Real-Time Water Quality Deployment Report

Mobile Environmental Monitoring Platform

October 1, 2014 to October 31, 2014

Newfoundland Labrador

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

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Real-Time Water Quality Deployment Report
MEMP – Great Pond, Torbay
2014-10-01 to 2014-10-31

General

- This is the initial deployment of the Mobile Environmental Monitoring Platform at the northern shore of Great Pond in Torbay. This deployment is intended to last approximately a year to understand the seasonal variation in water quality and weather in this area of the northeast Avalon Peninsula. Data gathered may be fed into a planned groundwater study of the area and will aid the town of Torbay in planning and development matters.
- Post-tropical storm Gonzalo approached the Avalon Peninsula on October 19th. Over the course of approximately 3 hours and fifteen minutes (starting October 19th 4:45 NST), 40 mm of rain was measured at the MEMP which resulted in a 20 cm rise in water level at Great Pond – peaking 31 hours later. This time frame is depicted by vertical dashed lines in the proceeding figures.
- 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.

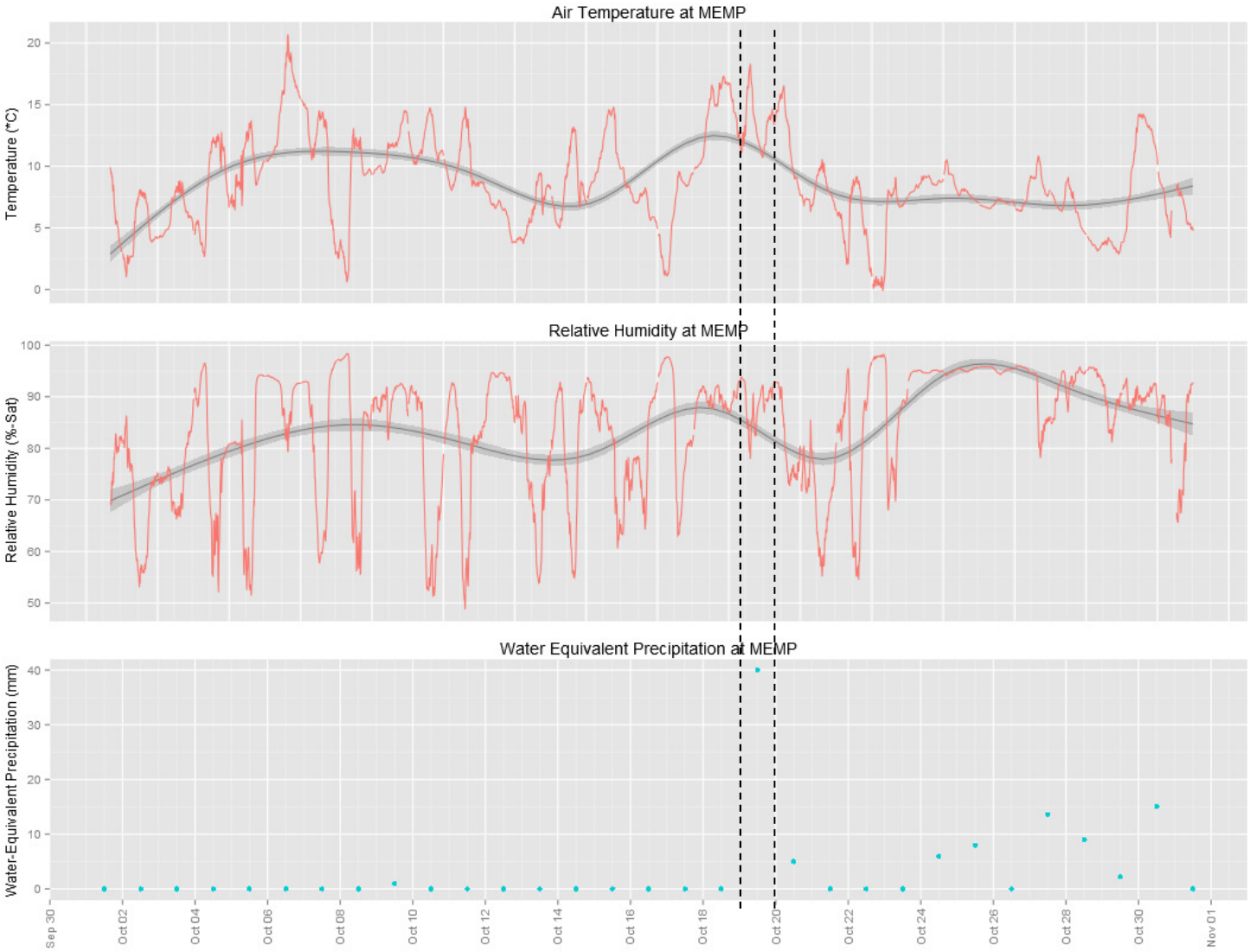
Table 1: Qualitative QAQC Ranking

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	2014-10-01	Deployment	NA	NA	NA	NA	NA
	20147-10-31	Removal	NA	NA	NA	NA	NA

- A lack of functional QAQC instruments during deployment and removal disallowed the use of Rankings for this deployment period. A grab sample taken at the time of deployment, however, was found to be in close agreement with the deployed Hydrolab giving good credibility to readings.

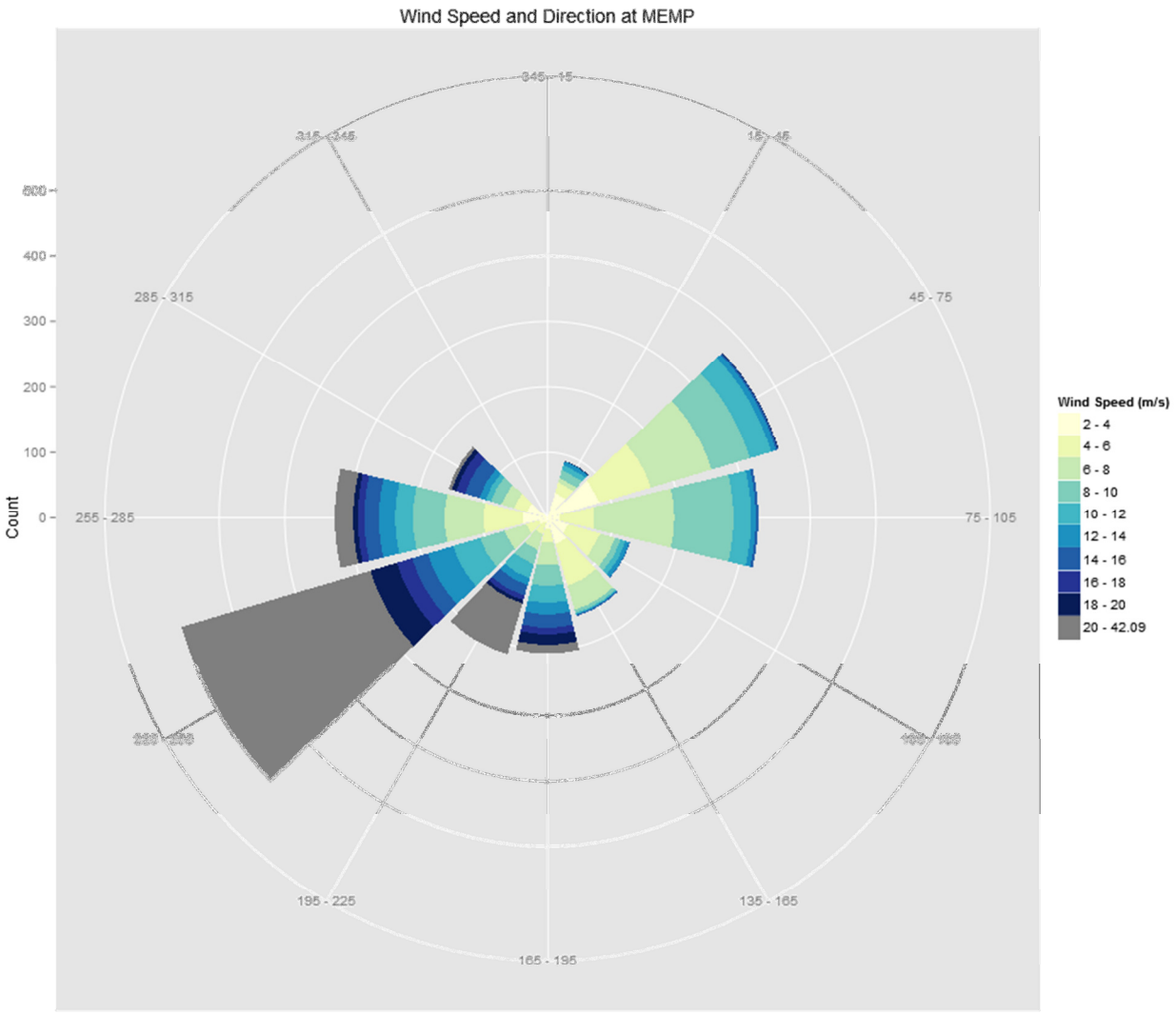
Data Interpretation

Weather



Variable	Mean	Median	Min	Max
Air Temperature (C)	8.70197562	8.35	-0.082	20.67
Relative Humidity (%-Sat)	83.82026472	87.9	48.86	98.4
Precipitation (mm - water equivalent)	3.222581	0	0	40

- October was a typical fall month with the exception of post-tropical storm Gonzalo. The storm dropped 40 mm of rain in the area around Great Pond. Nearby St. John's airport reported 50.1 mm during the same time period.

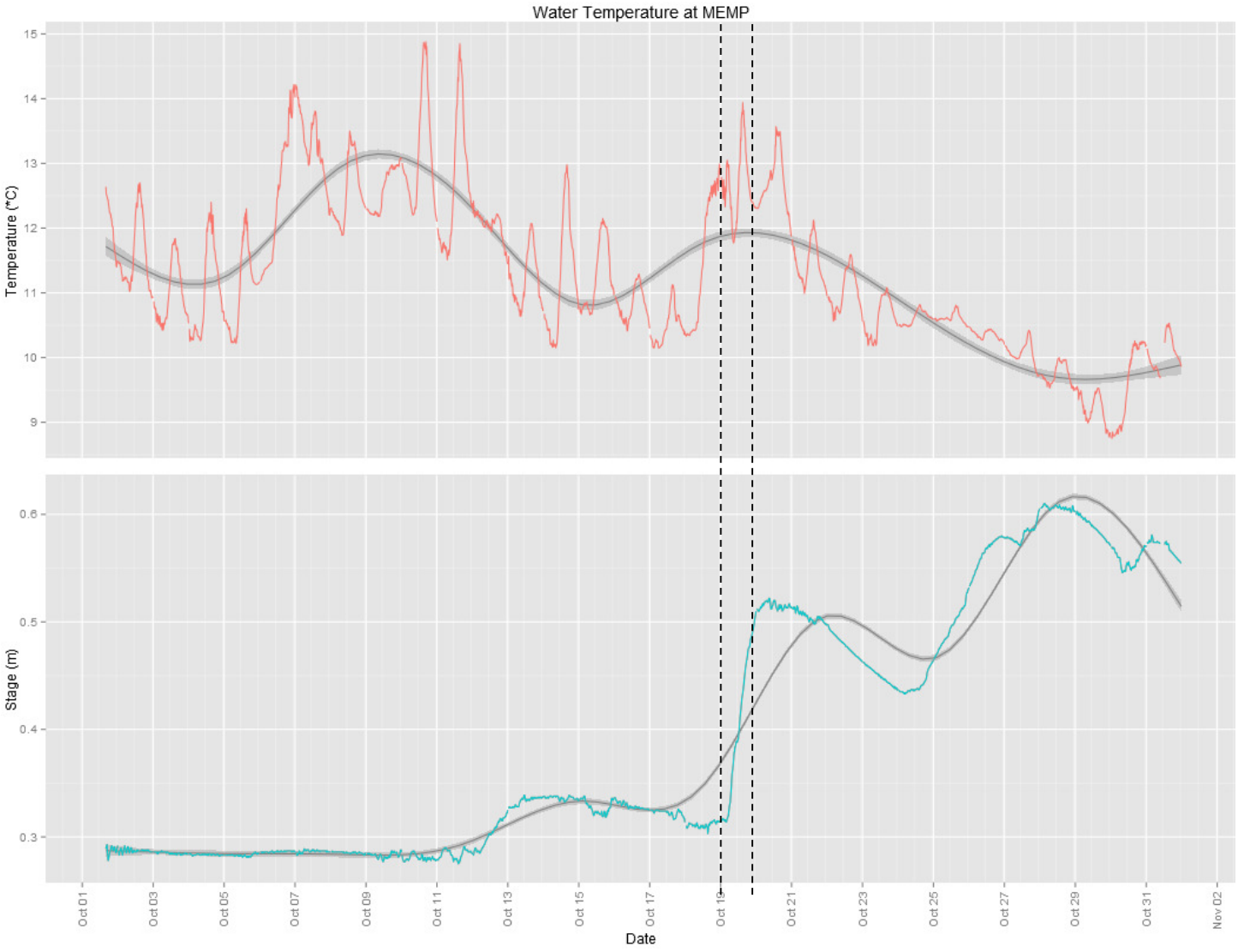


Variable	Mean	Median	Min	Max
Wind Speed (km/h)	10.36724277	7.602	0	42.09
Wind Direction (Deg)	179.4310641	200.1	2.252	346.5

- Strong northeast winds up to 42 km/h were encountered during Gonzalo and are reflected in the monthly average wind conditions above. Aside from Gonzalo, much of the wind experienced in October were light southwest winds between 0 – 14 km/h.

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.

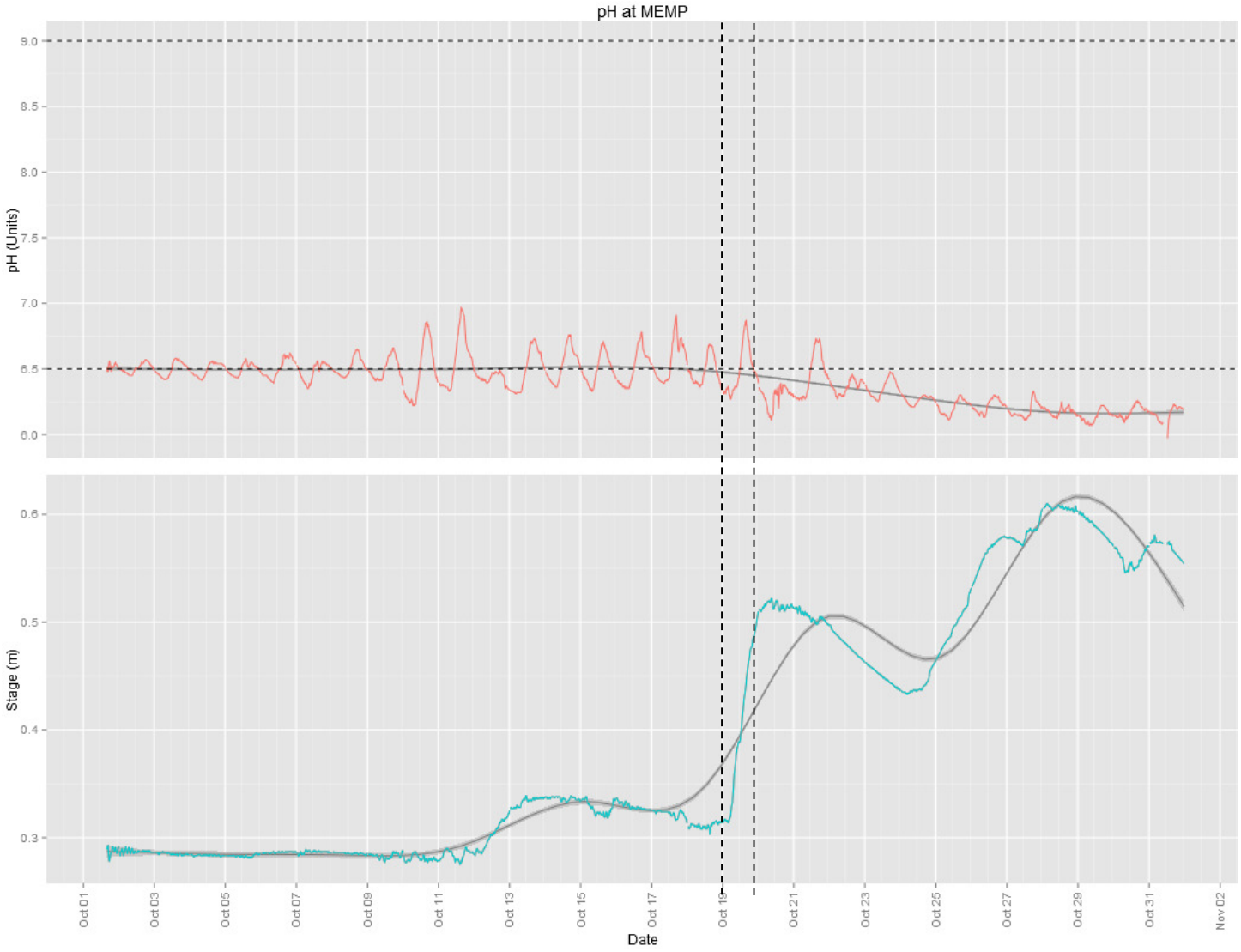


Variable	Mean	Median	Min	Max
Water Temperature (C)	11.30186346	11.09	8.75	14.88

- In general, water temperature fell throughout the deployment period with two significant instances of water temperature increase: one on October 6th related to a relatively warm day reaching > 20 °C. The other instance was observed around October 18th as warm air moved into the area ahead of Gonzalo. As relatively warm precipitation fell flowed into Great Pond, an additional increase in temperature was observed. A concurrent stage level increase of about 20 cm indicated the large volume of water intercepted by the water body.

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.

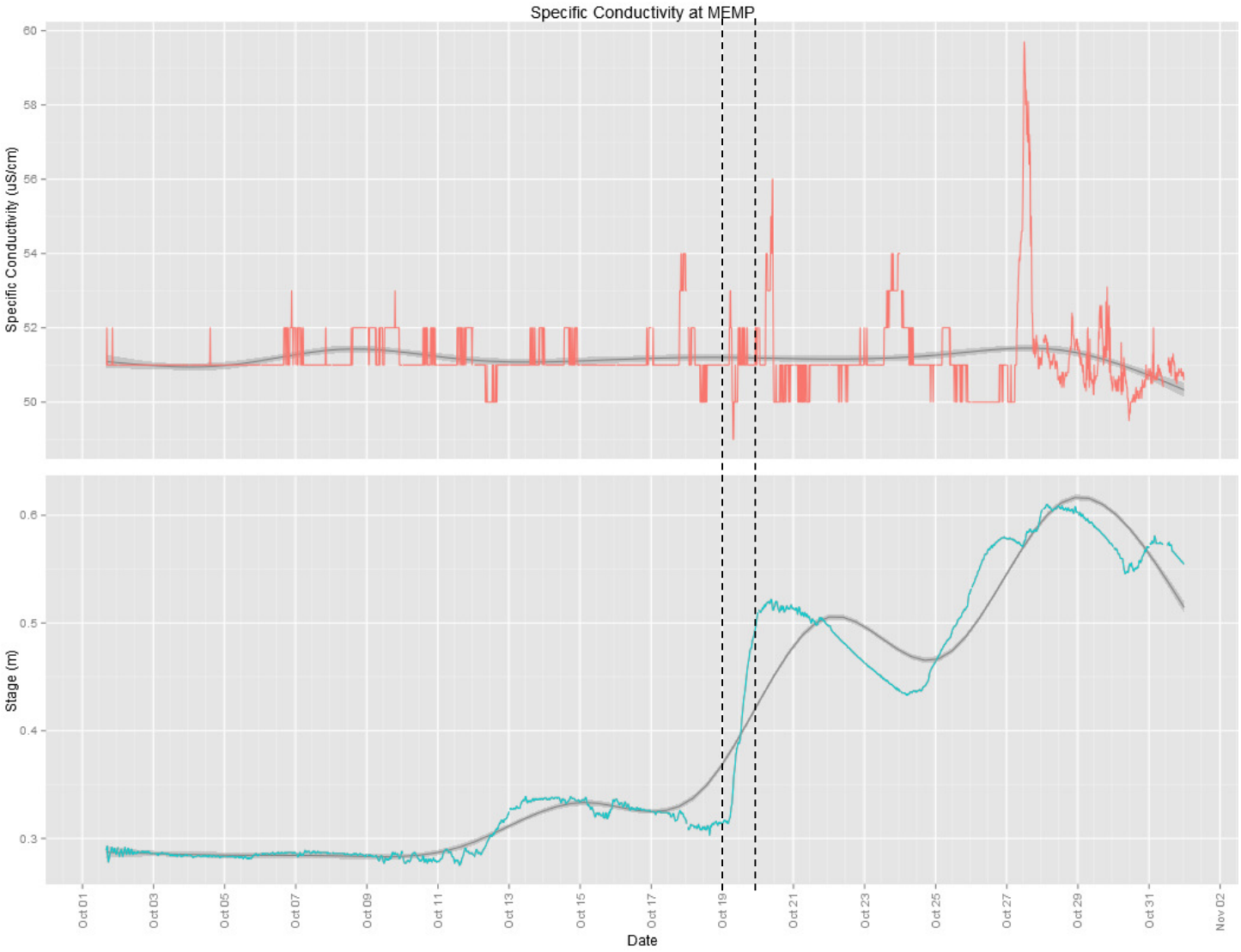


Variable	Mean	Median	Min	Max
pH (Units)	6.40337513	6.42	5.97	6.97

- Most pH values fell at or just below the CCME guidelines of 6.5 to 9 units for the protection of cold water biota (horizontal dashed lines).It must be noted that these are national guidelines and do not reflect the peculiarities of Newfoundland geology. The pH level at Great Pond tended towards slightly acidic conditions like most water bodies in this region of the province. pH was generally stable, aside from daily cycles throughout the deployment period, but showed a decline following heavy rains in the latter part of October.

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.

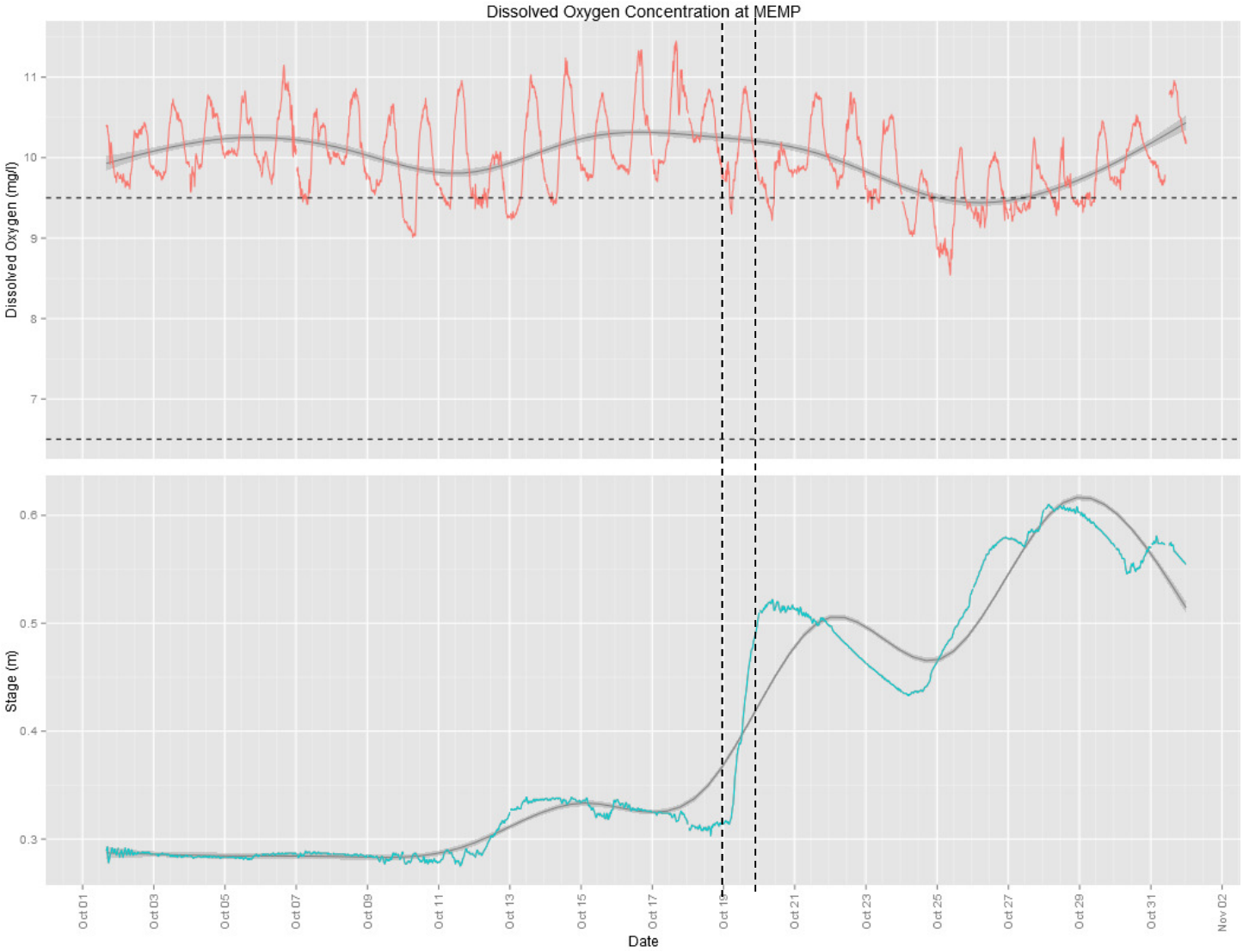


Variable	Mean	Median	Min	Max
Conductivity (uS/cm)	51.17039359	51	49	59.7

- Specific conductivity fell as fresh rainwater fell into the Great Pond basin and diluted pondwater. As the peak waters subsided conductivity began to rise sharply.

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.

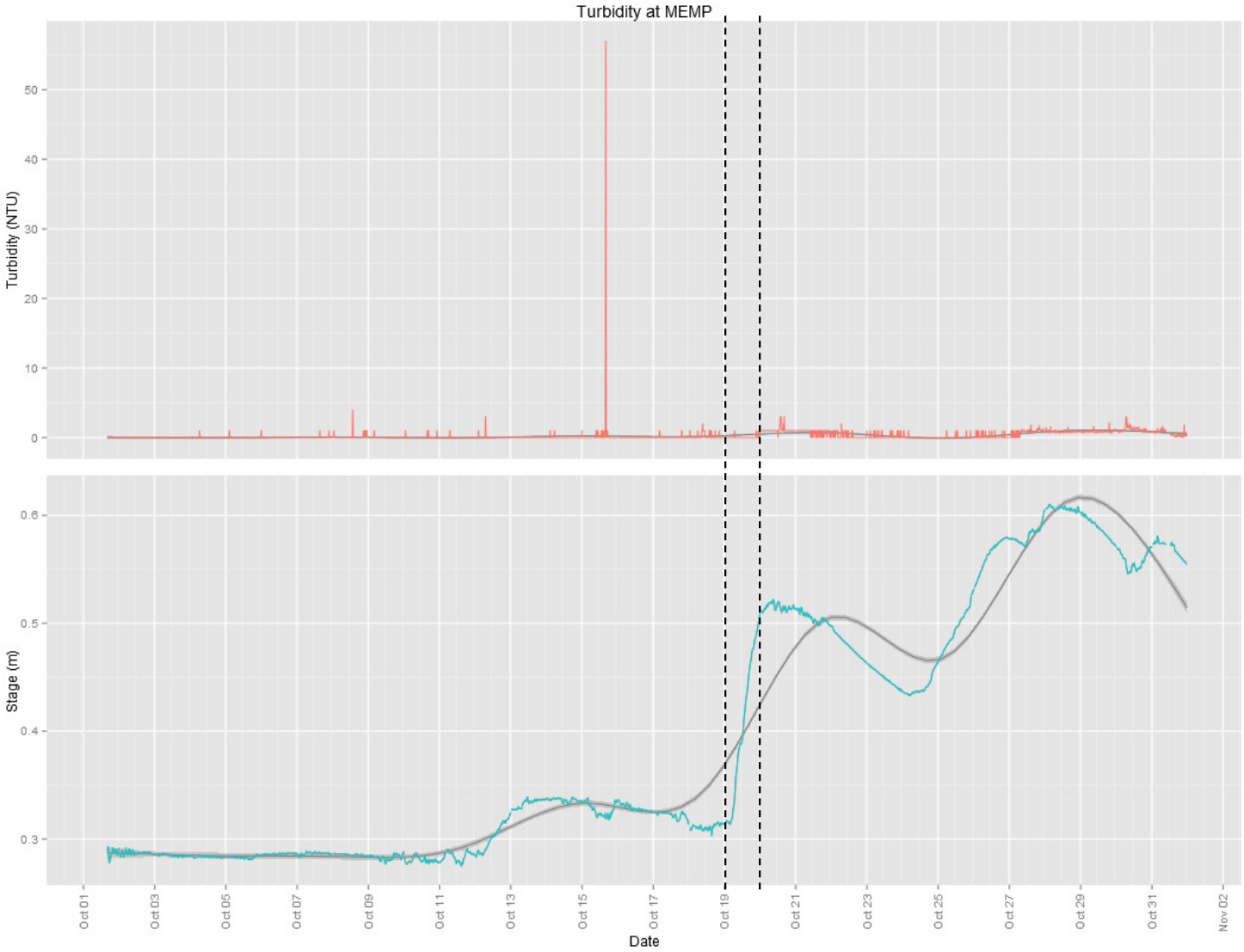


Variable	Mean	Median	Min	Max
DO (mg/l)	9.99543365	9.95	8.54	11.45

- Dissolved oxygen was above the CCME guideline of 9.5 mg/l for the protection of early life stage cold water biota (horizontal dashed lines) for the majority of the deployment period. DO concentration is expected to rise further into fall and winter as lower water temperatures allow further dissolution of gasses.

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
Turbidity (NTU)	0.26983629	0	0	57

- Turbidity at Great Pond was low for the entirety of the deployment period, even during heavy rainfall on October 19th. A single reading of 50 NTU on October 15th was likely the result of a temporary blockage of the sensor. Other values were low and rarely passed 2 NTU.

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