

## **Real Time Water Quality Report Teck Duck Pond Operations Deployment Period 2009-01-15 to 2009-03-31**

### **General**

- 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 Teck 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 graphs below may sometimes show vertical lines from the data string to zero or the bottom of the graph. These lines indicate when a probe was off-line or removed from service.
- There was effluent from Polishing Pond into the receiving waters (Tributary to Gills Pond Brook) from March 20, 2009 to March 24, 2009. Discharge was stopped to ensure compliance with regulated discharge criteria.
- Raw (uncorrected) data has been used in the preparation of the graphs and subsequent discussion below.

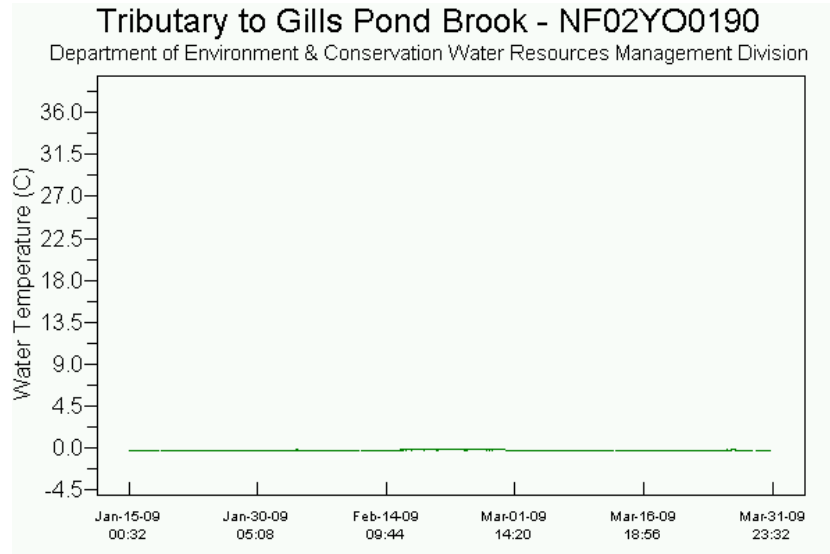
### **Maintenance and Calibration of Instrumentation**

- The regular DataSondes® were deployed in Tributary to Gills Pond Brook and East Pond Brook on December 17, 2008, after being cleaned, serviced and freshly calibrated. Due to the increased hazard of these instruments being damaged during winter removal and deployment, and inaccessibility through the ice, these instruments remain deployed beyond the reporting period (76 day period), and will remain deployed until the ice moves out and water levels are safe to access the instruments.
- The Quanta G® probe remains deployed in Monitoring Well After Tailings Dam Station (MW1) after being installed on November 14, 2008. Due to this well freezing at surface, this probe will remain deployed beyond the reporting period (76 day period), and will remain deployed until the well is no longer frozen, and the instrument can be removed.
- No *in-situ* measurements of ambient water quality could be taken during this deployment period. Thus, no comparative results between the DataSondes® and MiniSondes® are available.

## Data Interpretation

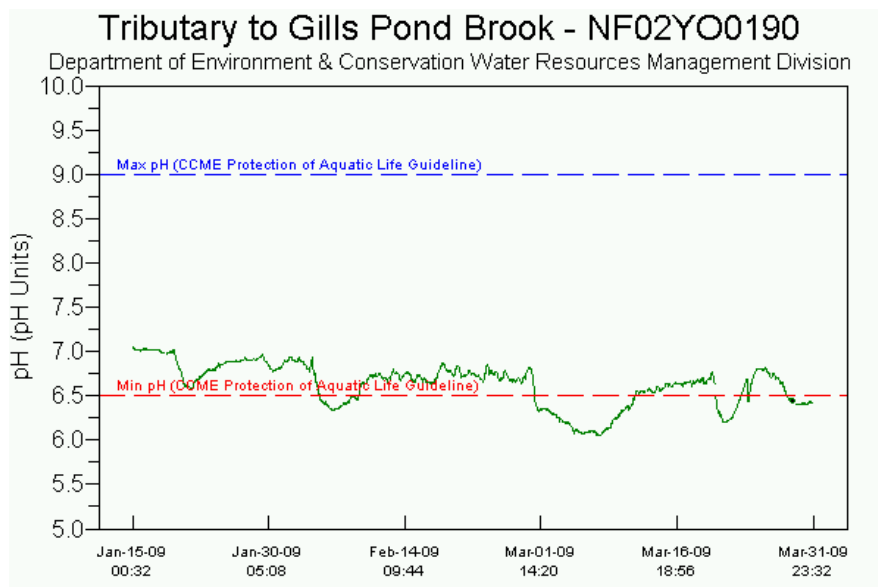
### TRIBUTARY TO GILLS POND BROOK

- The water temperature (**Figure 1**) remained constant throughout the deployment period. Temperature values ranged from a minimum of  $-0.30\text{ }^{\circ}\text{C}$  to  $-0.19\text{ }^{\circ}\text{C}$  over the deployment period.



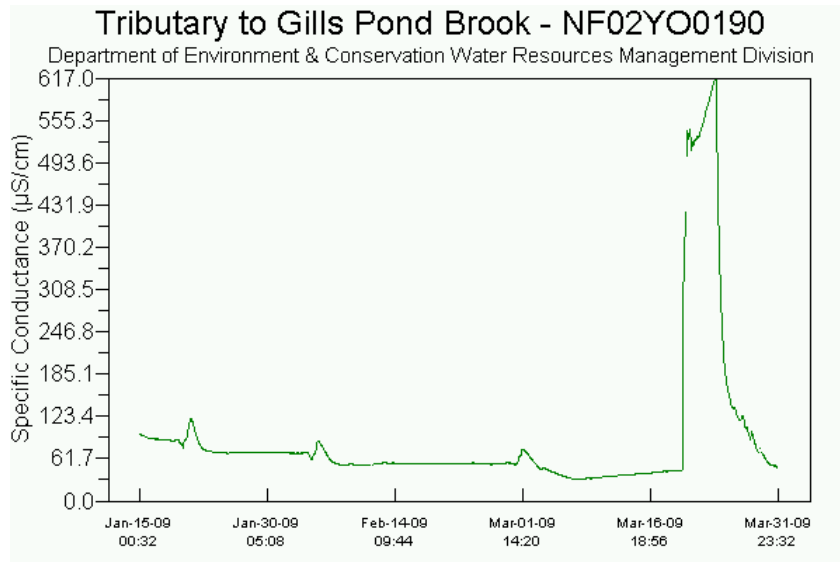
**Figure 1**

- Throughout the deployment period pH values (**Figure 2**) ranged from a minimum of 6.05 to a maximum of 7.05 with many 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. During the discharge period from Polishing Pond (March 20, 2009 to March 24, 2009) there is a slight dip in pH which is atypical. Usually, discharge from Polishing Pond results in an increased pH.



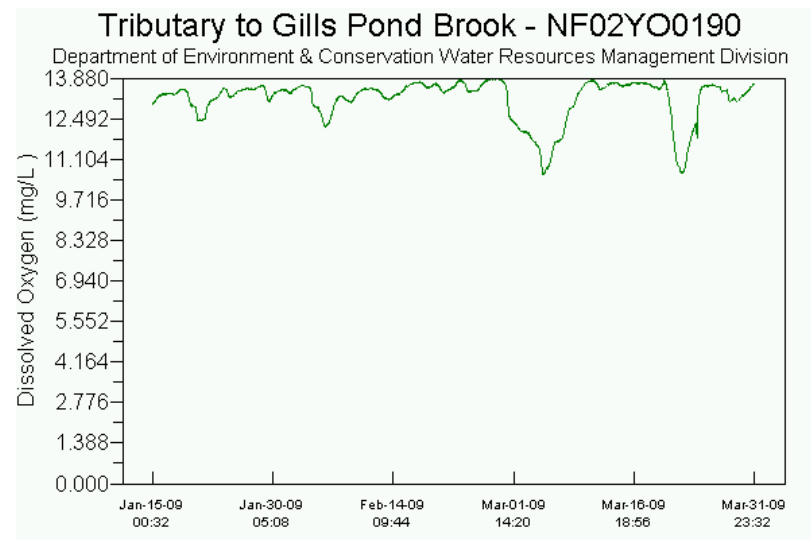
**Figure 2**

- The specific conductance (**Figure 3**) ranged from a minimum of 31.6  $\mu\text{S}/\text{cm}$  to a maximum of 617.0  $\mu\text{S}/\text{cm}$  over the deployment period. During the discharge period from Polishing Pond (March 20, 2009 to March 24, 2009) there is a marked increase in conductivity, which falls off slowly until the end of the deployment period.



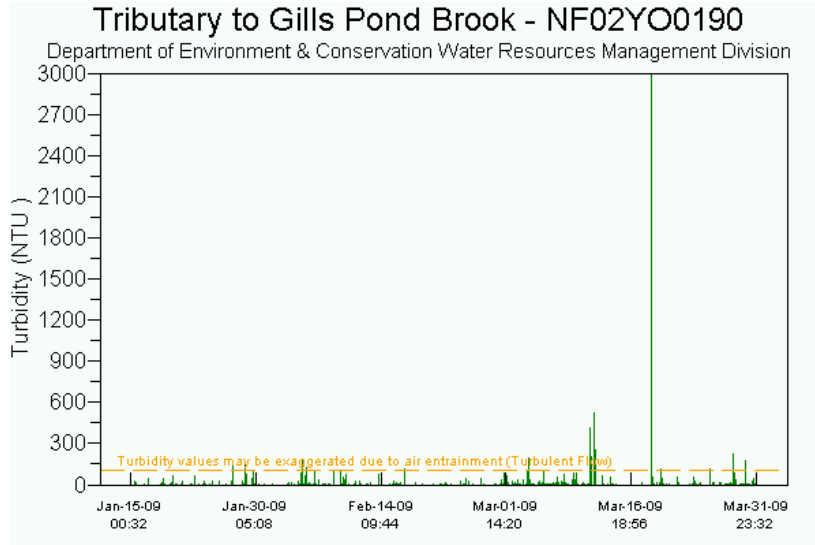
**Figure 3**

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 10.57 mg/L to a maximum of 13.88 mg/L over the deployment period. All dissolved oxygen values fall within the recommended CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (cold water/other life stages – above 6.5 mg/L; cold water/early life stages – above 9.5 mg/L).



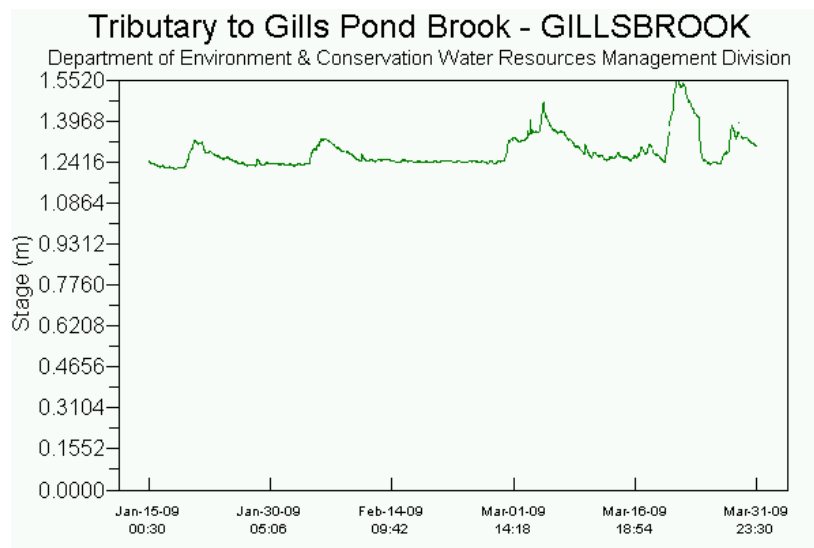
**Figure 4**

- The turbidity values (**Figure 5**) ranged from a minimum of 0.0 NTU to a maximum of 3000.0 NTU. Based upon previous investigation, it has been determined that turbidity values may be artificially increased due to air entrainment. Accordingly, the on-line real time turbidity graph for this station now contains the following comment “*Turbidity values may be exaggerated due to air entrainment (turbulent flow)*”. The spike (3000 NTU) on March 19, 2009 is considered to be an instrument error. Other peaks (up to 524 NTU) were observed, however, it is likely that these were false-positive values, as it is highly unlikely that turbidity values would be this high under winter conditions.



**Figure 5**

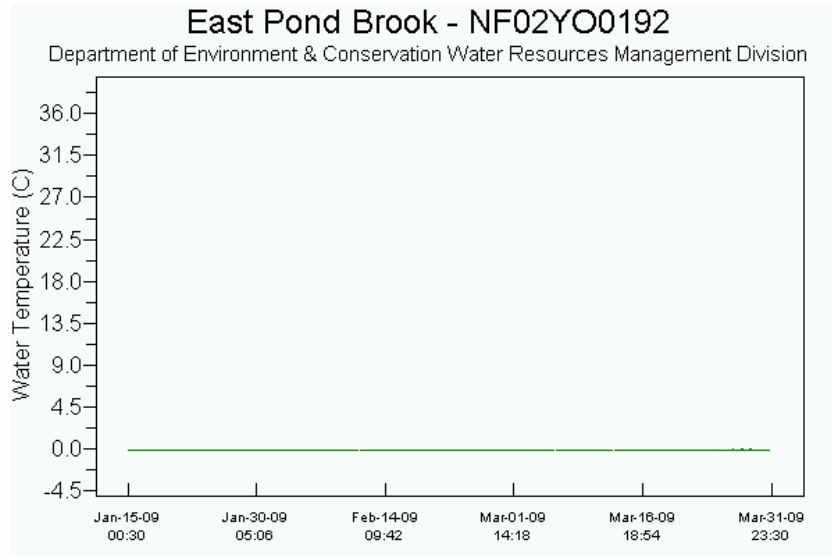
- The stage (**Figure 6**) or water level ranged from a minimum of 1.21 m to a maximum of 1.55 m. The highest peak corresponds to the discharge period from Polishing Pond (March 20, 2009 to March 24, 2009). Other peaks likely correspond to precipitation events or backwater effect under ice cover.



**Figure 6**

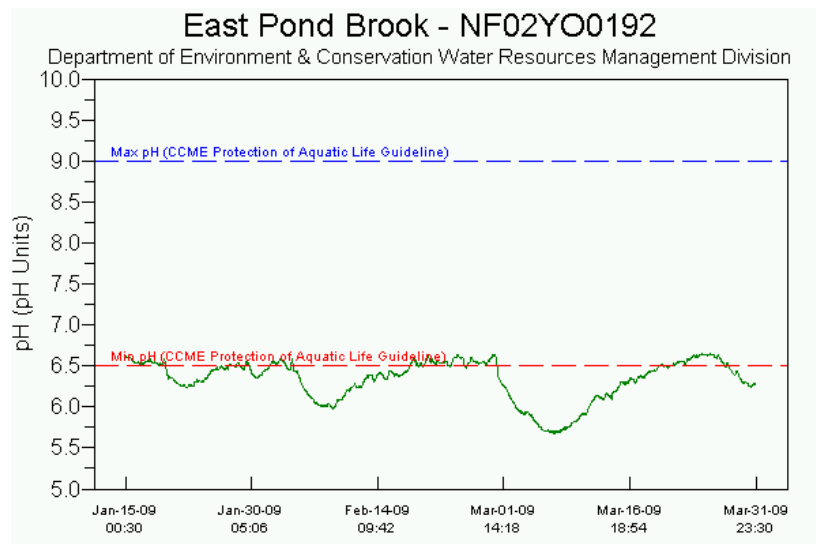
### EAST POND BROOK

- The water temperature (**Figure 7**) remained constant throughout the deployment period, ranging from a minimum of  $-0.13^{\circ}\text{C}$  to a maximum of  $-0.06^{\circ}\text{C}$ .



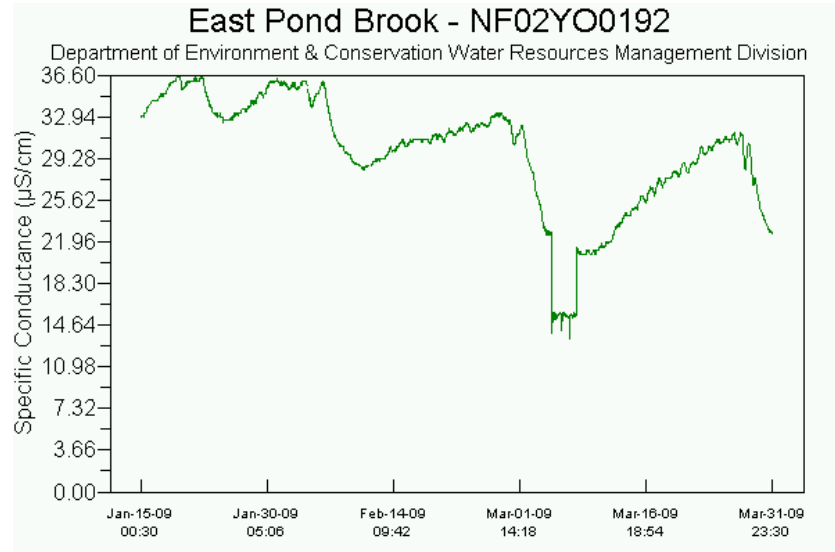
**Figure 7**

- pH values (**Figure 8**) ranged between a minimum of 5.67 and maximum of 6.65. For most of the deployment period, pH values were close to or below the lower limit of 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.

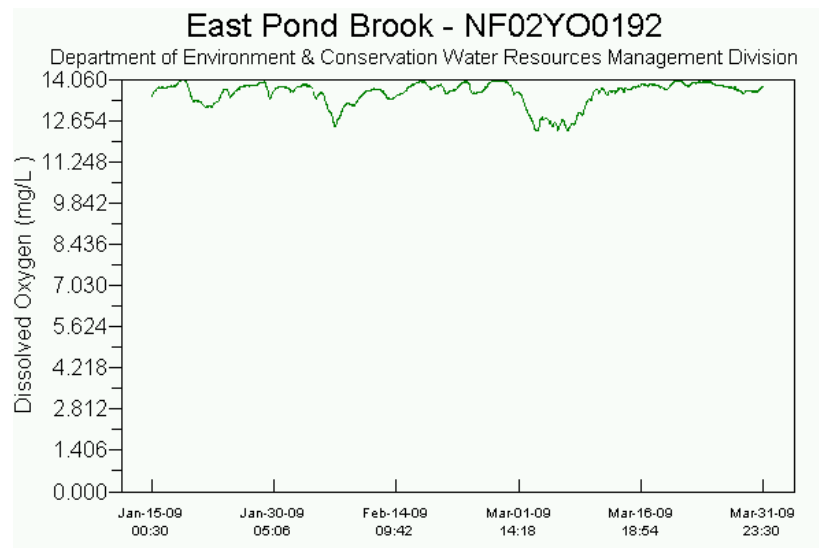


**Figure 8**

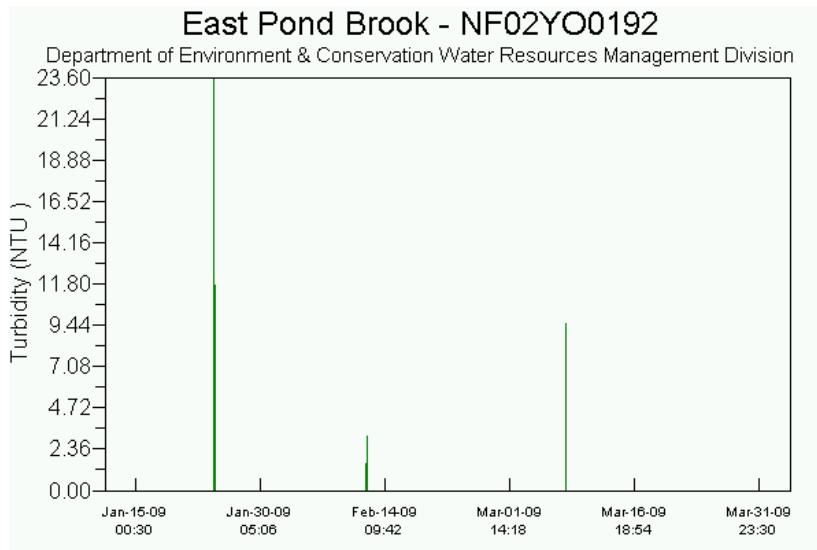
- The specific conductance (**Figure 9**) seemed to decrease over the deployment period. Values ranged from a minimum of 13.4  $\mu\text{S}/\text{cm}$  to a maximum of 36.6  $\mu\text{S}/\text{cm}$ . There is a curious little dip in the first half of March, for which we have no explanation.

**Figure 9**

- The dissolved oxygen (**Figure 10**) values ranged from a minimum of 12.30 mg/L to a maximum of 14.06 mg/L over the deployment period. All dissolved oxygen values fall within the recommended CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (cold water/other life stages – above 6.5 mg/L; cold water/early life stages – above 9.5 mg/L).

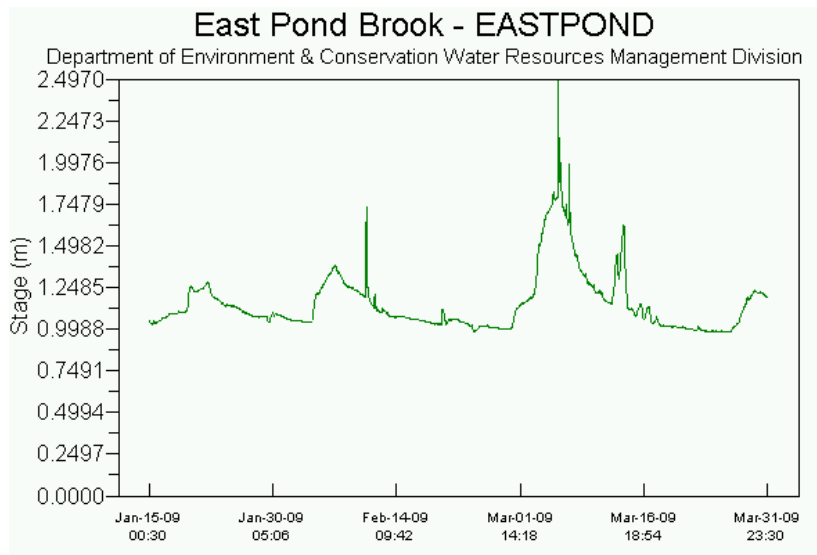
**Figure 10**

- The turbidity values (**Figure 11**) ranged from 0 NTU to 23.6 NTU throughout the deployment period. There were only two minor spikes. As these turbidity measurements were not sustained, there is no water quality impairment.



**Figure 11**

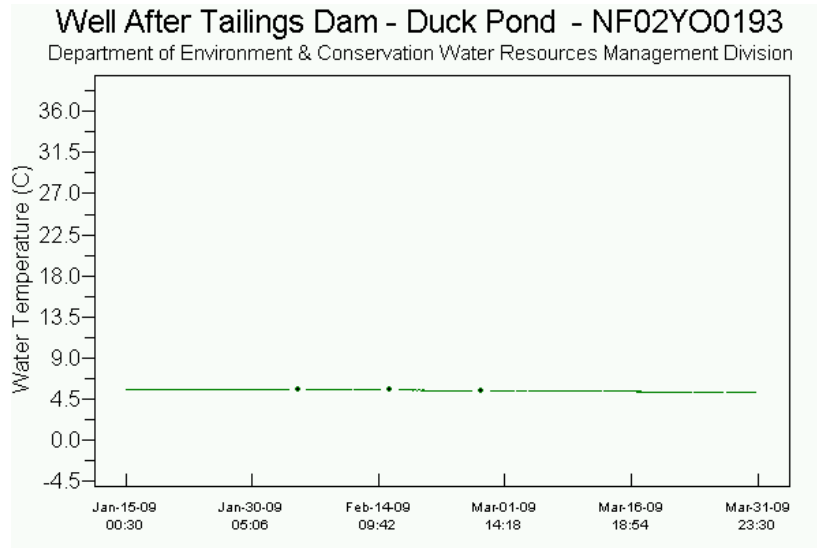
- The stage (**Figure 12**) or water level ranged from a minimum of 0.98 m to a maximum of 2.50 m. The higher peaks are the result of backwater under ice cover. It is unlikely that this stream would ever reach a stage of 2.50 m.



**Figure 12**

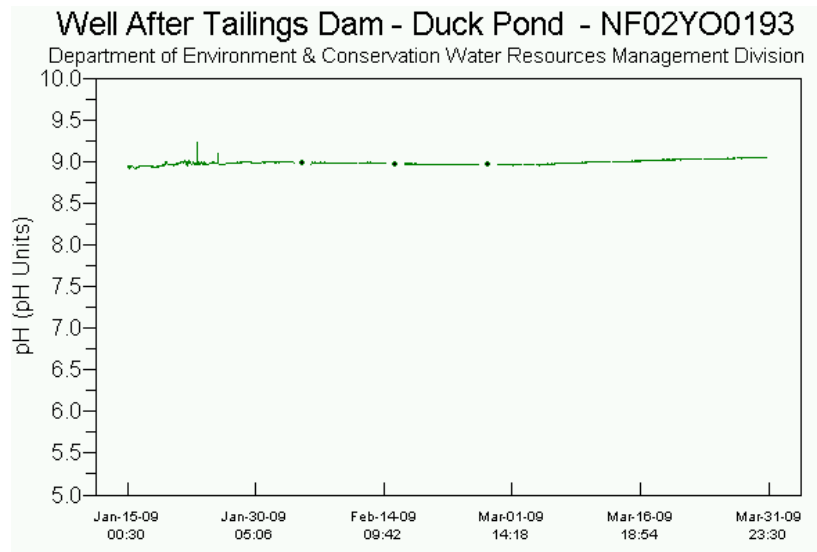
**WELL AFTER TAILING DAM A**

- Throughout the deployment period, water temperature (**Figure 13**) remained constant ranging between 5.22 °C and 5.59 °C.



**Figure 13**

- pH (**Figure 14**) increased slightly throughout the deployment period, ranging from a minimum of 8.91 to a maximum of 9.23.



**Figure 14**



- Specific Conductance (**Figure 15**) decreased slightly over the deployment period ranging from a minimum of 0.397 mS/cm to a maximum of 0.420 mS/cm.

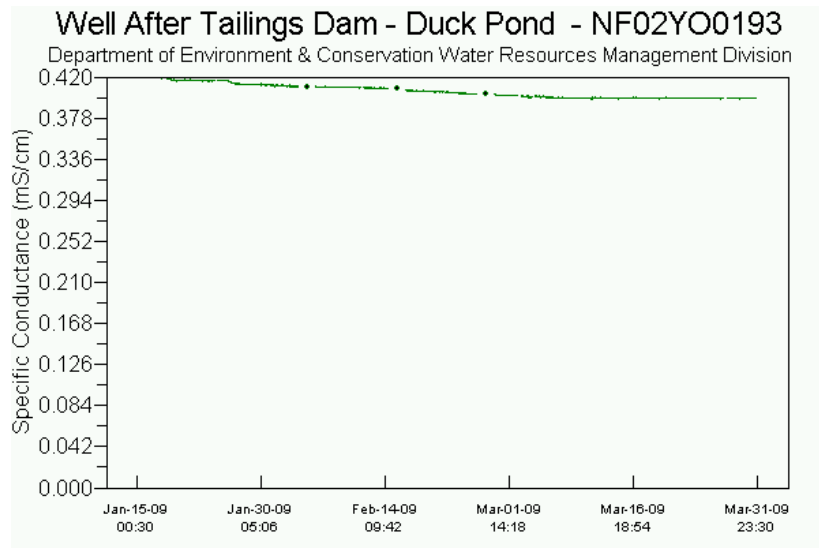


Figure 15

- The water level (**Figure 16**) generally increased throughout the deployment period, ranging from a minimum of 0.569 m to a maximum of 0.777 m.

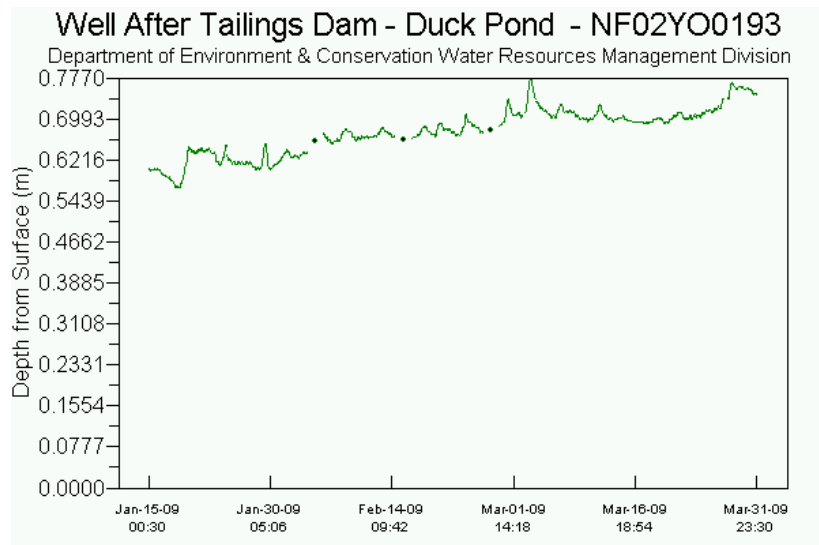


Figure 16

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