Real-Time Water Quality Deployment Report

Rattling Brook Network

November 4, 2011 to December 1, 2011

Government of Newfoundland & Labrador
Department of Environment and Conservation
Water Resources Management Division
St. John's, NL, A1B 4J6 Canada

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2011-11-04 to 2011-12-01

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- Due to a field cable failure the first week of data is absent from all below Bridge station graphs. Additionally, a failed o-ring on the pH reference cell sleeve allowed saturated KCL solution to dilute resulting in severe drift of the pH readings. Consequently, the pH graph is not considered in this report.
- A pH sensor issue was observed at Plant Discharge station during the deployment period. pH levels were found to be consistently elevated and much higher than expected. The pH graph has been omitted from discussion in this report.

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 *in situ*, adjacent to the Field Sonde. Depending on the degree of difference between each parameter from the Field and QAQC sondes a qualitative rank is assigned (See Table 1). The possible ranks, from most to least desirable, are: Excellent, Good, Fair, Marginal, and Poor. A grab sample is also taken for additional confirmation of conditions at deployment and to allow for future modelling studies.
  - At the end of a deployment period, a freshly cleaned and calibrated QAQC Sonde is placed *in situ*, adjacent to the Field Sonde. Values are compared between all parameters and differences are ranked for placement in Table 1.

Table 1: Qualitative QAQC Ranking

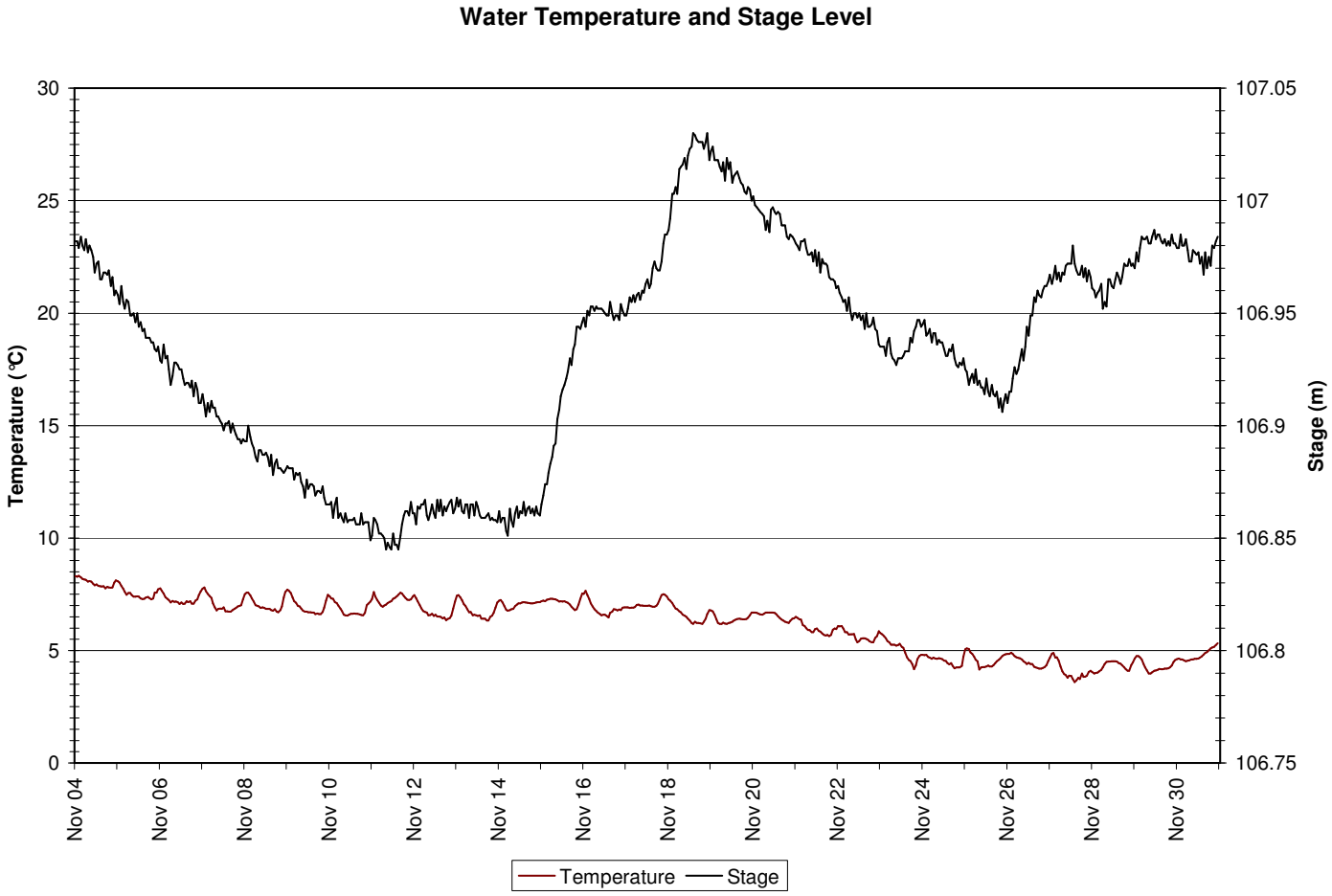
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	November 4, 2011	Deployment	Excellent	Excellent	Excellent	NA	Excellent
	December 1, 2011	Removal	Excellent	Excellent	Excellent	Good	NA
Rattling Brook below Bridge	November 4, 2011	Deployment	NA	NA	NA	NA	NA
	December 1, 2011	Removal	Good	Poor	Excellent	Excellent	Poor
Rattling Brook below Plant Discharge	November 4, 2011	Deployment	Excellent	NA	Good	Excellent	Excellent
	December 1, 2011	Removal	Excellent	NA	Excellent	Excellent	Excellent

Notes:
1) An unusually high turbidity reading from the QAQC sonde during removal at Bridge and Plant Discharge stations meant reliable QAQC ranks could not be made.
2) Due to a failure of the field cable during deployment of Bridge station, initial QA readings could not be made, disallowing any ranked comparisons between Field and QAQC sondes.
3) A lack of battery power in the QAQC sonde meant there was insufficient power to run the DO sensor. No readings were displayed.
4) pH ranking at Plant Discharge station was omitted due to a sensor issue.

Data Interpretation

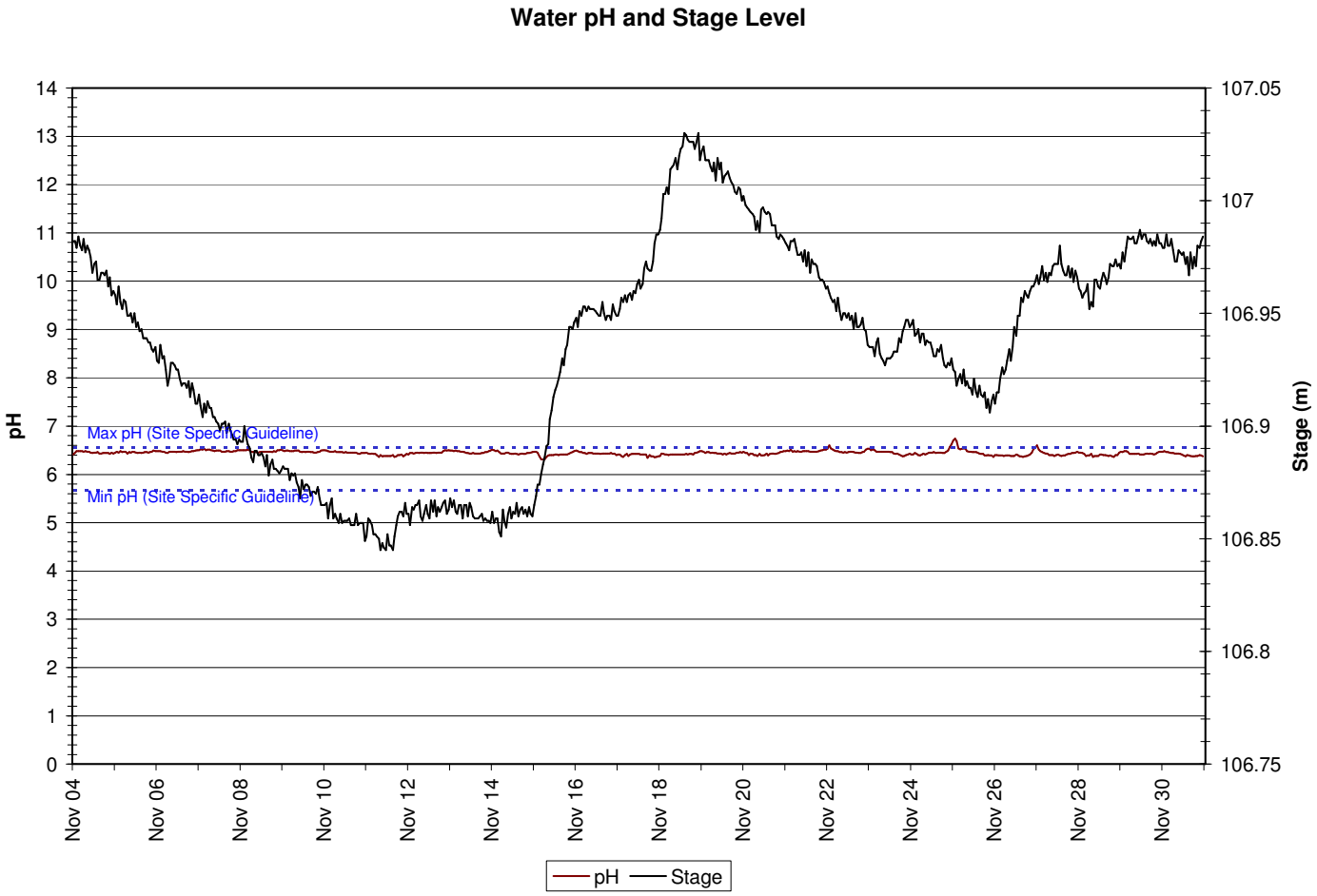
Rattling Brook Big Pond

Figure 1: Water Temperature at Rattling Brook Big Pond from November 4, 2011 to December 1, 2011



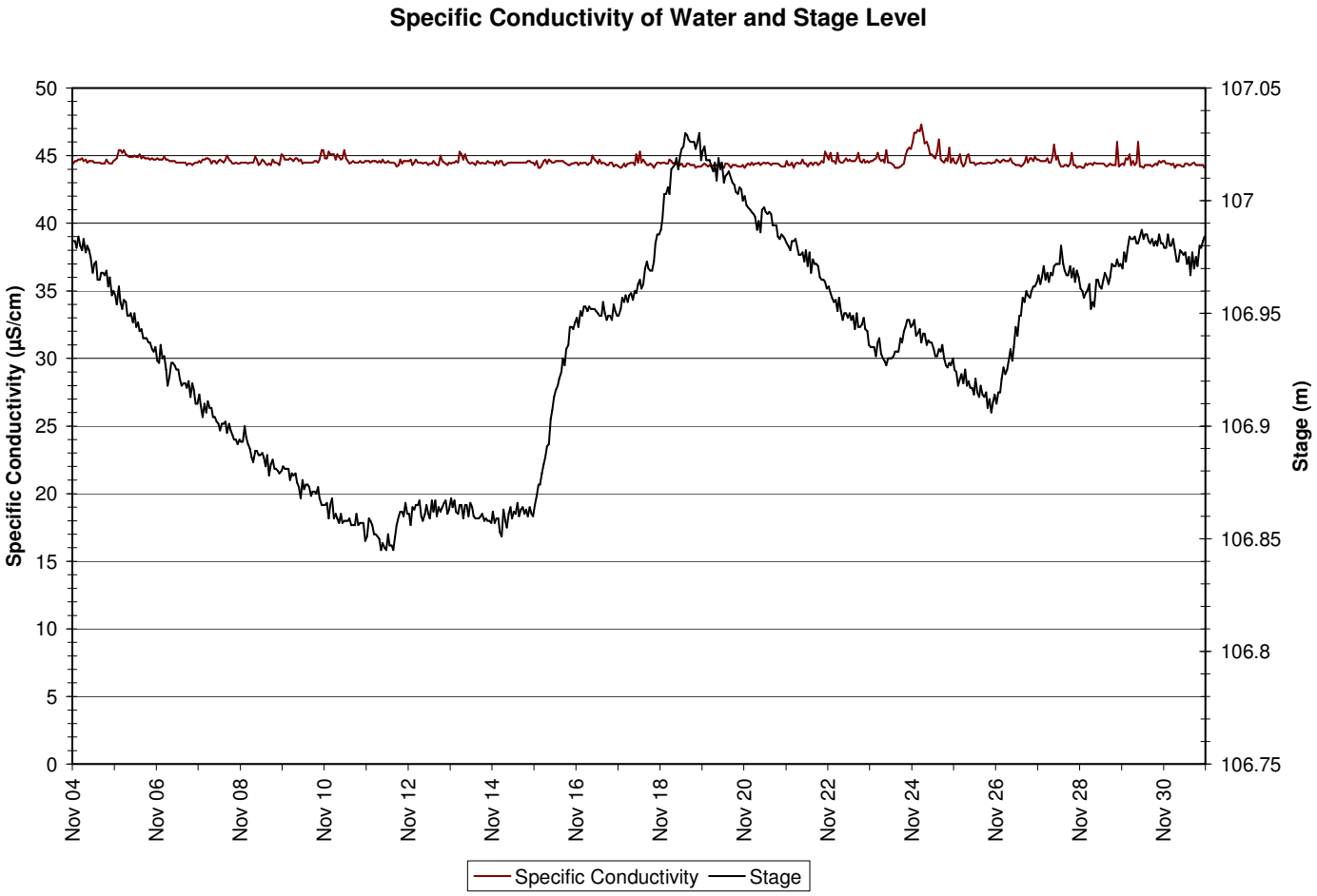
- Water temperature values fell throughout this month's deployment from a high of 8.33 to a low of 3.60°C (median value: 6.62°C).

Figure 2: pH at Rattling Brook Big Pond from November 4, 2011 to December 1, 2011



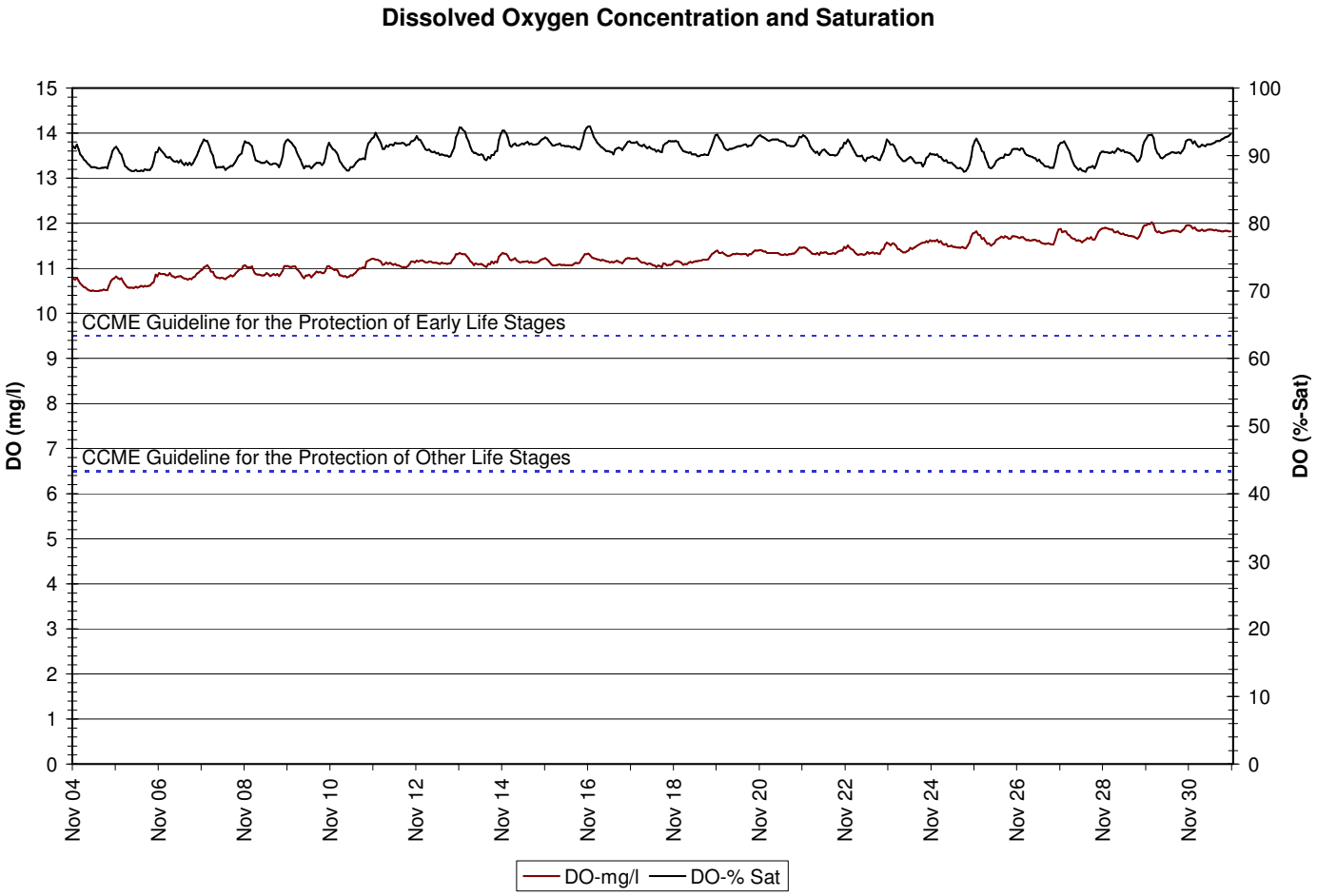
- pH values fell between 6.74 to 6.31 units (median value: 6.44) during the deployment. No particular trend or event was recognized during this time.
- The calculated site-specific guidelines for the Rattling Brook river system indicates pH values should fall within the range of 5.67 – 6.56 units 90% of the time. During the deployment period from November 4 to December 1, 2011, 1.1% values fell outside the site-specific guidelines – less than the expected 10%.

Figure 3: Specific Conductivity at Rattling Brook Big Pond from November 4, 2011 to December 1, 2011



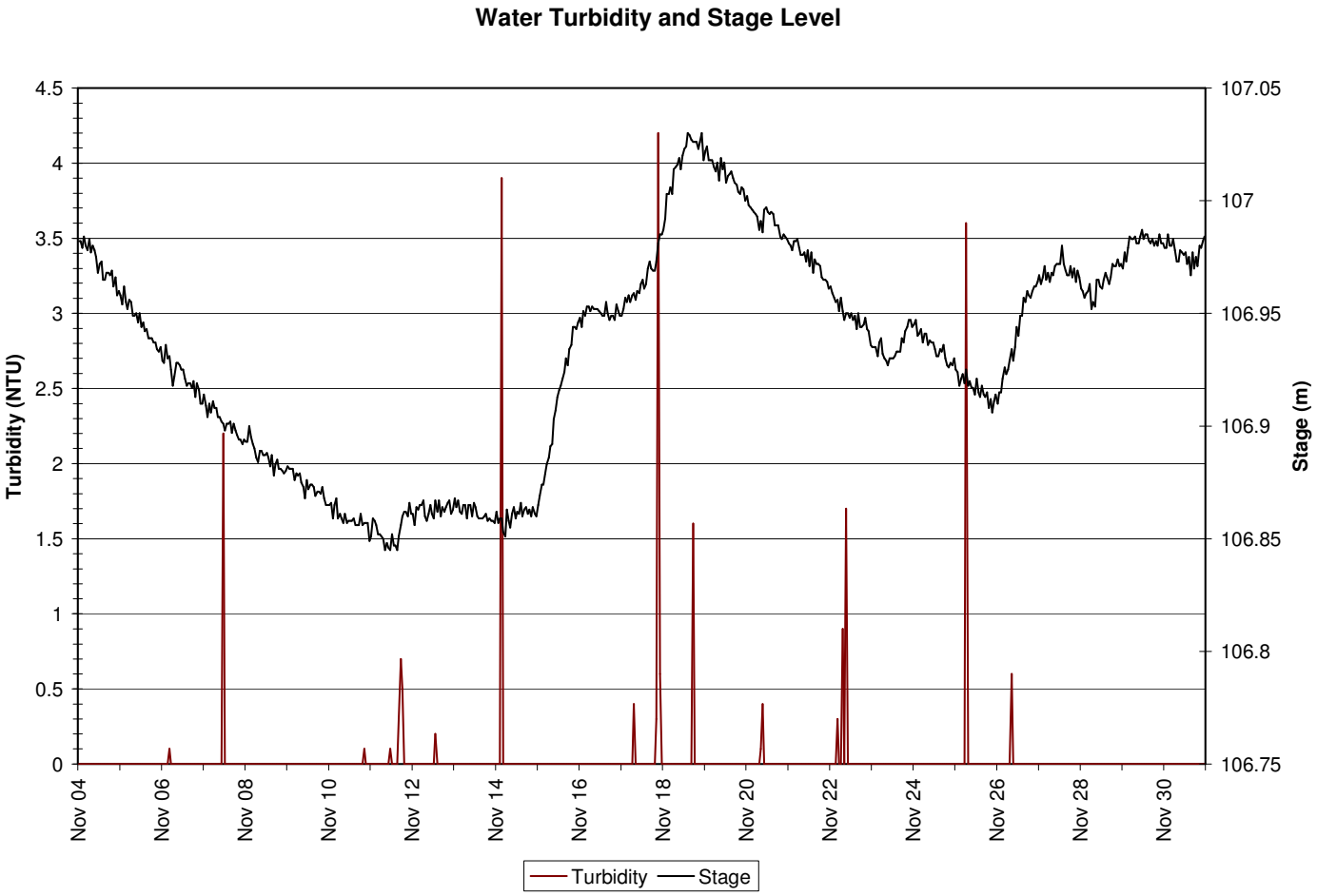
- Specific conductivity remained mostly level throughout the deployment period with no obvious trend or events present. Values ranged from 47.3 to 44.1 µS/cm during this time with a median value of 44.5 µS/cm.

Figure 4: Dissolved Oxygen at Rattling Brook Big Pond from November 4, 2011 to December 1, 2011



- Dissolved oxygen increased during the deployment period in conjunction with decreasing water temperatures. At deployment, the concentration of oxygen at Big Pond station was found to be 10.78 mg/l. At removal, the concentration was 11.82 mg/l (median value: 11.21 mg/l).
- All values were found to be above the CCME guidelines for the protection of Early and Other life stage cold water biota.

Figure 5: Turbidity at Rattling Brook Big Pond from November 4, 2011 to December 1, 2011

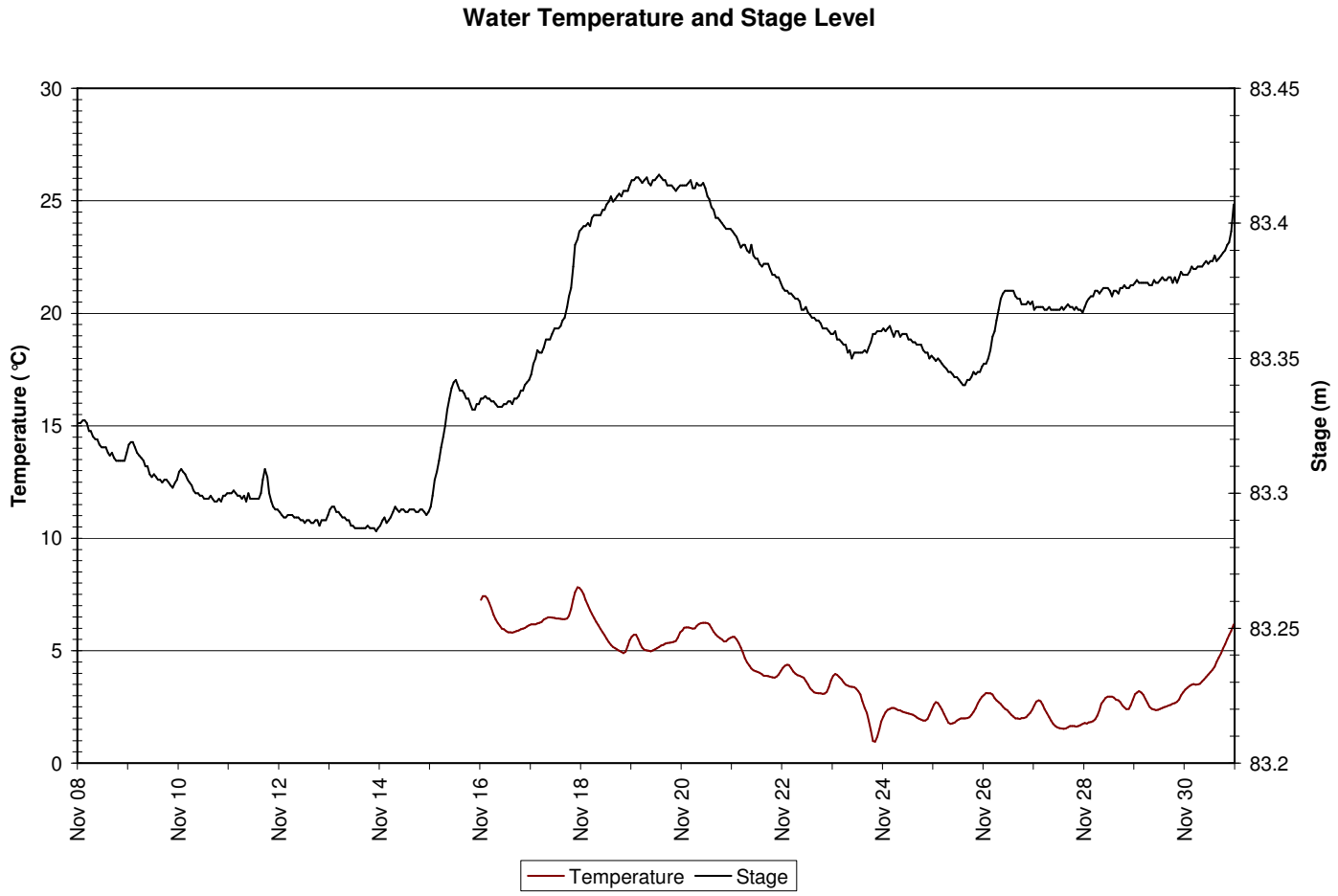


- Over the course of this 27 day deployment, turbidity levels were, generally, very low with periodic peaks up to 4.2 NTU. These peaks in turbidity were of short duration and resolved quickly, indicating that natural variability in water quality is likely the driving force behind any change. The median turbidity value at this time was 0.0 NTU.

Rattling Brook below Bridge

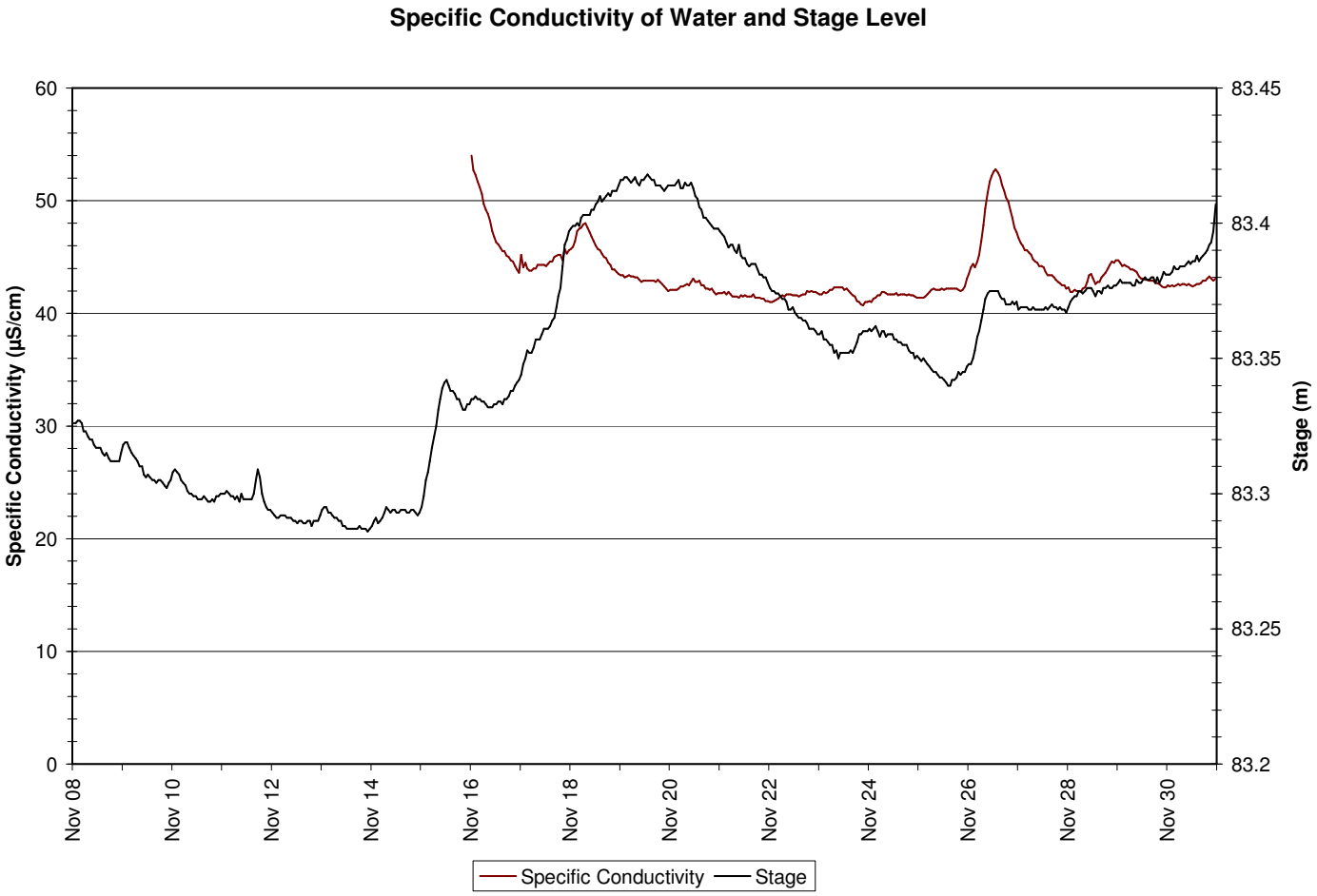
- Due to a failure of the field cable the first 8 days of water quality data are not available.

Figure 6: Water Temperature at Rattling Brook below Bridge from November 4, 2011 to December 1, 2011



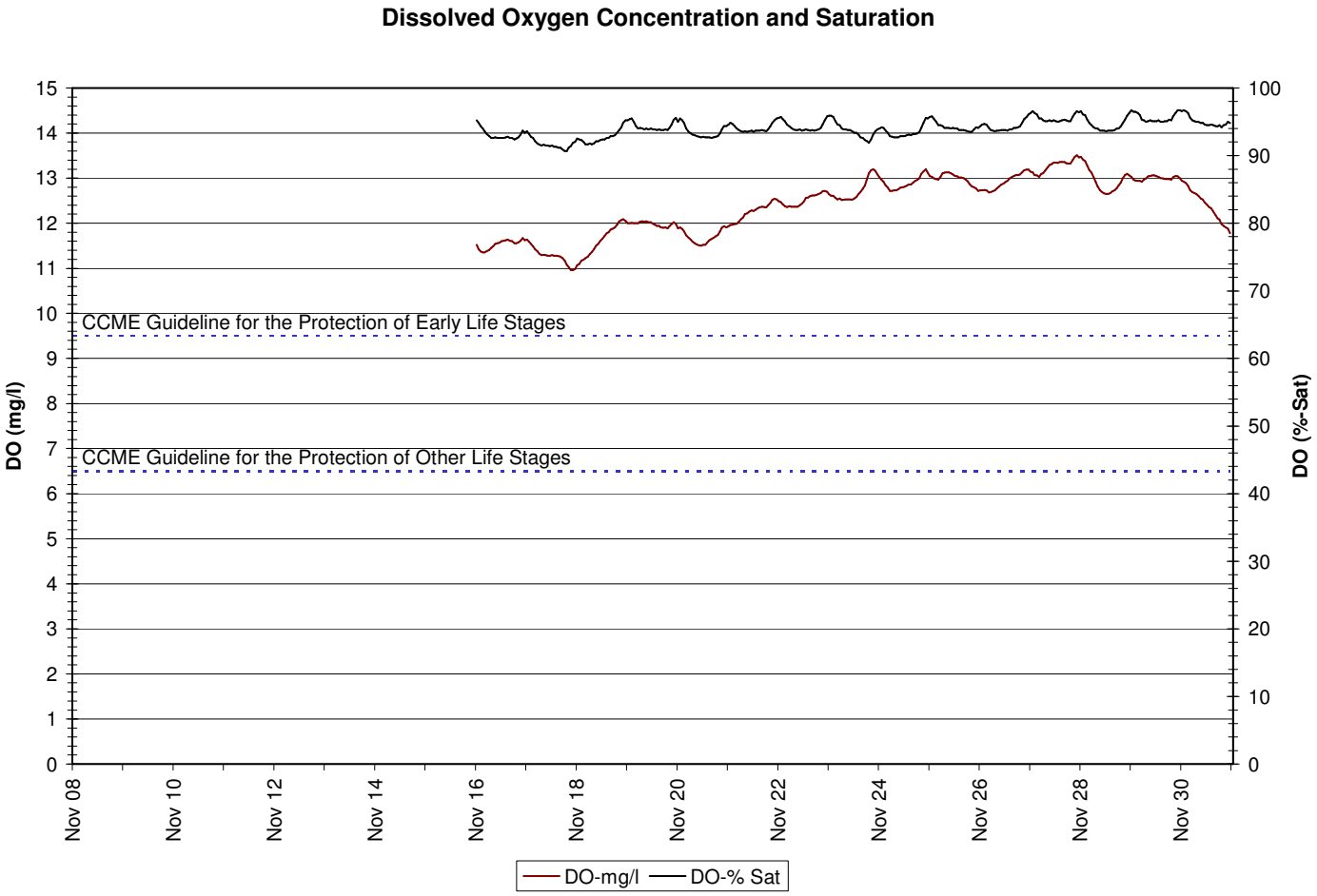
- Water temperature showed a decline into the last week of November with a subsequent increase towards December 1, roughly mirroring the air temperature trend over that time.

Figure 7: Specific Conductivity at Rattling Brook below Bridge from November 4, 2011 to December 1, 2011



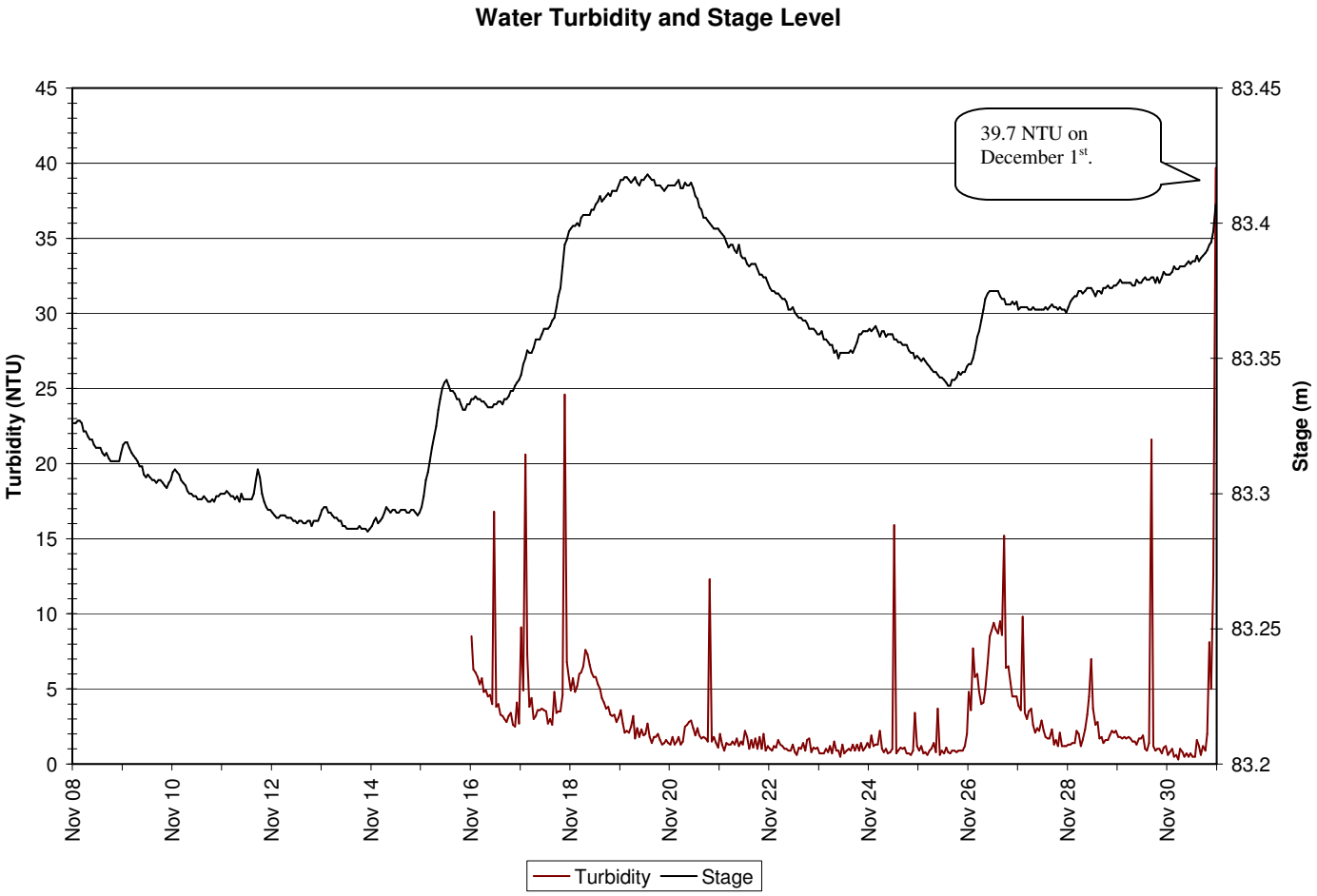
- Specific conductivity ranged from 54.0 to 40.7 µS/cm with a median value of 42.8 µS/cm during this deployment.

Figure 8: Dissolved Oxygen at Rattling Brook below Bridge from November 4, 2011 to December 1, 2011



- All available dissolved oxygen values were found to be above the CCME Guideline of 9.5 mg/l for the protection of early life stage cold water biota. The minimum concentration found during this deployment was 10.96 and reached a maximum of 13.51 mg/l (median value 12.55 mg/l).

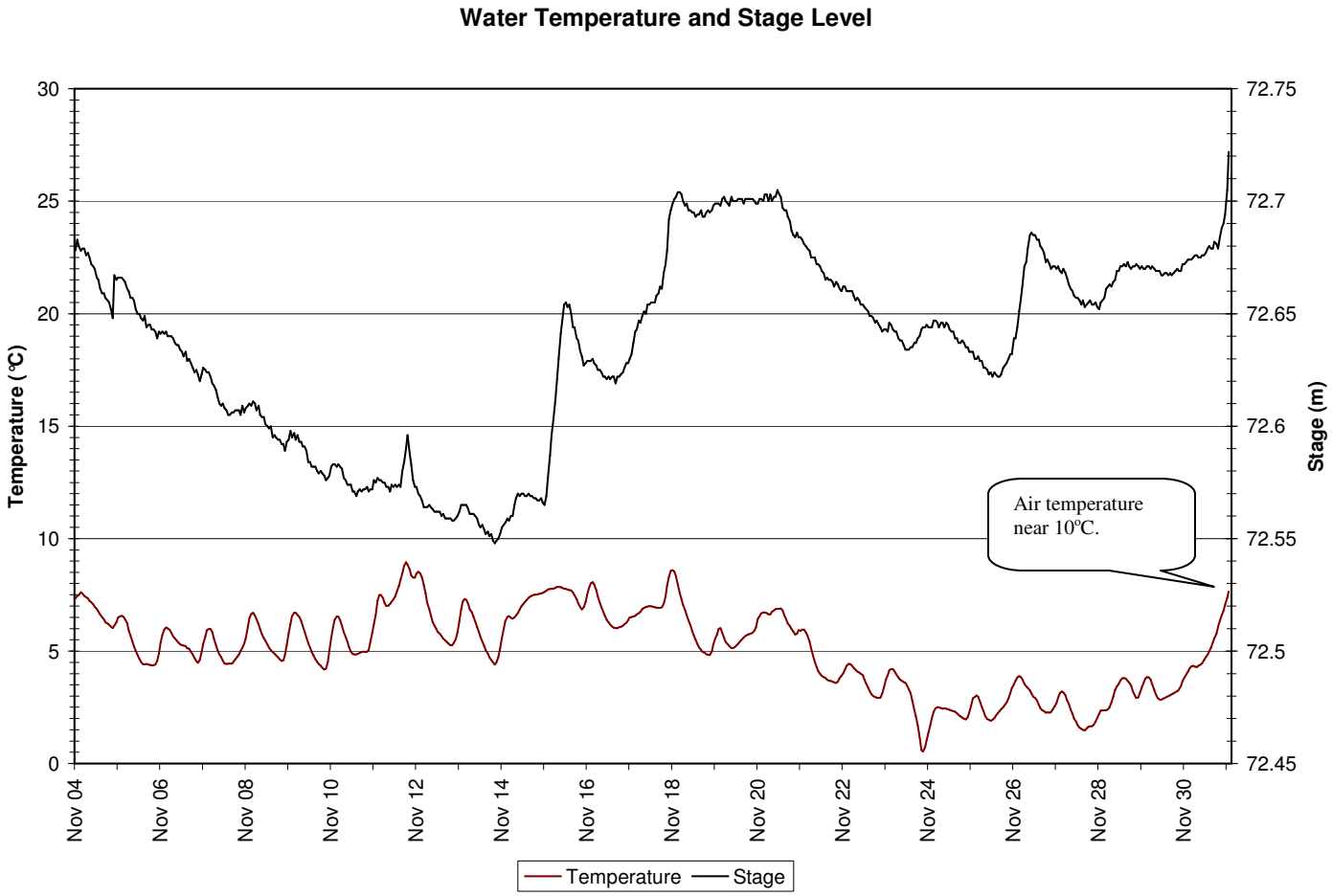
Figure 9: Turbidity at Rattling Brook below Bridge from November 4, 2011 to December 1, 2011



- Turbidity ranged from 0.3 to 39.7 NTU for the duration of this deployment period with a median turbidity value of 1.7 NTU.
- A series of turbidity spikes were observed during this deployment period. The highest, 39.7 NTU occurred on December 1 at 11:30 am during heavy rain and wind (near 40 mm of precipitation recorded).

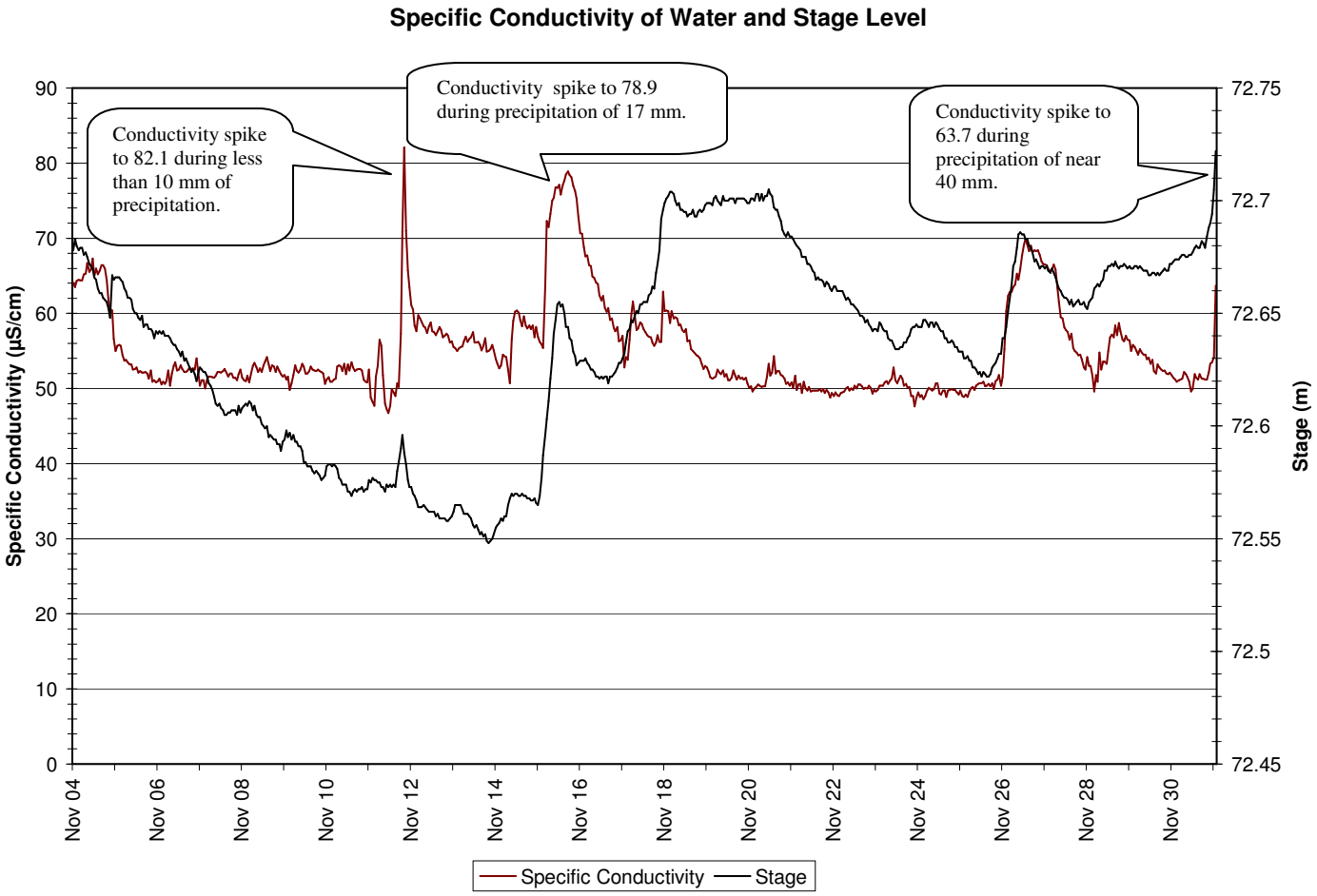
Rattling Brook below Plant Discharge

Figure 10: Water Temperature at Rattling Brook below Plant Discharge from November 4, 2011 to December 1, 2011



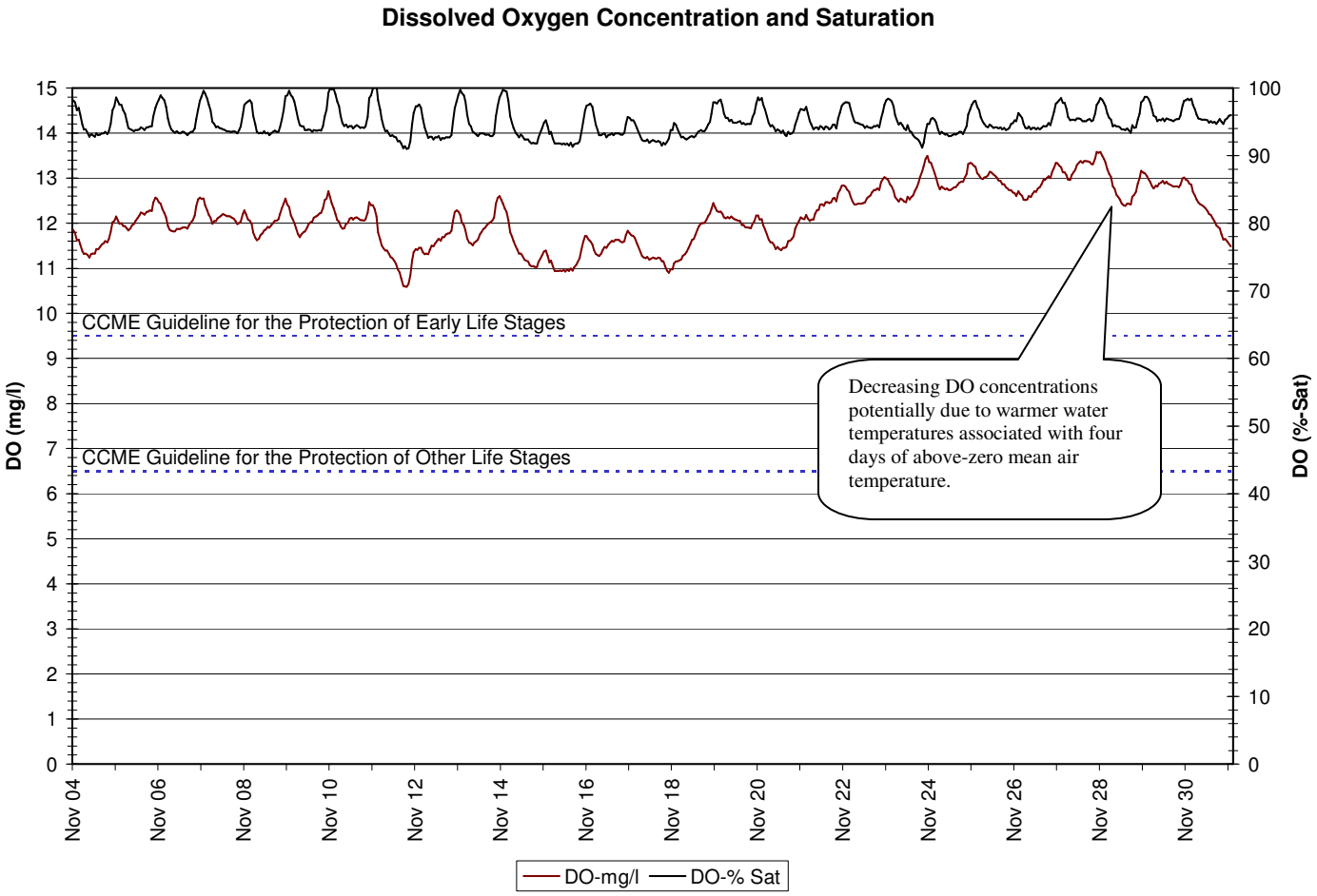
- Water temperature at Plant Discharge station exhibited a decline from November 18th to December 1st at which point temperature returned to a value seen at deployment time. Values ranged from 7.82 – 0.96°C with a median value of 3.52°C.

Figure 11: Specific Conductivity at Rattling Brook below Plant Discharge from November 4, 2011 to December 1, 2011



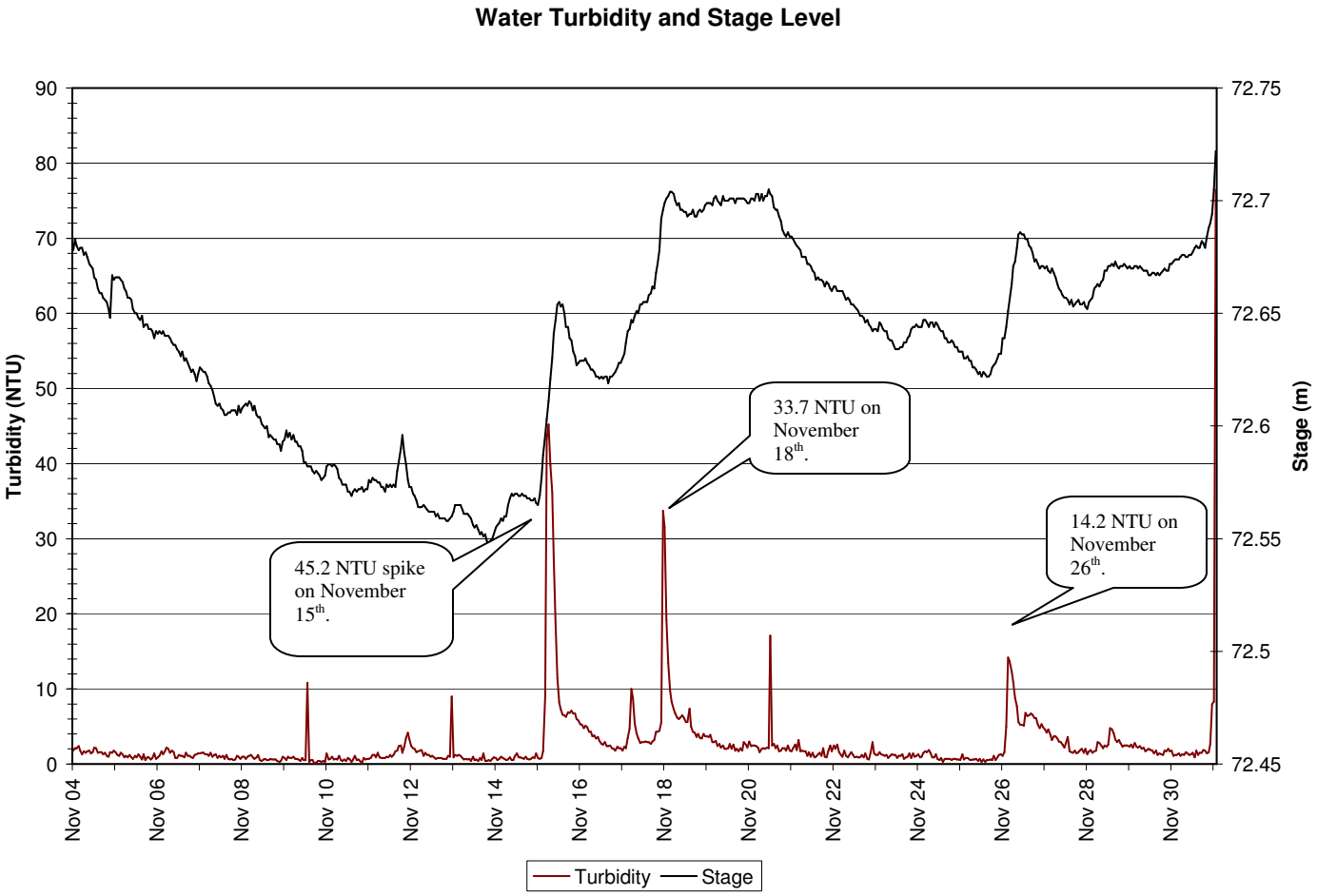
- Conductivity exhibited a series of peaks from November 4th to December 1st. Peaks tended to coincide with increasing stage levels as illustrated above.
- Values were found to fall between a low of 46.7 to a maximum of 82.1 µS/cm (median value: 52.7 µS/cm). No clear trend is observed over time – neither up nor down.

Figure 12: Dissolved Oxygen at Rattling Brook below Plant Discharge from November 4, 2011 to December 1, 2011



- All dissolved oxygen values were found to be above the minimum CCME guideline for the protection of early life stage biota. A slight upward trend appears to be present in the concentration of dissolved oxygen, although this may be a temporal trend since concentrations appear to decline towards the end of the deployment period.
- Concentrations range from a low of 10.59 mg/l to a high of 13.58 mg/l (median concentration: 12.11 mg/l).

Figure 13: Turbidity at Rattling Brook below Plant Discharge from November 4, 2011 to December 1, 2011

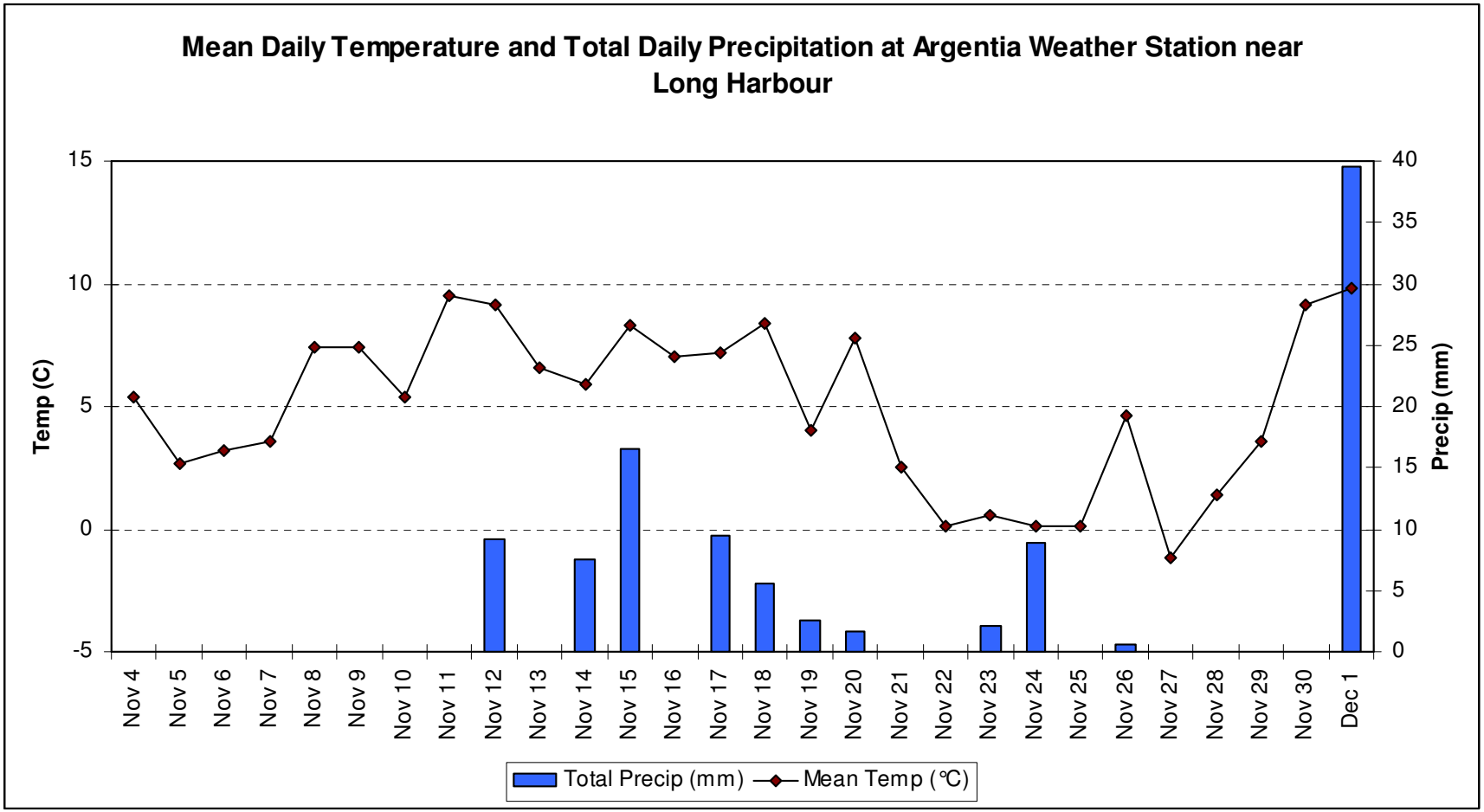


- Above, a series of turbidity events associated with increasing stage levels are identified. These peaks occurred during or just after notable precipitation events seen in the Appendix.
- Values ranged from a low of 0.1 NTU to a maximum value of 76.4 NTU (median value: 1.4 NTU).

Conclusions

- A field cable and two pH sensor issues were identified from November 4th to December 1st, 2012. The field cable attaching the Hydrolab to the datalogger was replaced on November 16th, alleviating the communication dropout seen in all parameters from Bridge station. pH sensor issues will be resolved prior to the next deployment.
- No significant water quality events were detected during this deployment period.

Appendix



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