



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, AK 99802-1668

January 13, 2026

Anthony High
U.S. Department of Agriculture
Rural Development, Rural Utility Service
1400 Independence Ave, SW
Room 4121, Stop 1590
Washington D.C. 20250

Re: Airraq Telecommunications Cable Project, Letter of Concurrence, AKRO-2025-03313

Dear Mr. High:

The National Marine Fisheries Service (NMFS) has completed informal consultation under section 7(a)(2) of the Endangered Species Act (ESA) regarding the proposed installation of fiber optic cable along marine routes to extend the Airraq telecommunications network to provide service to Yukon Kuskokwim Coastal communities in western Alaska (Figure 1). Environmental Resources Management (ERM) and Unicom, Inc. requested on behalf of the USDA Rural Utilities Service written concurrence that the proposed action may affect, but is not likely to adversely affect, Mexico DPS humpback whales (*Megaptera novaeangliae*), Western North Pacific humpback whales (*Megaptera novaeangliae*), Western North Pacific gray whales (*Eschrichtius robustus*), Western DPS Steller sea lions (*Eumetopias jubatus*) Arctic ringed seals ((*Pusa hispida hispida*), Arctic ringed seal critical habitat¹, Beringia DPS bearded seals (*Erignathus barbatus*), Beringia DPS bearded seal critical habitat², fin whales, (*Balaenoptera physalus*), or North Pacific right whales (*Eubalaena japonica*). Based on our analysis of the information you provided to us, and additional literature cited below, we concur with your determination.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 FR 24268). We are applying the updated regulations to this consultation.

^{1, 2} On September 26, 2024, the U.S. District Court for the District of Alaska vacated the critical habitat designations for ringed seals and bearded seals under the ESA and remanded the rules to NMFS for further consideration (*State of Alaska v. Nat'l Marine Fisheries Serv.*, Case No. 3:23-cv-00032-SLG, 2024 WL 4298114 (D. Alaska Sept. 26, 2024)). NMFS and the Center for Biological Diversity separately appealed that decision. Since that time, NMFS moved to dismiss both appeals, and the Ninth Circuit has dismissed NMFS's. In the interim, while the Center for Biological Diversity's appeal remains active, our consultations under section 7(a)(2) of the ESA will continue to address effects to ringed seal and bearded seal critical habitat when requested so that action agencies have the benefit of NMFS's analysis of the consequences of proposed actions on the critical habitat in the event that the appeal is successful.



The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to NMFS' existing practice in implementing section 7(a)(2) of the ESA (84 FR at 45015; 89 FR at 24268). We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this letter of concurrence would not have been any different under the 2019 regulations or pre-2019 regulations.

This letter underwent pre-dissemination review in compliance with applicable Data Quality Act guidelines. A complete administrative record of this consultation is on file in this office.

Consultation History

We received your request for consultation on November 7, 2025 and your correspondence identifying Unicom and their consultant, ERM, as your non-Federal representative for this project. NMFS sought clarification on the species requested for consultation via email on December 2, 2025; ERM responded on December 3, 2025. On December 8, 2025, NMFS requested clarification on details specific to the marine component of the project; ERM responded on December 11, 2025. NMFS sent draft mitigation measures to ERM on December 15, 2025; these were modified slightly and agreed upon on December 22, 2025. We initiated consultation on December 22, 2025.

Description of the Proposed Action

“Action” means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. 50 CFR 402.02.

This project proposes to extend the existing Airraq Network to provide high-speed broadband services to rural communities in the Yukon-Kuskowim Delta region. This action includes the installation of approximately 400 miles of fiberoptic cable starting in Nunapitchuk and extending to the communities of Mertarvik, Tununak, Toksook Bay, Alakanuk, and Emmonak, as well as installation of approximately 45 miles of fiber optic cable from Emmonak to Kotlik. Cable installation activities will occur across wetlands, through Baird Inlet, through the Bering Sea, and onto nearshore landfall sites (Figure 1). Cable installation activities will occur in two phases: Airraq Phase 3 and Airraq Kotlik. The Airraq Kotlik route will occur predominately overland, with some crossings over inland streams and rivers. As such, the effects of Airraq Kotlik will not be considered further. The entire marine route component of this action will occur in Airraq Phase 3, and thus proposed activities related to Airraq Phase 3 will be the focus of this assessment.

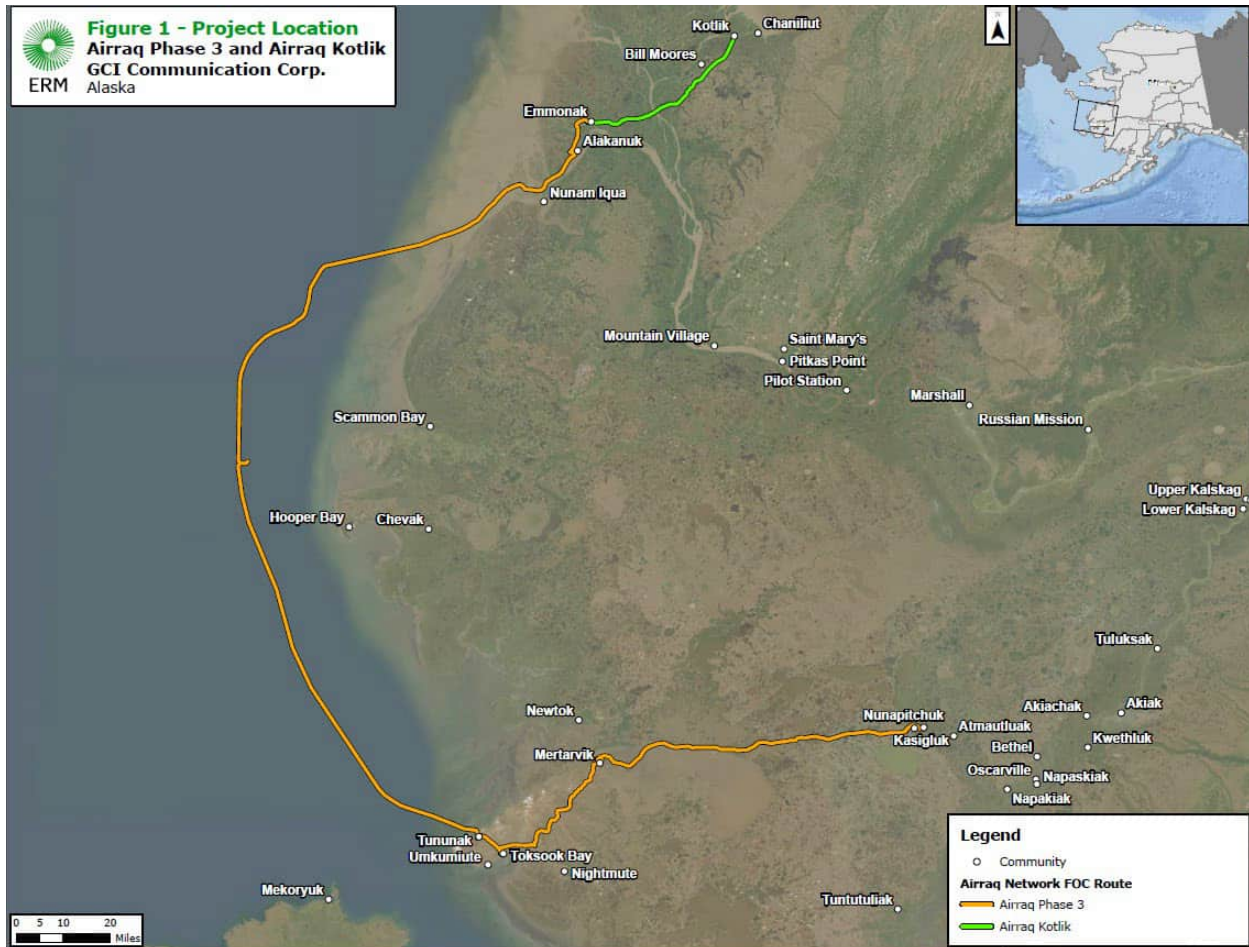


Figure 1. Cable installation route.

Airraq Phase 3 includes two marine components: the route between Nunapitchuk and Mertarvik, in which a portion of the route will be installed through Baird Inlet; and the route between Tununak and Alakanuk, which will consist of two branching units that will be installed in the Bering Sea. Landfall locations will occur at Mertarvik, Tununak, and Alakanuk. The marine route was identified through desktop studies and previously conducted benthic and geophysical surveys. The marine cable will measure approximately 1 inch in diameter, will be constructed from benign materials, and will not carry an electrical current. The marine route is expected to total 238.2 miles of cable, and will modify a total of 28.04 acres of subtidal or intertidal substrate. Once away from shore, the route parallels the coastline approximately 20 to 25 miles offshore. The cable will be installed in depths ranging from approximately 23 to 85 ft in the marine offshore environment.

Airraq phase 3 is expected to be completed within a 12-month timeframe, from summer/fall of 2026 through summer/fall of 2027. The marine cable will be installed during the summer months when the water is not frozen, and no ice accumulation is present. Landfall construction activities are expected to take place in July and August.

Pre-lay Grapnel Run

Prior to cable burial, a pre-lay grapnel run (PLGR) will be carried out to identify and remove debris within the proposed cable route. PLGR is conducted by pulling a grapnel along the route over the seabed. Any debris collected will be discharged onshore in accordance with local regulations. If debris cannot be recovered, then the proposed route will be adjusted to avoid the debris. The grapnel for the proposed action is expected to be a flatfish grapnel (~39.8 inches by 25.6 inches).

Vessels

Marine cable installation will rely on up to four vessels for different phases of construction and navigation. The cable laying method will be dependent on water depth and location. Offshore (>30 ft) installation will utilize a full-size cable ship (e.g., IT Intrepid or IT Infinity) that will rely on dynamic positioning (DP). The nearshore segments of the marine route (<340 ft), such as within Baird Inlet and approaching Alakanuk and Tununak, will be installed using either a tug and barge, a landing craft (e.g., M/V Polar Bear or M/V Unalaq) (~150 ft) or a small vessel of opportunity (~40 ft) with a shallow draft that can be grounded on mud flats, such that shallow waters are accessible.

Cable Installation

Cable Plow

In the offshore marine route, cable will be installed by either laying directly on the seafloor or burying it by insertion into the sediment using a cable sea plow. Laying the cable on the seafloor will be carried out within areas that have low risk of cable disturbance or where the geological conditions of the seafloor do not allow for plow burial (e.g., steep grades or bedrock). When laying the cable on the seafloor, a cable ship will be used with engineered slack to ensure the cable conforms to contours of the seafloor. In areas where the risk of outside aggression to the cable is present (i.e., popular fishing or anchoring locations) or area of ice scaring, a cable plow will be used to install the cable below the seafloor. The cable plow will be pulled along the seafloor by a tow wire connected to the cable ship. The cable will be fed through the plow's share blade, penetrating the seafloor sediments under the plow up to 5 ft deep through a plow share approximately 1 ft wide. The cable will exit the lower aft end of the share blade, and the sediments will immediately collapse on top of the cable behind the plow. It is estimated that up to 115 miles of cable will be buried using this method, and the remainder will be surface laid.

Water-jetting

In waters with depths less than 30 ft, the marine cable will either be surface laid where there is a low risk of disturbance or be buried through areas where additional protection from environmental conditions such as surf action and ice scour are needed. Where burial is required, a water jet sled operated from a landing craft or barge system may be used to install the cable below the seafloor. Pressurized water will be used to liquefy substrate on the seafloor and turn the fine sediments into a slurry, and the cable will then sink into the trench. The jet sled will be a

self-propelled system, and the pressurized water will be supplied from the surface through pressurized hoses, allowing for the jetting pressure and flow rates to be controlled based on benthic conditions. Divers will accompany the jet sled to monitor the trenching performance and assist in operations. For marine cable laying, use of a plow or jet sled to trench and re-cover the cable up to 1.5 ft deep in soft sediments means that no sidecast will be generated.

In waters along the marine cable routes that are very shallow (10 ft or less) or constrained, a smaller shallow draft vessel will be deployed to install the cable. In these shallow areas, the cable will either be surface-laid in areas with low risk of disturbance or buried using divers and hand jetting tools near villages or areas of known vessel anchoring activities. Divers will be used to facilitate cable shore landing at landfall sites.

Landfall

The landfall cable segments are between the mean low water (MLW) mark and an onshore beach vault. There will be one beach vault per landfall location, and each will be pre-cast measuring 3 ft by 4 ft by 4 ft (48 ft³) and will be fully buried at the high tide line (HTL). Excavation dimensions will not exceed 5 ft by 5 ft by 5 ft (125 ft³). Divers may be used to assist in transferring the cable from the installation vessel to the landing site. Once the cable is brought ashore, divers will then install armor protection and jet bury the cable within the surf zone out to a depth of approximately 10 ft of water. Landfall trenching will be conducted with either a chain or a backhoe. Other additional equipment may include a tracked excavator, utility trucks, hand tools (e.g., shovels, rakes), survey equipment, winch or turning sheave, and/or splicing equipment. A maximum of three 4-inch conduits per cable landing site will be placed in the excavated area, no deeper than 36 inches, to extend from the beach vault seaward to the beach above the MLW, allowing cables to be pulled into the beach vault without further disturbing the shoreline. For the cable trench in intertidal and subtidal areas, the expected maximum excavation dimensions are 3 ft wide by 3 ft deep, with a sidecast width of 5 ft. Horizontal directional drilling (HDD) may be utilized for installation of cables onshore. Up to 984 ft of split pipe articulated armor may also be used in the landing sites to provide additional protection for the project cable. Excavated material will be used to bury the conduits or cable. Depending on substrate characteristics, geotextile, ice pads, or construction mats will be used to manage excavated material and mitigate erosion, accumulation of water, and increased runoff associated with the project. Any excess material will be disposed of at an upland location.

Action Area

The action area is defined in the ESA regulations (50 CFR 402.02) all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. The action area is distinct from and larger than the project footprint because some elements of the project may affect listed species some distance from the project footprint. The action area, therefore, extends out to a point where no measurable effects from the project are expected to occur. NMFS defines the action area for this project as the area within which project-related noise levels are ≥ 120 dBrms re 1 μ Pa or approaching ambient noise levels (i.e., the point

where project-related sound attenuates to levels below non-anthropogenic sound).³ For this project, the action area is defined by vessel noise. Received sound levels associated with the cable-laying vessel (CLV) are expected to decline to 120 dB_{rms} re 1μPa within 10 km of the source, shown as yellow buffer extending out from the cable route in Figure 2. To define the action area, we considered the vessel size, type, and empirical measurements from similar projects (Kipple and Gabriele 2007; Tetra Tech 2013; Green et al. 2018; BOEM 2023).

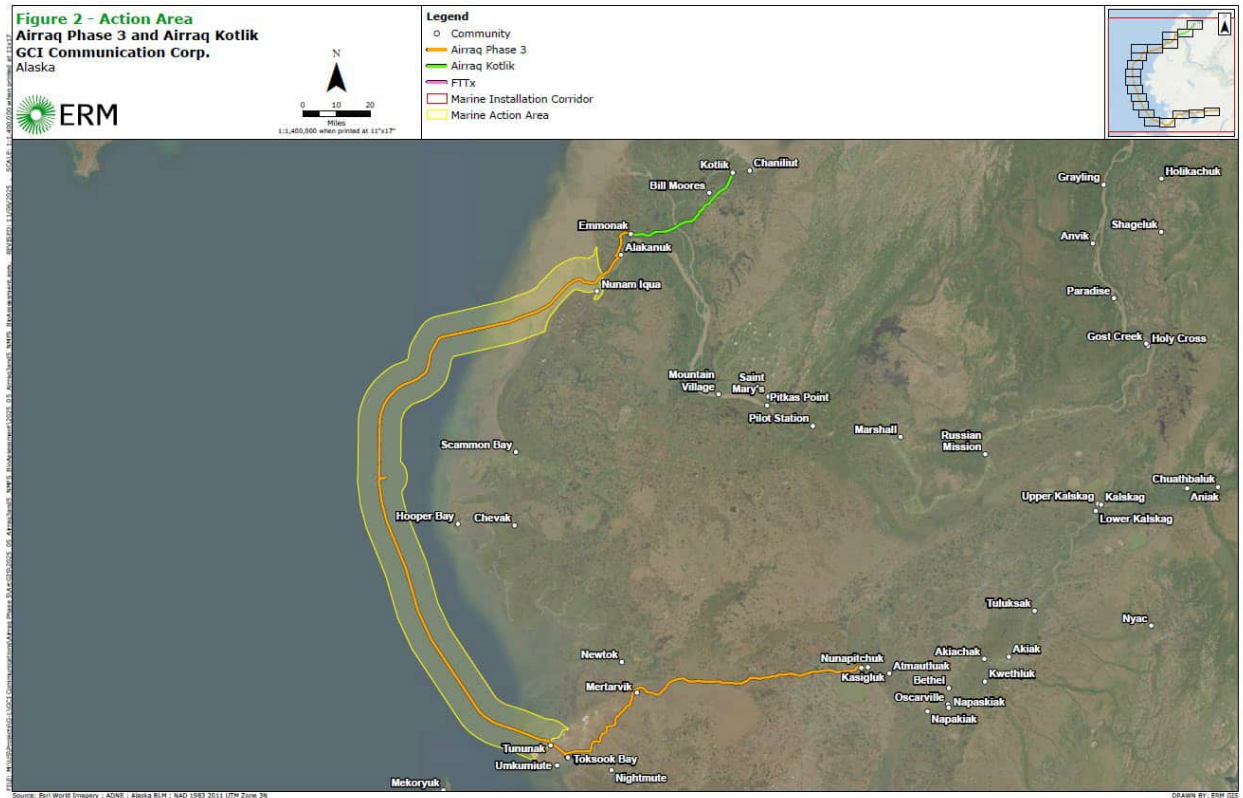


Figure 2. Action area.

³ We express noise as the sound force per unit micropascals (μPa), where 1 pascal (Pa) is the pressure resulting from a force of one newton exerted over an area of one square meter. Sound pressure level is expressed as the ratio of a measured sound pressure and a reference level. The commonly used reference pressure level in acoustics is 1 μPa, and the units for underwater sound pressure levels are decibels (dB) expressed in root mean square (rms), which is the square root of the arithmetic average of the squared instantaneous pressure values.

Mitigation Measures

The ERM informed NMFS via email on December 22, 2025 that the proposed action will incorporate the following mitigation measures:

For all reporting that results from implementation of these mitigation measures, NMFS will be contacted using the contact information specified in (Table 2). In all cases, notification will reference the NMFS consultation tracking number AKRO-2025-03313.

General Mitigation Measures

1. The project proponent will inform NMFS of impending in-water activities a minimum of one week prior to the onset of those activities (email information to akr.prd.records@noaa.gov).
2. If construction activities will occur outside of the time window specified in this letter, the applicant will notify NMFS of the situation at least 60 days prior to the end of the specified time window to allow for reinitiation of consultation.
3. In-water work will be conducted at the lowest points of the tidal cycle when feasible.
4. Consistent with AS 46.06.080, trash will be disposed of in accordance with state law. The project proponent will ensure that all closed loops (e.g., packing straps, rings, bands, etc.) will be cut prior to disposal. In addition, the project proponent will secure all ropes, nets, and other marine mammal entanglement hazards so they cannot enter marine waters.

PSO Requirements

5. At least one PSO will have either prior experience as a PSO in Alaska, or will have taken a NMFS-approved PSO or marine mammal observer training course.
6. PSO training will include:
 - a. field identification of marine mammals and marine mammal behavior;
 - b. ecological information on marine mammals and specifics on the ecology and management concerns of those marine mammals;
 - c. ESA and Marine Mammal Protection Act (MMPA) regulations;
 - d. proper equipment use;
 - e. methodologies in marine mammal observation and data recording and property reporting protocols; and
 - f. an overview of PSO roles and responsibilities.
7. PSOs will be individuals independent from the project proponent and must have no other

assigned tasks during monitoring periods.

8. The action agency or its designated non-federal representative will provide resumes or qualifications of PSO candidates to the consultation biologist and akr.prd.records@noaa.gov for approval at least one week prior to in-water work. NMFS will provide a brief explanation of lack of approval in instances where an individual is not approved.
9. PSOs will:
 - a. collectively be able to effectively observe the entirety of the monitoring zone;
 - b. be able to identify marine mammals and accurately record the date, time, and species of all observed marine mammals in accordance with project protocols;
 - c. be able to identify listed marine mammals that may occur in the action area, at a distance equal to the outer edge of the applicable monitoring zone, and determine the marine mammal's location and distance from sound source;
 - d. have the ability to effectively communicate orally, by radio or in person, with project personnel to provide real-time information on listed marine mammals;
 - e. possess a copy of mitigation measures; and
 - f. possess data forms.
10. PSOs will not scan for marine mammals for more than four hours without at least a one-hour break from monitoring duties between shifts. PSOs will not perform PSO duties for more than 12 hours in a 24-hour period.

PSO Procedures

11. PSOs will have the ability, authority, and obligation to order the appropriate mitigation response to avoid takes of listed marine mammals.
12. One or more PSOs will perform PSO duties onsite throughout the authorized activity.
13. Where a team of three or more PSOs are required, a lead observer or monitoring coordinator will be designated.
14. For each in-water activity, PSOs will monitor all marine waters within the indicated monitoring zone radius for that activity (Table 1).

Table 1. Monitoring Zones for Each Activity.

Activity	Zone Radius (m)
Cable laying	2,000

15. PSOs will be positioned such that they will collectively be able to monitor the entirety of each activity's monitoring zone.
16. Prior to commencing any activity listed in Table 1, PSOs will scan waters within the appropriate monitoring zone and confirm no listed marine mammals are within the monitoring zone for at least 30 minutes immediately prior to initiation of the in-water activity. If one or more listed marine mammals are observed within the monitoring zone, the in-water activity will not begin until the listed marine mammals exit the monitoring zone of their own accord, or the monitoring zone has remained clear of listed marine mammals for 30 minutes immediately prior to the commencement of the activities listed in Table 1.
17. The on-duty PSO(s) will continuously monitor the monitoring zone and adjacent waters during any of the activities listed in Table 1 for the presence of listed marine mammals.
18. PSOs will monitor during daylight hours.
19. Work will cease when conditions exceed Beaufort Sea State 6.
20. If a listed marine mammal is observed within a monitoring zone or is otherwise harassed, harmed, injured, or disturbed, the PSO will immediately report that occurrence to NMFS using the contact information specified in Table 2.
21. Prior to commencing any activity listed in Table 1, or at changes in watch, PSOs will establish a point of contact with the cable laying crew. The PSO will brief the point of contact as to the monitoring procedures if the PSO observes that listed marine mammals are likely to enter or enter the monitoring zone. If the point of contact goes "off shift" and delegates their duties, the point of contact must inform the PSO and brief the new point of contact.

Project-Dedicated Vessels (vessel and crew safety should never be compromised)

22. Vessel operators will:
 - a. maintain a watch for marine mammals at all times while underway;
 - b. stay at least 91 meters (100 yards) away from listed marine mammals, except that they will remain at least 460 meters (500 yards) away from endangered North Pacific right whales;
 - c. travel at less than five knots when within 274 meters (300 yards) of a whale;

- d. avoid changes in direction and speed within 274 meters (300 yards) of a whale, unless doing so is necessary for maritime safety;
 - e. not position vessel(s) in the path of a whale, and will not cut in front of a whale in a way or at a distance that causes the whale to change direction of travel or behavior (including breathing/surfacing pattern);
 - f. reduce vessel speed to less than 10 knots when weather conditions reduce visibility to 1.6 kilometers (one mile) or less; and
 - g. adhere to the Alaska Humpback Whale Approach Regulations when vessels are transiting to and from the project site (see 50 CFR 216.18, 223.214, and 224.103(b); these regulations apply to all humpback whales). Specifically, pilot and crew will not:
 - i. approach, by any means, including by interception (i.e., placing a vessel in the path of an oncoming humpback whale), within 100 yards of any humpback whale;
 - ii. cause a vessel or other object to approach within 100 yards of any humpback whale; or
 - iii. disrupt the normal behavior or prior activity of a humpback whale by any other act or omission.
23. If a whale's course and speed are such that it will likely cross in front of a vessel that is underway, or approach within 91 meters (100 yards) of the vessel, and if maritime conditions safely allow, the engine will be put in neutral and the whale will be allowed to pass beyond the vessel, except vessels will remain 460 meters (500 yards) from North Pacific right whales.
24. Vessels will not allow lines to remain in the water unless both ends are under tension and affixed to vessels or gear.
25. To the extent it is practicable and safe, vessel operators will operate their vessel thrusters (both main drive and DP) at the minimum power necessary to accomplish the work.
26. Vessels will travel at 2 knots during all cable installation activities, and at no more than 10 knots during transit.

Data Collection

PSOs have the following responsibilities for data collection:

- 27. PSOs will record observations on data forms or into electronic data sheets.
- 28. The project proponent will ensure that PSO data will be submitted electronically in a

format that can be queried such as a spreadsheet or database. Digital images of data sheets are not sufficient.

29. PSOs will record the following:

- a. project name, date, shift start time, shift stop time, and PSO identifier;
- b. date and time of each reportable event (e.g., a listed marine mammal observation, operation monitoring, reason for operation monitoring, change in weather conditions);
- c. weather parameters (e.g., percent cloud cover, percent glare, visibility) and sea state where the Beaufort Wind Force Scale will be used to determine sea state (<https://www.weather.gov/mfl/beaufort>);
- d. species, numbers, and, if possible, sex and age class of the observed listed marine mammal;
- e. the predominant anthropogenic sound-producing activities occurring during each listed marine mammal observation;
- f. observations of listed marine mammal behaviors and reactions to anthropogenic sounds and presence;
- g. geographic coordinates of initial, closest, and last location of listed species, including distance from observer to the listed species, and minimum distance from the predominant sound-producing activity to listed species; and
- h. whether the presence of a listed species necessitated the implementation of mitigation measures to avoid acoustic impact (i.e., monitoring), and the duration of time that normal operations were affected by the presence of listed species.

Reporting

Unauthorized Take

30. If a listed marine mammal is determined by the PSO to have been disturbed, harassed, harmed, injured, or killed (e.g., a listed marine mammal is observed entering a monitoring zone, or is injured or killed as a direct or indirect result of the action), the PSO will report the incident to NMFS within one business day, with information submitted to akr.prd.records@noaa.gov. These PSO records will include:

- a. digital, queryable documents containing PSO observations and records, and digital, queryable reports;
- b. the date, time, and location of each event (provide geographic coordinates);

- c. description of the event;
- d. number of individuals of each listed marine mammal species affected;
- e. the time the animal(s) was first observed or entered the monitoring zone, and, if known, the time the animal was last seen or exited the zone, and the fate of the animal;
- f. mitigation measures implemented prior to and after the animal was taken;
- g. if a vessel struck a listed marine mammal, the contact information for the PSO on duty on the vessel or the contact information for the individual piloting the vessel; and
- h. photographs or video footage of the animal(s), if available.

Stranded, Injured, or Dead Listed Species (not associated with the project)

- 31. If the PSO observes an injured, sick, or dead marine mammal (i.e., stranded), they will notify the Alaska Marine Mammal Stranding Hotline at 1-877-925-7773. The PSO will submit photos and available data to aid NMFS in determining how to respond to the stranded animal. If possible, data submitted will include date/time, location of stranded marine mammal, species and number of stranded individuals, description of the stranded marine mammal's condition, event type (e.g., entanglement, dead, floating), and behavior of live-stranded marine mammals.

Illegal Activities

- 32. If the PSO observes listed marine mammals or other marine mammals being disturbed, harassed, harmed, injured, or killed (e.g., feeding or unauthorized harassment), these activities will be reported to NMFS Alaska Region Office of Law Enforcement (Table 2; 1-800-853-1964).
- 33. Data submitted to NMFS will include date, time, location, description of the event, and any photos or videos taken.

North Pacific Right Whales

- 34. All observations of North Pacific right whales will be reported to NMFS within 24 hours. Photographs and/or video should be taken, if possible, to aid in photo identification of individual animals. Reports will include all applicable information that will be included in a final report.

Extralimital Sightings

- 35. All observations of ESA-listed marine mammal species not considered in this consultation will be reported to NMFS within 24 hours. Photographs and/or video should

be taken, if possible, to aid in photo identification of individual animals. Reports will include all applicable information that would be included in a final report.

Final Report

36. A final report will be submitted to NMFS within 90 calendar days of the completion of the project summarizing the data recorded by emailing it to akr.prd.records@noaa.gov. The report will summarize all in-water activities associated with the proposed action and results of PSO monitoring conducted during the in-water activities.

37. The final report for projects will include:

- a. summaries of monitoring efforts, including dates and times of construction, dates and times of monitoring, and dates, times, and duration of monitorings due to listed marine mammal presence;
- b. dates and times of listed marine mammal observations, geographic coordinates of listed marine mammals at their closest approach to the project site, water depth, species, age/size/sex (if determinable), and group sizes;
- c. number of listed marine mammals observed (by species) during periods with and without project activities (and other variables that could affect detectability);
- d. observed listed marine mammal behaviors and movement types versus project activity at the time of observation;
- e. numbers of marine mammal observations/individuals seen versus project activity at time of observation;
- f. any photos or videos taken of marine mammals; and
- g. digital, queryable documents containing PSO observations and records, and digital, queryable reports.

Table 2. Summary of Agency Contact Information

Reason for Contact	Contact Information
Consultation Questions & Unauthorized Take	akr.prd.section7@noaa.gov
Reports & Data Submittal	akr.prd.records@noaa.gov
Stranded, Injured, or Dead Marine Mammals	Stranding Hotline (24/7 coverage) 1-877-925-7773
Oil Spill & Hazardous Materials Response	U.S. Coast Guard National Response Center: 1-800-424-8802 and AKRNMFS_SpillResponse@noaa.gov
Illegal Activities (<i>not related to project activities; e.g., feeding, unauthorized harassment, or disturbance to marine mammals</i>)	NMFS Office of Law Enforcement (AK Hotline): 1-800-853-1964
In the event that this contact information becomes obsolete	NMFS Anchorage Main Office: 907-271-5006 or NMFS Juneau Main Office: 901-206-4342

Listed Species and Critical Habitat

Bearded Seal

The Beringia DPS of the *Erignathus barbatus nauticus* subspecies of bearded seal was listed as threatened under the ESA on December 28, 2012, primarily due to threats associated with long-term reductions in sea ice expected to occur within the foreseeable future “stemming from climate change” (77 FR 76739).

A reliable population estimate is not available (Muto et al. 2022). However, as discussed by Muto et al. (2022), using a limited sub-sample of spring aerial survey data collected from the U.S. portion of the Bering Sea in 2012, Conn et al. (2014) calculated a preliminary abundance estimate of 301,836 bearded seals (95 percent confidence interval: 238,195 to 371,147) in these waters.

Bearded seals are associated with moving pack ice that produces leads and other openings in the ice, and only rarely use areas of thick, continuous shorefast ice. They use sea ice as a platform for whelping and nursing of pups, pup maturation, and molting (shedding and regrowing hair and outer skin layers), as well as for resting (Cameron et al. 2010).

In late winter and early spring, bearded seals are widely but not uniformly distributed in broken, drifting pack ice the Bering Sea (Burns 1981; Braham et al. 1984). Some bearded seals also inhabit suitable pack ice the Chukchi and Beaufort seas over winter and spring (MacIntyre et al.

2015; Frouin-Mouy et al. 2016; Olnes et al. 2020; Quakenbush 2020). As the ice recedes in spring, many of the bearded seals that overwintered in the Bering Sea migrate north through the Bering Strait (mid-April to June) and spend the summer along the ice edge in the Chukchi and Beaufort seas, though some remain in open-water areas from the Bering Sea north (Burns 1981; Olnes et al. 2020; Quakenbush 2020).

During the open-water season, some bearded seals (largely juveniles) occur in small bays, lagoons, near river mouths, and up some rivers, particularly in late summer and fall (Oceana and Kawerak 2014; Gryba et al. 2021)⁴. While adult bearded seals have rarely been seen hauled out on land in Alaska (Burns 1981; Nelson 1981), (solitary) juvenile bearded seals have been observed or documented via satellite telemetry during the open-water season hauled out on land in some areas (Oceana and Kawerak 2014; Gadamus et al. 2015; Olnes et al. 2020).

Bearded seals feed primarily on benthic organisms including invertebrates (crabs, shrimp, clams, worms, and snails) and some fish found on or near the seafloor (in waters typically less than 200 m deep; Cameron et al. 2010). Bearded seals of the Beringia DPS primarily feed on bivalves and crustaceans, along with fishes such as sculpins, cods, and flatfishes (Dehn et al. 2007; Quakenbush et al. 2011a; Crawford et al. 2015; Quakenbush et al. 2020).

Bearded seals vocalize intensively underwater in association with territorial and mating behaviors, which occur in the spring (Van Parijs et al. 2003; Van Parijs and Clark 2006). NMFS defines the functional hearing range for phocids (earless seals) as 40 Hz to 90 kHz (NMFS 2024a).

Additional information on bearded seal biology and habitat is available at:

- [Bearded Seal Species Description](#)
- [2010 Status Review](#)
- [Marine Mammal Stock Assessment Report: Pinnipeds-Phocids](#)
- [Bearded Seal Critical Habitat](#)

Beringia DPS Bearded Seal Critical Habitat

NMFS issued a final rule designating critical habitat for the Beringia DPS of bearded seals in the northern Bering, Chukchi, and Beaufort seas on April 1, 2022 (87 FR 19180; Figure 2). On September 26, 2024, the U.S. District Court for the District of Alaska vacated the critical habitat designations for ringed seals and bearded seals under the ESA and remanded the rules to NMFS for further consideration (State of Alaska v. Nat'l Marine Fisheries Serv., Case No. 3:23-cv-00032-SLG, 2024 WL 4298114 (D. Alaska Sept. 26, 2024)). NMFS and the Center for Biological Diversity separately appealed that decision. Since that time, NMFS moved to dismiss

⁴ Northwest Arctic Borough. 2016. Important areas for marine and coastal species. Pages 415-529 in Iñuunialiqput Iliługu Nunannguanun: documenting our way of life through maps. Northwest Arctic Borough, Kotzebue, Alaska. Accessed at: <https://www.nwabor.org/subsistence-mapping-program/digital-atlas/>, (December 2019).

both appeals, and the Ninth Circuit has dismissed NMFS's. In the interim, while the Center for Biological Diversity's appeal remains active, our consultations under section 7(a)(2) of the ESA will continue to address effects to ringed seal and bearded seal critical habitat when requested so that action agencies have the benefit of NMFS's analysis of the consequences of proposed actions on the critical habitat in the event that the appeal is successful.

The essential physical or biological features of critical habitat designated for the Beringia DPS of bearded seals are: 1) sea ice habitat suitable for whelping and nursing, which is defined as areas with waters 200 meters or less in depth containing pack ice of at least 25 percent concentration and providing bearded seals access to those waters from the ice; 2) sea ice habitat as a platform for molting, which is defined as areas with waters 200 meters or less in depth containing pack ice of at least 15 percent concentration and providing bearded seals access to those waters from the ice; and 3) primary prey resources to support bearded seals: waters 200 meters or less in depth containing benthic organisms, including epifaunal and infaunal invertebrates, and demersal fishes (50 CFR 226.229).

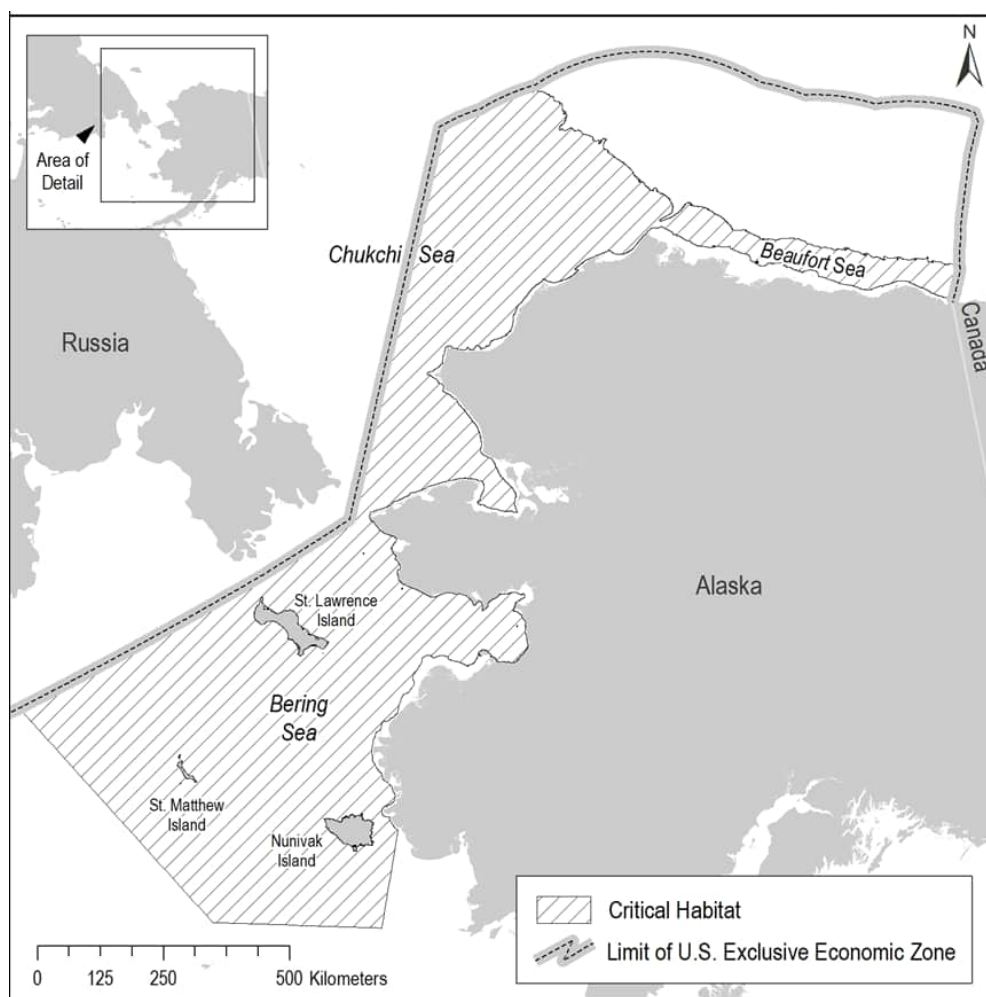


Figure 3. Critical habitat for the Beringia DPS of bearded seals.

Bearded seals and critical habitat in the action area

Project activities will overlap with Beringia DPS bearded seal critical habitat, and may overlap with bearded seals in small numbers. Most bearded seals that overwinter in the Bering Sea are expected to migrate north into the Chukchi and Beaufort Seas as sea ice recedes, though some remain in the Bering Sea during the open water period and bearded seal summer distribution is quite broad. While adult bearded seals have rarely been seen hauled out on land (Burns 1981; Nelson 1981), juvenile bearded seals may use terrestrial sites during the period of minimum ice extent (Olson et al. 2020). Juvenile seals have been observed hauled out on land along lagoons and rivers in some areas of Alaska, such as in Norton Bay (Huntington 2000), near Wainwright (Nelson 1981), and on sandy islands near Barrow (Cameron et al. 2010). Though considered rare, community members and news outlets^{5,6} have also reported bearded seals as far south as Nome in ice-free months, it is possible that bearded seal presence may overlap with the proposed action.

Arctic Ringed Seal

NMFS published a final rule listing the Arctic subspecies of ringed seals (*Pusa hispida hispida*) as threatened under the ESA on December 28, 2012, primarily due to threats associated with long-term reductions in sea ice and on-ice snow expected to occur within the foreseeable future (77 FR 76706).

A reliable population estimate for Arctic ringed seals is not available (Muto et al. 2022). Kelly et al. (2010) estimated the total population in the Chukchi and Beaufort seas in Alaska to be at least 300,000 based on estimates from aerial surveys conducted in the late 1990s and 2000 (Frost et al. 2004; Bengtson et al. 2005), which they noted is likely an underestimate since the Beaufort Sea surveys were limited to within 40 km of shore. In the Bering Sea, as discussed by Muto et al. (2022), Conn et al. (2014) calculated an abundance estimate of 174,418 ringed seals (95 percent confidence interval: 141,588 to 201,090) in these waters using a limited sub-sample of aerial survey data collected from the U.S. portion off the Bering Sea in 2012. Because this estimate did not account for availability bias or include ringed seals in shorefast ice, the actual number of ringed seals in the U.S. portion of the Bering Sea is likely much higher (Muto et al. 2022). A 2021 survey of the Beaufort Sea by NMFS (analysis pending), in combination with previous surveys in the Bering and Chukchi Seas (Boveng et al. In Prep), will allow for the determination of an estimate of ringed seal abundance in waters surrounding Alaska. It is anticipated that the total estimate of seals in this region will exceed 1 million individuals (NMFS 2024b).

Arctic ringed seals are highly associated with sea ice, which they use as a platform for whelping and nursing pups in spring, molting in spring to early summer, and resting throughout the year (Kelly et al. 2010)(Figure 3). Ringed seals are able to open and maintain breathing holes in the ice, which allows them to inhabit heavily ice-covered areas. At some breathing holes with

⁵ <https://alaskapublic.org/news/2015-12-22/stranded-seal-in-nome-released-into-wild>

⁶ <https://www.nomenugget.com/news/seal-pups-and-walrus-calves-found-stranded-regional-beaches>

sufficient snow cover, ringed seals excavate lairs in snowdrifts on the surface of the ice within which they rest and give birth to and nurse pups (Smith and Stirling 1975; Williams et al. 2006; Hauser et al. 2021). These subnivean lairs are important to pup survival because they provide shelter from extreme cold and concealment from predators (Lukin and Potelov 1978; Smith et al. 1991; Smith and Lydersen 1991; Stirling and Smith 2004).

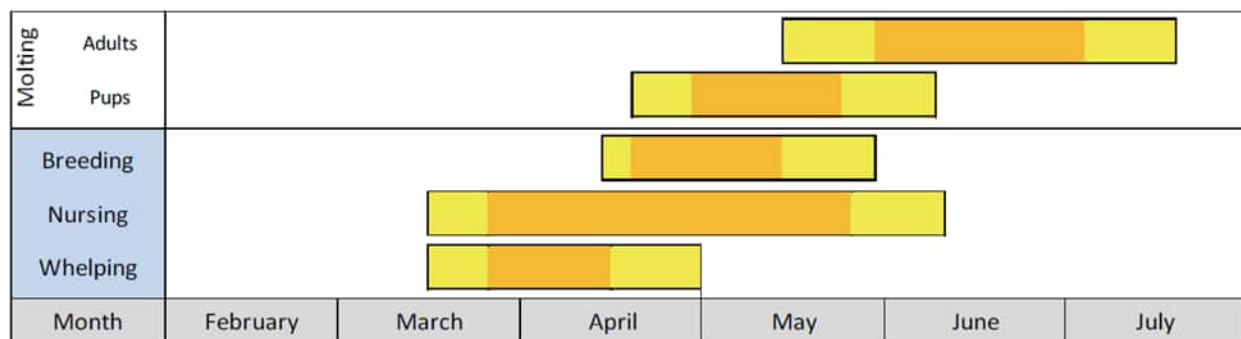


Figure 4. Approximate annual timing of Arctic ringed seal reproduction and molting. Yellow bars indicate the “normal” range over which each event is reported to occur and orange bars indicate the “peak” timing of each event (Kelly et al. 2010).

During winter and spring, ringed seals are found throughout the Chukchi and Beaufort seas (Frost 1985; Kelly 1988), and aerial surveys indicate that they use nearly the entire ice field over the Bering Sea shelf (Braham et al. 1984; Lindsay et al. 2021). Most ringed seals that winter in the Bering and southern Chukchi seas are thought to migrate north in spring as the ice recedes (Frost 1985). Tracking data indicate that ringed seals extensively use the continental shelf waters of the Chukchi and Beaufort seas during the open-water season, and some seals make excursions into deep waters north of the shelf break (Crawford et al. 2012; Quakenbush et al. 2019; Quakenbush et al. 2020; Von Duyke et al. 2020). Ringed seals (primarily juveniles) have also been observed near river mouths and in lagoons in some areas during the open water season, especially during fall (Oceana and Kawerak 2014; Gryba et al. 2021).

Arctic ringed seals typically lose a significant proportion of their blubber mass in late winter to early summer and then replenish their blubber reserves in late summer or fall into winter (Ryg et al. 1990; Young and Ferguson 2013; Quakenbush et al. 2020). Diet studies indicate that ringed seals in Alaska eat a wide variety of vertebrate and invertebrate prey species, but certain prey species, such as Arctic cod, saffron cod, shrimps, and amphipods occupy a prominent role in their diet (Dehn et al. 2007; Quakenbush et al. 2011b; Crawford et al. 2015; Quakenbush et al. 2020).

The behavioral context of ringed seal underwater vocalizations is not well known, but they are thought to play a role in the seals’ reproductive behavior (Stirling 1983; Kelly 2022). NMFS defines the functional hearing range for phocids (earless seals) as 40 Hz to 90 kHz (NMFS 2024a). A study on the hearing of captive ringed seals suggests that the species has the ability to detect signals surrounded by background noise (Sills et al. 2015).

More information on ringed seal biology, habitat, and distribution is available at:

- [Ringed Seal Species Description](#)
- [Marine Mammal Stock Assessment Report: Pinnipeds-Phocids](#)
- [2024 Status Review Arctic Ringed Seal Critical Habitat](#)

Arctic Ringed Seal Critical Habitat

Designated critical habitat for the Arctic ringed seal was published April 1, 2022 (87 FR 19232). Arctic ringed seal critical habitat comprises an area of marine habitat in the northern Bering, Chukchi, and Beaufort seas (Figure 4). On September 26, 2024, the U.S. District Court for the District of Alaska vacated the critical habitat designations for ringed seals and bearded seals under the ESA and remanded the rules to NMFS for further consideration (State of Alaska v. Nat'l Marine Fisheries Serv., Case No. 3:23-cv-00032-SLG, 2024 WL 4298114 (D. Alaska Sept. 26, 2024)). NMFS and the Center for Biological Diversity separately appealed that decision. Since that time, NMFS moved to dismiss both appeals, and the Ninth Circuit has dismissed NMFS's. In the interim, while the Center for Biological Diversity's appeal remains active, our consultations under section 7(a)(2) of the ESA will continue to address effects to ringed seal and bearded seal critical habitat when requested so that action agencies have the benefit of NMFS's analysis of the consequences of proposed actions on the critical habitat in the event that the appeal is successful.

The following physical and biological features associated with Arctic ringed seal critical habitat were identified as essential to the conservation of the species: 1) snow-covered sea ice habitat suitable for the formation and maintenance of subnivean lairs used for sheltering pups during whelping and nursing, which is defined as waters 3 meters or more in depth (relative to mean lower low water, MLLW) containing areas of seasonal landfast (shorefast) ice or dense, stable pack ice, that have undergone deformation and contain snow drifts of sufficient depth to form and maintain birth lairs (typically at least 54 centimeters deep); 2) sea ice habitat suitable as a platform for basking and molting, which is defined as areas containing sea ice of 15 percent or more concentration in waters 3 m or more in depth (relative to MLLW); and 3) primary prey resources to support Arctic ringed seals, which are defined to be small, often schooling, fishes, in particular, Arctic cod, saffron cod, and rainbow smelt; and small crustaceans, in particular, shrimps and amphipods (50 CFR 226.228).

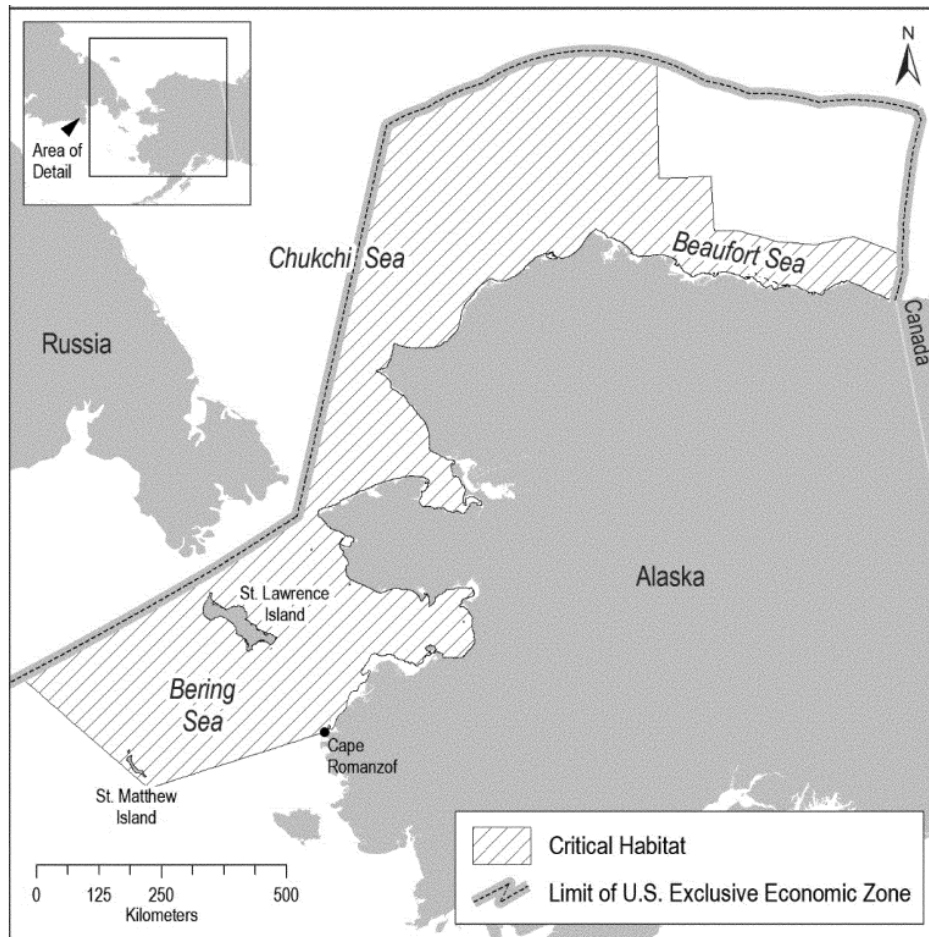


Figure 5. Ringed seal critical habitat.

Arctic ringed seals and critical habitat in the action area

Project activities will overlap with Arctic ringed seal critical habitat, but are unlikely to overlap with Arctic ringed seals. The proposed action will occur in the ice-free months, and most ringed seals that overwintered in the Bering Sea are expected to migrate north into the Chukchi and Beaufort Seas with the receding sea ice edge, where they will spend their summer months.

Western North Pacific DPS Gray Whale

The gray whale (*Eschrichtius robustus*) was originally listed as endangered in 1970 (35 FR 8491, June 2, 1970 (baleen whales listing); 35 FR 18319, December 2, 1970 (gray whales)). The Eastern North Pacific (ENP) DPS stock was delisted on June 16, 1994 (59 FR31094), when it reached pre-exploitation numbers. The Western North Pacific (WNP) population of gray whales remains listed as endangered. Critical habitat has not been designated for WNP DPS gray whales. The WNP DPS gray whales are considered to be gray whales that spend all or part of their lives in the western North Pacific in the waters of Vietnam, China, Japan, Korea (Republic of Korea and/or Democratic People's Republic of Korea), or the Russian Far East, including southern and southeastern Kamchatka but not necessarily areas north of 55°N in eastern

Kamchatka (NMFS 2023). Some WNP DPS gray whales spend part of their time in U.S. waters. The population size of the WNP DPS gray whales was estimated from photo-ID data for Sakhalin and Kamchatka at 290 non-calf whales in 2016 (90 percentile intervals = 271-311; Cooke et al. 2017; Cooke 2018). The non-ESA-listed ENP DPS gray whale population is estimated at approximately 19,260 individuals (Eguchi et al. 2024).

Gray whales travel alone or in small, unstable groups and are bottom feeders that remove infaunal invertebrate prey and sediments by suction (Oliver and Slattery 1985). WNP gray whales feed during the summer and fall in the Okhotsk Sea off northeast Sakhalin Island, Russia, and off southeastern Kamchatka in the Bering Sea (Damon-Randall 2023; NMFS 2023). The non-listed ENP population of gray whales feed mainly in the Chukchi, Beaufort, and northwestern Bering seas, with the exception of a small number of whales that summer and feed along the Pacific coast between Kodiak Island, Alaska and northern California (Carretta et al. 2022). The strong matrilineal fidelity exhibited by the whales feeding off Sakhalin Island, suggests behavioral separation of the WNP DPS from the ENP gray whales feeding in the northern Bering Sea (NMFS 2023). Therefore, we do not expect WNP DPS gray whales to be in the Alaskan waters of the Bering Sea.

In the North Pacific Ocean, the current migratory route and wintering areas of the WNP DPS of gray whales is complex and not fully understood (Weller et al. 2015; Weller et al. 2016). Studies support a trans-Pacific Ocean migration for some animals during the winter to areas off Canada, the U.S. West Coast, and Mexico. However, other animals stay in the western North Pacific Ocean and migrate south along the coast of Asia in the winter (Omura 1988; Brownell Jr et al. 2007; Weller and Brownell Jr 2012; Weller et al. 2015; Weller et al. 2016). Satellite tag tracks, photo-identification, and genetic matches between Sakhalin, Kamchatka, Canada, the U.S., and Mexico have identified 60 individuals known to travel between the eastern North Pacific Ocean and western North Pacific Ocean (Weller et al. 2012; Mate et al. 2015; Urban R. et al. 2019; Martinez-Aguilar et al. 2022) leaving open the question about the proportion of the Western North Pacific DPS of gray whales that remain in the western North Pacific Ocean year-round. The number of Western North Pacific DPS of gray whales remaining in the western North Pacific Ocean year-round is small, likely fewer than 100 individuals (Cooke 2018). The specific migration route and timing of the WNP DPS grays are unknown making it very difficult to predict when and where they might pass through the Aleutian Island chain or along the coast of Alaska.

Based on the best available information, it is expected that approximately 100 percent of the gray whales found in the western North Pacific Ocean feeding areas (Sakhalin, Kamchatka), wintering areas (Japan and China), and migratory corridor (Eastern Russia, North Korea, South Korea, Vietnam, and Japan) are from the Western North Pacific DPS (Damon-Randall 2023). It is expected that approximately 0.4 to 1.6 percent of the gray whales found in the eastern North Pacific Ocean wintering areas (Mexico) and migratory corridor (United States West Coast [Alaska, Washington, Oregon, and California], Canada, and Mexico) are from the Western North Pacific DPS (Damon-Randall 2023). Therefore, there is a low likelihood that a gray whale from the WNP DPS will be encountered in Alaskan waters along the Aleutian Islands, Gulf of Alaska, and Southeast Alaska.

No data are available regarding WNP DPS gray whale hearing and little regarding communication; but we assume that it is similar to the ENP DPS gray. Individuals produce broadband sounds within the 100 Hertz to 12 kHz range (Dahlheim et al. 1984; Jones and Swartz 2009). The most common sounds encountered are on feeding and breeding grounds, where “knocks” with a source level of roughly 142 decibels have been recorded (Thomson and Richardson 1995). Gray whale rattles, clicks, chirps, squeaks, snorts, thumps, knocks, bellows, and sharp blasts at frequencies of 400 Hz to 5 kHz have been recorded in Russian foraging areas (Petrochenko et al. 1991). NMFS categorizes gray whales in the low-frequency cetacean functional hearing group, with an applied frequency range between 7 Hz to 36+ kHz (NMFS 2024a).

More information can be found at:

- [Gray Whale Species Description](#)
- [Marine Mammal Stock Assessment Report: Cetaceans-Large Whales](#)
- [2023 WNP DPS Gray Whale Status Review](#)

Western North Pacific gray whales in the action area

WNP DPS gray whales do not range into the Bering Sea. Therefore, WNP DPS gray whales do not overlap with the proposed action and are not considered further in this assessment.

North Pacific Right Whale

The right whale (*Eubalaena* spp.) was listed as an endangered species under the ESCA in 1970 (35 FR 8491, June 2, 1970 (baleen whales listing); 35 FR 18319, December 2, 1970 (right whales listing)), and continued to be listed as endangered following passage of the ESA. NMFS later divided northern right whales into two separate endangered species: North Pacific right whales (*E. japonica*) and North Atlantic right whales (*E. glacialis*; 73 FR 12024, March 6, 2008). There are likely fewer than 500 North Pacific right whales remaining with less than 50 individuals estimated to remain of the eastern population found in Alaskan waters (Muto et al. 2022). The larger western population, on the coast of Russia and Japan, is outside of United States jurisdiction, so will not be considered further in this consultation.

The eastern North Pacific right whale is distributed from the Bering Sea to Baja California and has been sighted as far west as the Hawaiian islands (Kennedy et al. 2012). Sightings are rare, with the highest number seen in a single year was 17 distinct individuals, sighted over multiple ship surveys in the Southeastern Bering Sea (Wade et al. 2006). North Pacific right whales are primarily found in coastal or shelf waters but sometimes travel into deeper waters. From spring to fall, their distribution is dictated by the distribution of their prey. It is currently unknown if North Pacific right whales migrate to warmer habitats during winter as no migratory route or breeding and calving grounds have been identified and right whales have been sighted and detected acoustically in Alaskan waters in winter months (Wright et al. 2018b; NMFS 2022).

The North Pacific right whale is the first right whale species documented to produce song and it is hypothesized that these songs are reproductive displays (Crance et al. 2019). The singers

whose sex could be determined were all males and it is unknown if females also sing. Four distinct song types were recorded at five distinct locations in the southeastern Bering Sea from 2009-2017. A study of right whale ear anatomy suggests a total possible hearing range of 10 Hz to 22 kHz (Parks et al. 2007). NMFS categorizes right whales in the low-frequency cetacean functional hearing group, with an applied frequency range between 7 Hz to 36+ kHz (NMFS 2024a).

Bering Sea

Passive acoustic recorders located in the Bering Sea and Unimak Pass in the Aleutian Islands have detected right whales in the Bering Sea in most months of the year, with a peak in occurrence in known foraging habitats during summer (Wright 2016; Wright et al. 2018a; Crance et al. 2019). Detections were made at Unimak Pass during most months of the year, supporting the idea that right whales may use this area as more than just a corridor to enter and leave the Bering Sea (Wright et al. 2018a). In February 2022, there was an opportunistic sighting of two North Pacific right whales feeding north of Unimak Pass in the Aleutian Islands. This sighting is of particular interest as it is the first time right whales have been visually sighted in the area during that time of year (previous detections have been through acoustic moorings (Wright et al. 2018a)). Video footage confirmed that the whales were feeding, an activity not expected during the winter months when their prey is not as plentiful.

Numerous right whale detections have occurred in the critical habitat area of the southeastern Bering Sea, consistent with satellite tagging results and sightings (Zerbini et al. 2015; Crance et al. 2017; Crance et al. 2019). Detections and sightings have also occurred in the northern Bering Sea, including in the vicinity of St. Lawrence Island (Wright et al. 2019; Matsuoka et al. 2022), and acoustic detections have been increasing in frequency in recent years in this area (Wright et al. 2019).

North Pacific Right Whales in the Action Area

North Pacific right whales show preference for coastal and shelf waters, and are present in the Bering Sea most of the year. Therefore, overlap with North Pacific right whale individuals and project activities may occur, but encounters are highly unlikely due to the rarity of the whales.

Information on biology and habitat of the North Pacific right whale is available at:

- [North Pacific Right Whale Species Description](#)
- [Marine Mammal Stock Assessment Reports: Cetaceans-Large Whales](#)
- [North Pacific Right Whale Critical Habitat](#)

Fin Whale

The fin whale (*Balaenoptera physalus*) was decimated by commercial whaling in the 1800s and early 1900s. It was listed as an endangered species under the ESCA in 1970 (35 FR 8491, June 2, 1970 (baleen whales listing); 35 FR 18319, December 2, 1970 (fin whale listing), and continues to be listed as endangered following passage of the ESA. Critical habitat has not been designated

for fin whales. There are no reliable estimates of current and historical abundances for fin whales, and there continue to be uncertainties in their population structure (Muto et al. 2022). Based on dedicated line-transect surveys of the offshore waters of the Gulf of Alaska conducted by Rone et al. (2017), the best provisional abundance estimate in the northeast Pacific is 3,168 fin whales. However, this is an underestimate because these surveys covered only a small portion of fin whale range, and no correction factors were computed for this data (Muto et al. 2022).

Fin whales occur throughout the North Pacific, from the northeastern Chuckchi Sea to the Tropic of Cancer. They occur mostly offshore but frequently enter exposed coastal areas. It has been presumed that fin whales undergo regular long-range migrations between high latitude summer feeding grounds and lower-latitude winter calving grounds like other baleen whales. However, there is evidence that fin whales exhibit more complex and varied movement patterns, and do not perform concerted seasonal long-term migrations (Mizroch et al. 2009). Their winter distribution and location of primary calving areas (if any) are not well understood (Young et al. 2023). In any one season, fin whales can occur at many different latitudes, possibly depending on their age or reproductive state; movements can be inshore/offshore or north/south (NMFS 2010). Fin whales also exhibit residency patterns in some parts of their range (i.e., the Gulf of California and East China Sea) (Mizroch et al. 2009). Fin whales remain in Alaskan waters through the winter (Moore et al. 2006; Mizroch et al. 2009; Rice et al. 2021), and there is recent evidence for both feeding and reproductive behavior in high latitudes during winter (Koot 2015). However, it is not clear whether the fin whales that occur in northern latitudes in the winter represent year-round resident individuals, or if staggered migration patterns occur that result in at least some whales being present at all times.

Fin whale distribution is primarily driven by prey availability, which includes schooling fish, euphausiids, and copepods. Fin whale concentrations in the northern North Pacific and Bering Sea generally form along frontal boundaries, which are highly productive mixing zones between coastal and oceanic waters. These nutrient rich waters can sustain high biomasses of phytoplankton and zooplankton and correspond roughly to the continental shelf edge (NMFS 2010). Fin whales in the Gulf of Alaska are found consistently along the shelf break; passive acoustic monitoring studies recorded fin whales at more sites on or near the continental shelf compared to seamount sites in deeper water (Rice et al. 2021). Historical whaling data provide further evidence that fin whales are strongly associated with the shelf edge; habitat models based on catch data identified the continental slope as essential habitat for fin whales (Gregr and Trites 2001).

Fin whales produce a variety of low-frequency sounds, with their primary call types centered around 20 Hz and 40 Hz. These are highly stereotyped, frequency down-swept, loud (as high as 189 dB re 1 μ Pa at 1 m), and short duration ($\sim$ 1 second) (Watkins 1981; Wiggins and Hildebrand 2020). The 20 Hz note is the most commonly reported fin whale sound. Males produce 20 Hz pulses in repetitive doublet or triplet sequences (song); singing is only exhibited by males and is considered a reproductive display (Croll et al. 2002). The note pattern (i.e., singlets or doublets), internote interval, and sometimes frequency of the songs varies geographically among regions (Watkins et al. 1987; Hatch and Clark 2004). This geographic variation may reflect population structure. The 40-Hz call is not well understood, but evidence suggests it is associated with feeding behavior and may serve a foraging function (Watkins 1981; Širović et al. 2013).

While there is no direct data on hearing in low-frequency cetaceans, the applied frequency range is expected to be between 7 Hz and 36+ kHz (NMFS 2024a). Estimates based on scans of a fin whale calf skull indicate the range of best hearing for fin whale calves to range from approximately 20 Hz to 10 kHz, with maximum sensitivities between 1 to 2 kHz (Cranford and Krysl 2015).

Fin whales in the action area

Given their extensive range and year-round presence in Alaskan waters, the proposed action may overlap with fin whales. However, fin whales are typically found in deep water (Matsuoka et al. 2013; Rone et al. 2017) away from the immediate coast (Clarke et al. 2020), and show preference for frontal boundaries that aggregate prey. Therefore, encounters with fin whales are unlikely.

Additional information on fin whale biology and habitat is available at:

- [Fin Whale Species Description](#)
- [Marine Mammal Stock Assessment Reports: Cetaceans-Large Whales](#)
- [2019 Status Review](#)

Humpback Whale

The humpback whale (*Megaptera novaeangliae*) was listed as endangered under the ESCA in 1970 (35 FR 8491, June 2, 1970 (baleen whales listing); 35 FR 18319, December 2, 1970 (humpback whale listing)). Congress replaced the ESCA with the ESA in 1973, and humpback whales continued to be listed as endangered. NMFS conducted a global status review that led to changing the status of humpback whales under the ESA and dividing the species into 14 distinct population segments (DPS) (81 FR 62259, September 8, 2016). Of these 14 DPSs, NMFS listed four as endangered, one as threatened, and delisted the remaining nine. Three DPSs occur in waters of Alaska. The Western North Pacific DPS is listed as endangered; the Mexico DPS is listed as threatened; and the Hawaii DPS is not listed (81 FR 62259, September 8, 2016).

The Hawaii DPS population is estimated to be 11,540 animals (CV=0.04) with an annual growth rate between 5.5 and 6.0 percent. The Mexico DPS is comprised of approximately 2,913 animals (CV=0.7; Wade 2021) with an unknown, but likely declining, population trend (81 FR 62259; September 8, 2016). Approximately 1,084 animals (CV=0.09) comprise the Western North Pacific DPS (Wade 2021). Humpback whales in the Western North Pacific remain rare in some parts of their former range, such as the coastal waters of Korea, and have shown little sign of recovery in those locations.

Whales from these three DPSs overlap on feeding grounds off Alaska, and are visually indistinguishable unless individuals have been photo-identified on breeding grounds and again on feeding grounds. All waters off the coast of Alaska may contain ESA-listed humpbacks.

Humpback whales produce a variety of vocalizations ranging from 20 Hz to 10 kHz (Silber 1986; Richardson et al. 1995; Au 2000; Erbe 2002; Au et al. 2006; Vu et al. 2012). NMFS

categorizes humpback whales in the low-frequency cetacean functional hearing group, with an applied frequency range between 7 Hz and 36+ kHz (NMFS 2024a).

Bering Sea/Aleutian Islands/Chukchi and Beaufort Seas

The abundance estimate for humpback whales in the Bering Sea and Aleutian Islands is estimated to be 7,758 (CV= 0.2) animals, which includes whales from the unlisted Hawaii DPS (91 percent), threatened Mexico DPS (7 percent), and endangered Western North Pacific DPS (2 percent; NMFS 2021; Wade 2021) (Table 3). These same DPS proportions apply for the Chukchi and Beaufort seas. Humpback whales have increasingly been recorded during surveys in the eastern Chukchi Sea (67°–72°N, 157°–169°W) from July to October primarily over the continental shelf (Brower et al. 2018). During similar aerial surveys in 1982–1991, there was a complete lack of sightings of these whales (Brower et al. 2018). It is unknown if this is an indicator of population recovery, changing environmental conditions, or increased survey effort (Brower et al. 2018).

The area around the Aleutian Islands from Umnak Island northeastward along the Alaska Peninsula has been identified as a Biologically Important Area for humpback whales (Brower et al. 2022). Telemetry data from Kennedy et al. (2014) supported findings of historical data showing that humpback whales congregate in the shallow, highly productive coastal waters north of the eastern Aleutian Islands, between Unimak and Samalga Passes. The extremely high proportion of foraging within the narrow band 200 km east and west of Unalaska Bay further emphasizes the importance of the waters off the eastern Aleutian Islands for humpback whales (Kennedy et al. 2014). Annual vessel-based, photo-identification surveys in the Shumagin Islands from 1999 to 2015 identified 654 unique individual humpback whales between June and September (Witteveen and Wynne 2017).

Table 3. Percent probability of encountering humpback whales from each DPS in the North Pacific Ocean (columns) in various feeding areas (on left; Wade 2021).

Summer Feeding Areas	North Pacific Distinct Population Segments (DPS) (percent)			
	Western North Pacific (endangered)	Hawaii (not listed)	Mexico (threatened)	Central America (endangered)
Kamchatka	91	9	0	0
Aleutian I / Bering / Chukchi Seas	2	91	7	0
Gulf of Alaska	1	89	11	0
Southeast Alaska / Northern BC	0	98	2	0
Southern BC / WA	0	69	25	6
OR/CA	0	0	58	42
Note that in the past iteration of this guidance, upper confidence intervals were used for endangered DPSs. However, the revised estimates do not have associated coefficients of variation to cite. Therefore, the point estimate is being used for each probability of occurrence.				

Additional information on humpback whale biology and natural history is available at:

- [Humpback Whale Species Description](#)
- [Marine Mammal Stock Assessment Reports: Cetaceans-Large Whales](#)
- [Humpback Whale Critical Habitat](#)
- [Occurrence of Listed Humpback Whales off Alaska](#)

Humpback whales in the action area

Humpback whales are expected to be present in high numbers in their Alaskan feeding grounds during the summer months. Given their widespread range, relative abundance, their opportunistic foraging strategies, and frequent near-shore occurrence, humpback whales may overlap with project activities.

Western DPS Steller Sea Lion

The Steller sea lion (*Eumetopias jubatus*) was listed as a threatened species under the ESA effective December 4, 1990 (55 FR 49204, November 26, 1990). Based on genetic, morphological, ecological, and population trend data, NMFS reclassified the Steller sea lion into two DPS's, effective June 4, 1997 (62 FR 24345, May 5, 1997). The western DPS, comprised of animals originating from breeding sites west of 144° W longitude, was listed as endangered due to persistent decline and lack of recovery, while the eastern DPS remained listed as threatened. Effective on December 4, 2013, the eastern DPS was removed from the endangered species list (78 FR 66140, November 4, 2013).

The western stock of the Steller sea lion decreased from 220,000 to 265,000 animals in the late 1970s to less than 50,000 in 2000 (Loughlin et al. 1984; Loughlin and York 2000; Burkanov and Loughlin 2005). The sharp drop in abundance of the western DPS observed in the 1980s was caused largely by a steep decline in juvenile survival and a smaller decline in adult survival (York 1994; Holmes and York 2003). The minimum population estimate for the U.S. portion of the range of western DPS Steller sea lions in 2023 was 49,320 Steller sea lions; 11,987 pups (95 percent credible interval of 11,291-12,703) and 37,333 non-pups (95 percent credible interval of 34,274-40,245), respectively (Sweeney et al. 2023). Non-pups and pups in the western DPS of Alaska increased 1.05 and 0.50 percent y-1, respectively, between 2007 and 2022; however, there was high variability among regions (Sweeney et al. 2023). Steller sea lions in the western Aleutian Islands region continued to decline, along with pups in the adjacent central Aleutian Islands region. East of Samalga Pass, Aleutian Islands, pup production slowed or plateaued in the early 2010s, with subsequent non-pup plateauing or declines starting in the late 2010s in all regions (Sweeney et al. 2023). The 2014-2016 North Pacific marine heatwave (PMH), one of the most severe heatwaves ever recorded, resulted in reduced survival of adult female Steller sea lions in the Gulf of Alaska and reduced survival of adult female and adult male Steller sea lions in Southeast Alaska (Hastings et al. 2023) indicating that Steller sea lion populations in Alaska remain sensitive to environmental anomalies such as these (Suryan et al. 2021; Hastings et al. 2023).

Steller sea lions range throughout the North Pacific Ocean occurring from central California along the Pacific Rim through Alaska and Russia to Japan (Kenyon and Rice 1961; Loughlin et al. 1984). The western DPS of Steller sea lions are primarily found north of Sumner Strait in Southeast Alaska (Hastings et al. 2020). Most adult Steller sea lions occupy rookeries during the summer pupping and breeding season (mid-May through July) and exhibit a high level of site fidelity (Raum-Suryan et al. 2002; Hastings et al. 2017). During the breeding season, some juveniles and non-breeding adults occur at or near the rookeries, but most are on haulouts (sites that provide regular retreat from the water on exposed rocky shoreline, gravel beaches, and ice) (Call and Loughlin 2005; Ban and Trites 2007). Steller sea lions disperse widely after the breeding season, likely to access seasonally important prey resources (Gende and Sigler 2006; Sigler et al. 2009; Womble et al. 2009). During fall and winter many sea lions disperse from rookeries and increase use of haulouts, particularly on terrestrial sites but also on sea ice in the Bering Sea (Calkins 1998).

Steller sea lions forage near and off shore, in both benthic and pelagic zones, and eat a wide variety of prey, including many species of fish and cephalopods (including squid and octopus) (Pitcher and Calkins 1981; Calkins and Goodwin 1988; Calkins 1998; Sinclair et al. 2013; Tollit et al. 2017), and occasionally other marine mammals and birds (Pitcher and Fay 1982; NMFS 2008). During the breeding season, adult females must forage close enough to her rookery to return often to nurse her pup. Females attending pups usually forage within 20 nautical miles of breeding rookeries (Merrick and Loughlin 1997), which is the basis for designated critical habitat around rookeries and major haulout sites. Steller sea lions are not known to migrate annually, but individuals, especially juveniles and males, may disperse widely outside of the breeding season (Raum-Suryan et al. 2004; Trites et al. 2006; Lander et al. 2009; Jemison et al. 2013; Fritz et al. 2016; Sigler et al. 2017; Jemison et al. 2018).

The ability to detect sound and communicate underwater is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. NMFS categorizes Steller sea lions in the otariid pinniped functional hearing group, with an applied frequency range between 60 Hz to 68 kHz in water (NMFS 2024a).

Information on Steller sea lion biology and habitat is available at:

- [Steller Sea Lion Species Description](#)
- [Marine Mammal Stock Assessment Reports: Pinnipeds-Otariids](#)
- [2020 Status Review](#)
- [Occurrence of Western DPS Steller Sea Lions East of 144° W. Longitude](#)
- [Steller Sea Lion Critical Habitat](#)

WDPS Steller sea lions in the action area

Western DPS Steller sea lions are highly mobile and have large ranges. Additionally, numerous salmon spawning streams and rivers that may attract Steller sea lions occur along the cable installation route, and some landfall sites occur up rivers (e.g., Yukon River). Therefore, the proposed action may overlap with Western DPS Steller sea lions.

Effects of the Action

“Effects of the action” are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02). The applicable standard to find that a proposed action may affect but is “not likely to adversely affect” listed species or critical habitat is that all of the effects of the action are expected to be insignificant, extremely unlikely to occur, or completely beneficial. “Insignificant effects” relate to the magnitude of the impact and are those that one would not be able to meaningfully measure, detect, or evaluate; insignificant effects should never reach the scale where take occurs.

While the ESA does not define “harass,” NMFS issued guidance interpreting the term “harass” under the ESA as to: “create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering” (Wieting 2016). NMFS considers the following steps to assess whether proposed activities are likely to harass.

1. Whether an animal is likely to be exposed to a stressor or disturbance (i.e., an annoyance).
2. The nature of that exposure in term of magnitude, frequency, duration, etc. Included in this may be type and scale as well as considerations of the geographic area of exposures (e.g., is the annoyance within a biologically important location for the species, such as a foraging area, spawning/breeding area, or nursery area?).
3. The expected response of the exposed animal to a stressors or disturbance (e.g., startle, flight, alteration [including abandonment] of important behaviors); and;
4. Whether the nature and duration or intensity of that response is a significant disruption of those behavior patterns which include, but are not limited to, breeding, feeding, sheltering, resting, or migrating.

The potential effects of the proposed action on listed species and critical habitat include:

- Acoustic disturbance from cable-laying equipment, vessels and associated DP systems
- Disturbance due to physical presence of vessels
- Vessel strike
- Contamination from spills
- Substrate disturbance

Acoustic Thresholds

Since 1997, NMFS has used generic sound exposure thresholds to determine whether an activity produces underwater sounds that might result in impacts to marine mammals (70 FR 1871, 1872, January 11, 2005). NMFS developed comprehensive guidance on sound levels likely to cause injury to marine mammals through onset of permanent and temporary threshold shifts (PTS (Level A harassment) and TTS; 89 FR 84827, April 3, 2024). NMFS is in the process of developing guidance for behavioral disruption (Level B harassment). However, until such guidance is available, NMFS uses the following conservative thresholds of underwater sound pressure levels, expressed in root mean square (rms), from broadband sounds that cause behavioral disturbance, and referred to as Level B harassment under section 3(18)(A)(ii) of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1362(18)(A)(ii)):

- impulsive sound: 160 dB_{rms} re 1 µPa
- continuous sound: 120 dB_{rms} re 1µPa

The generalized hearing range for each hearing group is provided in Table 4.

Table 4. Underwater marine mammal hearing groups (NMFS 2024a).

Hearing Group [^]	ESA-listed Marine Mammals in the Action Area	Generalized Hearing Range*
Low-frequency (LF) cetaceans (Baleen whales)	Fin whales, Mexico DPS humpback whales, Western North Pacific humpback whales North Pacific Right whales	7 Hz to 36+ kHz
Phocid pinnipeds (PW) (true seals)	Arctic Ringed seals and Beringia DPS bearded seals	40 Hz to 90 kHz
Otariid pinnipeds (OW) (sea lions and fur seals)	Western DPS Steller sea lion	60 Hz to 68 kHz

[^] Southall et al. 2019 indicates that as more data become available there may be separate hearing group designations for Very Low-Frequency cetaceans (blue, fin, right, and bowhead whales) and Mid-Frequency cetaceans (sperm, killer, and beaked whales). However, at this point, all baleen whales are part of the LF cetacean hearing group, and sperm, killer, and beaked whales are part of the HF cetacean hearing group. Additionally, recent data indicate that as more data become available for Monachinae seals, separate hearing group designations maybe appropriate for the two phocid subfamilies (Ruscher et al. 2021; Sills et al. 2021).

* Represents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges may not be as broad. Generalized hearing range chosen based on ~65 dB threshold from composite audiogram, previous analysis in NMFS 2018, and/or data from Southall et al. 2007; Southall et al. 2019. Additionally, animals can detect very loud sounds above and below that generalized hearing range.

+ NMFS is aware that the National Marine Mammal Foundation successfully collected preliminary hearing data on two minke whales during their third field season (2023) in Norway. These data have implications for not only the generalized hearing range for low-frequency cetaceans but also on their weighting function. However, at this time, no official results have been published. Furthermore, a fourth field season (2024) is proposed, where more data will likely be collected. Thus, it is premature for us to propose any changes to our current Updated Technical Guidance. However, mysticete hearing data is identified as a special circumstance that could merit re-evaluating the acoustic criteria in this document. Therefore, we anticipate that once the data from both field seasons are published, it will likely necessitate updating this document (i.e., likely after the data gathered in the summer 2024 field season and associated analysis are published).

In addition, NMFS uses the following thresholds for in-air sound pressure levels from broadband sounds that cause Level B behavioral disturbance under section 3(18)(A)(ii) of the MMPA (16 U.S.C. 1362(18)(A)(ii)):

- 100 dB_{rms} re 20μPa for non-harbor seal pinnipeds

Acoustic disturbance

Sources of acoustic disturbance associated with the proposed action include vessels, the dynamic positioning system utilized by the cable laying ship, and equipment associated with cable laying operations.

Cable-laying/burial equipment

In-situ data on noise associated with cable laying is scarce. There are limited field studies on noise emissions during installation of subsea electric cables (Nedwell and Howell 2004; Bald et al. 2015). However, these cable laying methods involved pre-cut trenching with a forecutter (i.e., rock trenching), and the reported sound pressure levels are not applicable for telecom cables; pre-cut trenching will not occur in this project. During installation of surface-laid cables, sound generation will be restricted to the noise generated by the installation ship. Surface lay of cables is essentially silent, and passive plough burial has a very low noise impact (OSPAR 2023). Additionally, the sound generated by burial tools (e.g. water jet) is comparable to that of a small dredging operations, and sound emissions from activities associated with subsea cable installation generally do not exceed background shipping noises (OSPAR 2023). Currently, there are no clear indications that noise impacts related to the installation and operation of subsea cables pose a high risk of harming marine fauna, and underwater noise linked to undersea cables remain low (Taormina et al. 2018). Cable installation will also be spatially localized and temporary. The impact of cable installation and burial is expected to be minor and brief, therefore we conclude the acoustic effects of cable installation and burial equipment on listed marine mammals is insignificant.

Vessel noise

Underwater vessel noise may disturb or temporarily mask communication between marine mammals. Some marine mammals have also been known to alter their own signals to compensate for increased ambient noise levels (Au et al. 1974; Di Lorio and Clark 2010; Parks et al. 2011), incurring energetic costs in the process. Behavioral reactions of marine mammals to vessels vary depending on the type and speed of the vessel, the spatial relationship between the animal and the vessel, the species, and the behavior of the animal (e.g., feeding, traveling) prior to the disturbance from the vessel. Considerable variability in response type and magnitude has been observed for similar noise exposures as a function of species, age/sex class, individual behavioral state, and a suite of interacting biological and ecological contextual factors (Southall et al. 2021). Individual animals' past experiences with vessels also appear to be important in determining an individual's response.

Ambient noise can mask communication between sea lions and affect their ability to detect predators (Richardson and Malme 1993; Weilgart 2007). Steller sea lions are frequently observed hauling out in areas experiencing a high level of vessel traffic and human activity such as boat marinas and navigation buoys (Jeffries et al. 2000; Fisheries and Oceans Canada 2010). Potential impacts to Steller sea lions from acoustic disturbances may occur at haul-outs and near rookeries, where in-air vessel noise could cause behavioral responses (avoidance of the sound source, spatial displacement from the immediate surrounding area, trampling, and abandonment of pups) (Calkins and Pitcher 1982; Kucey 2005). The proposed cable laying route is greater than 100 nm to the nearest designated sea lion haul out at St. Lawrence Island. With the implementation of mitigation measures, distance from known haul-outs, and the majority of the action occurring offshore, it is unlikely that vessels associated with this action will disturb large numbers of hauled-out Steller sea lions.

Vessel noise has the potential to mask communication between seals (Terhune et al. 1979). However, Funk et al. (2010) noted among vessels operating in the Chukchi Sea where received sound levels were <120 dB, 40 percent of observed seals showed no response to a vessel's presence, slightly more than 40 percent swam away from the vessel, 5 percent swam towards the vessel, and the movements of 13 percent of the seals were unidentifiable. Richardson et al. (1995) found vessel noise does not seem to strongly affect seals in the water, concluding that seals on haul-outs often respond more strongly to vessels. During the proposed action in the ice-free month, the vessels are not expected to encounter hauled-out ice-associated seals.

Acoustic masking is also of concern for cetaceans, particularly for baleen whales because they vocalize at low frequencies over long distances, and their communication frequencies overlap with many anthropogenic sounds such as shipping traffic. Some baleen whales have adjusted their communication frequencies, intensity, and call rate to limit masking effects. For example, fin whales have reduced their calling rate in response to boat noise (Watkins 1986) and right whales have been observed changing vocal behavior due to shipping sound that caused an increase in overall background noise (Parks et al. 2011).

The primary underwater noise associated with vessel operations is the continuous cavitation noise produced by the propeller arrangement (Richardson et al. 1995). Generally, vessel noise levels increase with increasing speed and increasing vessel size, but propulsion type and horsepower can also be important factors. Small vessel noise may be more significant than large vessel noise, and vice versa, for certain animals (Kipple and Gabriele 2007). The CLV is expected to be 320-379 ft and produce sound source levels up to 180 dB re μ Pa at 1 m. This sound source level will decline to 120 dB within 10 km. Sound source verification studies by Kipple and Gabriele (2007) showed that large vessels traveling at 10 knots emit a range low frequency sounds that overlap with hearing ranges of all of the listed marine mammals discussed herein. However, large vessels in this study emitted peak spectra at 30 Hz and 90 Hz. These frequencies fall outside the most sensitive hearing ranges for baleen whales, seals, and sea lions (Southall et al. 2019), and thus are not perceived as loud signals at frequencies where the sound energy is most concentrated.

A tug and barge may also be used in this action for cable laying activities in nearshore or shallow waters. Tugs have higher speed engines and propellers than larger fueling vessels or barges. The

smaller vessel noise spectra peak around 300 Hz with a source level ranging from 145-170 dB re 1 μ Pa depending on if the tug is pulling an empty or loaded barge (Richardson et al. 1995). Continuous sounds for sea going barges have been measured at a peak sound source level of 170 dB re 1 μ Pa at 1 m, and they are emitted at dominant frequencies of less than 5 kHz, but generally are emitted at frequencies less than 1 kHz (Miles et al. 1987; Richardson et al. 1995). The source level of approximately 170 dB re 1 μ Pa associated with oceanic tug boat noise will decline to 120 dB within 2.2 km of the source. Frequencies emitted from the tug and barge overlap with the hearing ranges of all of the listed marine mammals discussed herein. The majority of acoustic energy emitted by the vessels are at frequencies (<1 kHz) below the best hearing ranges for seals, sea lions, and baleen whales (Southall et al. 2019). Thus, they are not perceived as loud signals at the frequencies where the sound energy is most concentrated.

A ~150 ft landing craft may also be used in this action during cable laying activities in shallow water. Sound source verification studies by Kipple and Gabriele (2007) showed vessels between 100 and 250 ft produced a mean sound source level of 178 dB re μ Pa at 1 m while traveling at 10 knots. This sound source level is expected to decline to 120 dB within 7,356 m. Sound source verification studies by Kipple and Gabriele (2007) showed that large vessels traveling at 10 knots emit a range of low frequency sounds that overlap with the hearing ranges of all of the listed marine mammals discussed herein. However, large vessels in this study emitted dominant peak spectra at 30 Hz and 90 Hz. These frequencies fall outside the most sensitive hearing ranges for baleen whales, seals, and sea lions (Southall et al. 2019), and thus are not perceived as loud signals at the frequencies in which the acoustic energy is most concentrated.

A small vessel of opportunity (~40 ft) may also be used in this action for cable laying activities in shallow waters. Sound source verification studies by Kipple and Gabriele (2007) showed vessels between 20 and 40 ft produced a mean source level of 168 dB re μ Pa at 1 m while traveling at 10 knots. This sound source level is expected to decline to 120 dB within 1,585 m. In this study, medium sized vessels traveling at 10 knots emitted a range of low frequency sounds that overlap with the hearing ranges of all of the listed marine mammals discussed herein. Vessels of smaller size classes emitted spectra peaks at 63, 125, 1,000, and 2,500 Hz; some of these overlap with the most sensitive hearing ranges for baleen whales, seals and sea lions.

Vessels in transit typically travel in a consistent and predictable direction and speed, essentially providing a gradually increasing signal of their approach. Consequently, we would not expect a startle response from any individual marine mammal. Individuals may exhibit deflection from the vessel noise, engage in low level avoidance behavior, exhibit short-term vigilance behavior, or experience and respond to short-term acoustic masking behavior, but these behaviors are expected to be very short in duration and not likely to result in significant disruption of normal behavioral patterns or affect the animals in a biologically meaningful way. The adherence to mitigation measures, such as maintaining watch for marine mammals, reducing vessel speed in the vicinity of marine mammals, and avoiding direct approach to marine mammals, are expected to further reduce the potential for listed whales or pinnipeds to react discernibly to project vessels. Additionally, while undergoing cable laying activities, all vessels will operate at 2 knots. Therefore, sound source levels are expected to be much lower for the majority of the project than those reported for 10 knot speeds. While marine mammals are likely to be exposed to vessel noise, the effects are expected to be too small to detect or measure. Therefore, we conclude that

the effects of project-related vessel noise on the ESA-listed whales and pinnipeds in the action area are insignificant.

Dynamic positioning (DP) systems

The CLV will use a dynamic positioning (DP) system, which is expected to be the dominant sound source associated with cable laying activities. DP systems are used to control a vessel's position by means of propellers and thrusters via onboard computers that receive real-time input from global positioning systems (GPS) and active acoustic positioning systems. These allow for the CLV to follow a predetermined track with high accuracy (Tetra Tech 2013). DP systems produce both high-frequency and low-frequency sounds. The active acoustic positioning systems used in DP are functionally analogous to echosounders, and are thus a source of high-frequency sound. However, these acoustic systems are generally quieter than other sound components from DP because their pulses are short, narrowband in frequency, have narrow and downward directed beam widths, and their high frequency results in faster attenuation (BOEM 2023). Therefore, it is highly unlikely a marine mammal will be exposed to the high frequency components of the DP system.

Higher amplitude and lower frequency sound components of DP systems come from the vessel thrusters (BOEM 2023). Depending on the direction they are pushing, thrusters produce sound that is highly variable in directionality and source level. They are prone to cavitation even at relatively low operation speeds, leading to high source levels. There are not consistent sound source measurements for DP thrusters due to the high directionality of the source and variability in vessel type and size, type of thruster, and operational conditions (BOEM 2023). Despite variable sound source levels, sounds from DP thrusters are generally below 1 kHz (BOEM 2023), which falls below the most sensitive hearing ranges for low-frequency cetaceans, sea lions, and seals (Southall et al. 2019), and thus they are not perceived as loud signals. Therefore, we do not expect marine mammals to respond to DP thruster noise in a biologically significant way. Additionally, vessel operators will operate their vessel thrusters (both main drive and dynamic positioning) at the minimum power necessary to accomplish the work (mitigation measure #25). Lastly, NMFS has concluded that sound produced by DP thrusters is similar to that produced by transiting vessels and will not result in harassment of marine mammals (85 FR 36537). Deflection and avoidance behavior are expected to be the most consequential responses in those instances where there is any response at all, but we do not expect noise associated with the DP system will result in long-term effects to marine mammals. The impact of DP systems is expected to be very minor, and thus adverse effects to listed marine mammals will be immeasurably small. Therefore, we conclude that the effects from DP systems on listed marine mammals are insignificant.

Physical presence of vessels

It is not clear whether the marine mammal response of avoidance when a surface vessel moves towards it is caused by the physical presence of a surface vessel, the underwater noise generated by the vessel, or an interaction between the two (Goodwin and Cotton 2004; Lusseau 2006). However, studies suggest that the behavioral responses of marine mammals to surface vessels are

similar to their behavioral responses to predators (Evans et al. 1992; Blane and Jaakson 1994; Evans et al. 1994).

Project-specific vessels could result in a temporary disturbance that alters an animal's natural behavior. The mere presence and movements of ships in the vicinity of seals and sea lions can cause disturbance to their normal behaviors (Calkins and Pitcher 1982; Kucey 2005; Jansen et al. 2006; Jansen et al. 2010). Numerous studies of interactions between surface vessels and marine mammals have demonstrated that free-ranging marine mammals engage in avoidance behavior when surface vessels move toward them.

Disturbances from vessels may motivate pinnipeds to leave haulout locations and enter the water (Kucey 2005). Greene and Moore (1995) concluded that the effects of vessel traffic on pinnipeds are generally negligible to non-existent when they are in the water. Similarly, studies by Bisson et al. (2013) found pinnipeds in the Chukchi Sea during the 2012 open-water season responded to a moving vessel by looking at the vessel (42 percent) or doing nothing (38 percent). Steller sea lions are often observed hauling out in areas experiencing a high level of vessel traffic and human activity, such as boat marinas and navigation buoys (Fisheries and Oceans Canada 2010; Jeffries et al. 2000), and appear to tolerate vessel presence. Vessel presence in close proximity to haul-outs or rookeries, however, could cause behavioral response such as avoidance, spatial displacement from the immediate area, trampling, and abandonment of pups (Calkins and Pitcher 1982; Kucey 2005). However, with the implementation of mitigation measures, distance from known major haul outs for Steller sea lions, and lack of ice platforms for ice-associated seals, it is unlikely that vessels associated with this action will disturb large numbers of hauled-out pinnipeds.

Based on a suite of studies of cetacean behavior to vessel approaches (Bauer and Herman 1986; Au and Green 2000; Nowacek et al. 2001; Magalhaes et al. 2002; Williams et al. 2002; Goodwin and Cotton 2004; Bain et al. 2006; Lusseau and Bejder 2007), the set of variables that help determine whether animals are likely to be disturbed by surface vessels include 1) the number of vessels, 2) distance between the animal and the vessel, 3) vessel speed and vector, and 4) behavioral state of the animal(s). Most animals tended to reduce their visibility at the water's surface and move horizontally away from the source of disturbance or adopt erratic swimming strategies (Williams et al. 2002; Lusseau 2003; Lusseau 2006). In the process, dive times may increase, vocalizations and breaching may decrease, individuals in groups may move closer together, swimming speeds may increase, and direction of travel may change to avoid the source of disturbance (Kruse 1991; Evans et al. 1994). Some individuals have also been documented to dive and remain motionless, waiting until the vessel moved past their location.

Humpback whale reactions to approaching boats are variable, ranging from approach to avoidance (Payne 1978; Salden 1993). Humpbacks show no reaction at distances beyond 800 m when they are feeding (Krieger and Wing 1986). Humpback whales are especially responsive to fast moving vessels, exhibiting aerial behaviors such as breaching or tail/flipper slapping (Jurasz and Jurasz 1979). However, temporarily disturbed whales often remain in the area despite the presence of vessels (Baker et al. 1988; Baker et al. 1992). Fin whales have been documented to respond to vessels at distances of about 1 km (Edds and Macfarlane 1987). Watkins (1981) found that fin and humpback whales appeared startled and increased their swimming speed to avoid

approaching vessels. Studies by Vermeulen et al. (2012) assessed the behavioral responses of right whales to controlled vessel approaches and demonstrated significant reductions in social interactions, and significant alteration or disruption to traveling and resting states.

Previous monitoring efforts have indicated a lack of adverse effects to marine mammals from cable-laying vessels. This is supported by recent marine mammal observations in the PSO reports from the 2022 Aleutians I Fiber Optic Cable (FOC) project (Smultea et al. 2022) and the initial Quintillion cable installation project in 2016 (Green et al. 2018). The following information was provided by the PSO reports from these projects.

- In 2016 and 2017, reactionary behaviors were documented during only two to three percent of all cetacean observations. Reactions included change of direction, avoidance, and swimming speed increase.
- None of the remaining 299 groups or 669 cetacean individuals encountered over the two years of monitoring exhibited a reaction to the presence of the cable ship.
- A majority of pinniped groups and individuals in 2016 and 2017, respectively, did not react to vessel activities. The most commonly observed reaction was “look”, meaning the animal acknowledged the presence of the vessel. Other reactions included diving, increased swimming speed, or clearly changing travel direction. No reactions were indications of the animals exhibiting threat or flee responses but were rather more curiosity or avoidance behaviors.
- The 2022 PSO report from the Aleutians I FOC project recorded similar results. Out of 196 observations comprising 378 marine mammals, only 1.5 percent of individuals were observed to react to the presence of the FOC vessel. All reactions recorded were incidences of Steller sea lions (3) or sea otters (2) orienting to look at the vessel.

Project vessels will emit continuous sound while in transit, which will alert marine mammals to their presence. Therefore, a startle response is not expected. Rather, deflection and avoidance are expected to be common responses. The adherence to mitigation measures, such as maintaining watch for marine mammals, reducing vessel speed in the vicinity of marine mammals, and avoiding direct approach to marine mammals, are expected to further reduce the potential for ESA-listed whales or pinnipeds to react discernibly to the transiting project-specific vessels. While marine mammals are likely to be exposed to project vessels, the effects are expected to be too small to detect or measure, therefore NMFS concludes that the effects of project-related vessel presence on the ESA-listed whales and pinnipeds in the action area are insignificant.

Vessel strike

Vessels transiting the marine environment have the potential to collide with or strike marine mammals (Laist et al. 2001; Jensen and Silber 2004a), resulting in serious injury or mortality to the animal. The probability of strike events depends on the frequency, speed, and route of the marine vessels, as well as distribution of marine mammals in the area. Laist et al. (2001) found that while all sizes and types of vessel can strike a whale, ships greater than 80 meters and those going faster than 14 knots were most likely to cause severe or fatal injuries. Similarly,

Vanderlaan and Taggart (2007) found that the chances of lethal injury to a large whale are greater than 50 percent at vessel speeds higher than 11.8 kts.

The project-related vessels in this action have the potential to strike a marine mammal along the cable-laying routes. Large whales, particularly humpback whales, are more likely to be struck than small cetaceans or pinnipeds. A total of 28 vessel strikes occurred in Alaskan waters between 2016 and 2020, the majority of which were humpback whales (n=18), followed by 3 fin whales, 3 unidentified whales, 2 sperm whales, 1 killer whale, and 1 Steller sea lion (Muto et al. 2022). Previous studies have also documented humpback whales as the most frequent subjects of vessel strike, accounting for 86 percent of reported collisions in Alaska (Neilson et al. 2012). The majority of strikes (76 percent) were reported in Southeast Alaska, however, where both vessel traffic and humpback whale density are concurrently high in summer months when humpbacks are feeding. Humpback whale densities are not expected to be as high in the action area; there is only a 7 percent chance that humpback whales will be from the threatened Mexico DPS, and a 2 percent chance that humpback whales will be from the endangered Western North Pacific DPS. Therefore, in the unlikely event that a project vessel collided with a humpback whale it would be highly unlikely that the whale would be from a listed DPS. Furthermore, implementation of mitigation measures (i.e., adherence to the Alaska Humpback Whale Approach Regulations) will reduce the likelihood of a project vessel striking a humpback whale.

While strip strike is one of the leading causes of North Atlantic right whale mortality⁷, there are no documented injuries to North Pacific right whales by ship strike in waters off Alaska (NMFS unpublished data). Given their low abundance estimate, it is highly unlikely that project barges will encounter a North Pacific Right whale. Additionally, project vessels will not transit through North Pacific Right whale critical habitat. Adherence to mitigation measures (i.e., remaining at least 460 m (500 yards) from North Pacific right whales, having a PSO onboard) will reduce the likelihood of vessel collision with North Pacific right whales.

Around the world, fin whales are killed and injured in collisions with vessels more frequently than any other whale (Laist et al. 2001; Jensen and Silber 2004b; Douglas et al. 2008). From 2012-2020, there were two documented injuries by ship strikes of fin whales in Alaska (NMFS unpublished data). One vessel-strike of a fin whale occurred while the commercial vessel was traveling over 18 knots, which is significantly faster than the vessels associated with this action. Adherence to mitigation measures (i.e., keeping watch for marine mammals while underway, traveling at less than 5 knots (9 km/hour) when within 274 m (300 yards) of a whale and avoiding changes in direction and speed when within 274 m (300 yds) of a whale, not positioning vessel(s) in the path of a whale, and not cutting in front of a whale) will make collision with a fin whale highly unlikely.

In Alaska, our data indicates that cetaceans are more frequently involved in vessel strikes than are pinnipeds, and this is consistent with data from other regions (Barcenas-De La Cruz et al. 2018) of high sea lion abundance. Although risk of vessel strike has not been identified as a

⁷ <https://www.fisheries.noaa.gov/species/north-atlantic-right-whale>

significant concern for Steller sea lions, the recovery plan for this species states that Steller sea lions may be more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated, e.g., near rookeries or haul-outs (NMFS 2008). There are no Steller sea lion haul-outs or rookeries along the cable-laying route. If sea lions are encountered, they may be able to avoid vessel interactions due to their relatively small size and high degree of maneuverability. With the implementation of mitigation measures (i.e., maintaining a watch for marine mammals at all times while underway) makes the occurrence of vessel strike on a Western DPS Steller sea lion highly unlikely.

To date, no bearded or ringed seal carcasses have been found with propeller marks and there is no record of bearded or ringed seal stranding due to vessel strike (NMFS unpublished data). Given the seasonal timing of the proposed action, ringed and bearded seals are more likely to be outside of the action area due to their life history traits and optimal foraging habitats that are closely tied to sea ice. Because the action period is during ice-free months, it is unlikely that the project vessels will overlap spatially or temporally with ringed or bearded seals; we consider encountering a ringed or bearded seal along project transit routes to be rare, and thus vessel strike to be exceedingly unlikely.

Mitigation measures are in place to minimize exposure of marine mammals to vessel activities (speed restrictions, timing restrictions, and approach restrictions). Furthermore, the majority of vessel operations will be conducted at 2 knots. Therefore, we consider vessel strike extremely unlikely to occur and therefore discountable.

Spills

There is risk of an oil spill associated project vessels during any of the proposed activities. Several different petroleum products may be associated with a spill, such as hydraulic oil, engine lubricant, gasoline, or diesel fuel. Collision, equipment failure, and grounding are the three main accident types associated with large spills (Dalton and Jin 2010). The effects of oil are determined by its chemical properties, such as molecular weight and solubility. Some compounds (typically the lower molecular weight substances) are acutely toxic, yet exhibit rapid dissipation and removal from the environment. Other forms of oil, such as tar or weathered oil, are less toxic but persist in the environment (Neff 1990). It is also possible for some fractions of oil, such as aromatic hydrocarbons, to interact synergistically (Rice et al. 1983).

Oil spills can affect marine mammals through various direct and indirect pathways. Direct pathways include inhalation, ingestion, and dermal contact/absorption, each of which can trigger a variety of physiological responses with potential consequences for health and long-term survival and/or reproduction (Helm et al. 2015). Inhalation of volatile, highly toxic aromatic compounds of oil poses the greatest acute health threat due to severe damage to the respiratory system. Ingestion of oil through grooming or consumption of contaminated prey has been documented to damage internal organs and organ systems (Engelhardt 1983; Helm et al. 2015). Contact exposure can cause temporary damage of the mucous membranes, eyes, or epidermis (Hansen 1985; Geraci 1990; St. Aubin 1990) and other external soft tissue areas (Helm et al. 2015). External oiling may interfere with thermoregulation for species that rely on fur for insulation, which can lead to life-threatening hypothermia (Helm et al. 2015, Engelhardt 1983).

Indirect pathways are effects associated with contamination that results in alterations in marine food webs, which may result in reductions in prey availability, injury to prey, or increases in predation (Helm et al. 2015).

For pinnipeds that rely primarily on blubber for insulation, external oiling does not significantly disrupt their ability to maintain core body temperature, and pinnipeds other than fur seals are less threatened by the thermal effects of oil-fouled fur (Helm et al. 2015, St. Aubin 1990). Studies have shown that oil has no effect on the relatively poor insulative capacity of the pelts of sea lions, bearded seals, and ringed seals (Kooyman et al. 1976). However, heavy oiling may result in death by smothering or interfere with an animal's capability to swim, resulting in drowning (St. Aubin 1990). Other studies on the toxicological effects of oil on pinnipeds demonstrated changes in respiratory epithelium consistent with inhalation of toxic fumes. In addition to respiratory surfaces, the eyes, oral cavity, and anal and urogenital orifices were found to be especially sensitive to prolonged contact with oil. Behavioral studies indicated that while pinnipeds are able to detect oil through vision and/or sense of smell, they do not show a strong avoidance response (St. Aubin 1990). Therefore, pinnipeds are likely to come into contact with oil if it enters their habitat, and they may be at an increased risk should an oil spill occur near a breeding colony, haul-out, or important foraging area.

Cetaceans can be exposed to oil through direct contact with the skin, eyes, mouth, and blowhole, inhalation of volatile fumes at the surface of the water, or ingestion of contaminated prey or water during feeding events. Unlike furbearing seals and sea lions, cetaceans are not at risk of uncontrolled heat loss through oiled-skin. They lack hair or fur and are constantly sloughing skin cells; oil does not readily adhere to cetacean bodies and thus does not compromise insulation (Helm et al. 2015). Additionally, studies detailed in Geraci et al. (1990) showed that cetacean skin is nearly impermeable to oil owing to tight intercellular bridges and the unusual thickness of their epidermis, even when the skin is compromised by an injury such as an open wound. Several studies referenced in a review by Helm et al. (2015) suggest that the inhalation of volatile toxic fractions at the air-water interface is the most concerning threat to cetaceans, rather than exposure through ingestion or absorption through the skin. Inhalation of toxic vapors may lead to inflammation of mucous membranes, lung congestion, and ultimately pneumonia (Hansen 1985). Toxicants that are inhaled can accumulate in blood and other tissues, leading to liver damage and other physiological malfunctions (Geraci 1990). Evidence for adverse health effects of oil exposure is supported by comparison health assessments between dolphins affected by the Deepwater Horizon oil spill to dolphins from non-oiled sites; dolphins in oil-affected areas had low hormone and blood sugar levels, were underweight, and showed signs of liver and/or lung damage (Schwacke et al. 2014).

When oil is released at the surface, it spreads out horizontally creating a slick. Larger droplets have the potential to coalesce and concentrate at the surface. While all marine mammals spend considerable time at the surface for feeding, breathing, swimming, or resting, baleen whales may be particularly at risk to oil exposure via ingestion due to their feeding strategies. They display a variety of surface feeding patterns, such as skim feeding exhibited by right whales, bubble net feeding by humpback whales, and lunge feeding by humpbacks and fin whales that have a greater potential for ingesting oil when filtering large quantities of water (Helm et al. 2015). Heavy oil fouling of baleen plates may also interfere with feeding efficiency (Geraci 1990). A

variety of cetacean species can visually detect oil, and toothed whales have been documented to avoid it visually and through echolocation capabilities. There is also some evidence to suggest that both toothed and baleen whales may be able to detect oil via cutaneous signals and therefore avoid it (Helm et al 2015, Geraci 1990). However, species with restricted ranges or specific habitat requirements may experience prolonged exposure to oil if they are not able to shift their ranges to avoid a spill. Similarly, cetaceans with limited diets or that take advantage of seasonally abundant or geographically restricted prey resources (such as humpback whales and North Pacific right whales) may be disproportionately affected by an overlapping oil spill.

Large and very large oil spills are a low probability but high impact event in which large numbers of ESA-listed marine mammals could experience prolonged exposure to toxic fumes, and/or ingest large amounts of oil, which could result in injury and mortality to a substantial number of animals. Based on data⁸ from Alaska Department of Environmental Conservation (ADEC), the majority of spill incidents that occurred in Alaska since 1979 involved diesel fuel, bilge oil, or hydraulic oil at volumes of 500 gallons or less. Therefore, in the rare instance a spill does occur, it is highly unlikely to be a large spill. In the occurrence of a small spill, refined petroleum products such as gasoline, diesel fuel, and solvents rapidly dissipate into thin films. The toxic volatile components of these products dissipate from the environment quickly via evaporation (Neff 1990), therefore exposure of marine mammals, or their prey, would be highly localized and transient. The probability of contamination occurring at harmful concentrations is very small, and thus we conclude adverse effects to listed pinnipeds and cetaceans are highly unlikely and therefore discountable.

Substrate disturbance

Physical changes to substratum will occur during cable route preparation (pre-lay grapnel run) and burial of the cable (ploughing, jetting, beach/intertidal excavation). These methods may lead to the modification of benthic habitat. Ploughing and jetting have a quick recovery of bottom topography, as the trench is filled with displaced re-suspended material after excavation and cable laying (Taormina et al. 2018). In intertidal areas at the landfall locations, impacts to the substrate will occur over a much larger surface area, of the order of tens of meters, due the use of vehicles such as mechanical excavators, trucks, and trenching equipment that heavily re-work the substrate. Unburied cables may also cause changes to habitat. Wave action may cause the cable to shift resulting in direct interaction with the seafloor such as surface scraping, although this is expected to be spatially limited due to the small width of telecom cables. Surface laid cables may also locally alter the near-seafloor hydrodynamic regime. Cable installation, in some cases, may actually increase habitat heterogeneity and locally enriched biodiversity (OSPAR 2023).

Increased turbidity in the water column will occur as result of project-related seabed disturbance. However, this is expected to be temporary and localized; at any given location on a cable route, sediment plumes are expected to persist from a few hours to a few days (Taormina et al. 2018). Increased turbidity may affect marine mammal prey species. For example, sediment particles in

⁸ <https://dec.alaska.gov/Applications/SPAR/PublicMVC/PERP/SpillSearch>, accessed Feb. 12, 2023

the water column may lead to gill damage in fish or limit foraging efficiency for fish that detect prey visually. Nevertheless, particle resuspension should generally have negligible effects on marine ecosystems (Taormina et al. 2018). Furthermore, the temporary and localized increase in turbidity is not expected to exceed normal turbidity levels expected from increased wave action or storm event. Therefore, fish and other prey species are expected to be somewhat tolerant to turbidity. The amount of prey potentially affected is not expected to have an appreciable effect on the availability of suitable prey for ESA-listed species. For these reasons, changes to the benthic habitat and turbidity effects are likely to have an imperceptibly small effect on the prey resources and habitat, and we conclude that the adverse effects from substrate disturbance are insignificant.

Analyzing Effects Upon Critical Habitat

Ringed Seal Critical Habitat

Critical habitat for the Arctic ringed seal was designated April 1, 2022 (87 FR 19232). Critical habitat for the Arctic ringed seal extends to an area of marine habitat in the northern Bering, Chukchi, and Beaufort seas Figure 5. Below we evaluate effects to physical and biological features of ringed seal habitat, as defined in 87 FR 19232.

1. Snow-covered sea ice suitable for the formation and maintenance of subnivean lairs, defined as waters 3 meters or more in depth, with seasonal landfast ice or stable pack ice having snow drifts of at least 45 centimeters in depth to form and maintain birthing, whelping and nursing lairs.

Because this project will only occur in ice-free months, it will not overlap with PBF 1.

2. Sea ice for molting is defined as waters of 200 meters depth or less, with a pack ice concentration of at least 15 percent.

Because this project will occur only in ice-free months, it will not overlap with PBF 2.

3. Primary prey resources to support Arctic ringed seals, which are defined to be small, often schooling, fishes, in particular Arctic cod, saffron cod, and rainbow smelt; and small crustaceans, in particular, shrimps and amphipods.

The physical presence and noise associated with vessels and cable laying equipment could displace ringed seal prey from optimal ringed seal foraging habitat. However, vessel disturbance will be very limited spatially and temporally, as will the response of fish to the vessel(s). Although there may be some short-term disturbance to prey species, we do not expect it to decrease the availability of prey or otherwise compromise their health or fitness. Moreover, temporary vessel disturbance is not expected to permanently displace primary prey or modify habitat in a way that it can no longer support primary prey species. Effects related to vessel noise and vessel presence are very minor, therefore we conclude that that any adverse effects from vessel noise or vessel presence on PBF 3 are insignificant.

Small spills associated with project vessels may occur which may affect ringed seals' primary prey species. Petroleum hydrocarbons can persist in the food chain, particularly in species that have a low capacity to detoxify. Marine fish metabolize and excrete petroleum hydrocarbon quickly, therefore even in heavily oil-contaminated environments, most fish do not accumulate or retain high concentrations of petroleum hydrocarbons, and thus are not likely to transfer them to predators. Likewise, most marine crustaceans are also able to metabolize and excrete accumulated hydrocarbons quickly. Conversely, amphipods are very sensitive to oil and experience high mortality and slow recovery in response to spilled oil (Neff 1990). However, refined petroleum products such as gasoline, diesel fuel, and solvents rapidly dissipate into thin films. The toxic volatile components of these products dissipate from the environment quickly via evaporation. Oil droplets and fractions of lighter hydrocarbons partitioned into the water column are expected to disperse with turbulence such as wind and tidal action (Neff 1990), which facilitates further dissipation of contamination over time. Therefore, adverse effects to primary prey species would be highly localized and transient. The probability of contamination occurring at harmful concentrations is very small, and therefore we conclude adverse effects of a small spill to primary prey species are extremely unlikely to occur and are therefore discountable.

Bearded Seal Critical Habitat

Critical habitat for the Beringia DPS bearded seal was designated April 1, 2022 (87 FR 19180). Critical habitat for the Beringia DPS bearded seal extends to the outer boundary of the U.S. Exclusive Economic Zone (EEZ) in the Chukchi and Beaufort seas and south over the continental shelf in the Bering Sea (Cameron et al. 2010) (Figure 3). Below we evaluate effects to physical and biological features of bearded seal habitat, as described in 87 FR 19180.

1. Sea ice habitat suitable for whelping and nursing, which is defined as waters of 200 meters depth or less, with a pack ice concentration of at least 25 percent.

Because activities will only occur during the ice-free months, this project will not overlap with on PBF 1.

2. Sea ice for molting, which is defined as waters of 200 meters depth or less, with a pack ice concentration of at least 15 percent.

Because activities will only occur during the ice-free months, this project will not overlap with PBF 2.

3. Primary prey to support bearded seals occurring in waters of 200 meters depth or less and containing benthic organisms and fishes found on or near the seafloor.

The physical presence and noise associated with vessels and cable laying equipment could displace bearded seal prey (i.e., benthic fishes) from optimal bearded seal foraging habitat. Additionally, the cable itself, or related cable laying/burying tools (i.e., plow, PLGR, water jet) may scour or disturb the benthic substrate that supports

primary prey, or come into contact directly with prey organisms. Vessel effects and substrate disturbance will be very limited spatially and temporally, and it has been suggested that cable installation may actually increase habitat heterogeneity and locally enriched biodiversity (OSPAR 2023). Although there may be some short-term disturbance to prey species, we do not expect it to decrease the availability of prey or otherwise compromise their health or fitness. Moreover, temporary vessel disturbance is not expected to permanently displace primary prey or modify benthic habitat in way that it can no longer support benthic species. Effects related to vessel noise and vessel presence are very minor, therefore we conclude that that any adverse effects from vessel noise or vessel presence on PBF 3 are insignificant.

Small spills associated with project vessels may occur which may affect bearded seals' primary prey species. Heavier fractions of oil sink and eventually deposit in sediments on the benthos where they can persist for extended periods of time (Neff 1990). Bearded seals feed primarily on benthic organisms including invertebrates (crabs, shrimp, clams, worms, and snails) and some fish found on or near the seafloor. Benthic invertebrates, particularly bivalves, accumulate and retain higher concentrations of petroleum hydrocarbons than other taxa (Neff 1990). However, refined petroleum products such as gasoline, diesel fuel, and solvents rapidly dissipate into thin films. The toxic volatile components of these products also dissipate from the environment quickly via evaporation. Oil droplets and fractions of hydrocarbons partitioned into the water column are expected to disperse with wind and tidal action, which facilitates further dissipation of contamination over time. Because the probability of contamination occurring at harmful concentrations is very small, adverse effects to benthic organisms are highly unlikely. Therefore, we conclude that the adverse effects of small spills on PBF 3 are extremely unlikely to occur and are therefore discountable.

Conclusion

Based on this analysis, NMFS concurs with your determination that the proposed action may affect, but is not likely to adversely affect Mexico DPS humpback whales (*Megaptera novaeangliae*), Western North Pacific humpback whales (*Megaptera novaeangliae*), Western North Pacific gray whales (*Eschrichtius robustus*), Western DPS Steller sea lions (*Eumetopias jubatus*) Arctic ringed seals (*Pusa hispida hispida*), Arctic ringed seal critical habitat, Beringia DPS bearded seals (*Erignathus barbatus*), Beringia DPS bearded seal critical habitat, fin whales, (*Balaenoptera physalus*), or North Pacific right whales (*Eubalaena japonica*). Reinitiation of consultation is required where discretionary federal involvement or control over the action has been retained or is authorized by law and if (1) take of listed species occurs, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this concurrence letter, or (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16).

Please direct any questions regarding this letter to Caroline Cummings at caroline.cummings@noaa.gov and to akr.prd.section7@noaa.gov.

Sincerely,

A handwritten signature in black ink that reads "Anne Marie Eich". The script is cursive and fluid.

Anne Marie Eich, Ph.D.
Assistant Regional Administrator
for Protected Resources

cc: anthony.high@usda.gov
genevieve.rozhon@erm.com

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National Marine Fisheries Service Biological Assessment

Airraq Phase 3 and Airraq Kotlik Fiber-
Optic Cable Interconnect

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ACRONYMS AND ABBREVIATIONS

Acronym	Description
BA	Biological Assessment
BIA	Biologically Important Area
BMP	best management practice
BV	beach vault
CFR	Code of Federal Regulations



Acronym	Description
CLS	cable landing station
cm	centimeter
CO	Central Office
CV	connection vault
DA	double armor
dB	decibels
dBA	A-weighted decibels
dB re 1 μ Pa	decibels referenced to 1 micropascal
dB _{rms}	decibels root mean square
DP	dynamic positioning
DPS	Distinct Population Segment
EEZ	Exclusive Economic Zone
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FE	federally endangered
FOC	fiber-optic cable
FR	Federal Register
ft	foot/feet
FT	federally threatened
FTTx	Fiber to the 'x'
HF	high-frequency
HTL	high tide line
kHz	kilohertz
km	kilometer
LF	low-frequency
m	meter
MLW	mean low water
mph	miles per hour
m/s	meters/second
N/A	not applicable
NMFS	National Marine Fisheries Service

Acronym	Description
NOAA	National Oceanic and Atmospheric Administration
OHW	ordinary high water
OW	Otariid pinnipeds
PLGR	pre-lay grapnel run
Project	Airraq Phase 3 and Airraq Kotlik of the Airraq Network
PSLM	Practical Spreading Loss Model
PSO	Protected Species Observer
PT	proposed threatened
PTS	permanent threshold shift
PW	Phocid pinnipeds
RUS	Rural Utilities Service
SELcum	cumulative sound exposure level
SI	Sirenians
SPL	sound pressure level
T	Tununak
TB	Toksook Bay
TBD	to be determined
TTS	temporary threshold shift
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
VHF	very high-frequency

EXECUTIVE SUMMARY

Unicom, Inc., a wholly owned subsidiary of GCI Communications Corporation, proposes to bring high-speed broadband internet service to Alaska's Yukon Kuskokwim Coastal communities as Airraq Phase 3 (RUS Project AK1706-C73/Application Number 101001351) and Airraq Kotlik (RUS Project AK1706-E61/Application Number 101001859) of the Airraq Network (Project). The Project will extend the existing Airraq Network by installing approximately 400 miles (643.7 kilometers) of fiber-optic cable starting in Nunapitchuk and extending to Mertarvik, Tununak, Toksook Bay, Alakanuk, and Emmonak (Phase 3); and install approximately 45 miles (72.4 kilometers) of fiber-optic cable from Emmonak to Kotlik (Airraq Kotlik). The U.S. Department of Agriculture (USDA) Rural Development Rural Utilities Service (RUS) has awarded a grant to Unicom for the Project through the RUS ReConnect program, thereby making the Project a federal action.

Under the federal Endangered Species Act (ESA), the USDA-RUS is required to consult with the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) to determine whether any federally listed endangered, threatened, proposed, or candidate species, or their designated critical habitats, could be affected by the proposed Project and whether the effects of the proposed Project could jeopardize any listed or candidate species or result in the destruction or adverse modification of designated critical habitat. This Biological Assessment (BA) has been prepared to facilitate consultation between the USDA-RUS (and Environmental Resources Management, Inc., the USDA-RUS designated federal representative for ESA consultation, see Appendix B) and NMFS under Section 7 of the ESA.

This BA has been prepared with reference to information retrieved from the NMFS website. The probable presence of listed species was further evaluated by reviewing publicly available data from the state of Alaska, stock assessments, other BAs and biological opinions developed for the region, species distribution spatial data, aerial photographs, bathymetric maps, and recent scientific literature. The actual occurrence of a species in the Project vicinity during Project construction would depend on multiple factors, such as the presence of suitable habitat, the season of the year, and the species' distinct migratory habits. This BA represents the initiation of consultation between the USDA-RUS and NMFS.

Federally threatened, endangered, and candidate species with the potential to occur in the Project area were analyzed in this BA. Species assessed include 16 mammal species (including 6 Distinct Population Segments [DPSs]); 8 fish species (including 9 Evolutionarily Significant Units [ESUs] and 8 DPSs); and 1 invertebrate. The findings of this analysis are summarized in Table ES-1 below, which includes the status of designated critical habitat within the Action Area and the effect determination for each species. Effect determinations consider the Project design, cable installation, and the proposed avoidance and minimization measures to be implemented by the Project.



TABLE ES-1 POTENTIALLY AFFECTED SPECIES AND EFFECT DETERMINATIONS

Species	Status	Is action likely to adversely affect species?	Is action likely to adversely modify critical habitat?
Mammals			
Bearded seal—Beringia DPS (<i>Erignathus barbatus</i>)	Threatened	No	No
Beluga whale—Cook Inlet DPS (<i>Delphinapterus leucas</i>)	Endangered	No	No
Blue whale (<i>Balaenoptera musculus</i>)	Endangered	No	N/A
Bowhead whale (<i>Balaena mysticetus</i>)	Endangered	No	N/A
False killer whale (<i>Pseudorca crassidens</i>)	Endangered	No	No
Fin whale (<i>Balaenoptera physalus</i>)	Endangered	No	N/A
Gray whale—Western North Pacific DPS (<i>Eschrichtius robustus</i>)	Endangered	No	N/A
Guadalupe fur seal (<i>Arctocephalus townsendii</i>)	Endangered	No	N/A
Humpback whale—Western North Pacific DPS (<i>Megaptera novaeangliae</i>)	Endangered	No	No
Humpback whale—Mexico DPS (<i>Megaptera novaeangliae</i>)	Endangered	No	No
Killer whale—Southern Resident DPS (<i>Orcinus orca</i>)	Endangered	No	No
North Pacific right whale (<i>Eubaelena japonica</i>)	Endangered	No	No
Ringed seal—Arctic subspecies (<i>Pusa hispida hispida</i>)	Threatened	No	No
Sei whale (<i>Balaenoptera borealis</i>)	Endangered	No	N/A
Sperm whale (<i>Physeter macrocephalus</i>)	Endangered	No	N/A
Steller sea lion—Western DPS (<i>Eumetopias jubatus</i>)	Endangered	No	No

Species	Status	Is action likely to adversely affect species?	Is action likely to adversely modify critical habitat?
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Fish

Chinook salmon—Lower Columbia River ESU, Puget Sound ESU, Snake River Fall ESU, Snake River Spring/Summer ESU, Upper Columbia River Spring ESU, Upper Willamette River ESU (<i>Oncorhynchus tshawytscha</i>)	Endangered (Upper Columbia ESU) Threatened (all other ESUs)	No	No
Chum salmon—Hood Canal Summer-run ESU (<i>Oncorhynchus keta</i>)	Threatened	No	No
Coho salmon—Lower Columbia River ESU (<i>Oncorhynchus kisutch</i>)	Threatened	No	No
Eulachon—Southern DPS (<i>Thaleichthys pacificus</i>)	Threatened	No	No
Green sturgeon—Southern DPS (<i>Acipensire medirostris</i>)	Threatened	No	No
Sockeye salmon—Snake River ESU (<i>Oncorhynchus nerka</i>)	Endangered	No	No
Steelhead—Lower Columbia River DPS, Middle Columbia River DPS, Snake River Basin DPS, Upper Columbia River DPS, Upper Willamette River DPS (<i>Oncorhynchus mykiss</i>)	Threatened	No	No
Yellow eye rockfish—Puget Sound/Georgia Basin DPS (<i>Sebastes ruberrimus</i>)	Threatened	No	No

Invertebrates

Sunflower sea star (<i>Pycnopodia helianthoides</i>)	Proposed Threatened	No	N/A
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Notes:

DPS = Distinct Population Segment; ESU = Evolutionarily Significant Unit; N/A = not applicable (denotes that species do not have areas designated as critical habitat by NMFS)

1. INTRODUCTION

Unicom, Inc., a wholly owned subsidiary of GCI Communications Corporation, proposes to bring high-speed broadband internet service to Alaska's Yukon Kuskokwim Coastal communities as Airraq Phase 3 (RUS Project AK1706-C73/Application Number 101001351) and Airraq Kotlik (RUS Project AK1706-E61/Application Number 101001859) of the Airraq Network (Project).

The Project will extend the existing Airraq Network by installing approximately 400 miles (643.7 kilometers [km]) of fiber-optic cable (FOC) starting in Nunapitchuk and extending to Mertarvik, Tununak, Toksook Bay, Alakanuk, and Emmonak (Appendix C, Figure 1). The route between Nunapitchuk and Mertarvik will be predominately overland (52 miles [83.7 km]), combined with a shorter submerged portion (approximately 24 miles [38.6 km]) through Baird Inlet. From Mertarvik, the Project will be routed overland and terminate at Tununak, with a T-junction on the pole line to Toksook Bay. The route from Tununak to Alakanuk would be entirely marine (215 miles [346 km]). The termination of the submarine cable will be in Alakanuk via coming up Yukon River and coming ashore near Dump Dock Road. From Alakanuk to Emmonak, a cable will be installed on poles on an existing power line to Emmonak. Phase 3 would also include approximately 9 miles (14.5 km) of the Fiber to the 'x' (FTTx) that Unicom would route throughout the community, connecting to local node splitters. The node splitters enable branching into feeder lines that deliver connectivity to the premise locations in Tununak, Toksook Bay, and Emmonak. The Kotlik component of the Project will extend the FOC 45 miles (72.4 km) from Emmonak to Kotlik, using a predominantly overland route through the Kwikpak Pass and heading north adjacent to the Kotlik River before reaching Kotlik. Airraq Kotlik would also include approximately 4 miles (6.4 km) of FTTx throughout the community.

The purpose of this Biological Assessment (BA) is to provide technical information and to review the Project in sufficient detail to determine to what extent federally threatened, endangered, or candidate species and/or their critical habitats may be affected. In addition, the BA is intended to support the U.S. Department of Agriculture (USDA)-Rural Utilities Service (RUS) Endangered Species Act (ESA) consultation with the National Marine Fisheries Service (NMFS). This BA has been prepared in accordance with the legal requirements found in Section 7(a)(2) of the ESA (50 Code of Federal Regulations [CFR] Part 402; 16 United States Code §1536 [c]).

Details of the activities required to install the Project are provided in Section 2.2. Aquatic activities include the installation of the FOC across wetlands, through Baird Inlet, through the Bering Sea, and nearshore landfall activities. The activities included in this BA are currently estimated to be completed within an approximately 12-month time period for Airraq Phase 3, from summer/fall of 2026 through summer/fall of 2027, and over a 10 to 12-month period for Airraq Kotlik, from winter 2027/2028 through the end of 2028. The Airraq Phase 3 construction activities will require both summer and winter work, while Airraq Kotlik construction activities will take place in the winter.

1.1 PURPOSE AND NEED

The purpose of the Project is to deliver fast, reliable broadband service to Emmonak, Kotlik, Toksook Bay, and Tununak Alaska Native Village Statistical Areas and socially vulnerable

communities in the Bethel and Kusilvak Census Areas, as part of a program that meets grant funding requirements provided by RUS ReConnect. The Proposed Action would aid in providing broadband service in rural areas that do not have sufficient access while facilitating the expansion of broadband services and infrastructure, fueling rural economic development within these communities, benefiting approximately 2,127 people, 33 businesses and five educational facilities.

The FOC network will provide capacity to meet the increased need for the availability of fast, reliable, broadband service to residents of rural communities. Extending the existing Airraq network in Nunapitchuk will provide connectivity to Tununak, Toksook Bay, Emmonak, and Kotlik, and will lay the groundwork for future connectivity in the communities of Mertarvik and Alakanuk. In doing so, the Project will achieve the following:

- Increase direct data communication links;
- Increase data communications reliability;
- Increase diversity of data communication pathways;
- Increase data transmission capacity and speeds to satisfy burgeoning demands; and
- Respond to increasing demand for connectivity.

1.2 DEFINITIONS

Definitions of key terms used throughout this BA are as follows:

- Project Area: Area of direct Project construction effects within the terrestrial and marine environment (Appendix C, Figure 1).
- Action Area: Area directly or indirectly affected by the Project. A full description of the Action Area is provided in Section 2 (Appendix C, Figure 2).
- Project: The installation of 400 miles (643.7 km) of FOC, extending the existing Airraq telecommunications network (Airraq Phases 1 and 2) from Nunapitchuk to Mertarvik, Toksook Bay, Tununak, Alakanuk and Emmonak (Airraq Phase 3); and 45 miles (72.4 km) of FOC, extending the Airraq Phase 3 Network from Emmonak to Kotlik (Airraq Kotlik).

1.3 CONSULTATION HISTORY

A pre-application meeting between Environmental Resources Management, Inc., Unicom, RUS, and NMFS Branch Chief Sierra Franks was held on March 7, 2025. During this meeting, the proposed route map was presented, installation methods were discussed, potential constraints were reviewed, and questions related to the ESA Section 7 consultation were addressed. The NMFS representative verified that appropriate species were being considered, that the proposed timeline for the Project was realistic, and that there were no additional data sources the team was missing. The only potentially relevant seasonal restriction identified was related to subsistence hunting in the fall.

2. DESCRIPTION OF THE ACTION AREA

The Action Area is defined in 50 CFR Part 402.02 as “all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action.” For the purposes of this BA, the Action Area was defined by analyzing the potential extent of effects of the proposed Project in the context of existing infrastructure, habitat suitability, and species sensitivity to human-caused disturbance.

The Action Area for this BA includes the marine and landfall portions of the Project footprint, which includes 298.58 miles (480.52 km) of marine route, where FOC will be laid to interconnect Mertarvik, Tununak, Toksook Bay, Alakanuk, and Emmonak with the existing Airraq Network (Appendix C, Figure 2). Project effects considered in the development of the Action Area include vessel traffic, cable entanglement, artificial light, water quality (including changes in turbidity), substrate disturbance, potential spills of fuel or other hazardous substances, underwater noise, habitat disturbance or loss, effects on habitats of prey of threatened and endangered species, and anthropogenic presence and disturbance. In addition to the Project footprint, the Action Area includes a buffer of 6.21 miles (10 km) to either side of the approximately 1,312-foot (400-m) cable corridor (i.e., the cable could be placed anywhere within this corridor area, allowing for micrositing). The buffer was developed to include the area within which any potential direct or indirect Project effects could occur (Appendix C, Figure 2).

2.1 ACTION AREA BASELINE CONDITIONS AND EXISTING THREATS

2.1.1 TERRESTRIAL ENVIRONMENT

The cable will make landfall in Mertarvik, Tununak, and Alakanuk. The landfall portion of the Action Area is comprised of a variety of habitats such as beaches, tidal mudflats, coastal wetlands, and salt marshes, which provide habitats for many aquatic and terrestrial wildlife species.

In Tununak, the cable makes landfall along the beach within the Tununak community in the vicinity of multiple residences (Appendix C, Figure 1). The Alaska ShoreZone Coastal Inventory and Mapping Project, a database of images, video, and maps of Alaska's coastline, characterizes the nearshore environment of the Action Area in Tununak as an exposed tidal flat of semi-protected mobile sediment (NOAA Fisheries 2024a). The assigned habitat class of semi-protected sediment indicates no epibenthic macro-biota (i.e., species living on or near the substrate's surface) were observed (Cook et al. 2017), but the tidal flat likely supports an epibenthic community of microfauna (i.e., microscopic organisms living on or just above the bottom sediments) typical of coastal tidal flats in Alaska.

At the northern end of the route near Alakanuk, the cable landings sites are within the Yukon-Kuskokwim Delta where the Yukon River meets the Bering Sea (Appendix C, Figure 1). Habitat at these locations is characterized as mostly salt and brackish marsh, and this area is also assigned the habitat class of semi-protected sediment (NOAA Fisheries 2024a). These landfall locations are not adjacent to or within communities.

2.1.1.1 MARINE MAMMAL HAUL OUTS AND ROOKERIES

Although pinnipeds are present in coastal waters surrounding the Yukon-Kuskokwim Delta, they are less common in coastal areas north of Bristol Bay, and many species (though not all) are strongly tied to sea ice movement (Frost et al. 1982). There are no major known haul out sites in the Yukon-Kuskokwim coastal region, nor are there any known rookeries in the region (Allen and Angliss 2013; GBIF 2025a). Small numbers of individuals may sporadically haul out along coastlines in the region, but large aggregations have not been recorded in the Action Area (GBIF 2025a).

2.1.1.2 ANTHROPOGENIC NOISE

The existing noise environment within the landfall portion of the Action Area is characterized by natural ambient sounds including environmental sounds (e.g., wind) and animal-produced sounds (e.g., bird calls), as well as noise generated by small, developed communities. In undeveloped areas, natural sounds are expected to vary from 45 to 70 A-weighted decibels (dBA), an expression of the relative loudness of sounds perceived by humans that gives more value to frequencies near the middle of the human range of hearing. Though studies of natural ambient sound within the Yukon-Kuskokwim Delta are not available, a study in Kenai National Wildlife Refuge to the south determined that the terrestrial soundscape averaged 45.1 dBA, while some bird calls can exceed 70 dBA (USEPA 1974; NPS 2000; USFWS 2010). In contrast, anthropogenic sound in the Action Area consists of occasional human-made noise from ship engines (70 to 90 decibels [dBs]), snowmachines (60 to 79 dB), all-terrain vehicles (65 to 90 dB), and low-flying aircraft (below 91 dB at 500 ft [152.4 m]) (Kuyek 2015; PAME 2019; Nicholas 2021). Within communities, more frequent anthropogenic noise sources include vehicle idling (58 dB), construction equipment (80–120 dB), and diesel generators (USEPA 1971; Przydatek et al. 2023). While noise levels remain relatively low in remote wilderness areas, anthropogenic sounds intermittently disrupt the natural soundscape, with potential implications for wildlife noise exposure.

2.1.1.3 AIR QUALITY

Although there are no air quality monitoring stations in the Project communities, monitoring of communities further inland from the Action Area indicates that current air quality conditions are generally good, and all monitored communities meet federal and state air quality standards (ADEC 2025). Since the area is remote, there are few major sources of pollution, and most emissions come from local activities such as vehicle travel, fires, and windblown dust. The nearest air quality monitoring station in the area is in Bethel (~90 miles [145 km] east of Mertarvik), which recorded one instance of high particulate matter 2.5 (i.e., PM_{2.5}) levels due to wildfire smoke between 2018 and 2020 but no issues with particulate matter 10 (i.e., PM₁₀) (ADEC 2023, 2024). Particulate matter, which comes from sources such as fires, road dust, and combustion, is a common concern in local communities, and the Alaska Department of Environmental Conservation has programs to help reduce emissions in rural areas.

2.1.2 MARINE ENVIRONMENT

The marine waters within the Action Area include Nushagak Bay, Bristol Bay, and Kuskokwim Bay, all of which open to the Bering Sea, and over 1,020 acres (412.8 hectares) of marine coastal wetlands. The marine portion of the Action Area consists of an approximately 238.2-mile (383.35-km) route in the Bering Sea between Tununak and the mouth of the Yukon River (Appendix C, Figure 2). Once away from shore, the route parallels the coastline approximately 20 to 25 miles (32.2 to 40.2 km) offshore. The Bering Sea covers a shallow continental shelf, and the cable will be installed in depths ranging from approximately 23 to 85 ft (7 to 26 m) in the marine offshore environment.

2.1.2.1 SEA ICE

Sea ice begins forming in the Bering Sea in the fall (October to November) and generally melts in the spring (March to May), though timing and extent can vary year to year (Kearney et al. 2021). Ice may extend all the way to the shoreline (i.e., shorefast ice), which provides local communities with access to marine habitats for subsistence fishing and hunting. Historically, the Bering Sea has experienced a maximum winter sea ice cover of 40 to 100 percent (Thoman et al. 2020). This sea ice plays a significant role in regulating climate by insulating marine waters from extremely low atmospheric temperatures (Thoman et al. 2020) and is also critically important for numerous species of marine mammal, including listed ringed seals (Kelly et al. 2010) and bearded seals (Cameron et al. 2010). Ice also serves as a surface for algal growth that plays an important role in initiating biological productivity (Szymanski and Gradinger 2016). In recent years, however, global climate change and associated warming of ocean temperatures have reduced the extent of sea ice in the Bering Sea, leading to a peak ice cover extent in 2018 that was only 47 percent of the mean extent based on historical records (Thoman et al. 2020). Landfast sea ice in the Action Area offshore of the Yukon-Kuskokwim Delta has exhibited an average width of approximately 5.5 miles (8.9 km), though this landfast sea ice has notably been exhibiting a trend of forming later in the year and breaking up earlier in the year (Jensen et al. 2020). Multiple studies have shown that Bering Sea ice exhibits greater interannual variability than sea ice in the Chukchi and Beaufort Seas to the north (Frey et al. 2015; Jensen et al. 2020). In general, landfast ice tends to form earlier in the season around the Yukon-Kuskokwim Delta compared to areas further to the north, but it also tends to break up earlier in the season (Jensen et al. 2020).

2.1.2.2 BENTHIC HABITATS

A bathymetric survey of the marine route plus an approximately 1,312-foot (400-m) buffer to allow for potential route adjustments around sensitive features was performed by Benthic GeoScience Inc. during the summer of 2024 and covered the FOC route starting approximately 11 miles (17.7 km) from shore in the south to approximately 16 miles (25.8 km) from shore in the north (Appendix D; Benthic GeoSciences 2024). This survey provided data on the benthic environment along the majority (~84 percent) of the offshore portion of the Action Area, covering approximately 136.7 miles (220 km) of the planned cable route that runs roughly parallel to the shore between Tununak and Alakanuk.

The survey found that seafloor bathymetry consisted of slopes less than 8 degrees, except in localized areas along the edges of features on the seafloor with relief of approximately 3.3 ft (1 m) over short distances. The depth of the survey area varied minimally, ranging from 22.3 to 84.3 ft (6.8 to 25.7 m). The seafloor was comprised primarily of featureless soft bottom areas, interspersed with structures such as boulders and scours caused by bottom currents and/or storm events. Starting from the southern end of the surveyed route, the first 71.5 miles (115 km) of the seabed along the route is characterized by featureless areas interspersed with boulder fields, boulder-cored pits, seabed pits, and sand ribbons. North of this reach, the seabed is characterized by current scours and ice wedge polygons. This scoured seabed continues until 112.5 miles (181 km) from the southern end of the survey area, and beyond that point current scours alternate with featureless seafloor for another 9.3 miles (15 km). For the next 6.1 miles (10 km) northward, the seafloor is marked with shallow depressions, followed by 0.6 miles (1 km) of featureless soft sediment seafloor. For the next 16.2 miles (26 km), the seabed is scoured, before changing to featureless, soft bottom substrate for the final 23 miles (37 km) to the northern terminus of the survey area (Benthic Geoscience Inc. 2024).

The substrates along the surveyed portion of the marine route were primarily fine sand; however, the southern half of the route had substrates comprised of fine sand with shell fragments, occasional shell beds, and trace silt. In the northern portion of the surveyed route, the substrates were still comprised primarily of fine sand, but silt and sandy silt were interspersed throughout the seabed due to the proximity of the mouth of the Yukon River. Boulders were most abundant in the southern portion of the surveyed area, with several large boulder fields near the southern terminus, and individual or small groups of boulders scattered throughout the rest of the survey area (Benthic Geoscience Inc. 2024).

Although these bathymetric surveys did not provide data on the community of benthic species present in the Action Area, shallow areas along the Bering Sea shelf are known to contain an exceptionally high biomass of benthic fauna, with polychaetes, crustaceans, and sea urchins being the dominant groups in these waters (Lin et al. 2018). Additional nearshore surveys are planned for the seasonal ice-free period in the summer of 2025. In the Action Area, ice-free conditions typically begin between April and early June following the initial breakup of ice between March and May (Jensen et al. 2020).

2.1.2.3 NOISE

Changes in the Arctic arising from climate change and associated decreases in sea ice coverage and increases in vessel traffic are leading to shifts in the underwater soundscape in the Bering Sea (McKenna et al. 2021). Acoustic surveys of the Bering Sea soundscape have demonstrated spatial and temporal variance in sound sources. Animal-produced sounds in the region align with life history patterns of marine mammals, with bearded seal calls occurring throughout the winter months and becoming more common later in spring (April and May; McKenna et al. 2021). Calls from bowhead whales, other baleen whales, and beluga whales are also common throughout the Arctic, with bowhead whale calls being the most frequently recorded in monitoring studies (McKenna et al. 2021). Unidentified, low-frequency biological sounds are also common in the region and may be produced by fish (Pine et al. 2020). Studies indicate that there are slightly

elevated ambient noise levels during daylight hours (Southall et al. 2020), possibly due to the operation of smaller, unmonitored vessels (McKenna et al. 2021). The soundscape in winter is characterized by ice-produced sounds (i.e., cracking), whereas anthropogenic sounds primarily arising from commercial ships are most common in the ice-free periods of summer and fall (McKenna et al. 2021). Acoustic modeling indicates that factors related to the abiotic environment (i.e., wind and ice) are the main driver of sound levels (McKenna et al. 2021).

Anthropogenic noise, mainly from fishing and transit vessels, is most prevalent during the ice-free summer months when activities in the marine portion of the Action Area are proposed. Marine waters in the Action Area experience varying vessel traffic from fishing and shipping activities (Silber and Adams 2019), with local communities relying on barges for commerce and transportation (USACE 2009). Vessel noise, typically reaching a maximum of 195 decibels referenced to 1 micropascal (dBs re 1 μ Pa [a standard reference pressure used in studies of underwater acoustics]) at 3.28 ft (1 m) is primarily generated by cavitation, a phenomenon where air bubble collapse is caused by rapidly moving propeller blades. Although the relative contribution of vessel noise to the Bering Sea soundscape is limited (McKenna et al. 2021), this may change with increasing shipping traffic in the region associated with decreasing extent and duration of sea ice (Ng et al. 2018). Vessel traffic may influence the communication of species inhabiting the Bering Sea via acoustic masking arising from ship-caused noise (Frankel and Gabriele 2017; Fournet et al. 2021).

2.1.2.4 VESSEL TRAFFIC

The Bering Sea supports an important intercontinental trade route between Asia and North America (Burns and Poe 2014) and consequently experiences significant vessel traffic. Although much of the shipping traffic occurs in the vicinity of the Aleutians to the south of the Action Area, a significant proportion of it moves into the more northern reaches of the Bering Sea through the Unimak Pass (Schwehr and McGillivray 2007). Notably, vessel traffic in the Bering Sea has shown an increasing trend that is expected to continue as the extent and duration of sea ice has been reduced by climate change, opening up shipping routes that were historically blocked by ice (Ng et al. 2016; Kapsar et al. 2023). In addition to commercial shipping vessels, the Bering Sea has the highest fishing vessel activity of any waterway in the Arctic, with thousands of fishing vessels and stern trawlers operating in the region each year (Silber and Adams 2019). Vessel traffic occurs across over 96 percent of the Bering Sea's surface, with most transits being short duration trips by fishing vessels (over 11,000 annually), and the most common non-fishing vessel traffic being bulk carriers followed by Cellular Container Ships (Silber and Adams 2019).

2.2 DETAILED PROJECT DESCRIPTION

2.2.1 PROPOSED ACTION

The Proposed Action will consist of funding Airraq Phase 3 and Airraq Kotlik of the Airraq Network (Appendix C, Figure 1). Airraq Phase 3 of the Airraq Network (RUS Project AK1706-C73/Application Number 101001351) will include installation of approximately 400 miles (643.7 km) of FOC, which will interconnect with the existing Airraq Network in Nunapitchuk and extend it to Mertarvik, Tununak, Toksook Bay, Alakanuk, and Emmonak (Appendix C, Figure 1).

From the point of interconnection with the Airraq Network in Nunapitchuk, the Project route will be extended to Mertarvik. This route would be predominately overland (52 miles [83.7 km]); however approximately 24 miles (38.6 km) of the route would be submerged and installed through Baird Inlet. From Mertarvik, the route would be overland and terminate at Tununak with a T-junction on the pole line to Toksook Bay. The route from Tununak to Alakanuk would be entirely marine (215 miles [346 km]). The termination of the submarine cable will be in Alakanuk via coming up Yukon River and coming ashore near Dump Dock Road. From Alakanuk to Emmonak, a cable will be installed on poles on an existing power line to Emmonak. Alternative routes from the offshore waters to Emmonak must be considered based on marine surveys and the presence of cable(s) installed by others. Airraq Phase 3 would also include approximately 9 miles (14.5 km) of the Fiber to the 'x' [FTTx] which would be routed throughout the community, connecting to local nodes where splitters enable branching into feeder lines that deliver connectivity to the premise locations in Tununak, Toksook Bay, and Emmonak. Further, two branching units in the marine waters outside of Scammon Bay and Alakanuk will lay the ground work for potential expansion to be delivered in future builds.

Airraq Kotlik (RUS Project AK1706-E61/Application Number 101001859), will include installation of approximately 45 miles (72.4 km) of FOC which would interconnect with the Airraq Phase 3 in Emmonak and extend to Kotlik (Appendix C, Figure 3). This route would be predominately overland (45 miles [72.4 km]); crossing the Kwikpak Pass and heading north adjacent to the Kotlik River before reaching Kotlik. Airraq Kotlik would also include approximately 4 miles (6.4 km) of FTTx throughout the community.

More details on the marine and overland portions of the Proposed Action for Airraq Phase 3 and Airraq Kotlik, as well as the separate proposed cable routes, are provided in Table 2.2-1 and Table 2.2-2 below.

TABLE 2.2-1 SUMMARY OF LENGTHS FOR AIRRAQ PHASE 3, INCLUDING ASSOCIATED FACILITIES

Proposed Route	Airraq Phase 3 Project Route	Airraq Phase 3 Total Length—miles (km)	Estimated Area of Impact (acres) ¹
<i>Overland Route</i>			
Airraq Phase 3	Aerial	17.0 (27.4)	0.0
Airraq Phase 3	Buried – Backhoe	3.0 (4.8)	3.0
Airraq Phase 3	Buried – Chain Trencher	0.2 (0.3)	0.1
Airraq Phase 3	Surface Lay	87.0 (140.0)	0.0
Airraq Phase 3 FTTx	Aerial	8.0 (12.9)	0.0
Airraq Phase 3 FTTx	Buried – Backhoe	1.0 (1.6)	1.0
Total Overland Route		116.2 (187.0)	4.1
<i>Marine Route (includes Baird Inlet and Offshore)²</i>			
Airraq Phase 3	Buried – Chain Trencher	0.0 (0.0)	0.0

Proposed Route	Airraq Phase 3 Project Route	Airraq Phase 3 Total Length—miles (km)	Estimated Area of Impact (acres) ¹
Airraq Phase 3	Buried – Diver Burial	0.1 (0.2)	0.02
Airraq Phase 3	Buried – Sea Plow	151.0 (243.0)	28.0
Airraq Phase 3	Surface Lay	63.0 (101.4)	0.0
Airraq Phase 3 – Baird Inlet	Buried – Diver Burial	0.1 (0.2)	0.02
Airraq Phase 3 – Baird Inlet	Surface Lay	24.0 (38.6)	0.0
Total Marine Route		238.2 (383.3)	28.04
Grand Total		354.4 (570.4)	32.14

Notes:

FTTx = Fiber to the 'x'; km = kilometer

¹ Estimate based on a maximum estimated terrestrial excavation width of 3 feet (i.e., backhoe excavation) plus a sidecast area of 5 feet for a total impact width of 8 feet, though the use of chain trencher in certain areas would result in a narrower trench width (6 inches) and narrower associated sidecast area. Estimates for marine portions of the route assume a maximum width of 1.5 feet will be disturbed by the jet sled or plow. Therefore, these values are likely an overestimate of area of impact.

² The Marine Routes of the Project include all proposed cable routes over water which include marine and freshwater environments and the landfall routes which terminate at BVs.

TABLE 2.2-2 SUMMARY OF LENGTHS FOR AIRRAQ KOTLIK PROJECT ROUTE, INCLUDING ASSOCIATED FACILITIES

Proposed Route	Airraq Kotlik Project Route	Airraq Kotlik Total Length—miles (km)	Estimated Area of Impact (acres) ¹
<i>Overland Route</i>			
Airraq Kotlik	Aerial	2.0 (3.2)	0
Airraq Kotlik	Buried - Backhoe	0.1 (0.2)	0.1
Airraq Kotlik	Surface Lay	38.0 (61.2)	0
Airraq Kotlik FTTx	Buried - Backhoe	4.0 (6.4)	0
Grand Total		44.1 (71.0)	0.1

Notes:

FTTx = Fiber to the 'x'; km = kilometer

¹ Estimate based on a maximum estimated terrestrial excavation width of 3 feet (i.e., backhoe excavation) plus a sidecast area of 5 feet for a total impact width of 8 feet, though the use of chain trencher in certain areas would result in a narrower trench width (6 inches) and narrower associated sidecast area. Therefore, these values are likely an overestimate of area of impact.

The following sections describe the construction methods and equipment used for the Landfall Route, Overland Route (which includes Community Connections), FTTx, and Marine Route. These methods are anticipated to follow those that were used in Airraq Phase 1 and Airraq Phase 2. The Proposed Action's Marine Route would be installed during the summer months when the water is

not frozen, and no ice accumulation is present. The Proposed Action's Overland Route would be installed during the winter months when the substrate is frozen which would result in less ground disturbances and impacts, and trenching activities in the tundra will not take place if the ground is not frozen. The Overland Route does not pass through the Yukon-Kuskokwim Delta National Wildlife Refuge.

2.2.1.1 LANDFALL ROUTE

The Landfall Route segments are between the mean low water (MLW) mark and each beach vault (BV). There will be one BV per landfall location, and each will be pre-cast measuring 3 ft by 4 ft by 4 ft (0.91 m by 1.22 m by 1.22 m) or 48 ft³ (1.35 m³) and will be fully buried above the high tide line (HTL). Excavation dimensions may vary by shoreline, bank contours, and substrate but will not exceed 5 ft by 5 ft by 5 ft (1.52 m by 1.52 m by 1.52 m) or 125 ft³ (3.54 m³). Divers may be used to assist in transferring the cable from the installation vessel to the landing site. Once the cable is brought ashore, divers are then used to install armor protection and jet bury the cable within the surf zone out to a depth of approximately 10 ft (3 m) of water. Landfall trenching will be conducted with either a chain trencher or backhoe. Chain trenchers dig a trench typically 6 inches (15.24 centimeters [cm]) wide and 36 inches (91.44 cm) deep, while backhoe trenches are 3 feet wide (0.9 m) and 3 feet (0.9 m) deep. When the situation allows, chain trenchers will replace the backhoe for excavation. Chain trenchers excavate smaller trenches and have less associated sidecast. When deemed necessary, additional protection may be provided to the cable at landfall locations with split pipe articulated armor. Chain trenchers and excavators will be staged on landing craft between the high and low water mark.

Up to two 4-inch (10.16-cm) conduits will be placed in the excavated area no deeper than 36 inches (91.44 cm) to extend from the BV seaward to the beach area above MLW, allowing the cables to be pulled into the BV without further disturbing the shoreline. The installation of the conduit will occur prior to the arrival of the cable ship and best management practices (BMPs) will be utilized to prevent erosion and address stormwater runoff concerns. Conduit installation will be conducted in a controlled manner using BMPs prior to the arrival of the cable ship. A maximum of three conduits will be utilized per cable landing site (one conduit per cable). Up to 984 ft (300 m) of split pipe articulated armor may also be used in the four landing sites to provide additional protection for the Project cable.

Excavated material from trench construction as well as BV or connection vault (CV) excavation will be sidecast temporarily (i.e., less than 1 week). In instances where landfall locations require excavation in soft substrates, such as mudflats or beaches composed primarily of other fine sediments, sidecast material will be underlain with geotextile, ice pads, or similar material to allow for removal of the temporary material to the maximum extent practical. Standard trenching techniques will be used to trench and regrade trenched areas to pre-existing contours. Trench design and backfill methods have been created with the intention of preventing constructed areas from collecting excess water and acting as a drain.

For the cable trench in intertidal and terrestrial areas, anticipated maximum excavation dimensions would be 3 ft wide by 3 ft (0.91 m by 0.91 m) deep, and the maximum sidecast width will be 5 ft (1.52 m), for an overall disturbance width of 8 ft (2.44 m). Once the conduit and BV or

CV are installed, or cable has been laid, the sidecast material will be used to bury the conduits or cable. The BVs will be closed for the life of the Project (25 years) unless service or maintenance is required. Cable-trenching work within wetlands and waterbodies under U.S. Army Corps of Engineers (USACE) jurisdiction will be considered a temporary impact, and placement of BVs and CVs will be considered permanent impact. Minimal excess material will be anticipated after compaction of the trench post-construction. Any excess material still present will be disposed of at an upland location. Although not anticipated, horizontal directional drilling (HDD) may be utilized for installation of cables onshore and/or from onshore to offshore.

For all intertidal work (between MLW and HTL), care will be taken to protect shorelines from future erosion, and BMPs will be employed to address stormwater runoff concerns. All construction operations will only occur during low tide. Construction mats will be used in areas without firm coarse sediments, such as cobbles and boulders, to protect the sediment from slumping and erosion. Similar mats were used in Airraq Phases 1 and 2, and are anticipated to cause temporary compaction with no permanent impacts. All impacts and alterations of shorelines would be temporary. Section 2.2.7 provides a summary of all BMPs planned to be administered during the Project's landfall construction activities to minimize and reduce impacts.

Equipment to be used during each landfall will likely include, but is not limited to, the following:

- Rubber wheel backhoe;
- Tracked excavator or backhoe;
- Utility truck and trailer to deliver materials;
- Chain trencher or cable plow;
- Hand tools such as shovels, rakes, and pry bars;
- Survey equipment;
- Winch or turning sheave;
- Small utility boat to run the pull line to the beach;
- Splicing equipment; and
- Shallow draft landing vessel.

Airraq Phase 3

Airraq Phase 3 will include landfall locations at Mertarvik (Appendix C, Figure 3) on the south side of the Ninglick River, Tununak near Allaq and Cemetery Roads (Appendix C, Figure 4), and Alakanuk (Appendix C, Figure 5). Table 2.2-3 provides the BV locations for Airraq Phase 3.

TABLE 2.2-3 AIRRAQ PHASE 3 BV LOCATIONS

BVs	Location (Coordinates)
Mertarvik BV	60.8217, -164.510554
Tununak BV	60.582577, -165.261992
Alakanuk BV	62.68482, - 164.651168

Notes:

Geographic Coordinate System: WGS84; Appendix C, Figures 3, 4, and 5.

BV = beach vault

2.2.1.2 OVERLAND ROUTE

The Overland Route refers to the FOC segments that originate and terminate within a BV or a CV, which will splice the incoming submarine cable with the outgoing terrestrial cable and will be used by communities that do not have a BV. Multiple approaches to the fiber installation were considered before choosing the overland route proposed herein. In addition to the overland route, two submarine paths were considered. The first route where the cable would have been laid far enough offshore that conventional, cable ship-based installation methods could be used for a portion of the route. A second river-based route and an entirely tundra-based route were also considered; however, none of these alternative approaches were found to be practicable.

Overland cable-laying activities will result in minor, temporary tundra habitat disturbance. These activities will take place in winter using vehicles that will not cause surface damage to the tundra. Tracked vehicles will be preferentially used over wheeled vehicles. All overland routes that cross wetlands will be installed during the winter months when the substrate is frozen, which would result in less ground disturbances and impacts. Overland construction activities will require artificial lighting and may take place 24/7. The segments spanning wetlands will use a lightweight submarine cable. Cable will be delivered in either 20-ft (6.1-m) International Organization for Standardization shipping containers or on steel reels. The 20-ft (6.1-m) container can hold approximately 132,000 ft (25 miles [40.23 km]) of lightweight cable, and a steel reel has a capacity of approximately 20,000 ft (3.78 mi [6.08 km]). Cable containers or spools will be towed by light tracked vehicles designed for low impact to the ground. A high-density polyethylene coating will be used with the lightweight submarine cables for added protection, which will measure approximately 0.35 inches (0.89 cm) in diameter. Segments will be joined with each other with a splice joint case that will be 10 inches (25.4 cm) in diameter and 6.5 ft (1.98 m) long. The Project cable will be laid on the substrate with additional slack to allow it to more naturally settle on vegetation and conform to changing surface features and environmental conditions.

The Project's overland sections will either be laid across the ground or trenched. The preferred method for installing the overland cable route is to lay the cable directly on the ground surface which significantly reduces the Project's impacts, especially through wetlands. However, the cable will need to be buried near trails, streambanks and riverbanks, or areas where the cable will be susceptible to damage. The cable will also need to be buried within 0.25 to 0.6 miles (0.40 to 0.97 km) of each community. If permafrost is present during trenching, the trenching will only occur within the vegetative mat above the permafrost, and the permafrost will be left intact.

Where cable trenching is required over wetlands, the cable route will first be cleared of all areas with deep snow. A trench will then be excavated, and the cable will be laid directly within the trench, which is similar to other trenching methods. The target trench depth will be approximately 8 inches (20.3 cm) deep but may vary depending on the conditions and terrain. Where the cable route crosses lakes and ponds, the cable will be laid over the ice surface with adequate slack to allow the cable to passively drop into the waterbody once the ice melts in the spring. The weight

of the cable should allow it to self-bury into the fine sediments at the bottom of the waterbody. Where crossing rivers (i.e., the Yukon River), a submarine cable will be used which will be spliced with the overland cable and buried into each stream back below ordinary high water (OHW) for added protection. Up to 164 ft (50 m) of split pipe articulated armor may also be used around river and stream crossing for added stabilization and protection. Segments crossing major rivers will use a landing craft to lay lightweight submarine cable across the river. Natural sediment transport will passively bury the cable. Major river crossings will be conducted during ice-free periods.

A post-lay inspection for all the terrestrial components of the Project's cable will be conducted following the snow and ice melts, and the exact position of the cable will be recorded using survey grade Global Positioning System. During the post-lay inspection, any portion of cable that is suspended will be repositioned and supported accordingly. Duckbill anchors may be used in certain areas to anchor the cable to the ground, if needed. All portions of the cable laying on vegetation will sink into the vegetated mat over time, eventually becoming overgrown and buried. Annual inspections of the cable will be conducted via walkthrough or helicopter to monitor erosion and bank failure.

Equipment to be used to install the Project cable across the overland routes includes, but is not limited to, the following:

- Piston Bully or similar snow cat or groomer;
- Large sleds to carry 20-ft (6.1-m) cable containers or cable reels;
- Cable highway and payout equipment;
- Rubber wheel backhoe;
- Tracked excavator or backhoe;
- Small bulldozer or other tracked machines to remove snow;
- Utility truck and trailer to deliver materials;
- Light tracked vehicles;
- Chain trencher;
- Hand tools such as shovels, rakes, chainsaws, and pry bars;
- Survey equipment; and
- Splicing equipment.

Airraq Phase 3

The Airraq Phase 3 overland routes will be composed of 14 different FOC segments from Nunapitchuk west to Toksook Bay and Tununak (Table 2.2-1). Cable will be installed through various construction methods including surface-lay (terrestrial and marine), chain trencher burial, buried cable, diver burial, conduit burial, backhoe trenching, and aerial attachment. The portion of the route between Mertarvik and CV Tundra to Poleline CV will be the longest overland segment and will cross extensive wetlands, lakes, ponds, and streams.

Four communities will have one CV in each community. Table 2.2-4 provides CV locations for Airraq Phase 3, and Table 2.2-1 above provides the overland route cable distances for Airraq Phase 3. Appendix C, Figure 6 shows the overland route between Nunapitchuk to Tunanuk, and Appendix C, Figure 7 shows the overland route near Alakanuk and Emmonak.

TABLE 2.2-4 AIRRAQ PHASE 3 CV LOCATIONS

CVs	Location (Coordinates)
Nunapitchuk CV	60.892691, -162.466307
Mertarvik CV	60.813948, -164.501123
Tununak Poleline CV	60.559827, -164.907474

Notes:

Geographic Coordinate System: WGS84

CV = connection vault

2.2.1.3 AIRRAQ KOTLIK

The Airraq Kotlik overland routes will be composed of three different FOC segments (see Table 2.2-2). Cable will be routed from Emmonak to Emmonak CV on existing utility poles. The portion of the route between Emmonak CV and Kotlik will be the longest overland segment and will be surface laid across open ground, wetlands, lakes, ponds, rivers, and streams. The segment from Emmonak will be buried from Kotlik CV into Kotlik and then change to aerial route through Kotlik.

Two communities will have one CV in each community. Table 2.2-5 provides CV locations for Airraq Kotlik, and Table 2.2-2 above provides the overland route cable distances for Airraq Kotlik. Appendix C, Figure 8 shows the overland route between Emmonak and Kotlik.

TABLE 2.2-5 AIRRAQ KOTLIK CV LOCATIONS

CVs	Location (Coordinates)
Emmonak CV	62°46'25.24"N, 164°29'44.65"W
Kotlik CV	63° 1'24.55"N, 163°33'42.61"W

Notes:

Geographic Coordinate System: WGS84

CV = connection vault

2.2.1.4 COMMUNITY CONNECTIONS

The Project's Community Connections include FOC sections between each community's BV or CV and a cable landing station (CLS) or a central office (CO). This section of cable is referred to as the shore route cable. It is attempted to have the most direct route for the shore route cables. The shore route cable can be part of the FTTx portion of the Project and use standard outside plant construction methods for either aerial or underground installations. A new prefabricated 12 ft by 20 ft (3.6 m by 6.1 m) CLS facility will be constructed within Tununak. Emmonak and Toksook Bay have existing CO facilities to house the new equipment needed to connect them to the Airraq Network. A new prefabricated CLS facility will also be constructed in Kotlik within a new lease area. In all cases, the splice point between submarine fiber cable and standard land fiber cable will be housed in a watertight splice enclosure within the BV or CV.

A CLS constructed on pilings and a gravel pad can measure up to 50 ft by 60 ft (15.2 m by 18.3 m). Each CLS will be equipped with fully redundant heating, ventilation, and air conditioning, as well as direct current power systems with 8-hour battery backup. The redundant power generators and transfer switching capability will provide additional resiliency and the quick provision of long-term backup power in the event of a community power grid failure. All facilities will be designed for full-capacity power consumption at commissioning and will not require upgrades as the network carries more traffic. Cable segments within community shore routes will be trenched or attached to existing utility poles and located adjacent to existing Unicom facilities when possible.

The equipment to be used to install the community shore routes includes, but is not limited to, the following:

- Rubber wheel backhoe;
- Tracked excavator or backhoe;
- Utility truck and trailer to deliver materials;
- Light tracked vehicles;
- Chain trencher;
- Hand tools such as shovels, rakes, and pry bars;

- Survey equipment; and
- Splicing equipment.

Airraq Phase 3

Each Airraq Phase 3 community will have one collocated CLS or CO. Each CLS or CO may require an additional generator on a pile platform (see Appendix C, Figures 6 and 7). Table 2.2-6 provides the CLS and CO locations for Airraq Phase 3, and Table 2.2-7 provides the community shore route cable distances by community for Airraq Phase 3.

TABLE 2.2-6 AIRRAQ PHASE 3 CLS FACILITY LOCATIONS

CLS	Location (Coordinates)
Tununak CLS	60.585237, -165.251018
Tooksook Bay CO (existing)	60.532394, -165.106.875
Emmonak CO (existing)	62.777941, -164.535828

Notes:

Geographic Coordinate System: WGS84

CLS = cable landing station; CO = Central Office

TABLE 2.2-7 AIRRAQ PHASE 3 COMMUNITY SHORE ROUTE CABLE DISTANCES

Community	Cable Trenched— miles (km)	Cable Attached to Existing Aerials— miles (km)	Total Distance— miles (km)
Tununak BV to CLS (existing)	0.06 (0.10)	0.52 (0.84)	0.58 (0.93)

Notes:

BV = beach vault; CLS = cable landing station; km = kilometers

2.2.1.5 AIRRAQ KOTLIK

A new CLS facility for Airraq Kotlik will be located within a new lease area near the existing Earth Station located near coordinates 63.035519, -163.532244.

2.2.2 FIBER TO THE 'X'

FTTx will begin at the CLS, which houses the FTTx local access distribution equipment. FTTx will then be routed throughout the community, connecting to local nodes where splitters will be installed to enable branching into feeder lines that deliver connectivity to the premise locations.

FTTx will be distributed throughout communities by trenching or attaching the cable to existing utility poles. If possible, no new utility poles will be constructed for the Proposed Action; instead, existing utility poles will be used where present. Where utility poles are not present, the FTTx route will be trenching.

The equipment to be used to install FTTx includes, but is not limited to, the following:

- Rubber wheel backhoe;

- Tracked excavator or backhoe;
- Utility truck and trailer to deliver materials;
- Light tracked vehicles;
- Chain trencher;
- Hand tools such as shovels, rakes, and pry bars;
- Survey equipment; and
- Splicing equipment.

2.2.2.1 AIRRAQ PHASE 3

FTTx installation will occur in Toksook Bay, Tununak, and Emmonak. Table 2.2-8 provides FTTx cable distances for Airraq Phase 3.

TABLE 2.2-8 AIRRAQ PHASE 3 FTTX CABLE DISTANCES

Community	Trenched FTTx— miles (km)	Aerial Hanging FTTx—miles (km)	Total FTTx— miles (km)
Toksook Bay	0.3 (0.48)	3.3 (5.31)	3.5 (5.63)
Tununak	0.00	1.2 (1.93)	1.2 (1.93)
Emmonak	0.4 (0.64)	3.4 (5.47)	3.9 (6.27)

Notes:

FTTx = Fiber to the 'x'; km = kilometer

2.2.2.2 AIRRAQ KOTLIK

FTTx installation will occur in Kotlik. Table 2.2-9 provides FTTx cable distances for Kotlik.

TABLE 2.2-9 AIRRAQ KOTLIK FTTX CABLE DISTANCES

Community	Cable Trenched— miles (km)	Cable Attached to Existing Aerials— miles (km)	Total Distance— miles (km)
Kotlik	4.00 (6.44)	0.00 (0.00)	4.00 (6.44)

Note:

km = kilometer

2.2.3 MARINE ROUTE—AIRRAQ PHASE 3 ONLY

The Airraq Phase 3 marine route is defined as components taking place below MLW. The Proposed Action Alternative will consist of two marine components: the route between Nunapitchuk and Mertarvik, in which a portion of the route will be installed through Baird Inlet; and the route between Tununak and Alakanuk, which will consist of two branching units that will be installed in the Bering Sea. The path chosen for the marine route was identified through desktop studies and a marine route benthic survey (IT Telecom 2024/5; Benthic GeoScience 2024/5). These engineering and field studies assist in selecting routes that provide consideration for environmental and anthropogenic forms of disturbance on the cable system that may lead to the

cable fault. Fishing activities have been identified by the International Cable Protection Committee as the primary cause for submarine faults and repairs (ICPC 2025). As such, the proposed route identified through desktop and benthic surveys avoids high-impact fishing grounds where possible, and the Project's cable will be buried where ground fishing areas could not be avoided. The identified cable route also utilizes nearshore areas and landfalls that have relatively low energy (wave and tidal energy), have low rates of erosion, are not developed, and are not defined anchorage areas for vessels. Geophysical reviews were also conducted for the route, and considerations were made to avoid areas prone to sediment slumping, fast currents, and other geological hazards. External aggression from the effects of seasonal ice has been identified as the highest risk to the cable in this region and both desktop study and marine survey will allow the route to avoid any areas identified with high ice scaring. If unavoidable, then the cable will require additional protection through higher armoring and cable burial. Historical Automatic Identification System data and the discussions of local mariners are used to avoid anchoring and barge landing areas, which can be a concern for cable safety.

2.2.3.1 PRE-LAY GRAPNEL RUN

Prior to cable burial, a pre-lay grapnel run (PLGR) will be carried out to identify and remove any debris within the proposed cable route to allow an easier installation process. PLGR is conducted by pulling a grapnel along the route over the seabed (Appendix C, Figure 9). Any debris identified by the PLGR will be collected and discharged onshore in accordance with local regulations. If the debris cannot be recovered, then the proposed route will be adjusted to avoid the debris. All industry standards for deploying towed grapnels will be adhered to during the PLGR operation, and the exact type and size of grapnel will be determined based on the specific characteristics of the seabed, but it is likely a flatfish grapnel (~39.8 inches [101.1 cm] wide by 25.6 inches [65 cm] long) will be utilized.

2.2.3.2 MARINE CABLE ROUTE INSTALLATION

Installing the cable along the marine route will rely on up to four vessels for in different phases of construction and navigation. Cable installation vessels may use ports in Unalaska, Homer, Seward, or other ports depending upon the contractors used. The cable-laying method for the cable in the marine route will be dependent on water depth and location. Most of the offshore marine route (in water greater than approximately 30 ft [9.1 m]) will be installed using a full-size cable ship (C.S. IT Intrepid or IT Infinity) (Appendix C, Figure 10) that will rely on dynamic positioning (DP). The nearshore segments of the Project's cable route (less than 340 ft [103.6 m]), such as within Baird Inlet and approaching Alakanuk and Tununak, will be installed using either a tug and barge, a small landing craft stored on the cable ship, or a separate operation using an Alaska Vessel of Opportunity. The Vessel of Opportunity will have a shallow draft and the ability to be grounded on mud flats, but an ideal vessel will be a larger landing craft such as the M/V Polar Bear or M/V Unalaq. These vessels have a shallow draft and large carrying capacity, making shallow waters and landings more accessible with the ability to lay longer lengths of cable at one time.

In the Project's offshore marine route in water depths greater than 30 ft (9.1 m), the cable will be installed by either laying it on the seafloor or burying it by insertion into the sediment using a cable sea plow. Laying the cable on the seafloor will be carried out within areas that have low risk

of cable disturbance or where the geological conditions of the seafloor do not allow for plow burial (e.g., steep grades or bedrock). When laying the cable on the seafloor, a cable ship will be used with engineered slack to ensure the cable conforms to contours of the seafloor.

In areas where the risk of outside aggression to the cable is present (i.e., popular fishing or anchoring locations) or area of ice scaring, a cable plow will be used to install the cable below the seafloor. The cable plow will be pulled along the seafloor by a tow wire connected to the cable ship. The cable will be fed through the plow's share blade, penetrating the seafloor sediments under the plow up to 5 ft (1.5 m) deep through a plow share approximately 1 ft (0.3 m) wide. The cable will exit the lower aft end of the share blade, and the sediments will immediately collapse on top of the cable behind the plow. It is currently estimated that up to 115 miles (185.1 km) of cable will be buried using this method, and the remainder will be surface laid.

In waters with depths less than 30 ft (9.1 m), the Project's cable will either be surface laid where there is a low risk of disturbance or be buried through areas where additional protection from environmental conditions such as surf action and ice scour are needed. Where burial is required, a water jet sled operated from a landing craft or barge system may be used to install the cable below the seafloor. Pressurized water will be used to liquefy substrate on the seafloor and turn the fine sediments into a slurry, and the cable will then sink into the trench. The jet sled will be a self-propelled system, and the pressurized water will be supplied from the surface through pressurized hoses, allowing for the jetting pressure and flow rates to be controlled based on benthic conditions. Divers will accompany the jet sled to monitor the trenching performance and assist in operations. Appendix C, Figure 11 shows a typical jet sled. For marine cable laying, use of a plow or jet sled to trench and re-cover the cable up to 1.5 ft (0.5 m) deep in soft sediments means that no sidecast will be generated.

In waters along the Project's cable routes that are very shallow (3 m / 10 ft or less) or constrained, a smaller shallow draft vessel will be deployed to install the cable. In these shallow areas, the cable will either be surface-laid in areas with low risk of disturbance or buried using divers and hand jetting tools near villages or areas of known vessel anchoring activities. Divers would be used to facilitate cable shore landing at landfall sites. The Project's marine cable will measure approximately 1 inch (2.5 cm) in diameter, will be constructed from benign materials and will not carry an electrical current. Landfall construction activities would take place in July and August.

2.2.4 CONSTRUCTION SCHEDULE

Unicom anticipates initiating construction for Airraq Phase 3 during the summer/fall of 2026 and completing by the end of 2027. Unicom anticipates initiating construction for Airraq Kotlik during the winter of 2027/2028; the FTTx construction is to be determined with final design. It is anticipated Airraq Kotlik construction will be completed by the end of 2028. Construction activities would take place primarily during daylight hours for the marine components, and primarily during nighttime hours for the overland components in the winter months. Additional details involving the construction activities scheduled are provided in Table 2.2-10 below.

TABLE 2.2-10 AIRRAQ PHASE 3 AND KOTLIK PROPOSED CONSTRUCTION SCHEDULE

Project Phase	Component	Season
Airraq Phase 3	CLS work	Summer/Fall 2026
Airraq Phase 3	FTTx Tununak	Summer/Fall 2026
Airraq Phase 3	Marine Installation – Baird Inlet	Late Summer/Fall 2026
Airraq Phase 3	Overland, tundra lay	Winter 2026/2027
Airraq Phase 3	Marine installation Tununak to Alakanak	Summer 2027
Airraq Phase 3	FTTx – Toksook Bay & Emmonak	Summer/Fall 2027
Airraq Kotlik	Emmonak to Kotlik	Winter 2027/2028
Airraq Kotlik	FTTx Kotlik	Summer/Fall 2027 or 2028

Notes:

CLS = cable landing station; FTTx= Fiber to the 'x'

2.2.5 CONSERVATION MEASURES

Unicom will implement the BMPs and conservation measures presented below to avoid or minimize the effects of the Project on listed species and their critical habitats.

2.2.5.1 ONSHORE/LANDFALL MEASURES

General Best Management Practices

Spill Contingency and Hazardous Substances

- All fuel and hazardous substances used by the Project will be handled and stored on-site in compliance with state and federal regulatory guidance. All fuels and chemicals will be stored in appropriate primary containment areas. Secondary containment areas will be designed in compliance with all applicable permits and regulations.
- Fuels and other products will be transported to the Action Area using a licensed, commercial transporter following U.S. Department of Transportation regulations for safe transport of materials to minimize spill risk.
- To fulfill federal and state reporting requirements, all onshore spills of oil, petroleum, or other hazardous substances, of any size, should be reported to the National Response Center (1-800-424-8802) and the Alaska Department of Environmental Conservation Spill Reporting Hotline (1-800-478-9300).

Equipment Use and Site Restoration

- Equipment access will be limited to the immediate Action Area. Tracked vehicles are preferred over wheeled vehicles to avoid soil compaction.
- Temporary fills will be removed in their entirety, and the affected areas will be returned to pre-construction elevations.

- The overland route will be inspected after breakup to ensure the cable is not suspended within water crossings, but instead, conforms to waterbody contours.

Invasive Species

- Equipment will arrive and leave the Action Area clean without visible soil clumps, plant, or animal material. A pressure washer will be used, with special attention given to wheel wells, areas behind the bumper, trailers, and other areas that are likely to catch vegetation or seeds.
- Equipment washing will occur at the same location during Project operations, surveyed regularly, and treated as necessary.
- Equipment will be cleaned away from waterways to prevent the spread of invasive plant species downstream.
- Project operations will occur in uninfested areas first to ensure that invasive species do not contaminate equipment and get moved to new areas.
- Invasive plant contamination of Project materials will be prevented by ensuring stockpile areas are free of invasive species. Gravel and construction materials will be covered to prevent the accidental introduction of plant parts such as seeds, roots, and propagules. Any plant parts will be removed from materials before they are deployed into the field.
- Certified weed-free gravel and hay will be used for the Project. Gravel will meet the standards outlined at plants.alaska.gov/invasives/weed-free-gravel.htm, and hay used in straw wattles will comply with plants.alaska.gov/invasives/weed-free-forage.htm.
- Soil disturbance, including contouring, grubbing, logging, moving, removing, excavating, and cutting, will be managed to minimize its impacts.
- Project materials such as fill, aggregate, and erosion control materials will be carefully managed to prevent the introduction of invasive plant seeds. Certified weed-free hay and gravel, as referenced above, will be used to further reduce the risk of infestation.
- Workers will wear clothing, boots, and gear that minimize soil and plant retention when possible. Before entering and leaving the worksite, they will clean off soil, mud, seeds, and plant material using appropriate tools. Coworkers will be informed about potential seed or propagule transfer on their gear.
- Vertebrate invasive species can stow away in cargo, grain, straw, and hay during transport. Rats and mice will be eradicated if detected on equipment to prevent their spread. Attractants such as shelter, food, and refuse will be eliminated, and trash will be stored in rodent-proof containers. Live rats and mice will never be released into the wild or thrown overboard, as they can swim to shore. Prevention and control measures will follow the Alaska Department of Fish and Game's State Invasive Rodent Plan (adfg.alaska.gov/static/species/nonnative/invasive/pdfs/invasive_rodent_plan.pdf).
Aquatic Resource Protection
Construction and Excavation Requirements
- Excavated material will be stored and contained in uplands. Stockpiled materials must be placed on construction cloth rather than directly on bare marsh surfaces, eelgrass, macroalgae, or other submerged aquatic vegetation.

- Heavy equipment working within wetlands or mudflats must be placed on mats or other measures taken to minimize soil disturbance.
- Temporarily impacted wetlands will be restored to pre-existing conditions (e.g., hydrology, grade, and vegetation).

Shoreline and Wetland Protection

- Disturbed shoreline and streambank areas affected by this Action will be restored to pre-construction contours and stabilized to prevent erosion and sedimentation.
- Existing rights-of-way will be used whenever possible to reduce wetland encroachment and disturbance.
- Natural drainage patterns will be maintained using appropriate methods. Excessive ponding or drying adjacent to fill areas will indicate non-compliance with this condition.

Waterbody Protection and Compliance

- All exposed soil and fills, as well as any work below OHW, will be permanently stabilized at the earliest practicable date.
- Structures or materials will not be placed in streams to facilitate crossings.
- Winter crossings will only occur if ice thickness is sufficient to support the equipment. Open water crossings with equipment and vehicles during winter will not occur.
- Equipment will not be fueled or serviced below OHW of permitted waterbodies. Fuel storage is also prohibited below OHW. Any vehicles leaking fuel, hydraulic fluids, or other pollutants will not be operated below OHW.

Vegetation and Habitat Protections

- The Project footprint will be minimized by using already disturbed areas or lower-quality habitats whenever possible.
- Infrastructure will be collocated in existing disturbed areas such as rights-of-way (e.g., using road corridors for utilities, placing new antennas on existing towers, and locating new structures near existing ones).
- Stream and riparian buffers will be preserved to maintain water quality, stabilize streambanks, support fish and wildlife habitat, and provide flood protection.
- Overland cable routes will be laid or trenched during winter to avoid or minimize ground disturbance and protect vegetation from heavy equipment and temporary sidecast.

Soil Protections

- Construction will avoid sensitive soils, including highly erosive soils and thaw-unstable permafrost, to prevent degradation and subsidence.
- Trenching in thaw-sensitive soils (e.g., continuous/discontinuous permafrost) will be avoided due to the risk of permafrost degradation and water quality impacts. Alternative methods such as direct cable lay, overhead cable with poles, or wireless broadband (4G/5G network towers) will be considered.

2.2.5.2 OFFSHORE MEASURES

As part of the proposed Project, Unicom has committed to the following measures intended to avoid and minimize adverse impacts on ESA-listed species and their habitat, which are NMFS Alaska Region standard mitigation measures:

- Unicom will inform NMFS of impending in-water activities a minimum of 1 week prior to the onset of those activities (email information to akr.prd.records@noaa.gov).
- If construction activities will occur outside the time window specified during consultation, the applicant will notify NMFS of the situation at least 60 days prior to the end of the specified time window to allow for re-initiation of consultation.
- In-water work will be conducted at the lowest points of the tidal cycle when feasible.
- Consistent with Alaska Statute 46.06.080, trash will be disposed of in accordance with state law. Trash comprised of closed loops (e.g., packing straps, rings, bands, etc.) will be cut prior to disposal. In addition, the Project proponent will secure all ropes, nets, and other marine mammal entanglement hazards so they cannot enter marine waters.

In addition to the NMFS Alaska Region standard mitigation measures, Unicom also proposes the following measures:

- Proposed Action-associated staff will cut all materials that form closed loops (e.g., plastic packing bands, rubber bands, all other loops) prior to proper disposal in a closed and secured trash bin. Trash bins will be properly secured with locked or secured lids that cannot blow open, preventing trash from entering the environment, thus reducing the risk of marine mammal entanglement should waste enter marine waters.
- To the extent it is practicable and safe, vessel operators will operate their vessel thrusters (both main drive and DP) at the minimum power necessary to accomplish the work.

Spill Contingency and Hazardous Substances

- All fuel and hazardous substances used by the Project will be handled and stored on-site in compliance with state and federal regulatory guidance. All fuels and chemicals will be stored in appropriate primary containment areas. Secondary containment areas will be designed in compliance with all applicable permits and regulations.
- Fuels and other products will be transported to the action area using a licensed, commercial transporter following U.S. Department of Transportation regulations for safe transport of materials to minimize spill risk.

Protected Species Observer

The NMFS Alaska Region standard mitigation measure to have Protected Species Observers (PSOs) is used for this Project, with specifics developed for this Project as listed below:

- Two PSOs will perform PSO duties on-site throughout cable-laying activities.
- When travel speeds are greater than 5 knots (5.8 miles per hour [mph]; 9.33 km per hour), two PSOs will monitor all marine waters within 6,234 ft (1900 m) of the vessel during all daylight hours, and report sightings to NMFS.

- PSOs will be positioned such that they will be best suited to safely monitor the entirety of each activity. Prior to commencing cable-laying activities, PSOs will scan waters within the cable-laying operations zone and confirm no listed marine mammal species are within the zone for at least 30 minutes immediately prior to initiation of in-water activity.
- If one or more listed marine mammal species are observed within the zone, the in-water activity will not begin until the listed marine mammal species exit the zone of their own accord. Alternately, if the PSO has continuously scanned these waters and has not observed listed marine mammals within the zone for 30 minutes, then cable laying may commence. If a listed marine mammal species is harassed, harmed, injured, or disturbed, PSOs will immediately report that occurrence to NMFS.
- Protected Species Observer Requirements: PSOs must be independent (i.e., not vessel or cable crew) and have no other assigned tasks during monitoring periods. The action agency or its designated non-federal representative will provide resumes or qualifications of PSO candidates to NMFS for approval at least 1 week prior to in-water work. NMFS will provide a brief explanation of lack of approval in instances when an individual is not approved.
- At least one PSO will have prior experience performing the duties of a PSO during construction activity.
- At least one PSO will complete PSO training prior to deployment (contact NMFS Alaska Regional Office Protected Resources Division for a list of trained and experienced PSOs) or have prior PSO experience as a PSO in Alaska. The training will include:
 - Field identification of marine mammals and marine mammal behavior;
 - Ecological information on marine mammals, and specifics on the ecology and management concerns of those marine mammals;
 - ESA and Marine Mammal Protection Act regulations;
 - Proper equipment use;
 - Methodologies in marine mammal observation and data recording, and proper reporting protocols; and
 - Overview of PSO roles and responsibilities.
- PSOs' abilities will include:
 - Vision that allows for adequate monitoring of the entire mitigation zone;
 - Effective oral communication, by radio and in person, with Proposed Action personnel;
 - Collection of field observations and recording field data accurately and in accordance with Proposed Action protocols;
 - Identification to species all marine mammals that occur within the proposed Action Area; and
 - Writing skills sufficient to create understandable records of observations.
- PSOs will work in shifts lasting no longer than 4 hours, with at least a 1-hour break from monitoring duties between shifts.
- PSOs will not perform PSO duties for more than 12 hours in a 24-hour period.

- PSOs will have the following equipment to address their duties:
 - Tools that enable them to accurately determine the position of a marine mammal in relationship to the mitigation zone;
 - Two-way radio communication, or equivalent, with on-site Project manager;
 - Tide tables for the Proposed Action area;
 - Watch or chronometer;
 - Binoculars (7 by 50 or higher magnification) with built-in rangefinder or reticles (rangefinder may be provided separately);
 - Instruments that allow PSO to determine geographic coordinates of observed marine mammals;
 - Legible copy of the letters of concurrence and all appendices; and
 - Legible and fillable observation record form, allowing for required PSO data entry.
- Prior to commencing in-water work or at changes in watch, PSOs will establish a point of contact with the crew. The PSO will brief the point of contact as to the mitigation procedures if listed species are observed to be likely to enter or within the operations zone and will request that the point of contact instruct the crew to notify the PSO when a marine mammal is observed. If the point of contact goes "off shift" and delegates their duties, the PSO must be informed and brief the new point of contact.

Data Collection and Reporting

- PSOs will record observations on data forms or into electronic data sheets.
- The action agency will ensure that PSO data will be submitted electronically in a format that can be queried, such as via a spreadsheet or database (i.e., digital images of data sheets are not sufficient).
- PSOs will record the following:
 - Date, shift start time, shift stop time, and PSO identifier;
 - Date and time of each reportable event (e.g., a marine mammal observation, operation shutdown, reason for operation shutdown, change in weather);
 - Weather parameters (e.g., percent cloud cover, percent glare, visibility) and sea-state, where the Beaufort Wind Force Scale will be used to determine sea-state;
 - Species; numbers; and, if possible, sex and age class of observed marine mammals, and observation date, time, and location;
 - Predominant anthropogenic sound-producing activities occurring during each marine mammal observation;
 - Observations of marine mammal behaviors and reactions to anthropogenic sounds and human presence;
 - Initial, closest, and last-known location of marine mammals, including distance from PSO to the marine mammal, and minimum distance from the predominant sound-producing activity or activities to marine mammals;

- Whether the presence of marine mammals necessitated the implementation of mitigation measures to avoid acoustic impact, and the duration of time that normal operations were affected by the presence of marine mammals; and
- Geographic coordinates for the observed animals (or location noted on a chart), with the position recorded using the most precise coordinates practicable (coordinates will be recorded in decimal degrees, or similar standard, and defined coordinate system).
- Observations of humpback whales will be transmitted via email to AKR.section7@noaa.gov by the end of the calendar year, including information specified in General Data Collection and Reporting (above), as well as photographs and videos obtained of humpback whales, most notably those of the whale's flukes.
- All observations of North Pacific right whales will be reported to NMFS within 24 hours. Photographs and/or video should be taken if possible to aid in photo identification of individual animals. Reports will include all applicable information that will be included in a final report.
- All observations of ESA-listed marine mammal species not considered in this consultation will be reported to NMFS within 24 hours. Photographs and/or video should be taken if possible to aid in photo identification of individual animals. Reports will include all applicable information that will be included in a final report.

Unauthorized Take

- If a listed marine mammal is determined by the PSO to have been disturbed, harassed, harmed, injured, or killed (e.g., a listed marine mammal(s) is observed entering a shutdown zone before operations can be shut down, or is injured or killed as a direct or indirect result of the Proposed Action), the PSO will report the incident to NMFS within 1 business day, with information submitted via email to akr.section7@noaa.gov. These PSO records will include:
 - All information to be provided in the final report (see Mitigation Measures under the Final Report heading below);
 - Number of animals of each threatened and endangered species affected;
 - Date, time, and location of each event (provide geographic coordinates);
 - Description of the event;
 - Time the animal(s) was first observed or entered the shutdown zone and, if known, the time the animal was last seen or exited the zone and the fate of the animal;
 - Mitigation measures implemented prior to and after the animal was taken;
 - Whether a vessel struck a marine mammal, the contact information for the PSO on duty, or the contact information for the individual piloting the vessel if no PSO was on duty; and
 - Photographs or video footage of the animal(s) (if available).

Stranded, Injured, Sick or Dead Marine Mammals

- If PSOs observe an injured, sick, or dead marine mammal (i.e., stranded marine mammal), they will notify the Alaska Marine Mammal Stranding Hotline at 1-887-925-7773. The PSOs will submit photos and available data to aid NMFS in determining how to respond to the

stranded animal. If possible, data submitted to NMFS in response to stranded marine mammals will include:

- Date/time;
- Location of the stranded marine mammal(s);
- Species and number of the stranded marine mammal(s);
- Description of the stranded marine mammal's condition;
- Event type (entanglement, dead, floating); and
- Behavior of live-stranded marine mammals.

Illegal Activities

- If PSOs observe marine mammals being disturbed, harassed, harmed, injured, or killed (e.g., feeding, unauthorized harassment), these activities will be reported to NMFS Alaska Region Office of Law Enforcement at 1-800-853-1964.
- Data submitted to NMFS will include:
 - Date/time;
 - Location;
 - Description of the event; and
 - Any photos or videos taken.

Final Reporting

- A draft of the final report will be submitted to NMFS within 90 calendar days of the completion of the Proposed Action summarizing the data recorded and submitted via email to AKR.section7@noaa.gov. A final report must be prepared and submitted within 30 calendar days following receipt of any NMFS comments on the draft report. If no comments are received from NMFS within 30 calendar days of receipt of the draft report, the report may be considered final. The report will summarize all in-water activities associated with the Proposed Action and results of PSO monitoring conducted during in-water activities. The final report will include:
 - Summaries of monitoring efforts, including dates and times of construction; dates and times of monitoring; and dates, times, and duration of shutdowns due to marine mammal presence;
 - Date and time of marine mammal observations; geographic coordinates of marine mammals at their closest approach to the Proposed Action area; and marine mammal species, numbers, age/size/sex categories (if determinable), and group sizes; and
 - Digital, queryable documents containing PSO observations and records; and digital, queryable reports.

Modify Vessel Operations

The NMFS Alaska Region standard mitigation measure to modify vessel operations will be used for this Project.

- Vessel operators will:
 - Maintain a watch for marine mammals at all times while underway;
 - Stay at least 100 yards (91.4 m) from listed marine mammals; exception is that they will remain at least 500 yards (457.2 m) from endangered North Pacific right whales;
 - Travel at less than 5 knots (5.8 mph [9.3 kph]) when within 300 yards (274.3 m) of a whale;
 - Avoid changes in direction and speed when within 300 yards (274.3 m) of a whale, unless doing so is necessary for maritime safety;
 - Not position vessel(s) in the path of a whale, and not cut in front of a whale in a way or at a distance that causes the whale to change direction of travel or behavior (including breathing/surfacing pattern);
 - Check the waters immediately adjacent to the vessel(s) to ensure no whales will be injured when the vessel gets underway;
 - Operate their vessel thrusters (both main drive and DP) at the minimum power necessary to accomplish the work to minimize acoustic disturbance;
 - Reduce vessel speed to 10 knots (11.5 mph) or less when weather conditions reduce visibility to 1 mi or less; and
 - Adhere to the Alaska Humpback Whale Approach Regulations when vessels are transiting to and from the Proposed Action area (see 50 CFR 216.18, 223.214, and 224.103[b]; note: these regulations apply to all humpback whales). Specifically, the pilot and crew will not:
 - Approach, by any means, including by interception (i.e., placing a vessel in the path of an oncoming humpback whale), within 100 yards (91.4 m) of any humpback whale;
 - Cause a vessel or other object to approach within 100 yards (91.4 m) of a humpback whale; or
 - Disrupt the normal behavior or prior activity of a whale by any other act or omission.
- If a whale's course and speed are such that it will likely cross in front of a vessel that is underway, or approach within 100 yards (91.4 m) of the vessel or 500 yards (457.2 m) for North Pacific right whales, and if maritime conditions safely allow, the engine will be put in neutral, and the whale will be allowed to pass beyond the vessel.
- Vessels will not allow unused or loose tow lines to remain in the water unless both ends are under tension and affixed to vessels or gear. No materials capable of becoming entangled around marine mammals will be discarded into marine waters.
- Project-specific barges will travel at 12 knots (13.8 mph [22.2 kph]) or less.
- Vessels will not approach within 3 nautical miles (5.6 km) of rookery sites listed in 50 CFR 224.103(d).
- Vessels will not approach within 3,000 ft (914.4 m) of any Steller sea lion haul out or rookery that is not listed in 50 CFR 224.103(d).
- Where possible, FOC will be laid on the seafloor, reducing effects on marine mammal habitat.

3. EFFECTS OF THE ACTION

The following describes the potential effects of the proposed Project. Section 4 evaluates these effects in relation to listed species with potential to occur in the Action Area.

3.1 HABITAT DISTURBANCE OR LOSS

3.1.1 LANDFALL

Project activities within the Action Area will result in minor, temporary disturbance to coastal habitat where cables will make landfall. Excavation and trenching will occur associated with burial of BVs and cable conduits. Chain trenchers and excavators will be staged on landing craft between the high and low water mark. Standard trenching techniques will be used to trench and regrade trenched areas to pre-existing contours at landfall sites. Excavated material will be sidecast temporarily and will be used to backfill trenched areas. In instances where landfall locations require excavation in soft substrates, such as mudflats or beaches composed primarily of other fine sediments, sidecast material will be underlain with geotextile, ice pads, or similar material to allow for removal of the temporary material to the maximum extent practical. Minimal excess material is anticipated after the completion of the trenches, and any excess material will be disposed of at an upland location.

Trenching in intertidal areas or near shorelines could result in erosion and stormwater runoff; however, effects and alterations of shorelines would be temporary. Construction activities will only occur during low tide, and construction mats will be used in areas without firm coarse sediments, such as cobbles and boulders, to protect the sediment from slumping and erosion. Effects on coastal habitat would be minimized with the implementation of conservation measures included in Section 2.2.7.

3.1.2 MARINE FORAGING HABITAT

Project activities within the marine portions of the Action Area could cause temporary disturbance to listed species benthic foraging habitat.

The use of the cable plow, water jet sled, and hand jets, as well as the PLGR, would affect the benthic environment by temporarily reducing the area of benthic habitat and disturbing benthic species. Benthic habitat could also be temporarily disturbed by trenching and cable-laying activities due to increased amounts of suspended sediments.

Benthic organisms and communities include invertebrates such as worms, clams, and crustaceans, as well as fish and marine mammals that utilize benthic areas and communities for foraging. The effects of the Project on these organisms are expected to be limited to the areas directly beneath and adjacent to the cable placement where cable laying and burial will occur. Motile invertebrates, fish, and other wildlife in the vicinity are anticipated to avoid the cable installation and areas of human activity, and expected to recolonize the area after the cable has been installed. Non-motile invertebrates directly affected by the cable could experience mortality as a result of crushing, smothering, or scouring, though levels are not anticipated to result in population-level effects given the narrow diameter and associated spatially restricted effects of the cable. The Project

plans to incorporate measures to avoid hard bottom communities to the greatest extent feasible based on the route survey data. The suspension of sediments during the Project may disrupt filter-feeding mechanisms and interfere with ingestion and respiration of sedentary invertebrates, as well as smother fish and invertebrate eggs in the vicinity and reduce photosynthesis of vegetation (Berry et al. 2003). The potential alteration of habitat and smothering of benthic substrates could diminish the availability of niches and microhabitats, resulting in local decreases in species diversity and abundance. Additionally, habitat degradation could interfere with ecological interactions (i.e., predator-prey relationships and competition) (Kayode-Edwards 2024); however, any suspended sediments occurring as a result of Project activity is anticipated to be localized and would therefore not be anticipated to result in a significant change from existing conditions. Further, it is expected that the sediment would naturally settle out and dissipate from the effects of vessel traffic, current, and wave action over a short duration (i.e., hours). Increased turbidity in the water column could also result in physical impairment of fish species, causing potential turbidity-induced clogged gills (i.e., suffocation or abrasion of sensitive epithelial tissue) and alteration of foraging behavior for visual predators. Fish typically avoid areas of increased suspended sediment (Wenger et al. 2017). Due to turbidity and other potential effects (e.g., underwater sound and human activity), it is anticipated that mobile species (e.g., fishes) would likely avoid areas of cable laying during the activity, instead moving to surrounding areas of similar habitat, then returning once the activity is complete and the sediment plume has dissipated. Mobile species such as fishes, clams, and shrimps are anticipated to recolonize the cable lay area quickly. It is anticipated that recolonization of the cable route would occur following completion of Project activities. Benthic communities tend to be resilient to direct disturbances. Studies show that benthic communities recover from direct physical disturbance at various rates, with some recovering as quickly as 100 days and others taking 2 years or more to fully recover (Germano et al. 1994; Dorn and Warwick 2003). No long-term effects to foraging areas from turbidity are anticipated which would preclude species from utilizing the Action Area. The potential effects of the Project activities on benthic habitat and species foraging/prey relationships resulting from sediment deposition and turbidity are anticipated to be minor, short-term, and localized to the area of the cable-laying route.

3.2 VESSEL STRIKES

Vessel speed has been correlated with marine species injury or mortality, with strikes tending to occur when vessels travel faster than 13 knots (6.7 meters/second [m/s]) and with a mean vessel speed of 18.1 knots (9.26 m/s) (Jensen and Silber 2003, McKenna et al. 2012; Currie et al. 2017). As speed increases from 8.6 to 15 knots (4.4 to 7.7 m/s), the probability for a strike to be fatal increases from 21 percent to 79 percent (Winkler et al. 2020). Cetacean species at risk of vessel strikes include not only slow-moving species that spend significant time near the water's surface but also fast-moving species. Calves and juveniles tend to spend more time at the surface, which makes them more vulnerable to collisions with vessels (Winkler et al. 2020).

Project vessels are expected to operate at low speeds (installation speeds up to 2 knots [1 m/s] and transit speeds up to 10 knots [5.1 m/s]) and proceed along a predictable path. Vessel transit during cable installation is not expected to significantly disrupt normal marine mammal behavioral

patterns (breeding, feeding, sheltering, resting, migrating, etc.) and vessel strikes are unlikely. Further, Project vessel activity would not represent a substantial increase over baseline vessel traffic in the Action Area, as barge operations are common in the Yukon-Kuskokwim Delta region for transporting goods among coastal communities (Alaska DOT&PF 2002).

The movement and sound of Project vessels would be detectable to marine mammals, giving them the opportunity to avoid vessels even if vessel noise interferes with the species' ability to determine the vessel's approach angle (Terhune and Verboom 1999; Allen et al. 2012; Williams et al. 2016; Leaper 2019); however, the possibility remains that marine species that are physically compromised due to illness, injury, or inability to perceive environmental stimuli could be struck. Strikes could also occur if marine species are resting or if they approach the cable and support vessels due to curiosity. Vessel strikes could result in injury or mortality. The increase in the number of Project-related vessels in the Action Area would be small, temporary, and localized and would be consistent with existing vessel traffic from fishing and transit vessels during the ice-free summer months when activities in the marine portion of the Action Area are proposed. PSOs would also be present during in-water work to alert crews to the presence of protected species and employ BMPs to avoid strikes (see Section 2.2.7).

3.3 ENTANGLEMENT

Historically, certain types of subsea cables have posed some risk to whales (Heezen 1957). For example, there are documented occurrences of sperm whale entanglements with submarine telegraph cables at depths up to 3,720 ft (1,134 m) (Heezen 1957); however, these telegraphic cables possessed very different physical characteristics than modern FOC, and historical installation methods differed from modern approaches. Modern FOC installations provide minimal risk of cable exposures or suspensions that could entangle marine species. Modern FOC systems and installation techniques have improved torsional and flexion characteristics in subsea cables as compared to historical cables, virtually eliminating the potential for exposed cable to entangle marine species (Wood and Carter 2009).

Fishing gear snagged and sacrificed on exposed cable is another potential source of entanglement for marine species. The majority of fishing gear that becomes snagged and subsequently abandoned or sacrificed by fishermen is caught on marine debris (Laist 1997; Watters et al. 2010), not necessarily on active and maintained cables. Snagged nets or fishing gear may incidentally entangle marine wildlife until the gear is removed or recovered.

The Project, as proposed, will include measures reducing the likelihood of exposed cable and sacrificed fishing gear, specifically proposed cable burial in high risk areas and avoidance of high-impact fishing grounds where possible. The Project's proposed routing and installation will include state-of-the-art cable route planning and installation techniques designed to increase burial success. The proposed route for the Airraq Phase 3 cable was developed based on desktop and seafloor surveys that mapped substrate types along the cable route. In waters greater than 30 ft (9 m) deep, the offshore cable will be surface-laid or buried into soft sediment using a sea plow. A cable plow will be used to install the cable to a depth of up to 5 ft (1.5 m) deep in areas where risk of outside aggression to the cable is present, such as popular fishing or anchoring locations. In nearshore waters at depths of less than 30 ft (9 m), the cable will be trenched to provide

additional protection from environmental conditions such as surf action and to reduce the potential for disturbance by fishing gear or wildlife. In areas of hard bottom or where geological conditions of the seafloor do not allow for plow burial, the cable will be surface-laid with only enough slack to allow the cable to conform to the seabed. In nearshore waters, the cable will also be articulated to reduce movement and the potential for entanglement.

3.4 LIGHT

Artificial lighting will be used during Project construction and operations. Offshore and onshore installation activities could occur 24 hours per day and will require nighttime lighting, although periods of offshore Project activity will align with the ice-free summer season when daylight lasts 18-21 hours, minimizing the periods when artificial lighting will be required. Ocean lighting is a growing concern among scientists due to the increasing illumination of the coastal zone (Depledge et al. 2010).

Artificial lighting in the marine environment may affect the processes and habitats of marine ecosystems (Marangoni et al. 2022). Illumination could cause artificially induced aggregations of fish (marine mammal prey species) and ichthyoplankton whose movement patterns are normally influenced by sun or moonlight and may enhance the ability of fish to locate and capture prey, especially prey that concentrate in lighted areas (Marchesan et al. 2005; Keenan et al. 2007). Additionally, artificial lighting has the potential to attract wildlife species. Some marine mammals could be attracted to the light seeking potential light-associated prey aggregations (Depledge et al. 2010; Yurk and Trites 2000).

Though some species may benefit from increased lighting through enhanced feeding opportunities, Kurvers et al. (2018) reported that fish daytime behavior is negatively affected by exposure to artificial nighttime lighting. Specifically, fish exposed to any level of nighttime lighting emerged from their daytime hiding places more quickly and fish exposed to bright light spend more time in open areas. This research suggests that fish exposed to nighttime lighting may be at greater risk of predation at any time. Project vessels would not require excessive lighting and would transit through the Action Area over a brief period. Therefore, the effects of vessel lighting would be localized and temporary.

3.5 WATER QUALITY

3.5.1 TURBIDITY

Project activities have the potential to result in the temporary, localized suspension of sediments during the PLGR and cable installation. The PLGR will be conducted in areas prior to trenching in order to clear any debris within the proposed cable route. During cable installation, surface-lay, cable sea plow burial, water jet sled burial, diver burial with hand jets, and trenched excavations for landfall could also result in turbidity. The use of a cable plow is anticipated to penetrate the seafloor sediments to a depth of up to 5 ft (1.5 m) and form a trench approximately 1 ft (0.3 m) in width. Water jet sled and diver burial will take place in areas less than 30 ft (9.1 m) in depth and will rely on pressurized water to turn sediments into a slurry. Project-generated turbidity is anticipated to be minimal due to the small size of the cable (approximately 1.5 inches [3.8 cm] in

diameter) necessitating the disturbance of only a narrow area along the full length of the cable burial route. It is anticipated that the cable will be buried along 115 miles (185 km) of the marine route, an assumed mean trenching width of 1 ft suggests a total area of approximately 13.9 acres (5.6 hectares) will be directly affected by trenching. Sediments and turbidity are expected to return to baseline levels within minutes (with the use of the plow or surface-lay) to hours (with the use of the water jet sled, hand jets, and trenched excavation) and are expected to be localized to the cable route. Notably, marine mammals often occupy turbid waters; therefore, significant negative effects from localized, temporary increases in turbidity arising from the suspension of sediment associated with activities disturbing the seafloor are considered improbable (Todd et al. 2014).

3.5.2 FUEL OR HAZARDOUS SUBSTANCE SPILLS

Project activities require the use of vessels and equipment that have the potential to release fuel, oil, or lubricants into the marine environment. Petrochemical releases into the marine environment have the potential to directly and/or indirectly affect all trophic levels and taxa of marine wildlife at some level, depending on the quantity released. Accidental releases could expose marine species to oil or hazardous materials, resulting in direct effects, such as becoming oiled or sickened, or indirect effects through destruction or degradation of habitat or food sources. Additionally, solid waste releases such as garbage or food waste from vessels can have negative effects on marine species, including federally protected species. Effects can be fatal, depending on the released solid materials.

Vessels operate under strict regulatory requirements that include measures to prevent and respond to an unforeseen accident. Requirements include federal and state oil spill prevention and response requirements. The conservation measures identified in Section 2.2.7 are recommended to avoid and minimize effects on marine wildlife resulting from fuel or hazardous substance spills.

3.6 UNDERWATER NOISE

The Action Area's offshore acoustic environment is currently influenced by multiple anthropogenic sources, such as commercial shipping, research, fishing, and recreation, as discussed in Section 3.6. Noise sources are typically classified into two main categories: impulsive and non-impulsive. Impulsive sounds are typically transient, brief (less than 1 second in duration), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay. Non-impulsive sounds can be broadband, narrowband, or tonal; brief or prolonged; continuous or intermittent; and typically do not have a high peak sound pressure with rapid rise and decay time. The following sections broadly discuss the expected effects of Project underwater noise on listed species with the potential to occur within the Project's Action Area.

3.6.1 LISTED SPECIES UNDERWATER NOISE THRESHOLDS

3.6.1.1 MARINE MAMMALS

NMFS released its Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 3.0; NMFS 2024a) to address the potential effects of underwater sound sources on marine mammals. The guidance defines thresholds at which marine mammals may

experience onset of temporary or permanent effects to hearing (i.e., “threshold shifts”). NMFS defines these marine mammal hearing thresholds as “the received levels at which individual marine mammals are predicted to experience changes in their hearing sensitivity for acute, incidental exposure to underwater anthropogenic sound sources” (NMFS 2024a). Threshold shifts are further categorized as temporary threshold shift (TTS) or permanent threshold shift (PTS). PTS refers to a permanent increase in the threshold of audibility for an ear at a specified frequency above a previously established reference level, whereas a TTS is a temporary change in hearing sensitivity that is non-injurious and reversible. In the Technical Guidance, NMFS equates the onset of PTS with “harm” as defined in the ESA (NMFS 2024a); therefore, PTS is considered equivalent to take. NMFS equates temporary TTS with “harassment,” as defined under the ESA. NMFS also considers noise that results in behavioral changes to constitute “harassment.” Table 3.6-1 presents a summary of the auditory bandwidth for various hearing groups, as well as injury and behavioral thresholds for impulsive and non-impulsive sounds. Both peak sound pressure level (SPL) and cumulative sound exposure level (SEL_{cum}) are used to define thresholds, depending on whether the underwater sound produced is on an impulsive or non-impulsive basis. These thresholds identify the levels at which a marine mammal is predicted to experience changes in hearing sensitivity, whether temporary or permanent, from acute exposure to underwater anthropogenic sound sources. The impulsive noise thresholds are dual metric, meaning whichever results in the largest isopleth (i.e., a line or surface in acoustic modeling showing where a specific sound threshold is reached) for calculating PTS or TTS onset should be used. NMFS recommends that the peak SPL threshold for impulsive noise be used if a non-impulsive sound has the potential to exceed the peak SPL noise threshold associated with impulsive sounds. Table 3.6-1 summarizes the auditory injury criteria used to analyze the effects of impulsive and non-impulsive Project-related noise.

Ocean noise pollution is of particular concern to marine species, especially marine mammals, because of their high dependency on sound as their primary sense for navigating, finding prey, avoiding predators, and communicating with conspecifics. Underwater noise disturbances may displace marine mammals from habitat, mask their ability to communicate, or cause stress (Hildebrand 2005). Louder anthropogenic sounds may also lead to temporary or permanent effects to hearing (TTS or PTS). This, in turn, could interfere with foraging efforts or increase vulnerability to predators. A relationship may exist between certain types of underwater noise (e.g., sonar exercises) and marine mammal strandings (University of Rhode Island and Inner Space Center 2021). Section 3.6.2 describes the auditory injury criteria and methods used to analyze the underwater Project noise.

TABLE 3.6-1 MARINE MAMMAL HEARING GROUPS AND NOISE THRESHOLDS

		Non-impulsive (Vibratory Pile Driving)		Impulse		(Impact Pile Driving)		Behavioral Disturbance Threshold	
Hearing Group ^a	Generalized Hearing Range ^a	TTS Threshold	PTS Threshold	TTS Threshold		PTS Threshold		Impulsive	Non-impulsive
		SELcum (weighted) (dB re 1 µPa2s)	SELcum (weighted) (dB re 1 µPa2s)	SELcum (weighted) (dB re 1 µPa2s)	Peak SPL (unweighted) (dB re 1 µPa)	SELcum (weighted) (dB re 1 µPa2s)	Peak SPL (unweighted) (dB re 1 µPa)		
LF cetaceans (baleen whales)	7 Hz to 36 kHz	177 dB	197 dB	168 dB	216 dB	183 dB	222 dB	160 dB _{RMS}	120 dB _{RMS}
HF cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz	181 dB	201 dB	178 dB	224 dB	193 dB	230 dB		
VHF cetaceans (true porpoises, Kogia, river dolphins, common bottlenose dolphin)	200 Hz to 165 kHz	161 dB	181 dB	144 dB	196 dB	159 dB	202 dB		
PW	40 Hz to 90 kHz	175 dB	195 dB	168 dB	217 dB	183 dB	223 dB		

		Non-impulsive (Vibratory Pile Driving)		Impulse		(Impact Pile Driving)		Behavioral Disturbance Threshold	
(true seals)									
OW (sea lions and fur seals)	60 Hz to 68 kHz	179 dB	199 dB	170 dB	224 dB	185 dB	230 dB		
SI (Manatees, Dugongs)	8 kHz to 60 kHz	180 dB	200 dB	171 dB	219 dB	186 dB	225 dB		

Notes:

dB = decibels; dB re 1 μ Pa_{2s} = decibels referenced to 1 micropascal; HF = high-frequency; kHz = kilohertz; LF = low-frequency; OW = Otariid pinnipeds; PTS = permanent threshold shift; PW = Phocid pinnipeds; SEL_{cum} = cumulative sound exposure level; SI = Sirenians; SPL = sound pressure level; TTS = temporary threshold shift; VHF = very high-frequency

3.6.2 EFFECTS OF UNDERWATER NOISE ON LISTED SPECIES

3.6.2.1 METHODS

Modeling Level A (PTS) Underwater Noise Isopleths

The NMFS User Spreadsheet Tool (Version 3.1; NMFS 2024b) was used to calculate potential Level A effects of underwater Project noise on marine mammals (Appendix A). Using this tool, the effect distances of non-impulsive mobile continuous sources, such as vessels, were calculated by specifying a weighting factor adjustment with frequency-based adjustments. Source-specific data, including sound source level, velocity, duty cycle, and source factor were input into the tool, assuming a propagation loss of $20 \log R$. The tool then calculated resultant isopleths (i.e., distance at which underwater noise would exceed marine mammal PTS thresholds) for various marine mammal hearing groups, applying species-specific weighting functions to account for different sensitivities.

Modeling Level B (TTS and Behavioral Disturbance) Underwater Noise Isopleths

Project-related cable installation methods and support vessels are expected to generate underwater noise levels of up to approximately 180 decibels root mean square (dB_{rms}) measured at 3.3 ft (1 m) from the vessel, based on vessel size and operational characteristics. Environmental Resources Management, Inc., used the Practical Spreading Loss Model (PSLM) (Appendix A), recommended by NMFS (2012) for spherical-spreading noise, to calculate the distance at which underwater noise would reach TTS and behavioral acoustic thresholds for all species groups. The PSLM is presented in NMFS (2012) as:

$$TL = 15 \log\left(\frac{R_2}{R_1}\right)$$

- TL is transmission loss.
- R_1 is the distance of a known or measured sound level.
- R_2 is the estimated distance required for the sound to attenuate to a predetermined acoustic threshold.

The equation may be rearranged to solve for R_2 as:

$$R_2 = R_1 * 10^{\left(\frac{(\text{dB at } R_1 - \text{dB acoustic threshold})}{15}\right)}$$

Project-related marine activities can be expected to generate the following ranges of underwater noise:

- Cable installation vessel: Peak underwater noise levels from the motors of cable lay vessels have been reported to range between 170 and 180 dB (re 1 μPa at 3.3 ft [1 m]) (Hale 2018).

- Installation support vessels: Peak underwater noise levels for small work vessels have been reported to range between 160 and 180 dB (re 1 μ Pa at 3.3 ft [1 m]), depending on the vessel size and design (BOEM 2023).

3.6.2.2 NOISE EFFECTS ON MARINE MAMMALS

The Project-related activities associated with the cable installation process would generate temporary non-impulsive underwater noise.

Marine Mammal PTS (Level A)

Only results for low frequency, otariids pinnipeds, and phocid pinnipeds from Table 3.6-1 are considered below, as listed species considered herein only fall within those three hearing groups. Project-related work vessel activities can be expected to generate peak underwater noise levels of around 180 dB based on anticipated vessel sizes. All NMFS-established marine mammal underwater PTS thresholds for non-impulsive sound levels are greater than the underwater noise generated by cable installation and support vessels; therefore, Project noise would not exceed PTS injury levels (i.e., Level A take) for any marine mammal hearing groups in the Action Area (NMFS 2024a) (Appendix A).

Marine Mammal TTS/Behavioral Disturbance (Level B)

Calculations using the PSLM indicate that a TTS could occur for low-frequency cetaceans (177 dB threshold) within 5.2 ft (1.58 m) of vessels. Phocid Pinnipeds (175 dB threshold) may experience TTS within 7.07 ft (2.15 m) of vessels and Otariid Pinnipeds may experience TTS within 3.82 ft (1.16 m) of vessels. In addition, vessel noise could exceed the behavioral disturbance threshold (120 dB_{rms}) for all marine mammals hearing groups in the Action Area, with sound levels reaching this threshold out to approximately 6.21 miles (10 km) from vessels, as calculated using the PSLM (Appendix A).

While species within the Action Area during Project activities may be exposed to elevated underwater noise levels, it is expected that marine mammals would avoid the immediate area where underwater noise would be generated during cable-laying activities partly due to noise but more likely due to vessel movements and human presence. Further, the noise calculations do not consider the current underwater noise levels in the ambient soundscape (i.e., baseline vessel traffic). Project vessel activity would not represent a substantial increase over baseline vessel traffic and associated underwater sound in the Action Area, as vessel traffic for transporting goods among coastal communities in the Yukon-Kuskokwim Delta region is common (Alaska DOT&PF 2002).

In addition, based on communications with the National Oceanic and Atmospheric Administration (NOAA) Office of Protected Resources on March 11, 2025, the agency would not consider these noise exposures to rise to the level of take. NOAA's recommendations regarding subsea cable projects has evolved in recent years based on modern noise analysis methods and an understanding of marine mammal hearing thresholds. Currently, NOAA does not consider vessel traffic on individual projects (with the exception of certain high levels of noise from tugging vessels) to rise to the level of take.

3.7 ANTHROPOGENIC PRESENCE AND DISTURBANCE

Marine species could be affected by increased general human disturbance for the duration of Project activities. Wildlife species may be displaced from landfall and aquatic habitats due to increased vessel traffic, as well as increased exposure to construction noise, equipment placement, and presence of Project personnel. The physical presence of Project activities and personnel may also cause visual disturbance to wildlife; however, the disturbance would be temporary and minimal considering the scope of existing vessel traffic and marine activities in the region and is not expected to exceed baseline levels.

4. ESA-LISTED SPECIES AND CRITICAL HABITAT CONSIDERED

The following sources were queried to identify federally listed threatened and endangered, proposed, and candidate species under NMFS jurisdiction that may occur within the Project vicinity:

- NOAA Fisheries ESA Threatened and Endangered Species list (NOAA Fisheries 2025d): ESA Threatened and Endangered Species under NOAA jurisdiction in Alaska (Appendix E).
- NOAA Fisheries National ESA Critical Habitat Mapper (NOAA Fisheries 2025c): designated critical habitats for listed species under NOAA jurisdiction in the Project area.

4.1 ESA-LISTED SPECIES CONSIDERED

Table 4.1-1 shows the 24 federally threatened, endangered, or candidate species identified during literature and desktop review that have the potential to occur in the vicinity of the Action Area and are under NMFS jurisdiction (Appendix E). Critical habitat for bearded seal (*Beringia* Distinct Population Segment [DPS]) and ringed seal (Arctic subspecies) overlaps with the Action Area (Appendix C, Figure 12). Based on existing scientific literature and technical reports, several species and critical habitat were eliminated from further consideration due to lack of habitat and/or the fact that the Action Area is outside of the species' known range. Rationale for exclusion is noted for each species.

TABLE 4.1-1 SPECIES AND DESIGNATED CRITICAL HABITAT DETERMINATIONS

Common Name	Scientific Name	Status ¹	Determination /Species Potential to Occur in Action Area	Determination /Critical Habitat Presence Within the Action Area
Mammals				
Bearded seal, Beringia DPS	<i>Erignathus barbatus</i>	FT	May affect but not likely to adversely affect. Bearded seals belonging to the threatened Beringia DPS are found in the Arctic Ocean and adjacent seas in the Pacific Ocean, including the Bering Sea (NOAA Fisheries 2024b). They migrate annually to follow sea ice, moving north in late spring/summer and south in fall. While bearded seals are known to occur in the Action Area (NMFS 2025), the DPS is less likely to be present in the vicinity of the Action Area during marine Project activities, which will occur during the navigable season after sea ice has retreated north. However, some juveniles may still be present in the Action Area, as young bearded seals are known to remain near the coasts of the Bering Sea during summer and early fall, particularly in bays, estuaries, and river mouths (NMFS 2025). Effects on the DPS could include habitat disturbance, effects on prey base, anthropogenic disturbance, noise, vessel strike, entanglement, and water quality effects (i.e., turbidity and hazardous substance spills). With implementation of BMPs and conservation measures (Section 2.2.7), the Project may affect but is not likely to adversely affect the DPS.	May affect but not likely to adversely modify. Designated critical habitat for the Beringia DPS includes marine areas within the Bering, Chukchi, and Beaufort seas. This habitat extends from the shoreward boundary (which is set as the 65.6-ft [20-m] isobath) to an offshore limit, with a maximum water depth of 200 m (87 FR 19180). The critical habitat designation for this DPS defines critical habitat for this species as sea ice habitat suitable for whelping, nursing, and molting, as well as underlying benthic habitat to provide prey resources. Critical habitat overlaps the Action Area, but Project activities within critical habitat will occur during a time of year when sea ice is not present (77 FR 76740). In addition, effects to benthic habitat would be temporary and insignificant. With implementation of BMPs and conservation measures (Section 2.2.7), the Project may affect but is not likely to adversely modify critical habitat.
Beluga whale, Cook Inlet DPS	<i>Delphinapterus leucas</i>	FE	No Effect. Belugas belonging to the Cook Inlet DPS remain in the waters of the Cook Inlet year-round (NOAA Fisheries 2024c) and therefore are not expected to occur in the Bering Sea	No Effect. Critical habitat for the Cook Inlet DPS includes only areas within the Cook Inlet and does not extend to the Bering Sea or the Action Area

Common Name	Scientific Name	Status ¹	Determination / Species Potential to Occur in Action Area	Determination / Critical Habitat Presence Within the Action Area
			in general, nor in the Action Area specifically The Project would have no effect on Beluga whale, Cook Inlet DPS.	(76 FR 20179). The Action would have no effect on this critical habitat.
Blue whale	<i>Balaenoptera musculus</i>	FE	No Effect. Blue whales exist in all global oceans except the Arctic, and they feed in polar waters in the summer months and move to equatorial regions during the winter (NOAA Fisheries 2023a). However, the northern extent of blue whale movement is generally considered the Gulf of Alaska (Burtenshaw et al. 2004), and they are rarely observed in the Bering Sea. Therefore, this species is not anticipated in the Action Area. The Project would have no effect on this species.	No Effect. NMFS has not designated critical habitat for blue whales.
Bowhead whale	<i>Balaena mysticetus</i>	FE	No Effect. Although bowhead whales inhabit the Chukchi, Bering, and Beaufort seas (NOAA Fisheries 2024d), the Bering Sea is the southern extent of their range and studies of their movements suggest they do not occupy shallow water habitats in the vicinity of the Action Area (Citta et al. 2015). The stock assessment report of the Western Arctic Stock indicates the species may be present in the Bering Sea in winter but is most likely to be in deeper waters west of Nunivak Island (Young et al. 2024a), outside the Action Area, and marine Project activities will not occur in winter. Therefore, this species is not anticipated in the Action Area during Project activities. The Project would have no effect on this species.	No Effect. NMFS has not designated critical habitat for bowhead whales.
False killer whale	<i>Pseudorca crassidens</i>	FE	No Effect. The false killer whale is distributed worldwide throughout warm temperate and tropical oceans (Jefferson et al. 2008).	No Effect. Critical habitat has been designated for the false killer whale, but it does not include waters off of Alaska (83 FR 35062).

Common Name	Scientific Name	Status ¹	Determination / Species Potential to Occur in Action Area	Determination / Critical Habitat Presence Within the Action Area
			While false killer whales have been observed off of the U.S. West Coast as far north as British Columbia, Canada, and their range may extend to the eastern Gulf of Alaska (NOAA Fisheries 2025a), this species' range does not extend to the Action Area.	
Fin whale	<i>Balaenoptera physalus</i>	FE	May affect but not likely to adversely affect. Fin whales occur throughout the North Pacific, including the Bering Sea, Gulf of Alaska, and in the Chukchi Sea during the summer months and are generally found outside of coastal waters (Crance et al. 2015; NOAA Fisheries 2024e). The species has the potential to occur in the Action Area during Project activities and be affected by habitat disturbance, effects on prey base, anthropogenic disturbance, noise, vessel strike, entanglement, and water quality effects (i.e., turbidity and hazardous substance spills). With implementation of BMPs and conservation measures (Section 2.2.7), the Project may affect but is not likely to adversely affect the species.	No Effect. NMFS has not designated critical habitat for fin whales.
Gray whale, Western North Pacific DPS	<i>Eschrichtius robustus</i>	FE	May affect but not likely to adversely affect. Gray whales of the Western North Pacific DPS may be present in the eastern Bering Sea and Gulf of Alaska (NOAA Fisheries 2021). From late February to May, gray whales are known to migrate north through coastal waters of the Bering Sea to summer feeding grounds further north and west. Therefore, this species has potential to occur in the Action Area during Project activities and be affected by habitat disturbance, effects on prey base, anthropogenic disturbance, noise, vessel strike, and entanglement. With implementation of BMPs and conservation	No Effect. NMFS has not designated critical habitat for the gray whale Western North Pacific DPS.

Common Name	Scientific Name	Status ¹	Determination / Species Potential to Occur in Action Area	Determination / Critical Habitat Presence Within the Action Area
			measures (Section 2.2.7), the Project may affect but is not likely to adversely affect the species.	
Guadalupe fur seal	<i>Arctocephalus townsendi</i>	FE	No Effect. Rare extralimital sightings of Guadalupe fur seals have occurred in Alaska; however they have been outside of vicinity of the Action Area (McCue et al. 2021). The species is not anticipated to occur in the Action Area. The Project would have no effect on this species.	No Effect. NMFS has not designated critical habitat for the Guadalupe fur seal.
Humpback whale, Western North Pacific DPS	<i>Megaptera novaeangliae</i>	FE	May affect but not likely to adversely affect. The Western North Pacific DPS of humpback whales is found in temperate and subpolar regions in summer months, often in shallower waters close to shore. Feeding grounds for this species are the northern Pacific Ocean, including the Bering Sea and the Aleutian Islands, as well as off the Russian coast (NOAA Fisheries 2024g). This population breeds in Japan and the Philippines, with evidence of a smaller breeding area in the western North Pacific. The Action Area is within the known range of humpback whales of the Western North Pacific DPS and species have the potential to occur during Project activities. The species could be affected by habitat disturbance, effects on prey base, anthropogenic disturbance, noise, vessel strike, entanglement, and water quality effects (i.e., turbidity and hazardous substance spills). With implementation of BMPs and conservation measures (Section 2.2.7), the Project may affect but is not likely to adversely affect the species.	No effect. NMFS designated Critical Habitat for Western North Pacific DPS in 2021 (86 FR 21082) which included areas within the eastern Bering Sea and Gulf of Alaska. Designated critical habitat does not overlap the Project's Action Area.

Common Name	Scientific Name	Status ¹	Determination / Species Potential to Occur in Action Area	Determination / Critical Habitat Presence Within the Action Area
Humpback whale, Mexico DPS	<i>Megaptera novaeangliae</i>	FE	May affect but not likely to adversely affect. Humpback whales belonging to the Mexico DPS feed from California to the Aleutian Islands and Bering Sea of Alaska, then migrate to Mexico's Pacific coast and Revillagigedo Islands to breed (NOAA Fisheries 2024g). The Action Area is within the known range of humpback whales of the Mexico DPS and species has the potential to occur during Project activities. The species could be affected by habitat disturbance, effects on prey base, anthropogenic disturbance, noise, vessel strike, entanglement, and water quality effects (i.e., turbidity and hazardous substance spills). With implementation of BMPs and conservation measures (Section 2.2.7), the Project may affect but is not likely to adversely affect the species.	No effect. NMFS designated critical habitat for Mexico DPS in 2021 (86 FR 21082), which included areas within the eastern Bering Sea and Gulf of Alaska. Designated critical habitat does not overlap the Project's Action Area.
Killer whale, Southern Resident DPS	<i>Orcinus orca</i>	FE	No Effect. The range of the southern Resident killer whale DPS extends from the inland waterways of Washington and Vancouver Island (Puget Sound) during spring, summer, and fall and then to the outer coastal waters of Washington and Vancouver Island in winter. In rare instances, they may be observed in the southeast portion of the Gulf of Alaska (NOAA 2025b; NOAA Fisheries 2023b). The range of killer whales of the Southern Resident DPS does not extend to the Bering Sea and the Action Area. Therefore, individuals of this DPS are not anticipated to occur in the Action Area.	No Effect. Designated critical habitat for the Southern Resident DPS does not include waters off Alaska (86 FR 41668).
North Pacific right whale	<i>Eubalaena japonica</i>	FE	May affect but not likely to adversely affect. Northern Pacific right whales occur in the central North Pacific and Bering Sea, though	No Effect. Critical habitat has been designated in the southeastern Bering Sea and in the Gulf of Alaska south of Kodiak Island. Critical

Common Name	Scientific Name	Status ¹	Determination / Species Potential to Occur in Action Area	Determination / Critical Habitat Presence Within the Action Area
			rare and scattered in distribution. The species is most consistently observed in the southeastern Bering Sea, but the summer range of the eastern stock of the Northern Pacific right whale includes the Bering Sea and the Gulf of Alaska (Young et al. 2024b). Migration patterns are unclear, but they are thought to travel to higher latitudes during the summer (NOAA Fisheries 2024i). The Action Area is within the Northern Pacific right whale's range. The species could be affected by habitat disturbance, effects on prey base, anthropogenic disturbance, noise, vessel strike, entanglement, and water quality effects (i.e., turbidity and hazardous substance spills). With implementation of BMPs and conservation measures (Section 2.2.7), the Project may affect but is not likely to adversely affect the species.	habitat does not overlap with the Action Area (73 FR 19000).
Ringed seal, Arctic subspecies	<i>Pusa hispida hispida</i>	FT	May affect but not likely to adversely affect. The Arctic subspecies of ringed seal occurs in the Arctic Ocean and Bering Sea and is strongly linked to ice cover, including pack ice and shorefast ice (Kelly et al. 2010). This species remains with the ice throughout the year, following the ice advancements and retreats. Though Project activities will occur in summer after sea ice has dissipated, ringed seals may still be present in the waters of the Action Area if ice has not fully retreated (Muto et al. 2021b). The species could be affected by habitat disturbance, effects on prey base, anthropogenic disturbance, noise, vessel strike, entanglement, and water quality effects (i.e., turbidity and hazardous substance spills). With implementation of	May affect but not likely to adversely modify. Critical habitat has been designated in the Bering, Chukchi, and Beaufort seas (87 FR 19232), and is defined as including offshore areas of 9.8 ft (3 m) or more in depth possessing shorefast, snow-covered sea ice for pup whelping and nursing, as well as for basking and molting. Critical habitat is also marked by areas containing primary prey resources, including small schooling fishes. The designated critical habitat for this species overlaps with the Action Area, but Project activities within critical habitat will occur during a time of year that sea ice is not present. With implementation of BMPs and conservation measures (Section 2.2.7), the Project may

Common Name	Scientific Name	Status ¹	Determination / Species Potential to Occur in Action Area	Determination / Critical Habitat Presence Within the Action Area
			BMPs and conservation measures (Section 2.2.7), the Project may affect but is not likely to adversely affect the species.	affect, but is not likely to adversely modify critical habitat.
Sei whale	<i>Balaenoptera borealis</i>	FE	No Effect. The range of sei whales is not known to extend into polar regions and they rarely enter the Bering Sea (Konishi et al. 2024), which suggests their presence in the Action Area is very unlikely. Therefore, this species is not anticipated to occur in the Action Area.	No Effect. NMFS has not designated critical habitat for sei whales.
Sperm whale	<i>Physeter macrocephalus</i>	FE	No Effect. Sperm whales are known to occur in the Bering Sea, but the most recent NOAA stock assessment places them only as far north as 62°N in the western Bering Sea (Muto et al. 2021c), which would suggest that the Action Area in the eastern Bering Sea is at the extreme northern limit of their potential distribution. Further, reviews of historical records indicate sperm whales have only very rarely been observed north of 50°N (Mizroch and Rice 2012), suggesting the Action Area is outside the sperm whale's range.	No Effect. NMFS has not designated critical habitat for sperm whales.
Steller sea lion, Western DPS	<i>Eumetopias jubatus</i>	FE	May affect but not likely to adversely affect. Steller sea lions belonging to the Western DPS range throughout the Bering Sea (Himes Boor and Small 2012). The Western DPS of this species is found mainly along coastlines of the North Pacific Rim, from northern Japan to California, but can also occur in deeper pelagic waters (NOAA Fisheries 2023c). In particular, males are more likely to occur further north in the Bering Sea (NOAA Fisheries 2023c).	No Effect. Designated critical habitat (58 FR 45269) for the Western DPS does not overlap with the Action Area.

Common Name	Scientific Name	Status ¹	Determination /Species Potential to Occur in Action Area	Determination /Critical Habitat Presence Within the Action Area
			Individuals may be present in the Action Area but there are no haul outs or rookeries in the vicinity of the Action Area (Fritz et al 2015). The Action Area is within the known range of Steller sea lions of the Western DPS and species has the potential to occur during Project activities. The species could be affected by habitat disturbance, effects on prey base, anthropogenic disturbance, noise, vessel strike, entanglement, and water quality effects (i.e., turbidity and hazardous substance spills). With implementation of BMPs and conservation measures (Section 2.2.7), the Project may affect but is not likely to adversely affect the species.	
Fish				
Chinook salmon, multiple ESU: Lower Columbia River ESU Puget Sound ESU Snake River Fall ESU Snake River Spring/Summer ESU Upper Columbia River Spring ESU Upper Willamette River ESU	<i>Oncorhynchus tshawytscha</i>	FE (Upper Columbia ESU) FT (all other ESUs)	No Effect. Stocks of Chinook salmon originating from California in the south through Southeast Alaska in the north are known to occur in the eastern Bering Sea and may be particularly common in that region in late spring and summer (Larson et al. 2013). However, Chinook generally occupy marine habitats over the Bering Sea shelf and therefore are farther offshore beyond the extent of Project activities and Action Area. Further, their pelagic behavior suggests they would not be affected by the Project.	No Effect. There is no critical habitat for any of the listed Chinook salmon ESUs in Alaska.

Common Name	Scientific Name	Status ¹	Determination / Species Potential to Occur in Action Area	Determination / Critical Habitat Presence Within the Action Area
Chum salmon, Hood Canal Summer-run ESU	<i>Oncorhynchus keta</i>	FT	No Effect. Chum salmon belonging to this ESU are known to migrate to feeding areas in the Northeast Pacific Ocean off the coast of Alaska (WDFW and PNPTT 2000). However, they largely occupy open ocean areas and are only known to migrate parallel to the coastline of southeast Alaska (not northern Alaska). This range, combined with their pelagic behavior, suggests that they are not anticipated to be affected by the Project.	No Effect. There is no critical habitat for chum salmon in Alaska.
Coho salmon, Lower Columbia River ESU	<i>Oncorhynchus kisutch</i>	FT	No Effect. Coho salmon from the Lower Columbia River ESU may move to Alaskan waters to feed and mature, but they are generally known to occur in the waters of southeast Alaska (NMFS 2013a). Their presence in the Bering Sea is unlikely, and they are not anticipated to be affected by the Project.	No Effect. There is no critical habitat for coho salmon in Alaska.
Eulachon, Southern DPS	<i>Thaleichthys pacificus</i>	FT	No Effect. The Southern DPS of eulachon extends from the Mad River in Northern California northward to the Nass River in British Columbia (NMFS 2013b). Eulachon in Alaska do not belong to a listed DPS. Therefore, eulachon of the Southern DPS would not be affected by the Project.	No Effect. There is no critical habitat for eulachon of the Southern DPS in Alaska.
Green sturgeon, Southern DPS	<i>Acipenser medirostris</i>	FT	No Effect. Although sub-adult and non-spawning adult green sturgeon belonging to the Southern DPS are known to occupy marine and estuarine habitats in Alaska, available evidence suggest they generally occur from Graves Harbor, Alaska southward (NMFS 2018), which places them more than 1,500 miles away from the Action Area. Further, they do not spawn in Alaska. Therefore,	No Effect. Critical habitat (74 FR 52299) for Southern DPS green sturgeon in marine environments extends only as far north as Cape Flattery, Washington. Freshwater and estuarine critical habitat is limited to California, Oregon, and Washington.

Common Name	Scientific Name	Status ¹	Determination / Species Potential to Occur in Action Area	Determination / Critical Habitat Presence Within the Action Area
			green sturgeon of the Southern DPS would not be affected by the Project.	
Sockeye salmon, Snake River ESU	<i>Oncorhynchus nerka</i>	FE	No Effect. Sockeye salmon originating from the Snake River ESU may occupy marine habitats of the coast of Alaska. However, studies of stock composition suggest that most sockeye salmon in the eastern Bering Sea originate from Alaskan rivers (Habicht et al. 2010). Even if Snake River sockeye are present, they are likely to be further offshore, beyond the Project's Action Area, and their pelagic behavior would suggest they are not at risk of effects arising from Project activities affecting the seafloor.	No Effect. There is no critical habitat for sockeye salmon in Alaska.
Steelhead trout, multiple DPS: Lower Columbia River DPS Middle Columbia River DPS Snake River Basin DPS Upper Columbia River DPS Upper Willamette River DPS	<i>Oncorhynchus mykiss</i>	FT	No Effect. Steelhead from most rivers along the Pacific Coast of North America occupy similar marine habitats in the North Pacific Ocean, including areas around Alaska. There have been extensive studies of steelhead distribution in the Gulf of Alaska, however, there is no information on steelhead distributions in the Bering Sea (Quinn and Meyers 2004). Because some steelhead have been recorded in the Bering Sea, it is possible that members of listed DPSs may be in the vicinity of the Action Area, but their presence is unlikely and their preference for feeding in the epipelagic zone further offshore would suggest they would not be affected by Project activities.	No Effect. There is no critical habitat for any of the listed steelhead DPSs in Alaska.
Yellow eye rockfish, Puget Sound/Georgia Basin DPS	<i>Sebastes ruberrimus</i>	FT	No Effect. The Puget Sound/Georgia Basin DPS of yelloweye rockfish includes only individuals in the Puget Sound region (NMFS 2017).	No Effect. Critical habitat for this DPS is limited to areas in the San Juan Island/Juan de Fuca Basin and the central and south Puget

Common Name	Scientific Name	Status ¹	Determination / Species Potential to Occur in Action Area	Determination / Critical Habitat Presence Within the Action Area
			Yelloweye rockfish in Alaska do not belong to a listed DPS.	Sound (79 FR 68041).
Invertebrates				
Sunflower sea star	<i>Pycnopodia helianthoides</i>	PT	Not Likely to Jeopardize the Continued Existence of the Species. The sunflower sea star is found in intertidal and subtidal coastal waters from the Aleutian Islands to northern Baja California, Mexico. Its range does not include the Action Area (NOAA Fisheries 2024m).	No Effect. NMFS has not designated critical habitat for the sunflower sea star.

Notes:

BMP = best management practice; DPS: Distinct Population Segment; ESU = Evolutionarily Significant Unit; FR = Federal Register; ft = feet; m = meters; NMFS = National Marine Fisheries Service; NOAA = National Oceanic and Atmospheric Administration

¹ Status: FT = federally threatened, FE = federally endangered, PT = proposed threatened

4.2 NO EFFECT

The BA concludes that the proposed Project would have no effect on the following species: beluga whale (Cook Inlet DPS), blue whale, bowhead whale, false killer whale, Guadalupe fur seal, killer whale (Southern Resident DPS), sei whale, sperm whale, Chinook salmon (all Evolutionarily Significant Units [ESUs]), chum salmon (Hood Canal Summer-run ESU), coho salmon (Lower Columbia River ESU), eulachon (Southern DPS), green sturgeon (Southern DPS), sockeye salmon (Snake River ESU), steelhead trout (multiple DPS), yelloweye rockfish (Puget Sound/Georgia Basin DPS), and sunflower sea star.

The BA also concludes that the proposed Project would have no effect on critical habitats for the following species: beluga whale (Cook Inlet DPS), false killer whale, humpback whale (Western North Pacific DPS, Mexico DPS), killer whale, North Pacific right whale, Steller sea lion (Western DPS), Chinook salmon (all ESUs), chum salmon (Hood Canal Summer-run ESU), coho salmon (Lower Columbia River ESU), eulachon (Southern DPS), green sturgeon (Southern DPS), sockeye salmon (Snake River ESU), steelhead trout (multiple DPS), and yelloweye rockfish (Puget Sound/Georgia Basin DPS).

These species and critical habitats are not considered further herein.

4.3 MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT

The BA concludes that the Project may affect but is not likely to adversely affect the following species: bearded seal (Beringia DPS, including critical habitat), fin whale, gray whale (Western North Pacific DPS), humpback whale (Western North Pacific DPS and Mexico DPS), North Pacific right whale, ringed seal (Arctic subspecies, including critical habitat), and Steller sea lion (Western DPS). Conclusions are discussed in detail for each species below.

4.3.1 BEARDED SEAL: BERINGIA DPS

4.3.1.1 REGULATORY HISTORY AND STATUS

There are two recognized subspecies of bearded seal, with individuals in the Atlantic portion of the species' range designated as *Erignathus barbatus barbatus* and those in the Pacific region designated as *E. barbatus nauticus*. The *E. barbatus nauticus* population is comprised of two DPSs: the Beringia DPS and the Okhotsk DPS. Of these, only the Beringia DPS extends into U.S. waters, whereas the Okhotsk DPS is found in the Sea of Okhotsk adjacent to Russia and Hokkaido in the Western Pacific. In December of 2012, both of these DPSs were listed as threatened under the ESA (77 Federal Register [FR] 76740). The designation of critical habitat for the Beringia DPS was delayed when the listing for that species was challenged in court, and critical habitat was only recently designated in 2022 (87 FR 19180). Designated critical habitat for the Beringia DPS (Appendix C, Figure 12) includes marine waters of the Bering, Chukchi, and Beaufort seas, which extends from the shoreward boundary to an offshore limit with a maximum depth of 656.2 ft (200 m) within the U.S. Exclusive Economic Zone (EEZ) (87 FR 19180). Although both the critical habitat area and past stock assessments for the Beringia DPS consider only bearded seals occurring within the EEZ, the full range of the Beringia DPS includes the continental shelf waters of the Bering, Chukchi, Beaufort, and East Siberian seas (Muto et al. 2021b).

4.3.1.2 LIFE HISTORY

Bearded seals have a circumpolar distribution, and their range extends from the Arctic Ocean south to Hokkaido, Japan in the Western Pacific (NOAA Fisheries 2024b). The species is widely distributed across its range but preferentially occupies areas with drifting, broken pack ice rather than coastal areas or areas with shorefast ice (NMFS 2024). They generally inhabit areas characterized by relatively shallow depths (i.e., less than 656.2 ft [200 m] deep), as they primarily feed on or near the seafloor and prey upon a variety of invertebrates and fish (NOAA Fisheries 2024b). Notably, dietary composition of bearded seals may be changing, as recent studies suggest that bearded seals over a year in age are consuming more fish and fewer invertebrates than they did historically (Crawford et al. 2015). They are believed to scan the seafloor using their whiskers to detect prey, and burrow into the sediment in pursuit of prey (Marshall et al. 2006). The largest of the northern ice-associated seals, adult bearded seals average 6.8-7.9 ft (2.1-2.4 m) in length and may weigh up to 790 pounds (358 kilograms [kg]) (Andersen et al. 1999). Because of their reliance on sea ice for resting and pupping, the distribution of bearded seals shifts seasonally, with individuals moving further north through the Bering Strait to the Chukchi and Beaufort Seas in the late spring and summer following the ice retreat and then moving south again in the fall and winter as the ice returns (NOAA Fisheries 2024b). Although studies of activity patterns in bearded seals are limited, it is believed that individuals haul out on ice in the afternoon and evening from late May to July and that they may only very rarely haul out from July to April, suggesting that they may not be dependent on sea ice as a resting habitat for a significant part of the year, though it is essential for pup rearing (Cameron et al. 2010).

On average, female bearded seals reach maturity at around 5 to 6 years of age, and males mature at 6 to 7 years of age (NOAA Fisheries 2024b). Females give birth to a single pup on the ice pack between mid-March and May, and pups are reared and nursed on the ice (NOAA Fisheries 2024b). Pups enter the water within a few days following their birth and will transition to diving and foraging while still in the nursing period, which usually lasts approximately 24 days (NOAA Fisheries 2024b). Both bearded seal pups and their mothers are highly aquatic during the nursing period—setting them apart from other large seals—with pups spending up to 50 percent of their time in the water (Cameron et al. 2010). Male bearded seals arrive at pupping locations on pack ice up to several weeks before females arrive to give birth, and mating takes place shortly after pups are weaned (NOAA Fisheries 2024). The mating behavior of bearded seals may vary from stationary to moving male territories, depending on the predictability and stability of sea ice, as more open areas with unstable ice may favor a roaming strategy for mate selection; however, bearded seal mating tactics generally tend to show long-term stability and strong site fidelity (Van Parijs and Clark 2006).

Bearded seals communicate through vocalizations, with peak calling occurring during the mating season (Cameron et al. 2010). These calls are believed to be made only by males and likely play a role in defending territories and signaling mate quality to females (Risch et al. 2007). The predominant calls produced by males are described as “trills,” and these may last up to 60 seconds and can be heard at distances of up to 18.6 miles (30 km) away (Cameron et al. 2010).

4.3.1.3 THREATS

The Beringia DPS of bearded seal was listed as threatened under the federal ESA in 2010 due to threats arising from climate change and associated reductions in the extent of sea ice (77 FR 76740). Current threats to the bearded seal include the effects of climate change on sea ice, on which the species relies for use as a haulout platform for whelping, nursing, and rearing pups, as well as for molting and resting (NOAA Fisheries 2024b). Other climate change-associated changes including ocean acidification, increasing temperatures, and shifts in community structure also pose a threat to bearded seals through reductions in the availability of their prey (NOAA Fisheries 2024b).

Decreasing sea ice cover has also led to increased interest in using the Arctic Ocean as a waterway for coastal, regional, and transcontinental marine activities, including shipping and oil and gas exploration. This potential increase in human activities in bearded seal habitat poses additional risks to the species through noise disturbance, degradation of habitats, and potential discharge of toxic substances (NOAA Fisheries 2024b).

4.3.1.4 POTENTIAL PRESENCE IN THE ACTION AREA

Bearded seals belonging to the Beringia DPS are known to occur in the Action Area; however, as they are associated with sea ice and are reliant on it as a habitat for pupping, they are less likely to be present in the Action Area during ice-free periods in the summer when cable-laying activities are to take place. Historic distribution data indicate that a small number of bearded seals (mostly juveniles) remain in waters along the coast of the Bering Sea during the summer and early fall instead of following the retreating sea ice northward. A satellite tracking study of young bearded seals has supported this finding and tracked individuals in the vicinity of the Action Area (Cameron et al. 2018). If bearded seals are present during offshore Project activities, they are anticipated to be solitary juvenile individuals, as mothers would have already weaned their pups by late spring before the ice melts and moved northward with the retreating ice. Any individuals that are present in the Action Area along the coast of the Yukon-Kuskokwim Delta during offshore Project activities in the summer months are most likely to be in estuaries or river mouths (Cameron et al. 2018) and are likely to be in the water and easily capable of moving away from Project activities.

4.3.1.5 CRITICAL HABITAT OVERLAPPING THE ACTION AREA

The designated critical habitat for this species is spread across the Chukchi, Bering, and Beaufort Seas and extends from the 65.6-foot (20-m) isobath (which is associated with the landward edge of sea ice) west to the seaward limit of the U.S. EEZ (Appendix C, Figure 12; 87 FR 19180). This designation is based on the identification of three physical and biological features that are essential to the conservation of the Beringia DPS of bearded seals. These include:

- 1) *“Sea ice habitat suitable for whelping and nursing, which is defined as areas with waters 200 m [656.2 feet] or less in depth containing pack ice of at least 25 percent concentration and providing bearded seals access to those waters from the ice;”*
- 2) *“Sea ice habitat suitable as a platform for molting, which is defined as areas with waters 200 m [656.2 feet] or less in depth containing pack ice of at least 15 percent concentration and providing bearded seals access to those waters from the ice;”*

- 3) “Primary prey resources to support bearded seals: Waters 200 m [656.2 feet] or less in depth containing benthic organisms, including epifaunal and infaunal invertebrates, and demersal fishes.”

All three of these components are seasonally present in the Action Area, and the Action Area falls within designated critical habitat.

4.3.1.6 POTENTIAL EFFECTS ON BEARDED SEAL

Critical Habitat

As described above, critical habitat designation for the Beringia DPS of bearded seal includes three physical and biological features: sea ice for breeding, sea ice for molting, and prey habitat. Project activities would not affect the first two of these features, as offshore activities will only take place during ice-free periods in the summer and early fall. As for the third feature, Project activities are not expected to have significant effects on bearded seal prey resources (see discussion of Project effects on foraging habitats in Section 3.1.2). Bearded seals are known to forage along the seafloor in relatively shallow areas with seasonal ice coverage (NOAA Fisheries 2024b). Cable-laying activities will cause disturbance to the seafloor and could affect associated bearded seal benthic prey species such as gastropods and bivalves via burial or smothering (Crawford et al. 2015), but this would not lead to significant effects on benthic prey populations, as these activities would be temporary, spatially limited, and linear in nature. Any suspended sediment would quickly be dissipated by currents and wave action, and the highly mobile fine substrates in the Action Area mean that any depressions in the seafloor resulting from trenching would be filled. As such, benthic prey species are not likely to suffer significant effects from the physical disturbance of cable placement. Further, vessel operations (and underwater noise) would be transitory and short-term (see discussion of the effects of Project activities on the underwater soundscape in Section 3.6). Project vessel noise is not expected to have significant effects on more mobile bearded seal prey species, which include fish such as Arctic cod (*Boreogadus saida*) and pricklebacks (fish of the family Stichaeidae) (Crawford et al. 2015). In addition, the similarity of surrounding habitats provides for additional ample foraging habitat for bearded seals. Effects to primary prey resources in designated bearded seal critical habitat are expected to be insignificant, short-term, and not affect the continued use of the Action Area as foraging habitat by bearded seals in the future, especially in winter after the cable installation in critical habitat is complete.

Vessel Strike and Entanglement

As discussed in Section 3.2, vessel traffic has the potential to pose the risk of vessel strike of listed species. Evidence suggests that vessel strikes of marine mammals are more likely to occur when vessels are traveling at speeds greater than 13 knots (6.7 m/s) and with a mean vessel speed of 18.1 knots (9.3m/s) (Jensen and Silber 2003; McKenna et al. 2012; Currie et al. 2017). Project vessels are expected to operate at low speeds (installation speeds up to 2 knots [1 m/s] and transit speeds up to 10 knots [5.1 m/s]), which would reduce the risk for potential strike of bearded seals. Further, the highly mobile nature of bearded seals suggests they would likely move away from any vessel that approaches them. The risk of vessel strike presented by Project cable-laying vessels and associated support vessels is not significant for bearded seals.

As discussed in Section 3.3, cable-laying activities also carry the potential for entanglement of listed species. Entanglement is not identified as a significant threat to bearded seals. Modern FOC installations present a low risk for cable exposures or suspensions that could entangle marine mammals. Further, the proposed burying of the subsea cable in areas with high fishing activity would significantly reduce the risk of snagging discarded fishing gear and associated increased risk of entanglement, and the predominantly fine substrates of the seafloor in the Action Area are expected to facilitate this process across portions of the planned cable route. Risk of bearded seal entanglement is insignificant.

Lighting

As discussed in Section 3.4, artificial lighting has the potential to negatively affect species in marine ecosystems (Depledge et al. 2010). Project activities will require the use of artificial lighting, as both offshore and onshore installation activities may occur 24 hours per day; however, periods of offshore Project activity will take place in the ice-free summer season when daylight lasts 18-21 hours, and artificial lighting will be required for only short durations.

Artificial lighting in the marine environment may affect the processes and habitats of marine ecosystems (Marangoni et al. 2022). Illumination has the potential to create artificially induced aggregations of fish (marine mammal prey species) and ichthyoplankton (Marchesan et al. 2005; Keenan et al. 2007). It may also attract marine mammals including bearded seals pursuing these light-associated prey aggregations (Depledge et al. 2010; Yurk and Trites 2000). However, Project vessels would not require excessive lighting and would transit through the Action Area over a brief period; therefore, the effects of vessel lighting would be localized and temporary and would not significantly affect bearded seals.

Water Quality Effects—Increased Turbidity and Fuel or Hazardous Substance Spills

As discussed in Section 3.5, Project activities have the potential to affect water quality through increased turbidity and fuel or hazardous substance spills. Turbidity is likely to be increased through suspension of sediment arising from surface-lay, cable sea plow burial, water jet sled burial, diver burial with hand jets, or from trenched excavations for landfall. The suspension of sediments caused by these Project activities would be temporary and localized. Marine mammals often occupy turbid waters and are not known to experience significant negative effects from localized, temporary increases in turbidity arising from suspension of sediments (Todd et al. 2014); therefore, the effects of increased turbidity on bearded seals would be insignificant.

Vessels and equipment that will be used for Project activities have the potential to release fuel, oil, or lubricants into the marine environment. Petrochemicals are known to cause direct effects to listed species like the bearded seal (e.g., becoming oiled or sickened), as well as indirect effects through destruction or degradation of habitat or prey species. Additionally, solid waste releases, such as garbage or food waste from vessels, can have negative effects on marine species. Vessels operate under strict regulatory requirements that include measures to prevent and respond to an unforeseen accident. Requirements include federal and state oil spill prevention and response requirements. By following these regulations and measures to avoid spills, the risk of hazardous material effects on bearded seals is insignificant.

Noise

As discussed in Section 3.6, Project activities have the potential to result in underwater noise that may affect listed species. Project vessels are expected to generate maximum underwater noise levels of approximately 180 dB_{rms}, which is below NMFS-established Level A thresholds for non-impulsive sound levels for seals. However, vessel noise is expected to be above the Level B (behavioral) threshold for all marine mammals (120 dB_{rms}) at approximately 6.21 miles (10 km) from the vessel, depending on individual vessel engines. Bearded seals would likely avoid the immediate area where underwater noise would be generated during cable-laying activities due to vessel movements and human presence but may also be driven away by the noise of Project vessels. Bearded seals are known to rely on vocal communication during the breeding seasons (Cameron et al. 2010), but Project activities will not take place during that time of year and therefore would not negatively affect bearded seal communication. In addition, the transitory nature of Project activities means that elevated levels of underwater noise would be restricted to relatively short durations (e.g., no more than a few hours) in any given location, as Project vessels would be continually moving along the cable-laying route. In addition, Project vessel noise is expected to fall within normal baseline noise levels for the area; therefore, noise created by Project vessels would not significantly affect bearded seals.

Anthropogenic Disturbance

As discussed in Section 3.7, Project activities have the potential to result in anthropogenic disturbance of listed species due to human presence and activity. Human activity has the potential to result in disturbance and disruption of normal seal behaviors (Permyakov and Trukhin 2021) and can be particularly harmful at seal rookeries or major haul out sites; however, due to the relatively solitary nature of bearded seals and their association with sea ice, large aggregations in the Action Area are not anticipated. During the summer when marine Project activities are to take place, few bearded seals are likely to be present in the Action Area, and any bearded seals that may occur in the area are likely to be solitary individuals who would not require haul outs for resting (Cameron et al. 2010). As such, they would be highly mobile and able to actively avoid Project activities. Though this may temporarily disrupt normal foraging or resting behavior, the ability of bearded seals to move away from the source of the disturbance suggests that any individuals present are unlikely to suffer lasting effects. Further, the transitory nature of the Project activities precludes the risks of chronic exposure to disturbance and associated long-term effects to bearded seals. Given these factors, minimal increased presence of humans and vessels in the Action Area is not anticipated to cause significant effects on bearded seals.

Conclusion

The Project may affect but is not likely to adversely affect bearded seals. Marine Project activities are planned to take place during navigable periods in summer when sea ice is not present. Bearded seals' reliance on sea ice and movement northward in the summer months reduces the potential for individuals to be exposed to Project effects; however, any individuals remaining in the Action Area would have the potential to be exposed to the following effects in the Project's Action Area: vessel strikes, entanglement, artificial light, water quality (i.e., turbidity and hazardous substance spills), underwater noise, and anthropogenic presence and disturbance.

None of these are anticipated to have significant effects on bearded seals. Any effects would be further minimized with the implementation of conservation measures included in Section 2.2.7.

The Project may affect but is not likely to adversely modify bearded seal critical habitat. Project activities would not affect the physical and biological features associated with sea ice, as offshore activities will only take place during ice-free periods in the summer and early fall. Further, Project activities are not expected to have significant effects on the bearded seal prey resources that are defined as a primary feature in the species' critical habitat designation. Any effects would be further minimized with the implementation of conservation measures included in Section 2.2.7.

4.3.2 RINGED SEAL: ARCTIC SUBSPECIES

4.3.2.1 REGULATORY HISTORY AND STATUS

There are five subspecies of ringed seal: Arctic (*Pusa hispida hispida*), Okhotsk (*P. h. ochotensis*), Baltic (*P. h. botnica*), Ladoga (*P. h. ladogensis*), and Saimaa (*P. h. saimensis*). The Saimaa subspecies was listed as endangered in 1993 (58 FR 26920). Three other subspecies (Arctic, Okhotsk, and Baltic) were listed as threatened and one (Ladoga) was listed as endangered under the ESA in 2012 (77 FR 76706). The Arctic ringed seal is the most abundant of the five subspecies and is the only one that occurs in Alaskan waters (NOAA Fisheries 2024k); therefore, it is the sole subspecies considered in this analysis. The Arctic subspecies of ringed seal occurs in the Bering, Chukchi, and Beaufort seas in Alaska (NOAA Fisheries 2024k). Arctic ringed seal critical habitat was designated in 2022 (Appendix C, Figure 12) and includes an area covering portions of the Bering, Chukchi, and Beaufort seas (87 FR 19232). Although this critical habitat area and stock assessments for the Beringia DPS consider only ringed seals occurring within the EEZ, the full range of the Beringia DPS includes the continental shelf waters of the Bering, Chukchi, Beaufort, and East Siberian seas (Muto et al. 2021b).

4.3.2.2 LIFE HISTORY

Ringed seals have a circumpolar distribution and occur in all seasonally ice-covered seas in the northern hemisphere (Muto et al. 2021b). During winter and spring, ringed seals occupy habitats in the Beaufort and Chukchi Seas, and they can occur in the Bering Sea as far south as Bristol Bay in years when ice coverage is sufficiently extensive (NOAA Fisheries 2024k). Most of the ringed seals that spend winters in the Bering and Chukchi seas are believed to migrate northward in the summer, following the receding edge of ice pack to the northern Chukchi and Beaufort Seas (NOAA Fisheries 2024k). They can survive in completely ice-covered habitats and dive to depths of 150 ft (~46 m) or more in search of prey (NOAA Fisheries 2024k). They do not live in large groups and are usually observed alone, though they may aggregate during molting season (NOAA Fisheries 2024k).

Adult ringed seals grow to lengths of 4.5 ft (~1.4 m), and up to 150 pounds (~68 kg) (NOAA Fisheries 2024k). They breed in heavy shorefast ice, and juveniles migrate south to the ice edge for the winter. Ringed seals are also an important subsistence resource for Alaska Natives (ADFG 2023). Throughout their range, ringed seals remain tied to ice-covered waters and are well adapted to occupying both shorefast and pack ice (Kelly 2022). They remain in contact with ice most of the year and use it as a platform for pupping and nursing in late winter to early spring, for

molting in late spring to early summer, and for resting in other times of the year (Lowry 2016). Ringed seals give birth in snow-covered ice lairs called subnivean dens in the late spring, and these dens are typically on the sea ice, where pups are weaned by the time the ice breaks up. Ringed seals are opportunistic predators, preying on invertebrates, fish, and amphipods (Kelly 2022). Cod comprise the majority of their diet in fall and spring, and crustaceans comprise a larger proportion of their diet during the open water season in the summer (NOAA Fisheries 2024k).

4.3.2.3 THREATS

Reduction of sea ice and snow cover, prey availability, disturbances from vessel traffic, human-caused underwater noise, pollutants, entanglement with fishing gear, and disease are all threats to the ringed seal. The reduction of sea ice and snow accumulation is expected to inhibit the ringed seal's ability to construct snow-covered dens. Further, sea ice is essential for breeding, molting, and resting, and reductions in the availability of sea ice may impede ringed seals from completing important components of their life history. Climate models predict a substantial decrease in sea ice extent and thickness, which would adversely affect the seals' ability to thrive (77 FR 76706). As of the 2020 stock assessment by NOAA, the current ringed seal minimum population estimate and population trend in Alaska is unknown (Muto et al. 2021b).

4.3.2.4 POTENTIAL PRESENCE IN THE ACTION AREA

Ringed seals are abundant in Alaskan waters throughout the northern Bering Sea, Norton and Kotzebue Sounds, and the Chukchi and Beaufort Seas during the winter and early spring. Depending on the extent of ice coverage, they may also be found as far south as Bristol Bay (Muto et al. 2021b). The distribution of the Arctic subspecies of ringed seal is known to overlap with the Action Area (NOAA Fisheries 2024k). Public sighting data indicates that ringed seals do occur along coastlines within the Action Area, although notably sighting records in the Yukon-Kuskokwim Delta region are most common in winter and spring, with few sightings taking place in summer (GBIF 2025b). In summer, most ringed seals would have followed the receding ice edge northward into the northern Chukchi and Beaufort Seas (NOAA Fisheries 2024k). Because Project activities will take place when waters are ice-free and navigable, ringed seals are unlikely to be present in large numbers.

4.3.2.5 CRITICAL HABITAT OVERLAPPING THE ACTION AREA

The final rule for designated critical habitat was published on April 1, 2022 for Arctic ringed seals (87 FR 19232). The location of critical habitat includes waters of the Beaufort and Chukchi Seas, as well as the northern Bering Sea (Appendix C, Figure 12). This designation is based on the identification of three physical and biological features that are essential to the conservation of the Arctic subspecies of ringed seal. These include:

1. *"Snow-covered sea ice habitat suitable for the formation and maintenance of subnivean birth lairs used for sheltering pups during whelping and nursing, which is defined as waters 3 m [9.8 feet] or more in depth (relative to MLLW [Mean Lower Low Water]) containing areas of seasonal landfast (shorefast) ice or dense, stable pack ice, that have undergone deformation*

and contain snowdrifts of sufficient depth to form and maintain birth lairs (typically at least 54 cm [1.8 feet] deep);”

2. *“Sea ice habitat suitable as a platform for basking and molting, which is defined as areas containing sea ice of 15 percent or more concentration in waters 3 m [9.8 feet] or more in depth (relative to MLLW);”*
3. *“Primary prey resources to support Arctic ringed seals, which are defined to be small, often schooling, fishes, in particular Arctic cod, saffron cod, and rainbow smelt; and small crustaceans, in particular, shrimps and amphipods.”*

The Action Area overlaps with critical habitat for the ringed seal in a section of the northern Bering Sea, and all three of these components are seasonally present in the Action Area (Appendix C, Figure 12).

4.3.2.6 POTENTIAL EFFECTS ON THE RINGED SEAL

Critical Habitat

As described above, the critical habitat designation for the Arctic subspecies of ringed seal (87 FR 19232) defined critical habitat as containing three physical and biological features: sea ice for breeding, sea ice for basking and molting, and prey resources.

Project activities would not affect the first two of these features, as offshore activities will only take place during ice-free periods in the summer and early fall. Ringed seals are associated with pack ice and are known to follow the receding ice edge northward in the summer months (NOAA Fisheries 2024k). Planned Project activities in the Action Area will only take place during navigable periods in the summer months and therefore would not disturb the sea ice and snow drifts that ringed seals rely on for pupping and nursing in the spring (Reimer et al. 2019). As for the third feature, as discussed in Section 3.1.2, Project activities have the potential to result in disturbance to foraging habitats. Ringed seals dive to depths near the seafloor for foraging (Von Duyke et al. 2020); therefore, effects on the substrate arising from Project activities may affect their foraging habitat.

However, these activities would be temporary, spatially limited, and linear in nature. Any suspended sediment would quickly be dissipated by currents and wave action, and the highly mobile fine substrates in the Action Area mean that any depressions in the seafloor resulting from trenching would be filled. As such, benthic prey species are not likely to suffer significant effects from the physical disturbance of cable placement. Further, vessel operations (and underwater noise) would be transitory and short-term (see discussion of the effects of Project activities on the underwater soundscape in Section 3.6). Project vessel noise is not expected to have significant effects on more mobile ringed seal prey species (e.g., Arctic cod, saffron cod, and rainbow smelt). In addition, the similarity of surrounding habitats provides for additional ample foraging habitat for ringed seals. Effects to primary prey resources in designated ringed seal critical habitat are expected to be insignificant, short-term, and not affect the continued use of the Action Area as foraging habitat by ringed seals in the future, especially in winter after the cable installation in critical habitat is complete.

Vessel Strike and Entanglement

As discussed in Section 3.2, vessel traffic has the potential to pose the risk of vessel strike to listed species. Studies have ranked ringed seals as having a low risk of vessel strike (Hauser et al. 2018), although limited data on the behavior of ringed seals during ice-free periods in the summer (Kelly et al. 2010) means that understanding of the relative risk posed by vessel strike is incomplete. Evidence suggests that vessel strikes of marine mammals are more likely to occur when vessels are traveling at speeds greater than 13 knots (6.7 m/s) and with a mean vessel speed of 18.1 knots (9.3 m/s) (Jensen and Silber 2003; McKenna et al. 2012; Currie et al. 2017). Project vessels are expected to operate at low speeds (installation speeds up to 2 knots [1 m/s] and transit speeds up to 10 knots [5.1 m/s]), which would reduce the risk for potential strike of ringed seals. Further, the highly mobile nature of ringed seals suggests they are unlikely to suffer vessel strike, as they would likely move away from any vessel that approaches them. Because of these factors, the risk of Project vessels striking ringed seals in the Action Area is insignificant.

As discussed in Section 3.3, cable-laying activities carry the potential for entanglement of listed species. Arctic ringed seals are not known to suffer significant injury and mortality from entanglement, largely because their distribution does not overlap with intensive commercial fisheries in most areas (NOAA Fisheries 2024k). Modern FOC installations present very low risk for cable exposures or suspensions that could entangle marine mammals (Wood and Carter 2009). Further, the proposed burying of the subsea cable in areas of high fishing activity would significantly reduce the risk of exposure to fishing gear, and the predominantly fine substrates of the seafloor in the Action Area are expected to facilitate this process across portions of the planned cable route; therefore, the risk of ringed seal entanglement posed by the Project is insignificant.

Lighting

As discussed in Section 3.4, artificial lighting has the potential to negatively affect species in marine ecosystems (Depledge et al. 2010). Project activities will require the use of artificial lighting, as both offshore and onshore installation activities may occur 24 hours per day; however, periods of offshore Project activity will take place in the ice-free summer season when daylight lasts 18-21 hours, and artificial lighting will be required for only short durations. Artificial lighting in the marine environment may affect the processes and habitats of marine ecosystems (Marangoni et al. 2022). Illumination has the potential to create artificially induced aggregations of fish (marine mammal prey species) and ichthyoplankton (Marchesan et al. 2005; Keenan et al. 2007). It may also attract marine mammals including ringed seals pursuing these light-associated prey aggregations (Depledge et al. 2010; Yurk and Trites 2000). However, Project vessels would not require excessive lighting and would transit through the Action Area over a brief period; therefore, the effects of vessel lighting would be localized and temporary and would not significantly affect ringed seals.

Water Quality Effects – Increased Turbidity and Fuel or Hazardous Substance Spills

As discussed in Section 3.5, Project activities have the potential to affect water quality through increased turbidity and fuel or hazardous substance spills. Turbidity is likely to be increased through suspension of sediments arising from surface-lay, cable sea plow burial, water jet sled burial, diver burial with hand jets, or from trenched excavations for landfall. The suspension of sediments caused by these Project activities would be temporary and localized. Marine mammals, such as ringed seals, often occupy turbid waters and are not known to experience significant negative effects from localized, temporary increases in turbidity (Todd et al. 2014). Increases in turbidity arising from Project activities would not have significant effects on ringed seals.

Project vessels and equipment have the potential to release fuel, oil, or lubricants into the marine environment, and these petrochemicals have the potential to result in direct effects to listed species like ringed seal (e.g., becoming oiled or sickened), as well as indirect effects through destruction or degradation of habitat or prey species. Additionally, solid waste releases, such as garbage or food waste from vessels, can have negative effects on marine species; however, vessels operate under strict regulatory requirements that include measures to prevent and respond to unforeseen accidents. Requirements include federal and state oil spill prevention and response requirements. By following these regulations and measures to avoid spills, the risk of hazardous material effects on ringed seals is insignificant.

Noise

As discussed in Section 3.6, Project activities have the potential to result in underwater noise that may affect listed species. Ringed seals have been known to abandon breathing holes and dens that are proximate to loud, human-produced sounds (i.e., seismic surveying) (Kelly et al. 1988); however, other studies have found ringed seals exhibited no obvious reactions to anthropogenic sounds, possibly as a result of habituation (Blackwell et al. 2004). Importantly, any ringed seals occurring in the Action Area during Project activities in the summer months would not be pupping or utilizing breathing holes (i.e., sea ice habitat required for those activities would have retreated by this time). Ringed seals are known to communicate with vocalizations and other sounds (Cummings et al. 1984), and sounds generated from Project activities have the potential to influence the ability of ringed seals to use this form of communication via masking; however, these sounds are associated with reproductive activities (Cummings et al. 1984), which would not be taking place in the Action Area during Project activities. Given the low likelihood of ringed seal presence in the Action Area in the summer, it is unlikely that underwater noise would affect their behavior. If they are present, the transitory nature of Project activities means that noise effects would be restricted to relatively short durations (e.g., no more than a few hours) in any given location. In addition, Project vessel noise is expected to fall within normal baseline noise levels for the area; therefore, noise produced by Project vessels would not have a significant effect on ringed seals in the Action Area.

Anthropogenic Disturbance

As discussed in Section 3.7, Project activities have the potential to result in anthropogenic disturbance to listed species due to human presence and activity. Vessel traffic in habitats

occupied by ringed seals has the potential to result in disturbance and disruption of their normal behaviors (Permyakov and Trukhin 2021), and human disturbance can be particularly harmful at seal rookeries or major haul out sites; however, the generally solitary nature of ringed seals and their requirement of sea ice when aggregating for molting (NOAA Fisheries 2024k) means that no large aggregations are likely to occur in the Action Area. During the summer when Project activities are to take place, few, if any, ringed seals are likely to be present in the Action Area. Any that are present would be in the water due to the lack of ice for hauling out and therefore would be highly mobile and able to actively avoid Project vessels. Further, the ability of ringed seals to move away from the source of the disturbance suggests that any individuals present are unlikely to suffer lasting effects. Further, the transitory nature of the Project activities precludes the risks of chronic exposure to disturbance and associated long-term effects on ringed seals. As such, the effects of human disturbance on ringed seals in the Action Area arising from Project activities would be insignificant.

Conclusion

The Project may affect but is not likely to adversely affect ringed seals. If they occur in the Action Area, ringed seals have the potential to be exposed to: vessel strikes, entanglement, artificial light, water quality (i.e., turbidity and hazardous substance spills), underwater noise, and anthropogenic presence and disturbance. None of these are anticipated to have significant negative effects on ringed seals. Any effects would be further minimized with the implementation of conservation measures included in Section 2.2.7.

The Project may affect but is not likely to adversely modify ringed seal critical habitat. Project activities would not affect physical and biological features associated with sea ice, as offshore activities will only take place during ice-free periods in the summer and early fall. Further, Project activities are not expected to have significant effects on the ringed seal prey resources that are defined as a primary feature in the species' critical habitat designation. Any effects would be further minimized with the implementation of conservation measures included in Section 2.2.7.

4.3.3 STELLER SEA LION: WESTERN DPS

4.3.3.1 REGULATORY HISTORY AND STATUS

The Steller sea lion was listed as threatened under the federal ESA in 1990 due to declines in their population arising primarily from the effects of commercial fishing (55 FR 12645). Steller sea lion populations were split into two DPSs (Eastern and Western) in 1997, at which time the Western DPS was upgraded to endangered (62 FR 24345). The Western DPS includes the Steller sea lion population westward from Cape Suckling (144° west longitude), which suffered population declines of 77 to 81 percent between the 1970s and early 2000s (NOAA Fisheries 2023c). The DPS has slowly increased since 2003, but there is considerable regional variation in this trend, and the abundance of Steller sea lions in the Western DPS is still only about half what it was in the 1950s (Young et al. 2024c). The Eastern DPS also occurs in Alaska but was delisted in 2013 (78 FR 66139). Eastern DPS individuals may occur in the Bering Sea (Jemison et al. 2018) and are visually indistinguishable from members of the Western DPS; therefore, for the purposes of this analysis, any Steller sea lions occurring in the Action Area are considered as potentially

belonging to the Western DPS. Critical habitat was designated for the full range of Steller sea lions in the United States in 1993 and includes all major rookery and haulout areas in Alaska (59 FR 30715), none of which overlap with the Action Area. NMFS is currently reviewing existing critical habitat to consider new information and the delisting of the Eastern DPS.

4.3.3.2 LIFE HISTORY

Steller sea lions belonging to the Western DPS originate from rookeries in the Gulf of Alaska, the Aleutian Islands, the Bering Sea, and Asia, and their range extends throughout temperate and subarctic waters of the North Pacific Ocean (NOAA Fisheries 2023c). Males mature at 3 to 8 years of age, but typically do not establish territory and successfully breed until they are 9 or 10 years of age (NOAA Fisheries 2023c). Females tend to give birth to their first pup at 4 to 6 years old, and pupping occurs in rookeries from mid-May through mid-July (NOAA Fisheries 2023c). Females will mate within 2 weeks of giving birth, and most pups are weaned before reaching 1 year of age, though some may nurse for up to 3 years (NOAA Fisheries 2023c). Males can live to be 20 years of age, whereas females may live to be 30 years of age (NOAA Fisheries 2023c).

Steller sea lions are a sexually dimorphic species, with males growing to sizes of 11 ft (~3.4 m) and 2,500 pounds (~1,134 kg), and females growing to only 9.5 ft (~2.9 m) and 800 pounds (~363 kg; NMFS 2023). Steller sea lions consume a wide variety of prey, including fish and cephalopods (NMFS 2023). They are typically found in coastal waters, but they may also forage in deeper pelagic waters farther offshore (NOAA Fisheries 2023c). Their distribution is at least in part dependent on seasonally available prey sources (Womble et al. 2009). Although they do not migrate, they move their “central-place haulout” throughout the year to track seasonal prey concentrations (ADFG n.d.d). During the breeding season in the summer, they are typically found in exposed, offshore rookeries and in the winter they tend to move to more protected haulouts (ADFG n.d.d).

4.3.3.3 THREATS

Vessels and aircraft may disturb Steller sea lions, resulting in negative effects at terrestrial haul out and rookery sites. In these locations, mass stampedes arising from the disturbance can result in mortality (NOAA Fisheries 2023c). They are also at risk of entanglement in marine debris, as well as vessel strikes, particularly in nearshore areas where Steller sea lions congregate or near large haul outs or rookeries (NOAA Fisheries 2023c). Further, commercial fisheries present a threat to the prey that Steller sea lions rely on, and climate change has the potential to further affect prey abundance and availability (NOAA Fisheries 2023c). Climate change may also lead to sea level rise effects on rookery and haulout sites, and harmful algal blooms arising from warming waters have the potential to cause the sickness and death of Steller sea lions (NOAA Fisheries 2023c).

4.3.3.4 POTENTIAL PRESENCE IN THE ACTION AREA

The distribution of the Western DPS of Steller sea lions is known to overlap with the Action Area (Himes Boor and Small 2012). Steller sea lions are most commonly found along coastlines but can also occur in deeper pelagic waters (NOAA Fisheries 2023c). In particular, males are more likely to occur further north in the Bering Sea (NOAA Fisheries 2023c) and may be more common in the

Action Area. Although individuals may be present in the Action Area, there are no haul outs or rookeries in the vicinity of the Action Area (Fritz et al. 2015). Notably, no known public sighting records of Steller sea lions exist in the Action Area.

4.3.3.5 POTENTIAL EFFECTS ON THE STELLER SEA LION

Habitat Disturbance Including Disturbance to Prey

No Steller sea lion haulouts or rookeries are known from the Action Area; however, as discussed in Section 3.1.2, Project activities have the potential to result in disturbance to marine benthic foraging habitats and associated prey species. Steller sea lions feed on fish and cephalopods (NOAA Fisheries 2023c), which have the potential to be affected by Project-related habitat disturbance. Disturbance would include temporary benthic habitat loss associated with the grapnel run, suspension of sediments, and elevated levels of underwater noise. Physical disturbance to seafloor habitats arising from Project activities would have a limited spatial footprint and are not expected to cause lasting change. In addition, suspended sediments would be restricted to the vicinity of the cable burial area and expected to settle within hours. Noise from Project vessels may result in disturbance and displacement of aggregations of their prey species (NOAA Fisheries 2023c); however, the spatially and temporally discrete nature of Project activities means that prey species and any Steller sea lions foraging for them could move away from the source of the disturbance. In addition, Project underwater noise would be in line with baseline acoustic conditions.

In addition, Steller sea lions are not known to occur or forage in great abundance in the Action Area, though individuals (particularly males) may be present (NOAA Fisheries 2023c). Given the limited likelihood for small numbers of Steller sea lions to occur in the Action Area during planned periods of Project activity combined with the temporary nature of any effects to foraging habitat, Steller sea lion habitat disturbance would be insignificant.

Vessel Strike and Entanglement

As discussed in Section 3.2, vessel traffic has the potential to pose the risk of vessel strike to listed species. There have been incidents of vessels striking and killing Steller sea lions in nearshore areas in Alaska, but these incidents are quite rare and are most likely to occur in areas such as rookeries or major haulouts where Steller sea lions are concentrated (Allen and Angliss 2013). As it is unlikely there would be large aggregations of Steller sea lions in the Action Area, the risk of vessel strike taking place is insignificant. Further, studies show that vessel strikes of marine mammals are more likely to occur when vessels are traveling at speeds greater than 13 knots (6.7 m/s) and with a mean vessel speed of 18.1 knots (9.3 m/s) (Jensen and Silber 2003; McKenna et al. 2012; Currie et al. 2017). Project vessels are expected to operate at low speeds (installation speeds up to 2 knots [1 m/s] and transit speeds up to 10 knots [5.1 m/s]), which would reduce the risk for potential strike of Steller sea lions. Further, the highly mobile nature of Steller sea lions suggests they are unlikely to suffer vessel strike, as they would likely move away from any vessel that approaches them. Given these factors, the risk of vessel strike posed to Steller sea lions by Project activities is insignificant.

As discussed in Section 3.3, cable-laying activities carry the potential for entanglement of listed species. At a population level, entanglement has more significant effects on Steller sea lions than vessel strikes, and a study in Southeast Alaska and British Columbia identified 386 instances of Steller sea lions of all age classes being either entangled in marine debris or ingesting fishing gear over a seven-year period (Raum-Suryan et al. 2009); however, available data suggest that entanglement risk is greater in Southeast Alaska than in other portions of the species' range, including the Bering Sea (NOAA Fisheries 2023c). Risk of entanglement in the FOC is insignificant, as modern FOC installations present very low risk for cable exposures or suspensions that could entangle marine mammals (Wood and Carter 2009). Further, the proposed burying of the subsea cable in areas of high fishing activity would significantly reduce the risk of exposure to fishing gear, and the predominantly fine substrates of the seafloor in the Action Area are expected to facilitate this process across portions of the planned cable route; therefore, Steller sea lions are not expected to be at risk of entanglement from the Project.

Lighting

As discussed in Section 3.4, artificial lighting has the potential to negatively affect species in marine ecosystems (Depledge et al. 2010). Project activities will require the use of artificial lighting, as both offshore and onshore installation activities may occur 24 hours per day; however, periods of offshore Project activity will take place in the ice-free summer season when daylight lasts 18-21 hours, and artificial lighting will be required for only short durations. Artificial lighting in the marine environment may affect the processes and habitats of marine ecosystems (Marangoni et al. 2022). Illumination has the potential to create artificially induced aggregations of fish (marine mammal prey species) and ichthyoplankton (Marchesan et al. 2005; Keenan et al. 2007). It may also attract marine mammals including Steller sea lions pursuing these light-associated prey aggregations (Depledge et al. 2010; Yurk and Trites 2000). However, Project vessels would not require excessive lighting and would transit through the Action Area over a brief period; therefore, the effects of vessel lighting would be localized and temporary and would not significantly affect Steller sea lions.

Water Quality Effects—Increased Turbidity and Fuel or Hazardous Substance Spills

As discussed in Section 3.5, Project activities have the potential to affect water quality through increased turbidity and fuel or hazardous substance spills. Turbidity is likely to be increased through suspension of sediment arising from surface-lay, cable sea plow burial, water jet sled burial, diver burial with hand jets, or from trenched excavations for landfall. The suspension of sediments caused by these Project activities would be temporary and localized. Marine mammals, such as Steller sea lions, often occupy turbid waters and are not known to experience significant negative effects from localized, temporary increases in turbidity arising from suspension of sediment associated with activities disturbing the seafloor (Todd et al. 2014); therefore, increases in turbidity arising from Project activities would not have a significant effect on Steller sea lions in the Action Area.

Project vessels and equipment have the potential to release fuel, oil, or lubricants into the marine environment, and these petrochemicals have the potential to result in direct effects to listed species like Steller sea lions (e.g., becoming oiled or sickened), as well as indirect effects through

destruction or degradation of habitat or prey species. Additionally, solid waste releases, such as garbage or food waste from vessels, can have negative effects on marine species; however, vessels operate under strict regulatory requirements that include measures to prevent and respond to an unforeseen accident. Requirements include federal and state oil spill prevention and response requirements. By following these regulations and measures to avoid spills, the risk of hazardous material effects on Steller sea lions is insignificant.

Noise

As discussed in Section 3.6, Project activities have the potential to result in underwater noise that may affect listed species. Noise has been demonstrated to lead to short-term behavioral changes and displacement of Steller sea lions from haulout sites (Fletcher 2012), but no haulout sites are present in the Action Area. The specific behavioral effects of underwater noise on Steller sea lions that are foraging or traveling are less clear, but it is believed that feeding behavior can be disturbed by underwater noise (NOAA Fisheries 2023c). Further, Steller sea lions are known to acoustically communicate underwater (Kastelein et al. 2005), and increased background noise from Project vessels may interfere with their ability to do so via masking; however, given the likely lack of large aggregations of Steller sea lions in the Action Area and the spatial discreteness and short duration of the Project activities, significant negative effects from noise are not expected to occur.

Anthropogenic Disturbance

As discussed in Section 3.7, Project activities have the potential to result in anthropogenic disturbance of listed species due to human presence and activity. Human activity in coastal areas where Steller sea lions are hauling out to rest or breed has been shown to result in disturbance, and the sensitivity of Steller sea lions to disturbance varies seasonally (Kucey 2005). Generally, these disturbances result in individuals leaving the haulout site and returning to the water (Kucey and Trites 2006); however, Steller sea lions are also known to become habituated to human disturbance, including vessel traffic (DFOC 2011). The effects that vessels have on Steller sea lions that are moving or foraging in open water are unclear; however, there is potential that Project vessels may lead to alterations of behavior in any Steller sea lions that happen to present in the Action Area. The lack of rookeries or haulouts in the Action Area, combined with the transitory nature of the Project activities and the ability of Steller sea lions to move away from the source of disturbance in an open water environment, suggest that no significant negative effects would occur.

Conclusion

The Project may affect but is not likely to adversely affect Steller sea lions of the Western DPS. If they occur in the Action Area, Steller sea lions have the potential to be exposed to: habitat disturbance, vessel strikes, entanglement, artificial light, water quality (i.e., turbidity and hazardous substance spills), underwater noise, and anthropogenic presence and disturbance. None of these are anticipated to have significant negative effects on Steller sea lions. Any effects would be further minimized with the implementation of conservation measures included in Section 2.2.7.

4.3.4 FIN WHALE

4.3.4.1 REGULATORY HISTORY AND STATUS

The fin whale was listed as endangered in 1970 under the Endangered Species Conservation Act (35 FR 12222) and again in 1973 under the ESA (35 FR 12222). This endangered status applies to fin whales throughout the world's ocean, which comprise three subspecies: *Balaenoptera physalus physalus* in the North Atlantic and North Pacific, *B. physalus quoyi* in the Southern Ocean, and *B. physalus patachonica* in the mid-latitude Southern Ocean (NOAA Fisheries 2024e). No critical habitat has been designated for the fin whale. For management purposes, NMFS divides fin whale populations in U.S. waters into four stocks: California/Oregon/Washington, Hawaii, Alaska (Northeast Pacific), and Western North Atlantic (Muto et al. 2021a).

4.3.4.2 LIFE HISTORY

Fin whales are a migratory species, spending the winters in warm, low latitude waters and moving to cold, high latitude waters for feeding in the spring and early summer. In Alaska, fin whales belonging to the Northeast Pacific stock of the subspecies *B. physalus physalus* are found in the western Chukchi Sea, the Bering Sea, and throughout the Gulf of Alaska (Clark 2008), where they lunge-feed on invertebrates such as krill and small schooling fish (Clark 2008). Their abundance in the Bering Strait and southern Chukchi Sea in the summer months varies with environmental conditions, but they generally occur in greater numbers when productive water masses (i.e., areas characterized by low temperatures and high salinities) are present (Escajeda et al. 2020). Fin whales are second in size only to the blue whale and grow to lengths of 75 to 80 ft (~22 to 24 m) (NOAA Fisheries 2024e). Physical maturity occurs at approximately 25 years, with individuals living up to 90 years and sexual maturity occurring between 6 to 12 years of age (NOAA 2024e). Breeding occurs in the winter, and females usually birth 1 calf every 2 to 3 years. Gestation lasts 11 months, and calves are weaned at 6 to 7 months (Clark 2008). It is believed that females give birth to calves on or near the winter grounds, but sightings in these locations are rare; therefore, this has not been confirmed (Mizroch et al. 2009). In the spring, mothers migrate with their calves to feeding grounds, and site fidelity to these grounds appears to be maternally directed (Clapham and Seipt 1991). Due to the long gestation and nursing period, the complete breeding cycle takes place over the course of 1.5 to 2 years, and most females produce a calf at 2-year intervals (Agler et al. 1993).

Fin whales are social and typically occur in groups of 6 to 10 individuals, though they are sometimes found in pairs, alone, or in groups of up to 100 individuals (Clark 2008). They have exceptionally fast swimming speeds and may travel at up to 23 mph (37 kph) (Clark 2008). They are known to be capable of diving to depths of up to 1,542 ft (470 m) (Panigada et al. 1999), though they generally do not dive this deep in the Northeast Pacific, as aggregations of their preferred prey in that region occupy shallower depths of less than 919 ft (280 m) (Brinton 1962).

4.3.4.3 THREATS

Current threats to the fin whale include vessel strikes, underwater noise, entanglement in fishing gear, and climate change. Fin whales, like all baleen whales, are more vulnerable to ship strikes

than other marine mammals because of their larger body size (Silber et al. 2010; McKenna et al. 2015). Fin whales are particularly vulnerable and are believed to be more susceptible to ship strikes than any other whale species except for North Atlantic right whales (*Eubalaena glacialis*) (NOAA Fisheries 2024e). Transpolar shipping routes are experiencing an increasing trend in vessel traffic, which, in turn, increases the risk of fin whale mortality or injury from collisions. An increase in shipping traffic would also increase the ambient underwater noise levels. This increase in noise levels can disrupt normal fin whale behavior, conspecific communication, cause injury and stress, and overall decrease the whales' ability to sustain their health (Aguilar de Soto et al. 2016).

Fin whales are also susceptible to being entangled in fishing gear like traps, pots, and gillnets. An entangled whale can carry gear for long distances, which can lead to fatigue, injury, or eventual death (NOAA Fisheries 2024e). Recent studies suggest the incidence of entanglement of fin whales may be more common than previously believed (Ramp et al. 2021).

Climate change is also a threat to fin whales, as altered oceanographic conditions can lead to changes in prey distribution that could in turn cause nutritional stress, altered foraging behavior, and diminished reproduction. Rising ocean temperature and changes in ocean currents could also lead to altered behavior by affecting the timing of the environmental cues fin whales rely on for navigation and foraging (NOAA Fisheries 2024e). Despite significant population recovery since cessation of industrial whaling, population models predict that climate change may lead to fin whale declines or even local extinctions due to reductions in prey from ocean warming and increasing competition with other whale species (Tulloch et al. 2019).

4.3.4.4 POTENTIAL PRESENCE IN THE ACTION AREA

In the eastern Pacific, fin whales spend the winter in the Gulf of Alaska and migrate as far north as the Chukchi Sea to reach their summer feeding grounds (Clark 2008). They have been documented to be consistently in an area of high productivity along the edge of the eastern Bering Sea continental shelf and at a lower frequency in the middle shelf (Springer et al. 1996), but they generally remain outside coastal waters (Muto et al. 2021a). While this species is known to occur within the Action Area, no Biologically Important Areas (BIAs) for fin whales have been identified within the Action Area (Brower et al. 2022), and no recently recorded sightings of fin whales within the Action Area were found. Therefore, fin whales have the potential to occur in the Action Area during Project activities in the summer, but this area is not known to be critical to the life history of the species.

4.3.5 HUMPBACK WHALES: WESTERN NORTH PACIFIC DPS AND MEXICO DPS

4.3.5.1 REGULATORY HISTORY AND STATUS

Humpback whales were listed as endangered in 1970 (Endangered Species Conservation Act), with protection continuing under the 1973 ESA. In September of 2016, the humpback whale ESA listing was formally revised to identify the 14 DPSs: 1 as threatened (Mexico DPS), 4 as endangered (Cape Verde Islands/Northwest Africa, Western North Pacific, Central America, and Arabian Sea DPSs), and 9 others as not warranted for listing (81 FR 62259).

Three subspecies of humpback whales are recognized globally: the Atlantic, Southern Hemisphere, and North Pacific subspecies. Only the North Pacific subspecies of humpback whale (*Megaptera novaeangliae kuzira*) is relevant to this Project and the Action Area. Humpback whales from three different DPSs of the North Pacific subspecies are known to occur in Alaskan waters, including the Action Area: the Mexico DPS (threatened), the Western North Pacific DPS (endangered), and the Hawaii DPS (the latter of which is not protected under the ESA, and therefore is not considered further in this BA). Humpback whales belonging to each of these DPSs are indistinguishable from one another, and individuals from any or all of these DPSs could be present in the Action Area; therefore, the remainder of this discussion simply refers to the individuals of each DPS collectively as humpback whales.

4.3.5.2 LIFE HISTORY

Humpback whales are distributed worldwide and migrate seasonally between subarctic and temperate summering areas to tropical and sub-tropical wintering areas (Young et al. 2023). Their migrations may cover distances of up to 5,000 miles (~8,050 km) (NMFS 2024). In the winter months, humpback whales are found in mating and calving areas in the tropics, and in the summer and fall, they are present on feeding grounds at higher latitudes, including the waters of Alaska (Gabriele et al. 2017). In the eastern Bering Sea, humpback whales usually occur over the southeastern Bering Sea shelf and generally exhibit a preference for coastal waters north of the Alaska Peninsula, where this preferred habitat is associated with the inner Bering Sea front (Zerbini et al. 2015b). This front is an area roughly aligned with the 164-ft (50-m) isobath that extends more than 1,000 km from the Unimak Pass, around Bristol Bay, and northwest past Nunivak Island and is characterized by nutrient upwelling and high productivity (Kachel et al. 2002). Humpback whales feed on krill and small fish and in the summer months (NOAA Fisheries 2024g). They are often found close to shore and will work together in groups to corral and disorient prey using group coordinated bubble net feeding (NOAA Fisheries 2024g).

Humpback whales may live up to 90 years and typically grow to lengths of 60 ft (~18 m) (NOAA Fisheries 2024g). They reach maturity between 4 to 10 years of age, and females typically produce a calf every 2 to 3 years (NOAA Fisheries 2024g). Calves are born following an 11-month gestation period and will stay with their mothers for up to 1 year prior to weaning (NOAA Fisheries 2024g). Calves migrate with their mothers from the winter breeding grounds to summer feeding grounds and typically arrive by mid-May, though individual whales may arrive on the feeding grounds as early as April (NOAA Fisheries 2024g). Humpback whales form small, unstable groupings on the feeding grounds, with large groups only temporarily occurring if extensive schools of prey are available (Clapham 2000). The diving behavior of humpback whales tends to be short and shallow, with most dives being under 3 minutes and to depths of less than 197 ft (60 m) (Dolphin 1987).

4.3.5.3 THREATS

The main threats to humpback whales include vessel strikes, climate change, entanglement in fishing gear, and vessel-based harassment (NOAA Fisheries 2024g). Specifically, NOAA's Alaska Marine Mammal Stock Assessment for humpback whales of the western North Pacific Stock indicates that vessel strikes and entanglement in fishing gear and/or marine debris are the most

common sources of human-related mortality for humpback whales (Young et al. 2023). In addition to vessel strikes, the tendency for humpback whales to be active at the surface in areas near coastlines places them at greater risk of vessel-based harassment in the form of whale watching tours and recreational boats, which may be a cause of stress and lead to behavior alteration (NOAA Fisheries 2024g). Climate change also poses a risk to humpback whale populations, namely due to changing ocean conditions and associated effects on the abundance and distribution of prey species (NOAA Fisheries 2024g). Changing climactic conditions may also affect the seasonal timing of environmental cues that are important for humpback whale migrations (NOAA Fisheries 2024g).

4.3.5.4 POTENTIAL PRESENCE IN THE ACTION AREA

The Action Area is within the known range of humpback whales (NOAA Fisheries 2025c), which are anticipated to be present in highest numbers during the summer months, when Project activities would occur. During the summer months humpback whales occupy and/or migrate through the Bering Sea and while primarily seen in Alaska during the summer months, they have been documented year-round (ADFG 2018).

While the species may occur in the Action Area, no BIAs for humpback whales have been identified in the Action Area (Brower et al. 2022), no humpback whale breeding grounds are known from the Action Area, no known important foraging areas for humpback whales have been identified within the Action Area (Brower et al. 2022), and no recently recorded sightings of humpback whales within the Action Area were found; therefore, this species has the potential to occur in the Action Area during Project activities in the summer, but the Action Area is not known to be of biological importance to this species.

4.3.6 GRAY WHALE: WESTERN NORTH PACIFIC DPS

4.3.6.1 REGULATORY HISTORY AND STATUS

NMFS currently recognizes two DPSs of gray whales in the North Pacific: the Eastern North Pacific DPS and the Western North Pacific DPS (LeDuc et al. 2002; Lang et al. 2014; Weller et al. 2013). The Western North Pacific DPS was listed as endangered throughout its range on January 7, 1993 (58 FR 3121), while the Eastern North Pacific DPS was delisted as endangered in 1994; therefore, only the western North Pacific subspecies of gray whale is relevant to this analysis. As both DPSs utilize Alaskan waters, any gray whale in the Action Area has the potential to belong to either DPS; therefore, they will herein be referred to as gray whales, collectively. However, as of March 2023 the Status Review Team, convened by NMFS, is currently considering combining the two DPSs into one single DPS (Weller et al. 2023). If NMFS were to formally adopt gray whales into a single DPS prior to the Project moving forward, there would be no change to the consideration of potential effects to the Western North Pacific DPS due to the indistinguishable nature of gray whales occurring in the Action Area.

4.3.6.2 LIFE HISTORY

Gray whales occur in shallow coastal waters of the western North Pacific and are the only large whales that can be regularly observed in large numbers from Alaska's shores (Frost and Karpovich

2008; NOAA Fisheries 2025c). Gray whales are highly migratory, migrating 5,000 to 7,000 miles (8,047 to 11,265 km) each way (ADFG n.d.b). During late February to May, most gray whales migrate north to their feeding grounds in the coastal waters of the northern Bering Sea and the southern Chukchi Sea, though some individuals may spend summers feeding along the Pacific Coast off Southeast Alaska, British Columbia, Washington, Oregon, and Northern California (NOAA Fisheries 2024f). They are bottom-feeders, with a diet consisting of a broad range of benthic and epibenthic invertebrates, which they filter from the seafloor by scooping up large areas of seafloor sediments (NOAA Fisheries 2024f). In the fall, gray whales from the eastern Pacific stock migrate back southwards to wintering and calving areas off the coast of Baja, Mexico (NOAA Fisheries 2024f). The specific migratory route of the Western Pacific stock is unknown, but they are believed to migrate to areas between the Sea of Okhotsk and southern Korea (ADFG n.d.b). At least some of these Western stock individuals migrate eastward to the waters of Alaska in the summer (NOAA Fisheries 2024f).

Gray whales reach sexual maturity between the ages of six and 12 years of age, and females have a gestation period of 12 to 13 months (NOAA Fisheries 2024f). Calves accompany their mothers on the northward migration to feeding grounds in the summer and nurse for a period of 7 to 8 months (ADFG n.d.b). Their lifespan remains unknown, but individuals as old as 80 years of age have been recorded (NMFS 2024). Adults grow to lengths up to 49 ft (~15 m) (NOAA Fisheries 2024f). They are generally found near coastal areas, and their summer distribution is largely concentrated in the Chirikov Basin in the northern Bering Sea, while those individuals that enter the Chukchi Sea are largely clustered near the shore between Cape Lisburne and Point Barrow (Moore et al. 2000). In the Chukchi Sea they are strongly associated with shallow coastal and shoal habitats that are less than 115 ft (35 m) in depth, whereas they occupy somewhat deeper areas between 118 and 164 ft (36 and 50 m) in depth in the northern Bering Sea (Moore et al. 2000).

4.3.6.3 THREATS

The main threats to gray whales include prey availability, vessel strikes, entanglement in fishing gear, pollutants, and incidental take in coastal fisheries (Carretta et al. 2020; NOAA Fisheries 2021). Additionally, the potential effects of climate change and ocean acidification could reduce the abundance of shell-forming organisms important to the gray whale diet (NOAA Fisheries 2021), and habitat degradation arising from offshore oil and gas development may negatively affect gray whale foraging habitat (NOAA Fisheries 2024f). The NMFS Alaska Marine Mammal Stock Assessment (NOAA Fisheries 2021) for gray whales also highlights unusual mortality events that began in 2019 as a threat to the species. Between 2019 and 2023, unusual mortality events in the United States alone resulted in between 44 and 122 gray whales strandings per year. Stranded whales were found to be in poor body condition. Various theories for the observed malnutrition focused on changes to foraging grounds and prey availability because of changing sea ice conditions, ultimately thought to be due to climate change (NOAA Fisheries 2021). This led to a dramatic decline in abundance estimates for gray whales, with an estimated population decline of 46 percent between 2016 and 2023 (Eguchi et al. 2023).

4.3.6.4 POTENTIAL PRESENCE IN THE ACTION AREA

During late February to May, gray whales are known to migrate north through coastal waters of the Bering Sea to summer feeding grounds further north in the Chirikov Basin of the northern Bering Sea and coastal areas of the Chukchi Sea (Moore et al. 2000). As such, migrating and feeding gray whales have the potential to occur in the Action Area during summer cable installation activities.

While the species may occur in the Action Area, no BIAs for gray whales have been identified in the Action Area, no known important foraging areas for gray whales have been identified within the Action Area, no recently recorded sightings of gray whales within the Action Area were found, and gray whale breeding habitats exist far to the south in tropical areas (Brower et al. 2022); therefore, this species has the potential to occur in the Action Area during Project activities in the summer, but the Action Area is not known to be of biological importance to this species.

4.3.7 NORTH PACIFIC RIGHT WHALE

4.3.7.1 REGULATORY HISTORY AND STATUS

The North Pacific right whale was originally listed as endangered since 1970 under the Endangered Species Conservation Act, and this listing was maintained in 1973 under the ESA. The species was originally listed as the “northern right whale” but was reclassified in 2008 as two separate endangered species: North Pacific right whale (*Eubalaena japonica*) and North Atlantic right whale (*E. glacialis*) (NOAA Fisheries 2024i). A third species, the southern right whale (*E. australis*) is also listed as endangered (NOAA Fisheries 2024i). The North Pacific right whale is the only one of the three species that occurs in the North Pacific and Bering Sea (NOAA Fisheries 2024j) and therefore is the only one relevant to this analysis.

4.3.7.2 LIFE HISTORY

North Pacific right whales historically were found across the North Pacific from temperate to subpolar latitudes (NOAA Fisheries 2024j). Today, they are among the rarest marine mammals (Wade et al. 2011), with a distribution spanning from Baja, California, to the Bering Sea. The highest concentrations of this species are reported in the Bering Sea, Gulf of Alaska, Okhotsk Sea, Kuril Islands, and Kamchatka area (ADFG n.d.c). Since 1980, the only area where this species has been consistently observed is on the middle shelf of the southeastern Bering Sea (Shelden et al. 2005), and since 1996, they have repeatedly been observed in their critical habitat in the southeastern Bering Sea during the summer months (NOAA Fisheries 2024j). Their migratory patterns remain unknown, but they are believed to spend summers in feeding grounds to the north and migrate to warmer areas, such as southern California, in the winter (NOAA Fisheries 2024j). The calving grounds of the North Pacific right whale have not been identified, but those of other right whale species are often associated with shallow, coastal waters (NOAA Fisheries 2024j). North Pacific right whales feed on zooplankton in the water column by skimming, a process of swimming with their mouth open at the water’s surface and filtering out the zooplankton with their baleen plates (NOAA Fisheries 2024j).

The lifespan of North Pacific right whales is unknown, but individuals as old as 70 years of age have been recorded (NOAA Fisheries 2024j). Similarly, data on right whale reproduction is limited, but they are believed to mate at around 8 years of age, and females give birth to their first calf at an average age of 9 or 10 years of age (NOAA Fisheries 2024j). Gestation lasts from 12 to 13 months, and females are believed to produce 1 calf once every 3 to 5 years (NOAA Fisheries 2024j). Calves remain with their mother through their first year of life (NMFS 2024). Though there are no reliable population estimates, it is believed that there are likely fewer than 500 North Pacific right whales remaining, of which only about 30 individuals are estimated to remain of the Eastern stock that visits Alaskan waters (NOAA Fisheries 2024j).

4.3.7.3 THREATS

Threats to this species include vessel strikes, entanglement, ocean noise, biotoxins from harmful algal blooms, and climate change (NOAA Fisheries 2024j). The primary human-caused source of mortality and injury for the North Pacific right whale is vessel strikes (Cole et al. 2005; Henry et al. 2012, 2019; Hayes et al. 2018). Due to their foraging behavior as primarily surface feeders, the Northern Pacific right whale is at an increased risk of vessel strike compared to other whales that feed in mid-water or on the seafloor. Other threats to North Pacific right whales include entanglement in fishing gear or other marine debris, negative health effects from harmful algal blooms, and the climate change effects that may alter the abundance or distribution of their zooplankton prey (NOAA Fisheries 2024j). Given the rare occurrence and scattered distribution of North Pacific right whales, any human-caused mortality or serious injury of an individual could result in population-level effects for the species (Young et al. 2024b).

4.3.7.4 POTENTIAL PRESENCE IN THE ACTION AREA

The Action Area is within the known range of the North Pacific right whale but is not close to any identified BIAs for the species (Brower et al. 2022; Young et al. 2024b). North Pacific right whales have most frequently been observed in the southeastern Bering Sea and nearby areas in the Aleutian Islands, where they are known to spend summers feeding (NOAA Fisheries 2024j). This species has the potential to occur within the Action Area, as it falls within the boundaries of their known distribution, but the Action Area is not known to be of biological importance to this species, and there are no known records of the species occurring there.

4.3.8 POTENTIAL EFFECTS ON WHALES (ALL ASSESSED SPECIES)

Habitat Disturbance

As discussed in Section 3.1.2, Project activities have the potential to result in disturbance to marine habitats. Project effects due to habitat disturbance for each whale species are discussed herein.

In the summer months when marine Project activities will be taking place, fin whales may be present in the Action Area (Clark 2008); however, this species is more commonly found over the edge of the Bering Sea continental shelf (Springer 1996), suggesting the likelihood of their using habitats in the Action Area is low. The pelagic feeding behavior and typical distribution of fin whales, combined with the transient nature of Project effects to the seafloor habitat in the Action

Area, suggest the risk of negative effects to fin whale arising from habitat disturbance are insignificant.

Humpback whales are known to forage in areas near coastlines on schooling fish, including herring and capelin, as well as on krill (Clapham 2000). Notably, all of their prey species are pelagic and occur at varying densities throughout the water column. In Alaskan waters, humpback whales selectively seek out the shallowest patches of prey and rarely dive below 394 ft (120 m) (Dolphin 1987). Given this preference for feeding in shallow areas near the coast, there is the potential that humpback whales could be feeding in the Action Area. Because Project activities are focused on cable installation in and on the seafloor, there would not be any direct effects to the pelagic foraging habitats on which humpbacks rely. Although Project activities may briefly make these habitats unsuitable for feeding by virtue of vessel and equipment presence, these effects would be transitory and localized; therefore, the risk of habitat disturbance causing negative effects to humpback whales is insignificant.

Gray whales are known to migrate through and forage in shallow environments along the Alaskan coastline in the Bering Sea, and their feeding involves scooping and filtering of the substrate along the seafloor (NOAA Fisheries 2024f). This behavior means that they have the potential to migrate or forage in habitats in the Action Area that would be disturbed by Project activities. Notably, studies of gray whale movement indicate that 95 percent of gray whales migrate within 2.6 miles (4.17 km) of shore (Shelden et al. 2002), although there is evidence that they move slightly farther offshore when migrating northward (Guazzo et al. 2017); however, females with calves are known to move very close to shore, even on their northward migration (Guazzo et al. 2017). The preference that gray whales exhibit for proximity to shore during their migrations suggests that most individuals are likely to be much closer to the coast than the planned cable route, which roughly parallels the coastline at a distance of 20 to 25 miles (~32 to 40 km) offshore. The likelihood that gray whales would be feeding along the planned cable route is minimal, but even if cable trenching and surface-lay does have effects on areas where gray whales are feeding, these effects would be highly localized and short in duration; therefore, the risk of habitat disturbance from Project activities having negative effects on gray whales is insignificant.

North Pacific right whale distribution and habitat use is poorly understood, but their distribution is presumed to be driven by the presence of suitable patches of their zooplankton prey (Gregar and Coyle 2009). Studies suggest their primary feeding grounds are in the coastal Gulf of Alaska and Pacific subarctic gyres (Wright et al. 2025), placing them south of the Action Area. Although they have the potential to occur in the Action Area, they forage on pelagic zooplankton species that reside in the water column (NOAA Fisheries 2024j). Project activities are focused on cable installation in and on the seafloor and therefore would not result in direct effects on the pelagic habitats in which North Pacific right whales forage. Although Project activities may briefly make these habitats unsuitable for feeding by virtue of vessel and equipment presence, these effects would be transitory and localized; therefore, significant negative effects to North Pacific right whales arising from habitat disturbance are highly unlikely.

Effects of Habitat Disturbance on Prey

As discussed in Section 3.1.2, Project activities have the potential to result in disturbance to the habitats of the prey of listed species. Project effects due to prey disturbance for each whale species are discussed herein.

Krill represent the most important prey item in the diet of fin whales, though they also consume small schooling fish such as herring (Ryan et al. 2013). Large aggregations of these pelagic prey species most commonly occur in productive areas of the ocean characterized by upwelling (Escajeda et al. 2020). In the Northeast Pacific, these areas tend to occur along the edge of the continental shelf, placing them far outside of the Action Area (Springer 1996). As such, the risk that Project activities on the seafloor in the Action Area would cause negative effects to the prey of fin whales is insignificant. Vessel presence associated with Project activities may have the potential to disturb schooling prey species and result in localized displacement of food sources for fin whales, but the tendency for fin whale feeding to occur further offshore suggest this risk is also insignificant. Further, in the unlikely event that such effects do occur, their effect would be short in duration due to the limited temporal and spatial scope of planned Project activities.

The prey species that humpback whales feed on are present in the water column rather than in the substrates of the seafloor (Clapham 2000); therefore, cable installation activities associated with the Project would not cause direct effects to humpback whale prey through disturbance of physical habitats. However, the activity of Project vessels may result in displacement of prey, which, in turn, may lead to localized disruption of humpback whale feeding behavior. If such effects on prey do occur, they would be limited in spatial and temporal extent due to the discrete and linear nature of the Project, as well as the short duration of Project activities in any one location; therefore, the risk of negative effects from Project activities on the prey of humpback whales is insignificant.

The benthic and epibenthic feeding habits of gray whales means that their preferred invertebrate prey items (e.g., amphipods) reside in or on the seafloor (NOAA Fisheries 2024f); however, gray whales typically occur in environments nearer to shore than the planned cable route (Shelden et al. 2002; Guazzo et al. 2017). Further, any negative effects to benthic prey species would be highly localized to the spatially limited, linear cable trench route and would likely be short in duration, as the substrate is expected to quickly return to a normal state through releveling of sediments resulting from wave action and current; therefore, the risk of negative effects to gray whale prey species arising from Project activities is insignificant.

The primary prey of North Pacific right whales in Alaskan waters are copepods (Baumgartner et al. 2013), which reside in the water column. The pelagic nature of these prey species means they are not at risk of direct effect from Project cable installation activities that would disturb the seafloor. Given the planktonic nature of these copepods, it is unlikely that vessel traffic would result in displacement of prey; however, if localized effects on copepods near the surface do occur, they would be limited in spatial and temporal extent due to the discrete and linear nature of the Project, as well as the short duration of Project activities in any one location. As such, the risk of negative effects to right whale prey species arising from Project activities is insignificant.

Vessel Strike and Entanglement

As discussed in Sections 3.2 and 3.3, vessel traffic has the potential to pose the risk of vessel strike and entanglement of listed species. Project effects due to vessel strikes and entanglement for each whale species are discussed herein.

Vessel strike is one of the primary human causes of death for large whales, and fin whales are known to suffer from vessel strike throughout their range (Panigada et al. 2006; Nichol et al. 2017; Rockwood et al. 2018). Fin whales are believed to be one of the species most susceptible to vessel strike (NOAA Fisheries 2024e). Models suggest that the vessel strike mortality of fin whales may be 2.7 times the recommended limit, suggesting vessel strike may be a significant impediment to population growth and recovery (Rockwood et al. 2018).

Recent studies have indicated the vast majority of humpback whale vessel strike incidents affect young individuals, a trend which may be driven by their surface foraging behavior and nearshore habitat use (Stepanuk et al. 2021). Based on the most recent stock assessment, the minimum mean annual mortality and serious injury rate resulting from vessel strikes in the western North Pacific stock of humpback whales was 0.14 from 2016-2020 (i.e., less than one whale per year) (Young et al. 2023); however, most vessel strikes of humpbacks in Alaska occur outside the range of the western North Pacific stock in Southeast Alaska (Young et al. 2023).

The Bering Sea has been identified as an area of high risk for gray whale vessel strike (Silber et al. 2021); however, collisions with gray whales in Alaskan waters are rare compared to trends documented elsewhere (Neilson et al. 2012). Recent assessments of the Eastern North Pacific gray whale stock found that vessel strikes accounted for nine mortalities or serious injuries between 2014 and 2018 (Carretta et al. 2020).

Vessel strikes are the primary cause of death in North Atlantic right whales, and it is presumed that North Pacific right whales are also at risk from vessel strike (NOAA Fisheries 2024j). Vessel interactions with North Pacific right whales are rare, and there is little data on the relative risk of vessel strikes in this population (Bouhassira 2023), but the low population size of an estimated 30 individuals (NOAA Fisheries 2024j) means that even a single vessel strike could have significant implications at the population scale. Further, the surface skimming foraging behavior of right whales puts them at elevated risk of vessel strike as compared to other whale species (Parks et al. 2010).

Although all listed whale species are susceptible to vessel strike, the risk posed to whales in the Action Area by Project vessels would be minimal, as all vessels are expected to operate at low speeds (between 0.5 and 10 knots [0.26 and 5.14 m/s]). Because vessel strikes are less common when vessels are traveling at speeds less than 13 knots (6.7 m/s) (Jensen and Silber 2003; McKenna et al. 2012; Currie et al. 2017), the risk of striking whales in the Action Area would be low. Further, Project vessels will reduce their speed to less than 5 knots (2.6 m/s) and will avoid changes in direction and speed (unless necessary for safety) when a whale is sighted within 300 yards (274 m), thereby further reducing the risk of vessel strike. In addition, PSOs would be present during daylight hours to monitor for marine mammals and provide direction to avoid vessel strikes. Offshore work will cease in low light or after dark when visibility is reduced to avoid

potential strikes. Given these factors, the risk of vessel strike negatively affecting whales in the Action Area is insignificant.

As discussed in Section 3.3, cable-laying activities carry the potential for entanglement of listed species. Evidence suggests that fin whales are at high risk of entanglement in discarded fishing gear (Ramp et al. 2021), and there is the potential for abandoned fishing gear to become snagged on the FOC. Similarly, estimates suggest that between 52 and 78 percent of humpback whales in Southeast Alaska have been entangled in fishing gear at some point in their lives (Neilson et al. 2009). The most common form of non-hunting, human-caused injury and mortality to gray whales in recent decades has been entanglement in pot fishery gear (Scordino et al. 2020). Commercial fishery-related incidents were found to have caused 50 gray whale mortalities or serious injuries from 2014 to 2018 in the Eastern North Pacific stock, whereas marine debris entanglements caused two incidents (Carretta et al. 2020). Studies of the North Atlantic right whale have shown that the population suffers significant effects from entanglement in commercial fishing gear (Maresh 2005), and it may be presumed that North Pacific right whales are similarly susceptible to entanglement.

Although all listed whale species that may potentially occur in the Action Area are susceptible to entanglement, the risk of entanglement in modern FOC is extremely low (Wood and Carter 2009). Further, the risk of discarded fishing gear becoming snagged on the FOC and presenting an additional source of entanglement would be minimized by burying of the cable in the sediment of the seafloor in areas of high fishing activity. In addition, the tendency for fin whales, humpback whales, and right whales to pursue pelagic prey puts them at minimal risk of coming into contact with debris on or near the seafloor. The benthic feeding behavior of gray whales does pose some risk of disturbing the buried cable; however the cable route being much farther offshore than the preferred feeding areas of gray whales (Shelden et al. 2002; Guazzo et al. 2017), combined with a burial depth of 5 ft (~1.5 m) suggest that the typical gray whale scour depth of 0.33 ft (0.1 m) (Nelson et al. 1987) is unlikely to lead to unburying of the cable and associated entanglement. Given these factors the risk of entanglement arising from Project activities and equipment negatively affecting listed whale species is insignificant.

Lighting

As discussed in Section 3.4, artificial lighting has the potential to negatively affect species in marine ecosystems (Depledge et al. 2010). Project activities will require the use of artificial lighting, as both offshore and onshore installation activities may occur 24 hours per day; however, periods of offshore Project activity will take place in the ice-free summer season when daylight lasts 18-21 hours, and artificial lighting will be required for only short durations.

Artificial lighting in the marine environment may affect the processes and habitats of marine ecosystems (Marangoni et al. 2022). Illumination has the potential to create artificially induced aggregations of fish (marine mammal prey species) and ichthyoplankton (Marchesan et al. 2005; Keenan et al. 2007). It may also attract marine mammals including whale species pursuing these light-associated prey aggregations (Depledge et al. 2010; Yurk and Trites 2000).

However, Project vessels will not require excessive lighting and will transit through the Action Area over a brief period. In addition, PSOs will be present during daylight hours to monitor for marine mammals and provide direction to avoid vessel strikes. Offshore work will cease in low light or after dark when visibility is reduced to avoid potential strikes; therefore, the effects of vessel lighting would be localized and temporary and would not significantly affect listed whale species.

Water Quality Effects – Increased Turbidity and Fuel or Hazardous Substance Spills

As discussed in Section 3.5, Project activities have the potential to affect water quality through increased turbidity and fuel or hazardous substance spills. Project effects due to water quality effects for ESA whale species are discussed herein.

Marine mammals, including listed whale species that often occupy turbid waters, are not known to experience significant negative effects from localized, temporary increases in turbidity arising from suspension of sediment associated with activities disturbing the seafloor (Todd et al. 2014). Turbidity is likely to be increased through suspension of sediment arising from surface-lay, cable sea plow burial, water jet sled burial, diver burial with hand jets, or from trenched excavations for landfall. The suspension of sediments caused by these Project activities would be temporary and localized; therefore, the risk of increased turbidity from Project activities having negative effects on listed whale species in the Action Area is insignificant.

Project Vessels and equipment have the potential to release fuel, oil, or lubricants into the marine environment. If spilled, petrochemicals have the potential to result in direct effects on listed whale species (e.g., becoming oiled or sickened), as well as indirect effects through destruction or degradation of habitat or prey species. Additionally, solid waste releases, such as garbage or food waste from vessels, can have negative effects on marine species; however, vessels operate under strict regulatory requirements that include measures to prevent and respond to unforeseen accidents. Requirements include federal and state oil spill prevention and response requirements. By following these regulations and measures to avoid spills, the risk of hazardous material effects on listed whale species in the Action Area is insignificant.

Noise

As discussed in Section 3.6, Project activities have the potential to result in underwater noise that may affect listed species. Project effects due to noise for each whale species are discussed herein.

Fin whales have been shown to alter their behavior and move away from underwater noise produced by human activities (Castellote et al. 2012). In particular, they have been shown to modify their acoustic communication in response to increased background noise (e.g., from vessels) and move away from areas for extended periods in response to seismic air gun noise (Castellote et al. 2012). Fin whales are known to call to one another in the feeding areas in the Bering Sea (Escajeda et al. 2020); therefore, disturbance arising from underwater noise produced by may result in negative effects on their ability to communicate and behave normally. However, the low likelihood of fin whales being present in the Action Area, the short duration of Project activities, and underwater noise levels in line with baseline conditions suggest that underwater sounds produced by Project activities are unlikely to cause significant effects.

Based on modeling and tracked individuals, humpback whales in the Bering Sea have a high degree of exposure to acoustic disturbance, namely as a result of their spatially localized foraging behavior (Costa et al. 2016). Humpback whales have been shown to exhibit behavioral disturbance from vessel noise, including decrease resting time and increased swim speeds (Sprogis et al. 2020). In addition to behavioral disturbance, underwater noise may interfere with auditory communication among humpback whales. Humpback whale song is known to occur in the Alaskan feeding grounds, although the function of these songs remain unclear (Marchand 2022). Research indicates that the level of noise plays a role in evoking behavioral responses, with louder noise exposures causing more significant behavioral responses in mother calf pairs as compared with lower noise levels; in fact, lower noise levels may not elicit any detectable behavioral effect (Sprogis et al. 2020). Given the anticipated short duration of vessel presence for Project activities and underwater noise levels in line with baseline conditions, any noise related effects to humpback whales in the Action Area are expected to be insignificant.

Studies of the effects of underwater noise on gray whales have shown varying results, with some finding no significant response in behavior (Muir et al. 2015) and others detecting increasing speed and respiration rate when sound exposures are higher (Gailey et al 2022). The severity of sound effects on gray whales may vary depending on the behavior they are exhibiting. For example, migrating gray whales were shown to respond to a sound source if it occurred directly in their migration route but did not respond when the same sound source was outside their migratory path (Tyack and Clark 1998). In addition to direct disturbance, underwater noise has the potential to interfere with gray whale acoustic communication, although gray whales have been shown to modify their acoustic communication to adjust for increased levels of background noise (Dahlheim and Castellote 2016). Given short duration of vessel presence in any one location and underwater noise levels in line with baseline conditions, any noise related effects to gray whales would be insignificant.

The effect that underwater noise produced by vessel activity has on North Pacific right whales remains largely unknown (Southall et al. 2007). Studies of North Atlantic right whales have shown that they may ignore the sound of vessels (Nowacek et al. 2004), although other research on North Atlantic right whales have found evidence that ship noise may increase stress levels (Rolland et al. 2012). Underwater noise also has the potential to interfere with right whale acoustic communication, although they have been shown to call louder when there is a higher level of background noise (Parks et al. 2010). The short duration of vessel presence in any one location and underwater noise levels in line with baseline conditions, suggests that any noise related effects on right whales would be insignificant.

Anthropogenic Disturbance

As discussed in Section 3.7, Project activities have the potential to result in anthropogenic disturbance of listed species due to human presence and activity. Project effects due to anthropogenic disturbance for each whale species are discussed herein.

Fin whales may exhibit negative responses to human activities such as vessel traffic, which often take the form of suspending vocal activity, moving away from the source of disturbance, or quickly diving and fleeing (Watkins 1986). Chronic stress from exposure to anthropogenic activity and

anthropized environments may lead to poorer welfare and body condition of fin whales (Boileau et al. 2024), although studies have also demonstrated that fin whales may become used to human activities through repeated exposure (Watkins 1986). Project activities in the Action Area will involve the use of vessels, but the transient nature of the planned cable-laying activities and the ability of fin whales to move away from the source of disturbance suggests that any effects would be short in duration. In addition, the number of Project vessels in the Action Area would be in line with baseline vessel traffic conditions. Though this may result in a temporary disruption of normal feeding behaviors, this is unlikely given their preference for feeding further offshore over the edge of the continental shelf (Springer 1996). Given these factors, the risk of negative effects from Project-related anthropogenic activity on fin whales is insignificant.

Studies in Alaska have demonstrated that humpback whales exhibit increased deviations in movements, increased swimming speeds, decreased inter-breath intervals, and increased respiration rates in response to vessel presence (Schuler et al. 2019). Further, differences in these behavioral changes have been correlated with increasing number of vessels and time spent in proximity to vessels, and humpback whales have been found to be more likely to stop surface activity if vessels are present (Schuler et al. 2019). Project activities in the Action Area will involve the use of vessels, but the transitory nature of the planned cable-laying activities and the ability of humpback whales to move away from the source of disturbance would suggest that negative effects would be avoided. In addition, the number of Project vessels in the Action Area would be in line with baseline vessel traffic conditions; therefore, the risk of anthropogenic disturbance negatively affecting humpback whales in the Action Area is insignificant.

Gray whale behavior has been shown to be significantly correlated with the presence of vessel traffic (Sullivan and Torres 2018). The response of gray whales to vessel presence may vary by location and may depend on the abundance of food resources in an area but under certain circumstances (i.e., when a rich foraging patch is not present), the approach of vessels has been demonstrated to cause gray whales to cease foraging behavior and travel away from the source of the disturbance (Sullivan and Torres 2018); however, gray whales may become accustomed to vessel presence (Sullivan and Torres 2018) and often show little evidence of spatial variation in their foraging in response to vessel traffic (Garner 1990). In general, guidelines restricting vessel proximity to gray whales seem to be adequate for preventing disturbance of their normal behavior (Bass 2000). The gray whale preference for foraging closer to shore than the planned cable route location (Shelden et al. 2002; Guazzo et al. 2017), the potential they would not alter their behavior as a result of vessel presence (Garner 1990; Bass 2000), and the transitory nature of the Project activities suggest that any effects are highly unlikely. In addition, the number of Project vessels in the Action Area would be in line with baseline vessel traffic conditions. Given these factors, the risk of anthropogenic disturbance negatively affecting gray whales in the Action Area is insignificant.

There have been few studies of how anthropogenic disturbance such as vessel activity may affect right whales, but available data suggest that the sensitivity of right whales to disturbance depends on what behaviors they are engaged in (Watkins 1986; NMFS 2006). Right whales that are actively feeding or courting may be unresponsive to disturbance, which, in turn, may put them at higher risk of encountering approaching vessels (NMFS 2013). Studies of closely related southern

right whales have failed to detect any significant short-term effects of vessel presence on their movement, although there is some evidence they may decrease their breathing rate and spend more time underwater when close to vessels (Chalcobsky et al. 2020); however, other studies have determined that southern right whales may actively avoid vessels depending on the approach behavior of said vessel (Argüelles et al. 2016). The concentration of North Pacific right whales over the middle shelf of the southeast Bearing Sea suggests that they are not likely to be in the Action Area (Zerbini et al. 2015). Further, evidence from closely related species suggests that following guidelines for vessel operation in proximity to right whales would reduce the risk of effects on their behavior (Argüelles et al. 2016), and any effects that do occur would be spatially and temporally restricted due to the nature of the Project activities. In addition, the number of Project vessels in the Action Area would be in line with baseline vessel traffic conditions; therefore, the risk of negative effects on right whales in the Action Area arising from anthropogenic disturbance is insignificant.

4.3.8.1 CONCLUSIONS

The Project may affect but is not likely to adversely affect fin, gray, humpback, and North Pacific right whales. In the Action Area, whales would have the potential to be exposed to: habitat disturbance, vessel strikes, entanglement, artificial light, water quality (i.e., turbidity and hazardous substance spills), underwater noise, and anthropogenic presence and disturbance. None of these are anticipated to have significant negative effects on listed whale species. Any effects would be further minimized with the implementation of conservation measures included in Section 2.2.7.

5. CONCLUSIONS

This BA forms the basis for the conclusions on the effects of the proposed Project on the following federally listed species: bearded seal (Beringia DPS), beluga whale (Cook Inlet DPS), blue whale, bowhead whale, false killer whale, fin whale, gray whale (Western North Pacific DPS), Guadalupe fur seal, humpback whale (Western North Pacific DPS, Mexico DPS), killer whale (Southern Resident DPS), North Pacific right whale, ringed seal (Arctic subspecies), sei whale, sperm whale, Steller sea lion (Western DPS), Chinook salmon (multiple ESUs), chum salmon (Hood Canal summer-run ESU), coho salmon (Lower Columbia River ESU), eulachon (Southern DPS), green sturgeon (Southern DPS), sockeye salmon (Snake River ESU), steelhead trout (multiple DPSs), yellow eye rockfish (Puget Sound/Georgia Basin DPS), and sunflower sea star.

It was determined that the Project would have no effect on beluga whale (Cook Inlet DPS), blue whale, bowhead whale, false killer whale, Guadalupe fur seal, killer whale (Southern Resident DPS), sei whale, sperm whale, Chinook salmon (all ESUs), chum salmon (Hood Canal Summer-run ESU), coho salmon (Lower Columbia River ESU), eulachon (Southern DPS), green sturgeon (Southern DPS), sockeye salmon (Snake River ESU), steelhead trout (multiple DPS), yelloweye rockfish (Puget Sound/Georgia Basin DPS), and sunflower sea star. It was also determined the Project would have no effect on critical habitats for the following species: beluga whale (Cook Inlet DPS), false killer whale, humpback whale (Western North Pacific DPS, Mexico DPS), killer whale, North Pacific right whale, Steller sea lion (Western DPS), Chinook salmon (all ESUs), chum salmon (Hood Canal Summer-run ESU), coho salmon (Lower Columbia River ESU), eulachon (Southern DPS), green sturgeon (Southern DPS), sockeye salmon (Snake River ESU), steelhead trout (multiple DPS), and yelloweye rockfish (Puget Sound/Georgia Basin DPS).

The Project may affect but is not likely to adversely affect the bearded seal (Beringia DPS, including critical habitat), fin whale, gray whale (Western North Pacific DPS), humpback whale (Western North Pacific DPS, Mexico DPS), North Pacific right whale, ringed seal (Arctic subspecies, including critical habitat), and Steller sea lion (Western DPS).

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APPENDIX A NOISE CALCULATIONS

C: MOBILE SOURCE: Non-Impulsive, Continuous ("SAFE DISTANCE" METHODOLOGY)							
VERSION 3.1: 2024							
KEY							
		Action Proponent Provided Information					
		NMFS Provided Information (Technical Guidance)					
		Resultant Isopleth					
STEP 1: GENERAL PROJECT INFORMATION							
PROJECT TITLE		Altraq 3 and Kotlik Fiber Optic Cable Interconnect					
PROJECT/SOURCE INFORMATION		Unicom, Inc. Altraq 3 and Kotlik Fiber Optic Cable Interconnect					
Please include any assumptions							
PROJECT CONTACT		Unicom, Inc.					
		Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value					
STEP 2: WEIGHTING FACTOR ADJUSTMENT							
Weighting Factor Adjustment (kHz)*		2.5		default value			
* Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab		+ If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 45), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.					
STEP 3: SOURCE-SPECIFIC INFORMATION†							
Source Level (L _{source})		180		NOTE: The User Spreadsheet tool provides a means to estimate distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.			
Source Velocity (meters/second)		1					
Duty cycle		1					
Source Factor		1E+18					
†Methodology assumes propagation loss of 20 log R; Activity duration (time) independent							
RESULTANT ISOPLETHS							
Hearing Group		Low-Frequency Cetaceans	High-Frequency Cetaceans	Very High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	
SEL _{cont} Threshold		197	201	181	195	199	
ADD INJ Isopleth to threshold (meters)		0.1	0.0	0.0	0.1	0.0	

Practical Spreading Loss Model Calculations

General Project Information

Project Title	Airraq 3 and Kotlik Fiber Optic Cable Interconnect
Project/ Source Information	Unicom, Inc. Airraq 3 and Kotlik Fiber Optic Cable Interconnect
Project Contact	Unicom, Inc.

The PSLM is presented in NMFS (2012) as:

$$TL = 15 \log (R2/R1)$$

- TL is transmission loss
- R1 is the distance of a known or measured sound level.
- R2 is the estimated distance required for the sound to attenuate to a predetermined acoustic threshold.

The equation may be rearranged to solve for R2 as:

$$R2 = R1 * 10^{((dB \text{ at } R1 - dB_{\text{Acoustic threshold}})/15)}$$

Project-related cable installation methods and support vessels are expected to generate underwater noise levels of up to approximately 180 dBrms measured at 3.28 feet (1 meter) from the vessel, based on vessel size and operational characteristics.

		Hearing Group				
		Low-Frequency Cetaceans	High-Frequency Cetaceans	Very High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
	Thresholds					
Level B	Behavior dBRMS	120	120	120	120	120
	TTS SELcum Threshold	177	181	161	175	179
Level A	PTS SELcum Threshold	197	201	181	195	199
	Calculations					
	Behavior	$3.28 \cdot 10^{((180-120)/15)}$	$3.28 \cdot 10^{((180-120)/15)}$	$3.28 \cdot 10^{((180-120)/15)}$	$3.28 \cdot 10^{((180-120)/15)}$	$3.28 \cdot 10^{((180-120)/15)}$
	TTS	$3.28 \cdot 10^{((180-177)/15)}$	$3.28 \cdot 10^{((180-181)/15)}$	$3.28 \cdot 10^{((180-161)/15)}$	$3.28 \cdot 10^{((180-175)/15)}$	$3.28 \cdot 10^{((180-179)/15)}$
	PTS	$3.28 \cdot 10^{((180-197)/15)}$	$3.28 \cdot 10^{((180-201)/15)}$	$3.28 \cdot 10^{((180-181)/15)}$	$3.28 \cdot 10^{((180-195)/15)}$	$3.28 \cdot 10^{((180-199)/15)}$
	Distance to Thresholds					
Level B	Behavior Isopleth (feet)	32800	32800	32800	32800	32800
	TTS Isopleth (feet)	5.2	2.81	60.61	7.07	3.82
Level A	PTS Isopleth (feet)	0.24	0.13	2.81	0.32	0.18

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APPENDIX B

USDA-RUS DESIGNATION OF ERM AS FEDERAL REPRESENTATIVE FOR ESA CONSULTATION



Rural Development

Rural Utilities Service

1400 Independence Ave, SW
Room 4121, Stop 1590
Washington, DC 20250

Voice: (202) 690-4673

September 24, 2024

U.S. Fish and Wildlife Service (FWS)
Anchorage Fish & Wildlife Field Office
4700 BLM Road
Anchorage, AK 99507-2546

National Oceanic and Atmospheric Administration
National Marine Fisheries Service (NMFS)
Alaska Region, Protected Resources Division
P.O. Box 21668
Juneau, AK 99802-1668

Re: USDA Rural Utilities Service R4 ReConnect Project AK 1706-C73 Unicom,
Incorporated – Designation of Non-Federal Representative

Dear FWS/NMFS Staff,

Unicom, Incorporated (Unicom) is seeking financial assistance from the Rural Utilities Service (RUS) under its Telecommunications ReConnect Program for construction of a fiber-to-the-premise (FTTP) network to provide high-speed broadband services to underserved rural communities located in the Yukon-Kuskokwim (Y-K) Delta region for the communities of Nunapitchuk, Mertarvik, Tununak, and Toksook Bay. This project may affect Endangered Species Act (ESA) listed or proposed species and/or designated or proposed critical habitat and possibly result in harassments of species protected under the ESA and Marine Mammal Protection Act (MMPA).

To facilitate Section 7 ESA and MMPA consultation, RUS is designating Unicom and their consultant, ERM, as our non-federal representative for the purpose of initiating informal consultation with the FWS and NMFS. The role of the non-federal representative includes conducting studies, attending meetings, participating in telephone and email contact, developing draft biological assessments, etc., in support of our eventual ESA determination. The authority for making Endangered Species Act determinations remains with USDA, RUS. As the USDA, RUS environmental point of contact for this project I can be reached at Anthony.High@usda.gov or (202) 690-4673, also please include Natalie Kovach, General Field Representative (GFR) at Natalie.Kovach@usda.gov on any correspondence.

Sincerely,

**Anthony
High**

Digitally signed by
Anthony High
Date: 2024.09.24
02:09:22 -04'00'

ANTHONY W. HIGH

Environmental Protection Specialist

Policy & Outreach Division Engineering Branch

Telecommunications Program

Rural Utilities Service

cc: Genevieve Rozhon, Principal Consultant, Genevieve.Rozhon@erm.com
Danna Allen, Principal Consultant, danna.allen@erm.com

Application #: 101001351



APPENDIX C FIGURES

Figure 1 – Project Location

Figure 2 – Action Area

Figure 3 – Mertarvik Landfall

Figure 4 – Tununak Landfall

Figure 5 – Emmonak Landfall

Figure 6 – Nunapitchuk to Tunanak

Figure 7 – Alakanuk to Emmonak

Figure 8 – Emmonak to Kotlik

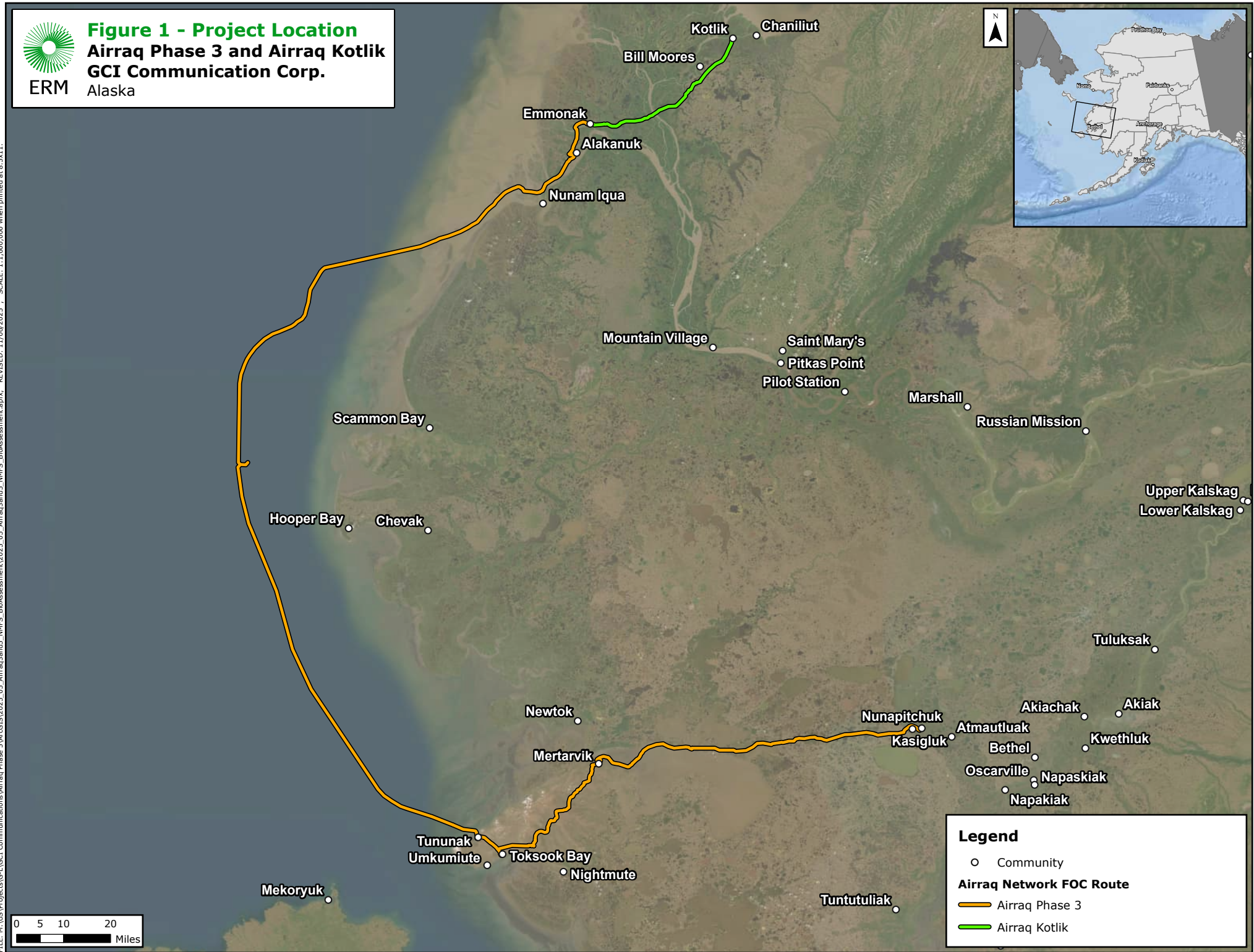
Figure 9 – Critical Habitat



ERM

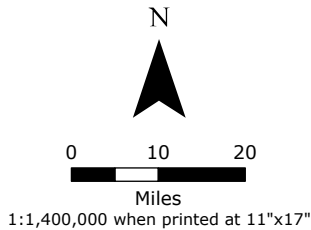
Figure 1 - Project Location
Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

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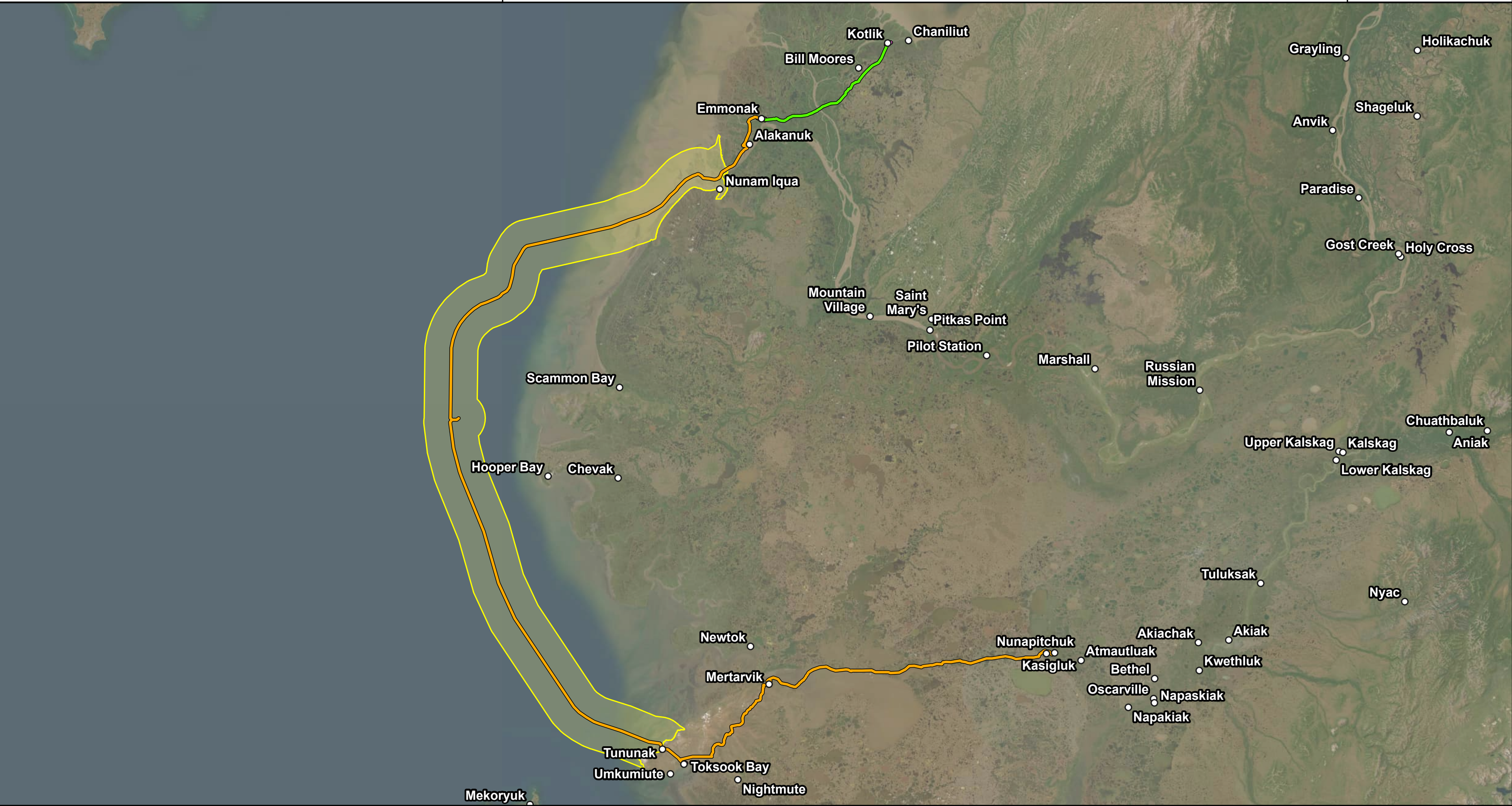
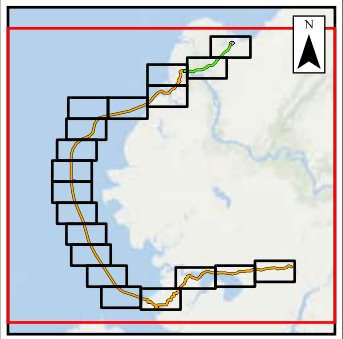


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Figure 2 - Action Area
Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

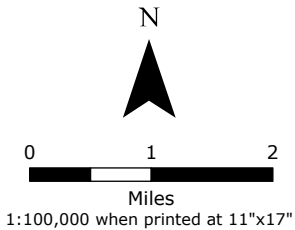


- Legend**
- Community
 - Airraq Phase 3
 - Airraq Kotlik
 - FTTx
 - Marine Installation Corridor
 - Marine Action Area

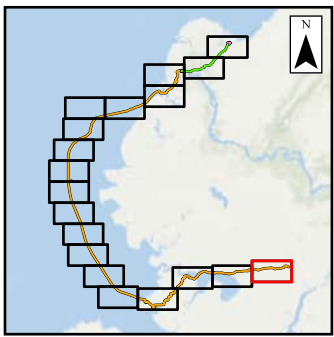


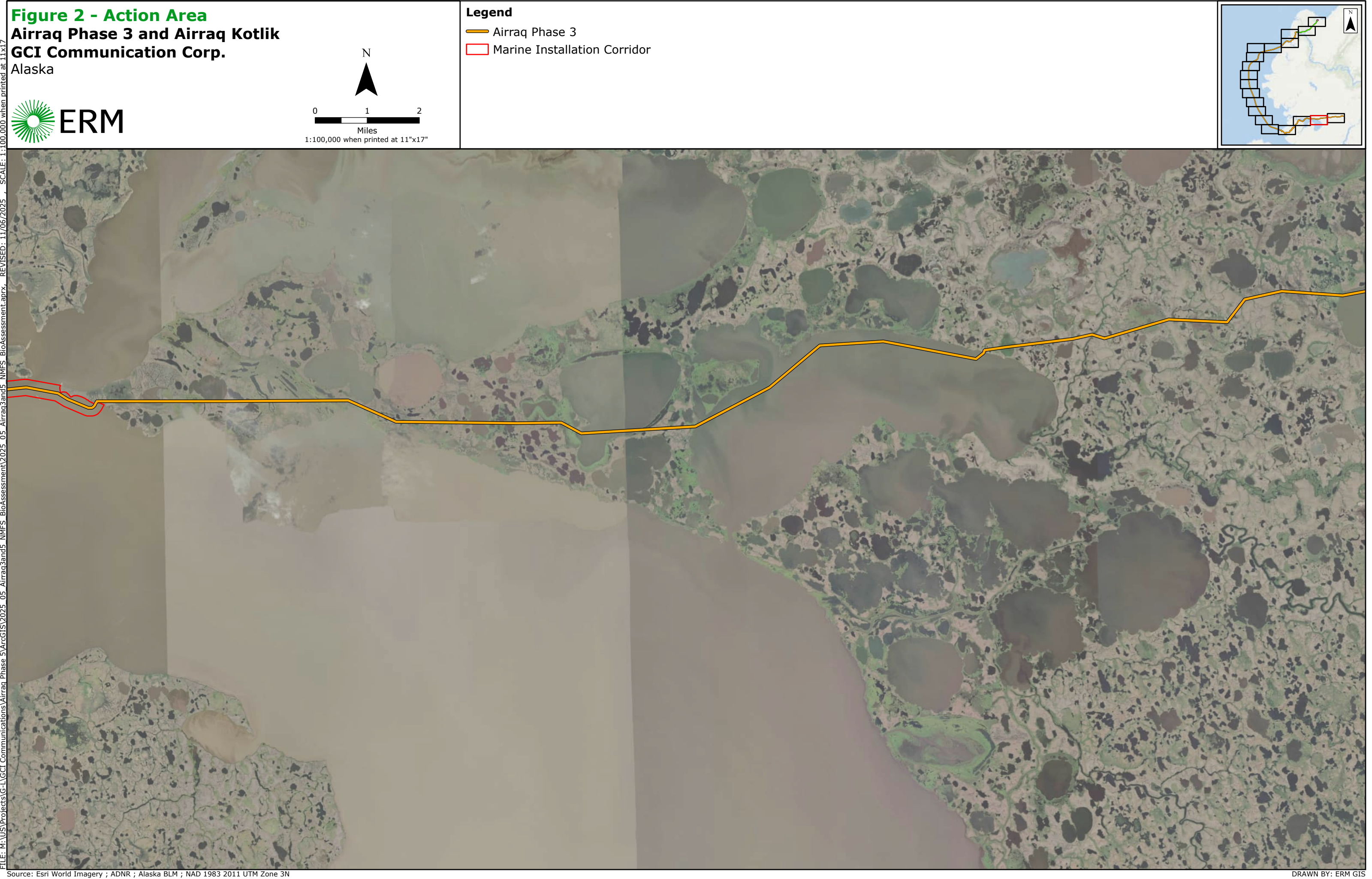
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Figure 2 - Action Area
Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska



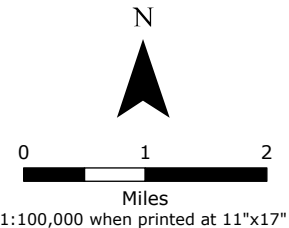
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- Community
 - Airraq Phase 3



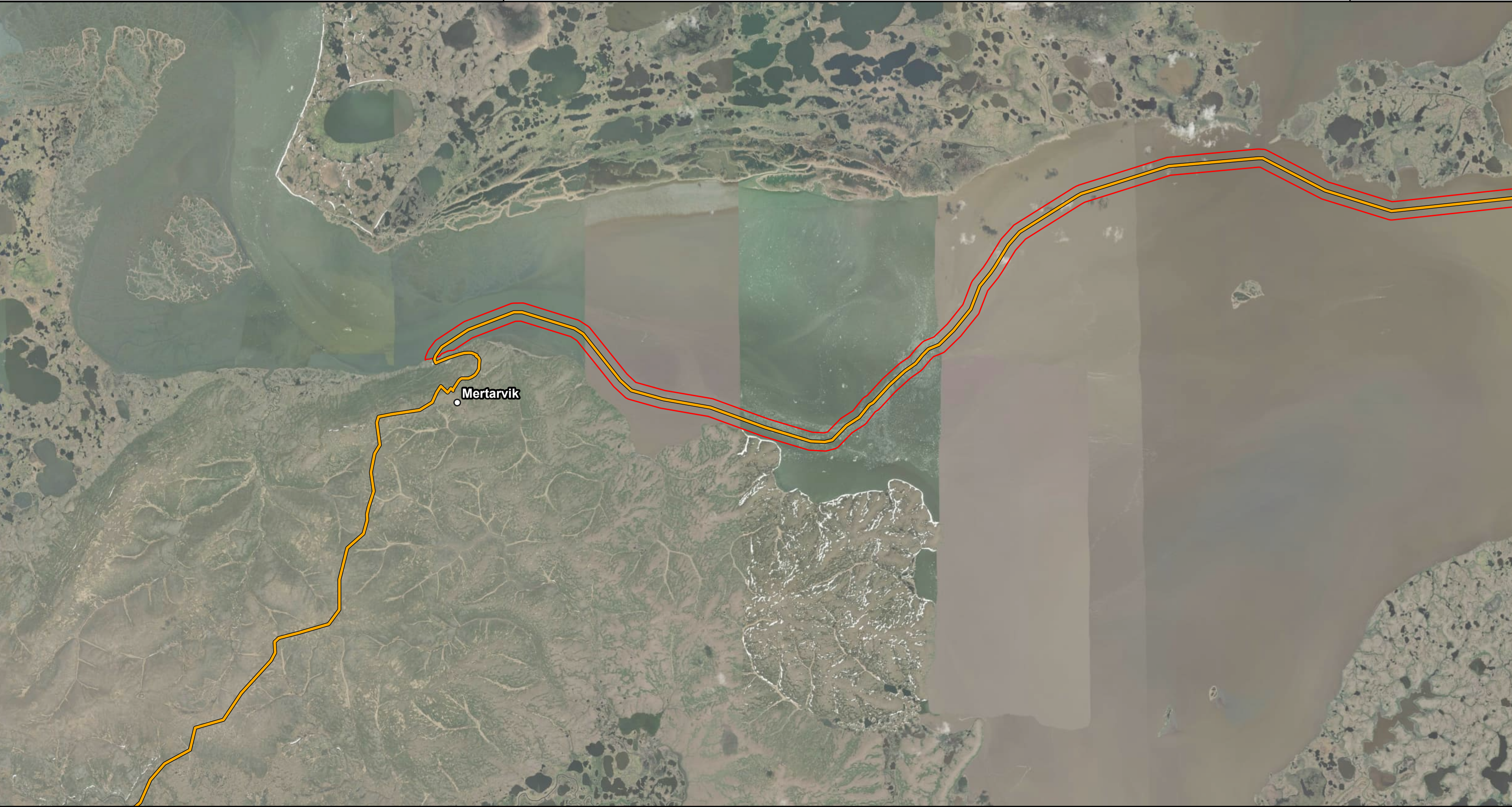
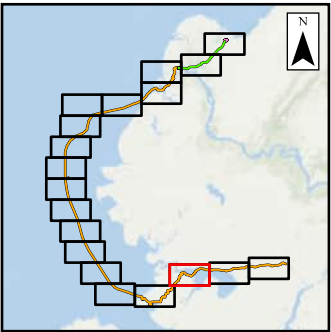


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GCI Communication Corp.
Alaska

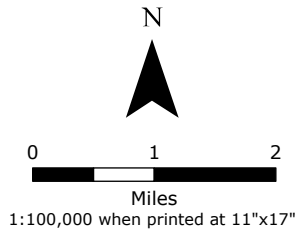


- Legend**
- Community
 - Airraq Phase 3
 - Marine Installation Corridor

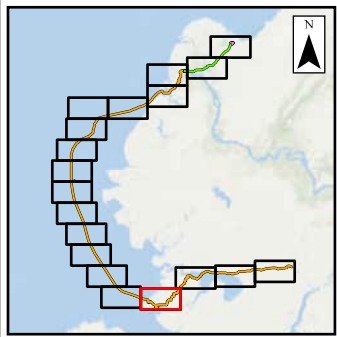


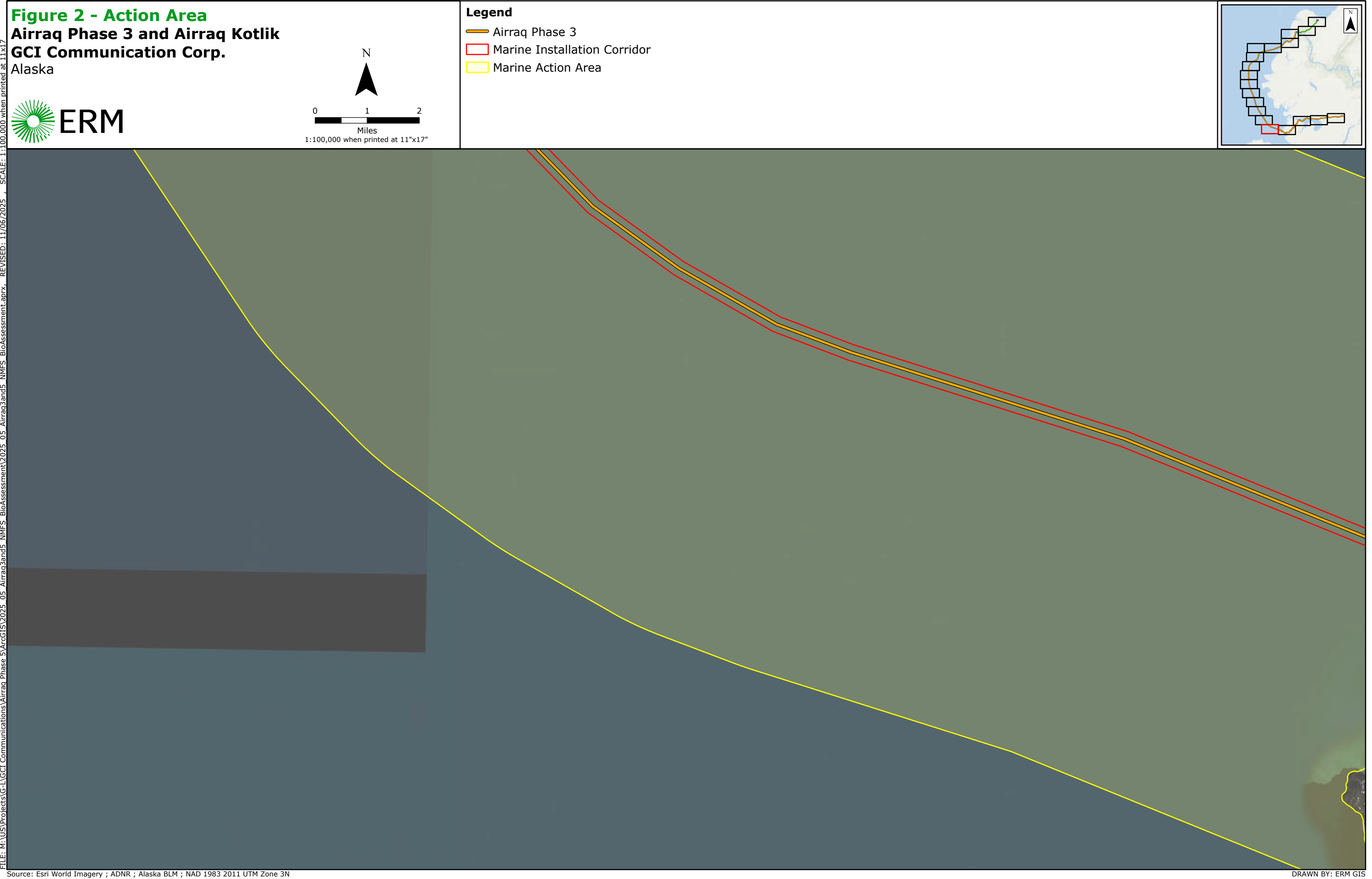
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Alaska



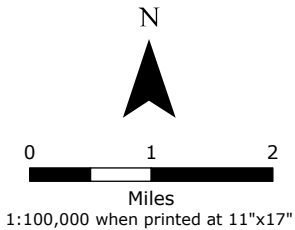
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- Community
 - Airraq Phase 3
 - FTTx
 - Marine Installation Corridor
 - Marine Action Area



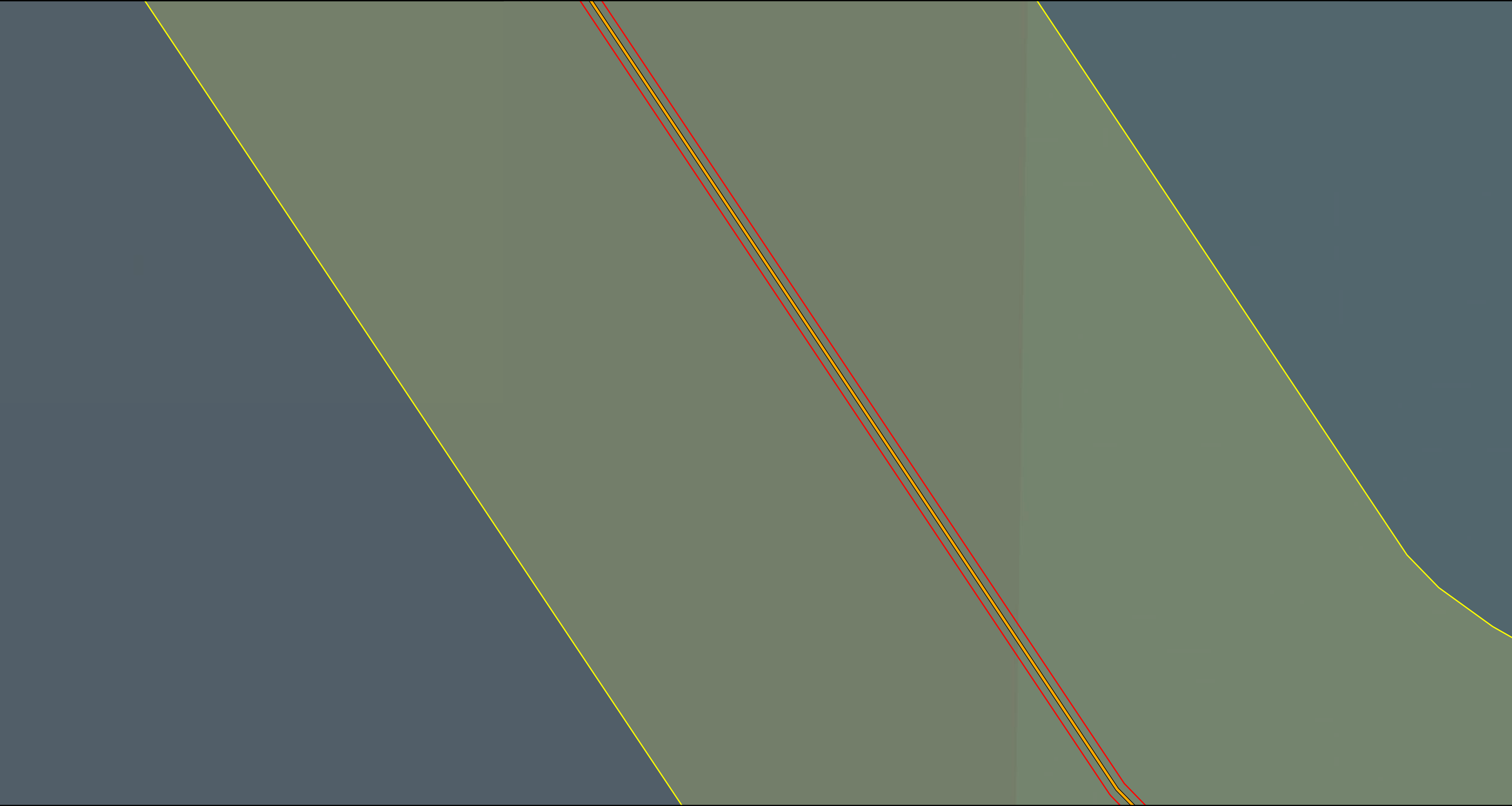
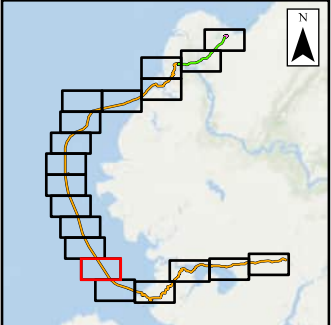


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Alaska

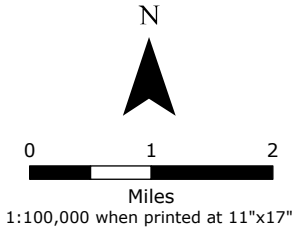


- Legend**
- Airraq Phase 3
 - Marine Installation Corridor
 - Marine Action Area

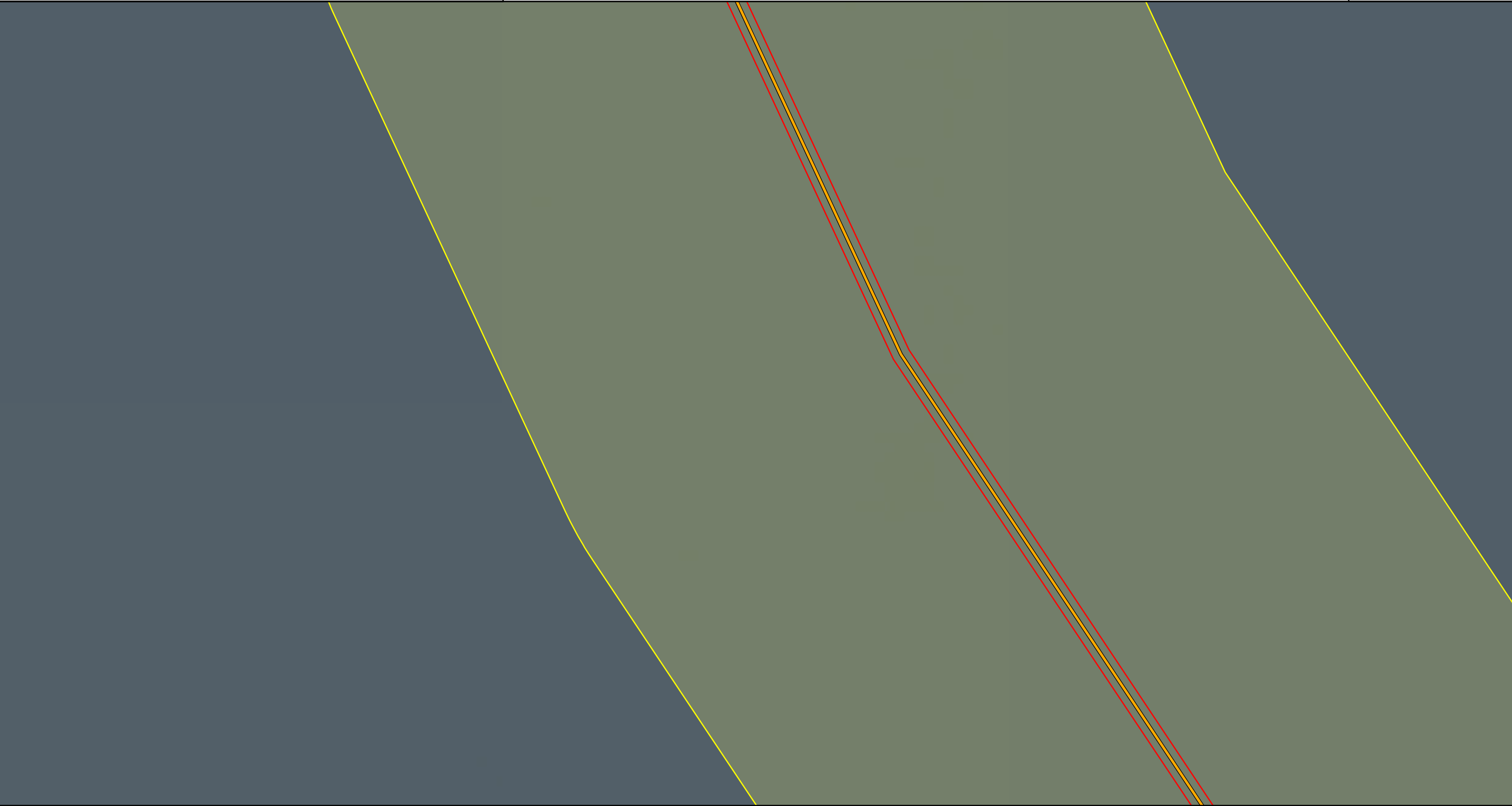
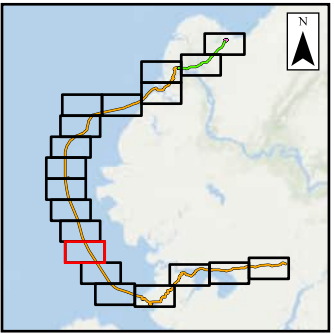


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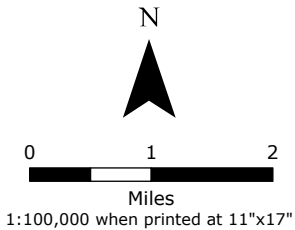


- Legend**
- Airraq Phase 3
 - Marine Installation Corridor
 - Marine Action Area

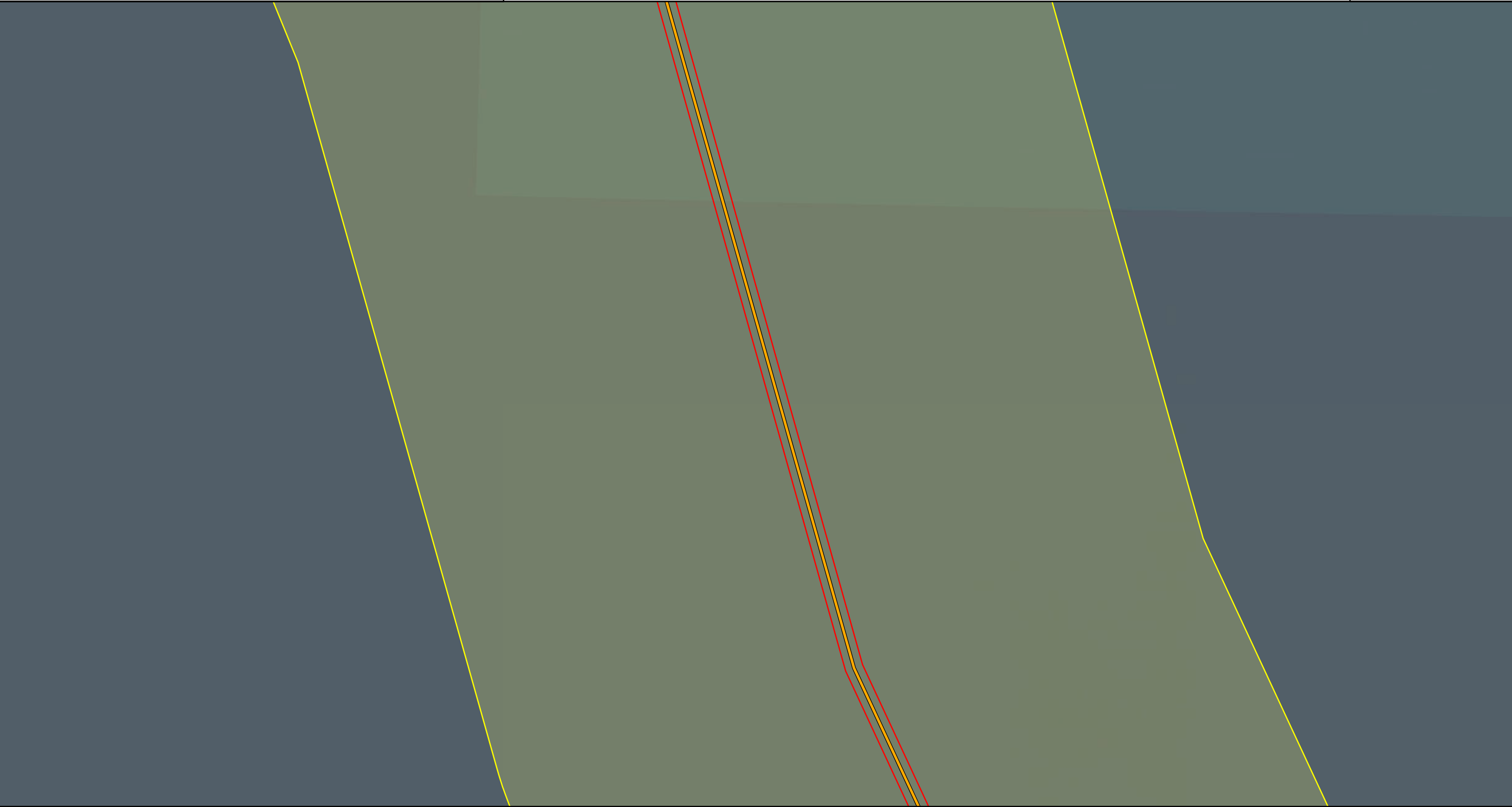
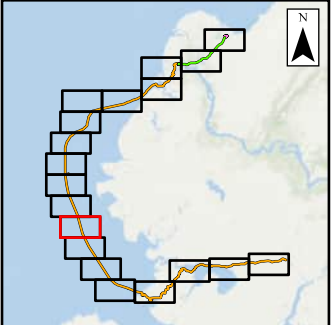


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Alaska

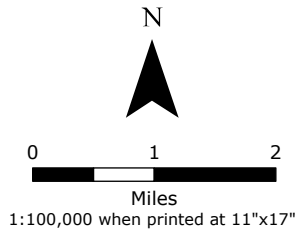


- Legend**
- Airraq Phase 3
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 - Marine Action Area

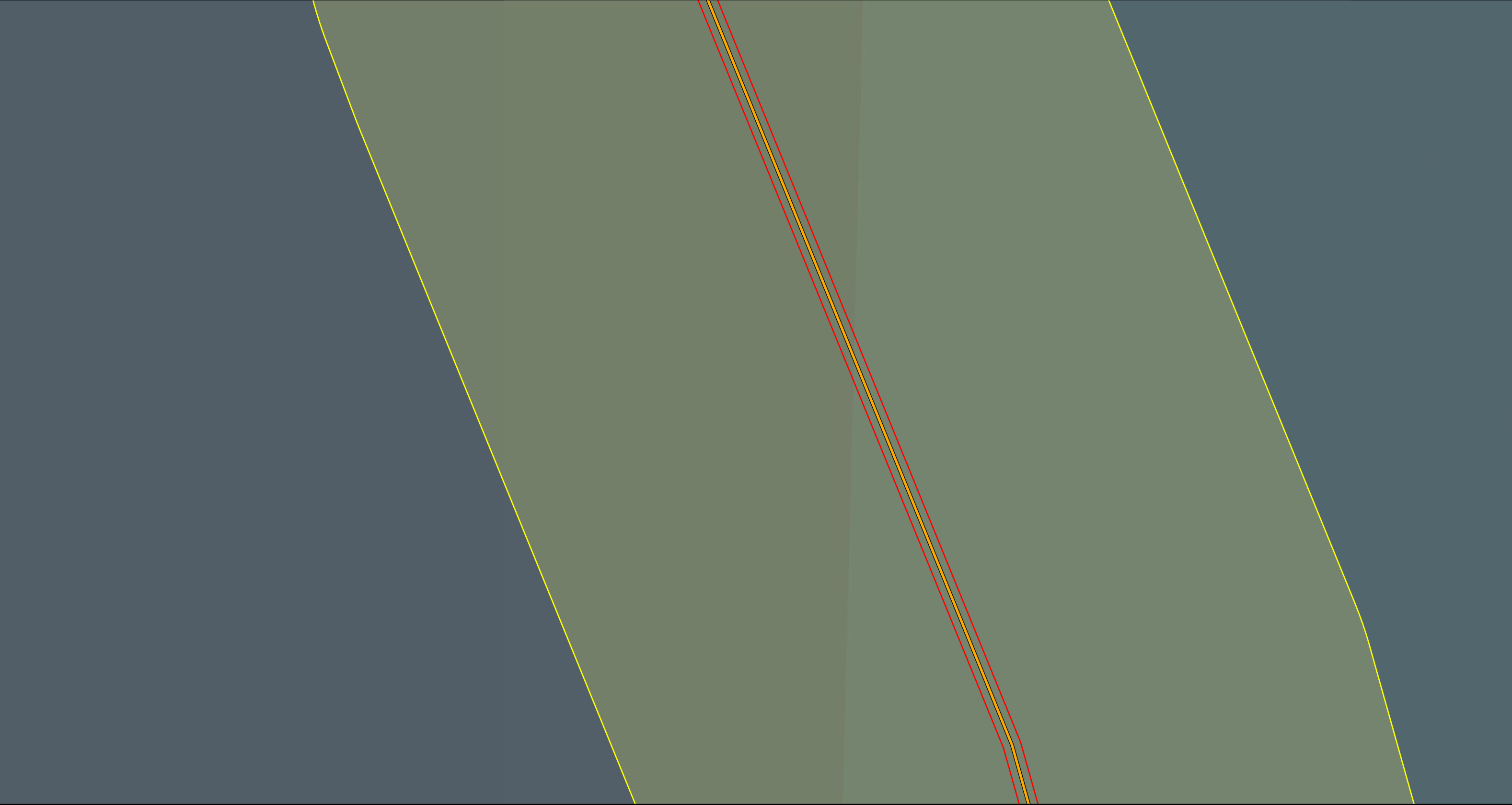
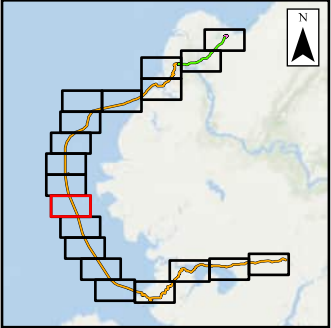


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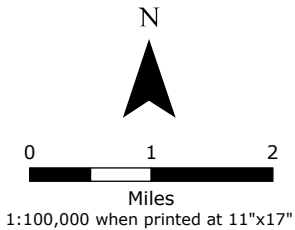


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 - Marine Action Area

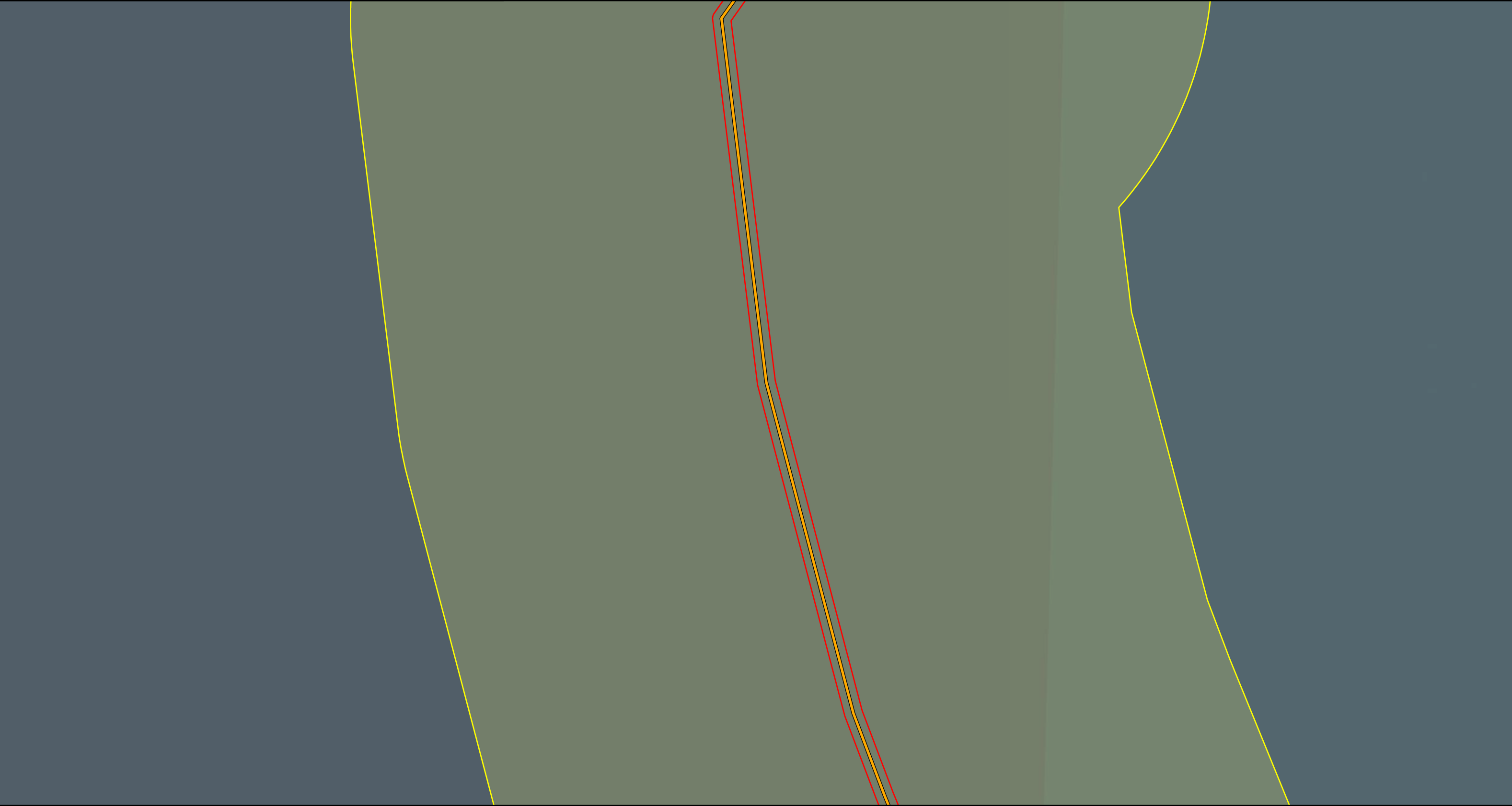
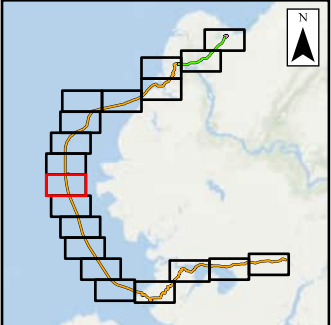


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Figure 2 - Action Area
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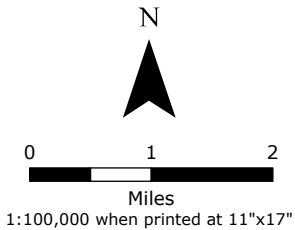


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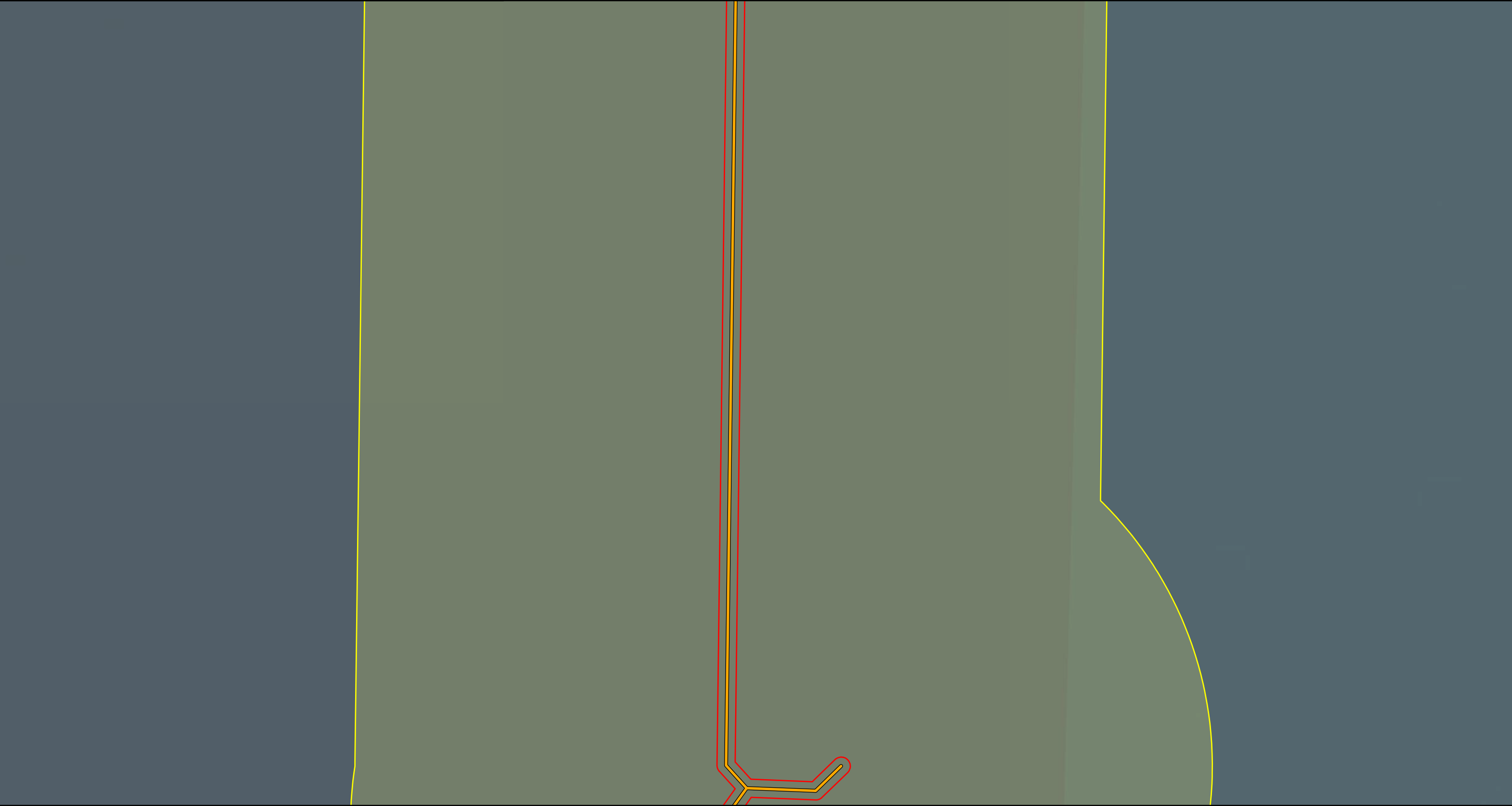
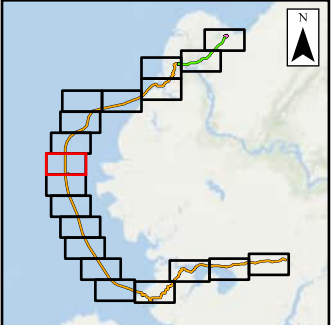


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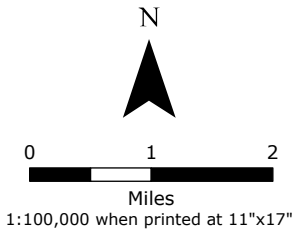


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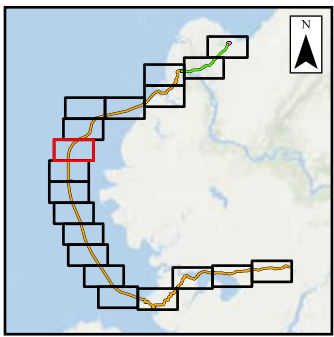


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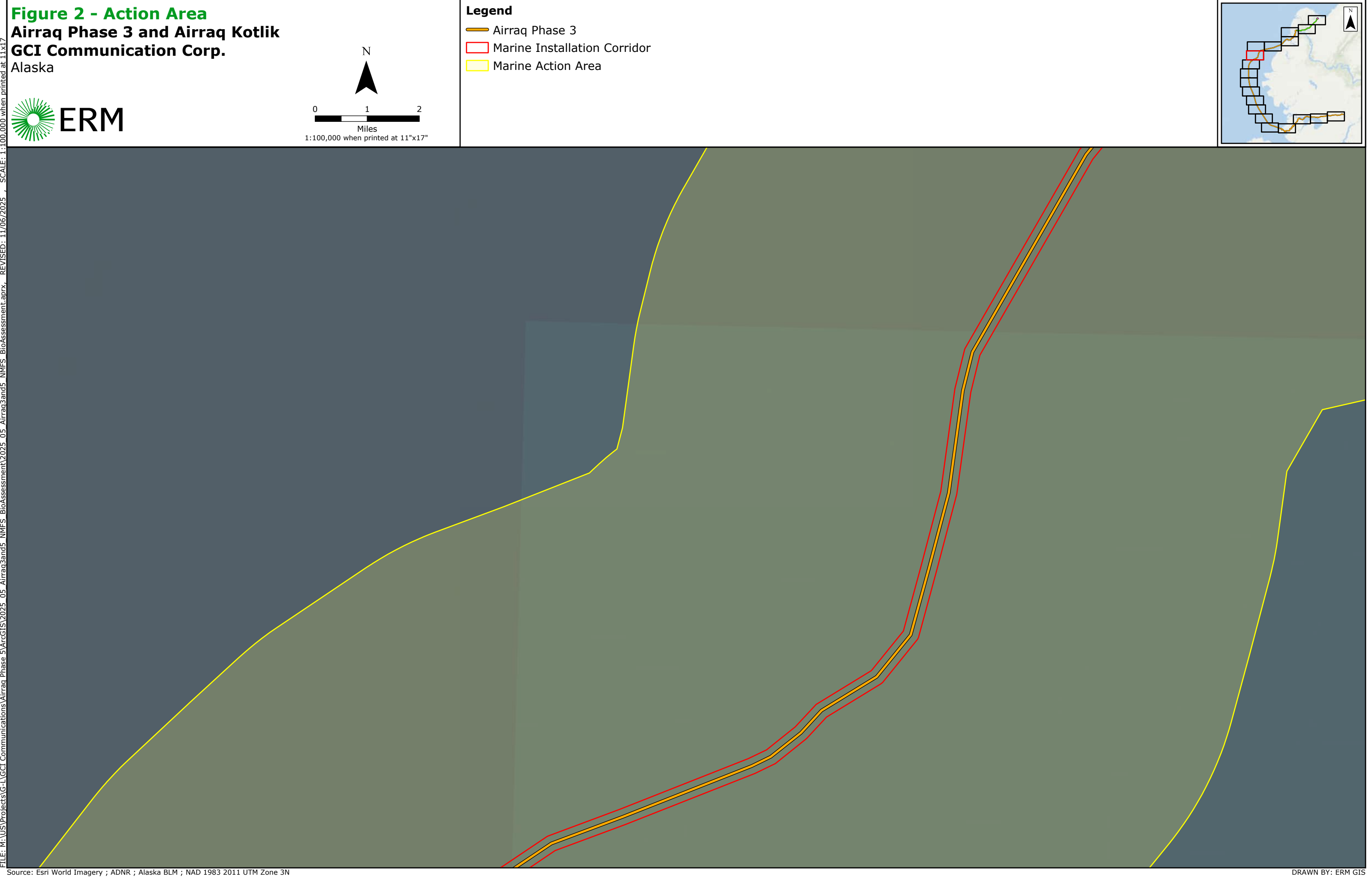
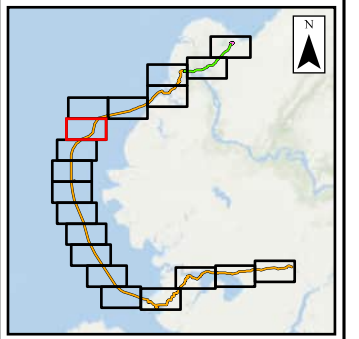


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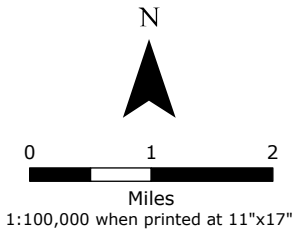
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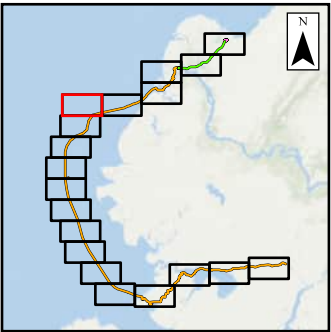


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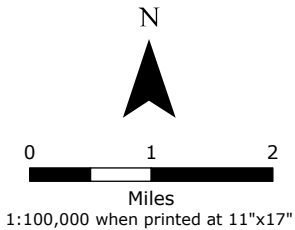


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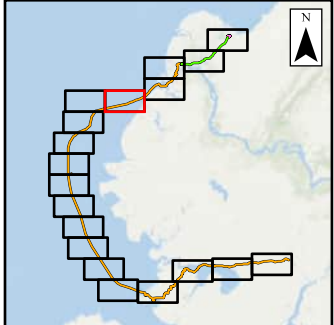


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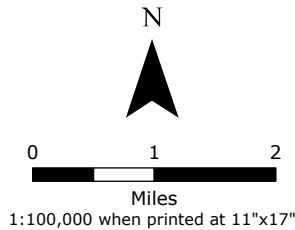


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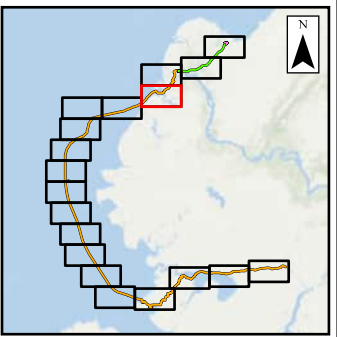


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GCI Communication Corp.
Alaska

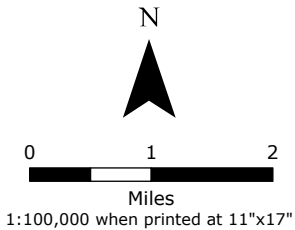


- Legend**
- Community
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 - ▭ Marine Installation Corridor
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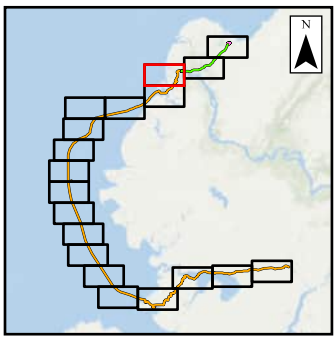


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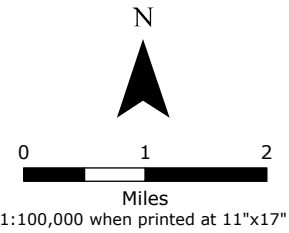


- Legend**
- Community
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 - Airraq Kotlik
 - FTTx
 - Marine Action Area

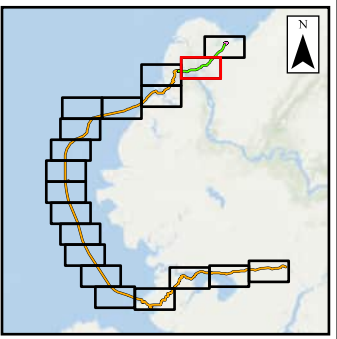


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Figure 2 - Action Area
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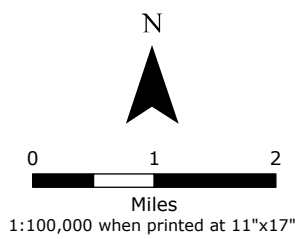


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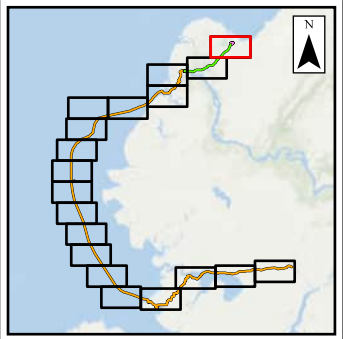


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Figure 2 - Action Area
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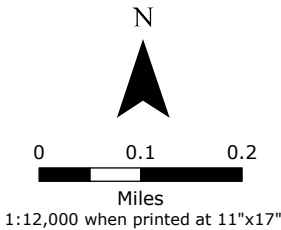


- Legend**
- Community
 - Airraq Kotlik
 - FTTx

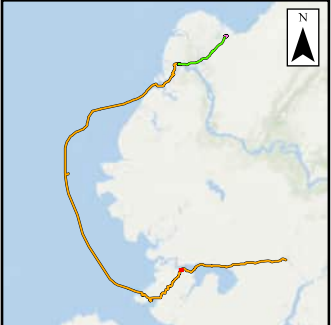


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Figure 3 - Mertarvik Landfall
Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

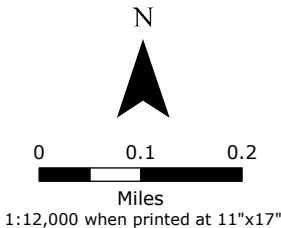


- Legend**
- Project Activities**
- ▲ Beach Vault
 - Airraq Phase 3



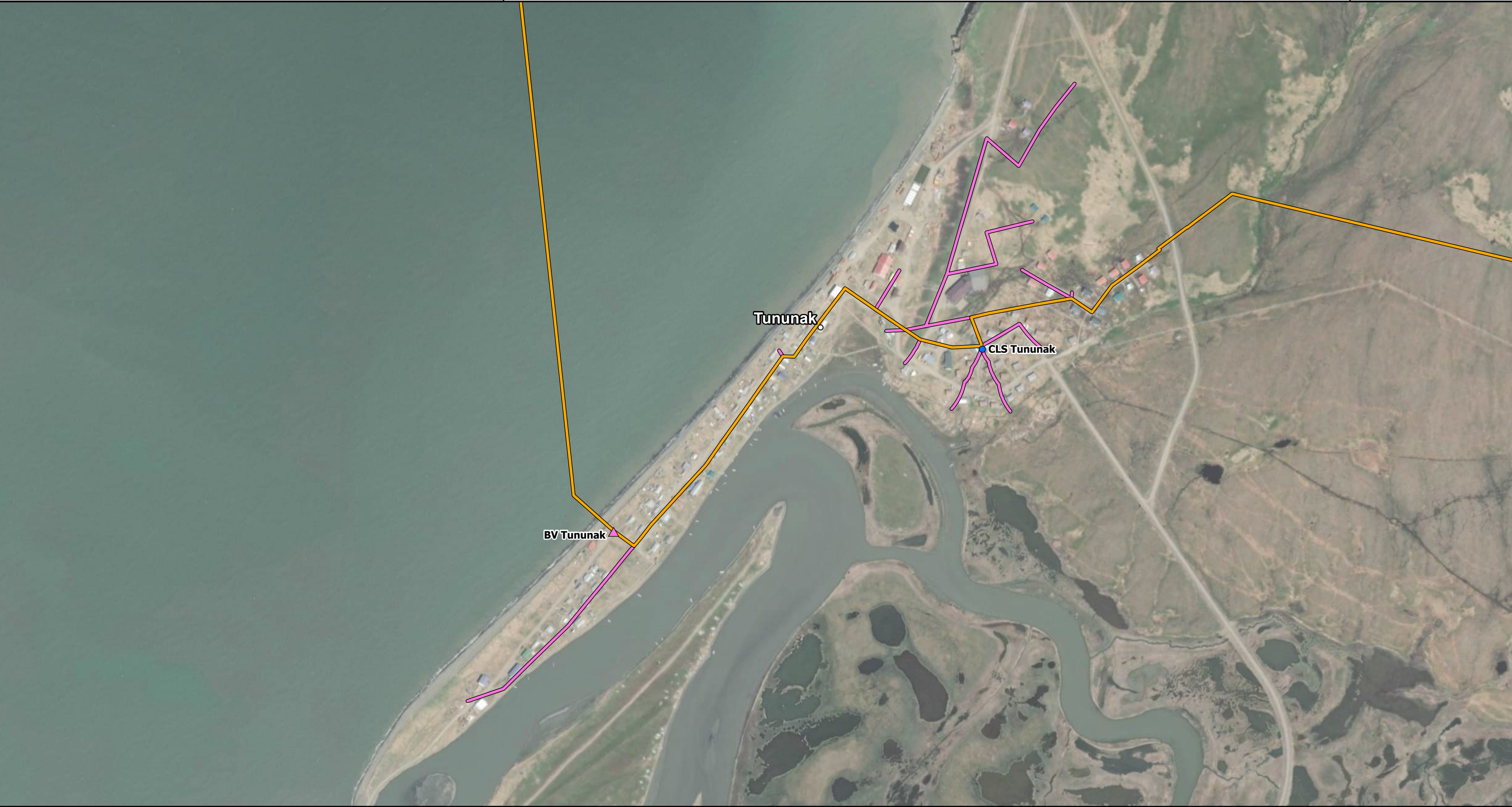
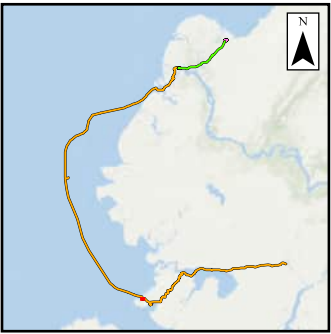
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Figure 4 - Tununak Landfall
Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska



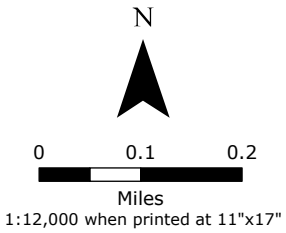
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- Community
- Project Activities**
- Cable Landing Station
- ▲ Beach Vault
- Airraq Phase 3
- FTTx

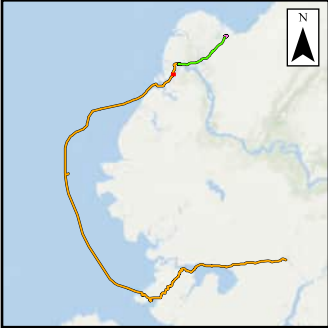


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Figure 5 - Emmonak Landfall
Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska

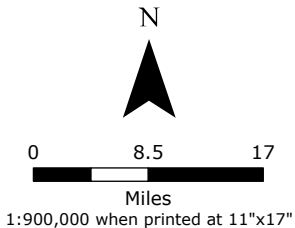


- Legend**
- Project Activities**
- Central Office
 - ▲ Beach Vault
 - Airraq Phase 3



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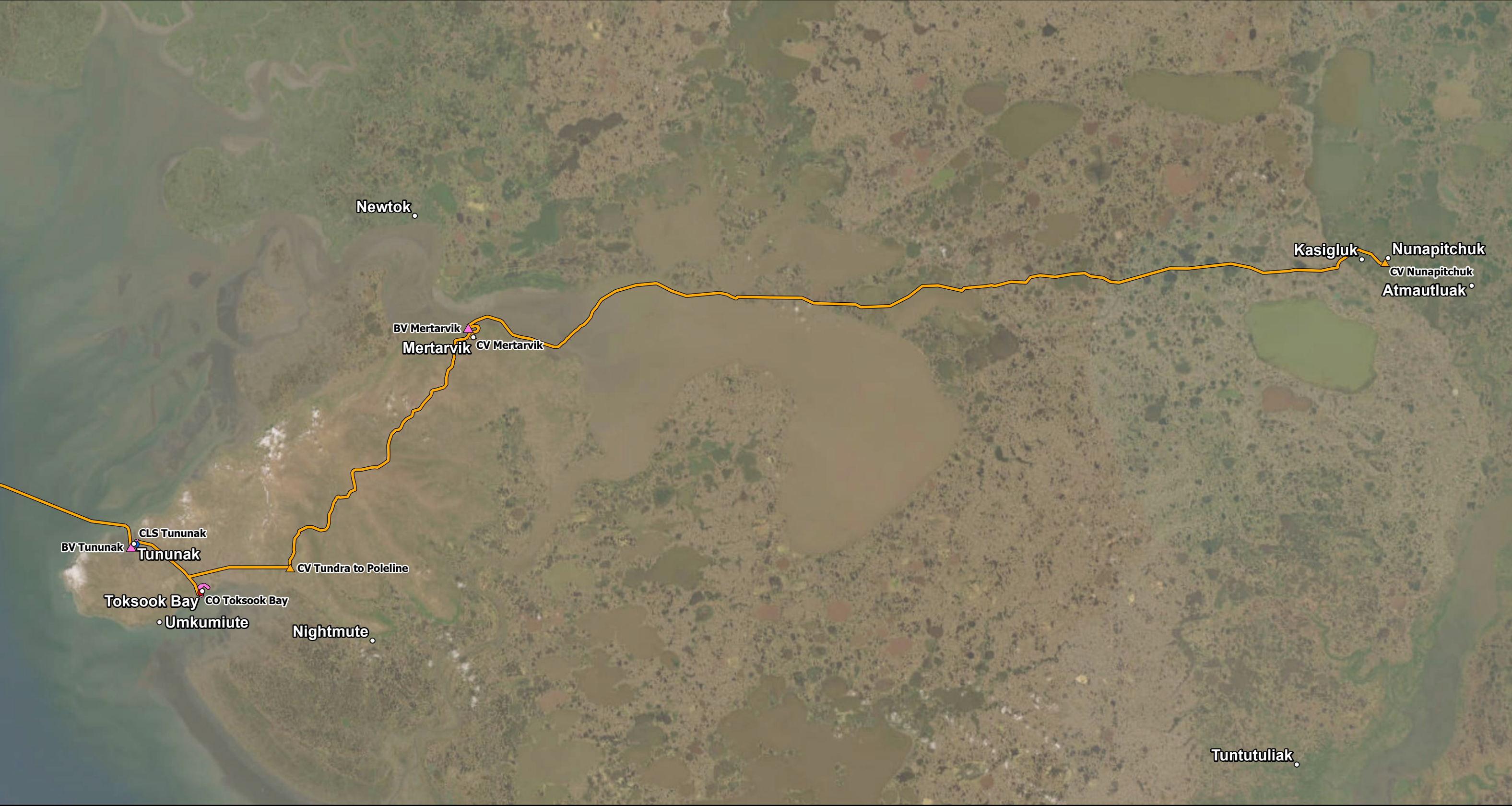
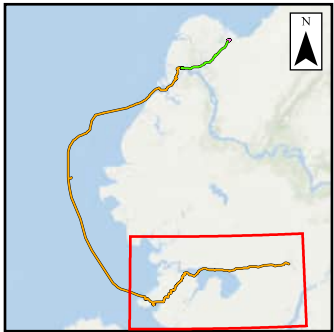
Figure 6 - Nunapitchuk to Tunanak
Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska



Legend

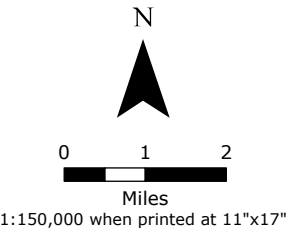
- Community
- Cable Landing Station
- Central Office

- ▲ Connection Vault
- ▲ Beach Vault
- Airraq Phase 3
- FTTx



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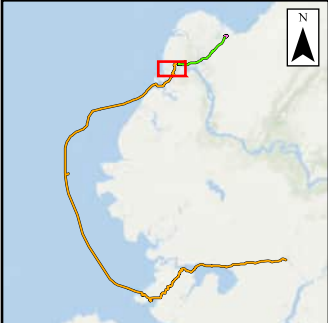
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Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska



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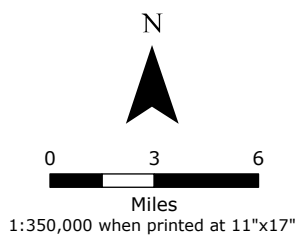
- Community
 - Cable Landing Station
 - Central Office
 - ▲ Connection Vault
- Project Activities**

- ▲ Beach Vault
- Airraq Phase 3
- Airraq Kotlik
- FTTx



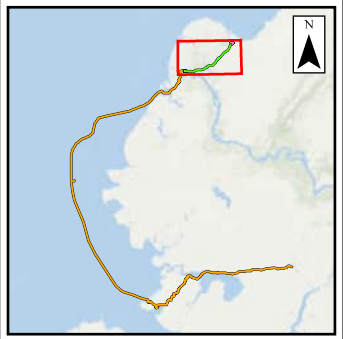
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Figure 8 - Emmonak to Kotlik
Airraq Phase 3 and Airraq Kotlik
GCI Communication Corp.
Alaska



Legend

- Community
- Cable Landing Station
- ▲ Connection Vault
- Airraq Phase 3
- Airraq Kotlik
- FTTx

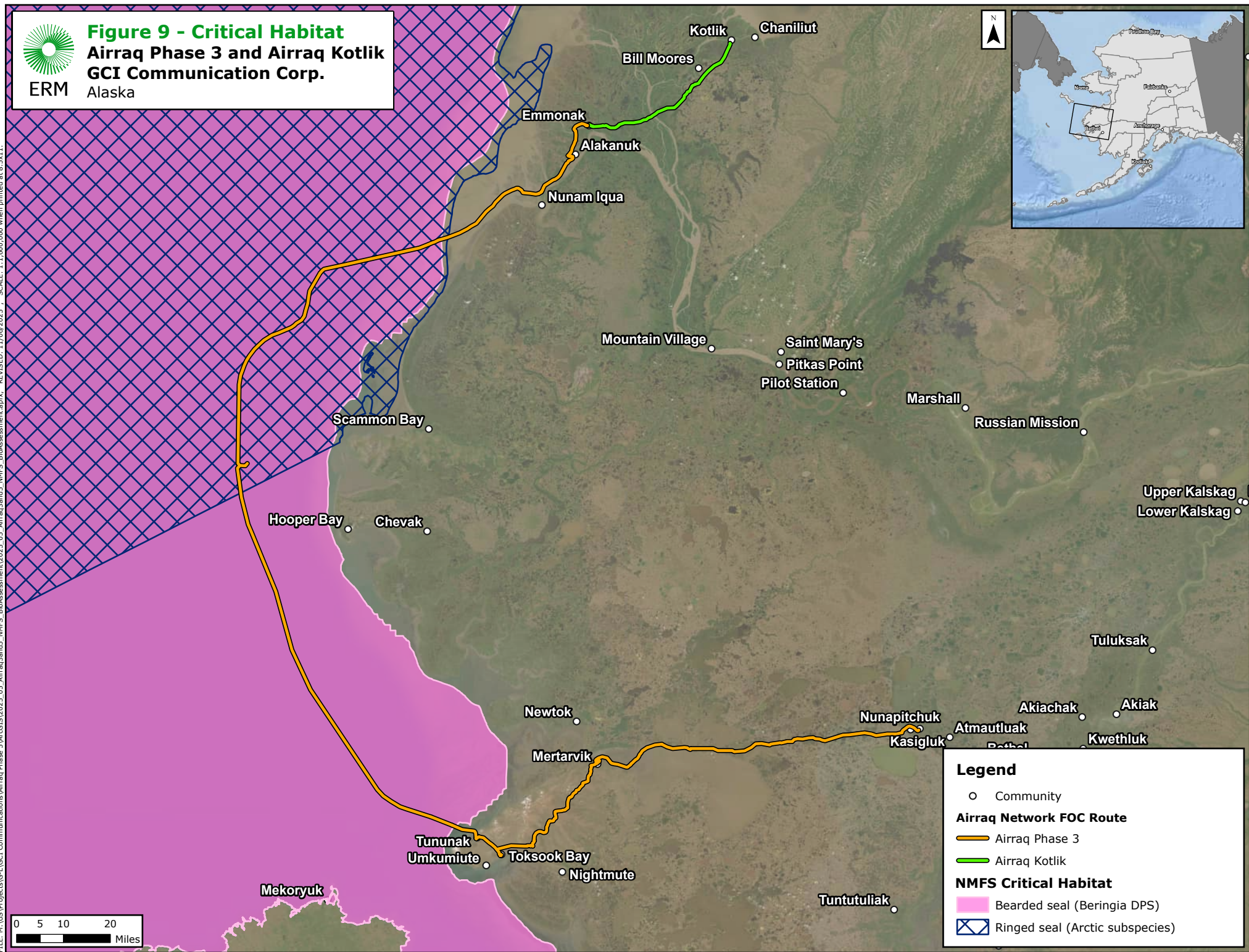




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Figure 9 - Critical Habitat
Airraq Phase 3 and Airraq Kotlik
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Alaska

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APPENDIX D

MARINE GEOPHYSICAL & GEOTECHNICAL ROUTE SELECTION SURVEY (BENTHIC GEOSCIENCES 2024)

Airraq Fiber Network

Marine Geophysical & Geotechnical Route Selection Survey

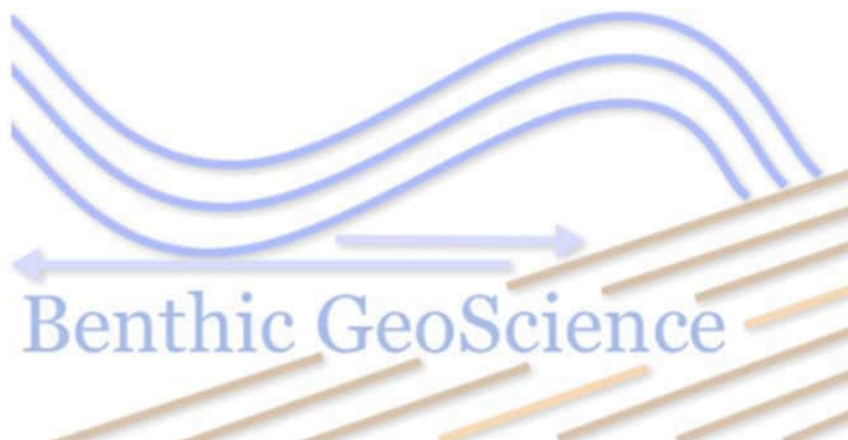
Interim Report

4 December 2024

Prepared for:



**Bethel Native
Corporation**



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EXECUTIVE SUMMARY

Airraq Fiber Network (Airraq 3) Marine Geophysical & Geotechnical Route Selection Survey (RSS)

Survey Dates	24 June – 07 August
Equipment	Multibeam Echo Sounder (MBE), Side Scan Sonar (SSS), Innomar Sub-bottom Profiler (SBP), Cone Penetrometer Test (CPT), Piston Core (PC), and Sea Floor Sampler (SFS)
Horizontal Coordinate System	Universal Transverse Mercator (UTM) Zone 3N, meters

DESCRIPTION OF ROUTE

During the summer of 2024, Segment 3.4.2 of the Airraq Fiber Network from Nunapitchuk to Emmonak, Alaska was surveyed, with a total route distance of 278 km. More than 3700 km of geophysical survey lines were acquired including centerline, wing lines, infills, branching units and route development. For logistical purposes the segment was divided into multiple Blocks, primarily based on water depth, to ensure comprehensive and full coverage.

BATHYMETRY & SEAFLOOR MORPHOLOGY

Water Depths

Water depths range from 6.8 m below MLLW at the start of the route corridor to 25.7 in a broad trough approximately 100 km from the northern end of the route.

Slopes

Slopes are less than 8° except for localized steep slopes at the edge of seabed features with approximately 1 m elevation difference over a short distance.

Seabed Morphology

Beginning in the south, the seabed crosses a boulder field followed by featureless seabed and another boulder field. Seabed with occasional boulder-cored pits and featureless seafloor then alternate for 60 km. Bedforms in the form of sand ribbons cross the route, still alternating with intermittent seabed pits and featureless areas. Current-scoured seabed begins roughly 115 km from the southern end of the survey area. Ice wedge polygons are found amongst scoured seabed adjacent to the mid-route Branching Unit areas. Scoured seabed persists until 181 km from the southern end of the route, then alternates with featureless seabed for 15 km. Shallow, circular depressions dot the

landscape for 10 km, followed by 1 km of smooth seafloor. Scoured seabed is dominant for 26 km, after which featureless and scoured seabed alternate for the remaining 37 km of the survey area.

SURFICIAL GEOLOGY

The surficial geology along the route corridor is dominated by fine SAND. The seabed of the southern half of the survey area consists of fine SAND with trace silt with shell fragments and occasional shell beds. SILT and sandy SILT are intermittently present at the seabed in the northern half of the survey area as the route approaches the mouth of the Yukon River, though the predominant seabed sediment type remains fine SAND.

SEAFLOOR FEATURES AND CONTACTS

A total of 1111 boulders were picked from SSS imagery. 1024 hazards for construction were identified, including 966 individual boulders with heights >0.25 m and 56 boulder fields. A majority of the boulders and hazards for construction are located in the southern portion of the survey corridor.

2 possible anthropogenic seabed features were identified. One is a linear slight depression, and the other is a linear feature with no discernable vertical expression.

GEOLOGY

Segment 05

H1	H1 is the base of Unit 1 and is mapped intermittently throughout the survey area except where currents have precluded deposition or scoured away recent sediments. H1 defines the base of surficial sediments and is generally 0-2 m below the seabed. Unit 1 sediments are typically fine sand with trace silt and shells in the southern half of the survey area. Unit 1 is occasionally absent through the central portion of the route but is consistently present in the northern corridor where it is siltier than in the south. Full CPT penetration was consistently achieved in Unit 1 sediments.
H2	H2 is an erosional unconformity at the base of a sand and silt unit generally less than 10 m thick. These sediments are thought to be more consolidated than the overlying Unit 1, though full CPT penetration is achieved in nearly all cases (Stations 43 and 57 met CPT refusal within Unit 2). Like Unit 1, Unit 2 is more sandy to the south and generally siltier as it approaches the mouth of the Yukon River in the north. This unit is interpreted to be fluvial and deltaic deposits.
H3	H3 is the erosional base of a deformed, layered silty unit. The top of this unit is generally deeper than 10 m and rarely comes within 2 m of the seabed in the northern and southern sections. The unit is intermittently exposed in the central section of the route, where ice wedge structures indicate that it was subaerially exposed. Full CPT penetration was achieved in nearly all locations where Unit 3 was encountered (Stations 34 and 35 met refusal within Unit 3).

SEABED AND SUB-SEABED HAZARDS

Cable	No cables were documented or detected during the survey.
Coarse Sediments/Gravel Layers	Shells and shell hash are intermittently present in sandy areas throughout the corridor. No other coarse sediments were identified.
Boulders	Boulders are most abundant in the southern portion of the survey area. Several large boulder fields are present near the southern end of the route. Numerous individual boulders and small groups of boulders are scattered throughout the remainder of the corridor
Mobile seabed sediments	Mobile sediments in the form of sand ribbons are present in the southern half of the corridor. Three small patches of ripples were identified in the northern part of the survey area.
Pipeline	No pipelines were documented or detected during the survey.
Seabed gradients	Seabed slopes are $>8^{\circ}$ for a vast majority of the route. Localized slopes $>15^{\circ}$ are associated with seabed pitting, ice wedge structures, and isolated areas of scoured seabed. These steep slopes are typically no taller than 1 meter.
Shallow gas	Shallow gas is indicated by elevated amplitudes and blanking in SBP records. Gas occurs at the southern end of the route, along two areas in the middle of the route, and intermittently along the northern third of the survey area.
Faulting	No evidence of faulting was identified along the route.
Wreck	No wrecks were documented or detected during the survey.
Ice Gouging	No indication of ice interaction with the seabed was found in the survey area.
Trawling/Anchoring	No evidence of trawling or anchoring were identified along the route.

1 OVERVIEW

This report outlines the operations for the Nearshore Geophysical Survey of the Airraq Network Marine Geophysical & Geotechnical Route Selection Survey conducted by Benthic GeoScience Inc. (Benthic) for the Airraq 3 Project.

The Airraq Network is an initiative by the US Federal Government, driven by a collaboration between Bethel Native Corporation (BNC) and General Communication Inc. (GCI). The project aims to provide fiber-optic connectivity to thirteen communities within the Yukon-Kuskokwim Delta region, enhancing digital infrastructure and connectivity in these remote areas.

The survey was conducted in late spring and early summer of 2024 with the goal of establishing a viable marine cable route for the telecommunications infrastructure, ensuring its longevity and resilience against environmental factors. A summary of project details is presented in Table 1.1.

Project details	
Client:	Bethel Native Corporation (BNC) and General Communication Inc. (GCI)
Project Name:	Airraq Network project (Airraq 3)
Benthic’s Project No.:	2403
Survey Type:	Geophysical, and Geotechnical Survey for Submarine Cable Route Selection
Area:	Bering Sea, Northeastern Part, adjacent to Yukon-Kuskokwim Delta
Survey Period:	24 June – 07 August
Survey Vessel	Research Vessel (RV) Woldstad

Table 1-1 Project details

1.1 Survey Goals

The primary goal of the survey is to initiate the identification of the safest and most continuous burial route for installing the submarine cable. This objective was achieved by continuously processing and interpreting data on board, which also helps guarantee the quality and quantity of the data acquired. Preliminary surface interpretations of the route help for early and accurate decision-making regarding route development or route changes during survey. These preliminary products were later refined and the

geotechnical results were integrated into the interpretation at Benthic's Processing Center in Palmer, AK following completion of the geotechnical survey.

This report exclusively encompasses operations within the Nearshore zone, defined as any areas of the survey corridor with water depths greater than 15 m.

The main objectives of the survey were:

- Acquire and interpret high quality seabed and sub-seabed data for project planning and execution. This includes bathymetry, seabed sediment distribution, seabed features, obstructions, wrecks, archaeological sites, crossing cables and pipelines, and evaluation of possible mobile sediments.
- Conduct sub-bottom profiling surveys along the survey lines to map shallow geological units (horizons).
- Perform seabed sampling and testing to provide in-situ geological data, supporting the interpretation of the shallow geophysical survey data.
- Provide accurate and detailed information to select the best sites to perform seabed sampling during the geotechnical operations.

The main goal and those objectives were achieved in three different phases.

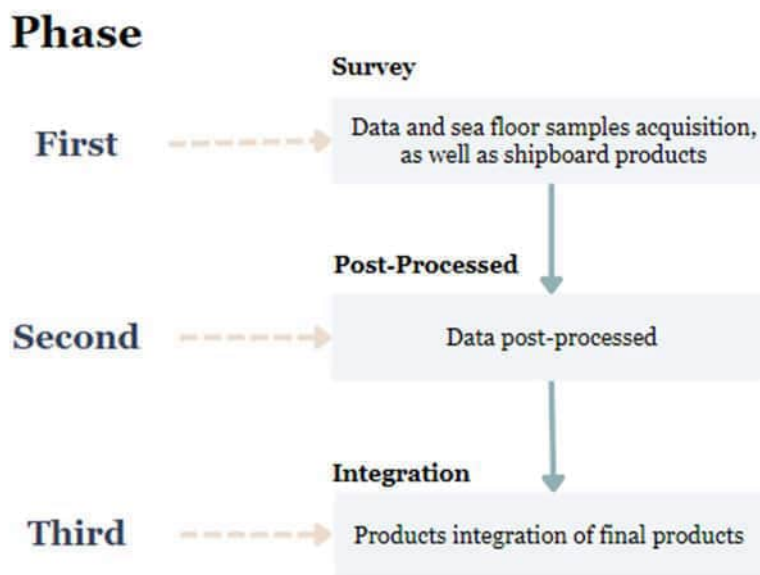


Figure 1-1 Three phases of deliverables production

In the first phase, Benthic conducted a comprehensive and continuous survey using Multibeam Echo Sounder (MBE), Side Scan Sonar (SSS), and Sub-Bottom Profiler (SBP) from 24 June to 22 July. This data enabled the creation of an onboard geological

interpretation which was used to pick appropriate locations for the geotechnical campaign, which took place between August 2-7.

During the second phase, all acquired data were post-processed at Benthic's Palmer, AK facility.

Finally, in the third phase, all products were integrated, and the geological interpretation was updated and correlated using the results from the August geotechnical survey.

1.2 Project Site Localization and Description

The worksite for the current project spans ~573.6 km from Nunapitchuk to Emmonak, Alaska. However, this report focuses exclusively on the portion of the Airraq 3 route surveyed in 2024.

Survey Segment Summary				
Segment	From	To	Route Distance (Km)	Comment
3.4.2	Tununak	Emmonak	289.0	Starting at -15 m MLLW

Table 1-2 2024 Marine Route Survey Segment Summary

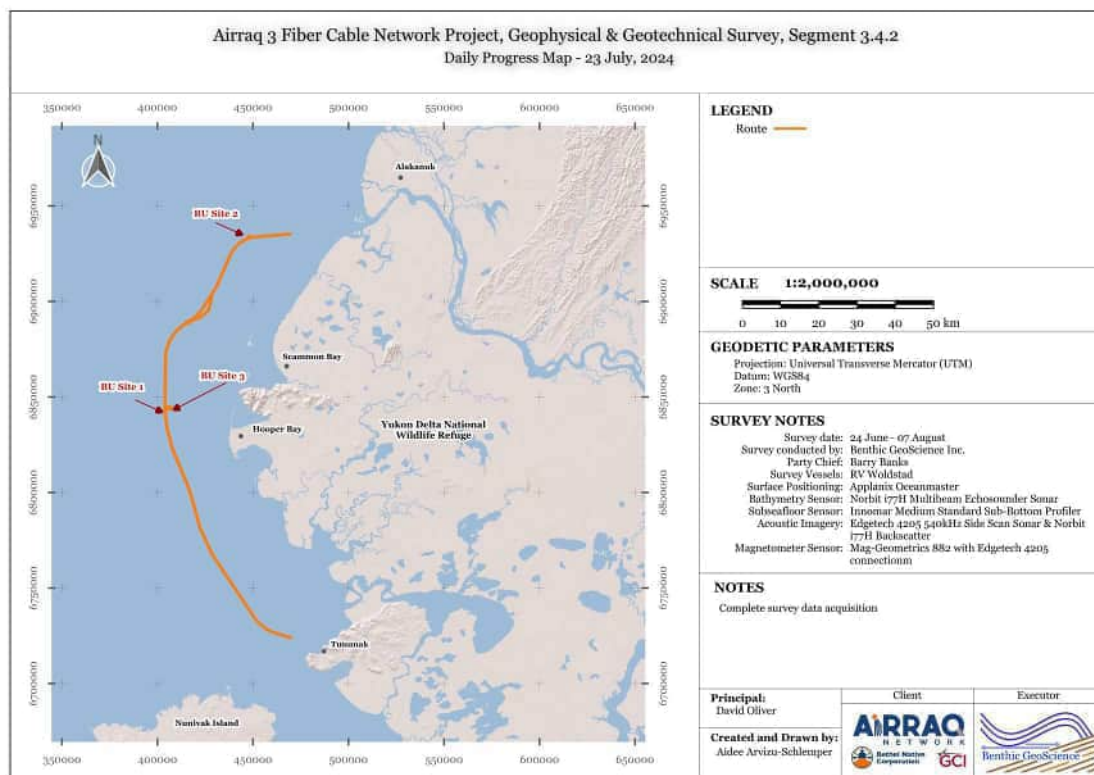


Figure 1-2 Overview of Nearshore Survey Route 2024

1.3 Survey Blocks and Line Plan

To facilitate survey data management and planning, Segment 3.4.2 was divided into six blocks (see Table 5-1 & Figure 5-1) primarily based on water depth to ensure complete coverage.

Multibeam Echo Sounder (MBE), Back Scatter (BS), Side Scan Sonar (SSS), and Sub-bottom Profiler (SBP) data were acquired simultaneously on all geophysical main lines.

1.4 Deviations to Scope of Work

During the geophysical survey, several deviations from the original scope of work were encountered, please see table 1.3.

Deviations from the original scope of work during survey		
Description	Acquisition Date	Cause
Line plan updated	27 June	Alternative route removed from the scope
Line plan updated	29 June	New route for Block 34204 to find deeper water
BU site 1 added	12 July	Branching Unit (BU) site 1 in Block 34203 added
BU site 3 added	18 July	Branching Unit (BU) site 3 in Block 34203 added
BU site 2 added	22 July	Branching Unit (BU) site 2 in Block 34205 added

Table 1-3 Deviations from the original scope of work during survey

2 SURVEY VESSEL

The effectiveness of any survey operation greatly depends on the selection of an appropriate platform. Specifically, vessel selection should be tailored to meet the operational requirements and environments.

Benthic arranged for the charter of the research vessel Woldstad from Support Vessels of Alaska (SVA) to accommodate the science crew during the geophysical and geotechnical surveys. This vessel was built for the Bering Sea and is a good fit for this environment.

2.1 RV Woldstad

The RV Woldstad was the live-aboard research vessel for this expedition, well-suited for the challenging conditions of the Bering Sea and Aleutian Islands. Originally commissioned by the State of Alaska for patrolling icy waters, this 121-foot steel vessel has been extensively overhauled for large-scale projects. The schematics could be reviewed at the following link.

<https://www.supportvesselsofalaska.com/wp-content/uploads/2016/11/Woldstad-Schematic-Final-2.1.pdf>



Figure 2-1 RV Woldstad

To perform the data acquisition required for this project the vessel was fitted with two retractable pole arms for mounting MBE, USBL, and SBP systems, along with a towed SSS managed by a stern winch.

3 PROJECT GEODESY

3.1 Geodetic Datum and Grid Coordinate System

The geodetic datum used for survey equipment during acquisition is presented in Table 2-1.

Horizontal datum			
Geodetic Datum	WGS 84	EPSG Datum code	32603
Spheroid	WGS 84 / UTM zone 3N	Prime meridian	Greenwich 0,00,00.0000 E
Semi-major axis (a)	6378137.00000 m	Semi-minor axis (b)	6356752.314245 m
Flattening (f)	0.003352810664747	Inverse flattening (1/f)	298.257223563000
First eccentricity (e)	0.081819190842621	Second eccentricity (e')	0.082094437949696

Table 3-1 Geodetic parameters used during acquisition

3.2 Tidal Datum

Multibeam echo sounder data were shifted during processing from ellipsoidal heights (ITRF2020) to Mean Lower Low Water (MLLW) tidal datum using a separation model specifically created for the survey area.

3.3 Time Datum

The time datum used for the survey was Coordinated Universal Time (UTC). All data acquisition and logging activities were synchronized to UTC to ensure consistency and accuracy across different survey components. Utilizing UTC allows for seamless integration of various datasets and ensures precise correlation between time-stamped data points.

Events in Daily Progress Reports (DPR), however, were recorded in local Alaska Daylight Time (AKDT) for convenience and ease of understanding.

4 EQUIPMENT AND SOFTWARE

4.1 Geophysical and Geotechnical Equipment

Various equipment and sensors were utilized for this project. A brief description of these sensors is provided in the following tables. The first table corresponds to geophysical equipment, while the second table pertains to geotechnical equipment. Following the tables, figures showing the layout of the equipment on each vessel are presented.

Sensor	Manufacturer	Series	Serial Number	Description
Inertial Navigation System (INS)	Applanix	Oceanmaster	N/A	It uses sensors to accurately track a vessel's position, speed, and heading, enhancing navigation and data collection in challenging conditions.
Multibeam Echo Sounder (MBE)	Norbit	i77H winghead	232507	Provided detailed bathymetric data, mapping the seafloor's topography with high resolution and accuracy.
Back Scatter (BS)	Norbit	i77H winghead	232507	Used to measure the intensity of sound waves reflected off the seabed, offering valuable information about the composition and texture of the seafloor.
Ultrashort Baseline (USBL)	iXblue	Gaps M7	7351	
USBL Beacons	iXblue	BCN-1119	2423046 2423047	Navigation data for monitoring SSS.
Side Scan Sonar (SSS)	EdgeTech	4205 dual frequencies	59652	Used to image the seafloor surface, identifying features, sediment types, and potential obstructions or hazards.
Sub-Bottom Profiler (SBP)	Innomar	Standard 100	E3111-4	Penetrated beneath the seafloor to map subsurface geological units and detect variations in sediment layers and geological structures.

Magnetometer (MAG)	Geometrics	G-882	883911	Not used, but onboard vessel and ready to deploy if needed to identify infrastructure crossings or large metallic debris.
Sound Velocity Profiler (SVP)	Valeport	RapidPro SVT	78721	Provide detailed measurements of the water column for speed of sound, salinity, and temperature to calibrate data from other sensors on board
		Swift SVP	60311	
		Swift SVP	69850	
		RapiPro CTD	81072	
		RapiPro CTD	75844	
Profiling winch controller	Revelare System	Underway Profiler	N/A	

Table 4-1 Equipment for geophysical operations

A brief description of the main equipment used during the geotechnical operations are described in the following table:

Item	Manufacturer	Series	Serial Number
Inertial Navigation System (INS)	Applanix	Oceanmaster	N/A
Winch	Okeanus	220 HLWR	50595
CPT	Datem	Neptune 3000	59
Piston Core			
Ultrashort Baseline (USBL)	IXBlue	GAPs M7	7351
Van Veen			N/A

Table 4-2 Equipment for geotechnical operations

The Norbit Multibeam Echo Sounder (MBE) was mounted on the port side, along with the USBL, while the SBP was mounted on the starboard side. The SSS was towed from the stern port side using a winch (Okeanus). The length of cable used for towing was determined primarily by the water depth, vessel speed, and environmental conditions.

The SVP sensor was deployed while underway from the stern starboard side with the assistance of a small winch (Revelare).

Below is a graphical representation of the geophysical sensor layout on the RV Woldstad:

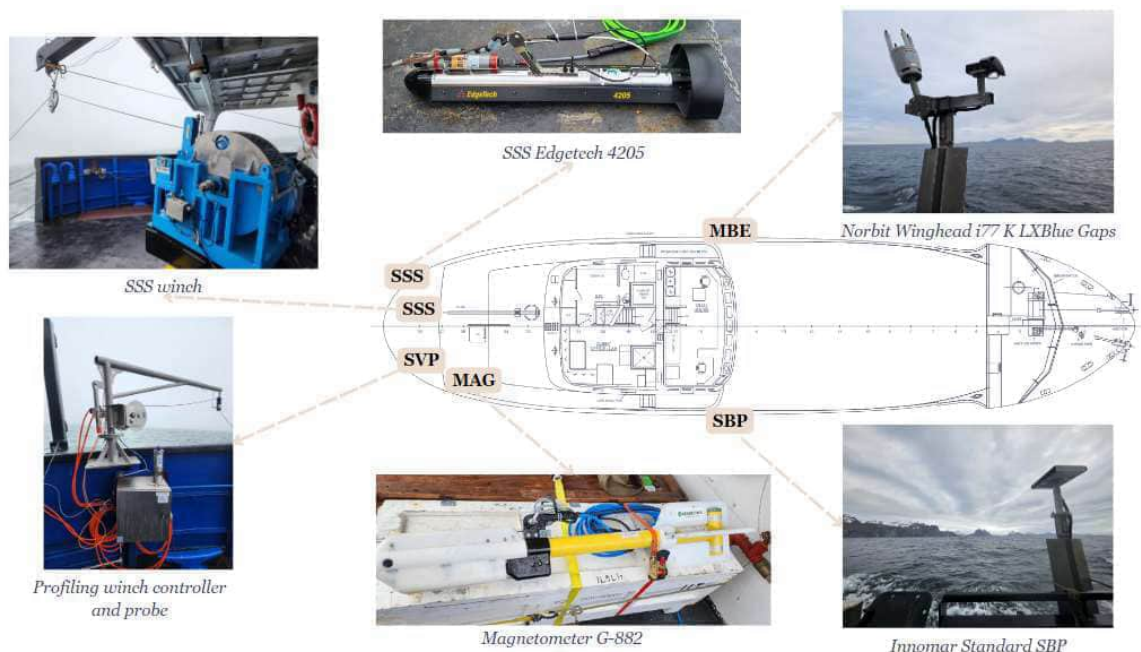


Figure 4-1 Geophysical Survey instrumentation layout for RV Woldstad

During the geotechnical survey phase, the RV Woldstad underwent a reconfiguration of its equipment layout to accommodate the specific needs of the survey operations. The Okeanus winch was relocated from the stern to the deck on the port side to facilitate better handling and access. The Cone Penetration Test (CPT) unit was positioned on the starboard side of the vessel to optimize its deployment and operation with the help of a crane.

Additionally, a temporary geological lab was established in the middle of the deck. This lab was used for the classification and analysis of the samples collected during the survey. The central location of the lab ensured efficient processing and handling of the samples from CPT and PC, contributing to the smooth execution of the geotechnical operations.

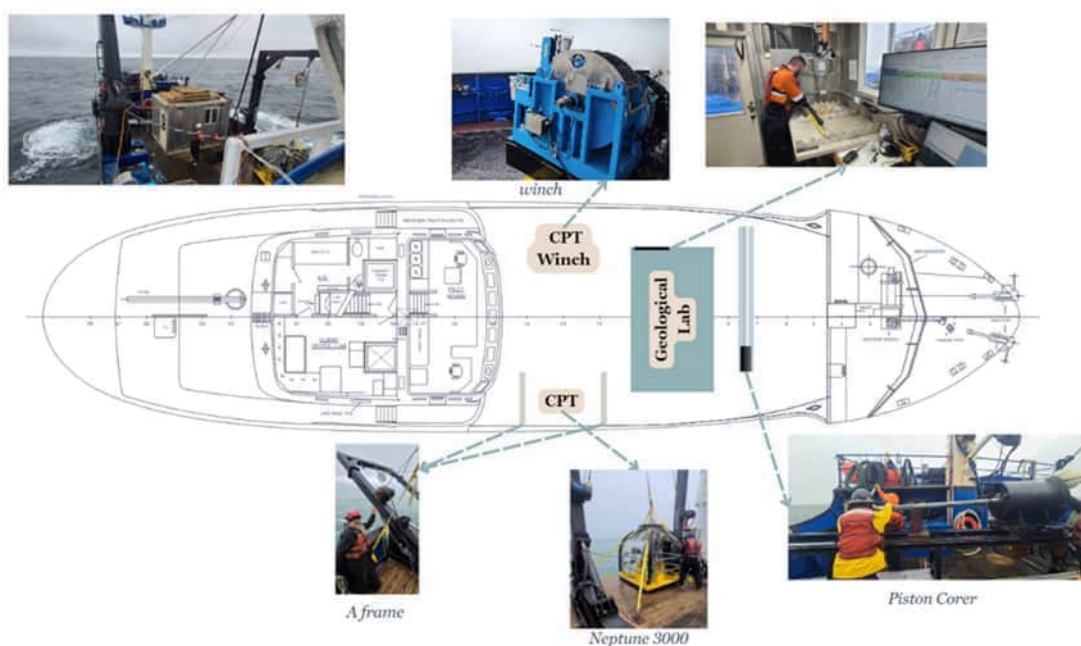


Figure 4-2 Geotechnical Survey instrumentation layout for RV Woldstad

4.2 Software

Several common software packages were employed during the geophysical and geotechnical phases of the survey. These programs were used during nearshore survey operations for shipboard processing, facilitating real-time decision-making for route adjustments or development. The following table presents a summary of installed software.

Software for Geophysical Operations			
Provider	Software	Description	Survey Phase
Blue Marble Geographics	Global Mapper	Geographic information system	All
Chesapeake Technology	SonarWiz	Designed for processing and analyzing sonar data, with tools for visualizing, interpreting, and managing data collected from different types of sonar systems, including side scan, sub-bottom, and bathymetric sonars.	Geophysical

GeoLogismiki	CPeT-IT	Process and interpretation of Cone Penetration Test (CPTu) data.	Geotechnical
Golden Software	Strater	Geotechnical and geological visualization.	Geotechnical
QPS	QINSy	Precise data collection, processing, and visualization for various hydrographic and geophysical surveys.	All
QPS	Qimera	Designed for the acquisition, processing, and visualization of multibeam and LiDAR data in hydrographic surveying and underwater mapping applications.	Geophysical
QPS	FMGT	Package for the visualization, analysis, and interpretation of geospatial data in marine and terrestrial environments.	Geophysical
RadExPro	RadExPro	SBP processing software	Geophysical
Seequent	Oasis Montaj	Visualize, analysis and integration of geoscience data	Geophysical
S&P Global	Kingdom	SBP interpretation	Geophysical
Trimble	Applanix & POSPac	Post-processing of GNSS and inertial data collected during land, marine, and airborne survey missions.	Geophysical

Table 4-3 RV Woldstad installed software

5 ACQUISITION PLAN

Several collection techniques were employed during the geophysical survey, including Multibeam Echo Sounder (MBE), Backscatter (BS), Side Scan Sonar (SSS), and Sub-Bottom Profiler (SBP). A magnetometer was mobilized on the vessel for use in identifying any subsea infrastructure or large debris but was not needed.

The geotechnical survey was conducted using cone penetration testing (CPT) and piston core (PC) techniques, with a Van Veen grab sampler available if piston core samples met refusal.

Both geophysical and geotechnical surveys were conducted on a 24-hour basis using two crews with shift changes every 12 hours.

5.1 Corridor and Coverage

Survey lines for geophysical data were run to ensure a minimum corridor width of 400 meters, with a minimum side scan sonar overlap of 100% and a bathymetry (MBE) overlap of 20% throughout the entire corridor, as well as 100% bathymetry coverage, meaning the entire seabed within the corridor was scanned without any gaps.

5.2 Line Planning

Since the swath width was dependent on factors such as depth and terrain slope, preplanning the survey lines was complex for the entire route. To determine the number of wind lines for geophysical data required for the segment, Benthic decided to begin data acquisition on the centerline. This approach facilitated the initial reconnaissance of the segment and assisted in planning the survey line route. The following maps and table presented the number of blocks and wing lines planned for each segment:

Line plan					
Segment	Block	No. of wing lines	Segment	Block	No. of wing lines
3.4.2	01	10	3.4.2	02	12
3.4.2	03	10	3.4.2	04	14
3.4.2	05	12	3.4.2	06	14
3.4.2	BU1	N/A	3.4.2	BU2	N/A
3.4.2	BU3	N/A	3.4.2	04 old route	N/A

Table 5-1 Line Plan

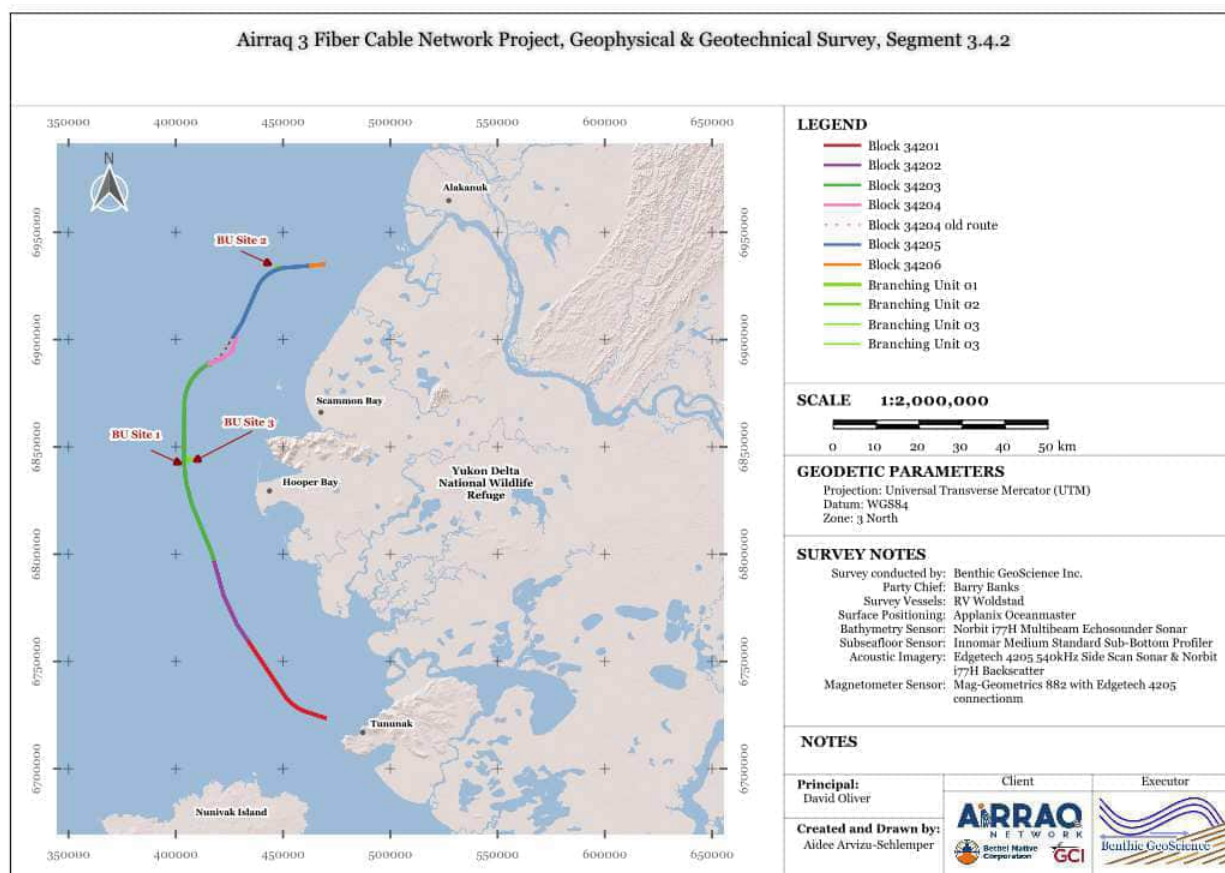


Figure 5-1 Blocks for Segment 3.4.2

5.3 Geotechnical Sites

A total of 60 sites were collected during the geotechnical survey campaign. To determine the best locations for each site, the MBE, SSS, and SBP datasets were used to determine the best possible locations based on seabed, subsurface conditions and seismic anomalies. Some locations deviated both perpendicularly and parallel within survey corridor due to a need to understand the soil properties of certain features.

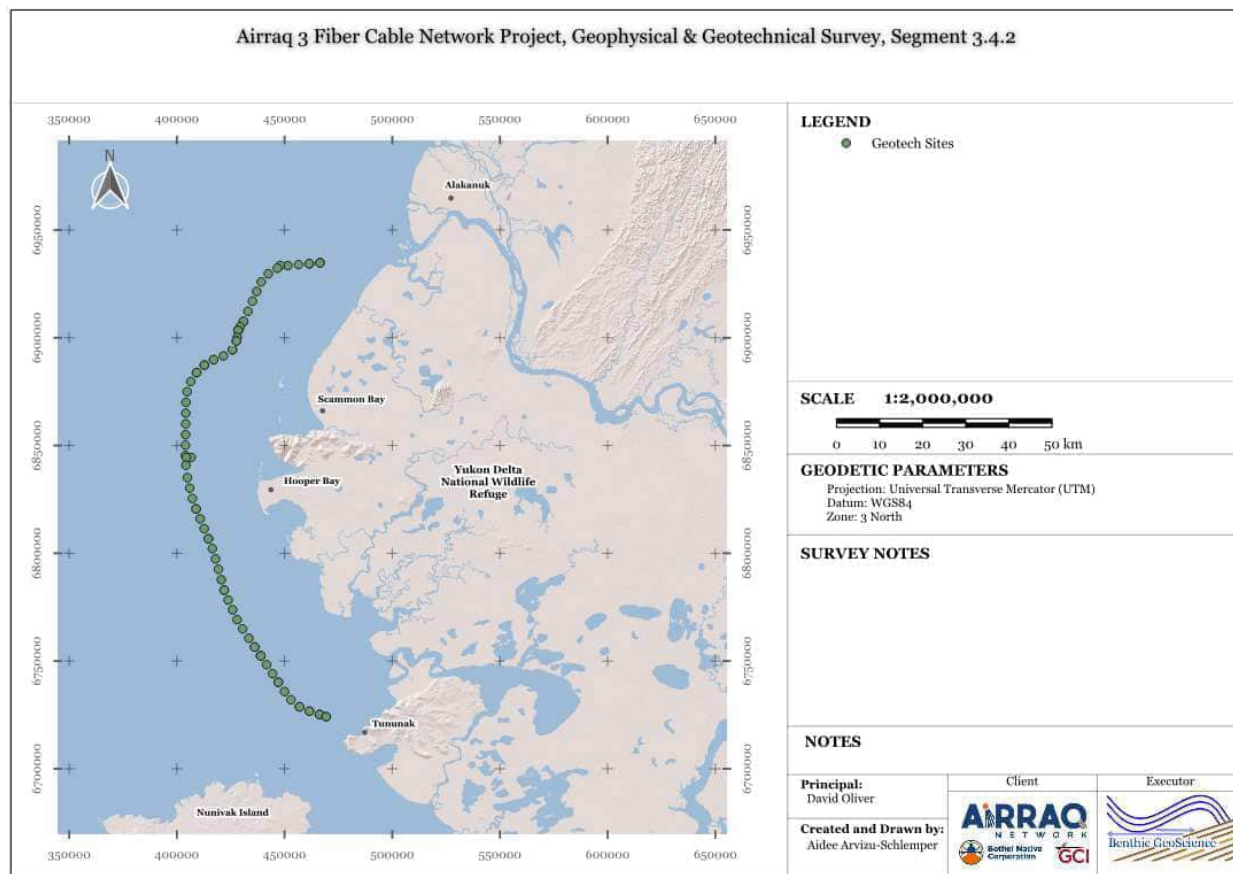


Figure 5-2 Geotech sites Segment 3.4.2

6 QUALITY CONTROL

Infield processing was performed sufficiently to assess coverage, data quality, and assess geohazards and inclement conditions necessitating route development. Further post processing was performed onshore at Benthic's Processing Center in Palmer, AK.

6.1 Equipment Calibration

The primary geophysical survey equipment was calibrated prior to the survey during the sea trials executed on 14 May 2024 in Kachemak Bay, including a multibeam patch test in Halibut Cove. Each sensor underwent calibration to ensure accuracy, precision, alignment, timing error, uncertainty value, and residual biases in roll, pitch, heading, and navigation. Comprehensive testing was conducted to verify that all systems were functioning correctly and were ready for survey operational use. At sea portions of the equipment calibrations were concluded on 15 May 2024. The crew finished processing the calibration data on 16 May.

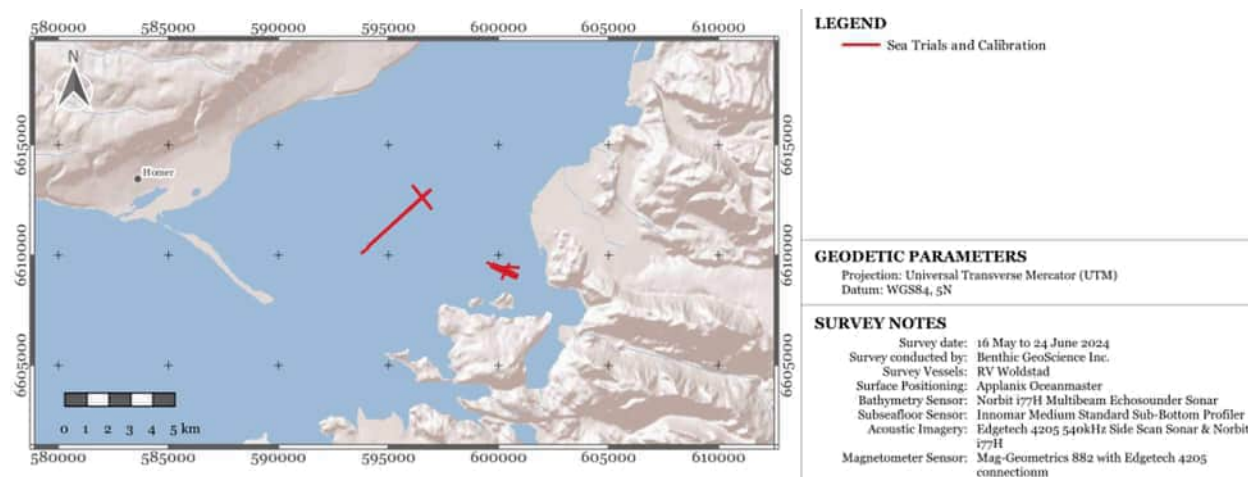


Figure 6-1 Geophysical Calibration Site

To verify the USBL system onboard, a check was conducted by comparing the USBL range with a measurable distance above water. Verification of the depth ranging of the sonar was done by dropping a lead line from the deck of the vessel to the seafloor under the sonar and comparing that to sonar depth.

The MBE calibration was completed by conducting a patch test. To verify the accuracy of the SSS different lines were run in reciprocal directions and imported into processing software. Based on this data, the functionality and positional accuracy of the SSS was determined to be satisfactory for survey operations. It's important to mention that during the Sea Trials the lines running southeast show more accurate, this could be related to environmental factors like underwater currents.

Several SBP profiles were recorded for calibration purposes, and after processing the seismic images, areas of distinct seabed topography were identified and compared with the MBE surface. Magnetometer calibrations were executed in much the same way as SBP, where bedrock outcrops identified in MBE and SSS were compared with the position of magnetic anomalies.

Calibration was not necessary for the Gaps M7 USBL system because it contains an INS inside of the USBL head. The calibration is done during the manufacturing process, making Gaps M7 a precalibrated system. A position verification of USBL-tracked SSS towfish was done, as stated earlier. Similarly, the SVP probes used in this project were calibrated at the factory and did not require on-site calibration.

Immediately after the geophysical demobilization took place, geotechnical mobilization and testing occurred. Test deployments of the CPT and the PC were performed close to the port of Nome shortly after personnel arrived at the Woldstad on 30 July. The crew performed seven tests for piston cores and calibrated the trigger weight and length to ensure accurate and reliable sampling.

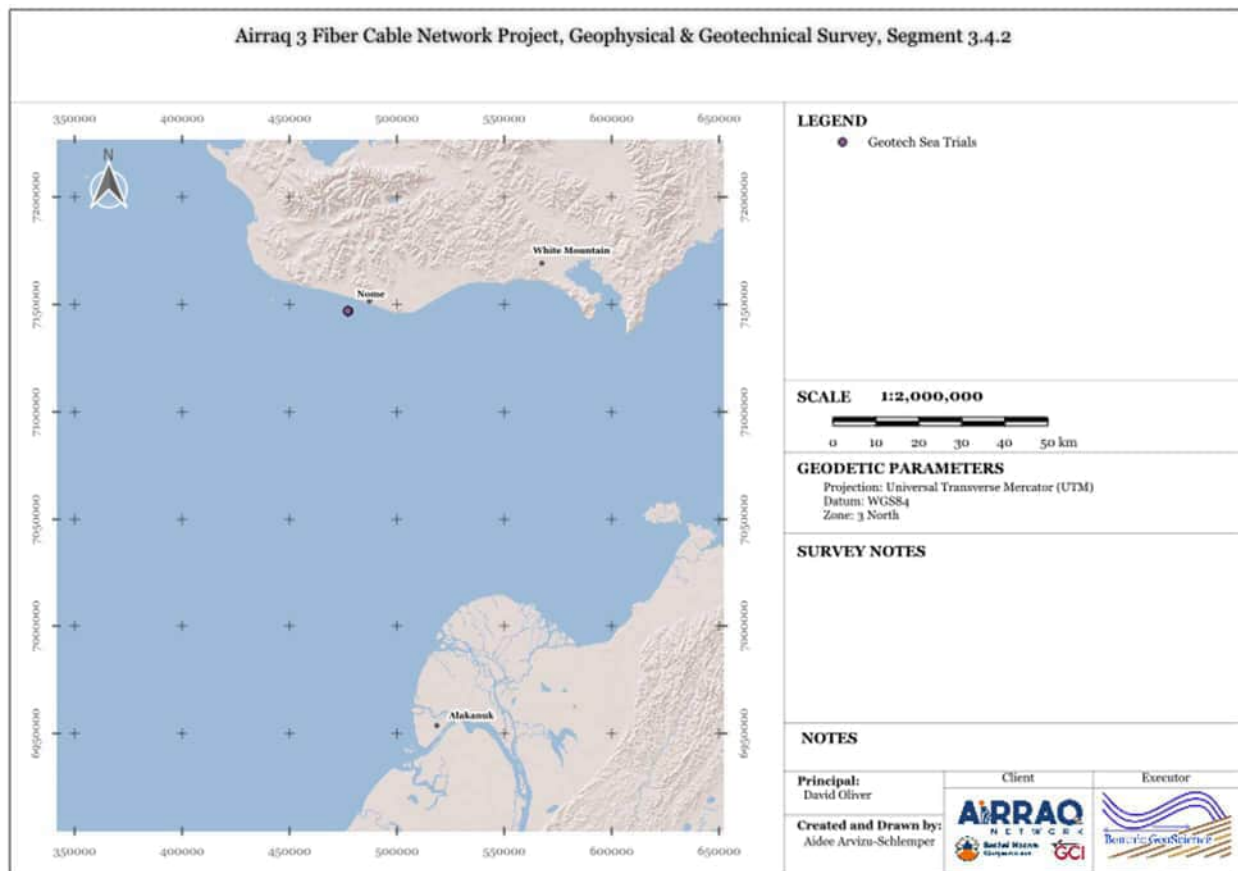


Figure 6-2 Geotechnical Calibration Site

6.2 Data Collection

MBE data was collected using Norbit software and fed into QINSy Navigation software, while SSS data was collected using Discover, SBP data was collected automatically by SESWin with ping triggering and file naming provided by QINSy. The multibeam operated at an automatic ping rate to optimize the coverage of the seafloor in variable water depths.

CPT data records and piston core samples were collected in accordance with the geotechnical plan established during the geophysical survey. During data acquisition, the vessel was halted to deploy the piston core and collect soil samples for analysis (Color, Plasticity, Dilatancy, Soil Strength) by the onboard geologists. Simultaneously, other crew members deployed the CPT equipment to test pore pressure, sleeve friction, and cone resistance at each site.

The file naming convention was inherent to QINSy and Discover to ensure that individual survey lines had unique names based on time of collection. In case of line break due to file size or other conditions, the original file name was kept but appended with an underscore and additional file number. All raw data files contained positional and attitude information and were stored on the acquisition computer's hard drive for the duration of the survey.

Chronological logs containing information specific to each line were maintained as an independent reference to aid in data integration and error tracking. Acquisition logs included the line name, start and end times in UTC and AK time, speed over ground, Vessel Heading, as well as additional comments and events deemed significant by the operator.

6.3 Initial File Handling

Shipboard data handling proceeded as follows: All raw files were organized by Julian day in UTC time, saved locally, copied onto the onboard networked-attached storage (NAS) using GoodSync software for synchronization, and uploaded to a dedicated and secured cloud storage site. As an additional safety measure, all data stored on the vessel NAS was backed up to a second NAS daily at midnight.

6.4 Field Data Processing

Preliminary processing of MBE, BS, SSS, and SBP data was conducted aboard the survey vessel during offshore operations. The data was reviewed daily by the party chief, geophysical interpreter, and geophysical interpreter-reporter for quality control. The data products were reviewed for initial surficial geology interpretation and analysis of bedforms and sediment thickness, which facilitated informed decisions for route development or route modifications. All shipboard products were later post-processed

and integrated with the geotechnical survey results at Benthic’s processing center in Palmer.

During the geotechnical survey, the geology team analyzed each sample and recorded the data in field logs while simultaneously reviewing the quality of the CPT records to ensure accuracy.

7 GEOPHYSICAL OPERATIONS

This section provides an overview of the geophysical operations and personnel involved in the geophysical survey, including the navigation/acquisition center, shipboard data processing center, and geophysical deck layout.

7.1 Mobilization Summary

The mobilization of geophysical and geotechnical equipment for the nearshore operations began on 24 April 2024, at Benthic’s Palmer facility. Key project personnel inspected equipment for completeness and damage upon arrival and all were generally found to be in order. Equipment was loaded into a project box truck for transport to Homer, AK and mobilization on RV Woldstad. The mobilization crew arrived at RV Woldstad on 06 May 2024 to begin mobilization. Table 6-1 outlines the project personnel directly involved in the mobilization operations for the project.

Role	Name
Principal and Technical Lead	David Oliver
Party Chief	Brent Johnston
Sr. Equipment Mobilizer	Thomas Lamoure
Jr. Equipment Mobilizer	James Thomas
Jr. Equipment Mobilizer	Emerson Kropp
Vessel Mobilization Specialist	Erick Kusnir
Vessel Mobilization Specialist	Bill Langolf
Vessel Mobilization Specialist	Tara Levy
Vessel Mobilization Specialist	Eduardo Niño

Table 7-1 Personnel for Mobilization



Figure 7-1 Mobilization

Starting on 06 May, all necessary equipment for operations was manually loaded onto the vessel, and heavy parts were loaded by crane. By 1 PM on the same day, all equipment was onboard. The crew began by inspecting the equipment and installing the pole arms that would be used to deploy various underwater sensors (MBE, SSS, and USBL).

During the following days the crew mounted and installed chafing gear for the MBE and USBL. Initial tests for MBE, USBL, SSS, deck cameras were successful, though minor USBL tracking issues had to be troubleshooted and quickly resolved. Over the following days the processing and navigation room were set up with computer equipment and screens. At the same time another part of the crew fabricated hydraulic hoses for the winch and installed the towing sheave on the aft crane, which was tested on the foredeck to confirm operational status.

After completing configuration of the navigation room, all equipment and software were tested to ensure that they were functioning properly.

For more detailed information, please refer to Daily Progress Reports in Appendix A.

7.2 Navigation/Acquisition Center

The Navigation/Acquisition (NAVACQ) center on the RV Woldstad was in the second deck starboard office space. NAVACQ and interpretation stations were established in this room, along with a workstation utilized by the Party Chief. The bridge was apportioned with a helmsman display and a bridge observation desk.

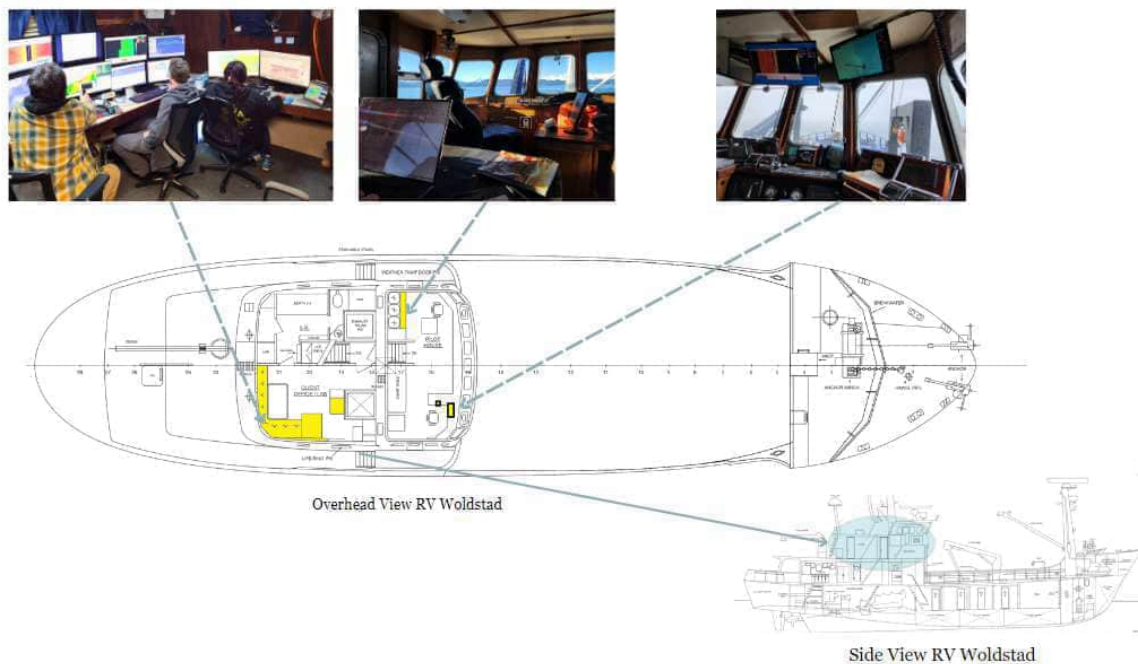


Figure 7-2 Geophysical NAVACQ Layout Plan

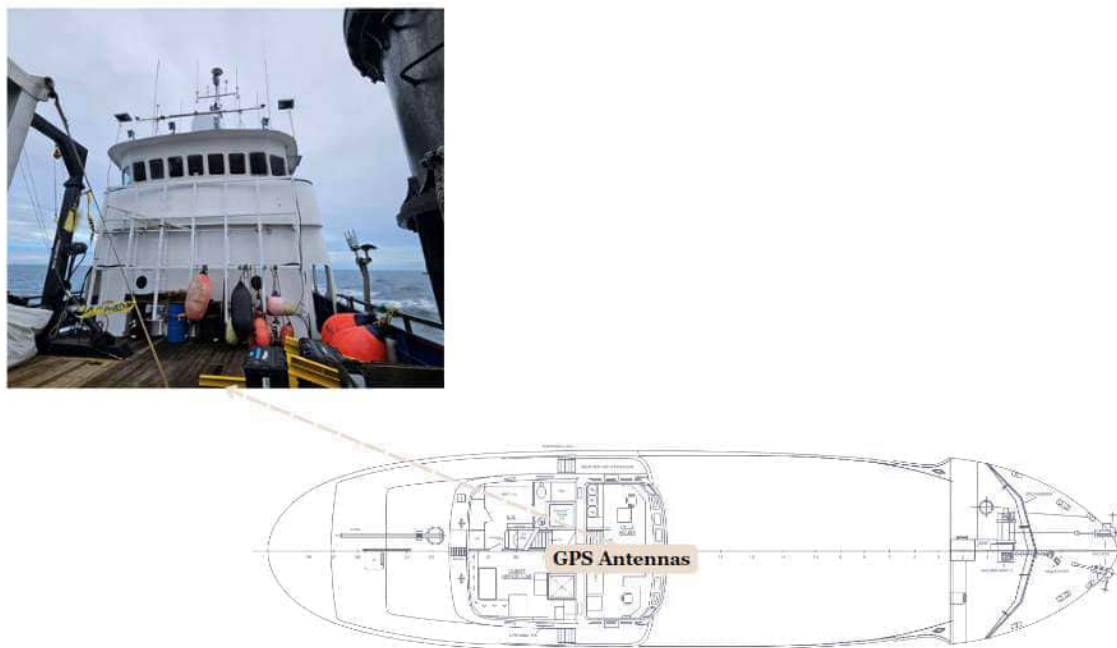


Figure 7-3 Navigation Antennas

The navigation system utilized during the survey was designed to provide high-precision positioning and navigation data. This system includes:

- **Differential Global Positioning System (DGPS):** Utilized for real-time positioning with sub-meter accuracy. A dual antenna Hemisphere 330 was used to

provide navigation to the helmsman. This positioning utilized WAAS SBAS corrections to provide better positioning to the QINSy Navigation Software. Heading was provided by the same instrument.

- **Inertial Navigation System (INS):** Used in tandem with the DGPS to enhance accuracy and reliability, especially in areas with limited satellite visibility. Benthic employed an Applanix Oceanmaster INS to provide precise real-time positioning and orientation data essential for accurate data collection and mapping. This integrates inertial technology with GNSS (Global Navigation Satellite System) to deliver reliable and high-accuracy navigation solutions tailored for marine survey applications. Provided continuous real-time tracking of the vessel's position, heading, roll, pitch, and heave.
- **Ultra-Short Baseline (USBL):** The iXblue Gaps M7 USBL system was used for precise subsea positioning of equipment, ensuring accurate data acquisition at various depths. This is a bi-directional acoustic positioning system, which communicates between ship (antenna) and one or more transponders (beacons).

The estimated accuracy of the navigation system for the surveyed area is as follows:

- **Horizontal Positioning Accuracy:** Achieved sub-meter accuracy (typically within ± 0.5 meters) due to the combination of DGPS and INS.
- **Vertical Positioning Accuracy:** Achieved accuracy within ± 1 meter, essential for precise bathymetric and subsurface data collection.

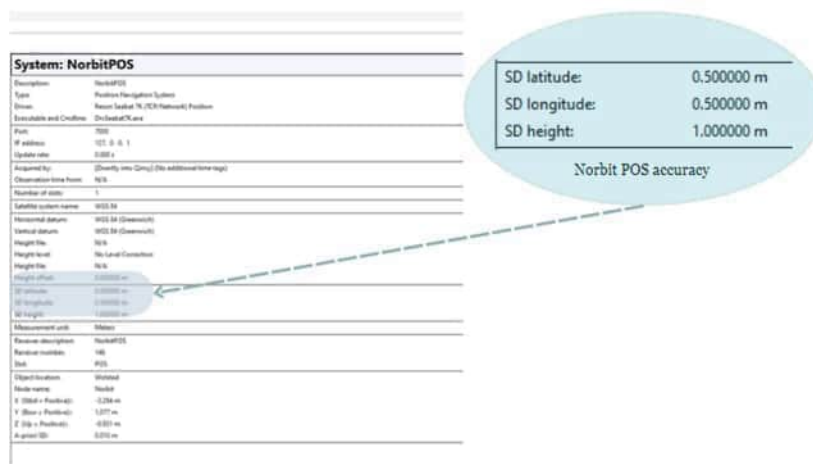


Figure 7-4 Navigation accuracy for POS

System: GAPS	
Description:	GAPS
Type:	Real-time Navigation System
Driver:	QinetiQ (GAPS) (GPS/INS/Motion)
Executable and Condition:	Dimensional/Location
Port:	8
Serial rate:	9600
Data bits:	8
Stop bits:	1
Parity:	None
Byte frame length (bytes):	1024 (1024 max)
Maximum data transfer rate:	100 bytes / second
Update rate:	0.001 s
Latency:	0.001 s
Acquired by:	(Directly into QinetiQ) (No additional time tag)
Observation time from:	N/A
Number of slots:	0
Latitude system name:	WGS 84
Horizontal datum:	WGS 84 (Geocentric)
Vertical datum:	WGS 84 (Geocentric)
Height type:	N/A
Height level:	No Level Correction
Height fix:	N/A
Height offset:	0.000000 m
SD latitude:	0.500000 m
SD longitude:	0.500000 m
SD height:	1.000000 m
Measurement unit:	Meters
Receiver description:	GAPS
Receiver number:	2
Object location:	100
Node name:	100-001
X (Offset = Positive):	0.000 m

SD latitude: 0.500000 m
SD longitude: 0.500000 m
SD height: 1.000000 m

GAPS accuracy

Figure 7-5 Navigation accuracy for USBL

7.3 Navigation

Below are the screenshots of the navigation system corresponding to the X, Y, and Z offsets of the sensor locations, as well as settings.

System: Norbit	
Description:	Norbit
Type:	Multibeam Echopounder
Driver:	Raison Seabat 70 (TCP/Network)
Executable and Condition:	Driverless/7x24
Driver specific settings:	RAWDATA=FALSE;RAW_SHIP_WINDOW=0;RAW_SHIP_WINDOW=0;PROCESSING_TOOL=FM Seacoder Toolbox (FIND);PROCESSING_TOOL_OPTION=Normalized snippets/RAW_BATHY=7027;RAW_SHIP=7000;RAW_WCD=0.5;RAW_RECORDING=FALSE;SYSTEM=Nautik
Port:	7000
IP address:	127.0.0.1
Update rate:	0.001 s
Acquired by:	(Directly into QinetiQ) (No additional time tag)
Observation time from:	N/A
Number of slots:	0
Manufacturer:	Unknown
Model:	Unknown
Object location:	Winnipeg
Node name:	Norbit
X (Offset = Positive):	-1.284 m
Y (Offset = Positive):	1.077 m
Z (Up = Positive):	-0.931 m
A priori SD:	0.010 m
Roll offset:	0.220
Pitch offset:	-0.560
Heading offset:	1.400
Unit is roll stabilized:	No
Unit is pitch stabilized:	No
Unit is heave compensated:	No
Beam steering (at transducer):	Yes
Beam angle width along:	1.000 m
Beam angle width across:	1.500 m
Maximum number of beams per ping:	1024
Use sound velocity from unit:	Yes
Unit:	1
ID type:	Pulse Frequency
ID pulse length:	0.150 ms
ID sampling frequency:	14.250 kHz
ID roll offset:	0.000°
ID pitch offset:	0.000°
ID heading offset:	0.000°
ID roll stabilization:	0.000°
ID pitch stabilization:	0.000°
ID heave compensation:	0.000 m
ID sound velocity:	0.000 m/s

Figure 7-6 Norbit system

System: Norbit [Pitch Roll Heave Sensor]	
Description:	Norbit [Pitch Roll Heave Sensor]
Type:	Pitch Roll Heave Sensor
Driver:	Recon Seabat 7K (TCP/Network) R-P-H
Executable and Cmdline:	DrvSeabat7K.exe
Port:	7000
IP address:	127. 0. 0. 1
Update rate:	0.000 s
Acquired by:	[Directly into Qinsy] (No additional time tags)
Observation time from:	N/A
Number of slots:	0
Object:	Wolstad
PRH sensor reference number:	2
Rotation convention pitch:	Positive bow up
Rotation convention roll:	Positive heeling to starboard
Angular variable measured:	HPR (roll first)
Angular measurement units:	Degrees
Sign convention heave:	Positive upwards
Measurement unit heave:	Meters
Conversion factor to degrees decimal:	N/A
Conversion factor to metres:	N/A
Quality indicator type pitch and roll:	No quality info recorded
Quality indicator type heave:	No quality info recorded
Description of quality indicator type:	N/A
Object location:	Wolstad
Node name:	Norbit
X (Std = Positive):	-3.294 m
Y (Bow = Positive):	1.077 m
Z (Up = Positive):	-0.931 m
A-priori SD:	0.010 m
(C-O) roll offset:	0.000 °
(C-O) pitch offset:	0.000 °
(C-O) heave offset:	0.000 m
Heave time delay:	0.000 s
Heave filter length:	20.000 s
SD roll and pitch:	0.050 °
SD heave (fixed):	0.050 m
SD heave (variable):	5.000 %
SD roll offset:	0.050 °
SD pitch offset:	0.050 °
SD heave offset:	0.050 m

Figure 7-7 Norbit system pitch, roll and heave

System: NorbitPOS

Description:	NorbitPOS
Type:	Position Navigation System
Driver:	Reson Seabat 7K (TCP/Network) Position
Executable and Cmdline:	DrvSeabat7K.exe
Port:	7000
IP address:	127. 0. 0. 1
Update rate:	0.000 s
Acquired by:	[Directly into Qinsy] (No additional time tags)
Observation time from:	N/A
Number of slots:	1
Satellite system name:	WGS 84
Horizontal datum:	WGS 84 (Greenwich)
Vertical datum:	WGS 84 (Greenwich)
Height file:	N/A
Height level:	No Level Correction
Height file:	N/A
Height offset:	0.000000 m
SD latitude:	0.500000 m
SD longitude:	0.500000 m
SD height:	1.000000 m
Measurement unit:	Meters
Receiver description:	NorbitPOS
Receiver number:	146
Slot:	POS
Object location:	Wolstad
Node name:	Norbit
X (Stbd = Positive)::	-3.294 m
Y (Bow = Positive)::	1.077 m
Z (Up = Positive)::	-0.931 m
A-priori SD:	0.010 m

Figure 7-8 Norbit-integrated POS system

Node: ANT1		Node: ANT2	
Object location:	Wolstad	Object location:	Wolstad
Node name:	ANT1	Node name:	ANT2
X (Stbd = Positive)::	-2.325 m	X (Stbd = Positive)::	2.316 m
Y (Bow = Positive)::	0.845 m	Y (Bow = Positive)::	0.942 m
Z (Up = Positive)::	10.291 m	Z (Up = Positive)::	10.580 m
A-priori SD:	0.010 m	A-priori SD:	0.010 m

Figure 7-9 Antenna offsets

Node: GAPS		Node: Norbit		Node: SBP	
Object location:	Wolstad	Object location:	Wolstad	Object location:	Wolstad
Node name:	GAPS	Node name:	Norbit	Node name:	SBP
X (Stbd = Positive)::	-3.294 m	X (Stbd = Positive)::	-3.294 m	X (Stbd = Positive)::	4.406 m
Y (Bow = Positive)::	0.247 m	Y (Bow = Positive)::	1.077 m	Y (Bow = Positive)::	0.677 m
Z (Up = Positive)::	-1.061 m	Z (Up = Positive)::	-0.931 m	Z (Up = Positive)::	-1.191 m
A-priori SD:	0.010 m	A-priori SD:	0.010 m	A-priori SD:	0.010 m

Figure 7-10 Gaps, Norbit, and SBP offsets

Node: Sheave		Node: Beacon1	
Object location:	Wolstad	Object location:	SSS
Node name:	Sheave	Node name:	Beacon1
X (Stbd = Positive)::	-2.434 m	X (Stbd = Positive)::	0.000 m
Y (Bow = Positive)::	-17.373 m	Y (Bow = Positive)::	0.640 m
Z (Up = Positive)::	6.159 m	Z (Up = Positive)::	0.840 m
A-priori SD:	0.010 m	A-priori SD:	0.010 m

Figure 7-11 Sheave and Beacon offsets

The vessel navigated along the route at an average speed of 6.5 knots, reaching a maximum of 7 knots and a minimum of 3.5 knots on a few occasions. Speed was determined to optimize data quality based on prevailing weather conditions. During acquisition, several days had weather conditions unfavorable for survey operations, accounting for 10% down time. The Daily Progress Report (DPR) provides detailed information on weather and sea state conditions for the whole project (see Appendix A and Appendix B).

7.4 Survey instrumentation

Sensor	Description	Configuration
MBE	Provides detailed bathymetric data, mapping the depth and characteristics of the seafloor with high resolution and accuracy.	Mounted on the port side.
SSS	Images the seafloor surface, identifying features, sediment types, and potential obstructions or hazards.	Towed from the port side aft.
SBP	Penetrates beneath the seafloor to map subsurface geological units and detect variations in sediment layers and geological structures.	Mounted on the starboard side.
MAG	Detects magnetic fields, anomalies in which can be useful in locating ferromagnetic objects and the identification of infrastructure crossings and large metallic debris.	Stowed unless needed – can be quickly mobilized and towed from port side aft.
SVP	Measures the speed at which sound travels through water. This information is crucial for accurate underwater mapping and navigation, as it helps in correcting the paths of sonar signals.	The SVP winch is mounted on the starboard side aft.

Table 7-2 RV Woldstad equipment for Geophysical operations

For this project, various sensors were utilized for the acquisition of geophysical data. These sensors are described in **Error! Reference source not found..**

7.5 Geophysical Calibrations

Sea trials for all geophysical systems took place from 14-16 May in Kachemak Bay. All systems were operational and within positional accuracy and data quality specifications. See Section 6.1 for more information.

7.6 Geophysical Operations

After receiving and integrating updated route information from GCI client representative Bruce Rein, survey work commenced at 22:54 (AKDT) on 23 June by transiting to the southern portion of the route corridor.

On June 24 at 09:37 hrs. (AKDT), the vessel arrived on site and began deploying geophysical sensors for a reconnaissance survey (recon line) to determine depths along the initial part of the route. At 12:03 hrs. on the same day, the RV Woldstad commenced survey acquisition on the Segment 3.4.2 centerline, continuing data collection for over two days until 11:43 hrs. on June 26. Immediately afterward, survey data acquisition began on the centerline of an alternative route, continuing until 16:37 hrs. the same day. Following the completion of this acquisition, the vessel transited to the Port of Nome for a crew change, refueling, and provisioning. During the transit, MBE data from the alternative route was processed and sent to Palmer headquarters for discussion with the GCI representative. It was subsequently decided not to use the alternative route for cable deployment.

On June 27 at 09:40 hrs., the new crew arrived, underwent vessel inductions, and completed handovers. By 19:00 hrs., the vessel departed the dock to continue the survey. The next day, on June 28 at 10:54 hrs., the vessel resumed data collection, focusing on the wing lines of block 34206 and filling in gaps. The acquisition for the entire block was completed by 22:42 hrs. of the same day. Later that night, at 23:31 hrs., survey acquisition commenced for Block 34205.

Given the shallow waters in Block 34204, the GCI representative suggested acquiring an additional reconnaissance line perpendicular to the route, extending 11.19 km. This reconnaissance allowed the Benthic and GCI team to decide on surveying 8 additional recon lines perpendicular and east of the original route to identify a better route for cable lay.

On June 1, a new centerline for Block 34204 was chosen, and data acquisition began the next day. Unfortunately, unfavorable weather conditions hindered data collection, leading to the decision to recover the equipment and navigate south of the segment to seek calmer waters and continue data acquisition for Block 34201.

During June 3 and 4, unfavorable weather conditions persisted, preventing consistent data collection as the data quality could have been compromised. It was decided to halt continuous data acquisition and take advantage of small windows of favorable weather. On June 5, the weather improved significantly, allowing for continuous work. This marked the completion of the acquisition for Block 34201, including infill lines, and the beginning of data acquisition for Block 34202.

Geophysical data collection continued generally uninterrupted until 22 July, when the final infills for Block 34205 and lines for the BU 3 site were collected and transit to Nome began. During the 24-hour transit to Nome, geophysical equipment was demobilized and packaged for offloading and shipment. A significant portion of the crew was exchanged in Nome between July 25 and 27, followed by a transition to the geotechnical phase of the survey. See Section 9.3 for a summary of geotechnical operations.

7.7 Geophysical Challenges

One of the biggest challenges for Segment 3.4.2 was the unreliable charted water depths, which caused route changes during the survey, as in Block 34204, which had to be completely altered to seek deeper water. Line plans for the geophysical acquisition were initially based on water depths from NOAA charts. Unfortunately, these depths proved unreliable for the area. To resolve this, the team decided to run the centerline of the remainder of the route and base line spacing on observed depths.

It is important to mention that a large portion of the route presented shallow depths. Therefore, the team consulted with the GCI representative about expectations regarding SSS data. The representative recommended that for depths less than 20 meters, acquiring SSS data was unnecessary unless BS data was insufficient or of low quality for the project's objectives. Thanks to this recommendation, the best logistical decision was made to ensure data quality and acquisition timelines were not impacted. The goal was to acquire as much SSS data as possible due to its high reliability in detecting bedforms and boulders on the seafloor.

As anticipated, weather sometimes impacted data collection. With the MBE and USBL heads collocated and mounted well beneath the water line, both were relatively weather tolerant. However, during extreme weather conditions between July 3-4 and 15-16, the data quality was compromised due to blowouts where the seabed is temporarily obscured by air bubbles beneath the sonar head. This led to a pause in data acquisition until the weather improved. This significant weather event degraded the data quality across all sensors, ultimately initiating a weather standby due to poor MBE data quality. Meanwhile, SSS data, although relatively weather tolerant, was susceptible to heavy cable snatch when the RV Woldstad was bucking into the weather, resulting in heavy striping of the final imagery. The SBP was the most susceptible to weather, especially when significant sea state roll caused a plunging cavitation action that wiped out traces. During the geophysical phase of the project, weather standby was called on 3 separate occasions, totaling 70 hours and 40 minutes (10% of the total time offshore).

8 GEOPHYSICAL DATA PROCESSING

The processing of geophysical data for this project followed a consistent methodology across all segments and portions. While there were minor variations to address specific needs of different data types and conditions, the overall approach remained uniform.

Initial processing of all data was conducted shipboard to ensure coverage and quality. This was followed by detailed post-processing at Benthic's Headquarters in Palmer, AK, where the data underwent further refinement to produce the final deliverables.

The following table presents the personnel involved in the data acquisition and processing activities offshore:

Role	Name
Principal and Technical Lead	David Oliver
Party Chief	Brent Johnston / Barry Banks
Geoscientist interpreter	Jane Hawken / Eric Lavering
Geophysical interpreter and Reporter	Aidee Arvizu-Schlemper
SBP Processor	Erick Kusnir
MBE Processor.	Eli Deshaies
MBE Processor.	Gabby Bejarano / Agno Rubim De Assis
SSS Processor	Tara Levy
SSS Processor	Makenna Andersen / Ronald Lipscomb
Navigator	Bill Langolf / David Lewis
Navigator	Kitrina Godding
SSS Tech.	Byron Thompson
SSS Tech.	Eduardo Niño

Table 8-1 Geophysical shipboard operations/processing personnel

The following table presents the personnel involved in the onshore post-processing, data integration, and creation of final deliverables:

Role	Name
Principal and Technical Lead	David Oliver
Geoscientist interpreter	Eric Lavering
Geophysical interpreter and Reporter	Aidee Arvizu-Schlemper
SBP Processor	Erick Kusnir
MBE Processor	Eli Deshaies
MBE Processor	Agno Rubim De Assis
SSS Processor	Makenna Andersen

Table 8-2 Onshore geophysical processing personnel

The following sections provide detailed descriptions of the various geophysical data processing and analysis steps undertaken:

8.1 Sound Velocity Profiles (SVP)

For the Nearshore operations, Benthic brought on board five probes (one in use and four spares) to perform sound velocity profiles. The probe was deployed using a Revelare winch mounted on the stern starboard side. The length of cable used for casting depended primarily on the water depth, vessel speed, and environmental conditions.

Sound speed varies with temperature, salinity, and depth; ocean temperature and salinity vary with season and location. The navigation crew, in consultation with onboard multibeam processors, ensured that sufficient casts were taken during data acquisition. During the Airraq 3 project, an SVP cast was acquired at least every hour during the survey, totaling 555 SVP casts for the entire route.

For each SVP cast, the navigator processed the raw profiles using HydrOffice Sound Speed Manager V2024.0.3. These profiles were imported and reviewed to ensure correct geolocation and timestamps. Erroneous points were manually removed from the profiles as needed. Sound velocity profiles were exported in CARIS.SVP format for subsequent multibeam processing and were also manually input into Norbit.

8.2 Multibeam Echo Sounding (MBE) Processing

Multibeam bathymetry was processed using QPS Qimera V2.6.2. Raw S7K files were imported and corrected with sound velocity profiles and processed SBET navigation files. Soundings were vertically shifted from ITRF2020 ellipsoid heights to a Mean Lower Low Water (MLLW) datum using a separation model specifically created for the survey area. The workflow diagram for MBE processing is shown in Figure 8-2.

Corrected soundings were reviewed, with erroneous soundings being rejected. TU Delft sound velocity corrections were applied to the data as needed. Soundings across the entire survey area were gridded at a 1 m resolution using the average CUBE method in Qimera.

During post-process Qimera's advanced cleaning tools were utilized to remove noise and erroneous soundings that created artefacts, with both automated and manual cleaning techniques employed to enhance data quality (Figure 8-1). 1 m resolution GeoTIFF and XYZ files were then exported from the final surface.

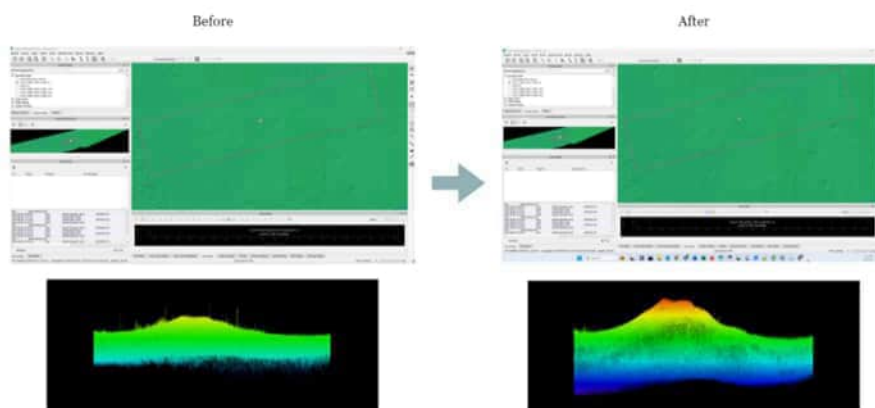


Figure 8-1 Removal of noise and erroneous soundings

The MBE slope grid was calculated in Global Mapper by down sampling the grid to a 2 m resolution and exporting it in FLT format in units of degrees. The FLT grid was then reimported into Global Mapper and exported as a GMG file. All MBE products were utilized by the interpretation team for reporting seabed conditions relevant to the marine route survey.

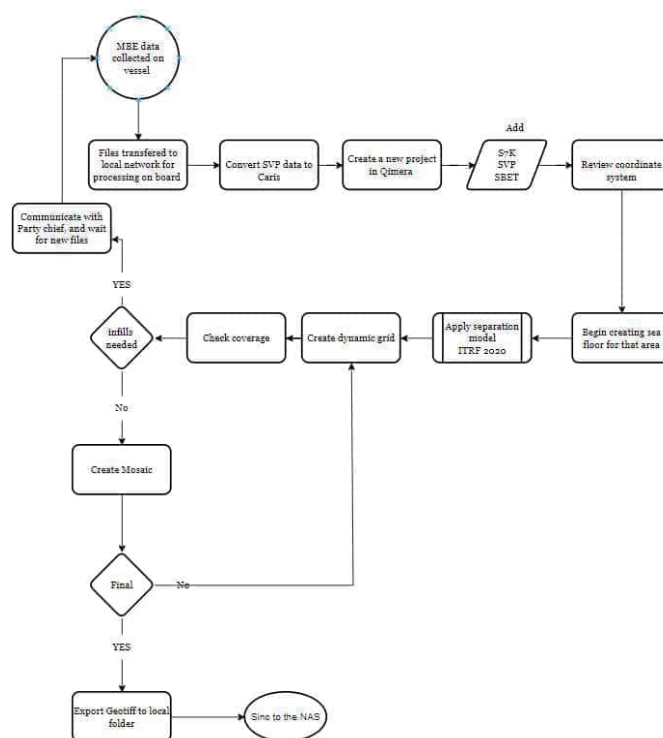


Figure 8-2 MBE basic workflow

8.3 Backscatter

Multibeam backscatter was processed using QPS Fledermaus Geocoder Toolbox (FMGT) V 7.10.3. The backscatter snippets data were exported from the S7k files into GSF format. The XYZ bathymetry data were used as a reference grid to correct angle dependency.

Geometric and radiometric corrections were performed in FMGT to ensure accurate backscatter representation. One of the most challenging aspects was determining an optimal grayscale for the visualization of anomalies, which required careful adjustment and iteration. Finally, backscatter geotiff mosaics were exported at a 0.50 m resolution, providing detailed and accurate imagery of the seabed.

8.4 Side Scan Sonar

Side scan Sonar files were recorded as Edgetech JSF files, processing and interpretation was conducted within Chesapeake SonarWiz software. Prior to importing raw SSS JSF files the water sound velocity at towing depth was confirmed and updated within the SonarWiz import settings. They were imported into SonarWiz and converted for the internal project into CSF files. The workflow diagram for SSS processing is shown in Figure 8-3.

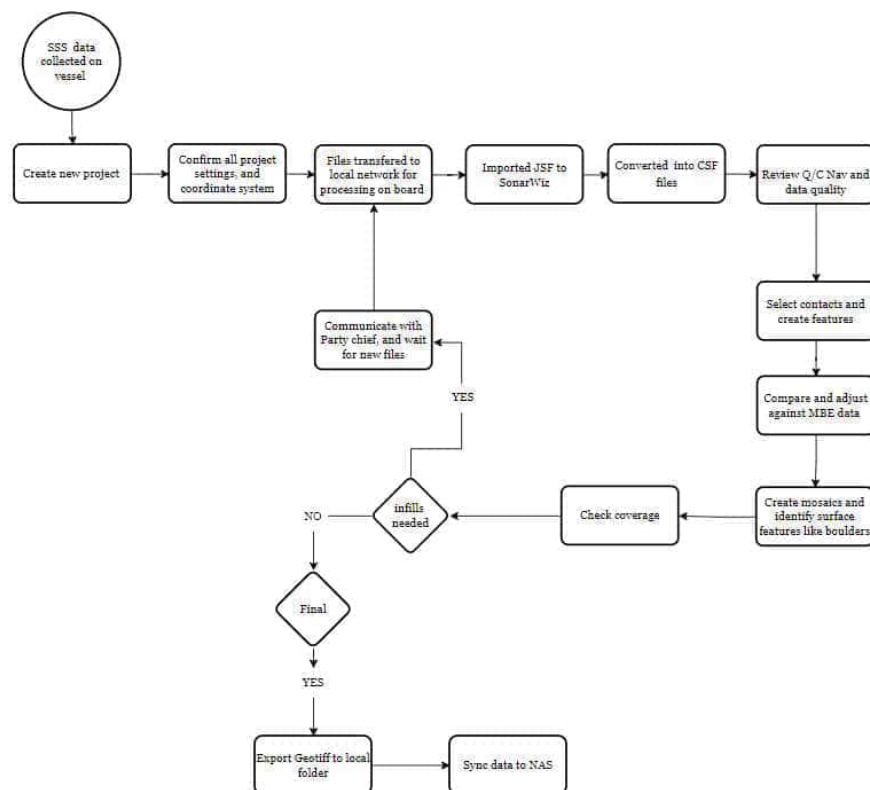


Figure 8-3 SSS basic workflow

The low frequency channel (540 kHz) was processed and used to create the mosaics and pick contacts. Additionally, the imported resolution was set at maximum (8192 samples per channel; Figure 8-4).

Lines were imported into SonarWiz as they were acquired. Once imported, the files were bottom tracked (first automatically by the threshold method and then fixed manually where needed) and navigation was smoothed or slightly corrected. Navigation was set to Course Made Good with 100 samples of smoothing as a basis for all lines. Additional smoothing was performed on a line-by-line basis in Z-edit, where navigation required it. For much of the project, the USBL system was operational and had generally good positioning with only minor dropouts. Sonar files were positioned using layback in isolated cases where USBL dropouts caused distorted imagery

An Empirical Gain Normalization (EGN) table was created at the beginning of the project was used throughout acquisition to balance gain values and create visually appealing imagery. A final EGN table was created in post-processing to capture the entirety of the intensity values and create the desired smoothed color surface.

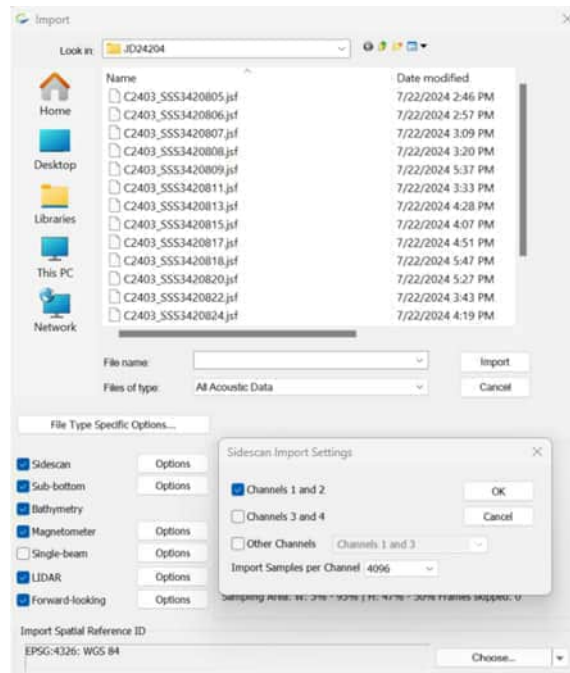


Figure 8-4 Resolution Import settings for SSS

Combined imagery mosaics were routinely provided to the onboard interpreter. Every file was compared with the multibeam bathymetry surface to identify surface features (i.e., boulders, sand waves, seabed scars, outcrops, shadows, and compositional drastic changes). The SSS data lines were adjusted as needed to precisely align with the MBE data (Figure 8-5).

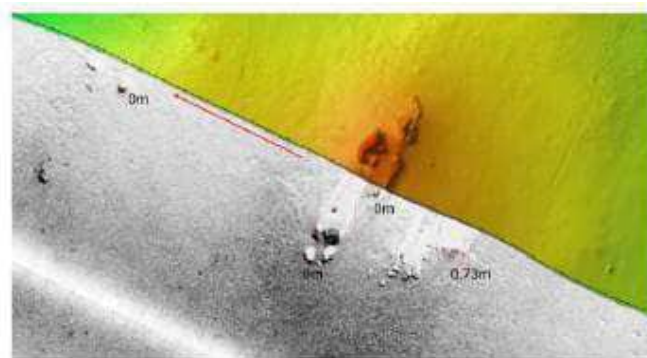


Figure 8-5 SSS vs MBE data

Once data was positionally correct and with the proper amplitude intensity, mosaics were created for each segment of the route, and for the project as a whole. Mosaic resolution was set to 0.25m per pixel onboard (final processing in the office was 0.15 m per pixel). Final tiles after post-processing were set to be 2km long by 2km wide and the resulting Geotiff was set to 32-bit.

8.5 Sub-Bottom Profiler

Seismic lines acquired by the Innomar were recorded in 24-bit digital resolution, SES3 format, and then converted to the seismic standard format of SEG Y using Innomar's conversion software SESConvert. The coordinates sent from QINSy to the Innomar recording software were in WGS84 Latitude and Longitude. Coordinate transformation to the project CRS, in this case WGS84 UTM Zone 4N and 5N, occurred upon import to Innomar SESConvert.

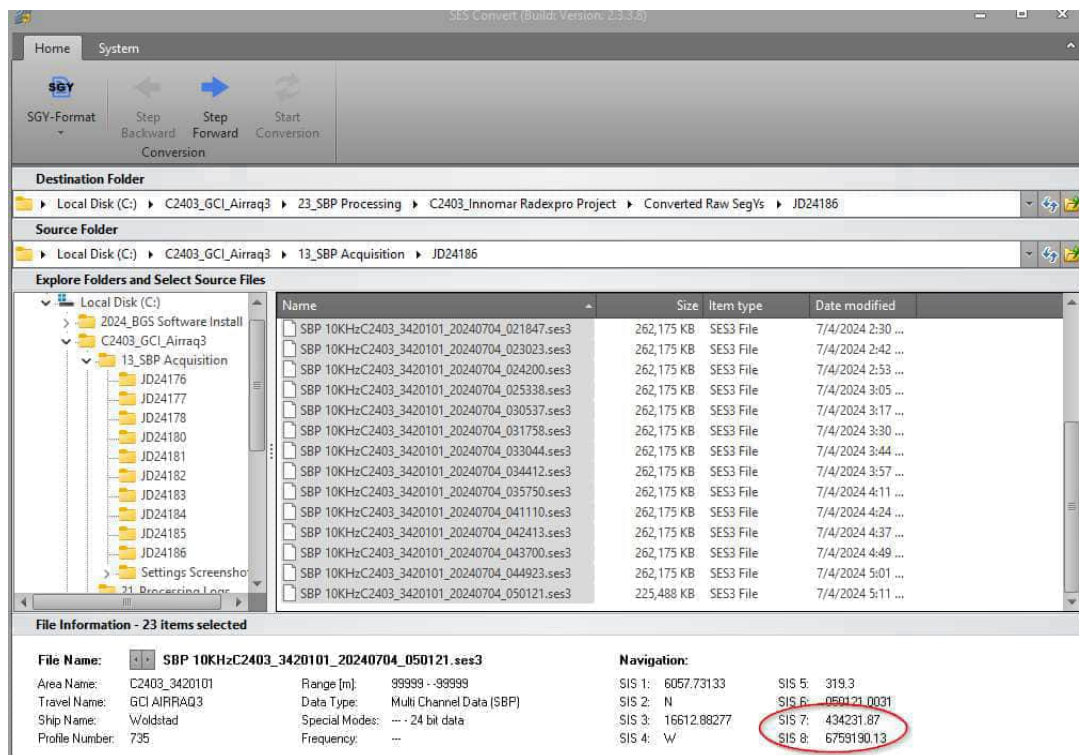


Figure 8-6 Innomar SESConvert software, showing X and Y coordinates in meters

Total RadExPro processing steps are shown in the following figure.

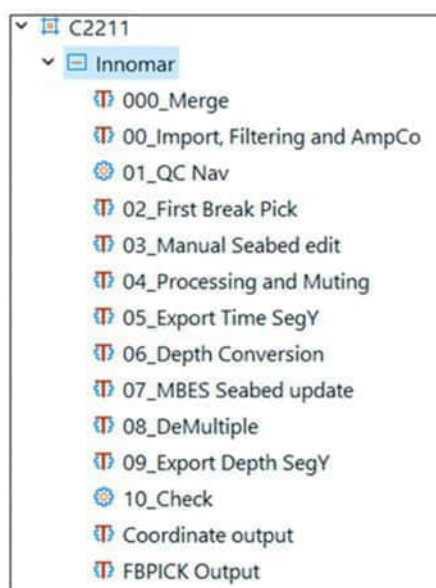


Figure 8-7 SBP processing steps using RadExPro

RadExPro has a series of modules/menus with parameters carefully filled with logical starting values and tested during calibration. Once data was collected in survey conditions, the data was further optimized and finally set for the whole project. The following figure provides an example of the modules within a typical RadExPro processing flow.

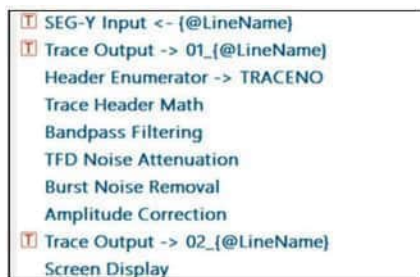


Figure 8-8 RadExPro modules

Navigation was then checked in RadExPro as shown below, plotting the coordinates as a crossplot:

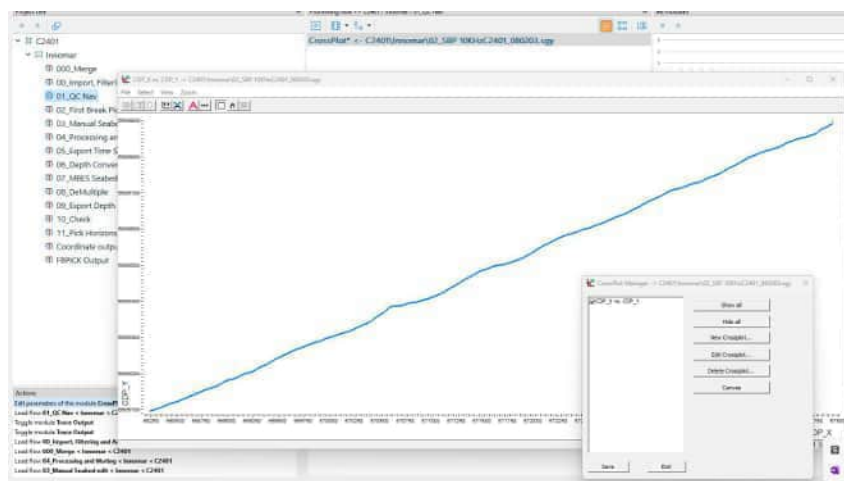


Figure 8-9 Example of RadExPro navigation plot

Generating the seafloor in RadExPro utilizes the first break peak wave. Using parameters optimized for this project, first an auto-picking method was used, then manually edited. This picked seabed is necessary for the later steps.

The SBP data was de-ghosted, compressing multiple arrivals of the same layers, especially layers that have strong seismic impedance contrast (e.g. water and seabed interface).

In shallow water, the removal of the seabed multiple was necessary for reducing interference with interpretation. In deeper water, the seabed multiple was deeper than the interpretation required, and removing the multiple was not necessary.

The SBP data was then shifted vertically using the multibeam surface (i.e., MLLW), which eliminates any residual motion from the sea state during acquisition. While motion artifacts are corrected within both the Innomar software and from POSMV directly, some residual motion may remain during times of increased sea state. Thus, matching the seismic seafloor with the multibeam surface eliminated any motion artifacts. This was performed using a 2-velocity model for the water and substrate, using 1500 m/s and 1640 m/s, respectively. Finally, the SBP data was shifted to the final MBE surface on a trace-by-trace basis (Figure 8-10). This was necessary for the interpretation team to integrate the geophysical and geotechnical datasets.

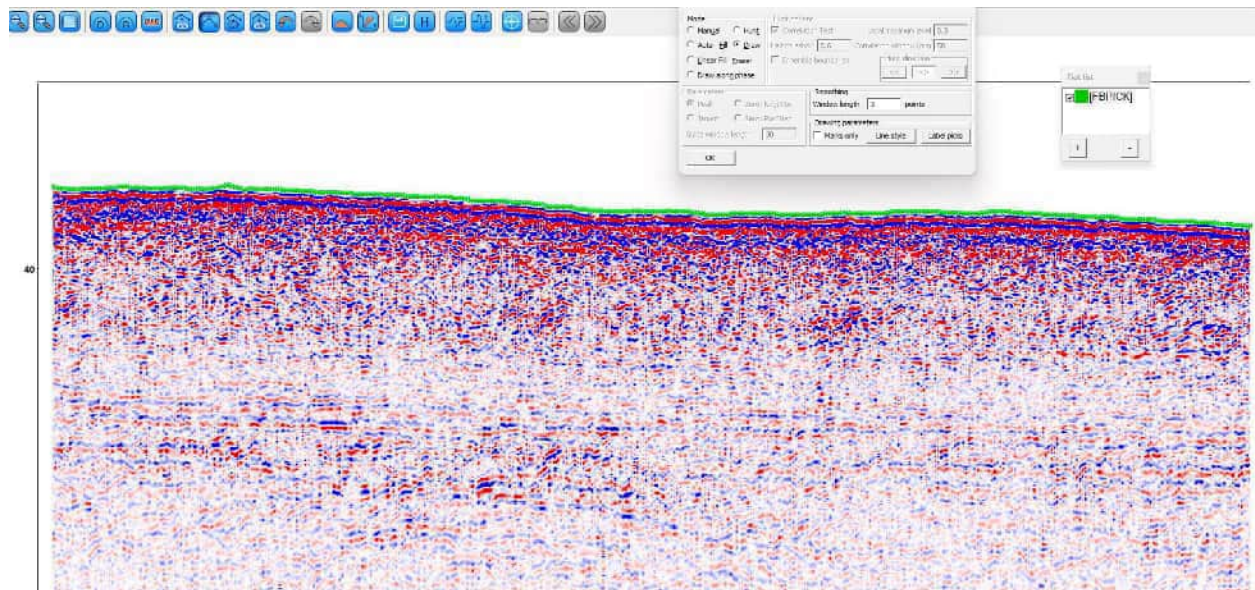


Figure 8-10 Example of depth converted SBP data

8.6 Sub-Bottom Profiler Interpretation

The SBP time data was first imported into the Kingdom software. At the beginning of the survey, a few filters were tested, but they did not increase the resolution of the data. Therefore, dynamic amplitude gains (overall gain) were applied where necessary to enhance reflectors. The dynamic amplitude was not applied to all files globally but rather adjusted on a file-by-file basis for interpretation purposes only. The seismic envelope was also calculated for each line to aid in visualizing subsurface reflectors. During periods when the motion of the vessel was evident due to weather conditions, the data was temporarily flattened to the seabed to aid in the digitizing of reflectors. All reflectors along the centerline of the surveyed route were digitized.

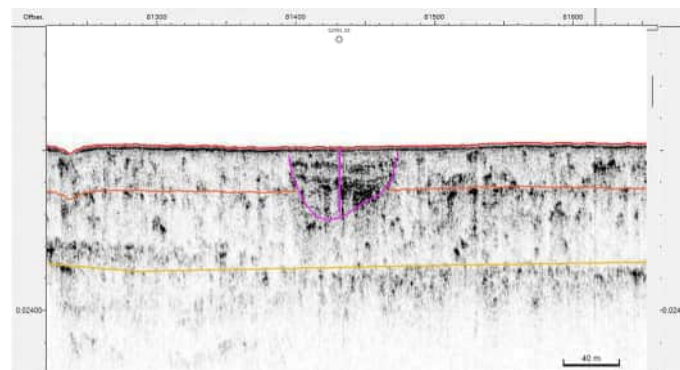


Figure 8-11 Example SBP data visualized as seismic envelope in Kingdom Software

After generating MBE products with MLLW corrections, seismograms in the depth domain were generated and imported into Kingdom. The distance from the seabed to the digitized reflectors was calculated using a sound velocity of 1640 m/s.

The subsurface interpretation generated onboard was correlated with MBE and SSS mosaics. The onboard interpretation was further refined by integrating the results of the geotechnical samples after that campaign concluded in late August.

8.7 Shipboard Analysis and Integration of Survey Products

In-field processing was performed sufficiently to assess coverage, data quality, and evaluate geohazards and inclement conditions necessitating route development. This approach ensured continuous assessment and allowed for immediate adjustments as needed.

The initial analysis of surficial geology and bedforms was conducted using the Side Scan Sonar (SSS) and backscatter (BS) imagery in Global Mapper software. BS and SSS mosaics were exported as GeoTIFF files and imported into Global Mapper for digitization and feature extraction. These mosaics were then correlated with Sub-Bottom Profiler (SBP) data to map linear and polygonal surface features.

To achieve an integrated interpretation, the bedforms and surficial geology interpreted from the SSS data were cross-referenced with Multibeam Echo Sounder (MBE) grid data. This comprehensive analysis ensured that all available data were considered for a cohesive interpretation of the survey area.

The interpretation of SSS contacts was performed using SonarWiz software. In digitizing mode, SSS data was examined, and contacts were selected based on predefined criteria. These interpreted contacts were then integrated into the Global Mapper project.

Sediment thickness data was also incorporated into the Global Mapper project. This data was derived from horizons identified using Kingdom software from the SBP data, providing an additional layer of detail for sediment characterization.

After the geotechnical survey, the classifications of surficial geology and seabed sediments were reconciled with the geotechnical results to validate and refine the sediment classifications. This reconciliation process was conducted onshore at the Palmer office during the post-processing phase, ensuring accurate and detailed sediment classification.

9 GEOTECHNICAL OPERATIONS

This section provides an overview of the geotechnical operations and personnel involved during the survey and post-processing phases.

A total of 60 sites were collected during the geotechnical survey campaign. Field MBE, SSS, and SBP datasets were used to determine the best possible geotechnical locations based on seabed and subsurface conditions. Some locations deviated both perpendicularly and parallel within survey corridor due to a need to understand the soil properties of certain features.

Infield processing was performed sufficiently to assess data quality and determine soil properties. Further post-processing will be performed onshore at Benthic's Processing Center in Palmer, AK.

The following table presents the personnel involved in the data acquisition and processing activities offshore:

Role	Name
Principal and Technical Lead	David Oliver
Party Chief	Brent Johnston
Geologic Interpreter	Dimitri Tzekakis
Geologic Interpreter	Nick Hatsios
Sr CPT	Trevor Hoskins
Jr CPT	Damion Montisino
CPT Processor	Erick Kusnir
Sr Piston Corer	Ryan Kennedy
JR Piston Corer	Gregorio Cruz
Back Deck Support	Grace Smythe
Back Deck Support	James Thomas
Back Deck Support	Josh Moraches

Back Deck Support	John Parks
Back Deck Support	Emerson Kropp
Geologic Interpreter	Aidee Arvisu-Schlemper
Back Deck Support	Colby Gottschalk

Table 9-1 Geotechnical shipboard operations/processing personnel

After the geotechnical survey, the classifications of surficial geology and seabed sediments derived from geophysical datasets were reconciled with the geotechnical results to validate and refine the sediment classifications. This reconciliation process was conducted onshore at the Palmer office during the post-processing phase, ensuring accurate and detailed sediment classification.

The following table presents the personnel involved in the onshore post-processing, data integration, and creation of final deliverables:

Role	Name
Principal and Technical Lead	David Oliver
Interpreter and Reporter	Aidee Arvizu-Schlemper
Processor	Erick Kusnir

Table 9-2 Onshore geophysical processing personnel

9.1 Mobilization Summary

Mobilization of a significant portion of the geotechnical equipment took place during the initial mobilization in Homer, AK. The Mooring Systems Inc. PC-300 Piston Core (PC) and supporting accessories including three-meter barrels and core liners were delivered to Nome on 24 July (Figure 9-1).



Figure 9-1 Mooring Systems Inc. PC-300 Piston Corer on SVA's custom piston core launch and recovery system

The Datem Neptune 3000 Cone Penetrometer Test (CPT) and winch was delivered to the Woldstad on 27 July and tested during the 3 following days (Figure 9-2).



Figure 9-2 Datem Neptune 3000 Cone Penetrometer Test (CPT) system

9.2 Geotechnical Sea Trial

Sea trials for the CPT and piston coring equipment took place on 30 June at a location just south of Nome, AK. All systems were shown to be operational. See section 6.1 for more information.

9.3 Geotechnical Operations

The Woldstad began transit to the project site at 18:35 hrs. on the 31 July, arriving 21 hours later. Upon arrival, production was briefly delayed due to adverse weather

conditions. The following day, coring, seafloor sampling, and CPT operations were conducted for over 15 hours, but were eventually suspended due to building weather, which made it difficult for the vessel to maintain station. Operations resumed on 5 August at 09:01 hrs, and all 60 sites were completed by 16:32 hrs. on 7 August. The vessel then commenced transit to another project.

During acquisition, several days had weather conditions that were unfavorable for survey operations, accounting for 26% weather down time. The Daily Progress Report (DPR) provides detailed information on weather and sea state conditions for the whole project (see Appendix A and Appendix B).

9.4 Geotechnical Challenges

One of the biggest challenges was operation in shallow water depths. This increased difficulty for vessel operators to hold station as acceptable horizontal movement of the vessel is reduced for safe CPT operations.

High currents especially combined with wind and elevated sea states proved to be the most significant challenge faced by the geotechnical crew. At times wind speed was above 20.0 kts, and currents greater than 2.0 kts on the sea surface made vessel positioning and station keeping very difficult and time consuming. On some sites positioning of the vessel took over an hour.

One final note is that the penetration value recorded for piston cores was often inaccurate. Penetration was measured by a garter that was placed on the outside of the core barrel and was supposed to slide up the barrel as the corer penetrated the seabed. This garter was too tight and did not slide freely on the barrel, leading to perceived penetration values that were often smaller than the recovered sample.

10 GEOTECHNICAL DATA PROCESSING

10.1 CPT Processing

The CPT data were processed using CPeT-IT software at Benthic's office in Palmer. The raw CPT data was recorded as ASCII text files and included tip resistance (q_c - MPa), the sleeve friction (f_s - kPa), pore pressure (u_2 - kPa), and inclination (degrees). Additionally, the header in the text file included the area cone size (mm). Each CPT was imported, adding the site acquisition date and UTM coordinates.

The tip resistance data was de-spiked of clear outliers which were not to be included in the processing calculations. These values are called "Hand Auger" values and are set to -9999. For final CPT interpretation, these -9999 values were set to "Null" and not included in the final core logs.

CPT Data QA/QC was performed by checking the cross correlation between the tip resistance and sleeve friction for each CPT. This correlation should be zero.

When they were not, the f_s column was shifted by applying a filter that calculates the samples needed to be shifted. An image of the cross-correlation plot, the curves, and the data columns is shown in **Error! Reference source not found.** Additionally, the inclination value was loaded in the software and used to correct for depth for each CPT. Pore pressure was loaded as u_2 , thus it was unnecessary to convert from u_1 . No other filters were applied.

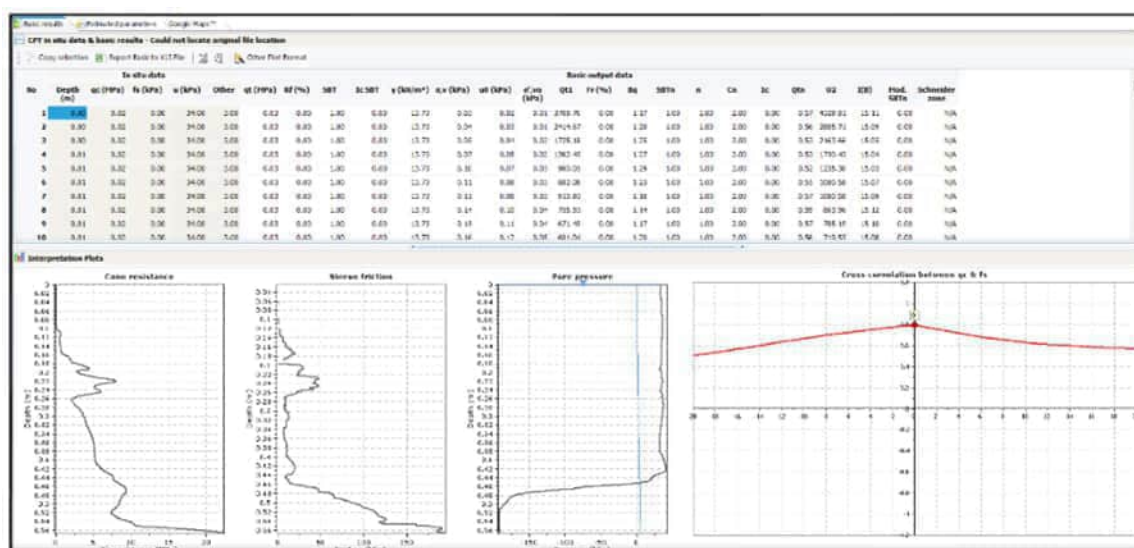


Figure 10-1 Example cross correlation plot between q_c and f_s

Many of the parameters were left as default in the CPeT-IT software. A few were changed and described below.

The probe radius was updated after review of the CPT headers. The cone area ratio was left at 0.8 (Robertson et.al., 2016). Figure 10-2 shows the general parameters utilized for processing. OCR (Over-consolidation ratio) and Nkt (undrained shear strength cone factor for clays) were checked to be calculated by the software and not set for a manually set value. A value of 2 was used for the Cn cutoff, a normalization factor for N-variable needed to normalize the cone resistance to the effective stress. Ns (constant used for soil sensitivity) was set to 7.1 as described in Robertson et al. (2016). Figure 10-3 shows the calculation parameters used for processing. ASCII tables with the most relevant parameters were exported for each CPT for the interpretation team, namely tip resistance (qc), sleeve friction (fs), pore pressure (u2), and relative density (Dr).

Several additional parameters were calculated and exported (Figure 10-4). “Mod. SBTN” is the 2016 (latest) Soil classification that corrects for effective stress and is modified to incorporate the possible presence of internal layering structures within each zone or lithology. “Ic” is the Index used by Robertson to create the SBTn classifications. The “Schneider zone” is an additional soil classification method. “Ksbt” is the permeability in cm/sec, “Es” the Young Modulus, and “Go” is the shear modulus.

Parameter	Value	Unit
Average interval	3	
Penetration rate	0.0200	(m/s)
Ground elevation	0.00	(m)
Probe radius	0.0309	(m)
GWT	0.00	(m)
Cone area ratio	0.80	

☐ Non-hydrostatic piezom. profile

☐ Auto transition layer detection

☐ Cone resistance is corrected

Figure 10-2 General parameters used for CPT processing

Figure 10-3 shows the 'Calculation Properties' tab in a software interface. The tab is active, displaying various parameters for calculation. The parameters are organized into sections: General Properties, Calculation Properties, and Miscellaneous Properties. The Calculation Properties section includes fields for Unit weight of water (9.81 kN/m³), Auto unit weight (checked, 19.00 kN/m³), Cn cutoff (checked, 2.00), Auto OCR number (checked, 0.33), Auto Nkt (checked, 14), Dr constant (350), Ns (7.10), Nu (7), ϕ'_{cv} (32.0), Q (10.0), Delta Ic (0.00), Qtn,cs (100), Show on qt plot (unchecked), Default peak ϕ (0), and Remove loose sand criteria (checked).

Figure 10-3 Calculation parameters for CPT processing

Figure 10-4 shows the 'Custom Export to XLS' dialog box. The 'Select Columns to Export' section is active. Under 'Raw Data', Depth, qc, fs, and u2 are checked. Under 'Basic Interpretation', qt, Rf, SBT, Ic SBT, Unit Weight, Total stress, Hydrostatic press., Eff. stress, Qt1, Fr, Bq, SBTn, n, Ic SBTn, Qtn, U2, I(B), Mod. SBTn, SBT Description, SBTn Description, Mod. SBTn Description, and Schneider zone are checked. Under 'Estimations', Ksbt, SPT, M, Dr, Friction Angle, Es, Go, Nkt, Su, Su ratio, OCR, Vs, Grain factor, Qtn,cs, Residual Su, S, Peak ϕ , Bulk unit weight, Water content, Void ratio, Dry unit weight, and Porosity are checked. The 'Uncheck All' and 'Check All' buttons are at the bottom right, along with 'OK' and 'Cancel' buttons.

Figure 10-4 Calculation exports from CPT processing

Two Modified SBTn were utilized during processing: Robertson 2016 and Schneider 2008. The Modified SBTn (Soil Behavior Type, normalized) is a soil classification method for CPT data, heavily relied upon in the industry which tends to agree with core samples. Cases in which is best to apply to is to clean lithology of each type, while mixtures are harder to correlate to core data. Internal structuring also creates divergence from the SBTn results to coring data. For each CPT, two additional SBTn from Robertson 1986 and

2010 were also calculated. Examples of both SBTn (Robertson 2016 and Schneider 2008) of CPT logs for this survey are shown in **Error! Reference source not found.** and **Error! Reference source not found.**

Full reports for each CPT log were generated and are included in the deliverables package.

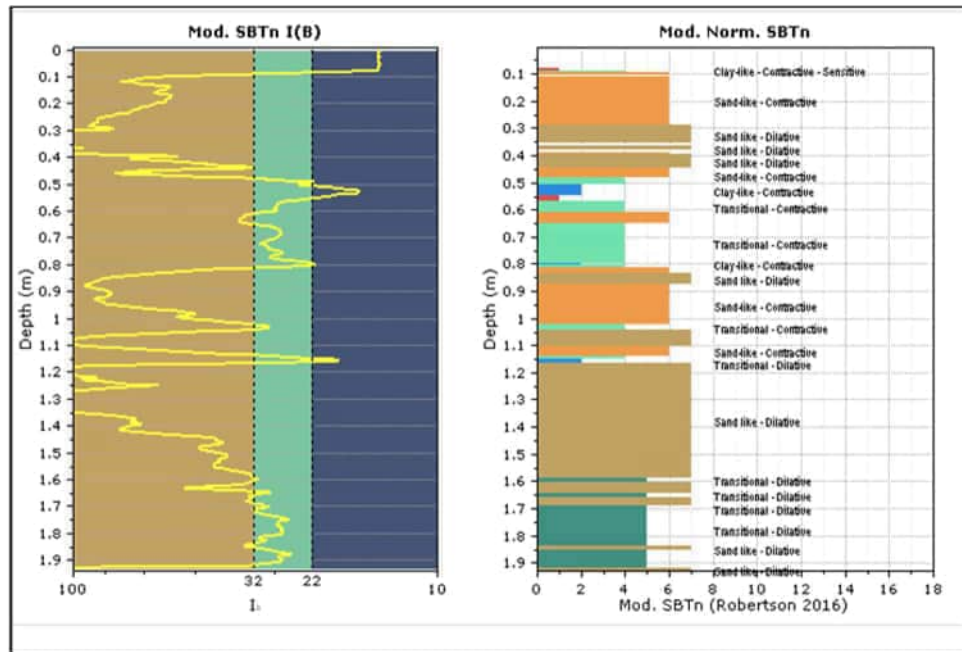


Figure 10-5 SBTn soil classification plots

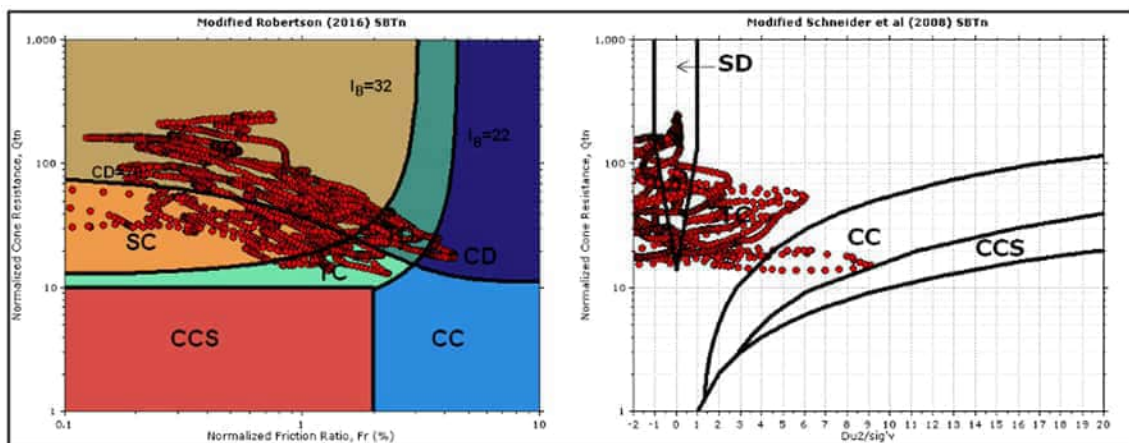


Figure 10-6 SBTn soil classification plots by Robertson 2016 (left) and Schneider 2006 (right)

10.2 Piston Core Processing

Infield piston core data processing and logging was performed sufficiently to assess sediment types and discrete geotechnical parameters per the Scope of Work established by Benthic.

Lithology was evaluated using Manual/Visual Geologic Classification methodology. Core logging was guided by the Unified Soil Classification System, Munsell Color Charts, and Torvane/Penetrometer user manuals, in addition to geologic and industry best practices.

Geologic Core Logs included:

- Length of core recovered
- Classification of major/minor soil units (and inclusion lithologies)
- Depth of each soil unit
- Palm Roll Test
- Torvane shear test
- Hand (pocket) penetrometer measurements

Each core was also photographed, segmented into approximately 0.5 m lengths of core in each photo. Core names and depth profile were annotated in each photo. Field logs were recorded on waterproof paper by the on-shift geologist upon recovery of each core and digitized in Excel at the end of each geologist's watch. Cores were not retained after logging and photographing.

Further data processing was performed onshore which included incorporation of core logs, core photos, and CPT data into Golden Software Strater for final PDFs of geotechnical sampling site reports.

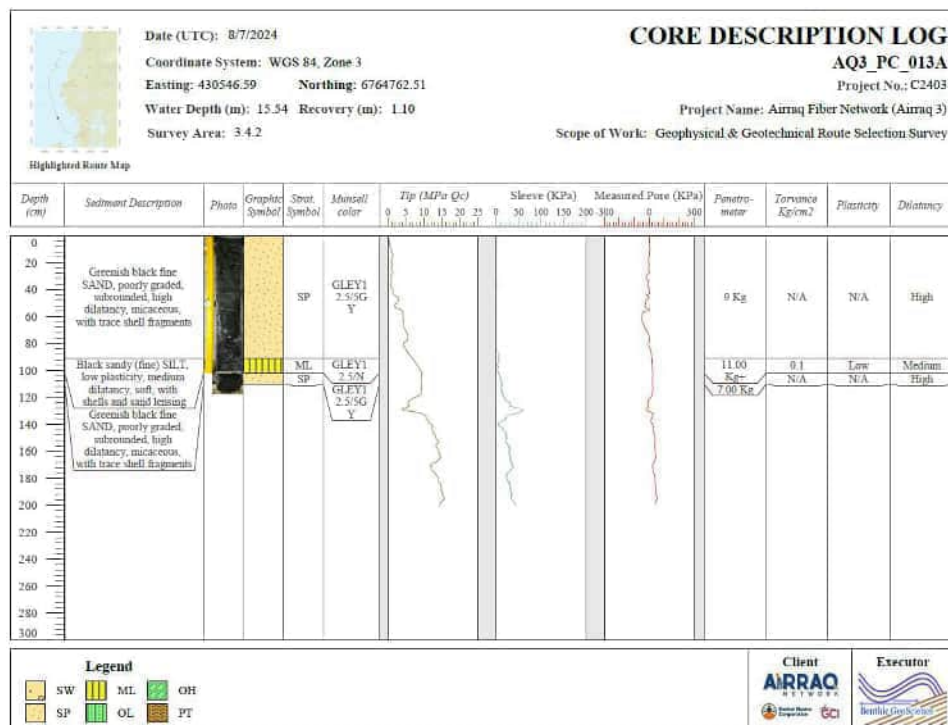


Figure 10-7 Example of Geotechnical Evaluation Record

11 INTEGRATION AND INTERPRETATION

Initial interpretation of each geophysical dataset was accomplished in near real time as part of the processing and quality control procedure. These various datasets were later compiled, integrated, and refined by the lead geologist to produce a comprehensive and holistic interpretation of the data collected. This preliminary interpretation was carried out onboard the RV Woldstad.

Following the conclusion of the geotechnical campaign, the piston core, seafloor sample, and CPT results were used to verify and improve the existing geomodel. The preliminary results were largely supported by the new information, but by integrating the geotechnical “ground truthing”, Benthic can offer the following interpretations with a high level of confidence in their accuracy.

The descriptions of the survey corridor in this section reference geotechnical sampling stations to discuss the locations of features. There are 60 geotechnical stations spaced nominally at 5 km, beginning in the south of the survey corridor and ending in the north (Figure 11-1).

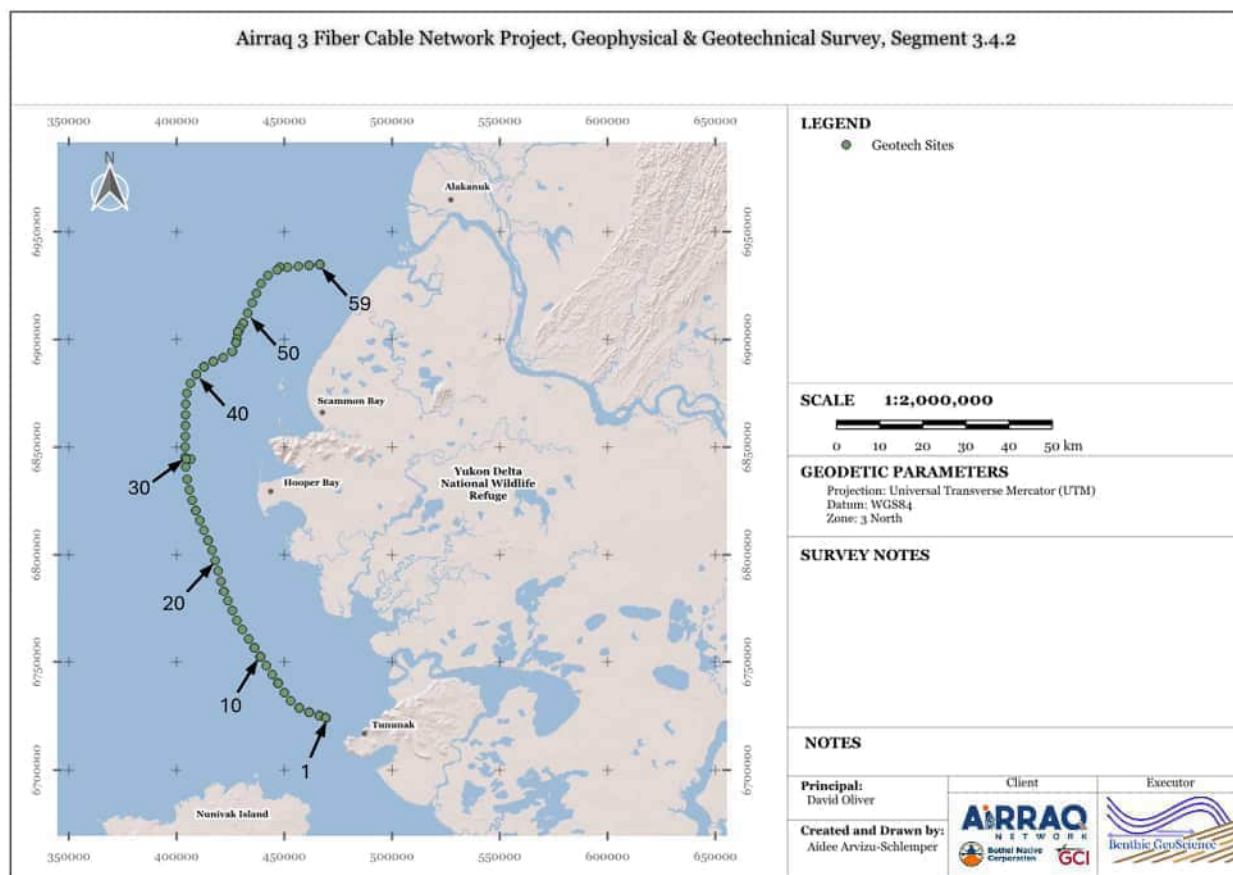


Figure 11-1 Geotechnical sites with every 10th station labeled

11.1 Geologic Background

Surficial bedrock units of the lower Yukon River basin and eastern Bering Sea shelf date back at least to Lower Cretaceous time (145 to 100.5 Ma; Hults et al., 2015). Rock outcrops are sparse and bedrock is deeply buried by late Cenozoic sediments through much of the region, making recent geologic history more pertinent to the scope of this project.

The Yukon River has the 18th largest suspended sediment load in world and has emptied into the eastern Bering Sea since at least Early Pliocene time (5.3 to 3.6 Ma; Dupré, 1980; Duk-Rodkin et al., 2001). The entire route corridor lies on the combined Yukon-Kuskokwin Delta and has accumulated sediments from those two rivers for millions of years. Numerous glaciations during the Pleistocene Epoch (2.6 to 0.01 Ma) lowered global sea levels and caused repeated subaerial exposure of the survey area. Tundra, permafrost, and fluvial deposits covered the region during lowstands, while marine deposits of terrigenous silt and sand dominated during highstands. The survey area has been inundated through much of Holocene time, and sedimentation rates for the eastern Bering Sea shelf during this period are on the order of 8-70 cm per thousand years (Knebel et al., 1974).

11.2 Bathymetry

Multibeam echosounder data revealed a maximum elevation of -6.8 m at the southern terminus of the surveyed area and a minimum elevation of -25.7 m near Station 38. Additional high points occur between Station 17 and 20 and beyond Station 57 (Figure 11-1 & Figure 11-13: Dangers to Navigation).

11.2.1 Bathymetric profiles

Bathymetric profiles along the route highlight the generally mild terrain throughout the surveyed area. Water depth varies by only around 17 m over the nearly 275 km of surveyed corridor. Extreme vertical exaggeration was required to highlight the bathymetric features seen in Figure 11-2.

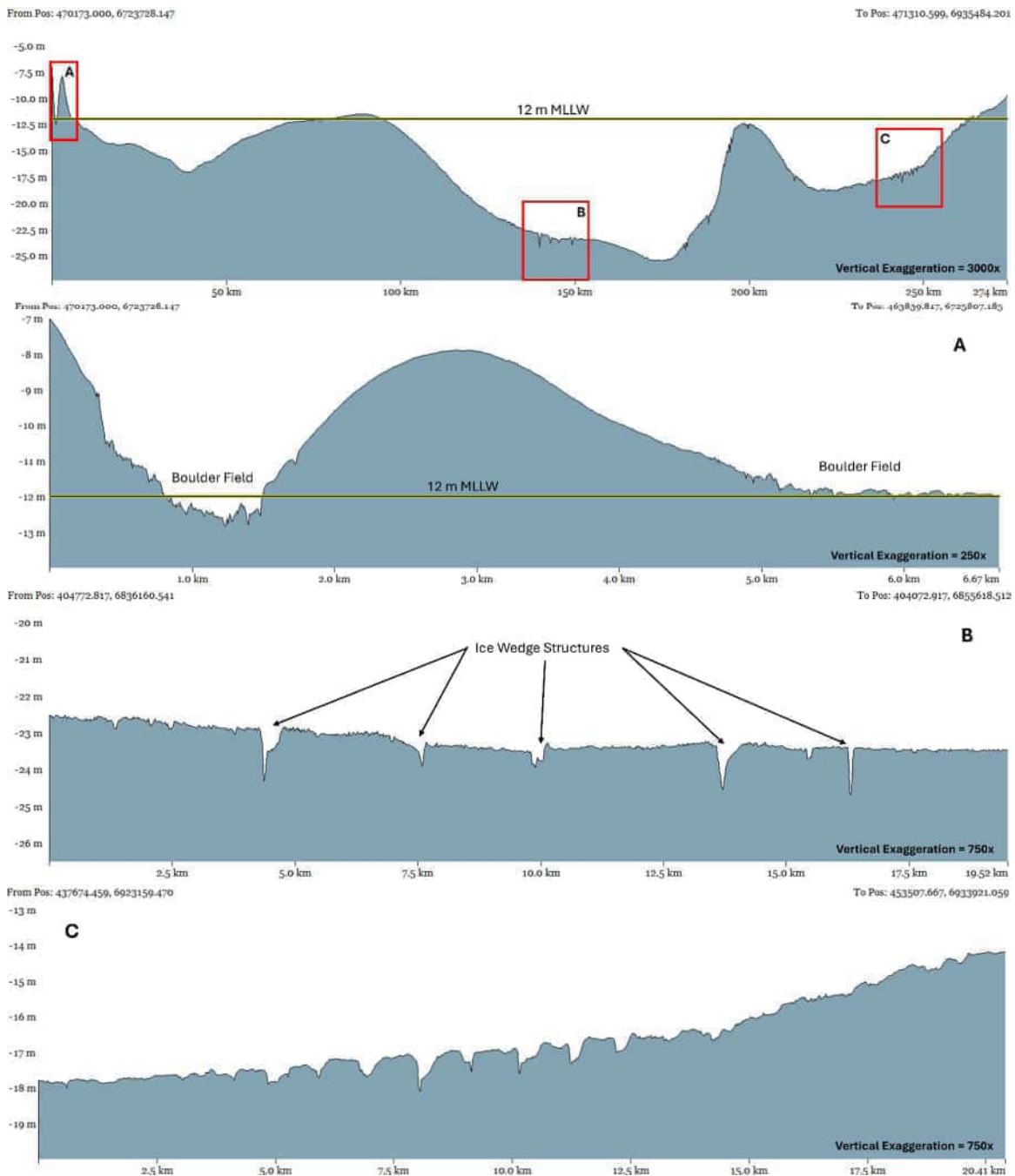


Figure 11-2 Bathymetric profiles. Top: profile of entire surveyed centerline with insets for profiles A, B, and C. 12 m isobath that is the threshold for “Dangers to Navigation” is marked (see §11.6.4). Inset A: Shoalest portion of the route at the southern terminus with 12 m isobath highlighted. Inset B: Prominent depressions where ice wedge polygons are exposed. Inset C: Linear scoured depressions near the northern end of corridor. Note the extreme vertical exaggeration in the lower right of each image that was necessary to highlight small elevation changes.

11.2.2 Slopes

Slopes along the route corridor are generally very mild. There are no regional slopes greater than 8°, and the few localized slopes exceeding 8° represent small elevation changes of around 1 m or less over a short distance. These localized abrupt steps occur intermittently throughout the survey area. In the southern portion of the route, they are found on the edges of boulder-cored scour pits several meters across. Between geotechnical stations 29 and 34, small, steep slopes are located along the edge of ice wedge polygons that are concentrated in groupings of rugose seabed several hundred meters wide (Figure 11-3, insets B and C). In the north-central and northern section of the corridor beyond Station 39, steep slopes are located along small escarpments caused by scouring (Figure 11-3, inset D). These escarpments are located between Stations 39 and 41, then again from Station 51 to 55.

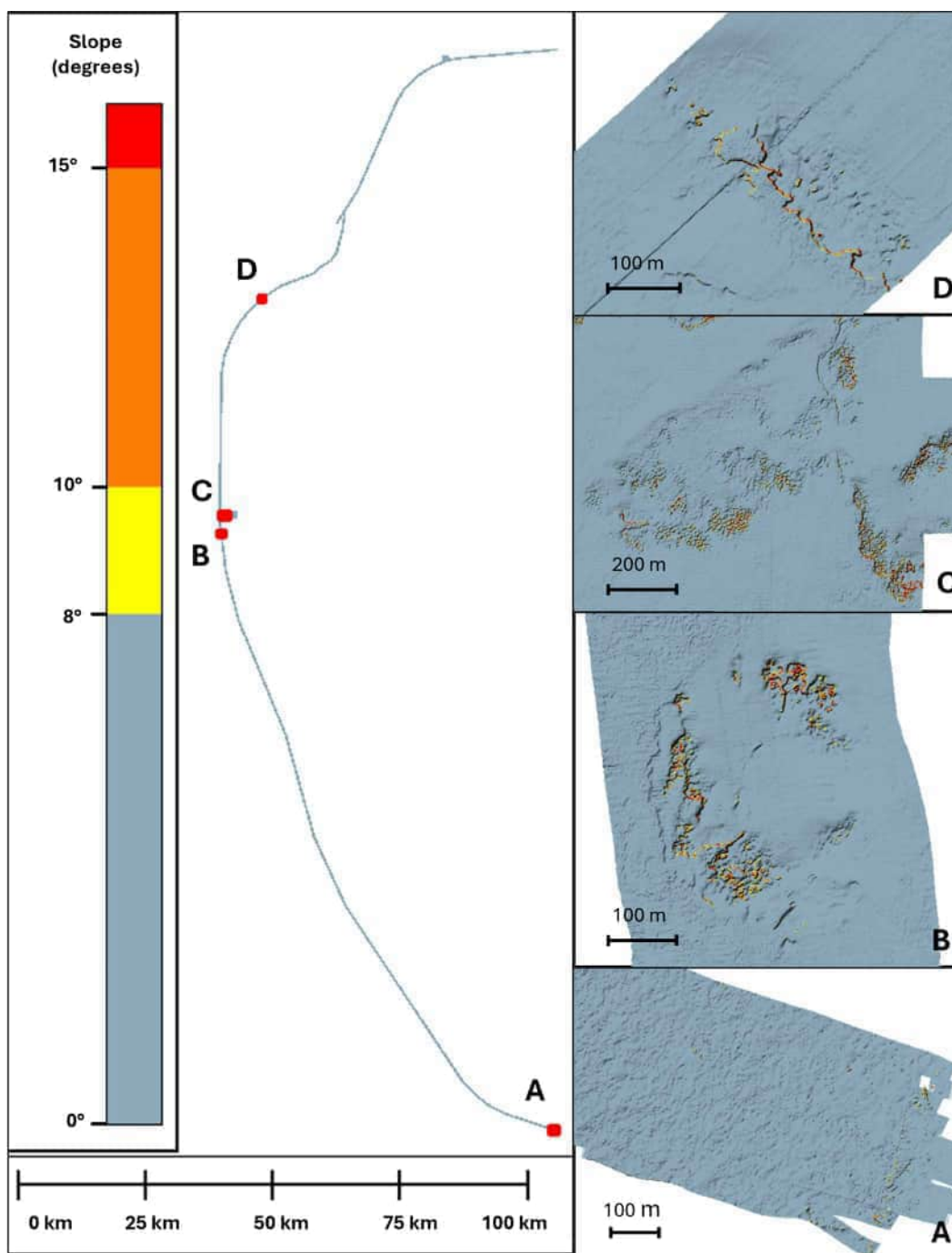
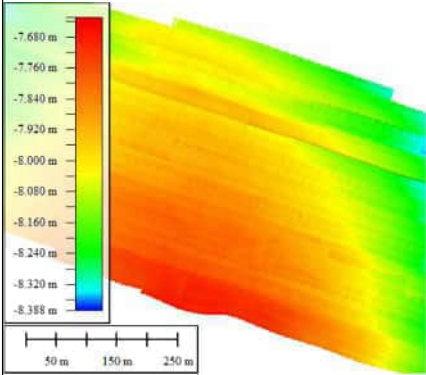
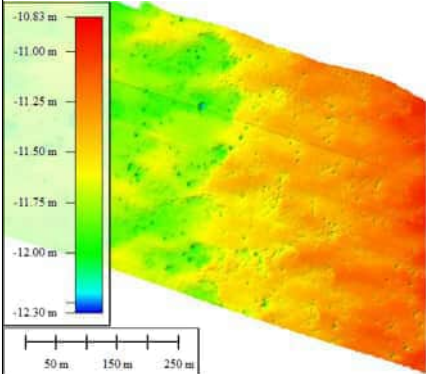
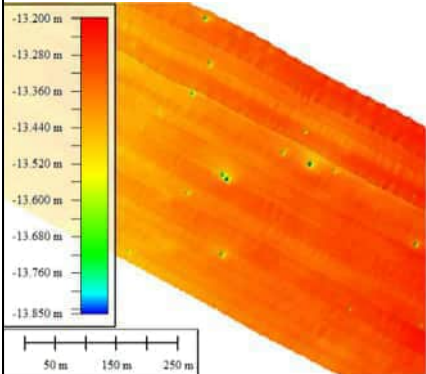
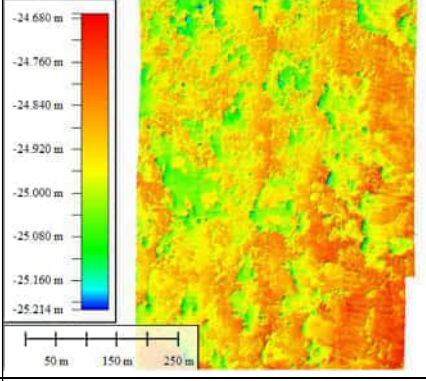
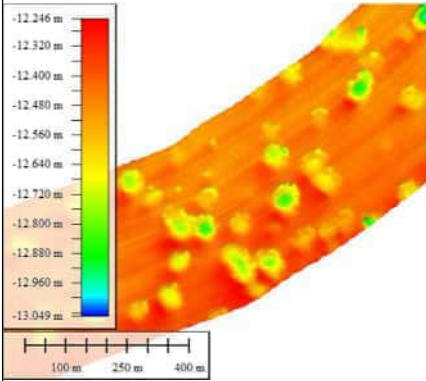
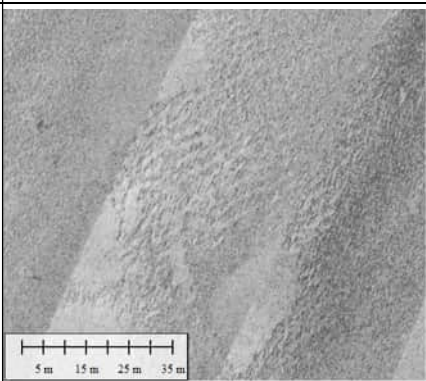
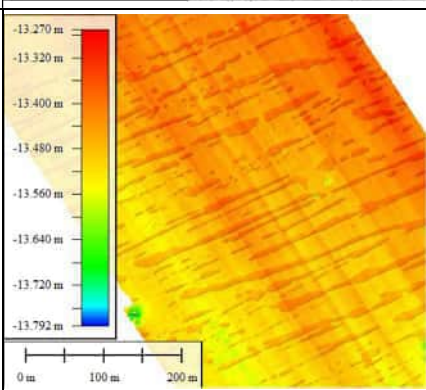


Figure 11-3 Slopes along route corridor. Inset A: slopes at southern terminus of survey area are mostly <8°. Insets B and C: examples of localized steep slopes along the edge of ice wedge polygons in the central portion of the survey area. Inset C is located at Branching Unit 1. Inset D: example of one of the small escarpments that crosses the northern portion of the survey area. Elevation change is approximately 0.8 m over 1.5 m distance.

11.3 Seabed Morphology

The seabed along the survey corridor was classified based on the morphological character as determined from multibeam bathymetry. A summary of the classes used for this report are included below in **Error! Reference source not found..**

Seabed Morphological Class	Description	Example Image
Featureless Seabed	Characterized by a relatively smooth, undisturbed seabed. Isolated boulders and low-relief mounds or depressions are possible.	 A bathymetric map showing a relatively smooth seabed. The color scale ranges from -7.680 m (red) to -8.388 m (blue). The map shows a slight gradient from left to right, with a small scale bar indicating 50 m, 150 m, and 250 m.
Boulder Field	Numerous boulders, typically with associated scour pits. This occurs near the southern end of the survey corridor.	 A bathymetric map showing a seabed with numerous boulders and associated scour pits. The color scale ranges from -10.83 m (red) to -12.30 m (blue). The map shows a more complex, textured surface with a scale bar indicating 50 m, 150 m, and 250 m.
Pitted Seabed	Areas of seabed where bottom currents have eroded pits, usually cored by a boulder or group of boulders. Density of pits is variable. This occurs near the southern portion of the corridor.	 A bathymetric map showing a seabed with numerous pits. The color scale ranges from -13.200 m (red) to -13.850 m (blue). The map shows a more complex, textured surface with a scale bar indicating 50 m, 150 m, and 250 m.

Scoured Seabed	Areas of rough, low-relief seabed that has been scoured and eroded by bottom currents and/or storm events. Scoured seabed textures are variable and extensive in the northern 2/3 of the survey corridor.	
Seabed depressions	Seabed with regular circular shallow depressions, found in a small area of the north-central portion of the corridor	
Ripples	Ripples (wavelength <5 m, height <0.1 m) are present in several isolated patches at the northern end of the corridor. They are faintly seen in SSS data but are too small to be identified in MBE data.	
Sand Ribbons	Elongate, low-relief bedforms that form parallel to prevailing current and cross parts of the southern portion of the corridor.	

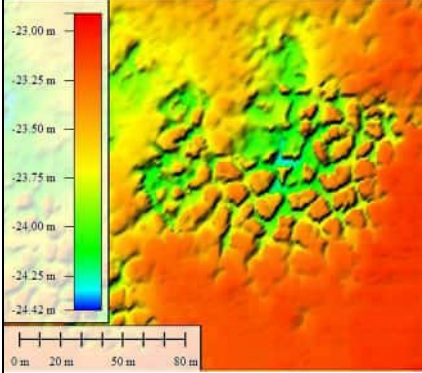
Ice Wedge Structures	Fissured seabed with a polygonal texture found in the central portion of the route corridor.	
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Table 11-1 Descriptions of seabed morphological classes

Seabed morphology at the southern end of the route corridor consists of boulder fields and alternating pitted and featureless seabed (Figure 11-4, inset A). Boulder density and associated pitting decreases to the north, and by geotechnical Station 6 the corridor has transitioned to a stretch of featureless seabed approximately 15 km long. Sections of pitted seabed resume from Station 9 through Station 14, then are absent for the remainder of the route corridor.

Sand ribbons appear beginning near Station 8 and are seen intermittently for the next 80 km until beyond Station 24 (Figure 11-4, inset B). These are characterized by long, narrow, low-relief stringers of sand, the most well-formed of which are <10 cm high, approximately 10 m across, and hundreds of meters long (Table 11-1). These bedforms are thought to be formed by tidal currents or wave action and indicate bottom currents of around 1 m/s (2 kts) oriented parallel to the long axis of the ribbon, in this case roughly E-W across the route corridor (Reynaud & Dalrymple, 2012; Stride, 2012; Hunter et al., 1981).

A low-relief, rugose seabed morphology suggestive of scouring first appears between Stations 24 and 25. This scoured seabed covers a majority of the route corridor to the north of here and is characterized by irregular depressions that are generally 5-10 cm below the surrounding seabed but up to 50 cm deep in some areas. These surface irregularities occasionally show a slight N-S orientation, indicating that they are formed by regional shore-parallel currents. The cause of scouring in areas without a preferred orientation may be either longshore currents or other means such as tides or storm wave scouring.

Ice wedge structures are intermittently observed at the seabed between Stations 29 and 34 and within the Branching Unit sites to the east of the main corridor (Figure 11-4, inset C). This morphology presents as a lattice of fissures approximately 1 meter deep, giving the seafloor a distinctive polygonal texture. This texture is typical of ice wedge polygons that form in subaerially-exposed, fine-grained permafrost soils (Morse & Burn, 2013). The sediments recovered by piston cores here were organic rich silts, suggesting that these features are analogous to the tundra permafrost ice wedge polygons seen on land in many polar locations today.

Featureless seabed alternates with scoured seabed from approximately Station 39 to Station 42. Small escarpments roughly 1 m high are part of the scoured seabed morphology on this stretch between Stations 39 and 41.

Shallow circular depressions dot an otherwise featureless seabed starting at 419908 E, 6890554 N (See Table 11-1 & Figure 11-4, inset D). The largest depressions are <0.5 m deep and approximately 50 m across. The genesis of the depressions is unknown, though fluid expulsion (i.e. pockmarks) is unlikely as SBP records show little evidence of gas in this area. Seabed depressions are seen discontinuously until 427185 E, 6896824 N, where 1 km of featureless seabed is followed by 26 km of scoured seabed until Station 52.

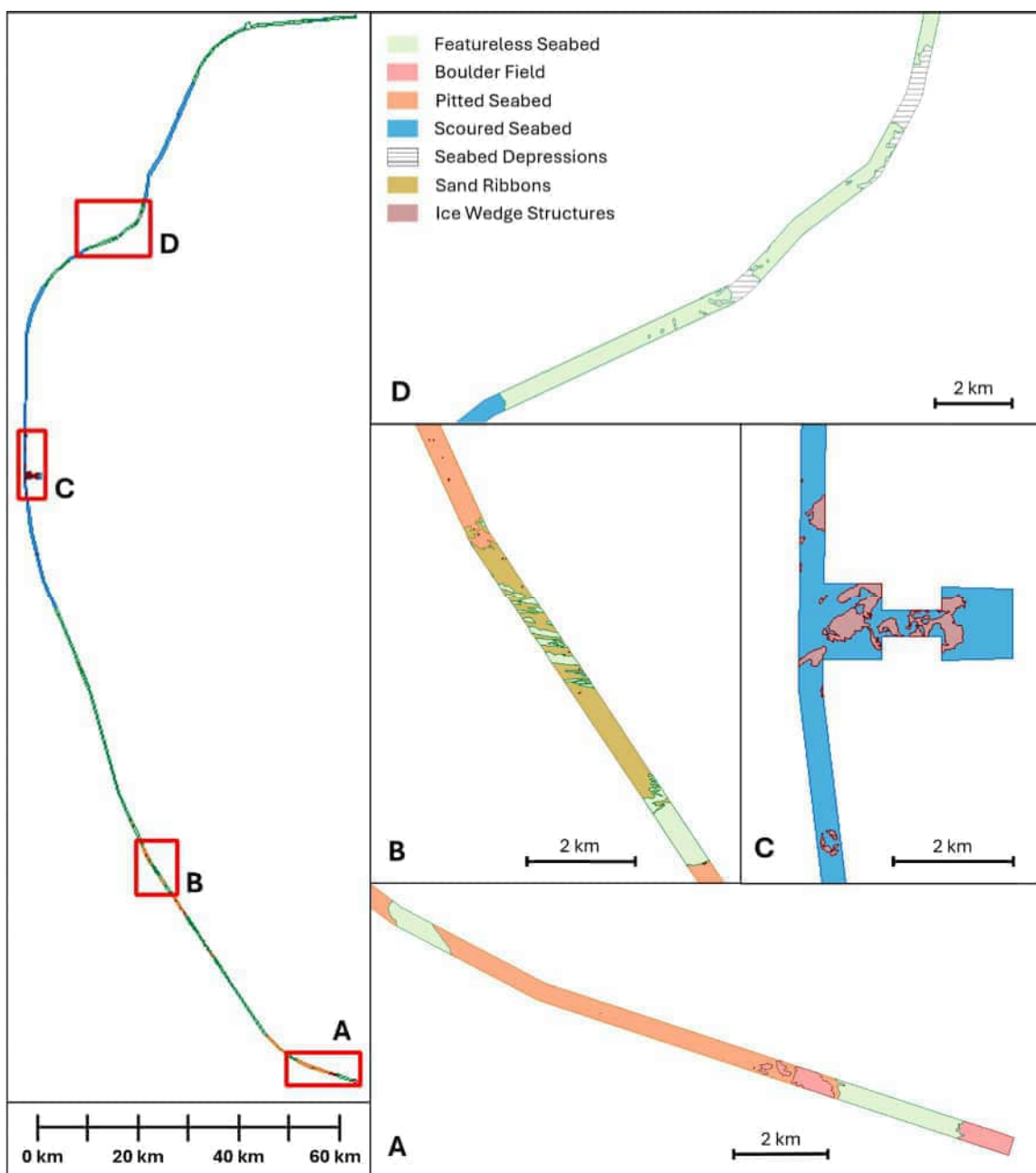


Figure 11-4 Seabed morphology

A small patch of ripples occurs at 434216 E, 6915683 N, followed by two more patches adjacent to Station 55 (Table 11-1). These ripples are small enough to have no measurable height in MBE data and are barely discernible in SSS sonograms.

Featureless seabed resumes as the main morphology beginning at 437344 E, 6922467 N. Alternating bands of scoured seabed cross the corridor at approximately 1 km intervals until Station 55. Featureless seabed with less frequent and irregular sections of scoured seabed fills the survey corridor from Station 55 until the northern end of the route.

11.4 Seabed Sediment Classification

Seabed sediments were classified based on acoustic response in both sidescan sonar and multibeam backscatter datasets. Determination of sediment type was further refined by analyzing geotechnical results. In general, sand covers most of the survey area, with silt and sandy silt patches scattered across the northern half. Several very small areas of gravel are located near the northern end of the route.

Sand comprises the seafloor of the southern 134 km of route corridor. Geotechnical samples in this area consistently contain fine sand with trace silt and occasional shells. Patches of silt are exposed at the seabed within shallow depressions beginning at Station 28 (Figure 11-5 inset A). Most of these silty depressions correspond to the ice wedge polygons described in §11.3.

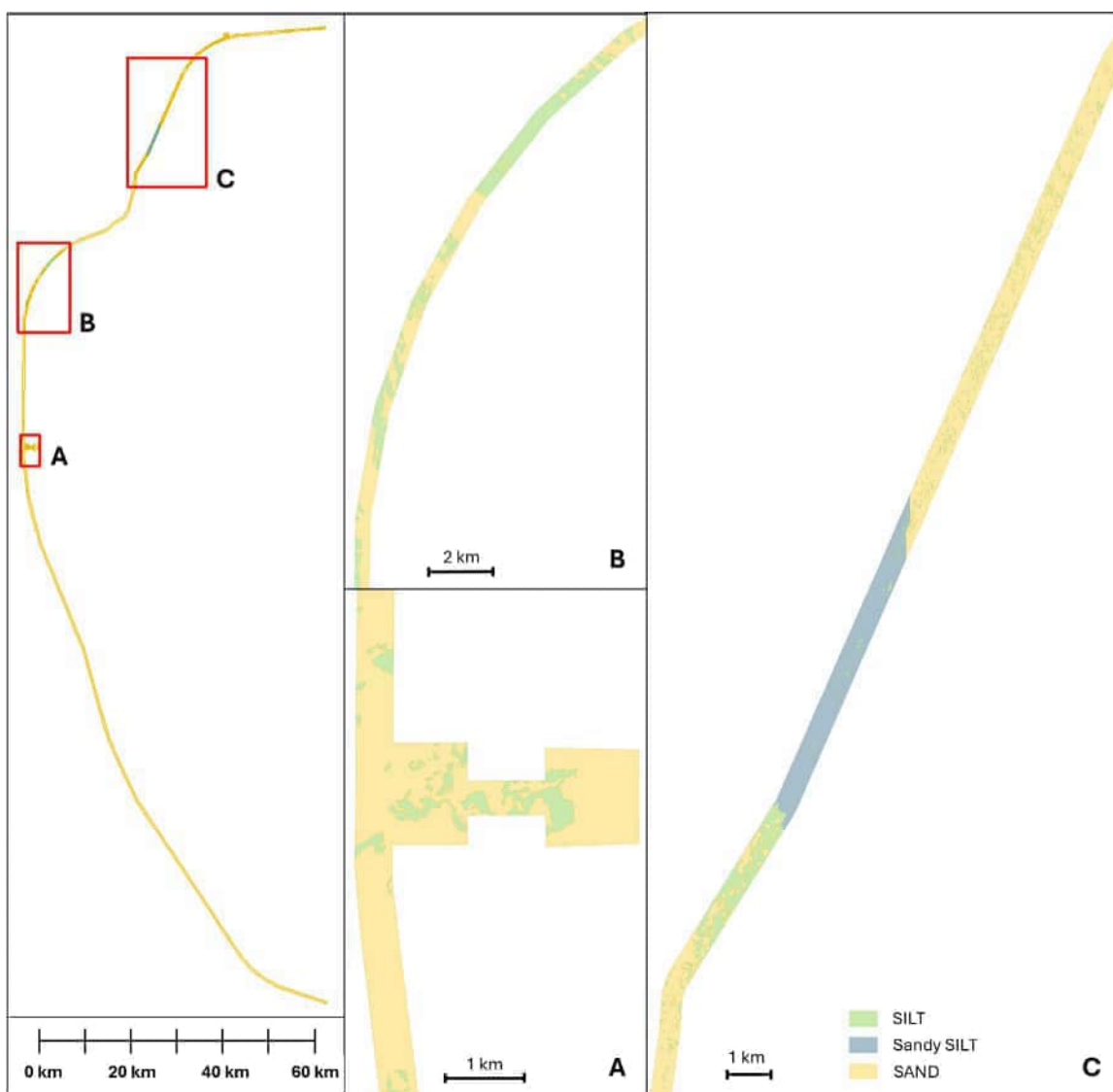


Figure 11-5 *Sediment classification*

Silt is intermittently found at the seabed until Station 33, after which there is a 20 km stretch of sand until Station 37. The piston core at Station 36 recorded 8 cm of sandy silt at the seabed, but as this veneer of silt was not visible in SSS or backscatter imagery, the seabed sediment type here was mapped as sand.

Silt and sand alternate from Station 37 to Station 41, followed by 22 km of sand (Figure 11-5, inset B). Beginning at Station 46, small patches of silt are interspersed amongst predominant sand. Silt is the main surface sediment type from Station 48 to 49, followed by 7 km of sandy silt (Figure 11-5, inset C). This section of sandy silt has higher amplitude returns than the preceding silt in geophysical datasets. Geotechnical samples, however, record predominantly silt with fine sand. The sediment grain size change in this area is

gradational between the silt at Station 49 and the sand at Station 51. After Station 51, the remainder of the route corridor is sand with scattered silt patches.

11.5 Subsurface Interpretation

Interpretation of sub-bottom profiler data was accomplished using Kingdom software. 4 main horizons were interpreted, representing the base of their respective units.

H1: Base of surficial unit, generally 0-2 m thick, thought to be mobile sand and silt either recently deposited by the Yukon river or reworked from the underlying units. Shells are common in sediment samples.

H2: Base of more consolidated silt and sand unit that is generally less than 10 m thick. Horizon H2 appears to be an erosional unconformity. Unit 2 is more sandy in the south and becomes siltier toward the northern end of corridor and the mouth of the Yukon River. Unit 2 is interpreted as Holocene fluvial and deltaic deposits.

H3: Base of deformed unit of layered silt and sand. Unit 3 is generally deeper than 10 m and rarely comes within 2 m of the seabed. Unit 3 has ice wedge structures that indicate subaerial exposure during Pleistocene lowstands.

Channels: Base of paleochannels

Additionally, internal reflectors and shallow gas have been interpreted where appropriate and are included with digital deliverables.

From the southern end of the survey area, the route corridor crosses immediately into a boulder field where the fine sand of Unit 3 is exposed at the surface (Figure 11-6). Coral fragments were sampled at geotechnical Station 1, suggesting that the cause of poor SBP penetration in this area may be partially biologic in origin.



Figure 11-6 Location of SBP figures

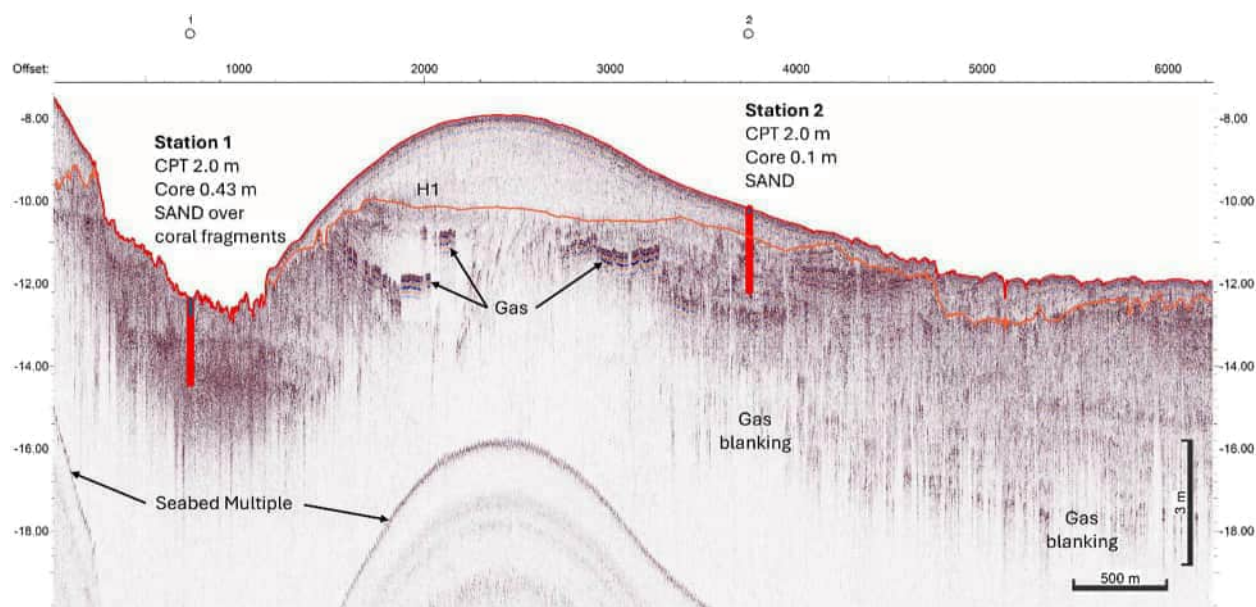


Figure 11-7 Station 1-2 SBP section showing current-scoured boulder fields on either side of an acoustically transparent sand package. Note gas blanking and gas enhancement below H1. Unit 3 lies directly beneath H1 in this area and is exposed at geotechnical Station 1.

A 0-2 m thick drifted package of recent, acoustically transparent fine sand covers the route corridor until beyond Station 2, after which Unit 1 settles into a thickness of around 1 m that persists for much of the remainder of the survey area. Gas enhancement as shown by high-amplitude reflectors are visible within Unit 3 beneath the drifted sand package. Gas blanking is widespread for the first 40 km of route corridor until beyond Station 8 (Figure 11-7).

By Station 5, Unit 2 can be seen between the deformed sediments of Unit 3 and the thin surficial layer of Unit 1. Unit 2 is within 2 m of the seabed at Station 7, where it is flanked in SBP records by two broad channels capped by prominent internal reflectors (Figure 11-8). Smaller paleochannels cut into the top of Unit 2 and are infilled by recent sediments. Shell beds along H1 can be seen as high-amplitude streaks in SBP records.

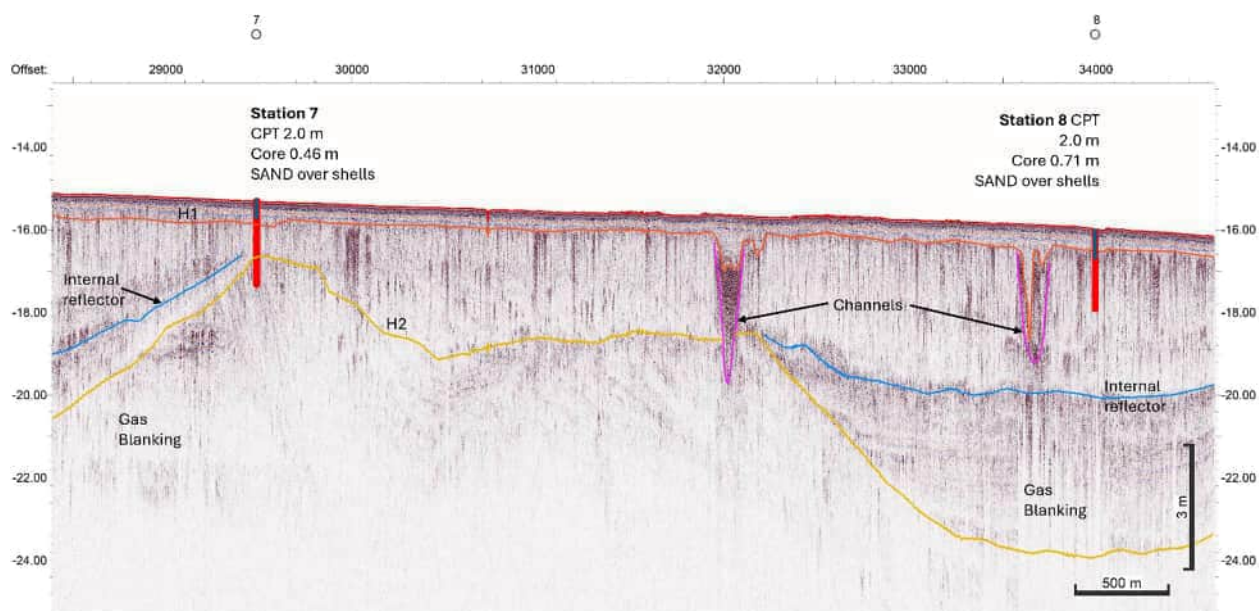


Figure 11-8 Station 7-8 SBP section. Shell beds at the base of Unit 1 show up as high amplitude returns. Small paleochannels (magenta) cut into Unit 2, while very broad channels can be seen deeper in Unit 2 beneath a prominent internal reflector.

Unit 1 varies in thickness from several decimeters up to 4 m between Station 8 and Station 33 but is present at the seabed nearly everywhere. Paleochannels intermittently cut into the sediments directly beneath H1 (Figure 11-9). H2 is visible for much of this stretch but is deep enough to be obscured in some areas. Both H1 and H2 are sometimes obscured due to the shell hash that was recorded in piston core samples. By Station 33, Unit 2 has pinched out against H1, leaving Unit 3 near the seabed. Unit 3 is exposed in several areas, revealing the ice wedge polygons described in §11.3 (Figure 11-9).

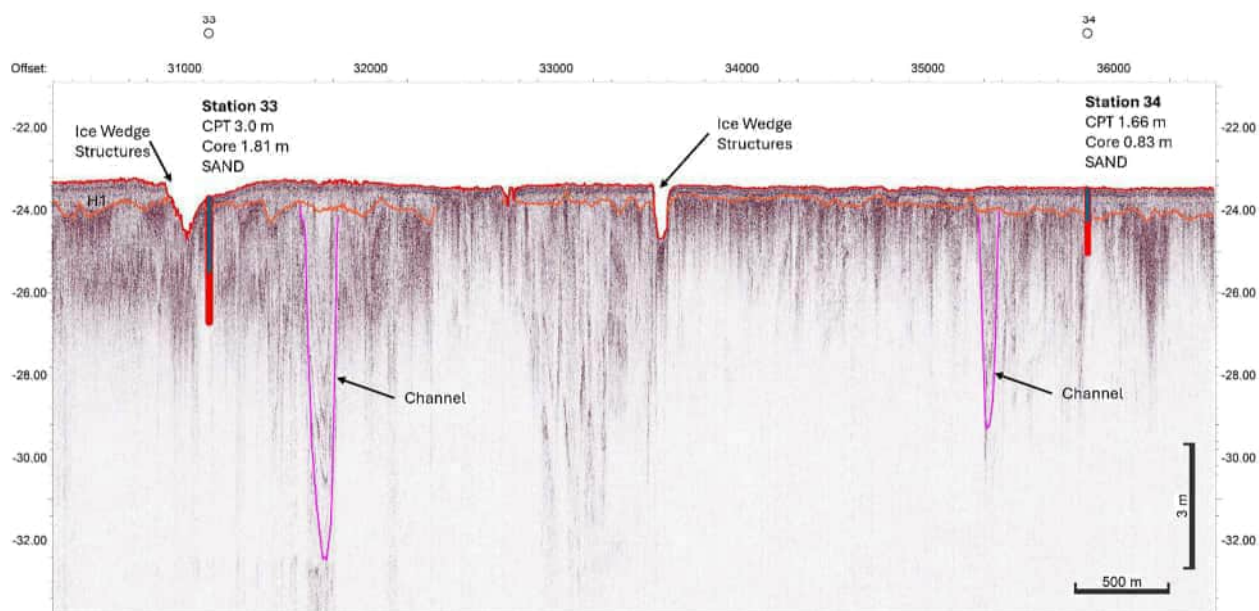


Figure 11-9 Station 33-34 SBP section. Unit 3 underlies H1 in this area. Ice wedge polygons are intermittently exposed where Unit 1 is not present.

Unit 2 is again present beginning shortly after Station 34. It remains between Units 1 and 3 for most of the next 55 km until it pinches out just before Station 45 (Figure 11-10). Shallow scoured depressions on the seabed cut through Unit 1 in this area, exposing small windows of Unit 3 at the seabed. Gas blanking can be seen intermittently from Station 45 until the end of the route corridor.

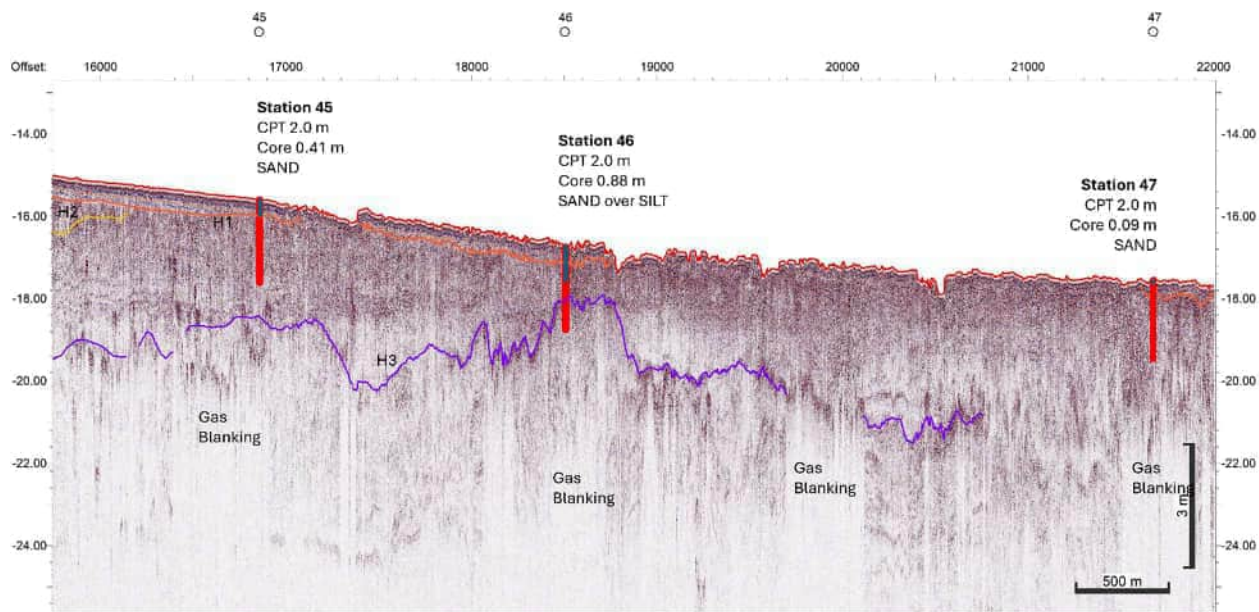


Figure 11-10 Station 45-47 SBP section. Unit 2 pinches out on the left (south) side of this image

Units 1 and 2 become siltier (though still predominantly sand in many places) in the northern section of the route corridor as it approaches the mouth of the Yukon River (Figure 11-11). Shell beds are still intermittently present, giving SBP records a mottled appearance. The depth of H2 is more consistent than in the south, staying 3-4 m below the seabed. Intermittent gas blanking and gas enhancement is common throughout the northern portion of the survey area.

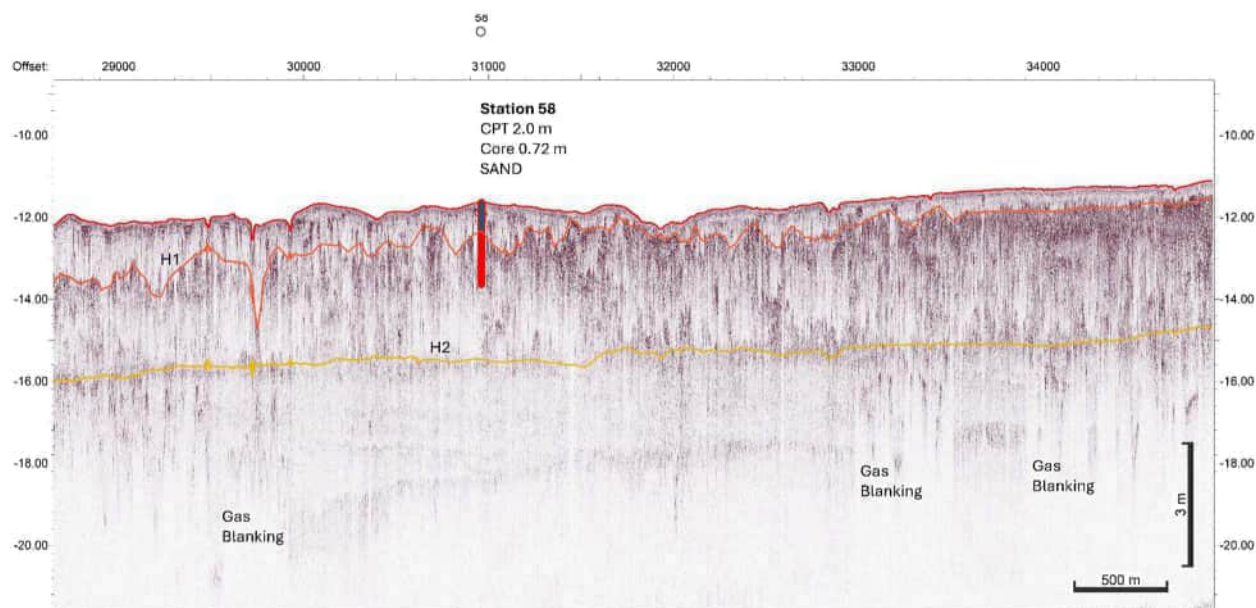


Figure 11-11 Station 58 SBP section, nearing the Yukon River mouth.

11.6 Seabed Features

11.6.1 Anthropogenic features

Only two possible anthropogenic features were identified. Both are linear features within 1 km of geotechnical Station 49. The southern feature is a 0.07 m deep by 125 m long seabed scar and is located at 430602 E, 6907480 N. The northern feature is barely visible in SSS imagery. It is approximately 150 m long, has no discernable vertical expression, and is located at 431273 E, 6908630 N.

11.6.2 Boulders

A total of 1111 boulders were picked from SSS imagery (not including boulders defined as “hazards for construction”; see §11.6.3 below). The highest concentration is in the southern portion of the survey area, with 739 boulders mapped south of geotechnical Station 15 (Figure 11-12).

11.6.3 Hazards for Construction

Hazards for construction are defined as any object protruding more than 0.25 m from the seabed. There were a total of 1024 hazards for construction identified, including 966 individual boulders and 56 boulder fields (Figure 11-12, red dots and red solid areas, respectively). All but 4 of these boulder fields are small groupings of boulders from a few meters to several tens of meters across. The highest concentration is in the southern portion of the survey area, with 743 hazards for construction identified south of geotechnical Station 15.

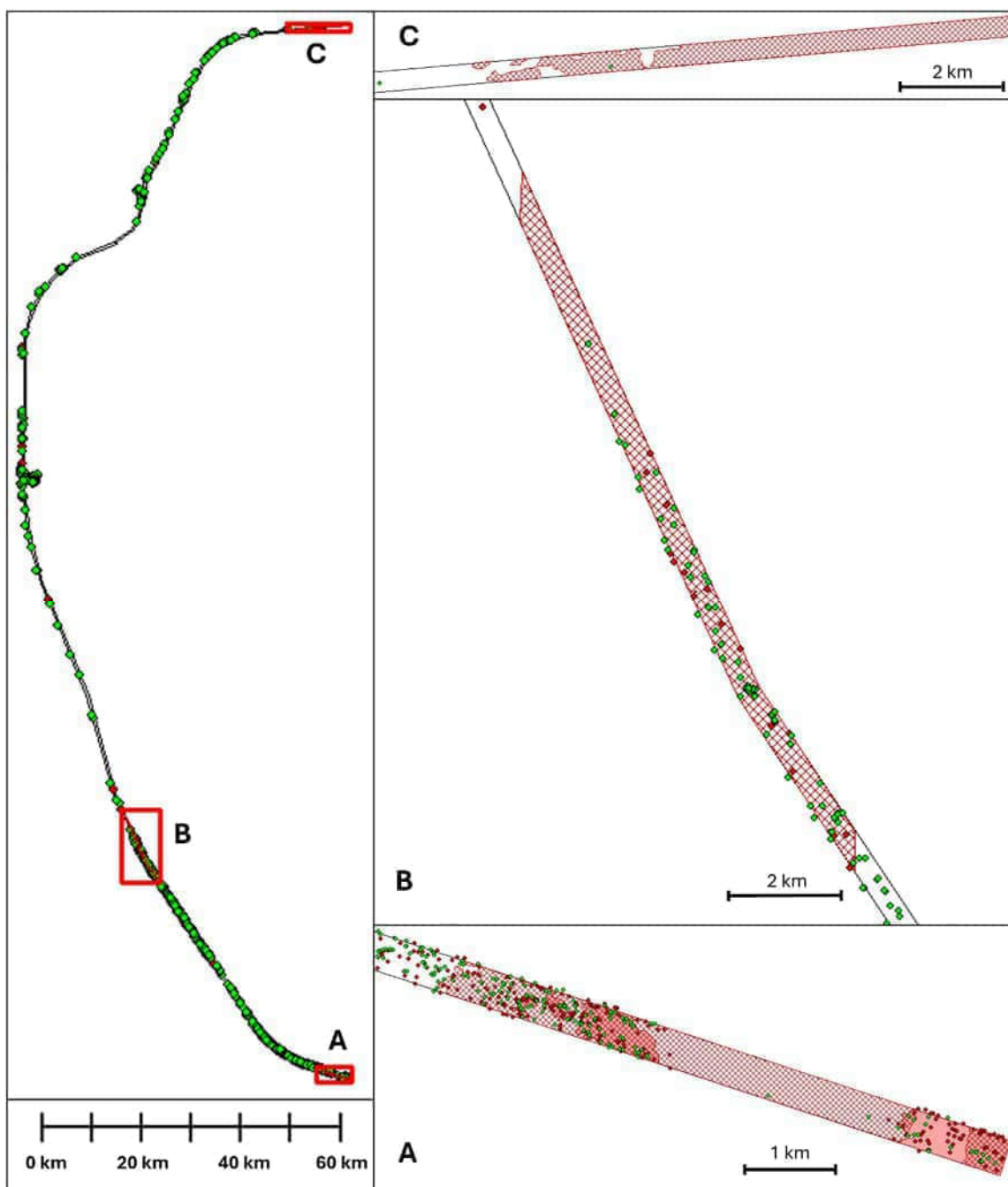


Figure 11-12 Seabed Features. Hazards to Navigation (areas with depth <12 m) in red hatch pattern; boulder fields in solid red; individual boulders are green dots; hazards for construction are red dots

11.6.4 Dangers to Navigation

Dangers to navigation are defined for this project as any area of seabed shoaler than 12 m MLLW. These depths are found at the very northern and southern ends of survey area and also from geotechnical Station 17 to Station 20 (Figure 11-12). All three of these

shallow areas occur as part of gently inclined regional slopes and are not abrupt bathymetric features that could catch vessels by surprise.

11.6.5 Absent Seabed Features

Throughout the course of the survey, Benthic personnel were watchful for seabed features that could indicate hazardous conditions such as ice gouging, bottom trawling, or vessel anchoring. No signs of these hazards were identified within the survey corridor. This lack of seabed scarring could indicate that ice and vessel activity are not a threat to infrastructure in this area. Alternately, evidence of ice or human activity may have been infilled due to soft, mobile sediments and bottom currents. Further investigation in the form of a desktop study is recommended to determine the risk of ice gouging and human activities to the proposed cable.

11.7 Summary of Hazards

Figure 11-13 below summarizes the potential hazards as outlined in previous sections.

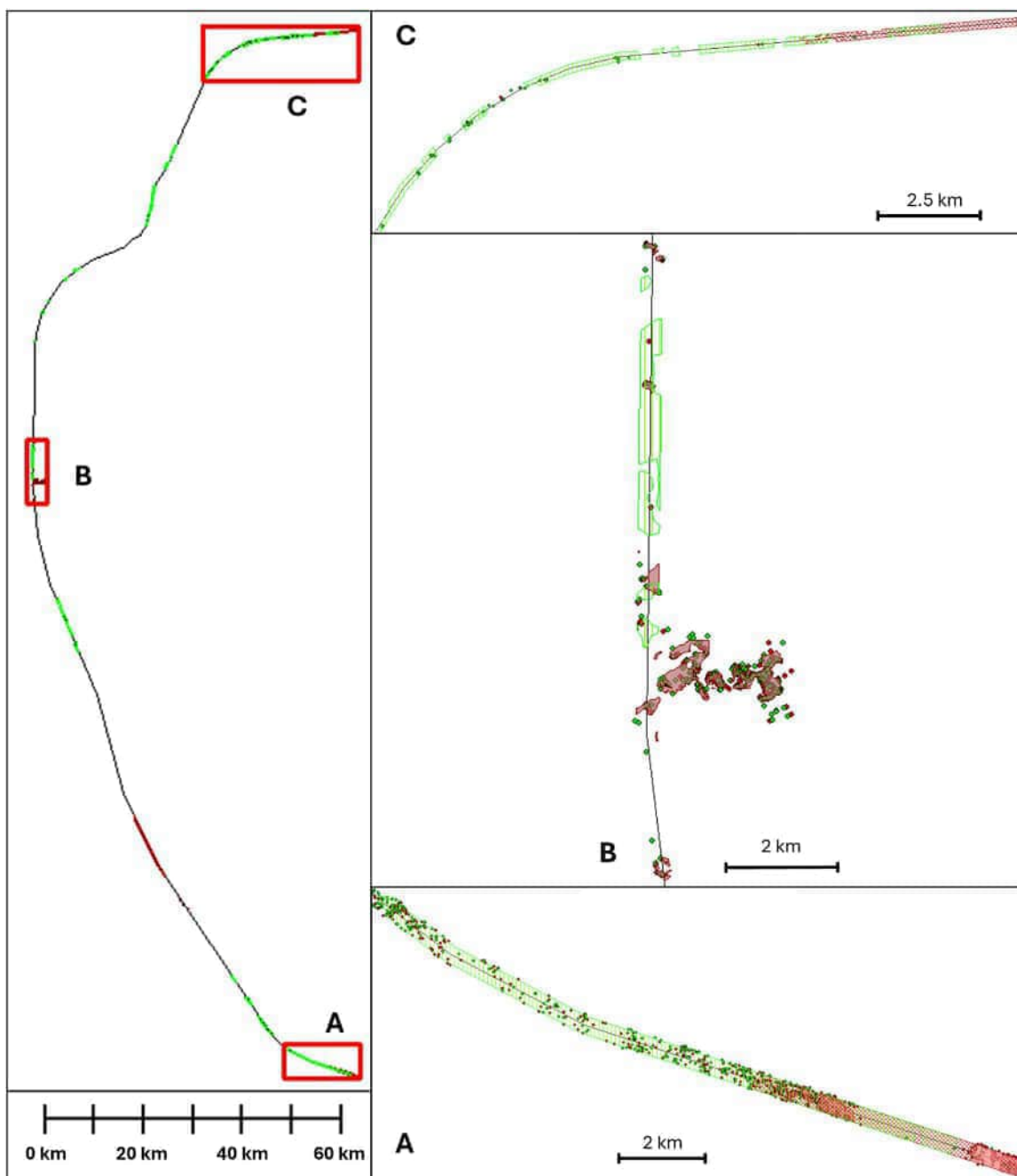


Figure 11-13 Summary of hazards. Danger to Navigation in red cross hatch. Boulder fields in solid light red (Inset A). Areas of shallow gas in green hatch. Ice wedge polygons in dark red are included due to steep but brief slopes along the edges of polygons (Inset B). Green dots are individual boulders, and red dots are individual hazards for construction.

12 REFERENCES

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13 APPENDICES

Appendix A – Daily Progress Reports (DPR) – Geophysical Expedition

Appendix B – Daily Progress Reports (DPR) – Geotechnical Expedition

Appendix C – Geotechnical Interpretation Logs

Appendix D – CPT Processing Results

Appendix E – Digital Survey Deliverables

APPENDIX A - Daily Progress Reports (DPR) – Geophysical Expedition

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APPENDIX E

NMFS ALASKA ESA SPECIES LIST



Species Directory

All Species

ESA Threatened & Endangered

Marine Mammals

Sustainable Seafood

ESA Threatened & Endangered

NOAA Fisheries has jurisdiction over 165 endangered and threatened marine species (80 endangered; 85 threatened), including [66 foreign species](#) (40 endangered; 26 threatened).

Additional species are currently under review or have been proposed for Endangered Species Act listing: [42 petitioned species](#) awaiting a 90-day finding, [9 candidate species](#) for ESA listing, [11 proposed species](#) for ESA listing.

In the table below, the Region column shows if the species can be found in a NOAA Fisheries region. If the species occurs only in areas beyond the U.S. exclusive economic zone and territorial waters, the region is labeled as Foreign.

Species Name

Species Category

All

Protected Status

All

Region

Alaska

Display

25

[Display All](#)

Species Name ▼	Species Category	Listed Entity	Protected Status	Year Listed	Recovery Plan	Critical Habitat	Region
Bearded Seal <i>Erignathus barbatus</i>	SPECIES CATEGORY Seals & Sea Lions	Beringia DPS	ESA Threatened	2012	---	Final	Alaska
		Okhotsk DPS	ESA Threatened - Foreign	2012	---	---	Foreign
Beluga Whale <i>Delphinapterus leucas</i>	SPECIES CATEGORY Whales	Cook Inlet DPS	ESA Endangered	2008	Final	Final	Alaska
Blue Whale <i>Balaenoptera musculus</i>	SPECIES CATEGORY Whales	Species	ESA Endangered	1970	Final	---	Alaska New England/Mid-Atlantic Pacific Islands Southeast West Coast
Bowhead Whale	SPECIES CATEGORY	Species	ESA Endangered	1970	---	---	Alaska

Species Name ▼	Species Category	Listed Entity	Protected Status	Year Listed	Recovery Plan	Critical Habitat	Region
<i>Balaena mysticetus</i>	Whales						
Eulachon <i>Thaleichthys pacificus</i>	SPECIES CATEGORY Fish - Protected Fish	Southern DPS	ESA Threatened	2010	Final	Final	Alaska West Coast
False Killer Whale <i>Pseudorca crassidens</i>	SPECIES CATEGORY Dolphins & Porpoises SPECIES CATEGORY Whales	Main Hawaiian Islands Insular DPS	ESA Endangered	2012	Final	Final	Pacific Islands
Fin Whale <i>Balaenoptera physalus</i>	SPECIES CATEGORY Whales	Species	ESA Endangered	1970	Final	---	Alaska New England/Mid-Atlantic Pacific Islands Southeast West Coast
Gray Whale <i>Eschrichtius robustus</i>	SPECIES CATEGORY Whales	Western North Pacific DPS	ESA Endangered	1994; 1970 (original)	---	---	Alaska West Coast
Green Sturgeon <i>Acipenser medirostris</i>	SPECIES CATEGORY Fish - Protected Fish	Southern DPS	ESA Threatened	2006	Final	Final	Alaska West Coast
Guadalupe Fur Seal <i>Arctocephalus townsendi</i>	SPECIES CATEGORY Seals & Sea Lions	Species	ESA Threatened	1985	---	---	Alaska West Coast
Humpback Whale <i>Megaptera novaeangliae</i>	SPECIES CATEGORY Whales	Central America DPS	ESA Endangered	2016	Under Development	Final	West Coast

Species Name ▼	Species Category	Listed Entity	Protected Status	Year Listed	Recovery Plan	Critical Habitat	Region
		Western North Pacific DPS	ESA Endangered	2016	Under Development	Final	Alaska
		Arabian Sea DPS	ESA Endangered - Foreign	2016	Final	---	Foreign
		Cape Verde Islands/Northwest Africa DPS	ESA Endangered - Foreign	2016	Final	---	Foreign
		Mexico DPS	ESA Threatened	2016	Under Development	Final	Alaska West Coast
Killer Whale <i>Orcinus orca</i> Also Known As Orca	SPECIES CATEGORY Dolphins & Porpoises SPECIES CATEGORY Whales	Southern Resident DPS	ESA Endangered	2005	Final	Final	Alaska West Coast
Leatherback Turtle <i>Dermochelys coriacea</i>	SPECIES CATEGORY Sea Turtles	Species	ESA Endangered	1970	Final	Final (U.S. Caribbean) Final (U.S. West Coast)	New England/Mid-Atlantic Pacific Islands Southeast West Coast
North Pacific Right Whale <i>Eubalaena japonica</i>	SPECIES CATEGORY Whales	Species	ESA Endangered	2008; 1970 (original)	Final	Final	Alaska West Coast
Ringed Seal <i>Phoca (pusa) hispida</i>	SPECIES CATEGORY Seals & Sea Lions	Ladoga subspecies	ESA Endangered - Foreign	2012	---	---	Foreign
		Saimaa subspecies	ESA Endangered - Foreign	1993	---	---	Foreign
		Arctic subspecies	ESA Threatened	2012 (original); 2018 (reinstated)	---	Final	Alaska

Species Name ▼	Species Category	Listed Entity	Protected Status	Year Listed	Recovery Plan	Critical Habitat	Region
		Baltic subspecies	ESA Threatened - Foreign	2012	---	---	Foreign
		Okhotsk subspecies	ESA Threatened - Foreign	2012	---	---	Foreign
Sei Whale <i>Balaenoptera borealis</i>	SPECIES CATEGORY Whales	Species	ESA Endangered	1970	Final	---	Alaska New England/Mid-Atlantic Pacific Islands Southeast West Coast
Sperm Whale <i>Physeter macrocephalus</i>	SPECIES CATEGORY Whales	Species	ESA Endangered	1970	Final	---	Alaska New England/Mid-Atlantic Pacific Islands Southeast West Coast
Spotted Seal <i>Phoca largha</i>	SPECIES CATEGORY Seals & Sea Lions	Southern DPS	ESA Threatened - Foreign	2010	---	---	Foreign
Steelhead Trout <i>Oncorhynchus mykiss</i>	SPECIES CATEGORY Fish - Protected Fish	Southern California DPS	ESA Endangered	1997	Final	Final	Alaska West Coast
		California Central Valley DPS	ESA Threatened	1998	Final	Final	Alaska West Coast
		Central California Coast DPS	ESA Threatened	1997	Final	Final	Alaska West Coast
		Lower Columbia River DPS	ESA Threatened	1998	Final	Final	Alaska West Coast
		Middle Columbia	ESA Threatened	1999	Final	Final	Alaska West Coast

Species Name ▼	Species Category	Listed Entity	Protected Status	Year Listed	Recovery Plan	Critical Habitat	Region
		River					
		Northern California DPS	ESA Threatened	2000	Final	Final	Alaska West Coast
		Puget Sound DPS	ESA Threatened	2007	Final	Final	Alaska West Coast
		Snake River Basin DPS	ESA Threatened	2006	Final	Final	Alaska West Coast
		South-Central California Coast DPS	ESA Threatened	1997	Final	Final	Alaska West Coast
		Upper Columbia River DPS	ESA Threatened	2006; 1997 (original)	Final	Final	Alaska West Coast
		Upper Willamette River DPS	ESA Threatened	1999	Final	Final	Alaska West Coast
		Middle Columbia River XN	ESA Experimental Population	---	---	---	Alaska West Coast
		Olympic Peninsula DPS	ESA Candidate	---	---	---	West Coast
Steller Sea Lion <i>Eumetopias jubatus</i>	SPECIES CATEGORY Seals & Sea Lions	Western DPS	ESA Endangered	1997; 1990 (original)	Final	Final	Alaska West Coast
Yelloweye Rockfish <i>Sebastes ruberrimus</i>	SPECIES CATEGORY Fish - Protected Fish	Puget Sound/ Georgia Basin DPS	ESA Threatened	2010	Final	Final	Alaska West Coast



Rural Development

Rural Utilities Service

1400 Independence Ave, SW
Room 4121, Stop 1590
Washington, DC 20250

Voice: (202) 690-4673

September 24, 2024

U.S. Fish and Wildlife Service (FWS)
Anchorage Fish & Wildlife Field Office
4700 BLM Road
Anchorage, AK 99507-2546

National Oceanic and Atmospheric Administration
National Marine Fisheries Service (NMFS)
Alaska Region, Protected Resources Division
P.O. Box 21668
Juneau, AK 99802-1668

Re: USDA Rural Utilities Service R4 ReConnect Project AK 1706-C73 Unicom,
Incorporated – Designation of Non-Federal Representative

Dear FWS/NMFS Staff,

Unicom, Incorporated (Unicom) is seeking financial assistance from the Rural Utilities Service (RUS) under its Telecommunications ReConnect Program for construction of a fiber-to-the-premise (FTTP) network to provide high-speed broadband services to underserved rural communities located in the Yukon-Kuskokwim (Y-K) Delta region for the communities of Nunapitchuk, Mertarvik, Tununak, and Toksook Bay. This project may affect Endangered Species Act (ESA) listed or proposed species and/or designated or proposed critical habitat and possibly result in harassments of species protected under the ESA and Marine Mammal Protection Act (MMPA).

To facilitate Section 7 ESA and MMPA consultation, RUS is designating Unicom and their consultant, ERM, as our non-federal representative for the purpose of initiating informal consultation with the FWS and NMFS. The role of the non-federal representative includes conducting studies, attending meetings, participating in telephone and email contact, developing draft biological assessments, etc., in support of our eventual ESA determination. The authority for making Endangered Species Act determinations remains with USDA, RUS. As the USDA, RUS environmental point of contact for this project I can be reached at Anthony.High@usda.gov or (202) 690-4673, also please include Natalie Kovach, General Field Representative (GFR) at Natalie.Kovach@usda.gov on any correspondence.

Sincerely,

**Anthony
High**

Digitally signed by
Anthony High
Date: 2024.09.24
02:09:22 -04'00'

ANTHONY W. HIGH

Environmental Protection Specialist

Policy & Outreach Division Engineering Branch

Telecommunications Program

Rural Utilities Service

cc: Genevieve Rozhon, Principal Consultant, Genevieve.Rozhon@erm.com
Danna Allen, Principal Consultant, danna.allen@erm.com

Application #: 101001351