Real-Time Water Quality Deployment Report

MEMP at Great Pond

October 31, 2014 to November 24, 2014

Newfoundland Labrador

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

General

- Less than one week from the end of the anticipated deployment period, telemetry from the MEMP ceased. Since this is not an uncommon occurrence and a field trip to the station was planned within a few days of the end of telemetry an early field trip to fix the problem was not made. Upon arrival to the site at the scheduled end of the deployment it was found that several components of the MEMP were stolen and the remainder set fire. The MEMP was a total loss, as photos show in the Appendix.
- This is the final report from the MEMP.
- Department of Environment and Conservation staff monitors the real-time web pages consistently.

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

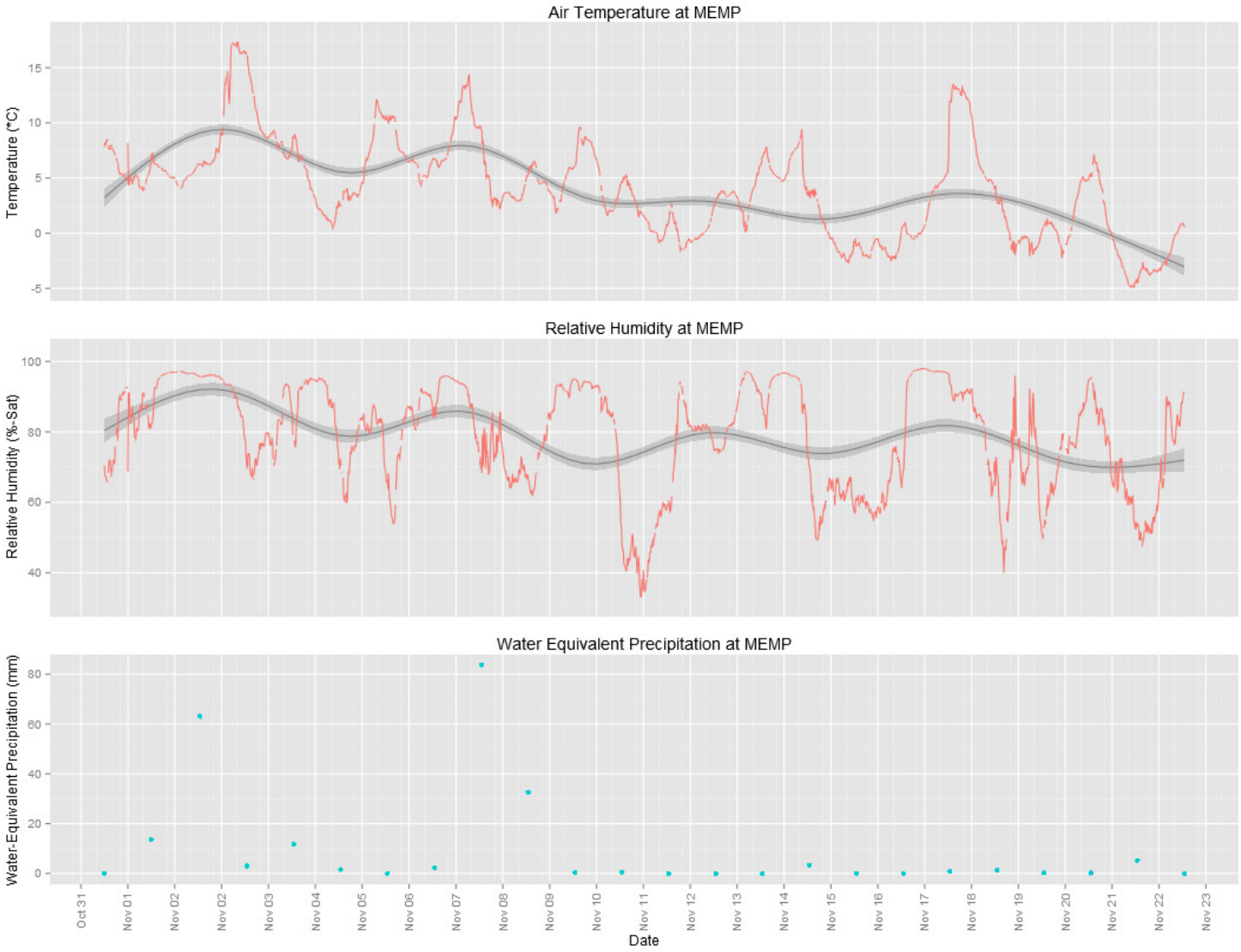
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
MEMP at Great Pond	October 31, 2014	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	November 24, 2014	Removal	NA	NA	NA	NA	NA

- No rankings are available at removal due to station destruction.

Data Interpretation

Weather Data

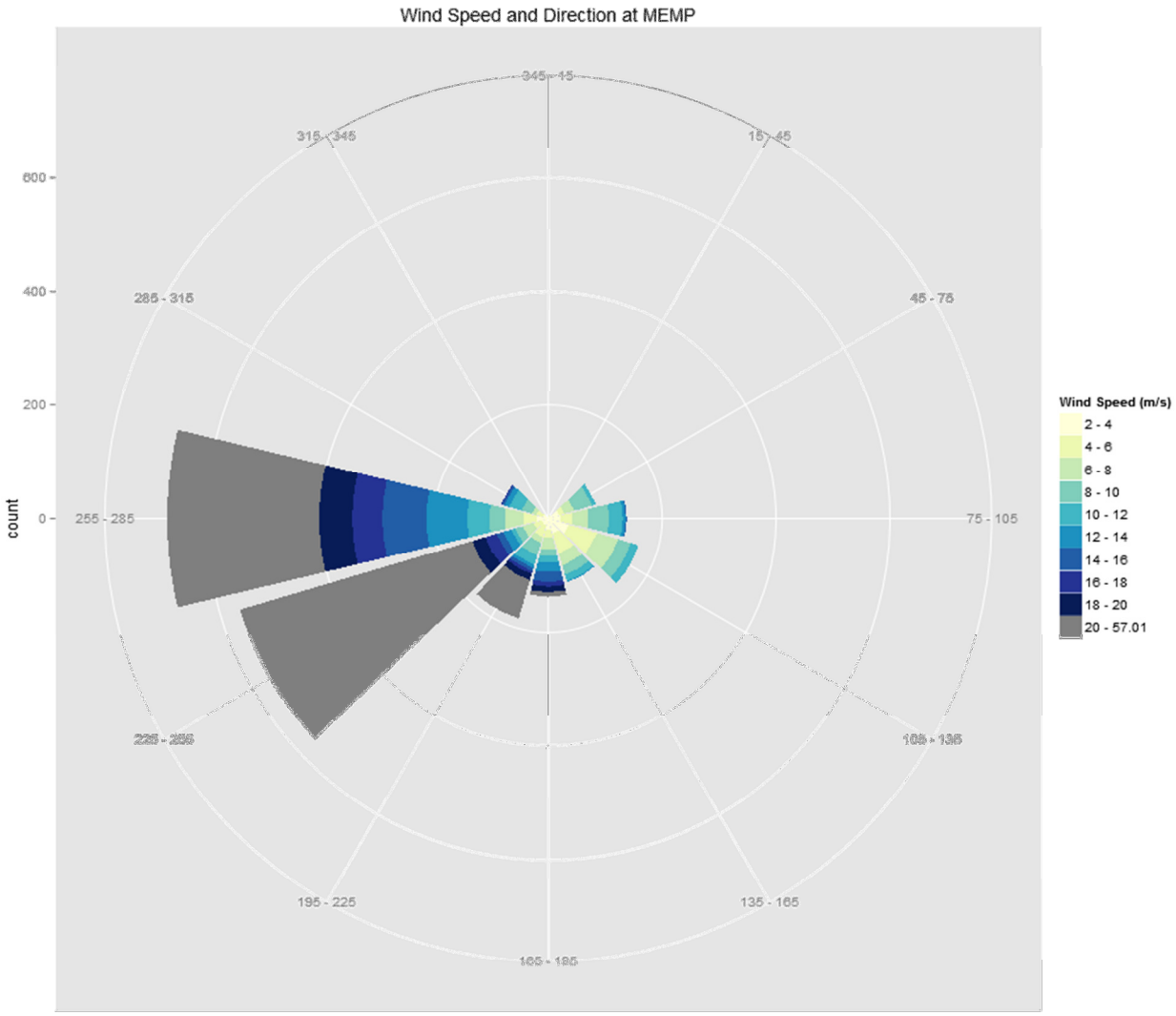
Temperature, Relative Humidity and Precipitation



Variable	Mean	Median	Min	Max
Air Temperature (C)	4.05	4.06	-5.10	17.36
Relative Humidity (%-Sat)	79.14	81.90	33.13	98.00
Precipitation (mm - water equivalent)	8.97	0.6	83.8	0.0

- A total of 224.3 mm of precipitation fell during this deployment period which is 47% more precipitation than was encountered at St. John's airport, nearby. Air temperature was somewhat cooler at the MEMP compared to the airport – 4.05°C versus 4.9°C.

Wind Speed and Direction



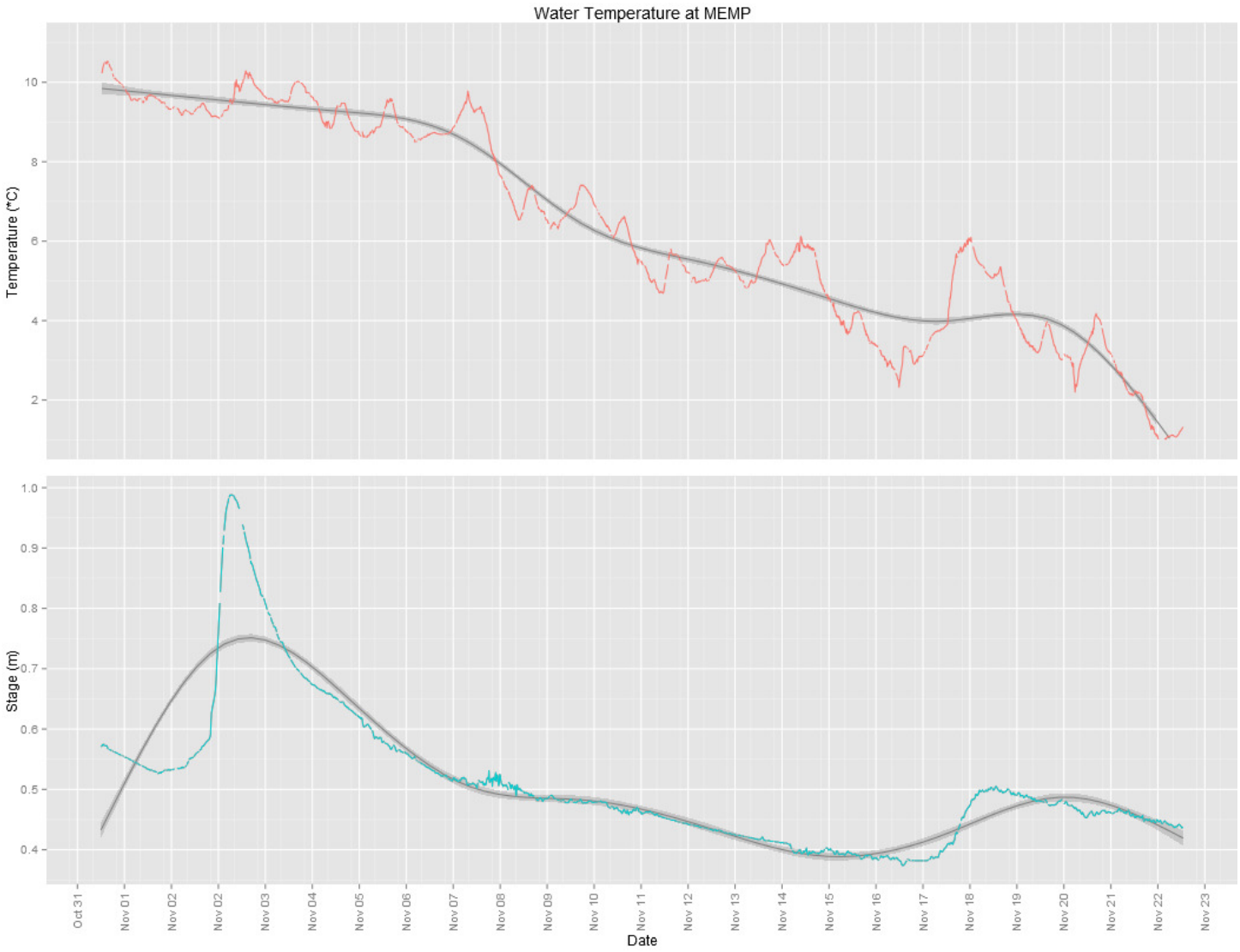
Variable	Mean	Median	Min	Max
Wind Speed (km/h)	15.9	12.8	0.0	57.0
Wind Direction (Deg)	214	241	8	336

- Predominantly easterly winds of approximately 16 km/h were observed during this deployment period.

Water Quality Data

Temperature

Water Temperature is a major factor used to describe water quality. Temperature has major implications on both the ecology and chemistry of a water body, governing processes such as the metabolic rate of aquatic plants and animals and the degree of dissolved oxygen saturation.

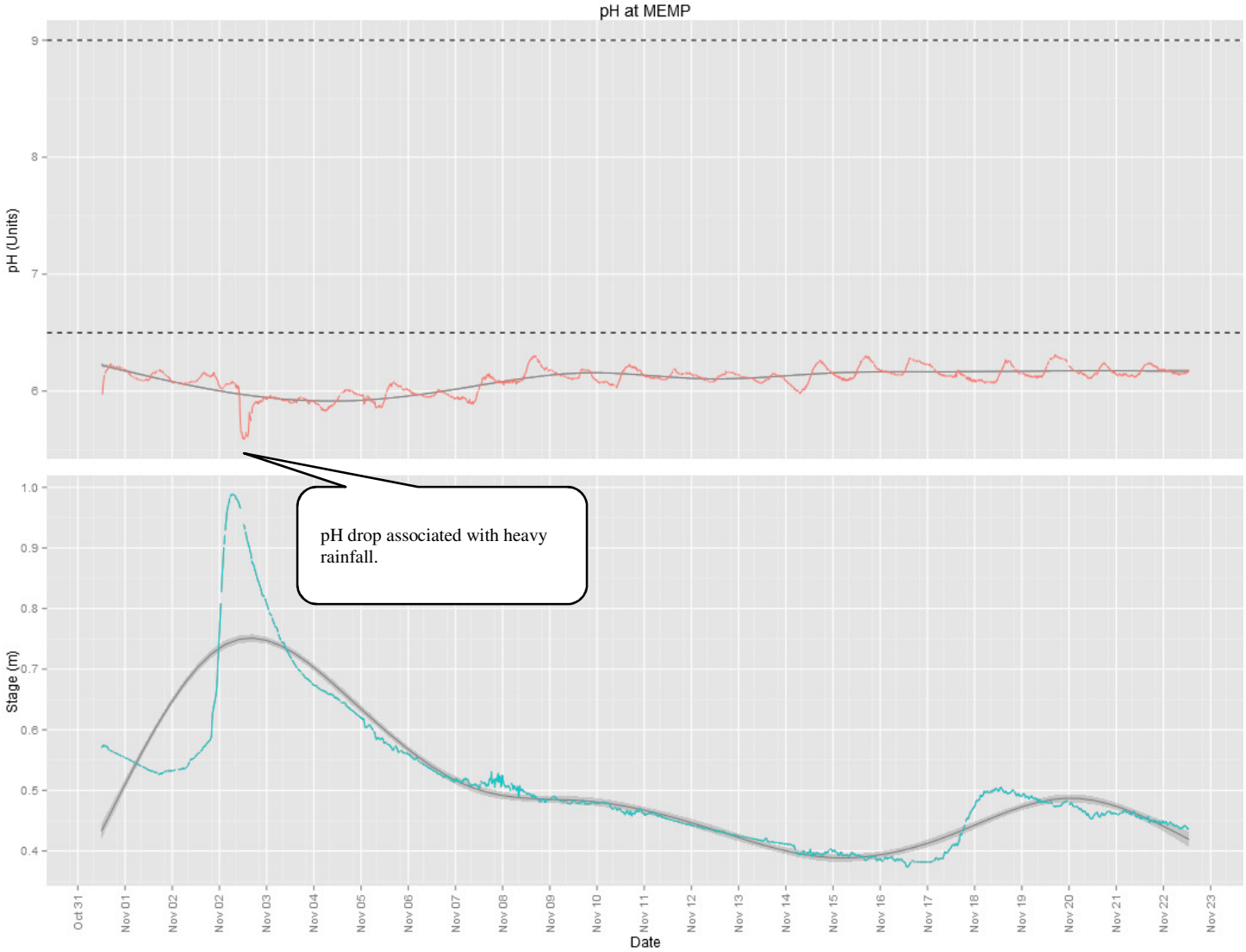


Variable	Mean	Median	Min	Max
Water Temperature (C)	6.31	5.93	0.96	10.53
Stage (m)	0.510	0.481	0.374	0.988

- Water temperature fell consistently during this deployment period reaching near-freezing conditions. Observation of nearby ponds showed intermittent ice formation at the shoreline margin; however this may not have been present at Great Pond.

pH

pH is used to give an indication of the acidity or basicity of a solution. A pH of 7 denotes a neutral solution while lower values are acidic and higher values are basic. Technically, the pH of a solution indicates the availability of protons to react with molecules dissolved in water. Such reactions can affect how molecules function chemically and metabolically.

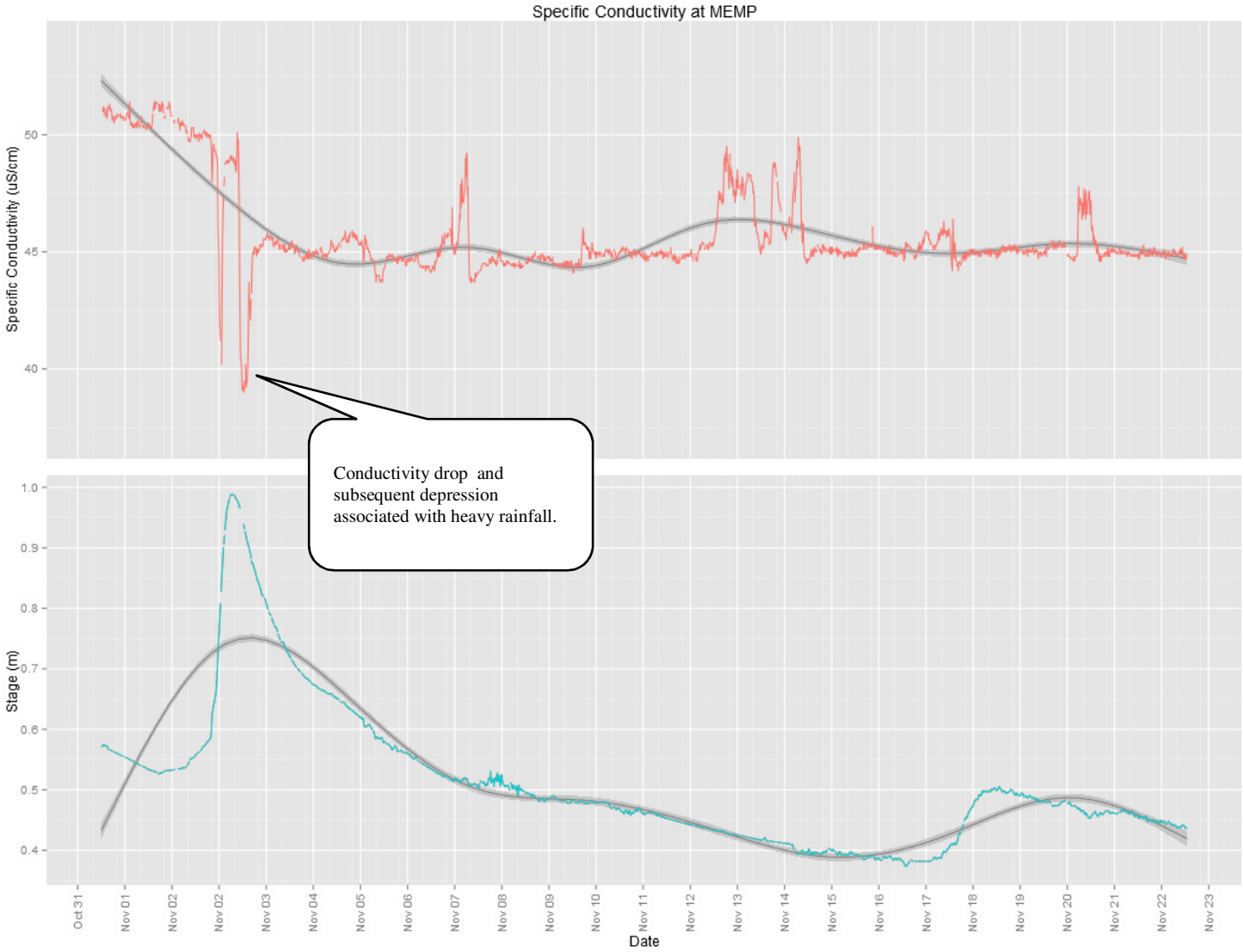


Variable	Mean	Median	Min	Max
pH (Units)	6.10	6.12	5.59	6.31
Stage (m)	0.510	0.481	0.374	0.988

- pH remained below the CCME guideline of 6.5 units for the protection of cold water biota. This is typical for the region. A slight upward trend was observed which is also common for the time of year.

Specific Conductivity

Conductivity relates to the ease of passing an electric charge – or resistance – through a solution. Conductivity is highly influenced by the concentration of dissolved ions in solution: distilled water has zero conductivity (infinite resistance) while salty solutions have high conductivity (low resistance). Specific Conductivity is corrected to 25°C to allow comparison across variable temperatures.

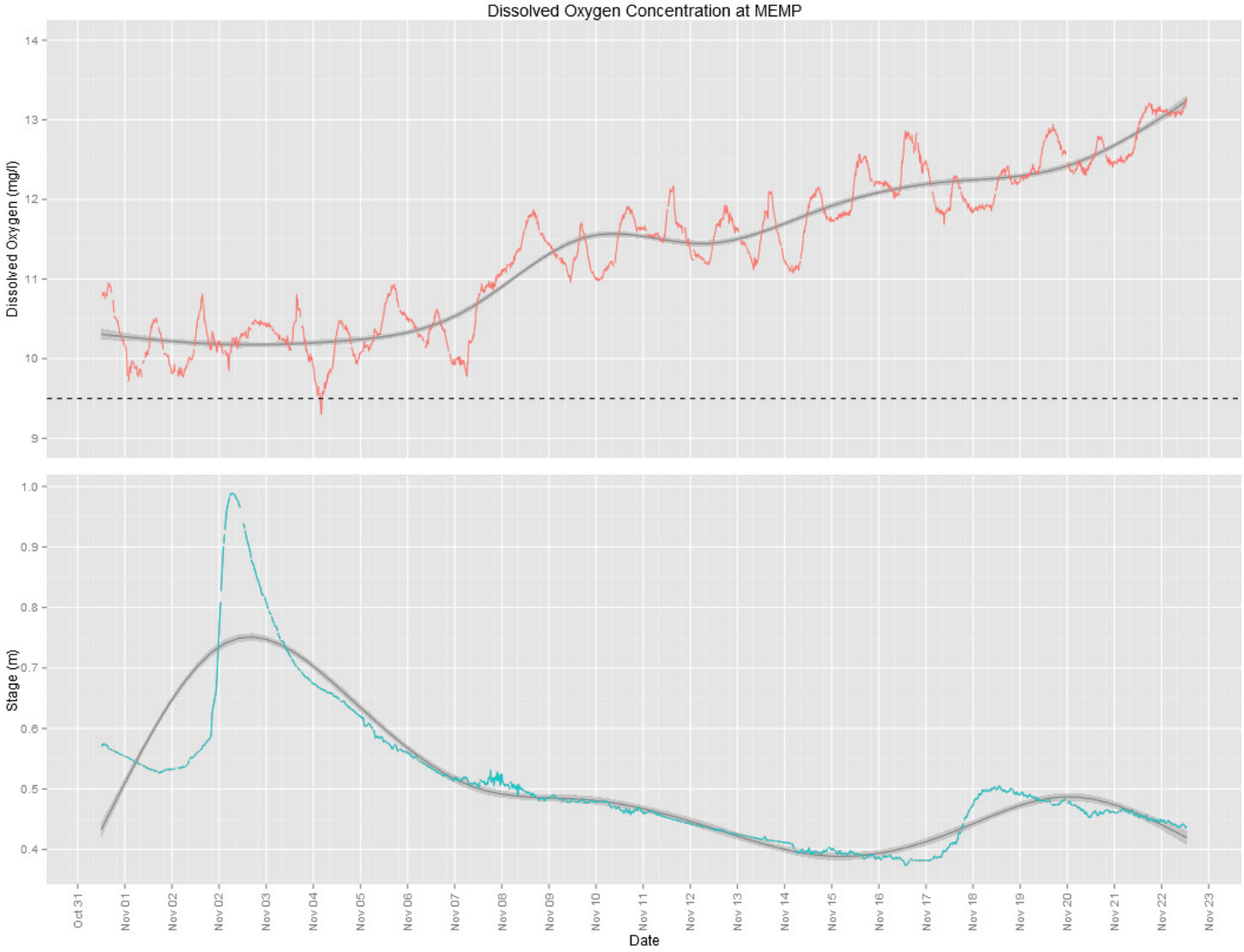


Variable	Mean	Median	Min	Max
Conductivity (uS/cm)	45.8	45.1	39.0	52.0
Stage (m)	0.510	0.481	0.374	0.988

- Conductivity fell through early in the deployment following a high volume of rainfall on November 2 (63.1 mm). Following heavy rainfall, conductivity levels were substantially lower for the remainder of the deployment period.

Dissolved Oxygen

Dissolved oxygen is a metabolic requirement of aquatic plants and animals. The concentration of oxygen in water depends on many factors, especially temperature – the saturation of oxygen in water is inversely proportional to water temperature. Oxygen concentrations also tend to be higher in flowing water compared to still, lake environments. Low oxygen concentrations can give an indication of excessive decomposition of organic matter or the presence of oxidizing materials.

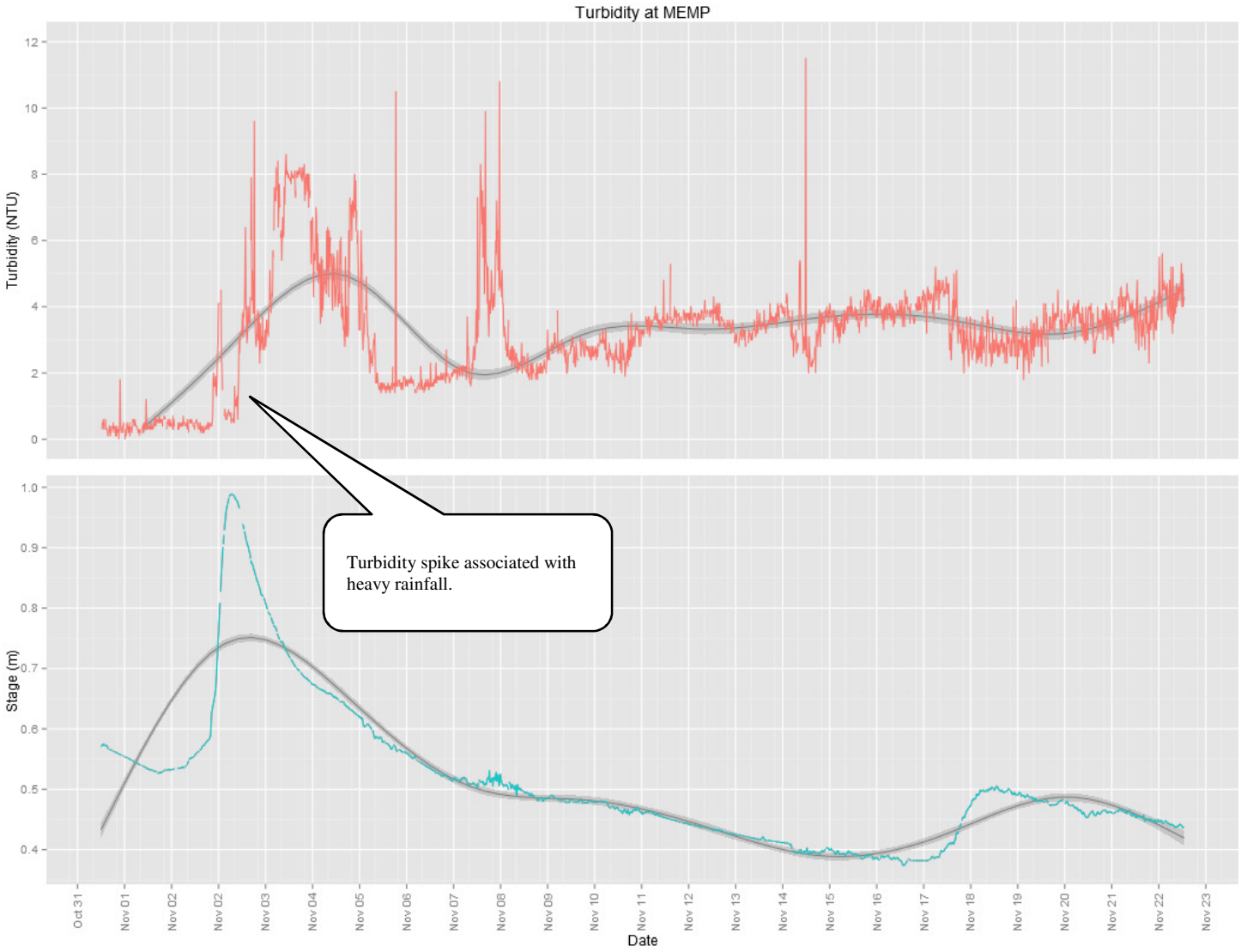


Variable	Mean	Median	Min	Max
DO (mg/l)	11.36	11.44	9.30	13.52
Stage (m)	0.510	0.481	0.374	0.988

- Dissolved oxygen progressed upwards for the entirety of the deployment period in lockstep with falling water temperatures. Almost all values were found to be above the CCME guideline of 9.5 mg/l DO for the protection of cold water biota.

Turbidity

Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover spawning areas.



Variable	Mean	Median	Min	Max
Turb (NTU)	3.2	3.3	0.0	11.5
Stage (m)	0.510	0.481	0.374	0.988

- Turbidity increased consistently throughout the deployment period indicating possible fouling of the turbidity sensor. A few events were still detected in conjunction with rainfall, however – especially beginning on November 2nd and another on November 7th and 8th.

Appendix

- Below are photos of the MEMP after the trailer was looted and burned.

Figure 1

Figure 2