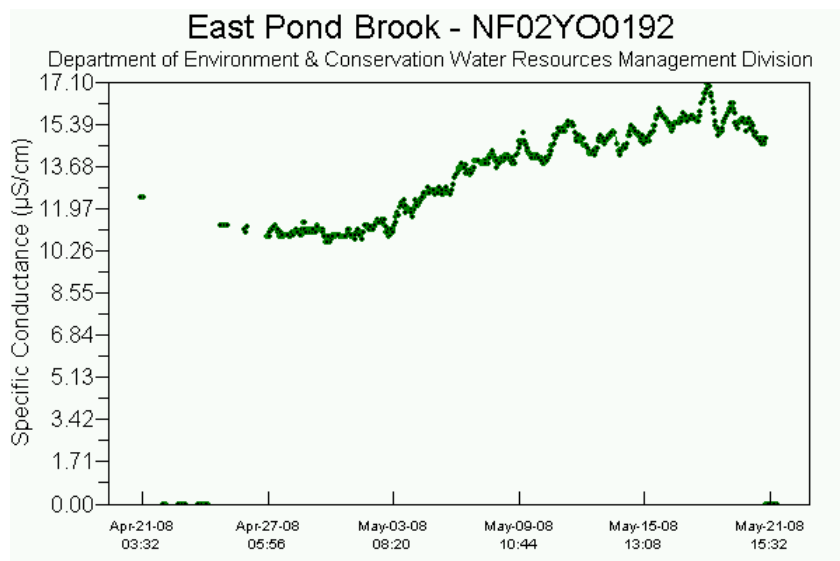


Figure 9

- The dissolved oxygen (**Figure 10**) values ranged from a minimum of 9.54 mg/L to a maximum of 14.37 mg/L over the deployment period. Dissolved oxygen levels are generally inversely proportional to water temperature. All dissolved oxygen values fall within the recommended CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* for dissolved oxygen (cold water/other life stages – above 6.5 mg/L; cold water/early life stages – above 9.5 mg/L).

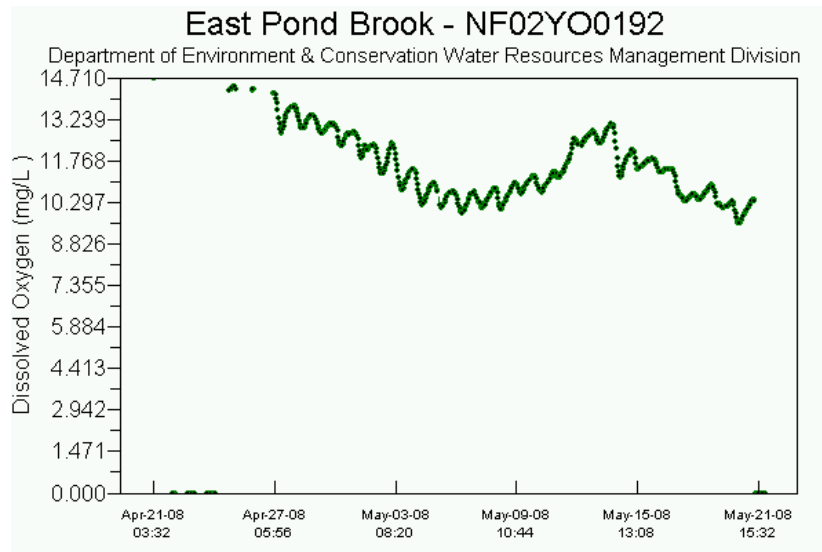


Figure 10

- The turbidity values (**Figure 11**) are constant at 0 NTU throughout most of the deployment the deployment period. There were a few minor peaks with the greatest turbidity level being measured at 103.3 NTU. As these turbidity measurements were not sustained, there is no water quality impairment. Higher values can be attributed to natural sediment and debris in the stream. Due to a data processing error, this data graphed as a scatter plot as opposed to the regular line graph. There are only four (4) turbidity values above zero (0) NTU during this deployment period.

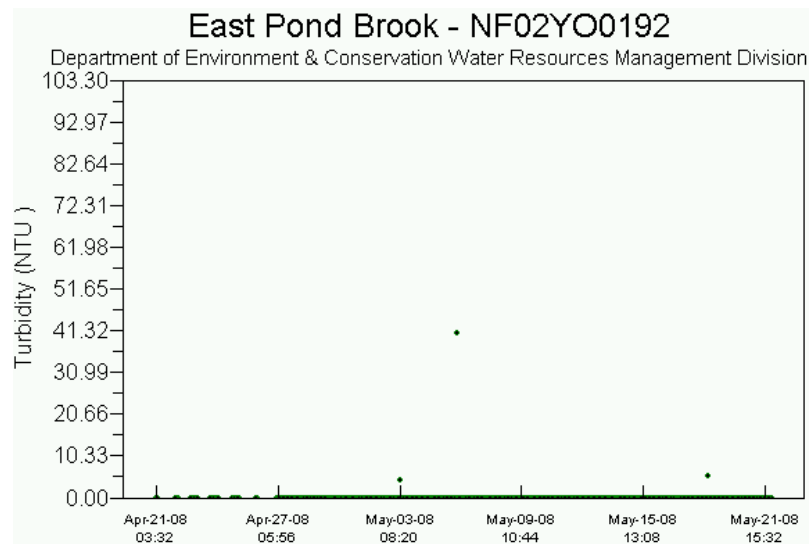


Figure 11

- The stage (**Figure 12**) or water level ranged from a minimum of 1.19 m to a maximum of 1.61 m. This range is normal for this stream and would simply represent runoff from snowmelt and precipitation.

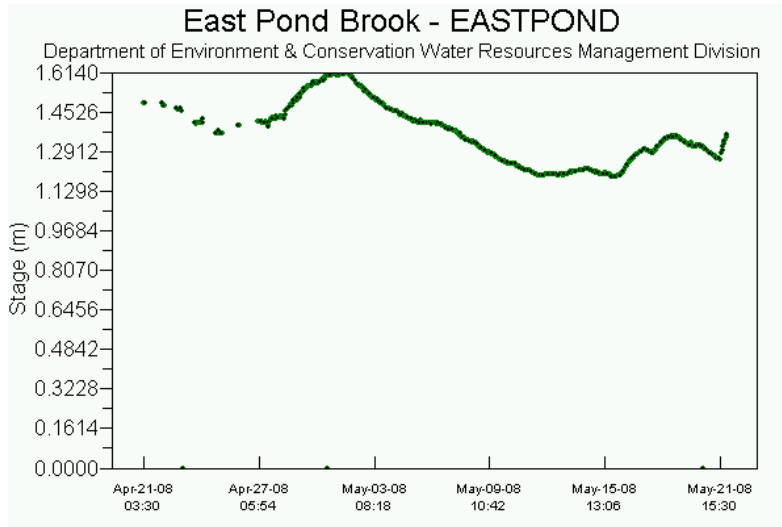


Figure 12

WELL AFTER TAILING DAM A

- Due to the instrument being removed prior to freeze-up, there is no data for this period.

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