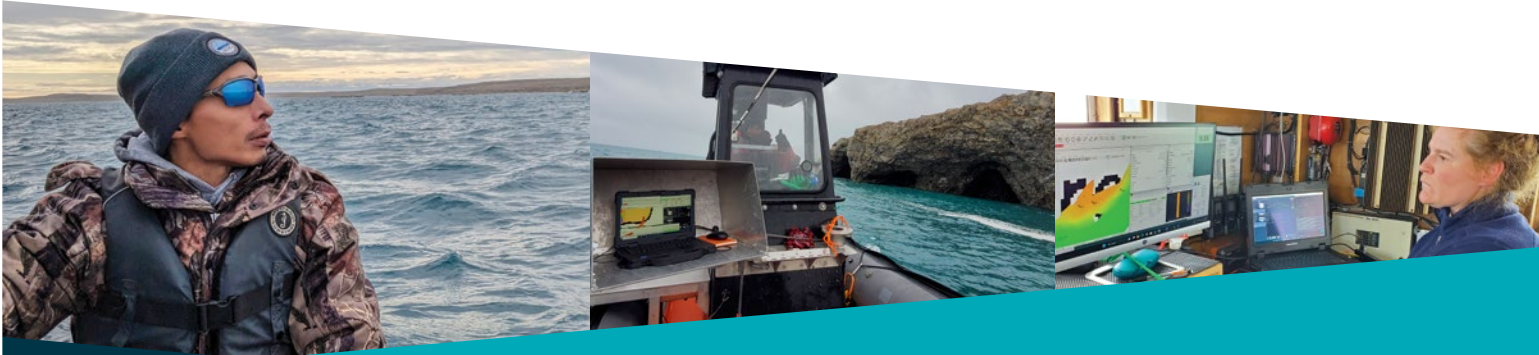




# Community Hydrography



## Empowering Coastal Communities

Community Hydrography Program  
Canadian Hydrographic Service (CHS)

» 2023



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada

Canada 

From left to right: Terrence Green, Yan Bilodeau, Sara Graham, Daniel Mose, Dave Mark, Jesse Maconnell, Marshall Moubert, Angus Green, Joel McDonald, Andrew Majewski.

---



Front cover credits: All photos are from Community Hydrography team except the bottom one which is from Adobe Stock.

Captions: Top image: Paulatuk, NT; Middle-left: Terrence “Leo” Green; Middle-center: Frosti’s research and rescue launch; Middle-right: Sara Graham; Bottom image: Cape Dorset, NU.

---

E-Mail: [publications.XNCR@dfo-mpo.gc.ca](mailto:publications.XNCR@dfo-mpo.gc.ca)  
[libraries-bibliotheques@dfo-mpo.gc.ca](mailto:libraries-bibliotheques@dfo-mpo.gc.ca)

© His Majesty the King in Right of Canada, as represented by the Minister of the Department of Fisheries and Oceans, 2022

ISBN **Fs1-96E-PDF**

This report provides information on the Community Hydrography program, a five-year initiative. While the report is scientific or technical in nature, it has not undergone formal scientific peer review.



# Table of contents

Introduction

**2**

Communication  
and engagement

**3**

DFO Ecosystems  
and Oceans Science  
Contribution Framework

**4**

Data collection with  
bathymetric data loggers

**5**

Satellite-derived  
Bathymetry (SDB)

**6**

Multibeam echosounder  
data collection

**7**

Tools for processing  
the collected data

**9**

UMap, a tool  
for map creation

**11**

Data visualization with  
the Enhanced Maritime  
Situational Awareness  
(EMSA) portal

**12**





## Introduction

The Community Hydrography Program is a DFO initiative (2022-2027), part of the Oceans Protections Plan, that aims at empowering coastal communities in collecting and using bathymetric data. A great number of projects were launched in 2023 and we are happy to share the main highlights in this report.

The projects were successful in large part due to the interest and the curiosity communities have shown in learning about hydrography. The Canadian Hydrographic Service (CHS), Transport Canada and the Canadian Coast Guard also played a key role in welcoming our efforts and enabling fruitful projects with collaboration across the country.

As you will see in the following pages, community hydrography touches on various aspects, such as accessing existing bathymetric data, learning about bathymetric data collection, processing data, and creating maps.

We hope this report will help inspire and foster interest for hydrography in coastal communities in Canada.

**Michel Breton, Manager**  
Community Hydrography Program



## Communication and engagement

In 2023, the Community Hydrography Program prioritized communication and engagement with stakeholders. Community Hydrography staff attended a number of in-person and online stakeholder meetings this year, including a workshop with community members in Paulatuk, NT, and the Oceans Research in Canada Alliance meeting (ORCA), Transport Canada Marine Dialogue Forums in the Pacific region, Atlantic region, and in Ottawa. Those events were leveraged to present the Program and engage with coastal communities. Through this engagement, the Program team and partnering communities established meaningful, respectful, and trusting relationships.



ORCA Meetings, St. John's,  
NL, June 2023.



# DFO Ecosystems and Oceans Science Contribution Framework

Through Fisheries and Oceans Canada's (DFO) Ecosystems and Oceans Science Contribution Framework, the Community Hydrography Program funded six projects in 2023. Four provided funding and resources directly to communities to support them in collecting and using bathymetric data; the other two supported academia with ventures that we believe will benefit coastal communities.



Paulatuk, NT.

Projects	Timeframe	Funding
Bathymetry and hydrographic data collection in support of Ecosystem Knowledge in Areas of Importance to the Miawpukek First Nations <b>Recipient:</b> <i>Mi'kmaq Alsumk Mowimsikik Koqey Association Inc.</i>	2023–2024	\$100,000
Bathymetry and hydrographic data collection in the Qikiqtani region of Nunavut – Kinngait <b>Recipient:</b> <i>Qikiqtaaluk Corporation</i>	2023–2024	\$100,000
Community Driven Bathymetric Mapping in Tuktoyaktuk <b>Recipient:</b> <i>Tuktoyaktuk Hunters and Trappers Committee (THTC)</i>	2023–2026	\$100,000
Hydrographic Field Operations training course: A Complex Multidisciplinary Field Project (CMFP) focused on multibeam sonar operations <b>Recipient:</b> <i>University of New Brunswick</i>	2023–2024	\$41,159
Nanwakolas Council Society Community Hydrography <b>Recipient:</b> <i>Nanwakolas Council Society</i>	2023–2025	\$100,000
Rapid Processing of Hydrographic and Coastal Data for General Use <b>Recipient:</b> <i>University of New Hampshire</i>	2023–2025	\$100,000

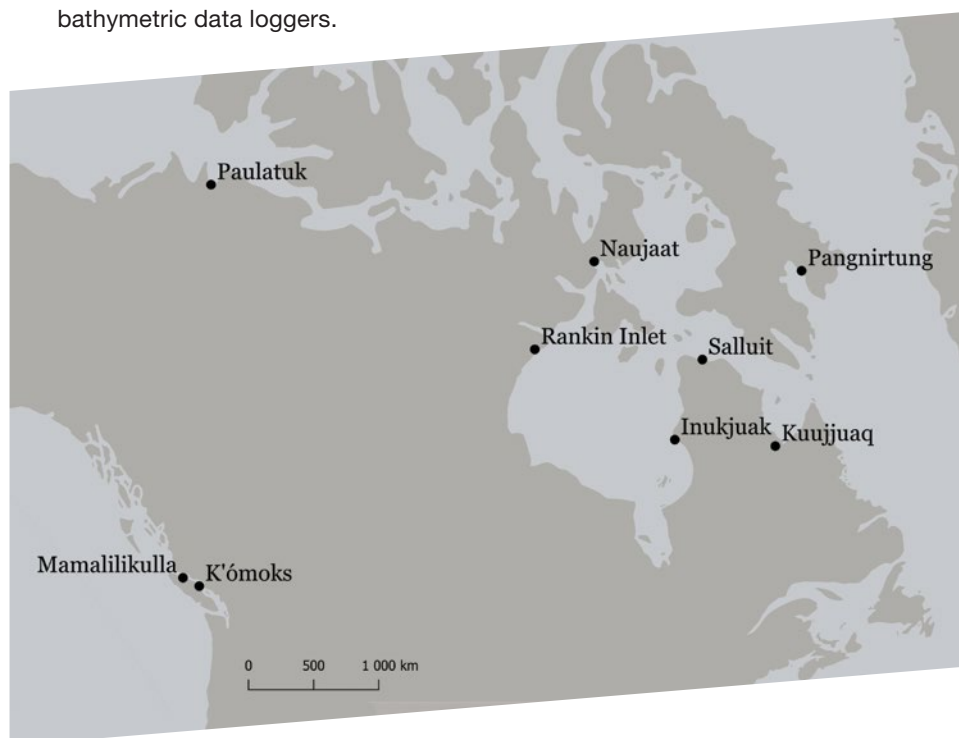
Bathymetric data logger installed in 2023 on a Canadian Coast Guard Auxiliary vessel in the hamlet of Pangnirtung, Nvt.

## Data collection with bathymetric data loggers

The Community Hydrography Program supports communities in building and strengthening their bathymetric data collection capacity, using simple and low maintenance equipment.

A bathymetric data logger is a small device that records positions, depths, and time data received from a vessel's GPS antenna and echosounder (sonar). This equipment is ideal for beginners in hydrography.

In 2023, the team worked with different communities and installed nine bathymetric data loggers.



Communities with bathymetric data loggers.

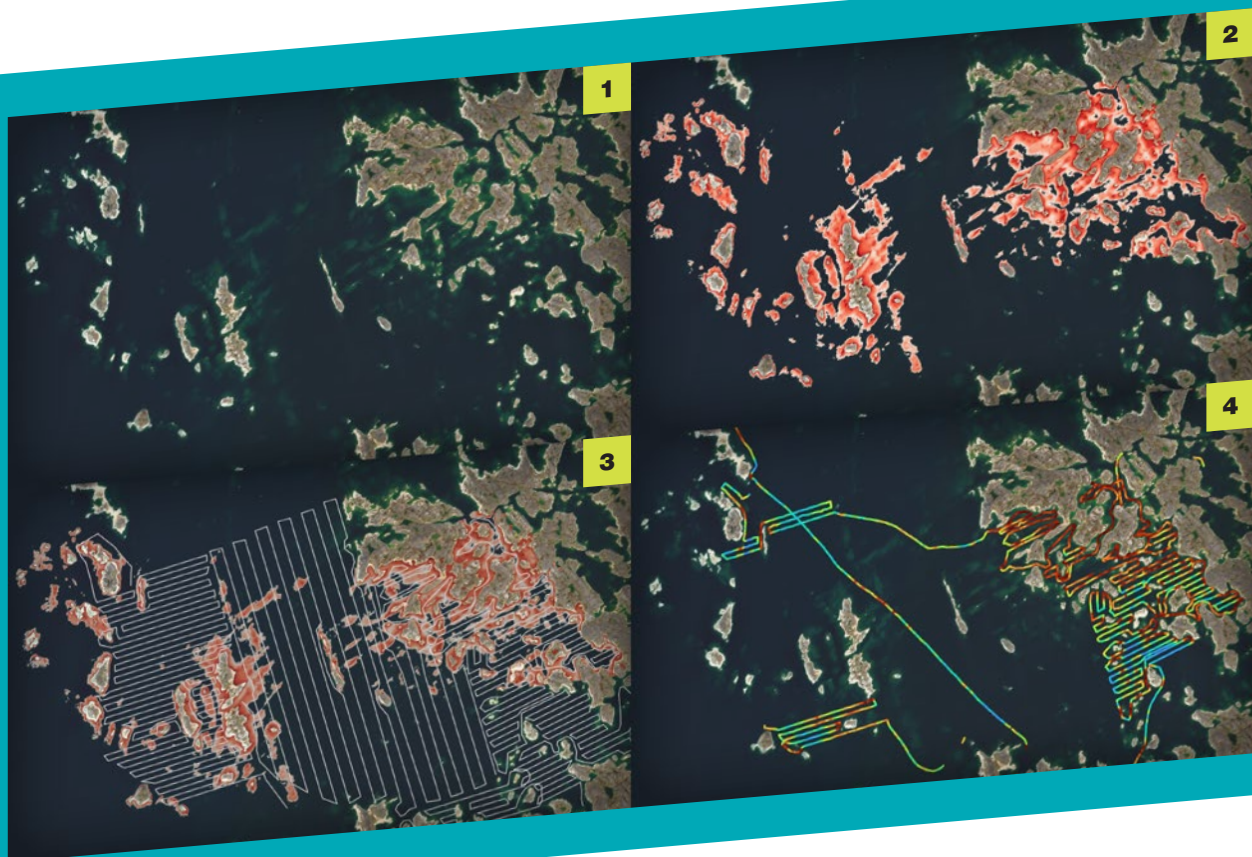
# Satellite-derived Bathymetry (SDB)

Satellite-derived bathymetry (SDB) is a valuable complement to community-led surveys as it measures the depth of water using satellite imagery. A great example of this is the Inukjuak Community, where SDB was used as reconnaissance to securely plan a bathymetric survey in October 2023 aboard the *Arvik*.

## About the process:

- 1** The community identified an area of interest, in this case the Inukjuak Marine Region (IMR), an important corridor and a traditional Inuit hunting ground.
- 2** SDB was used as reconnaissance to securely plan a bathymetric survey.
- 3** A line pattern was drawn to avoid possible hazards, notably shoals and rocks in nearshore areas represented in red.
- 4** Inukjuak survey team used the survey line pattern to safely collect bathymetric data.

SDB simplifies planning for on-water surveys and data collection, saving time and efforts for communities involved in hydrographic projects.



Steps of the SDB reconnaissance process for Inukjuak's bathymetric survey of October 2023: 1) No bathymetric data available in the area of interest; 2) SDB data ordered and analyzed. Depths detected range from 0m to 10m; 3) Line pattern created; and, 4) Bathymetric field survey following the line pattern. Colors give depths information ranging from 4m (red) to 56m (blue).



Workshop in Paulatuk, NT,  
in April 2023.

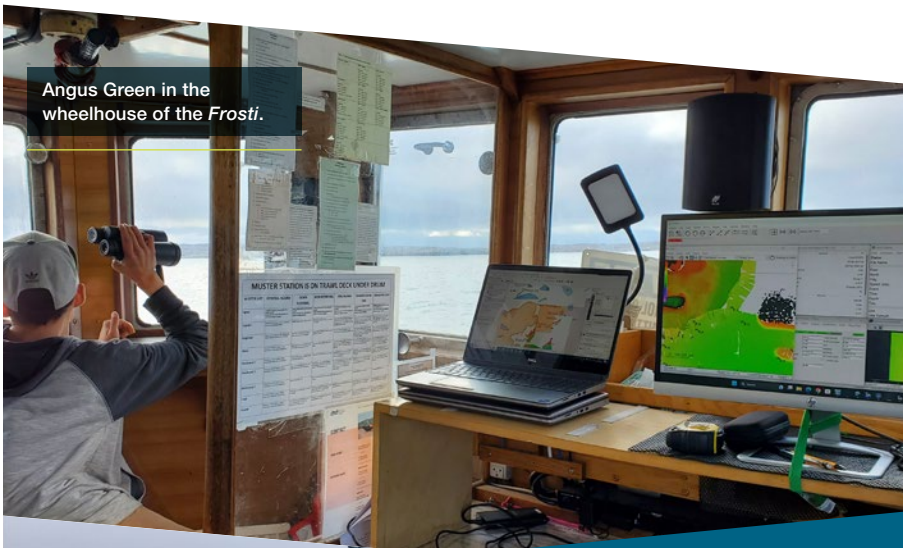


## Multibeam echosounder data collection

In addition to bathymetric data loggers and satellite-derived-bathymetry, the Community Hydrography Program has a number of portable multibeam echosounders that can be deployed on any type of vessel.

A multibeam echosounder survey was planned and conducted in 2023 as part of the Anguniaqvia Niqiqyuam Marine Protected Area (ANMPA) Habitat Mapping Project. Prior to field deployment, the Paulatuk Hunters and Trappers Committee (PHTC) identified and prioritized areas of interest during a workshop held in Paulatuk from April 24 to 26, 2023.

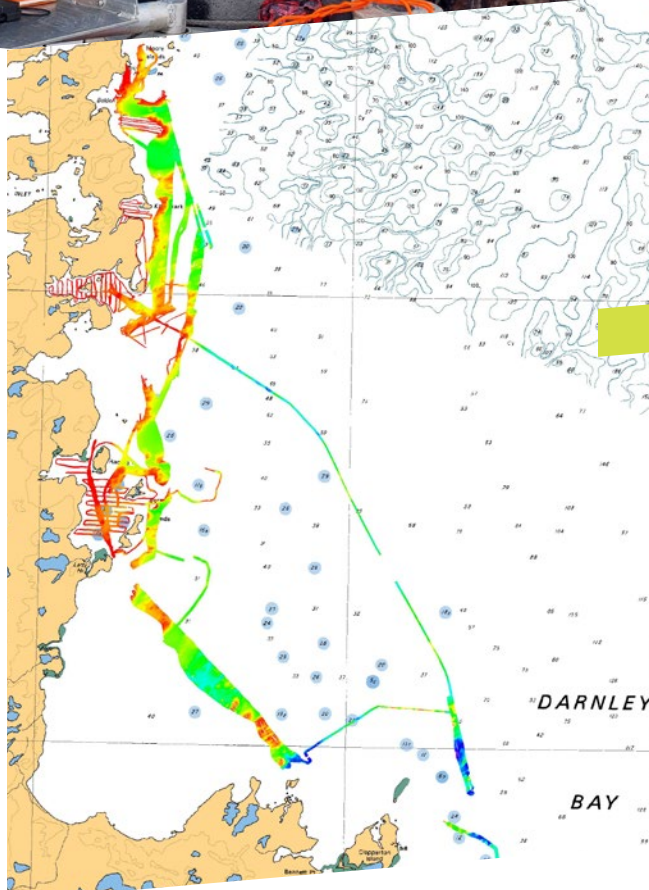




Angus Green in the wheelhouse of the *Frosti*.



Terrence "Leo" Green on board the *Frosti*'s research and rescue launch.



The survey mission took place from August 28 to September 3, 2023, and was led by Angus Green and Terrence "Leo" Green on behalf of the PHTC. Two vessels were sent out for this survey, the *Frosti* and its rapid research and rescue vessel. Both vessels were outfitted with a Norbit iWBMS multibeam hydrographic survey system.

More than 100 km<sup>2</sup> of multibeam data was collected during the ANMPA Habitat Mapping Project in 2023. Having community members from Paulatuk participating in the survey operations helped the mission. Their local knowledge were essential to identify the near-shore areas of importance to the community and define the navigation corridors.

Multibeam data coverage collected in the ANMPA, 2023. Colors give depths information ranging from 3m (red) to 95m (blue).

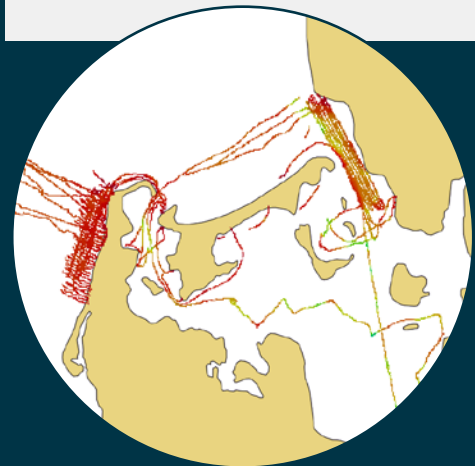
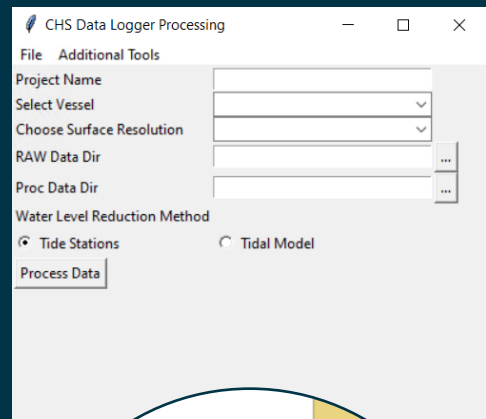
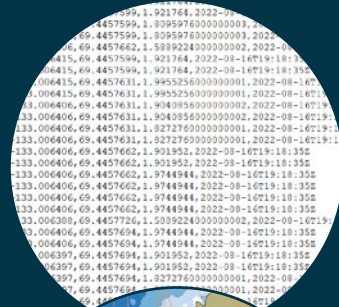


# Tools for processing the collected data

Accounting for tide is one of the most important steps when processing bathymetric data. For data to be useful, it must be adjusted to a common reference which, in hydrography, is the chart datum. This refers to the lowest normal tide so that the water level will seldom fall below it.

Tidal reduction is the process of subtracting the tidal-water portion of the measured depths. Once reduced, the depths are then all adjusted to the same reference.

In 2023, the Program team developed a tool to automate tidal reduction. Though the team is currently using it to support various projects, the ultimate goal is to make the tool open source, so it can be leveraged by any community.



Tidal reduction tool.



The Program helped Aklavik and Tuktoyaktuk, two Northern Villages located in the Inuvialuit Settlement Region (ISR) of the Northwest Territories, to conduct tidal reduction on 10,400 km of data they had collected.



Fleet of four community boats heading out of harbour in Tuktoyaktuk, NT, to conduct a bathymetric survey.  
Credit: Natalya Saprunova



Daniel Mose, captain of the Frosti, sounding 1.5 nautical mile offshore Browns Harbour.

# UMap, a tool for map creation

Maps are essential tools for representing underwater features. Creating maps with communities in a timely manner has great impact on the community's activities. This is why efforts were put into building a tool to help communities visualize hydrographic data on a map with as little delay as possible.

UMap is a free tool for the open-source software Quantum Geographic Information System (QGIS). UMap requires three inputs for the area of interest to be mapped: 1) the extent of the area of interest; 2) the coastline; and, 3) one or more bathymetric datasets.

The maps created with the UMap extension are referred to as community maps, which we define as follows:

- » **A community map is a map that is created by and for a specific community to support a better understanding of the seafloor topography in an area. It is mostly constructed from open data (for example, leveraging data from the Non-Navigational (NONNA) bathymetric data portal in Canadian waters), and can also incorporate data collected by the community. It is important to mention that a community map is not an official navigational product and should not be used as such.**



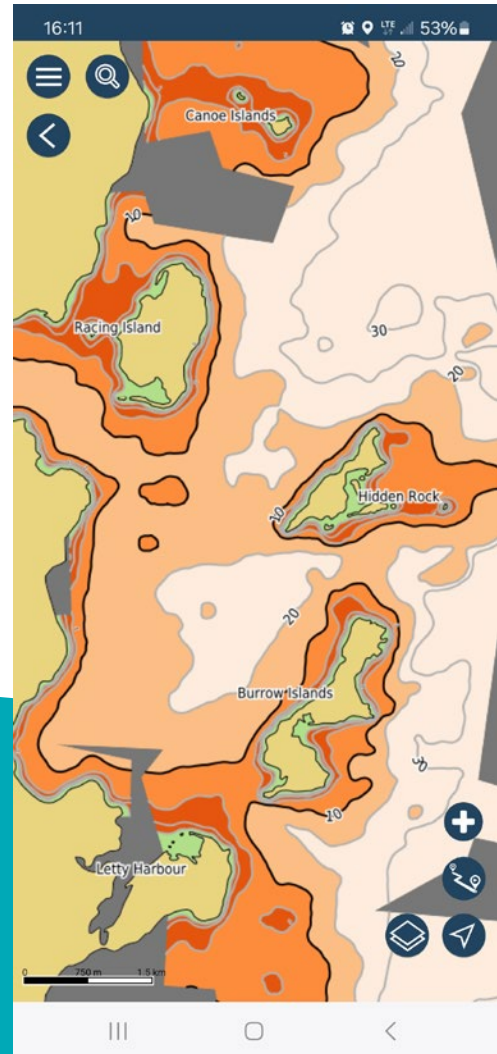
The UMap plugin for QGIS can aid in constructing a community map in an area of interest.



# Data visualization with the Enhanced Maritime Situational Awareness (EMSA) portal

The Enhanced Maritime Situational Awareness (EMSA) system is a web platform that has been co-developed by Transport Canada and 13 Indigenous partners across Canada. The EMSA portal provides near real-time vessel locations and other marine environmental information in local waters while protecting and honouring Indigenous knowledge and data. Since its launch in 2019, EMSA has grown to have over 900 users, including 90 different Indigenous communities across Canada.

Data collected as part of the Program can easily be uploaded to the EMSA portal. The portal is accessible online as well as on the EMSA App so that communities collecting bathymetric data can conveniently access their community maps, which are at their fingertips at all times.



Community map, close-up of the area around Letty Harbour, NT, displayed in the EMSA App.



Salluit, QC.



## » Acknowledgements

This year, we have developed a working relationship with many people from communities, ministries, universities, private sectors, and NGOs. The Community Hydrography team at the Canadian Hydrographic Service extends our kind thanks to all of them.



### In alphabetical order, they are:

- › Aklavik Hunters and Trappers Committee (AHTC)
- › Arctic Eider Society/SIKU
- › Arqviiliit IPCA
- › Canadian Coast Guard Arctic Marine Response Station of Rankin Inlet
- › Canadian Coast Guard auxiliary Search and Rescue units in Kuujuaq, Naujaat, Pangnirtung, and Salluit
- › Center for Coastal Ocean Mapping of University of New Hampshire
- › CIDCO: Interdisciplinary Centre for the Development of Ocean Mapping
- › EOMAP: Earth Observation & Environmental Services
- › Kyuquot and Checlesheht First Nations
- › Marine Institute of Memorial Newfoundland University
- › Miawpukek First Nations
- › Nanwakolas Council Society
- › Northern Village of Inukjuak
- › Ocean Mapping Group at the University of New Brunswick
- › Orange Force Marine
- › Paulatuk Hunters and Trappers Committee (PHTC)
- › Qikiqtaaluk Corporation
- › Transport Canada, EMSA and CEMS
- › Tuktoyaktuk Hunters and Trappers Committee (THTC)

And our DFO colleagues of the Ecosystems and Oceans Science sector in Winnipeg and Yellowknife, the Canadian Coast Guard in Burlington, Ontario, research scientists at Natural Resources Canada in Dartmouth, and everyone at the Canadian Hydrographic Service across the country.

Back cover credits: All photos are from Community Hydrography team

Captions: Top, Middle-center and Bottom images: Paulatuk, NT, Middle-right was taken at Cape Spear Lighthouse, Newfoundland while Middle-left was taken with Mamaliikulla First Nations, in Telegraph Cove, BC.



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada

Canada 