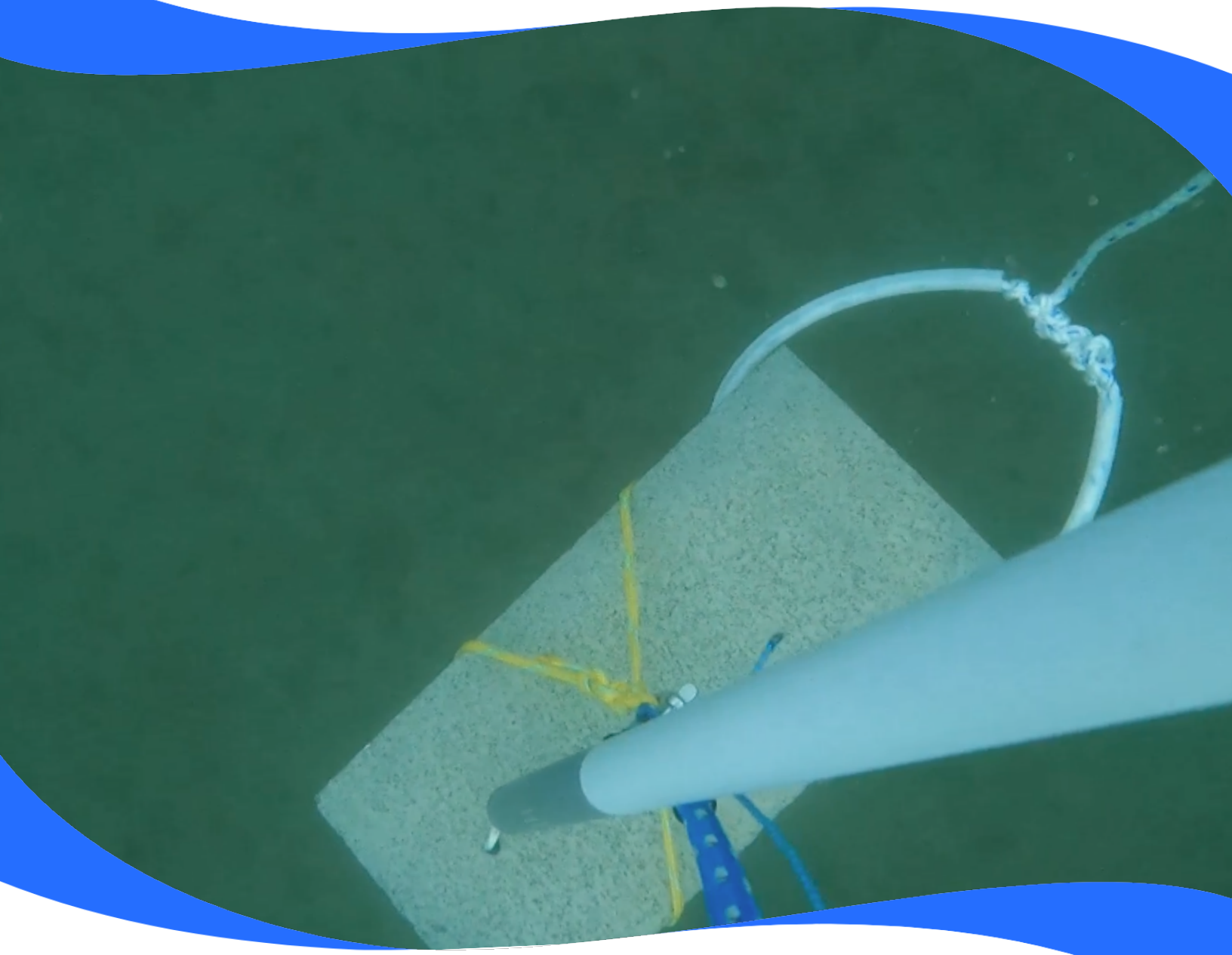
Technical Brief

Tilt Current Meter Deployment

July 2026

prepared by Meredith Melia



Stone Living Lab

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Tilt Current Meter Deployment

Main Report

1. Overview

Tilt meters are underwater instruments used for measuring water velocity in an offshore environment. In a preliminary study, these measures help define hydrodynamic forces of an area which can aid in establishing baseline data for the design and installation of nature-based approaches. In this deployment, six tilt meters were deployed offshore of Cathleen Stone Island on May 12, 2026, to characterize water movement around the North Bluff.

1.1 Deployment Unit Components

The tilt meters used are the TCM-1 Tilt Current Meter by Lowell Instruments, LLC. The buoys used for retrieval are the TR45 Popup Time Release units from Sub Sea Sonics. The components in a single deployment unit include one tilt meter, one pop-up buoy, one cinderblock, one weight, and four different essential lines for attaching each piece together (Figure 1). While other tilt meter deployment methods exist, this is the method used by the Stone Living Lab.

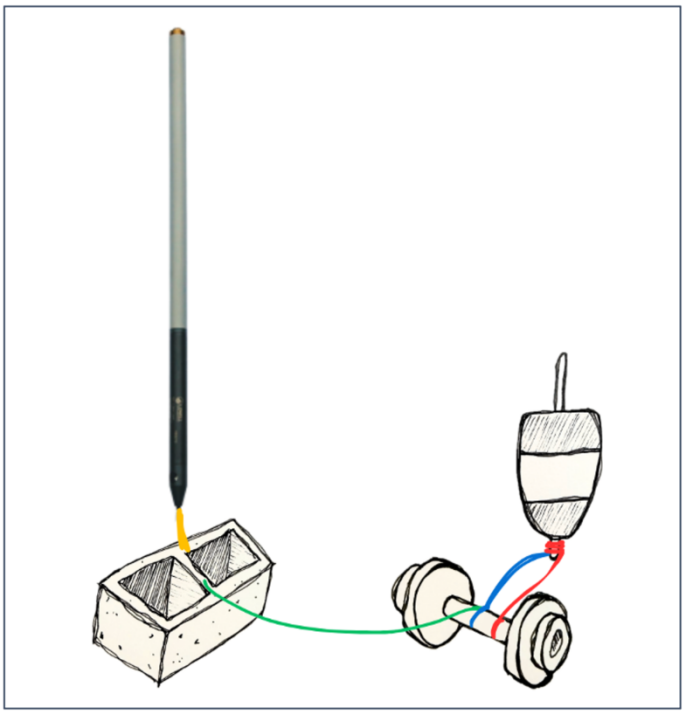

Figure 1: *Diagram depicting one deployment unit for a tilt meter. Colored lines depict the different lines tethering the unit components together.*

1.2 Deployment Unit Configuration

With a short tether (yellow line in Figure 1), the tilt meter attaches to the cinderblock, which anchors the tilt meter to the bottom of the ocean floor allowing it to float in an upright position. In this position, moving water tilts the meter in the direction of flow allowing speed and direction to be recorded by the data logger.

From the cinderblock base, a weighted line (green) extends across the ocean floor to a weight and pop-up buoy. This line is tied directly to the weight, which anchors the pop-up buoy. Two lines are used to secure the pop-up buoy to the weight: a short line with tension (blue) and a long line with slack (red). The short line is attached to the pop-up buoy through a fusible link. When the programmed pop-up time is reached, the link will rapidly erode via electrolytic erosion, disconnecting the small line from the pop-up buoy.

In the absence of the tension from the short line, the buoy will begin to float to the surface, unwinding the long line that is tied to the weight. This keeps the buoy connected to the rest of the deployment unit. From the surface, the buoy emerges, allowing for quick identification of the deployment unit. This retrieval setup allows for retrieval of the entire deployed unit directly from the boat.

2. Pre-Deployment

2.1 Programming

Preparation prior to deployment includes programming tilt meters and pop-up buoys, unit assembly, and location planning. Tilt meters are programmed using Lowell Instrument's Domino Software. Each tilt meter has a USB micro-B port that can be connected to a computer with the software installed. This software is how settings can be configured, including sampling settings and collection start/stop times. The deployment program is saved to the logger's USB drive.

The pop-up buoy is programmed with Sub Sea Sonic's TRP-45C programmer, the compatible unit to the TR-45 Popup buoy. With the programmer, a timer is set (Time Until Release) which is then transferred, via direct contact, to the pop-up buoy. After dual contact is made, the timer starts.

2.2 Location Planning & Assembly

Deployment locations are determined by water depth, local bathymetry, and navigational aids of the study area. Criteria used to determine tilt meter locations for this deployment included more than 5 feet of water at Mean Low Water to avoid noise, avoiding steep slopes, and avoiding navigation channels and buoys.

After the six deployment locations were selected, the coordinates were recorded in Degrees Minutes Seconds (DMS) in consistency with UMass Boston Marine Operations. DMS is the format used on the chart plotter of the Marine Operations' landing craft. Recording the locations allows for coordination with the boat captain during deployment in the field.

The unit is then assembled by tethering the lines to their corresponding components, as shown in Figure 1: a short tether between the tilt meter and cinderblock, a weighted line connected to the cinderblock with the weight, the slack line from the pop-up buoy to the weight, and the tension line from the weight to the pop-up buoy.

3. Deployment

On the day of deployment, all gear gets loaded on the boat. This includes all the deployment units and as well as the equipment to lower the units off the boat. For this, a specific deployment device is used to lower and release each unit onto the ocean

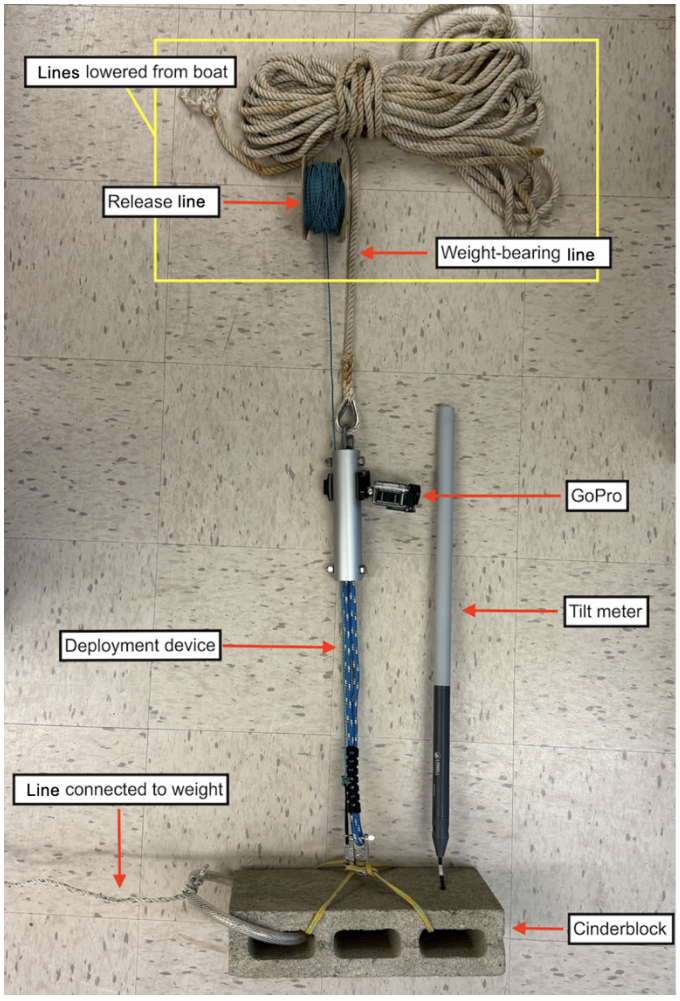

Figure 2: *When ready for deployment, the unit is attached to a deployment device which enables the unit to be lowered and dropped from the boat at the drop site.*

floor. This device uses a quick release link attached to a weight bearing line to lower the unit (Figure 2). Once lowered, the link is released by pulling a separate line attached to the release mechanism (Figure 3).

Upon arrival at the drop site, the deployment device is attached to the cinderblock with the tilt meter, lowered to the ocean floor, and dropped. Immediately after, the deployment device is attached to the weight with the pop-buoy, lowered, and dropped slightly away (~5ft) from the tilt meter drop site.

Time and location of the drop are recorded. This process is repeated for each deployment unit at each location. This quick release system allows for easy deployment from the boat and coordination with the boat captain to ensure alignment with the desired drop location. The tilt meters are scheduled for retrieval on July 7, 2026, with the pop-up buoys set to surface at 7AM.

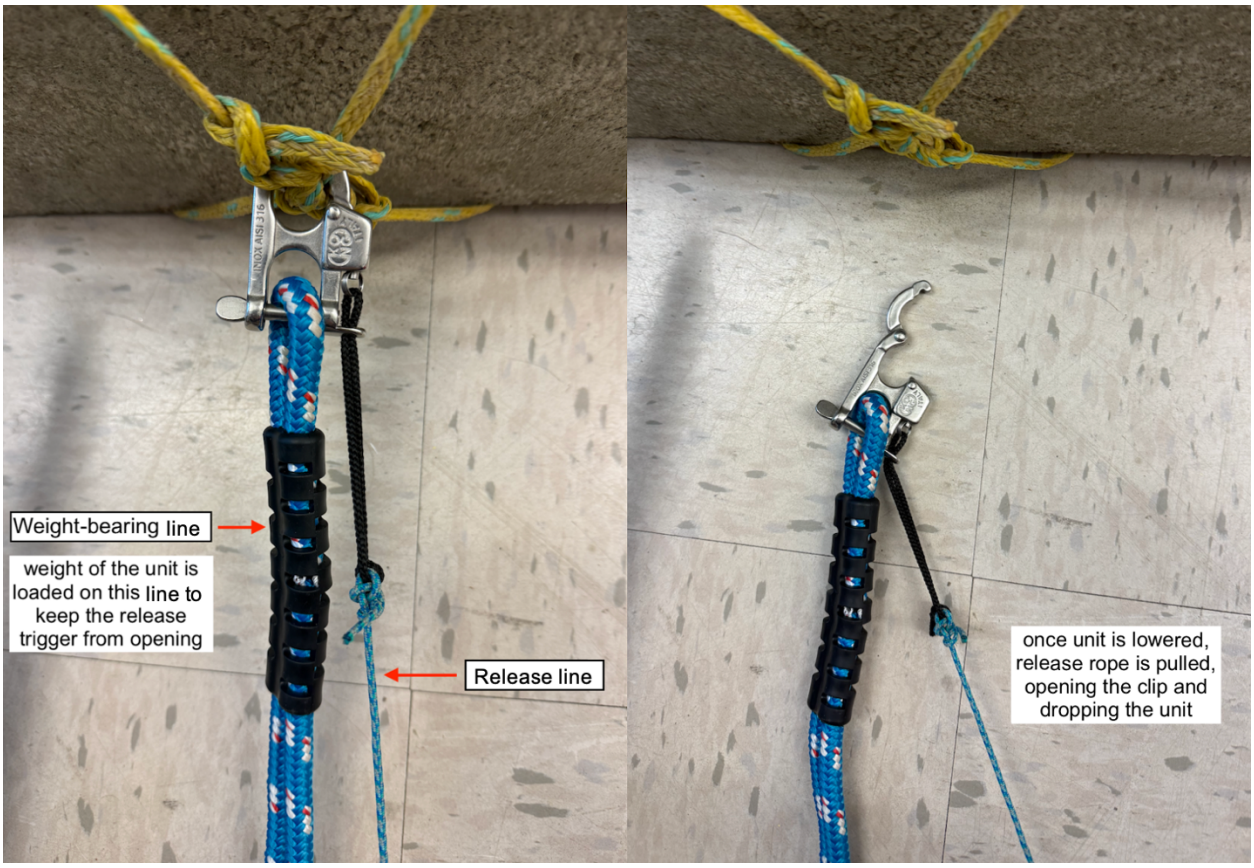

Figure 3: *The deployment device utilizes a weight-bearing line to lower the unit and a release line to trigger the release mechanism.*

4. Metadata

The following information pertains to the tilt meter deployment on May 12, 2026, offshore of Thompson Island proposed as Cathleen Stone Island in Boston Harbor. Six tilt meters were dropped. The locations listed are the coordinates of the tilt meters recorded from the boat at the time of deployment. The deployment map linked includes these deployed locations as well as the planned locations. The meter letter (i.e., Meter B) is an alphabetic name assigned to the different locations so the meter ID (i.e., TCM-2006010) could be easily correlated to its location.

Deployment Date:	05-12-2026
Boat Departure Time:	11:05 AM
Captain:	Viking Gustafson (Marine Ops)
Tides:	High Tide at 7:42 AM LST/LDT, 3.73ft NAVD88 Low Tide at 2:00 PM LST/LDT, -4.47ft NAVD88 From NOAA Station 8443970 Boston, MA

Deployment Map

Meters:

Meter B:	TCM-2006010
Deployment Time:	12:03 PM
Location:	42°19'20.98"N 71°00'22.49"W
Meter C:	TCM-2004057
Deployment Time:	12:00 PM
Location:	42°19'22.59"N 71°00'14.18"W
Meter D:	TCM-2004052
Deployment Time:	11:50 AM
Location:	42°19'22.05"N 70°59'56.18"W
Meter E:	TCM-2006004
Deployment Time:	11:45 AM
Location:	42°19'20.87"N 71°00'07.00"W
Meter F:	TCM-2004055
Deployment Time:	11:39 AM
Location:	42°19'17.60"N 70°59'49.49"W

Meter G:	TCM-2006003
Deployment Time:	11:33 AM
Location:	42°19'07.83"N 70°59'46.04"W

Tilt Meter Programming:	Scheduled start at 2026-05-13 12:00:00 Manual stop
Accelerometer:	Burst Interval - 1 minute Burst Rate - 8 Hz Burst Duration - 20 seconds
Temperature:	1-minute intervals
Pop-Up Buoys:	Programmed pop-up set for 07-07-2026 at 7:00AM through 7:15AM