

**Real Time Water Quality Report
Duck Pond Operations
(Teck Cominco Limited)
Deployment Period 2008-06-26 to 2008-07-28**

General

- The Water Resources Management Division's (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.
- For Tributary to Gills Pond Brook there were data transmission errors that resulted in loss of data for four 24 hour periods between June 30 - July 1, July 1 – July 2, July 11 - July 12, and July 22 – 23.
- Many of the graphs below show vertical lines from the data string to zero or the bottom of the graph. These lines indicate when a probe was taken off-line or removed from service.
- Due to a calibration failure, the Quanta G was not deployed in Monitoring Well After Tailings Dam Station (MW1) during this period. It was returned to the vendor for servicing.
- There was effluent from Polishing Pond into the receiving waters (Tributary to Gills Pond Brook) from the beginning of the deployment period to June 27, 2008, then again from July 18, 2008 until July 26, 2008.
- Raw (uncorrected) data has been used in the preparation of the graphs and subsequent discussion below.

Maintenance and Calibration of Instrumentation

- The regular DataSondes were deployed in Tributary to Gills Pond Brook and East Pond Brook on June 26, 2008, after being cleaned, serviced and freshly calibrated. Both instruments were deployed until July 28, 2008 (32 day period).
- Due to a calibration failure, the Quanta G was not deployed in Monitoring Well After Tailings Dam Station (MW1) during this period. It was returned to the vendor for servicing.
- *In-situ* measurements of ambient water quality were undertaken with a freshly calibrated MiniSonde each time a DataSonde was installed or removed. No *in situ* measurements can be taken in the Monitoring Well.
- 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	2008-06-26	Installation	Good	Excellent	Fair	Good
	2008-07-28	Removal	Marginal	Excellent	Marginal	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	2008-06-26	Installation	Good	Excellent	Good	Excellent
	2008-07-28	Removal	Good	Excellent	Excellent	Excellent

Data Interpretation

TRIBUTARY TO GILLS POND BROOK

- The water temperature (**Figure 1**) increased gradually during deployment period, with an obvious diurnal pattern. Temperature values ranged from a minimum of 10.15 °C to 27.35 °C over the deployment period.

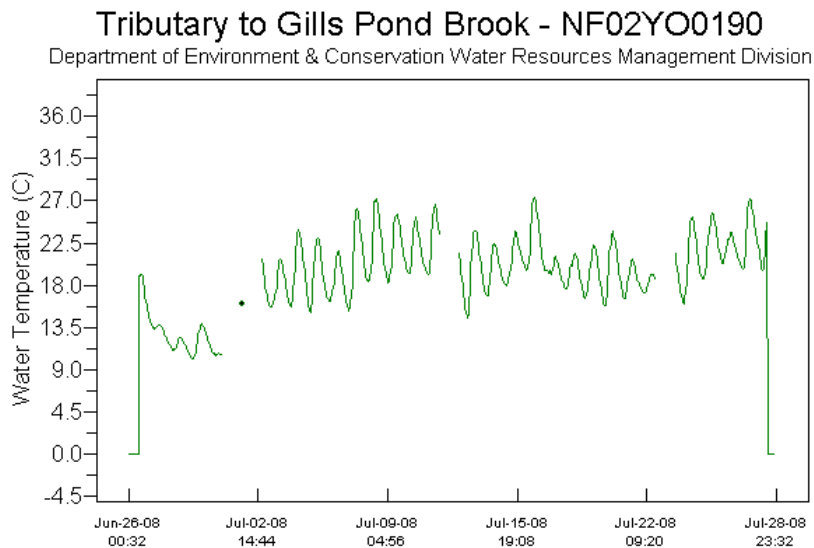
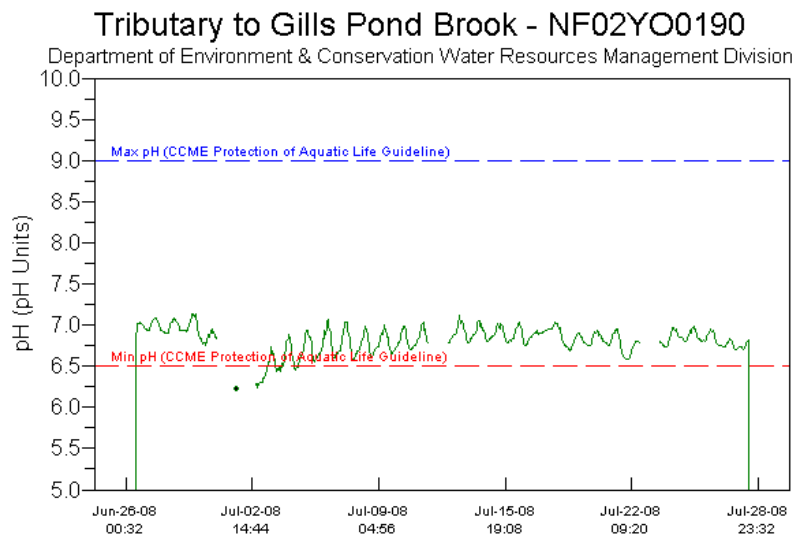
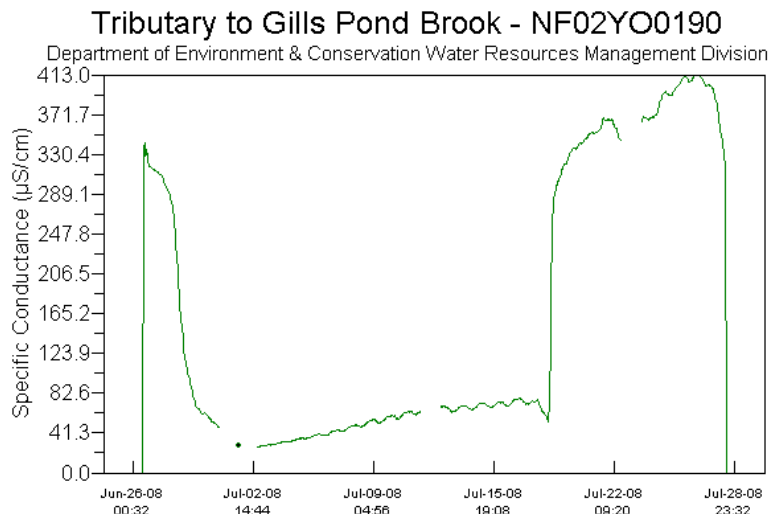


Figure 1

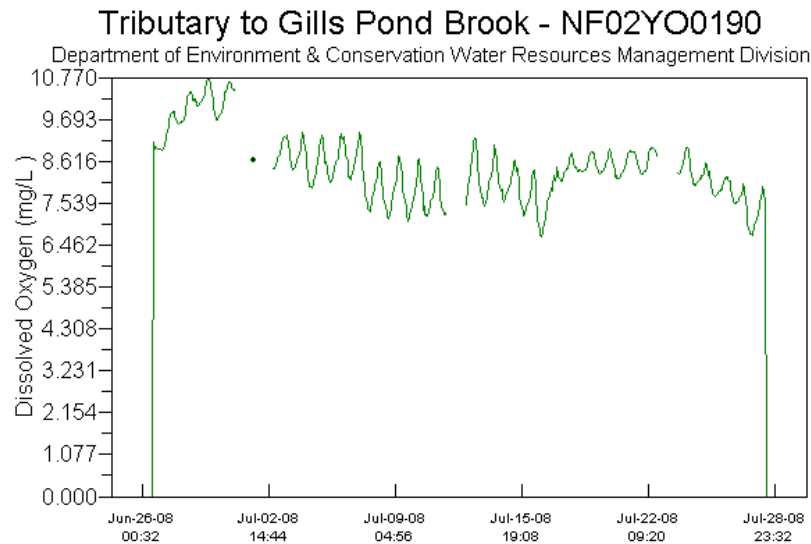
- pH values (**Figure 2**) remained fairly constant throughout the deployment period. The pH values ranged from a minimum of 6.22 to a maximum of 7.14 with most of the values falling within the recommended range (6.5 – 9.0) for the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life*. The background pH of this stream is normally around the lower limit of the recommended range. A dip in the pH around July 1, 2008 corresponds with a sudden increase in stream stage (**Figure 6** and **Figure 12**), which was the result of a precipitation event.



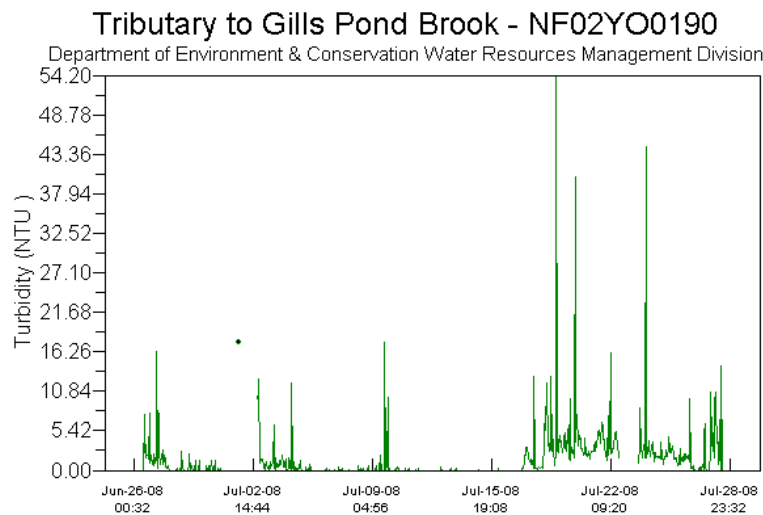
- The specific conductance (**Figure 3**) ranged from a minimum of 26.4 $\mu\text{S}/\text{cm}$ to a maximum of 413 $\mu\text{S}/\text{cm}$ over the deployment period. The dramatic changes in conductivity correspond to the discharge events from the Polishing Pond. Effluent from the Polishing Pond has a higher specific conductance than the stream's background levels.



- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 6.66 mg/L to a maximum of 10.77 mg/L over the deployment period. Dissolved oxygen variation is inversely proportional to water temperature. Many of the dissolved oxygen values generally fall outside 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) however, this is a natural occurrence resultant from the higher water temperatures. A similar profile occurs in East Pond Brook (**Figure 10**).



- The turbidity values (**Figure 5**) ranged from a minimum of 0.0 NTU to a maximum of 54.20 NTU. While turbidity spiked throughout the deployment period, the frequency and intensity of spikes was greater during the second period of discharge from the Polishing Pond. Turbidity values from grab samples collected by staff of Department of Environment returned results less than 1.0 NTU. Turbidity at this location will continue to be investigated.



- The stage (**Figure 6**) or water level ranged from a minimum of 1.17 m to a maximum of 1.46 m. The end of the initial discharge period and beginning and end of the second discharge period from Polishing Pond are obvious. There was also an increase around July 1, 2008 corresponding to a rainfall event. A similar spike is obvious from East Pond Brook stage data as well (**Figure 12**).

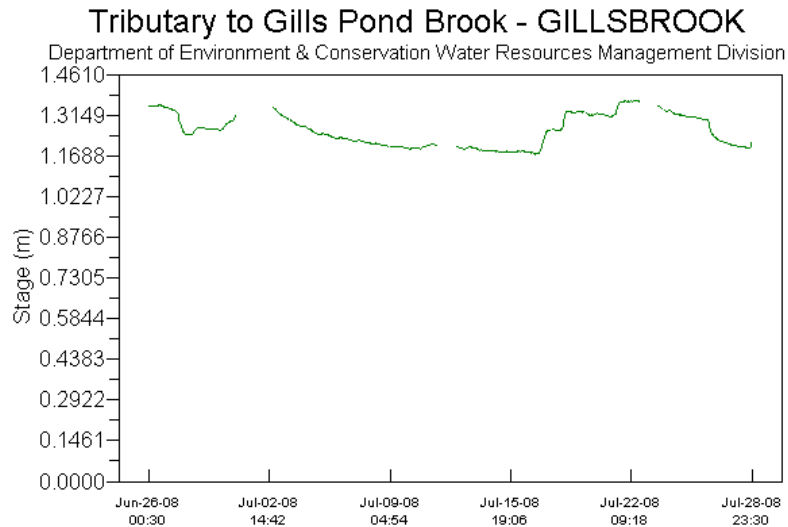


Figure 6

EAST POND BROOK

- The water temperature (**Figure 7**) increased gradually during deployment period, with an obvious diurnal pattern. Temperature values ranged from a minimum of 10.64 °C to 28.52 °C over the deployment period.

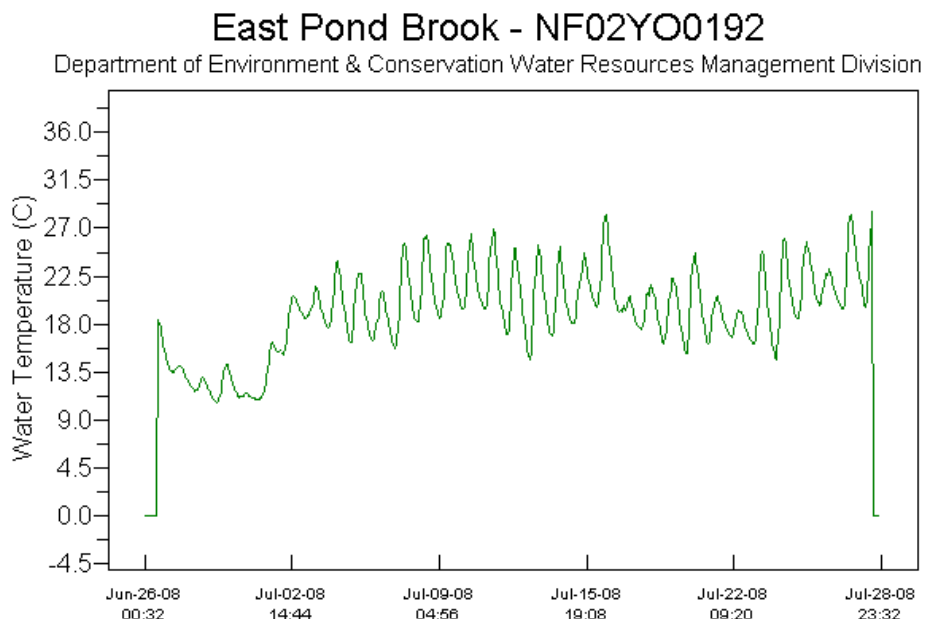
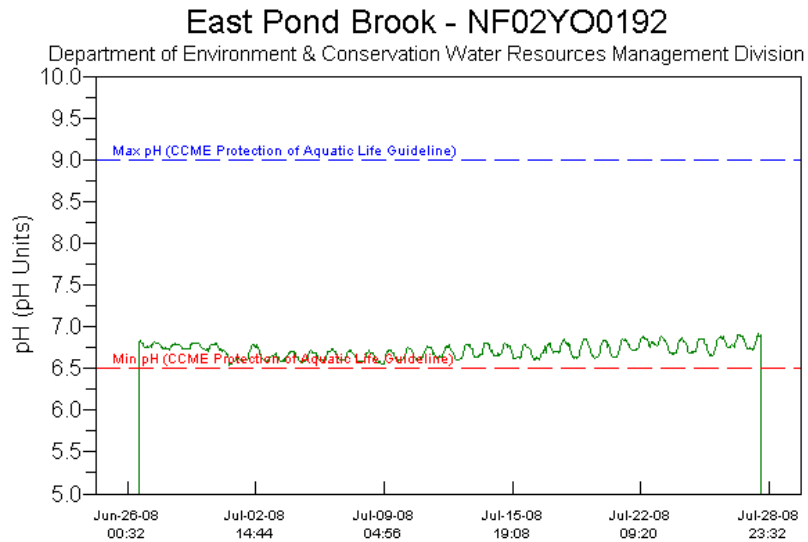
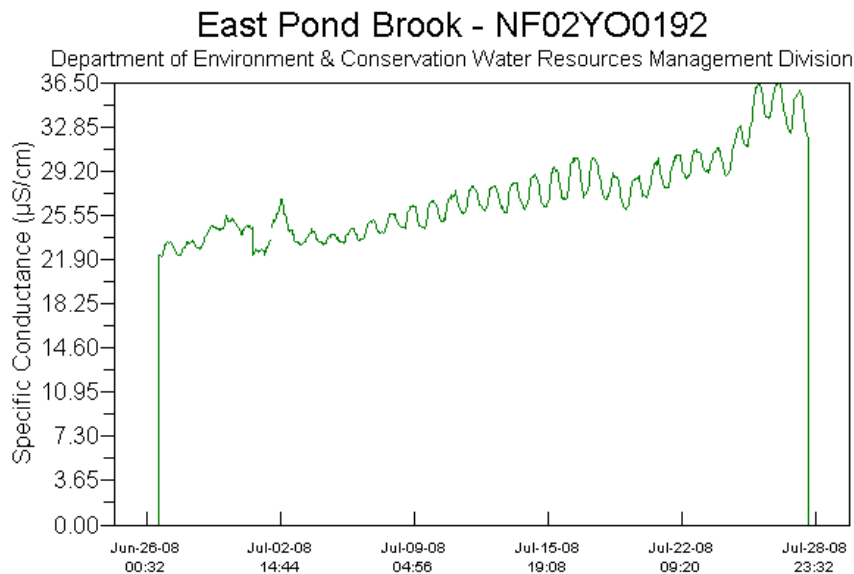


Figure 7

- pH values (**Figure 8**) remained fairly constant throughout the deployment period, ranging between 6.53 and 6.92. All pH values fell within 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.



- The specific conductance (**Figure 9**) ranged from a minimum of 22.1 $\mu\text{S}/\text{cm}$ to a maximum of 36.5 $\mu\text{S}/\text{cm}$ over the deployment period. This normal variation is inversely proportional to the stage or water level. See Figure 12.



- The dissolved oxygen (**Figure 10**) values ranged from a minimum of 7.59 mg/L to a maximum of 10.74 mg/L over the deployment period. Dissolved oxygen levels are generally inversely proportional to water temperature. Some dissolved oxygen values fall below 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), however this is a normal pattern as water warms up during the summer months.

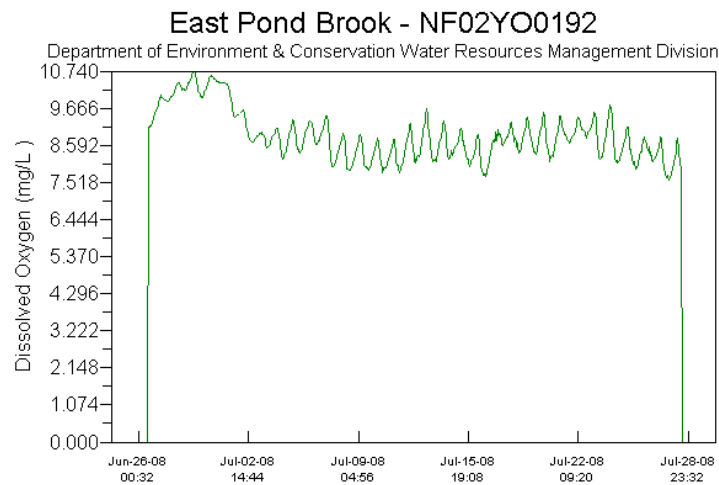


Figure 10

- The turbidity values (**Figure 11**) ranged from 0 NTU to 13.7 NTU throughout the deployment period. There were a few minor peaks prior to July 24, 2008. 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. Following July 24, 2008, there is a period of sustained turbidity peaks lasting until the instrument was removed from service. It was noted that there was an accumulation of algae and other organic matter on the probe which likely caused the increased turbidity values. There was no evidence of water quality impairment.

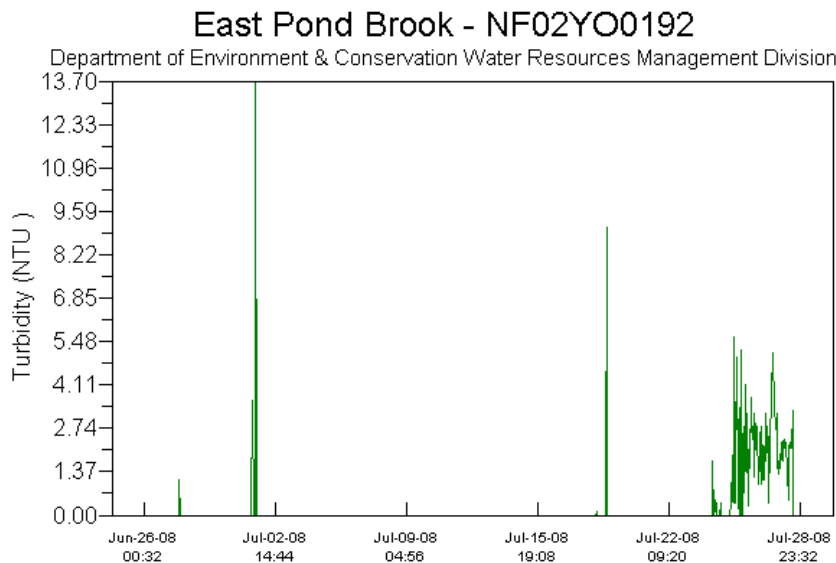


Figure 11

- The stage (**Figure 12**) or water level ranged from a minimum of 0.93 m to a maximum of 1.31 m. This range is normal for this stream and would simply represent runoff from precipitation. The peak around July 1, 2008 corresponds to a precipitation event.

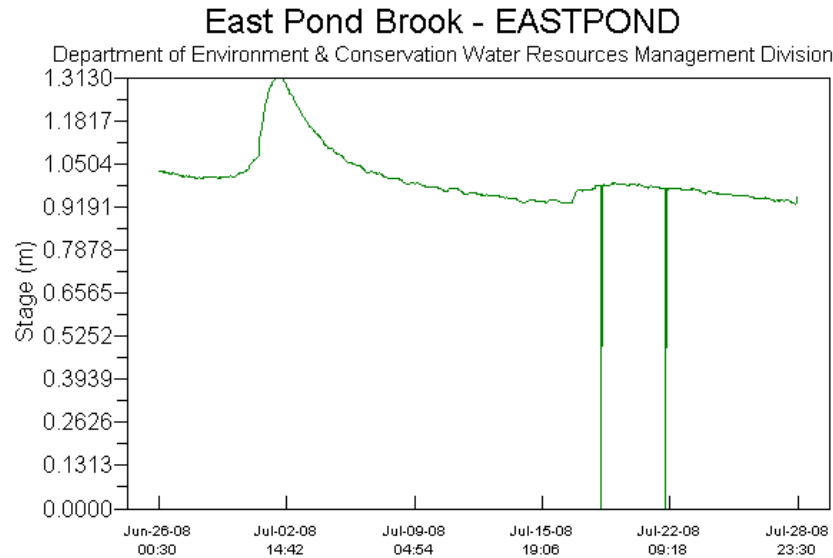


Figure 12

WELL AFTER TAILING DAM A

- Due to a calibration failure, the Quanta G was not deployed during this period. It was returned to the vendor for servicing.

Prepared by:

Robert Wight
Environmental Scientist
Water Resources Management Division
Department of Environment and Conservation
Tel: 709-292-4280
Fax: 709-292-4365
e-mail: robertwight@gov.nl.ca