



Inuit Marine Monitoring Program

Processes for Implementing an
Ecosystem Approach to Management
on Shipping, Tourism, and Exploration
for the Nunavut Region

June 23-27, 2019
Bergen, Norway

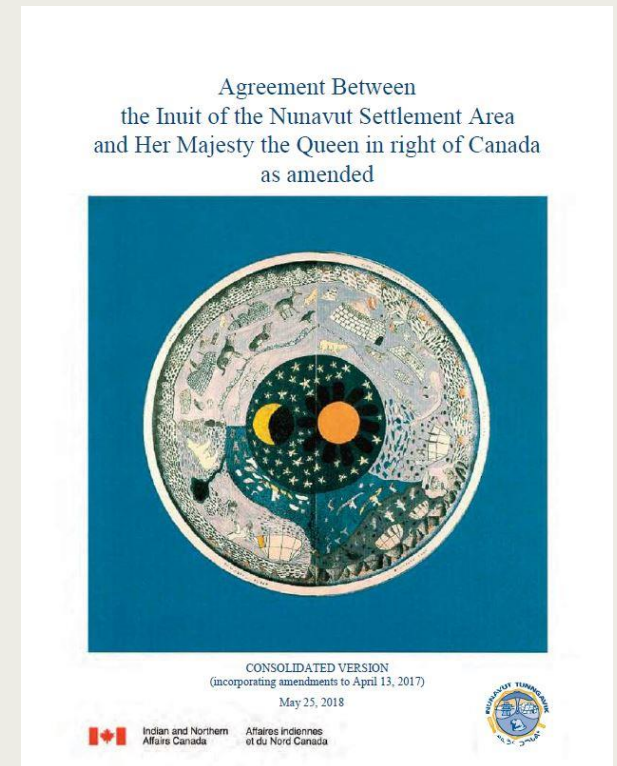


Concept of Inuit-led Marine Monitoring in Nunavut, Canada

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What is Nunavut Tunngavik Inc?

- NTI represents Inuit under the 1993 *Nunavut Agreement*. This modern day treaty sparked the political development for the Territory of Nunavut joining Canadian Confederation in 1999.
- Under the Nunavut Agreement; “Canada's sovereignty over the waters of the Arctic archipelago is supported by Inuit use and occupancy.” and;
- “Canada recognizes the contributions of Inuit to Canada's history, identity and sovereignty in the Arctic.”
- NTI’s Mission; “Inuit Economic, Social and Cultural Well-being Through Implementation of the Nunavut Agreement.”
- On October 22, 2015 the NTI board of Director passed a resolution that stated; “Members call on the Government of Canada and the Government of Nunavut to fully involve and closely consult with Inuit on the formulation and development of any plan, strategy, policy, legislation and regulations regarding the use of and resource development in the waters of the Northwest Passage.”



Oct 2016 NTI Board Resolution

- Called on “the Government of Canada and Nunavut to strengthen monitoring and management efforts on marine shipping traffic in Nunavut waters”
- Directed “NTI and Regional Inuit Associations to establish, on a pilot basis, an Inuit-led monitoring system”



Why did NTI develop this program?

- Shipping is increasing in Nunavut and communities are concerned
- Communities have many shared concerns
 - Small vessels transiting near community harvesting areas
 - Potential for accidents, pollution, oil spills
 - Wildlife disturbance, interference with hunting, traditional practices, and well-being of marine mammals
 - Help Nunavut communities implement policy and guidelines for the Northwest Passage in the future (NWP)
- Nunavut communities needed for more information on shipping activities, tourism, yachting, near their community
- Inuit need to have greater role in shipping management



Regional Inuit Associations Core Areas of Interest

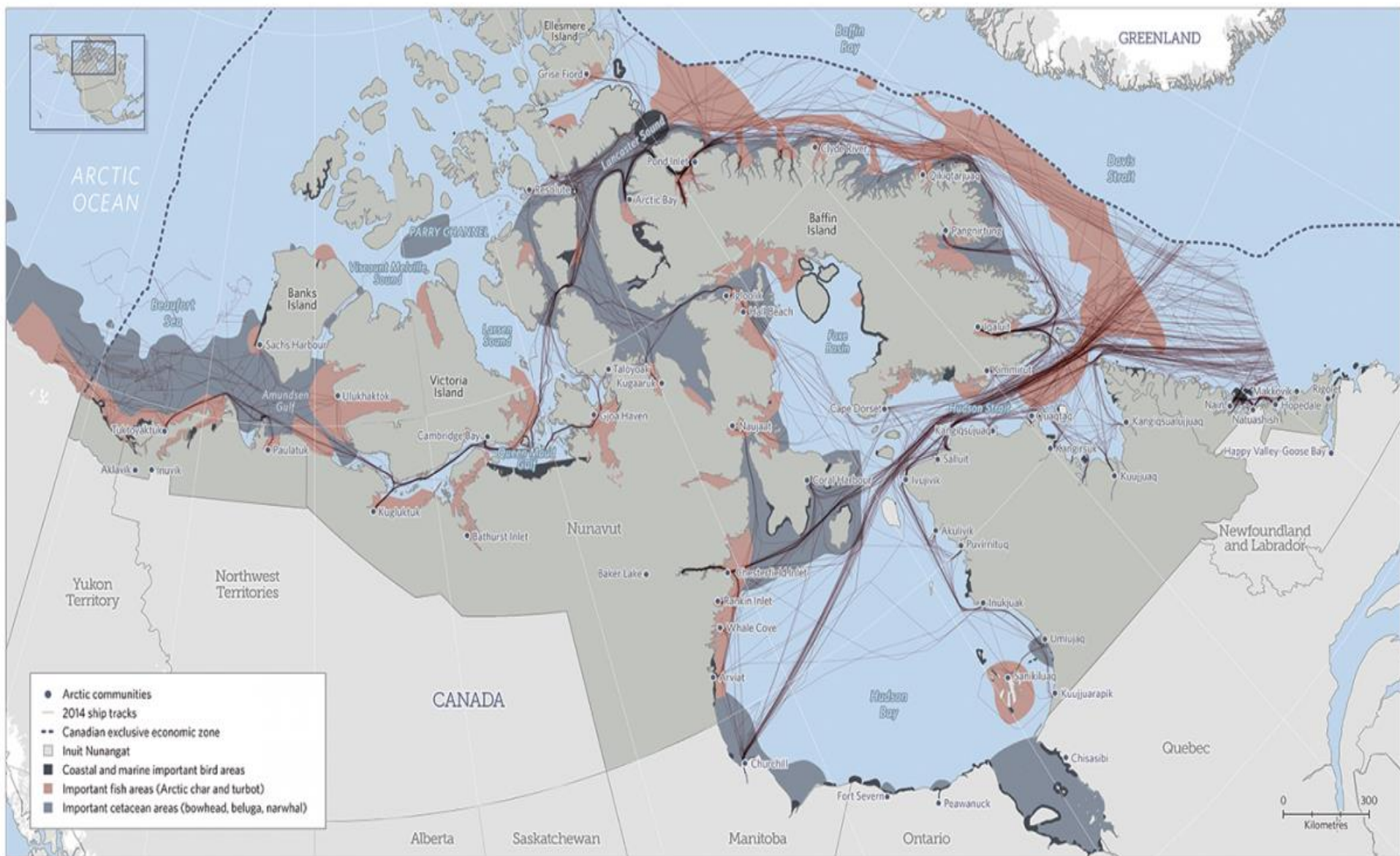
Information to collect:

- Ship characteristics (type, color, flag, etc.)
- Concerns (wildlife, noise, pollution, etc.)
- Location, speed, heading
- Behaviour/Activity
- Timing
- Suspicious vessels
- Concerns identified by the community

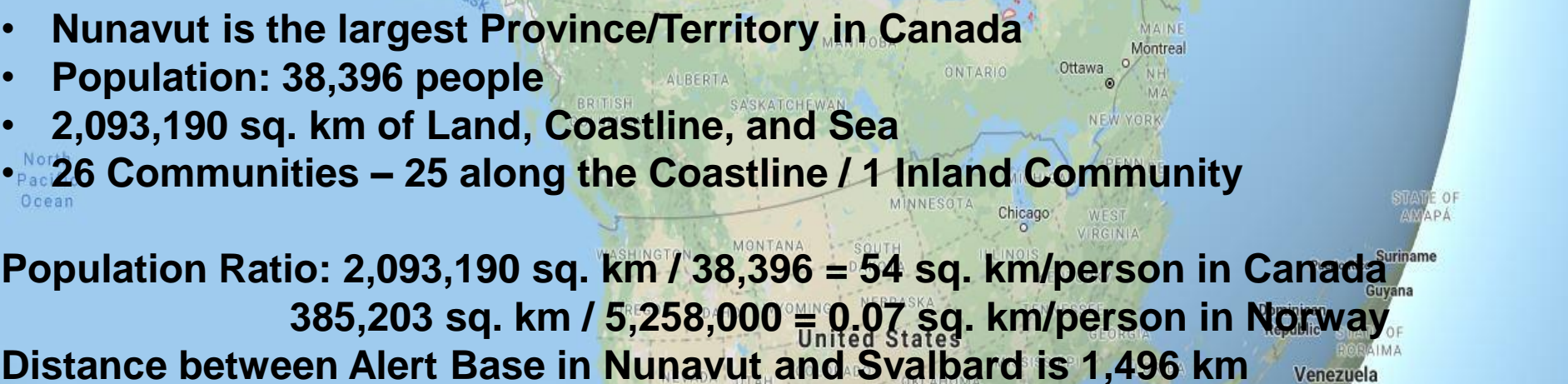


Map 1 Canada's Arctic Passageways Are Shared by Ships and Wildlife

Vessel, whale, fish, and bird movements



Sources: Important Bird Areas Canada, http://www.ibacanada.ca/explore_how.jsp?lang=EN; Fisheries and Oceans Canada, 2010 Arctic Marine Workshop, <http://www.dfo-mpo.gc.ca/Library/341178.pdf>; Bureau of Ocean Energy Management, *Satellite Tracking of Bowhead Whales* (2013), <http://www.data.boem.gov/PV/PDFimages/ESPS/5/5343.pdf>; exactAIS Archive, *Satellite AIS Data—Arctic*, <http://www.exactearth.com>; Flanders Marine Institute, *VLIZ Maritime Boundaries Geodatabase*, accessed Sept. 4, 2015, <http://www.marinerregions.org>



- Population Ratio: $2,093,190 \text{ sq. km} / 38,396 = 54 \text{ sq. km/person}$ in Canada**
 $385,203 \text{ sq. km} / 5,258,000 = 0.07 \text{ sq. km/person}$ in Norway
Distance between Alert Base in Nunavut and Svalbard is 1,496 km

385,203 sq. km / 5,258,000 = 0.07 sq. km/person in Norway



Inuit Marine Monitoring Program

The program takes an innovative approach to vessel monitoring in Nunavut that couples:

- Inuit marine monitors
- With real-time vessel tracking technology (AIS)



Initial HTO/A invitation and monitor selection



- How do we decide where to work?
- Assessment of heavy traffic areas within IMMP Staff and communities identified by RIA's
- Send invitation letters to the HTO/A
- Once approved, send information package about the Program
- Community visit to discuss possible monitor locations and AIS site



Marine Monitors

- Build a network of experienced hunters hired as Marine Monitors during the shipping season to record observations of vessel activities in Nunavut's coastal areas
- Organize and utilize Inuit knowledge and local capacity
- Fill important data gaps on small vessels, local concerns
- Inform and support an emerging dynamic management regime



AIS Infrastructure

- Install AIS receivers in communities and in remote locations of cultural and environmental significance
- Refine design for seasonal, remote AIS sites
- Build a user-friendly interface
- Compliments Coast Guard system (primarily satellite-based in Arctic)



Program Objectives

- Improve AIS network through land-based infrastructure
- Collect Inuit knowledge, expertise and presence in key areas
- Improve information for communities and Inuit organizations
- Increase capacity and coordination on ship/vessel monitoring in Nunavut
- Establish a basis of information to support policy-making and participation in the shipping management regime
- Educate communities about the Program through community visits and recruitment of summer students during shipping season





Overview of IMMP Development and Lessons Learned

Daniel Taukie
Program Coordinator

Plans for 2018/2019

Marine Monitors



- Expand Monitors to 8 communities (16 Marine Monitor Captains and 16 Helpers)
 - Cambridge Bay, Clyde River, Qikiqtarjuaq, Iqaluit, Kimmirut, Coral Harbour, Resolute, and Chesterfield Inlet
- Train monitors:
 - AIS Assembly/Dismantling
 - Vessel Identification
 - SVOP (Small Vessel Operators Proficiency)
 - Improve Data Collection / Management
 - Introduction to Hydroball
 - Understand and study wildlife stressors from prey or close proximity to ship/vessel and marine mammals observations will be documented
- One training session in Rankin Inlet was administered by NFMTC and the Marine Institute:
 - Marine Basic First Aid; Marine Emergency Duties; Radio Operators Certificate; and Small Vessel Operators Permit and all participants received certification
- Revise protocols and reporting to Canadian Coast Guard Operations Centre and NTI during deployment will improve information gathering from Monitor
- Cabins will be built in some key areas to support Monitor safety

NTI (Nunavut Harvesters Support Program)



- Non-profit Organization within NTI's Inuit Programs and Services
- Support HTO/A's in community cabin infrastructure for Elders and Youth to engage in cultural practices
- Cabins will also support the marine monitors in finding suitable monitoring location to house monitors and researchers for safety





What is AIS?

- Automatic Identification System
- Relatively new technology used to track vessels
- IMO requirement for large ships – but many smaller ships elect to use it
- Designed to transmit long distances over VHF



Ships not required to transmit AIS

- Pleasure craft
- Any ship that is under 300 tons
- Yachts carrying limited passengers
- Personal speed boats and other small vessels
- There is no legislation to keep AIS on to track vessels under 300 tons. It can be turned off anytime



Info broadcasted by AIS transceiver

Every 2 to 10 seconds while underway:

- MMSI identification number
- Navigation status – "at anchor", "under way using engine(s)", "not under command", etc.
- Rate of turn
- Speed over ground
- Position
- Course over ground
- True heading
- True bearing at own position

Every 6 minutes:

- IMO ship identification number
- Radio call sign
- Name of the vessel
- Type of ship/cargo
- Dimensions of ship
- Location of positioning system's antenna on board the vessel
- Type of positioning system
- Draught of ship
- Destination
- ETA at destination



How can AIS be used?

- Collision avoidance
- Fishing Fleet Monitoring and Control
- Vessel traffic services
- Maritime Security
- Aids to navigation
- Search and rescue
- Accident investigation
- Ocean currents estimates
- Infrastructure Protection
- Fleet and cargo tracking





Outcomes from 2017 AIS



- AIS was developed in partnership with Marine Exchange of Alaska
 - Custom remote AIS design
 - Training for NTI and Oceans North staff
 - Data hosting and technical support
 - Back-end website development
- Remote AIS stations were deployed and installed outside Cambridge Bay, Clyde River and Iqaluit. These were taken down in the Fall and used for troubleshooting.
- Animal interference with exposed cables, poor satellite connectivity and insufficient power generation compromised data collection from some units.
- In-town AIS receivers were installed in Kimmirut, Rankin Inlet and Chesterfield Inlet. These units will be decommissioned and used for parts for 2018/2019 as NTI/Oceans North switch to Canadian Suppliers from the Marine Institute.



Why These Systems?



- The ability to track and identify these vessels in areas of concern for the affected communities. Currently we have seen Approximately 100-150kms in range during our testing. Maximum of 200km at higher elevation.
- The ability to provide live weather information about these areas which includes wind speed/direction, Temperature, Barometric pressure, and humidity to the Harvesters within the community.
- Our equipment is now Canadian made and relatively easy to use, with the potential to add more capabilities as the project develops towards the future.



Why These Systems?

As per Transport Canada regulations, vessels 300+ gross ton, 65+ feet in length, as well as Yacht vessels with 12+ passengers on board are required to be equipped with an AIS transmitter.

AIS enables us to address some of the main areas of interest identified by RIAs such as, Ship characteristics (type, color, flag, etc.) Location, speed, heading Behavior/Activity, Timing, and Suspicious vessels



NTI's 2 Types Of AIS Units



Remote AIS Unit



In-Town AIS Unit

Remote AIS systems

- Our remote AIS systems are powered by 2 solar panels as well as a single wind turbine. Two Deep cycle batteries are able to provide sufficient power storage to run the system on only a few hours of sun a day during winter months.
- Our remote systems are capable of receiving and transmitting live AIS and **weather** data, which will be made available to the community that is chosen for the AIS system.

In-Town AIS Units



- Our In-Town AIS units are made to be installed in doors with an antenna installed on the roof of the building
- Rather than transmitting data via satellite, these units utilize internet to transmit AIS data
- Our New Yellow AIS Units are now sourced from within Canada

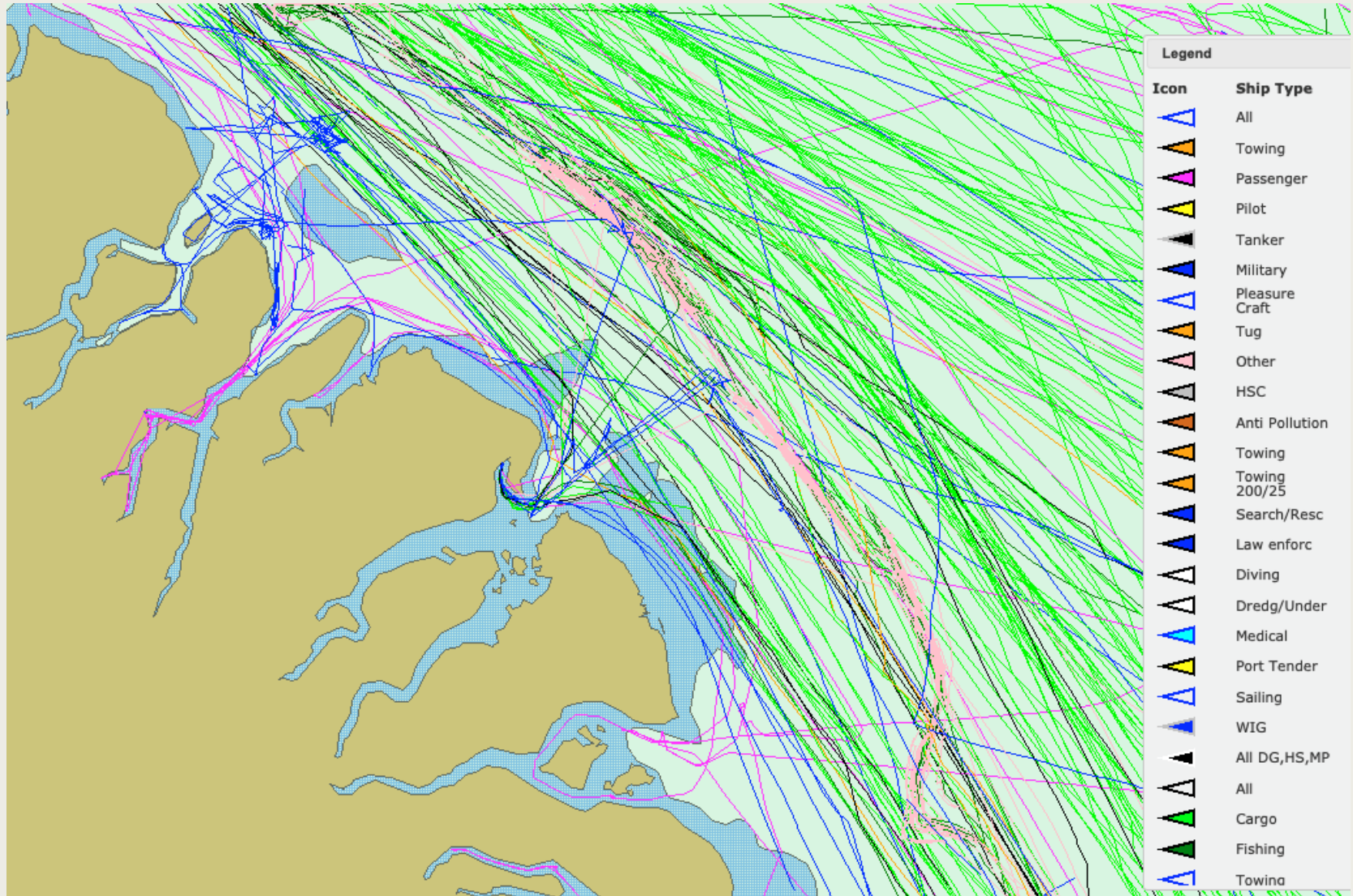
Components of a remote AIS system



- Aluminum frame
- Wind Turbine
- Solar panels
- MET (weather) station
- Satellite transmitter
- Battery box with 2 batteries
- Remote AIS unit

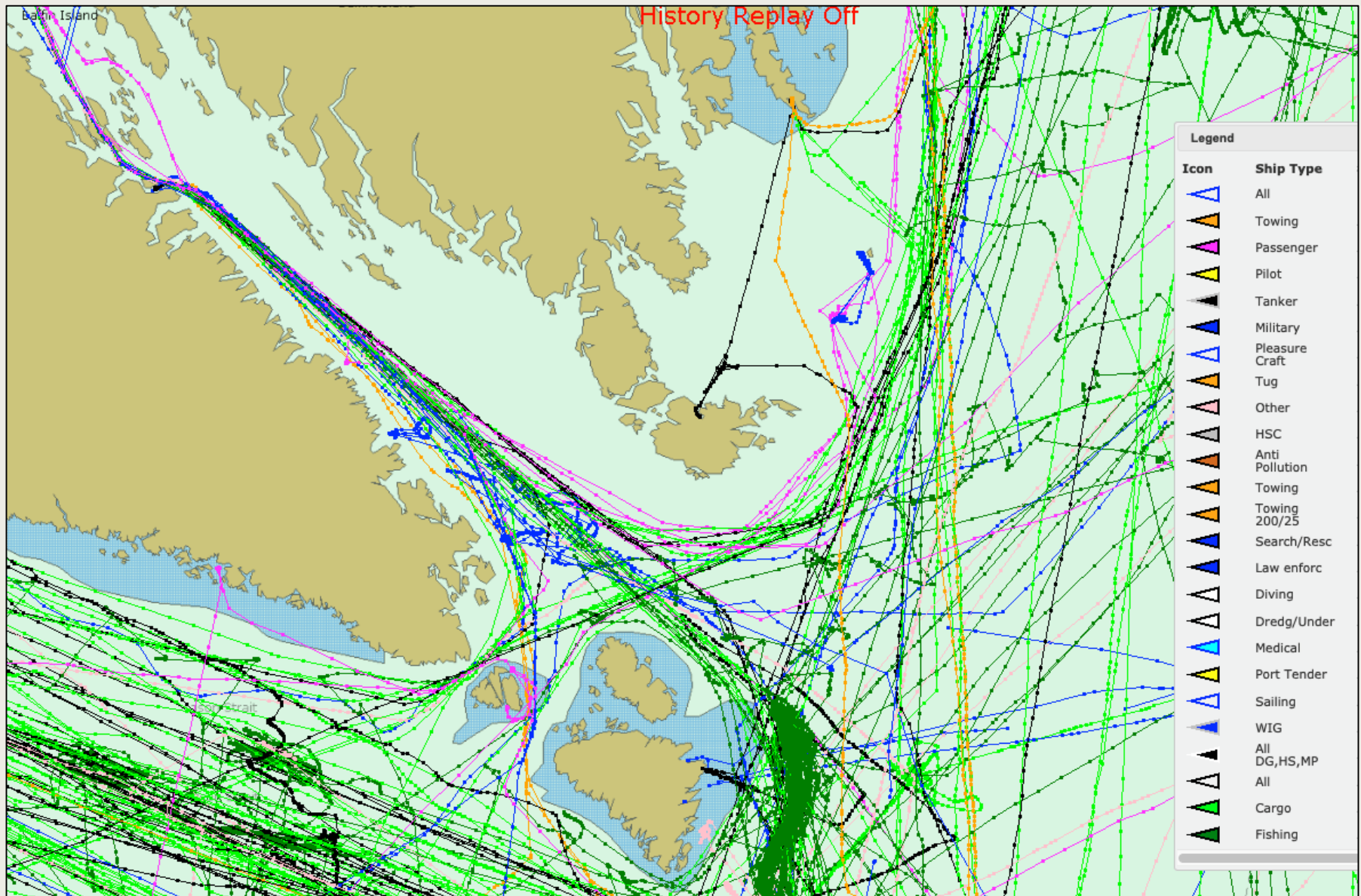
Clyde River Maritime Traffic

August 2, 2018 – November 3, 2018



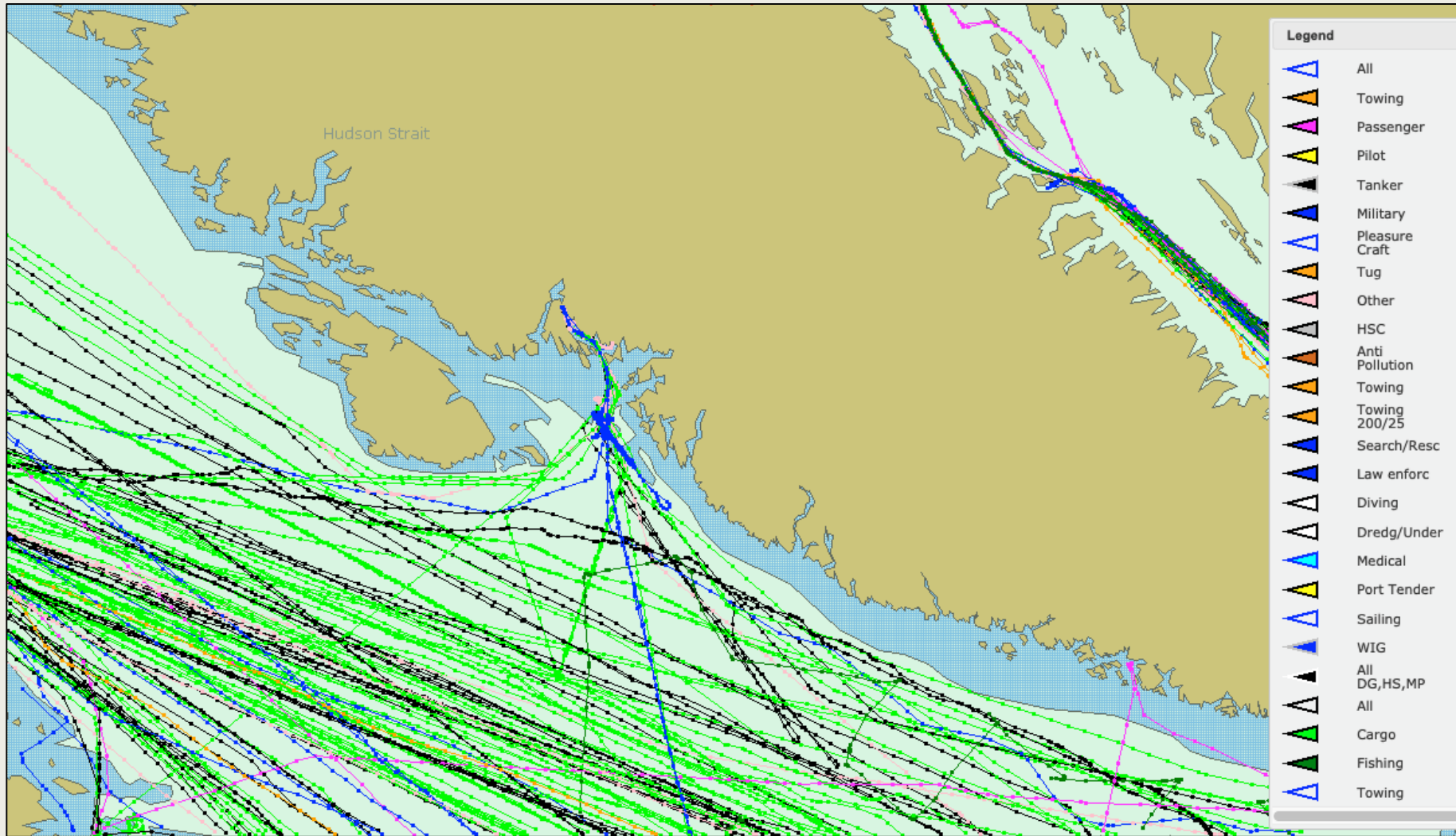
Iqaluit Maritime Traffic

August 2, 2018 – November 3, 2018



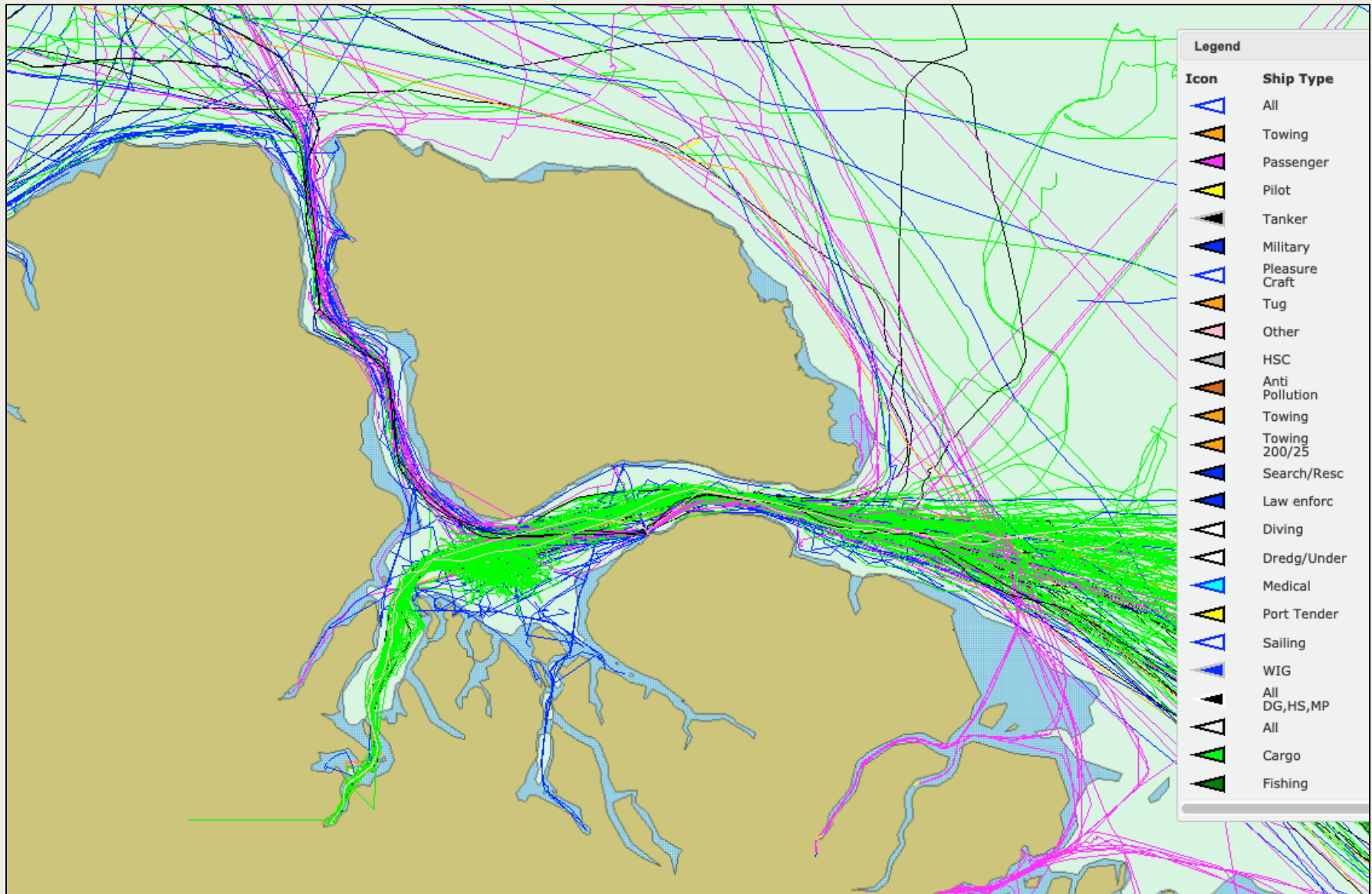
Kimmirut Maritime Traffic

August 2, 2018 – November 3, 2018

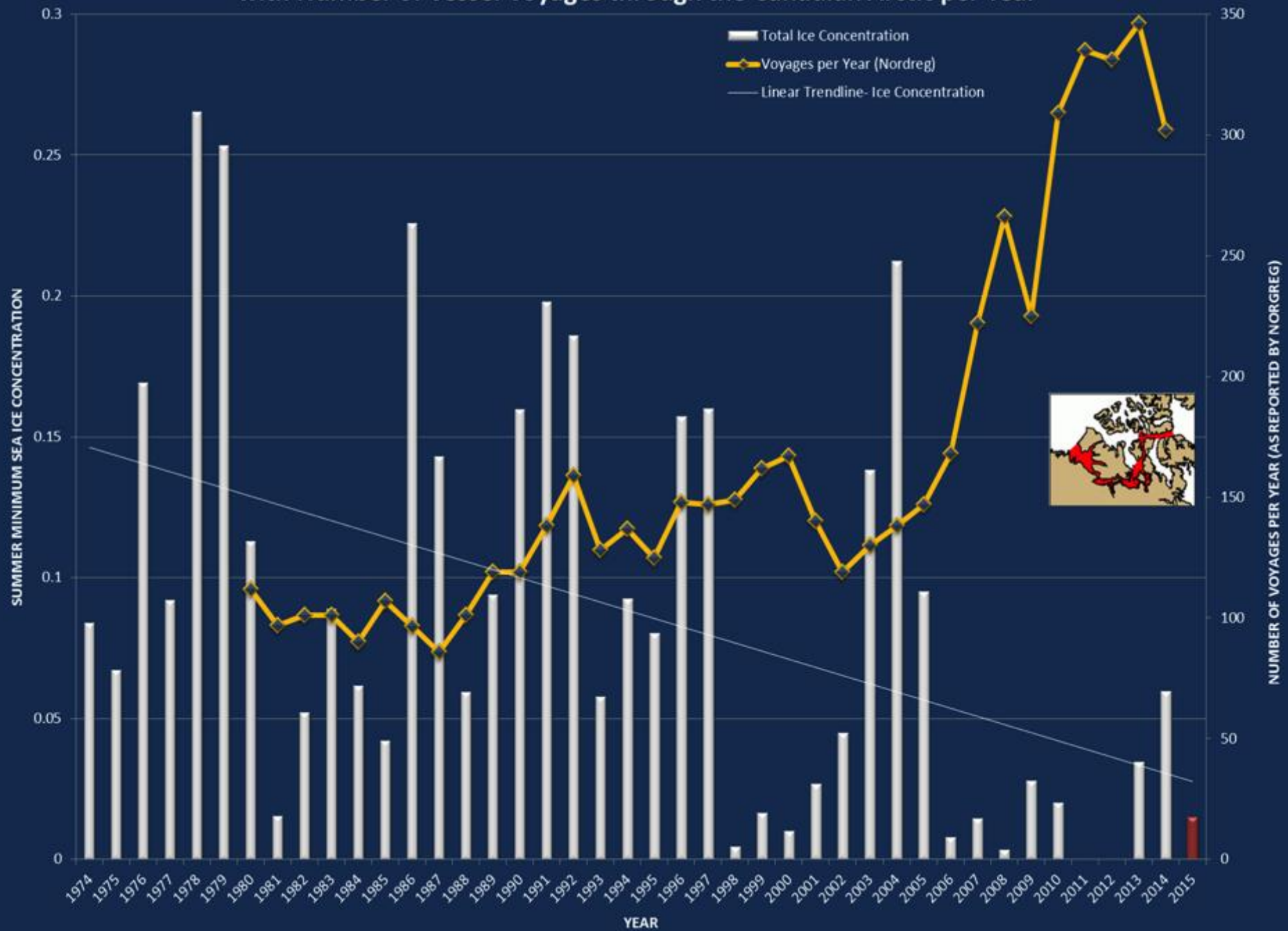


Pond Inlet Maritime Traffic

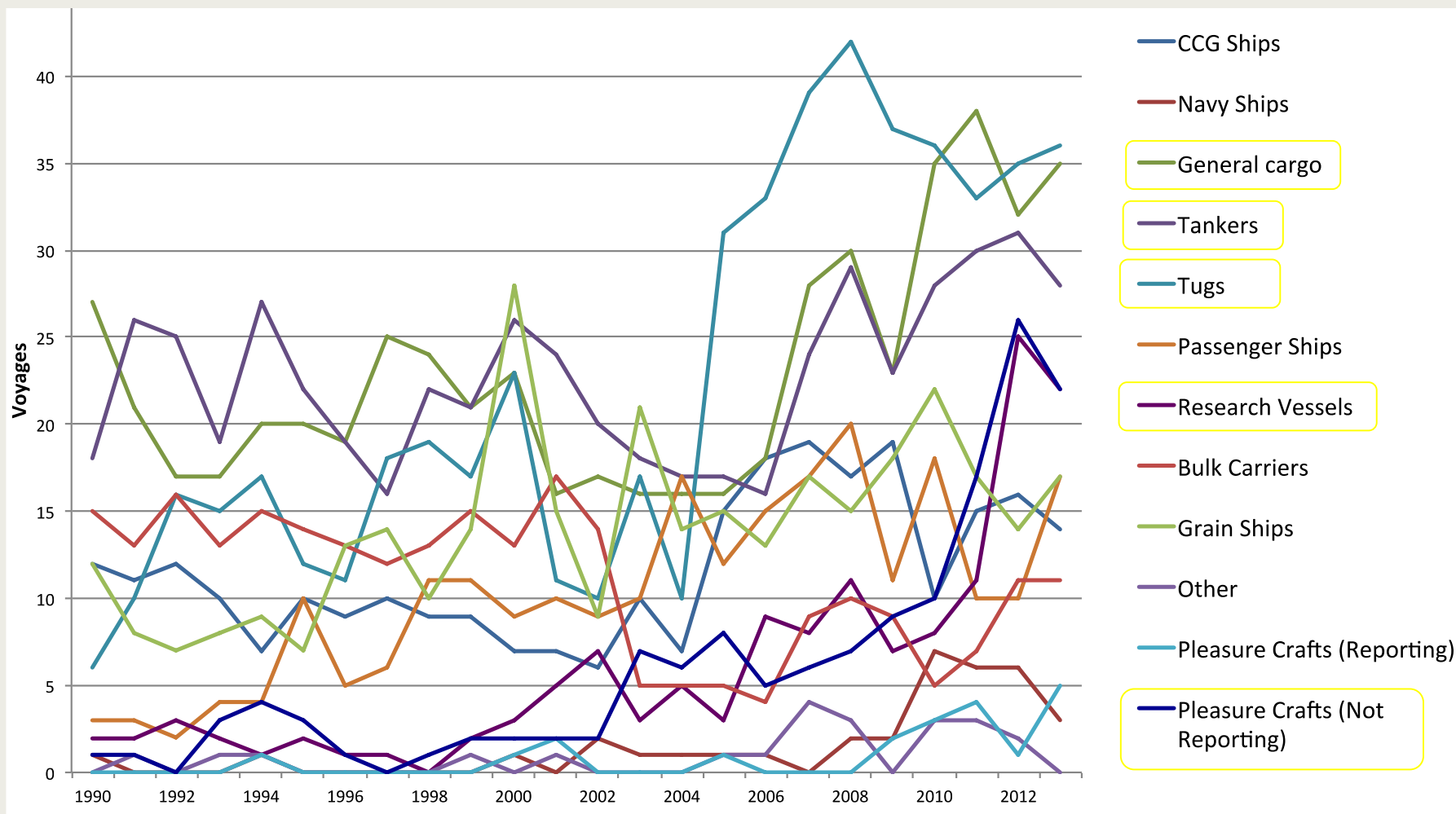
August 2, 2018 – November 3, 2018



Summer Minimum Sea Ice Concentration in the NWP, 1974-2015, with Number of Vessel Voyages through the Canadian Arctic per Year



Very different trends according to ship type





**Northwest
Passage**

**Northeast
Passage**

Plans for 2018-2019

AIS



- Transfer to Canadian AIS equipment and data servers
 - All AIS data hosting and AIS equipment procurement contracts are being transferred to Canadian providers.
- Seven remote AIS sites and 3 additional in-town sites
 - Outside Kimmirut, Cambridge Bay, Clyde River, Coral Harbour, Resolute, Kimmirut and Iqaluit; and additional in-town AIS will be installed in Rankin Inlet, Chesterfield Inlet, Qikiqtarjuaq, and Gjoa Haven.
 - Adding weather stations to all remote sites
 - Possible additions may include time-lapse cameras
 - Improved design to enhance battery efficiency with wind turbines
- Improve technical capacity:
 - Monitors will receive training on AIS equipment installation, dismantling and trouble-shooting.
 - A full-time AIS Technician/Trainee has been hired to manage and expand the AIS network.







AIS Community Reports for 6 Communities in 2017 and 8 Community Reports 2018/2019

- Cambridge Bay
- Iqaluit
- Kimmirut
- Clyde River
- Rankin Inlet
- Chesterfield Inlet



Kimmirut

MMSI	Name	Type	Length (meters)	Beam	Flag
244750736	EXEBORG	Cargo ship	145	16	Netherlands
245299000	ATLANTICBORG	Cargo ship	142	21	Netherlands
316002340	UMIAVUT	Cargo ship	113	19	Canada
316003010	CLAUDE A. DESGAGNES	Cargo ship	138	21	Canada
316003543	CAMILA DESGAGNES	Cargo ship	133	20	Canada
316003790	NUNALIK	Cargo ship	138	21	Canada
316006460	POLAR PRINCE	Cargo ship	72	15	Canada
316011358	ROSAIRE A. DESGAGNES	Cargo ship	138	21	Canada
316013075	QAMUTIK	Cargo ship	384	54	Canada
316013740	AVATAQ	Cargo ship	113	19	Canada
316015133	ZELADA DESGAGNES	Cargo ship	139	21	Canada
316015251	SEDNA DESGAGNES	Cargo ship	139	21	Canada
316025029	MITIQ	Cargo ship	135	19	Canada
316035119	BBC VOLGA	Cargo ship	144	23	Canada
316054000	ARCTIC	Cargo ship	221	23	Canada
316330000	ACADIA DESGAGNES	Cargo ship	120	18	Canada
316337000	NORDIKA DESGAGNES	Cargo ship	143	22	Canada
316355000	TAIGA DESGAGNES	Cargo ship	143	23	Canada

18 Cargo
Ships

273414400	AKADEMIK S. VAVILOV	Passenger ship	117	18	Russia
308429000	BREMEN	Passenger ship	112	18	Bahamas
311000419	OCEAN ENDEAVOUR	Passenger ship	136	21	Bahamas
311000422	OCEAN ATLANTIC	Passenger ship	140	22	Bahamas
311542000	SILVER EXPLORER	Passenger ship	108	16	Bahamas
578000200	LE SOLEAL	Passenger ship	142	18	

6
Passenger
Ships

Kimmirut

10 Tankers

218019000	SEACOD	Tanker	188	32	Germany
310587000	STENA POLARIS	Tanker	183	40	Bermuda
316003980	STEN FJORD	Tanker	145	21	Canada
316012308	SARAH DESGAGNES	Tanker	147	23	Canada
316013840	NANNY	Tanker	116	19	Canada
316024245	TRAVESTERN	Tanker	161	23	Canada
316057000	HAVELSTERN	Tanker	161	23	Canada
316093000	JANA DESGAGNES	Tanker	124	18	Canada
636015281	FALCON NOSTOS	Tanker	182	32	
538005278	NUNAVIK	Tanker:DG,HS,MP(C)	178	27	Marshall Islands

Plans for 2019

Information Use



- A public-facing website featuring low-bandwidth, real-time vessel tracking map will be launched in 2018/2019
- Improvements to AIS equipment and reporting will ensure better data collection
- Community posters, radio appearances and pamphlets will be used to promote the program and information use in communities
- Data will be used to:
 - Provide communities with real time information
 - Support partnership with Canadian Coast Guard and other organizations, as appropriate
 - Provide NTI and other Inuit Orgs data on shipping activities to inform initiatives such as low-impact shipping corridors and MPA planning



Pond Inlet




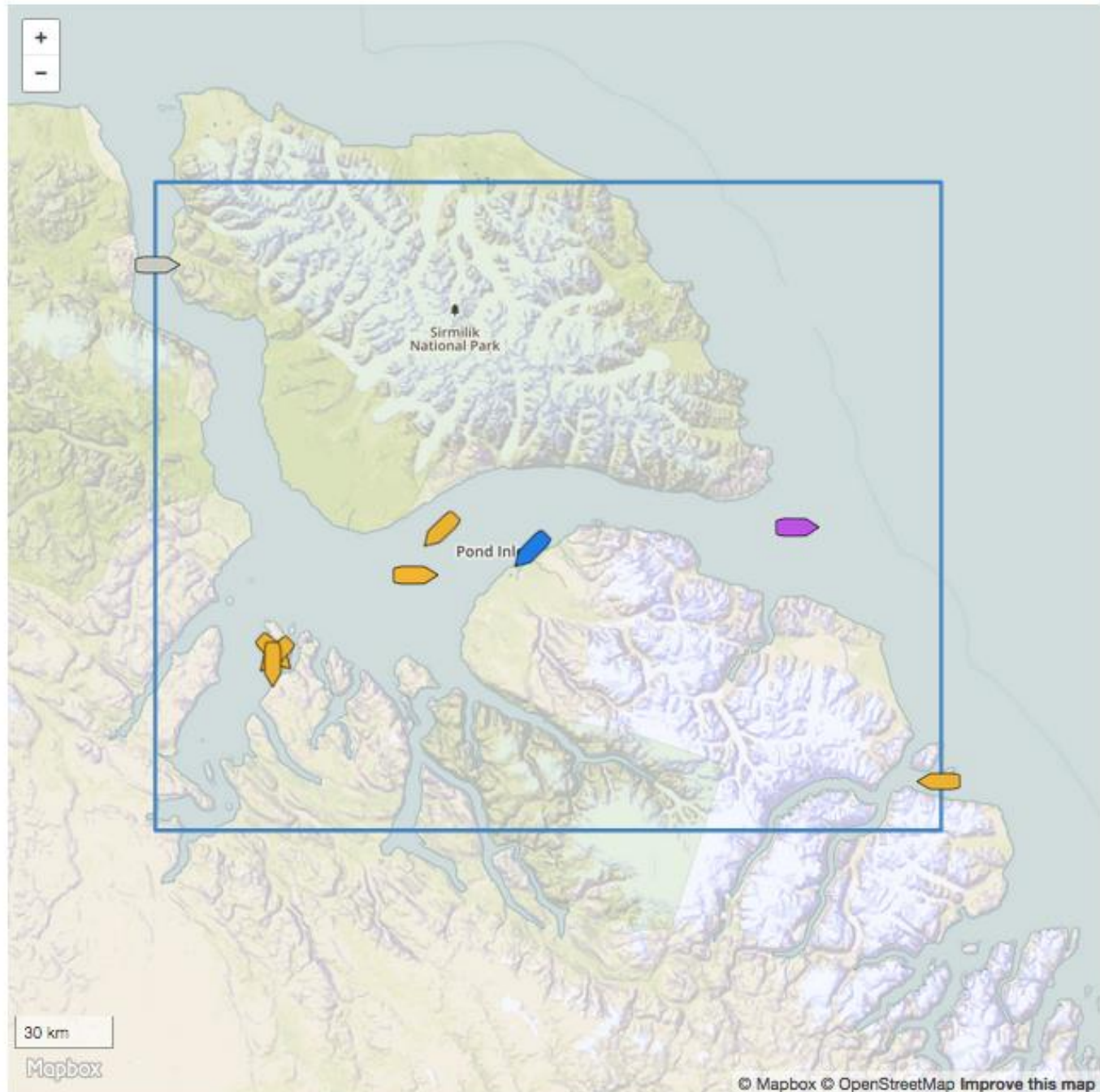
Markers refresh about every minute, hover on marker for name, click for info

Vessel Type

-  Pleasure
-  Tanker
-  Cargo
-  Towing
-  Passenger
-  Fishing
-  Pilot
-  Sailing
-  Other

DeLorme

-  inReach



Government of Canada partnership 2-year Pilot Project



- Real-time information sharing with MCTS – AIS data and Marine Monitor observations
- Support for technical capacity building in Nunavut
- Support for evolution of Marine Monitor roles, which *could* include:
 - Emergency response
 - Community-based hydrography
 - Aids to Navigation
 - Scientific monitoring
 - Expanding VHF coverage



Training Support



- AIS training support from Marine Institute (Newfoundland)
- Monitor training via NTI (Nunavut Tunngavik Inc.) and NFMTC (Nunavut Fisheries and Marine Training Consortium)
- Transport Canada
- Canadian Coast Guard
- Tides Canada



Long Term Vision/Goals



- Increase capacity and coordination in ship/vessel monitoring and policy development in Nunavut
- Inform policy development to the Government of Canada and International Maritime Organization
- Provide a basis for Nunavut Inuit to engage with the Government of Canada on new ways to strengthen monitoring, stewardships, and management efforts on marine shipping traffic in Nunavut waters
- Help communities to engage and educate in marine wildlife monitoring to reduce cumulative impacts from shipping/tourism towards the future

Thank you! Nakurmiik!

Acknowledgements and Partners



Questions?

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