CENTRE FOR MARINE APPLIED RESEARCH

CURRENT REPORT FOR 1086 WEST (2025)

Deployment ID: PC006-TILT

Prepared By	Date	Version	Contact
Danielle Dempsey	October 2025	Pile of Leaves	P: 1-902-442-4660
Anne McKee			E: info@cmar.ca
Kiersten Watson			W: www.cmar.ca

Table of Contents

1 Introduction

The Centre for Marine Applied Research (CMAR) measures essential ocean variables around the coast of Nova Scotia through the Coastal Monitoring Program. Current speed and direction have been measured around the province using tilt meters and Acoustic Doppler Current Profilers (ADCPs).

This document presents deployment details and summary figures from a tilt meter deployment in Pictou County (Figure 1), at the **1086 West** Station (Figure 2) in 2025 (deployment ID PC006-TILT). Current reports from other stations can be found on the Reports page of the CMAR website. The data are available for download from the Nova Scotia Open Data Portal. For more information on CMAR and the current datasets, visit the CMAR website.

This document should be considered as a guide only. The information may be revised pending ongoing data collection and analyses.

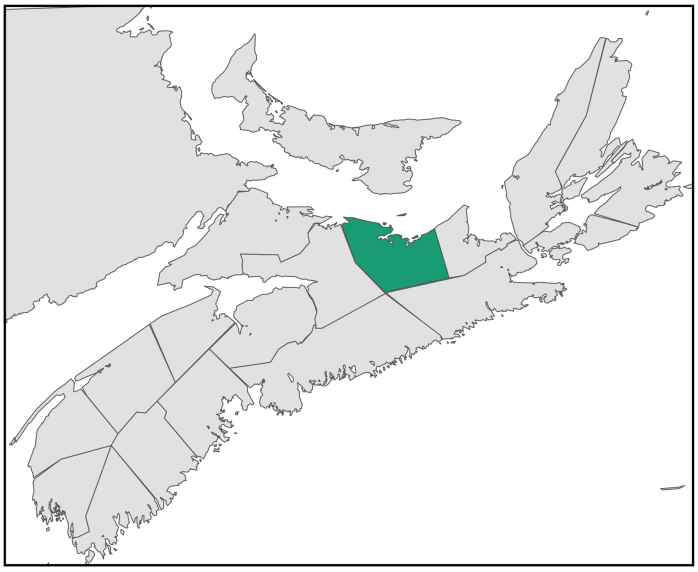

Figure 1: Pictou County (green).

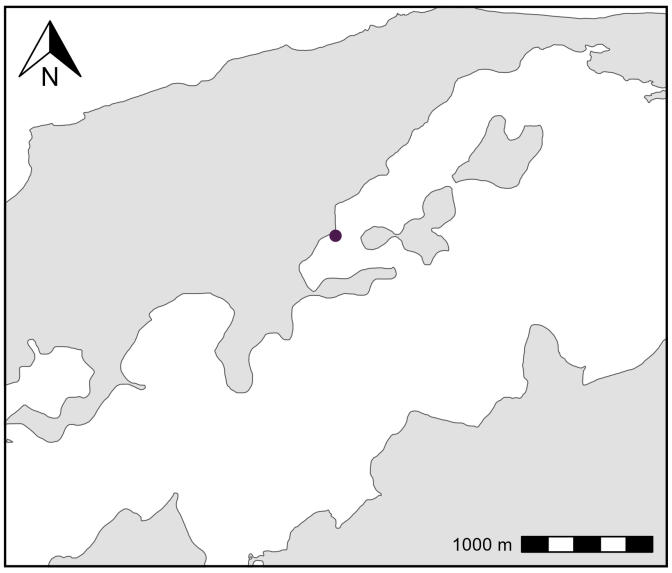

Figure 2: Location of tilt meter deployed at the 1086 West station in Merigomish Harbour in 2025.

1.1 Data Collection

The data presented in this report were measured using a tilt meter. A tilt meter consists of a buoyant logger attached to an anchor on the sea floor by a flexible tether. Moving water tilts the logger in the direction of flow (Figure 3). The water speed and direction are calculated using the drag-tilt principle (Lowell Instruments LLC, 2022).

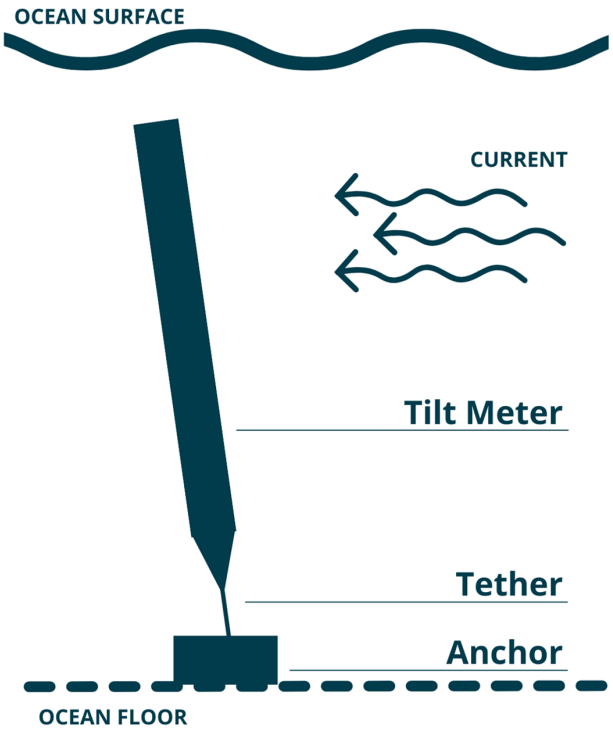

Figure 3: Schematic representation of tilt meter (not to scale).

Compared to acoustic current profilers, tilt meters are inexpensive, small, and simple to operate (Lowell et al., 2015). Tilt meters have been shown to measure current speed and direction with accuracy similar to an ADCP (Lowell et al., 2015). However, tilt meters only record current parameters for a single depth, rather than at multiple depth bins through the water column. Slow current speeds (≤ 5 cm/s) may not tilt the meter enough for reliable direction measurements (Lowell Instruments LLC, 2019a, 2019b). Additionally, tilt meters may become biofouled, which can result in an overestimation of the current speed (Lowell et al., 2015).

CMAR ADCPs, which are owned by the Nova Scotia Department of Fisheries and Aquaculture, are not well suited for measuring in shallow areas. CMAR therefore deploys tilt meters in shallow areas, where a single depth bin will provide adequate current information for the expected data users. Data are reviewed to determine if slow currents or biofouling impacted the measurements.

CMAR uses the TCM-1 and TCM-4 current meters manufactured by Lowell Instruments LLC (Lowell Instruments LLC, 2019a, 2019b). Domino software is used to process the raw accelerometer and magnetometer data into current speed and direction measurements. CMAR compiles and formats

the data for publication with the tilt R package (Dempsey, 2025). For more detail on the tilt meter measurements and calculations made by the Domino software, refer to the TCM-x Universal User Guide (Lowell Instruments LLC, 2022).

Current speed and direction figures are presented below. The tilt meters also measure temperature, which is presented in this report to provide additional context for the current data. The temperature data is not yet included in the published dataset. Please review the CMAR Data Access Map to download published temperature data from nearby stations. Reach out to info@cmar.ca to request a copy of the 1086 West station temperature dataset if required.

1.2 Quality Control

An automated "Gross Range" test was applied to the tilt meter data to identify observations outside of the reliable measurement range of the sensors (Lowell Instruments LLC, 2022). For consistency with the CMAR Water Quality and Wave datasets, each data point was assigned a flag of "Pass", "Fail", or "Suspect/Of Interest"[1] (IOOS, 2020).

Observations within the reliable measurement range were flagged as "Pass", and are shown in the figures below. Observations flagged as "Fail" were outside the measurement range, and not shown in the figures. Speed observations greater than the reliable measurement range but less than the absolute measurement range of the sensor were flagged as "Suspect/Of Interest". Most of these speed observations are shown in the figures. Direction observations corresponding to a water speed ≤ 5 cm/s were flagged as "Suspect/Of Interest" (Lowell Instruments LLC, 2019a, 2019b), and are not shown in the figures.

Removing flagged observations can result in patchy time series, especially for current direction data. The full 1086 West Station tilt meter data, including Quality Control flags, can be downloaded from the Nova Scotia Open Data Portal.

[1]The "Not Evaluated" flag level is not applicable for the Gross Range test.

2 1086 West Current Data

Table 1: PC006-TILT deployment details.

Station	1086 West
Instrument Model	TCM-1
Latitude	45.66018
Longitude	−62.41141
Deployment Date	2025-08-01
Retrieval Date	2025-09-11
Duration (d)	41
Depth Sounding (m)	< 1 m based on chart depth
Sensor Height Above Sea Floor (m)	0.57
Ensemble Interval (s)	60
Averaging Interval (s)	20
Observations per Interval	160

2.1 Current Variables

2.1.1 Current Time Series

Figure 4: Current variables over time. Top: the direction the current is travelling to; Bottom: current speed.

2.1.2 Current Rose

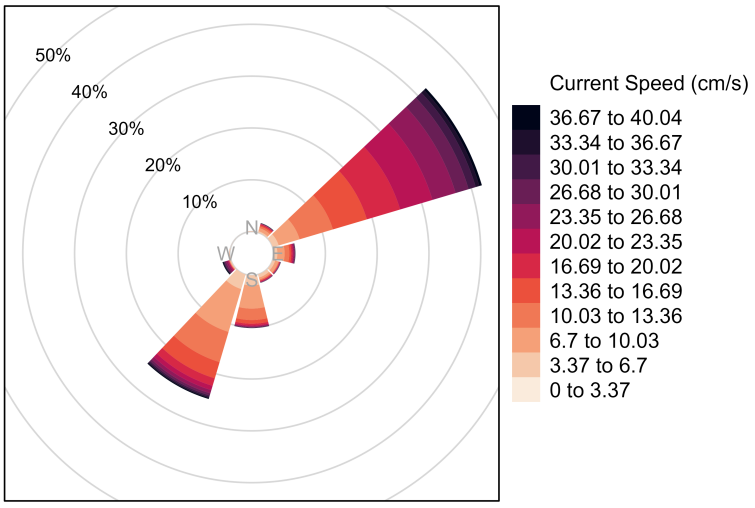

Figure 5: Current speed and the direction the current is travelling to (relative to True North).

2.1.3 Current Histogram

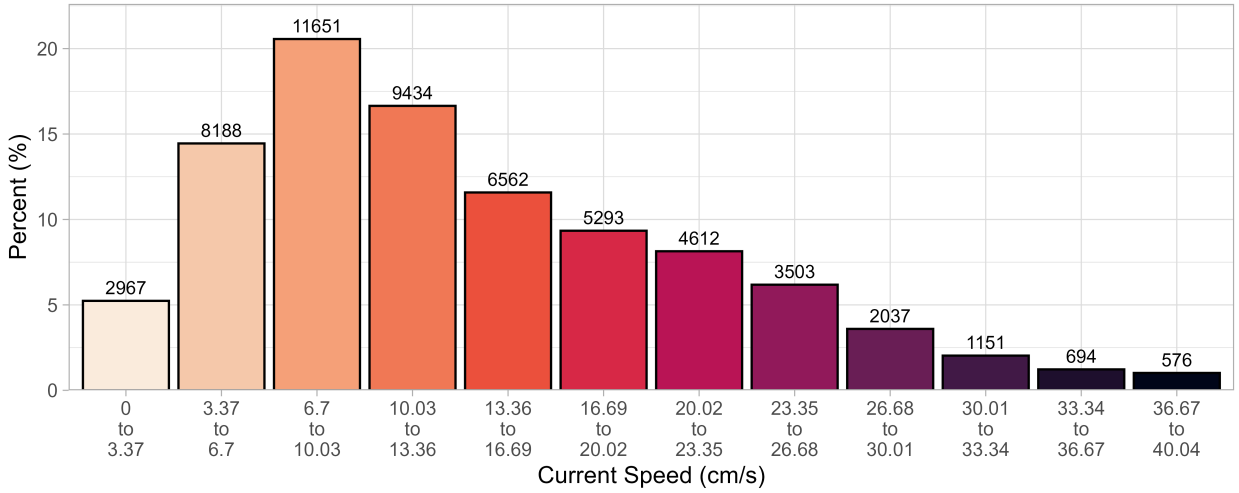

Figure 6: Current speed distribution. The number of observations in each interval is noted above the bar.

2.2 Temperature Time Series

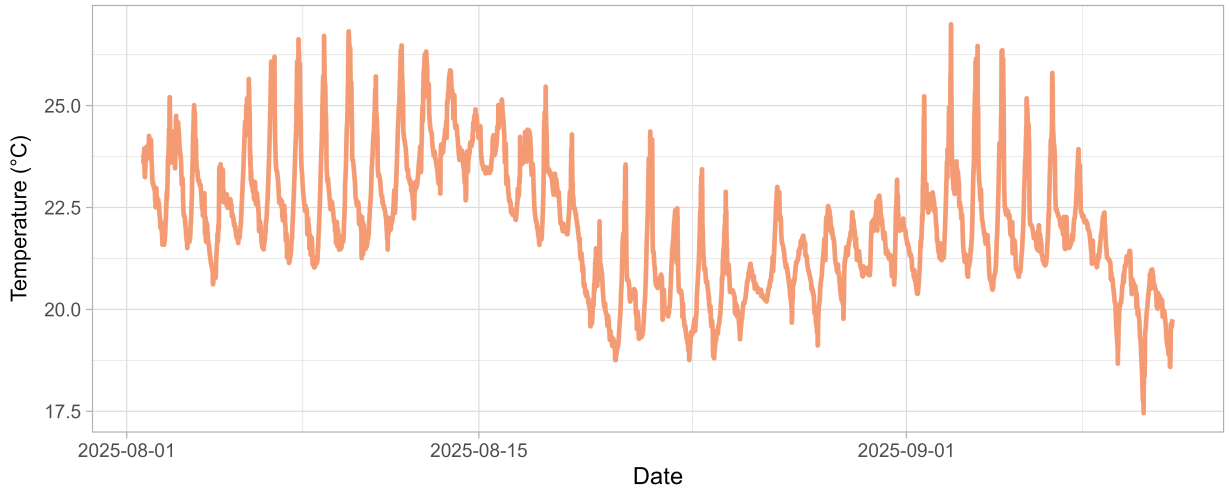

Figure 7: Temperature measured over time.

3 Data Acknowledgement

CMAR aims to prioritize data collection and processing efforts that best serve coastal interest holders. If you use this Coastal Monitoring Program data in a project or for decision making, please complete our anonymous questionnaire with your feedback. Please cite the report and/or datasets used.

4 Document History

Version	Date	Amendments
V1	2025	New document.

References

Dempsey, D. (2025). Tilt: Format and visualize tilt meter data. https://github.com/dempsey-CMAR/tilt

IOOS. (2020). QARTOD manual for real-time oceanographic data quality control flags (1.2). https://cdn.ioos.noaa.gov/media/2020/07/QARTOD-Data-Flags-Manual_version1.2final.pdf

Lowell Instruments LLC. (2019a). Product data sheet: TCM-1 tilt current meter. https://lowellinstruments.com/products/tcm-1-tilt-current-meter/

Lowell Instruments LLC. (2019b). Product data sheet: TCM-4 tilt current meter. https://lowellinstruments.com/products/tcm-4-tilt-current-meter/

Lowell Instruments LLC. (2022). Universal user guide for TCM-x current meters, MAT-1 data logger and domino software. https://lowellinstruments.com/products/tcm-1-tilt-current-meter/

Lowell, N. S., Walsh, D. R., & Pohlman, J. W. (2015). A comparison of tilt current meters and an acoustic doppler current meter in vineyard sound, massachusetts [Conference Proceedings]. 2015 IEEE/OES Eleventh Current, Waves and Turbulence Measurement (CWTM), 1–7. https://doi.org/10.1109/CWTM.2015.7098135