



N A L A Q U Q

TECHNOLOGICAL SOLUTIONS FOR COMMUNITY EMPOWERMENT

Backyard Buoys

Project Description

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1.0 Introduction

As part of the Backyard Buoys Program (<https://backyardbuoys.org/>), the Alaska Ocean Observing System (AOOS) has been supporting coastal community partners to deploy low-cost and scalable marine technology to gather and use wave data. In 2023 and 2024, AOOS partnered with the Alaska Eskimo Whaling Commission (AEWC) to deploy Spotter wave buoys (Spotters) near villages across the Arctic coast. This program has been very successful in providing near real time wave information to mariners utilizing the waters near these communities. With additional funding from the National Oceanic and Atmospheric Administration (NOAA), AOOS has continued to expand this critical program by partnering with Nalaquq, LLC (Nalaquq), an Alaskan Native-owned business in the Yukon-Kuskokwim Delta (Y-K Delta). Nalaquq proposes to deploy up to three Spotters offshore near the community of Quinhagak in Kuskokwim Bay, Alaska. Each buoy is housed with integrated solar power, satellite data connectivity, sea surface temperature, and a wave sensor to provide critical wave data for community members of the Y-K Delta, as well mariners, researchers, and resource management agencies. Near real time data will be served on existing regional data visualization systems and customized applications developed during the Backyard Buoys Program based on user interviews and iterative feedback. With accessible data tools, these data will serve community needs for decisions on scales from daily (e.g., safety for maritime operations and coastal hazards) to longer planning horizons (e.g., resilience for climate change and ecosystem function). Wave buoy data from other Backyard Buoys Community Partners is currently available on the AOOS data portal (<https://portal.aos.org/#metadata/2346/affiliate>).

2.0 Description of Activities

Nalaquq plans to deploy up to three Spotters in marine waters in the Y-K Delta to collect real-time wave data (Figure 1). A Community Facilitator will be hired by Nalaquq to deploy, maintain, and retrieve the Spotters. Nalaquq worked with the community of Quinhagak and the local Search and Rescue organization to identify initial buoy locations as presented in Table 1. Figure 2 displays the buoy area as well as anticipated initial buoy locations.

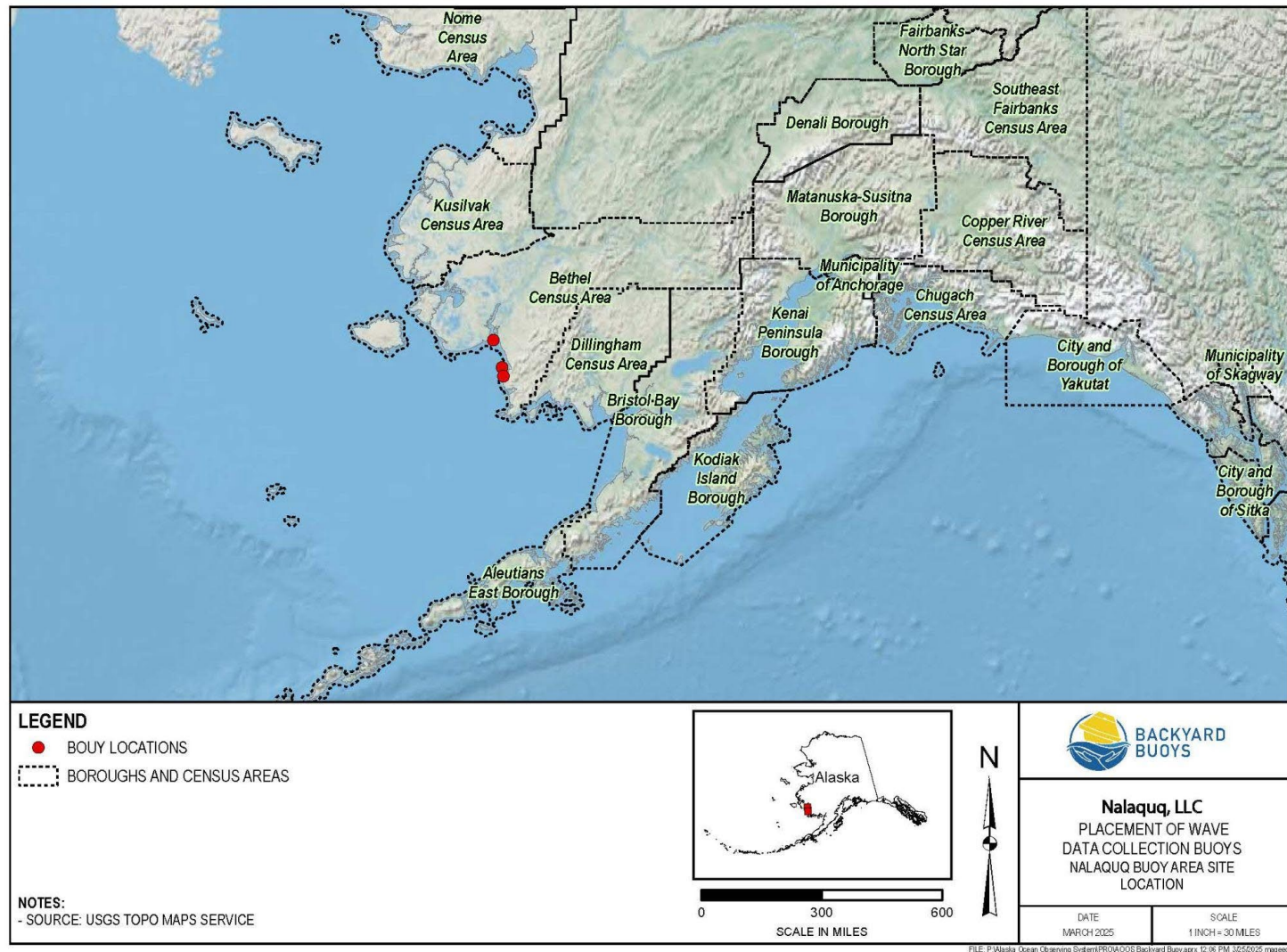


Figure 1. Vicinity of Nalaquq Backyard Buoy Area

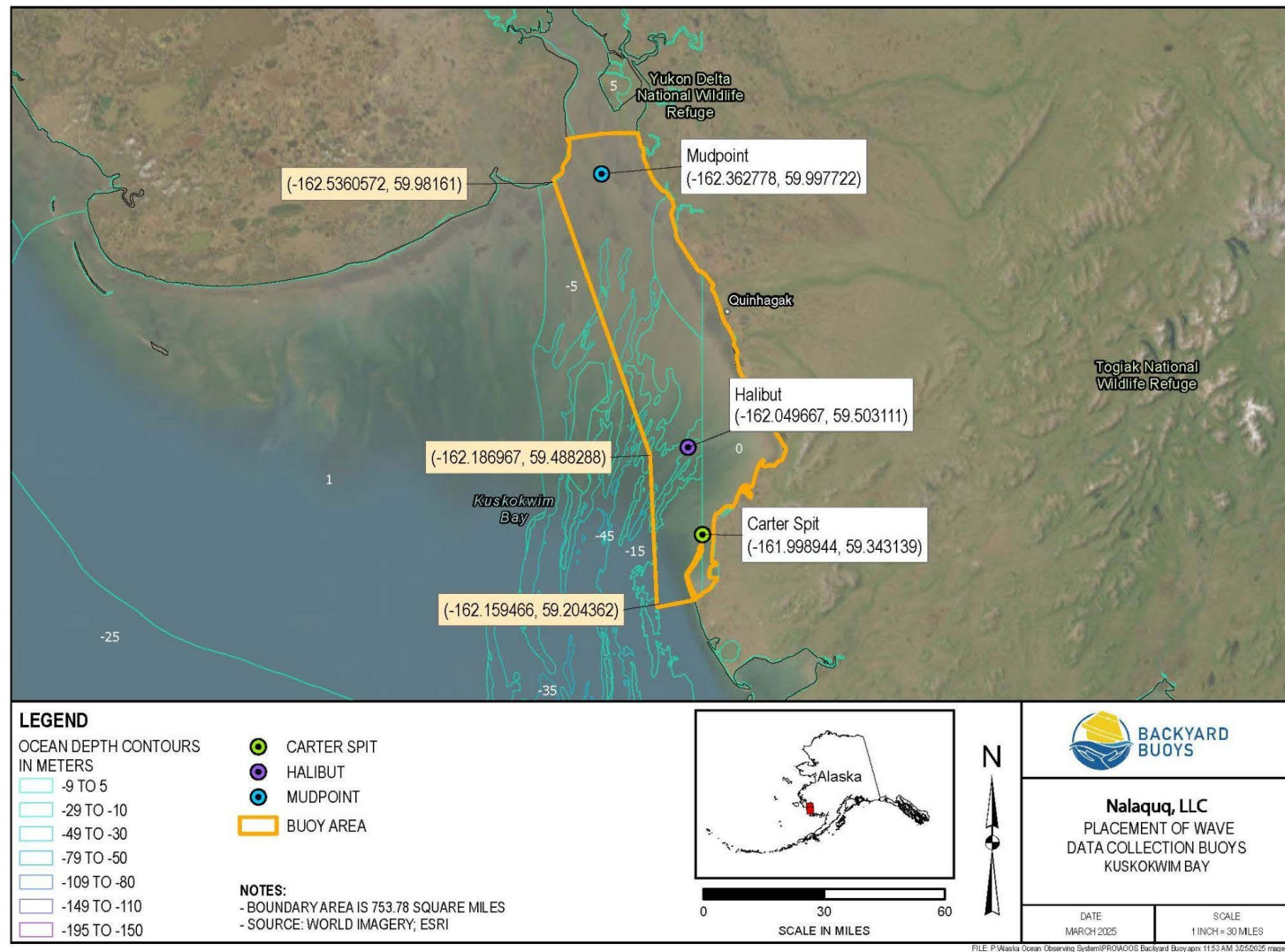


Figure 2. Quinhagak Buoy Area and Initial Buoy Locations

Table 1. Year 1 Initial Nalaquq Spotter Locations

Buoy Number	Location Description	Latitude	Longitude
Quinhagak 1 (Carter Spit)	>0.5 miles from Carter Spit	59.343139	-161.998944
Quinhagak-2 (Halibut 1)	15 miles southwest of Quinhagak	59.503111	-162.049667
Quinhagak 3 (Mudpoint)	25 miles northwest of Quinhagak in the Kuskokwim River delta	59.997722	-162.362778

Spotters are compact and lightweight instruments consisting of a waterproof hull, solar panel array, and electronics package (Figure 3). Figure 4 shows dimensions of the Spotter. Each Spotter will be anchored on the seafloor using one of the following anchor options (to be decided by the Community Facilitator):

1. **Up to three 50-lb (22.7 kg) kettlebells connected with a chain to the mooring line** – Figure 5 shows dimensions of a typical 50-pound (lb) (22.7 kilogram [kg]) kettlebell similar to that which would be used for Spotters. A conservative impacted seafloor surface area for each 3-kettlebell anchor option, is 3.63 square feet (sq ft.) (0.00008 acres [ac]).
2. **A single 50-lb kettlebell attached by a chain to a small boat anchor** - Figure 5 shows the dimensions of a typical boat anchor similar to that which would be used for Spotters. A conservative impacted seafloor surface area for each kettlebell/boat anchor option is 5.079 sq ft. (0.0001 ac).
3. **Four anchor chain links** – Figure 5 shows dimensions of a typical anchor chain link similar to that which would be used for Spotters. A conservative impacted seafloor surface area for each 4-chain link anchor option is 1.5 sq ft. (.00003 ac).

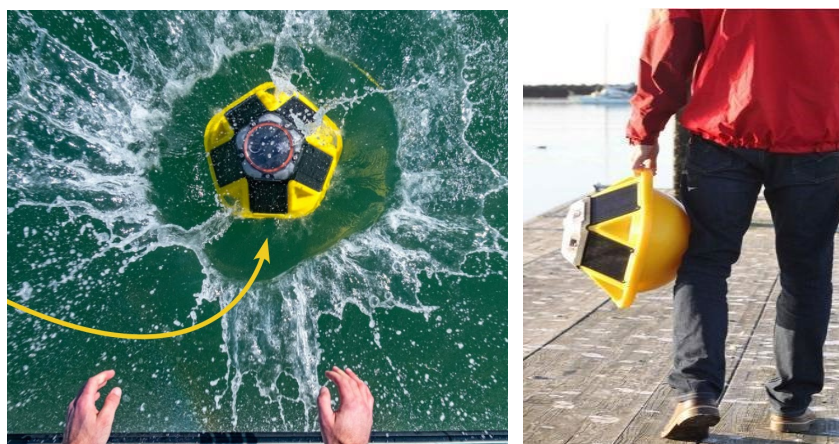
**Figure 3. Spotter Buoy Photos**



Figure 4. Spotter Buoy Dimensions

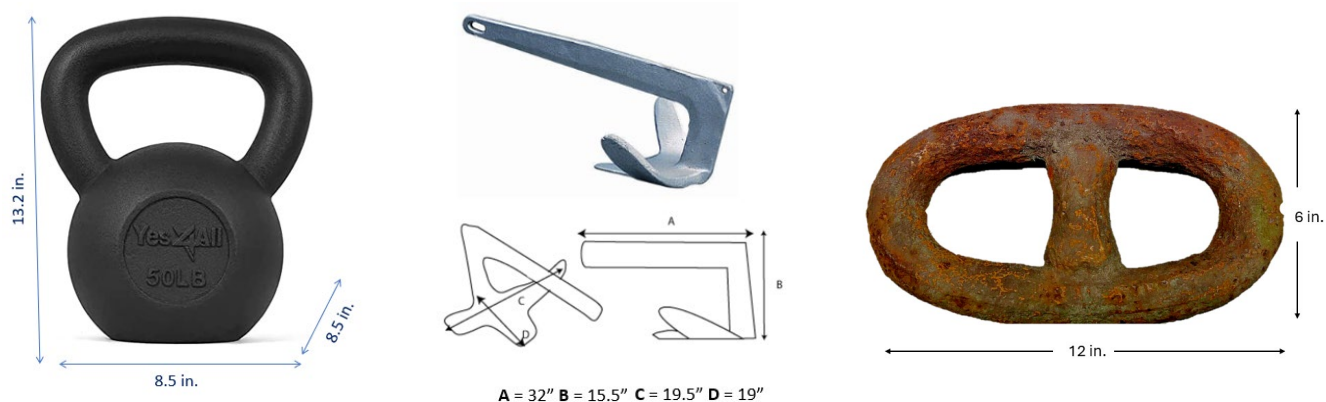


Figure 5. Typical Anchor Options

The Spotters will be anchored to the seafloor in water depths up to 50 feet (ft.) (15.2 meters [m]) using a mooring system similar to those depicted in Figure 6 and Figure 7. The mooring system is the underwater extension of the Spotter Platform. Figure 6 presents the typical mooring system used during other Backyard Buoys deployments. As a result of experience gained and feedback gathered during other Backyard Buoys deployments, the mooring system may be altered (e.g., float capacity may be increased in areas with high currents to prevent the Spotter from submerging, maximizing data collection; larger floats and/or flags may be incorporated, as presented in Figure 7, to increase visibility, aiding in locating the buoy during recovery and reducing risk of entanglement with passing vessels). Decisions regarding modifications of the mooring system will be made by the Community Facilitator responsible for buoy deployment. Nalaquq has been working with members of the AEWC who deployed Spotters in 2023 and 2024 to integrate lessons learned into the plans for 2025.

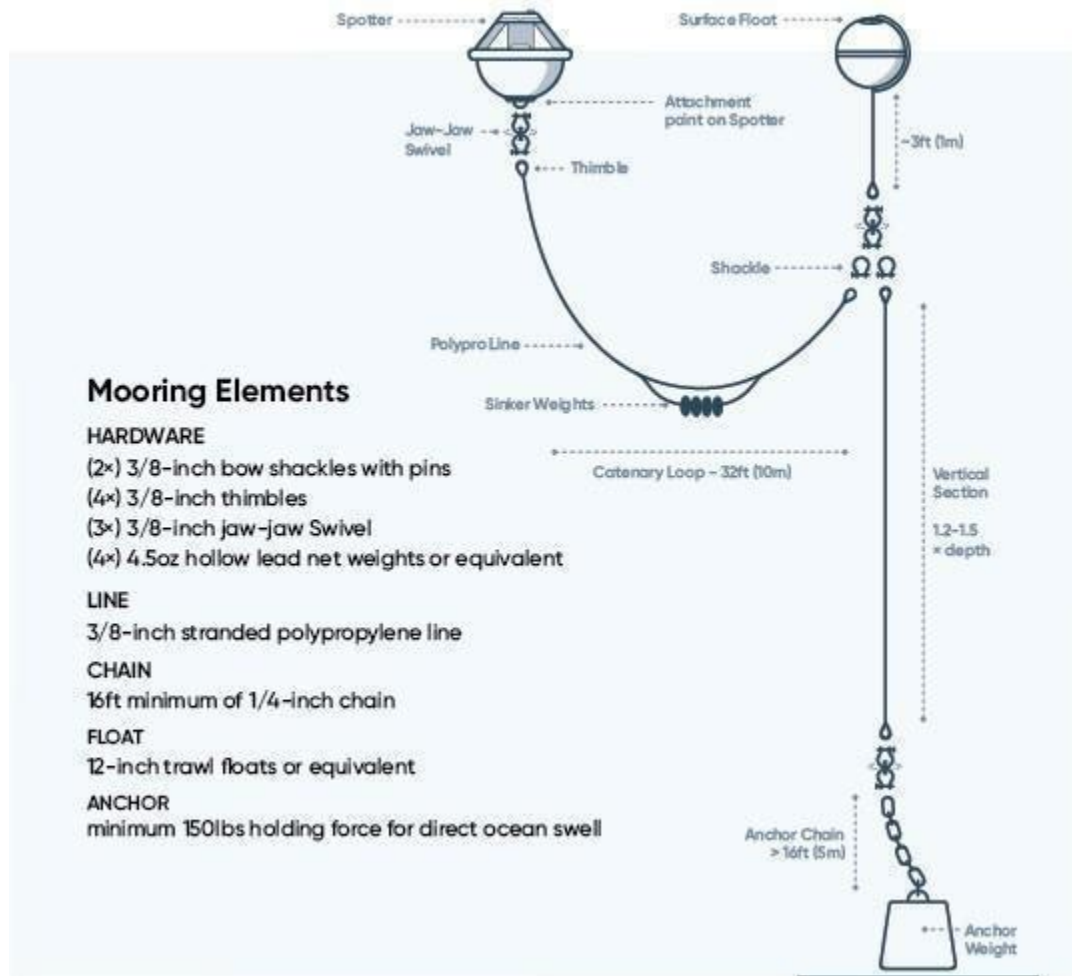


Figure 6. Typical Mooring System Used in Backyard Buoys Deployments

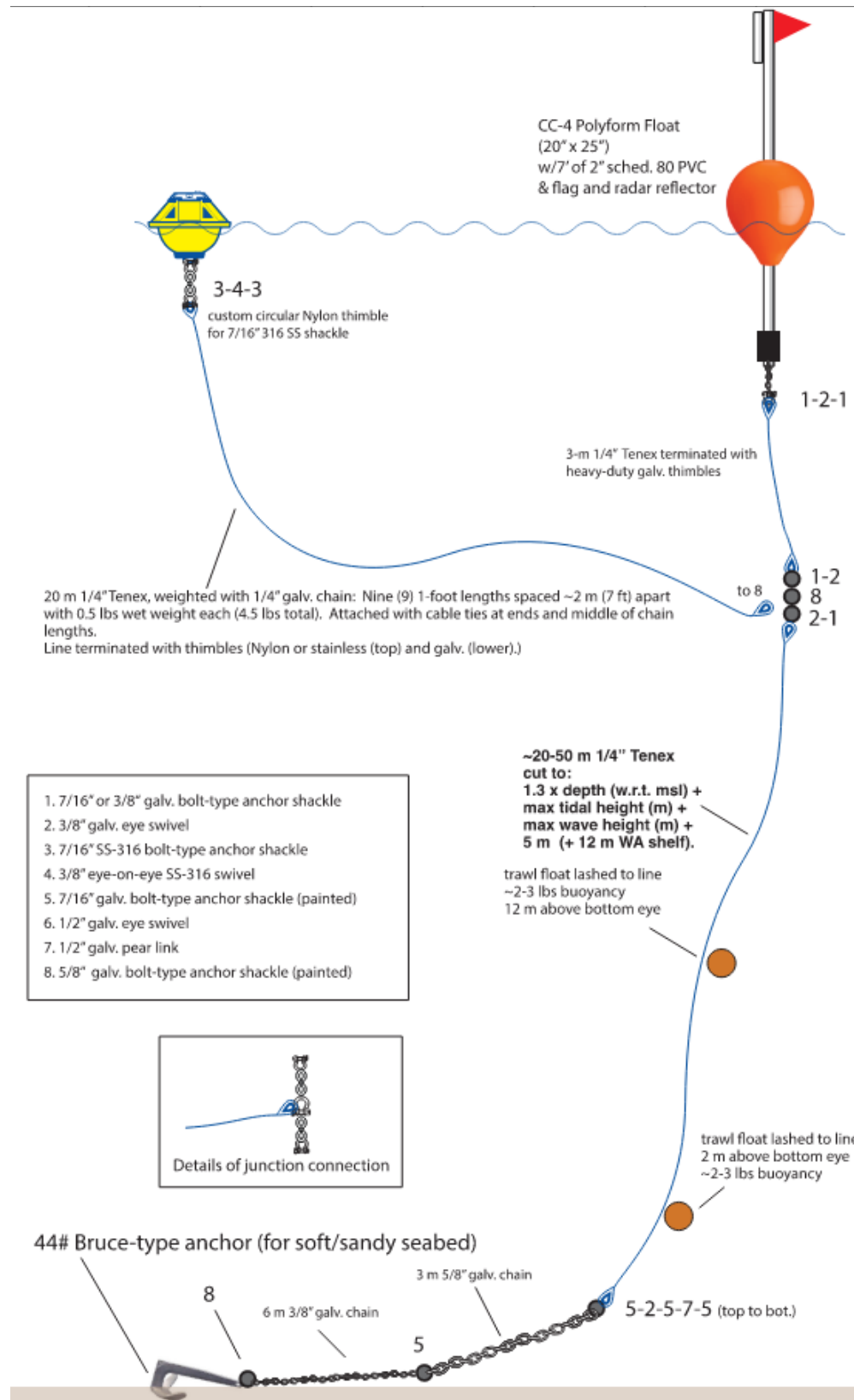


Figure 7. Typical Mooring System with Modified Surface Float

The Community Facilitator will deploy Spotters over the side of a subsistence boat within the buoy area polygon. Buoys will similarly be retrieved by pulling the buoy, mooring system, and anchor over the side of a single fishing boat. The boat used for deployment will be a typical open aluminum fishing boat with an outboard motor (typically up to 250 HP), approximately 18-24 ft. (5.5-7.3 m) in length. Up to 120 gallons of fuel will be stored on the fishing boat. Figure 8 shows typical Quinhagak boats, similar to those which will be used for proposed buoy deployment and retrieval.



Source: Sheyna Wisdom

Figure 8. Typical Fishing Boat

3.0 Mitigation Measures/Wildlife Interaction Procedures

The following mitigation measures are proposed to be implemented, as appropriate, during implementation of the Nalaquq Backyard Buoys Project:

- Spotters will not be placed such that they block access of any species to an area (e.g., they will not prevent movement in or out of a river or channel).
- Spotters will be removed annually prior to ice advancing over the buoy area polygons at the end of the open water season.
- Spotters will be re-deployed once the ice has retreated from the buoy area polygons.
- All personnel associated with Spotter deployment will be instructed about the potential presence of species protected under the Endangered Species Act (ESA) and the MMPA.

- All on-site personnel will observe water-related activities for the presence of protected species.
- Any collision with and/or injury to a protected species during Spotter deployment, maintenance, or retrieval operations will be reported immediately, or as soon as practical, to the following:
 - NMFS' Office of Protected Resources at jolie.harrison@noaa.gov (for whales, seals, or sea lions);
 - Alaska Regional Stranding Hotline at (877) 925-7773 (for whales, seals, or sea lions);
 - USFWS' Marine Mammals Management at fw7_ak_marine_mammals@fws.gov (800) 362-5148 during business hours or the Alaska Sealife Center at (888) 774-7325 after hours (for birds, walruses, or polar bears); and
 - USFWS' Endangered Species Branch (Ted Swem) at (907) 456-0441 (for spectacled eiders or Steller's eiders).
- Any observed stranded, injured, or dead marine mammals (not resulting from proposed project activities) observed during Spotter deployment, maintenance, or retrieval operations shall be reported immediately to the Alaska Marine Mammal Stranding Hotline at (877) 925-7773.
- All boat operators shall watch for and avoid collision with protected species. Boat operators must avoid potential interactions with protected species and operate in accordance with the following protective measures:
 - Operation of the boat shall cease immediately if a listed species is observed within a 50-ft. (15.24-m) radius of the boat and shall not resume until the species has departed the area of its own volition.
 - If the detection of protected species is not possible during certain weather conditions (e.g., fog, rain, wind), then in-water operations will cease until weather conditions improve and detection is again feasible.
 - Boats will avoid approaching within 328 ft. (100 m) of marine mammals.
 - When these animals are sighted while the boat is underway, the operator will attempt to keep the boat parallel to the animal's course.
 - Boat operator will avoid multiple or abrupt changes in direction or speed.
 - Boat operator will maintain a general speed of 5 miles per hour (4 knots) or less when near protected species and when safe to do so.
 - In-water mooring setups will include as little line as possible in the water column in order to measure wave movement and collect quality data. To the extent practical in order to collect quality data, excess line in the water column will be kept to a minimum to minimize the risk for marine mammal entanglement.

4.0 Assessment of Potential Effects on Endangered Species Act-Listed Species in Buoy Area Polygons

Endangered Species Act (ESA) listed species occur in the Nalaquq Backyard Buoys Project Area. Table 2 presents ESA-listed species and associated Critical Habitat which occur within the Nalaquq buoy area polygon.

Table 2. ESA-Listed Species and Critical Habitat Occurring within Proposed Nalaquq Buoy Area Polygon

Species	ESA Status	Critical Habitat Present in Project Area? (Yes/No)	Population Estimate	Expected Effect from Spotter Deployment and Operation
Fin whale	Endangered	N/A ^a	3,168 ^b	No Effect
North Pacific right whale	Endangered	No	31 ^b	No Effect
Humpback whale	Endangered	No	1,107 ^b 1,918 ^c	No Effect
Sperm whale	Endangered	N/A ^a	244 ^{b,d}	No Effect
Steller sea lion	Endangered	No	43,201 ^b	No Effect
Ringed seal	Threatened	No	158,507 ^b	No Effect
Bearded seal	Threatened	No	273,676 ^b	No Effect
Polar bear	Threatened	No	900 ^e (Southern Beaufort Sea Stock) 2,000 ^f (Chukchi/Bering Sea Stock)	No Effect
Spectacled eider	Threatened	No	6,956 ^g	No Effect
Steller's eider	Threatened	No	199 ^h	No Effect

^aNo critical habitat has been designated.

^bMuto et al. 2021

^cCaretta et al. 2019

^dMinimum population estimate (Nmin); no reliable abundance estimate exists.

^eBromaghin et al. 2015

^fStishov 1991

^gWilson et al. 2018; ACP breeding population

^hLarned 2012a; ACP breeding population

The Spotters do not emit sound into the marine environment. Given Spotter size and design, and by implementing the proposed mitigation measures, the Spotters do not create obstructions to animal movement, encourage aggregations of predators, or disrupt wave patterns. They are too small to attract fish and larger predators that would increase predation, and they are too small to disrupt wave patterns.

A Community Facilitator and Whaling Captain working on another Backyard Buoys project in Alaska (John Hopson Jr of Wainwright) provided feedback during a project meeting in response to his initial concerns

that the buoys might result in unintended impacts (i.e. deflection) on bowhead whale migration routes and affect subsistence hunting success. During the 2023 Fall whaling season, the first whale landed was less than 0.5 miles from one of the buoys. He noted the buoys did not seem to disrupt the whale migration. In fact, as they were pulling the first whale, they saw many others passing by. He said this observation reassured him the buoys would not impact their subsistence hunt.

1.1 Routes of Effect

ESA-listed species have the potential to be affected by a number of “routes of effect.” These routes of effect, and Nalaquq’s assessment of whether and how they affect ESA-listed species and/or critical habitat, are described in the sections below. In particular, we assessed the potential for the following routes of effect to have an effect on ESA-listed species and critical habitat occurring in the buoy area polygon:

- Direct physical effects from placement of buoy anchors on seafloor;
- Effects from turbidity from disturbed seafloor sediments during anchor placement;
- Entanglement with Spotter mooring line; and
- Boat collision.

Direct Physical Effects from Placement of Buoy Anchor on Seafloor

Table 3 presents the estimated impact area for each of the three anchor options. Placing the anchor setup is not anticipated to directly affect ESA-listed species. There is a potential that anchor setup placement could smother or crush benthic organisms, some of which are prey to ESA-listed species such as bearded seals, gray whales, and spectacled and Steller’s eiders.

Table 3. Estimated Impacted Area by Anchor Option

Anchor Option	Estimated Area of Impact on Seafloor Per Mooring (sq ft./ac)	Estimated Total Area of Impact on Seafloor for All Moorings (sq ft./ac)
Up to three 50-lb (22.7 kg) kettlebells connected with a chain to the mooring line	3.63/0.00008	7.26/0.0002
A single 50-lb kettlebell attached by a chain to a small boat anchor	5.079/0.0001	10.158/0.0002
Four anchor chain links	1.5/0.00003	3/0.00007

sq ft.=square feet; ac=acres

Up to 3 total Spotters would be deployed, and each one may be moved up to 10 times during a single open water season. If all buoys were moved 10 times, the most conservative total seafloor impact area each year would be approximately 101.6 sq ft. (0.002 ac). Any impacts on benthic organism populations would be temporary, as the area would likely be recolonized by benthic animals within a short timeframe upon removal of the anchor setup. Impacts on benthic foraging habitat would also be limited to the footprint of the anchor setup. Injuring or killing benthic prey in this relatively small area would not adversely affect available critical habitat for ESA-listed species as the impacted area would be a small fraction of area of critical habitat available to ESA-listed species. Physical placement of the anchor setup on the seafloor is expected to have no effect on ESA-listed species or critical habitat.

Nalaquq is not aware of any identified Critical Sites within the proposed buoy area polygons. Any sites identified by the State Historic Preservation Office (SHPO) during consultation with the USACE, or identified while conducting project-related activities, will be avoided and a buffer of at least 500 ft. (152.4 m) will be implemented to mitigate any potential impacts on Critical Sites. Geographical positioning system (GPS) coordinates and geographical information system (GIS) data will be provided to SHPO for any sites identified in the field during project activities.

Effects from Turbidity from Disturbed Seafloor Sediments During Anchor Placement

A small and temporary increase in turbidity would likely result from placement of the anchor weights on the seafloor. This slight increase is expected to return to ambient levels within a short time frame after anchor placement. The rise in turbidity is expected to be no greater than many natural processes which might cause increased turbidity (e.g., marine mammal foraging, weather). No sediments will be moved during anchor placement. The slight and brief effect of increased turbidity in the water column is expected to have no effect on ESA-listed species or critical habitat.

Entanglement with Spotter Mooring Line

ESA-listed whales can become entangled by encountering in-water lines, such as Spotter mooring lines. The risk to whales depends on the number of in-water loops created by lines attached to surface floats and on the extent of excess line in the water column. The nature of wave buoy data collection necessitates some excess line in order for the buoy to rise and fall with the wave action. Surface floats are also necessary in order to allow for proper buoy movement for data collection. Depending on typical wave conditions for a particular location, more surface floats may be needed in order to collect quality data and limit the risk of the buoy being pulled underwater or damaged. As described above, whaling crews hunting near Spotters deployed for another Backyard Buoys project offshore of Wainwright landed whales in near proximity to the Spotters, and the whales' migration path did not appear to be affected by presence of the buoys (J. Hopson, personnel communication). Proposed moorings will be installed in a manner to minimize the risk of entanglement (i.e., as few looping lines and as little excess line in the water column as practical in order to collect quality wave data). The small quantity of Spotter buoys in the water at any given time (up to 3 total) further limits the risk of whale entanglement. Therefore, deployment of the proposed Spotter buoys is expected to have no effect on ESA-listed whales from entanglement with underwater mooring lines.

Boat Collision

Increased boat traffic in the marine environment could increase the potential for boat collisions with ESA-listed species. Proposed Spotter buoy deployment will not result in more than an incremental increase in vessel traffic in offshore waters within the buoy area polygons, and as such it is extremely unlikely that the project will increase the incidence of boat collisions with ESA-listed species. Boats proposed for this project are the same fishing boats transiting through the area for subsistence fishing and hunting. They will be adding an incrementally small number of trips in the same region with the same fishing boats. Furthermore, the proposed mitigation measures (e.g., reduced speed when protected species are present, ceasing buoy deployment and retrieval operations when weather conditions prevent detection of protected species, etc.) will further mitigate the potential for collisions with animals, resulting in no effect on ESA-listed species from collisions with project boats during buoy deployment, maintenance, and retrieval.

1.2 Summary of Effects

Based on the nature of the proposed project and the proposed mitigation measures, Nalaquq anticipates effects determinations as presented in Table 4.

Table 4. Summary of Anticipated Effects on ESA-Listed Species from Nalaquq Backyard Buoys Project

Potential Routes of Effect	Anticipated Effect on ESA-Listed Species	Anticipated Effect on Critical Habitat
Direct Physical Effects from Placement of Spotter Buoy Anchors on Seafloor	No Effect	No Destruction or Adverse Modification
Effects from Turbidity from Disturbed Seafloor Sediments During Anchor Placement	No Effect	No Destruction or Adverse Modification
Entanglement with Spotter Mooring Lines	No Effect	No Destruction or Adverse Modification
Boat Collision	No Effect	No Destruction or Adverse Modification

Similar determinations of effect on ESA-listed species and critical habitat from marine placement of Spotters were made by USACE for Backyard Buoy projects in other regions (North Slope [POA-2023-00217], Puget Sound [NWS-2023-648], and off the Olympic Coast [NWS-2023-912]).

5.0 Lessons Learned from Other Backyard Buoys Deployments

Lessons learned documented during other Backyard Buoys projects resulted in adaptive management measures which will be implemented for Nalaquq's 2025 activities. John Hopson Jr. of Wainwright (Community Facilitator, Whaling Captain, and AEWC Chair) provided feedback during a project meeting in response to his initial concerns that the buoys might result in unintended impacts (i.e., deflection) on bowhead whale migration routes and affect subsistence hunting success. During the 2023 Fall whaling season, the first whale landed was less than 0.5 miles from one of the buoys. He noted the buoys did not seem to disrupt the whale migration. In fact, as they were pulling the first whale, they saw many others passing by. He said this observation reassured him the buoys would not impact their subsistence hunt. John also noted that the data from the buoys at 5 and 10 miles offshore provided valuable information in making decisions to launch the boat each day. Nalaquq is working with Dr. Thilo Klentz of the University of Alaska Fairbanks (UAF) with experience in oceanographic deployments, as well as with AEWC members who deployed Spotters in 2023 and 2024 to assist with mooring design and deployment techniques.

6.0 Permits

Nalaquq will obtain permits and authorizations listed in Table 5 prior to buoy deployment.

Table 5. Permits and Authorizations

Permit	Agency	Status
Nationwide Permit 5 – Scientific Measurement Devices	U.S. Army Corps of Engineers	Application Submitted
Clean Water Act Section 401 Water Quality Certification	Already granted by State of Alaska, Department of Environmental Conservation for NWP 5	Application Submitted
Land Use Permit	State of Alaska, Department of Natural Resources	Application Submitted
Private Aids to Navigation Approval/Local Notice to Mariners	U.S. Coast Guard	Submitted after buoys deployed

7.0 Spill Prevention and Response

As each boat will be powered by an outboard motor, each Community Facilitator will ensure a spill kit, including absorbants, is available on the boat. All personnel will be briefed on the location of the spill kit and proper use in the event of an accidental fuel release. Any spill will be reported in accordance with federal, state, and local regulations.

8.0 Emergency and Medical Events

The Community Facilitator and assisting personnel will be equipped with a cell phone and VHF radios onboard each boat. In the case of an emergency or medical event during proposed activities, personnel will contact Police and/or Search and Rescue for assistance.

9.0 References

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