Real-Time Water Quality Deployment Report
Rattling Brook Network
February 2nd, 2010 to March 2nd, 2010

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- This monthly deployment report interprets the data from Rattling Brook Big Pond, Rattling Brook below Bridge and Rattling Brook below Plant Discharge stations for the period of February 2nd, 2010 to March 2nd, 2010; a period of 30 days.
- Vale Inco will be informed of any significant water quality events in the form of a monthly deployment report and automated alerts as they occur.
- Ice conditions at Rattling Brook Big Pond precluded the deployment of a Hydrolab on February 2nd, 2010. A request was made to Vale Inco staff to monitor ice conditions periodically and update Real-Time staff for the potential to deploy when conditions are suitable. As of March 1st, ice conditions were still unacceptable for deployment of a Hydrolab. Monitoring on Big Pond is tentatively slated to resume in early April.
- On February 9th, 2010, the Stage Level benchmark was changed at Rattling Brook below Bridge to reflect geodetic elevation. Stage has been removed from the graphs for below Bridge for this month's report.

Maintenance and Calibration of Instrument

- As part of the Quality Assurance and Quality Control protocol (QAQC), an assessment of data reliability recorded by an instrument is made at the beginning of deployment and at removal based on the approach used by the United States Geological Survey.
  - Upon deployment, a QA/QC sonde is temporarily deployed along side the field sonde. Values are compared between the Field Sonde and the QAQC Sonde for temperature and dissolved oxygen. A grab sample is also taken for comparisons between the grab sample and the Field Sonde for specific conductivity, pH and turbidity parameters. Based on the degree of difference between the Field Sonde and grab sample or QAQC Sonde, a qualitative statement is made on the data quality in Table 1 upon Deployment.
  - At the end of a deployment period, readings are taken in the water body from the Field Sonde before and after a thorough cleaning in order to assess the degree of biofouling. During calibration, an assessment of calibration drift is made and the two error values are combined to give Total Error (Te). If Te exceeds a predetermined value, a correction based on Te is applied to the dataset using linear interpolation. Based on the value for Te, a qualitative statement is made on the data quality in Table 1 upon Removal.

Table 1: QA/QC Data Comparison Rankings upon Deployment on February 2nd, 2010 to March 2nd, 2010.

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Big Pond	NA	NA	NA	NA	NA	NA	NA
	NA	NA	NA	NA	NA	NA	NA
Below Bridge	February 2nd, 2010	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	March 2nd, 2010	Removal	Excellent	Excellent	Excellent	Excellent	Marginal
Below Plant Discharge	February 2nd, 2010	Deployment	Excellent	Poor	Excellent	Good	Excellent
	March 2nd, 2010	Removal	Excellent	Good	Excellent	Excellent	Excellent

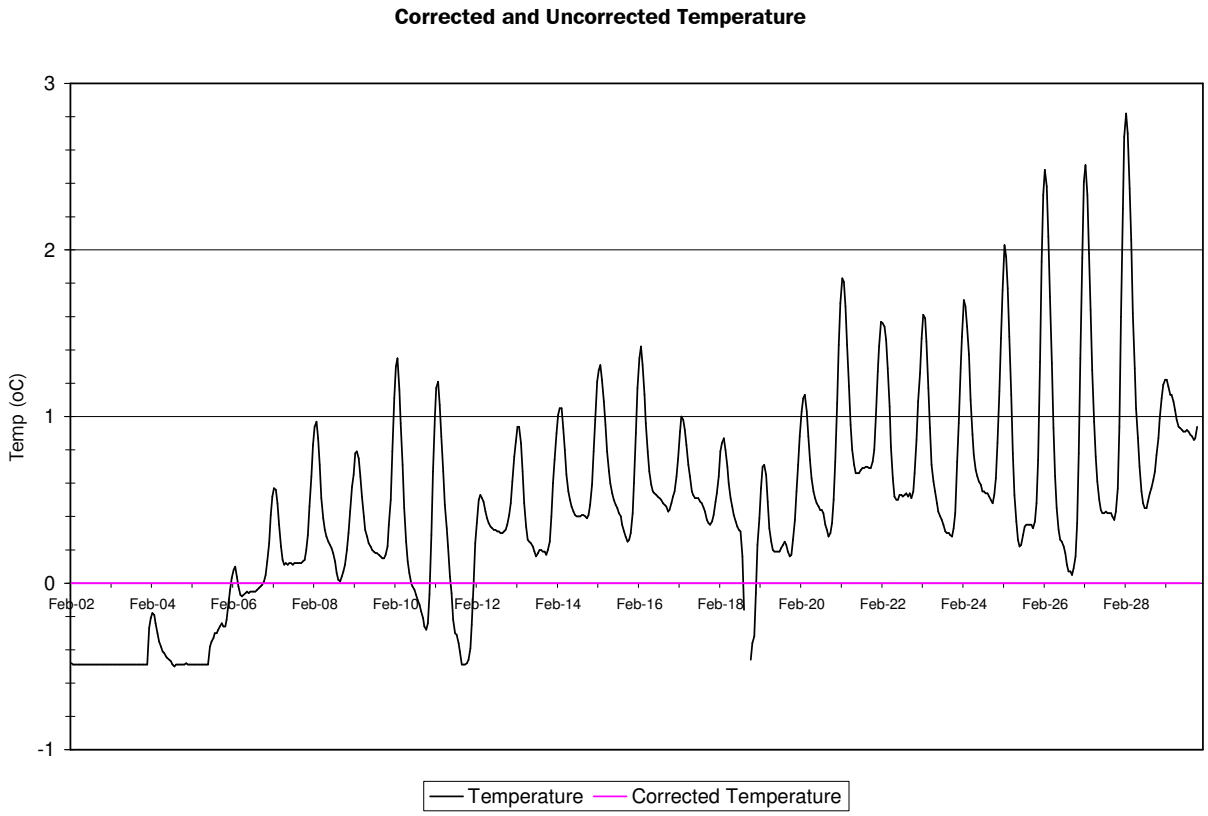
- During deployment, pH was ranked as 'poor' in comparison with a grab sample. The pH as measured by the field sonde was 4.30 vs. 6.03 for the grab sample. This could be due to insufficient time given for Field Sonde equilibration in the river or due to a change in the sample pH as it was transported from the field to the lab.

Data Interpretation

RATTLING BROOK BELOW BRIDGE

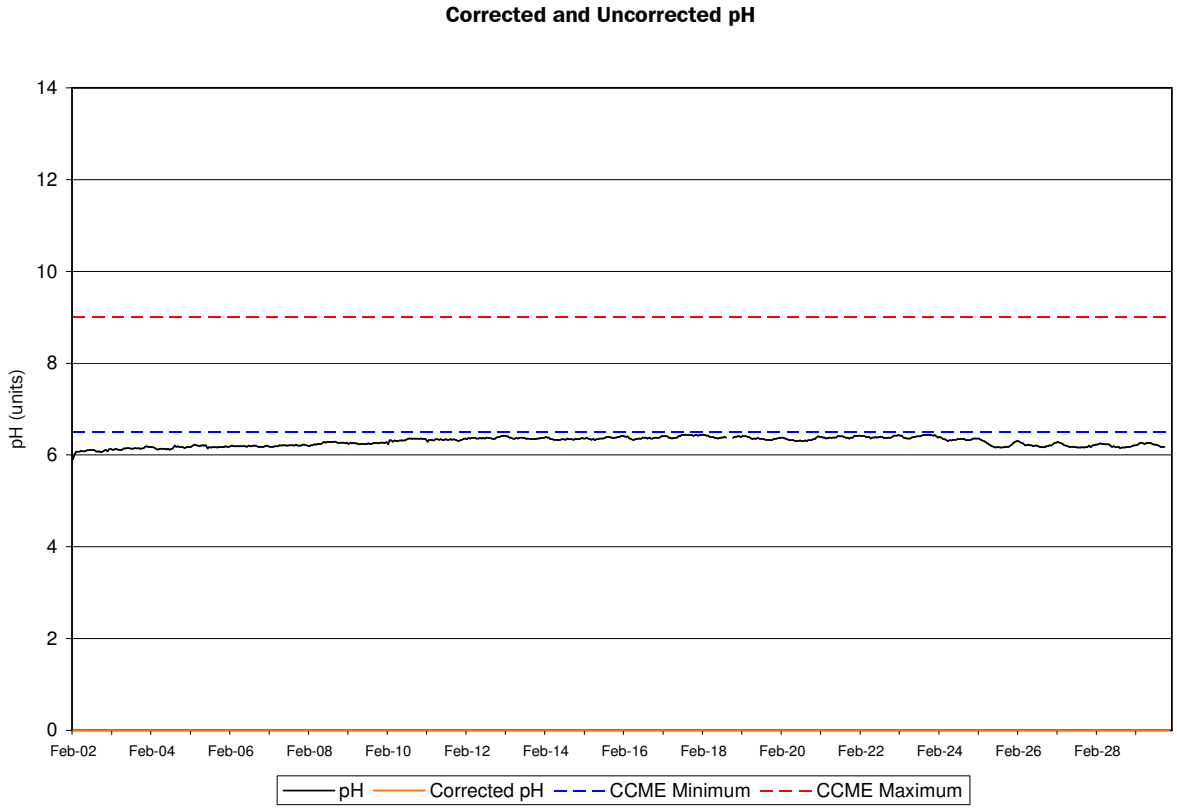
- During this deployment, a correction was not required for temperature since total error did not exceed the data correction criterion. Temperature ranged from -0.50 to 2.82°C for the month. Ice cover was present during the deployment on February 2nd as seen by the flat line at the start of Figure 1. However, the ice had melted by removal in March as indicated by the increasing trend as the deployment period went on.

Figure 1: Water temperature at Rattling Brook below Bridge from February 2nd, 2010 to March 2nd, 2010.



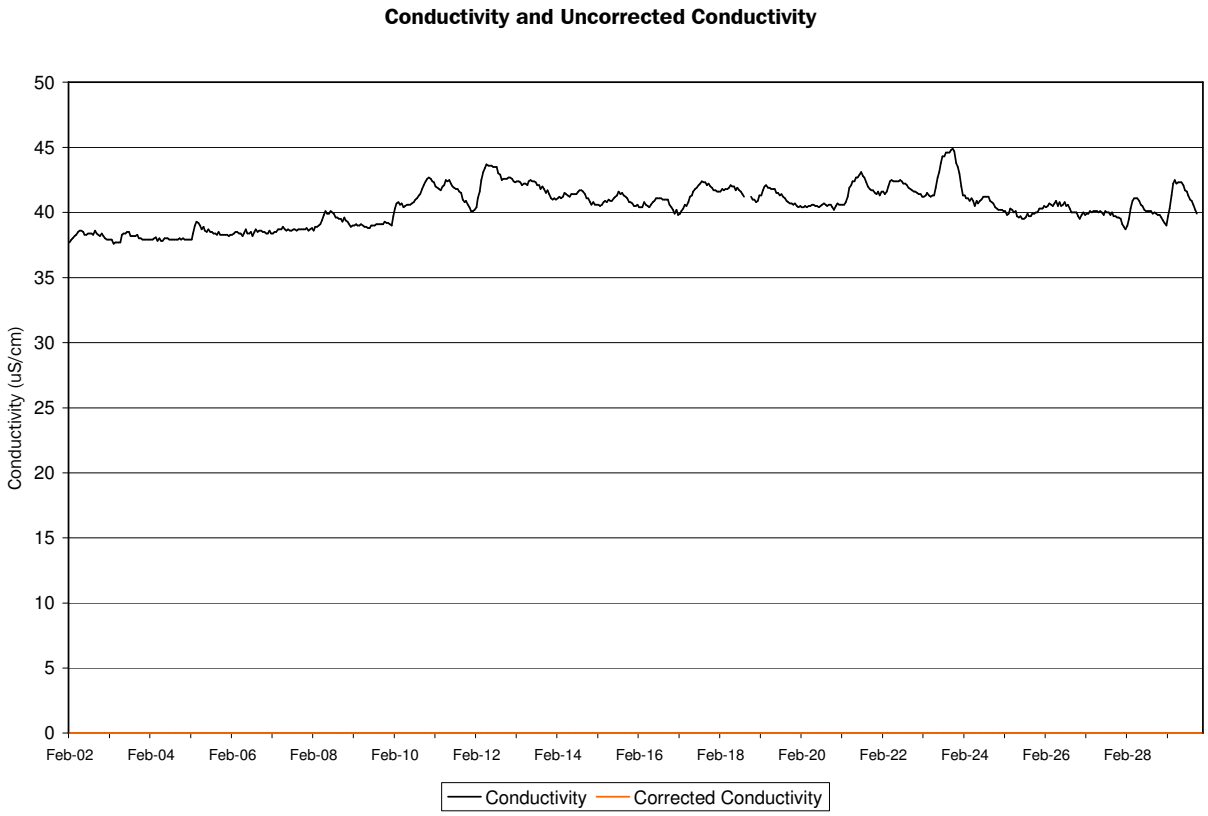
- A correction was not applied to pH during this month's deployment since the data correction criterion was not exceeded. pH ranged from 5.90 to 6.44 and remained outside the minimum CCME Guideline of 6.5 for the Protection of Aquatic Life. No concern is warranted as this is the natural state for rivers in this region of the province.

Figure 2: pH at Rattling Brook below Bridge from February 2nd, 2010 to March 2nd, 2010.



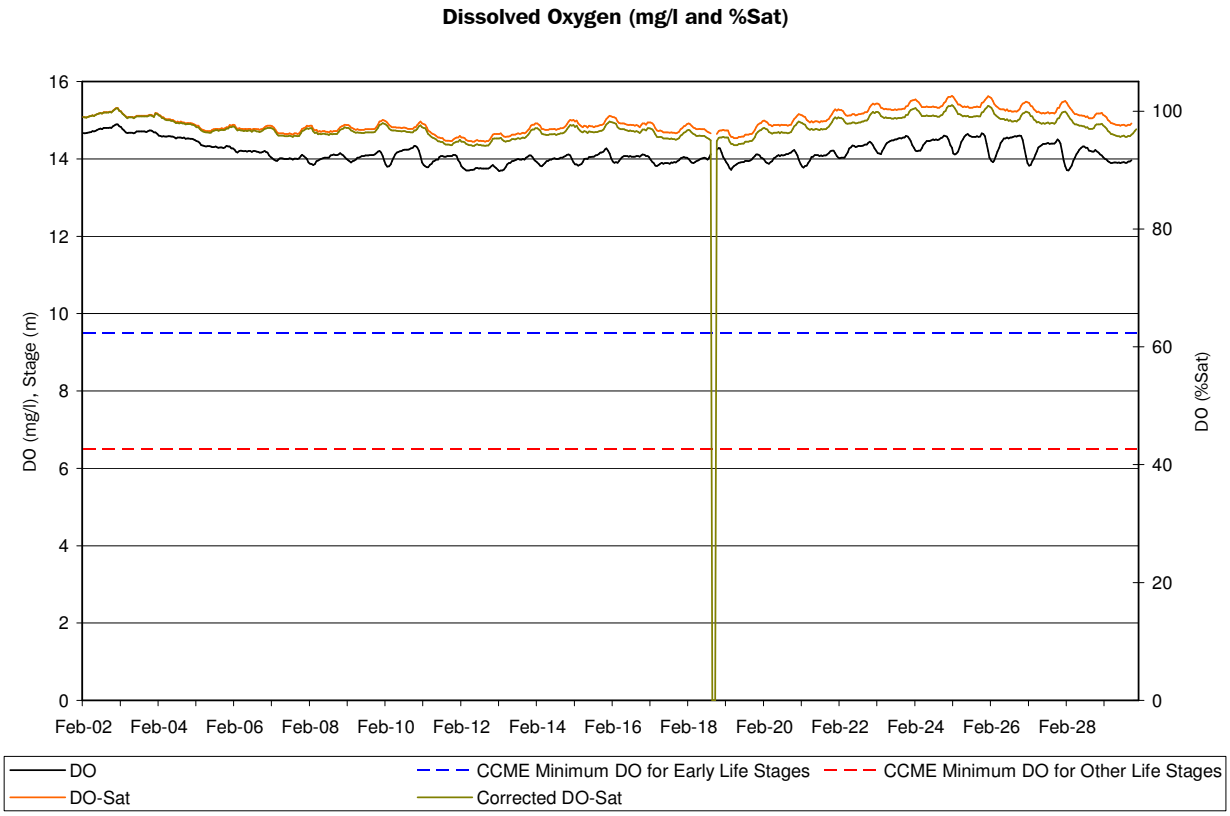
- No correction was applied to Specific Conductivity for this deployment period since the data correction criterion was not exceeded. Conductivity values ranged from 37.6 to 44.9 µS/cm during the deployment period.

Figure 3: Specific Conductivity at Rattling Brook below Bridge from February 2nd, 2010 to March 2nd, 2010.



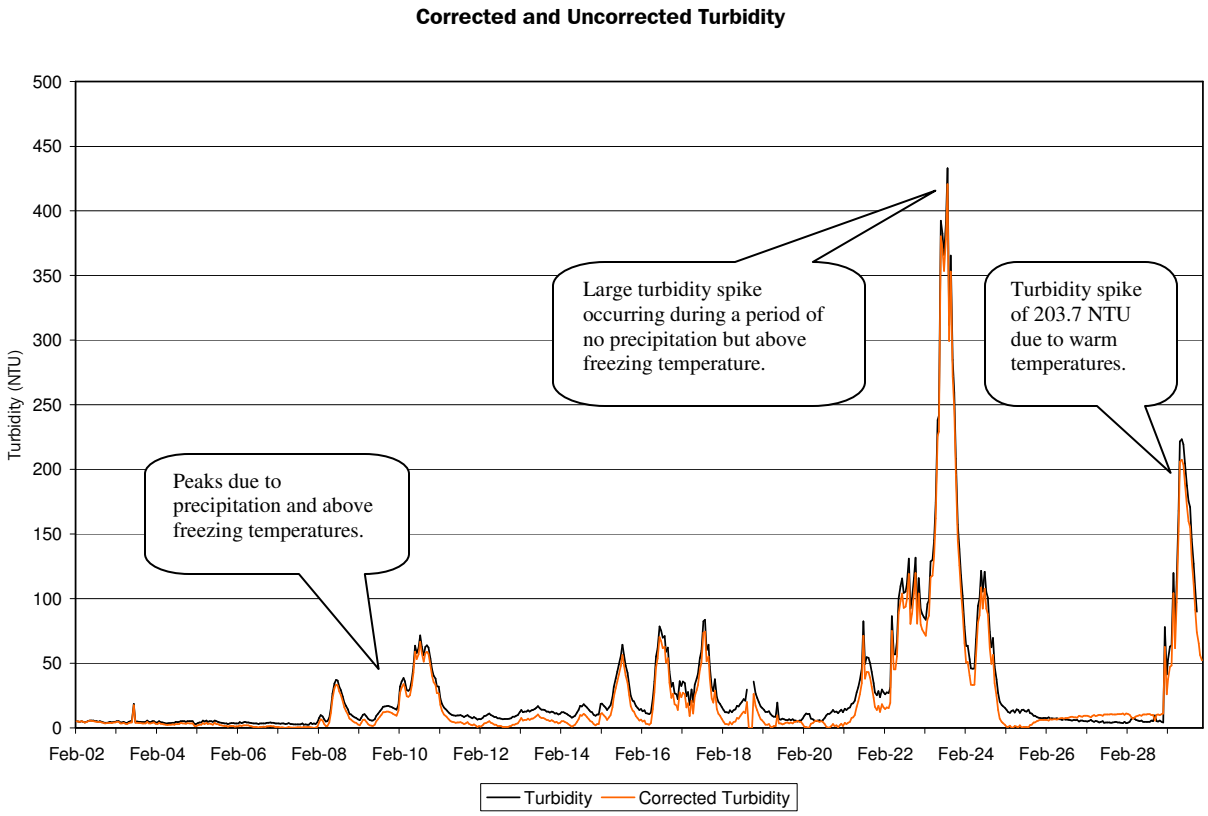
- A slight correction of -1.9% was applied to % saturation of dissolved oxygen at the end of deployment. Dissolved Oxygen ranged from 13.69 to 14.90 mg/l during this deployment period and all values were well above the CCME Guideline of 6.5 and 9.0 mg/l for the protection of Early Life Stage and Other Life Stage cold water biota.

Figure 4: Dissolved Oxygen at Rattling Brook below Bridge from February 2nd, 2010 to March 2nd, 2010.



- A correction of -16.0 NTU was applied to the end of the deployment period as a correction factor due to fouling of the sensor. Corrected turbidity ranged from 0.0 to 420.6 NTU. A large spike occurred on February 23rd during a period of warm temperatures with snow melt and runoff (the max temperature on February 22nd and 23rd was 5.9 and 4.1°C, respectively).

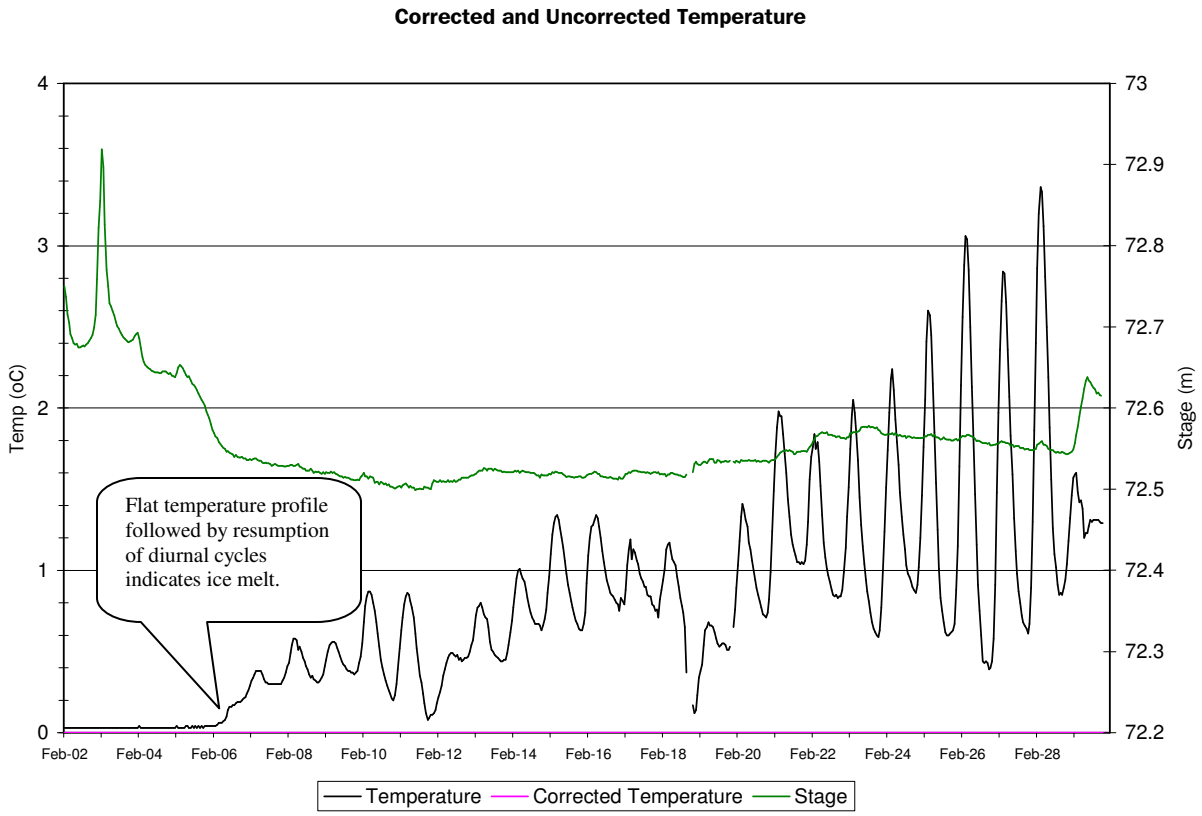
Figure 5: Turbidity at Rattling Brook below Bridge from February 2nd, 2010 to March 2nd, 2010.



RATTLING BROOK BELOW PLANT DISCHARGE

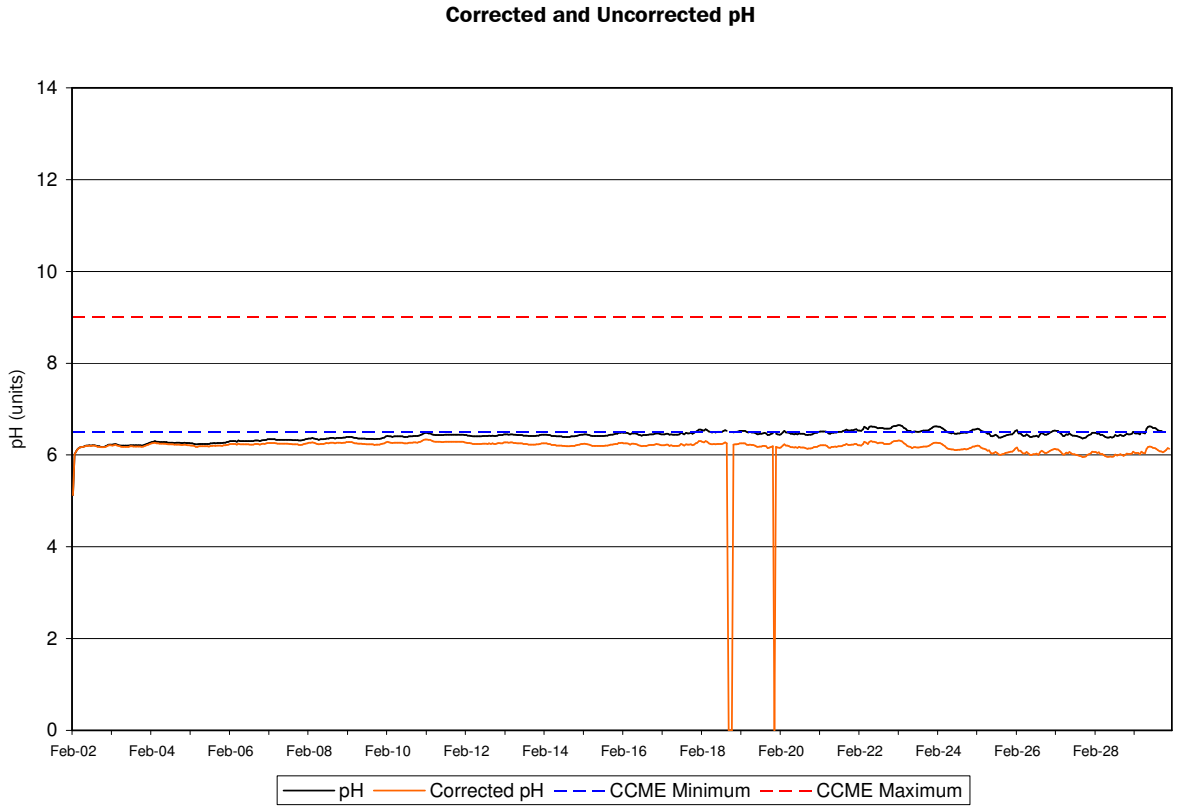
- No correction was required in water temperature during the deployment period at Rattling Brook below Plant Discharge as the data correction criterion was not exceeded. Temperature ranged from 0.03 to 3.36°C during the period from February 2nd, 2010 to March 2nd, 2010. At the start of Figure 6, water temperature is very flat and stable but quickly rises and begins to show diurnal cycles as ice melts and the water begins to accept incoming solar radiation.

Figure 6: Water temperature at Rattling Brook below Plant Discharge



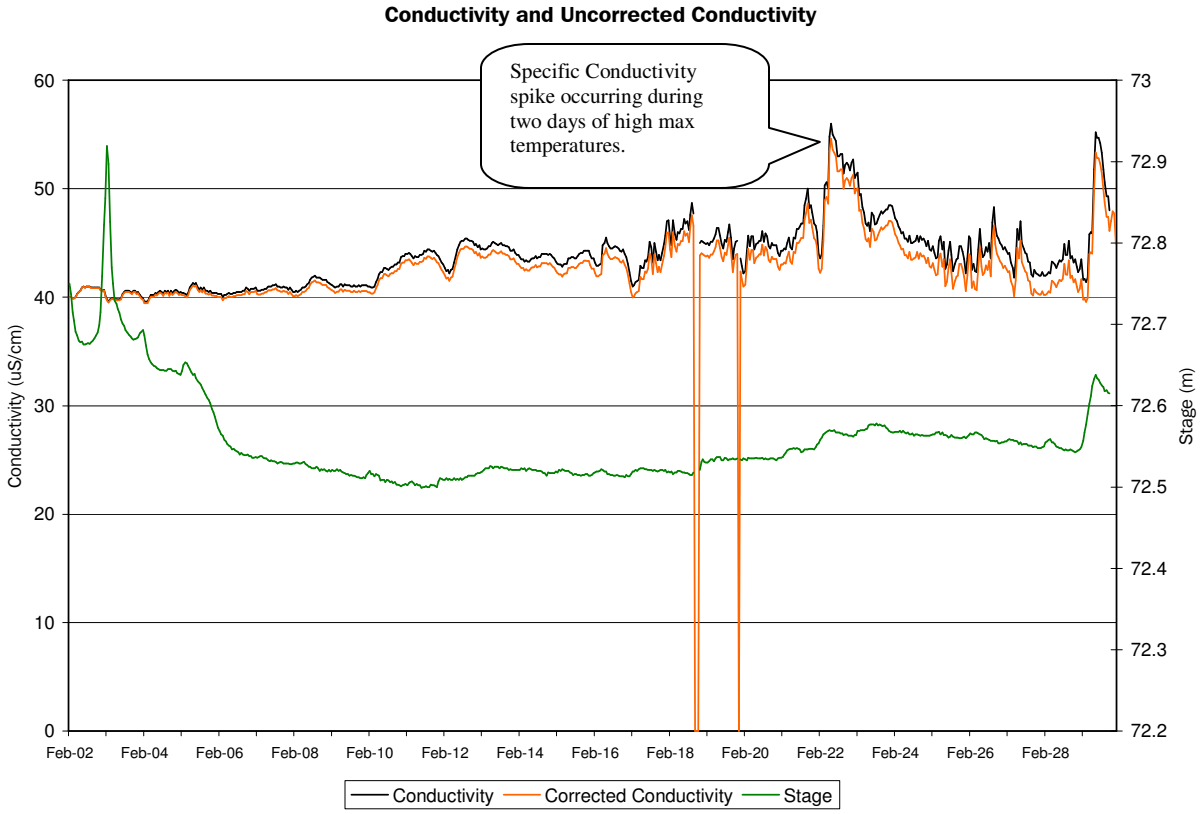
- A slight correction of -0.45 was applied to pH at the end of the deployment period. Corrected pH ranged from 5.12 to 6.34 during this deployment period. These values fall outside the minimum CCME Guideline of 6.5 for the Protection of Aquatic Life. This is not of concern, however, as rivers in this area of the province are slightly acidic.

Figure 7: pH at Rattling Brook below Plant Discharge



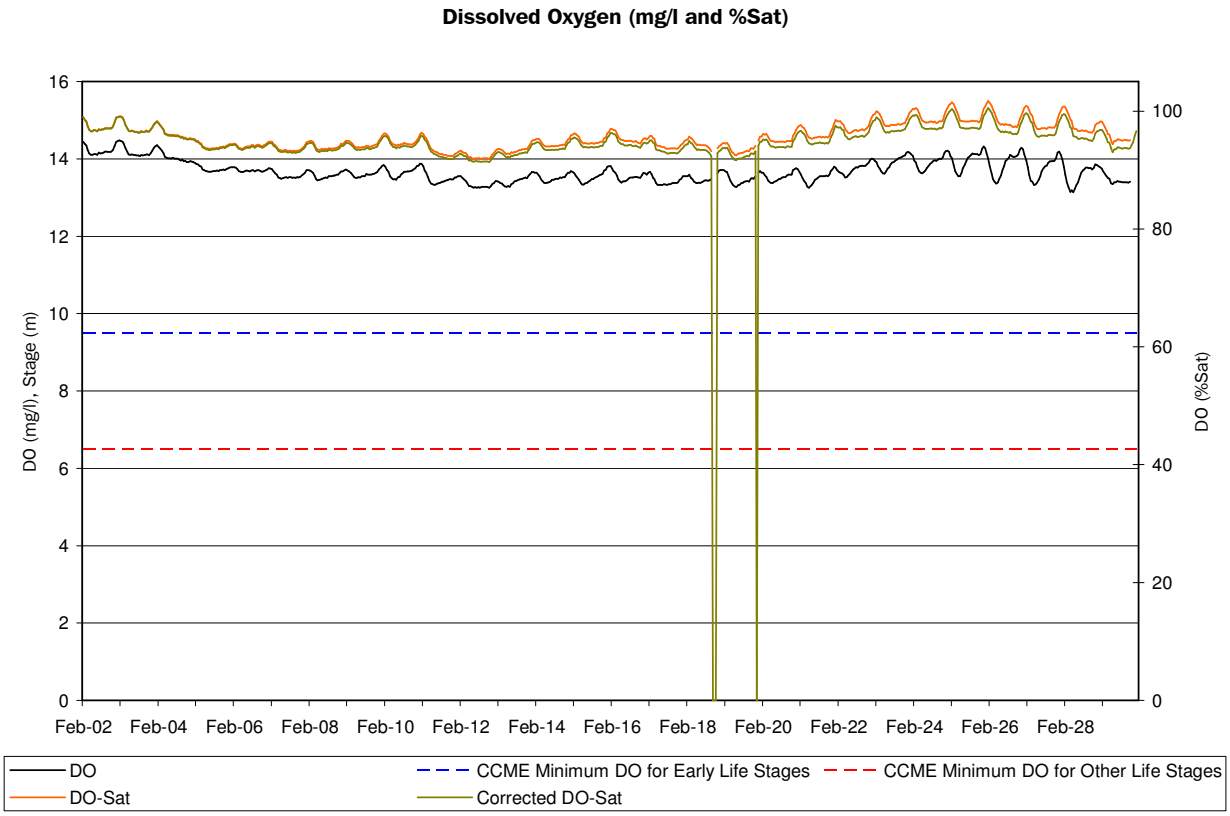
- A correction of -1.9 was applied to Specific Conductivity at the end of the deployment period. Corrected conductivity ranged from 39.5 to 54.6 µS/cm from February 2nd to March 2nd. A large spike on February 22nd relates to a maximum temperature of 5.9°C on that day. The resultant melt water carried a load of ions into the stream canal increasing conductivity.

Figure 8: Specific Conductivity at Rattling Brook below Plant Discharge



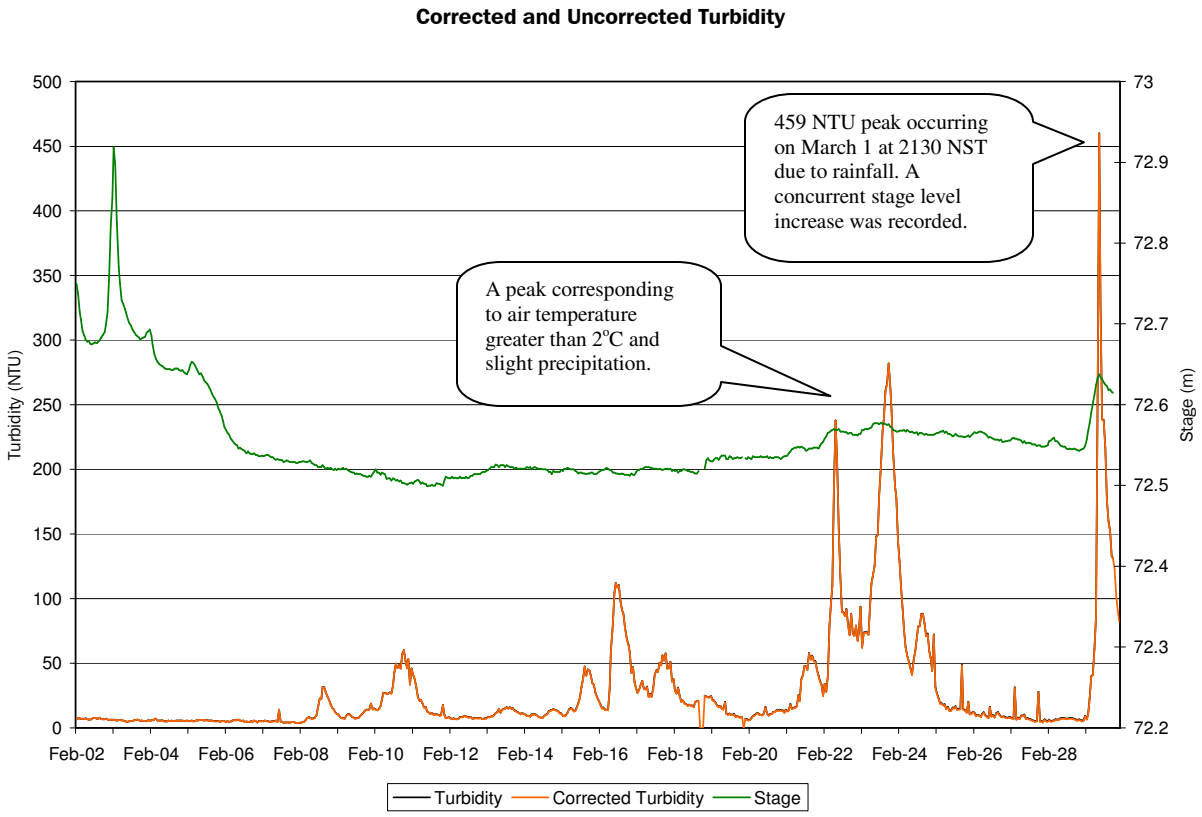
- A slight correction of -1.4 % was applied to the record of dissolved oxygen saturation for this deployment. Dissolved oxygen ranged from 13.14 to 14.48 mg/l during this deployment period – all values were greater than the minimum CCME guideline value of 6.5 and 9.0 mg/l for the protection of Early Life Stage and Other Life Stage cold water biota.

Figure 9: Dissolved Oxygen at Rattling Brook below Plant Discharge



- A minor correction of -0.55 NTU was applied to the turbidity record for this month. Values ranged from a low of 3.7 NTU to a maximum of 459.5 NTU on March 1st, 2010 at 21:30 NST during a rain event and increased stage level. Such a rise in flow likely resulted in runoff depositing sediment in the stream channel and possibly lofting silt that had previously settled on the stream bed. During this deployment, the median turbidity value was found to be 11.36 NTU.

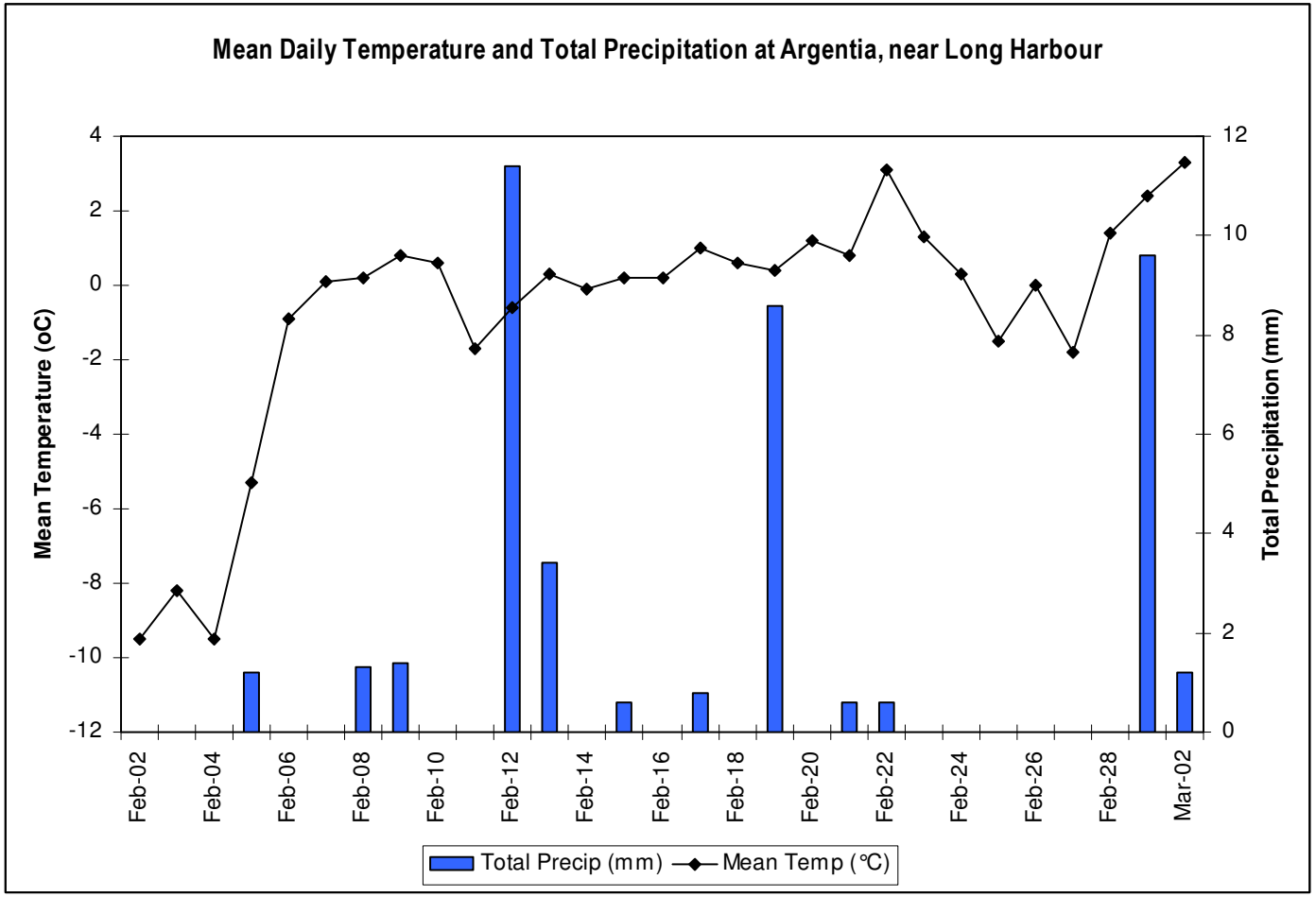
Figure 10: Turbidity at Rattling Brook below Plant Discharge



Conclusions

- The stations at Rattling Brook below Bridge and below Plant Discharge performed as expected from February 2nd, 2010 to March 2nd, 2010. Water temperature, pH and dissolved oxygen were found to be within the expected ranges for this time of year. Turbidity, however, exceeded the set alert levels multiple times throughout the deployment period.
- Rattling Brook Big Pond station was inactive for this period due to ice conditions preventing deployment. The station will resume operation as soon as conditions allow.

Appendix



Prepared by:
Ryan Pugh
Department of Environment and Conservation
Water Resources Management Division
Phone: 709.729.1681
Fax: 709.729.3020