Real-Time Water Quality Deployment Report
Rattling Brook Network
March 3rd, 2010 to March 30th, 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 below Bridge and Rattling Brook below Plant Discharge stations for the period of March 3rd, 2010 to March 30th, 2010; a period of 28 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.

Maintenance and Calibration of Instrument

- As part of the Quality Assurance and Quality Control protocol (QAQC), an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is 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 for temperature and dissolved oxygen are compared between the two instruments. A grab sample is taken to compare with the Field Sonde for specific conductivity, pH and turbidity parameters. Based on the degree of difference between parameters recorded by the Field Sonde, QAQC Sonde and grab sample 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 in the laboratory, an assessment of calibration drift is made and the two error values are combined to give Total Error (T_e). If T_e exceeds a predetermined data correction criterion, a correction based on T_e is applied to the dataset using linear interpolation. Based on the value for T_e, a qualitative statement is also made on the data quality in Table 1 upon Removal.

Table 1: QA/QC Data Comparison Rankings upon Deployment on March 3rd, 2010 to March 30th, 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	March 3rd, 2010	Deployment	Excellent	Good	Excellent	Good	Poor
	March 30th, 2010	Removal	Excellent	Excellent	Good	Excellent	Good
Below Plant Discharge	March 3rd, 2010	Deployment	Good	Good	Excellent	Excellent	Poor
	March 30th, 2010	Removal	Excellent	Excellent	Excellent	Good	Good

- Turbidity at Plant Discharge station was ranked as 'Poor' upon deployment and ranked as 'Good' upon removal. This suggests that the turbidity result from the grab sample taken during the deployment under reported the turbidity value recorded simultaneously by the Hydrolab. The grab sample value reported 16.0 NTU while the Hydrolab recorded a value of 41.0 NTU.

Data Interpretation

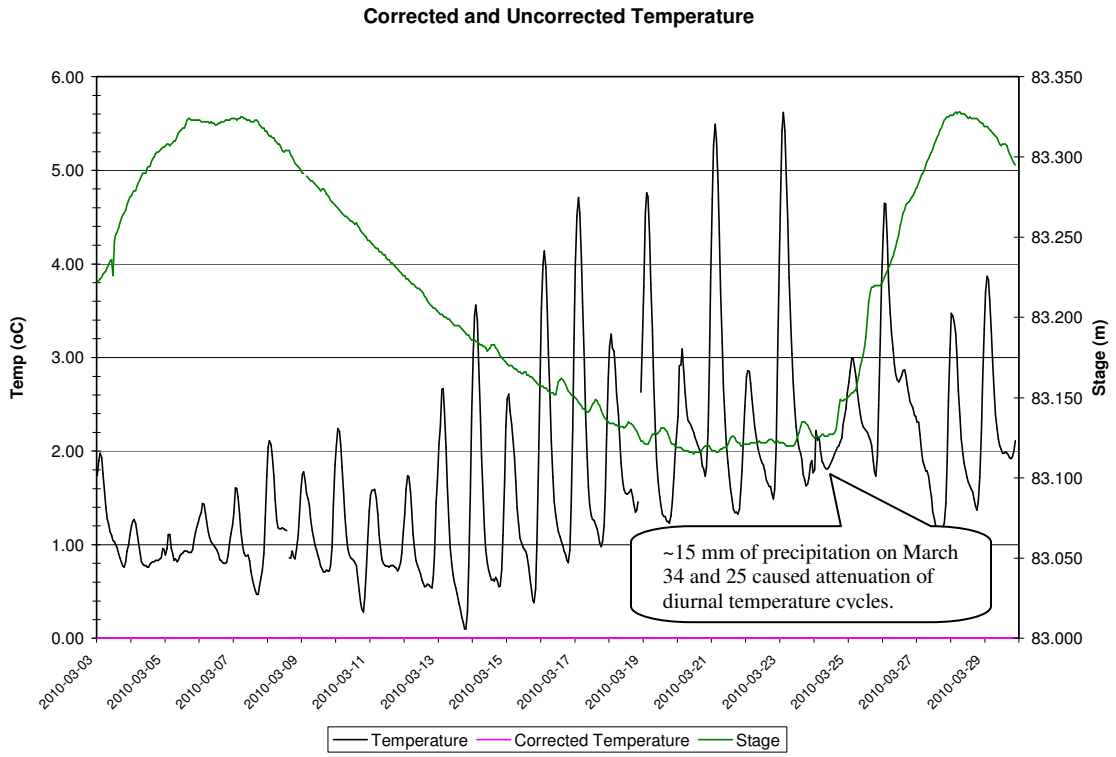
RATTLING BROOK BIG POND

- Ice conditions at Rattling Brook Big Pond precluded the deployment of a Hydrolab on March 3rd, 2010. A reassessment will be made during the next maintenance/calibration outing in early April, 2010 to determine if a re-deployment is appropriate.

RATTLING BROOK BELOW BRIDGE

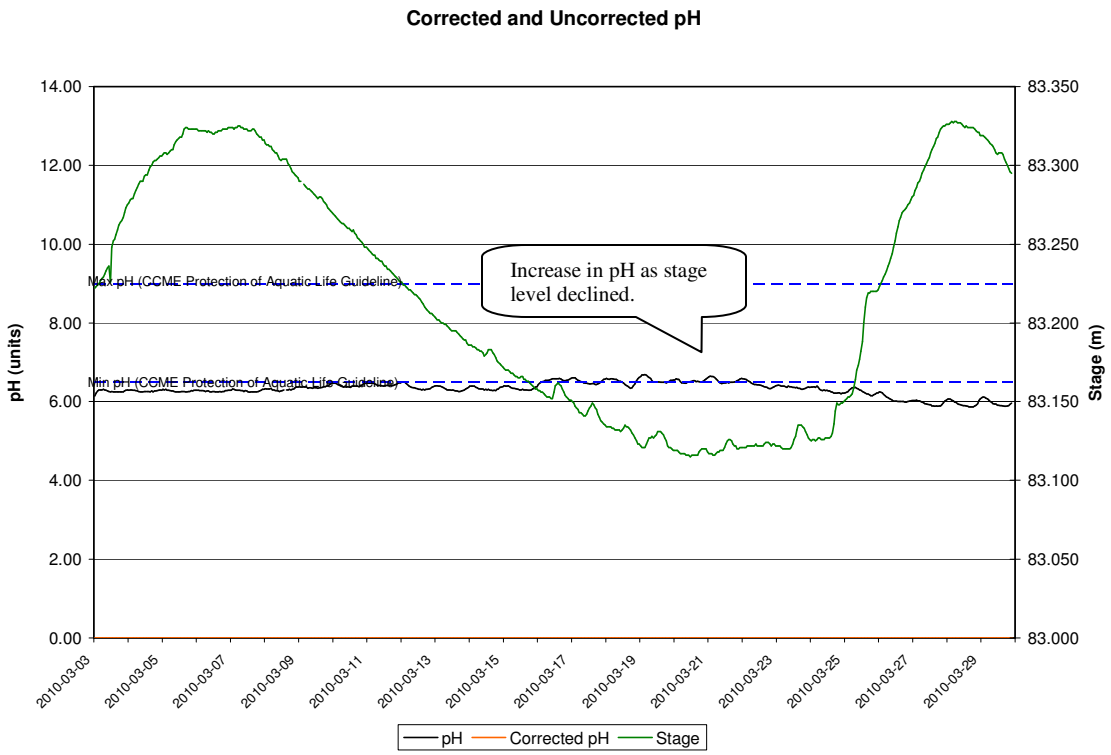
- Total Error calculated for temperature did not exceed the data correction criterion for this deployment; no correction was applied and the raw data is displayed in Figure 1. The temperature ranged from 0.10 to 5.62°C during the 28 day period. As the remaining ice cover on the river receded and air temperature began to rise as the deployment went on, diurnal cycles became much more obvious and an increasing trend in temperature is evident. Precipitation on March 24th and 25th caused attenuation in the diurnal temperature cycles but recovered quickly.

Figure 1: Water Temperature at Rattling Brook below Bridge from March 3, 2010 to March 30, 2010.



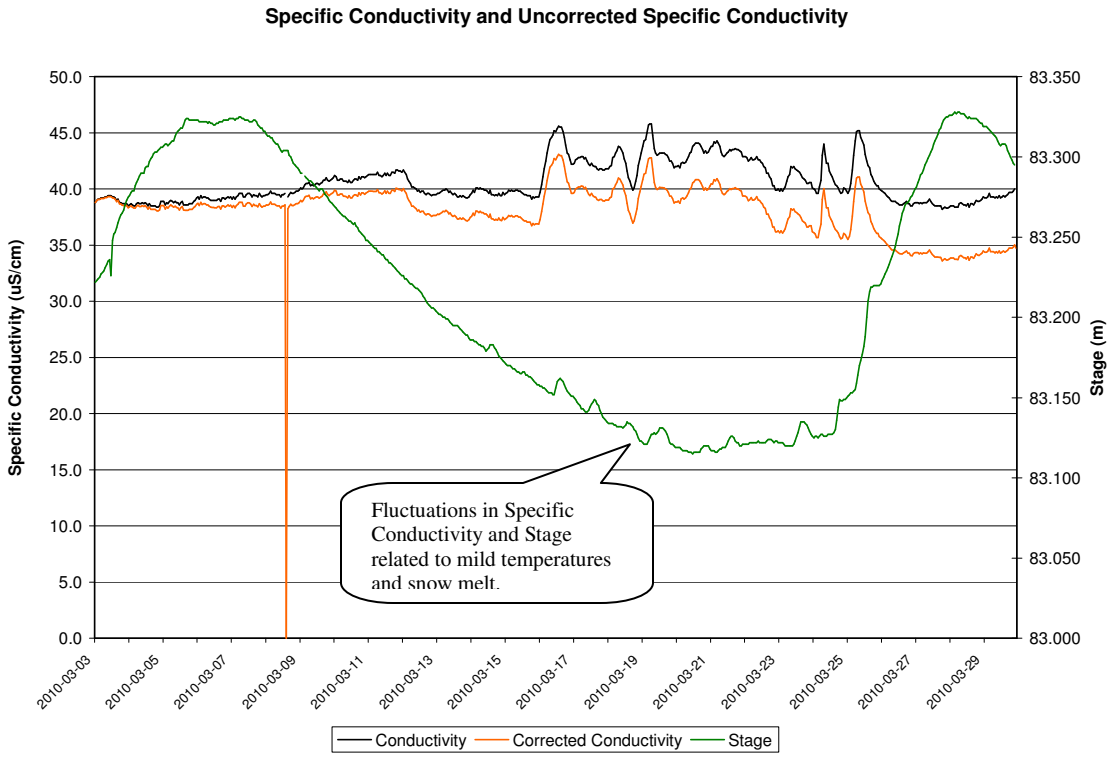
- During this deployment, the Total Error for pH did not exceed the data correction criterion and the data presented is raw data. The range in pH was from 5.87 to 6.69 but no rapid spikes were seen that would suggest an unusual event. A slight rise in pH was observed as stage level reached the deployment minimum. Most values were found to be below the CCME Guideline for the Protection of Aquatic Life of 6.5; however, this is expected for the region.

Figure 2: pH at Rattling Brook below Bridge from March 3, 2010 to March 30, 2010.



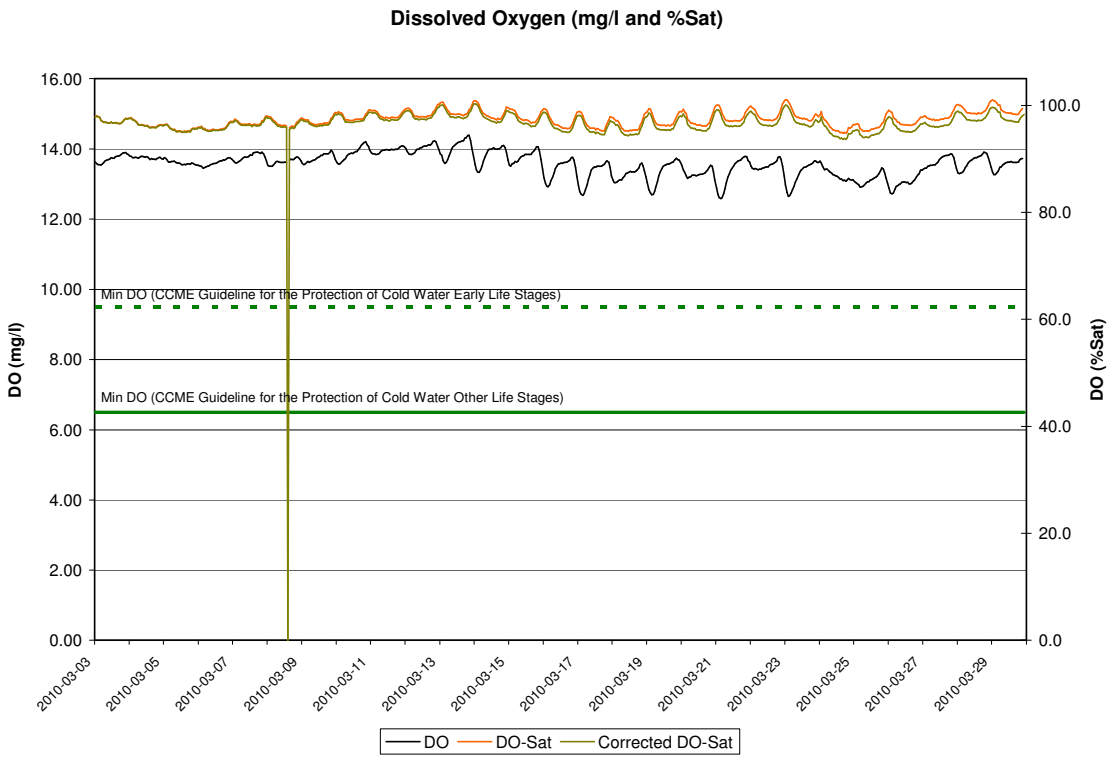
- During laboratory calibration, the conductivity probe produced an inflated measurement in the calibration standard. Because of this the Total Error for specific conductivity exceeded the data correction criterion and a correction of 5 µS/cm was applied. Corrected specific conductivity ranged from 33.6 to 43.1 µS/cm. March 15th through 25th were mild days and resulted in fluctuations in specific conductivity as snow melted and water was released into the stream channel. This is supported by the presence of small, short-term changes in stage.

Figure 3: Specific Conductivity at Rattling Brook below Bridge from March 3, 2010 to March 30, 2010.



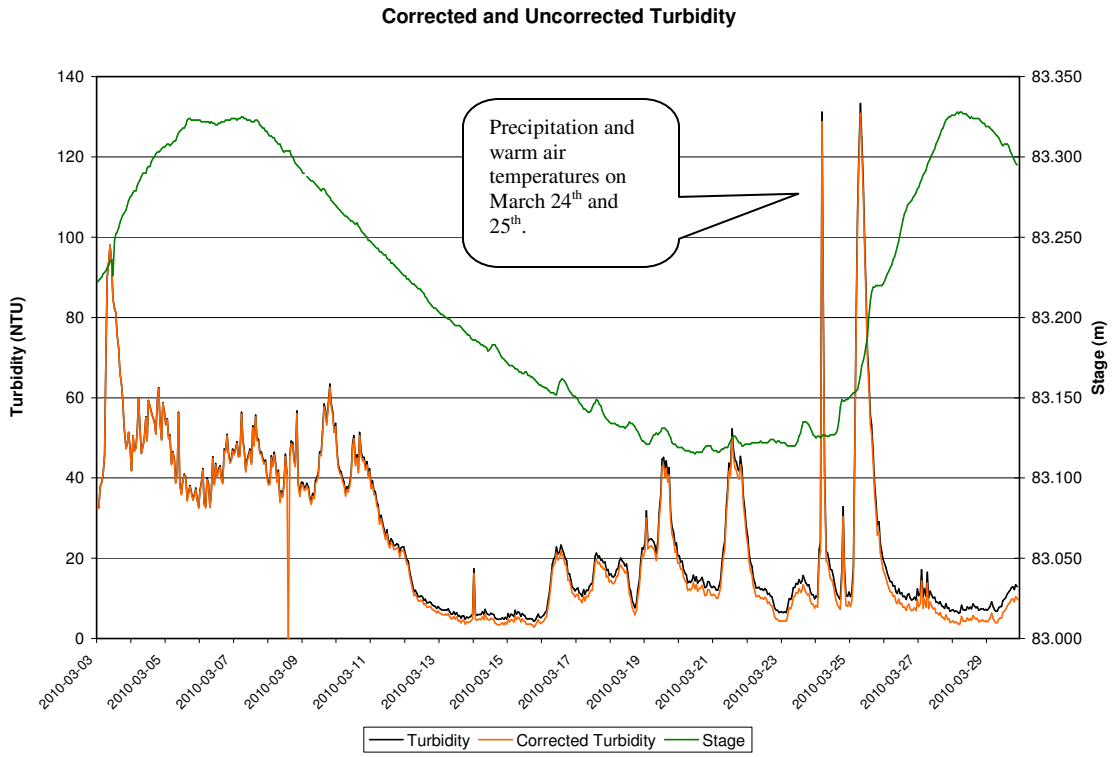
- A small correction of 1.4% was applied to percent saturation for this deployment. The saturation of dissolved oxygen ranged from 93.7 to 100.3% and DO concentration ranged from 14.39 to 12.58 mg/l. All values were above the CCME guidelines of 6.5 mg/l and 9.0 mg/l for the Protection of Early Life Stage and Other Life Stage Cold Water Biota. A marginal downward trend is seen in the concentration of DO as water temperature begins warming with the seasonal temperatures.

Figure 4: Dissolved Oxygen at Rattling Brook below Bridge from March 3, 2010 to March 30, 2010.



- During the field cleaning and laboratory calibration process, a Total Error of -3 NTU was found and applied to the turbidity record. Turbidity ranged from 4.3 to 133.3 NTU for this deployment period. It appears that a trend towards lower turbidity is occurring throughout the deployment period, however, two large spikes are still seen in later points in the deployment – though these are likely related to the precipitation on March 24th and 25th.

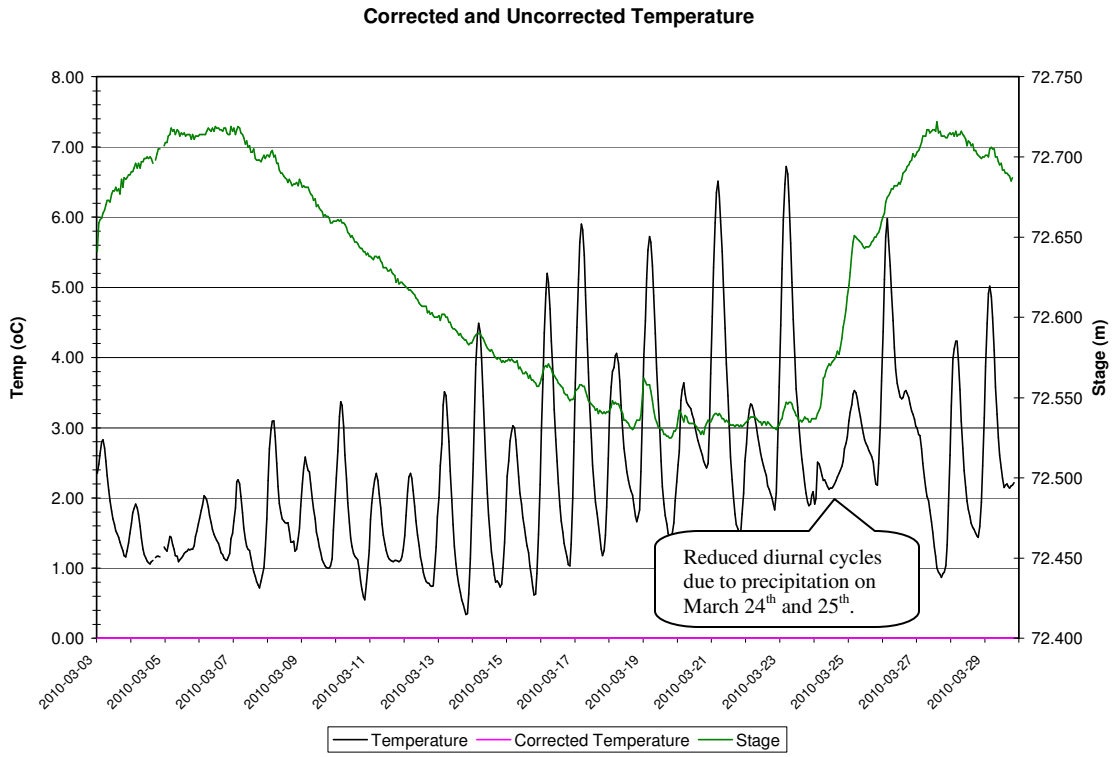
Figure 5: Turbidity at Rattling Brook below Bridge from March 3, 2010 to March 30, 2010.



RATTLING BROOK BELOW PLANT DISCHARGE

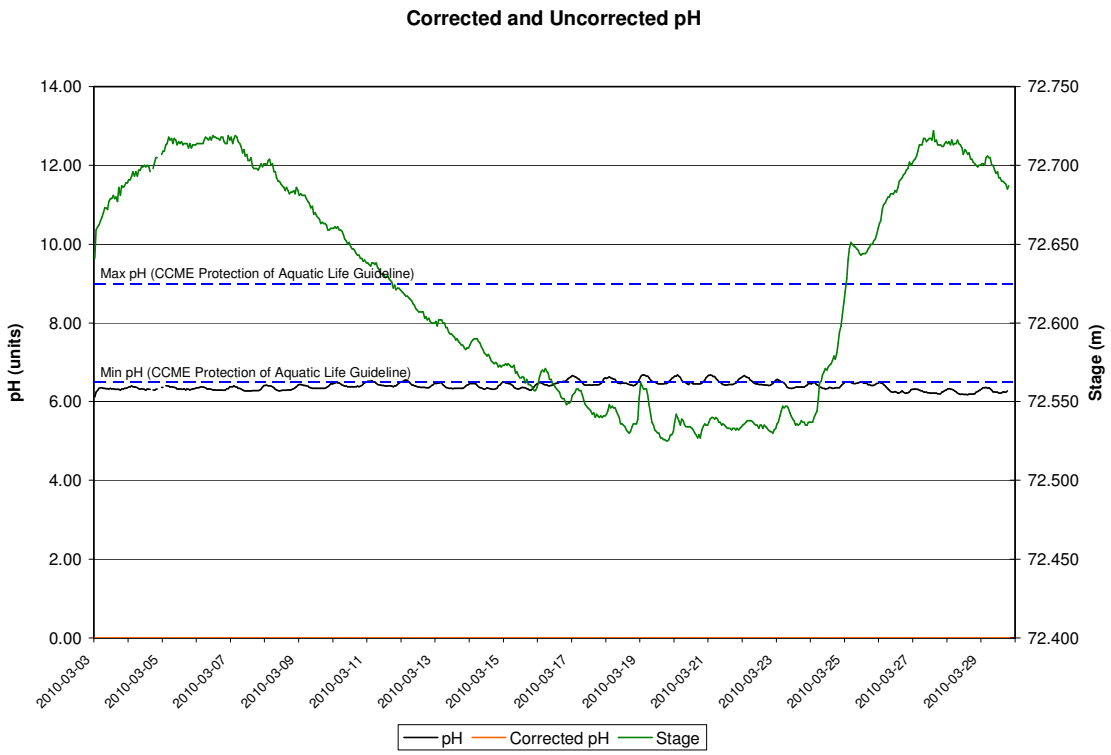
- No correction was deemed necessary for water temperature during this deployment as the Total Error was below the correction threshold. Temperature ranged from 0.34 to 6.72°C during this deployment period. An upward trend is seen in water temperature as are the obvious diurnal cycles in temperature. Precipitation on March 24th and 25th resulted in a damping of the diurnal effects, however, these recovered quickly upon fine weather.

Figure 6: Water Temperature at Rattling Brook below Plant Discharge from March 3, 2010 to March 30, 2010.



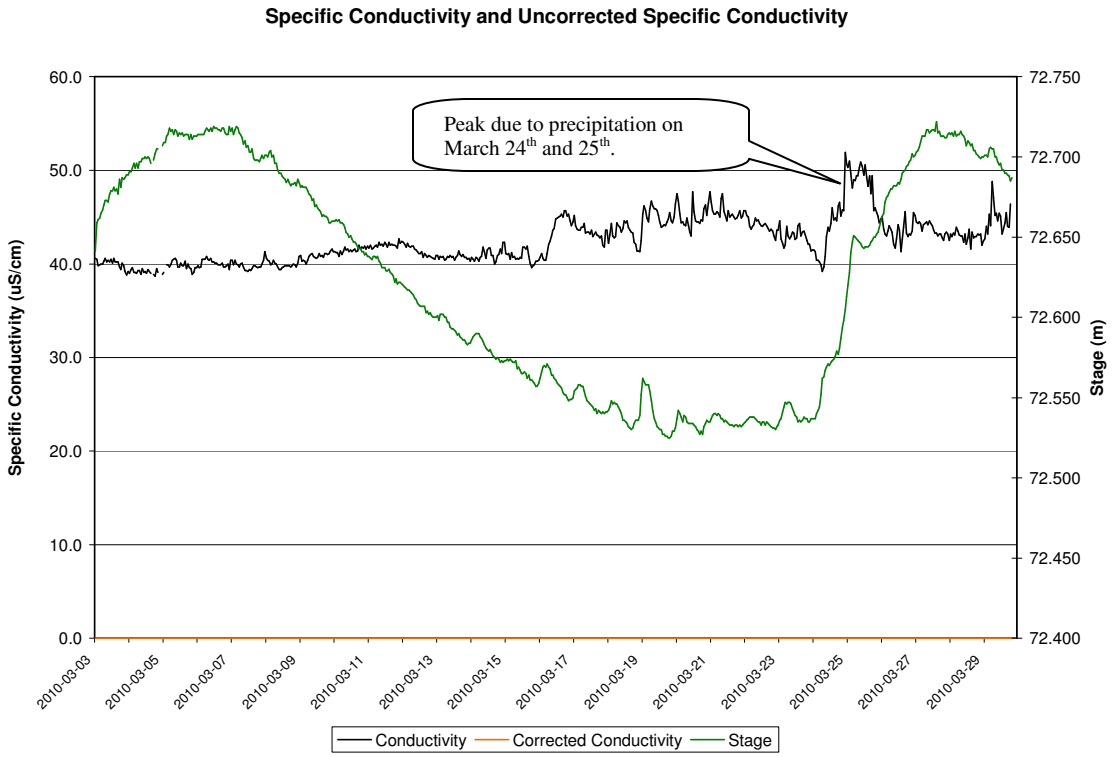
- No correction was required to pH during this deployment period since the correction criterion was not exceeded. pH values ranged from 6.12 to 6.68 and rose slightly when Stage was lowest. This trend was mirrored at Rattling Brook below Bridge station when pH was highest as Stage at the deployment minimum.Values were below the CCME Guideline for the Protection of Aquatic Life of 6.5; however it is normal for water bodies to be slightly acidic in this region.

Figure 7: pH at Rattling Brook below Plant Discharge from March 3, 2010 to March 30, 2010.



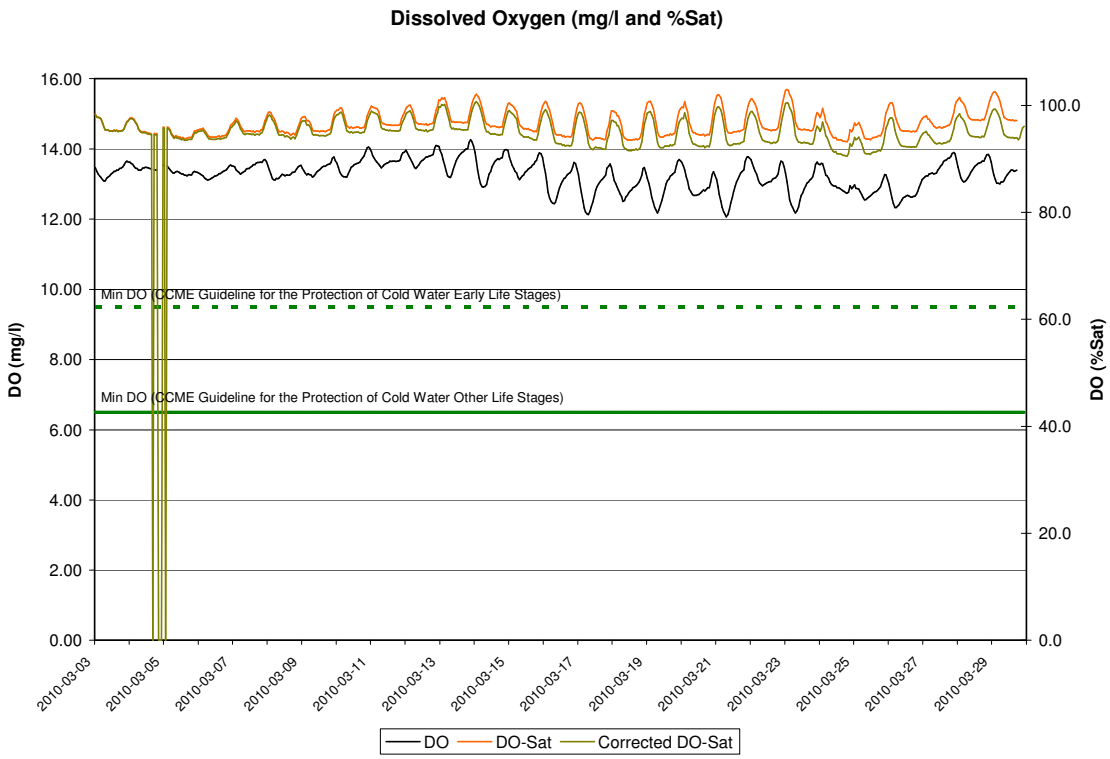
- During this deployment, the data correction criterion for specific conductivity was not exceeded and the data presented are the raw values. Unlike below Bridge station, conductivity values at this station show much more short term variation as shown by the jagged appearance of Figure 8. Values ranged from 38.7 to 51.9 µS/cm during this deployment period and peaked during warm temperatures and precipitation on March 24th and 25th.

Figure 8: Specific Conductivity at Rattling Brook below Plant Discharge from March 3, 2010 to March 30, 2010.



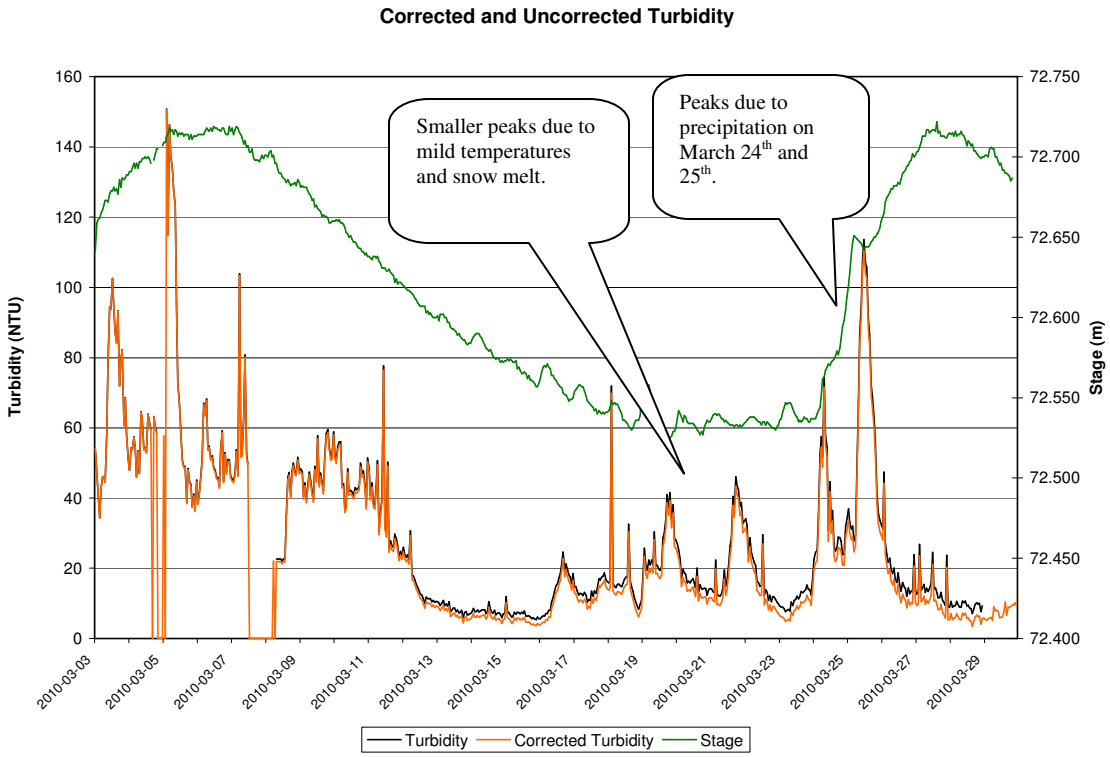
- Percent Saturation was corrected by 3.30% for this deployment period and ranged from 93.2 to 103.0%. Corresponding to this was a concentration of dissolved oxygen that ranged from 14.27 to 12.07 mg/l and remained above the CCME Guidelines of 6.5 and 9.0 mg/l for the Protection of Early Life Stage and Other Life Stage Cold Water Biota throughout all 28 days.

Figure 9: Dissolved Oxygen at Rattling Brook below Plant Discharge from March 3, 2010 to March 30, 2010.



- A small correction of 3.75 NTU was applied to this month's turbidity record due to an exceedence of the data correction criterion. Corrected data ranged from 3.5 to 150.5 NTU during this 28 day period. Turbidity was quite high and variable during the first third of the deployment, likely due to precipitation on March 1st and 2nd when ~11 mm fell. This effect began to settle down around March 12th as Stage level receded. Smaller peaks were observed in the middle of the deployment, likely in relation to mild weather and snow melt causing high flows through the river. Near the end of deployment, a rainfall of about 15 mm over two days caused two peaks in turbidity and a large increase in stage level.

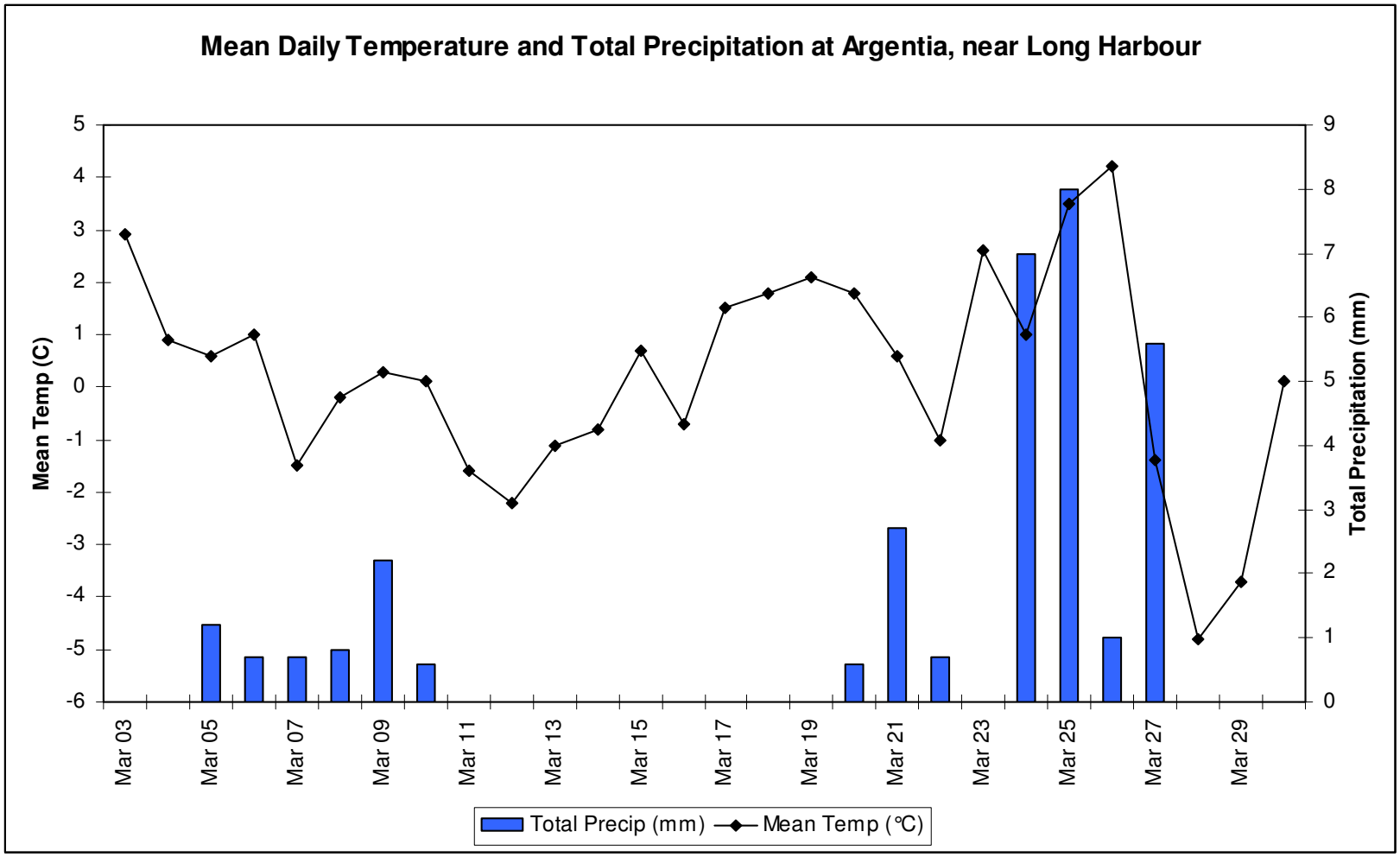
Figure 10: Turbidity at Rattling Brook below Plant Discharge from March 3, 2010 to March 30, 2010.



Conclusions

- Rattling Brook Big Pond station was inactive for the second month in a row due to unfit ice conditions that precluded instrument deployment. It is anticipated that re-deployment will be in early April during the next routine maintenance/calibration trip to Long Harbour.
- Stations at Rattling Brook performed as expected and reported temperature, pH, specific conductivity and dissolved oxygen levels appropriate for this time of the year. Due to extensive construction and runoff, turbidity levels are still elevated compared to historical records.

Appendix



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