Meeting Report: Bering Strait Marine Domain Awareness (MDA) and Arctic Watch

4–5 March 2025, Nome, Alaska

Contents

Meeting Purpose and Overview

The mission of Arctic Watch is "to employ technology, communications, and local expertise to enhance safe, secure, and environmentally responsible maritime operations in Alaska's Arctic waters." Arctic Watch is focusing its efforts on developing sustainable solutions within-budget to address Marine Domain Awareness (MDA) needs on the Arctic coasts of Alaska. Recognizing the immense geographical size of this area, Arctic Watch is centering its attention at the bottleneck of marine traffic in the western Arctic: the Bering Strait waterway. Local leadership from the Bering Strait region has called for more local awareness and involvement in marine shipping policy.[1,2,3]

Short-term grant funding provided from the National Park Service (NPS) to the Alaska Ocean Observing System (AOOS) was utilized for a meeting in Nome during March 2025 to discuss Arctic Watch equipment buildout options and gain a better understanding of community needs relating to MDA in the Bering Strait. Participants included Marine Exchange of Alaska (MXAK), AOOS, Ikaaġun Engagement, NPS, Alaska Sea Grant, Kawerak Marine and Emergency Preparedness programs, and local mariners and community representatives from Wales, Teller, Nome, Gambell, Savoonga, Elim, Unalakleet, Shaktoolik, and Stebbins. Due to stormy weather, some participants joined remotely. Many meeting attendees previously took part in the Arctic Watch Partners Workshop in Juneau as tribally selected delegates roughly one year prior to the Nome meeting. Ikaaġun

[1] Bering Strait Voices on Arctic Shipping: Workshop Report (2014)
[2] Bering Strait Voices on Arctic Shipping: Workshop Report (2016)
[3] Arctic Watch: Marine Traffic Workshop Report (2024)

Engagement and AOOS provided meeting organization, and Ikaaġun Engagement and MXAK provided meeting facilitation.

Figure 1. Bering Strait Marine Domain Awareness Discussion participants, both in-person and virtual, work together to identify regional needs for maritime safety and communication.

Day one began with a group discussion that introduced the Arctic Watch program and allowed attendees to introduce themselves and share how and why marine communications and safety are important to them and their respective communities. During the afternoon, the Arctic Watch team carefully walked through the tools and resources that Arctic Watch offers and is currently developing. This led to conversations about how to make the suite of tools most effective for local use and safety. These discussions continued throughout the day and evening and into day two of the meeting. The second day focused more on the buildout plan of marine communications sites and the factors that impact where Arctic Watch can build and operate these sites. The discussions delved into optimal locations for communications sites in relation to locals' needs, as well as costs for installation, maintenance and operation, and locations of existing infrastructure such as towers with or without electrical sources.

Throughout the discussions, excellent insights and information were exchanged. These discussions were extremely helpful as Arctic Watch works to maximize limited funding and identify future needs.

Arrangement of this Report

This document provides information, concepts, needs, and ideas that were discussed during the Nome meeting on MDA and Arctic Watch. The discussions and information are organized into three main sections: (1) MDA capabilities/needs in Bering Strait waterways that Arctic Watch is addressing in 2025–2026; (2) Additional MDA capabilities/needs in Bering Strait waterways that Arctic Watch can support; and (3) Other essential communications infrastructure capabilities/needs in the region. The final section includes an index of important terminology related to Arctic Watch, Marine Domain Awareness (MDA), and the Bering Strait.

Figure 2. Map of Bering Strait region courtesy of Kawerak, Inc. and Ikaaġun Engagement.

MDA Capabilities and Needs in Bering Strait Waterways that Arctic Watch is addressing in 2025–2026

During the two-day meeting, the Arctic Watch team shared the suite of tools and resources that Arctic Watch and MXAK currently offer that can be utilized throughout the Bering Strait waterways, such as live vessel tracking. An overview of these tools is included in this report in addition to buildout plans for summer seasons of 2025 and 2026 and discussions on sustainability of tools and infrastructure related to Arctic Watch. This section shares important questions, responses, ideas, and insights that were raised by meeting attendees.

The lead entity in Arctic Watch, the Marine Exchange of Alaska, is based in Juneau and operates as a non-profit organization focused on preventing maritime incidents and improving safety. They maintain a network of 150 Marine Safety Sites along the Alaska coastline, which include Automatic Identification System (AIS) equipment to track vessel movements and weather stations to provide real-time weather data. The organization operates 24/7, monitoring vessel traffic and communicating important information to ships. They are working to expand MDA capabilities and infrastructure in the Arctic region and have been working with local entities and leaders for input on where to prioritize equipment placement to maximize benefits and reduce risks. MXAK aims to improve maritime safety and communications for all vessel operators in Alaskan waters.

Table 1. Tools and Resources Offered by Arctic Watch (Powered by MXAK).

Name of Tool/Resource	Description	Notes on Availability
VHF-FM Marine Radio	MXAK utilizes a Voice over Internet Protocol (VoIP) based system to connect Alaskan waterway users to our 24-hour Maritime Operations Center in regions that are not covered by the Coast Guard. Currently, 23 VHF-FM towers have been installed across the state, and Channel 16 (International Hailing and Distress Communications) is monitored.	The installed sites are fully operational and MXAK continues to build out new locations as funding becomes available. VHF-FM coverage maps can be found here: MXAK Coverage App
Geofences	Geofencing provides monitoring of specified areas and/or vessels. Whether you're a biologist interested in vessel traffic near important bird or wildlife habitat or a port official looking to monitor vessel speed in harbors, geofence services are custom-tailored to meet your needs and notifications are sent via text or e-mail.	Historical Vessel Tracking Data | Marine Exchange of Alaska
PACTRACs	MXAK's system to track AIS-equipped vessels throughout Alaska and the Pacific. Larger vessels are required to transmit position, course, speed, flag of registry, and destination. The system also allows for a 6-month history for each of those vessels. A critical tool for Sea Traffic Management and Maritime Domain Awareness.	Fully available and essential tool for Arctic Watch and the Maritime Operations Center. Subscription-based, 6 funded accounts for Arctic Watch liaisons. Tracking | Marine Exchange of Alaska
Arctic Watch Live	Real-time weather from fixed and mobile Marine Safety Sites. Includes NOAA tides and current predictions as well as the National Weather Service Marine Hazard Warnings.	Fully operational and available at: Arctic Watch | Supporting Safe Arctic Maritime Operations
Weather Stations (Live feed)	Real-time weather from fixed and mobile Marine Safety Sites. Includes NOAA tides and current predictions as well as the National Weather Service Marine Hazard Warnings.	Map of Sites | Marine Exchange of Alaska

**See QR code at the end of this report for a link to the Arctic Watch website.

Buildout Plans for 2025

Note: This section includes updated information from Nick Hatch, MXAK, June 2025

For 2025, MXAK is upgrading the following Marine Safety Sites (MSS) with new VHF-FM marine radio systems:

- Kivalina (completed May 2025)
- Kotzebue (completed May 2025)
- Nome (planned for July 2025)
- Wales (planned for summer 2025)

MXAK is also working on plans to deploy additional VHF-FM marine radio systems at Teller and Stebbins. They will be upgrading existing Marine Safety Sites with AIS Aids to Navigation (AtoN) transceivers and Digital Selective Calling (DSC) receivers at Point Hope (completed), and Emmonak (summer 2025). Communications with GCI have been initiated to assess the potential for installing MSS equipment at existing telecommunication sites in the Norton Sound region (Cape Darby and Blueberry Hill). These telecommunication facilities have the potential to provide VHF radio coverage to most of Norton Sound.

In response to what was learned at this meeting, MXAK is investigating options for new weather monitoring equipment for Wales and Stebbins (cameras and weather stations) and is investigating potential options for improving maritime communications for the waters surrounding St. Lawrence Island.

Discussions on Sustainability of Tools and Resources Associated with Arctic Watch

Meeting participants continually emphasized the importance of reliable marine communication systems for safety and response times. They also discussed the need for improved infrastructure and resources to address incidents and emergencies in the region. The discussions focused on how the region can use the tools offered by MXAK and Arctic Watch. The group also discussed the need for a more collaborative approach to addressing regional challenges, emphasizing the importance of teamwork and continued communication with the relevant entities and leadership in communities. More specific and technical questions were answered as the Arctic Watch team shared and discussed the interactive tools and resources that Arctic Watch provides.

> "*Several years ago, in the storm before Merbok in 2018, we had a couple of weather cameras. They were damaged, never fixed thereafter so we have to keep the highway open between Stebbins and St. Michael in the winter months. Most of the funds for that are exhausted because there are six months of winter. It is difficult to maintain that, to rely on the St. Michael airport and their weather instruments to send out medevacs. We are trying to open that road right now to get passengers out during the storm. Lived with this since weather camera was destroyed in 2018 storm, 617 people rely on that. Just got a grant for three weather cameras to be installed in May. People use those weather cameras to watch for waves coming in to evacuate for flood. Speaking on behalf of all these communities living in the flood plain, in fall anxiety raises. Need to implement training and have faster response times. These instruments are especially vital to low-lying communities in the floodplain.*"
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> —Daisy Katcheak, Stebbins

Additional MDA Capabilities and Needs in Bering Strait Waterways Targeted for Future Arctic Watch Support

During the meeting, hosts and attendees spoke at length about the many types of technology and infrastructure that can be installed and utilized for better MDA in the Bering Strait, and about the varying costs for installation and operation. Also discussed was how the Arctic Watch project is stretching its resources to maximize its

impacts. Although the project does not have enough funds to address all MDA needs, this section provides an overview of ideas on how Arctic Watch and its suite of tools and expertise can help in the future, given more time and resources.

Primary Example: Stand-alone Marine Safety Site on St. Lawrence Island

A stand-alone marine safety and communications site would allow for VHF communication between north and south shores of the island and would provide crucial weather information. Current locations on school or community buildings are too low in elevation, providing an insufficient range. A higher elevation site that would serve both Gambell and Savoonga would be ideal—either the highest point in the mountains between the two communities or on the mountain at Northeast Cape. A remote power source would be required for either of these locations (i.e., propane fuel cell, wind turbine, solar), which necessitates additional funding, planning, and coordination with both communities.

Once a stand-alone design is developed, other locations, such as King Island, could be explored. Diomede has been identified by partners as a location where an operational weather station is needed. Funding has been dedicated to this project by AOOS, and a recent partnership among AOOS, MXAK, North Point Defense, and the Village of Diomede is working toward installation of a new weather station during summer 2025.

In all cases, local expertise should be included in site plans and equipment installation to prevent loss of equipment due to weather events or damage to important local landscape features, such as water sources.

> "*VHF is important for hunters. When you break down and you're alone, VHF is often the only communication.*"
>
> —Wayne Moses, Elim

Other Essential Communications Infrastructure Capabilities and Needs in the Region

Throughout the meeting, local representatives and mariners identified a variety of needs, concerns, and possible solutions regarding other essential communication and infrastructure needs that are outside the scope of Arctic Watch, but nonetheless extremely important issues facing communities in the region. Better information to support air travel was repeatedly brought up as one of the most important issues Bering Strait communities face. Specifically, the reliability of the Automated Weather Observing System (AWOS) for air travel into rural communities. Below are statements from meeting attendees on how the unreliability of the AWOS system is negatively impacting community safety and wellbeing, and how local community observers—the original system utilized before AWOS—may be the answer to address this glaring issue.

Primary Example: AWOS System a Failure to our Communities. Possible Solution: Local Observers?

> "*This frustration is decades long. Unalakleet had a reasonably large DOT staff, begged for years to train local staff to flip the (AWOS) switch. Not a major overhaul of equipment often, just a switch that needs flipped. We squawk louder because of more flights turned daily. If it's something so simple they can tell what the problem is remotely, they still need to fly someone out, leaving a community without air service for a week. That is a bureaucratic problem.*"
>
> —Jeff Erickson, Unalakleet

"I used to work for Bering Air and would report weather by observing and calling it in. Later, when stringent FAA rules went into effect, the AWOS was built, they were told by the dispatcher that weather observations were no longer approved, only AWOS. They still gave the weather report. When a strong wind from the east was blowing and AWOS would say it was calm, the dispatcher asked him to check on the AWOS. The wind had knocked down the wind indicator and the tower fell. The little fan was still spinning hidden from the wind. I told Bering Air not to come out…We have to be a voice. The AWOS requirement is a matter of life and death."

—Merle Appasingok, Gambell

Local weather observation expertise is an underutilized resource in the region. Reliance on automated technology that is both prone to failure and often maintained by technicians that live out of the region or even out-of-state threatens communities that rely on air transport for supplies/cargo, medical emergencies, and travel. While Arctic Watch focuses on maritime weather, efforts will be made to support aviation weather, where possible. Training for local, community-based technicians to maintain and repair equipment and provide weather observations is needed and this point was emphasized during the meeting.

Next Steps

Continued partnerships, relationship building, and exchange of information are key to improved Marine Domain Awareness in Bering Strait waterways. Meeting organizers from AOOS, Ikaaġun Engagement, and MXAK will continue to meet with discussion participants individually or in small groups to communicate buildout plans and refine understanding of community needs. In the short-term, MXAK is providing five free PACTRACS (https://www.mxak.org/services/mda/tracking/) accounts to community hubs for vessel tracking. A progress update was shared via a UAF Strait Science webinar in June 2025 (Recording: https://www.youtube.com/watch?v=L1Qss0r2a3A). Longer-term, a safety committee for Bering Strait waterways will be formed and a user guide developed with procedures to reduce risk of maritime accidents.

Index of Important Terminology in Relation to Arctic Watch

Terminology	Description	How it relates to Arctic Watch
Arctic Watch	A program aimed at improving Arctic maritime safety, communication, and environmental monitoring through local engagement and technology.	Accessed via Arctic Watch | Supporting Safe Arctic Maritime Operations you will find information on community and vessel enrollment as well as workshop reports.
Areas to be Avoided (ATBA)	An ATBA is an area within defined limits that should be avoided by all ships or certain classes of ships, in which navigation is particularly hazardous or in which it is exceptionally important to avoid casualties.	These areas are monitored by MXAK's 24-hour Arctic Watch Maritime Operations Center to identify AIS-equipped vessels that maybe approaching the zones.
Automated Information System (AIS)	A tracking system used by vessel traffic services for identifying and locating vessels using AIS transponders. International law requires that vessels (60 feet+) use AIS transponders to share information such as vessel name, country of registry, GPS location, destination, course, and speed. These receiver systems enhance maritime domain awareness and support sea-traffic management.	The Automated Information System is used by the Arctic Watch project to track ships moving thought the region.
Automated Weather Observing System (AWOS)	Weather monitoring stations located at airports that provides continuous real-time atmospheric data.	Surface Weather Observation Stations (ASOS/AWOS) | Federal Aviation Administration. Not managed.
Maritime Operations Center	Manned 24/7, 365 days-a-year Arctic Watch Maritime Operations Center provides VHF Channel-16 monitoring as well as real time vessel traffic monitoring and serves as a critical communication conduit and information hub for maritime operations throughout the Arctic & beyond.	Provides weather information, enrolled community and vessel contact information.

Terminology	Description	How it relates to Arctic Watch
Doppler Radar	A radar system that produces velocity data about objects (i.e., precipitation, clouds) at a distance.	
Ham Radio	Ham radio refers to the use of certain radio frequency bands by licensed operators for non-commercial communication. It can be used for personal enjoyment, experimentation, public service, and emergency communications. Operators, often called "hams," utilize various types of equipment, including transceivers, antennas, and receivers, to connect with others both locally and globally.	Ham radio plays a critical role in emergencies when conventional communication systems might fail. Many operators assist in disaster response efforts, providing essential communication links during crises. Arctic Watch does not possess Ham radios, nor do they monitor those frequencies.
Geofence	A technology that creates virtual geographic boundaries, triggering alerts or actions when vessels enter or leave defined zones.	Allows automated alerts to be sent when a vessel enters/exits a geofenced area.
Global Positioning System (GPS)	GPS, or Global Positioning System, is a space-based radio-navigation system that provides accurate location and time information to users on or near Earth. It consists of at least 31 satellites that orbit the Earth, with 24 operational satellites typically in use at any given time. GPS technology is utilized in various applications, including navigation for vehicles, mapping, and location tracking for personal devices. It works by triangulating signals from multiple satellites to determine a user's precise location.	
Marine Domain Awareness (MDA)	Maritime Domain Awareness has been defined by the International Maritime Organization (IMO) as the effective understanding of anything associated with the maritime domain that could impact the security, safety, economy, or environment.	Generating and displaying critical information for Alaska's mariners, maritime communities, and industries. MXAK developed and maintains a comprehensive system to provide Maritime Domain Awareness (MDA) for ports, regulatory agencies, vessel operators, and maritime communities to promote safe, efficient, and environmentally sound maritime operations throughout Alaska. MDA services include, vessel tracking, real-time weather reports, and access to aids to navigation including Print-on-demand nautical charts, tidal, and current information.
Maritime Domain Management (MDM)	MXAK provides information that aids in the management of Alaska's maritime domain to minimize marine casualties, environmental harm, and disruption to trade. MXAK has extensive experience in maritime operations including regulatory compliance, and vessel tracking analysis.	Providing 24/7 vessel monitoring, and assistance with regulatory compliance and in-depth AIS data analysis
Marine Exchange of Alaska (MXAK)	Founded in 2001, MXAK is a non-profit that provides real-time maritime information and vessel tracking to enhance marine safety in Alaskan waters and throughout the Pacific. Providing information, communications, and services to aid safe, secure, efficient, and environmentally responsible maritime operations.	Marine Exchange of Alaska | Serving the Alaska Maritime Community
Marine Safety Sites (MSS)	MXAK owns and operates AIS equipment at 150 unique geographic locations throughout the state of Alaska. Each site has varied capabilities that can include AIS receive; Digital Selective Calling (DSC), AIS AtoN transmit; weather sensor; weather camera; VHF-FM Voice Maritime Radio.	A list of each Marine Safety Site can be found here: Automatic Identification System (AIS). The Marine Safety Sites provide the environmental data, communication, and vessel tracking tools that the 24-hour Maritime Operations Center utilizes.
PACTRACS	PACTRACS is a user-friendly vessel tracking display that presents vessels' position reports, dimensions, type of vessel and other information transmitted by vessels' AIS and/or satellite transponders via the web. The display can be accessed by a computer, cell phone, or PDA and allows users to select from a variety of display options as well as search for vessels, establish arrival and departure alert messages and replay a vessel's past transits.	A vessel traffic monitoring system that provides real-time maritime data to enhance awareness and security. The Maritime Operations Center and select liaisons will have access to the enhanced features outside of the Arctic Watch Live.

Terminology	Description	How it relates to Arctic Watch
Progressive Web Application (Arctic Watch Live)	A type of web application that provides app-like experiences on the web, usable offline and in real-time.	Provides real-time AIS, NOAA Marine Weather Alerts, NOAA ice concentration maps, predicted tides and currents.
Spotter Buoys	Spotter buoys make direct observations of wave spectra, wind, sea surface temperature, and atmospheric pressure. Can be deployed free-drifting or anchored with conventional mooring.	The Backyard Buoy program enables Indigenous and coastal communities to gather and use wave data, enhancing their blue economy and hazard protection. Leveraging low-cost and scalable marine technology, Backyard Buoys offers a system for community-managed ocean buoys and web apps that simplify data access to complement Indigenous Knowledge. Backyard Buoys – Wave Data & Indigenous Wisdom
Telemetry System	Remote data collection systems that transmit information, often used for weather and environmental monitoring.	
VHF (Very High Frequency)	A radio frequency range (30 MHz to 300 MHz) used for marine communications, especially for line-of-sight transmissions. VFH-FM Channel-16 is internationally established as a hailing and distress frequency.	The Maritime Operations Center provides 24-hour monitoring of MXAK's VHF radio system on Channel-16. A map of their current VHF installations across the state can be found here: Maritime Distress Communications
Vessel Monitoring System (VMS)	Satellite-based system used by authorities to monitor the location and activity of commercial fishing vessels.	VMS is used to support law enforcement initiatives and to prevent violations of laws and regulations. VMS also helps enforcement personnel focus their patrol time on areas with the highest potential for significant violations.
Arctic Waterways Safety Committee	The mission of the Arctic Waterways Safety Committee is to enhance safe, efficient, and environmentally sound maritime operations in the Arctic region by fostering a productive exchange of information among mariners and other stakeholders and establishing and promoting best practices and standards of care.	Will set the regional goals and standards for the Arctic Watch Maritime Operations Center to monitor and seek compliance with vessels transiting or otherwise utilizing the waterways.
Arctic Waterways Safety Guide	The purpose of the Arctic Waterways Safety Guide is to formalize key information for all waterway users that includes local hazards as well as procedures for maritime operations in the region to include community protocols, wildlife and marine mammal protection areas and migratory patterns, and Areas to be Avoided to ensure safe and efficient maritime operations.	Will set the regional goals and standards for the Arctic Watch Maritime Operations Center to monitor and seek compliance with vessels transiting or otherwise utilizing the waterways.

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More information on Arctic Watch:

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