

Integrated Marine Response Planning (IMRP) –

Ocean Measurements in Frobisher Bay for Spill Prevention and Response

Initiative within the Oceans Protection Plan (OPP), led by Canadian Coast Guard, a key component of the Marine Pollution Preparedness Response initiative.

Specifically, we work with Canadian Coast Guard Marine Environmental and Hazards Response (CCG-MEHR) personnel, some of which work in Iqaluit at the MCTS Station.

Supported by:

- Fisheries and Oceans Canada
- Environment and Climate Change Canada
- Transport Canada
- Health Canada

IMRP - Fisheries and Oceans Canada – Arctic Region

Our Team

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The Integrated Marine Response Planning (IMRP) program at Fisheries and Oceans Canada, Arctic Region works to provide the Canadian Coast Guard with ecosystem information in the Arctic Region to prevent and prepare for marine spill incidents in the Arctic Region.

The Problem We'd Like to Help Solve:

The Nunavut Impact Review Board (2019)* identified a gap in chemical and physical oceanographic knowledge in Davis Strait, Baffin Bay, including Frobisher Bay. The lack of oceanographic data in Frobisher Bay makes it challenging to create reliable current models for the region which are necessary to determine oil spill trajectories. Models currently employed focus on the larger region, making it difficult to simulate small scale processes in Frobisher Bay due to lack of real-world data and large areas modelled.

As an example, Neas Inc., a sealift company, lost ~20 containers during sealift operations in October 2023, and had a man go overboard. Several (6-7) of those containers have not been found, and no one can predict their location(s).

*Nunavut Impact Review Board. 2019. Final Report for the Strategic Environmental Assessment in Baffin Bay and Davis Strait Volume 2: Background Information. NIRB File No. 17SN034. Retrieved from: <https://www.nirb.ca/publications/Strategic%20Environmental%20Assessment/first%20row-second%20file-190731-17SN034-Final%20SEA%20Report-Volume%202-OPAE.pdf>

We would like to measure the properties of the ocean in Frobisher Bay to understand the fate and behavior of pollutants in the region. Our goal is to estimate where pollutants will end up, how fast they will get there, and to what depth in the water column they will sink.

Collaboration with the Amaruq Hunters and Trappers Association:

We heard at the HTA meeting on 19 February that harp seal hunters have information on surface currents (and that harp seals swim against the tide). If the hunters would be open to sharing their knowledge, we would be interested in collaborating and would appreciate any help the HTA could provide to facilitate further discussion.

We also heard that some Board members would like locally focused studies of ocean properties, especially currents, and we'd hope to further those discussions with the HTA for future budget and work planning.

If the Amaruq HTA supports the proposed annual measurements in the inner Bay, we'd like to know how the board, HTA and the community would like to receive the results? We'd also like to hear how the HTA and community would like to be involved in the work?

If possible, we would ask for a supporting letter or comment from the Amaruq HTA to include in our eventual submission of this proposed work to the Nunavut Impact Review Board.

The Data We'd Like to Generate:

We would like to get annual data in Frobisher Bay on salinity and temperature, and ocean mixing, to forecast the fate/behavior of different pollutants. We will measure:

- Tides on an annual cycle in the region (not just at the port in the summer);
- Ocean temperature and salinity on an annual cycle, especially in the fall, winter, and spring;
- Ocean currents on an annual cycle, especially under sea ice.

In order to accomplish the data generation, we'd like to put a mooring in Frobisher Bay, because currently there's no moorings that could possibly provide the information we're after (see Figure 1).

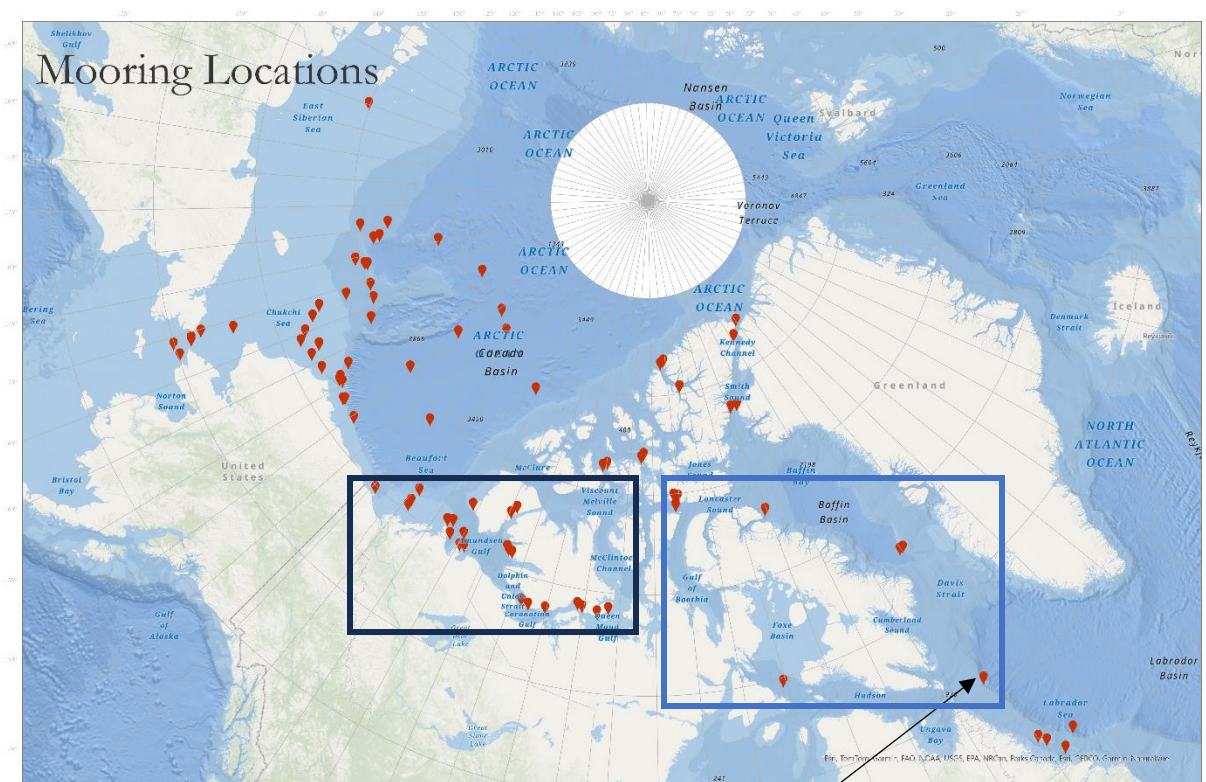


Figure 1: Scientific mooring locations known to Fisheries and Oceans Canada, 2023-2025.

There's currently only a few moorings in the whole of Canada's eastern Arctic (Figure 1, blue box), the closest one to Frobisher Bay being the Hatton Basin mooring at the Labrador Sea shelf (Figure 1). The Inuvialuit Settlement Region and the Kitikmeot Region (Figure 1, black box) have supported the method for annual oceanographic data collection (Figure 1). An example of a similar project is the Kitikmeot Science Sea Study:

<https://www.canada.ca/content/dam/polar-polaire/documents/publications/aqhaliat/volume-4/infosheets/k3s-english.pdf>

Proposed Mooring Location:

As discussed at the Amaruq Hunters and Trappers Association (HTA) Board Meeting on 19 February 2025, we're happy to collaborate with the HTA on the location. The location we propose is in the shipping lane north of Pike-Resor Channel, in about 115 meters of water.

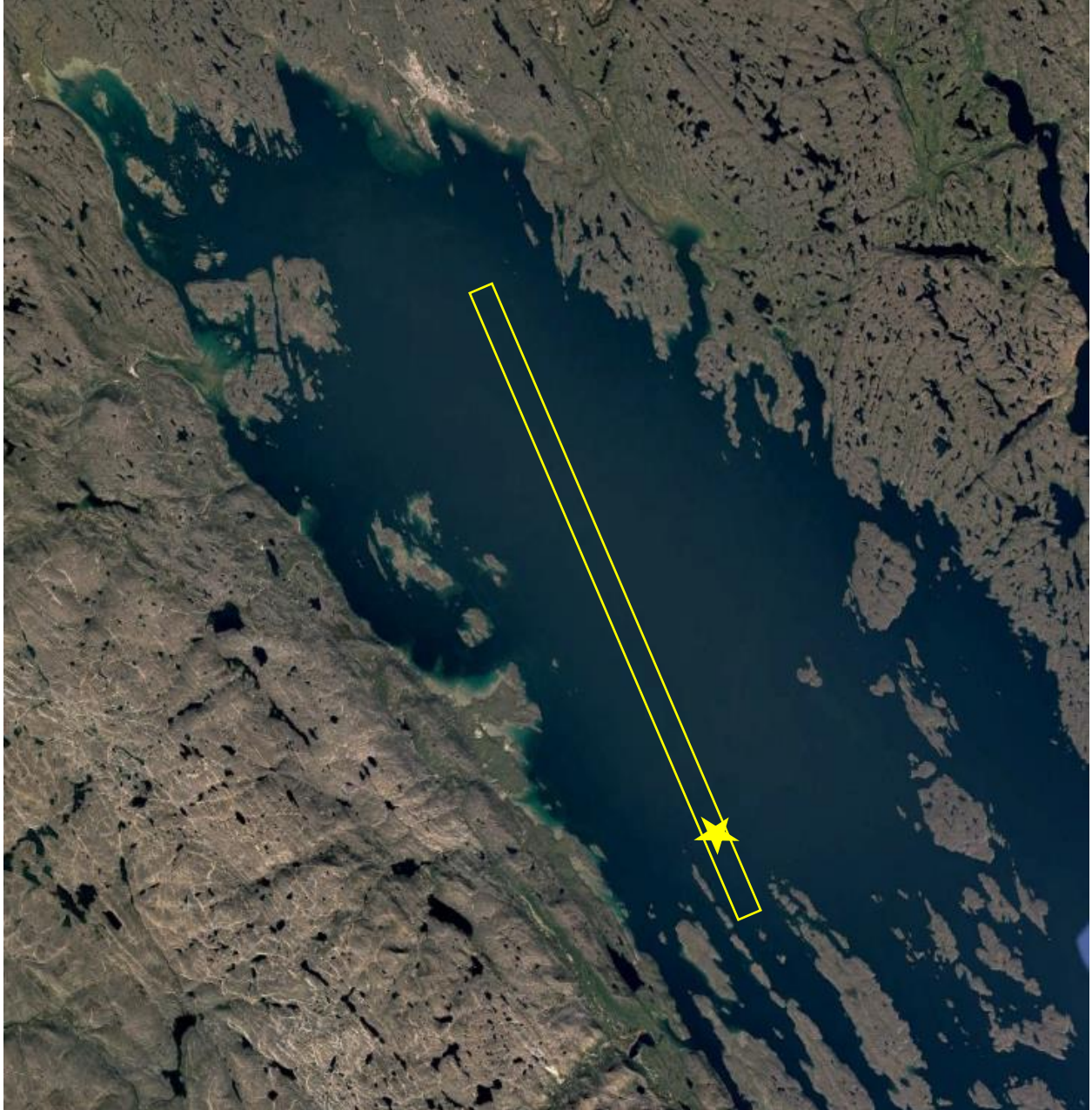


Figure 2: Potential mooring location (yellow star) in the shipping lane (yellow rectangle) in inner Frobisher Bay as proposed by the Arctic Region IMRP Team, Fisheries and Oceans Canada.

The Frobisher Bay location, rather than elsewhere in Canada's eastern Arctic was chosen for this work for a number of reasons:

- The NIRB (2019) report indicating that the NIRB would like their identified knowledge gap in Frobisher Bay to be filled with in-situ data;
- Increased shipping, ship traffic are expected now that the new Port of Iqaluit is operational.
- We have significant capacity in Iqaluit both in terms of DFO and CCG personnel and resources;

The proposed mooring location (Figure 2, yellow star) seems like a good spot for a number of reasons:

- It's in the shipping lane;
- Canadian Hydrographic Service would like surface current information for their navigational charts in the area;
- It's relatively deep, while the whole water column can be measured from the bottom;
- It will capture the ocean currents in the inner bay which may be more important, useful to the HTA and the people of Iqaluit, while hopefully observing the interaction between the inner and outer portions of Frobisher Bay;
- We have heard accounts of thin ice in this area, and would like to try to explain;
- We have engaged a physical oceanographic modeler, Yongsheng Wu, at the Bedford Institute of Oceanography (BIO) for ocean, sea ice and oil spill modelling using the SCHISM model.

SCHISM – Semi-Implicit Cross-scale Hydroscience Integrated System Model

<https://ccrm.vims.edu/schismweb/>

The SCHISM model includes ocean, sea-ice, and oil spill modules. Dr. Yongsheng Wu (Fisheries and Oceans Canada, Bedford Institute of Oceanography) is currently running this model for the Atlantic Ocean, Labrador Sea, Davis Strait and Baffin Bay (see Figure 3 (top panel) for the models' spatial domain).

Dr. Wu has agreed to build a nested, high resolution physical model of Frobisher Bay based on the data we will generate using SCHISM so that sea ice, ocean, and oil dynamics are accurately understood in the region.

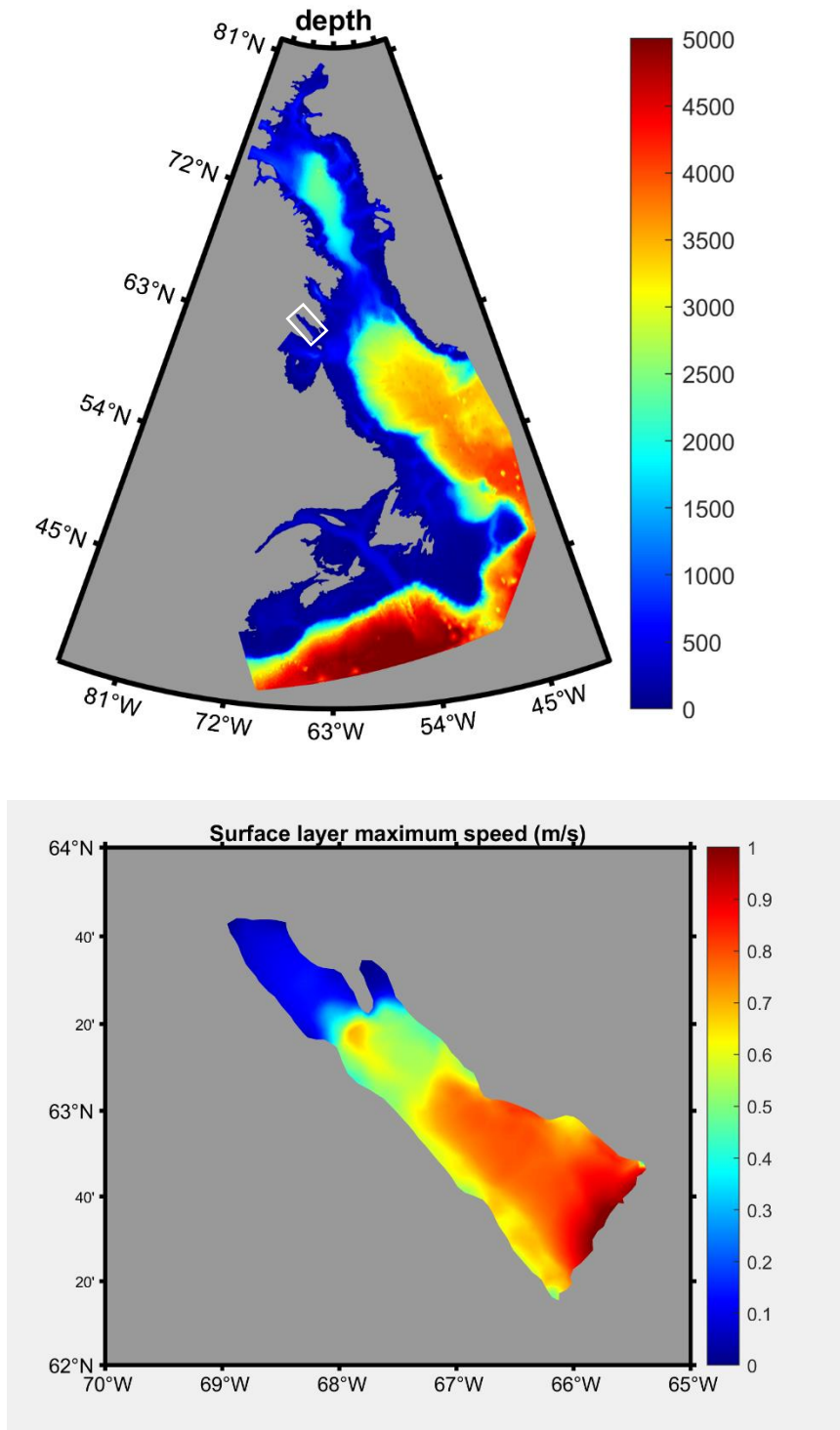


Figure 3: (top) Spatial domain with bathymetry (meters) of the ocean model currently run by Yongsheng Wu at Bedford Institute of Oceanography. Proposed high resolution Frobisher Bay model domain approximated by the white rectangle, (bottom) example of the current unverified model output and resolution.

Mooring Design:

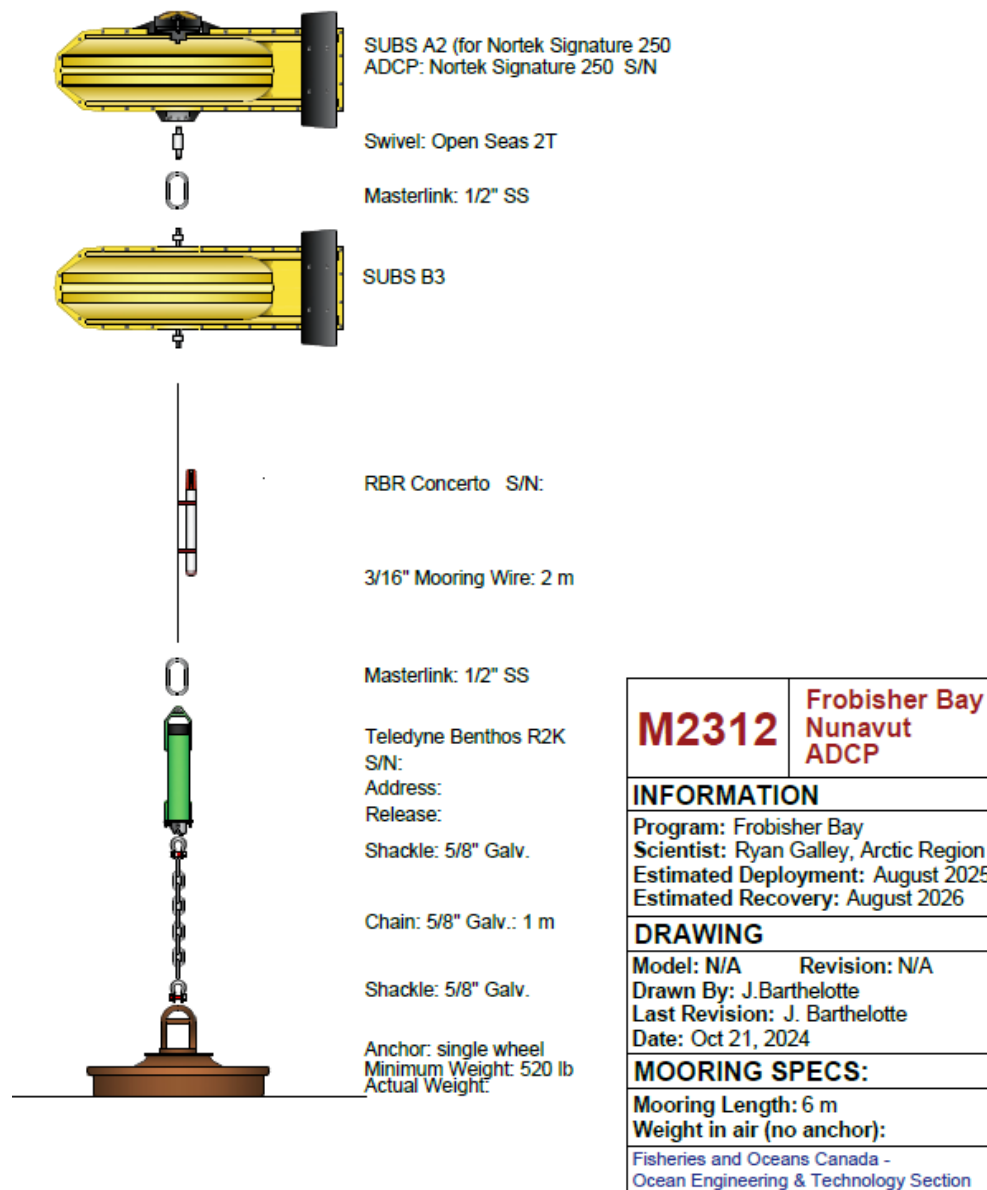


Figure 4: Potential design for a 6-m tall mooring setup using floats, a Nortek Signature 250 current meter, an RBR Concerto CTD and a Teledyne Benthos release held to the bottom by a single train wheel anchor.