

Real Time Water Quality Report Teck Duck Pond Operations Deployment Period 2009-04-01 to 2009-05-05

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 April 3, 2009 to April 14, 2009 and April 27, 2009 to May 1, 2009.
- 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 remained deployed until May 5, 2009. This report covers the latter 35 days of this period.
- The **Quanta G**® probe was installed on November 14, 2008 in Monitoring Well After Tailings Dam Station (MW1) and remained deployed until May 5, 2009 due to this well freezing at surface. The report covers the latter 35 days of this deployment period.
- *In-situ* measurements of ambient water quality were undertaken with a freshly calibrated **MiniSonde**® each time a **DataSonde**® was removed. No *in situ* measurements can be taken in the Monitoring Well.
- The comparative results between the **MiniSonde**® and **DataSonde**® values at the end of the deployment period are shown in **Table 1** for Tributary to Gill's Pond Brook and **Table 2** for East Pond Brook.

Tributary to Gills Pond Brook Station (NF02YO0190)				
Date (yyyy-mm-dd)	Parameter	MiniSonde® Data	DataSonde® Data	Rating
n/a Installation	Temp (°C)	n/a	n/a	n/a
	pH (units)	n/a	n/a	n/a
	Sp. Conductivity (uS/cm)	n/a	n/a	n/a
	Dissolved Oxygen (mg/L)	n/a	n/a	n/a
	Turbidity (NTU)	n/a	n/a	n/a
2009-05-05 Removal	Temp (°C)	12.37	12.26	Excellent
	pH (units)	6.71	6.80	Excellent
	Sp. Conductivity (uS/cm)	32.1	34.0	Excellent
	Dissolved Oxygen (mg/L)	10.53	10.51	Excellent
	Turbidity (NTU)	0.0	0.0	Excellent

Table 1

East Pond Brook Station (NF02YO0192)				
Date (yyyy-mm-dd)	Parameter	MiniSonde® Data	DataSonde® Data	Rating
n/a Installation	Temp (°C)	n/a	n/a	n/a
	pH (units)	n/a	n/a	n/a
	Sp. Conductivity (uS/cm)	n/a	n/a	n/a
	Dissolved Oxygen (mg/L)	n/a	n/a	n/a
	Turbidity (NTU)	n/a	n/a	n/a
2009-05-05 Removal	Temp (°C)	14.18	14.20	Excellent
	pH (units)	6.56	6.28	Good
	Sp. Conductivity (uS/cm)	17.4	18.6	Excellent
	Dissolved Oxygen (mg/L)	9.94	9.99	Excellent
	Turbidity (NTU)	0.0	0.0	Excellent

Table 2

Data Interpretation

TRIBUTARY TO GILLS POND BROOK

- The water temperature (**Figure 1**) increased throughout the deployment period. Temperature values ranged from a minimum of $-0.31\text{ }^{\circ}\text{C}$ to a maximum of $14.19\text{ }^{\circ}\text{C}$.

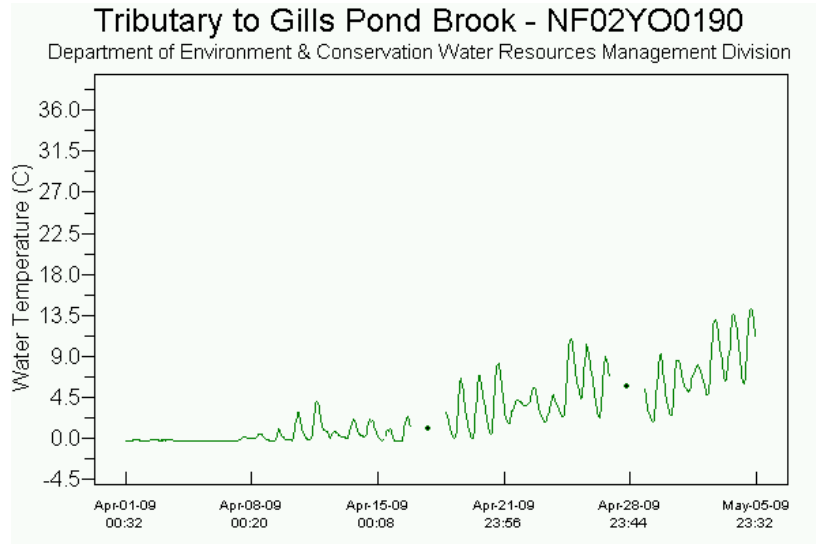


Figure 1

- Throughout the deployment period pH values (**Figure 2**) ranged from a minimum of 5.89 to a maximum of 7.04 with many 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 around the lower limit of the recommended range. During the discharge periods from Polishing Pond, pH is generally higher than the background pH.

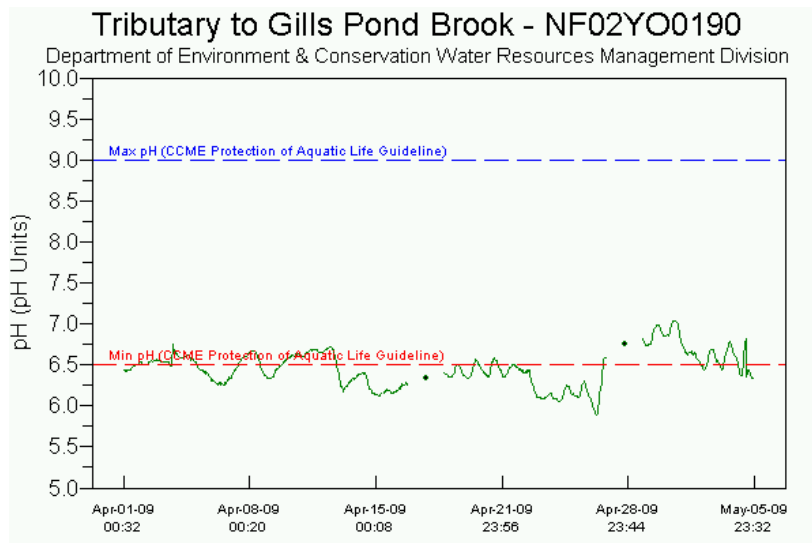


Figure 2

- The specific conductance (**Figure 3**) ranged from a minimum of 23.2 $\mu\text{S}/\text{cm}$ to a maximum of 382.0 $\mu\text{S}/\text{cm}$ over the deployment period. During the discharge periods from Polishing Pond there are marked increases in conductivity. During the first Discharge Period (April 3, 2009 to April 14, 2009) there are several peaks and dips. The dips are the result of dilution caused by increased stream flow, from periods of precipitation and/or snow melt.

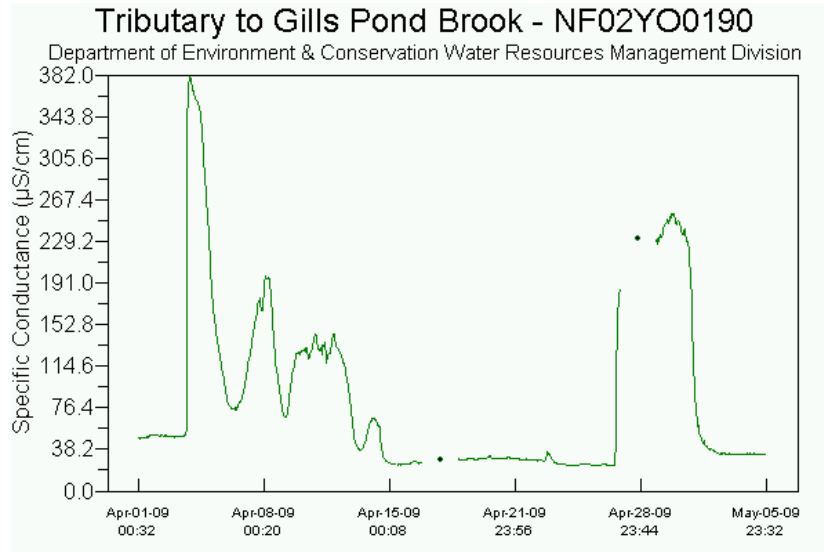


Figure 3

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 9.81 mg/L to a maximum of 13.78 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).

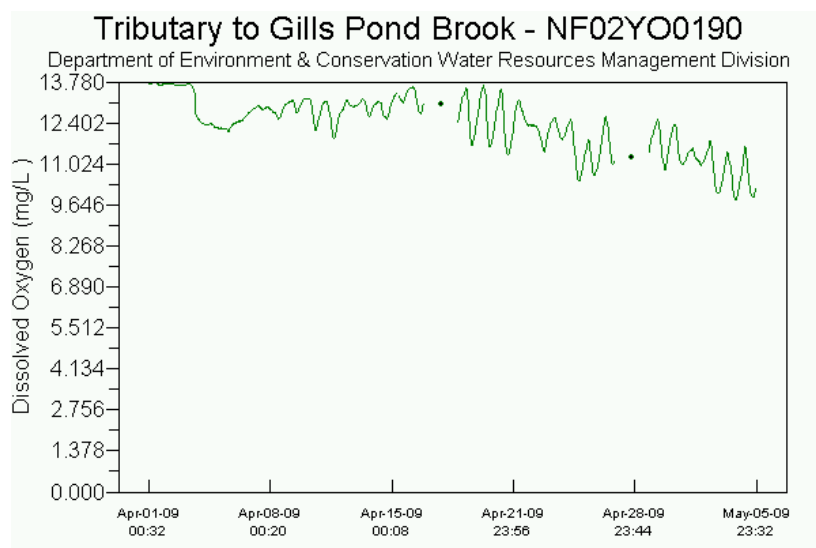


Figure 4

- The turbidity values (**Figure 5**) ranged from a minimum of 0.0 NTU to a maximum of 3000.0 NTU. Values of 3000 NTU are system errors and are considered to be incorrect. Other values recorded for this station are typical. 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)*”.

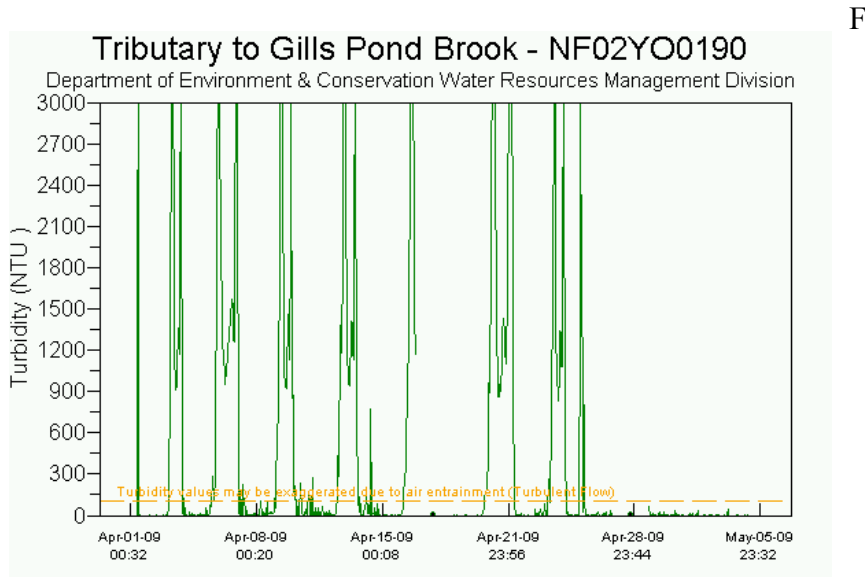


Figure 5

- The stage (**Figure 6**) or water level ranged from a minimum of 1.26 m to a maximum of 1.64 m. The discharge periods are obvious, with the highest peaks corresponding to spring snowmelt and precipitation events.

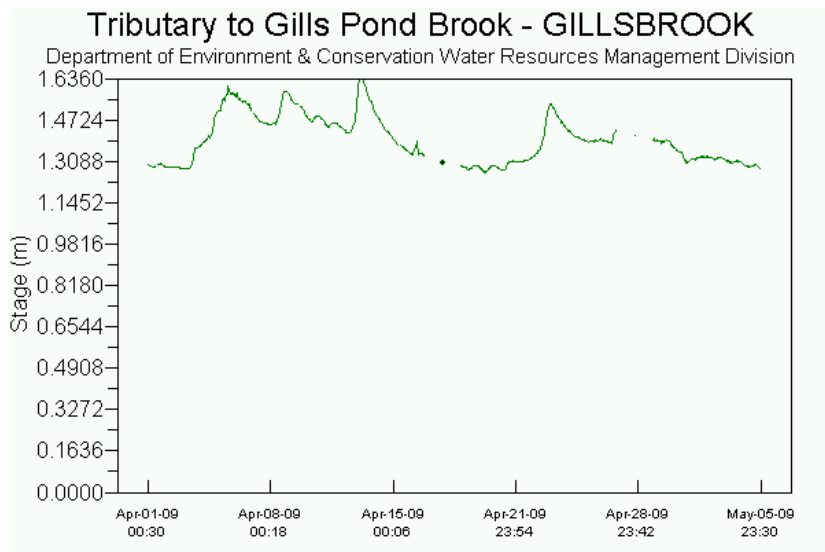


Figure 6

EAST POND BROOK

- The water temperature (**Figure 7**) increased throughout the deployment period, ranging from a minimum of -0.14°C to a maximum of 14.52°C .

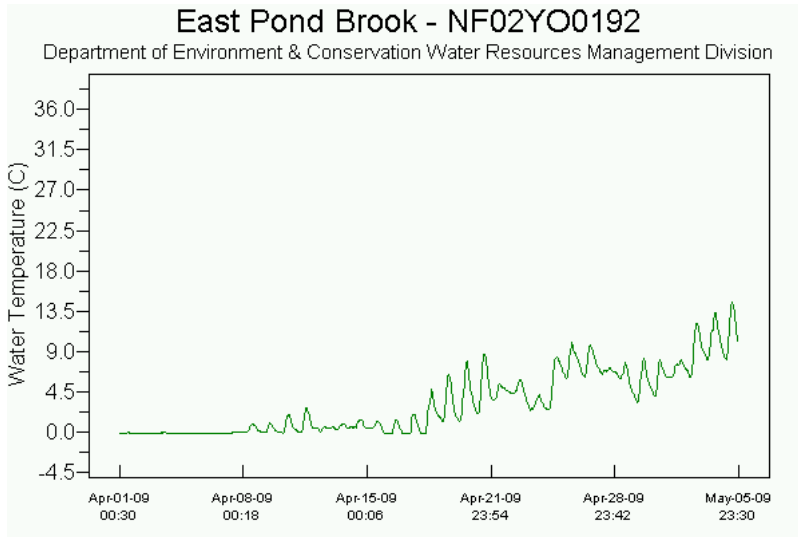


Figure 7

- pH values (**Figure 8**) ranged between a minimum of 5.65 and maximum of 6.53. For most of the deployment period, pH values were 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.

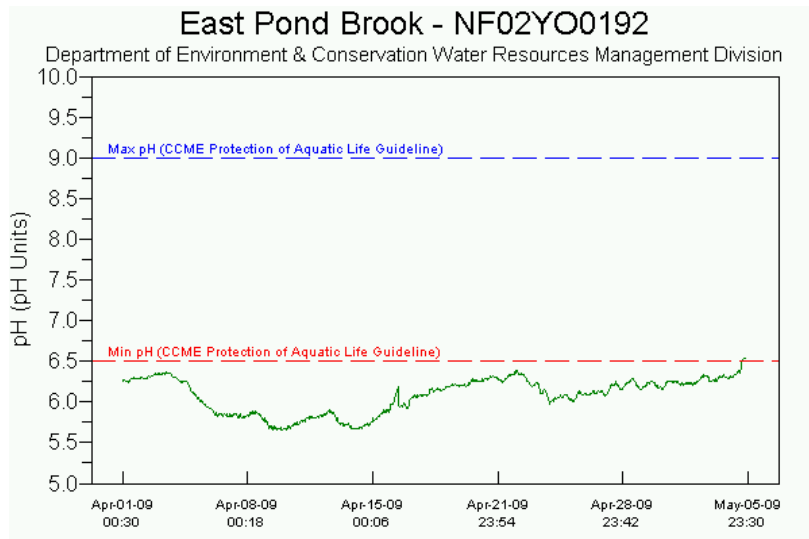
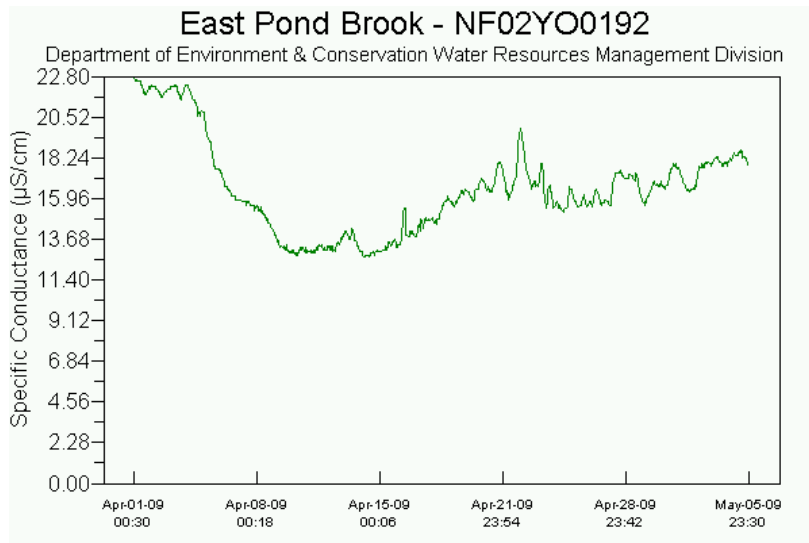
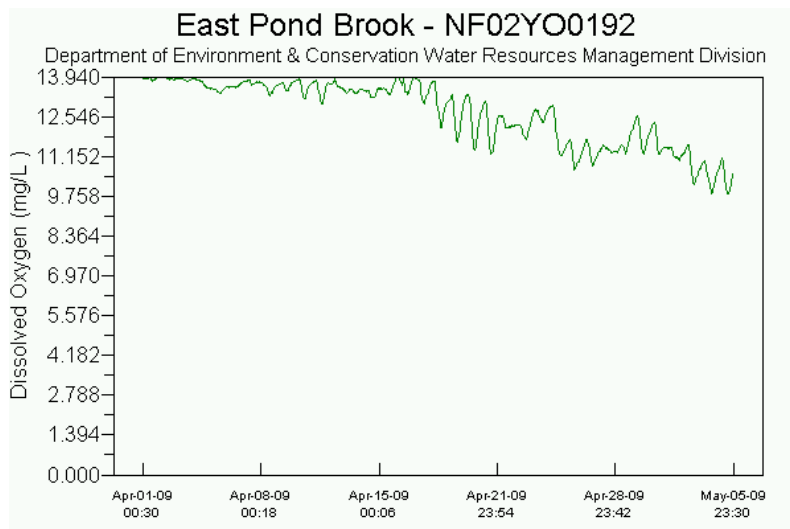


Figure 8

- The specific conductance (**Figure 9**) ranged from a minimum of 12.7 $\mu\text{S}/\text{cm}$ to a maximum of 22.8 $\mu\text{S}/\text{cm}$. Lowest conductivity values correspond to periods of spring snow melt and precipitation.

**Figure 9**

- The dissolved oxygen (**Figure 10**) values ranged from a minimum of 9.85 mg/L to a maximum of 13.94 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 a minimum of 0.0 NTU to a maximum of 3000.0 NTU. Values of 3000 NTU are system errors and are considered to be incorrect. Other values recorded for this station are typical. As peaks are not sustained, there is no indication of water quality impairment.

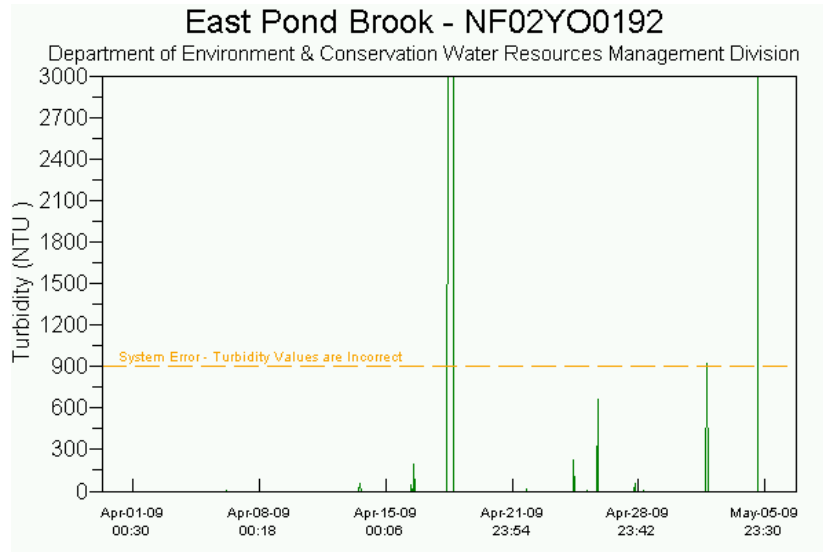


Figure 11

- The stage (**Figure 12**) or water level ranged from a minimum of 1.053 m to a maximum of 1.935 m. The highest peaks are the result of spring snow melt and precipitation.

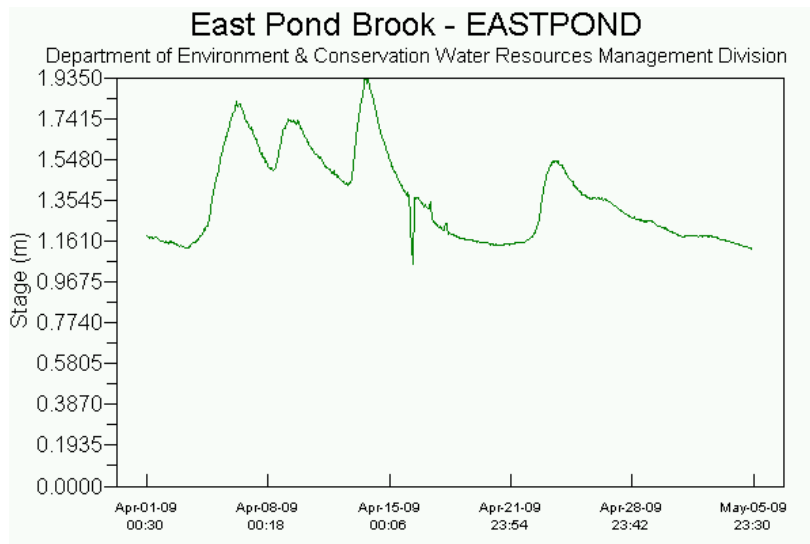


Figure 12

WELL AFTER TAILING DAM A

- Throughout the deployment period, water temperature (**Figure 13**) remained constant ranging between 5.01 °C and 5.23 °C.

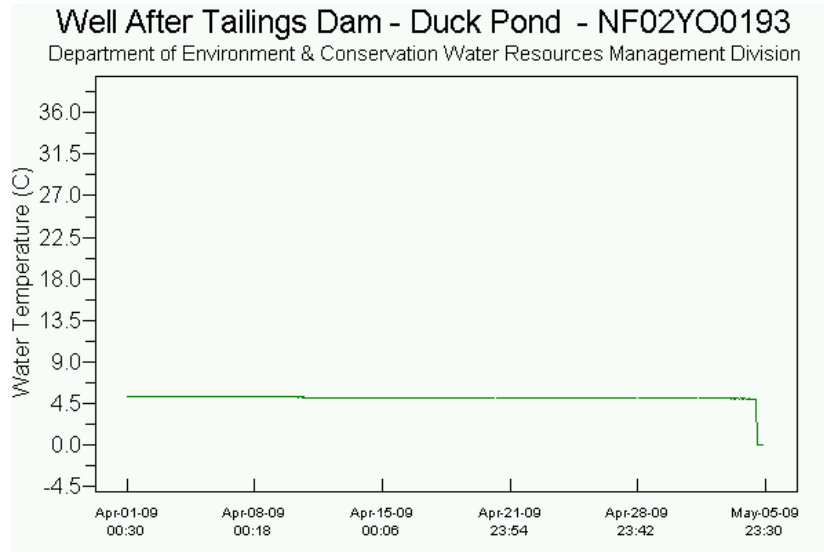


Figure 13

- pH (**Figure 14**) remained fairly constant throughout the deployment period, ranging from a minimum of 9.04 to a maximum of 9.12.

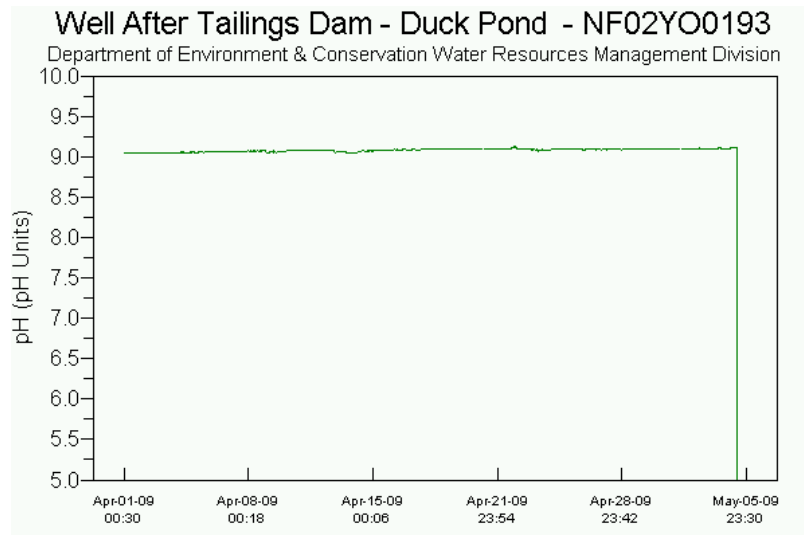


Figure 14

- Specific Conductance (**Figure 15**) remained fairly constant over the deployment period ranging from a minimum of 0.397 mS/cm to a maximum of 0.406 mS/cm.

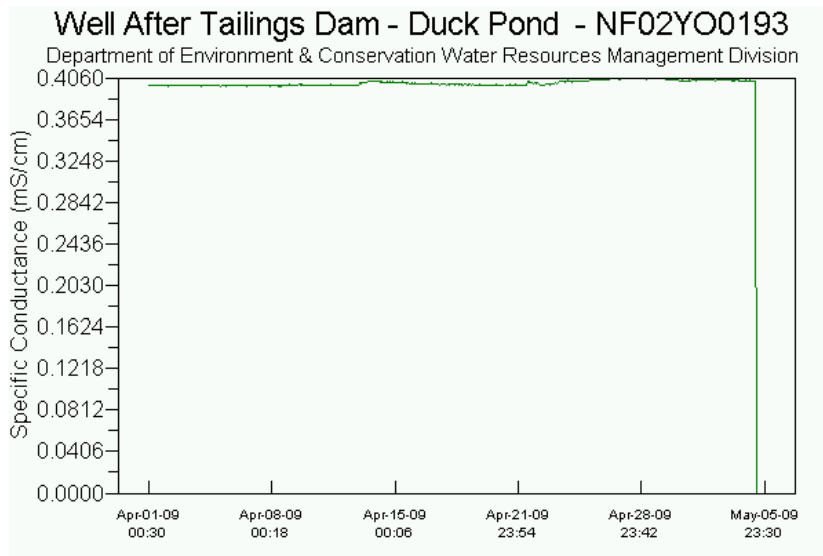


Figure 15

- The water level (**Figure 16**) generally increased throughout the deployment period, ranging from a minimum of 270.925 m to a maximum of 271.018 m.

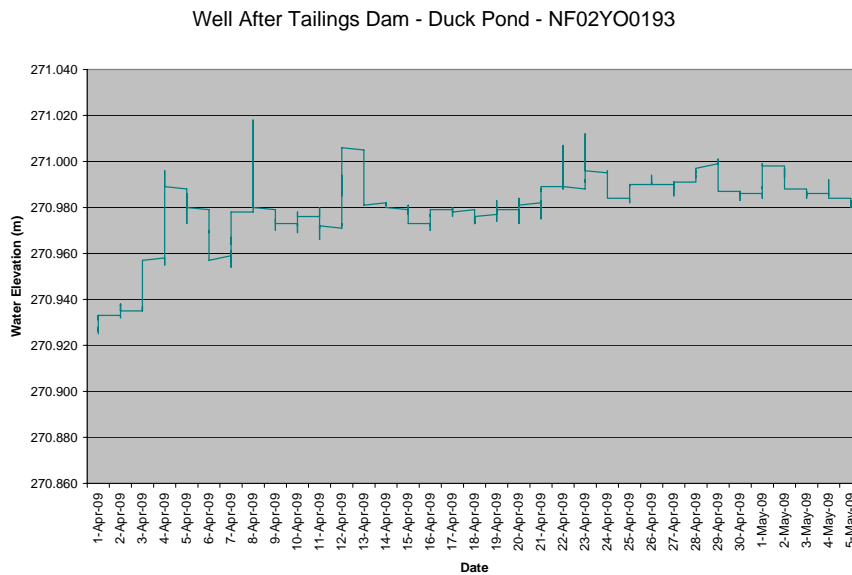


Figure 16

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