# Real-Time Water Quality Deployment Report

## Leary's Brook at Prince Philip Drive

**September 8, to October 27, 2010**

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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# Leary's Brook at Prince Philip Drive – NF02ZM0178
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## General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- Hurricane Igor, occurred on September 21st, 2010 causing a massive deluge of rain coupled with heavy winds. The resulting extreme runoff flooded nearby Prince Philip Drive further downstream and tore shrubbery and grass from the streambanks. Branches, shrubs and other debris became lodged in willows near Leary's Brook station resulting in the formation of huge debris walls and gouging deeply into the stream banks. Streambank instability presents a problem in the form of heavy siltation with small rain events since the sediment is no longer held by plant roots. Sensors are often buried and periods of poor data are not uncommon.
- For a period of nine days (September 22nd to October 1st) no Hydrolab was at Leary's Brook station due to extreme fouling as a result of Igor. Since no data could be taken from the sonde at removal, no corrections data could be calculated and the deployment period was correspondingly short, two deployment periods are combined in this report. All data herein is raw data, without corrections due to the complications caused by Igor.
- This deployment report discusses the 50 days of monitoring resulting from the combination of the September 8th to 22nd and October 1st to 27th deployments

## 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.

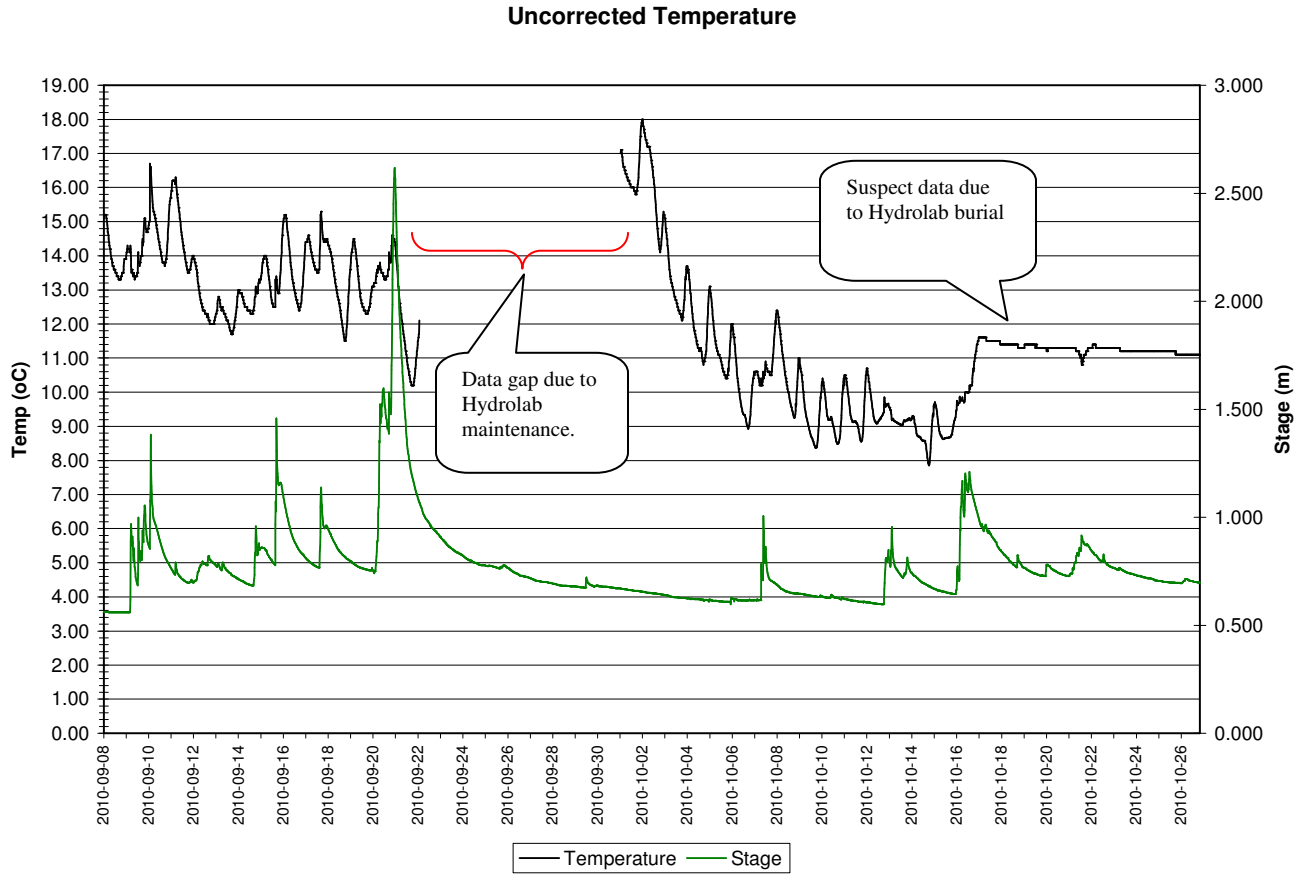
| Station | Date | Action | Comparison Ranking | | | | |
|---|---|---|---|---|---|---|---|
| | | | Temperature | pH | Conductivity | Dissolved Oxygen | Turbidity |
| Leary's Brook at Prince Philip Drive | September 8, 2010 | Deployment | Excellent | Marginal | Fair | Excellent | Excellent |
| | October 27th, 2010 | Removal | NA | NA | NA | NA | NA |

- Data Quality rankings were not calculated at removal due to the complications of Hurricane Igor and the combination of the short September deployment and the October deployment.

## Data Interpretation

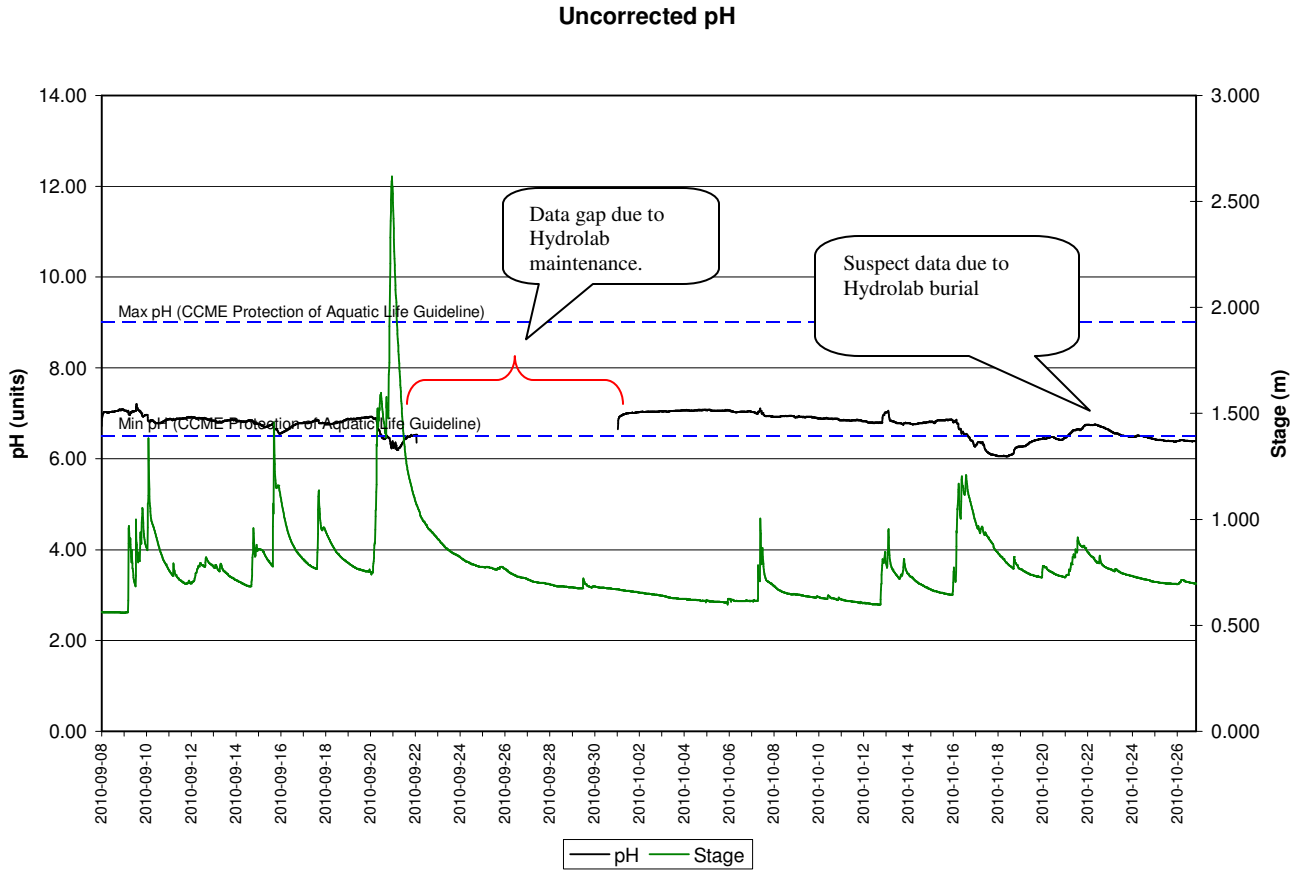
- Water temperature at Leary's Brook ranged from a high of 18.00 to a low of 7.85°C for this deployment period. Despite the gaps in data, it appears that the high and low points captured on the graph below are representative of expected values.
- Water temperature is recorded as between 11.0 to 11.5°C during the final portion of the deployment. This is due to a partial burial of the instrument and protective casing as a result of bank instability and siltation.

**Figure 1: Water Temperature at Leary's Brook from September 8 to October 27, 2010**



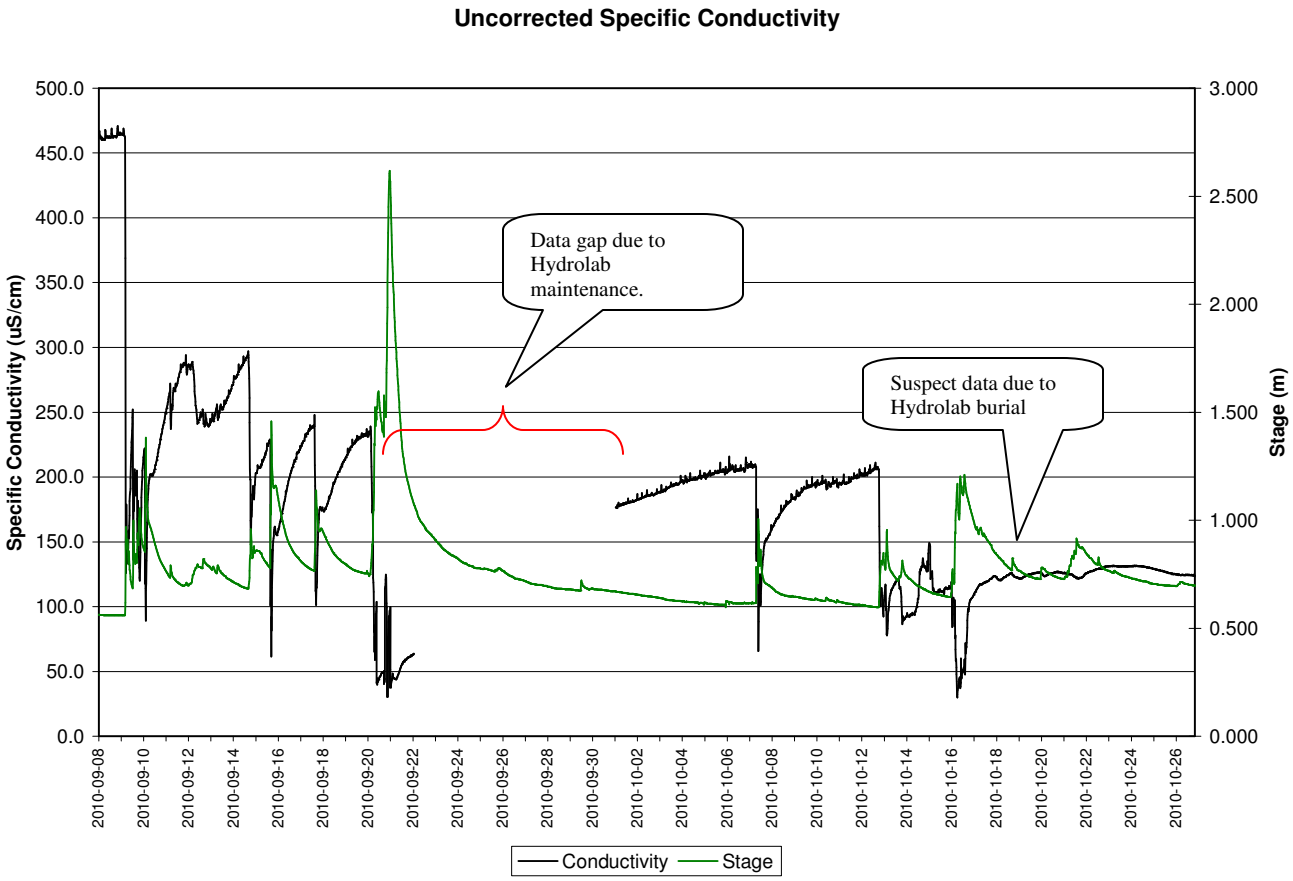

- pH ranged from 6.05 to 7.21 units with a median of 6.82 from September 8th to October 27th. As such, more than 50% of recordings are greater than the CCME Guideline of 6.5 for the protection of Early Life Stage cold water biota. Low values are found to have occurred during Igor and the rain event on October 16 when the Hydrolab was buried.
- pH recordings during the final 10 days of deployment are likely not accurate since the probe was below the streambed.

**Figure 2: pH at Leary's Brook from September 8 to October 27, 2010**



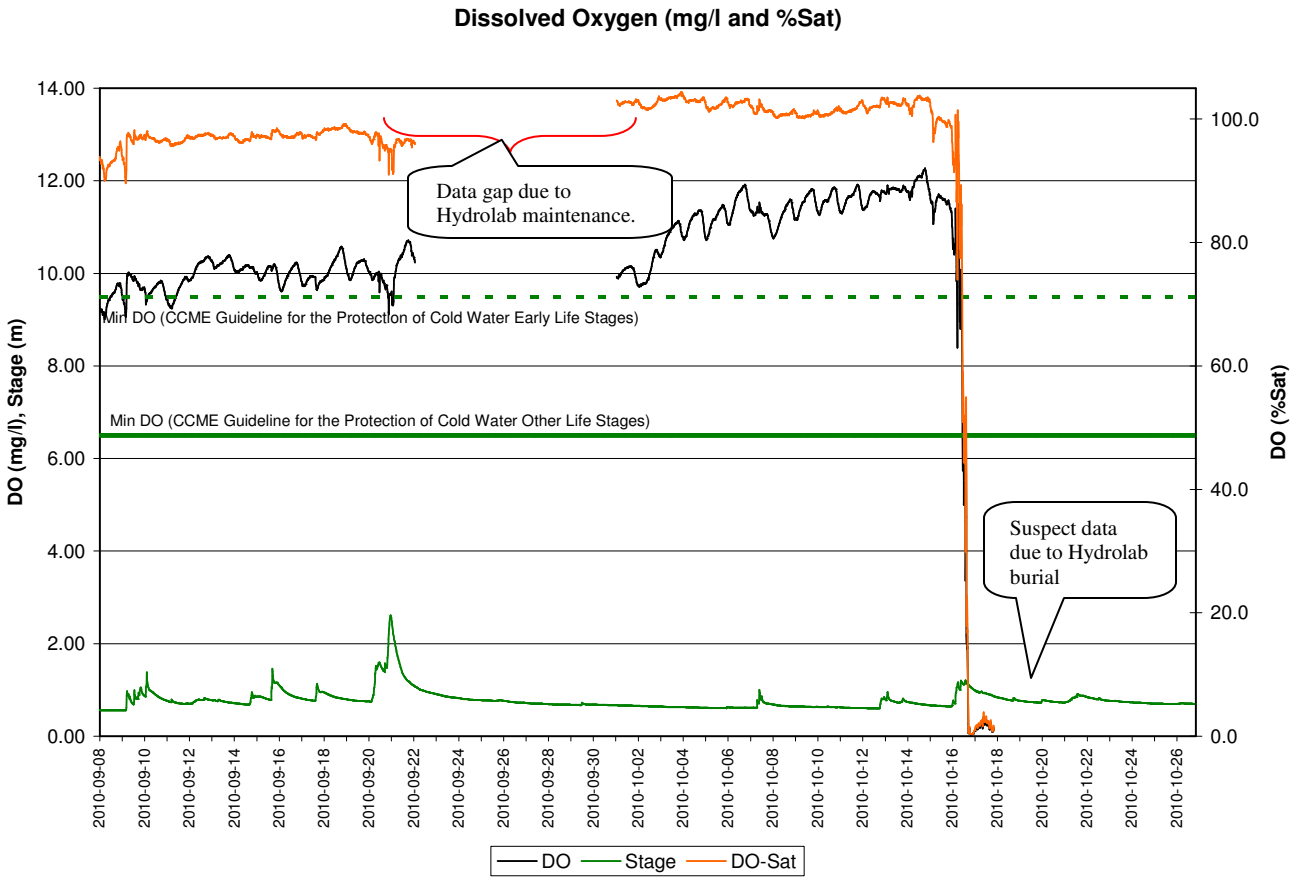

- Conductivity at Leary's Brook is generally quite high because of influential urban runoff. Urban runoff contains a myriad of chemicals, metals and dust that is pervasive in a city environment. As water washes off road surfaces, residue is carried into stream channels increasing the amount of electrically conductive ions in the water. With sufficient runoff, a river is essentially flushed clear.
- During and following Igor, conductivity is found to be much lower than historical levels. Conductivity ranged from a high of 471.0 µS/cm before Igor to 30.0 µS/cm after Igor. Despite this flushing effect, rebounds of conductivity are found as streamflow returns to normal levels.

**Figure 3: Specific Conductivity at Leary's Brook from September 8 to October 27, 2010**



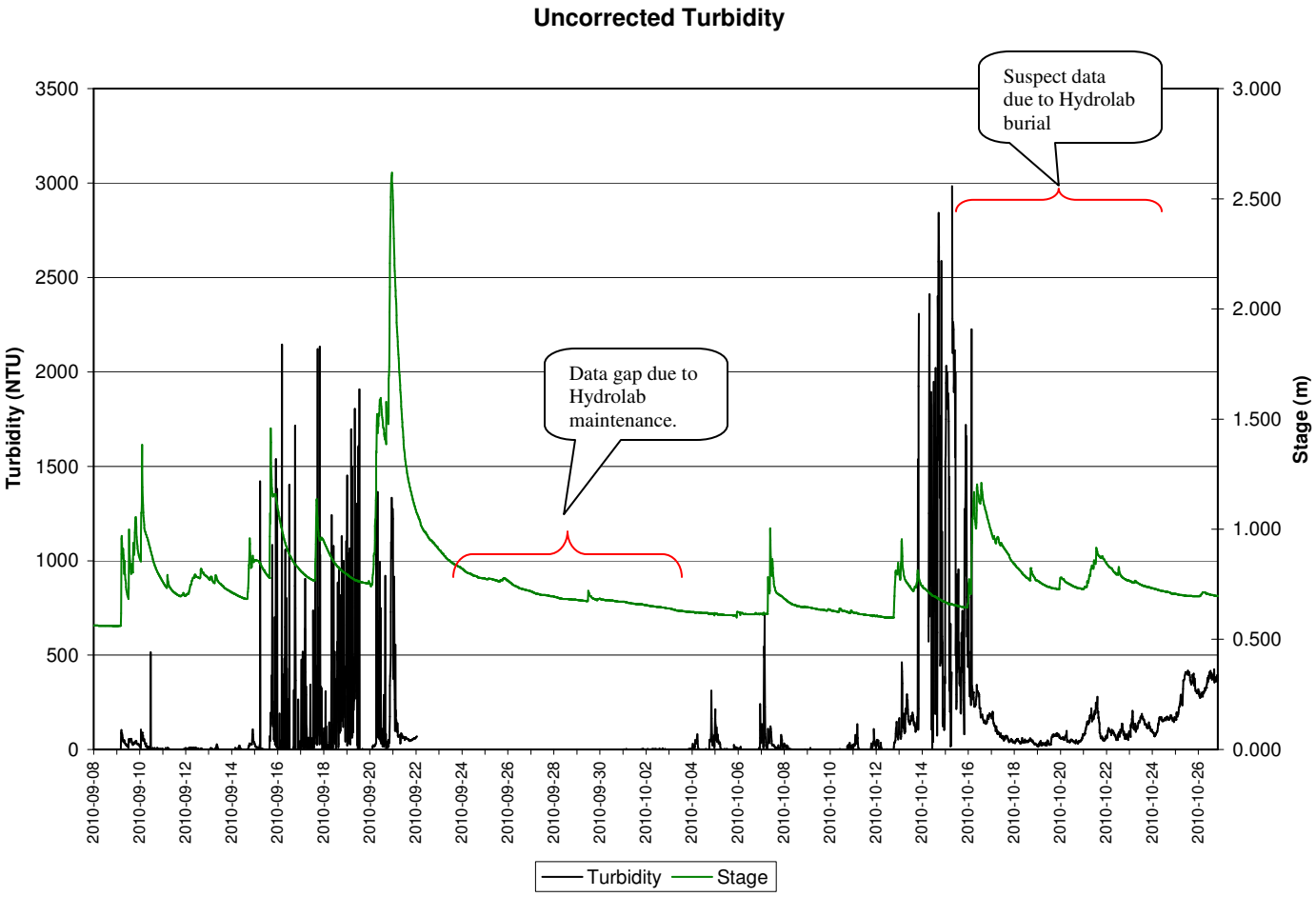

- Dissolved oxygen saturation was recorded at a high of 104.4% and a low of 0.4%. Such a low dissolved oxygen concentration is the result of the probe being partially buried in the anoxic substrate of Leary's Brook. The values following the silt deposition on October 16th are not representative of actual in-channel dissolved oxygen values – values as low as recorded would result in fish kills.
- A steady rise in dissolved oxygen concentration was recorded from the beginning of deployment on September 8th to the silt deposition event on October 27th. The max value recorded was 12.27 mg/l with a low point of 0.04 mg/l during burial.
- All values were found to be greater than the CCME Guideline of 6.5 mg/l for the protection of Early Life Stage cold water biota. Most values also greater than the minimum of 9.5 mg/l for the protection of Other Life Stage cold water biota.

**Figure 4: DO at Leary's Brook from September 8 to October 27, 2010**




- Turbidity readings following Hurricane Igor are highly variable because of decreased bank stability. Small changes in flow and stage level result in disproportionately large spikes in turbidity.
- Values ranged from 0.0 to 2985.0 NTU with a median value of 28.4 NTU. The values after October 16th are not reliable due to the silt deposition on the Hydrolab.

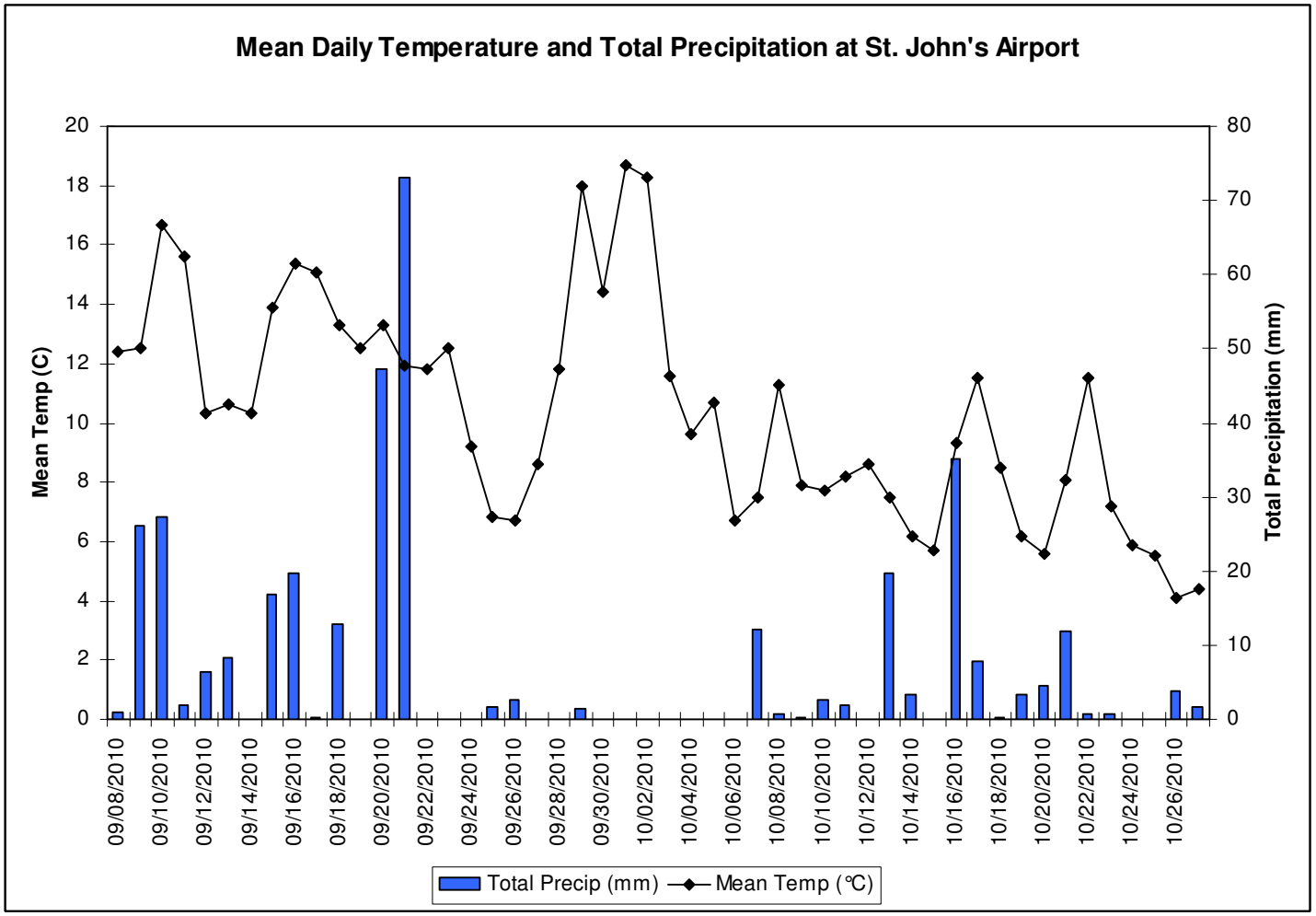
**Figure 5: Turbidity at Leary's Brook from September 8 to October 27, 2010**




## Conclusions

- This deployment report combines two deployments into one: a short, abbreviated deployment from September 8th to September 22nd and another from October 1st to October 27th.
    - Initially, the deployment period starting on September 8th was to be removed for regular maintenance and calibration on or around October 9th. As a result of Hurricane Igor, however, a massive amount of debris coupled with extremely heavy flow required an earlier removal on September 22nd.
    - Stream flow on September 22nd, the day after the storm, was still too high to attempt field cleaning and no correction data was collected.
- Stream bank instability resulted in the burial of the Hydrolab on October 16th after 35 mm of rain. Values after this period are considered to be incorrect.

# Appendix




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